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COAST AND GEODETIC SURVEY
R. S. PATTON, *Director*

UNITED STATES COAST PILOT

ATLANTIC COAST

SECTION C

SANDY HOOK TO CAPE HENRY

INCLUDING DELAWARE AND CHESAPEAKE BAYS

[THIRD EDITION]

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INTRODUCTION

DEPARTMENT OF COMMERCE,
U. S. COAST AND GEODETIC SURVEY,
Washington, February 12, 1930.

This publication covers the coast from Sandy Hook to Cape Henry, including the Delaware and Chesapeake Bays and tributaries, and the inside route from New York to Norfolk. It is based mainly upon the work of the United States Coast and Geodetic Survey, including the results of a special examination in 1929.

This volume covers the same territory as the first edition of Section C, excepting that the inland waterway along the coast of New Jersey has been omitted, as this route is fully described in the Inside Route Pilot, Coast of New Jersey. The present (third edition) has been prepared by G. D. Cowie, hydrographic and geodetic engineer, Coast and Geodetic Survey, under the direction of J. H. Hawley, chief, coast pilot section.

Valuable assistance has been rendered by the Lighthouse Service, the United States engineers, and local authorities in furnishing information for use in this volume.

The aids to navigation are corrected to February 12, 1930.

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

R. S. PATTON, *Director.*

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NOTE

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

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

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

Except where otherwise stated, all depths are at *mean low water*.

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

Heights are given in feet with metric equivalent in parentheses.

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

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

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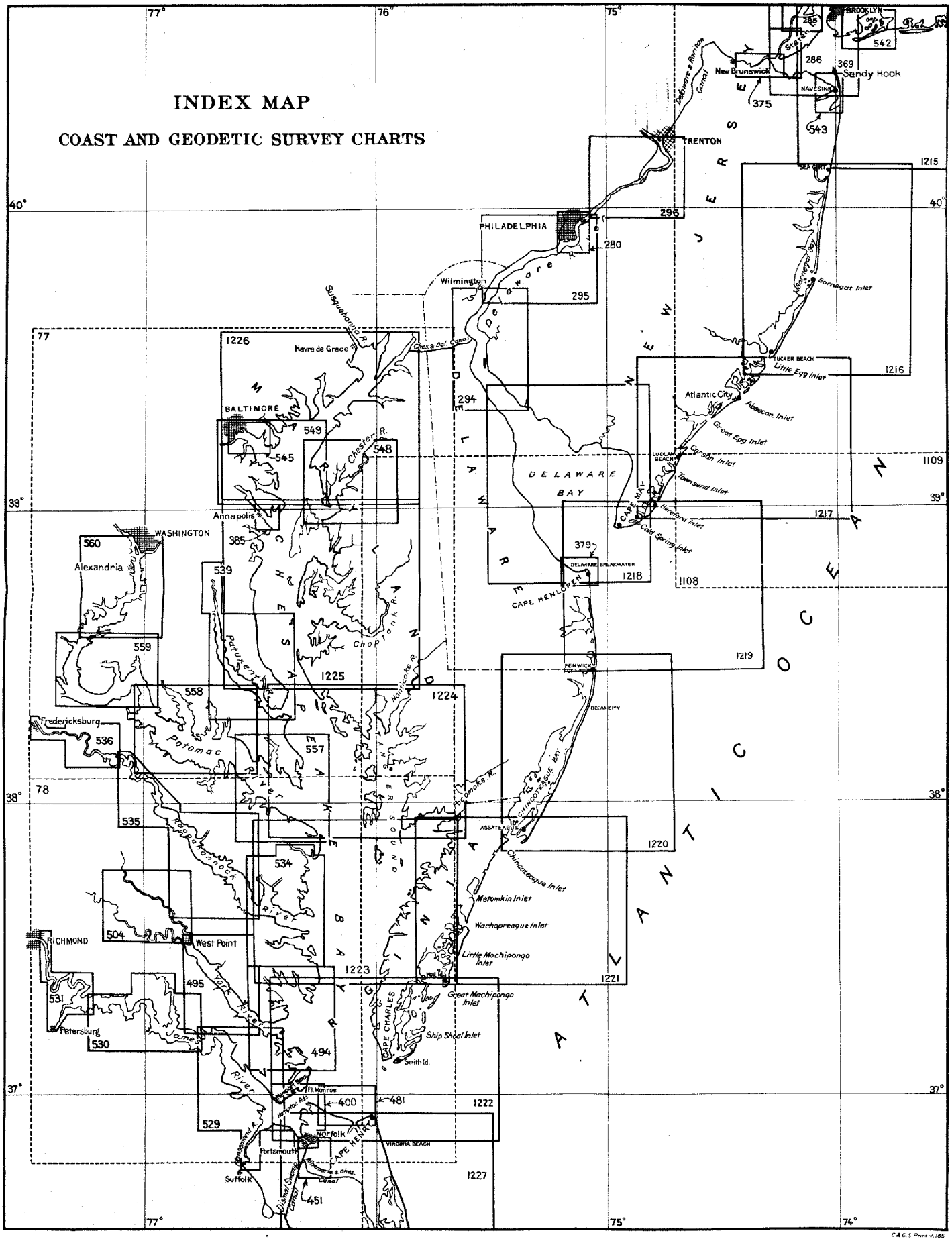
COAST AND GEODETIC SURVEY CHARTS



UNITED STATES COAST PILOT

ATLANTIC COAST—SECTION C—SANDY HOOK TO CAPE HENRY

GENERAL INFORMATION

The information contained in this volume relates to the coast from Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays and tributaries, and the inside route from New York to Norfolk, and embraces the coast of New Jersey, Delaware, Maryland, and a part of Virginia.

The general character of the coast is low and sandy, backed by woods, except in the vicinity of Navesink Highlands, where the land reaches a height of 180 feet (55 m.). The coast of New Jersey is distinguished by the large number of summer resorts, and the coast southward has few landmarks except the lighthouses and Coast Guard stations. The depths along the coast are irregular, there being many outlying sand shoals, and the lead is of little assistance to the navigator.

The coast is broken by two important entrances, Delaware and Chesapeake Bays, having broad and deep channels leading into them, and all of the other entrances are narrow inlets, subject to frequent change in depth and position. Inside the entrances there is generally little natural change in the shore, shoals, and other features, except in the more open parts of Delaware and Chesapeake Bays. The only rocky areas within the limits of this volume are a few scattered spots in Delaware River, in Chesapeake Bay above Patapsco River, and near the heads of the larger tributaries on the western side of Chesapeake Bay.

Harbors and ports.—The most important places, either commercially or as harbors of refuge, are Delaware Breakwater, Wilmington, Chester, Philadelphia, Camden, Hampton Roads, Norfolk, Newport News, and Baltimore.

The only **anchorage** between New York Harbor and Chesapeake Bay entrance available for vessels bound along the coast is Delaware Breakwater, used by vessels of all classes. Small local craft often seek shelter inside the inlets, but they can not be entered in safety during heavy weather, and are often difficult for strangers even in good weather. Hampton Roads is the most important anchorage in the southern part of Chesapeake Bay, though vessels entering the bay for shelter often anchor in Lynnhaven Roads in southerly weather. The principal anchorages in Delware Bay and River are described on page 45, and those in Chesapeake Bay on page 103.

Aids to navigation.—The lighthouses, lightships, and other aids to navigation are the principal guides and mark the approaches and channels to the important ports. The buoyage accords with the system adopted in United States waters which is described below. The principal coast lights are described in the text of this volume. Descriptions of all aids to navigation will be found in the following publications of the United States Lighthouse Service.

The Light List, Atlantic and Gulf Coasts of the United States (price $0.50), contains complete descriptions of all lighted aids along the coasts mentioned.

Local Light List, Narragansett Bay to Cape May (price $0.20), and Local Light List, Cape May to Cape Lookout, including Delaware and Chesapeake Bays (price $0.30), contain descriptions of all lighted aids, buoys, and daymarks in the sections mentioned.

These publications may be obtained from the Division of Publications, Department of Commerce, and from agents in various ports. A list of agents is published in the first notice each month of the Weekly Notice to Mariners.

All lightships and some light stations in the region covered by this volume are equipped to transmit radio fog signals, and there are numerous radiocompass stations located along the coast, and particularly in the vicinity of the entrances to the principal ports. (See Radio service, p. 12).

System of buoyage.—In conformity with section 4678 of the Revised Statutes of the United States, the following order is observed in coloring and numbering buoys in United States waters, viz:

In approaching the channel, etc., from seaward, *red* buoys, with *even* numbers, will be found on the starboard side.

In approaching the channel, etc., from seaward, *black* buoys, with *odd* numbers, will be found on the port side.

Buoys painted with red and black horizontal stripes will be found on obstructions, with channel ways on either side of them, and may be left on either hand *in passing in*.

Buoys painted with white and black perpendicular stripes will be found in midchannel, and must be passed close-to to avoid danger.

All other distinguishing marks to buoys will be in addition to the foregoing and may be employed to mark particular spots.

Perches, with balls, cages, etc., will, when placed on buoys, be at turning points, the color and number indicating on what side they shall be passed.

Nun buoys, properly colored and numbered, are usually placed on the starboard side and can buoys on the port side of channels.

Day beacons (except such as are on the sides of channels, which will be colored like buoys) are constructed and distinguished with special reference to each locality, and particularly in regard to the background upon which they are projected.

Buoys maintained by the United States Army Engineers for dredging purposes are painted white with the top, for a distance of 2 feet, painted dark green.

Bridge regulations.—Regulations for lighting bridges over navigable waters, also for lights on sheer booms, piers, dams, and similar obstructions to navigation are prescribed by the Department of Commerce. A copy of these regulations will be sent free of charge to any shipmaster, pilot, or bridge owner on application to the Division of Publications, Department of Commerce, Washington, D. C. The lighthouse superintendents have immediate au-

thority over lighting of structures in their respective districts and are charged with the enforcement of the regulations.

Regulations for the operation of drawbridges are prescribed by the Secretary of War and are included in the War Department publication Rules and Regulations relating to the Navigable Waters of the United States (price $0.50), which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. Extracts from these regulations are given in this volume in connection with descriptions of various localities where the regulations apply.

Fish weirs are numerous along the outside coast and in Chesapeake Bay and tributaries. The stakes often become broken off and form a danger to navigation, especially at night. Regulations limiting the areas within which fish weirs may be established have been prescribed by the Secretary of War, and the supervision of the fishing structures is controlled by the Chief of Engineers, United States Army. Strangers should proceed with caution when crossing areas of possible fish weirs, and should avoid crossing such areas at night, whenever possible. The areas within which fish weirs are allowed along the coast from Cape Henlopen to Cape Charles are described on page 87; further information concerning fish weirs in Chesapeake Bay is given on page 104. As a general rule, fish-trap limits are shown on the charts.

Fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation as follows:

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 highwater 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 War 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.

Regulations for passing dredges are prescribed by the Secretary of War for many channels and are given under the descriptions of the channels.

Signals for surveying vessels.—The following special signals for surveying vessels of the United States employed in hydrographic surveying have been prescribed:

A surveying vessel of the United States, under way or at anchor in a fairway and employed in hydrographic surveying, may carry where they can best be seen, but in any case well above the running lights prescribed by law for preventing collisions, three lights in a vertical line one over the other and not less than 6 feet apart. The highest and lowest of these lights shall be green, and the middle light shall be white, and they shall be of such a character as to be visible all around the horizon at a distance of at least 2 miles. In the case of a small vessel the distance between the lights of such private code may be reduced to 3 feet if necessary.

By day such surveying vessel may carry in a vertical line, not less than 6 feet apart, where they can best be seen, three shapes of 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.

Lighthouse tenders when working on buoys in channels or other frequented waters may display a red flag (international signal-code letter B) and a black ball at the fore as a warning to other vessels to slow down in passing.

The wire drags, some of which are over 2 miles long, 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 not to pass close to the towing launch; also to change course so as to cross the drag approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires.

Supplies.—Coal, fuel oil, gasoline, fresh water, and supplies of all kinds are obtainable at Wilmington, Philadelphia, Norfolk, Newport News, Richmond, Washington, and Baltimore. Coal in limited quantities can also be obtained at the other cities and many of the larger towns. Gasoline, provisions, and water are obtainable at practically all of the towns and villages. Further information is given under the different headings.

Repairs.—Philadelphia, Camden, Wilmington, Chester, Norfolk, Newport News, and Baltimore are the principal places at which ex-extensive repairs to the hulls and machinery of vessels can be made. Small vessels and motor boats can be hauled out and minor repairs to machinery can be made at many other places, as mentioned under the descriptions of the towns.

The following table lists the largest dry docks and marine railways at the places mentioned:

Dry docks and marine railways

Port	Type	Length over blocks	Depth on sill at high water	Capacity
Sandy Hook to Cape May		*Feet*	*Feet*	*Tons*
Bayhead	Railway	[1] 65	4	
Forked River	do	75	5	70
Atlantic City	do	75	8	
Cape May Harbor	do	125	10	100
Delaware Bay and River				
Bivalve	Railway		7	150
Dorchester	do	120	12	250
Greenwich Piers	do	120	9	
Wilmington	do	225	13	1,000
Do	Dry dock	344	12	4,000
Chester	Floating dock	[1] 550	40	11,000
Essington	Railway	120	12	125
Camden	do	300	11, 16	2,000
Do	Floating dock	230	12	2,000
Philadelphia	do	250	16	3,500
Do	Railway	270	13, 17	2,500
Philadelphia (navy yard)	Dry dock	1,011	43	
Cape Henlopen to Cape Charles				
Chincoteague	Railway	[1] 65	5	50

[1] Length of vessel that can be hauled.

Dry docks and marine railways—Continued

Port	Type	Length over blocks	Depth on sill at high water	Capacity
Chesapeake Bay		*Feet*	*Feet*	*Tons*
Hampton	Railway	[1] 125	6, 9	125
Norfolk	Floating dock	[1] 360	19	4, 000
Do	Railway			1, 000
Berkley	do	400		5, 000
Portsmouth (navy yard)	Dry dock	1, 011	35	
Newport News	do	737	30	20, 000
West Point	Railway	120	8	300
Mobjack Bay	do	60	5	
Weems	do	[1] 180	12	1, 000
Urbanna	do	[1] 50	5	
Ocran	do	40	4	
Reedville	do	85	7	85
Alexandria	do	200	11, 15	
Washington	do	65	3, 6	75
Washington (navy yard)	do	130	8, 12	500
Solomons	do	[1] 125	10	200
Baltimore	Dry dock	600	24	20, 000
Do	Railway	380	15, 20	4, 000
Pocomoke City	do	125	7	200
Crisfield	do	100	6	125
Salisbury	do	125	5, 10	175
Sharptown	do	173	7, 13	1, 000
Seaford	do	[2] 155		
Bethel	do	100	7	100
Cambridge	do	[1] 100	9	150

[1] Length of vessel that can be hauled. [2] Temporarily out of commission

Holidays observed by stevedores.—Holidays observed by stevedores at a number of ports in the region covered by this volume are listed in the following table. As a general rule, Sundays are observed as holidays and, when another holiday falls on Sunday, the following Monday is observed.

Unless otherwise noted, stevedores are not prohibited from working ships on holidays by law, union rules, or other regulations, and it is possible to make arrangements in advance for work on such days. For work on holidays stevedores usually receive extra pay in accordance with rates fixed by agreement between the labor unions and ship operators.

Port	Holidays observed													Remarks
	Jan. 1	Jan. 19	Feb. 12	Feb. 22	Good Friday	May 30	July 4	Labor Day[1]	Oct. 12	Election day	Nov. 11	Thanksgiving Day[2]	Dec. 25	
Baltimore, Md	X	--	--	X	X	X	X	X	--	--	X	X	X	Overtime for work on Saturday afternoons. Only mail and baggage handled on July 4, Labor Day, and Dec. 25 except by special agreement.
Newport News, Va	X	X	--	X	--	X	X	X	--	X	--	X	X	Only mail, baggage, and ships in distress can be worked on July 4, Labor Day, and Dec. 25.
Norfolk, Va	X	X	--	X	--	X	X	X	--	X	--	X	X	Do.
Philadelphia, Pa	X	--	X P	X P	--	X	X	X	--	--	X P	X	X	Half-day on Saturdays. Work done on holidays only when extremely necessary. Sunday work prohibited by law.
Trenton, N. J	--	--	--	--	--	--	--	--	--	--	--	--	--	No holidays observed. Special arrangements necessary for Sunday work.
Wilmington, Del	X	--	X	X	X	X	X	X	X	X	X	X	X	Half-day on Saturdays.

[1] First Monday in September.
[2] Last Thursday in November.
X indicates day observed as holiday; XP indicates day observed as partial holiday.

PILOTS AND PILOTAGE

Pilots.—Pilotage is compulsory for certain inward and outward bound vessels in Delaware Bay and River and Chesapeake Bay. Pilots cruise off the entrances of both bays and are always available. Further information concerning pilotage in Delaware Bay and River is given on page 46, and in Chesapeake Bay on page 102.

Local boatmen competent to act as pilots can usually be found near the entrances to the principal inlets and to the tributaries of Delaware and Chesapeake Bays; the charge for piloting in this case is by special agreement with the pilot.

Towboats are stationed at Wilmington, Philadelphia, Norfolk, Newport News, West Point, Washington, and Baltimore.

Harbor masters are appointed for the principal ports, and they have charge of the anchorage and berthing of vessels in their respective harbors. Harbor and anchorage regulations are given under the descriptions of the ports or in the Appendix.

Navigation laws of the United States are published by the Bureau of Navigation, Department of Commerce, at intervals of four years, the present edition being that of 1927. The volume can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.; price, $1.

Rules of the Road.—International and inland "Rules to prevent collisions of vessels," lines within which the inland rules apply, and "Regulation of motor boats," are published in the Appendix.

Pilot Rules for certain inland waters of the Atlantic and Pacific coasts and of the coast of the Gulf of Mexico are published by the Steamboat Inspection Service in Form 804.

Copies of these pamphlets are furnished by the officers of the Steamboat Inspection Service, and can also be obtained from the Division of Publications, Department of Commerce, Washington, D. C.

QUARANTINE AND MEDICAL RELIEF

Quarantine.—Quarantine for all ports within the limits of this volume is enforced in accordance with the regulations of the United States Public Health Service. These regulations will be found at the stations of the service and at American consulates and will be furnished to vessels upon application, either by officers of the service or by the bureau in Washington, D. C. Every vessel should be provided with the quarantine regulations.

Quarantine inspection for all ports on Delaware Bay will be conducted by the United States Public Health Service at Marcus Hook, Pa.

Quarantine inspection for all ports on Chesapeake Bay and tributaries, excepting Baltimore, is conducted by the United States Public Health Service in Hampton Roads, off Point Comfort.

Vessels bound to Baltimore are not required to undergo quarantine inspection in Hampton Roads, and should proceed direct to the quarantine anchorage off Leading Point, Patapsco River, and there undergo the required quarantine inspection conducted by the United States Public Health Service.

Vessels bound for Alexandria or Washington should undergo quarantine inspection in Hampton Roads, but may be inspected at

port of arrival; this latter procedure, however, may subject the vessel to some delay, as facilities for performing the necessary inspections are not as good as in Hampton Roads.

Medical relief.—American merchant seamen are entitled to free medical relief at the expense of the Government through the United States Public Health Service at its established marine hospitals and relief stations. A list of such stations in the region covered by this volume is given below.

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

Marine hospitals:
- Baltimore, Md.
- Norfolk, Va.

Relief stations:
- Philadelphia, Pa.
- Cambridge, Md.
- Chincoteague, Va.
- Lewes, Del.
- Perth Amboy, N. J.
- Solomons, Md.
- Washington, D. C.

Relief stations:
- Cape May, N. J.
- Crisfield, Md.
- Newport News, Va.
- Richmond, Va.
- White Stone, Va.

Relief stations, fourth class (in charge deputy collector of customs):
- Wilmington, Del.
- Reedville, Va.

WEATHER

Prevailing winds.—North of the thirty-eighth parallel the prevailing winds are westerly. South of the thirty-eighth parallel they are southerly throughout the year, except in September and October, when they are northeasterly. They are subject to many variations at all seasons. See also the meteorological tables in the Appendix.

Fogs are most frequent along the coast during the months of March and April, but may be met with at other times during the year. Easterly winds bring them and westerly and northerly winds clear them away. In the late fall dense fogs are liable to occur, and may last two or three days, sometimes practically suspending navigation in the harbors and bays.

In Chesapeake Bay fogs are most frequent in the spring, fall, and winter months and will sometimes remain for a period of several days, during which time navigation in the bay and its tributaries is seriously interrupted. The most dense fogs and those of longest duration occur from early in November to March. During the summer months there will sometimes be a fog in the tributaries of the bay during the early morning, but it rarely interrupts navigation after the sun is two hours high.

The following table shows the average number of hours per month, from a record of about five years, that the fog-signals were operated at the stated light stations of the United States:

Hours of operation of fog signals

Light station	January	February	March	April	May	June	July	August	September	October	November	December	Total
Ambrose Channel Light Vessel	123	86	116	86	113	89	69	43	70	57	55	76	983
Northeast End Light Vessel	124	84	154	121	133	70	35	18	59	64	34	97	993
Overfalls Light Vessel	80	65	71	43	72	58	37	23	55	49	43	43	639
Fourteen-foot Bank	92	58	68	30	43	23	13	4	45	27	45	37	485
Ship John Shoal	85	48	61	24	27	16	11	5	30	22	52	43	424
Christiana North Jetty	59	31	49	12	12	7	6	6	19	12	42	43	298
Cherry Island	75	41	56	15	15	5	8	6	20	20	48	45	354
Fort Mifflin	48	33	48	16	10	9	11	12	46	24	42	44	343
Fenwick Island Shoal Light Vessel	48	51	57	50	74	49	15	10	23	17	29	29	452
Winter Quarter Shoal Light Vessel	35	50	67	48	68	50	8	6	23	16	25	23	419
Killick Shoal	29	38	28	13	26	13	2	1	11	10	26	29	226
Cape Henry	46	42	55	41	35	19	0	1	4	18	18	35	314
Thimble Shoal	31	31	37	18	15	6	1	1	4	13	23	28	208
Newport News Middle Ground	29	23	27	10	8	2	5	1	8	14	23	26	176
Deep Water Shoals	32	21	24	6	4	3	1	0	8	9	22	28	158
Jordan Point	12	10	8	1	1	0	1	1	2	8	14	15	73
York Spit	40	40	47	15	15	6	1	0	4	8	27	35	238
Bells Rock	17	18	13	7	3	2	1	0	16	18	23	16	134
Bowlers Rock	27	16	8	3	3	3	3	2	8	11	28	14	126
Windmill Point	58	46	64	21	18	6	1	0	7	16	25	45	307
Janes Island	51	35	35	10	8	2	0	1	8	3	24	33	210
Smith Point	60	58	62	21	19	7	1	0	11	6	23	31	299
Blackistone Island	39	28	47	8	5	2	0	0	7	8	31	20	195
Maryland Point	39	30	39	6	8	4	1	1	13	14	28	21	204
Fort Washington	38	38	27	6	4	4	1	2	20	20	38	21	219
Great Shoals	52	37	42	11	7	11	2	3	21	13	26	28	253
Cedar Point	60	49	56	17	16	8	0	1	10	12	28	30	287
Sharps Island	51	46	45	10	12	3	0	0	4	6	24	22	223
Choptank River	59	54	45	10	12	6	4	3	18	13	37	32	293
Bloody Point Bar	62	42	46	11	15	4	0	0	8	3	32	22	245
Sandy Point	74	53	73	20	20	6	2	1	11	9	35	38	342
Fort Carroll	49	29	33	6	2	2	0	1	11	5	33	23	194
Pooles Island	30	15	10	5	4	2	0	1	4	3	23	14	111
Turkey Point	70	22	54	13	20	9	3	4	10	20	55	45	325

Ice rarely interferes with navigation along the coast, but in severe winters may form a serious obstacle to navigation inside the entrances. Ice conditions in Delaware Bay are described on page 47 and in Chesapeake Bay on page 104. Ice in the tributaries is treated under their descriptions.

STORM WARNINGS

Storm warnings are displayed by the United States Weather Bureau at numerous places on the coasts of the United States and the Great Lakes.

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.

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, indicate the approach of a storm of marked violence with winds beginning from the northeast.

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.

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.

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.

Day hurricane warnings (flags) are displayed on the following islands in the Atlantic: Jamaica, Santo Domingo, Turks Island, Bermuda, Haiti, Porto Rico, St. Kitts, Dominica, Barbados, Trinidad, and Cuba.

The following are the storm warning display stations within the limits covered by this volume:

New Jersey:
- Atlantic City.[1]
- Avalon Coast Guard station.
- Bivalve.
- Cape May Point Coast Guard station.
- Great Egg Coast Guard station.
- Island Heights (summer only).
- Little Egg Coast Guard station.
- Long Branch.
- Ocean City Coast Guard station.
- Sandy Hook.

Delaware:
- Delaware Breakwater.[2]
- Reedy Island.

Pennsylvania:
- Philadelphia, The Bourse.[2]

Maryland:
- Annapolis.
- Baltimore (American Building).
- Baltimore (The Anchorage).
- Sledds Point.
- Oxford.

Virginia:
- Cape Henry.[1]
- Fort Monroe.
- Newport News.
- Norfolk (Royster Building).[1]
- Norfolk (Navy wireless).
- Reedville.

Information relative to radiotelegraphic weather broadcasts will be found on page 21.

WEST INDIAN HURRICANES

Tropical cyclones of the North Atlantic Ocean are usually designated as West Indian hurricanes, but actually many of these storms originate and die out far from the mainland and hundreds of miles from the West Indies. The storm area varies from 100 miles or so to 500 or more miles in width, with a comparatively calm center (the area of lowest atmospheric pressure) some 10 or 20 miles in diameter. This center in some respects is the most dangerous part of the hurricane since, although the air movement within it, if any, is usually light and fitful, yet the seas here in most cases are terrible and confused, rendered so by the shifting violent winds surrounding it. The center, or "eye," is therefore a region to be especially avoided, if possible, by seamen caught in a cyclone of this character. The storm field advances in a straight or curved track, sometimes with considerable speed and sometimes at a very slow rate. The highest

[1] At these stations barometers may be compared with standards.
[2] Delaware Breakwater display duplicated on The Bourse, Philadelphia.
NOTE.—The Weather Bureau station at Cape Henry, Va., is equipped for day and night communication with passing vessels. The International Code is used by day and the Morse Code, flash light, by night. Messages to or from vessels will be forwarded to destination.

rates of progression usually occur when the storm moves northward or northeastward over the United States, or in middle and higher latitudes over the ocean. The average speed is about 12 to 15 miles an hour.

Hurricanes form over a great range of the sea between the Cape Verde and the Windward Islands, over the western part of the Caribbean Sea, and in the Gulf of Mexico. While some move northward in the beginning, especially those that originate southeast of Bermuda, the majority take a westerly to northwesterly course. Of these some curve gradually northward, either to the eastward of or above the larger islands of the West Indies, then turn northeasterly or easterly near to or far from the Atlantic coast of the United States. Others pass over or south of the greater islands and enter the Gulf of Mexico, there curving northward or northeastward and striking some part of the east Gulf coast or continuing to the westward and striking the west Gulf coast. Tracks of hurricanes are shown on the pilot charts of the North Atlantic Ocean and Central American waters, published monthly by the United States Hydrographic Office.

The hurricane season is likely to begin in June and close with November. The months of greatest frequency are August, September, and October. Hurricanes are most likely to be severe during August and the early half of September. During all the months of the season, however, the possibilities of encountering an intense storm are sufficiently great to warrant the mariner in keeping careful watch of the weather elements while in these waters.

Signs of approach.—One of the earliest signs of a hurricane is the appearance of high cirrus clouds which converge toward a point on the horizon that indicates the direction of the center of the storm. The snow-white fibrous mares' tails appear when the center is about 300 or 400 miles distant. Another usual early indication is a long, heavy swell propagated to a great distance, sometimes two or three days in advance, when there is no intervening land to interrupt it, and which comes from the general direction in which the storm is approaching. There is usually a slight rise of the barometer at the outset, followed by a continuous fall. In front of the storm, if it is advancing in some westerly direction toward the observer, the winds blow from a northerly point (northeast, north, or northwest); if in some northerly direction toward the observer, they will blow from an easterly point (southeast, east, or northeast). A further indication is a rough, increasing sea. If one or more of these signs be wanting, there is little cause for anticipating a hurricane.

As the storm center approaches the barometer continues to fall, the velocity of the wind increases and blows in heavy squalls, and the changes in its direction becomes more rapid. Rain in showers accompanies the squalls, and when closer to the center the rain is continuous and attended by furious gusts of wind; the air is frequently thick with rain and spume drift, making objects invisible at a short distance. A vessel on a line of the hurricane's advance will experience the above disturbances, except that as the center approaches the wind will remain from the same direction, or nearly so, until the vessel is close to or in the center.

Distance from center.—The distance from the center of a hurricane can only be estimated from a consideration of the height of the barometer and the rapidity of its fall, and the velocity of the wind and rapidity of its change in direction. If the barometer falls slowly and the wind increases gradually it may be reasonably supposed that the center is distant; with a rapidly falling barometer and increasing winds the center may be supposed to be approaching dangerously near.

Practical rules.—When there are indications of a hurricane vessels should remain in port or seek one if possible, carefully observing and recording the changes in barometer and wind and taking every precaution to avert damage by striking light spars, strengthening moorings, and if a steamer, preparing steam to assist the moorings. In the ports of the Southern States hurricanes are generally accompanied by very high tides, and vessels may be endangered by overriding the wharf where lying if the position is at all exposed.

Vessels in the Straits of Florida may not have the sea room to maneuver so as to avoid the storm track and should use every endeavor to make a harbor or stand out of the straits to obtain sea room. Vessels unable to reach port and having sea room to maneuver should observe the following rules:

When there are indications of a hurricane near, sailing vessels should heave to on the starboard tack and steamers remain stationary and carefully observe and record the changes in wind and barometer so as to find the bearing of the center and ascertain by the shift of wind in which semicircle the vessel is situated. Much will often depend on heaving to in time.

Bearings of center.—Facing the wind, the storm center will be 8 to 12 points to the right; when the storm is distant it will be from 10 to 12 points, and when the barometer has fallen five or six tenths it will be about 8 points.

A line drawn through the center of a hurricane in the direction in which it is moving is called the axis or line of progression, and looking in the direction in which it is traveling the semicircle on either side of the axis is called, respectively, the right hand or dangerous semicircle and the left hand or navigable semicircle.

To find in which semicircle the vessel is situated:

If the wind shifts to the right, the vessel will be in the right hand or dangerous semicircle with regard to the direction in which the storm is traveling, in which case the vessel should be kept on the starboard tack and increase her distance from the center.

If the wind shifts to the left, the vessel will be in the left or navigable semicircle. The helm should be put up and the vessel run with the wind on the starboard quarter, preserving the compass course, if possible, until the barometer rises, when the vessel may be hove to on the port tack, or if there is not sea room to run the vessel can be put on the port tack at once.

Should the wind remain steady and the barometer continue to fall, the vessel is in the path of the storm and should run with the wind on the starboard quarter into the navigable semicircle.

In all cases act so as to increase as soon as possible the distance from the center, bearing in mind that the whole storm field is advancing.

In receding from the center of a hurricane the barometer will rise and the wind and sea subside.

RADIO SERVICE

The supervision of radio communication in the United States, including the Hawaiian Islands, is controlled by the Department of Commerce and the Federal Radio Commission.

The Radio Division of the Department of Commerce issues the following publications, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices stated:

Commercial and Government Radio Stations of the United States (includes shore and ship stations), price $0.15.

Radio Service Bulletin (issued monthly to supplement Commercial and Government Radio Stations of the United States; contains amendments and other information), price $0.05 per copy; annual subscription, $0.25; foreign, $0.40.

Amateur Radio Stations of the United States, price $0.25.

Air-line Distances between Cities of the United States, price $0.05.

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

Time signals.—Radio time signals are sent daily from United States naval radio stations as indicated in the following table:

Station	Call sign	Time		Frequency in kilocycles and type of emission
		Greenwich civil	75th meridian	
Arlington, Va.[1]	NAA	1700 and 0300	Noon and 10 p. m.	113; 690; 4,015; 8,030; and 12,045; (A2).
Do	do	0800	3 a. m.	113 and 8,030 (A2).
Annapolis, Md.[1]	NSS	1700, 0300, and 0800.	Noon, 10 p. m., and 3 a. m.	17.8; (A1).
Key West, Fla.[2]	NAR	1700	Noon	106: (A1).

[1] First-order time signals suitable for chronometer rating and scientific use; normally correct as broadcast to less than one-tenth second.

[2] Second-order time signals suitable for chronometer rating and ordinary use; normally correct as broadcast to less than five-tenths second, having a generally constant lag.

NOTE.—Types of emission are: A1, unmodulated continuous waves; A2, continuous waves modulated at audible frequency.

The 690-kilocycle Arlington signal, which is in the radiophone broadcast band, is not of sufficient power for distant reception. All other Arlington and Annapolis transmissions are high power.

The observatory time signal will be transmitted one hour after the regular times in case of error or failure. For the noon signal, should the trouble not be remedied by 1 p. m., the signal will be sent out at 2 p. m. In case of the 10 p. m. signal, no further attempt will be made to transmit the signal after 11 p. m. if failure occurs at that time.

The signals begin at five minutes before the hour and continue for five minutes. During this interval every tick of the clock is transmitted except the twenty-ninth second of each minute, the last five seconds of each of the first four minutes, and finally the last 10 seconds of the last minute. The time signal is the beginning of the dash after this long break. Hydrographic information, weather reports, and other information of benefit to shipping are sent out from these stations.

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

On page 15 is given a table of corrections for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radio-compass stations or 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 radio-compass stations and radiobeacons listed in the Coast Pilots, in the light and buoy lists published by the Lighthouse Service, or in the publication Radio Aids to Navigation (H. O. No. 205), issued by the Hydrographic Office, United States Navy. The largest scale chart available should be used for this purpose.

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

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

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

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

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

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

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

Formula for the conversion of radio bearings into Mercator bearings.—The Mercator bearing is equal to the radio bearing received, plus or minus one-half the convergence of the meridians in minutes, which expressed as a formula is

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

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

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

By the formula—

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

$B=37°\ 20'$
$B'=35°\ 14'$
$B+B'=72°\ 34'$
$\frac{B+B'}{2}=36°\ 17'$
sine 36° 17′=0.59176 (from the table of natural sines, below).

Substituting these values in the formula, and observing that since the ship is in north latitude and east of the radio-compass station the + sign is used (see p. 13 for determination of signs), we have—

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

Table of natural sines

Mid. L.	Sine	Mid. L.	Sine	Mid. L.	Sine	Mid. L.	Sine	Mid. L.	Sine	Mid. L.	Sine
0°	0.00000	11°	0.19081	22°	0.37461	33°	0.54464	44°	0.69466	55°	0.81915
1°	.01745	12°	.20791	23°	.39073	34°	.55919	45°	.70711	56°	.82904
2°	.03490	13°	.22495	24°	.40674	35°	.57358	46°	.71934	57°	.83867
3°	.05234	14°	.24192	25°	.42262	36°	.58779	47°	.73135	58°	.84805
4°	.06976	15°	.25882	26°	.43837	37°	.60182	48°	.74314	59°	.85717
5°	.08716	16°	.27564	27°	.45399	38°	.61566	49°	.75471	60°	.86603
6°	.10453	17°	.29237	28°	.46947	39°	.62932	50°	.76604	61°	.87462
7°	.12187	18°	.30902	29°	.48481	40°	.64279	51°	.77715	62°	.88295
8°	.13917	19°	.32557	30°	.50000	41°	.65606	52°	.78801	63°	.89101
9°	.15643	20°	.34202	31°	.51504	42°	.66913	53°	.79864	64°	.89879
10°	.17365	21°	.35837	32°	.52992	43°	.68200	54°	.80902	65°	.90631

Table of corrections, in minutes

[Difference of longitude in minutes]

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

Radiobeacons (fog signals).—Radiobeacons operated by the United States Lighthouse Service in or near the section covered by this volume are listed in the following table:

Name of station and frequency	Call sign	Latitude N.		Longitude W.		Signal [1]	Clear-weather transmission
		°	′	°	′		
Nantucket Shoals (LS) 310 kc.	WPS [2]	40	37	69	37	4 dashes (60/120)	Second 15 minutes of each hour.
Vineyard Sound (LS) 300 kc.		41	23	71	00	1 dot and 2 dashes (60/120).	4.30 to 5 and 10.30 to 11, a. m. and p. m.
Little Gull Id. (L) 290 kc.		41	12½	72	06½	1 dot and 3 dashes (60/15).	11 p. m. to 1 a. m. and 12 noon to 12.30 p. m.
Stratford Shoal (L) 290 kc.		41	03	73	06	1 dot, 2 dashes and 1 dot (60/30).	2 to 2.30 a. m., 12 noon to 12.30 p. m., and 8 to 10 p. m.
Execution Rocks (L) 290 kc.		40	52½	73	44½	1 dash, 1 dot and 1 dash (60/15).	5 to 6.30 a. m., 12 noon to 12.30 p. m., and 6.30 to 7.30 p. m.
Fire Island (LS) 300 kc.	WPZ [2]	40	28	73	11	2 dashes (60/120)	5.30 to 6 and 11.30 to 12, a. m. and p. m.
Ambrose Channel (LS) 300 kc.	WRG [2]	40	28	73	50	Single dots (60/120)	Second 15 minutes of each third hour, beginning at midnight (3, 6, 9 a. m., 12 noon, 3, 6, 9 p. m.).
Barnegat (LS) 300 kc.	WRA [2]	39	46	73	56	3 dashes (60/120)	12.30 to 1 and 6.30 to 7, a. m. and p. m.
Five-Fathom Bank (LS) 290 kc.	WRE [3]	38	47	74	34	2 dots and 2 dashes (60/120).	4.30 to 5 and 10.30 to 11, a. m. and p. m., and second 15 minutes of each third hour, beginning at midnight (3, 6, 9 a. m., 12 noon, 3, 6, 9 p. m.).
Winter Quarter (LS) 300 kc.	WRO [3]	37	55	74	56	3 dashes and 1 dot (60/120).	12 to 12.30 and 6 to 6.30, a. m. and p. m.
Chesapeake (LS) 285 kc	WRS [2]	36	59	75	42	1 dot, 2 dashes and 1 dot (60/120).	1 to 1.30 and 7 to 7.30, a. m. and p. m.
Smith Point (L) 305 kc.		37	53	76	11	1 dash, 2 dots and 1 dash (60/120).	4 to 4.30 and 10 to 10.30, a. m. and p. m.
Cove Point (L) 305 kc.		38	23	76	23	1 dot and 2 dashes (60/120).	5 to 5.30 and 11 to 11.30, a. m. and p. m.
Cape Henry (L) 285 kc.		36	55½	70	00½	1 dash, 1 dot and 1 dash (60/120).	2 to 2.30 and 8 to 8.30, a. m. and p. m.
Diamond Shoals (LS) 300 kc.	WRV [3]	35	05	75	19	2 dashes and 1 dot (60/120).	Third 15 minutes of each hour.

[1] Sending and silent periods indicated in parentheses; thus Nantucket Lightship transmits for 60 seconds and is then silent for 120 seconds.

[2] Radio operator stands watch on 500 KC/s (600 meters) for the first 15 minutes of each hour from 8 a. m. to 9.15 p. m. (until 10.15 p. m. on Nantucket Shoals Lightship) in clear weather. Station will transmit signals for reasonable additional periods upon request.

[3] Radio operator stands watch as noted above and also from 10 to 10.15 a. m. and from 4 to 4.15 p. m. during foggy weather, at which intervals the radiobeacon is not operated.

NOTES. (L—) indicates light station; (LS) indicates lightship.

Except for stations that transmit only on request or are silent for certain watch periods during thick weather, as noted above, transmission is continuous during thick or foggy weather.

Signals are also transmitted at certain periods during clear weather as noted in the table.

Stations for which no call letters are given do not maintain radio communication.

These radio fog signals are intended for the use of vessels equipped with radio compass. By use of this radio compass (also termed radio direction finder) the bearing of the radio fog-signal station may be determined with an accuracy of approximately 2° and at distances considerably in excess of the range of visibility of the most powerful coast lights. The apparatus is simple and may be operated by the navigator without the assistance of a radio operator or without knowledge of the telegraph code. The radio direction-finding apparatus consists of a radio receiving set, similar in operation to those used for radio telegraph or telephone reception, and a rotatable coil of wire in place of the usual antenna. By rotating the coil the in-

tensity of the signal received from the transmitting station is caused to vary, and by noting the position of the coil when the signal is heard at its minimum intensity the bearing of the transmitting station is readily obtained.

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

The signals from the stations have definite characteristics for identifying the stations, as have the flashing lights and sound fog signals, and bearings may be obtained with even greater facility than sight bearings on visible objects.

During thick or foggy weather *Nantucket Shoals Lightship* sounds radio fog signals and submarine signal at the same time. The submarine signal sounds 2 groups of blasts every 90 seconds, thus, six 1-second blasts, 3½ seconds apart, 12 seconds silence, six 1-second blasts, 3½ seconds apart, 31 seconds silence. In each repetition the first dash of the radio signal and the first blast of the submarine signal are sounded at the same time. The difference in time in seconds between the reception of the first dash of the radio signal and the first blast of the submarine signal multiplied by 1,600 will give the distance in yards of the observer from the lightship.

Vessels are requested to forward reports to the Commissioner of Lighthouses, Washington, D. C., or Superintendent of Lighthouses, Boston, Mass., as to the effectiveness of this signal.

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

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

These radio-compass stations are provided, primarily, to assist the mariner in closing the land during fog or poor visibility, but they may also be used to obtain the positions of vessels at sea in radio-compass range, about 150 miles, when for any reason positions can not be obtained by other means. The maximum distance for which bearings from these stations are accurate is 150 miles. (See preceding pages for reduction of observed bearings to Mercator bearings.)

Radio-compass stations are divided into two classes: (*a*) Single stations, operating independently and furnishing a single bearing. (*b*) Harbor-entrance groups. All stations in harbor-entrance groups are connected to and controlled by the master station. All stations of the group take bearings simultaneously, and these bearings are transmitted to the ship requesting them by the control station. In some cases individual stations of a group are available for independent bearings and for use as radiobeacons.

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

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

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

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

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

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

The following radio-compass stations will be of use for vessels navigating within the approximate limits of this volume. In plotting bearings furnished by these stations the *position of receiver* must be used. Vessels equipped with a radio compass may also use these stations as radiobeacons. For this purpose a station will transmit, upon request, its call letter for 45 seconds on 800-meter wave. When the bearing is taken on the vessel, the *position of transmitter* must be used for plotting.

Station	Call letters	Position of receiver						Position of transmitter						Arc of calibration
		Latitude, north			Longitude, west			Latitude, north			Longitude, west			
		°	′	″	°	′	″	°	′	″	°	′	″	Degrees
Fire Island, N. Y.	NJY [1]	40	38	07	73	12	32							88–260
Sandy Hook, N. J.	NHD [1]	40	27	54	73	59	50	40	37	59	73	13	00	0–182
Manasquan, N. J.	NFK [1]	40	07	05	74	01	58							20–190
Cape May, N. J.	NSD [2]	38	55	53	74	54	35							40–240
Cape Henlopen, Del.	NSD [2]	38	47	35	75	05	26	38	47	35	75	05	26	0–200
Bethany Beach, Del.	NBN [2]	38	32	45	73	03	22							0–200
Virginia Beach, Va.	NCZ [3]	36	51	10	75	58	33	36	50	20	75	58	54	0–155
Poyners Hill, N. C.	NDX [3]	36	17	16	75	47	48	36	17	18	75	47	49	0–150
Cape Hatteras, N. C.	NDW [4]	35	15	59	75	31	18	35	16	00	75	31	19	30–225
Cape Lookout, N. C.	NAN [4]	34	36	11	76	32	18	34	36	12	76	32	19	40–229

[1] New York entrance group; Fire Island, master station. Bearings from Manasquan unreliable at present.
[2] Delaware Bay entrance group; Cape Henlopen, master station.
[3] Chesapeake Bay entrance group; Virginia Beach, master station; Poyners Hill also available for independent bearings and for use as radiobeacon.
[4] Hatteras group; Cape Hatteras, master station; stations also available for independent bearings and for use as radiobeacons.

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

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

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

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

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

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

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

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

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

When three stations, so situated as to give intersecting bearings, can be used and the three simultaneous bearings cross with a small "triangle of error," considerable reliance can be placed in the position obtained.

In the case of bearings which cut the coast line at an oblique angle, errors of from 4° to 5° have been reported. Bearings obtained between about one-half hour before sunset and one-half hour after sunrise are generally unreliable. It is probable that the accuracy of a bearing is also affected if the ship's transmitting instrument is not adjusted to the correct wave length. Bearings signaled as "approximate" or "second class" should be regarded with suspicion as being subject to considerable error.

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

1. Name of ship.
2. Name of radio-compass station.
3. Date and local standard time at which radio bearing was taken.
4. Bearings given by radio station.
5. Estimated position of ship at above time and dates by methods other than radio.

6. The probable degree of accuracy of the estimated position.
7. Weather conditions at above time.
8. Remarks, if any.
9. Signature of master or responsible navigating officer.

There is no charge for bearings furnished by the United States naval radio-compass stations.

Radiotelegraphic weather broadcasts.—The United States Weather Bureau issues daily (Sundays and holidays included) bulletins containing weather reports, forecasts, and warnings for the benefit of marine and aviation interests, which are broadcast from radio stations on the Atlantic coast.

Major bulletins.—These bulletins are broadcast from the Arlington (Va.) Naval Radio Station (call letters NAA) twice daily, as follows:

Morning bulletin at 10 a. m. (75th meridian) (1500 GCT) on 68 kc., 113 kc., and 16,120 kc. (continuous waves modulated at audible frequency), simultaneously.

Evening bulletin at 10 p. m. (75th meridian) (0300 GCT) on 68 kc. and 113 kc. (continuous waves modulated at audible frequency) simultaneously.

The bulletins are divided into two parts and invariably begin with the words "Weather Bureau bulletin." The first part consists of surface weather conditions based upon observations taken at 8 a. m. and 8 p. m.

Weather reports from ships in the Atlantic Ocean, and during the hurricane season additional ship reports from the Gulf of Mexico and Caribbean Sea, follow the reports from land stations in the first part of the bulletin, as follows:

In the afternoon bulletin—7 a. m. reports received too late for inclusion in the morning bulletin, and 7 p. m. reports, both of current day.

In the morning bulletin—7 p. m. reports of previous day received too late for inclusion in afternoon bulletin, and 7 a. m. current-day reports.

NOTE.—Ship reports of previous observation included only when conditions are unusual.

The second part of the bulletin consists of a summary of general atmospheric pressure distribution over land and sea, including the locations of "high" and of "low" areas and the barometer readings at their centers; wind and weather forecasts for Atlantic and Gulf of Mexico offshore areas; and storm warnings for these areas.

The weather reports contained in the bulletins and supplemented by others picked up from vessels can be used in the production of weather maps, which will be of much value to navigating officers; and charts prepared for this purpose, which show the reporting stations and their key letters, will be forwarded upon application to the United States Weather Bureau.

Complete details relative to the above service, including method of decoding the major bulletins and a list of stations from which localized broadcasts are made, are published in Circular No. 13, issued by the United States Weather Bureau. Copies of this circular may be obtained without charge upon application to any United States Weather Bureau office on the Atlantic coast. A new edition of the

Radio Weather Code, for Vessel Weather Observers (W. B. 860) was published in 1925.

Additional broadcasts are made from the following stations:

Baltimore, Md. (WMH), 418 kc. (A2), 10.30 a. m.
Norfolk, Va. (NAM), 122 kc. (A2), 8.30 a. m. and 8.30 p. m.; also 4 a. m., 11 a. m., and 4 p. m.

Wind and weather conditions at Sandy Hook, N. J., are broadcast from radio stations as follows:

New York, N. Y. (NAH), 102 kc. (A1), 10.30 a. m.
Chatham, Mass. (WIM), 406 kc. (A1), 9 a. m. and 5 p. m.
Marion, Mass. (WCC), 129 kc. (A1), 9 a. m. and 5 p. m.
Tuckerton, N. J. (WSC), 462 kc. (A1), 9 a. m. and 5 p. m.
Sayville, N. Y. (WSL), 500 kc. (A1), 9 a. m. and 5 p. m.

This information includes barometric pressure and tendency, temperature, wind direction and velocity and tendency, visibility, cloudiness, and state of sea at Sandy Hook. The information is also given by the radio stations to vessels whenever requested.

Free medical advice to seamen by radio.—Through the efforts of the Seaman's Church Institute of New York, in cooperation with the United States Public Health Service, the Radio Corporation of America has undertaken to furnish radio medical advice for the benefit of sick and injured persons on ships (of all nationalities) at sea. In addition to the marine coastal stations furnishing this service, all vessels served or controlled by the Radio Corporation of America and the United Fruit Co. or the Tropical Radio Telegraph Co. will assist in the transmission of messages, or, if carrying a doctor, will furnish radio medical advice.

The stations of these companies give preference to medical radiograms over all other messages except distress calls. There is no charge whatever either for the medical advice furnished or for the radio service in connection therewith.

The following stations of the Radiomarine Corporation of America on the east coast of the United States are at all times ready to furnish medical advice:

	Call letters
Chatham, Mass	WCC
Chatham, Mass	WIM
New York, N. Y	WNY
Tuckerton, N. J	WSC
Galveston, Tex	WGV
East Moriches, Long Island, N. Y	WSH
New London, Conn	WSA
Palm Beach, Fla	WOE
Port Arthur, Tex	WPA

Messages requesting medical advice should be signed by the master of the vessel and should state briefly but clearly the symptoms shown by the afflicted person. Operators should indicate the number of words in the message and use the prefix "DH MEDICO."

The following information on this subject has been furnished by the United Fruit Co.:

The following is a list of radio stations of the United Fruit Co. and affiliated companies through which medical service may be obtained without charge, so far as these companies are concerned, by ships of all nationalities:

Station	Call letters	Owner
Boston, Mass	WBF	Tropical Radio Telegraph Co.
Miami, Fla	WAX	Do.
New Orleans, La	WNU	Do.
Fort Morgan, Ala	WIO	Do.
Mobile, Ala	WNN	Do.
Tegucigalpa, Honduras	UG [1]	Do.
Puerto Barrios, Guatemala	UF [1]	Do.
Managua, Nicaragua	UL [1]	Do.
Bluefields, Nicaragua	UQ [1]	Do.
Cape Gracias, Nicaragua	UW [1]	Do.
Preston, Cuba	CME	Do.
Santa Marta, Colombia	UJ [1]	United Fruit Co.
Puerto Limon, Costa Rica	UX [1]	Do.
Almirante, Panama	RXA	Do.
Tela, Honduras	UC [1]	Tela Railroad Co.
Puerto Castilla, Honduras	UA [1]	Truxillo Railroad Co.
Puerto Armuelles, Panama	RXB	Chiriqui Land Co.

[1] Call letters subject to change in near future to comply with International Regulations.

Radiograms requesting medical advice should be signed by the captain of the ship and should state briefly but clearly the symptoms of the person afflicted. Such radiograms, if intended for a United Fruit Co. hospital, should be addressed "UNIFRUITCO," followed by the name of the place where the hospital is located. United Fruit Co. hospitals giving this service are located at the following points and may be reached through any of the above-mentioned radio stations: Santa Marta, Columbia; Puerto Limon, Costa Rica; Almirante, Panama; Preston, Cuba; and Puerto Barrios, Guatemala. The Tela Railroad Co. hospital is located at Tela, Honduras, and may be reached by calling "TELARAILCO TELA." The Truxillo Railroad Co. maintains a hospital at Puerto Castilla, Honduras, for which point messages should be addressed "TRURAILCO CASTILLA."

The Miami and New Orleans stations of the Tropical Radio Telegraph Co. are in a position to render medical advice through their connections with hospitals in those cities. Messages for Miami should be addressed to the radio station there, and those for New Orleans should be addressed "UNIFRUITCO NEWORLEANS."

All United Fruit Co. passenger steamships carry doctors, and free medical advice may be secured by radio from any of them by a radiogram addressed "Ship's doctor," followed by the name of the steamship.

This free medical service is established primarily for the benefit of ships not carrying doctors. However, should occasion require, ships' doctors may hold consultation by radio with the United Fruit Co. ships' doctors and hospital staffs.

The physicians and surgeons comprising the medical staff of the United Fruit Co. and its associated companies are thoroughly qualified, but in view of the fact that radio medical advice to ships at sea is given free and without an opportunity for a personal examination of the patients, no responsibility will be assumed by either the United Fruit Co. and its associated companies or the physicians or surgeons giving the advice as to its accuracy or for error or delay in the receipt or transmission of any message sent or received in connection therewith.

It is requested that when sending medical advice radiograms, radio operators check them "(number of words) DH MEDICO."

"DH MEDICO" radiograms will be given preference over all other radiograms, except S O S calls, throughout the radio service of the United Fruit Co. and affiliated companies.

Medical advice will be phrased in language intelligible to a layman. Complete details relative to the service furnished by all companies are published in the manual "Ship Sanitation and First Aid" issued by the Seaman's Church Institute of New York. This information includes diagrams and a list of symptoms to be considered in

preparing messages. Information on this subject is also included in the 1929 edition of "The Ship's Medicine Chest and First Aid at Sea" published by the United States Public Health Service.

UNITED STATES COAST GUARD STATIONS

Coast Guard stations in the region covered by this volume are listed in the following table. The stations are fully manned throughout the year and are supplied with boats, wreck guns, beach apparatus, and all other appliances for affording assistance in case of shipwreck. Instructions to enable mariners to avail themselves fully of the assistance thus afforded will be found in the appendix, page 282.

The Coast Guard stations are provided with the International Code Signals and are prepared to send or receive signals in that code or by means of the Semaphore Code, the Occulting or Flashing-light Code, or the International Morse Wigwag Code. Telephone facilities are available at the stations for the summoning of Coast Guard cutters, tugs, or other assistance, or for communicating with telegraph lines.

Name of station	State	Locality
Sandy Hook	N. J	On bay side, ½ mile south of point of Hook.
Spermaceti Cove	N. J	2½ miles south of Sandy Hook Light.
Seabright	N. J	About 1½ miles south of Navesink Light.
Monmouth Beach	N. J	About 1 mile south of Seabright.
Long Branch	N. J	Breens Pond.
Deal	N. J	Asbury Park.
Shark River	N. J	North side of the mouth of Shark River Inlet.
Spring Lake	N. J	2½ miles south of Shark River Inlet.
Squan Beach	N. J	1 mile southeast of Manasquan.
Bayhead	N. J	At the head of Barnegat Bay.
Mantoloking	N. J	2½ miles south of head of Barnegat Bay, on Island Beach.
Chadwick	N. J	5¼ miles south of head of Barnegat Bay.
Toms River	N. J	On the beach abreast mouth Toms River.
Island Beach	N. J	1½ miles south of Seaside Park.
Forked River	N. J	2¼ miles north of Barnegat Light.
Barnegat	N. J	½ mile south-southeast of Barnegat Light.
Loveladies Island	N. J	2½ miles south of Barnegat Light.
Harveys Cedars	N. J	5½ miles south of Barnegat Light.
Ship Bottom	N. J	Midway of Long Beach.
Long Beach	N. J	1¾ miles northeast of Beach Haven.
Bonds	N. J	2¼ miles southwest of Beach Haven and ½ mile north of the new inlet.
Little Egg	N. J	1¾ miles north of Little Egg Inlet.
Little Beach	N. J	South side of Little Egg Inlet.
Brigantine	N. J	5¾ miles northeast of Absecon Light.
South Brigantine	N. J	3¼ miles northeast of Absecon Light.
Atlantic City	N. J	At Absecon light.
Great Egg	N. J	6 miles southwest of Absecon Light.
Ocean City	N. J	Southside of Egg Harbor Inlet, at Ocean City.
Pecks Beach	N. J	3⅜ miles northeast of Corson Inlet.
Corson Inlet	N. J	At Strathmere.
Sea Isle City	N. J	At Sea Isle City, 3¼ miles north of Townsend Inlet.
Townsend Inlet	N. J	Near the inlet, north side.
Avalon	N. J	4¼ miles south-southwest from Ludlam Beach Light.
Stone Harbor	N. J	2⅝ miles north by east of Hereford Inlet Light.
Hereford Inlet	N. J	Near Hereford Light.
Wildwood	N. J	At Wildwood.
Cold Spring	N. J	½ mile east of Cape May City.
Cape May Point	N. J	Near the light.
Lewes	Del	2 miles west from Cape Henlopen Light.
Cape Henlopen	Del	⅞ mile southerly of Cape Henlopen Light.
Indian River Inlet	Del	North of inlet.
Fenwick Island	Del	1½ miles north of light.
Isle of Wight	Md	3½ miles south of Fenwick Light.
Ocean City	Md	At Ocean City.
North Beach	Md	10 miles south of Ocean City.
Popes Island	Va	9¾ miles northeast of Assateague Light.
Assateague Beach	Va	On Fishing Point, 3⅛ miles southwest of Assateague Light.

Name of station	State	Locality
Wallops Beach	Va	1½ miles south of Chincoteague Inlet.
Metomkin Inlet	Va	On Metomkin Beach north of the inlet.
Wachapreague	Va	South end of Cedar Island.
Parramore Beach	Va	Midway of beach.
Hog Island	Va	South end of Hog Island.
Cobb Island	Va	South end of Cobb Island.
Smith Island	Va	At Cape Charles light (old tower).
Cape Henry	Va	¾ mile southeast of Cape Henry Light.

VARIATION OF THE COMPASS

The magnetic variations for 1929 and the annual increase at points mentioned are as follows:

Locality	Variation west		Annual increase
	°	′	′
Sandy Hook	10	45	5
Atlantic City	9	15	4
Overfalls Light Vessel	8	15	4
Ship John Shoal Lighthouse	8	30	4
Reedy Island	8	30	4
Philadelphia	9	15	4
Winter Quarter Shoal Light Vessel	7	45	4
Chesapeake Light Vessel	6	30	4
Hampton Roads	6	00	3
Richmond	5	30	3
Wolf Trap Lighthouse	6	15	3
West Point	6	00	3
Pocomoke Sound	6	45	4
Vienna	7	30	4
Potomac River entrance	6	30	4
Washington	6	45	4
Cambridge	7	15	4
Bloody Point Bar Lighthouse	7	30	4
Baltimore Harbor	7	30	4
Havre de Grace	8	00	4

CURRENTS, SANDY HOOK TO CAPE HENRY

The following statements are deduced from current observations which have been made at the lightships along this section of the coast and from other sources:

Tidal currents.—These are rotary in character, generally turning clockwise, with minimum velocities three hours after strength of flood and ebb in a direction at right angles to that at the time of strength. When not influenced by the larger bays or rivers, such as Delaware River, Chesapeake Bay, and New York Bay, these tidal currents are weak, averaging about 0.2 knot at strength, the direction of the flood and ebb at strength being on and off shore, respectively. In the immediate vicinity of the larger bays or rivers, the direction of flood and ebb at strength is directly in and out, and the strength of the current is increased, depending on the proximity of the mouth. These three rivers and bays affect the direction of the tidal currents to a distance of about 20 miles from their entrances,

but the strength of the offshore current is not affected until within a few miles of the mouth.

Wind currents.—Moderate to heavy winds set up strong currents in a direction about 20° to the right of the wind, reversing or greatly accelerating the normal currents; in fact, the principal currents along this stretch of coast, when away from the larger bays, are the wind currents. Their strength and set depend on the direction, strength, and duration of the wind. The greatest observed velocities of the current at the lightships are Ambrose Channel, 1.4 knots; Northeast End, 1.2 knots; Overfalls, 3.6 knots; Winter Quarter, 0.8 knot; Fenwick Island, 2 knots; and Tail of the Horseshoe, 2.8 knots. These results are for three winter months, and probably closely approximate the maximum which might be expected.

Offshore currents.—Observations made offshore have developed the existence of weak tidal currents, veering around the compass, similar in character to those inshore, although of less strength. These are accompanied by a general drift in a southerly to southwesterly direction, amounting to about ¼ of a knot; this extends from about the 20-fathom curve out nearly to the Gulf Stream.

The following is a more detailed statement of the observations at each lightship. The wind currents are of more importance than the tidal currents, and the two must be combined in making allowance for set.

Ambrose Channel Lightship.—The tidal currents have a mean velocity of about ¼ knot at strength of flood or ebb, the flood setting in a westerly and the ebb in an easterly direction. The strength of flood occurs about 1¼ hours before time of high water at Sandy Hook, and the strength of ebb about 1¼ hours before time of low water at Sandy Hook. Wind velocities of 10 to 25 miles produce currents of about 0.5 to 1 knot, setting about 20° to the right of the wind. The greatest observed velocity of the current was about 1.4 knots during a gale.

Northeast End Lightship.—The tidal currents have a mean velocity of ¼ knot at strength of flood or ebb, the flood setting in a northwesterly and the ebb in a southeasterly direction. The strength of flood occurs about 1½ hours earlier than the strength of flood at Overfalls Lightship (or about 2½ hours earlier than the time of high water at Sandy Hook). The strength of ebb occurs about 1 hour earlier than the strength of ebb at Overfalls Lightship (or about 2¼ hours earlier than the time of low water at Sandy Hook). Wind velocities of 10 to 30 miles produce currents of about 0.5 to 0.9 knot, setting about 20° to the right of the wind. The wind current must be combined with the tidal current in making an allowance for set. The greatest observed velocity of the current was 1.2 knots during a 50-mile-an-hour gale.

Overfalls Lightship.—See currents, Delaware Bay.

Fenwick Island Lightship.—The tidal currents have a mean velocity of about ¼ knot at strength of flood or ebb, the flood setting in a northerly direction and the ebb in a southerly direction. The strength of flood occurs approximately at the same time as at Overfalls Lightship (or about 1 hour before the time of high water at Sandy Hook), and the strength of ebb occurs approximately at the same time as at Overfalls Lightship (or about 1 hour before the time

of low water at Sandy Hook). Wind velocities of 10 to 30 miles produce currents of about 0.5 to 1 knot, setting about 20° to the right of the wind. This wind current must be combined with the tidal current in making an allowance for set. The greatest observed velocity of the current was 2 knots during a 60-mile-an-hour gale.

Winter Quarter Shoal Lightship.—The tidal currents have a mean velocity of about 0.1 knot at strength of flood or ebb, the flood setting in a southwesterly direction and the ebb in a northeasterly direction, occurring 1¾ hours after the time of low water and high water, respectively, at Sandy Hook. Wind velocities of 15 to 30 miles produce currents of about 0.3 to 0.6 knot, setting about 20° to the right of the wind. The greatest observed velocity of the current was 1.0 knot.

Current tables.—Current tables, published annually in advance, give a great deal of useful information relative to currents along the coast and in Delaware and Chesapeake Bays. They are for sale by any of the sales agents or at the Coast and Geodetic Survey Office, Washington, D. C., price 10 cents.

INLAND WATERWAYS

The following data about the inland waterways are included for ready reference:

The inland waters extending eastward from New York include Long Island Sound, Narragansett Bay, Buzzards Bay, and Vineyard and Nantucket Sounds. From the head of Buzzards Bay there is an available passage through Cape Cod Canal, from which the passage to the New England coast must be made mostly outside although there are harbors at short intervals.

Long Island Sound has harbors at short intervals on both sides from its west end to Eatons Neck, and thence on its north side to and including Fishers Island Sound. From Watch Hill boats must go outside to the bays and sounds eastward, but Point Judith Harbor of Refuge is available, and shortens the distance between harbors.

On the south coast of Long Island there is at present no inside route between Jamaica Bay and the inland waters eastward. Boats must go outside from New York to East Rockaway Inlet, and the latter requires local knowledge, because of frequent changes. But from East Rockaway Inlet boats of 5 feet (1.5 m.) draft can be taken inside through Great South Bay and 3 feet (0.9 m.) draft through Moriches and Shinnecock Bays and Shinnecock Canal to Great Peconic Bay. Masted boats are limited to a height of less than 20 feet (6.1 m.) above the water by the fixed bridges over Shinnecock Canal, and otherwise all bridges have draw openings. This route is described in Coast Pilot, Section B, under the heading "Inland waters, south coast of Long Island."

By the Hudson River and Erie Canal boats can be taken from tidewater of the Hudson at Troy into the Great Lakes. There are 35 locks, and the distance from Troy to Tonawanda on the Niagara River is 290 miles. The controlling depth is 12 feet (3.6 m.), and the usable lock dimensions are 300 feet long and 44 feet wide; the lifts range from 6 to 40½ feet. By the Hudson River and Champlain Canal vessels can be taken from tidewater of the Hudson River at Troy into Lake Champlain. There are 11 locks of the same di-

mensions as given for the Erie Canal. The principal ports on the lake are Port Henry, N. Y., near the south end; Burlington, Vt., and Plattsburgh, N. Y., near midlength; and Rouses Point, N. Y., near the international boundary. Vessels can pass from Lake Champlain into the St. Lawrence River, at Sorel, 30 miles below Montreal, through the Richelieu River and Chambly Canal. The limiting dimensions of the smallest lock are 118 feet (110 feet available), 22½ feet wide. The limiting depth is 6½ feet (1.9 m.) at low water. There are nine locks in the canal and one at St. Ours, 12 miles above Sorel. The total distance from Lake Champlain (international boundary) is 69 miles.

Charts may be obtained from the New York State Superintendent of Public Works, Albany, N. Y., covering the canals in New York State, and charts of the natural navigable waters embraced in the canal system may be had from the United States Lake Survey, Detroit, Mich.

The nearest inlet connecting with the inside waters on the **coast of New Jersey** is nearly 45 miles southward of Sandy Hook (Barnegat Inlet), and boats must pass outside between these points, unless taking the route through the Delaware & Raritan Canal. But from the head of Barnegat Bay to Cape May Harbor there is an inside route for boats of 6 feet (1.8 m.) draft by taking advantage of the tide in places.

There is an inside route, good for small boats, 1 foot (0.3 m.) draft at high water, along the **coast of Delaware, Maryland, and Virginia,** from Delaware Bay southward to Cape Charles.

New York to Key West.—Vessels of 7 feet (2.1 m.) draft can pass inside from New York Bay to Delaware River through the Delaware & Raritan Canal. Masted vessels are limited to a height of 50 feet above canal level by a bridge without draw at New Brunswick, N. J.

Vessels of 10 feet (3.0 m.) draft can pass inside from Delaware River to Beaufort, N. C., through the Chesapeake & Delaware Canal, Chesapeake Bay, Elizabeth River, Albemarle & Chesapeake Canal, Albermarle and Pamlico Sounds or the Alligator River-Pungo River Canal, Neuse River, Adams Creek, canal to Core Creek, and Newport River. A draft of 3 feet (0.9 m.) can be taken inside about 40 miles southward from Beaufort, N. C., to New River Inlet. All bridges have draw openings.

There is no inside passage from Beaufort, N. C., to Winyah Bay, a distance of about 163 nautical miles, and vessels must pass outside between these points. Cape Fear River, halfway between them, is available as a harbor.

Vessels of 5 feet (1.5 m.) draft can pass inside from Winyah Bay, S. C., to St. Johns River, Fla. All bridges have draw openings.

Vessels of 3 feet (0.9 m.) draft can pass inside from St. Johns River to Miami, Fla., through Pablo Creek, North Matanzas, Halifax, and Hillsborough Rivers, Mosquito Lagoon, Indian River, South Jupiter Narrows, Hobe and Jupiter Sounds, Lake Worth, Key Biscayne Bay, and the canals connecting them. All bridges have draw openings.

From Miami to Key West, Fla., there is practically an inside route through the Hawk Channel that can be used by vessels of 10

feet (3.0 m.) draft. Cuts with a depth of 5 feet (1.5 m.) have been made in places so that vessels of 4 feet (1.2 m.) draft can go from Miami through Key Biscayne Bay, Card Sound, Barnes Sound, railroad drawbridge at Cross Key, Blackwater Sound, Tarpon Basin, Florida Bay along the north side of the keys to Long Key, and thence northwestward into the Gulf of Mexico at Cape Sable, or can continue in Florida Bay along the north side of the keys, through Big Spanish Key Channel, and thence in the Gulf of Mexico to Key West.

Boats of 3 feet (0.9 m.) draft can be taken across Florida by way of North New River Canal to Lake Okeechobee. West of there the route is closed, due to damage to a lock at Fort Thompson in 1926, which has not been repaired.

Gulf of Mexico.—From Key West to New Orleans there are several detached stretches of inside waters, available for a draft of 4 to 5 feet (1.2 to 1.5 m.), and a partially sheltered route with frequent harbors for small craft along the entire coast.

From New Orleans westward through Louisiana there is a network of inside waters affording a through route, for drafts of 3 to 5 feet (0.9 to 1.5 m.), to Sabine Pass. From Sabine Pass to Galveston there is no inside route.

From Galveston southwestward to Corpus Christi there is an inside route for a draft of 4 feet (1.2 m.) by way of several extensive bays and dredged canals connecting them. Beyond Corpus Christi there is no inside route available.

Charts covering the routes along the Atlantic coast and Gulf of Mexico are published by the United States Coast and Geodetic Survey.

A catalogue showing the charts of the route along the Atlantic and Gulf coasts can be obtained free of charge on application to the Coast and Geodetic Survey, Washington, D. C., or to any of its agents. A list of agents for the sale of charts and other publications of the Coast and Geodetic Survey is given in the catalogue and in the first notice each month of the Notice to Mariners, published weekly by the Bureau of Lighthouses and the Coast and Geodetic Survey.

The inland waters are covered in the following publications of the Coast and Geodetic Survey.

United States Coast Pilot, Section A, St. Croix River to Cape Cod.

United States Coast Pilot, Section B, covering the coast and inland waters from Cape Cod to Sandy Hook, including Long Island Sound, New York Harbor, and tributaries.

United States Coast Pilot, Section C (this volume), covering the coast and inland waters from Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays, and the inside route from New York to Norfolk.

Inside Route Pilot, coast of New Jersey.

United States Coast Pilot, Section D, covering the coast from Cape Henry to Key West and inland waters from Cape Henry to Beaufort, N. C.

Inside Route Pilot, New York to Key West.

United States Coast Pilot, Gulf Coast, Key West to the Rio Grande. Inside Route Pilot, Key West to the Rio Grande.

Distances between ports

From— \ To—	New York	Barnegat Inlet	Atlantic City	Cape May Harbor	Trenton	Philadelphia	Chester	Wilmington	Harbor of Refuge	Baltimore	Annapolis	Washington	Fredericksburg	West Point	Richmond	Petersburg	City Point (Hopewell)	Newport News	Norfolk	Chesapeake City	Queenstown	St. Michaels	Cambridge	Crisfield
New York, N. Y.	----	62	95	125	270	240	227	219	156	418	397	430	404	323	379	361	351	291	294	[1] 146	413	400	391	335
Barnegat Inlet, N. J.	62	----	35	66	188	158	145	136	78	346	325	358	332	251	307	289	279	219	222	[1] 153	341	328	319	263
Atlantic City, N. J.	95	35	----	37	159	129	116	107	50	319	298	331	305	224	280	262	252	192	195	[1] 113	314	301	292	236
Cape May Harbor, N. J.	125	66	37	----	126	96	83	74	17	291	270	303	277	196	252	234	224	164	167	[1] 74	286	273	264	208
Trenton, N. J.	270	188	159	126	----	30	43	57	117	417	396	429	403	322	378	360	350	290	293	[1] 77	412	399	390	334
Philadelphia, Pa.	240	158	129	96	30	----	13	27	87	381	360	393	367	286	342	324	314	254	257	[1] 47	376	363	354	298
Chester, Pa.	227	145	116	83	43	13	----	14	74	368	347	380	354	273	329	311	301	241	244	[1] 34	363	350	341	285
Wilmington, Del.	219	136	107	74	57	27	14	----	66	360	339	372	346	265	321	303	293	233	236	[1] 26	355	342	333	277
Harbor of Refuge, Del.	156	78	50	17	117	87	74	66	----	297	276	309	283	202	258	240	230	170	173	[1] 65	292	279	270	214
Baltimore, Md.	418	346	319	291	417	381	368	360	297	----	29	176	206	167	244	226	216	169	172	47	32	46	60	103
Annapolis, Md.	397	325	298	270	396	360	347	339	276	29	----	155	185	146	223	205	195	135	138	52	23	25	39	82
Washington, D. C.	430	358	331	303	429	393	380	372	309	176	155	----	218	179	256	238	228	168	171	199	171	158	149	132
Fredericksburg, Va.	404	332	305	277	403	367	354	346	283	206	185	218	----	154	231	213	203	143	146	229	201	188	179	128
West Point, Va.	323	251	224	196	322	286	273	265	202	167	146	179	154	----	149	131	121	61	64	190	162	149	140	86
Richmond, Va.	379	307	280	252	378	342	329	321	258	224	223	256	231	149	----	38	28	88	99	267	239	226	217	160
Petersburg, Va.	361	289	262	234	360	324	311	303	240	226	205	238	213	131	38	----	110	70	81	249	221	208	199	142
City Point (Hopewell), Va.	351	279	252	224	350	314	301	293	230	216	195	228	203	121	28	10	----	60	71	239	211	198	189	132
Newport News, Va.	291	219	192	164	290	254	241	233	170	169	135	168	143	61	88	70	60	----	13	179	151	138	129	72
Norfolk, Va.	294	222	195	167	293	257	244	236	173	172	138	171	146	64	99	81	71	13	----	182	154	141	132	75
Chesapeake City, Md.	[1] 146	[1] 153	[1] 113	[1] 74	[1] 77	[1] 47	[1] 34	[1] 26	[1] 65	47	52	199	229	190	267	249	239	179	182	----	49	69	83	126
Queenstown, Md.	413	341	314	286	412	376	363	355	292	32	23	171	201	162	239	221	211	151	154	49	----	41	55	98
St. Michaels, Md.	400	328	301	273	399	363	350	342	279	46	25	158	188	149	226	208	198	138	141	69	41	----	42	85
Cambridge, Md.	391	319	292	264	390	354	341	333	270	60	39	149	179	140	217	199	189	129	132	83	55	42	----	75
Crisfield, Md.	335	263	236	208	334	298	285	277	214	103	82	132	128	86	160	142	132	72	75	126	98	85	75	----

[1] Via Chesapeake & Delaware Canal and other inland waters.

NOTES.—All distances are in nautical miles. In general, each distance between two ports is along the shortest route marked by aids to navigation and affording a safe depth for the maximum draft that can enter both ports. All distances between ports not on the same bay are coastwise, with the exception of distances to and from Chesapeake City, which are via the inside route, as noted. To find the distance via the Chesapeake & Delaware Canal between a port in Chesapeake Bay and a port to the northward, find the distance from each port to Chesapeake City and add the two distances. A more complete tabulation of distances between ports of the United States and its off-lying territories will be found in the publication Distances Between United States Ports. (See p. 262).

DESCRIPTIONS AND SAILING DIRECTIONS

DIRECTIONS, NEW YORK TO CHESAPEAKE BAY ENTRANCE

(Charts 1215 to 1222, 1108, and 1109)

A description of the coast and outlying shoals from Sandy Hook to Cape May is given on page 35, and from Cape Henlopen to Cape Charles on page 83.

General remarks.—From Sandy Hook southward to Brigantine Shoal, a distance of about 70 miles, the coast is comparatively free from off-lying shoals, but southward of this point the coast is fringed with extensive areas of broken ground, depths of 10 fathoms (18.3 m.) and less being found at distances of nearly 20 miles offshore in places.

Owing to the numerous outlying shoals this coast is a dangerous one for deep-draft vessels, and unless sure of the vessel's position soundings should be taken to give warning of too close an approach from seaward. The 15-fathom (27.4 m.) curve extends from 15 to 20 miles offshore northward of Winter Quarter Shoal lightship and 20 to 25 miles offshore southward, and in thick weather vessels should keep outside this depth. The water shoals quite regularly from 30 fathoms to 15 fathoms (55 to 27.4 m.), but inshore of the latter depth the soundings are irregular, and shoals rise abruptly in many cases from about 10 fathoms (18.3 m.) of water. In case one of the lights or lightships are not made when in a depth of 15 fathoms (27.4 m.) it is advisable to stand alongshore until one of them is sighted.

Standing along the coast, vessels of the deepest draft usually pass outside of the lightships and out of sight of land, except between Northeast End lightship and New York. At night, if on this track, some of the lighthouses and the lightships will be sighted, so that the vessel's position can be readily determined. The large number of sailing vessels, steamers, and tows passing up and down this coast make it necessary to keep a sharp lookout to prevent collisions.

The routes followed by vessels along this part of the coast vary greatly, according to their draft and the condition of wind and weather. Complete directions to meet all conditions can not be given, but the following suggestions may be of some assistance to strangers.

Vessels of the deepest draft should in all cases keep outside of the lightships and should, wherever possible, avoid crossing areas of a less charted depth than about 9 fathoms (16.5 m.). The following courses lead in a least depth of about 9 fathoms (16.5 m.) except in approaching the entrance to Chesapeake Bay, where they lead across a least depth of 7 fathoms (12.8 m.) but close to 6-fathom (11 m.) spots.

From Ambrose Channel lightship steer 187° true (S. by W. ⅝ W. mag.) for 42 miles to Barnegat lightship. Then steer 203° true (SSW. ⅞ W. mag.) for 120 miles to a position ½ mile eastward of Winter Quarter Shoal lightship, passing 5 miles outside Brigantine Shoal gas and whistling buoy, 5½ miles outside Northeast End lightship, 5 miles outside Five-Fathom Bank lightship,

and 5 miles outside Fenwick Island Shoal lightship. From here a 213° true (SW. ½ S. mag.) course for 77 miles will lead close eastward of Chesapeake lightship, and to a position 3 miles eastward of Chesapeake Bay entrance gas, whistling, and submarine bell buoy. The last course, if followed closely, leads over a least found depth of 42 feet (12.8 m.) but leads 2 miles southeastward of 36-foot (11 m.) depths about 10½ miles eastward of Ship Shoal Inlet.

The last 5 miles of the course leads between shoals of 33 to 36 feet (10 to 11 m.) depth; care should be taken not to make the entrance buoy anywhere on the port bow on this course, and not to make it more than 3½ miles to the eastward unless passing well outside.

Many large vessels entering Chesapeake Bay from the northward run from Winter Quarter Shoal Lightship on course 216° true (SW. ⅛ S. mag.), to the gas and whistling buoy 5 miles westward of Chesapeake lightship, passing 2½ miles off Smiths Island Shoal gas and whistling buoy, thence to Cape Henry gas and whistling buoy on course 250° true (WSW. ⅞ W. mag.). The least found depth crossed on these courses is 37 feet (11.3 m.).

Coasting vessels of 17 to 24 feet (5.1 to 7.2 m.) draft and the largest tows, except those trading between Delaware Bay and points northward, usually keep outside the lightships.

The following courses represent approximately the mean of the courses followed by vessels of this class. They are varied but little on account of weather conditions except northward of Five Fathom Bank, where courses leading farther offshore are sometimes followed during easterly weather and closer inshore during westerly weather. These courses depend entirely on making the aids, and soundings are of little value to insure safety; in thick weather it is safer to keep farther offshore between Five Fathom Bank and Sandy Hook and exercise care to keep outside of Barnegat lightship.

Directions, New York (Sandy Hook) to Chesapeake Bay entrance

	Course		Distance in nautical miles
	True	Magnetic	
	°	Points	
1. Gedney Channel gas and whistling buoy to Barnegat lightship.	182	S. by W. ⅛ W.	43
This course leads 1 mile eastward of Shrewsbury Rocks gas and bell buoy and and 5½ miles eastward of Sea Girt lighthouse. Or from Scotland Lightship a 181° true (S. ⅞ W. mag.) course will lead ½ mile eastward of Shrewsbury Rocks gas and bell buoy and to Barnegat lightship.			
2. To 2 miles east of Five Fathom Bank lightship.	206	SW. ¾ S.	65
This course leads 4 miles eastward of Brigantine Shoal gas and whistling buoy and 3 miles eastward of Northeast End lightship.			

Directions, New York (Sandy Hook) to Chesapeake Bay entrance—Contd.

	Course		Distance in nautical miles
	True	Magnetic	
	°	Points	
3. To ½ mile eastward of Fenwick Island Shoal lightship.	204	SSW. ⅞ W	24½
For vessels bound to or from Delaware Bay a 272° true (W. ⅞ N. mag.) course from Five Fathom Bank lightship will lead to Overfalls Lightship, or a 152° true (S. by E. ¾ E. mag.) course from Overfalls Lightship will lead to Fenwick Island Shoal lightship.			
4. To ½ mile westward of Winter Quarter Shoal lightship.	198	SSW. ¼ W	31
5. To the gas and whistling buoy 5 miles west of Chesapeake lightship, passing 2 miles off Smith Island Shoal gas and whistling buoy.	216	SW	71
6. To Cape Henry gas and whistling buoy	250	WSW. ⅞ W	5½

Tows and other local vessels of less than 17 feet (5.2 m.) draft usually pass inside of Five Fathom Bank and Fenwick Island Shoal at all times, and inside of McCrie Shoal and Winter Quarter Shoal, except in easterly weather. The route most often followed both northward and southward in good weather by vessels with local knowledge is as follows: From the outer end of Ambrose Channel or from Scotland lightship to ½ mile westward of Shrewsbury Rocks gas and bell buoy; thence to 4 miles westward of Barnegat lightship; thence to Brigantine Shoal gas and whistling buoy; thence to 1 mile northwestward of McCrie Shoal gas and whistling buoy; thence to Overfalls lightship; thence to 1 mile westward of Fenwick Island Shoal gas and whistling buoy; thence to ½ mile westward of Little Gull Bank gas and whistling buoy; thence to 1 mile eastward of Black Fish Bank gas and whistling buoy; thence to close eastward of Parramore Banks gas and whistling buoy; thence to eastward of Smith Island Shoal gas and whistling buoy; thence to gas and bell buoy No. 4 in the entrance to Chesapeake Bay; thence to Tail of the Horseshoe gas and whistling buoy.

In westerly or northwesterly weather vessels of this class bound northward run closer inshore in places. The generally used route for vessels with local knowledge is as follows: From Smith Island Shoal gas and whistling buoy to Great Machipongo Inlet bell buoy; thence along shore at a distance of about 3 miles to Turners Lump gas and bell buoy; thence between Chincoteague Shoals and Black Fish Bank gas and whistling buoy; thence to a gas buoy 6 miles northwest of Winter Quarter Shoals gas and whistling buoy; thence to ½ mile westward of Little Gull Bank gas and whistling buoy; thence to the eastward of the 10-foot (3 m.) spot east of Isle

of Wight Bay; thence along shore to Overfalls lightship. The courses from here to Barnegat Inlet are not much varied in any weather, but from Barnegat Inlet to Shrewsbury Rocks vessels follow close inshore, not more than 1 mile off, but always pass outside of Shrewsbury Rocks can buoy.

In easterly weather the route often used by vessels of this class is from Chesapeake lightship to Winter Quarter Shoal gas and whistling buoy; thence to 1 mile westward of Fenwick Island Shoal gas and whistling buoy; thence to 1 mile eastward of McCrie Shoal gas and whistling buoy; thence to Brigantine Shoal gas and whistling buoy; thence to 4 miles westward of Barnegat lightship; and thence to Scotland lightship. This route is also sometimes used by vessels bound southward in heavy easterly weather. The least found depth crossed is about 27 feet (8.2 m.).

The following courses are suggested for strangers of 15 feet (4.5 m.) or less draft in good weather. In bad weather or with a deeper draft, follow the directions for vessels of 17 to 24 feet (5.2 to 7.3 m.) draft, preceding.

Directions, Sandy Hook to Chesapeake Bay

	Courses		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
1. Gedney Channel gas and whistling buoy to Barnegat lightship. This course leads 1 mile eastward of Shrewsbury Rocks gas and bell buoy and 5½ miles eastward of Sea Girt Lighthouse. Or, from Scotland Lightship a 181° true (S. ⅞ W. mag.) course will lead ½ mile eastward of Shrewsbury Rocks gas and bell buoy and to Barnegat lightship.	182	S. by W. ⅛ W	43
2. To Brigantine Shoal gas and whistling buoy.	213	SW. ¼ S	26½
3. To 1 mile northwestward of McCrie Shoal gas and whistling buoy. This course leads 2 miles southeastward of Hereford Inlet whistling buoy and 3½ miles eastward of Hereford Inlet Lighthouse.	222	SW. ½ W	43
4. To Overfalls lightship	244	WSW. ½ W	8½
5. To 1 mile westward of Fenwick Island Shoal gas and whistling buoy.	173	S. ⅛ W	21
6. To ½ mile westward of Little Gull Bank gas and whistling buoy.	197	SSW. ¼ W	10½
7. To 1 mile westward of Black Fish Bank gas and whistling buoy. The course leads close to a perpendicular striped gas buoy.	204	SSW. ⅛ W	30
8. To ½ mile eastward of Parramore Bank gas and whistling buoy.	202	SSW. ⅝ W	20

Directions, Sandy Hook to Chesapeake Bay—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
9. To 1 mile east of Smith Island Shoal gas and whistling buoy.	207	SW. ⅞ S	31
10. To gas and bell buoy No. 4 in the entrance to Chesapeake Bay.	242	WSW. ¼ W	11

COAST FROM SANDY HOOK TO CAPE MAY

[Charts 1215 to 1219]

The coast of New Jersey has a general south-southwesterly trend for 43 miles from Sandy Hook to Barnegat Inlet, and then a southwesterly trend for 67 miles to Cape May Point. The coast from Sandy Hook southward to Corson Inlet is free from dangers if it be given a berth of 5 miles or more. From Corson Inlet southwestward to Cape May there are shoals with a least depth of 15 feet (4.5 m.) extending about 14 miles offshore, but with channels inside of them.

Shoals extend for a considerable distance off many of the inlets; all of the inlets are obstructed by shifting bars and require local knowledge to carry the best water. The principal ones, with their approximate depths, are: Barnegat Inlet, depth 6 feet (1.8 m.) in a narrow crooked channel; Little Egg Inlet, depth 10 feet (3 m.); Absecon Inlet, depth 9 feet (2.7 m.); Great Egg Inlet, depth 5 feet (1.5 m.); and Cape May Harbor, depth 17 feet (5.2 m.). The most favorable time for entering the inlets is on a flood tide with a smooth sea; in easterly gales or in a heavy sea they can not be entered in safety.

New York Bay, including Navesink and Shrewsbury Rivers, is described in Coast Pilot, Section B, Cape Cod to Sandy Hook.

Sandy Hook, the northern point of the New Jersey coast, is a low sand spit. North Hook beacon is located on the north end. Near this beacon are a Coast Guard station, a storm warning display station, and two tall observation towers from which vessels are reported to the Maritime Exchange in New York City. These observation towers and a large black tank to the southeast are the most prominent objects on the northern end of the hook. Southward from these are some houses, Sandy Hook beacon and Sandy Hook Lighthouse.

Sandy Hook Lighthouse is a white stone tower. The light is fixed white, 88 feet (26.8 m.) above the water, and visible 15 miles.

Sandy Hook Point light is on the northwest end of the point. The light is fixed white with a vertical beam, and a horizontal beam visible 11 miles. A fog bell sounds 1 stroke every 10 seconds.

Navesink Highlands is a prominent high wooded ridge 5 miles southward of the north end of Sandy Hook, on the side of which, in a cleared space, is Navesink Lighthouse. The latter consists of two brownstone towers connected by a dwelling. The light, shown from

the south tower, is flashing white of high power (light 0.3 second, eclipse 4.7 seconds), 246 feet (75 m.) above the water, and visible 22 miles. In case of accidental extinguishment of the flashing light, a fixed white light will be shown from the north tower.

There is practically a continuous line of summer resorts along the coast from Navesink Highlands southward to Bayhead. The following are the names of the most important, with their distances southward of Navesink Lighthouse: **Seabright,** 2 miles; **Long Branch,** 6 miles; **Asbury Park,** 10½ miles; **Ocean Grove,** 11 miles; **Bradley Beach,** 12 miles; **Belmar** (south side of Shark River Inlet), 13 miles; **Spring Lake,** 15 miles; **Sea Girt,** 16 miles; **Manasquan,** 17 miles; **Point Pleasant,** 19 miles; and **Bayhead,** 20 miles. Long Branch and Asbury Park are most conspicuous on account of the greater number of large buildings.

An electric advertising sign, visible 18 miles in clear weather, is shown from the top of a building in Asbury Park. This sign has two sides and is so placed that the end points a little south of east. When viewed from the end the light shows occulting white (light 10 seconds, eclipse 1 second). When seen from either side it shows light 10 seconds, eclipse 11 seconds. Mariners should be careful not to confuse this sign with any of the seacoast navigational lights.

Manasquan is marked by twin water tanks about 1 mile southwest of Sea Girt Lighthouse; Point Pleasant by a standpipe, and Bayhead by a water tank with a conical top and bottom.

Shrewsbury Rocks, 3½ miles southward of Navesink Lighthouse, extend 1¼ miles from shore, have a least depth of 15 feet (4.5 m.), and are marked at the eastern end by a black can buoy and by a gas and bell buoy ⅞ mile farther eastward. From Shrewsbury Rocks southward to within 4 miles of Barnegat Inlet the coast is clear, and the 5-fathom (9.1 m.) curve lies nowhere more than ¾ mile from shore.

Shark River Inlet, 17 miles southward from Sandy Hook, has been improved by the State of New Jersey by the construction of retaining walls on both sides of the entrance and a stone breakwater jetty 500 feet long on the north side to protect the entrance. On the south side a similar jetty 500 feet long has been constructed by the State in conjunction with the municipality. There is very little water on the bar, and except in smooth weather breakers extend across the entrance. A highway drawbridge crosses the inlet just inside the entrance, and there are two fixed bridges ¾ mile from the entrance, with headroom of from 4 to 5 feet and a depth of about 3 feet (0.9 m.) in the channel at high water. Between the first two bridges the river is bulkheaded on the south side with a launch basin midway. Most of the area is bare, or nearly so, at low water, with a crooked channel sometimes marked by stakes. The river is frequented by small local yachts and fishing boats of about 2-foot (0.6 m.) draft. Gasoline and provisions can be obtained. The entrance should not be attempted without local knowledge.

Sea Girt Inlet, just northward of Sea Girt Lighthouse, is closed at low water, and is only occasionally used at high water and with a smooth sea by small fishing boats of 2 feet (0.6 m.) draft.

Sea Girt Lighthouse, 16 miles south-southwestward of Navesink Lighthouse, is a square brick tower in front of a dwelling. The light is flashing white.

Manasquan Inlet, 22 miles southward from Sandy Hook, is now closed. There is an inland waterway from Manasquan River southward to Cape May Harbor, good for a draft of 6 feet (1.8 m.) by taking advantage of the tide at the shoal places. It is entered from seaward through a number of inlets with shifting entrances, in most cases marked by buoys. The inlets and interior waters give access to a large number of summer resorts along the beach and many villages on the mainland. They are used by many pleasure boats and boats engaged in the oyster and clam industry and inside and outside fishing. There is considerable passenger and general freight business between points inside, but little coasting trade. The waterway is fully described in Inside Route Pilot, Coast of New Jersey, published by this bureau, price 30 cents.

The beaches separating the inside waters from the ocean are low, and the summer resorts are more widely separated than those northward. For vessels bound southward along the coast the first landmark southward of Bayhead is the town of **Mantoloking,** a large group of houses with a water tank showing only a little above the buildings. Southward of this are **Chadwick** and **Lavallette,** small groups of houses without prominent marks, and a hotel at **Ortley.** About 1 mile southward of Ortley is **Seaside Heights,** a town with a tank at the north end, and 1½ miles farther south is **Seaside Park,** marked by a black water tank and low brick chimney.

There is a small group of houses around Island Beach Coast Guard Station, 1¼ miles southward of Seaside Park, and from there to Barnegat Inlet, a distance of about 7½ miles, the only marks are the Coast Guard stations.

Barnegat Lighthouse, the most prominent mark in the vicinity of Barnegat Inlet, is a conical tower, lower half white, upper half red. The light is flashing white (flash 2.5 seconds, eclipse 7.5 seconds), 175 feet (53 m.) above the water, and visible 19 miles.

Barnegat Inlet is marked on the south side by Barnegat Lighthouse. The deepest draft taken across the bar is about 7 feet (2.1 m.) at high water. The channel is marked by perpendicularly striped buoys which are intervisible, but is subject to change both in depth and position, and the buoys can not always be depended upon to mark the best water. Strangers usually take a pilot, either picking up a fisherman outside or setting a signal and waiting for one from Barnegat City. With a smooth sea it is usually safe for boats of 3 to 4 feet (0.9 to 1.2 m.) draft to enter by following the buoys. In the summer of 1929 there was a depth at mean low water of 6 feet (1.8 m.) across the bar.

Barnegat Inlet has been moving slowly southward for many years. The channel changes so rapidly that directions are impossible. Inside the inlet the channels are more stable, and there is good anchorage in the channel westward of the lighthouse. From the inlet the principal inside channel, which is buoyed and has a least depth of about 7 feet (2.1 m.), leads westward and northward, as shown on the chart, until westward of Sedge Island, and then through Oyster Creek Channel. Local boats bound to Barnegat or southward usually leave the buoyed channel about midway between Clam and Sedge Islands and follow the slough westward and southwestward

toward the mouth of Double Creek. It is marked by bush stakes, but strangers should not attempt to run it. There are no channels from the inlet southward between the islands except for small boats at high water.

Barnegat City, the terminus of the railroad on the south side of the inlet, is a summer resort with a permanent settlement of oystermen and fishermen. A privately dredged channel leads from the main channel southward to the landings on the inner beach just inside the point.

Lying 4 miles southwestward of Barnegat Lighthouse is **Highpoint,** marked by a green water tank, and 1 mile farther south is **Harvey Cedars,** a small settlement without prominent marks. Two miles below it is **Surf City,** marked by a red water tank on a steel tower.

Southwestward of Surf City are several small settlements with water tanks, and 14 miles southwestward of Barnegat Lighthouse is **Beachhaven,** a large town marked by two black water tanks. There is a small group of houses around Bond Coast Guard Station, 1½ miles southwestward of Beachhaven, and another group at **Tucker Beach,** 2½ miles farther southwestward.

Beachhaven Inlet has broken through the beach 3 miles southward of Beachhaven. It has two narrow, unmarked, winding channels with a controlling depth of about 7 feet (2.1 m.), and should not be mistaken for Little Egg Inlet or attempted by a stranger.

There is broken ground along the shore and a charted wreck between Barnegat and Little Egg Inlets, and vessels should give this area a berth of 3 miles or more to insure a depth of 30 feet (9.1 m.).

Little Egg Inlet, 2 miles southward from Tucker Beach, is used by fish steamers and many smaller schooners and motor boats. The shore and channels at the inlet are subject to rapid change, both in location and depths. The depth on the bar usually is ample for boats that can use the inland waterway, and in 1929 was reported to be 10 feet (3 m.) at mean low water. The inlet is marked by perpendicular striped buoys, which are intervisible until inside the inlet, and a gas sea buoy. There are no regular pilots, but strangers usually can pick up a fisherman outside to act as a pilot, or can set signal and wait for one from the Coast Guard station. Breakers form all the way across the entrance only in very heavy weather.

From Little Egg Inlet to Absecon Inlet, a distance of 8 miles, there are no marks except the Coast Guard stations and scattered groups of houses. Broken ground extends nearly 5 miles offshore and is marked at its eastern end by Brigantine Shoal gas and whistling buoy, which lies 8 miles eastward of Absecon Lighthouse and 5 miles from shore. There is a black can buoy about 3 miles westward of the gas buoy, marking the outer end of the 18-foot (5.5 m.) depth on the shoal.

Brigantine Inlet is 7 miles northeastward of Absecon Lighthouse and 4 miles southwestward of Tucker Beach. It is nearly bare at extreme low water and has 5 or 6 feet (1.5 to 1.8 m.) at high water. It is not buoyed, and the only boats using it are small oyster and fishing boats, and then only with a smooth sea and on a rising tide. Strangers should not attempt to enter. The Coast Guard stations

are the only marks. The several thoroughfares leading from Brigantine Inlet are shoal at their western ends and can only be navigated by small boats at high water. Strangers should not enter them.

Absecon Inlet is marked on the south side by **Absecon Lighthouse** (yellow and black tower, fixed white light) and Atlantic City. A gas buoy marks the seaward entrance, and can and nun buoys mark the channel as far as the north point of Atlantic City. In the summer of 1929 there was a depth at mean low water of 9 feet (2.7 m.) across the bar. The channel is subject to change, but the buoys are usually maintained in the best water. The shore on the south side of the inlet is protected from extensive change by artificial means.

Most of the business through Absecon Inlet is to Atlantic City, but there are some boats running to the town of **Absecon** and to points north and south on the line of the inland waterway. A transportation line from Atlantic City to New York is operated at times. Strangers, unless of light draft, usually take a pilot, either picking up a fisherman outside or signaling for a pilot from shore. If of not more than 6 or 7 feet (1.8 to 2.1 m.) draft, they can enter with a smooth sea and on a rising tide by following the buoys, keeping well away from rough water. Breakers extend across the inlet in heavy weather.

Atlantic City is the largest resort on the Atlantic coast and is frequented by many boats, both from outside and from points along the interior waterways. It has several railroad connections with the mainland, an electric road connecting it with Pleasantville, Somers Point, and Ocean City, and along the beach southward to Longport, where boat connections can be made to Ocean City and points southward.

The casino at the north end of Atlantic City has a long wharf westward of it, with a depth of 12 to 15 feet (3.6 to 4.5 m.), inside of which is a small basin with a depth of 2 to 4 feet (0.6 to 1.2 m.), which is used only by fishing boats kept for hire.

Gardner Basin, a bulkheaded basin nearly ½ mile long and 60 yards wide, has its entrance 500 yards westward of the casino. It has a depth of 8 feet (2.4 m.) in mid-channel to the head and is used by many motor boats. All boats make fast to the bulkheads, for which a small wharfage charge is made. All kinds of supplies are obtainable, and there are railways and machine shops.

Another large basin lies just west of Gardner Basin. On it is a large plant of an oil company, where fuel oils and gasoline may be obtained in large quantities.

There are a standpipe and chimney of same height close together at **Ventnor,** 3½ miles southwestward of Absecon Lighthouse, a standpipe at **South Atlantic City,** and a standpipe at Longport, on the north side of Great Egg Inlet.

Longport is a summer resort on the north side of Great Egg Inlet. It is connected with Ocean City in summer by launches and with Atlantic City by an electric railway along the beach. On account of shoaling at the south end of Broad Thorofare, boats bound from Longport to Ocean City must cross the entrance to Great Egg Inlet.

Great Egg Inlet, 7½ miles southwestward of Absecon Lighthouse, had a depth in 1929 of 5 feet (1.5 m.) at mean low water across the bar is a buoyed channel. It is used by many yachts of 4 to 5 foot (1.2 to 1.5 m.) draft and local fishing and pleasure boats.

The shore line on the south side and the position of the channel are fairly stable, and the buoys usually mark the best water. Strangers of 4 or 5 foot (1.2 to 1.5 m.) draft do not usually take a pilot in smooth weather but follow the buoys, preferably on a rising tide, being also guided by the appearance of the water. Pilots may usually be had from fishing boats outside or from Ocean City in answer to signal. Breakers extend across the inlet in moderately heavy weather. In winter it is used only by a few fishermen and is often rendered dangerous by floating ice.

The prominent landmarks in approaching Great Egg Inlet are: A black standpipe with white top and two iron chimneys close to it, showing over the buildings of Ocean City, 1½ miles southwestward of the inlet, and a black water tank on a steel tower at Longport, on the north side.

Ocean City, a large summer resort on the south side of Great Egg Inlet, has railroad and electric road connections with the mainland and southward along the beach to Corson Inlet. The wharves are on the northwest side, ½ to 1½ miles southwestward of the inlet, and have depths of 6 to 12 feet (1.8 to 3.6 m.) at the ends. There are two launch basins.

Corson Inlet, 6 miles southwestward of Ocean City, had a depth across the bar in 1923 of about 4 feet (1.2 m.). It is buoyed but is only used by a few local fishing and pleasure boats up to 4 or 5 foot (1.2 to 1.5 m.) draft. The appearance of the water is the best guide, but the channel is subject to rapid change and is not recommended for a stranger.

Peck Beach is a small group of houses, without prominent marks, about 1 mile northward of Corson Inlet. It can only be reached by small boats at high water from westward.

Corson Inlet (Strathmere P. O.) is a village and railroad station on the south side of Corson Inlet. A red water tank is prominent. The channel from Corson Inlet northward into Main Thorofare is bare at low water and is crossed by two bridges. It is seldom used. The main channel leads southwestward through three drawbridges at Strathmere, then southward of a marshy island and close along the south shore to the east side of Beach Thorofare; it then leads north-northwestward for the south point of the marsh and follows it to Ben Hands and Upper Thorofare. A draft of about 5 feet (1.5 m.) can be carried from inside the inlet to this point.

Sea Isle City is a summer resort on the beach about midway between Corson and Townsend Inlets. The most prominent marks are a slender standpipe, a gray brick stack ¼ mile southward of it, and two church spires farther south. **Ludlam Beach Lighthouse,** (flashing white), visible 12 miles, near the north end of the town, is not prominent by day.

There is a shoal with a depth of 15 feet (4.5 m.) marked by a horizontally striped gas buoy about 4 miles southeastward of Ludlam Beach Lighthouse. Broken ground, with a least depth of 4 fathoms (7.3 m.) extends about 2½ miles east-northeastward from the buoy. There is deeper water inside these shoals, but, on account of the

broken bottom and abrupt changes of depth, vessels of greater draft than 15 feet (4.5 m.) should pass outside of them.

Townsend Inlet usually has a depth of 4 feet (1.2 m.) across the bar. It is used by small fishing and pleasure boats and an occasional cruising yacht up to 5-foot (1.5 m.) draft, which enter only at high water and with a smooth sea. The channel and shore line are subject to considerable change and are moving southward at present. A railroad with a drawbridge on the south side crosses the inlet just inside the mouth. The channel is marked by perpendicularly striped buoys, but strangers generally take a pilot.

Townsend Inlet is a small resort just northward of the inlet. There are no prominent marks. There is a wharf, with a depth of 12 feet (3.6 m.), alongside.

Avalon is a resort on the south side of Townsend Inlet. A black water tank is the most prominent mark.

Peermont is a small resort on the beach 1½ miles southwestward of Townsend Inlet.

Stone Harbor is a summer resort on the beach about 3 miles northeastward of Hereford Inlet. It is marked by a slender standpipe with a white top.

Hereford Inlet, 6 miles northeastward of Cape May Harbor, is subject to rapid change, and the buoys can not always be depended upon to lead in the best water. It has depths of 6 feet (1.8 m.) in two channels south of the middle ground. In the entrance there are large areas bare at low water and usually having a sand ridge showing at high water. They are covered with marsh grass in summer. Breakers form across the inlet in heavy weather and on the shoals at all times, and the appearance of the water is the best guide in entering. A new inlet formed north of the middle ground in 1929, having a least depth at mean low water of 2½ feet (0.7 m.).

The different inlets are used by many fishing boats and some yachts. Pilots can usually be obtained from fishing boats outside. Stone Harbor Coast Guard station is the only mark on the north side of the inlet. There are buildings on the south side all the way from Hereford Inlet to 2 miles north of Cape May Harbor, and several prominent marks. **Hereford Inlet Lighthouse** (group flashing white), visible 13 miles, is a tower on a dwelling and is not prominent by day. There is a slender black standpipe ¼ mile westward of it.

Anglesea is a summer resort on the south side of Hereford Inlet and is frequented by a large number of fishing boats. There are several wharves along the water front northwestward of the Coast Guard station.

North Wildwood, Wildwood, Holly Beach, and **Wildwood Crest** are summer resorts on Five Mile Beach. There are a water tank and a slender standpipe close together at Wildwood.

Cape May Harbor has been improved by private enterprise under a project to create a basin of about 500 acres with depths of from 30 to 40 feet (9.1 to 12.2 m.). It is used by fish steamers, pilot boats, and many yachts and large pleasure boats. Some of these anchor in the west end of the harbor, the others go to the docks, or up

Cape Island Creek to landings near the drawbridge. Many fishing steamers go to the fish wharf up the first channel opening to the eastward from the east end of Cape May Harbor. Gasoline, fuel oils, and coal in small quantities can be obtained at the docks. There are two marine railways, one of which can handle vessels up to 10-foot (3 m.) draft, 125-foot length, and 100 tons. A large hangar and water tank on Sewell Point are prominent.

The entrance, 4½ miles eastward of Cape May Lighthouse, has been improved by building parallel stone jetties 850 feet apart and dredging a channel 400 feet wide with a present depth of about 17 feet (5.1 m.) midway between them to the inner harbor. In 1929 a sunken schooner lay on the north side of the channel at the entrance, narrowing the passage somewhat.

The controlling depth to the docks at Cape May is 11 feet (3.3 m.) at mean lower water. The channel in the harbor is marked by buoys. There are flashing lights on the outer ends of the jetties, the southwestern one being green and the other white. A fog bell has been established on the southwest breakwater just inshore from the light. There are railway connections at Cape May with Camden, N. J.

About 2 miles westward of the entrance to Cape May Harbor is **Cape May,** a summer resort having several large and prominent hotels; and 2 miles westward of Cape May is the summer resort of **Cape May Point,** marked by Cape May Lighthouse.

Cape May Lighthouse (flashing white every 30 seconds) is 165 feet (50 m.) above the water and visible 19 miles.

Five Fathom Bank is an area of broken ground about 13 miles eastward of Cape May. It is about 9 miles long in a northerly and southerly direction inside the 5-fathom (9.1 m.) curve and about 2 miles wide, and there are detached shoal spots eastward and northward of it. The least depth found is 15 feet (4.5 m.), lying 10 miles 133° true (SE. ½ S. mag.) from Hereford Inlet Lighthouse, and is marked on the northeast side by a horizontally striped nun buoy. There is a red nun buoy marking a 21-foot (6.4 m.) spot about 3½ miles southward of the horizontally striped buoy. It is near the south end of the shoals and should be given a berth of ½ mile or more when passing eastward and southward of it.

There is very broken ground, with 5 fathoms (9.1 m.) or less, and abrupt changes in depth, between Five Fathom Bank and Cape May, and there is broken ground extending to a distance of about 6 miles southward of Cape May Harbor and Cape May.

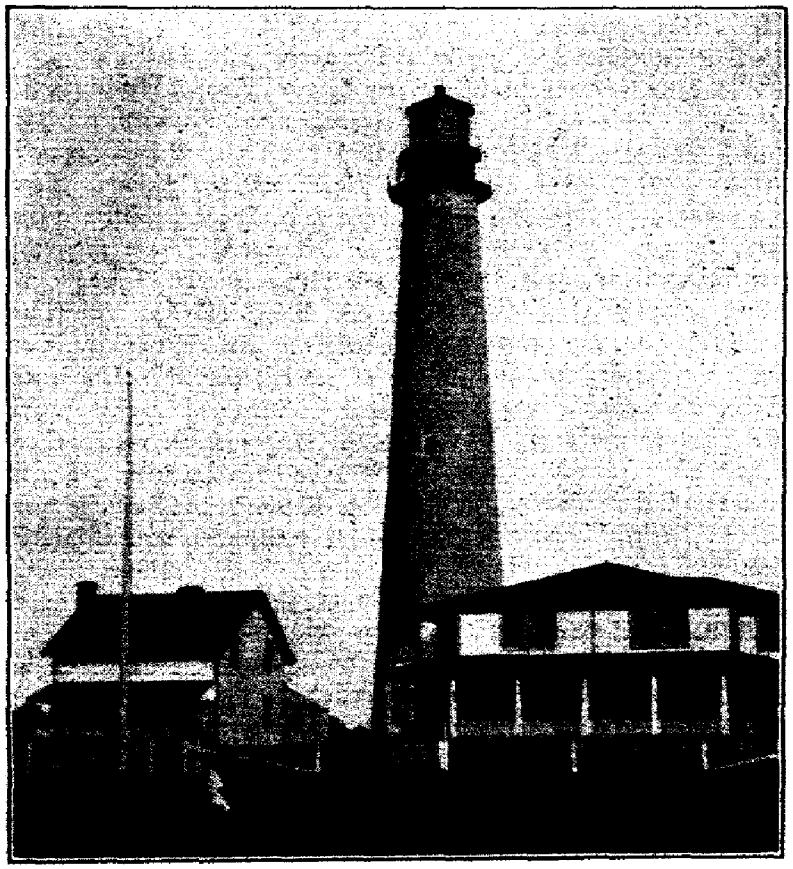
Two wrecks are charted between Northeast End and Five Fathom Bank lightships.

The **passage inside of Five Fathom Bank,** passing either eastward or westward of McCrie Shoal, is generally used by coasting vessels entering Delaware Bay from northward. In a heavy sea, vessels of a greater draft than 18 feet (5.5 m.) should pass outside of Five Fathom Bank, and this is also the safer course at all times for strangers in vessels of a greater draft than 18 feet (5.5 m.).

Northeast End Lightship, about 6½ miles eastward of the north end of Five Fathom Bank, has a red hull with "Northeast" on the sides, two masts with lantern galleries; deck houses and masts white, galleries and stack black. Light shown from foremast is occulting white every 2 seconds, visible 14 miles. If occulting light

is out of order, a fixed white light will be shown from the mainmast. The fog signal is given on an air siren (blast 2 seconds, silent 2 seconds, blast 24 seconds). If siren is disabled, a bell is sounded by hand. Submarine bell strikes " 45 " every 36 seconds.

Five Fathom Bank Lightship, about 4 miles southeastward of the south end of Five Fathom Bank, has a straw-colored hull with " Five Fathom " on the sides and two masts with round daymarks at the head of each. Light shown from foremast 65 feet above the water is occulting white every 6 seconds. If out of action, a similar light is shown from the mainmast. Fog signal is a whistle (blast



Cape May Lighthouse (from shoreward)

4 seconds, silent 56 seconds). A bell will be struck by hand if whistle is disabled. The submarine bell strikes " 42 " every 28 seconds. A radio beacon transmits signals. See page 16.

McCrie Shoal, having a least depth of 17 feet (5.2 m.), lies 7 miles 136° true (SE. ¾ S. mag.) from Cape May Lighthouse. It is marked on the southeast side by a gas and whistling buoy. The shoals and channels southwestward of Cape May are described under "Delaware Bay, Eastern Side."

Tides.—The mean range of tide on the outside coast is about 4.6 feet.

Storm warnings of the United States Weather Bureau are displayed along the coast at several stations. See page 9.

form the boundary between the State of New Jersey on the east and the States of Delaware and Pennsylvania on the west. They are the approach to the cities of Wilmington, Chester, Philadelphia, Camden, and Trenton, and to many smaller cities and towns, and they have a large trade carried both in foreign and domestic vessels. Philadelphia, one of the important ports of the United States, and Trenton, the head of navigation, are 88 and 116 miles, respectively, above the entrance. The main entrance near Cape Henlopen is available for vessels of any draft. (See "Channels," following.) Vessels of 7 feet (2.1 m.) draft can pass from New York Bay to Delaware Bay through the Delaware & Raritan Canal, and vessels of 12 feet (3.6 m.) draft can pass from Chesapeake Bay to Delaware River through the Chesapeake & Delaware Canal. The route from New York Bay through Delaware River to Chesapeake Bay is described under the heading "Inside route, New York to Norfolk," on page 244.

Delaware Bay is, properly speaking, only an expansion of the lower part of the Delaware River. The dividing line is 44 miles above the entrance and extends from a monument lying 300 yards northwestward of Liston Point to a monument lying eastward of the south point at the entrance of Hope Creek.

Except at the entrance, Delaware Bay is bordered on both sides by wide areas of marsh, and there are no towns of any size on its shores. Detailed descriptions of the shores and tributaries are given under the headings "Delaware Bay, eastern side," and "Delaware Bay, western side."

Channels.—The main entrance to the bay, which is used by deep-draft vessels and strangers, has a clear width of over 2½ miles between Cape Henlopen and the shoals, which extend 7 miles south-southwestward from Cape May Point.

The bay is shoal along its eastern and western sides, and there are extensive shoal areas close to the main channel through the center of the bay, but a channel with a depth of 33 feet (10 m.) or more leads from the entrance to the lower end of the dredged channel near the head of the bay. The least width (about ¼ mile between the 30-foot (9.1 m.) curves) is abreast Elbow of Cross Ledge Lighthouse. The channel is well marked by lighthouses and buoys, but strangers in deep-draft vessels should not attempt to enter by night.

Improvements are in progress to secure a channel 35 feet (10.6 m.) deep from that depth in Delaware Bay to Allegheny Avenue (upper end of Port Richmond), Philadelphia, 800 feet wide in the straight reaches, 1,200 feet wide at Bulkhead Bar, 1,000 feet wide in the other bends, and 1,000 feet wide from abreast Gloucester to Allegheny Avenue. The latest examinations show a depth of 32.5 feet (9.8 m.) or more on the center line throughout the entire length of the channel.

The minimum depth on the ranges of 32.5 feet (9.8 m.) (reported in January, 1930), was on a small gravel shoal near the upper end of East Horseshoe Range.

The condition of this channel is given at frequent intervals in the Notice to Mariners.

Anchorage.—Delaware Breakwater Harbor and Harbor of Refuge are among the important harbors of refuge on the Atlantic coast and are extensively used by all classes of vessels. (For description, see p. 54.)

Deep-draft vessels sometimes anchor in the vicinity of the main channel above Fourteen Foot Bank Lighthouse. **Bombay Hook Roads** is the widened part of the channel of the bay between Ship John Shoal Lighthouse and the entrance to the dredged channel, which was formerly used as an anchorage by sailing vessels while waiting for a favorable tide to cross Duck Creek Flats. Deep-draft vessels can anchor here, south of the Liston range, in 5 to 7 fathoms (9.1 to 12.8 m.), soft bottom; the shoals rise abruptly in places on the sides of the channel, as shown on the chart.

In Delaware River there is good anchorage anywhere where the depth and bottom are suitable; in every case care must be taken not to anchor on or close to the ranges, nor in the dredged channels. The anchorages off Philadelphia are on the eastern side of the river from abreast Gloucester to Kaighn Point and on the east side of the channel abreast Petty Island. (See Greenwich Point and Port Richmond anchorages.) Anchorage limits are prescribed by regulation, as follows:

Marcus Hook Anchorage is on the southeast side of Marcus Hook range, between Marcus Hook and the lower end of Raccoon Island.

Fort Mifflin Anchorage extends from the lower end of Fort Mifflin to a point south of the prolongation of the Horseshoe lower range and lies westward of the Schuylkill River range and Fort Mifflin Bar range.

League Island Anchorage is east of the mouth of Schuylkill River and north of the channel marked by the Horseshoe west group lower range and extends to a point opposite Broad Street (middle of League Island).

Greenwich Point Anchorage is east of the main ship channel between two anchorage buoys (being white with a black anchor painted thereon), located opposite (1) the lower coal pier at Greenwich Point, to mark the lower limit of anchorage, (2) Dickinson Street to mark the upper limit of anchorage; the latter buoy is off Kaighn Point.

Cooper Point Anchorage is in the channel between Cooper Point and Petty Island, so as not to interfere with vessels going to or from Cooper River.

Port Richmond Anchorage is east of the main ship channel, between the prolongation of lines drawn from the lower and upper ends of Petty Island, and is marked by two anchorage buoys (being white with a black anchor painted thereon). Buoy No. 1 is placed off the lower end of Petty Island. Buoy No. 2 is placed off Petty Island opposite Pier G, Port Richmond, about midway of the anchorage. The anchorage ground extends from the head of Petty Island to a point 900 yards below buoy No. 1 and northward of Cooper Point.

War vessels of the United States and of foreign nations and pleasure yachts, with permission of the commissioners of navigation, may anchor in such location as not to interfere with the navigation of the river.

Vessels must not anchor at any place in the Schuylkill River, nor lie at any wharf in that river more than two abreast, without the permission of the commissioners of navigation.

Pilotage is compulsory between Delaware Bay entrance and any point on Delaware Bay or River for all vessels, except those employed in and licensed for the coasting trade or American vessels entirely loaded with coal mined in the United States, if spoken or offered the services of a pilot outside of a line drawn from Cape May Lighthouse to Cape Henlopen Lighthouse.

The fees for piloting between Delaware Bay entrance and the port of Philadelphia or any other place on Delaware River are as follows: Vessels of 12 feet or less draft, $2 per ½ foot; vessels of over 12 feet draft, $2.50 per ½ foot. An increase of 10 per cent over these fees is charged when a vessel is spoken east of Five Fathom Bank lightship or north of Hereford Inlet Lighthouse or south of Fenwick Island Lighthouse, and a deduction of 10 per cent is made when a vessel is spoken inside of a line joining Cape May and Cape Henlopen Lighthouses, but pilotage is not compulsory in the latter case: *Provided, however*, under the laws of Delaware, a vessel is not exempt until Brandywine Light bears east.

Every ship or vessel bound to the Delaware Breakwater for orders shall be obliged to receive a pilot, provided she is spoken or a pilot offers his services outside of a straight line drawn from Cape Henlopen Light to Cape May Light, and every ship or vessel bound to the Delaware Breakwater for orders shall pay pilotage fees as follows: A sum equal to half the pilotage to the port of Philadelphia, and she shall be obligated to receive a pilot and pay the same pilotage fees when outward bound from the breakwater, and if such ship or vessel, without discharging her pilot, proceed to the port of Philadelphia, or any other port or place on the Delaware Bay or River, only one full pilotage fee shall be paid, in addition to the fee for detention: *Provided, however*, That the pilot bringing such ship or vessel to the breakwater be there discharged, and if the ship or vessel afterwards proceeds to Philadelphia or any other port or place on the Delaware Bay or River she shall make the usual signal for a pilot and continue to make such signal until reaching Brandywine Light, and if spoken by or offered the services of a duly licensed Pennsylvania pilot before reaching Brandywine Light shall be obliged to employ such pilot and pay him the regular rates in addition to the fee paid for bringing her into the breakwater and for detention, if any.

Either Pennsylvania or Delaware pilots are taken to or from any point on Delaware Bay or River, and the fees in either case are the same. Both Pennsylvania and Delaware pilots will be found aboard one vessel, either a steamer or auxiliary schooner, which will be found cruising outside the entrance of the bay.

In case a pilot having charge of a vessel and whilst conducting said vessel be detained, either by order of the master, owner, or consignee, or by ice or any other unavoidable circumstance not personal

to himself, he shall receive compensation for such detention at the rate of $3 per day for each and every day so detained, commencing at a period of 24 hours from the time the detention first occurred.

Vessels waiting in Delaware Breakwater for orders usually retain the pilot and pay him the detention fee.

Repairs.—Repairs to the hulls and machinery of large vessels can be made at Philadelphia, Camden, Chester, and Wilmington, and to small vessels and motor boats at these places and at Essington, Pa., and Bivalve, Dorchester, and Greenwich Pier, N. J. Further information is given under the description of these places.

Freshets are of rare occurrence, except in the vicinity of Trenton, and unless accompanied with ice do not interfere with navigation.

Ice.—In ordinary winters there is usually sufficient ice in the bay and river to make it a source of care to sailing vessels. Thin ice has been known to form early in December between Chester and Philadelphia, but the heavier ice does not usually begin to run before January. The tidal currents keep the ice in motion, except where it packs in the narrower parts of the river, when it often forms an obstruction that requires the services of steam, and the ice boats, of which there are a number at Philadelphia, are employed in keeping these parts of the river open. The greatest danger encountered from the ice is at Ship John Shoal, just above Fort Delaware, off Deepwater Point, and at the Horseshoe; at these places the ice usually packs heavier than elsewhere. After the first part of March ice is rarely met with.

In severe winters navigation above Chester has occasionally been interrupted, but with the powerful steamers now employed in the foreign and coasting trade to Philadelphia the channel is kept navigable for steamers during the most severe winters. The greatest danger is to wooden sailing vessels, which if caught in the pack ice are set on the shoals, and if in the thin ice are liable to be cut through on the water line.

Further information concerning freshets and ice above Philadelphia is given on page 83.

Reporting stations.—Vessels are reported to the Maritime Exchange at Philadelphia, during either day or night, from reporting stations at Delaware Breakwater and Marcus Hook, and by day from reporting stations at Reedy Island and New Castle. During the ice season an auxiliary station is placed in commission at Gloucester, N. J. Messages can be exchanged by International Code with any of the stations during the day and with the Delaware Breakwater station by night by means of a flashing lamp and the Morse Code. Vessels passing in or out of Delaware Bay should display their signals between Overfalls Lightship and Harbor of Refuge Lighthouse. The station will answer all signals with pennant by day and by one long flash, followed by one short flash, at night. The following suggestions are made when signaling by means of a flashing lamp:

1. All other lights in the vicinity of the flashing lamp should be obscured.

2. The flashing lamp should be kept continually pointed directly toward the station or vessel.

3. Care should be taken that proper regularity is observed in the length of the flashes and spaces, and that the spaces between the words are considerably longer than those between the letters.

4. Vessels should, if possible, avoid coming within the rays of a lighthouse while signaling.

5. When "Morsing" a vessel's name, it is desirable that the name be spelled in full.

A **United States Branch Hydrographic Office** is established in the Bourse Building, Philadelphia. Bulletins are posted here giving information of value to seamen, 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.

Towboats will usually be found cruising in the river and bay or at Delaware Breakwater. Towboats to tow vessels or barges into the tributaries of Delaware River are usually engaged from Delaware City, Wilmington, or Philadelphia.

Vessels employing the city ice-breaker steamers for towing purposes when in the ice pay a fixed rate for such service.

Quarantine inspection for all vessels on Delaware Bay will be performed by United States Public Health Service officials at Marcus Hook, Pa.

Supplies.—Coal and fuel oil for large vessels can best be obtained at Philadelphia and Wilmington and for small steamers and tugs at these places and at Delaware City, Pigeon Point, and Chester. Water is obtainable at all of these places, and at half ebb tide the water in the river as far down as Chester is fresh enough for use in boilers. Gasoline and provisions are obtainable at all of the towns on the river and bay. Points near Delaware Bay where they are obtainable are Lewes, Bivalve, and Bowers, and at Bayside during the fishing season.

Storm warnings of the United States Weather Bureau are displayed at Cape May Point Coast Guard station, Delaware Breakwater, Bivalve, Reedy Island, and on the Bourse Building, Philadelphia. A branch office of the Weather Bureau is maintained at the Bourse Building, Philadelphia, to serve marine interests.

Tides.—The mean range of tides is 4.2 feet at Delaware Breakwater Harbor, 4.9 feet at Brandywine Shoal Lighthouse, 5.8 feet at Elbow of Cross Ledge Lighthouse, 5.9 feet at Ship John Shoal Lighthouse, 5.9 feet at Reedy Island, 5.4 feet at Marcus Hook, and 5.2 feet at Philadelphia. Tidal information for the tributaries is given under their descriptions. Full tidal information, including daily predictions for Philadelphia and Breakwater Harbor, is given in the Tide Tables for the Atlantic Coast. Tidal data for many intermediate stations and a discussion of the tidal analysis is given in the publication Tides and Currents in Delaware Bay, price 30 cents, for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C.

CURRENTS, DELAWARE BAY AND RIVER

The predicted times of slack water for every day in the year at Overfalls Lightship, Delaware Bay Entrance, are given in the Current Tables, Atlantic Coast, issued annually in advance by this bureau. This publication contains time differences for slack water

at about 500 stations and six current diagrams, including one for Delaware Bay and River. An analysis of the currents in the bay is given in the publication mentioned in the preceding paragraph.

Five Fathom Bank Lightship.—The tidal current is rotary. turning clockwise. The strength of the flood occurs about 1¼ hours earlier than the strength of the flood at Overfalls Lightship (or about 2¼ hours earlier than the time of high water at Sandy Hook) and sets westward with a velocity of about ½ knot. The strength of the ebb occurs about 1¼ hours earlier than the strength of ebb at Overfalls Lightship (or about 2¼ hours earlier than the time of low water at Sandy Hook) and sets eastward with a velocity of about ½ knot. Currents of a knot or more occur only with strong winds.

Main ship channel off Fourteen Foot Bank Lighthouse.—The slack waters before flood and ebb occur about ¼ hour after the corresponding slack waters at Overfalls Lightship (or approximately 2¼ hours after the times of high and low waters, respectively at Sandy Hook). The strength of the flood sets northwesterly with an average velocity of about 1¼ knots and the strength of the ebb sets southeasterly with an average velocity of about 1½ knots.

Channel off Ship John Shoal.—The slacks before flood and ebb occur about 1½ hours after the corresponding slack waters at Overfalls Lightship (or approximately 3½ hours after high water and 2 hours after low water, respectively, at Philadelphia). The strength of flood sets northwesterly with a velocity of about 1½ knots and the strength of ebb sets southeasterly with a velocity of about 2 knots.

Channel off Reedy Island.—The slacks before flood and ebb occur about 2¾ hours after the corresponding slack waters at Overfalls Lightship (or approximately 2¾ hours before low water and 1½ hours before high water, respectively, at Philadelphia). The strength of flood sets northward with a velocity of about 1¾ knots, and the strength of ebb sets southward with a velocity of about 2 knots.

Channel off New Castle.—The slack water before flood occurs about 4 hours later than at Overfalls Lightship (or approximately 1½ hours before low water at Philadelphia), and the slack water before ebb occurs about 3½ hours later than at Overfalls Lightship (or approximately 1 hour before high water at Philadelphia). Strengths of flood or ebb have an average velocity of about 2 knots. The flood sets northeastward and the ebb southwestward.

Channel off Chester.—The slack waters before flood and ebb occur about 4¾ hours after the corresponding slack waters at Overfalls Lightship (or approximately ¾ hour before low water and ½ hour after high water, respectively, at Philadelphia). Velocities at strength of flood and ebb average about 1¾ knots. The flood sets northeastward and the ebb southwestward.

Channel off Philadelphia.—The slack waters before flood and ebb occur about 6 hours and 5¼ hours, respectively, after the times of the corresponding slacks at Overfalls Lightship (or approximately ½ hour after low water and 1 hour after high water, respectively, at Philadelphia). Velocities at strength of flood or ebb average about 1¾ knots. The flood sets northward and the ebb southward.

Channel off Burlington.—The slack waters before flood and ebb occur approximately 7½ hours and 6½ hours, respectively, after the

times of the corresponding slack waters at Overfalls Lightship (or approximately 2 hours after low water and high water, respectively, at Philadelphia). The flood and ebb currents have velocities at strength of about 1¼ knots.

GENERAL REMARKS, APPROACHES TO DELAWARE BAY

[Charts 1219, 1109]

Between the parallels of 38° 15′ N. and 39° 15′ N. the 100-fathom (183 m.) curve is from 75 to 90 miles offshore and the 30-fathom (55 m.) curve is about 25 miles closer in toward the shore, both having a general northeasterly and southwesterly trend. Inside the 30-fathom (55 m.) curve the water shoals gradually westward to the 20-fathom (36 m.) curve, but inside the latter curve the depths are somewhat irregular, and if uncertain of her position, especially in thick weather, a vessel, when inside of the 20-fathom (36 m.) curve, should approach the coast with care and in no case approach closer than in 12 fathoms (21.9 m.) until sure of her position. On a clear night the lights of the lightships and lighthouses should be made in time to prevent too close approach to the shore.

Vessels coming **from southward and seaward** in clear weather should shape a course so as to cross the meridian of 74° 30′ W. in latitude 38° 45′ N.; this will lead them within 5 miles of Five Fathom Bank Lightship. If uncertain of the longitude, soundings should be taken frequently and the water not shoaled to less than 20 fathoms (36 m.) until between the parallels of 38° 40′ N. and 38° 50′ N., and the entrance then be approached between those parallels.

In approaching the entrance **from northward and seaward,** when between the parallels of 39° 15′ N. and 38° 40′ N., soundings of 20 fathoms (36 m.) indicate a distance of 25 to 30 miles from shore. In clear weather a vessel standing westward on the parallel of 38° 45′ N. should make Five Fathom Bank Lightship before the depth is lessened to 15 fathoms (27.5 m.). There are least found depths of 29 to 38 feet (8.8 to 11.6 m.) between latitude 38° 39′ N. and 38° 42′ N., and longitude 74° 43′ W. and 74° 49′ W.

Entering from northward, the passage inside of Five Fathom Bank eastward or westward of McCrie Shoal, is used by most of the coasting vessels of less than 24 feet (7.3 m.) draft. In a heavy sea vessels of a greater draft than 18 feet (5.5 m.) are advised to pass eastward of Five Fathom Bank, and this is the safest course at all times for strangers in vessels of a greater draft than 18 feet (5.5 m.).

Entering from southward, coasting vessels of the deepest draft keep outside Fenwick Island Shoal Lightship. Vessels of 15 feet (4.5 m.) draft usually pass inside of Fenwick Island Shoal in good weather, but strangers should use this passage with caution.

DIRECTIONS, DELAWARE BAY AND RIVER TO PHILADELPHIA

[Charts 280, 294, 295, and 1218]

Directions for the outside coast and courses to Overfalls Lightship from northward and southward are given on page 31. Directions for Delaware Breakwater are given on page 54.

The channel is well marked by lighthouses and buoys to the entrance of the dredged channel and by lighted ranges and buoys above

that point. The dredged channels are generally 800 feet wide in the straight reaches, 1,000 feet wide in the bends, and 1,200 feet wide in Bulkhead Bar Channel. The buoys marking the dredged channels are usually maintained on or close to the edge, and vessels on the ranges will usually pass them at a distance of 100 to 200 yards. Buoys marking each range are numbered separately, and each buoy bears the first letter of the range which it marks. The ranges do not all show well as daymarks, but vessels will ordinarily have no trouble in running by the buoys except when ice is running, at which times the buoys may be dragged from their positions.

Shoaling is liable to take place at any time where the channel has been improved, but the channels are usually redredged as soon as the shoaling is found. In general, the bottom is soft and vessels, if on or close on the ranges, do not sustain damage from grounding, except near the intersection of the Marcus Hook and Chester ranges and near the intersection of the Chester and Tinicum ranges, where the bottom is rocky. At the shoalest places deep-draft vessels take advantage of the tide, which has a mean rise and fall of 5 to 6 feet (1.5 to 1.8 m.) between the entrance of the river and the wharves at Philadelphia, but during strong northerly winds the high and low waters may be as much as 2.5 to 3.5 feet (0.8 to 1 m.) lower than the mean.

It must be remembered that the channel in the river is being improved and that dredges may be found at work on or near any of the range lines. Directions for passing dredges are given on page 272.

At night a stranger may be confused by the lights of vessels at anchor near the channels, and strangers in deep-draft vessels are advised not to run. Red sectors are established in the lighthouses to cover the dangers on both sides of the channel from Overfalls Lightship to the entrance of the dredged channel and should be observed closely if running at night.

The following table gives the courses and distances from Overfalls Lightship to Philadelphia. They lead in a least depth of 33 feet (10 m.) to the entrance of the dredged channel and in the dredged channel (least depth 33 feet (10 m.)) to Philadelphia. Many cutoffs are possible for light-draft vessels, but strangers are advised to follow the main channel.

Delaware Bay entrance to Philadelphia

[Abbreviations for lights: F., fixed; Fl., flashing; Occ., occulting; Alt., alternating; W., white; R., red. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
1. From Overfalls lightship (Occ.) to 0.3 mile east-northeast of gas and bell buoy No. 11, passing 0.4 miles eastward of gas and bell buoy No. 7, 0.8 mile westward of Brandywine Shoal Light (Occ.), close westward of gas and bell buoy No. 10 (marking a 29-foot (8.8 m.) spot), 0.7 mile eastward of Fourteen Foot Bank Light (Occ.). Miah Maull Shoal Light (Occ.) is slightly on the starboard bow on this course.	335	N. by W. ½ W..	19.1

Delaware Bay entrance to Philadelphia—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
2. To 300 yards west-southwest of Elbow of Ledge Light (Gp. Occ.), passing 300 yards northeastward of gas and bell buoy No. 13.	325	NNW. ⅜ W	6.5
3. To 300 yards east-northeast of gas and bell buoy No. 17.	335	N. by W. ½ W	1.5
4. To 200 yards southwest of Ben Davis Point Shoal gas and bell buoy No. 16, Elbow of Ledge Light astern.	330	NNW	2.8
5. To midway between buoys Nos. 1 B and 2 B, passing 0.3 mile southwest of Ship John Shoal Light (Occ.), entering the dredged channel 200 yards southward of gas and bell buoy No. 2, L, and steering the Liston range.	318	NW. by N	17.1
6. To midway between buoys Nos. 1 R and 2 R, Baker range ahead.	355	N. ⅝ E	1.7
7. To eastward of gas and bell buoy No. 1 N, Reedy Island range astern.	15	NNE. ⅛ E	4.3
8. To junction with Bulkhead Bar range, New Castle range ahead.	334	N. by W. ½ W	4.4
9. To junction with Deepwater Point range, Bulkhead Bar range ahead.	8	N. by E. ½ E	0.5
10. To junction with Cherry Island range, between buoys Nos. 1 C and 2 C, Deepwater Point range ahead.	42	NE. ½ E	3.8
11. To junction with Bellevue range 200 yards northwest of gas buoy No. 2 B, Cherry Island range ahead.	17	NNE. ¼ E	4.3
12. To junction with Marcus Hook range 200 yards west-northwestward of gas and bell buoy No. 2 M, Bellevue range astern.	36	NE	3.1
13. To junction with Chester range 200 yards north-northeastward of gas and bell buoy, Marcus Hook range astern.	58	ENE	4.3
14. To 200 yards northward of gas buoy No. 6 C, Chester range ahead.	51	NE. by E. ⅝ E	1.8
15. To 300 yards northeast of gas buoy No. 2 T.	64	ENE. ½ E	0.9
16. To 200 yards south-southeast of gas buoy No. 5 T, Tinicum range ahead.	92	E. by S	3.1
17. To 150 yards south of gas buoy No. 1 F	70	E. by N	1.1
18. To junction with Horseshoe range, west groups, Fort Mifflin Bar range astern.	54	NE. by E. ⅝ E	2.8
19. To junction with Eagle Point range, Horseshoe range, west group, astern.	94	ESE. ⅞ E	1.9
20. To junction with Horseshoe range, east group, Eagle Point range astern.	64	ENE. ½ E	0.5
21. To 100 yards nothwestward of white buoy No. 51, off the immigration station, Gloucester, Horseshoe range, east group, astern.	27	NE. ¾ N	1.1
22. Above Gloucester the mid-channel is clear but the best water favors the western side of the river along the wharves at Philadelphia, Pa.	------	Various	--------

DELAWARE BAY, WESTERN SIDE

The western shore of Delaware Bay is low and marshy, with few prominent marks northward of Delaware Breakwater. The principal marks visible from the western channel are as follows: A small group of houses at Waterloo, just above Broadkill River entrance; a group of houses at Slaughter Beach, just below Cedar Beach; the lighthouse and fish factory in the mouth of Mispillion River; a large group of houses at Bowers; a small group at Kitts Hummock; the lighthouse and a few houses at Mahon River; and the ranges at Leipsic River.

The rivers on the western side of Delaware Bay are very narrow and crooked, and vessels have considerable difficulty in making some of the turns. They are frequented by freight and passenger steamers and schooners carrying produce, fertilizer, and canned goods to or from the towns at their heads and the farm landings below, the usual draft of boats engaged in this trade being 6 to 8 feet (1.8 to 2.4 m.). Oyster and fishing boats also seek anchorage in the mouths of many of them. Towboats are not often used, and strangers seldom enter.

Most of the business from the rivers is northward to Chester and Philadelphia. Local vessels usually take advantage of the tide up and down the Delaware River, leaving the mouths of the creeks bound northward at a little after low water, and leaving Philadelphia bound southward at high water or a little before. In entering or leaving the creeks allowance should be made for the current in the bay, which sets across the dredged channels and has considerable velocity at times.

There are many detached shoal spots with depths of 2 to 6 feet (0.6 to 1.8 m.) along the western side of Delaware Bay from Delaware Breakwater northward to Bombay Hook Point. They are generally unmarked, except in the vicinity of the main ship channel, and are subject to some change, both in depth and position. Strangers using any of the channels westward of the main ship channel should proceed with caution.

There is a **channel along the western side of Delaware Bay** which is marked by a line of perpendicularly striped buoys from off the mouth of St. Jones River southward to below Old Bare Shoal. It is used by most of the vessels frequenting the tributaries on the western side of the bay. It is said to lead clear of dangers if the buoys are followed closely, but leads close to the shoals in places.

Vessels entering the channel from northward usually leave the main channel of Delaware River at gas and bell buoy No. 21, 2½ miles southward of Ship John Shoal Lighthouse, pass close eastward of buoy No. 3, at the north end of Blake Channel, and steer 183° true (S. by W. mag.) to the gas buoy off the entrance of St. Jones and Murderkill Rivers. The northerly sector of Mahon River Lighthouse covers the entrance to the channel at night. The least depth crossed on this course is 7 or 8 feet (2.1 or 2.4 m.).

Cape Henlopen, on the southwest side of the entrance to Delaware Bay, is a high white sand hill, bare of vegetation. The point of the cape, from a comparison of the surveys, is moving northward at a slow but uniform rate. Vessels should keep in the white sector of

Delaware Breakwater light when passing north of the cape. A shoal with little depth, as shown on the chart, extends nearly 3/8 mile eastward from the end of Cape Henlopen, and is marked at its easterly end by a black bell buoy.

Delaware Breakwater (chart 379) is the name generally applied to the entire anchorage in the vicinity of Cape Henlopen, including the inner anchorage (Breakwater Harbor) and the outer anchorage (Harbor of Refuge).

Breakwater Harbor, on the west side of Cape Henlopen, southward of the inner breakwater, is easy of access both day and night and is a safe harbor for light-draft vessels in all but heavy northwesterly gales, and affords considerable protection even in such weather. Under the most favorable conditions a vessel of as much as 15 feet (4.5 m.) draft can select anchorage with sufficient swinging room in the easterly part of the harbor, but the harbor is generally crowded in heavy weather, and vessels of a greater draft than about 10 feet (3 m.) should preferably anchor westward or northwestward of the inner breakwater or in Harbor of Refuge.

Breakwater Harbor has depths of 10 to about 30 feet (3 to 9.1 m.) in its easterly part, eastward of a line joining the reporting station on the breakwater and the easternmost fish-oil works. The angle in the westerly part of the breakwater is shoal, depths of 9 to 10 feet (2.7 to 3 m.) extend nearly 3/8 mile south-southwestward from the westerly half of the breakwater, and depths of 12 to 13 feet (3.6 to 3.9 m.) extend to shore southwestward.

Tides.—The mean range of tides is about 4.3 feet.

Currents.—The tidal currents have considerable velocity behind the breakwater in the inner harbor, especially near its eastern end. The flood sets westward and the ebb eastward, and at strength have estimated velocities of 1½ to 2 knots. Outside the outer breakwater the velocity of the current at strength is 1.9 knots. The general direction of tidal currents is parallel with the breakwater, with a considerable set toward the lower end on the ebb and toward the upper end of the flood.

Directions, Breakwater Harbor.—From Overfalls Lightship steer 279° true (WNW. ½ W. mag.) until Delaware Breakwater Lighthouse bears about 240° true (WSW. mag.). Then steer this course for that lighthouse and pass about 100 yards southeastward of it in entering the harbor. The entrance is about ¼ mile wide between the lighthouse and the edge of the shoal southeastward. Caution is necessary at night during heavy weather on account of the large number of vessels which will usually be found at anchor in the harbor. Vessels should keep in the white sector of the Delaware Breakwater light when passing Cape Henlopen at night.

Coming down Delaware Bay pass eastward of Brown Shoal gas and bell buoy, and steer 175° true (S. ¼ W. mag.) for Harbor of Refuge Lighthouse (flashing white) with Brandywine Shoals Lighthouse astern, pass 350 yards eastward of the lighthouse and then steer 203° true (SSW. ¾ W. mag.) to pass 100 yards eastward of Delaware Breakwater Lighthouse.

Wharves.—The easterly wharf on the south side of Breakwater Harbor is the property of the Government, and has a depth of 16 feet (4.8 m.) at its end, but is in bad repair. Westward of it are

wharves of fish-oil works, with about 12 feet (3.6 m.) at the ends, some of them in ruins, and 1¼ miles westward is a railroad wharf with 12 feet (3.6 m.) at its end.

Speed trial course.—A speed trial course is located east of the outer breakwater and is defined by range lines. The front objects are skeleton towers located on the outer breakwater; the southern rear object is a skeleton tower near the western end of the inner breakwater and the northern rear object is a skeleton tower on shore 1½ miles west-northwestward of the railroad wharf at Lewes. Westward of the range tower is an old tower, formerly the Delaware Breakwater rear range light. The exact distance between the range lines is 1.000067 nautical miles on a course 319° true (northbound) or 139° true (southbound).

Lewes is a town with railroad communication lying ½ mile southwestward of the railroad wharf. Provisions, gasoline, ice, and some ship chandlery are obtainable, and some coal in case of necessity.

The inner breakwater is nearly 1 mile long in a west-northwesterly direction, and is marked at its east end by Delaware Breakwater Lighthouse, and at its west end by a red light. A telegraph and **reporting station,** from which vessels are reported to the Maritime Exchange at Philadelphia, is located near the middle of the breakwater, and storm warnings are displayed.

Delaware Breakwater Lighthouse (occulting white), on the east end of the inner breakwater, is a brown conical tower. It has a red sector south of 240° true and 101° true, covering a shoal off the point of Cape Henlopen and Breakwater Harbor. It is 61 feet (18.6 m.) high and visible 13 miles. The fog signal is given on a horn, blast 2 seconds, silent 13 seconds. If the horn is disabled a bell will be struck by hand.

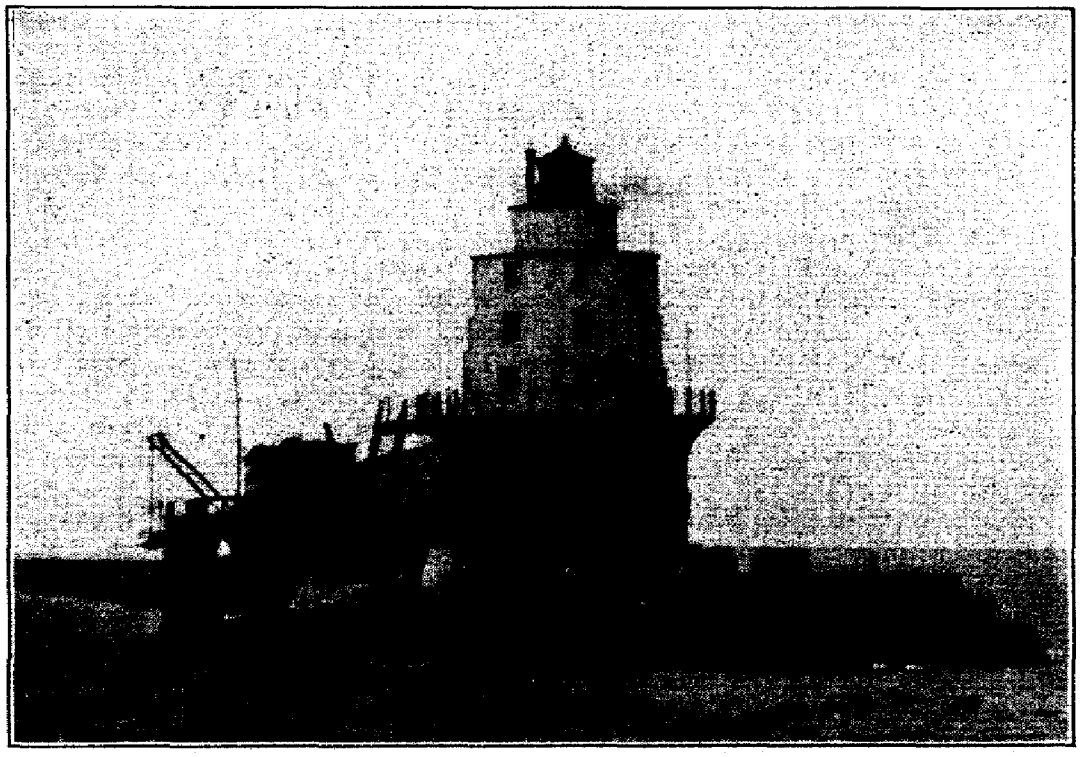
Lying westward and northwestward of the inner breakwater is an extensive anchorage with depths of 16 to 25 feet (4.8 to 7.6 m.), muddy bottom, where vessels are sheltered from southeasterly and northeasterly winds, and this anchorage is much used by coasting vessels. The anchorage is easy of access, the least depths in the approach being 23 to 30 feet (7 to 9.1 m.) between the inner breakwater and Marshall Shoal red and black buoy.

Harbor of Refuge, lying 1 to 2 miles north-northwestward of Cape Henlopen, is formed by a breakwater which extends 1¼ miles south-southeastward from the southeast end of **the Shears,** and by a row of ice breakers on the Shears. The breakwater is marked on its south end by Harbor of Refuge Lighthouse, and at its north end by a red light. The harbor, except in its northern part, has depths of 4 to 7 fathoms (7.3 to 12.8 m.), muddy bottom, for a distance of nearly 1 mile west-southwestward from the breakwater. It affords a harbor in easterly gales for deep-draft vessels. The entrance from southward is deep and clear, while that from northward across the Shears has depths of 9 to 12 feet (2.7 to 3.6 m.). The deepest water, depths 5 to 7 fathoms (9.1 to 12.8 m.), will be found ⅜ mile westward of the south half of the breakwater. During seasons of ice drifting ice often forms a danger.

A ridge, having lumps with depths of 12 to 18 feet (3.6 to 5.5 m.), extends 145° true (SSE. ½ E. mag.) from the south end of the Shears toward Delaware Breakwater Lighthouse. The south end of the

shoaler part of the ridge is marked by a horizontally striped buoy, which lies 1⅛ miles 274° true (W. by N. mag.) from Harbor of Refuge Lighthouse. Another similar buoy, located ⅜ mile northeastward of the angle in the inner breakwater, marks a continuation of the above shoal but with deeper water over it. Depths of 24 feet (7.2 m.) have been found on the ridge for a distance of 600 yards south-southeastward from the latter buoy.

Harbor of Refuge Lighthouse, on the south end of the Harbor of Refuge Breakwater, is a flashing white light, 72 feet (21.9 m.) above the water and visible 16 miles. Red sector from 325° to 351° true covers Hen and Chickens Shoal, and from 127° to 175° covers Brown Shoal. The fog signal is a siren giving blasts as follows:



Harbor of Refuge Lighthouse

Three 2-second blasts, 2 seconds apart; silent 35 seconds. A bell is struck once every 15 seconds if the siren is disabled.

On the north end of the Harbor of Refuge Breakwater and on the west end of Delaware Breakwater are fixed red lights.

Broadkill River empties into the Delaware River 3½ miles northwestward of Lewes. A channel has been dredged in the entrance and to the town of **Milton,** the head of navigation, 10 miles above the mouth. A jetty, marked on its end by a beacon and a flashing white light, has been constructed on the west side at the mouth. The entrance is subject to rapid change. In 1929 there was a depth of 2.9 feet (0.9 m.) in the mouth and 3.5 feet (1 m.) from there to the town of Milton. A drawbridge crosses the creek about 5 miles above the mouth. The draw has a clear width of 35 feet, a headroom of 4 feet at high water when closed, and a depth of 6 feet (1.8 m.) in the opening.

Shoals extend about 300 yards offshore to the 6-foot (1.8 m.) curve, and are subject to change. The channel leads close to the jetty, and thence to the head the mid-channel is the best water, except for a middle ground, bare at a little below high water, which lies 1 mile above the mouth. The middle ground shows discolored water at all times, is usually marked by bush stakes, and the best water is on its south side.

The entrance to the canal which connects Delaware Bay with Rehoboth Bay is about ½ mile inside the entrance of Broadkill River, and is described under the heading, "Inside waters, Cape Henlopen to Cape Charles."

Tides.—The mean range of tides is 4.4 feet at the entrance and 3.5 feet at Milton. High and low water at Milton occur 55 minutes later than at the entrance.

There are several **drainage canals** between Broadkill and Mispillion Rivers, which are used to some extent for purposes of navigation by small local boats, but they are of little interest to a stranger.

Mispillion River lies 13 miles northwestward of Lewes and is marked at the entrance by a lighthouse (brown, pyramidal, skeleton steel tower with white daymark; flashing white light with a red sector); and by a fish factory just inside the mouth. A channel 4.3 feet (1.3 m.) deep and 150 feet wide has been dredged at the entrance, and 4.1 feet (1.2 m.) deep and 60 to 75 feet wide from there to the town of Milford, at the head of navigation 12 miles above the entrance. A long jetty, having an occulting red light with white sector near the end, has been constructed on the south side of the mouth, and a short jetty on the north side. The river is used by freight steamers, some schooners, and motor boats, the deepest draft being 7 feet (2.1 m.).

Vessels bound into Mispillion River from northward steer southwestward from the gas buoy at the north end of Old Bare Shoal until off the dredged cut, and then follow the south jetty at a distance of 100 feet through the cut on a 308½° true (NW. ⅛ N. mag.) course for Mispillion River Lighthouse. At night the northeasterly edge of the red sector leads along the axis of the dredged channel. From the inner end of the jetty the channel follows closely the south and west sides until above the lighthouse wharf and then follows a general mid-channel course to Milford, passing southward of the island lying 1 mile above the mouth. The channel is very crooked, and steamers have difficulty in making some of the turns. From southward steer on the range of the south jetty light and Mispillion Lighthouse.

Tides.—The mean range of tides is 5.1 feet at the entrance and 4.1 feet at Milford. High and low water at Milford occur 1 hour and 5 minutes later than at the entrance.

Murderkill River is 8 miles northward of Mispillion River, 245° true (WSW. ½ W. mag.) from Miah Maull Shoal Lighthouse. A channel 7 feet (2.1 m.) deep and 100 feet wide has been dredged across the flats into the entrance, and 7 feet (2.1 m.) deep and 80 feet wide to the town of **Frederica,** at the head of navigation, 7 miles above the mouth. In 1928 the controlling depth at mean low water was 5.2 feet (1.5 m.) at the mouth and 5.4 feet (1.6 m.) from there to the

town of Frederica. The deepest draft ordinarily going to Frederica is about 7 feet (2.1 m.). The river is used by steamers and schooners to Frederica and by fishing and oyster boats at the entrance. A freight steamer makes regular trips to Frederica.

There is a lighted range for entering Murderkill River. The front range is a white skeleton tower just above the steamer wharf, and shows against a low gray building with higher buildings on either side. There is a low iron chimney showing about 100 feet to the right of it. The back range is a black skeleton tower and shows well above the buildings at Bowers.

There is a mud bank along the south side of the entrance cut, which is bare for a considerable distance at low water, marked by bush stakes. There is a can buoy off the entrance, maintained at the intersection of the Murderkill and St. Jones River ranges.

To enter Murderkill River, from the can buoy head in on the range, course 247° true (WSW. ⅝ W. mag.), passing 40 feet northward of the bushes marking the mud bank. From the wharf at Bowers, the best water generally favors the ebb-tide bends to the head. The river has been straightened by cuts across the sharper bends, the old bed of the stream having been filled by the dredged material near the cuts.

Bowers is a post village and summer resort on the point of land between Murderkill and St. Jones Rivers, and is prominent from offshore. Gasoline and provisions are obtainable.

Tides.—The mean range of tides is 5.4 feet at the entrance and 3.0 feet at Frederica.

St. Jones River is just north of Murderkill River. In 1928 there was a depth from the bar to the mouth of the river of 3.1 feet (0.9 m.), thence to **Lebanon,** a village 9½ miles above the mouth, a depth of 5.5 feet (1.6 m.), and from here to a point 2.7 miles above the Lebanon Highway bridge a depth of 6.5 feet (1.9 m.). Beyond this point there was a depth of 3 feet (0.9 m.) to **Dover,** 15 miles above the mouth. The deepest draft entering the river is 8 feet (2.4 m.).

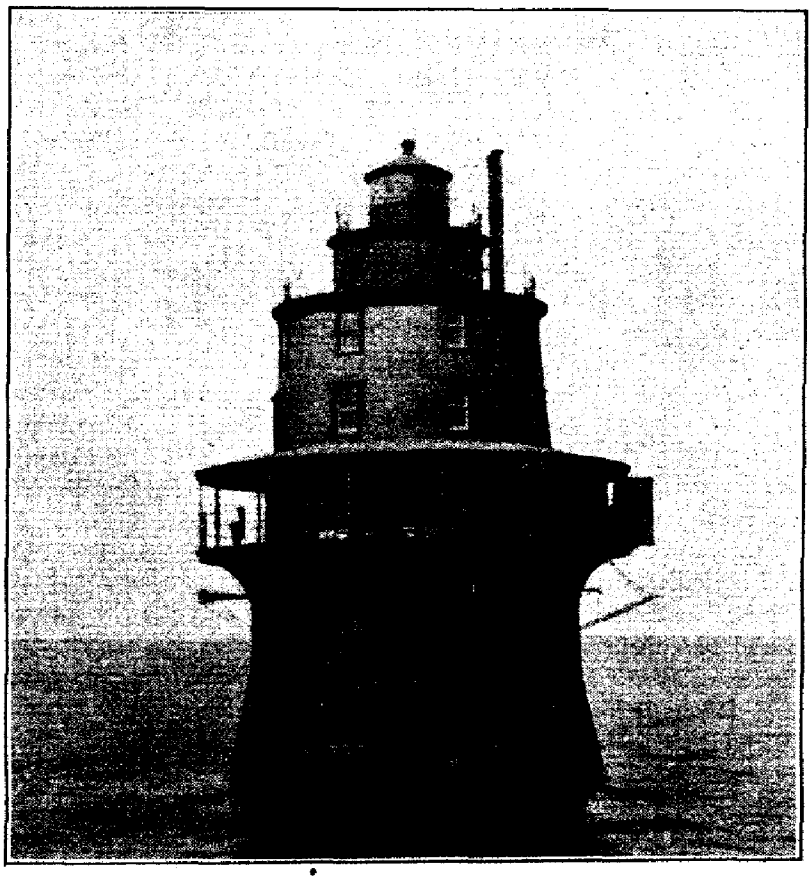
A drawbridge with a clear width of 31 feet crosses the river at **Barker Landing,** 6 miles above the mouth, and 1 mile westward of the bridge is the village of **Magnolia.** A drawbridge crosses the river at Lebanon; width of opening 30 feet. Dover has railroad communication, and Lebanon and the landings below have communication with Philadelphia by a passenger steamer.

There is a lighted range for entering St. Jones River. The front light is flashing red and the rear one is occulting red. Both are carried on white posts. A mud bank on the south side of the entrance is bare at the inner end at half tide and at the outer end at extreme low water, and is usually marked by bush stakes.

To enter St. Jones River, from the gas buoy (can buoy substituted when the ice runs) off the entrance, head in on the range, course 266° true (W. ¼ N. mag.), passing 40 feet northward of the bushes marking the mud bank. From **Bowers Landing,** just inside the mouth, the best water favors the southwest side for about ½ mile, and then a general mid-channel course in the straight reaches and the ebb-tide bends in the curves is the best to the head.

Tides.—The mean range of tides is 5.4 feet at the entrance, 3 feet at Lebanon, and 1.2 feet at Dover.

Little Creek, 1½ miles southward of Mahon River Lighthouse, is navigable to the village of Little Creek, 2½ miles above the mouth. A channel has been dredged to a depth of 5 feet (1.5 m.) to Little Creek, 60 feet wide across the bar and 40 feet wide in the creek. The controlling depth in 1928 was 2.8 feet (0.8 m.) at the mouth, thence 2.7 feet (0.8 m.) to a point 1,000 feet downstream from the highway bridge at Little Creek, thence 2.5 feet (0.7 m.) to the landing at Little Creek.



Miah Maull Shoal Lighthouse

There is a lighted range for entering, course 310° true (NW. ¼ N. mag.), plainly visible by day. The best water follows the northeast side around the bend from the north point at the entrance until past the front light, and then the mid-channel to the head. Small boats can go a short distance above a drawbridge at Little Creek.

Tides.—The mean range of tides is 5.6 feet at the entrance and 4.5 feet at Little Creek. High and low water at Little Creek occur 30 minutes and 50 minutes, respectively, later than at the entrance.

Mahon River is marked by Mahon River Lighthouse (flashing white with 3 red sectors) and three smaller houses around it. There is a depth of about 5 feet (1.5 m.) across the bar at the mouth and 10 to 15 feet (3 to 4.5 m.) inside, and it is extensively used as an anchorage by oyster and fishing boats. The point of marsh on the

east side at the entrance is wearing away, and a shoal extends southward from it. The base of an old lighthouse, which is covered at high water, lies close inshore, 3/8 mile southward of the entrance. The southerly edge of the east red sector of Mahon River Lighthouse marks the entrance at night. Small boats can pass through Mahon River into Dona River, but there is little business above the mouth.

Dona River, 2¼ miles northward of Mahon River Lighthouse, has a depth of about 3 or 4 feet (0.9 or 1.2 m.) across the flats at the mouth and 6 to 12 feet (1.8 to 3.6 m.) inside. It is used to some extent as an anchorage. The entrance is not marked. Small boats can, with difficulty, pass through into Leipsic River, but it is not often done.

Leipsic River, 3½ miles northward of Mahon River Lighthouse, and 3¾ miles south-southwestward of Ship John Shoal Lighthouse, is the approach to the town of **Leipsic,** about 8½ miles above the mouth. A channel 6 feet (1.8 m.) deep and 50 feet wide, with several cut-offs, has been dredged to Leipsic, and 5 feet (1.5 m.) deep and 40 feet wide to the head of navigation about 4½ miles above Leipsic, with a turning basin at the head. The controlling depth in 1928 was 6.5 feet (1.9 m.) to the mouth, and 6.4 feet (1.9 m.) from there to Leipsic, thence 2.5 feet (0.7 m.) to Garrison Mill. A drawbridge with a draw opening 35 feet wide crosses the river at Leipsic. The south opening has the best water.

There is a lighted range for entering Leipsic River, each a post with slatted daymark, plainly visible by day. The course on the range is 285° true (WNW. mag.), and it should be closely followed to avoid shoals close to it on the south side. Above the entrance a general mid-channel course is the best.

Tides.—The mean range of tides is 5.6 feet at the entrance, 3.8 feet at Leipsic, and 2.5 feet, at the head of navigation.

Duck Creek, extending from Leipsic River to Smyrna River, is navigable at high water throughout most of its length from Leipsic River, but has a dam at the northern end which prevents entrance from Smyrna River. It is used only by boats with hunting parties and schooners carrying marsh hay. A fixed bridge crosses the creek just back of Woodland Beach.

Smyrna River, 5¾ miles southward of Stony Point Shoal, is navigable to **Smyrna Landing,** about 9 miles above the mouth and 1 mile from the town of **Smyrna.** The deepest draft entering is about 7½ feet (2.2 m.), and this draft is taken to **Mill Creek** at high water. In 1928 a depth of 5.6 feet (1.7 m.) existed from the bay to the mouth of the river, thence 5.3 feet (1.6 m.) to Mill Creek, thence 2.9 feet (0.9 m.) to Prices Landing, thence 1.6 feet (0.5 m.) to Smyrna Landing.

There is a lighted range for entering, course 237° true, (SW. by W. ¾ W. mag.), front light flashing red, on a white iron post, and rear light occulting white, on a skeleton tower, both plainly visible by day. A white dwelling shows 250 yards to the left of the range.

There is a spoil bank, bare at low water, on the south side of the entrance of Smyrna River. The range leads across a shoal bar about ½ mile outside the entrance. Local steamers usually enter at near high water, when the bar can be crossed on the range, but

if entering at low water, must pass well southward of it and then steer northwestward inside the bar until on the range, but some local knowledge is required to carry the best water. From inside the entrance to the head the best water generally follows a mid-channel course or favors the ebb-tide bends. A drawbridge crosses the river at Flemings Landing, 3 miles above the mouth. It is a center-pier draw, each opening 36 feet wide; the north opening is generally used.

Tides.—The mean range of tides is 6 feet at the entrance and 3.5 feet at Smyrna Landing. High and low water at Smyrna Landing occur 2 hours and 13 minutes later than at the entrance.

DELAWARE BAY, EASTERN SIDE

[Chart 1218]

The eastern side of Delaware Bay is low and has few prominent marks except the lighthouses. There are many small creeks, frequented mostly by fishing and oyster boats and a few truck boats, and two large tributaries, Maurice and Cohansey Rivers, which have considerable trade, the deepest draft being about 11 feet (3.3 m.).

The ruling depth on the eastern side of Delaware Bay is 7 to 15 feet (2.1 to 4.5 m.) with many spots of less than 6 feet (1.8 m.) These shoals are generally unmarked and some local knowledge is required to avoid them. There are bars at the mouths of the creeks and deeper water inside.

Cape May, on the eastern side of the entrance to Delaware Bay, is marked by the dirigible hangar and water tank on Sewell Point, by the large hotels at the town of Cape May, and by Cape May Lighthouse at the town of **Cape May Point.**

Storm warnings are displayed at Cape May Point Coast Guard station, southward of the lighthouse.

The shoals and channels on the northeastern side of Delaware Bay entrance, as determined by the 1914 and 1927 surveys, show little change in position or depth. The bottom, in places, consists of clay and sand mixed and with a consistency of hard pan. The ridges run approximately in the same directions as the currents.

Cape May channel is the principal one of the several buoyed channels. Passing through this channel and then between North and Crow Shoals, the least depths are 15 to 18 feet (4.5 to 5.4 m.). Some tugs pass northward of South Shoal. The channels have strong tidal currents, and many tide rips occur near Prissy Wicks Shoal. Strangers should enter the bay by the main channel along the southwest side, which is broad and deep.

Small boats may pass along the south side of Cape May and cross Prissy Wicks Shoal about 0.3 mile off the cupola at Cape May shown on the chart. There are depths through here 9 feet (2.7 m.) or more.

There are several unimportant creeks northward of Cape May, but the first one open to navigation is **Goshen Creek,** 13½ miles north-northeastward of Cape May Lighthouse. There is a depth of about 1 foot (0.3 m.) across the flats at the mouth and 2 feet (0.6 m.) to **Goshen Landing,** 1 mile above the mouth and 1 mile below the village of **Goshen.** It is only entered by small local boats.

Dennis Creek, 6⅜ miles eastward of East Point Lighthouse, has a depth of 2 feet (0.6 m.) across the flats at the mouth and 6 to 12 feet (1.8 to 3.6 m.) inside. It is navigable for a considerable distance, but is principally used as an anchorage by oyster boats. The entrance is marked by range lights, which lead in the best water across the flat in the approach. There is a fixed highway bridge across the creek near Dennisville.

West Creek, 1 mile northwestward of the entrance to Dennis Creek, is nearly bare at low water at the mouth and has a depth of about 3 feet (0.9 m.) inside. It is little used.

Deadman Shoal, lying 5⅜ to 7 miles southward of East Point Lighthouse, had a least depth of 3 feet (0.9 m.) in 1914. It is marked on the east side by a gas buoy and at the north end by a horizontally striped buoy. Extending southward (true) from the west end of the shoal is a ridge with 6 to 7 feet (1.8 to 2.1 m.) over it, the south end of which lies 3 miles southwestward from the gas buoy.

East Point Lighthouse (flashing white), a white dwelling on the point on the east side of Maurice River Cove, is the most prominent mark in the vicinity.

Maurice River is navigable to the city of Millville, 21 miles above the mouth. The landings near the mouth are the center of a large oystering and fishing industry, and there is considerable trade in the upper river, mostly in towed sand barges. The deepest draft entering the river is 11 feet (3.3 m.), and this draft is taken to Millville at high water. In 1927 there was a depth of 5¾ feet (1.7 m.) and width of 100 feet in a dredged channel across the flats outside the mouth. From inside the mouth to 2,000 feet above the Millville bridge there was a least depth of about 6 feet (1.8 m.).

Bivalve is a railroad terminus and important oyster-shipping point on the west bank of Maurice River, 2½ miles above the mouth. Gasoline and provisions are obtainable and there is water on the wharves. There is a railway capable of hauling out vessels of 150 tons and 6 or 7 feet (1.8 or 2.1 m.) draft, and a machine shop for ordinary repairs to motors. **Storm warnings** are displayed.

Maurice River, a post office opposite Bivalve, is also the terminus of a railroad and a shipping point for sea food.

Shellpile is the name of a group of oyster-packing plants just up the river from Bivalve. There is deep water at the docks.

Port Norris is a town about ¾ mile from the river and northward of Bivalve.

Between Port Norris and Millville are the villages of Leesburg, Dorchester, Brickboro, and Port Elizabeth on the east bank, all on the railroad, and Mauricetown on the west bank. There are railways at Dorchester capable of hauling out vessels of about 250 tons, 120-foot length, and 7-foot (2.1 m.) draft, and a machine shop for ordinary repairs to motors.

A highway drawbridge crosses the river at Mauricetown. It has a center pier draw, width of openings 58 feet. Either opening is clear, but the eastern opening is the one generally used, as there is a westerly set on both ebb and flood tide.

In the season over 600 oyster boats operate out of the river. Much sand and gravel is handled.

Millville is an important town at the head of navigation on Maurice River. It has railroad communication and several factories. A drawbridge having a draw opening 36 feet wide crosses the river at the lower end of the wharves. Gasoline and provisions may be obtained.

Tides.—The mean range of the tides is 5.7 feet at the entrance and 6 feet at Millville; it is high water at the latter place about 1 hour and 55 minutes later than at the mouth of the river. The tidal currents change at the entrance ½ hour and at Mauricetown 1 hour after the currents change at Overfalls Lightship. At Millville the flood current changes to ebb a little before high water, and the ebb changes to flood about ¾ hour after low water; this applies to the river in summer, when there are no freshets.

Directions, Maurice River.—There are numerous oyster stakes off the entrance, but no difficulty will be experienced if guided by the fixed aids until sure of the buoys. The following courses will lead in a depth of 9 feet (2.7 m.) or more until approaching the entrance:

A 358° true (N. ½ E. mag.) course from a position ½ mile westward of the western end of Cape May Point will lead to a position ½ mile eastward of Deadman Shoal gas buoy. Then a 335° true (N. by W. ½ W. mag.) course will lead to a position ¼ mile southwestward of the entrance to the dredged channel.

Or a 14° true (NNE. mag.) course with Brandywine Shoal Lighthouse astern will lead to the above position off the entrance.

Coming down Delaware Bay the safest course for a stranger is to pass southward of the buoy at the south end of Miah Maull Shoal, steer 82° true (E. mag.) for 4½ miles, until East Point Lighthouse bears 35° true (NE. ¼ N. mag.), then steer 31° true (NE. ½ N. mag.) for 4¾ miles to the entrance of the dredged channel.

The channel across the bar is marked by an unlighted range and buoys, and into the river by a lighted range and buoys. The outer range shows a little to the westward of East Point Lighthouse (flashing white); the inner shows to the left of a dwelling.

The center line of the dredged channel follows the northern edge of the white sector between two red sectors in East Point Lighthouse on a 47° true (NE. ⅞ E. mag.) course until on the inner range, then a 346° true (N. ½ W. mag.) course on this range until inside the mouth. On the flood, vessels should guard against a northwesterly set. For a distance of 16 miles above the entrance the channel has ample width and is easily followed; in the absence of local knowledge it is safer to take it on a rising tide and proceed with caution. In the upper 5 miles to Millville the channel is narrow and some local knowledge is required to follow the dredged channel. Towboats bound to or from the upper part of the river usually run with the current.

There is a narrow cut through the marsh leading into Maurice River about ⅜ mile eastward of the main entrance. It has a depth of about 2½ feet (0.7 m.) and is much used by motor boats.

Dividing Creek, 2½ miles northeastward of Egg Island Lighthouse, has a depth of about 2½ feet (0.7 m.) across the flats at the mouth and 5 to 15 feet (1.5 to 4.5 m.) inside. A draft of about 4 feet (1.2 m.) at high water can be carried through a very narrow

crooked channel to the town of Dividing Creek, about 8 miles above the mouth. It is used only by a few oyster boats.

Oranoaken Creek, ½ mile westward of Dividing Creek, has a depth of about 2½ feet (0.7 m.) across the flats at the entrance and deeper water inside. It is little used.

Egg Island Lighthouse (occulting white every 2 seconds), a white dwelling, is the most prominent mark in its vicinity. There are shoals southward of the point marked on the south and west sides by buoys; also an unmarked slough, good for a depth of about 7 feet (2.1 m.) close along the point inside the shoals. The slough is used by local vessels, but strangers should pass southward of the shoals.

Fortescue Beach is a post village and small summer settlement on the shore about 4 miles north-northwestward of Egg Island Lighthouse.

Nantuxent Creek, 6¼ miles east-southeastward of Ship John Shoal Lighthouse, has a depth of about 5 feet (1.5 m.) in the entrance, and is navigable at high water to within about 1 mile of the village of **Newport.** It is used only by local oyster boats.

Shoal spots with a least depth of about 5 feet (1.5 m.) extend about 1 mile south-southwestward of **Nantuxent Point,** and are marked off the west side by Hog Shoal gas buoy. Boats bound alongshore should keep outside of the buoy and well eastward of **Ben Davis Point Shoal,** which has a depth of 5 feet (1.5 m.) and borders the main channel of Delaware Bay.

Cedar Creek, 1¾ miles eastward of Ben Davis Point, has a depth of 4 feet (1.2 m.) across the flats at the mouth, 4½ feet (1.3 m.) for a distance of about 3 miles above the mouth, and about 3½ feet (1 m.) at high water for a farther distance of 2½ miles to the village of **Cedarville.** The mouth is used as an anchorage for small boats and there is little traffic above.

Back Creek, on the east side of Ben Davis Point, has a depth of about 5 feet (1.5 m.) across the flats at the entrance, and is navigable with a good depth of water for about 3 miles. It is used only as an anchorage by local boats.

Cohansey River, marked by Cohansey Lighthouse (flashing white), a white dwelling, and a lighted range, is navigable to the city of Bridgeton, 17½ miles above the entrance. It has considerable trade, carried mostly in barges to the upper end, and small schooners and motor boats in the lower end. The deepest draft entering the river is about 11 feet (3.3 m.) and this draft is taken to Bridgeton at high water. A large amount of garden truck is shipped down the river in season.

A new mouth 100 feet wide and 7 feet (2.1 m.) deep has been dredged into the river 500 yards northwestward of Cohansey Lighthouse, and the channel has been improved above to secure a width of 100 feet and depth of 7 feet (2.1 m.) to the lower drawbridge at Bridgeton, and a width of 60 to 75 feet and depth of 7 feet (2.1 m.) for a farther distance of about ¼ mile to the head of navigation. In 1928 there was a depth of 8 feet (2.4 m.) from Delaware Bay to the mouth, thence 5.4 feet (1.6 m.) to the Broad Street bridge at Bridgeton, thence 2.6 feet (0.7 m.) to the Commerce Street bridge, and 1.5 feet (0.4 m.) to the nail works bridge.

The range at the mouth of the river consists of two flashing white lights on white pyramidal slatted posts.

Greenwich Pier, a railroad terminus and shipping point for sea food, is on the west bank of Cohansey River, about 4 miles above the entrance. Gasoline, provisions, and water are obtainable. There is a railway capable of hauling out small vessels up to 8 feet (2.4 m.) draft, and machine shop for ordinary repairs to motors. **Greenwich** is a town about 1 mile from the wharves.

Fairton is a village on the east bank of Cohansey River, 3½ miles below Bridgeton.

Bridgeton is an important manufacturing town and railroad center at the head of navigation on Cohansey River. There are two drawbridges at Bridgeton, each a center pier draw, both openings clear. The clear width of openings of the lower bridge is 42.5 feet and of the upper bridge about 40 feet.

Supplies.—Gasoline, coal, and provisions may be obtained at Bridgeton.

Tides.—The mean range of the tides is 6.0 feet at the entrance and 6.5 feet at Bridgeton. It is high water at the latter place about 1½ hours later than at the entrance.

Directions, Cohansey River.—Vessels approaching the river from northward usually leave the main channel of Delaware Bay southward of the red buoy at the south end of Arnold Point Shoal, steer 104° true (ESE. ⅛ E. mag.) with Cohansey Lighthouse on the port bow, until up to the Cohansey range, then steer 30° true (NE. ¾ N. mag.) down the axis of the dredged cut, keeping south of the range. Vessels from the southward may steer in on Cohansey range from the main channel on a 36° true (NE. ⅛ E. mag.) course, until about 1 mile from shore, then down the axis of the dredged cut as above. A channel sometimes used is to the southward and eastward of Cohansey Lighthouse, avoiding the shoal making out from Cohansey Lighthouse in an east-southeasterly direction.

From inside the entrance to about 1 mile below Bridgeton there is a natural channel with ample width and depth and easily followed; in the absence of local knowledge it is safer to take it on a rising tide and proceed with caution. Thence to Bridgeton the channel has been obtained by dredging, and some local knowledge is required to follow it. Vessels bound to or from the upper part of the river usually run with the current.

Stow Creek, 3 miles northwestward of Cohansey Lighthouse, has a depth of about 4 feet (1.2 m.) in the entrance and deeper water inside. It is said to be navigable at high water to within about 1 mile of the village of **Canton,** about 10 miles above the entrance. There are farm landings near the head from which some produce is shipped, the deepest draft being 6 feet (1.8 m.). The best water in entering lies close alongshore southward of the entrance, then eastward and northward of the island in the mouth.

Bayside, at the mouth of Stow Creek, is a railroad terminus and important shipping point for sea food. There is a depth of 3 feet (0.9 m.) at the wharf. Gasoline and some provisions are obtainable during the fishing season.

Mad Horse Creek, 6 miles northwestward of Cohansey Lighthouse, has a depth of about 6½ feet (1.9 m.) in the entrance. It is

navigable for several miles, but is entered only by an occasional truck boat.

DELAWARE RIVER BELOW CHRISTIANA RIVER

[Chart 294]

Hope Creek, on the east side, 1¾ miles southeastward of Stony Point Shoal, has a depth of about 2 feet (0.6 m.) at the mouth and is navigable for several miles, but is little used.

Blackbird Creek, on the west side, ⅜ mile southward of Reedy Island range front light, can be entered with a draft of about 3 feet (0.9 m.) at low water by following the shore from well southward of the entrance, as mentioned in the description of Appoquinimink Creek, and this draft can be carried several miles above the mouth. It is frequented only by small produce boats. The creek is crossed by a drawbridge about 4 miles above the mouth, but is seldom opened.

Appoquinimink Creek, marked at the mouth by range lights (white latticed steel posts), is navigable at high water for vessels of 8 feet (2.4 m.) draft to the village of **Odessa,** 6 miles above the mouth, and for small boats a farther distance of about 2 miles.

The channel in Appoquinimink Creek has been improved by dredging and by cut-offs across the bends. In 1928 there was a depth of 3.2 feet (1 m.) from Delaware Bay to the mouth of the creek, thence 7.7 feet (2.3 m.) to Rock Reach, thence 4.6 feet (1.4 m.) to Odessa.

A drawbridge crosses Appoquinimink Creek about 3 miles above the mouth. The bridge is a center-pier draw, each opening 39 feet wide, with a headroom of 7.3 feet at high water. There is a drawbridge just above the wharves at Odessa with a single clear opening 44 feet wide and a headroom of 4½ feet at high water.

Tides.—The mean range of the tides is 6 feet at the mouth and 3.3 feet at Odessa. At Odessa high and low water occur about one hour after high and low water at the mouth.

The shoalest part of **Stony Point Shoal** has been surrounded by a bulkhead and raised to above high water by dumping, forming an artificial island about 2½ miles long. A dike, visible at all stages of the tide, connects the south end with **Stony Point.** The area back of this island has shoaled to a general depth of about 5 feet (1.5 m.). Groups of old vessels are anchored or grounded just south of the south dike.

Alloway Creek, eastward of the north end of the artificial island on Stony Point Shoal, is navigable for vessels to the village of **Quinton,** 7 miles above the mouth, and with some difficulty for small boats at high water for a farther distance of 4 miles to the village of **Alloway.** A channel 6 feet (1.8 m.) deep and 60 to 75 feet wide has been dredged to Quinton. The controlling depth in 1928 was 3 feet (0.9 m.) to the mouth, thence 4.9 feet (1.5 m.) to Hancocks Bridge, thence 5 feet (1.5 m.) to Upper Hancocks Bridge, thence 3.9 feet (1.2 m.) to Quinton. Two cut-offs have been made across sharp bends, one 1¼ miles above the entrance and the other above Hancocks Bridge; also two shore dikes have been constructed 2½ and 5½ miles above the entrance.

A drawbridge crosses the creek at the post village of **Hancocks Bridge,** 4 miles above the mouth. The bridge has a center pier

draw, each opening about 48 feet wide, with the best water in the north opening.

Upper Hancocks Bridge crosses the river 5½ miles above the entrance; width of opening, 35 feet. There is a drawbridge at Quinton, width of opening, 31 feet.

Boats entering Alloway Creek must pass northward of the artificial island on Stony Point Shoal, and should enter the creek on a northeasterly course to avoid shoals off the points on either side. Above the entrance the best water does not always follow midstream, and some local knowledge is required to keep in the best water. Strangers should take it on a rising tide and proceed with caution.

Tides.—The mean range of tides is 6 feet at the entrance, 4 feet at Quinton, and 2.5 feet at Alloway.

Reedy Island, formerly the site of a Federal quarantine station, is now used at times as a detention station. **Storm warnings** are displayed here and a day reporting station of the Philadelphia Maritime Exchange is operated. A dike extends 2½ miles southward from the south end of the island. It is covered by the red sector of Old Reedy Island Lighthouse. The lower end is submerged at high water. There is no navigation around the south end of the jetty except in small motor boats. **Old Reedy Island Lighthouse** (flashing white), a white tower on a dwelling, is on the dike ¼ mile southward of Reedy Island. About midway between the lighthouse and the south end of Reedy Island is an opening in the dike 150 feet wide, with a depth of 5 feet (1.5 m.) at low water, used by boats up to 7-foot (2.1 m.) draft bound to Port Penn. The opening is not marked, but the dike on each side is visible at high water.

Port Penn is a village on the west bank westward of Reedy Island. It can be approached from southward, through the opening in the dike at the south end of Reedy Island, and from northward with a depth of about 7 feet (2.1 m.) by passing westward of **Reedy Island Bar.** The anchorage off the town, known as **Reedy Island Harbor,** has a depth of about 20 feet (6.6 m.), but is little used except during the fishing season. There are depths of 1 to 2½ feet (0.3 to 0.8 m.) at the wharves at Port Penn, and 10 feet (3 m.) at the pier, about ½ mile southward of the town.

Salem River, emptying into **Salem Cove,** 3 miles southeastward of Pea Patch Island, is the approach to the city of **Salem,** at the junction of Salem and **Little Salem Rivers,** 3 miles above the mouth. A cut-off channel, 12 feet (3.6 m.) deep, has been dredged across a neck of land below Salem shortening the distance to Salem by a mile. There is little trade by water, but occasionally tugs of 9-foot (2.7 m.) draft and a few freight vessels use the river. There is 10 feet (3 m.) of water at the city dock, dockage free. Gas, oil, water, and provisions may be obtained. Small motor boats may be repaired here. In 1929 from Delaware Bay through the cut-off to a point 225 feet above Penns Neck Bridge there was a controlling depth of 10.9 feet (3.3 m.), thence 3 feet (0.9 m.) to a fixed highway bridge in Salem.

The channel across Salem Cove follows the southeast side and is marked by buoys and by a set of range lights. The front range is a post on a white house with black base, and the back range is a tall

white mast above a house. On the northwest side of the entrance channel there are several areas that are bare at low water.

To enter Salem River, leave the main channel of Delaware River off Elsinboro Point, steering 38° true (NE. ⅛ E. mag.) to pass close southeastward of black spar buoy No. 1, until up to the Salem River range, thence along this range on course 28° true (NE. ¾ N. mag.) to westward of red spar buoy No. 2, thence through the buoyed channel the cut-off, and mid-channel of the river above to Salem.

There is a bascule bridge crossing Salem River just below the mouth of Little Salem River. It has an opening 60 feet wide and headroom of 5 feet (1.5 m.) at high water.

Tides.—The mean range of tides at the entrance and at Salem is 5.6 feet, the tides occuring at the latter place 25 minutes later than at the former.

Salem River was originally navigable to Courses Landing, 15 miles above Salem and 2½ miles below the village of Sharptown. A dam has been placed across the river about 9 miles above Salem, and the river above the dam is connected with Delaware River by Salem Canal.

Salem Canal and Salem River above the dam are said to be navigable, with a draft of 4 or 5 feet (1.2 or 1.5 m.) at high water to Courses Landing. They are used only by a few truck boats. The entrance to Salem Canal is marked on the north side at the entrance by Deepwater Point range front light (white house, black vertical stripe on channel face).

Pea Patch Island is low and shoals extend for a long distance northward and southward of it. Large warning signs mark the shore ends of a telegraph cable extending from the wharf on this island to a wharf on the east shore of the river. Vessels should not anchor in the vicinity of this cable.

Delaware City is on the west bank of Delaware River southwestward of Pea Patch Island. There is 12 feet (3.6 m.) at the docks there, but little marine business is carried on.

The main entrance to the new Chesapeake and Delaware Canal is located at Reedy Point about 1½ miles below Delaware City. A branch canal connecting Delaware City with the new canal has a depth of about 3 feet (0.9 m.) The Chesapeake and Delaware Canal is described under Inside Route, New York to Norfolk, on page 248.

Bulkhead Shoal Channel, westward of Pea Patch Island and Bulkhead Shoal, is used by vessels bound through the canal.

A submerged dike extending from the north end of Pea Patch Island is now being constructed over Bulkhead Shoal. Its northern end will lie near mid-river off the south end of New Castle.

A curved jetty extends ⅝ mile westward from the eastern bank of Delaware River, 2 miles above Pea Patch Island, and is marked on its end by a light (occulting white).

New Castle is a town on the west bank of Delaware River, 4 miles below the entrance of Christiana River. It has little trade. The main wharf has a depth of 4 feet (1.2 m.) at its end, and the other wharves are in bad repair.

A small harbor, protected from drifting ice by ice breakers, is located at New Castle.

On the north side of town there is a ferry slip which is used by ferries running to Pennsville, on the other side of the river. A yacht basin with 4 feet (1.2 m.) is maintained by a club on the water front of New Castle.

Pennsville is a village on the east bank, 3½ miles below the entrance to Christiana River. There are depths of 7 to 8 feet (2.1 to 2.4 m.) at the docks.

A new dock has been built at River View Beach just on the north side of Pennsville. It is connected with Wilmington and Philadelphia by regular steamers during the summer season.

Just south of the Salem Canal some bulkheading has been erected and dredging alongside was underway in the summer of 1929. An electric plant is being built on the filled-in ground back of the bulkhead.

There is a railroad wharf, with a depth of 9 feet (2.7 m.) at the end, on the end of **Pigeon Point,** 1 mile southward of the entrance to Christiana River. It is used as a shipping point for coal and other freight, principally in car floats and barges. Coal and water are obtainable. There is a railroad wharf and car ferry slip at Deepwater Point, which is the site of large factories. There is 26 feet (7.9 m.) off the wharf.

CHRISTIANA RIVER

[Chart 294]

on the west side of Delaware River about 64 miles above Cape Henlopen and 26 miles below Philadelphia, is the approach to the city of Wilmington, 2½ miles above the mouth, and the villages of Newport and Christiana.

Wilmington has large manufacturing interests and considerable trade by water. The city is connected with Chester and Philadelphia by passenger and freight steamers and with Penns Grove by ferry.

Two parallel jetties have been constructed at the entrance. The north jetty is visible at all stages of the tide and has a flashing red light (post on white house) and fog bell on the end. The south jetty is marked on its outer end by a white tower carrying a flashing white light. The Bellevue range rear light (fixed white) is near the inner end of the north jetty, and is on a prominent black skeleton tower.

Just inside the mouth of the Christiana River on the south bank are the ferry slips of the Penns Grove-Wilmington ferries. Above that is the modern Wilmington marine terminal, with its bulkheaded water front, freight sheds, mechanical freight-handling equipment, and rail and highway connections.

Channels.—These have been dredged in the river, and in 1929 the following depths existed: From Delaware Bay to the marine terminal 25 feet (7.5 m.), thence 16.2 feet (4.9 m.) to the pulp works, thence 10 feet (3 m.) to Philadelphia, Baltimore & Washington Railroad bridge No. 4, thence 7 feet (2.1 m.) to a point 900 feet above the highway bridge at Newport. The depths in the channel at the entrance are constantly changing. Strangers should not attempt to enter without obtaining local information.

Lobdell Canal is on the south side of the river just above the marine terminal. It is used by towboats and barges.

Brandywine Creek, emptying into Christiana River 1¼ miles above the entrance, is good for a depth of about 4 feet (1.2 m.) at low water to the railroad bridge 1 mile above the mouth, and a draft of about 6 feet (1.8 m.) at high water can be taken a farther distance of about ¾ mile to a fixed bridge at the head of navigation. There is considerable traffic, mostly in barges of 4 to 6 feet (1.2 to 1.8 m.) draft. The channel is rocky above the railroad bridge.

Christiana River is lined with docks on both banks in the city of Wilmington. The municipal dock is located just above the second bridge (highway) on the north bank. It is open to the public. Water may be obtained from a connection on the dock.

Above this dock is the plant of a shipbuilding firm.

Christiana is a village at the head of navigation on Christiana River, about 12 miles above the entrance. A draft of 2 feet (0.6 m.) at low water and about 5 feet (1.5 m.) at high water can be taken to the town. There is some trade in motor boats and barges up to 4 feet (1.2 m.) draft.

Bridges.—The following are the drawbridges crossing Christiana River, the distance in nautical miles above the outer ends of the jetties at the entrance, the least width of the draw openings, and the clear height above high water, when closed:

Pennsylvania Railroad (lower), 1.2 miles, 90 feet, 7 feet.
Third Street (highway), 2 miles, 150 feet, 6 feet.
Market Street (highway), 2.7 miles, 175 feet, 8.5 feet.
Baltimore & Ohio Railroad, 3.1 miles, 70 feet, 3.5 feet.
Pennsylvania Railroad (middle), 3.6 miles, 67 feet (east), 62 feet (west), 6.4 feet.
Philadelphia & Reading Railroad, 3.7 miles, 66.5 feet (east), 57.3 feet (west), 3.2 feet.
Pennsylvania Railroad (upper), 4.8 miles, 48 feet, 2.4 feet.
Newport (highway), 8 miles, 50 feet, 2.4 feet.
Churchmans (highway), 10.3 miles, 27 feet, 7.5 feet.

Four bridges cross Brandywine Creek between the mouth and the head of navigation, and all have draw openings.

Bridge regulations prescribed for the highway bridges crossing Christiana River and Brandywine Creek require that the draws shall be opened immediately at all times of the day or night upon a signal of three blasts of a whistle or horn if no person or vehicle passing over the bridge is then in the way. The answer from the bridge is three blasts of a whistle or horn if the bridge can be opened immediately, and two blasts if the bridge can not be opened immediately.

Regulations prescribed for the railroad bridges crossing Christiana River and Brandywine Creek require that the draws shall be opened immediately at all times of the day or night upon a signal of three blasts of a whistle or horn, unless a train is due to arrive within 5 minutes of the time of giving the signal. But in no case shall there be a delay of more than 10 minutes in opening the draws. The signal shall be answered from the bridge by three blasts of a whistle or horn if the bridge can be opened immediately, and two blasts if the bridge can not be opened immediately.

Channel regulations.—(1) Vessels over 20 tons propelled by machinery shall not proceed at any time within the limits of these waters at a greater speed than 8 statute miles per hour. (2) Vessels over 15 tons propelled by machinery passing any plant employed in the improvement of said waters shall not proceed at a speed greater

than 4 statute miles per hour, and the propelling machinery of vessels passing any such plant shall be stopped at a distance of 300 feet from said plant and not started in motion until said vessel shall have passed abreast of such plant, except where it may become necessary to avoid an accident, or in the case of a vessel with heavy tow. When it becomes necessary for a vessel to pass between any such plant and any buoys indicating the position of the mooring anchors of such plant, such vessel shall give the following warning signal to said plant to lower the mooring lines: Four short blasts of a whistle or horn in quick succession, said warning signal to be given when said vessel is about ½ mile away from the plant.

Paragraphs 3 to 9 of the regulations for Delaware River, given on page 272, apply to Christiana River.

Supplies.—Water, provisions, ship chandlery, Diesel oil, and coal in any amount can be obtained at Wilmington.

Repairs.—There are good facilities for construction and repair of hulls and machinery. There is a dry dock and several marine railways the capacities of which are given in the table on page 4.

Tides.—The mean range of tides is 5.6 feet at Wilmington, 5.6 feet at Newport, and 3.5 feet at Christiana. High and low water at Newport occur 1 hour 10 minutes and 1 hour 40 minutes, respectively, later than at Wilmington, and at Christiana 2 hours 30 minutes and 3 hours, respectively, later than at Wilmington.

Directions, Christiana River.—The following directions are available for vessels of 10 feet (3 m.) draft or less; vessels of deeper draft should take a pilot. Enter the river on course 291° true (NW. by W. ⅜ W. mag.), passing midway between the north and south jetty lights until abeam of Lobdell Canal, then favor the west bank to the first bridge. From here to the docks at Wilmington the mid-channel is clear. Above the docks a mid-channel course should be followed to Newport.

DELAWARE RIVER, CHRISTIANA RIVER TO PHILADELPHIA

[Chart 295]

There is a powder factory on **Carney Point,** on the south side of **Helms Cove,** eastward of the entrance to Christiana River. A tank and several chimneys are prominent.

Pennsgrove is a town on the east side of Delaware River, 2 miles northeastward of the entrance to Christiana River. It is a railroad terminus, and has communication by ferry with Wilmington. There is a depth of 7 feet (2.1 m.) at the steamboat wharf.

Edgemoor is a village on the west side of Delaware River, 2 miles northward of the entrance to Christiana River. A rolling mill and a buoy depot of the Lighthouse Service are located here.

A jetty extends from Edgemoor for ⅔ mile south-southwestward parallel with Cherry Island Channel. Bellevue front range light (flashing white) is located at the lower end of it.

A dike, marked at its end by a red buoy, extends 580 yards off **Oldmans Point,** on the east bank, between **Marcus Hook Bar** and **Cherry Island Flats.** The outer end is submerged. Southward of the dike there is a pier.

Oldmans Creek, on the east side of Delaware River, 4 miles above Christiana River, is the approach to the villages of **Pedricktown** and **Auburn,** 4½ and 9½ miles, respectively, above the mouth. Considerable produce is shipped from the creek, the deepest draft of vessels being 8 feet (2.4 m.). A channel 6 feet (1.8 m.) deep and 100 feet wide has been dredged across the bar at the mouth, 6 feet (1.8 m.) deep and 75 feet wide to Pedricktown, and 5 feet (1.5 m.) deep and 40 feet wide to Auburn, and nine cut-offs have been made between the mouth and Auburn. In 1928 there was a depth of 4.1 feet (1.2 m.) from Delaware River to the mouth of the creek, thence 5.1 feet (1.5 m.) to Pedricktown, thence 1.7 feet (0.5 m.) to Auburn.

To enter Oldmans Creek, steer 73° true (E. ¾ N. mag.), with Cherry Island range rear light (black daymark on white tower) astern, to just south of buoy No. 1, thence be guided by the buoys to the river, and in the river steer a mid-channel course.

Three **drawbridges** cross Oldmans Creek below Auburn. The highway bridge 2½ miles above the entrance has a draw opening 45 feet wide, the railroad bridge ¾ mile above has a draw opening 36 feet wide, and the highway bridge at Pedricktown has a draw opening 36 feet wide. There is a fixed bridge at Auburn under which small boats can pass.

Tides.—The mean range of tides is 6 feet at the entrance, 2.5 feet at Pedricktown, and 1 foot at Auburn. At Pedricktown high and low water occur 35 minutes and 25 minutes, respectively, after high and low water at the entrance, and at Auburn high and low water occur 2 hours and 45 minutes after high and low water at the entrance.

Marcus Hook, on the west side of Delaware River, 2 miles below Chester, has oil refineries and is an important oil-shipping point. There is a depth of 25 feet (7.6 m.) at the public wharf and 20 to 30 feet (6.1 to 9.1 m.) at the oil wharves.

A rocky patch with a depth of about 25 feet (7.6 m.) has been found 50 yards out from the chemical company's dock.

A Federal quarantine station operated by officers of the United States Public Health Service is maintained here. Also a signal station and a day and night reporting station of the Philadelphia Maritime Exchange.

A small harbor protected by ice breakers is located here.

Raccoon Creek, on the southeast side of Delaware River, 1 mile southward of the lower end of Chester, is the approach to the towns of **Bridgeport** and **Swedesboro,** 1½ and 8 miles, respectively, above the entrance. Vessels of 6½ feet (1.9 m.) draft are taken to Swedesboro at high water. A channel has been dredged, and in 1928 had a controlling depth of 6 feet (1.8 m.) from Delaware River to the mouth, thence 6.1 feet (1.8 m.) to Bridgeport, thence 4.7 feet (1.4 m.) to Springers Wharf, thence 1.3 feet (0.4 m.) to Swedesboro.

There is a bar off the entrance with a least depth of ½ foot (0.1 m.) on it, and a channel eastward of it to the mouth of the creek, with a least depth of 6 feet (1.8 m.) from southward. A jetty has been built out from the south point; there is a flashing red light on the outer end. Enter about 1 mile below the mouth of the creek, pass close southward of spar buoy No. 1, and follow along the

buoyed channel. An unmarked channel of lesser depth enters from the northward, following close to the shore north of the mouth of the creek.

Two **bridges,** having draw openings 47 and 38 feet wide, and clearances of 5 feet at high water, cross Raccoon Creek at Bridgeport. Three bridges cross the creek at Swedesboro. The lower bridge has an opening 60 feet wide; the second is fixed and has a headroom of 21 feet at high water; the third, at the head of the dredged channel, is fixed and has a headroom of 7 feet at high water.

The section of channel on Marcus Rock and Chester ranges, which was formerly obstructed by ledge rock, has been blasted and dredged, but sweep examinations show that it has not yet been cleared to grade. The minimum depth near the range is 34.4 feet (10.4 m.) on broken rock, located 400 feet above the intersection of Chester and Marcus Hook ranges and 100 feet west of the center line.

From 1,700 feet to 3,600 feet above the intersection of Marcus Hook and Bellevue Ranges, both east and west of the center line, there are scattered bowlders and rocks on which the minimum depth is 33 feet (10 m.) at mean low water.

Tides.—The mean range of tides is 6 feet at the entrance and 5 feet at Swedesboro. At Swedesboro high and low water occur 1 hour and 30 minutes after high and lower water at the entrance.

Chester is an important manufacturing city 73½ miles above the entrance to Delaware Bay and 14½ miles below Philadelphia. It has considerable trade by vessels. Most of the docks open to the public do not have deep water alongside. The principal wharves of the industrial plants have from 8 to 25 feet (2.4 to 7.5 m.) alongside.

Water and limited quantities of coal can be obtained at Chester. There are several machine shops and shipbuilding plants at Chester and marine railways at Essington, 3 miles eastward.

Chester Island, in mid river off the upper wharves at Chester, is marshy and has no prominent mark. A dike visible at high water extends from the eastern bank of the river nearly to the northeast end of the island. The channel from the dike to the southwest end of the island has been used as a dumping ground and shoaled to a depth of 4 feet (1.2 m.).

Chester Creek had a depth in 1928 of 5.9 feet (1.8 m.) from Delaware Bay to the Philadelphia & Reading Railroad bridge, then 9.2 feet (2.8 m.) to Second Street Bridge, and about 3 feet (0.9 m.) to the village of Upland. There is a railroad bridge just inside the mouth, with a single draw opening 59 feet wide and a headroom of 1½ feet at high water, and there are numerous fixed bridges between this point and Upland, having a least headroom of 6 feet at high water. Most of the business in the creek is in barges of about 6-foot (1.8 m.) draft, carrying coal to the industrial plants. The mean range of the tides is 5.5 feet at the entrance and about 5 feet at Upland.

Ridley Creek has a depth of about 5 feet (1.5 m.) at high water to a dam 2 miles above the mouth. The shoalest places are at the mouth and at the head of navigation. The creek is crossed by numerous fixed bridges having a least headroom of 9.5 feet at high water. There is little business by water.

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Eddystone, a town just above Chester, has a large factory and other industrial works. The Baldwin Locomotive Works ships locomotives from its piers direct to foreign countries.

Crum Creek, just westward of Chester range rear light, is bare in places at low water, and has a depth of 5 feet (1.5 m.) at high water to the fixed railroad bridge, about 1 mile above the entrance. It is crossed by several bridges having but little headroom at high water.

Darby Creek, ⅜ mile eastward of Chester range rear light, has a depth of about 7 feet (2.1 m.) for 4 miles above the mouth and 3 feet (0.9 m.) for a further distance of about 2 miles to the fork, ½ mile from the town of **Darby.** It is used only by small pleasure boats. Five bridges cross the river below the fork. Three of them have draw-openings and the others are fixed. The mean rise and fall of tides is about 6 feet at the mouth, 5 feet at the fork, and nothing at Darby.

Essington is a town on the north side of Delaware River northward of Tinicum Island. There is a depth of 14 feet (4.2 m.) at the shipyard wharf and 3 to 7 feet (0.9 to 2.1 m.) at the clubhouse wharves. Vessels bound to the town, unless of light draft, must pass around the western end of Tinicum Island. The largest marine railway has a capacity of 125 tons, and can take out vessels 120 feet long and 12 feet (3.6 m.) draft.

Tinicum Island, 11 miles below Philadelphia, is a long, marshy island with bushes on its western end. An oil-pipe line is laid between Bramell Point and the east end of Tinicum Island.

There are several large factory buildings between **Thomson** and **Crab Points,** and two wharves, the upper one having a depth of 23 feet (7 m.) at the end and the lower one 11 feet (3.3 m.). A large oil depot is located east of **Bramell Point,** and 33 feet (10 m.) can be carried alongside.

Billingsport is a village on the southeast side of Delaware River, 1 mile above the upper end of Tinicum Island. It has communication by steamer with Philadelphia and other points on the Delaware River.

Mantua Creek, on the southeast side of Delaware River, ½ mile above Billingsport, is the approach to the villages of **Paulsboro, Mount Royal,** and **Mantua,** 1½, 4, and 7½ miles, respectively, above the entrance. A channel has been dredged 12 feet (3.6 m.) deep and 100 feet wide from the Delaware River to the fertilizer factory 700 yards above the entrance, 8 feet (2.4 m.) deep and 80 feet wide to Paulsboro, and 7 feet (2.1 m.) deep and 60 feet wide to the wharf near Mount Royal. There is a depth of about 1 foot (0.3 m.) to the head of navigation at Mantua. There are jetties on both sides at the entrance, and the channel is buoyed to the fertilizer factory. The controlling depth in 1927 was 11.9 feet (3.6 m.) from Delaware River to the fertilizer plant, 7 feet (2.1 m.) to the highway bridge at Paulsboro, 4.8 feet (1.5 m.) to Parkers Landing, and 3 feet (0.9 m.) to the end of the dredging project.

A railroad and a highway drawbridge, having clear openings 35 feet and 41 feet wide, respectively, cross the creek at Paulsboro, There are two fixed bridges about ¾ mile above the wharf at Mount Royal. The clear width and height above high water of the lower

bridge are 42 feet and 13 feet, and of the upper bridge 60 feet and 12 feet. There are two fixed bridges close together at Mantua, with a least headroom of 13 feet at high water, but boats seldom go above them.

Tides.—The mean range of tides is 5.6 feet at the entrance, 4.5 feet at Paulsboro, 4 feet at Mount Royal, and 2.5 feet at Mantua. High and low water occur later than at the entrance, as follows: Paulsboro, 20 minutes; Mount Royal, 50 minutes; Mantua, 2 hours and 5 minutes.

Woodbury Creek, on the southeast side of Delaware River, 1 mile southward of the entrance to Schuylkill River, has been improved by dredging a channel 6 feet (1.8 m.) deep and 60 feet wide from Delaware River to a highway bridge 1 mile above the entrance, and 6 feet (1.8 m.) deep and 40 feet wide to the town of **Woodbury,** 3½ miles above the mouth, with two cut-offs near the mouth and one near the head. The controlling depth in 1928 was 3.9 feet (1.2 m.) at the mouth, thence 6.2 feet (1.9 m.) to the first bridge, thence 3.9 feet (1.2 m.) to the second bridge, thence 3.8 feet (1.1 m.) to the highway bridge at Woodbury.

Two drawbridges cross the creek below the head. The lower bridge is a center pier draw with one clear opening 40 feet wide and a headroom of 6 feet at high water when closed; the south opening is the better. The second bridge, ¾ mile above the lower one, is a center pier draw with one clear opening 45 feet wide and a headroom of 4 feet at high water when closed. There is a fixed highway bridge at Woodbury with a headroom of 10 feet at high water. The dredged channel stops at this bridge and there is little navigation above. The mean rise and fall of tides is 5.5 feet at the entrance and 4 feet at Woodbury. High and low water at Woodbury occur 40 minutes and 50 minutes, respectively, later than at the mouth.

There is a middle ground in Delaware River northwestward of the entrance to Woodbury Creek, which is marked on the southwest end by **Block Island Light** (flashing white). Vessels bound into Woodbury Creek can pass on either side of the middle ground. The channel at the entrance is buoyed, but some local knowledge is necessary to enter with the best water.

Vessels **approaching Woodbury Creek** from southwestward should pass 400 yards southwestward and southward of Block Island. Approaching from northward, eastward of the middle ground, pass 100 to 200 yards off the wharf at Philadelphia Sanitarium, 250 yards offshore abreast the white monument at **Red Bank,** and 600 yards off the mouth of the creek. The course in the channel into the entrance passing on the north side of the buoys is 125° true (SE. ⅛ E. mag.) to the entrance. At low water the channel in the creek is well defined.

PORT OF PHILADELPHIA

[Chart 280]

The port of Philadelphia officially includes the Delaware River from Marcus Hook to Trenton.

The harbor of Philadelphia embraces the Delaware River from the mouth of the Schuylkill River to the Pennsylvania Railroad

bridge in the upper part of the city, a distance of 12.5 statute miles, and the Schuylkill River as far as the Fairmount Dam, a distance of 8.6 miles.

Immigration service.—The United States immigration station for the port of Philadelphia is located at Gloucester, N. J., directly opposite Philadelphia on the Delaware River.

Customs service.—The customhouse is located on Chestnut Street, between Fourth and Fifth Streets, and is open from 9 a. m. to 4.30 p. m., except on Saturday, when it is open until noon.

Quarantine service.—This is furnished by the United States Public Health Service at Marcus Hook, Pa. There is a relief station of the Public Health Service at Philadelphia.

Railroad terminals.—The Philadelphia & Reading Railway owns the piers at Port Richmond, where it handles coal, grain, ore, and general cargo. The Pennsylvania Railroad handles similar freight at its terminals at Greenwich and Girard Points.

Oil bunkering.—There are facilities at Point Breeze and Petty Island in the harbor of Philadelphia and at Paulsboro, N. J., Chester, Pa., Marcus Hook, Pa., and Claymont, Del., for supplying oil-burning vessels with fuel.

Coal bunkering.—There are several companies engaged in bunkering vessels with coal. Vessels as a rule are bunkered from barges while at their regular berths loading cargo.

Dry docks and marine railways.—With the exception of those at the navy yard there is only one dock at Philadelphia and neighboring localities of sufficient capacity for docking a ship 350 feet long. One of the floating docks can accommodate a ship 230 feet long. There are numerous marine railways suitable for hauling out the smaller types of vessels.

Commerce.—The imports of raw materials are mainly iron ore, sugar, petroleum and its products, manganese ore, sulphur, and nitrates of soda. This represents about 60 per cent of the imports.

Exports are made up mostly of heavy commodities, such as petroleum and its products, coal, grain, flour, iron and steel, lumber, and manufactured articles.

Domestic commerce consists mainly of coal, sand, gravel, petroleum and its products, sugar, fertilizers, besides the local business of the Delaware Bay and River.

In 1920 the total of all this commerce amounted to 24,000,000 tons.

For **Harbor and Anchorage Regulations,** and for **Speed Regulations** see the appendix. For anchorages see page 45.

Wharves.—The wharves and piers on the Philadelphia side of the Delaware River are numbered consecutively from the foot of Market Street northward to Port Richmond and southward to Greenwich Point. The wharves at Port Richmond are numbered independently. Those on the west side of the river, including Petty Island, and the east side opposite Philadelphia have depths of 5 to 35 feet (1.5 to 10.6 m.) at mean low water. On the Schuylkill River there are depths of 3 to 32 feet (0.9 to 9.7 m.) at the wharves. There are several municipal piers equipped with modern freight handling equipment.

The wharves on the Camden side are numbered consecutively from Pavonia southward to Newton Creek, except for the Pennsylvania Railroad wharves, which are numbered independently.

Schuylkill River, emptying into Delaware River at the lower end of the city of Philadelphia and at the western end of League Island, is navigable to the entrance of the Schuylkill Navigation Canal, near the **Fairmount Dam,** 7½ miles above the entrance, and by a canal for a farther distance of 80 miles. It is an important outlet for a part of the commerce of Philadelphia. There are large storage elevators at **Girard Point,** oil-refinery wharves opposite **Point Breeze** and at **Gibsons Point,** and other industrial wharves, besides several yacht clubs.

The dredging project in Schuylkill River provides for a channel 35 feet (10.6 m.) deep at mean low water and 400 feet wide to Twenty-ninth Street, thence 30 feet (9.1 m.) deep and 300 feet wide to Passyunk Avenue, thence 26 feet (7.9 m.) deep and 200 feet wide to Gibson Point, and thence 22 feet (6.7 m.) deep and 200 feet wide to Cleveland Avenue (now University Avenue). The project is completed except for the removal of scattered rock shoals in the section above Girard Point, and deepening of the channel to 35 feet (10.6 m.) at mean low water between the mouth and Girard Point which, under the law adopting the project, must be deferred until the completion of the 35-foot (9.1 m.) channel in the Delaware River.

The channel in the Schuylkill River is crooked but is marked by an entrance range and by buoys as far as the Baltimore & Ohio Railroad bridge. Above this point chart 280 is the best guide. A black buoy off the mouth of **Mingo Creek** marks a rock with 8 feet (2.4 m.) over it. **Anchorage** in Schuylkill River is prohibited except by permission of the commissioners of navigation.

Schuykill Navigation Canal is a succession of short canals and slack-water pools following the course of the Schuylkill River from a point near Fairmount Dam, 7½ miles above the entrance, to **Port Clinton,** a distance of about 80 miles. It is used mostly by canal boats, but is also frequented by many yachts and motor boats. The available depth throughout at low stage is about 4½ feet (1.3 m.). It has 55 locks, each 18 feet wide and 110 feet long. All of the bridges crossing the canal are fixed, the lowest being a bridge at **Norristown,** 21 miles above the mouth, which has a headroom of 13 feet at mean summer stage and 1 foot at flood stage. The canal is closed for about 4 months in winter.

Bridges.—The following are the drawbridges crossing the Schuylkill River, the distance in nautical miles above the entrance, the least width of the two draw openings, and the clear height above high water:

Penrose Ferry (highway), 1.2 miles, 183 feet, 18 feet.
Passyunk Avenue (highway), 3.1 miles, 200 feet, 33 feet.
Baltimore & Ohio Railroad, 4.6 miles, 57 feet, 15 feet.
Greys Ferry (railroad), 4.9 miles, 75 feet, 22.8 feet.
Greys Ferry (highway), 4.9 miles, 75 feet, 22 feet.
Pennsylvania Railroad, 5.7 miles, 65 feet, 25.5 feet.
South Street (highway), 6 miles, 100 feet (bascule lift).

Walnut Street Bridge, 6.5 miles above the entrance, and the bridges above as far as Fairmount Dam, are fixed and have sufficient headroom for the passage of small tugboats and barges. The least headroom at high water is 17 feet.

Bridge regulations prescribed for the drawbridges crossing the Schuylkill River require that they shall be opened at all times during the day or night to all vessels that can not pass underneath them, if no person or vehicle passing over the bridge is then in the way or a railroad train is on the bridge or within 5 minutes of the schedule time of a passenger train. The signal is three blasts of a whistle or horn, to be answered from the bridge by three blasts if the bridge can be opened immediately, or two blasts if the bridge can not be opened immediately. The draw need not be opened for the passage of a tug or other craft equipped with a smokestack which can be lowered so as to permit passage under the closed draw.

League Island, at the junction of the Delaware and Schuylkill Rivers, is the site of a **United States navy yard.** The basin on the north side of the island and its entrance from Schuylkill River have been dredged to a depth of 30 feet (9.1 m.).

Big Timber Creek, on the southeast side of Delaware River southward of Gloucester, has a depth of about 3 feet (0.9 m.) on the flats at the mouth and deeper water inside. Tugboats and barges of 6 feet (1.8 m.) draft go to the wharves at **Westville.** There is a drawbridge at the mouth and two drawbridges at Westville. The river is navigable at high water for several miles.

Gloucester is a city on the eastern side of Delaware River opposite the lower end of Philadelphia and the site of a shipbuilding plant. The depths at the wharves are 12 feet (3.6 m.) or less, the principal traffic being coal and building materials. During the ice season a signal station is maintained here by the Philadelphia Maritime Exchange.

Newton Creek, on the eastern side of Delaware River between Camden and Gloucester, is crossed by three fixed bridges and one bascule bridge near the mouth. There is 30 feet (9.1 m.) of water in the mouth between the docks of a shipbuilding company.

Camden is an important manufacturing city opposite Philadelphia, and is connected with it by several lines of ferries and a suspension bridge. The high-water clearance of the bridge is 135 feet. The depth of water at most of the Camden docks is only 10 feet (3 m.), or less, but the municipal dock can accommodate vessels up to 30 feet (9.1 m.) draft. There are good railroad connections here, and several large shipbuilding plants, with deep water at their docks.

Petty Island, eastward of the main channel at the northern end of the city of Camden, is 1½ miles long, and is the site of several industrial plants. There are oil-storage tanks near the center of this island and loading piers on its north side.

The channel eastward of Petty Island is principally used by the traffic to and from Cooper River, and has a least depth of 18 feet (5.4 m.) at the westerly entrance, which is generally used and is easy of access with the aid of the chart. It is crossed by a railroad drawbridge. The easterly entrance is a dredged cut 300 feet wide, with a least depth of about 13 feet (3.9 m.) between two buoys which mark the ends of spits bare at low water extending from Fisher Point Dike and the northeast end of Petty Island.

Fisher Point Dike, extending nearly ¾ mile west-southwestward from Fisher Point, shows well above high water and is sparsely wooded to the end.

Cooper River, southward of Petty Island, has been improved by dredging a channel 12 feet (3.6 m.) deep and 70 feet wide across the flats at the mouth and 1¼ miles above the entrance. This depth existed in June, 1929. There is a depth of about 6 feet (1.8 m.) for a further distance of about 1 mile, and a depth of 2 feet (0.6 m.) at low water and 4 feet (1.2 m.) at high water to **Stoys Landing,** at the head of navigation 7¼ miles above the entrance. Vessels using the creek are tugboats and barges up to 12 feet (3.6 m.) draft to the industrial plants in the lower part, and small truck and pleasure boats in the upper part. There is a black buoy on the eastern side of the dredged channel at the entrance. Above the entrance the best water follows a general midcreek course.

Cooper River is crossed by eight bridges between the entrance and the head of navigation. The first four, all within a distance of 3 miles from the mouth, are drawbridges, having a least draw width of 35 feet and a least headroom of 4 feet at high water when closed. The others are fixed bridges with a least width of 39 feet and a least headroom of 6 feet at high water.

Tides.—The mean range of tides is 5.3 feet at Cooper Point, just outside the entrance, and 2 feet at Stoys Landing. High and low water at Stoys Landing occur 2 hours and 15 minutes after high and low water at Cooper Point.

DELAWARE RIVER ABOVE PHILADELPHIA

[Chart 296]

The Delaware River is navigable for a distance of 24½ miles above the Pennsylvania Railroad bridge at Philadelphia to the city of Trenton. It is crooked and has many bars and shoals, but has been improved by dredging a channel 200 feet wide and 12 feet (3.6 m.) deep from Philadelphia to Trenton. It is marked by buoys and by lighted ranges in the upper end and is easily followed with the aid of the chart. This stretch of the river is used extensively by yachts and is a favorite cruising ground.

Steamers of 6 to 9 feet (1.8 to 2.7 m.) draft make regular trips to all of the towns on the river between Philadelphia and Trenton, and there is also considerable trade on the river in steamers, schooners, and barges up to 14 feet (4.2 m.) draft to the industrial plants along the shores. Schooners take a tow at Philadelphia or below. The river is also the approach to the Delaware and Raritan Canal, which has its entrance at Bordentown. **Directions** for the river from Bordentown to Philadelphia are given on page 256, under "Inside route, New York to Norfolk."

In September, 1929, the controlling depth from Philadelphia to Trenton was 12 feet (3.6 m.).

The Pennsylvania Railroad bridge, crossing the river 1 mile above Petty Island, has a center pier draw, each opening 120 feet wide, with a headroom of 50 feet at high water under either the draw when closed or the fixed spans.

Pensauken Creek, on the eastern side, ¾ mile above the railroad bridge, has a depth of about 3 feet (0.9 m.) at low water for a distance of 5 miles above the mouth, but is crossed by six fixed bridges, which limit the navigation to barges and motor boats. The first five

bridges have a headroom of about 10 feet at high water, and the other a headroom of about 3 feet at high water.

The Tacony-Palmyra bridge crosses the river between the places of those names. It has a width between fenders of 250 feet.

Riverton is a town on the eastern side, 3¼ miles above the railroad bridge. There is a depth of 7 feet (2.1 m.) at the steamboat wharf. A ferry connects Riverton with Tacony.

Bridesburg, Tacony, and **Torresdale** are parts of the city of Philadelphia, 1, 2½, and 6 miles, respectively, above the railroad bridge.

Frankford Creek, on the western side, 1½ miles above the railroad bridge, has been dredged to a depth of 6 feet (1.8 m.) and width of 60 feet for ¾ mile above the mouth, and has a depth of 5 feet (1.5 m.) at high water for a further distance of about 2 miles. It is crossed by three drawbridges within a distance of 1 mile from the mouth and by several fixed bridges between the upper drawbridge and the head of navigation. Navigation is confined almost exclusively to the lower 1 mile, and the deepest draft entering is about 9 or 10 feet (2.7 or 3.0 m.).

Pennypack Creek, on the western side, 4½ miles above the railroad bridge, has a depth of about 6 feet (1.8 m.) at high water to a fixed bridge 1 mile above the entrance. It is used by tugboats and barges of 6 feet (1.8 m.) draft. The **Philadelphia House of Correction** is on the south side.

The **Philadelphia filter plant** is on the western side of the river, ⅜ mile above the mouth of Pennypack Creek. A very tall chimney and a straw-colored cylindrical tower are prominent.

Rancocas River, on the eastern side of the Delaware River, 5½ miles above the railroad bridge, has a depth of 7 feet (2.1 m.) for a distance of 4½ miles above the mouth and 4 feet (1.2 m.) to the junction of the Lumberton and Mount Holly branches, 7¾ miles above the mouth. It is used by many tugboats and barges up to 10 feet (3 m.) draft and by one freight steamer of 7 feet (2.1 m.) draft, which goes as far as Hainesport, on the Lumberton Branch. The Lumberton Branch above Hainesport and the Mount Holly Branch are used only by small pleasure boats. The channel southwest of Hawk Island is marked by a lighted range and buoy. The channel of Rancocas River, above Bridgeboro especially, is very narrow and crooked, follows generally the ebb tide, bends back and forth between shoals, and is difficult, even with local knowledge. The drawbridges crossing the river below the fork are described with Delanco, Bridgeboro, and Bougher.

The channel from the fork to the town of **Mount Holly,** a distance of 4½ miles, is nearly bare in places at low water and has a depth of about 3 feet (0.9 m.) at high water. Several fixed bridges, with a least headroom of 6 feet at high water, cross the river at Mount Holly.

There is a depth of 3 feet (0.9 m.) at low water in the **Lumberton Branch** to the town of **Hainesport,** 2½ miles above the fork, and about 4 feet (1.2 m.) at high water for a farther distance of 2¼ miles to the town of **Lumberton.** Two bridges cross the Lumberton Branch at Hainesport. The highway bridge has a draw opening and the railroad bridge is fixed, but has headroom of 27 feet.

Riverside is a town on the south side of Rancocas River, 1¼ miles above the entrance. It has several factories and considerable business by water.

Delanco is a town on the north side of Rancocas River, 1½ miles above the entrance. There are wharves on both the Delaware and Rancocas River water fronts. There is a railway here capable of hauling out boats of 50 feet length and 5 feet (1.5 m.) draft. Two center-pier drawbridges cross Rancocas River between Delanco and Riverside. Each opening in the highway bridge is 50 feet wide and in the railroad bridge 43 feet.

Bridgeboro is a village on the south side of Rancocas River, 3 miles above the mouth. A bascule bridge with opening 60 feet wide, and a swing bridge, opening 45 feet wide, cross the river at this point.

Bougher is a village on the south side of Rancocas River, 7 miles above the mouth. A bridge having a center-pier draw with a width of 50½ feet in the south opening crosses the river at this point. The north opening is shoal.

Hawk Island is a marshy island, wooded in the center, at the junction of Delaware and Rancocas Rivers.

Mud Island, ¾ mile northward of Hawk Island, is a mud flat covered with marsh grass in summer and is partially submerged at high water. A channel used only by motor boats leads around the northwest side.

Beverly is a city on the eastern side, 9 miles above the railroad bridge at Philadelphia. The principal business by water is by the regular river steamers and a few coal barges. There is a depth of 9 feet (2.7 m.) at the steamboat wharf. A black standpipe is prominent.

Edgewater Park is a settlement of summer residences along the high bank eastward of Beverly. There are no wharves except for small motor boats.

Neshaminy Creek, on the northern side, ¾ mile east-northeastward of the standpipe at Beverly, has a depth of about 3 feet (0.9 m.) at the mouth and is used at high water by barges of 8 feet (2.4 m.) draft and by pleasure boats to the second bridge 1¼ miles above the mouth. It is crossed by four fixed bridges, under which barges and motor boats can pass.

Burlington is a city on the southern side of Delaware River, 12 miles above the railroad bridge at Philadelphia. It has several industrial plants, and considerable trade by water in steamers, schooners, and barges, the deepest draft being 15 feet (4.5 m.). There is a depth of 12 feet (3.6 m.) at the public wharf, 400 yards westward of a broad standpipe. Water and coal can be obtained at the wharves. The city is connected with Bristol by a ferry, which in summer also makes landings at Burlington Island.

Burlington Island, just north of the city of Burlington, is high and sparsely wooded. The center of the island is occupied by a pleasure park (Burlington Island Park). There is a wharf on the northwest side opposite Bristol with a depth of 8 feet (2.4 m.) at the end, at which river steamers and motor boats land. The channel southeastward of the island has a depth of 8 feet (2.4 m.), being shoalest at the upper end. Vessels of 12 to 15 feet (3.6 to 4.5 m.)

draft use the lower end as far as a pipe foundry, ¾ mile above the entrance, but the upper end is used only by motor boats.

Bristol is a town on the northwest side of the river, 13 miles above the railroad bridge at Philadelphia. It is the terminus of the Delaware & Lehigh Canal. The principal trade by water is by the regular steamer line. There is a depth of 12 to 16 feet (3.6 to 4.8 m.) at the wharves.

The entrance to the **Delaware & Lehigh Canal** is at the south end of the town of Bristol. It is navigable to **Easton** and **Mauch Chunk,** distant 52 and 94 miles, respectively, above the entrance, and is used principally by coal barges and an occasional motor boat and yacht. The locks are 90 feet long, 11 feet wide, and 6 feet (1.8 m.) deep.

Florence is a town on the south side of the river, 16 miles above the railroad bridge at Philadelphia. There is a large pipe foundry on the point at the bend of the river, at which schooners and barges load to a draft of 14 feet (4.2 m.). The steamboat wharf, ¾ mile eastward of the bend, has a depth of 12 feet (3.6 m.) at the end.

Money Island, abreast the eastern end of Florence, is a wooded marsh. The channel northward of the island is bare at low water. **Roebling** is a town established in connection with a large wireworks 17½ miles above the railroad bridge at Philadelphia. There is a depth of 10 feet (3 m.) at the clubhouse wharf and 12 feet (3.6 m.) at the wireworks wharf 400 yards above. There is considerable dredging for sand outside the dredged channel between Roebling and Newbold Island.

Newbold Island, 18½ miles above the railroad bridge at Philadelphia, is high and sparsely wooded, and has a house on the northwest side. A dike extends 300 yards westward from the lower end. The channel eastward of the island is nearly bare at low water.

Fieldsboro is a town on the high bank on the east side of the river, ¾ mile above the upper end of Newbold Island. There are factories and a railroad yard close alongshore at the foot of the bank. The steamboat wharf has a depth of 10 feet (3 m.) at the end.

Bordentown is on the high bank on the east side of the river, 21 miles above the railroad bridge at Philadelphia. It is important as the outlet to the Delaware & Raritan Canal, which is described on page 246. There is a depth of 6 feet (1.8 m.) at mean low water in the entrance to the canal between the black and red buoy marking the channel near its lower end. The bottom, however, is soft. There is a depth of 9 feet (2.7 m.) at the steamboat wharf. Gasoline and provisions are obtainable.

Crosswick Creek, at the north end of Bordentown, has a depth of about 3 feet (0.9 m.) for 3 miles above the mouth, but the channel is crooked and difficult. A fixed bridge, under which small boats can pass, crosses the creek at the mouth.

The **dredged channel** from Bordentown to Trenton is well marked by buoys and range lights, and is easily followed. The piers of an unfinished railroad bridge are located in the river about 2 miles below the Pennsylvania Railroad bridge at Trenton. There are two main openings between the piers each 120 feet wide.

Trenton, at the head of navigation, 24½ miles above the railroad bridge at Philadelphia, has two wharves at the lower end of the city, with a depth of 12 feet (3.6 m.) at the ends. A **dredged channel** 200 feet wide with a controlling depth of 13 feet (3.9 m.) leads along the water front to the railroad bridge, with a turning basin just below the bridge. The city wharf is at the head of the channel and has a depth of 12 feet (3.6 m.) alongside. There is also a city wharf near the lower end of the city used for handling low-grade freight, and a public landing for yachts. The mid river south of the railroad bridge has a depth of 3 to 4 feet (0.9 to 1.2 m.) and is used only as an anchorage for motor boats. There is no navigation above the bridge. The deepest draft of vessels going to the wharves are tugboats and coal barges drawing 10 feet (3 m.).

Tides.—The mean range of the tides is 5.2 feet at Philadelphia, 4.9 feet at Burlington and Bordentown, and 4.8 feet at Trenton. Daily predictions for Philadelphia are given in the tide tables published annually by the Coast and Geodetic Survey.

Ice.—The river above Philadelphia is generally closed to navigation by ice for extended periods during January and February, and during severe winters navigation is practically suspended during these months. Ice seldom forms before January.

Freshets.—During March and April freshets of from 10 to 20 feet (3 to 6 m.) in height above mean low water may be expected at Trenton. The highest water level is reached during the breaking up of the ice in the spring, and rain freshets do not ordinarily cause a height of over 9 feet (2.7 m.) above mean low water. Unless accompanied by ice, freshets are not ordinarily dangerous to shipping. The highest freshet on record, occurring in 1903, reached a height above low water of 21.6 feet at Trenton, 19.6 feet at Bordentown, and 12.8 feet at Bristol.

Directions for Delaware River from Bordentown to Reedy Point are given on pages 256 to 258, under the heading "Inside route, New York to Norfolk."

COAST FROM CAPE HENLOPEN TO CAPE CHARLES

[Charts 1219 to 1222]

From Cape Henlopen the coast trends southward for 21 miles to Fenwick Island Lighthouse and then trends south-southwestward for 96 miles to Cape Charles. The coast southward of Cape Henlopen is a chain of low sand beaches, backed by woods, and presents few characteristic features from offshore. There are few towns along the outer beach, and the most prominent marks are the lighthouses and Coast Guard stations. There are no harbors of refuge between Cape Henlopen and Cape Charles. Assateague Anchorage, which was formerly used, has filled in and can only be used by shallow-draft boats. The inlets and interior waters are described under "Inland waters, Cape Henlopen to Cape Charles," page 88.

The only towns visible from offshore between Cape Henlopen and Cape Charles are the summer resorts of **Rehoboth, Bethany Beach,** and **Ocean City,** 5, 16, and 29 miles, respectively, southward of Cape Henlopen. Rehoboth is distinguished by a standpipe, and a large hotel; Bethany Beach by a small group of houses without

prominent marks; and Ocean City by a water tank and several other prominent objects.

The coast between Cape Henlopen and Cape Charles is fringed with broken ground, on which lumps with depths up to 6 fathoms (10.9 m.) are found for distances of 8 to 11 miles from shore. The latest information from the old surveys respecting the outlying shoals is shown on the charts. The principal ones to which names have been applied are mentioned in the following description. There are lightships off the outer edge of the broken ground and deep-draft vessels keep outside of them.

Hen and Chickens Shoal, close inshore off Cape Henlopen, by the last survey, had a least found depth of 8 feet (2.4 m.), and there was a channel westward of it with a least depth of 22 feet (6.7 m.), seldom used except by small boats. Strangers should pass outside of it. At night a red sector in Harbor of Refuge Lighthouse covers the shoal. A black buoy, lying nearly 2 miles southeastward of Cape Henlopen Coast Guard station, marks the south end of the shoaler part, but a bank with 4 to 5 fathoms (7.3 to 9.1 m.) extends 3 miles southeastward from the buoy; this extension is marked by a gas and whistling buoy.

Fenwick Island Lighthouse (occulting white) has a white tower, 83 feet (25.3 m.) above the water, and visible 15 miles.

Shoals with depths of 5 fathoms (9.1 m.) or less extend 8 miles offshore eastward of Fenwick Island Lighthouse. **Fenwick Island Shoal** had a least depth of 8 feet (2.4 m.) by the last survey and is marked on the west side by a black gas and whistling buoy. A spot with 5 fathoms (9.1 m.) over it lies 10½ miles 92° true (E. ⅞ S. mag.) from Fenwick Island Lighthouse.

Fenwick Island Shoal Lightship, 14 miles 98° true (ESE. ⅝ E. mag.) from Fenwick Island Lighthouse, has a red hull with a white band covering bulwarks and "FENWICK" on each side and two masts with a black lantern gallery at each masthead. The light is 66 feet (20.1 m.) above the water, group flashing white, 3 flashes every 12 seconds, visible 14 miles. A riding light (fixed white) is exhibited from the forestay. The fog signal is a siren, blast 3 seconds, silent 17 seconds. If the siren is disabled a steam whistle will sound the same characteristic. The submarine bell strikes "3" every 6 seconds. The station buoy, red nun, lies 700 yards northward and marks a wreck.

Isle of Wight Shoal, 7 miles 120° true (SE. ¾ E. mag.) from Fenwick Island Lighthouse, had a least depth of 16 feet (4.8 m.) by a late survey and is marked on the western side by a horizontally striped buoy. A shoal with 3½ fathoms (6.4 m.) on it lies about midway between Isle of Wight Shoal and Fenwick Island Shoal. It was reported that soundings of from 5½ to 9 fathoms (10 to 16.4 m.) were obtained on a shoal about 10 miles southeast from Fenwick Island Shoal Lightship. A subsequent search failed to reveal the 5½-fathom (10 m.) spot, but a least depth of 6½ fathoms (11.9 m.) was found 11.4 miles 120° true from the lightship.

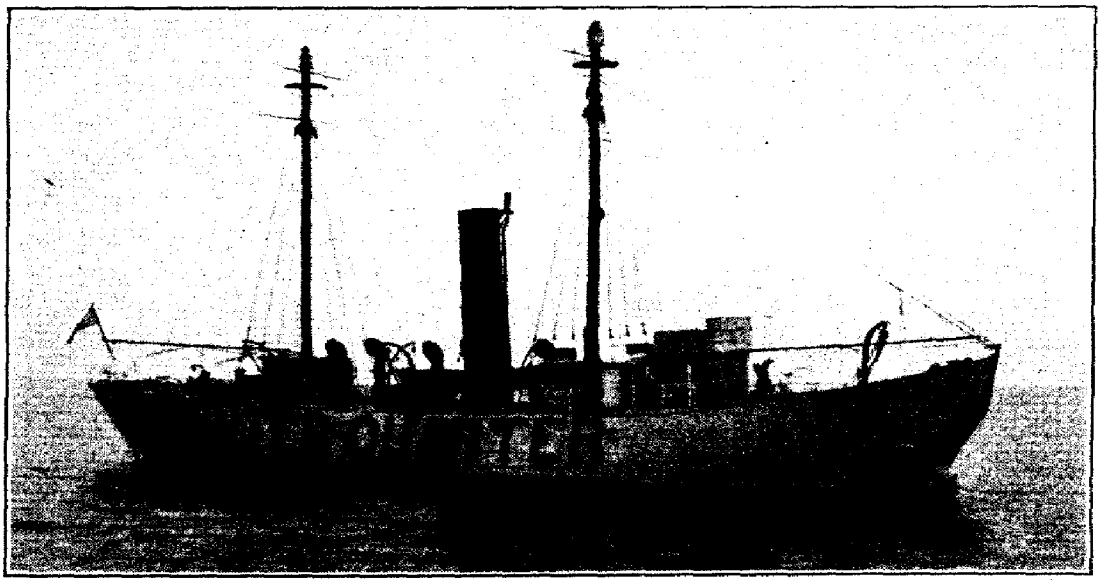
Little Gull Bank, 2½ miles southeastward of Ocean City, has a least depth of 12 feet (3.6 m.) by the last survey. It is marked by a gas and whistling buoy lying 1⅜ miles off the southeast side, and at

the southwest end by a horizontally striped buoy. There is a wreck with 24 feet (7.3 m.) over it just south of the gas and whistling buoy.

Great Gull Bank, 2½ miles southward of Little Gull Bank, had a least depth by the last survey of 17 feet (5.2 m.) at the southwest end and is unmarked. Numerous unmarked spots with less than 5 fathoms (9.1 m.) lie off shore between Great Gull Bank and Winter Quarter Shoal, as shown on the chart.

Winter Quarter Shoal, 11 miles 72° true (E. by N. mag.) from Assateague Lighthouse, had a least depth of 12 feet (3.6 m.) by the last survey, and is marked on the southwest end by a horizontally striped buoy. There is a gas and whistling buoy 2 miles eastward of the shoal.

Winter Quarter Shoal Lightship, 20 miles 88° true (E. ½ S. mag.) from Assateague Lighthouse, has a straw-colored hull with "WINTER QUARTER" on the sides, and two masts with black



Winter-Quarter Shoal Lightship

lantern galleries. The light is group flashing white (flash 2 seconds, eclipse 3 seconds, flash 2 seconds, eclipse 13 seconds), 66 feet (20.1 m.) above the water, and visible 14 miles. A fixed white light is shown from the forestay. The fog signal is given on a chime whistle, blast 3 seconds, silent 57 seconds. If whistle is disabled, a bell will be struck by hand. The submarine bell strikes groups of 4 strokes every 15 seconds. There is a radiobeacon, the details for which are given on page 16.

Assateague Lighthouse has a red tower. The light is fixed white, 154 feet (47 m.) above the water, and visible 19 miles. The tower shows well above the trees surrounding it, and is the most prominent mark in the vicinity.

Assateague Anchorage has filled in at the entrance so that in the summer of 1929 there was only 7 or 8 feet (2.1 or 2.4 m.) at low water in it, and the anchorage was being used only by fishing vessels of 5 to 6 feet (1.5 to 1.8 m.) draft, and by an occasional boat of 9

feet (2.7 m.) draft. Local knowledge should be had in entering. The channel passes close westward of Fishing Point Light.

Fishing Point is a bare sand spit on the south side of the anchorage and is extending rapidly northwestward. From 1908 to 1911 the rate of movement was 200 yards per year, and from 1911 to 1922 about 75 yards. The end of the point is marked by **Fishing Point Light** (flashing white).

There are two fish factories, with prominent iron stacks, located on the north side of Fishing Point.

Chincoteague Inlet, southwestward of Fishing Point, affords some protection from northerly and northeasterly swell for vessels anchoring near the bell buoy. Vessels in entering should avoid the wreck with 20 feet (6.1 m.) over it, about 2 miles northwestward of Turners Lump gas and bell buoy.

The shoals southeastward and eastward of Fishing Point are subject to some change both in depth and position, and strangers should proceed with caution when in this vicinity. The off-lying shoals are fairly stable, but those southward of Fishing Point are moving slowly southward.

Blackfish Bank, least depth 15 feet (4.5 m.), lies 4 to 5 miles off Assateague Island, and is marked near the south side by a gas and whistling buoy. Coasting vessels seeking protection from westerly weather pass westward of this bank.

Porpoise Banks, 10 miles southward of Assateague Anchorage and the same distance offshore, is a broken area on which the least depths found were 5½ to 6 fathoms (10 to 10.9 m.) as shown on the chart. The banks have not been closely developed and should be avoided by deep-draft vessels.

Parramore Banks, extending 8 miles from shore off Wachapreague Inlet, is a broken area on which the least depths found are 3½ to 4 fathoms (6.4 to 7.3 m.), as shown on the chart. The banks have not been closely developed. A gas and whistling buoy, moored 15 miles 51½° true from Hog Island Lighthouse, marks the eastern end of the banks.

Hog Island Lighthouse is a black skeleton tower. The light is flashing white (flash 3.5 seconds, eclipse 41.5 seconds), 180 feet (55 m.) above the water and visible 20 miles. There is a white unused lighthouse tower ½ mile southward of the lighthouse.

Smith Island Shoal has a present least depth of 23 feet (7.0 m.), lying 7¾ miles 101° true (ESE. ½ E. mag.) from Cape Charles Lighthouse. It is marked by a red gas and whistling buoy. Depths less than 30 feet (9.1 m.) extend 2 miles, and broken ground with least found depths of 5½ to 6¼ fathoms (10 to 11.6 m.) extends 11½ miles, northeastward from Smith Island Shoal, as shown on the chart.

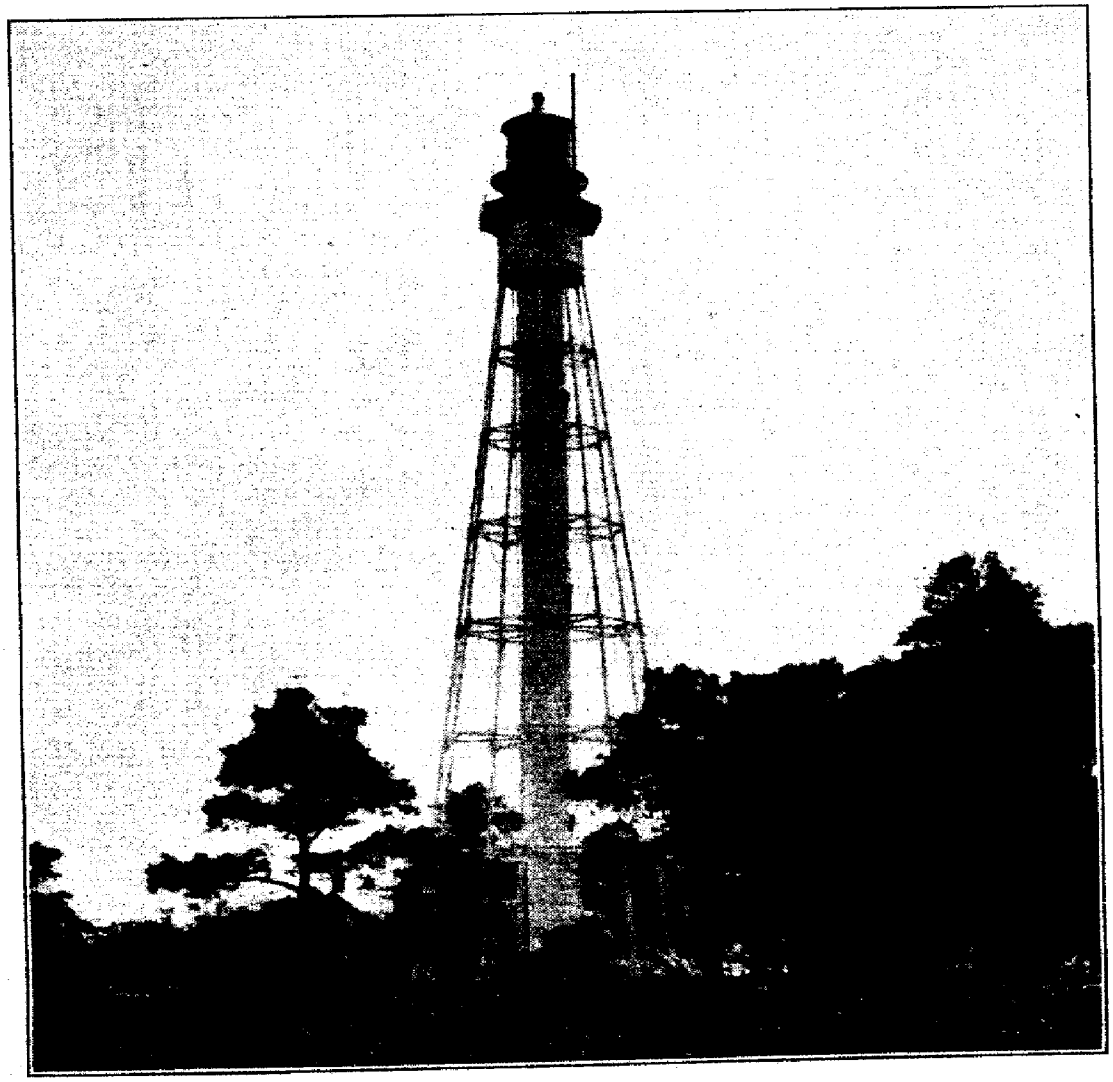
A vessel drawing 22½ feet (6.8 m.) reported striking 1¾ miles northwest of Smith Island Shoal gas and whistling buoy, and a recent survey shows a least depth of 25 feet (7.6 m.) in that vicinity.

Cape Charles Lighthouse is a white skeleton tower. The light is group flashing white, 180 feet (55 m.) above the water, and visible 20 miles. The light flashes 9 times every 60 seconds, thus: Four flashes, eclipse 6.5 seconds, five flashes, eclipse 25 seconds; each flash 1.2 seconds duration.

Smith Island, upon which the lighthouse is located, is low and sparsely wooded, and the lighthouse shows well above the trees surrounding it.

The shoals and channels on the northeast side of the entrance to Chesapeake Bay are described on page 110.

Chesapeake Lightship, in 63 feet (19.2 m.), 15 miles 78° from Cape Henry Lighthouse, off entrance to Chesapeake Bay, has a red hull with "CHESAPEAKE" on the sides, red tubular mast with



Cape Charles Lighthouse

black lantern and gallery. Light is occulting white, every 4 seconds, shown from foremast. It is 66 feet (20.1 m.) above the water and visible 14 miles. A fixed white riding light is exhibited from the forestay. The fog signal is made on a chime whistle once every half minute. A radiobeacon is maintained. Station receives and transmits radio messages. Call WRS. See page 16.

Fish weirs along the outside coast between Cape Henlopen and Cape Charles are limited by regulation to certain areas. The inner

limit of the areas for the entire distance is approximately ½ mile from shore. The limits of fish traps are shown on the charts.

Tides.—The mean range of tides on the outside coast is about 4 feet, and high and low waters occur at approximately the same time as at Sandy Hook.

INLAND WATERS, CAPE HENLOPEN TO CAPE CHARLES

[Charts 1219 to 1222]

The bays and connecting channels on the coast of Delaware, Maryland, and Virginia form a continuous inland waterway from Lewes, Del., southward to Cape Charles. Except for a small inlet which has been cut through the beach from Indian River Bay to the ocean and which had only ½ foot (0.2 m.) in the entrance at low water in May, 1929, there are no navigable entrances to the interior waters from outside between Cape Henlopen and Chincoteague Inlet, a distance of 61 miles, but southward of Chincoteague Inlet there are several inlets through which the inside waters can be reached. All of the inlets have shifting entrances, in some cases marked by buoys.

The inlets and interior waters give access to the villages and summer resorts on the beaches and the adjacent mainland. They are used by a large number of small craft engaged in the oyster and clam industry and inside and outside fishing, and by some pleasure boats. There is some freight business between points inside, and some coasting trade in sea food, wood, and lumber.

The north end of Rehoboth Bay is connected with Delaware Bay by a canal dredged 6 feet (1.8 m.) deep and 50 feet wide, except in the deep cuts, where it is 40 feet wide. This leads from just inside the mouth of Broadkill Creek (5 miles northwestward of Cape Henlopen) southeastward in Lewes Creek to Lewes, then by a canal southeastward to Gordon Pond, then southward through **Rehoboth Canal** to Rehoboth Bay. In June, 1928, the controlling depth, at mean low water, from Delaware Bay to Rehoboth Bay via Lewes Creek and Canal was 4 feet (1.2 m.) at the entrance in Delaware Bay, thence 5 feet (1.5 m.) to the highway bridge at Rehoboth, thence 5½ feet (1.6 m.) to Rehoboth Bay.

The commerce is mostly in motor boats and lighters, carrying fish, coal, shells, fertilizers, and farm products.

There are two wharves at Lewes open to the public and two private ones at Rehoboth. Directions for the inland waters are given on page 90.

Supplies.—Gasoline, provisions, and water can be obtained at Lewes, Rehoboth, Ocean View, Ocean City, Franklin City, Chincoteague, Wachapreague, Broadwater, Willis Wharf, and Oyster. Coal can be had in limited quantities at Ocean City, and at Chincoteague. There is communication by telephone at all villages and by telegraph at the railroad stations.

Repairs.—There is a railway at Chincoteague capable of hauling out vessels of 50 tons, 65 feet length, and 5 feet (1.5 m.) draft, and shops for ordinary repairs to hulls and motors. There are also smaller railways at Ocean View, Ocean City, Franklin City, Accomac, Wachapreague, and Willis Wharf capable of hauling out most of the boats frequenting those places.

Pilots.—There are no regular pilots for the inside passages or the inlets, but all of the local boatmen are competent pilots. In good weather there are often fishing boats outside the inlets, and strangers can obtain a fisherman for a pilot. There are no towns at the inlets from which a pilot may be obtained on signal, but a member from the Coast Guard station nearest the inlet will usually go out if a signal is set.

Bridges.—There are three fixed bridges crossing the canal between Indian River Bay and Little Assawoman Bay, with a least headroom of 8 feet. All of the other bridges have draw openings with sufficient width for any of the boats using the inside waters.

Communication.—Lewes, Rehoboth, Ocean City, and Franklin City have railroad communication. Points on the beaches from Ocean City southward can be reached only by boat. Points on the mainland adjacent to the interior waters can be reached from the railroad and highway a few miles westward of them.

Ice.—The inside waters northward of Chincoteague Bay are usually closed to navigation by ice during ordinary winters. From Chincoteague Bay southward the waters tributary to the inlets are closed by ice during severe winters, but remain so for only short periods of time. The principal inlets are rarely closed by ice, and are used by local boats throughout the winter.

Tides.—In the inland waterways the tides are greatly affected by winds, both in time and height, westerly winds producing low water and easterly winds high water. In Assawoman, Isle of Wight, Sinepuxent, and Chincoteague Bays northerly and southerly winds drive the water to the ends of the bays. With strong winds of long duration the change in depth may be as much as 3 feet (0.9 m.) above or below the normal high or low water, respectively, and the time of high or low water may be accelerated or retarded by more than an hour.

At the western end of the inlet cut through from Indian River Bay there is a range of tide of about 1 foot, and at the south end of the bay there is no range. From here to the north end of Chincoteague Bay there is no tidal range, the only variation being due to winds as mentioned in the preceding paragraph.

Under the following stations in Chincoteague Bay and Inlet are given the mean range of tides and the time of high or low water after high or low water at Assateague Anchorage, Snow Hill Landing, 0.4 foot, 5 hours 30 minutes; Assacorkin Island, 0.4 foot, 3 hours 55 minutes; Franklin City, 1 foot, 2 hours 25 minutes; Chincoteague, 1.9 feet, 55 minutes; Chincoteague Point, 3 feet, 0 minute.

The mean range of tides at Assateague Anchorage and at the entrances of the inlets southward is about 4 feet, and high and low waters occur 15 minutes before they do at Sandy Hook. Along the inside waters between Chincoteague Inlet and Cape Charles the mean range is about 4 feet and high and low waters occur from 30 minutes to 1 hour, depending on the distance from the nearest inlet, after high and low waters at the inlets.

Currents.—The currents have considerable velocity in the inlets and the narrow channels connecting the inlets with the adjacent bays and sounds. No observations are available, but it is estimated

that current velocities of as much as 3 knots may be experienced at times in places of maximum velocities. In the inland waters from Rehoboth southward to the north end of Chincoteague Bay there are no tidal currents, the only currents being due to winds.

Aids to navigation.—The more important of the navigable inlets are marked by buoys, but the channels are shifting and the buoys can not always be depended upon. Breakers form on the shoal areas even in ordinary weather and are often a good guide. Some of the more important interior channels are marked by beacons and lights, but most of them are marked only by bush stakes maintained by local authorities, which are of little use to a stranger. The sloughs leading through mud flats can best be followed at low water, when the shoals are visible. Strangers drawing near the limit of draft for the interior channels should take a pilot.

DIRECTIONS, INSIDE ROUTE REHOBOTH TO CAPE CHARLES

The directions and description following are written for use with charts 1219, 1220, 1221, and 1222, published by the Coast and Geodetic Survey.

Rehoboth to Ocean View, distance 10½ miles, least depth 4 feet (1.2 m.).—From the head of the canal 1 mile westward of **Rehoboth,** the waterway follows the canal southward for 1¾ miles to Rehoboth Bay. The south end of the canal leads between two stone jetties and is marked by a light on the east side and a prominent white shanty on the west side.

From here the best water slightly favors the west side of **Rehoboth Bay,** passes about ½ mile eastward of **Piney Island,** about 300 yards northeastward of **Bluff Point** (marshy and not marked), and close eastward and southward of the large island southeastward of it (marked by an old house in the center and a cedar thicket on the east end). The channel then passes through **Big Ditch,** the thoroughfare westward of **Middle Islet,** which lies between **Burton Islands** and **Indian River Neck.** Middle Islet is marked by a single tree and shanty.

From Big Ditch the waterway trends southwestward for 1 mile in **Indian River Bay** to avoid the shoals in its eastern part, then leads south-southeastward to **White Creek,** and then follows White Creek for 1½ miles to the mouth of the canal at Ocean View. There are shoals, usually marked by bush stakes, making off many of the points in White Creek.

Ocean View to Ocean City, distance 15 miles.—The least depth in 1929 was about 2 feet (0.6 m.).

The waterway leads from Ocean View southward through a canal crossed by 3 drawbridges to Little Assawoman Bay, then southward across the mouth of **Miller Creek,** passing westward of two grassy islets and eastward of a string of islets, and then close along the marsh on the west and south sides to the Narrows.

It favors the west side through the **Narrows,** keeping out of the bight, then leads southward, favoring the west side of **Little Assawoman Bay** to the thoroughfare connecting it with Assawoman Bay, passes through this thoroughfare and the eastern fork at its south end, and then favors the west side of **Assawoman** and **Isle of**

Wight Bays. Close to the south side of Isle of Wight Bay and 1¼ miles southeastward of **Keyser Point** there are two low, grassy islands (Collier Islands); the best water, about 2 or 2½ feet (0.6 or 0.7 m.), leads about ¼ mile northwestward of them, and then follows the shore through the narrow slough southward of them, and then favors the western side of **Sinepuxent Bay** to the drawbridges at **Ocean City.**

Ocean City to Chincoteague, distance 30 miles.—The least depth from Ocean City to the north end of Chincoteague Bay is 2½ feet (0.7 m.), and from there to Chincoteague is 5 feet (1.5 m.).

From the drawbridges at Ocean City the best water favors the east side of Sinepuxent Bay for 400 yards, and then the west side for about 1½ miles, until near the ruins of a pile jetty crossing the bay from **Coffin Point.** It leads through the eastern opening in the jetty, then in mid-channel until just northward of **Sandy Point,** and then favors the western side to South Point. For a distance of ¾ mile southward from Sandy Point the channel is narrow and lies about ¼ mile from the west shore.

The waterway rounds **South Point** at a distance of about 200 yards and follows the marsh northwestward at a distance of about 300 yards. There is a house and barn ¼ mile eastward of **Island Point;** pass about 150 yards southward of Island Point, and bring the house and barn astern on a westerly course until about ½ mile from Island Point. Then head for **Robins Marsh** (covered by bushes) and pass ¼ mile eastward of it. Then head a little westward of **Big Bay Point** until about 1 mile from it, and then pass ¼ mile eastward of it. Pass about 250 yards off the southeast end of Big Bay Point, about ¼ mile westward of **White Rock** (bare at extreme low water and usually marked by bush stakes), and about ¼ mile eastward of **Assacorkin Island.** Pass about 200 yards eastward of the southeast end of **Mills Island,** and between the two largest islets southeastward of that point on a southwesterly course; shoals extending a short distance southward from these islets are sometimes marked by bush stakes.

Pass ¼ mile eastward of the island off Long Point, steer southwestward for ¾ mile, and then bring the railroad wharf at **Franklin City** astern and pass 200 to 300 yards westward of light No. 4 (fixed red). Then head for light No. 5 (fixed white), pass close eastward of it, and head for a position about 200 yards northwestward of **Killick Shoal** Lighthouse (fixed white), white dwelling on piles. Pass 75 yards southwestward of the lighthouse and follow the curve of the channel, passing southwestward of light No. 2 (fixed red) and eastward of lights Nos. 3 (fixed white) and 1 (fixed white), to the wharves at **Chincoteague.**

With adverse winds the canal west of Bethany Beach nearly goes dry and boats have been marooned there for 10 days at a time.

Chincoteague to Wachapreague Inlet, distance 33 miles.—The least depth is not more than 1 foot (0.3 m.) at mean low water, and it often goes bare in places. There is 3 or 4 feet (0.9 or 1.2 m.) at mean high water, and it is only used at half tide or higher. The deepest draft using it is 4 feet (1.2 m.) and usual draft 2 or 3 feet (0.6 or 0.9 m.). Navigation is difficult, and local knowledge is necessary. The shoalest places are found in Kegotank, Metomkin, Cross

Broad Water, and Floyds Bays. Boats from Chincoteague southward can carry the best water by leaving on the last of the ebb tide, and from Wachapreague northward by leaving about 2 hours after the beginning of the flood. A little deeper draft can be carried northward than southward on a single tide. A drawbridge crosses Chincoteague Channel at Chincoteague; width of openings, 55 feet, with 18 feet headroom at low water.

From the wharves at Chincoteague the route follows **Chincoteague Channel** southwestward to Chincoteague Point, rounds the point between the fixed red light and the nun buoy off it, and runs southeasterly to a position about 0.4 mile northwestward of the channel can buoy between Assateague Point and Gunboat Point. Then the route crosses over to Gunboat Point, passing over a bar with 4 feet (1.2 m.) least depth, and follows along the shore westward, keeping about 250 yards off it, to **Ballast Narrows.** It leads westward through Ballast Narrows, through **Island Hole Narrows,** and then in a dredged channel across **Bogues Bay,** 4½ feet (1.3 m.) deep in 1929, and through **Cat Creek,** 5 feet (1.5 m.) deep in June, 1929; the dredged channel is marked by spoil banks. At the south end of Cat Creek the waterway follows the easternmost narrow slough to **Hog Creek,** and down the latter to **Assawaman Inlet.**

From Assawaman Inlet the waterway leads northwestward in **Assawaman Creek** for ½ mile, then westward through a short cut-off, and then follows the most westerly thoroughfare, as shown on the chart, to the northwest end of Kegotank Bay. It passes westward of an islet on the west side of **Kegotank Bay,** and then leads southeastward across the bay (least depth at low water is 1 foot (0.3 m.)) to the easternmost narrow slough at its south end. It then follows this slough and **North Gargathy Creek** southward to **Gargathy Inlet,** and **South Gargathy Creek** westward and southwestward to Metomkin Bay. There is a shanty on the west side of the thoroughfare at its outlet into Metomkin Bay.

The best water leads westward of two islets just after entering **Metomkin Bay,** then southeastward for about ¼ mile, then favors the east side of the bay, where the water is from 1 to 2 feet (0.3 to 0.6 m.) deep at low water, and passes through the eastern slough in its southern part, as shown on the chart, to **Metomkin Inlet.** From here it leads westward through **Longboat Creek,** through the middle of **Cross Broad Water** to its south end (least depth 2 feet (0.6 m.)), westward through **Teagles Ditch,** southwestward near the middle of the north part of **Floyds Bay** (least depth 1 foot (0.3 m.)) for 1 mile, and then in the slough near its west side, as shown on the chart, to the north end of **Hummock Channel,** and then southward in the latter to the entrance of **Finney Creek,** which leads to **Wachapreague.** The waterway continues southward through **Black Rock Reach,** then eastward for ¾ mile, and then southward across **Wachapreague Inlet,** following the marsh on its west side to avoid the middle ground shown on the chart.

Wachapreague Inlet to Great Machipongo River, distance 15 miles, least depth 5 feet (1.5 m.) at low water and about 9 feet (2.7 m.) at high water.—The shoalest place is at the south end of Drawing Channel, and the deepest draft will be carried across

this point by leaving Wachapreague Inlet at high water. The channels are difficult, and local knowledge is required to avoid the shoals. From Wachapreague Inlet the waterway leads southward along **Horseshoe Lead** and **Drawing Channel,** then westward and southward through the **Swash** and **Little Sloop Channel** to Sandy Island Channel. From here the more direct route, good for a depth of about 2½ feet (0.7 m.), leads southwestward along **Sloop Channel** and southeastward along **Cunjer Channel** to **North Channel;** but the deeper and more generally used passage leads southeastward along **Sandy Island Channel** to **Little Machipongo Inlet,** then southwestward and westward along **North Inlet** and North Channel to Great Machipongo River. North Channel and Great Machipongo River are marked by lighted beacons.

Great Machipongo River to the southwest end of Smith Island, distance 30 miles, least depth about 6 feet (1.8 m.).—The shoalest part is through the Ramshorn, which is very narrow and difficult and can be followed only at low water when the flats show above water. All of the channels are more easily followed at low water.

From the intersection of North Channel and **Great Machipongo River** the waterway leads southward for 3½ miles to the western branch, and then westward through this branch and **The Deeps** to The Outlet. From here a draft of 2½ feet (0.7 m.) can be carried southwestward through **The Outlet** and into The Thoroughfare, as shown on the chart; but the deeper and more generally used channel leads westward along The Deeps, then northwestward, northward, and southwestward into **The Thoroughfare,** following the channel lying nearest to the mainland. This part of the waterway is known as **The Ramshorn.**

From here the waterway leads southward through The Thoroughfare and the channel in **Magothy Bay** to the southwest end of **Smith Island,** as shown on the chart. There is a light at the intersection of **Sand Shoal Channel** and The Thoroughfare, and single pile beacons with daymarks at frequent intervals between there and Smith Island. Boats can leave the waterway through **Smith Island Inlet,** which has a depth of 2 feet (0.6 m.) at low water and about 6 feet (1.8 m.) at high water, or through **Fisherman Inlet,** which has a depth of about 4 feet (1.2 m.) at high water. Further information is given on page 100.

REHOBOTH TO CHINCOTEAGUE BAY

Rehoboth is a summer resort with railroad communication, on the beach southward of Cape Henlopen. In summer motor boats run to Ocean View and Bethany Beach. A black standpipe is the most prominent mark.

Rehoboth Bay has a depth of 4 to 7 feet (1.2 to 2.1 m.) and is much frequented by boats of 3 to 4 feet (0.9 to 1.2 m.) draft running produce from the tributaries of Rehoboth and Indian River Bays to Rehoboth for shipment. There is a landing, to which a depth of 4 feet (1.2 m.) can be carried, at the northeast end, westward of Rehoboth Beach Coast Guard station. There is no tidal effect, but the water level is changed from ½ to 1½ feet (0.1 to 0.4 m.) by winds.

Love Creek, at the northwest end of Rehoboth Bay, is navigable for small boats to a milldam near the village of **Robinsonville,** 3½ miles above the mouth. It is crossed by a fixed bridge, under which motor boats without houses can pass.

Herring Creek, at the southwest end of Rehoboth Bay, is navigable with a draft of about 2½ feet (0.7 m.) to the fork, about 2 miles above the mouth, and with a less draft for a short distance up either fork. It is little used. **Angola** is a post village near the head of navigation.

An inlet has been dredged across the beach from Indian River Bay to the ocean and had a depth at the entrance in May, 1929, of ½ foot (0.1 m.). It is located about 1¾ miles south of Indian River Inlet Coast Guard station.

Indian River Bay has general depths of 6 or 7 feet (1.8 or 2.1 m.); except along the eastern end, which is shoal. It is used by boats bound north or south along the waterway and by local boats carrying produce and wood products to Rehoboth or Millsboro. The usual draft of boats is 2 to 4 feet (0.6 to 1.2 m.).

Indian River, at the west end of Indian River Bay, has a depth of 3½ feet (1 m.) in mid-channel to the milldam at Millsboro, the upper 1½ miles being a privately dredged channel. **Millsboro** is a town on the railroad 5½ miles above the mouth.

Pepper Creek and **Vine Creek,** on the south side at the western end of Indian River Bay, have a depth of 3 feet (0.9 m.) for about 1½ miles above their junction; they have several farm and mill landings.

White Creek, on the south side of Indian River Bay, has a depth of about 4 feet (1.2 m.) to **Ocean View,** a village at its head 2 miles above the mouth. It forms a part of the inland waterway.

A canal, dredged to a width of 20 feet and depth of 4 feet (1.2 m.), but shoaled to 2 feet (0.6 m.), connects White Creek with the north end of Little Assawoman Bay.

Bethany Beach is a small summer resort on the beach, 2 miles southeastward of Ocean View and 4½ miles northward of Fenwick Island Lighthouse. A privately dredged channel, marked by spoil banks, leads from the canal eastward through the south side of **Salt Pond** to near the beach. It had a depth of 2 feet (0.6 m.) in 1929 and this depth could be brought to it from Indian River Bay. In summer motor boats run to Ocean View, Millsboro, and Rehoboth.

Little Assawoman Bay has depths of 2 to 4 feet (0.6 to 1.2 m.) and is little used. It is covered with grass in summer, which is an obstruction to navigation for boats not equipped with weedless propellers. **Miller Creek** and **Dirickson Creek,** on the west side of the bay, have a depth of 1½ feet (0.4 m.) for about 1½ miles above their mouths and are little used. Little Assawoman Bay and Assawoman Bay are connected by a narrow throughfare having a least depth of about 7 feet (2.1 m.); it is crossed by a highway drawbridge; width of draw span, 33 feet. **Bayville** is a post village 1½ miles northwestward of the bridge.

Assawoman and **Isle of Wight Bays** have general depths of 4 to 6 feet (1.2 to 1.8 m.) along their western sides, but only 2 feet (0.6 m.) can be brought to them from north or south. They are

frequented by pleasure boats from Ocean City and by boats engaged in traffic between points on the tributaries.

Roy Creek and **Grey Creek** have depths of 3 feet (0.9 m.) nearly to their heads, but are little used.

St. Martin River, on the northwest side of Isle of Wight Bay, has a depth of about 3 feet (0.9 m.) to the fork, 3½ miles above the mouth, and 2 feet (0.6 m.) to the post village of **Bishopville,** at the head of navigation on the north branch **(Bishopville Prong)** 2½ miles above the fork. It is crossed by a drawbridge about 1 mile below Bishopville. The west branch, called **Shingle Landing Prong,** is said to be navigable for small boats for 1½ miles.

Sinepuxent Bay has depths of 3 to 5 feet (0.9 to 1.5 m.); it can be entered from northward with a draft of 2 feet (0.6 m.) and from southward with a draft of 2½ feet (0.7 m.). It is frequented by fishing and pleasure boats and boats bound north or south along the inland waterway. The ruins of a pile jetty cross the bay 1¾ miles southward of Ocean City; the eastern opening is the best.

Bridges.—A railroad center-pier drawbridge and highway lift bridge cross Sinepuxent Bay at Ocean City; width of openings, 34.5 and 40 feet; height above mean low water, 5 feet (railroad bridge), 6 feet (highway). The following are regulations prescribed for the railroad bridge:

1. Between 6 a. m. and 10 p. m. daily the drawbridge shall be opened within 5 minutes after any boat entitled to opening has signaled, except as provided below. At other times the drawbridge shall be opened as soon as practicable.
2. Signal for opening shall be given by three blasts on a horn or steam whistle and shall be recognized by the bridge tender by the waving of a red flag by day or a red lantern by night.
3. The drawbridge shall be opened for the passage of all boats that can not pass under the bridge. Boats that can pass under the bridge by unstepping masts of 4 inches or less diameter shall not be entitled to have the drawbridge opened, unless the mast is permanently stepped in the boat or permanently attached thereto by stays or guys.
4. Boats unprovided with proper horns for signaling shall notify the bridge tender in any convenient manner, and the draw shall be opened as soon as practicable after the notification is received.
5. The drawbridge shall not be opened or allowed to remain open for passage of boats within 10 minutes of expected arrival of scheduled trains.

Ocean City is a summer resort with railroad communications, 7½ miles southward of Fenwick Island Lighthouse. It is frequented by many small boats in summer, and is the shipping point for a large amount of sea food and produce. A water tank is prominent.

CHINCOTEAGUE BAY AND INLET

Chincoteague Bay, about 20 miles long, has depths of 5 to 7 feet (1.5 to 2.1 m.) along its western side and is shoal along its eastern side. There are depths of 2 to 3 feet (0.6 to 0.9 m.) at its junction with Sinepuxent Bay. It is frequented by a large number of boats up to 5 feet (1.5 m.) draft, engaged in the oyster, clam, and fishing industry.

Newport Creek, at the north end of Chincoteague Bay, is said to be navigable with a draft of 2 feet (0.6 m.) for about 6 miles to within 1½ miles of the town of **Berlin.**

Franklin City is a village and railroad terminal on the west side of Chincoteague Bay, 3½ miles northward of Killick Shoal Light-

house. It is the shipping point for the sea food and produce of this vicinity. A draft of 5 feet (1.5 m.) can be carried to the wharves from southward. Boats run regularly to Chincoteague. Two white church spires are prominent.

Sinnickson is a post village about 1 mile westward of Cockle Point.

Chincoteague is a town on the west side of **Chincoteague Island,** southeastward of **Killick Shoal Lighthouse.** It is the center of most of the oystering and fishing industry in this vicinity, and has boat connection with the railroad at Franklin City. There are depths of 5 to 8 feet (1.5 to 2.4 m.) at the wharves, where all kinds of supplies are obtainable. There is a drawbridge connecting Chincoteague with the mainland; width of openings, 55 feet.

Chincoteague Inlet, from the ocean to Chincoteague Bay, has a least depth of 6 feet (1.8 m.). It is used by many boats carrying oysters.

Pilots for the inlet can usually be obtained from one of the Coast Guard stations in the vicinity. There is good anchorage anywhere in the channel inside of Chincoteague Point.

Assateague Inlet, the channel eastward of Chincoteague Island, has a depth of 2½ feet (0.7 m.) at its south entrance and deeper water inside. The north entrance is shoal and not used.

Wire Narrows, Queen Sound, and **Cockle Creek** have good depths into them from southward, but are shoal at their outlets into Chincoteague Bay. They are used only by small oyster boats.

CHINCOTEAGUE INLET TO GREAT MACHIPONGO INLET

Watts, Powells, and **Bogues Bays** are shoal; a draft of 4 to 5 feet (1.2 to 1.5 m.) can be carried to them through **Roots, Ballast,** and **Island Hole Narrows.**

Wishart Point is a landing on the mainland between Powells and Bogues Bays. A draft of about 4 feet (1.2 m.) can be carried to the wharf at low water through Ballast Narrows.

Assawaman Inlet, 5 miles southwestward of Chincoteague Inlet, had a depth across the bar in 1929 of about 2 feet (0.6 m.). The channel is unmarked, is changeable in depth and position, and is seldom used; there are usually breakers across the entrance.

Assawaman Creek, leading northwestward from the inlet, is navigable for small boats for about 3½ miles.

Kegotank Bay has a depth of about 1 foot (0.3 m.) at low water and frequently goes bare over most of its area at extreme low water. There is about 4 feet (1.2 m.) at high water.

Gargathy Inlet, 9 miles southwestward of Chincoteague Inlet, had a depth across the bar in 1929 of about 4 feet (1.2 m.). It is not marked, is changeable, and used only by an occasional small local boat. The appearance of the water is the best guide.

Kegotank Creek, leading northwestward from Gargathy Inlet, is navigable for small boats at high water for about 4 miles to within about 1 mile of the village of Modest Town.

Metomkin Inlet, 15 miles southwestward of Chincoteague Inlet, had a depth across the bar in 1929 of about 7 feet (2.1 m.). It is used by some local fishing and oyster boats up to 6 feet (1.8 m.) draft. The channel is marked by buoys, but is changeable, and strangers

should not attempt to enter without a pilot. The Coast Guard station on the north side of the inlet is the only mark in approaching.

Metomkin Bay has several sloughs with depths of 6 to 10 feet (1.8 to 3.0 m.) leading northward from the inlet, but the north end has a general depth of only 1 to 2 feet (0.3 to 0.6 m.). The best water in the north end of the bay leads along its eastern side.

Folly Creek, leading westward from the south end of Metomkin Bay, is said to have a depth of 3 feet (0.9 m.) at low water to the landing at its head, 3 miles above the mouth and 1 mile from **Accomac,** a town on the main highway.

Longboat Creek, leading westward from Metomkin Inlet, has a least depth of about 9 feet (2.7 m.).

Cross Broad Water, 2 miles southwestward of Metomkin Inlet, can be crossed with a least depth of 2 feet (0.6 m.) at low water and about 5 feet (1.5 m.) at high water. It is connected with the north end of Floyds Bay by **Teagles Ditch,** which has a least depth of 12 feet (3.6 m.).

Floyds Bay, extending northward from Wachapreague Inlet, has several sloughs with good water leading northward from the south end, terminating in shoals at the north end. **Hummock Channel,** marked on the east side by a row of oyster houses on small grassy islets, is the most important. It has a depth of 20 feet (6.1 m.) at its south end, gradually shoaling to a general depth of about 1 foot (0.3 m.) in the north end of the bay.

Wachapreague is a post village on the west bank of **Finney Creek,** 4 miles west-northwestward of Wachapreague Inlet. It is the center of most of the oystering and fishing industry in this vicinity and is frequented by some pleasure boats in summer. Excellent fishing makes this place, although small, a popular summer resort. A draft of about 8 feet (2.4 m.) can be carried from Wachapreague Inlet through Black Rock Reach and Finney Creek to abreast the wharves. About 1 foot (0.3 m.) at low water can be carried to the village from southeastward across the flats through the drains and the privately dredged ditches connecting the drains. A white church spire at Wachapreague is prominent from eastward with the sun on it.

Wachapreague Inlet, 20 miles south-southwestward of Chincoteague Inlet and 12 miles north-northeastward of Hog Island Lighthouse, had a depth in 1929 of 8 feet (2.4 m.) in the main channel which led northwestward, and about 4 feet (1.2 m.) in a northern channel which follows the beach on the north side of the inlet. The latter is used by the local fishermen in shallow-draft boats. Many fishing boats use the inlet and a few boats seeking shelter. Strangers should take a pilot, as the channel is shifting and the buoys do not always mark the best water. A single heavy storm may change the channel somewhat, and even the local people frequently find it necessary to sound their way across the bar.

The buildings of the Coast Guard station and several other buildings on the north side of Wachapreague Inlet are the most prominent marks in approaching. A clubhouse and windmill on the point of marsh 1 mile northwestward of the entrance are also prominent. There is a wharf at the Coast Guard station just inside the entrance

The best anchorage is in **Horseshoe Lead,** southwestward of the entrance, where there is a depth of 20 to 36 feet (6.1 to 10.9 m.) along the east side of the channel. There is a middle ground inside the inlet and northwestward of the entrance; the channel leading eastward and northward of it has the deepest water, but the other channel southward and westward of it has a least depth of 9 feet (2.7 m.).

Southward of Wachapreague Inlet there is deep water in the channels just westward of Parramore Island as far as the south end of Drawing Channel. Here the controlling depth is 5 feet (1.5 m.) at low water in a privately dredged channel.

Little Machipongo Inlet, 4½ miles north-northeastward of Hog Island Lighthouse, was reported to have a depth across the bar in 1929 of about 4 feet (1.2 m.). It is not marked and is used only by local boats of 5 or 6 feet (1.5 or 1.8 m.) draft. A house on the point of beach on the south side of the inlet and a windmill and clubhouse on the southeast side of Revel Island are the only marks visible in approaching the inlet. The appearance of the water is the best guide in entering, but strangers should not enter without a pilot.

Quinby is a small post village on the mainland about 5½ miles north-northwestward of Little Machipongo Inlet. A draft of 6 feet (1.8 m.) can be carried to within 1½ miles of it, and the remaining distance is navigable only for small boats at high water.

Broadwater is a post village of oystermen and fishermen on Hog Island near the lighthouse. The south end of Hog Island has been washing away considerably in recent years and the channel around the south end to the lighthouse wharf on Heather Channel has shoaled to 2 feet (0.6 m.) at low water. The mail and supplies are brought to the island from Willis Wharf through the drains in the flats north of Rogue Island, least depth 3 feet (0.9 m.).

GREAT MACHIPONGO INLET TO CAPE CHARLES

Great Machipongo Inlet, 2 miles southward of Hog Island Lighthouse, had a depth in 1929 across the bar of about 15 feet (4.5 m.) in the buoyed channel, which led westward into the inlet approximately as shown on the chart. Breakers form on the bar only in heavy weather, but form on the shoals on each side at all times. While the inlet is not subject to radical changes with every gale, it has a slow but steady change from year to year and no permanent directions can be given. The usual draft of boats using it is 5 or 6 feet (1.5 or 1.8 m.), and the deepest draft 14 feet (4.2 m.). The prominent marks in approaching the inlet are Hog Island Lighthouse and the old tower ½ mile southward of it.

Pig Island, on the south side of Great Machipongo Inlet, has been formed in recent years. It is a low sandy island which is subject to considerable change with every big storm.

Great Machipongo River, leading westward and northward from Great Machipongo Inlet, has a least depth of about 17 feet (5.1 m.) for 12 miles above the inlet to the mouth of **Little Machipongo River** (Parting Creek), about 6 feet (1.8 m.) for a further distance of 5 miles, and is navigable by small boats at high water for a considerable distance farther. For a distance of 9½ miles from the inlet it leads through mud flats bare at low water. It is marked by buoys and lights, as shown on the chart, but can best be navigated

at low water, when the flats show above water. The best water leads eastward of the large island just after entering the mainland. There is little business above the mouth of Little Machipongo River.

Willis Wharf is a village on the west side of Little Machipongo River, 1 mile above its junction with Great Machipongo River, and 13 miles by water from Great Machipongo Inlet. It is 2 miles from the railroad station of **Exmore,** and is the most important shipping point for sea food south of Franklin City. A draft of 6 feet (1.8 m.) can be brought to the wharves at low water, and schooners loaded to 8 feet (2.4 m.) leave at high water.

In entering the mouth of Little Machipongo River, favor the north side to avoid a shoal area about in midstream. The best water leads southward and westward of the island ½ mile above the mouth, then favors the west side to the wharves. There is a marine railway at Willis Wharf capable of hauling out any of the boats frequenting the near-by waters, and a machine shop for making repairs to engines. Supplies may be obtained in moderate quantities.

There are several sloughs leading from Great Machipongo River southwestward to Sand Shoal Channel. A draft of about 3½ feet (1 m.) at high water can be carried from Great Machipongo Inlet southwestward in **Rowes Hole Channel,** then south-southwestward between two large islands and through **Loon Channel** to Sand Shoal Inlet. It is unmarked and local knowledge is required to follow it.

A draft of about 2 feet (0.6 m.) at low water and 5 feet (1.5 m.) at high water can be carried up **Gould Marsh Channel,** through a narrow slough into **Eckichy Channel,** and down this to Sand Shoal Channel.

The best and generally used channel is the most westerly one, leading through The Deeps and The Ramshorn to the north end of The Thoroughfare, as described in the direction for the inside route preceding.

Sand Shoal Inlet (Cobb Inlet), 7½ miles southwestward of Hog Island Lighthouse and 11½ miles northeastward of Cape Charles Lighthouse, had a depth in 1929 of 10 feet (3 m.) over the bar about 3 miles southeastward of the south end of Cobb Island. The northeast channel, marked by buoys, was reported to have about 13 feet (3.9 m.) in it. It leads southwesterly about ¼ mile off Cobb Island Beach. While the inlet is not subject to radical changes with every gale, it has a slow but steady change from year to year and no permanent directions can be given. The southeast and south channels are used to some extent by local boats, but are unmarked and should not be attempted by strangers. The usual draft of boats using the inlet is 5 to 6 feet (1.5 to 1.8 m.) and the deepest draft about 14 feet (4.2 m.). The Coast Guard station on the south end of Cobb Island, and two houses on the north end of Wreck Island, are the only marks visible in approaching the inlet.

In the present location of Cobb Island there were two islands in 1888, the inlet between them closing up some time prior to 1910.

Loon Channel, leading northward from Sand Shoal Inlet close to Cobb Island, can be entered with a draft of about 8 feet (2.4 m.). It has a depth of about 20 feet (6.1 m.) off the Coast Guard station and is a good boat anchorage.

Sand Shoal Channel, leading westward from Sand Shoal Inlet, has a least width of ¼ mile and a least depth of 30 feet (9.1 m.) in midchannel for 5 miles westward from the inlet to its junction with The Thoroughfare. It is marked by buoys, lights, and beacons, as shown on the chart, and is easily followed.

Oyster is a post village on the mainland 1 mile westward of the intersection of Sand Shoal Channel and The Thoroughfare. It is 2 miles from the railroad station of **Cheriton,** and is the shipping point for a large amount of sea food. It can be reached through a narrow, crooked slough which has been deepened to 4 feet (1.2 m.) and marked by lights. The entrance is about ½ mile northwestward of the light at the intersection of Sand Shoal Channel and The Thoroughfare.

New Inlet, 9 miles northeastward of Cape Charles Lighthouse, is shoal and unmarked, is very changeable, and is seldom used even by local boats. A draft of about 6 feet (1.8 m.) at high water can be carried from the inlet southwestward and southward into Ship Shoal Channel; small boats can also pass westward along **Great Drum Drain** and northward along **Man and Boy Channel** to Sand Shoal Channel.

Ship Shoal Inlet, 7 miles northeastward of Cape Charles Lighthouse, had a depth across the bar in 1921 of about 6 feet (1.8 m.). It is unmarked and is used only by local oyster boats of 3 to 5 feet (0.9 to 1.5 m.) draft. There is deep water inside, but no connection with the main waterways, except for small boats. A draft of about 2 feet (0.6 m.) at low water can be carried along **Ship Shoal Channel** and through a very crooked slough through the flats to The Thoroughfare, westward of Cape Charles Lighthouse.

Little Inlet, 5½ miles northeastward of Cape Charles Lighthouse, had a depth of about 3 feet (0.9 m.) in 1921; it is unmarked and is used only by a few local boats of 2 or 3 feet (0.6 or 0.9 m.) draft. Small boats can pass from Little Inlet to Ship Shoal and Smith Island Inlets at high water only.

Smith Island Inlet, entering 2 miles south-southwestward of Cape Charles Lighthouse, had a depth in 1929 of about 2 feet (0.6 m.). The channel is buoyed, but is narrow, is subject to rapid change, and the buoys can not always be depended upon. It is the southern outlet to the inside waters, and is used at high water by many local boats of about 3 to 4 feet (0.9 to 1.2 m.) draft, carrying sea food to Norfolk, Cape Charles, Crisfield, and other points.

Fisherman Inlet, entering westward of Cape Charles Lighthouse, has a depth of about ½ foot (0.2 m.) at low water and 4 feet (1.2 m.) at high water; it is used by boats of 2 or 3 feet (0.6 or 0.9 m.) draft, and is preferred to Smith Island Inlet when the depth is sufficient, as it has ample width and is protected from heavy seas. There is a perpendicularly striped buoy at the western entrance. From here the best water follows the channel northeastward close along the south point of the mainland, then east-southeastward across the flats to the channel of Smith Island Inlet, or passes through Raccoon Creek and across the flats to Magothy Bay.

Magothy Bay, extending 7 miles northward from Smith Island Inlet, is shoal except in the main channel, which has a least depth of about 9 feet (2.7 m.) from Smith Island northward to Sand Shoal

Channel. The channel is marked by two lights and at frequent intervals by single pile beacons with day mark, but can best be navigated by a stranger at low water, when the flats show above water.

Magotha is a post village on the mainland about 3 miles northwestward of Cape Charles Lighthouse. A draft of about 3 feet (0.9 m.) at high water can be carried to the wharf through a narrow slough leaving the main channel just northward of Long Point Island.

There is a long wharf on the northwest side of **Smith Island** abreast the lighthouse, to which a depth of 6 feet (1.8 m.) can be carried from southward.

CHESAPEAKE BAY

[Charts 77, 78, 1222 to 1226]

Chesapeake Bay is 170 miles long from the entrance to the mouth of Susquehanna River at the head. It is the approach to the seaports of Baltimore, Norfolk, Newport News, and many other important cities, and has a large trade carried in foreign and domestic vessels. It is also the center of a large oystering and fishing industry.

The main entrance is between Cape Charles on the north and Cape Henry on the south. It can also be entered from Delaware River by vessels of 12 feet (3.6 m.) draft through the Chesapeake & Delaware Canal, at the north end of the bay; and from Albemarle Sound by vessels of 7 feet (2.1 m.) draft throught the Dismal Swamp Canal, and 12 feet (3.6 m.) draft (in 1929) through the Albemarle & Chesapeake Canal, both connecting the inside waters southward with the Chesapeake Bay at Norfolk.

The shores of the bay from the south end northward to Patuxent River entrance on the western side and to Chester River entrance on the eastern side are generally low and present no prominent features. Above these points they are hilly and generally wooded, rising to a considerable height in the vicinity of Northeast and Susquehanna Rivers.

The most important tributaries on the western side are generally broad and deep at their entrances, are navigable for long distances, and have a large general trade. Those on the eastern side are generally shoal at the mouths and have little coasting trade, but are frequented by many vessels engaged in the bay trade.

Channels.—The main channel of Chesapeake Bay has a least depth of 35 feet (10.6 m.) from the entrance to Baltimore, a distance of 149 miles. It follows the natural channel of the bay from the entrance to Sandy Point, 21 miles from Baltimore, except through York Spit dredged channel, where a depth of 35 feet (10.6 m.) existed in August, 1929. From Sandy Point to Baltimore the channel is a dredged one with a least depth of 35 feet (10.6 m.) in July, 1929. The channel in the bay has ample room, is well marked and easy of navigation by day or night. It leads close to middle grounds just inside the entrance, but above here the mid-channel is clear, although shoals make off for a long distance from many of the points. A depth of about 24 feet (7.3 m.) has been found a little westward of the gas and bell buoy on the Tail of the Horseshoe.

Pilots.—Pilotage is compulsory between Chesapeake Bay entrance and Smith Point, Yorktown, Newport News, Norfolk, or any intermediate point, for all vessels other than vessels exclusively engaged in the coastwise trade and those made exempt by United States statutes, if spoken outside of a line with Cape Henry bearing south. Pilotage is also compulsory for foreign vessels and vessels from a foreign port and all vessels sailing under register, bound to and from Baltimore, except vessels employed in and licensed for the coasting trade and American vessels laden either in whole or in part with coal or coke mined in the United States.

Virginia pilots are taken to any port in Virginia, and Maryland pilots to any port in Maryland. Two pilot steamers will usually be found cruising outside the entrance of the bay, except when one goes in for supplies, at which time both Virginia and Maryland pilots are are aboard one steamer. The night signal for a Virginia pilot is one long and one short blast of whistle, and for a Maryland pilot three long and one short blasts. Vessels bound up the Potomac may take either a Virginia or a Maryland pilot, but pilotage is not compulsory. If a pilot is taken, the rates of pilotage to Smith's Point shall be paid. Pilots for the smaller tributaries of the bay are oystermen or fishermen living in the vicinity, and can be obtained from boats at work near the entrance, or on signal from shore.

The fees for piloting to or from Smith Point, Yorktown, Newport News, or Norfolk or intermediate points are as follows:

		Cargo	Bunkers or orders
Under 501 N. R. T	per foot	$2. 70	$1. 90
501 to 1,000 N. R. T	do	3. 15	2. 20
1,001 to 1,500 N. R. T	do	3. 60	2. 50
1,501 to 2,000 N. R. T	do	4. 05	2. 85
Over 2,000 N. R. T	do	4. 50	3. 15

		Any tonnage, paying no sea pilotage	Any tonnage, paying sea pilotage
Newport News to Richmond or intermediate points	per foot	$3. 00	$1. 50

For each message or order delivered to any ship	$5. 00
Shifting between Norfolk and Newport News or from one anchorage to another, any tonnage	12. 50

Detention after six hours later than sailing time $1 per hour, but not to exceed $7.50 for any 24-hour day.

Pilotage fees to and from Baltimore are as follows:

Vessels drawing 13 feet or over	per foot	$5. 50
Vessels drawing 10 feet or less than 13 feet	do	4. 00
Vessels drawing less than 10 feet	do	3. 50
Detention, extra	per day	5. 00
Pilot service in port		15. 00

Towboats.—Towboats will sometimes be found cruising in the lower part of the bay near the entrance, and sometimes in the bay between the entrance and the mouth of Patapsco River. At Old Point Comfort tugs may be ordered by telegraph to Hampton Roads

from Norfolk and Baltimore. Towboats from Baltimore seldom cruise below Sandy Point Lighthouse unless previously notified.

Anchorages.—The following anchorages are the principal ones available for vessels bound up and down Chesapeake Bay: Lynnhaven Roads, just westward of Cape Henry, affords shelter against southerly winds in depths of 20 to 28 feet (6.1 to 8.5 m.); Hampton Roads is a secure anchorage in all weather for vessels of any draft; York River above Tue Marshes Lighthouse affords good anchorage in 6 to 11 fathoms (11 to 20 m.), protected from all but easterly winds; Mobjack Bay has secure anchorage westward of New Point Comfort in depths of 10 to 24 feet (3 to 7.3 m.); Rappahannock River has anchorage within its mouth in depths of 3 to 10 fathoms (5.5 to 18.3 m.); Great Wicomico River affords secure anchorage in depths of 15 to 20 feet (4.5 to 6.1 m.); anchorage secure from northerly winds can be had in depths of 15 to 30 feet (4.5 to 9.1 m.) in Cornfield Harbor inside of Point Lookout, and secure anchorage in any weather in St. Marys River, 5 miles northwestward; Patuxent River entrance affords secure anchorage for the largest ships, well sheltered and with good holding ground. There are several good anchorages on the eastern side of the bay, but they are seldom used by strangers.

The anchorages prescribed for Hampton Roads are given on page 262 in the appendix, and for Baltimore Harbor on page 196.

Supplies.—Baltimore, Norfolk, and Newport News are available as coaling ports for large vessels and have wharves equipped for rapid coaling. Fuel oil, Diesel oil, water, and ship-chandlers' supplies are obtainable at these places. As mentioned under the different headings, supplies can be obtained at many other places, but the quantity is apt to be limited and the facilities are not always good. Small vessels and motor boats bound up and down Chesapeake Bay and desiring supplies can best obtain them at Cape Charles, Reedville, Solomons Island, or Annapolis.

Repairs.—Repairs to the hulls and machinery of large vessels can be made at Baltimore, Newport News, and Norfolk. Places near Chesapeake Bay where repairs to small vessels can be made are Hampton, Weems, Solomons Island, Annapolis, and Crisfield. Further information is given under the different headings, and a table of dry docks and marine railways is given on page 4.

A list of **storm warning** display stations of the United States Weather Bureau is given on page 9.

Fog.—See page 8.

The **reporting station** for vessels entering Chesapeake Bay is at Cape Henry, from which vessels are reported to Norfolk and Baltimore either day or night, and with which vessels can communicate by use of the International Code by day or a flashing lamp and the Morse Code by night. Messages to or from vessels will be forwarded to destination. Vessels bound to Baltimore are also reported from Cove Point and Sparrows Point.

Quarantine.—See page 6.

Speed trial course.—A speed trial course 1 nautical mile long has been established on the western side of Kent Island, 5 miles northward of Bloody Point Bar Lighthouse. The ranges are masts with white day marks. A line joining Bloody Point Bar and Sandy

Point Lighthouses leads at right angles to the ranges. Buoys have been established to mark the ends of the mile course.

Fish weirs are numerous in Chesapeake Bay and tributaries in season, the fishing season usually lasting from about March to July and from October to December, and many of them will be found in position throughout the year. They are thickest on the western side of the bay from Hampton Roads to Potomac River, but will be found throughout the bay and for a considerable distance above the entrances to the tributaries. Areas of possible fish traps should be avoided by small craft, especially at night, on account of the danger from stakes which may have been broken off and not removed. Fish-trap limits are shown on charts 1222 to 1226. They are generally marked by black and white striped spar buoys.

Ice.—In severe winters ice forms in the head of the bay and in many of its tributaries. Under the influence of wind and tide ice will sometimes be met as far down the bay as Cove Point, very seldom below this. The weather shore is generally free from ice. Large steam vessels can always pass up and down the bay, but some of the tributaries may be closed to navigation for a period of a month or more during the winter. To vessels bound to and from Baltimore, ice sufficient to interfere with navigation of vessels is most often found in the vicinity of Seven Foot Knoll Lighthouse, where ice packs are of frequent occurrrence. The ice-breaker steamers from Baltimore attempt to keep the channel open, but navigation is sometimes blocked for limited periods, and none but the largest vessels enter or leave at night when ice may be expected.

In the tributaries north of Pocomoke Sound entrance on the eastern side and York River on the western side ice sufficient to interfere with navigation of small vessels and motor boats may be met with at any time between January 1 and April 1, and north of Patapsco River entrance ice is sometimes found a little before and after these dates.

The ice from Tangier and Pocomoke Sounds does not interfere with the larger vessels in the bay, but small vessels engaged in oystering and fishing are frequently held up by the ice, especially in Kedges and Hooper Straits, and are forced to employ towboats to assist them.

Tides.—Data relative to tides are given in the text with the descriptions of the different places. Full tidal information is given in the Tide Tables for the Atlantic Coast, published by the Coast and Geodetic Survey.

CURRENTS, CHESAPEAKE BAY

The tidal currents in the bay and its tributaries are greatly influenced by the winds, which also affect the rise and fall of the tides to a marked extent, especially near the head of the bay. Strong northerly winds will increase the velocity of the ebb current and may, for a period, interrupt the flood current, while a strong southerly wind will increase the velocity of the flood current and may interrupt or retard the ebb current. Under average conditions the velocities of the flood and ebb strengths are 1 knot and 1½ knots, respectively, at the Tail of the Horseshoe; ¾ knot off Sandy Point; and 1¼ knots and 1½ knots, respectively, off Worton Point.

In the entrance of the bay and between the Middle Ground and the Tail of the Horseshoe and in the channels eastward of the Middle Ground the currents have a somewhat greater velocity than at the Tail of the Horseshoe, and under the influence of strong winds the shoals will sometimes be marked by rips. The effects of the flood and ebb currents are marked at the entrance of the principal tributaries, the effect being felt sometimes for a considerable distance from the entrances. Off the mouths of York, Rappahannock, and Potomac Rivers, especially the latter, a considerable set by ebb or flood currents is often experienced.

At Tail of the Horseshoe gas and bell buoy.—Daily predictions of the times of slack water and the times and velocities of the strength of current in this part of the entrance are included in the Atlantic Coast Current Tables, beginning with the issue for the year 1930. Under average conditions slack water before flood occurs approximately 2 hours 50 minutes before the time of high water at Old Point Comfort and slack water before ebb approximately 2 hours 40 minutes after the time of high water at Old Point Comfort. The mean velocity of the current at strength of flood is 1 knot, and at strength of ebb is 1.5 knots. These velocities are influenced to a considerable extent by winds. A westerly gale will at times cause a very strong ebb current and will greatly diminish, or even overcome the flood current, and an easterly gale will at times cause a very strong flood current and will greatly diminish or overcome the ebb current. During 10 months of observations in the summer and fall the greatest ebb current measured was 3.0 knots during a northwester, and the greatest flood current observed was 2.6 knots in an easterly gale.

At Middle Ground gas and whistling buoy No. 10.—Slack water before the flood occurs about ½ hour after the time when the current turns northwest at Chesapeake Bay entrance (or approximately 2¼ hours before the time of high water at Old Point Comfort), and slack water before the ebb occurs about ½ hour after the time when the current turns southeast at Chesapeake Bay entrance (or approximately 3 hours after time of high water at Old Point Comfort). The mean velocity of the current at strengths of flood or ebb is approximately 1 knot.

Off Wolf Trap Lighthouse.—Slack water before the flood occurs about 1¾ hours after the time when the current turns northwest at Chesapeake Bay entrance (or approximately 1 hour before time of high water at Old Point Comfort), and slack water before the ebb about 1¾ hours after the time when the current turns southeast at Chesapeake Bay entrance (or approximately 1½ hours before time of low water at Old Point Comfort). The mean velocity of the current at strength of flood (northerly) is 1 knot and at strength of ebb (southerly) is 1½ knots.

Southeast of Windmill Point Lighthouse.—Off the mouth of the Rappahannock River a set to the eastward, due to an ebb current, and to the westward (to a less extent), due to a flood current, is often experienced.

Off Windmill Point.—The time of greatest strength of the flood and ebb currents and the times of slack water are about 2½ hours

after the time of the corresponding strengths and slacks at Chesapeake Bay entrance. The approximate times of the four phases of the current refer to the time of tide at Old Point Comfort, are as follows:

Slack water before flood, ¼ hour before high water.
Strength of flood, 2½ hours after high water.
Slack water before ebb, ¾ hour before low water.
Strength of ebb, 2¾ hours after low water.

Off Smith Point Lighthouse.—Slack water before the flood occurs about 3¼ hours after the time when the current turns northwest at Chesapeake Bay entrance (or approximately ½ hour after high water at Old Point Comfort), and slack water before the ebb occurs about 3¼ hours after the time when the current turns southeast at Chesapeake Bay entrance (or approximately at time of low water at Old Point Comfort.

Between Smith Point and Point Lookout.—A considerable set to the eastward due to an ebb current and to the westward due to a flood current is frequently experienced. The strengths of flood and ebb current occur about 3¾ hours after the corresponding strengths at Chesapeake Bay entrance (or approximately 3¾ hours after high water and 2½ hours before high water, respectively, at Old Point Comfort, or ½ hour before low water and ¼ hour before high water, respectively, at Baltimore). The approximate mean velocity at strength of flood is ½ knot and at strength of ebb 1 knot.

Off Point No Point.—The current is inclined to be irregular and velocities at strength are generally less than 1 knot. On the average the slack waters occur about 5 hours after the corresponding slacks at Chesapeake Bay entrance. Referring to the tide at Old Point Comfort the slack before flood occurs about 2¼ hours after high water and the slack water before ebb occurs about 1¾ hours after low water. Referred to the tide at Baltimore the slack water before flood occurs about 2¼ hours before low water and the slack water before ebb about 2½ hours before high water. Strengths of flood or ebb have average velocities of about ½ knot.

Off Hooper Island Lighthouse.—All phases of the current occur about 5½ hours after the times of the corresponding phases at Chesapeake Bay entrance. The slack before flood occurs about 1¾ hours before low water at Baltimore, and the slack before ebb occurs about 2 hours before high water at Baltimore. Strengths of both flood or ebb have average velocities of about ½ knot.

Off Cove Point.—All phases of the current occur about 5¾ hours after the corresponding phases of the current at Chesapeake Bay entrance. The slack water before flood occurs about 1½ hours before low water at Baltimore and the slack water before ebb occurs about 1¾ hours before high water at Baltimore. The average velocity of the current at strength is about ¾ knot for both flood and ebb.

Off Sharps Island Lighthouse.—The slack waters and strengths of flood and ebb current occur about 7 hours after the corresponding slacks and strengths at Chesapeake Bay entrance. Slack water before flood occurs about ¼ hour before the time of low water at Baltimore and slack water before ebb occurs about ½ hours before the time of high water at Baltimore.

Off Sandy Point Lighthouse.—The slack waters and the strengths of flood and ebb current occur about 8¾ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs about 1½ hours after low water at Baltimore and the slack after ebb occurs about 1¼ hours after high water at Baltimore. The average velocity of the current at strength of flood or ebb is about ¾ knot. Proceeding from Sandy Point toward Baltimore the velocity of the current diminishes rapidly. At Seven Foot Knoll the average velocity at strength of flood or ebb is about ½ knot.

At Fort McHenry.—The tidal current is very weak and the velocity and direction of flow depends mainly upon the wind.

Off Worton Point.—The slack water and the strengths of the flood and ebb occur about 10¼ hours after the time of the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before the flood occurs about 3 hours after the low water at Baltimore and the slack before ebb occurs about 2½ hours after high water at Baltimore. The average velocity of the strength of flood is about 1¼ knots and the average velocity of the strength of ebb is about 1½ knots.

Further current information for Chesapeake Bay is given in the current tables for the Atlantic coast of the United States. These tables include the predicted times of slack water and the predicted times and velocities of strengths of flood and ebb for Chesapeake Bay entrance for each day of the year for which they are issued. They also contain a current diagram of Chesapeake Bay with explanation and a table of differences and constants by means of which the predicted times and velocities of the current at a large number of places in Chesapeake Bay and its tributaries may be obtained. These tables may be purchased for 10 cents per copy from the Coast and Geodetic Survey or its sales agents.

GENERAL REMARKS, APPROACHES TO CHESAPEAKE BAY

The prominent landmarks visible in approaching Chesapeake Bay entrance are described on page 110.

From northward.—General remarks and directions for the outside coast from New York to Chesapeake Bay are given on page 31. Currents for the outside coast are described on page 25.

From eastward.—The entrance may be approached boldly, as there are no outlying dangers. Twenty fathoms (36.5 m.) will be found about 45 miles eastward of Cape Henry; inside that depth the water shoals irregularly. In clear weather Chesapeake Lightship, 15 miles eastward of Cape Henry, should be picked up and the gas and whistling buoys followed to Chesapeake Bay. In thick weather vessels should keep outside the 10-fathom (18.3 m.) curve unless the lightship is sighted. In rough weather vessels of deepest draft should enter the bay through the channel about 3 miles off the shore south of Cape Henry.

From southward.—Between Cape Henry and Cape Hatteras, a distance of about 105 miles, there are no dangerous outlying shoals over 5 miles from the beach; with the exception of a few places, 5 to 9 fathoms (9.1 to 16.4 m.) may be carried as close as 1 mile from the beach. Vessels of the deepest draft may, in smooth weather, run as

close as 5 miles from the beach, but are not advised to do so, as it is a dangerous coast to be caught on in an easterly gale. The narrow stretch of sand beach forming the greater length of the coast is low and frequently may not be visible more than 4 or 5 miles. The 100-fathom (183 m.) curve, which, abreast of Cape Henry, is about 65 miles offshore, gradually approaches the coast southward, and southeastward of Cape Hatteras is only about 20 miles from the beach. The 30-fathom (55 m.) curve is about 5 miles inside of the 100-fathom (183 m.) curve. Abreast of Cape Henry 20 fathoms (36.5 m.) will be found about 45 miles off the coast, but farther southward that depth is found closer in, and at Cape Hatteras it is only 11 miles offshore. Inside of 15 fathoms (27.4 m.) the depths are extremely irregular, and there are many holes of limited extent lying far inside of the general limits of corresponding depth. In thick weather close attention should be paid to the soundings and the chart, and even then the navigator may be confused by the irregularities in depth.

DIRECTIONS, CHESAPEAKE BAY

Directions for entering Hampton Roads are given on page 122, and for Patapsco River and Baltimore Harbor on page 109. Directions from the head of Chesapeake Bay to Norfolk for vessels following the inside route are given on page 258.

The least depth in the channel between Chesapeake Bay entrance and the entrance to the dredged channel leading to Baltimore is in the dredged channel eastward of York Spit, which is 35 feet (10.6 m.) deep and 1,000 feet wide. Between the entrance to the bay and this point the channel leads between Middle Ground Shoal and Tail of the Horseshoe and is well marked by buoys. Northward of York Spit the bay is clear in mid-channel, but shoals extend a long distance off many of the points and islands. Strangers, unless in small boats, should keep outside the buoys and lighthouses marking the ends of the shoals.

The following table gives courses and distances from Chesapeake lightship, or entrance buoy No. 2 CB., to Baltimore. They lead in a least depth of 35 feet (10.6 m.). Between Tail of the Horseshoe gas and whistling buoy and Wolf Trap Lighthouse vessels of less than 20-feet (6.1 m.) draft often pass westward of York Spit channel. Many deviations from these courses are possible for light-draft vessels, but for these the chart is the guide.

Chesapeake Bay Entrance to Baltimore

[Abbreviations for lights: F., fixed; Fl., flashing; Gp., group; Occ., occulting; Alt., alternating; W., white; R., red; G., green. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
FROM CHESAPEAKE LIGHTSHIP—	°	*Points*	
1. To 2.3 miles 77° true (E. ⅝ N. mag.) from Cape Henry Lighthouse (Gp. Fl. (3)), passing ¼ mile south of gas and whistling buoy No. 2.	257	W. ⅝ S	12.7
Or from entrance buoy No. 2CB steer 309° true (NW. mag.) for 6.8 miles to the same point.			

Chesapeake Bay entrance to Baltimore—Continued

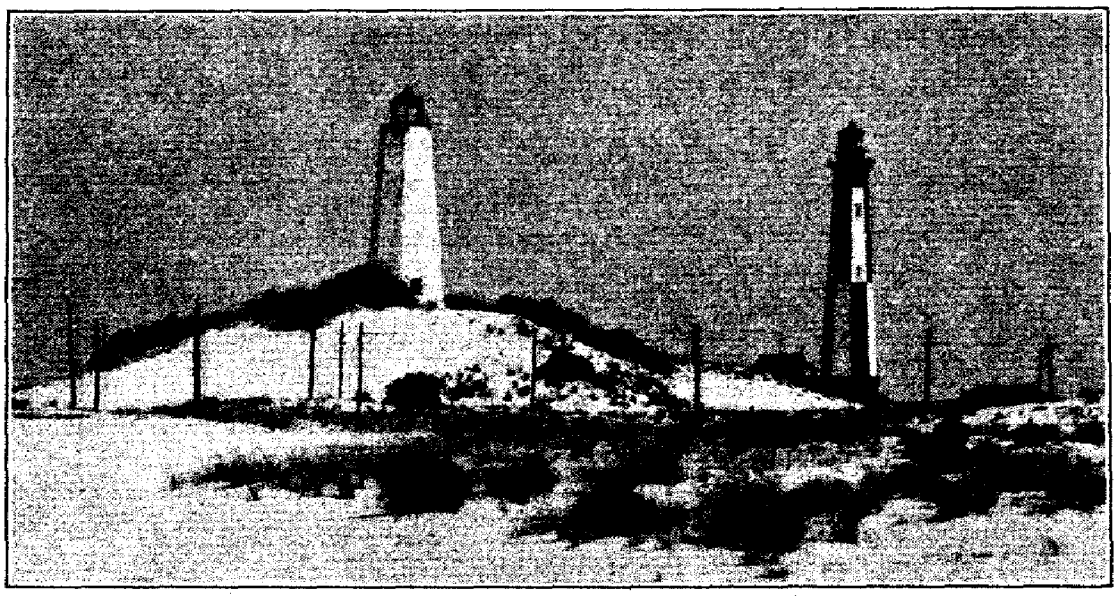
	Course		Distance in nautical miles
	True	Magnetic	
FROM CHESAPEAKE LIGHTSHIP—continued	°	*Points*	
2. To 0.9 mile west of Middle Ground gas and whistling buoy No. 10, passing 0.4 mile northeast of Tail of the Horseshoe gas and whistling buoy.	320	NW. by N	14. 1
3. To entrance of York Spit Channel, midway between gas buoys Nos. 1 and 2.	352	N. ⅛ W	4. 0
4. To north end of York Spit Channel	17	NNE	3. 5
5. To 3 miles east of Wolf Trap Lighthouse (Fl.).	2	N. ¾ E	9. 0
6. To ⅜ mile westward of Tangier Island Lump gas and bell buoy, passing 4 miles eastward of Windmill Point Light (F.).	355	N. ⅛ E	23. 3
A 20-foot spot lies 0.85 mile, 14° true, from Tangier Shoal Lump gas and bell buoy, 12 TL, and is a menace to vessels passing close eastward of the buoy.			
7. To 1 mile eastward of Smith Point Light (Fl.).	4	N. ⅞ E	6. 2
8. To close westward of Sharps Island gas and bell buoy, passing 1½ miles eastward of Point No Point Light (Fl., Alt., W., and R.), and 1 mile eastward of Cove Point Light (Fl.).	343	N. ⅞ W	42. 6
9. Popular Island Shoal gas and bell buoy	357	N. ⅜ E	11. 8
10. To 1 mile eastward of Thomas Point Shoal Lighthouse (Fl.).	6	N. by E. ⅛ E	8. 9
11. To ½ mile eastward of Sandy Point Lighthouse (Gp. Fl.).	16	NNE	7. 2
12. To south of Craighill Channel. Marked by gas buoys. Passing 0.4 mile east of Baltimore Lighthouse (Fl.).	344	N. ¾ W	3. 4
13. Through Craighill Channel (range ahead) to Cut-off Channel range (buoy No. 2 K).	0	N. ⅝ E	3. 5
14. Through Cut-off Channel (range ahead) to Brewerton Channel range.	329	NNW. ⅛ W	3. 6
15. Through Brewerton Channel (range ahead) to gas buoy No. 1 M.	291	NW. by W. ½ W	3. 9
16. Through Fort McHenry Channel to Lazarette Point.	321	NNW. ¾ W	4. 5
Fort McHenry Lighthouse (Fl.) ahead.			
Thence as desired the chart being the guide.			
Vessels desiring to pass westward of York Spit Channel can leave course 2 above and steer for York Spit Channel entrance gas and whistling buoy, thence steer 8° true (N. by E. ⅜ E. mag.) for 14½ miles to a position 3 miles eastward of Wolf Trap Lighthouse, and then follow the courses in the table.			

CHESAPEAKE BAY ENTRANCE

[Chart 1222]

The entrance to Chesapeake Bay leading between Cape Charles on the north and Cape Henry on the south is about 10 miles wide; the main channel leads along the south side and is broad and deep. The northern half of the entrance is obstructed by shoals through which several minor channels lead.

The channel south of Nautilus Shoal and between Fisherman Island and Inner Middle Ground, and thence through either North or Beach Channel, had a depth by the last survey of 24 feet (7.3 m.), but with spots of 16 and 17 feet (4.8 and 5.1 m.) close to its southern side. The shoals on the north side have shifted southward and it has become necessary to add two more buoys to mark the channel



Cape Henry Lighthouse (right) and Old Tower

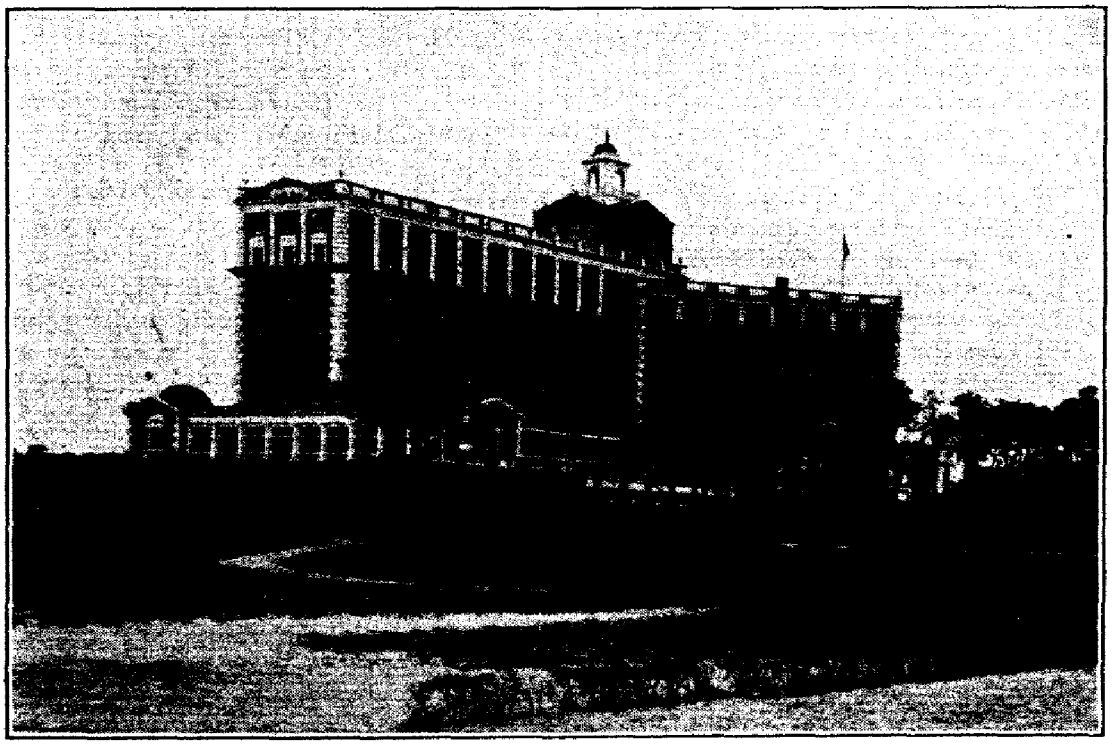
there. It is used by fish steamers and tugboats up to 12 feet (3.6 m.) draft, but is not recommended for strangers.

The most prominent landmarks seen in approaching the entrance to Chesapeake Bay are Cape Charles Lighthouse and Cape Charles old tower on Smith Island, and a tank and several buildings on Fisherman Island, all on the north side; and Cape Henry, Cape Henry Lighthouse, Cape Henry old tower, and the Cavalier Hotel at Virginia Beach, on the south side. Cape Charles Lighthouse is described on page 86.

Cape Henry is a prominent bold range of sand hills 80 feet (24.4 m.) high, with lower ones near the water. On the beach near the point of the cape is Cape Henry Lighthouse, and 340 feet southwestward of it is a white unused light tower; near the lighthouse are a storm-warning display station and a seacoast telegraph station of the United States Weather Bureau, from which vessels are reported to Norfolk and Baltimore, and with which they may communicate by the use of International code signals by day or the Morse code by night.

Cape Henry Lighthouse is an octagonal pyramidal tower, upper and lower half of each face alternately black and white. The light is group flashing white (group of 3 flashes every 20 seconds), with a red sector between 154° true (S. by E. ¾ E., mag.) and 233° true (SW. by W. ¼ W. mag.), 157 feet (47.8 m.) above the water, and visible 19 miles. The fog signal is a siren, blast 4 seconds, silent 41 seconds. A radiobeacon described on page 16 is operated.

Lynnhaven Roads, an open bight extending from 2 to 5 miles westward from Cape Henry Lighthouse, is sometimes used as an anchorage and is protected from southerly winds. It has depths of 20 to 28 feet (6.1 to 8.5 m.). The shoaling is abrupt eastward of Lynnhaven Inlet, and the 18-foot (5.5 m.) curve lies nowhere more than ⅜ mile from shore. Westward of the inlet the shoaling is



Cavalier Hotel, Virginia Beach; from northeastward. Photo by Norfolk-Portsmouth Advertising Board.

gradual, and depths of 18 feet (5.5 m.) can be found ¾ mile from shore.

Lynnhaven Inlet, on the south side of Lynnhaven Roads, forms the approach to **Lynnhaven Bay** and several other shoal bays. It had a depth by the last survey of 2½ feet (0.7 m.) across the bar, but is subject to frequent change, and local knowledge is required to enter. A bridge with a draw opening 30 feet wide crosses the inlet just inside the entrance. The depths in the bays inside are 2 to 10 feet (0.6 to 3 m.) and they are frequented by many small craft engaged in oystering and fishing.

Eight miles west of Cape Henry Lighthouse there is a water terminal of the Pennsylvania Railroad Co. for car ferries operating to Cape Charles. The entrance is between parallel jetties, marked

on their ends by lights. A fog bell is located on the eastern one near the light. A bell buoy lies off the entrance. In October, 1929, the controlling depth in the channel between the jetties and to the ferry slips was 17 feet (5.1 m.). There are railway connections with Norfolk.

HAMPTON ROADS AND ADJACENT PORTS

[Charts 1222, 400, and 451]

Hampton Roads, at the south end of Chesapeake Bay, 16 miles westward of Cape Henry, is the approach to Norfolk, Portsmouth, Newport News, and points on the James River to Richmond, and is also one of the important anchorages on the east coast of the United States. A well-marked deep-water channel leads into Hampton Roads where there is secure anchorage for vessels of any draft.

The ports adjacent to Hampton Roads carry on a large business in coal, tobacco, grain, cotton, and other commodities, and have excellent terminal and railroad facilities. Shipbuilding and repair plants are available for all classes of ship construction and repair work.

Prominent objects.—In approaching Hampton Roads the most prominent objects are: **Thimble Shoal Lighthouse** (red conical tower on pier); **Old Point Comfort Lighthouse** (white tower); the Chamberlain-Vanderbilt Hotel at Old Point Comfort (twin towers on colonial brick building); a low gray structure on the south side of the entrance abreast Old Point Comfort; and a large group of buildings at **Ocean View,** a summer resort on the beach, 4 miles southeastward of Old Point Comfort.

From inside the entrance may be seen: A tower, the high dome of the Soldiers' Home, and several chimneys at Hampton; a grain elevator at Newport News; **Newport News Middle Ground Lighthouse** (brown conical tower on pier); the piers and buildings of the naval base on the east side of the channel to Norfolk; the Virginian Railway coal piers; and a large grain elevator southward.

Channels.—The approach from eastward is through **Thimble Shoal Channel,** which has a depth of 40 feet (12.2 m.) and a width of 750 feet, and is marked by flashing red gas buoys on the north side and black (flashing white) gas buoys on the south side. The least depths outside of and near the dredged channels are 28 to 35 feet (8.5 to 10.6 m.).

The following regulations prescribed by the Government restrict the use of this channel:

1. The use of Thimble Shoal Channel is hereby restricted to navigation by vessels of greater draft than 25 feet or by towboats with tows drawing more than 25 feet. Vessels, either sailing or power, and all tows drawing less than 25 feet are not permitted to use this channel.
2. Vessels permitted to use Thimble Shoal Channel under section 1 of these regulations must proceed through channel at a reasonable speed such as not to endanger other vessels and not to interfere with any other work which may become necessary in maintaining, surveying, or buoying the channel; and they must not anchor in the channel, except in cases of emergency, such as fog or accident, which would render progress unsafe or impossible.
3. These regulations are not to be construed as prohibiting any necessary use of the channel by any Government boats while on Government duty, nor in emergencies by pilot boats, whether steam or sail, nor by police boats.

From the western end of Thimble Shoal Channel to the eastern end of Newport News Middle Ground the channel has ample width and depth and is marked by Thimble Shoal and Old Point Comfort Lighthouses and by several buoys, some of which are lighted.

Two channels have been dredged around Newport News Middle Ground to Newport News. The straight channel northward of the Middle Ground had a depth of 35 feet (10.6 m.) in June, 1928, and is being dredged to a project depth of 40 feet (12.2 m.). It is marked by red gas buoys (flashing red) on the north side and black gas buoys (occulting white) on the south side. The currents do not always set fair with the channel, especially with strong winds, and some trouble has been experienced at times by deep-draft vessels in keeping in the channel. The least depths outside of and near the dredged channel are 21 to 24 feet (6.4 to 7.3 m.).

The curved channel southward of Newport News Middle Ground was dredged to a depth of 30 feet (9.1 m.) and width of 500 feet, but shoaling has occurred and the channel will not be redredged. The area southward of the Middle Ground is now considered as anchorage ground, and the old channel is not marked.

The dredged channel leading to Norfolk and Portsmouth had depths in June, 1929, as follows:

Hampton Roads to 620 feet downstream from the Belt Line Railroad bridge, 37 feet (11.2 m.); thence 34 feet (10.3 m.) to the Belt Line bridge; thence 30 feet (9.1 m.) to the Virginian Railway bridge; thence 25 feet (7.6 m.) to the Norfolk and Western Railway bridge. In the Eastern Branch, between the mouth and the Norfolk and Berkley highway bridge, 25 feet (7.6 m.); thence 20.4 feet (6.1 m.) to the Norfolk and Western Railway bridge; thence 25 feet (7.6 m.) to the Virginian Railway bridge. In Western Branch, between the mouth and the first bridge, 18 feet (5.5 m.).

Anchorages.—The anchorage areas, prescribed by the War Department and enforced by the captain of the port of Hampton Roads (office in Norfolk), are described in the appendix. They are also shown in red on chart 400.

Quarantine.—All vessels subject to quarantine are inspected by the officers of the United States Public Health Service off Old Point Comfort. A quarantine anchorage there is shown on chart 400 and is described in the appendix to this volume.

Hospitals.—There are many public and private hospitals at the larger cities. The most prominent of the public hospitals are as follows:

Norfolk, Va.—United States Marine Hospital, No. 82, Tanners Creek; Hospital of St. Vincent De Paul, corner of Church and Wood Streets; Norfolk Protestant Hospital, corner Raleigh and Colley Avenues.

Portsmouth, Va.—The King's Daughters' Hospital, corner Chestnut and Leckie Streets.

Newport News, Va.—Elizabeth Burton Hospital, on boulevard overlooking Hampton Roads; the Wittaker Memorial Hospital, corner of Twenty-ninth and Orcult Avenues; the Riverside Hospital.

Hampton, Va.—The Dixie Hospital.

Supplies of all kinds are obtainable at Newport News and Norfolk, and in limited quantities at Hampton and sometimes at Old Point Comfort. Water can be obtained at the wharves and from water boats. Bituminous coal can be had, through chutes, from the

coal wharves at Newport News and the coal piers at Sewall Point and Lambert Point. Anthracite and bituminous coal can be obtained at the wharves in Norfolk or from lighters at the anchorage. Water, provisions, and ship chandlery will be delivered by boat to vessels in Hampton Roads.

Regulations for passing dredges.—The following regulations apply to Norfolk; Hampton Roads; Nansemond, Pagan, and Appomattox Rivers; harbors at Cape Charles City, Va.; waterways from Norfolk Harbor, Va., to Albemarle Sound, N. C., via both Albemarle & Chesapeake and Dismal Swamp Canals; Edenton Bay; and Roanoke River, N. C:

Vessels propelled by machinery and passing within ¼ mile of plant, employed in the improvement of said waters, shall not proceed at a speed greater than 4 miles per hour. In case it is necessary for any reason to pass said plant at a less distance than ¼ mile the propelling machinery of passing vessels must be stopped while said vessels are abreast of said plant. When it is necessary for a vessel to pass between any such plant and the buoys indicating the position of the mooring anchors of said plant, such vessel shall give as a signal to said plant to lower the mooring lines four short blasts of a whistle or horn in quick succession, given when said vessel is about ½ mile away from the plant. Vessels, when their draft permits, must go outside of the buoys indicating the position of the mooring anchors of all such plants.

No vessel shall anchor in such a place as to obstruct the view of the front or rear range or other marks erected for the guidance of any plant engaged in improving the above-mentioned waters. No vessel or raft shall pass over or so near to any buoys, piles, or other marks placed in connection with the above-mentioned improvements as to destroy, move, or injure them.

Storm warnings are displayed at Cape Henry, Old Point Comfort, Newport News, and Norfolk.

Tides.—The mean range of tides in Hampton Roads is 2.5 feet.

Currents.—In the center of the channel southward of Old Point Comfort the slack water and strengths of flood and ebb current occur about 1¼ hours before the time of the corresponding slack waters and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2½ hours after the time of low water at Old Point Comfort and the slack water before ebb occurs about 1½ hours after high water at Old Point Comfort. The average velocity of the current at strength of flood is about 1¾ knots and at strength of ebb about 2 knots; the currents, however, are influenced considerably by the wind and at times attain a velocity much in excess of these mean values. Along the wharves at Old Point Comfort the currents change about 1 hour earlier than in the center of the channel. In the center of the channel off the shipyard at Newport News the slack waters and the strengths of flood and ebb currents occur approximately ¼ hour before the times of the corresponding slack waters and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 3 hours before the time of high water at Old Point Comfort, and the slack water before ebb occurs about 2½ hours after the time of high water at Old Point Comfort. The average velocity of the current at strength of flood is about 1¼ knots and at strength of ebb about 1¾ knots.

Ice seldom interferes with navigation in Hampton Roads for full-powered vessels, even in severe weather.

Horseshoe is described under the heading Hampton Roads to York River. **Thimble Shoal,** with depths of 9 to 12 feet (2.7 to 3.6 m.), forms the southern edge of the Horseshoe and the north

side of the channel into Hampton Roads between Thimble Shoal Lighthouse and Old Point Comfort.

Old Point Comfort is a town and summer resort on the north side at the entrance to Hampton Roads. It has communication by railroad and electric road with Hampton and Newport News, with Norfolk by steamer, and with the west end of Willoughby Spit by ferry. Most of the steamers plying from Norfolk to points on Chesapeake Bay and tributaries land at Old Point Comfort. Gasoline, provisions, and water in small quantities are obtainable. Landing at the wharf is often rendered difficult by the strong tidal currents. The first of the ebb tide sets southeastward from the wharf and the last of the ebb sets directly on the wharf and northward through the opening eastward of Hampton Bar. The direction of the flood current is approximately west-southwestward.

Mother Hawkins Hole is an anchorage, with depths of 9 to 12 feet (2.7 to 3.6 m.), much used by small local craft, on the west side of Old Point Comfort and north of the easterly end of Hampton Bar. The entrance is between the wharf at Old Point Comfort and the horizontally striped buoy close westward of it and has a depth of 18 feet (5.5 m.). Leading westward from the west end of Old Point Comfort is a buoyed channel with depths of 8 to 20 feet (2.4 to 6 m.), which affords good anchorage for boats.

Mill Creek, inside of Old Point Comfort, has large areas bare at low water and several narrow channels. It is crossed by two fixed bridges at the mouth, under which small boats can pass. The creek is little used.

Hampton Bar, with 1 to 5 feet (0.3 to 1.5 m.) over it, extends from 100 yards to 2 miles west-southwestward from Old Point Comfort; it is marked by red buoys on the south side and horizontally striped buoys at each end.

Hampton Creek, 1¼ miles west-northwestward of Old Point Comfort, is the approach to the town of Hampton. There is a depth of 8 feet (2.4 m.) across Hampton Flats, from both eastward and southwestward, to the entrance and in the channel in the creek. Steamers from Norfolk make regular trips to several wharves in the creek. It is the headquarters of a large number of boats engaged in oystering and fishing and has some trade by schooners and barges, the deepest draft being 10 feet (3 m.). The part of the river between the public wharf and the lower bridge, a distance of ¼ mile, is used as an anchorage for boats. The river is crossed by several fixed bridges, and there is no navigation above them except in small motor boats without houses. Gasoline, provisions, and coal and water are obtainable, and there is a shipyard and railway capable of hauling out vessels of 125 tons, 125 feet length, 9 feet (2.7 m.) draft aft, and 6 feet (1.8 m.) forward.

Hampton Creek is usually approached from eastward, northward of Hampton Bar. Pass 300 yards southward and 175 yards westward of Hampton Creek Light, off the entrance, and 150 feet westward of the red buoy near the entrance; then head midway between the wharves at the entrance, and follow the wharves on the west side at a distance of about 100 feet.

Jones Creek, between the National Soldiers' Home and Hampton Institute, has depths of 10 feet (3 m.) in the channel and serves

as a protected anchorage for small boats. Permission to use this area should be obtained from the local authorities.

Newport News is an important seaport. It is the terminal of the Chesapeake & Ohio Railroad, which owns the wharves, grain elevator, and coal chutes at the south end of the city, and the site of the Newport News Shipbuilding & Dry Dock Co. plant, which has wharves at the northwest end of the city. Depths alongside the coal wharves are from 32 to 35 feet (9.7 to 10.6 m.) at mean low water. Coal can be loaded at the rate of 1,200 tons per hour.

There is 35 feet (10.6 m.) of water at the shipbuilding company docks. Bay and coastwise steamers frequently land at the Old Dominion Land Co. dock, where there is a depth of 27 to 30 feet (8.2 to 9.1 m). At the municipal pier there is 18 feet (5.5 m.) of water.

There is a small boat harbor in the mouth of **Newport News Creek,** constructed by the city, ¾ mile southeastward of the most southerly coal pier. The harbor is 3,300 feet long and 300 feet wide. In 1929 there was a depth of 13 feet (3.9 m.) at the outer end of the pier, 9 feet (2.7 m.) at the entrance to the harbor, and 9 to 11 feet (2.7 to 3.3 m.) in mid-channel inside the harbor. The best water in approaching the entrance is from southwestward and leads close along the western side of the pier when entering. Gasoline and yacht supplies can be obtained. A ferry leaves the municipal pier for Sewall Point, where electric cars make connection for Norfolk. A boat of the Chesapeake & Ohio Railway Co. runs regularly from here to Norfolk.

Willoughby Bank is on the south side of the channel into Hampton Roads. From Fort Wool (Rip Raps) the shoalest part of the bank extends 2½ miles east-northeastward and is marked off its northeast side by a gas and bell buoy and off the north side by a gas buoy. This part of the bank has been used as a dumping ground and has little depth over it. Just southward of Fort Wool is a narrow channel with a depth 13 feet (3.9 m.), which leads south of Willoughby Bank; it is little used except by boats engaged in dredging operations.

Willoughby Bay, formed by Willoughby Spit and the shoal extending northward from it and by Sewall Point, has depths of 8 to 12 feet (2.4 to 3.6 m.) in the outer part and 3 to 5 feet (0.9 to 1.5 m.) in the eastern end, and serves as an anchorage for small boats. The buildings of the naval base on the south side are prominent. There is a wharf on the western end of Willoughby Spit at which the ferry from Old Point Comfort lands, and there is an electric road from here to Ocean View and Norfolk. The entrance to the bay, ⅜ mile west-southwestward of Fort Wool, has a depth of 8 feet (2.4 m.) and is marked by a light and a bell buoy on the west side and a black buoy on the east side. In entering pass 40 yards eastward of the light. There is a light on the western edge of a shoal about midway between the entrance and the wharf at Willoughby Spit. A dredged channel, 15 feet (4.5 m.) deep and marked by buoys, leads along the north side of the naval base to the entrance to the bay. Mason Creek, on the south side of Willoughby Bay, is nearly bare at the entrance at low water and is little used. It is crossed by a drawbridge just inside the entrance.

Boush Creek is reached through a dredged channel east of the naval base. It is used chiefly by small boats of the Navy.

Elizabeth River, emptying into Hampton Roads from southward, forms the approach to and the harbors of Norfolk and Portsmouth. It is also important as a part of the inside route, connecting Hampton Roads with the Albemarle & Chesapeake Canal and the Dismal Swamp Canal, both of which lead southward to the sounds of North Carolina.

Channel.—The controlling depths in the dredged river channel are given on page 113. There are no natural ranges for this channel and some local knowledge is required for vessels of the deepest draft to follow the best water. Range beacons mark the center line of the channel, but at times they are hard to see on account of hazy weather. Otherwise the channel is well marked and easily followed in clear weather, although the channel is often crowded with traffic. Shoals rise abruptly in places on the sides of the channel, as shown on the chart. A towboat is generally used by large vessels when docking. The directions for navigating the river are included in the table of directions from Chesapeake Bay to Newport News and Norfolk on page 122.

Tides.—The mean range of tides is 2.6 feet at Craney Island and 2.8 feet at the Portsmouth Navy Yard.

Currents.—In the Elizabeth River and its Eastern Branch the slack waters and strengths of flood and ebb occur about 2¼ hours before the time of the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 1¼ hours after the time of low water at Old Point Comfort and the slack water before ebb occurs about ½ hour after the time of high water at Old Point Comfort.

In the Southern Branch opposite the navy yard the slack water and strengths of flood and ebb occur about 1½ hours before the time of the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2 hours after the time of low water at Old Point Comfort and the slack water before ebb occurs about 1¼ hours after the time of high water at Old Point Comfort. In the Elizabeth River and in each of its three branches the average velocity of the current at strength is about ¾ knot.

Ice.—The harbor is generally free of ice and navigation is never obstructed for full-powered vessels. In severe winters the upper part of Southern Branch is sometimes closed for short periods.

Sewall Point is at the eastern side of the mouth of the Elizabeth River. The north end of the point is occupied by the Hampton Roads Naval Base. A fixed white light, 8 feet above the water and visible all around the horizon, has been established at the northeastern corner of the naval air station flying field at the base. There are piers with depths from 25 to 35 feet (7.6 to 10.7 m.) and an inclosed basin 25 feet (7.6 m.) deep, affording protection to small naval vessels.

South of the naval base is the ferry slip of a Newport News ferry, and just south of that the coal piers of the Virginia Railway Co., with depths of 30 to 35 feet (9.1 to 10.7 m.) alongside.

South of these are the wharves of the municipal terminal with 35 feet (10.7 m.) alongside but only 32 feet (9.7 m.) in the approach.

Grain and general cargo are handled here and from here to Norfolk via a belt-line railway.

Next comes the Standard Oil Co. pier and two piers, with 30 feet (9.1 m.) depths, operated by the Norfolk Tidewater Terminal Co.

Dredged channels lead to all these wharves and are subject to change.

La Fayette River, formerly Tanner Creek, has a depth in the entrance of 4½ feet (1.3 m.) and 7 feet (2.1 m.) inside to the fork 3½ miles above the entrance, above which there is a depth of 2 feet (0.6 m.) in either fork to near the head of navigation. It is frequented only by small boats. The entrance is marked by a range and buoys, but is narrow and has extensive shoals on either side. The creek and its branches are crossed by several bridges; the first three have draw openings, the least width being 27 feet. A day's notice is required for opening the third bridge.

Craney Island (low and sparsely wooded) is the site of a quarantine station of the cities of Norfolk and Portsmouth. There is a depth of 2½ feet (0.7 m.) to the wharf on the southwest side. The shoal formerly extending eastward from the island has been bulkheaded and filled, and the southern end of the area is occupied by a large fuel-oil depot. Pipe lines extend to wharves along the east face, at which there is 30 feet (9.1 m.) of water. Craney Island Lighthouse (white house on piles) is off the northeast end of the filled area. A water-pipe line crosses the channel on Craney Island. The crossing is marked by range lights and sign, and vessels are cautioned not to anchor in the vicinity.

Lambert Point, on the eastern side of Elizabeth River, 1 mile southward of Craney Island Lighthouse, is the site of the large coal and other piers of the Norfolk & Western Railroad. Depths of 25 to 35 feet (7.6 to 10.6 m.) are maintained by dredging alongside the wharves, and vessels load here to a draft of 33 feet (10 m.). There are also piers belonging to the same company ¾ mile southeastward, at which depths of 28 to 30 feet (8.5 to 9.1 m.) have been dredged.

Norfolk, on the east bank of the Elizabeth River, 7 miles above Sewall Point and 30 miles from the entrance to Chesapeake Bay, is one of the important ports of the United States. It has a large foreign and coasting trade and is the terminus of several railroads. The harbor consists of the Elizabeth River, a tidal estuary, and certain portions of its branches, known as the Eastern, Southern and Western Branches.

This harbor is about 15 miles long with a varying width of from ⅙ to 2 miles.

Several lines of coasting and bay steamers ply from the port, and it is the center of steamboat traffic to Cape Charles City and to the tributaries on the west side of the bay as far as the Rappahannock River. It has ferry communication with Berkley and Portsmouth and frequent steamer service to Old Point Comfort, Hampton, and Newport News.

The water front is lined with wharves, two of which are public. One of these, at the foot of City Hall Avenue, is used by small craft up to 8 feet (2.4 m.) draft. The other (municipal pier) at the foot of Jefferson Avenue, provides 1,150 feet of berthing space

with a depth of 18 feet (5.5 m.). Depths at other wharves range up to 27 feet (8.2 m.).

Further information regarding facilities at the several wharves of Norfolk and vicinity can be found in the War Department publication, Port Series, No. 15, and in Ports of Hampton Roads Annual, published in Norfolk.

A **United States Branch Hydrographic Office** is located at the customhouse. Bulletins are posted here giving information of value to seamen, 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. A time ball is dropped at noon, seventy-fifth meridian time, and is visible from anywhere in the harbor.

Berkley, a part of the city of Norfolk, is on the point between Eastern and Southern Branches. The main freight terminus of the Norfolk Southern Railroad, and several lumber and fertilizer wharves are located here, and there are also several shipyards and marine railways. Depths up to 27 feet (8.2 m.) can be found at several of the wharves.

Western Branch on the west side of Elizabeth River, is frequented by vessels up to 18 feet (5.5 m.) draft to a wharf at West Norfolk, and by towboats, car floats, and barges to the railroad wharves at Port Norfolk, the deepest draft being 14 feet (4.2 m.). The channel is well marked, as shown on the chart.

For a distance of 3 miles above West Norfolk to the fourth bridge, Western Branch has a depth of 8 feet (2.4 m.) in a narrow unmarked channel. It is shoal in places above the fourth bridge, but is navigable for small boats for a further distance of about 3 miles. There is considerable traffic above West Norfolk in small vessels to farm landings. The chart is the only guide for strangers.

Six **bridges** cross Western Branch between the entrance and the head of navigation, and all have draw openings, the clear widths of which, in order from the entrance, are 140 feet (new bridge); 46 feet (left opening); 50 feet (always open); 50 feet; 32 feet (highway lift bridge); and 28 feet (always open).

West Norfolk, on the north side, at the entrance of Western Branch, is the site of a smelting plant to which ore vessels go. The deeper draft vessels usually employ a towboat when entering. There is a shipyard and railway just above the bridge, which can take out vessels of 90 feet length and 10 feet (3 m.) draft.

Port Norfolk, on the south side, at the entrance of Western Branch, has a wharf and several ferry slips, at which car floats, towboats, and barges from the town of Cape Charles make landings. A depth of 15 feet (4.5 m.) can be taken to the wharves.

Pinner Point, on the southwest side of Elizabeth River, just above the entrance to Western Branch, is the main terminal of the Atlantic Coast Line and Southern Railroads, and has several wharves at which large vessels load and discharge. There are depths at the wharves of from 15 to 30 feet (4.5 to 9.1 m.).

Scott Creek, between Pinner Point and Hospital Point, has been improved by private enterprise and has a depth of 7 feet (2.1 m.) in a narrow channel to a drawbridge, above which it is shoal. It is used by vessels to the lumber wharves on the south side just below

the bridge and by small boats to the oysterhouses just above the bridge. The bridge has a center pier draw, each opening 35 feet wide, with a headroom of 3 feet at high water when closed.

Hospital Point is the site of a naval hospital. It is wooded. A black water tank and the dome of the main hospital building are visible above the trees.

Smith Creek, the "Hague" anchorage, opposite Hospital Point, has a depth of 10 feet (3 m.) in the entrance and inside along the docks. It is frequented by motor boats and barges carrying sand and gravel, and its northern arm is used as an anchorage for motor boats. It is crossed at the mouth by a drawbridge (western side open to navigation) 49 feet wide and with a high-water clearance, when closed, of 5 feet. The bridge is opened from 5 a. m. to midnight upon signal of three blasts of a whistle.

Portsmouth, on the west side of Elizabeth River, opposite Norfolk and Berkley, is the site of a **United States navy yard** and is the main terminus of the Seaboard Air Line Railroad. It has several other commercial wharves and has considerable trade in foreign and coastwise vessels.

Eastern Branch, extending eastward along the south side of the city of Norfolk, has been improved by dredging a channel, the depths of which are given on page 113.

Above the fourth bridge the branch has a natural channel with a depth of 10 feet (3 m.) to the fork, 3⅓ miles above the entrance.

The north fork (**Broad Creek**) has a depth of 2 feet (0.6 m.) for 1⅜ miles, and the south fork a depth of 2 feet (0.6 m.) for about 2 miles. Below the third bridge there is an extensive traffic to the wharves at Norfolk and Berkley, but above that point the branch is little used except by small local craft.

Four **drawbridges** cross Eastern Branch between the entrance and the fork. The Berkley bridge, ⅝ mile above the entrance, is a double-leaf bascule draw, with a clear opening of 126 feet, and a headroom of 35 feet at high water when closed. The Norfolk & Western Railroad bridge, ⅞ mile above the entrance, has a lift opening 140 feet wide and a headroom of 4 feet at high water when closed. The Campostella Bridge, 1⅜ miles above the entrance, has a swing truss draw with two clear openings 133 feet wide and a headroom of 4 feet at high water when closed. The Virginian Railway bridge, 2½ miles above the entrance, has a center pier draw, each opening 60 feet wide, with a headroom of 6 feet at high water when closed. The ebb current through the latter bridge has a southerly set. Three bridges cross the north fork (Broad Creek). The first two, just above the fork, have draw openings about 28 feet wide, and the third, 1⅛ miles above the fork, is a fixed bridge.

Indian River, on the south side of Eastern Branch, 2½ miles above the entrance, has a depth of 3 feet (0.9 m.) for ¾ mile above the mouth.

Southern Branch of Elizabeth River (Chart 451) forms the southern approach to the two canals which afford passages from Chesapeake Bay to the inland waters of North Carolina. This branch is of considerable commercial importance; there are several

large lumber mills and other manufactories at which vessels load, and the commerce using the canals also passes through the branch. The inside route through the canals is described in United States Coast Pilot, section D, Cape Henry to Key West; and Inside Route Pilot, New York to Key West. The depths below the Norfolk & Western Railway bridge are given on page 113; above here there is a depth of 12 feet (3.6 m.) to the entrance to the Albemarle & Chesapeake Canal.

The channel for its whole length of 10½ miles is marked by buoys and is not difficult to navigate as far as the entrance to Deep Creek with the aid of the chart. Above this, to the lock of the Albemarle & Chesapeake Canal, some local knowledge is needed to follow the channel.

Bridges, Southern Branch.—The whistle signal for all bridges across Southern Branch is three long blasts.

Belt Line Railroad bridge, 1¾ miles above the entrance, has a center pier draw, each opening 110 feet wide, with a headroom of 15 feet at high water when closed.

Norfolk and Portsmouth highway bridge is located ¼ mile south of the Belt Line bridge, has a lift span with clearance of 15 feet at mean high water when closed and clearance of 148 feet when raised.

Virginian Railway bridge, 2¾ miles above the entrance, has a center pier draw, each opening 110 feet wide, with a headroom of about 7 feet at high water when closed.

Norfolk & Western Railroad bridge, 5 miles above the entrance, has a single lift opening 125 feet wide, and a headroom of 7 feet at high water when closed.

The railroad bridge across Southern Branch, ¾ mile above the mouth of Deep Creek, has a center pier draw, each opening 80 feet wide, with a headroom of 7½ feet at high water when closed.

The highway bridge ¾ mile farther up has a center pier draw, each opening 80 feet wide, with a headroom of about 6 feet at high water when closed.

The Albemarle & Chesapeake Canal route is owned and maintained by the Government and is free of tolls. This canal connects the Southern Branch of Elizabeth River with **North Landing River,** and is entered about 10½ miles from Norfolk. The canal is 7¼ miles long and had a controlling depth of 12 feet (3.6 m.) in 1929. It is crossed by four drawbridges. The depth of water in the canal is lowered by northerly winds and raised by southerly winds; severe storms may cause a difference of 2 feet (0.6 m.) or more below or above the normal.

Deep Creek, which empties into Southern Branch about 6 miles above Norfolk, is 2½ miles long to the entrance of the Dismal Swamp Canal. The creek has been improved by dredging a channel 100 feet wide and 10 feet (3 m.) deep from the Southern Branch to the canal. On the south side at the entrance of the creek there is a signboard directing the way to the Dismal Swamp Canal.

Dismal Swamp Canal, owned by the Government, connects Deep Creek with the Pasquotank River. The northern lock of the canal is about 8½ miles above Norfolk. This canal is about 19 miles long, 60 feet wide, and had a controlling depth of 7 feet (2.1 m.) in 1929.

89926°—30——9

There are turnouts at distances of about 3 miles where vessels may pass each other; the two locks are 250 feet long and 39 feet wide.

Directions, Chesapeake Bay entrance to Newport News and Norfolk

[Abbreviations for lights; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red. Color white unless otherwise indicated]

	Courses		Distance in nautical miles
	True	Magnetic	
From 2.3 miles 77° true (E. ⅝ N. mag.) from Cape Henry Lighthouse.	°	*Points*	
1. To ½ mile southwest of Thimble Shoal Lighthouse (Occ. W., 2 secs.), passing through Thimble Shoal Channel, lighted on both sides.	287	WNW	14.5
2. To 1.8 miles east of Old Point Comfort Lighthouse (F. R., W. sector); head for lighthouse, passing ¼ mile northward of Willoughby Spit gas and bell buoy No. 15.	262	W. ⅛ S	1.0
3. To ½ mile southeast of Old Point Comfort Lighthouse midway between it and gas buoy No. 17, Thimble Shoal Light astern.	250	WSW. ¾ W	1.5
If bound for quarantine proceed to Anchorage A, west of Old Point Comfort, as shown on Chart 400.			
4. To 0.2 mile northwest of Gas and Bell Buoy No. 3., Newport News Middle Ground Lighthouse (F., Fl., 20 secs.) ahead.	235	SW. by W. ⅜ W	2.2
Anchorage can now be made in Hampton Roads as desired.			
If bound for Newport News			
5. To entrance to Newport News dredged channel.	224	SW. ½ W	1.5
6. To west end of dredged channel, lighted on both sides.	264	W	2.5
7. To Newport News piers	306	NW. ¼ W	--------
If bound for Norfolk			
(Continue from course 4)			
5a. To mid-channel, between gas buoys off Pier 2, Craney Island range ahead. (Shows between the two eastern rows of oil tanks on Craney Island.) Channel buoyed on both sides.	183½	S. ⅞ W	3.5
6a. To position between spar buoys Nos. 32 and 11L. off the southern piers on Lambert Point, range ahead. Channel buoyed.	172	S. ⅛ E	2.8
7a. To 200 yards east of spar buoy No. 36, Hospital Point range astern. Channel buoyed.	131	SE. ⅛ S	2.1
Thence to Norfolk docks as desired.			

Directions, Chesapeake Bay entrance to Newport News and Norfolk—Continued

	Course		Distance in nautical miles
	True	Magnetic	
If bound for Berkley or Portsmouth			
8a. To 180 yards east of the railway wharves at the north end of Portsmouth water front.	° 155	*Points* S. by E. ¾ E.	0.5
9a. Along the Portsmouth water front to wharf as desired or continue in mid-channel between the piers on each side of the Southern Branch.	187	S. by W. ⅛ W.	0.3
Vessels bound for the Albemarle & Chesapeake Canal continue along Southern Branch via courses given in United States Coast Pilot, Section D, Cape Henry to Key West; or Inside Route Pilot, New York to Key West.			

Vessels approaching from northward.—Deep-draft vessels pass ¼ mile eastward and southward of Tail of the Horseshoe Gas and Bell Buoy, then steer 265° true (W. mag.) for 4 miles to Thimble Shoal Channel entrance buoys.

With a smooth sea a draft of 19 feet (5.8 m.) can be carried between the Horseshoe and Tail of the Horseshoe by steering 178° true (S. ⅜ W. mag.) from the southern entrance of York Spit Channel to ¾ mile southward of the gas and bell channel buoy west of Tail of the Horseshoe; then when Old Point Comfort Lighthouse bears 266° true (W. ⅛ N. mag.) it may be steered for on that course, passing close southward of two red buoys marking the channel, and north of Willoughby Bank Gas and Bell Buoy, to a junction with course 3 in the preceeding table.

Nansemond River (Chart 529), on the southwest side of Hampton Roads, between Pig Point and Barrel Point, and 2 miles southwestward of Newport News Middleground Lighthouse, is the approach to the city of Suffolk, 18 miles above the mouth. At Pig Point a long partly ruined wharf leads out to a depth of 12 feet (3.6 m.). The river has some trade in small produce boats and a few barges and schooners and considerable trade in vessels loaded with fertilizer. There are several wharves below Suffolk from which farm produce is shipped. The channel has been improved by dredging and in 1927 had a controlling depth of 9.7 feet (2.9 m.) from the mouth to bridge at Suffolk and 7 feet (2.1 m.) from there to the head of navigation, a further distance of ½ mile. Small boats can go several miles above Suffolk.

From the entrance to the mouth of Western Branch, 6 miles below Suffolk, the river is wide, but the channel is crooked and leads between extensive shoals which are nearly bare in places at low water. Above this point the river is narrow and crooked, but the mid-channel is clear to Suffolk. The channel is marked by buoys and

several lights as far as Western Branch. There is a dike on the eastern side of the channel opposite the mouth of Western Branch; the northern end is submerged at extreme high water and unmarked. Strangers up to 6 feet (1.8 m.) draft should have no trouble in following the channel to Suffolk with the aid of the chart. Those of deeper draft are advised to take a pilot. One can usually be obtained near the mouth of the river or at Norfolk or Newport News.

A highway bridge crosses the lower part of Nansemond River. It has a single bascule span with a width of 94 feet and a high-water clearance when closed of 16 feet.

Bennett Creek, on the south side of Nansemond River, 2¾ miles above Nansemond River lighthouse, has a depth of about 3 feet (0.9 m.) on the bar at the entrance and 6 feet (1.8 m.) inside for 5 miles above the entrance to the A. C. L. bridge. It is frequented by produce and pleasure boats, the deepest draft being 4 feet (1.2 m.). A staked channel carries 3 feet (0.9 m.) over the bar into the creek. To enter, leave the stakes on the port hand.

Western Branch, on the west side of Nansemond River, 6 miles below Suffolk, has a depth of 8 feet (2.4 m.) as far as the village of **Reids Ferry,** and is said to have a depth of 5 feet (1.5 m.) at high water for 5 miles above the mouth and is used by a few small produce and wood boats.

Suffolk, a city at the head of navigation for vessels on Nansemond River, is an important railroad center. Gasoline and provisions are obtainable, and there is water on the wharves. A drawbridge having a draw opening 38 feet wide crosses the river at the upper end of the wharves, and there is little traffic above.

Tides.—The mean range of tides is 2.6 feet at the entrance and 3.4 feet at Suffolk.

JAMES RIVER

[Charts 529, 530, and 531]

emptying into the western end of Hampton Roads at Newport News, is the approach to the cities of Richmond and Petersburg and the towns of Smithfield and City Point. It is navigable to the city of Richmond, 89 miles above Newport News. The river has a large trade in coal, oil, farm and wood products, and general merchandise carried in barges, schooners, and the regular steamers. The deepest draft vessel using the river draws 18½ feet (5.6 m.), but the majority draw 16 feet (4.8 m.) or less.

The channel has been improved by dredging, so that on June 30, 1929, there was a least depth from the mouth to City Point of 21 feet (6.4 m.), and from there to Richmond a least depth of 18 feet (5.5 m.).

There are numerous wharves along the main channel of James River, many of them with a store and post office but no settlement near them. They are used as shipping and receiving points for farm and wood products and supplies for the surrounding country. Regular steamers between Norfolk and Richmond make stops at most of them, and there is regular freight service to New York.

The small creeks tributary to James River are usually shoal at the entrances with deeper water inside for long distances. Most of them

are frequented by small produce boats and by barges and small sail vessels carrying wood and lumber. Local knowledge is generally necessary to keep in the best water.

The James River is crossed by a highway bridge from the north end of Newport News to Fishing Point. It has a vertical lift span in the eastern section with a horizontal clearance of 250 feet, and a vertical clearance of 145 feet when raised and 50 feet when closed. At night it is lighted by red lights when the span is down and by green lights when raised. An airway beacon (flashing white) is located on the northeastern tower of the lift span. Another navigable span is located at the western side of the channel. It is fixed and has a vertical clearance of 25 feet.

Chuckatuck Creek, 4 miles southwestward of Newport News, has a depth of 3½ feet (1 m.) across the bar at the entrance and deeper water inside to the village of **Crittenden,** just above the entrance. There is a depth of 3 feet (0.9 m.) to the village of **Chuckatuck,** 5 miles above the entrance. There is a shipyard and railway at Crittenden capable of hauling out any of the boats navigating the creek. The channel in the approach leads northward and westward of the light (fixed white) in the entrance of Ragged Island Creek, then southward of the light (fixed red) in the entrance of Chuckatuck Creek.

Chuckatuck Creek is crossed by a highway bridge near its lower end; width between fenders 80 feet, high-water clearance 20 feet when span is closed.

Ragged Island Creek, just northward of Chuckatuck Creek, is shoal and little used. Small boats can go to near the head at high water only.

White Shoal, a middle ground 5 miles northwestward of Newport News, is marked by **White Shoal Lighthouse** (flashing white), white hexagonal house on piles. There are channels on either side.

Pagan Creek, on the southwest side of James River, southwestward of White Shoal Lighthouse, has been improved by dredging a channel 10 feet (3 m.) deep and 80 feet wide to the town of Smithfield, 5 miles above the entrance, but is subject to some shoaling. The deepest draft entering is 10 feet (3 m.) at high water, and usual draft not over 8 feet (2.4 m.). There is a black bell buoy on the southwest side of the main channel of James River, in line with the entrance cut of Pagan Creek. The channel is also marked by buoys and several lights. Navigation by vessels is rendered difficult on account of the narrow channel and the sharp turns, and strangers should take a pilot; one can be obtained at Newport News or Battery Park. The mean range of tides is 2.5 feet.

Jones Creek, on the south side of Pagan Creek, just inside the entrance, has a depth of 3 feet (0.9 m.) across the flats at the entrance and deeper water inside for 3½ miles. It is crossed by two drawbridges, having a least width of 23 feet; the first is near the mouth and the second 2½ miles above.

Battery Park is a post village on the south side of Pagan Creek, just inside the entrance. There are marine railways here, the largest capable of hauling out boats of 50 tons, 60 feet length, and 8 feet (2.4 m.) draft.

Cypress Creek, a tributary of Pagan Creek from southward just below Smithfield, has a depth of 4 feet (1.2 m.) for about 3 miles above the mouth. A highway bridge with a single clear opening 30 feet wide crosses the creek at the entrance.

Smithfield, a town at the head of steamboat navigation on Pagan Creek, is connected with Newport News and Norfolk by steamer. There are depths of 10 feet (3 m.) at the wharves. Gasoline, provisions, and water are obtainable. A highway bridge having a draw opening 28 feet wide crosses the creek just above the wharves at Smithfield. Pagan Creek is navigable for small boats for 3 miles above the bridge, but is little used.

Warwick River, on the north side of James River, 7 miles above Newport News, has a depth of 6 feet (1.8 m.) in a narrow unmarked channel for 2 miles above the entrance, 2½ feet (0.7 m.) for the next ¾ mile, and deeper water for a farther distance of 3 miles or more. The entrance is used as an anchorage by small oyster and fishing boats. The deepest draft entering is about 5 feet (1.5 m.). There are unmarked shoals with depths of 3 to 5 feet (0.9 to 1.5 m.) off the entrance. A 351° true (N. ⅜ W. mag.) course, with White Shoal Lighthouse astern, will lead to the entrance.

Point of Shoals is an extensive shoal area in mid river 10 miles above Newport News, and there are extensive unmarked shoals extending to the shore northeastward. The main shoal is marked by **Point of Shoals Lighthouse** (fixed white) on the western end. The main channel of the James River formerly passed southward of the Shoals through Burwells Bay and Point of Shoals Channel, marked by lighted ranges and buoys. In 1929 a new channel was being dredged across Rocklanding Shoal east of Point of Shoals to a depth of 22 feet (6.7 m.). When completed it will be the main channel.

Fergusons Wharf (Rushmere post office), on the western side of James River westward of Point of Shoals Lighthouse, is now in poor condition.

Mulberry Point, on the east bank of the river, is surrounded by a large group of decommissioned vessels, anchored on both sides of the channel.

Lawns Creek, 1¾ miles westward of Deep Water Shoals Lighthouse (flashing white), has a depth of about 3 feet (0.9 m.) across the bar, and this depth can be carried for 4 miles above the entrance. The deepest draft entering is about 5 feet (1.5 m.) A prominent long wharf, now in bad condition, ⅜ mile southward of Deep Water Shoals Lighthouse is the landing for Camp Eustis.

Skiff Creek, 2 miles northeastward of Deep Water Shoals Lighthouse, has a depth of 2 feet (0.6 m.) across the flats at the mouth and deeper water inside for about 3 miles. It is little used.

Hog Point, 23 miles above Newport News, is low, with scattered clumps of trees. Homewood Wharf, marked by a light (flashing white) on the end, and post office are on the east side of the point.

College Creek, on the north side of James River, northward of Hog Point, has a depth of 2 feet (0.6 m.) across the flats at the mouth, 6 feet (1.8 m.) inside for 2 miles, and 2½ feet (0.7 m.) for a farther distance of ½ mile to **Williamsburg Landing,** 1 mile

from the town of **Williamsburg.** The channel is difficult without local knowledge.

Jamestown Island is on the north side of James River, 27 miles above Newport News. **Jamestown** has two wharves and a post office. A ferry runs to Scotland on the other side of the river. A white monument and the wharves are prominent.

The Thoroughfare and **Back River,** northward of Jamestown Island, have a depth of about 2 feet (0.6 m.) at the eastern and western ends and 7 to 20 feet (2.1 to 6.1 m.) in the narrow channel northward of the western end of the island. They are used to some extent as an anchorage for small boats, but through navigation is prevented by a fixed bridge, under which only small boats without houses can pass.

Cobham Wharf is a landing on the south side of James River, southward of Jamestown Island and ⅜ mile westward of Goose Hill Channel Range Lights. One mile northwestward is **Scotland Wharf** (11 feet (3.3 m.) of water alongside) and post office, from which there is railroad communication with the Norfolk & Western Railroad at **Wakefield.** A large amount of lumber and wood is shipped in schooners and barges. Gasoline and Diesel oil may be obtained here. The tanks for the above are painted an aluminum color and are very prominent.

Just westward of Scotland is **Grays Creek,** which has a depth of 3 feet (0.9 m.) across the flats at the entrance and deeper water inside for about 4 miles.

Chickahominy River (Chart 530) is on the north side of James River, 33 miles above Newport News and 5 miles above Jamestown Island. It has been improved by dredging a channel 14 feet deep across the bar at the entrance and 8 feet deep to Windsor Shades, but the project is abandoned and the channels have shoaled. By the last survey there was a depth of about 11 feet (3.3 m.) at the entrance, 10 feet (3 m.) to **Binns Bar,** 20 miles above the entrance, and 6 to 7 feet (1.8 to 2.1 m.) for a farther distance of 2 miles to **Windsor Shades.** Small boats can go several miles farther, but navigation is difficult. The principal trade in the river is in wood and lumber, carried in barges and an occasional schooner. The deepest draft loaded in the river at or below Windsor Shades is about 9 feet (2.7 m.).

The channel of Chickahominy River is crooked, narrow, and obstructed by shoals, and local knowledge is necessary to keep in the best water. Towboats are always employed and are usually obtained from Norfolk. The best water in the approach leads along the north shore from Jamestown Landing to the buoys at the mouth. The mean rise and fall of tides is 1.9 feet at the mouth and 2.4 feet at Windsor Shades. Chickahominy River has several narrow tributaries with a good depth of water for several miles. **Gordons, Morris,** and **Yarmouth Creeks** are the ones most often entered by barges and schooners.

Lanexa is a post office and railroad station on Chickahominy River, 15 miles above the entrance.

Claremont is a village and railroad station on the south side of James River, 38 miles above Newport News. There are several

wharves, with depths of 7 to 15 feet (2.1 to 4.5 m.), but there is little business here. Gasoline and provisions are obtainable. On the north side of the river, opposite Claremont, is **Sandy Point Landing** (Tettington post office).

Chippoak Creek is on the south side of James River, 1½ miles westward of Claremont. It has a depth of about 4 feet (1.2 m.) for 4 miles and 2 feet (0.6 m.) to near the head of navigation. The best water in the entrance leads close along the south side. There are two wharves with warehouses on the south side at the entrance, one of which is in ruins.

A wreck not covered at any stage of the tide lies in 33 feet (10 m.) of water off Chippoak Point.

Between Chippoak Creek and the bend, 3½ miles northward, are **Brandon Wharf** (marked by a flashing white light) and post office and **Ritchie Wharf** (store) on the west side and **Trees Point wharves** (ruins) and **Oldfield Wharf** on the east side. On the north side of the river, opposite Kennon Marsh, are two wharves. There is a brickyard at the upper wharf. On the south side are ruined wharves at **Upper Brandon** and a new wharf at **Brandon Farms,** ¼ mile east of Stanley Wharf. **Kittewan Creek,** on the north side, 1¼ miles westward of Kennon Marsh, is nearly bare at the mouth at low water and has deeper water inside. **Wards Creek,** on the south side, ¾ mile southeastward of Weyanoke Point, has a depth of 1 to 2 feet (0.3 to 0.6 m.) across the flats at the mouth and deeper water inside for 3 miles. The ruins of a pier, submerged at extreme high water, are on the edge of the main channel at the entrance of the creek.

Fort Powhatan is marked by a ruined wharf with a flashing light on the end.

Ruffins Wharf is in good shape, but the two wharves at Weyanoke are in ruins.

Wilcox Wharf and post office are on the north bank of James River, northward of Windmill Point. Just east of the wharf are the beacons of a lighted range.

Herring Creek, on the north side, 2 miles westward of Windmill Point, has a depth of 2 feet (0.6 m.) across the flats at the entrance and is used by boats of 4 feet (1.2 m.) draft at high water. A wharf and prominent water tank lie ½ mile westward of the creek, and ¾ mile farther westward are **Westover Wharf** and post office. On the south side, opposite the entrance to the creek, are **Blairs Wharf** and post office.

Powells Creek, just eastward of Coggins Point, has a depth of 4 feet (1.2 m.) for 3 miles above the entrance and is entered by boats of 6 feet (1.8 m.) draft at high water.

Jordan Point Lighthouse (flashing white), on the end of Jordan Point, is prominent from up or down the river.

Hopewell is composed of the former villages of City Point and Hopewell and has now a population of approximately 13,000. It lies at the junction of James and Appomattox Rivers, 60 miles above Newport News, and is the terminus of a branch railroad line to Petersburg. There are large rayon-silk plants, paper-pulp works, and the large plant of the Atmospheric Nitrogen Corporation here.

The latter has a large concrete dock with 20 feet (6.1 m.) on the north side. A privately dredged channel, with 20 feet (6.1 m.) least depth, leads from the main channel of the river to the north side of the dock. It is marked by several buoys.

Just south of this dock is the aerial cableway and unloading pier of the pulp mill. There is 18 feet (5.5 m.) on the channel side of the dock.

There are wharves at the point for the regular freight steamers, also for sand and gravel barges. The depths are from 15 to 20 feet (4.5 to 6.1 m.). Gasoline, fuel oil, and provisions are obtainable. Pilots for the upper part of James River and Appomattox River can be obtained here, and towboats may be ordered by telephone or telegraph. A ferry makes regular trips from here to Upper Shirley Wharf, on the other bank several miles above, and to Bermuda Hundred, opposite Shirley.

Appomattox River, on the west side of James River, 61 miles above Newport News and 28 miles below Richmond, is navigable for vessels to the head of navigation at Petersburg, 10 miles above the mouth. The river has been improved by dredging and the construction of training walls to obtain a channel 80 feet wide and 9 feet deep to Petersburg and had a controlling depth of 5.5 feet (1.6 m.) in April, 1929. It is used by freight steamers, barges, and schooners of about 7 feet (2.1 m.) draft. There are only two wharves between Petersburg and the mouth. The difficult part of the channel, through the flats at the mouth (marked by a lighted beacon and buoys), has a least depth of 12 feet (3.6 m.). From Point of Rocks to 1 mile above it the channel is marked by buoys. Except at these places a general mid-channel course is best, although unmarked shoals extend nearly to mid-channel in places. Strangers should have no trouble to take a draft of 5 feet (1.5 m.) to Petersburg with the aid of Chart 531. A pilot can be obtained at Hopewell. A highway bridge crosses the river above Hopewell.

Directions, James River, Newport News to City Point (Hopewell) and Richmond

[Abbreviations for lights: F., fixed; Fl., flashing; Occ., occulting; W., white; R. red. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
	°	Points	
1. From ¼ mile off Newport News docks to the lift span opening of James River Highway Bridge.	322	NNW. ⅞ W	2.8
2. To midway between fish trap spar buoys Nos. 36H and 37H.	301	NW. ¾ W	2.0
3. To 200 yards west-southwestward of nun buoy No. 2, south of Jail Island.	306	NW. ¼ W	3.4
4. To ½ mile east true from the bell buoy southeastward of Point of Shoals, nun buoy No. 2 astern, and passing just northward of spar buoy No. 1.	255	W. ¾ S	1.5
Or, from lift-span opening of James River Bridge, passing westward of White Shoal Lighthouse (F.).			

Directions, James River, Newport News to City Point, etc.—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
2a. To position 1,000 yards beyond fish trap spar buoy No. 35H.	282	WNW. ⅜ W	1.9
3a. To abeam White Shoal Lighthouse	300	NW. ¾ W	1.2
4a. To 0.6 mile, 295° true from White Shoal Lighthouse.	311	NW. ⅛ N	0.6
5a. To junction with course 4 above, White Shoal Lighthouse astern.	295	NW. by W. ¼ W	2.8
5. To 100 yards south of nun buoy No. 2, Burwells Bay Range. (Continue from course 4.)	281	WNW. ½ W	1.1
6. To south of nun buoy No. 2A, Burwells Bay Range ahead. Range does not show well in the afternoon.	271	W. ⅝ N	1.2
7. To 150 yards westward of nun buoy No. 2B.	293	NW. by W. ⅜ W	0.5
8. To Point of Shoals Channel Range, ¼ mile southwest of the lighthouse. Head between the light and the outer end of the ruins of Fergusons Wharf.	340	N. by W. ¼ W	0.7
9. To north end of Point of Shoals dredged channel abeam of spar buoy No. 7C, range astern (west side of channel marked by two buoys).	23	NNE. ⅝ E	1.4
10. To abeam of Deep Water Shoals Lighthouse.	4	N. ⅞ E	3.7
11. Round the lighthouse at a distance of 300 yards until north of it.	------	Various	0.4
12. To a position where bell buoy No. 2 is on range with the end of Homewood Wharf, Deep Water Shoals Lighthouse astern bearing 185° true, passing 300 yards eastward of the red and black nun buoy 1¼ miles north of Deep Water Shoals Lighthouse.	5	N. by E	2.1
NOTE.—Spar buoy No. 47H on range with beacon on north side of channel at end of course 12.			
13. To southward of the beacon 2 miles east by north from Hog Point. Beacon ahead on range with spar buoy No. 47H.	327	NNW. ⅜ W	1.1
14. To 200 yards westward of spar buoy No. 48H.	313	NW. ⅜ N	0.8
15. To 100 yards north of gas and bell buoy No. 17, passing well northward of buoys Nos. 15 and 4.	264	West	1.6
Or, for vessels of under 15 feet (4.5 m.) draft, from position abeam of Deep Water Shoals Lighthouse.			
11a. To position with Deep Water Shoals Lighthouse bearing 160° true.	4	N. ⅞ E	0.3
12a. To position 1.7 miles from Deep Water Shoals Lighthouse, light astern.	340	N. by W. ¼ W	1.3

Directions, James River, Newport News to City Point, etc.—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
13a. To 0.2 miles south of bell buoy No. 2	327	NNW. ⅜ W	0.9
14a. To abeam of Homewood Wharf Light (Fl.).	315	NW. ½ N	0.8
15a. To 100 yards north of Hog Point gas and bell buoy, joining course 15 above.	299	NW. ⅞ W	1.1
From course 15 above			
16. To east of nun buoy No. 4A, on Goose Hill Channel Range.	245	WSW. ¼ W	1.7
17. To midway between bell buoy No. 6 and spar buoy No. 51H Goose Hill Channel Range ahead.	229	SW. ⅞ W	1.7
18. To Swann Point Shoal Channel Range, 450 yards eastward of bell buoy No. 25, passing ¼ mile southwestward of Church Point Wharf Light (Fl.) and 0.1 mile eastward of can buoy No. 23.	314	NW. ½ N	3.8
19. To 300 yards southeast of nun buoy No. 10, Swann Point Shoal Channel Range astern and Dancing Point Shoal Channel Range ahead.	265	W. ⅛ N	4.8
20. To 100 yards off Claremont Wharf on Sloop Point.	296	NW. by W. ⅛ W	2.4
21. To Brandon Wharf Light (Fl.)	310	NW	2.3
22. To Bachelor Point Light (Fl.), giving light a berth of 100 yards.	358	N. ⅜ E	2.5
23. To spar buoy No. 12, going nothing to the southward of the course when off Kennon Marsh.	295	NW. by W. ¼ W.	1.3
24. To 400 yards west of Stanley Wharf, spar buoy No. 12 astern.	226	SW. ⅝. W	1.9
25. To position off Wards Creek with Fort Powhatan Light (Fl.) bearing 267° true.	216	SW. ¼ S	1.0
26. To mid-channel off Fort Powhatan	272	W. ¾ N	1.0
27. Thence via various mid-channel courses until ½ mile south of Weyanoke Wharf.	------	Various	0.8
28. Pass midway between red and black buoys on the south end of Minzie Middle Ground and Weyanoke Wharf on course 5° true until the tangent to Windmill Point bears 285° true.	5	N. by E	1.2
29. To junction with Wilcox Wharf Range, Wilcox Wharf Light (Fl.) ahead.	312	NW. ¼ N	0.8
NOTE.—In lieu of courses 28 and 29, vessels of less than 13 feet (3.9 m.) draft may steer 345° true (N. ¾ W. mag.) on Wilcox Wharf Range until midway between Wilcox Wharf Light and the red and black buoy off Windmill Point.			
30. To junction with Jordan Point Range, near Blairs Wharf.	250	WSW. ¾ W	2.2

Directions, James River, Newport News to City Point, etc.—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	Points	
31. To black spar buoy No. 31, Jordan Point Range ahead.	280	WNW. ⅝ W	2.3
32. To midway between can buoy No. 35 and spar No. 18, North Flats Lower Range ahead.	302	NW. ⅝ W	1.1
33. Then steer various courses, passing 100 yards off the black buoys off Jordan Point and south-southwestward of it, to spar buoy No. 45 off the unloading dock of the pulp works at Hopewell.	------	Various	3.0
34. To docks of Hopewell on City Point	310	NW	0.9
35. To Richmond	------	Various	27.7
NOTE.—Local knowledge is necessary for vessels in this part of the river and strangers should take a pilot. Small craft should have no difficulty in following the channel with the aid of Chart 531. Information supplemental to that shown on the chart is given on page 133.			

The **northern branch** of Appomattox River, entering the main channel at **Point of Rocks,** has a depth of 7 feet (2.1 m.) at the entrance. There is a farm landing ¾ mile above the entrance, at which barges are sometimes loaded. The best water in entering leads 100 feet off Point of Rocks.

Petersburg has communication by railroad and by steamboat with Richmond, Hopewell, and Norfolk. All kinds of supplies are obtainable. Ice and freshets do not interfere with navigation. The wharves have available depths of 5 to 6 feet (1.5 to 1.8 m.) A railroad siding, extending for almost the entire length of the wharf front, furnishes a means of transfer between the wharves and the railroads.

Bermuda Hundred is a post office on the west bank of James River, 1½ miles above Hopewell. The wharf has depths of 5 to 9 feet (1.5 to 2.7 m.). A flashing white light is shown from the outer end. Opposite Bermuda Hundred is **Shirley Wharf** and post office. **Hardens Wharf,** on the east bank, 2¼ miles above Bermuda Hundred, is a lumber shipping point.

There are several farm wharves between Hardens Wharf and Richmond but no villages. The shores are generally wooded on both sides and present no characteristic features.

Curles Swamp Creek, on the west side, 6 miles above Hopewell, has a depth of 1 foot (0.3 m.) at the entrance and deeper water inside.

Presque Isle is a small group of houses at the neck of Turkey Island where the land is about 20 feet above ordinary high water.

Woodson Rock is bare at low water, and the Woodson Rock Range leads clear of it. The range shows through a narrow opening in the trees, on top of a bluff.

Meadowville is a farm near the Woodson Rock Range Lights and has a wharf in poor condition. No boats land there.

Dutch Gap Canal is a short artificial cut 16 miles above Hopewell and 13 miles below Richmond. The southwest side of the canal is marked by a light and a monument. A prominent white house stands near the monument.

Richmond, at the head of navigation on the James River, has considerable trade in regular steamers and barges, the deepest draft being 18 feet (5.5 m.), and the usual draft not over 16 feet (4.8 m.). It is connected with Norfolk and intermediate points and New York by steamers. The general cargo for Richmond is handled in the basin of the former James River & Kanawha Canal, known as the Richmond City Dock, which has a depth of 15 feet (4.5 m.). It is open to the public. The dock is 3,450 feet long and entered from the river by a masonry lock, lift of 15 feet (4.5 m.) The lock chamber is 168 feet long and 35½ feet wide. The other wharves in Richmond are on both banks of the river below the lock. They have from 10 to 16 feet (3 to 4.8 m.) of water alongside.

The principal products handled by boat from or to Richmond are fertilizers, tobacco, paper, cotton goods, sand and gravel, and general merchandise. There are railway connections to some of the wharves and highway connections to the others.

Freshets occur irregularly in the fall, winter, and spring, their height at Richmond ranging from 4 to 28 feet (1.2 to 8.5 m.), though the latter is exceptional. The maximum freshet heights usually occur between the middle of March and the middle of April, the freshets occuring at other times not usually reaching a greater height than 4 to 6 feet (1.2 to 1.8 m.) above the normal high water. The number of freshets causing the water to rise above the level of the wharves, on the main channel at Richmond average about one per year, and the water level seldom rises above the level of the city dock. The rise of water level due to freshets rapidly decreases below Richmond and is little felt at Hopewell.

Anchorage out of the way of traffic is permitted in the channel at Richmond, but vessels usually go to the wharves. Small boats anchor on the flats or in the cove having its entrance just westward of the entrance to the city dock. The harbor master at Richmond attends to the berthing and anchorage of vessels on request. The city has a tugboat ready to assist vessels.

Pilotage is not compulsory for James River above Newport News. Pilots can be obtained at Hampton Roads or Newport News, or at Hopewell for Appomattox River or James River above that point. Strangers should take a pilot if navigating above Hopewell if of more than 12 feet (3.6 m.) draft.

The following information is given to supplement Chart No. 531:

Wing dams which show above water extend out to the edge of the channel in places. Shoals between these dams have been raised by deposit and now show above water or by the grass covering them. The deepest water in the river follows along the outside bank of all the curves. The distance is 31 miles.

Buoys mark the east side of the channel from Hopewell to Shirley. Beyond Upper Shirley the east bank can be followed at a distance of 100 yards to the light on Hardens Wharf. Above this the channel passes around Turkey Island and is marked on the south side by buoys. A light is maintained on Pickets Wharf and another at Point Bremo.

A wharf light and a buoy mark the channel a half mile north of Mount Blanco. For a mile above this place the channel is constricted by projecting jetties. The channel then turns about Jones Neck and narrows near Woodson Rock. Follow the range to clear the rock and then a mid-channel course between the wing dams above.

The river has ample depth in Dutch Gap Canal but makes a sharp turn and is difficult to navigate, especially during freshets, or by long vessels. These are sometimes forced to anchor below the gap and to wait until the crest of the flood has passed.

Two lights serve as leading marks through Kingsland Reach and the channel above it. A light marks the turn near Chaffins Bluff. There is a wharf light at Falling Creek 2 miles above the old fortifications at Drewrys Bluff, and between here and Richmond a few lights and spar buoys.

Supplies.—All kinds of supplies are obtainable at Newport News and Richmond. Gasoline, Diesel oil, provisions, and water may be obtained at many of the other landings along the river.

Repairs.—Minor repairs to machinery can be made at Richmond and Petersburg, and there are small railways at Battery Park; but the nearest dry dock is at Newport News, and extensive repairs to hulls and machinery can best be made there or at Norfolk.

Towboats can be had at Hampton Roads, and there is a municipal-owned tug for assistance in Richmond Harbor.

Ice.—There is some drift ice in the river during severe winters, and at times the river is frozen over, interrupting navigation for a few days. Navigation to Richmond is hardly ever suspended 30 days at one time on account of ice.

Tides.—The mean rise and fall of tides is 2.5 feet in Hampton Roads, 2.8 feet at Hopewell, 3.4 feet at Dutch Gap, and 3.7 feet at Richmond.

Currents.—The currents follow the general direction of the channel except between Hog Island and Jamestown Island, where they set across Goose Hill Flats. Their velocities are variable; in the lower reaches the flood current approximately equals the ebb in velocity; the main counteracting effect on the flood is the freshet current. The times of slack water also vary to a considerable extent, due principally to freshets, especially in the upper reaches of the river. The strength of current and the times of slack water in the following list are for normal conditions, and under abnormal conditions may differ, therefore, sometimes to a considerable extent.

Currents, James River.—*Off Hog Point.*—In the center of the channel the slack waters and the strengths of flood and ebb occur about 1¾ hours after the time of the corresponding slack waters and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 1 hour before the time of the high water at Old Point

Comfort and the slack water before ebb occurs about 1½ hours before the time of low water at Old Point Comfort. The average velocity of the current at strength of flood is about 1 knot and at strength of ebb about 1½ knots.

Off Claremont Landing.—The slack waters and the strengths of flood and ebb currents occur about 3 hours after the time of the corresponding slack waters and strengths at Chesapeake Bay entrance. The slack water before flood occurs about ¼ hour after the time of high water at Old Point Comfort and the slack water before ebb occurs about ½ hour before the time of low water at Old Point Comfort. The average velocity of the current at strength of flood or ebb is about 1½ knots.

Off Wilcox Wharf.—The slack waters and the strengths of flood and ebb current occur about 3¼ hours after the times of the corresponding slack waters and strengths of current at Chesapeake Bay entrance. The slack water before flood occurs about ½ hour after the time of high water at Old Point Comfort and the slack water before ebb occurs about the time of low water at Old Point Comfort. The usual velocity at strength of flood or ebb is about 1¼ knots.

Off Hopewell.—The slack waters and strengths of flood and ebb occur about 4 hours after the time of the corresponding slack waters and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 1¼ hours after the time of high water at Old Point Comfort and the slack water before ebb occurs about ¾ hour after the time of low water at Old Point Comfort. The approximate average velocity of the current at strength of flood is 1¼ knots and at strength of ebb 1½ knots.

Above Hopewell the velocity of the current and times of slack water are variable. At Richmond the currents are chiefly nontidal.

HAMPTON ROADS TO YORK RIVER

[Charts 1222 and 494]

Horseshoe is a shoal with depths less than 18 feet (5.5 m.), which extends 5 miles from the shore between Old Point Comfort and Back River Lighthouse, its southern edge bordering the north side of the channel into Hampton Roads. This shoal has depths of 13 to 18 feet (3.9 to 5.5 m.) over its eastern half; its western half has a least depth of 8 feet (2.4 m.) if the shore be given a berth of ½ mile, but there are depths of 6 to 7 feet (1.8 to 2.1 m.) ¾ to 1 mile southeastward of Back River Lighthouse. The eastern extension is marked by a gas and bell buoy.

Local steamers and small craft of 7 feet (2.1 m.) or less draft, with a smooth sea, plying between Hampton Roads, York River, and Mobjack Bay, use routes leading across the fish-trap area off Old Point Comfort, varying the courses according to the locations of the traps.

A clear channel between traps is as follows:

Directions, Hampton Roads to York River

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color is white unless otherwise noted]

	Course		Distance in nautical miles
	True	Magnetic	
For vessels of 8 feet (2.4 m.) draft or less	°	*Points*	
1. From 0.2 mile south of Old Point Comfort Lighthouse (F. R.) to 1.7 miles eastward of Old Point Comfort Lighthouse.	77	E. ⅝ N	1.7
2. To 1.3 miles east-northeastward of Back River Lighthouse (Fl.), passing eastward of the black and white spar buoys marking fish-trap limits.	13	N. by E. ¾ E	5.6
Boats for Back River turn left here and follow aids to navigation up the river.			
3. To between can buoy No. 1 and bell buoy No. 2, 1.8 miles westward of York Spit Lighthouse, passing eastward of the fish-trap buoys.	342	N. by W. ⅛ W	7.5
4. To 0.3 mile southwest of bell buoy No. 2A	306	N. W. ¼ W	1.4
If bound for Poquoson River or Bennet, Cheeseman, and Back Creek, turn left, being guided by the chart and the numerous aids to navigation.			
5. To 0.5 mile north-northeastward of Tue Marshes Lighthouse. (F.), at the mouth of the York River.	286	WNW	3.4

Approaches to York River from the northward and eastward.—Deep-draft vessels bound from Chesapeake Bay to York River enter the main channel between fish-trap buoys Nos. 8H and 9H, 2½ miles west-southwestward of the horizontally striped gas and whistling entrance buoy, and proceed on course 320° true (NW. by N. mag.) to 0.8 mile south-southwest of York Spit Light, then on course 306° true (NW. ¼ W. mag.), to a junction with course 3 of the preceding table.

Vessels of 15 feet (4.5 m.) or less draft from northward may enter the main channel through a side channel between the fish-trap buoys west of New Point Comfort Middle Ground, passing 0.2 mile southeast of spar buoy No. 2H, and steering a 225° true (SW. ½ W. mag.) course to a junction with the main-channel course, ⅓ mile southwest of gas and bell buoy No. 2.

Buckroe Beach is a summer resort on the shore 2½ miles north-northeastward of Old Point Comfort Lighthouse. It has communication by electric road with Old Point Comfort, Hampton, and Newport News. The lights at night during the summer are prominent.

Back River, having its entrance 6½ miles north-northeastward of Old Point Comfort, has a depth of about 9 feet (2.7 m.) across

the bar at the entrance and 7 feet (2.1 m.) to abreast **Amorys Wharf** (Earnest post office), which is on the north side at the intersection of Northwest and Southwest Branch. Gasoline may be obtained at the wharf and general supplies ½ mile up the road. There is telephone communication. There is a depth of 6 feet (1.8 m.) at the wharf. A large hangar and a water-tank at Langley Field, on the peninsula between Northwest Branch and Southwest Branch, are very prominent for many miles. Flashing flood lights on the water-tank are shown at night when airplanes are expected.

Northwest Branch has a depth of 6 feet (1.8 m.) for ¾ mile above the entrance and 2 feet (0.6 m.) to near the head. **Southwest Branch** has a depth of 4 feet (1.2 m.) for 1½ miles, above which it shoals rapidly. **Harrison Creek,** on the south side of Back River, has a depth of 3 feet (0.9 m.) for ¾ mile; **Fox Hill** is a village on the east side near its head.

Back River is the center of a large oystering and fishing industry, and is also frequented by many produce boats, the deepest draft being 7 feet (2.1 m.). **Back River Lighthouse** (flashing white), white tower showing against the trees, and a wharf and house on the western end of **Northend Point** are the most prominent marks in the approach. The main channel is narrow in places, but is marked by buoys and lights and is easily followed with the aid of the chart. The tributaries are unmarked. The shore and shoals near the entrance are subject to some change. A channel 800 yards wide and marked by black and white buoys is kept clear of fish traps in the approach, the south edge of this channel extending from the black buoy at the entrance through the perpendicularly striped bell buoy lying 2 miles eastward of Back River Lighthouse. The mean rise and fall of tides at the mouth is 2.4 feet.

There are shoals, covered with scattered oyster rocks nearly bare at low water, extending from 1 to 2 miles offshore between Back River and Poquoson River entrances. Strangers, even in small boats, should keep outside of the 6-foot (1.8 m.) curve.

Poquoson River, on the south side of York River entrance, westward of York Spit Lighthouse, has a depth of 6½ feet (1.9 m.) to the village of **Yorkville,** where gasoline and some general supplies may be obtained, and 2 feet (0.6 m.) to near the heads of all its tributaries. The river is frequented by small produce boats and a few schooners and barges loading wood, the deepest draft being 9 feet (2.7 m.). There are no wharves on the main branch except for small boats. The mean range of tides at the mouth is 2.4 feet.

Bennett Creek, on the southeast side, at the entrance of Poquoson River, has a depth of 6 feet (1.8 m.) for 1½ miles above the entrance and is marked by a light, and by buoys for ¾ mile. There is a marine railway near the head capable of hauling out boats of 75 tons and 6 feet (1.8 m.) draft.

Cheeseman Creek, on the north side of Poquoson River, just inside the entrance, has a depth of 6 feet (1.8 m.) in a narrow channel for 2 miles, and 3 feet (0.9 m.) nearly to the head. It is unmarked. There is an old fish factory on the northeast side ½ mile west-northwestward of York Point, with a wharf extending to a depth of 7 feet (2.1 m.). Gasoline and some provisions can be

obtained near the head of the creek, and there is a railway capable of hauling out boats of 75 tons and 6 feet (1.8 m.) draft.

Back Creek, having its entrance 2 miles southward of Tue Marshes Lighthouse, has a depth of 8 feet (2.4 m.) to abreast **Slates Wharf,** on the south side westward of **Clarkston Creek,** and 2 feet (0.6 m.) to near the head. The most prominent mark is an old fish factory on the south end of **Goodwin Islands.** The creek is frequented by fish steamers of 9 feet (2.7 m.) or less draft, and by many smaller oyster and produce boats. Gasoline and some provisions are obtainable near the head. There is a well-equipped machine shop, capable of making extensive repairs to vessels, near Slates Wharf. The channel is marked by buoys and Candy Point Light (flashing white) as far as the entrance to Clarkston Creek. A 269° true (W. 3/8 N. mag.) course with York Spit Lighthouse astern will lead to the first black buoy.

The Thoroughfare, connecting Back Creek with York River westward of Goodwin Islands, has a depth of about 3 feet (0.9 m.) at high water and is extensively used by small local boats. The channel is usually marked by bush stakes, but is difficult without local knowledge.

YORK RIVER

[Charts 494, 495, and 504]

formed by the junction of Mattaponi and Pamunkey Rivers at West Point, 35 miles above the entrance, has a broad and comparatively straight channel with a least depth of 20 feet (6.1 m.) to West Point. It is marked by lights and buoys and is easily followed by day with the aid of the chart.

The river has some trade, carried mostly in the regular steamers from Baltimore and in schooners and barges. The deepest draft ordinarily taken to West Point is 15 feet (4.5 m.). The tributaries have a large trade in wood products carried in schooners and barges.

York Spit Swash, the slough leading through York Spit 5 miles northwestward of York Spit Lighthouse and 1¼ miles southeastward of the marshy islands between York River and Mobjack Bay, had a least depth of 8 feet (2.4 m.) by the last survey, and is used by local vessels up to 7 feet (2.1 m.) draft. It is marked by buoys, but strangers should proceed with caution. On a bright day the channel shows up well.

Monday Creek is described under Mobjack Bay.

Sedger Creek, on the north side, 2 miles northwestward of Tue Marshes Lighthouse (flashing white) has a depth of 7½ feet (2.2 m.) in a narrow, crooked channel to **Browns Wharf** (Perrin post office), at the bend 3/8 mile above the entrance. There is a store at the wharf, and gasoline is obtainable. A machine shop adjoining the wharf can make oil and gasoline engine repairs. There is also a marine railway capable of hauling a 75-ton boat. The channel is marked by an entrance beacon (red structure), having a fixed white light, and by buoys. The red sector of Tue Marshes Light covers the entrance of the creek. Local fishermen may be obtained to pilot strangers.

Wormley Creek and **West Branch,** on the south side, 4 miles westward of Tue Marshes Lighthouse, have a common entrance with a depth of 4 feet (1.2 m.) across the bar and 2 feet (0.6 m.) in both creeks nearly to the heads. They are little used.

A naval fuel-oil dock, with 30 feet (9.1 m.) of water alongside, is located on the York River about ¾ mile westward of Wormley Creek.

Sarah Creek, on the north side, 1 mile eastward of Gloucester Point, has a depth of about 7 feet (2.1 m.) in the entrance and for a short distance up the west branch and 3 feet (0.9 m.) in either branch for about ¾ mile. The deepest draft using it is 7 feet (2.1 m.). There are no wharves.

There is a small railway here capable of handling vessels of from 5 to 6 feet (1.5 to 1.8 m.) draft.

West of Sarah Creek are several docks and a large group of cottages extending as far as Gloucester.

Gloucester Point is a village on the point opposite Yorktown. The end of the point is low and marked by several wharves, some conspicuous gasoline tanks, and several buildings. There is ferry communication with Yorktown.

Yorktown is on the south side of York River, 6 miles above Tue Marshes Lighthouse. The main part of town is on the high bank and is not visible from the river. The Yorktown Monument, a group of buildings along the beach near the wharves, and some oil tanks are prominent. A large wharf below the monument has depths alongside of more than 16 feet (4.8 m.). There are several wharves at the west end of town, some used by fishermen and one used by the regular steamer. Some provisions, gasoline, Diesel oil, water, and ice may be obtained here.

Anchorage.—Vessels can anchor anywhere in the wider part of the channel of York River where the depth is suitable. A good anchorage for deep-draft vessels is westward or northwestward of Gloucester Point, on the north side of the channel. The areas eastward of Yorktown are used by naval vessels.

Claybank and **Almondsville** have long wharves and post offices. They are on the northeast side of the river 8¼ and 11¾ miles, respectively, above Gloucester Point.

A naval dock, long and prominent, is located 1⅜ miles above Yorktown.

Timber Neck, Bush, Carter, and **Aberdeen Creeks,** between Carmines Islands and Claybank Wharf are shoal and frequented only by small local boats.

Kings Creek, on the southwest side, 4 miles above Yorktown, has a depth of 2 feet (0.6 m.) across the flats at the entrance and a little deeper water inside. It is little used.

Queens Creek, on the southwest side, 1½ miles west-southwestward from Pages Rock Lighthouse, has a depth of 2½ feet (0.7 m.) across the flats at the entrance 4 feet (1.2 m.) inside for 2½ miles, and 1½ feet (0.4 m.) for a farther distance of 2 miles to a fixed bridge 1½ miles from the town of **Williamsburg.** It is used by a few produce boats in the lower end and by small motor boats to the bridge. The channel is difficult in places without local knowledge. Some pulp wood is handled on the creek.

Poropotank Creek, 4 miles above Almondsville Wharf and eastward of Poropotank Creek Light, has a depth of 6 feet (1.8 m.) in the entrance, 3 feet (0.9 m.) across **Morris Bay,** and 5 feet (1.5 m.) above to **Miller Landing,** 4½ miles above the entrance. Small boats can go several miles farther. There are several landings on the

creek from which wood products are shipped in boats of 6 to 7 feet (1.8 to 2.1 m.) draft. The channel is usually marked by bush stakes, but is crooked and narrow in places and difficult without local knowledge. The best water favors the east shore in the approach through Poropotank Bay.

West Point, at the junction of Mattaponi and Pamunkey Rivers, is the terminus of a branch of the Southern Railway and is connected by daily steamer with Baltimore and the intermediate landings on York River. It has considerable trade in bay and coasting vessels, the deepest draft being 15 feet (4.5 m.). Gasoline, provisions, water, and coal in limited quantities are obtainable. Towboats and pilots for Mattaponi and Pamunkey Rivers can be obtained. There is a machine shop for minor repairs to machinery and a railway capable of hauling out vessels of 300 tons, 120 feet length, and 8 feet (2.4 m.) draft.

Anchorage can be made off the wharves on either side of West Point in depths of 18 to 40 feet (5.5 to 12. 2 m.).

Mattaponi River (Chart 504) is the approach to the villages of **Walkerton** and **Aylett,** 25 and 33 miles, respectively, above West Point, and many other landings. It has a depth of 12 feet (3.6 m.) to **Mantapike,** 18½ miles above West Point, and 8 feet (2.4 m.) to Walkerton. Between Walkerton and Aylett the river has been improved by dredging a channel 5½ feet (1.6 m.) deep and 40 feet wide, but considerable trouble is experienced in maintaining it. From Walkerton to **Rosepout Landing** there was a least depth of 6 feet (1.8 m.) in 1925. There is a depth of about 2 feet (0.6 m.) for a distance of 2½ miles above Aylett, where there is a fixed bridge, to the fixed bridge at **Dunkirk.** The river for a distance of 53 miles above Dunkirk is shoal, but is used for rafting and logging at high stages.

A highway bridge crosses the river about 1 mile above West Point. It has a bascule span 80 feet wide and a high-water clearance of 7 feet when closed. A swing bridge crosses the river at Walkerton, 47 feet wide between fenders.

There is considerable trade in wood products carried in schooners and barges, the deepest draft being 14 feet (4.2 m.). The river is unmarked and navigation is difficult without local knowledge. Pilots and towboats can be obtained at West Point. Schooners usually carry a gasoline boat to assist them in the narrow channels. Supplies can best be obtained at West Point, though gasoline and provisions are usually obtainable at many of the landings.

Freshets occur at irregular intervals, being more severe during March and April, and have reached a height of 17½ feet (5.2 m.) above mean low water at Aylett and 5 feet (1.5 m.) at Walkerton, though this is exceptional, but are little felt at West Point or below. The river is not fresh below West Point. The mean tidal range during low stages of the river is 2.9 feet at West Point, 3.9 feet at Walkerton, and 2.3 feet at Aylett.

Pamunkey River (Chart 504) has a depth of 15 feet (4.5 m.) to **Lester Manor,** 9 feet (2.7 m.) to the railroad bridge at **White House,** 7 feet (2.1 m.) to **Bassett Ferry,** and 5 feet (1.5 m.) to **New Castle Bridge,** 24, 28, 43, and 45 miles, respectively, above **West Point.** It is navigable for small lighters and rafts for a

farther distance of about 7 miles to **Hanovertown.** The channel between White House and Bassett Ferry has been improved by dredging to a depth of 7 feet (2.1 m.) and width of 80 feet.

There are no towns on Pamunkey River, but there are many landings, from which considerable wood products and grain are shipped in schooners and barges, the deepest draft being 15 feet (4.5 m.). There are post offices and railroad stations at **Sweethall** and Lester Manor, and a railroad station at White House.

From West Point to Sweethall Landing, 14½ miles above, the river is easy of navigation with the aid of the chart. Above this point navigation is difficult without local knowledge. Pilots can be obtained at West Point, Lester Manor, and White House, and towboats at West Point. Artesian water can be obtained at several of the landings, and the river water is fresh above Cumberland Landing. There are several narrow cut-offs with sufficient depth for small boats, but local knowledge is usually necessary.

Freshets occur at irregular intervals in Pamunkey River, being more severe during March and April. The mean range of tides during low stages of the river is 2.9 feet (0.9 m.) at West Point and 1.7 feet (0.5 m.) at New Castle.

The railroad bridge at White House has a draw opening 55 feet wide and a headroom of 8 feet at high water when closed. The bridge at New Castle has a draw opening 40 feet wide and a headroom of about 13 feet at ordinary stage of the river, and sometimes not more than 7 feet during freshets. It is seldom opened.

Pilots.—Pilotage is compulsory as far as Yorktown for all vessels other than those exclusively engaged in the coastwise trade and those made exempt by United States statutes. Vessels required to take a pilot will get one at Chesapeake Bay entrance or Hampton Roads. Pilots for Mattaponi and Pamunkey Rivers can be obtained at West Point.

Towboats.—Sailing vessels seldom take a towboat, but usually carry a small motor boat to assist them. Towboats for York River can be obtained at Hampton Roads, and for Mattaponi and Pamunkey Rivers at West Point.

Repairs to small vessels can be made at West Point, but extensive repairs to machinery and to hulls of large vessels can best be made at Baltimore, Newport News, or Norfolk.

Ice sometimes interferes with navigation for short periods during severe winters, but in ordinary winters navigation is not interrupted below West Point.

Tides.—The mean range of tides is 2 feet at the entrance, 2.4 feet at Yorktown, and 2.9 feet at West Point.

Currents.—The currents follow the general direction of the channel, except in its narrowest parts, where they have a tendency to set a vessel on shoals. The velocity of the current and the times of slack water vary somewhat in York River, and to a considerable extent in the Mattaponi and Pamunkey Rivers, due principally to freshets, but also to some extent to winds.

At York Spit Lighthouse.—The slack waters and strengths of flood and ebb occur about 1¼ hours before the time of the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2½ hours after the time of low

water at Old Point Comfort and the slack water before ebb occurs about 1½ hours after the time of high water at Old Point Comfort. The velocities at strengths of flood or ebb average about 1 knot.

Between Tue Point and Yorktown.—The slack waters and strengths of flood and ebb occur about 1 hour before the times of the corresponding slacks and strengths at Old Point Comfort. The slack water before flood occurs about 2¾ hours after the time of low water at Old Point Comfort and the slack water before ebb occurs about 1¾ hours after the time of high water at Old Point Comfort. Off Tue Point the average velocity at strength of flood or ebb is about 1 knot. Off Yorktown the average velocity at strength of flood is about 1¼ knots and at strength of ebb 1¾ knots.

Off Claybank.—The slack waters and the strengths of flood and ebb occur at about the times of the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2¾ hours before the time of high water at Old Point Comfort and the slack water before ebb occurs about 2¾ hours after the time of high water at Old Point Comfort. Between Yorktown and West Point the average velocity at strength of flood is about 1¼ knots and at strength of ebb 1½ knots.

In the Mattaponi River at West Point.—The slack waters and the strengths of flood and ebb current occur about ½ hour after the times of the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2¼ hours before the time of high water at Old Point Comfort and the slack water before ebb occurs about 2¾ hours before the time of low water at Old Point Comfort. At the bridge near West Point the average velocity of the strength of the flood current is about 1¼ knots and of the strength of the ebb current 1½ knots.

In the Mattaponi River at Mattaponi.—The slack waters and the strengths of flood and ebb current occur about 1½ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. Slack water before flood occurs about 1¼ hours before the time of high water at Old Point Comfort and slack water before ebb occurs about 1¾ hours before the times of the low water at Old Point Comfort. Between West Point and Walkerton average velocities at strength of current range from 1 to 1½ knots.

In the Pamunkey River at West Point.—The slack waters and strengths of flood and ebb current occur about 1½ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack waters before flood occurs about 1¼ hours before the time of high water at Old Point Comfort and the slack water before ebb occurs about 1¾ hours before the time of low water at Old Point Comfort. At the bridge, near West Point, the average velocity of strengths is about 1¾ knots and at strength of ebb about 2 knots.

In the Pamunkey River at White House railroad bridge.—The slack waters and the strengths of flood and ebb current occurs about 3 hours after the time of the corresponding slacks and strengths slack waters and the strengths of flood and ebb current occur about ¼ hour after the time of high water at Old Point Comfort and the slack water before ebb occurs about ½ hour before the time of low water at Old Point Comfort. Between West Point and Bassett Ferry the average velocity at strength of current is about 1 knot.

Directions, York River

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color is white unless otherwise noted]

	Course		Distance in nautical miles
	True	Magnetic	
From 0.5 mile north-northeastward of Tue Marshes Light.	°	*Points*	
1. To 0.4 mile northward of the Navy fuel depot wharf; Gloucester Point Light (F.) bearing 302° true.	263	W. ⅛ S	4.7
2. To mid-channel off Gloucester Point	293	NW. by W. ⅜ W.	1.4
3. To 0.6 mile, 169° true from Pages Rock Light (F.).	313	NW. ⅜ N	5.2
Pass close eastward of Sandy Point Light (F.) and 200 yards southeastward of nun buoy No. 6.			
4. To ½ mile from the end of Claybank Wharf, heading for it.	334	N. by W. ¾ W	2.6
Pass 300 yards westward of Pages Rock Light and 250 yards eastward of can buoy No. 9 off Gum Point.			
5. To 0.7 mile west of Barren Point, the fixed light off Purtan Island ahead.	321	NNW. ⅞ W	4.9
Pass close eastward of spar buoy No. 9A., and 200 yards eastward of spar buoy No. 9B and can No. 11.			
6. To 300 yards westward of spar buoy No. 10, heading a little inside of Terrapin Point; Almondsville Wharf Light (F.) astern.	316	NW. ⅝ N	3.7
Pass 200 yards westward of Purtan Island and Poropotank (F.) Lights.			
7. To 200 yards west-northwestward of Bells Rock Light (Fl.).	331	NNW	2.4
Pass 100 yards east of bell buoy No. 13.			
8. To 0.2 mile north-northwestward of Fillbates Creek Flats Light (F.); Bells Rock Light astern.	298	NW. by W	1.7
9. To abreast of spar buoy No. 23 off Ferry Creek; Fillbates Creek Flats Light astern.	334	N. by W. ¾ W	1.2
The west side of the channel is well marked by spar buoys.			
10. To abreast of docks at West Point. Drawspan of bridge ahead.	330	NNW. ⅛ W	0.8
NOTE.—If bound up Mattaponi River cut across the shoal between the nun buoys off Goff Point and navigate by the chart or with local knowledge. A depth of 12 feet (3.6 m.) governs across the shoal.			

MOBJACK BAY

[Chart 494]

having its entrance between York Spit and New Point Comfort, has several tributaries, the most important being East, North, Ware, and Severn Rivers. It is obstructed by extensive shoals, but has a depth of 22 feet (6.7 m.) in the entrance and 15 feet (4.5 m.) through the bay and for a considerable distance in the tributaries.

The entrance is marked on the north side by New Point Comfort Lighthouse (flashing white), white tower, and on the south side by York Spit Lighthouse (fixed red), white house on piles, and these are the only prominent marks in the approach. Many of the shoals in the bay and tributaries are marked by buoys and lights. A daily steamer from Norfolk makes landings at four wharves on East River. A gasoline boat which runs to other landings on Mobjack Bay connects with this steamer. Fish foods in season and potatoes and general freight make up the bulk of cargo.

A good **anchorage** can be found in the bay, with shelter from all but southerly and southeasterly winds. Small craft find safe anchorage in the bight westward of New Point Comfort and in the rivers and creeks.

New Point Comfort, marked by a lighthouse, is low and sparsely wooded and has a wharf, depth 8 feet (2.4 m.), on its west end and at which steamers make landings during the fishing season. Gasoline is obtainable.

Bayside Wharf is a long wharf on the northeast side of Mobjack Bay, 1¾ miles northwestward of New Point Comfort Lighthouse. Gasoline is obtainable.

East River, emptying into Mobjack Bay from northward, has a narrow channel with a depth of 13 feet (3.9 m.) for 4 miles above the entrance and 4 feet (1.2 m.) for a farther distance of 2 miles to near the head. The entrance is marked by Pultz Bar light (fixed white), and Pond Point Shoal light (fixed white), and by buoys. Unmarked shoals extend for some distance off many of the points above the entrance, but mid-channel is clear if the points be given a good berth.

There are four wharves with post offices on East River: **Philpots** (Mobjack post office), on the west side; **Diggs,** on the east side, just inside the entrance; and **Williams** and **Hicks Wharves,** about 3¼ miles above the entrance. Gasoline and provisions can be obtained at Philpots and at Williams Wharf.

North River, emptying into the head of Mobjack Bay from northward, is wide, but has shoals making off for a long distance from many of the points. The channel is marked by lights and buoys. **Auburn Wharf,** on the north bank, 4 miles above the entrance, is the principal landing and has a depth of 7 feet (2.1 m.) at the end. There is a depth of 12 feet (3.6 m.) in the channel to abreast Auburn Wharf.

Ware River, emptying into the head of the bay from northwestward, has a depth of 15 feet (4.5 m.) to the mouth of Wilson Creek, 3 miles above the entrance, and 7 feet (2.1 m.) for a farther distance of 2 miles. Shoals, some of them marked by buoys, extend for a long distance off many of the points. The landings are **Bailey Wharf,** on the west side, and **Browns Wharf,** on the east side, distant 4¼

and 4¾ miles, respectively, above the entrance. Gasoline is obtainable at Bailey Wharf.

Severn River, emptying into Mobjack Bay from southwestward, has a depth of 15 feet (4.5 m.) to the junction of Northwest and Southwest Branches, and 8 feet (2.4 m.) for 1¼ miles in **Southwest Branch** and 1¾ miles in **Northwest Branch.** The most prominent shoals are marked by buoys. **Severn Wharf** is on the south side of Southwest Branch 1⅛ miles above the fork. There is a store here, and gasoline is obtainable. A marine railway opposite this wharf can haul a vessel 60 feet long and 5 feet (1.5 m.) draft. There are wharves, used by local boats, on Northwest Branch about 1 and 2 miles above the entrance.

Monday Creek, forming a thoroughfare between Mobjack Bay and York River, has a depth of about 3 feet (0.9 m.) at high water and is extensively used by small local boats. It is difficult without local knowledge.

Pilots.—There are no regular pilots for Mobjack Bay and tributaries, though a pilot can usually be obtained from boats at work near the entrance.

Tides.—The mean range of tides is about 2 feet.

Directions, Mobjack Bay

[Abbreviation for lights: F., fixed; R., red. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
A channel 800 yards wide is kept clear of fish traps in the main entrance to Mobjack Bay			
From Middle Ground Shoal north end gas and whistling buoy.			
1. To 0.4 mile south of East River entrance bell buoy No. 6, passing south of the white and black buoys marking the fish-trap limits.	° 320	*Points* NW. by N	13.3
For directions to East River see courses 1a and 2a below.			
2. To 0.8 mile, 230° true from Pultz Bar Light (F.).	320	do	1.7
For directions to Severn and Ware Rivers see courses 1b to 3b, and 1c to 3c, below.			
3. To 0.25 mile, 341° true from Ware Point Shoal Light (F. R.).	320	do	2.1
North River			
4. To 0.25 mile eastward of Lone Point Light (F.), Ware Point Light astern, passing 100 yards eastward of spar buoy No. 1.	342	N. by W. ⅛ W	2.6
5. To 100 yards south of Cradle Point Light (F. R.).	287	WNW	1.7

Directions, Mobjack—Continued

	Course		Distance in nautical miles
	True	Magnetic	
East River			
From 0.4 mile south of East River entrance bell buoy No. 6.			
1*a*. To 200 yards west of spar buoy No. 2., passing well clear of Pultz Bar Light.	° 355	*Points* N. ⅛ E	2.0
2*a*. To 200 yards east of Pond Creek Shoal Light (F.), Pultz Bar Light astern.	24	NNE. ⅝ E	0.6
From this point course can be laid to Mobjack or Diggs Wharf, or with local knowledge an approximate mid-channel course can be followed to Williams Wharf.			
Severn River.			
From 0.8 mile 230° true from Pultz Bar Light.			
1*b*. To 250 yards northwest of spar buoy No. 1. Pultz Bar Light astern.	230	SW. by W	1.9
2*b*. To 0.25 mile south-southeastward of Turtle Neck Point.	242	WSW	1.0
3*b*. To 100 yards north of spar buoy No. 3, off Southwest Branch.	272	W. ¾ N	0.8
If going into Southwest Branch round buoy No. 3 and pass 350 yards east of the western point at the entrance, and then keep near the middle of the branch for a distance of 1 mile to the landing. If going to Northwest Branch follow the mid-channel, keeping out of the bights, rounding buoy No. 5, 1 mile above No. 3, and heading for Cod Point Wharf.			
Ware River			
From 0.8 mile 230° true from Pultz BarLight.			
1*c*. To 0.3 mile west-southwestward from spar buoy No. 2, Pepper Creek Entrance Light astern.	289	NW. by W. ¾ W	2.8
2*c*. To 200 yards northwestward of spar buoy No. 1.	309	NW	1.1
3*c*. To Roanes Wharf, passing 150 yards off Windmill Point Light (F.), and the same distance south of the fixed red light northeast of the wharf.	252	WSW. ⅞ W	1.1

MOBJACK BAY TO PIANKATANK RIVER

The shoals on the west side of Chesapeake Bay between Mobjack Bay and Rappahannock River are generally more or less obstructed by fish traps during the season. The limits of the fish traps along the west side of the bay in this vicinity are shown on Chart 1223.

The directions for this locality route vessels through the channels clear of fish traps. Other courses may be used where local knowledge of the locations of traps is available.

Horn Harbor, 3 miles northward of New Point Comfort Lighthouse, has a depth of about 3½ feet (1 m.) across the bar at the entrance and 6 to 15 feet (1.8 to 4.5 m.) in a narrow channel inside for about 2 miles above the bar. It is considerably used as a harbor by fishing and oyster boats. The depth of the bar is subject to some change. The best water favors the western shore in entering and is marked by light beacons. There is a small marine railway here.

Winter Harbor and the other sloughs and creeks having their entrance 4½ miles north-northeastward of New Point Comfort Lighthouse are shoal at the entrance and generally consist of mud flats bare at low water inside. They are little used.

PIANKATANK RIVER

[Charts 534 and 1223]

just south of Rappahannock River entrance, has a depth of 12 feet (3.6 m.) to within 2½ miles of the village of Freeport, and 6 feet (1.8 m.) to Freeport. Small boats and lighters can go several miles above Freeport. Steamers from Baltimore drawing 8 feet (2.4 m.) make landings in Milford Haven and at Warehouse Wharf. River landings above this point are served by connecting gasoline launches. Schooners up to 12 feet (3.6 m.) draft carrying wood products also make use of the river.

The river is marked by **Stingray Point Lighthouse** (fixed red), white house on piles, on the north side at the entrance, and by several lights and buoys, but the channel is obstructed by many shoal spits and middle grounds. Strangers should have no trouble in taking a draft of 10 feet (3 m.) to **Doctor Point,** 11 miles above the entrance, with the aid of the chart.

Between Doctor Point and Freeport the channel is shoal and very narrow in places. It is usually marked by bush stakes but is difficult without local knowledge. Schooners and barges usually complete their loading from lighters about 2½ miles below Freeport. Gasoline and some provisions can be obtained at **Green Point** (Dixie post office), southward of Wilton Point, and at Freeport.

Hills Bay, on the south side of Piankatank River just inside the entrance, forms the approach to Milford Haven and Queens Creek.

Milford Haven can be entered from Piankatank River at the northwest end and from Chesapeake Bay at the southeast end. The entrance at the southeast end has a depth of 3 feet (0.9 m.) and is used by small local boats, but is unmarked, exposed to a heavy sea, and difficult without local knowledge. The main entrance, at the northwest end, has been improved by dredging a channel 10 feet (3 m.) deep and 200 feet wide from Hills Bay to **Callis Wharf** (Grimstead post office), on the north side ¾ mile above the entrance, and by the construction of a jetty 1,200 feet long on the north side at the entrance. The controlling depth in December, 1928, to Callis Wharf was 9.5 feet (2.8 m.). There is a depth of 6½ feet (1.9 m.) from Callis Wharf to **Fitchetts Wharf** and post office, on the south

side of **Stutts Creek** 3 miles above. Steamers from Baltimore make regular trips to the landings in Milford Haven as far as Fitchetts Wharf. The entrance to the dredged channel is marked by a buoy, and the most prominent shoals as far as Fitchetts Wharf are marked by single pile beacons with slatted daymarks, maintained by steamboat company.

In **entering Milford Haven** a 185° true (S. by W. mag.) course with Stove Point Light astern will lead through Hills Bay to the entrance. Pass 75 yards eastward of the red buoy, follow the jetty at a distance of 60 yards to the inner end, and then head for **Cricket Hill Wharf.** From this wharf steer 45° true (NE. ½ E. mag.) with Callis Wharf a little on the port bow for 350 yards, to avoid a shoal on the northwest side, marked by a beacon, and then bring Callis Wharf well on the starboard bow until close to it to avoid a shoal making off the southern shore, nearly bare at extreme low water and marked by a beacon. From Callis Wharf to Fitchetts Wharf follow a general mid-channel course and give the points a good berth, being guided by the chart. There are stores at Callis Wharf, and gasoline is obtainable.

Queens Creek, at the southwest end of Hills Bay, is obstructed by a bar with a depth of 1½ feet (0.4 m.) at the mouth. It is frequented only by small local boats and is unmarked.

Fishing Bay, on the north side, has depths of 19 to 20 feet (5.8 to 6.1 m.), and at its head is a marine railway capable of hauling vessels of 6-foot (1.8 m.) draft, 152 feet length, and 350 tons weight.

Ice.—Piankatank River is closed by ice for short periods only, during severe winters.

Tides.—The mean range of tides is 1.2 feet at the entrance.

Directions, Piankatank River.—To avoid possible fish traps vessels should approach Piankatank River, heading toward fish-trap buoys Nos. 4W and 6W on any course between 257° and 310° true.

From midway between these buoys head for Stove Point on course 246° true (WSW. ⅜ W. mag.), passing between the fish-trap buoys, to 0.3 mile westward of buoy No. 3, then steer 189° true (S. by W. ⅜ W. mag.), passing 200 yards westward of Cherry Point light (fixed white), and around Stove Point light (fixed red) at the same distance. When west of it follow a northwesterly course to a position 0.3 mile north of buoy No. 5, then steer 289° true (NW. by W. ¾ W. mag.) with Roane Point light (fixed white) slightly on the starboard bow until off Iron Point, crossing a shoal with least depth of 11 feet (3.3 m.), then haul around to course 307° true (NW. ⅛ W. mag.) and pass midway between the light and the northshore. Continue on up the river using the chart as a guide, there being no further artificial aids to navigation.

RAPPAHANNOCK RIVER

[Charts 534, 535, and 536]

on the western side of Chesapeake Bay, 40 miles above the entrance and 111 miles below Baltimore, is the approach to the city of Fredericksburg, at the head of navigation 95 miles above the entrance, and to numerous villages and landings. Steamers from Baltimore and Norfolk of 7 to 10 feet (2.1 to 3 m.) draft make regular trips

to the principal wharves on the river and its tributaries as far as Sharps Wharf; above this point only the Norfolk steamer navigates, going as far as Fredericksburg.

The lower end of the river is frequented by fish steamers of 9 to 11 feet (2.7 to 3.3 m.) draft, and by many smaller craft engaged in the oystering and fishing industry. Fredericksburg has some trade in wood products, carried mostly in barges of 8 to 9 feet (2.4 to 2.7 m.) draft. The tributaries have some trade in farm and wood products, carried in barges, lighters, and schooners.

Channel.—Rappahannock River has a natural channel 30 feet (9.1 m.) deep for 26 miles, and 14 feet (4.2 m.) deep to the town of Tappahannock, 39 miles above the entrance. Above Tappahannock the river is being improved, and in January, 1929, the controlling depth to Fredericksburg was 9.6 feet (2.9 m.)

Westland Wharf and post office is on the north side, ¾ mile westward of Windmill Point. **North End Wharf** (Grinels post office) is on the south side, 3 miles westward of Stingray Point. Each is distinguished by several white buildings on the end of the wharf.

Mill Creek and **Lockley Creek,** on the south side of Rappahannock River 6 miles westward of the entrance, have depths of 5 feet (1.5 m.) or more until well inside the entrances, and are frequented by many small local craft. There are railways in both creeks capable of hauling out boats of 30 feet length and 4 feet (1.2 m.) draft. The approach to Mill Creek is marked by two lights. Mill Creek Wharf, eastward of the entrance to Mill Creek, can be reached with a draft of 9 feet (2.7 m.) at low water. To enter, give the edge of the shoal northeastward of Parrot Island a good berth, steer 231° true (SW. by W. mag.) for the outer light, and pass 50 yards eastward of it on a 197° true (SSW. mag.) course. To go farther in, the best water will be carried by passing about 200 feet off the wharf, the same distance southward and westward of the inner light, and then with that light astern steer for **Clarks** (formerly Woodland) **Wharf** until less than 300 yards from it. Lockley Creek is marked by two buoys on its north side. A light off Grey Point serves as an aid in approaching the creek.

A channel dredged 4 feet (1.2 m.) deep in 1925 leads from the mouth of Mill Creek to that of Lockley Creek.

Lockley Creek is easily approached by passing midway between the fixed light off Grey Point and Parrot Island, then hauling to southward and with the light astern steering to pass 50 yards eastward of buoy No. 2. Head for the mouth of the creek, keeping south of the spar buoy marking a shoal off the northern point.

Whitestone Wharf (Taft post office), marked by a prominent red building, is on the north side of Rappahannock River 6 miles above Windmill Point. A fish factory and a wharf are located on Cherry Point.

Carter Creek, on the north side of Rappahannock River 9½ miles above Stingray Point, is the approach to the villages of **Weems** and **Irvington.** It has several oyster houses and a fish factory, is the center of a large oystering and fishing industry, and is extensively used as an anchorage by local vessels. The channel has been improved by dredging, and in December, 1928, had a controlling depth

of 16 feet (4.8 m.) with a width of 200 feet in the entrance channel, and 14 feet (4.2 m.), with width of 100 feet in the inner channel at Galley Hook Point. There is an ice plant on the east side of Carter Creek where both ice and water can be obtained. Above this point there are two marine railways, the larger one being able to haul vessels of 12 feet (3.6 m.) draft, 180 feet length, and 1,000 tons. There are also machine shops well equipped to handle repairs to machinery of any of the vessels that can enter the creek. Gasoline, oil, and provisions can be obtained at either Irvington or Weems. The mean range of tides is 1.4 feet (0.4 m.).

To enter Carter Creek, pass between the flashing white light and buoy No. 2, on a 10° true (N. by E. ⅜ E. mag.) course, pass close westward of buoy No. 4 and the fixed red light and steer for the wharf at Weems. From Weems Wharf steer a little to the southward of Galley Hook Point light (fixed white), then toward the point south of Irvington, and when the main wharf at Irvington bears about 51° true steer for it.

Corrotoman River, on the north side of Rappahannock River 12 miles above the entrance, has a depth of 18 feet (5.5 m.) to the junction of Eastern and Western Branches, 4 miles above the entrance. **Eastern Branch** has a depth of 9 feet (2.7 m.) for 2½ miles and 6 feet (1.8 m.) for a farther distance of ¾ mile. **Western Branch** has a depth of 12 feet (3.6 m.) for 2½ miles and 6 feet (1.8 m.) for a farther distance of 1 mile. The channel is obstructed by shoal spits and middle grounds, but the principal shoals as far as the fork, and for ½ mile above in Western Branch, are marked by buoys and lights. **Millenbeck Wharf** and post office, on the western side 1½ miles above the entrance, and **Ottomans Wharf** and **Merry Point Wharf** and post office, on Western Branch, ¾ and 1 mile, respectively, above the fork, are the principal landings. There are stores at Millenbeck and Merry Point. There is also a wharf on the eastern side at the entrance. The mean range of the tides is 1.4 feet.

Directions, Corrotoman River.—Head for Millenbeck Bar buoy No. 1 on any course between 357° and 33° true. Round it to the eastward at 100 yards distance and, when north of it, steer 287° true (WNW. mag.) until Millenbeck Wharf bears 337° true. Then steer for the wharf and, when west of Corrotoman Point Light (fixed red), steer 40° true (NE. ⅛ E. mag.) until buoys Nos. 4 and 6 are in range, haul to a true north course and pass 75 to 100 yards west of them and between Bar Point Light (fixed white) and the point opposite. When West Point Light (fixed red) bears 318° true (NW. ¾ N. mag.), steer for it, rounding it to the westward at a distance of 100 yards, pass close eastward of buoy No. 5, and head for Merry Point Wharf. Beyond this point or in Eastern Branch the chart is the guide.

Burhans Wharf (Cooper post office) is on the south side of Rappahannock River southwestward of the entrance to Corrotoman River.

Urbanna Creek, on the southwest side of Rappahannock River, 15 miles above the entrance, has been improved by dredging a channel 10 feet (3 m.) deep and 150 feet wide across the bar at the entrance, and to the steamboat wharf at Urbanna ½ mile above,

with a turning basin of the same depth off the wharf. The creek has a depth of 6 feet (1.8 m.) for a mile above the steamboat wharf and is extensively used as a harbor for small vessels. There is excellent anchorage for a limited number of vessels of 9 feet (2.7 m.) or less draft, and depths of 4 to 9 feet (1.2 to 2.7 m.) at the wharves. It is frequented by passenger steamers, schooners, and barges of 10 feet (3 m.) or less draft. A ferryboat runs regularly to Irvington.

There is a railway at Urbanna for hauling out boats of 50 feet length and 5 feet (1.5 m.) draft, and a machine shop for ordinary repairs to motors.

The entrance to Urbanna Creek is marked by a buoy and two lights. A large brick hotel on the hill on the north side and some cottages near the entrance are prominent. The mean range of tide is 1.6 feet.

To enter, approach the outer light (fixed red) on a westerly course, pass 100 feet southward of it and the red buoy near the inner end of the jetty, pass about midway between the wharf just westward of the red buoy and the inner light, and then keep in mid-channel to the steamboat wharf at the north end of the bridge. The bridge crossing Urbanna Creek has a sliding draw with an opening 27.8 feet wide.

There is a long wharf at **West Urbanna** (Remlik), ¾ mile northwestward of the entrance to Urbanna Creek, at which the steamers make regular landings. A water tank on shore and the white buildings on the end of the wharf are prominent.

On **Balls Point** there is a prominent white flagpole and a water tank showing above the trees.

Robinsons Creek, just northward of West Urbanna, has a depth of 5 feet (1.5 m.) in the entrance and 3 feet (0.9 m.) to the head.

La Grange Creek, 1¾ miles northward of Urbanna Creek, has a depth of 7 feet (2.1 m.) in the entrance and 3 feet (0.9 m.) for 1½ miles above.

Weeks Creek, on the southwest side of the river 4 miles above Urbanna Creek, has a depth of about 2 feet (0.6 m.) and is seldom used.

Monaskon is a post office and wharf on the northeast side of the river, 5½ miles above Urbanna Creek. Gasoline and oil may be purchased.

Waterview is a wharf and post office on the southwest side of the river 6 miles above Urbanna Creek. Just west of Waterview is **Parrotts Creek,** which has a depth of 4 feet (1.2 m.) in the entrance and 2 feet (0.6 m.) to near the head. **Mud Creek,** just northward of Parrotts Creek, is generally bare at low water inside.

Deep Creek, on the northeast side of Rappahannock River 8 miles above Urbanna Creek, has a depth of 2 feet (0.6 m.) across the flats at the entrance and 4 to 6 feet (1.2 to 1.8 m.) inside to several branches. The deepest draft using it is about 4 feet (6.2 m.).

Whealton Wharf (Morattico post office), on the northeast side of the river 9½ miles above Urbanna Creek, is an important shipping point. The long wharf and several buildings on the end are prominent. **Mulberry Creek,** just eastward of the wharf, has a depth of 4 feet (1.2 m.) at the entrance and 2 feet (1.6 m.) to the head. In

December, 1928, there was 6½ feet (1.9 m.) in a dredged channel across the creek to the wharves at Morattico. Just westward of Whealton Wharf is **Lancaster Creek,** which has a depth of 5 feet (1.5 m.) for 1 mile and 2 feet (0.6 m.) to **Woodhouse Landing,** 4½ miles above the entrance.

Morattico Creek, emptying into Lancaster Creek from northward, has a depth of 3 feet (0.9 m.) at the entrance and 2 feet (0.6 m.) to near the head. **Farnham Creek,** 3½ miles northwestward of Whealton, has a depth of 2½ feet (0.7 m.) at the entrance and for a distance of 3 miles above. All of these creeks are frequented by many motor boats and lighters carrying farm and wood products and general merchandise.

Bayport is a wharf and post office on the southwest side of the river opposite Whealton. On the northeast side 4 miles above Whealton is **Sharps Wharf,** a steamer wharf and freight transfer point, and alongside of it a gasoline and oil station with prominent white tanks on the end of the wharf. On the southwest side just westward of Bowlers Rock Lighthouse (flashing white) is **Bowlers Wharf.** A draft of 8 feet (2.4 m.) can be taken to the latter from north-northwestward and 9 feet (2.7 m.) east-southeastward. A foul area containing numerous uncharted rocks is reported to exist on the west side of the channel from ¼ mile southeastward of Bowlers Rock light to 1¾ miles northwestward of the light. This area should be avoided in approaching Bowlers Wharf.

Totuskey River, on the northeast side of Rappahannock River, 3 miles above Bowlers Rock Lighthouse, has a depth of 4½ feet (1.3 m.) across the bar at the entrance and 3½ feet (1 m.) inside to a fixed bridge, 4½ miles above the entrance. The deepest draft using it is 6 feet (1.8 m.). The channel is narrow in places and difficult without local knowledge.

Wellfords Wharf is on the northeast side of Rappahannock River 4 miles above Bowlers Rock Lighthouse, and **Wares Wharf** is directly opposite on the southwest side. The former has 9 feet (2.7 m.) of water alongside and the latter 10 feet (3 m.).

Piscataway Creek, on the southwest side 2½ miles below Tappahannock, has a depth of 3½ feet (1 m.) across the flats at the entrance and 6 feet (1.8 m.) inside for a distance of 5 miles; the deepest draft using it is 6 feet (1.8 m.). It is crossed by a drawbridge 4 miles above the entrance, having a single opening 28.6 feet wide. Directly opposite Piscataway Creek is **Little Carters Creek,** having a depth of 3½ feet (1 m.) at the entrance and 2 feet (0.6 m.) for a distance of 3 miles.

Hoskins Creek, just below Tappahannock, has a depth of 2 feet (0.6 m.) across the bar at the entrance and deeper water inside for a considerable distance. It is crossed by a drawbridge ⅝ mile above the entrance.

Tappahannock is a village on the western side of Rappahannock River 39 miles above the entrance. There is a steamer wharf with conspicuous red buildings on the end and a depth of 9 feet (2.7 m.) alongside. Just south of this dock is an oil dock with about 5 feet (1.5 m.) at the end. Gasoline, Diesel oil, and motor oils are for sale here in large quantities. Between these docks the water is shallow. Groceries can be obtained in the village.

A highway bridge crosses the river at Tappahannock. It has a draw span 100 feet wide between fenders, with a high-water clearance of 10 feet.

There are numerous wharves and landings between Tappahannock and Fredericksburg, some of them being post offices, but no villages except Port Royal. The most important landings are **Naylors** and **Leedstown,** 2¾ and 15 miles, respectively, above Tappahannock.

The channel for 2 miles above the Tappahannock bridge is narrow and shallow. It had a controlling depth of about 12 feet (3.6 m.) in December, 1928, in the channel a short distance above buoy No. 4A. This part of the river is buoyed but the depths outside of the channel are shallow.

The white buildings at Naylors are prominent and serve as a leading mark when coming down river.

The channel above here is generally marked by bush stakes.

Cat Point Creek, on the northeast side 2½ miles above Tappahannock, has a depth of about 5 feet (1.5 m.) across the bar at the entrance and deeper water inside for 7 miles. The deepest draft using it is 6 feet (1.8 m.). A drawbridge crosses the creek just inside the entrance.

Mount Landing Creek, on the southwest side 2 miles above Tappahannock, has a depth of 1½ feet (0.4 m.) across the flats at the entrance and deeper water inside for 3½ miles.

Occupacia Creek, on the western side 7 miles above Tappahannock, has a depth of 4 feet (1.2 m.) across the bar at the entrance and for 5¾ miles above in the main branch. The eastern branch has a depth of 2 feet (0.6 m.) to a fixed bridge 1¼ miles above its entrance. There are no wharves on either branch. The creeks emptying into Rappahannock River above Occupacia Creek are all shoal and of little interest to navigation.

Carters Wharf, on the east bank about 10 miles above Tappahannock Bridge has some conspicuous cannery buildings.

Laytons Wharf, on the west bank 4 miles above Carters, has two docks; one, from which lumber and ties are shipped, is in fair condition.

Port Royal is a village on the southwest side of Rappahannock River 70 miles above the entrance. **Port Conway** is a village opposite Port Royal. The controlling depth in January, 1929, to Port Royal was 9.6 feet (2.9 m.).

Newton Rock, on the southwest side 2 miles below the wharves of Fredericksburg, is bare at a little below high water. It lies 50 feet from the high-water shore line and the best water leads 100 feet outside of it.

Fredericksburg, a city at the head of navigation on Rappahannock River, has some trade by water, carried mostly in the regular steamers and in barges of 8 to 9 feet (2.4 to 2.7 m.) draft. Steamer navigation terminates at the wharves at the southern end of the city, though small boats can go about 1 mile farther. The river is crossed by two fixed bridges just above the wharves. Anchorage room is limited and vessels generally make fast to the wharves.

Anchorages.—Good anchorages for deep-draft vessels will be found in the mouth of the river southward or westward of Mosquito

Point. Vessels can anchor anywhere in the channel of the river where the bottom is soft and the depth suitable. Carter and Urbanna Creeks are extensively used as harbors for small craft.

Pilots.—Pilotage is not compulsory for Rappahannock River. Strangers bound up the river can obtain a pilot at Carter Creek, Urbanna, or Tappahannock, and unless of light draft should not go above the latter place without one. Pilots for the upper part of the river can also be found at Port Royal.

Supplies.—Gasoline and provisions can be obtained at Irvington, Weems, Urbanna, Tappahannock, Port Royal, Port Conway, and Fredericksburg, and there are stores at many of the other landings where some supplies are obtainable. Artesian water can be had at or near the wharves in Carter Creek, at Urbanna, Tappahannock, Fredericksburg, and several other landings. Coal can be obtained at Fredericksburg and in limited quantities from the fish factories in Carter Creek.

Repairs to hulls of vessels up to 1,000 tons, 180 feet length, and 12 feet (3.6 m.) draft, can be made in Carter Creek, and to boats of 50 feet length and 5 feet (1.5 m.) draft in Urbanna Creek. There are machine shops at both places and at Fredericksburg, where ordinary repairs to machinery can be made. Railways for hauling out small motor boats can be found in Mill and Lockley Creeks, Eastern Branch of Corrotoman River, and at Fredericksburg.

Ice, during severe winters, closes the river nearly to its mouth, but during ordinary winters the channels are usually kept open by the regular steamers. Ice, sufficient to interfere with navigation of small craft, will usually be met with in January and February and is most often found above Port Royal.

Freshets occur during the spring and fall, but are of short duration, and are not ordinarily dangerous to shipping. The highest water level on record was 32.8 feet (10 m.) above mean low water at Fredericksburg, but the usual height due to freshets is not over 9 to 12 feet (2.7 to 3.6 m.) and only occasionally rises above the wharves. The effect on the water level due to freshets decreases rapidly below Fredericksburg, and is ordinarily negligible below Farleyvale Reach, 11 miles below. The water is usually fresh above Port Royal, but is not suitable for use in boilers.

Tides.—The mean range of the tides at the mouth of the river is 1.2 feet; at Tappahannock, 1.6 feet; and at Fredericksburg, 2.8 feet. It is high water at the mouth of the river 1 hour 45 minutes after high water at Old Point Comfort, and at Tappahannock 4 hours 30 minutes later than at the mouth of the river.

Currents.—The currents follow the general direction of the channel. In the upper reaches of the river the velocities of the currents and the times of slack water vary to a considerable extent, due principally to freshets, but also to some extent to winds; they vary in a similar manner in the lower part of the river, but to a much less extent.

Off Mosquito Point.—The slack waters and strengths of flood and ebb current occur about ¾ hour after the time of the corresponding slack waters and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2 hours before the time of high water at Old Point Comfort and the slack water before ebb occurs about

2¾ hours before low water at Old Point Comfort. The average velocity at strength of flood or ebb is about ¾ knot.

At Tappahannock.—The slack waters and strengths of flood and ebb current occurs about 3¾ hours after the time of the corresponding slack waters and strengths of current at Chesapeake Bay entrance. The slack water before flood occurs about 1 hour after the time of high water at Old Point Comfort and the slack water before ebb occurs about ½ hour after the time of low water at Old Point Comfort. At Tappahannock Bridge the average velocity at strength of flood or ebb is about 1¼ knots.

The approach to Rappahannock River leads between Rappahannock Spit on the north and Stingray Point Shoal on the south. The shores on both sides at the entrance are wooded, and the most prominent landmarks are Windmill Point Lighthouse (fixed white) and Stingray Point Lighthouse (fixed red), both white houses on piles.

Rappahannock Spit, extending 4.4 miles east-southeastward from Windmill Point, is marked by Windmill Point Lighthouse near the center, and a black gas buoy at the outer end. A red and black bell buoy 0.4 mile west-northwestward of the gas buoy marks the wreck of the ram *Katahdin*. Vessels of 10 feet (3 m.) draft can cross the spit anywhere between the lighthouse and the gas buoy provided it is clear of fish traps. A clear passage is always maintained through the traps in a northeasterly direction passing ½ mile east of the lighthouse. It is marked on the eastern side by white and black striped buoys. Charts 1223 and 535 show fish trap limits along the entrance and in the river.

The channel from the mouth to Tappahannock is comparatively straight, gradually decreasing in width, and leads between shoals which make out from both banks. The principal dangers are marked. Strangers should have no trouble in taking a draft of 10 feet (3 m.) to Tappahannock by day, with the aid of the chart. Above Tappahannock the river is narrow and crooked and requires local knowledge. Rocks occur in places on both sides of the channel for a distance of 4 miles below Fredericksburg, and the shores should be given a good berth. Strangers can safely carry a draft of 6 feet (1.8 m.) to Fredericksburg with the aid of the chart, but with a deeper draft are advised to take a pilot at Tappahannock.

Directions, Rappahannock River entrance to Tappahannock

[Abbreviations for lights: F., fixed; Fl. flashing, R. red. Color white unless otherwise noted]

	Course		Distance in nautical miles
	True	Magnetic	
Enter from Chesapeake Bay between fish-trap buoys Nos. 3W. and 9W. and proceed to a position ½ mile east-northeast of fish-trap buoy No. 6W. off the entrance to Piankatank River. Thence as follows:	°	*Points*	
1. To 0.4 mile south of buoy No. 2 off Mosquito Point, Grey Point ahead, passing 0.3 mile north of Sturgeon Creek Shoal Light (Fl).	284	WNW. ¼ W----	6.8

Directions, Rappahannock River entrance to Tappahannock—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
2. To 0.9 mile south of the light at the mouth of Carter Creek.	299	NW. ⅞ W	4.8
3. To 0.25 mile south-southwestward of buoy No. 4 off Towles Point.	266	W. ⅛ N	3.1
4. To 0.9 mile from Urbanna Creek outer light (F. R.), outer and inner lights on range.	302	NW. ⅝ W	2.3
5. To 0.5 mile east of buoy No. 1A, off Smoky Point.	346	N. ¾ W	4.3
6. To 300 yards northeastward of buoy No. 3.	317	NW. ¾ N	3.2
7. To 200 yards southwestward of buoy No. 6, Jones Point ahead.	293	NW. by W. ⅜ W	2.3
The channel is narrow above Jones Point, and strangers must depend upon the buoys and lights. The current has considerable strength at times and care must be taken not to be set off the course by it.			
8. To 250 yards northeast of Jones Point light (F.).	319	NW. ⅞ N	1.1
9. To 150 yards northeast of buoy No. 7	309	NW	1.3
10. To 250 yards south off Bowlers Rock buoy No. 10, Bowlers Rock Light (Fl.) ahead, passing close southward of buoy No. 8 off Sharps Wharf.	308	NW. ⅛ W	1.7
11. To 300 yards east of buoy No. 7B off Eubank.	326	NNW. ½ W	2.6
12. To position where buoy No. 7B is on range with Bowlers Rock Light and the mouth of Totuskey River bears 60° true.	319	NW. ⅞ N	0.7
13. To position 0.2 mile southeastward of buoy No. 7C, Lowry Point Light (F.) on range with the point 1 mile westward.	338	N . by W. ⅜ W	1.7
14. To 0.6 mile eastward of Jones Point	311	NW. ⅛ N	2.2
15. To abreast the wharves at Tappahannock, heading between the draw span of the river bridge and the ends of the wharves.	299	NW. ¾ W	2.1
Anchorage can be had in 13 to 17 feet (3.9 to 5.2 m.) anywhere in the channel between the wharf and the red buoy 1 mile east-southeastward.			

RAPPAHANNOCK RIVER TO GREAT WICOMICO RIVER

[Charts 534 and 1223]

The western shore of Chesapeake Bay between Rappahannock River and Great Wicomico River is generally low and presents no prominent features. It is indented by numerous creeks and by Great

Wicomico River. The creeks have numerous small villages and landings, but no large towns. Fish factories are located on most of them, and they are frequented by fish steamers of 8 to 12 feet (2.4 to 3.6 m.) draft and by many smaller craft engaged in the oystering and fishing industry. Steamers from Baltimore make regular trips to the principal landings between Great Wicomico River and Dymer Creek.

The outer limit of fish traps between Smith Point Lighthouse and Rappahannock Spit bell buoy is shown on the charts. The outer limit is marked by a line of black and white horizontally striped buoys. Inside this limit fish traps are numerous in season, but are prohibited along the regular navigable channels and at a greater distance from shore in the tributaries than one-third their width between shores. On account of the fish traps, strangers should not attempt to enter at night.

The mean range of the tide in all the tributaries is about 1.1 feet.

Fleets Bay, just northward of the entrance to Rappahannock River, forms the approach to Little Bay and Tabbs, Dymer, and Indian Creeks.

Little Bay and **Antipoison Creek,** emptying into Fleets Bay from southward, have a depth of 8 feet (2.4 m.) in a narrow channel for 2½ miles above the entrance. A prominent shoal in Little Bay is marked by a buoy. The creeks are frequented only by small local boats. There is an ice plant on the north shore of Antipoison Creek.

Tabbs Creek has a depth of 12 feet (3.6 m.) in the entrance and 7 feet (2.1 m.) to near the head. It is unmarked and frequented only by small craft.

Dymer Creek has been improved by dredging a channel to a depth of 17 feet (5.1 m.) and width of 200 feet in the approach through Fleets Bay, and has a natural channel 15 feet (4.5 m.) deep for 1 mile above the mouth and 8 feet (2.4 m.) to near the head. The dredged channel is marked by a red buoy and a light on the north side, and the entrance to the creek by a light on each side. Fish steamers drawing 12 feet (3.6 m.) are the deepest draft entering.

Ocran, a village on the south side of Dymer Creek ⅝ mile above the entrance, is the principal landing, and a fish factory here is the most prominent mark in the vicinity. Gasoline, provisions, and water are obtainable, and coal in limited quantities from the fish factory. There is a railway in the creek capable of hauling out boats of 40 feet length and 4 feet (1.2 m.) draft.

Directions, Dymer Creek.—From 3 miles off the entrance steer 236° true (SW. by W. ½ W. mag.) to pass 100 yards north of buoy No. 3, change course to 300° true (NW. ¾ W. mag.) when the two lights at Dymer Creek entrance are in range, and pass about 60 yards south of the fixed light in Fleets Bay. When 400 yards beyond this light steer 317° true (NW. ¾ N. mag.) to pass between the two lights at the entrance of the creek, and then follow a mid-channel course in the creek.

Indian Creek has a depth of 10 feet (3 m.) to Kilmarnock Landing and 6 feet (1.8 m.) to near the head. The principal landings are **Byrdton,** on the northeast side 1 mile above the entrance, and **Kilmarnock Landing,** on the southwest side 2½ miles above the entrance; the latter is at the foot of a road leading to the village of

Kilmarnock. There are fish factories at Kilmarnock Landing, where gasoline, provisions, and water are obtainable. There are two lights on the north side at the entrance between the shoals, and a small private beacon, lighted during the fishing season, to mark the end of the shoal on the northeast side west of Henrys Creek.

Directions.—Keep southward of the shoals with depths less than 18 feet (5.5 m.) lying eastward of Cotton Patch Bar Light (fixed white), entrance to Indian Creek, and when the light is on range with Old Toms Light (fixed red), steer 305° true (NW. ⅜ W. mag.) to pass 50 yards south of them; when beyond Old Toms Light bring it astern on course 300° true (NW. ¾ W. mag.) and run to mid-channel off Longs Creek; beyond this point a mid-channel course may be followed.

Dividing Creek has its entrance between shoals 7¼ miles 343° true (N. by W. mag.) from Windmill Point Lighthouse. It has a depth of 12 feet (3.6 m.) to **Hardings** and **Harveys Wharves,** 1¾ miles above **Hughletts Point** at the entrance, and 6 feet (1.8 m.) for a farther distance of ¾ mile. The channel is marked by lights and buoys from the entrance between the shoals up to Prentice Creek and by bush stakes on the ends of the prominent shoals above that point. Prominent white fish factories are located on the point on the south side of Prentice Creek, ¼ mile above its entrance, and on the north side of the north point of Prentice Creek, and are visible from outside. There is a beacon on the south side at the entrance of **Prentice Creek.** Gasoline, provisions, water, and coal in limited quantities are obtainable.

Directions.—A channel clear of fish traps can be navigated with Windmill Point Light astern on course 344° true (N. ⅞ W. mag.) to a position 0.2 mile east-northeastward of Dividing Creek Light (fixed white), then steer 278° true (WNW. ¾ W. mag.), passing 250 yards north of the light to 0.2 mile south of Hughletts Point Flats Light (fixed red); then 299° true (NW. ⅞ W. mag.) to close northward of Jarvis Point Shoal Light (fixed white); and 329° true (NNW. ¼ W. mag.) to mid-channel between Hughletts Point and the point north of Prentice Creek. Beyond this a mid-channel course leads to the wharves above.

GREAT WICOMICO RIVER

[Chart 534]

6 miles southwestward of Smith Point Lighthouse, is a good and convenient harbor and is extensively used by small vessels. It is also frequented by fish steamers, the regular passenger steamers, and schooners and barges carrying wood products. The draft of vessels entering it does not ordinarily exceed 12 feet (3.6 m.). It has a depth of 18 feet (5.5 m.) for 5¾ miles above Great Wicomico River Lighthouse, 10 feet (3 m.) for 2½ miles farther to abreast Sampson Wharf, and is navigable for small craft for a farther distance of 2½ miles.

The channel is marked by lights and buoys to **Rogues Point,** 4¼ miles above Wicomico River Lighthouse. The principal landings

on the main channel of Great Wicomico River are **Mila, Blackwells,** and **Tipers Wharves.** The principal marks for the entrance are Great Wicomico River Lighthouse (white house on piles) and a group of buildings, a church spire, and an iron stack at Fleeton, on **Fleets Point.** The shoals outside the entrance are generally covered by fish stakes, the limits of the fish traps being shown on chart 1223.

Ingrams Bay and **Mill Creek,** west-southwestward of Great Wicomico River Lighthouse, have a depth of 12 feet (3.6 m.) for 3 miles above the lighthouse and 8 feet (2.4 m.) for a farther distance of 1 mile. The channel is narrow and unmarked and strangers should not enter without a pilot.

Cockrells Creek, on the north side, just inside the entrance of the river, has numerous fish factories and is the center of a large trade by water. **Fleeton, Fairport,** and **Reedville** are villages on the creek, and there are several other landings. All kinds of supplies are obtainable, and there is a railway for hauling out boats of 85 feet length, 7 feet (2.1 m.) draft, and 85 tons.

Some ship chandlery can be obtained at Reedville, as well as water, gasoline, Diesel oil, and coal in limited quantities; there are depths of 8 to 15 feet (2.4 to 4.5 m.) at the wharves. Fleet Point Light (fixed red) is the principal guide to the entrance.

The other tributaries of Great Wicomico River are used by small local boats but are unmarked and of little interest to general navigation.

Anchorage.—Vessels entering Great Wicomico River for shelter usually anchor off and in the mouth of Cockrells Creek in 15 to 20 feet (4.5 to 6.1 m.). Motor boats usually anchor in the creek. Cockrells Creek is also considerably used as a secure harbor from ice.

Ice does not close the river to navigation except in severe winters, and then only for short periods.

Tides.—The mean range of tides is 1.1 feet at the entrance of Great Wicomico River.

Directions, Great Wicomico River.—Fish traps will usually be found on the shoals near and off the entrance to Great Wicomico River, and strangers entering at night should follow the deepest water and proceed with caution.

Entrance between the fish traps can be made on a 287° true (WNW. mag.) course, passing 300 yards north-northeastward of Dammeron Marsh Shoal buoy No. 3, 350 yards southward of the lighthouse and 150 yards southward of Fleet Point buoy. If bound to Reedsville, continue beyond the buoy until the end of the wharf above Fleeton bears 33° true (NE. ½ N. mag.) when it may be steered for; beyond this point a mid-channel course between the wharves will lead in the best water.

If bound above Cockrells Creek, steer 326° true (NNW. ½ W. mag.) for Sandy Point light (fixed white), round it at a distance of 200 yards, and then steer 306° true (NW. ¼ W. mag.) for Haynes Point light (fixed red); round this point at a distance of 100 yards, and steer 330° true (NNW. ⅛ W. mag.) to the eastward of Rogue Point light (fixed white). Beyond this point the chart is the guide.

on the western side of Chesapeake Bay, 66 miles above the entrance and 84 miles below Baltimore, forms the boundary between the States of Maryland and Virginia, and is the approach to the cities of Alexandria and Washington and many villages and landings. It is navigable by vessels to Washington 95 miles above the entrance and by small unmasted vessels for about 3 miles above to Little Falls. The vessels using the Potomac River are occasional coasting and foreign vessels bound to Alexandria and Washington, the regular steamers from Washington, Baltimore, and Norfolk to the landings, and a large number of small craft engaged in oystering and fishing.

Smith Point, on the south side of the entrance to Potomac River, is low and inconspicuous. Off it the water is shallow, there being depths of 11 feet (3.3 m.) 2 miles off shore. There is also **Smith Point Shoal,** with a least depth of 18 feet (5.5 m.), marked on its east side by Smith Point Lighthouse (flashing white, every 10 seconds), white tower and dwelling on a brown pier. A red sector, from 3° to 156° true, covers the shoal water off the point. The fog signal is a diaphone, blast 3 seconds, silent 12 seconds. A bell will be struck in case the diaphone is disabled. For information regarding the radiobeacon see page 16.

Little Wicomico River, entering the south side of Potomac River ⅞ mile northwestward of Smith Point, is nearly dry at low water at the entrance, and not more than 3 feet (0.9 m.) can be taken across the bar under the most favorable conditions of high water and a smooth sea. The entrance is also subject to change. The depths in the river are said to range from 6 to 15 feet (1.8 to 4.5 m.). There is no traffic to and from the river, shipments being made by way of Great Wicomico River. **Sunnybank** is a post office on the south side of the river, 1 mile above the entrance.

Hack Creek, Cubitt Creek, Hull Creek, Presley Creek, and **Cod Creek,** on the south side of Potomac River between Little Wicomico and Coan Rivers, are not used. The entrances are often dry at low water.

Coan River is on the south side of Potomac River, 14 miles above Smith Point Lighthouse and 6½ miles 251° true (WSW. ⅞ W. mag.) from Point Lookout Lighthouse. Steamers drawing 9 feet (2.7 m.) or a little over make regular trips to the landings. The entrance is marked by aids, some of which are lighted, and is easy of access. Above the entrance, pile beacons with slatted day marks or bush stakes are maintained by the steamboat company in a depth of about 6 feet (1.8 m.) on the principal shoals as far as the landings, but some difficulty may be experienced in taking a greater draft than 8 feet (2.4 m.) to Coan and Bundicks. The mean range of tides is 1.4 feet.

The landings are **Lewisetta, Cowarts, Walnut Point, Lake, Coan,** and **Bundicks,** and these landings are post offices. The bight on the south side of Walnut Point is used as an anchorage by small craft. There are stores at the landings, and artesian water and gasoline can be had at some of them.

There is a marine railway west of Cowarts Wharf, capable of hauling boats up to 50 feet length, and a machine shop on the south side of **Honest Point** with equipment for making minor repairs to launches.

Kingscote Creek, the northern branch on the west side of Coan River, is navigable for vessels of 8 feet (2.4 m.) draft for a distance of ¾ mile above the wharf at Lewisetta. Shoals extend halfway across the entrance from the west side northward of Cowarts Wharf and the channel is further narrowed by a shoal extending southwestward from the next point above Lewisetta Wharf. Above these shoals the mid-channel is clear.

The Glebe, the principal tributary on the west side of Coan River, is navigable for vessels of 9 feet (2.7 m.) draft for a distance of 1½ miles above Cowarts Wharf; the mid-channel is clear, except for a shoal which extends well off from the point on the south side ¾ mile above Cowarts Wharf. The south arm at the head of the Glebe has a channel depth of 8 feet (2.4 m.) for a distance of ½ mile above the entrance.

There is 9 feet (2.7 m.) of water at each of the wharves mentioned above. At Bond Wharf there is 7 feet (2.1 m.) and at Coan Hall there is 6 feet (1.8 m.).

Directions, Coan River.—A channel 500 yards wide is kept clear of fish stakes in the approach to Coan River; passing ⅝ mile southeastward of Coan River gas and bell buoy, the center line of this channel trends 231° true (SW. by W. ⅛ W. mag.) to a position 250 yards northwestward of Coan River Light (flashing white), black pile structure. Pass 100 yards westward of Coan River Light, steer 169° true (S. ½ E. mag.) and pass eastward and southward of Travis Point Light (fixed red), rounding it at a distance of 200 to 300 feet. Then steer 271° true (W. ⅝ N. mag.) for Cowarts Wharf. Lewisetta Wharf may be steered for when it bears north.

A stranger wishing to navigate above Walnut Point should employ a local pilot. Bush stakes mark the channel but are hard to follow as they do not indicate on which side they should be passed.

Judith Sound, just northward of the entrance to Coan River, is shallow, and motor boats bound northward from Coan River must go outside of Hog Island.

Yeocomico River is on the southwest side of Potomac River, 17 miles above Smith Point Lighthouse and 9 miles 269° true (W. ½ N. mag.) from Point Lookout Lighthouse. It has a depth of 13 feet (3.9 m.) in the entrance and 9½ feet (2.8 m.) to **Lodge Landing** on **South Yeocomico River** and to **Kinsale** on **West Yeocomico River.** Steamers between Baltimore and Washington drawing 9½ feet (2.8 m.) make regular trips to several landings in the river. Lynch Point Light (fixed red), on the north side, is the principal guide to the entrance. A light (fixed white) and a red buoy mark the entrance to West and South Yeocomico Rivers. The mean range of tides is 1.4 feet.

The landings in Yeocomico River are **Kinsale, Munday Point, Harryhogan Point,** and **Lodge,** and there is a post office at each. Kinsale is the principal village, and gasoline, provisions, and water are obtainable there. Some supplies can also be obtained at the other landings. There is a marine railway of 40 tons capacity on

Harryhogan Point, and a machine shop near Lodge Landing for making repairs to launches.

White Point Creek, the northwestern branch of Yeocomico River, has a depth of 9 feet (2.7 m.) for 1 mile above the entrance. **White Point** is a landing on its southwest side, but the dock is in poor condition. Opposite it on the point north is **Corn Patch Wharf,** used for loading lumber. A marine railway with a capacity of 20 tons is on the south side of Mill Branch.

To enter White Point Creek, bring Barn Point Light (fixed white) astern on a 315° true (NW. ½ N. mag.) and head for White Point. When off White Point, follow a mid-channel course which is clear except for a shoal which extends northeastward to mid river from the point on the north side of Mill Branch.

There are depths of 9 to 10 feet (2.7 to 3 m.) at most of the docks on the river. Lumber, tomatoes in season, and general merchandise are the principal freight.

Directions, Yeocomico River (passing through the channel clear of fish traps).—From a point nearly 2 miles 68° true (ENE. ⅝ E. mag.) from Lynch Point Light (fixed red), steer 243° true (WSW. ¼ W. mag.) to a position 325 yards southward to Lynch Point Light, and then 261° true (W. ¼ S. mag.) to a position 325 yards northward of Barn Point Light (fixed white). Pass 200 yards northward and westward of Barn Point Light, steer southward for the red buoy westward of Barn Point, and pass eastward of it.

West Yeocomico River.—Pass close southward of the red buoy off Barn Point and steer about 272° true (W. ¾ N. mag.) passing midway between the points. A depth of 9 feet (2.7 m.) can be taken to Kinsale, or anchorage may be had in a depth of 10 feet (3 m.) in the mouth of Hampton Hall Branch, just below the wharf. There is a drawbridge just above Kinsale.

South Yeocomico River.—With the red buoy off Barn Point astern steer 183° true (S. ¾ W. mag.) toward Harryhogan Point, and when up to the wharves on the north side of Mill Creek, follow a mid-channel course to Lodge Landing, giving the points a good berth. There is a depth of 3 feet (0.9 m.) for ¾ mile above the landing.

Point Lookout Lighthouse (fixed white), on the north side of Potomac River entrance, is a white dwelling with a lantern. The fog signal is a bell sounding one stroke every 10 seconds. The light is 41 feet (12.5 m.) above water and visible 12 miles. A black water tank and a hotel on Lookout Point are prominent.

Cornfield Harbor, just inside of Point Lookout, is sheltered from northerly and northeasterly winds and vessels bound up and down the bay frequently use it as an anchorage for the night. The shoaling is gradual and the lead a good guide except off **Cornfield Point,** and at the south end of the shoal (marked by a bell buoy with prismatic reflector) extending ¾ mile southward from Point Lookout, where it is abrupt and the bottom hard sand. There are several spots with 18 feet (5.5 m.) over them about a mile west of Point Lookout. A 6-foot (1.8 m.) spot lies between them and the shore. It is marked on its south side by a red spar buoy. There is a wharf just west of the lighthouse extending 330 feet out from the shore and with a depth of 12 feet (3.6 m.) at its end.

Point Lookout and Cornfield Point have post offices.

Point Lookout Creek has a depth of about 2 feet (0.6 m.) in its entrance.

The small creeks between Cornfield Point and Smith Creek are shoal and little used; most of them can not be entered at low water.

Smith Creek, on the north side of Potomac River, 5½ miles northwestward of Point Lookout, has a depth of 10 feet (3 m.) across the bar at the entrance and 17 feet (5.1 m.) inside to the junction of the northern and eastern branches. Both branches have a depth of 12 feet (3.6 m.) for ¾ mile and 8 feet (2.4 m.) to near their heads. Steamers drawing 9½ feet (2.8 m.) make regular trips to **Millers Wharf** (Wynne post office) in the creek, and many small boats make use of the creek as a harbor. There is a store at Millers Wharf, where gasoline and some provisions are obtainable.

Directions, Smith Creek.—The channel is narrow and difficult at the entrance, but well marked. To keep clear of fish traps enter on a 355° true (N. ⅛ E. mag.) course, with the middle of the creek ahead, to 300 yards true west of spar buoy No. 2 GP. Then steer 20° true (NNE. ¼ E. mag.) to 80 yards east of a black buoy; pass the same distance east of Kitts Point Light (flashing white), and round it, passing midway between it and buoy No. 2. Steer 296° true (NW. by W. ⅛ W. mag.) to 100 yards west of Smiths Creek Light (flashing red), then 354° true (N. mag.) to a position 150 yards west of buoy No. 4, round it at the same distance and then head for Millers Wharf on course 75° true (E. ¾ N. mag.).

St. Marys River, on the north side of Potomac River, 6 miles northwestward of Point Lookout, has a depth of 24 feet (7.3 m.) or more to Priests Point, 21 feet (6.4 m.) to St. Marys, and 8 feet (2.4 m.) to Lynch Island, distant 3½, 6, and 8½ miles, respectively, above the entrance. It is 2 miles wide at the entrance and has a channel width of ½ to ¾ mile up to Priests Point, forming a secure harbor. It is the principal anchorage in the mouth of Potomac River for vessels seeking shelter in heavy gales. The mean range of tides is 1.7 feet.

A shoal extends 1¼ miles southeastward from St. George Island and is marked by a horizontally striped buoy, which is the principal guide to the entrance. There is a horizontally striped buoy ½ mile south-southeastward of Cherryfield Point, marking the point of a shoal, with depths of 12 to 17 feet (3.6 to 5.1 m.) ½ mile southeastward of it. **Priests Point** is marked by a large white building. **Windmill Point** is a low yellow bluff, with a cluster of trees at the end. On **St. Marys Point** is a low church spire visible above the trees, and a monument on the end of the point.

The landings are **Bromes Wharf** (St. Marys City post office) and **Portobello,** on St. Marys River, and **Grayson Landing,** on the south side of **St. Inigoes Creek,** 1 mile above its mouth. Steamers drawing 10 feet (3 m.) make regular trips to all of them, and there is daily auto service between St. Marys and Washington. Some provisions can be obtained at St. Marys.

Directions, St. Marys River (clear of fish traps).—Approach the entrance on course 346° true (N. ¾ W. mag.) to ¼ mile east of the entrance spar buoy, then steer 355° true (N. ⅛ E. mag.), with Windmill Point ahead, to 400 yards west of Priests Point Light

(fixed white). From this point a mid-channel course leads up the river in good depth of water, except off Horseshoe Point, which should be given a berth of ¼ mile.

St. George Island is a long, low, sparsely wooded island on the west side of the entrance to St. Marys River, and the southwest side of St. George River. It is thickly settled, mostly by oystermen and fishermen, and is also used to a considerable extent as a summer resort. There is a post office and a landing (Adams Wharf) for small boats on the northeast side, where gasoline and provisions can be obtained. Pilots can also be obtained for any of the adjacent tributaries.

St. George River has a narrow, crooked channel with a depth of 10 feet (3 m.) for 4 miles. Shoals make out from many of the points. It is frequented by oystering and fishing boats during the entire year, and by many pleasure craft during the summer; 3 to 5 feet (0.9 to 1.5 m.) is the usual draft of boats frequenting it, though vessels of 8 to 10 feet (2.4 to 3 m.) draft sometimes load with wood products. The red and black horizontally striped buoy southeastward of Cherryfield Point is the only mark, and local knowledge is required to carry the best water above the entrance. A channel 600 yards wide is kept clear of fish traps in the entrance, the north edge of the channel trending 309° true (NW. mag.) to the horizontally striped buoy.

St. George River can be entered with a depth of 3 feet (0.9 m.) at low water through **the Straits,** at the northwest end of St. George Island. Headroom is limited to 8 feet (2.4 m.) by a bridge crossing the Straits. There is a post office (Piney Point) on the southwest side of St. George River just above the Straits.

Piney Point is marked by **Piney Point Lighthouse** (flashing white), a white tower. There is a steamboat wharf with a depth of 10 feet (3 m.) ¼ mile northeastward of the end of the point, and gasoline and provisions may be obtained. There is a summer hotel here. The point should be given a berth of 300 yards to avoid a shoal, bare at low water, extending southward from it, and to avoid fish stakes just eastward of the point.

Ragged Point, on the southwest side of Potomac River, 15 miles above Point Lookout, has shoals extending off it in all directions, the northeast edge of the shoals being marked by **Ragged Point Lighthouse** (flashing white), white house on piles. Deep-draft vessels should give the lighthouse a berth of ¼ mile or more.

Machodoc River, 2½ miles westward of Ragged Point Lighthouse and 5 miles 127° true (SE. ⅛ E. mag.) from Blakistone Island Lighthouse, has a depth of 12 feet (3.6 m.) for 1½ miles, 8 feet (2.4 m.) in a dredged channel through the narrows 2 miles above the entrance, and 6 feet (1.8 m.) above to near the head of navigation. Steamers from Washington drawing 6 feet (1.8 m.) make regular trips to **Edgewater Wharf,** which is the principal landing. Gasoline can be obtained from a store near Edgewater Wharf and water from an artesian well. The entrance is narrow and obstructed by shoals extending from either side and is marked by a light and buoys. Cables cross the river from Barnes Point to a point south of Crab Point, and the Potomac River from Ragged Point Lighthouse to Piney Point Lighthouse. Vessels are cautioned not to anchor in cable areas.

Directions, Machodoc River.—Approach the river on course 173° true (S. mag.) with Barnes Point Shoal Light (fixed white) ahead, then round it to the westward at a distance of 150 yards, pass midway between the spar buoys southeastward of it, and follow a mid-channel course to Plumb Island Point light (fixed red). Pass close eastward of the light and the buoy south of it and head for Edgewater Wharf. Follow close along the shore south of the wharf for 200 yards and then in mid-channel to the head of navigation, except at Kirk Point, which should be passed close-to.

Nomini Bay, on the south side of Potomac River, 22 miles above the entrance and 3½ miles 165° true (S. ¾ E. mag.) from Blakistone Island Lighthouse, has depths of 15 to 19 feet (4.5 to 5.8 m.) and forms the approach to Nomini Creek and Currioman Bay. The shoaling is abrupt on the east side and gradual on the west side.

Nomini Creek has been improved by dredging a channel from the head of Nomini Bay to **Hickory Point,** 1 mile above, and by the construction of a jetty on the east side at the entrance. In November, 1928, there was a depth of 10.2 feet (3.1 m.) and width of 100 feet in the entrance channel.

The creek has a natural depth of not less than 8 feet (2.4 m.) to Beals and McGuires Landings and not less than 7 feet (2.1 m.) to Nomini, 2½ miles above, 5 feet (1.5 m.) to a drawbridge 1 mile above Nomini, and 3 feet (0.9 m.) for a further distance of 1 mile.

The landings are **Beales, McGuires,** and **Mount Holly,** on the southeast side, and **Deep Point** and **Nomini** on the west side. Mount Holly is a post office. Gasoline, provisions, and water are obtainable in several places. There is an automobile ferry from McGuires to Leonardtown, Md. A center pier drawbridge, each opening 60 feet wide, with a headroom of 5 feet (1.5 m.) at high water when closed, crosses the creek at Nomini. The mean range of tides is 1.8 feet.

Directions.—The dredged channel into Nomini Creek is marked by buoys, lights, and bush stakes. To enter give the shores of Nomini Bay a berth of ½ mile and head for the outer end of the jetty. Pass 100 yards westward of it, and steer 152° true (SSE. mag.) in the dredged channel, following the buoys, and passing 100 feet westward of White Point Light (fixed white) and 250 feet westward of Ice House Point Light (fixed white). Bring the latter light astern on a 181° true (S. ⅝ W. mag.) course, follow the dredged channel, and pass eastward of the red buoy at its south end and intermediate private aids. From this point to Nomini the mid-channel is clear. Shoals make off from many of the points, and they should be given a good berth.

Currioman Bay, emptying into Nomini Bay from westward, has a depth of 8 feet (2.4 m.) at its entrance and 7 to 10 feet (2.1 to 3 m.) anywhere in mid-channel to near the head. It is separated from the river by a narrow, marshy spit, wooded in the center, and awash near its western end. **Currioman Wharf** is the principal landing. The end of the shoal extending southeastward from **Elbow Point** is marked by buoys, and usually by a bush stake.

To enter, pass 200 yards westward of the north end of the jetty at the head of Nomini Bay, steer 205° true (SSW. ⅝ W. mag.) for 400 yards and then 270° true (W. ½ N. mag.) for the same distance,

passing southward of the buoys and bush stake marking the end of the shoal. When past the second buoy steer northwestward into the bay, favoring slightly the northeast side at the entrance, and then keep in mid-channel.

Piney Point, Herring, Blake, Poplar Hill, and **Flood Creeks,** between Piney Point and Bretons Bay are shoal and unimportant; 1 or 2 feet (0.3 or 0.6 m.) can be taken into most of them at low water, but they are little used.

Bretons Bay is on the north side of Potomac River, 2 miles eastward of Blakistone Island Lighthouse, and is a favorite anchoring ground for yachts. Steamers drawing 10 feet (3 m.) make regular trips to the landing on the northeast side of Lovers Point (Abell Wharf) and to **Leonardtown** at the head. There is a depth of 13 feet (3.9 m.) or more for 3½ miles above the entrance to Lovers Point Light. The channel for this distance is marked by buoys and is easily followed, but care is required to follow the best water above this point to Leonardtown. The latter is reached through a dredged channel 150 feet wide and 11 feet (3.3 m.) deep, in November, 1928, and there is a turning basin 300 feet wide off the wharf. Gasoline, ice, and provisions can be obtained at Leonardtown and gasoline at Ewells Wharf; the latter is inside the entrance of Cooms Creek, on the north side of Bretons Bay, 2 miles above the entrance. A channel with a depth of about 6 feet (1.8 m.) leads into the creek to the landing at **Ewells.** The entrance is narrow between shoal spits marked by stakes. There are marine railways with capacities of 80 tons each near the entrance to the creek. Leonardtown has daily auto bus communication with Washington. **Compton P. O.** is at the upper end of the west branch of Cooms Creek. The mean range of tides in Bretons Bay is 1.8 feet.

A shoal with little depth extends ¾ mile southwestward from Higgins Point, on the east side at the entrance, and is marked by a lighted beacon (flashing white).

Directions, Bretons Bay.—Keep clear of the shoal off Heron Island, passing eastward of the horizontally striped buoy, then, with this buoy astern, steer 14° true (N. by E. ⅞ E. mag.) until buoy No. 4 is on range with Lovers Point, then change course to 62° true (ENE. ⅛ E. mag.) keeping 100 yards north of the range until east of the buoy, then bring the buoy astern on the same course. When Lovers Point Light (fixed red) bears 27° true, steer 18° true (NNE. ¼ E. mag.) to abeam of the light, round it at a distance of 125 yards to course 125° true (SE. ¼ E. mag.) and when Lovers Point wharf bears 206° true (SSW. ⅞ W. mag.) steer for it; or continue up the bay on a mid-channel course entering the dredged channel on a 34° true (NE. ⅜ N. mag.) course, heading 75 yards to the eastward of Buzzards Point Light (fixed white). Round the light at a distance of 100 yards and steer 305° true (NW. ¼ W. mag.) for the wharves at Leonardtown.

St. Clement Bay is on the north side of Potomac River, north-northeastward of Blakistone Island Lighthouse. There are three entrances. The eastern or main entrance, between Heron Island Shoal and Newtown Neck, is ½ mile wide with a depth of 18 feet (5.5 m.), and is easily followed by day; the middle entrance, between Heron Island Shoal and Blakistone Island, is narrow and crooked, is marked

by beacons and buoys, and is easily followed in the daytime; the western entrance, called Dukeharts Channel, requires some local knowledge.

Steamers drawing 10 feet (3 m.) make regular trips to the landings at **Cobrums Wharf** and **Bayside Landing** (Stones Wharf), near the head of steamboat navigation 5 miles above the entrance of St. Clement Bay; the channel is easily followed. **Palmers,** on the south side of **St. Patricks Creek,** is a post office; the creek is navigable for motor boats. **Canoe Neck Creek** has a depth of 6 feet (1.8 m.) for about 1 mile. **Morris Point Landing** is just inside the creek. Gasoline, provisions, and water can be obtained, and there is communication by steamer with Washington. The mean range of tides in St. Clement Bay is 1.8 feet.

Directions, St. Clement Bay—From southeastward.—Pass ¼ mile northeastward of the horizontally striped buoy off the east end of Heron Island Shoal, and steer 310° true (NW. ⅛ N. mag.) to a position 200 yards west of buoy No. 2 off Newtown Neck.

From southward.—Pass 100 yards northeastward of buoy No. 1, east of Blakistone Island, and 100 yards northeastward of Blakistone Island Shoal Light (flashing white) on a 316° true (NW. ¾ N. mag.) course with buoy No. 3 ahead. When 250 yards from buoy No. 3, steer 0° true (N. ⅝ E. mag.) to midway between that buoy and Heron Island Bar beacon, then 24° true (NNE. ¾ E. mag.) to 200 yards west of buoy No. 2, off Newtown Neck.

From westward—Through Dukeharts Channel.—Pass close to buoy No. 6 on course 39° true (NE. ⅛ E. mag.), close westward of a light (fixed red), and round buoy No. 5 to the northward. Bring Cobb Point Bar Light (fixed white) astern on course 114° true (SE. by E. ¼ E. mag.), pass 60 yards south of buoy No. 4, steer 78° true (E. ½ N. mag.) heading toward Higgins Point Light (flashing white) until clear of the north point of Blakistone Island, then 89° true (E. ½ S. mag.) passing close northward of buoy No. 3 to position midway between that buoy and Heron Island Bar beacon, thence on course 24° true (NNE. ¾ E. mag.) to 200 yards west of buoy No. 2.

Above this point a mid-channel course leads in deep water except at Cedar Point Light (fixed white), which must be passed 100 yards or more to the eastward. Approach Stones Wharf on a 7° true (N. by E. ¼ E. mag.) course to avoid shoals on either side.

Heron Island Shoal is an extensive shoal area entirely submerged at high water, and having an extensive area bare at low water. It is marked at the eastern end by a horizontally striped buoy.

Blakistone Island is sparsely wooded and is marked at the south end by **Blakistone Island Lighthouse** (fixed white), white dwelling. Shoals extend from it in all directions, the southern limit of the shoal area being marked by a red buoy.

Wicomico River, on the north side of Potomac River, 28 miles above Point Lookout, has a depth of 24 feet (7.3 m.) or more for 3½ miles above Cobb Point Bar Lighthouse, at the entrance, and 12 feet (3.6 m.) for a further distance of 1½ miles. Above this point there are many detached shoals which render navigation difficult for boats of a greater draft than 5 feet (1.5 m.), though with local knowledge a draft of 8 feet (2.4 m.) can be taken 8 miles above the entrance,

and 3 feet (0.9 m.) to the head of navigation, 12 miles above the entrance. The river is characterized by spits, with little depth and terminating abruptly, which extend to mid-river in places; those near the entrance are marked by **Cobb Point Bar** Lighthouse (fixed white), white house on piles, and by several buoys. The mean range of tides is 1.9 feet.

Steamers drawing 10 feet (3 m.) make regular trips to **Rock Point** and **Bushwood** (Blakistone post office), the principal landings. Gasoline and provisions are obtainable at these landings.

St. Catherine Sound, on the east side of Wicomico River, at the entrance, has depths of 5 to 9 feet (1.5 to 2.7 m.) through the middle, but there are extensive shoals close to the channel. A depth of 2½ feet (0.7 m.) can be carried through it into Wicomico River. **River Springs** is a post office on the northeast side.

Neals Sound, on the west side of Wicomico River, southward of Rock Point, has a depth of 6 feet (1.8 m.) in the entrance and 7 to 11 feet (2.1 to 3.3 m.) inside, and forms a secure anchorage for motor boats. The entrance is obstructed by rocks close to the channel and a stranger should proceed with caution. The outlet into Potomac River, near the head, has a depth of about 1 foot (0.3 m.) at low water.

Chaptico Bay, on the east side of Wicomico River, 6½ miles above the entrance, has a depth of 2 to 5 feet (0.6 to 1.5 m.). It has no wharves and little business by water.

Directions, Wicomico River.—Enter on course 339° true (N. by W. ¼ W. mag.) passing ¼ mile eastward of the horizontally striped buoy at the entrance, and Cobb Point Bar Light (fixed white) (Rock Point church spire ahead) to 150 yards west of buoy No. 2, off St. Margarets Island. Then head for Rock Point Wharf on course 342° true (N. by W. mag.), keeping clear of the shoal off the east point of Cobb Island, or to Bushwood Wharf on a 29° true course (NE. ¾ N. mag.), or up the river on course 10° true (N. by E. ½ E. mag.) with the island off White Point ahead, to a position 100 yards east of buoy No. 1. Above this point follow a 339° true (N. by W. ¼ W. mag.) course and be guided by the chart.

Pope Creek, on the southwest side of Potomac River, 4 miles below Colonial Beach, is bare at low water at the entrance.

Mattox Creek, 1 mile southward of Colonial Beach, has a depth of 6 feet (1.8 m.) in a narrow, crooked channel to **Wirts** and **Masseys Wharves,** 2 miles above the entrance, and 4 feet (1.2 m.) for a farther distance of 2 miles to a highway drawbridge. The entrance is marked by lights and buoys, but strangers seldom enter except in small boats. **In entering,** pass 100 yards westward of the lights and be guided by the chart and the buoys. The shoal extending eastward from **Paynes Point** is usually marked by a bush stake.

Colonial Beach is a summer resort on the southwest side of Potomac River, 34 miles above the entrance and 61 miles below Washington. It is connected with Washington by steamer. Motor boats carry passengers from the railway station Popes Creek on the opposite side of the river. There is a wharf with 10 feet (3 m.) alongside, but there is no place for boats to get water or gasoline except at Monroe Creek.

Monroe Creek, having its entrance at the south end of Colonial Beach, is extensively used as an anchorage for boats; it has depths of 6 feet (1.8 m.) in the entrance and 3 feet (0.9 m.) almost anywhere in the creek. Gasoline and provisions are obtainable. There is a small marine railway in the creek. Water can be obtained from a well on Winkedoodle Point or from one of the gasoline stations. **To enter,** give the east and south shore of Colonial Beach a berth of over ¼ mile and approach the entrance on a northerly course about 500 feet from the west shore. Pass through the entrance close along the end of Gunn Bar Point, head for a small clump of trees about 100 yards from the end of Dicksons Point, on the west side, until nearing the point, above which 3 feet (0.9 m.) can be carried anywhere.

Potomac Beach is a post office and landing on the south side of Potomac River southeastward of the mouth of Rosier Creek. Oil tankers use one of the wharves and pipe gasoline and oil to some large tanks inshore. Some provisions can be obtained.

Rosier Creek, 3 miles above Colonial Beach, has a depth of 4 feet (1.2 m.) in the entrance and 3 feet (0.9 m.) for 1 mile above. The best water in the approach leads close along the ends of the wharves at Potomac Beach and follows the shore at a distance of 100 yards. The creek has no wharves and is little used.

Upper Machodoc Creek is on the west side of Potomac River, 2 miles southwestward of Lower Cedar Point Lighthouse. It has been improved by dredging a channel 16 feet (4.8 m.) deep from deep water to **Dahlgren,** 6½ feet (2 m.) deep and 100 feet wide to **Little Ferry Landing,** 4 miles above the entrance, and 6 feet (1.8 m.) deep and 50 feet wide to **Milford Landing,** 6¾ miles above the entrance, with a turning basin at each place. The entrance is also extensively used as an anchorage by small boats during the oystering and fishing season. There is a store at **Berrys Wharf,** 1½ miles above the entrance, where gasoline and some provisions are obtainable. The buildings and water tank at Dahlgren are prominent. The mean range of tides is 1.8 feet.

Directions.—Enter on course 282° true (WNW. ¼ W. mag.) just north of gas buoy No. 13 (flashing white) on range ahead (channel buoyed on the north side). Follow the buoys to the wharf at Dahlgren.

If bound up the creek, pass close southward of the range beacons and through the 6½-foot (2 m.) dredged channel on a 289° true (NW. by W. ¾ W. mag.) course, with Beabors Point Light (flashing white) astern, then 280° true (WNW. ½ W. mag.) for Berrys Wharf. Local knowledge is needed to proceed beyond this point.

Caution.—The lower Potomac, from Dahlgren to the mouth, is used extensively by the Navy as a firing range and torpedo speed trial course. Buoys and barges will be found anchored in various localities, of which notice will be given in the Notices to Mariners.

The firing range of the United States Naval Proving Ground, Dahlgren, Va., involves the entire portion of the Potomac River below a line joining Persimmon Point, Va., with the entrance of Popes Creek, Md., and constitutes a danger zone. Firing over this

range will normally take place between the hours of 9 a. m. and 4 p. m. on all days except Sunday.

Any vessel propelled by mechanical power at a speed greater than 5 miles per hour may proceed directly through the danger zone without restriction, except when especially notified to the contrary.

When firing is in progress, all vessels in or near the danger zone will be duly met by representatives of the inspector of ordnance in charge, suitably warned, and given the necessary instructions and orders to insure their safety. During the period from February 15 to May 15 the area between Smith Point and Ragged Point, the authorized fish-stake line, and the Virginia shore will not be fired into.

These regulations shall be enforced by the inspector of ordnance in charge, United States Naval Proving Ground, through such officers, enlisted men, and employees at the United States Naval Proving Ground as may be designated, including always the commanding officer of the range patrol, using all agencies as Government vessels, seaplanes, and other suitable equipment as may be necessary. These agencies will fly or expose a square red flag in clearing a danger zone.

Cuckold Creek, 3 miles southeastward of Lower Cedar Point, is said to have a depth of 2½ feet (0.7 m.) at the entrance and deeper water inside. It is unmarked and little used.

Piccowaxton Creek, 1¾ miles southeastward of Lower Cedar Point, can be entered only by small boats at high water.

Lower Cedar Point has a wharf and post village **(Morgantown)** on the end, is an important shipping point, and is used by the regular steamers of 10 feet (3 m.) draft. Gasoline, water, and provisions can be obtained, and there is autobus communication with Washington and a passenger ferry to Dalhgren and Colonial Beach. A channel 10 feet (3 m.) deep and 150 feet wide, with a turning basin 300 feet wide and 400 feet long, has been dredged to the wharf from the westward and is marked by buoys on both sides and a lighted range. The lights (front light on the wharf and the rear light on a white skeleton tower on shore) lead through the channel on a 61° true (ENE. mag.) course to the wharf. There is a strong cross current on both the ebb and flood tide. A depth of 7 feet (2.1 m.) can be taken to the wharf on a course between northwest and north-northwest, passing eastward of the shoal extending southwestward from the turning basin and marked at its end by a flashing white light.

Popes Creek, 3¼ miles above Lower Cedar Point, is a post village, the terminus of a railroad from Baltimore and Washington, and is connected with Colonial Beach by motor boat. The creek is not navigable, but a depth of about 4 feet (1.2 m.) can be taken to the wharf at the railroad. Gasoline and provisions are obtainable and there are telephone and telegraph connections. A buoy marks a 3-foot (0.9 m.) spot just south of the wharf.

Port Tobacco River, having its entrance in the northern end of the shoal bight northward of Mathias Point, has a depth of 9 feet (2.7 m.) to the entrance, 7 feet (2.1 m.) for 1¾ miles above, and 3 feet (0.9 m.) to near the head.

The docks at Chapel Point and Brents have become dilapidated and are no longer used. **Chapel Point** is a summer resort.

The generally used route in entering, which leads in a depth of 7 feet (2.1 m.), is to pass ¼ mile eastward of Port Tobacco River Flats Light (flashing white) and steer 17° true (NNE. mag.) for 1¾ miles to a position ⅜ mile from the eastern shore at the entrance. Favor somewhat the eastern side at the entrance to avoid the shoal which extends nearly halfway across from Windmill Point, and then follow a general mid-channel course to the head. The mean range of tides is 1.5 feet.

Mathias Point landing and post office is on the northwest side of Mathias Point ½ mile southwestward of Mathias Point Lighthouse (fixed white).

Nanjemoy Creek, 1½ miles westward of Upper Cedar Point Lighthouse (fixed white), has a depth of 7 feet (2.1 m.) in the entrance and is navigable by small vessels for about 5 miles. It has considerable trade in wood products. The best water favors the east side at the entrance, as shown on the chart. **Riverside Landing** (flashing white light on end of wharf) and post office is 3 miles west-southwestward of Upper Cedar Point Lighthouse. Gasoline may be obtained. On the south side, ½ mile southwestward of Metomkin Point, is **Stuarts Wharf.**

Somerset Beach is a landing on the south side, 1 mile southeastward of Maryland Point Lighthouse (flashing white). There is a store and post office about 1 mile distant.

Potomac Creek, 4 miles westward of Maryland Point Lighthouse, has a depth of 7 feet (2.1 m.) at the entrance and 3 feet (0.9 m.) for 2 miles above. It is used only by light-draft boats carrying wood products. The best water favors the south shore at the entrance, as shown on the chart. **Bull Bluff,** high and wooded, is on the south side, at the entrance.

Aquia Creek, on the west side, 6 miles above Maryland Point Lighthouse, has been improved by dredging a channel 6 feet (1.8 m.) deep and 100 feet wide to a railroad bridge 3½ miles above the entrance, 6 feet (1.8 m.) deep and 60 feet wide to **Coal Landing,** 5¾ miles above the entrance, and widened in the upper 500 yards to a width of 100 to 150 feet to form an anchorage basin. In November, 1928, there was a depth of 6.2 feet (1.9 m.) in a channel 60 feet wide upstream and downstream from the railroad bridge.

Small boats can go 1 mile above Coal Landing. The channel from the entrance to the **Narrows,** 1 mile above the railroad bridge, leads between broad flats on either side. Above the Narrows the creek is narrow and crooked, the best water generally favoring the high land. The creek has considerable trade in wood products, carried in small sailing vessels and a few barges. Several beacons in a depth of 5 feet mark the channel for a distance of 1½ miles above the entrance, to Thorney Point. The outer beacon is on the end of the shoal extending ⅞ mile southward from **Brents Point,** on the north side, at the entrance. Above **Thorney Wharf** there are no marks, and strangers may have difficulty in keeping in the dredged channel. A straight course from Thorney Wharf to the draw span of the railroad bridge leads through the dredged channel.

The railroad bridge crossing Aquia Creek has a draw opening 28 feet wide, and a headroom of 19 feet at high water. The draw will be opened at all times between sunrise and sunset and between

9 p. m. and midnight on signal, unless a train is due within 15 minutes. The mean range of tides is 1.6 feet.

Dent Landing (Clifton Beach) is on **Smiths Point,** 5½ miles above Maryland Point Lighthouse. Smiths Point is marked by a flashing white light.

A restricted anchorage ground, the northeast and southeast corners of which are marked by buoys, is located between Brents Point and Widewater.

Liverpool Point, on the east side of the river, 4 miles above Smiths Point, is a steamer landing.

A wharf for an aviation field, just westward, is located ¾ mile south of Chopawamsic Island.

Chopawamsic Creek, on the west side, 1 mile below Quantico, has a depth of 6 feet (1.8 m.) across the bar at the entrance and deeper water for 1½ miles above. The best water in the entrance leads close westward of the island in the mouth. The creek is crossed by a highway bridge having a fixed span, with a high-water clearance in the middle of 21 feet, and a railroad bridge having a draw opening 24.8 feet wide, which will be opened at all times between sunrise and sunset on signal unless a train is approaching or due within 15 minutes.

Chicomuxen Creek, on the east side, opposite Quantico Creek, has a depth of 5 feet (1.5 m.) in the entrance and to **Poseys Wharf,** but shoals up rapidly above. It is little used except by boats carrying wood products.

Quantico Creek has a depth of 7 feet (2.1 m.) in a narrow, crooked channel in the entrance, and 2 feet (0.6 m.) for about 2 miles above. It is crossed by a railroad bridge at the entrance having a draw opening 30 feet wide. The draw will be opened at all times between sunrise and sunset on signal unless a train is approaching or due within 15 minutes. The creek is considerably used as an ice harbor by local boats when the river above is closed.

Quantico, on the south side of the creek at the entrance, is a town and the site of the United States Marine Barracks. A pier and launch harbor, with 6 feet (1.8 m.) at low water, just south of the mouth of the creek fronts the location of the marine barracks. The lights are prominent at night.

Mattawoman Creek, on the east side of Potomac River, 3 miles below Indianhead, has a depth of 7 feet (2.1 m.) across the flats at the entrance, deeper water for 4 miles above, and 6 feet (1.8 m.) for a farther distance of 2 miles. The creek is clear in mid-channel for a distance of ¾ mile, but above this point the channel is very narrow and crooked and leads between flats on both sides. It is sometimes partially marked by bush stakes, but is difficult without local knowledge. The marsh extending southeastward from Deep Point to the edge of the channel is marked by a clump of trees at the end. The mean range of tides is 1.6 feet at the entrance.

Powells Creek, opposite Mattawoman Creek, has a depth of 3 feet (0.9 m.) to a railroad bridge at the entrance and 1 to 2 feet (0.3 to 0.6 m.) for a short distance above. The railroad bridge has an opening 30 feet wide, with a headroom of 10 feet at high water. **Cherry Hill,** a village and railroad station 1 mile southward of the entrance, has landings for small boats.

Occoquan Bay and **Creek,** on the west side of Potomac River, westward of Indianhead and 23 miles below Washington, is the approach to the town of **Occoquan** and the **District of Columbia workhouse,** at the head of navigation, 5 miles above the entrance. It has considerable trade, carried mostly in scows and schooners.

The creek has been improved by dredging and in January, 1929, the controlling depth was 6.5 feet (2 m.), with a width of 150 feet downstream of Sandy Point and a width of 100 feet upstream to Occoquan. There are depths of 10 to 14 feet (3 to 4.2 m.) anywhere in mid-channel off the wharves at Occoquan. The channel is marked by lights and buoys to the bridge. The bay is used as an ice harbor for local boats when the channel of the river above is closed.

Occoquan Creek is crossed by a fixed railroad bridge 3½ miles above the entrance, having a headroom of 66 feet at high water, and by a fixed highway bridge just above the wharves at Occoquan.

The mean range of the tide is 1.8 feet.

Neabsco Creek, a tributary of Occoquan Bay at its south end, has depths of 2 to 4 feet (0.6 to 1.2 m.). It is crossed, ½ mile above its mouth by a fixed-span railroad bridge, having a navigable span 30 feet wide and 34 feet high.

Directions, Occoquan Bay and Creek

[Abbreviation for lights: F, fixed; Fl., flashing. Color is white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
1. From Potomac River to between buoys Nos. 1 and 2, buoy No. 1 on range with Sandy Point Light (Fl.).	346	N. ⅝ W	1.9
2. To west of Sandy Point Light, being guided by the buoys.	345	N. ¾ W	1.0
3. To close eastward of Taylors Point Light (Fl.).	339	N. by W. ¼ W	0.7
4. To close southwestward of Upper Mud Bar south light (Fl.).	315	NW. ⅝ N	0.6
5. To close westward of Upper Mud Bar North Light (Fl.).	340	N. by W. ¼ W	0.4
6. To draw span of bridge, Upper Mud Bar North Light astern.	320	NW. by N	0.4
Above the bridge steer an approximate mid-channel course, being guided by the chart.			

Indianhead is a prominent, high, wooded bluff on the southeast side of the river 21 miles below Washington.

An electrically operated bell on the lower wharf serves as a fog signal. It strikes once every 10 seconds.

Glymont is a steamer landing on the southeast side of the river, 1½ miles above Indianhead. The wharf is marked on its end by a flashing light.

Craney Island, northward of Glymont, is an islet marked by a clump of trees. It is surrounded by an extensive shoal, and there is a narrow unmarked channel with a depth of 7 feet (2.1 m.) northward of it.

Pamunkey Creek, 2 miles above Glymont, is nearly bare at low water above the entrance.

Gunston Cove, on the west side, 16 miles below Washington, has a depth of 3 to 4½ feet (0.9 to 1.3 m.) across the bar, the deeper water favoring the southwest side. Above the bar there is a depth of 6 feet (1.8 m.), except near the shores, to the junction of **Accotink** and **Pohick Bays,** and 2 to 4 feet (0.6 to 1.2 m.) in both bays for about ½ mile. A ruined wharf is on the north side of the cove just inside the entrance.

Dogue Creek, on the west side of Potomac River, opposite Marshall Hall, has depths of 2½ to 5 feet (0.7 to 1.5 m.), but is covered with grass and little used. White Stone Point Light (flashing white) is at the southern entrance to the creek.

Marshall Hall, on the east side, 14 miles below Washington, is an excursion resort. The wharf has a depth of 10 feet (3 m.).

Mount Vernon, the home of Washington, is on the west side, 13 miles below Washington, with which it is connected by steamer and autobus. A channel 10 feet (3 m.) deep has been dredged across the flats to the wharf, but considerable shoaling has occurred. The wharf is not open to the public.

Bryan Point is marked by a white house and windmill and has a wharf with a depth of 13 feet (4 m.).

Little Hunting Creek, opposite Bryan Point, has a depth of about 4½ feet (1.3 m.) in a narrow dredged channel leading to a brickyard 1¼ miles above the entrance. The channel is sometimes marked by bush stakes, but is difficult without local knowledge. A bridge having an opening 27 feet wide and a headroom of 19 feet, crosses the creek just below the brickyard.

Piscataway Creek, on the east side, 11 miles below Washington, has depths of 2 to 4 feet (0.6 to 1.2 m.), but is covered with grass in summer and little used. Considerable sand dredging is done in the creek, and there is a dredged channel to a wharf ¾ mile above the entrance.

Sheridan Point has the ruins of a long wharf, marked by a light (flashing white) near the end extending to the edge of the channel. Piles may extend beyond the outer end. Passing vessels should give the light a good berth.

The point on the east side of the river just north of Piscataway Creek has a wharf with a fixed red light on the end. A fog bell sounds one stroke every 10 seconds. Opposite this point a dredged channel leads to a wharf on the west side of the river. This channel is marked by a black buoy on the south side of the entrance and has a depth of about 12 feet (3.6 m.). A cable crosses the river here and vessels should not anchor near it.

Swan Creek has a depth in the entrance of 2 feet (0.6 m.). **River View** is an excursion resort just north of this creek.

Broad Creek, on the east side, 8 miles below Washington, has depths of 2 to 4 feet (0.6 to 1.2 m.). There are landings for boats

on the south side near the entrance, but the creek is covered with grass in summer and is little used.

Rosier Bluff is a prominent wooded bluff on the east side, 2 miles below Alexandria. A wharf at the southern end is marked by a flashing white light.

Hunting Creek, on the south side of Alexandria, has depths of 1½ to 4 feet (0.4 to 1.2 m.), but is covered with grass in summer and little used. It is crossed by two bridges. The lower bridge has a center pier draw, each opening 40 feet wide, and the upper bridge is fixed, but motor boats without houses can pass under it.

Alexandria has considerable trade, mostly in river and bay vessels and a few coasting vessels, the deepest draft being 18 feet (5.5 m.). The area in front of the wharves has been dredged to a depth of 24 feet (7.3 m.). In October, 1928, the controlling depths were 17 feet (5.2 m.) at the upper end of the water front and 22 feet (6.7 m.) at the lower end.

Coal, water, gasoline, ice, and general provisions are obtainable, and there is a shipyard and a railway capable of hauling out vessels of 200 feet length, 11 feet (3.3 m.) draft forward and 15 feet (4.5 m.) aft.

Oxon Creek, eastward of the northern end of Alexandria, has depths of 1 to 3 feet (0.3 to 0.9 m.), but is little used except by sand dredgers. Channels have been dredged by them across the flats. These are generally marked by bush stakes, and the channels are well indicated at low water by the grass.

Washington Harbor consists of three parts—Washington Channel, Virginia Channel, and Anacostia River.

Washington Channel leads between the sea wall of Potomac Park and the wharves of the city. It has been dredged to a depth of 20 feet (6.1 m.) over nearly the entire area and 24 feet (7.3 m.) along the eastern side to the head. In June, 1928, there was a controlling depth of 21.5 feet (6.5 m.) in the channel. The principal wharves are on the east side.

Virginia Channel, the main channel of the Potomac River, leads to the wharves at Georgetown (West Washington), 4 miles above the junction with the Washington Channel. The channel has been improved by dredging to a present controlling depth of 20 feet (6.1 m.) and width of 400 feet. The depth in the channel is liable to some change due to freshets.

The channel is crossed by three bridges below Georgetown; the lower, a railroad bridge, has a center-pier draw, each opening 105 feet wide, with a headroom of 18 feet at high water when closed. The second, a highway and street-railway bridge, has a center-pier draw, each opening 100 feet wide, with a headrom of 18 feet when closed. The third, in the process of construction, is the Memorial Bridge, a concrete arch bridge with a bascule lift span 165 feet long.

The Frances Scott Key Bridge crosses the river at Georgetown. It has a width between fenders of 207 feet and height of 61 feet in the navigable span.

The channel is well marked with buoys to Georgetown.

Regulations prescribed for the two drawbridges crossing Virginia Channel require that the draws shall be opened on signal of three blasts sounded when a vessel is not more than 5 minutes distant from

the bridge, when the clearance is less than 16.7 feet, except between 8.20 and 8.50 a. m., during which time the draws will not be opened except for the passage of Government vessels. When more than 16.7 feet the draws will be opened only during the periods 10 to 11 a. m., 2 to 3 p. m., and 8 p. m. to 6 a. m. The clearance is indicated by distant reading gauges, one on the downstream end of the railroad pivot-pier fender, one on the upstream end of the highway pivot-pier fender, one ½ mile above the bridge, and one ½ mile below the bridge on the Potomac Park sea wall. Owners of tugs and power boats habitually using these waters are advised to reduce the height of their vessels under 16.7 feet in order that they may pass under or through the bridge at all times. No vessel shall pass under the closed draw span of either bridge at any time unless the vertical clearance between the lowest point of said span and the highest vertical projection of the vessel is at least 18 inches.

In case the draws can not be opened immediately, the fact shall be signaled from the bridges by the display of two red lights in a vertical line by night, or by the waving of a red flag or by four short blasts of a steam whistle by day.

Anacostia River has been improved by dredging a channel 20 feet (6.1 m.) deep and 400 feet wide to the United States Naval Gun Factory at Washington, 1½ miles above the mouth, and is marked by buoys and easily followed to this point. It has a depth of 16 feet (4.8 m.) in an unmarked channel to the Pennsylvania Avenue Bridge, 2¼ miles above the entrance, and is navigable for small boats and lighters to Bladensburg, Md., 7¾ miles above the entrance. It is crossed by several bridges between the Naval Gun Factory and Bladensburg; Anacostia Bridge, just above the Naval Gun Factory, has a draw opening 100 feet wide and a headroom of 21 feet at high water; Pennsylvania Avenue Bridge, ¾ mile above, is fixed and has a headroom of 28 feet at high water; the bridges above are fixed and have a least headroom of about 7½ feet (2.2 m.) at high water. The draw in the Anacostia Bridge will be opened at any time during the hours 9 a. m. to 5 p. m.

Anchorage.—Vessels bound up or down the Potomac River anchor anywhere in the channel where the bottom is soft. St. Marys River is the best anchorage for vessels in the lower end, though deep-draft vessels sometimes anchor for the night in Cornfield Harbor. Small craft can find secure anchorage in any of the tributaries near the lower end. There is no anchorage above Alexandria for vessels of any size, except off Georgetown below Aqueduct Bridge. Vessels usually go to the wharves. Motor boats anchor in the north end of Washington Channel, westward of the anchorage buoys.

Harbor Regulations.—Every vessel coming to anchor in the Potomac River between the junction of the Washington and Georgetown Channels of said river and the extension of the south line of P Street SW., in the city of Washington, shall anchor as near the flats in said river as possible, so that the channel of said river will not be obstructed; and if such vessel is to remain over 12 hours it shall be moored with both anchors, so as to give room for passing vessels and so as not to swing and obstruct said channel. Every vessel coming to anchor in any other portion of the navigable waters in the District of Columbia shall also be so moored under the direc-

tion of the harbor master, or the pilot of the police boat acting in the harbor master's absence, as not to obstruct the channel, and be secured with an anchor at bow and stern so as to keep the long axis of the vessel parallel with that of the channel and prevent it from swinging so as to obstruct the free passage of the channel by other vessels.

No vessel shall be permitted to anchor in the Washington Channel of the Potomac River between a point 1,000 feet south of the south line of P Street and the north line of K Street south extended, each point to be designated by a white buoy; and all vessels coming to anchor above the north line of K Street aforesaid shall come to anchor as near the flats as possible and so that the channel will not be obstructed; and all vessels coming to anchor shall be so moored by the use of both anchors as to prevent obstruction of the channel within 400 feet of the nearest wharf, the said anchorage to continue only 24 hours unless otherwise ordered or directed by the harbor master.

Freshets.—Freshets occur at irregular intervals, but as a rule do not interfere with the navigation of the river below Alexandria unless accompanied by floating ice. At Washington, during the highest freshet recorded, the river rose 13.26 feet (4 m.) at the foot of Seventeenth Street, and the deposit in the dredged channels decreased the depth from 20 feet to 14 feet (6.1 to 4.2 m.) in some places.

Ice.—During severe winters the tributaries of the Potomac are closed by ice, and the river is frozen over to Cedar Point; the upper part of the river is then closed to navigation. During ordinary winters the towboats and steamers plying on the river keep a channel open, but sailing vessels usually require the assistance of steam when bound to Alexandria or Washington.

Tides.—The mean range of tides is 1.3 feet at Point Lookout, 1.5 feet at Yeocomico River entrance, 2.2 feet at Blakistone Island, 1.4 feet at Lower Cedar Point, 1.1 feet at Maryland Point, 1.7 feet at Indianhead, and 2.9 feet at Washington. Above Washington the river is nontidal.

Currents, Potomac River.—The velocity of the tidal currents in the Potomac River is variable and is influenced by the force and direction of the wind; the set is generally in the direction of the channel. During freshets there is little or no flood current. The tides are influenced by the force and direction of the wind and the freshet conditions, and may at times vary considerably. The strength of current and times of slack water in the following list are for mid-channel under normal conditions.

Point Lookout to Piney Point.—The slack water and strengths of flood and ebb occur about 4 hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before flood occurs about 2 hours after high water at Washington and the slack water before ebb occurs about 1 hour after low water at Washington. The average strength of flood and ebb is approximately ½ knot.

Off Blakistone Island.—The slack waters and strengths of flood and ebb occur about 5 hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack water before

flood occurs about 3 hours after high water at Washington and slack water before ebb occurs about 2 hours after low water at Washington. The average strength of flood is about ½ knot and of ebb about 1 knot.

Off Colonial Beach.—The slack waters and strengths of flood and ebb occur about 6½ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs about 2 hours before low water at Washington and slack before ebb occurs about 2½ hours before high water at Washington. The average strength of flood is about ½ knot, and of ebb about ¾ knot.

Off Persimmon Point.—The slack waters and strengths of flood and ebb occur about 7 hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs about 1½ hours before low water at Washington and slack before ebb occurs about 2 hours before high water. The average strength of flood is approximately 1 knot, and of ebb approximately 1¼ knots.

Off Maryland Point.—The slack waters and strengths of flood and ebb occur about 7¼ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs about 1¼ hours before low water at Washington and slack before ebb occurs about 1¾ hours before high water. The average strength of flood is approximately 1 knot and of ebb approximately 1¼ knots.

Off Quantico.—The slack waters and strengths of flood and ebb occur about 7½ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs about 1 hour before low water at Washington and the slack before ebb about 1½ hours before high water. The average strength of flood or ebb is approximately ¾ knot.

Off Hallowing Point.—The slack waters and strengths of flood and ebb occur about 8½ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs at about the time of low water at Washington and slack before ebb about ½ hour before high water. The average strength of flood or ebb is approximately 1 knot.

Off Alexandria.—The slack waters and strengths of flood and ebb occur about 8¾ hours after the corresponding slacks and strengths at Chesapeake Bay entrance. The slack before flood occurs at about the time of low water at Washington, and slack before ebb about the time of high water. The average strength of flood or ebb is approximately 1 knot.

At Washington.—In Virginia Channel the average current at strength of ebb is about ½ knot. There is seldom a flood current. In Washington Channel there is practically no current. In the Anacostia River the current is irregular with an average strength on flood and ebb of less than ½ knot.

Directions, Potomac River

[Abbreviations for lights: F, fixed; Fl., flashing; R., red. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
	°	Points	
1. From 1.25 miles northeastward of Smith Point Light (Fl.) to 1 mile southwestward of Piney Point Light (F.).	307	NW. ⅛ W	22.5
2. To 0.75 mile, 28° true, from Ragged Point Light (Fl.).	315	NW. ⅝ N	3.5
3. To 0.75 mile southwest of Blakistone Island Light (F.).	285	WNW. ⅛ W	8.0
4. To midway between Kettle Bottom Channel entrance gas and bell buoy, passing north of buoy No. 7.	297	NW. by W	5.1
NOTE.—Kettle Bottom Shoals consist generally of small lumps of hardpan, with deep water close to, and the lead will not serve as a guide to avoid them; there is often a pocket of slightly deeper water around the lumps than is found near by. The area has been closely surveyed, but there are probably lumps which were not found with the lead. They occupy a stretch of the river about 8 miles long, above Wicomoco River. A straight channel across the shoals has been dredged to a depth of 24 feet (7.3 m.) at mean low water and is marked by buoys.			
5. To midway between the gas buoys at the northwest end of Kettle Bottom Channel. (Channel buoyed on both sides.)	295	NW. by W. ⅛ W.	2.9
6. To Kettle Bottom Shoals upper gas and bell buoys, passing south of buoy No. 20, marking a 19-foot (5.8 m.) spot.	296	NW. by W. ⅛ W.	3.1
7. To 350 yards east of gas buoy No. 13, entrance to Dahlgren, Va.	327	NNW. ⅜ W	2.1
8. To 0.25 mile east of Lower Cedar Point Light (F.).	2	N. ¾ E	1.9
9. To 1.1 miles 1° true from Persimmon Point Light (Fl.).	350	N. ¼ W	3.0
10. To 0.4 mile from Port Tobacco Flats Light (Fl.), light ahead.	306	NW. ¼ W	1.9
11. To 0.5 mile 75° true from Riverside Wharf Light (Fl.) (light ahead), passing 200 yards north of Mathias Point Light (F.), and 500 yards south of Upper Cedar Point Light (F.).	255	W. ¾ S	5.0
12. To midway between buoy No. 30 and buoy No. 23.	229	SW. by W	2.9
13. To 600 yards, 82° true, from Maryland Point buoy No. 25, buoy ahead.	262	W. ⅛ S	1.2

Directions, Potomac River—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points* °	
14. To close southward of buoy No. 32, entrance to dredged channel.	283	WNW. ¼ W	1. 1
15. To east of gas buoy No. 27	303	NW. ½ W	0. 9
16. To east of gas buoy No. 29, being guided by buoys on east side of channel.	335	N. by W. ⅝ W	2. 5
17. To 0.8 mile beyond Sandy Point Light (Fl.), and 200 yards east of buoy No. 33, being guided by buoys.	356	N. ¼ E	5. 6
18. To 0.25 mile westward of gas buoy No. 52, off Chicomuxen Creek.	10	N. by E. ½ E	2. 2
19. To close eastward of buoy No. 35, off Mattawoman Creek.	42	NE. ⅜ E	2. 3
20. To close eastward of buoy No. 39, passing east of the buoys along the dredged channel.	39	NE	2. 7
21. To 400 yards off buoy 52A, on line between that buoy and High Point, Hallowing Point ahead.	53	NE. by E. ⅜ E	1. 3
22. To 0.4 mile east of Glymont Wharf Light (Fl.), light ahead.	83	East	1. 5
23. To 0.3 mile, 30° true, from Glymont Wharf Light, Chapman Point ahead.	62	ENE. ⅛ E	0. 6
24. To midway between buoys Nos. 43 and 54, Glymont Wharf Light astern.	31	NE. ⅝ N	0. 9
25. To 0.3 mile from gas buoy No. 56, buoy on range with White Stone Point Light (Fl.), passing 200 yards off buoy No. 45.	349	N. ⅜ W	2. 2
26. To 100 yards northwestward of the gas buoy.	10	N. by E. ½ E	0. 3
27. To midway between buoy No. 58 and White Stone Point Light (Fl.).	32	NE. ½ N	1. 1
28. To 100 yards southwest of buoy No. 45A	53	NE. by E. ⅜ E	0. 6
29. To 200 yards south of buoy No. 47, off Sheridan Point, passing close southward of the buoys off Ferry Point.	73	E. ⅞ N	2. 8
30. To 300 yards, 232° true, from Fort Washington Light (F. R.), light ahead.	52	NE. by E. ¼ E	0. 8
31. To midway between River View Wharf and buoy No. 51.	24	NNE. ¾ E	0. 7
32. To 125 yards west of buoy No. 62	350	N. ¼ W	1. 0
33. To 150 yards west of Fort Foote Light (Fl.).	8	N. by E. ⅜ E	1. 9
34. To 100 yards off Alexandria water front, 350 yards above Jones Point Light (Fl.).	348	N. ½ W	1. 4
35. To 225 yards west of Intake Crib Light (F. R.) and bell, passing 150 yards west of the buoys opposite Alexandria.	8	N. by E. ⅜ E	1. 7
36. To 300 yards south of the gas and bell buoy off Potomac Park, dome of War College ahead, going nothing to westward of the course when ¼ mile above Bellevue Light (F. R.).	16	NNE	1. 8
Above the intersection of Anacostia River and Washington Channel the chart is the guide. The channels are well marked.			

ST. JEROME CREEK

[Chart 1224]

is on the western side of Chesapeake Bay 5 miles north of Point Lookout and 2½ miles 253° true (W. by S. mag.) from Point No Point Lighthouse. It is shoal and of little importance; some oysters, wood, and farm products are shipped in light-draft vessels, but it is principally used as an anchorage for small craft engaged in oystering and fishing. The channel is subject to change. There is a buoy off the entrance and a light on Deep Point, the south entrance point. There is a store at the landing on **Otter Point,** just inside the entrance. The general depths in the creek are 4 to 7 feet (1.2 to 2.1 m.) as shown on the chart. The entrance to the south branch of the creek between Otter Point and **Deep Point** is nearly bare at low water, and this shoal extends northward of the line joining the points.

PATUXENT RIVER

[Chart 539]

on the western side of Chesapeake Bay, 87 miles above the entrance and 64 miles below Baltimore, has a depth of 30 feet (9.2 m.) into the entrance and 23 feet (7 m.) to Benedict, 12 feet (3.6 m.) to Jones Point, 9 feet (2.7 m.) to Lyons Creek Wharf, and 7 feet (2.1 m.) to Bristol Landing, at distances of 18½, 28, 36, and 40 miles, respectively, above Drum Point at the entrance. The mouth of the river forms a secure anchorage for vessels of any draft and is extensively used. Steamers from Baltimore of 8 to 9 feet (2.4 to 2.7 m.) draft make regular trips to Millstone Wharf and Solomons, and a river steamer runs from Solomons to the principal landings as far as Nottingham. The river and its tributaries are also frequented by schooners and a few barges carrying wood products, and in the lower end by vessels engaged in the oystering and fishing industry.

Cedar Point Lighthouse, on the end of the point on the south side at the entrance is a flashing light on a post. A tank back of the point is prominent.

The entrance to the river is easy of access either by day or by night for vessels of 24 feet (7.3 m.) draft without a pilot, and vessels of 28 feet (8.5 m.) can enter by following the directions on page 184. The channel between the entrance and Benedict is narrow in places but is comparatively straight except off Point Patience, and the most prominent shoals are marked. Strangers should have little trouble in taking a draft of 15 feet (4.5 m.) to Sheridan Point and 12 feet (3.6 m.) to Benedict in the daytime with the aid of the chart. Above Benedict the channel is narrow in places and obstructed by shoals and is not sufficiently well marked to be followed by strangers.

The most prominent mark in approaching Patuxent River from southward is the tall tank on Cedar Point, and from northward is Cove Point Lighthouse (flashing white) and the high bluffs at Little Cove Point, 1½ miles southward. In the entrance the most prominent marks are Drum Point Lighthouse (fixed white), white house on piles, and the fish factories and other buildings at Solomons Island.

Cove Point Lighthouse gives fog signals on an electric nautophone, blast 3 seconds, silent 7 seconds, or on a bell if nautophone

is disabled. It also has a radiobeacon, particulars for which are given on page 16. It serves as a vessel reporting station, for day service, reporting by telephone to Baltimore.

Drum Point Lighthouse has red sectors covering shoals off Drum Point, Hog and Fishing Points, and Sandy Point. Fog signal is given on a bell, 2 strokes every 15 seconds.

Solomons Island, 1¾ miles west of Drum Point, is the site of a village (Solomons post office) composed mostly of fishermen and oystermen. There is a depth of 18 feet (5.5 m.) at low water at the steamer dock on the northeast end of the island and 12 feet (3.6 m.) at the gasoline station wharf in the cove on the north side of the village. There is 15 feet (4.5 m.) generally in the cove, except off the southward of the small island near its center. It is used as an anchorage by many yachts and by the fishermen. There are several shipyards and marine railways, the largest capable of hauling out vessels of 200 tons, 125 feet length, and 10 feet (3 m.) draft. Gasoline, water, ice, and provisions may be obtained.

Mill Creek, opposite Solomons Island, has a depth of 22 feet feet (6.7 m.) in the entrance and 12 feet (3.6 m.) for 1¼ miles above in the main branch and ¾ mile above in the western branch (Back Creek).

The approach to Mill Creek is marked by a beacon and buoys. The deepest draft can be taken to the entrance by heading for the building on the point at the eastern side of the entrance on a 330° true (NNW. ⅛ W. mag.) course, passing eastward of the beacon and entering the creek in mid-channel. A draft of 12 feet (3.6 m.) or more can be taken to the entrance from eastward by following the north shore at a distance of 200 yards, passing northward of a middle ground marked by buoys and covered with oyster stakes.

Solomons Island is connected with the mainland by a low fixed bridge which prevents navigation around the western end.

Millstone Landing and post office is a steamer stop and post office about 2 miles southeastward of Solomons Island and connected with it by a ferry.

Town Point is low and bare and has a steamboat landing (Spencers Wharf) and several buildings on the north side. The end of the shoal off this point is marked by a buoy.

Mill Creek and **Cuckold Creek** have a common entrance with a depth of 15 feet (4.5 m.), 1 mile northwestward of Point Patience. Cuckold Creek has a depth of 12 feet (3.6 m.) for ¾ mile and 8 feet (2.4 m.) for a farther distance of ¾ mile, and Mill Creek has a depth of 12 feet (3.6 m.) for ¾ mile and 8 feet (2.4 m.) for a farther distance of ¼ mile. The deepest draft entering are schooners drawing 10 feet (3 m.). A black buoy on the end of the shoal on the north side at the entrance is the only mark. In approaching the entrance, pass 400 yards southward of the buoy and 600 yards northward of the point south-southwestward of it. The mid-channel is clear above the entrance.

Hellens Creek, 1¾ miles above Point Patience, has a depth of 3 feet (0.9 m.) across the bar at the entrance and 10 feet (3 m.) inside for ¾ mile. It is principally used as a harbor for small boats. The best water favors the eastern side in entering.

St. Leonards Creek, on the northeast side 7½ miles above Drum Point, has a depth of 16 feet (4.8 m.) into the entrance and 10 feet (3 m.) for 2½ miles above. The lower end of the creek forms a safe anchorage in any weather in depths of 16 to 23 feet (4.8 to 7 m.). **Petersons Point Light** (fixed white) is the principal guide to the entrance. In entering pass 600 yards eastward of the light and follow a mid-channel course through the mouth. The mid-channel is clear for 2½ miles above.

Sotterley Wharf is on the southwest side of the river westward of the entrance to St. Leonards Creek.

Broome Island is a low bare point marked by Broome Island Light (fixed red). Broome Island post office is a small village northward of the point. **Island Creek,** on the east side of Broome Island, has a depth of 10 feet (3 m.) for ¾ mile above the entrance, but there are unmarked shoals close to the channel. It is little used except by small local craft.

Parkers Wharf is on the north side 1½ miles north-northwestward of Broome Island Light. The best water in approaching Parkers Wharf is from south-southeastward. Give the western side of Broome Island a berth of ⅜ mile.

Forrest Wharf is on the southwest side of the river 2⅝ miles above Broome Island Light.

Battle Creek, on the north side northward of Forrest Wharf, has a depth of 10 feet (3 m.) for 2 miles above the entrance, and is navigable for small boats for a farther distance of about 2 miles. The deepest draft entering are schooners drawing 10 feet (3 m.). The entrance should be approached on a northeasterly course to avoid unmarked shoal spots on either side. The ruins of a wharf and freight house are on the eastern side at the entrance.

Dukes Wharf is on the south side of **Sheridan Point** 6 miles above Broome Island Light. Directly opposite on the southwest side are **Washington** and **Persimmon Creeks,** both shoal and little used.

Trent Hall Creek and **Indian Creek,** on the west side just below Benedict, have depths of 5 feet (1.5 m.) in the entrances and 3 feet (0.9 m.) to near the heads.

Benedict is a village on the western side of Patuxent River 18½ miles above the entrance. A cannery with twin stacks and a church spire are prominent. Schooners of 10 to 17 feet (3 to 5.2 m.) draft sometimes ascend the river to this point. The wharf has a depth of 9 feet (2.7 m.) at the end; there is a shoal southward of it which can be avoided by approaching the wharf on a northwesterly or westerly course.

Hallowing (Holland) Point is a steamer landing directly opposite Benedict. There are numerous landings on both sides of Patuxent River between Benedict and the head, but the only villages are **Lower Marlboro** on the east side and **Nottingham** on the west side, distant 10 and 15 miles, respectively, above Benedict.

Swanson Creek, on the west side 1½ miles above Benedict, has depths of 2 to 4 feet (0.6 to 1.2 m.) and is little used.

Hunting Creek, just above on the east side, has a depth of 3 feet (0.9 m.) across the flats at the entrance and for a distance of 3 miles above. It is frequented by motor boats and lighters. A railroad

bridge having a draw opening 74 feet wide crosses the river 1 mile below Bristol Landing.

Western Branch, entering the river just above the bridge, is not navigable except for a short distance above the mouth.

Upper Marlboro is a village on the railroad, 1¾ miles westward of the fixed bridge at the head of navigation on Patuxent River.

Anchorage.—Deep-draft vessels frequently anchor in the mouth of the river for the night. Shelter from westerly winds is found in 3½ to 4 fathoms (6.4 to 7.3 m.) from 2¼ to 3½ miles southward of Cove Point Lighthouse and quite close in to the shore. If seeking shelter from easterly winds, stand into the entrance and anchor in 5 to 10 fathoms (9.1 to 18.3 m.) in the channel about 1½ miles above Drum Point Lighthouse. Good anchorage for light-draft vessels is found close into the north bank westward of Drum Point Lighthouse, taking care not to get aground on the oyster bank, which is marked by buoys. Small local vessels up to 10 feet (3 m.) draft anchor in Mill Creek or in the cove behind Solomons Island, but there is little room to swing at this anchorage. St. Leonards Creek is a safe anchorage for small vessels in any weather. The bottom in the channel as far as Benedict is generally soft, and vessels can anchor where convenient.

Supplies.—Gasoline and provisions are obtainable at Solomons, Benedict, and Lower Marlboro, and provisions at Nottingham. There is artesian water near the wharves at Solomons and Benedict. Coal in limited quantities can sometimes be obtained from the fish factories or canneries.

Repairs to hulls of small vessels and minor repairs to machinery can be made at Solomons, but Baltimore is the nearest place for extensive repairs to hull or machinery.

Pilots can be obtained at Solomons or Benedict. If the directions are closely followed, a pilot is not required below Benedict, but strangers, unless in small boats, should not go above that place without one.

Ice closes the river to near the mouth in severe winters.

Tides.—The mean range of tides is 1.2 feet at the entrance, 1.6 feet at Benedict, and 2.5 feet at Nottingham.

Directions, Patuxent River

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
1. From position 1.5 miles true north of Cedar Point Light (Fl.) to 0.2 mile north of buoy 1A. off Hog Point, Drum Point Light (F.) ahead.	264	W. ⅛ N	1. 4
Red sectors of the light cover the shoals. If bound to an anchorage west of Drum Point, continue course 1 to near the light, round the point at 300 yards, and anchor in 26 to 28 feet (7.9 to 8.5 m.).			

Direction, Patuxent River—Continued

	Course		Distance in nautical miles
	True	Magnetic	
	°	*Points*	
2. To 0.25 mile south of Sandy Point buoy No. 4.	254	W. ¾ S	2.8
3. To 350 yards, 68° true, from Town Point buoy 3A.	324	NNW. ⅝ W	1.2
4. To 250 yards southwest of Point Patience Light (F. R.).	283	WNW. ¼ W	0.8
5. To 600 yards, 20° true, from buoy No. 5	359	N. ½ E	1.2
6. To 0.4 mile north-northeast of buoy 5A., Petersons Point Light (F.) ahead.	336	N. by W. ½ W	1.5
7. To 250 yards northeast of buoy No. 7	304	NW. ⅜ W	1.7
8. To 200 yards southwest of Broome Island Light (F. R.).	300	NW. ¾ W	1.5
9. To 0.6 mile, 288° true, from Battle Creek Shoal Light (F.), passing 350 yards southwest of it.	305	NW. ¼ W	3.7
10. To mouth of Mud Creek bearing 245° true, Sheridan Point ahead, Forest Wharf astern.	330	NNW	1.6
11. To 300 yards west-northwest of Sheridan Point, Long Point ahead.	324	NNW. ⅝ W	0.8
12. To 60 yards southwest of buoy No. 10, Benedict Light (F. R.) ahead.	335	N. by W. ⅝ W	1.5
13. To position with Benedict Light on range with Town Point and mouth of Mill Creek bearing 272° true.	326	NNW. ⅜ W	0.9
14. To 100 yards west of Benedict Light	352	N. ⅛ W	0.3
15. To abreast of Benedict Wharves, Town Point ahead.	10	N. by E. ½ E	0.2
Approach to wharves on a westerly course to avoid the 6-foot (1.8 m.) shoal south of them. Or proceed up the river, being guided by the buoys and the chart. Difficulty will be had in crossing the broad part of the river 1 mile below Nottingham, where there is a depth of 9 feet (2.7 m.) in a very narrow channel. The best water follows a curved line favoring the western shore. There is a stone pile, with a depth of 5 feet (1.5 m.), over it, near the center of this broad section.			

PATUXENT RIVER TO SEVERN RIVER

[Chart 1225]

The western side of Chesapeake Bay for a distance of 23 miles northward from Cove Point is unbroken by tributaries, and is generally high and wooded. The 5-fathom (9.1 m.) curve is nowhere more than 1⅝ miles from shore. The outer limit of possible fish traps is marked by a line of black and white buoys shown on the chart.

Governors Run is a landing 9 miles above Cove Point Lighthouse.

Chesapeake Beach is a summer resort 20½ miles above Cove Point. A stack and a water tank showing above the trees and several buildings showing against the trees are prominent. The wharves were badly damaged during the fall of 1929. Gasoline and provisions are obtainable, and there is railroad communication with Washington.

Herring Bay, westward of Popular Island and 8 miles 232° true (SW. by W. ¼ W. mag.) from Bloody Point Bar Lighthouse (fixed white), is extensively used as an anchorage. A shoal having depths of 2 to 4 feet (0.6 to 1.2 m.) extends from the north side south-southwestward nearly across the bay, and is marked at its south end by Parkers Island Shoal Light (fixed white). There is a depth of 12 feet (3.6 m.) around the south end. There is good anchorage in westerly weather eastward of the shoal in depths of 15 to 20 feet (4.5 to 6.1 m.). Small vessels usually anchor westward of the shoal, where there are depths of 7 to 12 feet (2.1 to 3.6 m.), protected against easterly winds to a considerable extent by the shoal outside. Small boats find shelter in **Rockhole Creek** at the northwest end, which has a depth of 2½ feet (0.7 m.) at the entrance and 3½ feet (1 m.) inside to a highway bridge 1 mile above. Gasoline and provisions are obtainable in the creek. **Fairhaven** is a post office on the west side of Herring Bay. The mean range of tides is 0.9 foot.

To enter Herring Bay, pass northward of Holland Point Bar buoy and head for Parkers Island Shoal Light on a 245° true (WSW. ⅜ W. mag.) course. Pass 200 yards southward and westward of the light and head for the end of Fairhaven Wharf on a north-northwesterly course. Anchorage can be had 100 to 500 yards eastward of the wharf in depths of 10 to 11 feet (3 to 3.3 m.).

West River, 31 miles below Baltimore and 3 miles southwestward of Thomas Point Shoal Lighthouse (flashing white), has a depth of 15 feet (4.5 m.) in the entrance, gradually decreasing to 7 feet (2.1 m.) 4½ miles above. Shoals extend nearly to mid-channel off many of the points. Those near the entrance are marked by a buoy (reflector) and a light (fixed red), and those above the entrance by buoys. Steamers from Baltimore and Annapolis of 6 feet (1.8 m.) draft make regular trips to **Galesville** (Galloway post office), **Shadyside**, and **Chalk Point**. Gasoline and provisions are obtainable at Galesville and there is a railway for hauling out small motor boats. The Corinthian Yacht Club is located at Galesville.

Directions, West River.—Approach a position 400 yards north-northwestward of buoy No. 1, reflector, on any course between 234° and 284° true, round the buoy at a distance of 400 yards, steer 200° true (SSW. ⅜ W. mag.) to southeast of Dutchman Point Shoals Light (fixed red), round it at a distance of 400 yards and then with the light astern steer 252° true (W. by S. mag.) to northward of buoy No. 3. From this point be guided by the buoys and the chart.

Rhode River, on the north side of West River, has a depth of 10 feet (3 m.) for 1¾ miles above the entrance. Passenger steamers make landings at two wharves. There is a railway on the creek capable of hauling out boats of 4 feet (1.2 m.) draft and 40 feet length. **Cadle Creek**, on the north side, has a depth of 4 feet (1.2 m.) to the post village of **Mayo** near the head, where gasoline

and provisions are obtainable. A shoal extends 400 yards southwestward from **Dutchman Point,** on the northeast side at the entrance to Rhode River, and vessels should favor the southwest side in entering. Above the entrance the mid-channel is clear if the points to be given a good berth.

South River, just westward of Thomas Point Shoal Lighthouse, has a narrow channel with a depth of 15 feet (4.5 m.) for 7 miles above the entrance and 9 to 12 feet (2.7 to 3.6 m.) into the tributaries. The principal shoals for a distance of 4 miles above the entrance are marked by buoys.

A highway drawbridge, with openings 66 feet wide and a clearance when closed of 6 feet, crosses the river 6 miles above the entrance. Between the hours of one hour before sunrise and one hour after sunset the draw will be opened on signal, if no person or vehicle is then in the way, for all vessels whose masts permanently remain standing or which have masts that may be unstepped, but which are 20 feet or more in height and 5 inches or more in diameter. The signal is three blasts of a whistle or horn, to be answered from the bridge by three blasts if the bridge can be opened immediately, or one blast if the bridge can not be opened immediately.

Numerous small creeks enter into the river. Many of these have good water in their channels and are extensively used by local yachts and motor boats.

Edgewater and **Riverview** are post villages near the bridge. Gasoline and provisions are obtainable near the head.

Directions, South River.—Approach on course 315° true (NW. ⅝ N. mag.) with Bloody Point Bar Light (fixed white) astern, to midway between buoys Nos. 1 and 4, steer 313° true (NW. ½ N. mag.) passing close southward of buoy No. 6, to close northward of buoy No. 3, then be guided by the chart.

Thomas Point Shoal extends 1¼ miles southeastward from the point, and is marked by **Thomas Point Shoal Lighthouse** (white house on piles) and a black buoy. The fog signal is given on a bell, 3 groups every 30 seconds.

The wreck of the barge *Calvert*, with 39 feet (11.8 m.) over it, lies 1.5 miles 55° true from Thomas Point Shoal Lighthouse.

SEVERN RIVER AND ANNAPOLIS HARBOR

[Charts 385 and 1225]

Severn River, on the west side of Chesapeake Bay 124 miles above the entrance and 26 miles below Baltimore, is the approach to Annapolis, the capital of Maryland. The river is frequented by many small local craft and by small naval vessels as far as Annapolis, the deepest draft being 16 feet (4.8 m.) and usual draft not exceeding 12 feet (3.6 m.). There is little business by water above Annapolis except in small boats seldom exceeding 6 feet (1.8 m.) in draft.

A channel has been dredged from deep water in Chesapeake Bay to abreast the docks of the Naval Academy. In October, 1924, there was a depth of 29 feet (8.8 m.) in the channel to Annapolis.

The dredged channel is marked by spar buoys on the northeast side and can buoys on the southwest side, and the 12-foot (3.6 m.)

curve on the southwest side is marked by spar buoys as far as Annapolis. The river has a natural channel with a depth of 18 feet (5.5 m.) for 7 miles above Annapolis and 6 feet (1.8 m.) for 2 miles farther. The channel above Annapolis is only partially marked, but is broad and easily followed with the aid of the chart.

Tolly Point, on the south side of the entrance to Severn River, is wooded and has a group of cottages on it. **Tolly Point Shoal** extends 1 mile southeastward from the point and is marked by a gas and bell buoy on the end. There is a slough through the shoal, ⅝ mile west-northwestward of the buoy, through which boats of 6 feet (1.8 m.) draft pass, but it is unmarked and strangers should not attempt to use it.

Lake Ogleton, ½ mile westward of Tolly Point, has 9 to 10 feet (2.7 to 3 m.) of water in it but only 1 foot (0.3. m.) in the entrance.

Greenbury Point Shoal extends southward and southeastward from Greenbury Point, and is marked by **Greenbury Point Shoal Lighthouse** (fixed white), white house on piles, and a row of red buoys along the southwest side. The 18-foot (5.5 m.) curve lies 250 yards southwestward of the lighthouse, and there are depths of 6 feet (1.8 m.) and less for 400 yards west-northwestward of it. A naval radio station is on Greenbury Point. The six tall towers are prominent over a large area up and down the bay.

Back Creek, a tributary of Severn River on the southeast side of Eastport, has a depth of 9 feet (2.7 m.) in the entrance and 12 feet (3.6 m.) inside, shoaling to 7 feet (2.1 m.) near the head. The entrance is very narrow and has extensive shoals on either side. The creek is used as a harbor for small boats.

Eastport is a small town just southward of Annapolis, with which it is connected by a bridge. It has a shipyard and a railway for hauling out vessels of 60 tons and 7 feet (2.1 m.) draft.

Annapolis is the site of the **United States Naval Academy,** which occupies the entire northeastern part of the city between Spa and College Creeks. The two inclosed basins and the entire water front on the northeast side and for a distance of ⅜ mile on the southeast side are a part of the Naval Academy. The steamboat landing and private wharves are on the northwest side of Spa Creek, between the Naval Academy grounds and the bridge across the creek.

Market Slip, 250 yards below the bridge, is ⅛ mile long and 40 yards wide and has a depth of 8 feet (2.4 m.) to near the head. It is open to the public and extensively used by small craft. The mouth of Spa Creek below the bridge has depths of 10 to 13 feet (3 to 3.9 m.) and is extensively used as an anchorage. Gasoline, provisions, ice, coal, and water can be obtained at Annapolis, and there are machine shops for ordinary repairs to motors. Storm warnings are displayed. Annapolis is connected with Baltimore and Claiborne by steamer.

Spa Creek is crossed by a highway bridge just above the wharves having a center pier draw, each opening 38 feet wide with a headroom of 7 feet (2.1 m.) at high water when closed. The bridge is opened at all times between sunrise and sunset on a signal of three blasts, and the operating machinery is accessible to masters of vessels at other times. Favor the southeast side in approaching the

draw to avoid a shoal on the northwest side. The creek has a depth of 8 feet (2.4 m.) for ¾ mile above the bridge and the mid-channel is clear.

College Creek, on the northwest side of Annapolis, has a depth of 11 feet (3.3 m.) in the entrance and 8 feet (2.4 m.) to near the head. It is crossed by three bridges, all having draw openings, the least width of opening being 38 feet. The draws are opened at all times between sunrise and sunset on a signal of three blasts of a whistle or horn. The best water in entering leads along the south side to near the lower bridge.

Weems Creek, 1½ miles above Annapolis, has a depth of 12 feet (3.6 m.) for 1 mile above the entrance and 6 feet (1.8 m.) to the head. It is crossed by a highway bridge having a center pier draw, each opening 21 feet wide.

Round Bay, an expansion of Severn River 4 miles above Annapolis, has depths of 17 to 22 feet (5.2 to 6.7 m.) and is frequented by motor boats.

Anchorage.—Deep-draft vessels anchor off the mouth of the Severn in 18 to 45 feet (5.5 to 13.7 m.), sheltered from westerly winds. There is good anchorage in the river northeastward of the Naval Academy in a depth of 21 to 28 feet (6.4 to 8.5 m.) but vessels must not anchor in the pipe line area extending 65° true from the mast near the east corner of the academy grounds to the other side of the Severn River. Small vessels anchor in and off the mouth of Spa Creek where the anchorage grounds are marked by buoys.

Bridges.—Two bridges cross the Severn just above Annapolis. The lower, a highway bridge, has a bascule span with an opening 71 feet wide and a headroom when closed of 15½ feet; the other is a railway bridge with a swing span 62 feet wide in either opening and a headroom of 5 feet when closed.

Both bridges are opened at any time of day or night on a signal of three blasts, unless a train is approaching.

Pilots.—Local boatmen who are competent pilots will be found near the entrance if a pilot is desired.

Ice seldom interferes with navigation, except in severe winters, and then only for a limited time.

Tides.—The mean range of tides is 0.9 foot and is greatly influenced by winds. The tidal currents seldom exceed ½ knot in strength.

Directions, Severn River.—The following directions are for vessels of not over 16 feet (4.8 m.) draft to Annapolis in the daytime. Strangers, unless of light draft, should not attempt to enter at night.

From southward.—From the outer end of the dredged channel, lying ½ mile northeastward of Tolly Point Shoal gas and bell buoy, steer 316° true (NW. ¾ N. mag.) in the dredged channel, leaving the buoys at a distance of 30 yards, until westward of Greenbury Point Shoal Lighthouse and 30 yards northeastward of buoy No. 9. Then steer 333° true (N. by W. ¾ W. mag.) for ¾ mile until southwestward of buoy No. 14; on this course the lighthouse wharf, in front of a group of white houses, will be a little on the starboard bow and the United States Naval Experimental Station buildings on

the port bow. From buoy No. 14 a 305° true (NW. ¼ W. mag.) course will lead to the dredged anchorage basin off the Naval Academy.

From northward.—Vessels of suitable draft may steer course 237° true (SW. by W. ¾ W. mag.) from buoy No. 33 to buoys Nos. 5 and 6 on the dredged channel, picking their way through the fish traps. Thence up the channel as above. A passenger and automobile ferry runs from Annapolis to Claiborne on the eastern shore of Chesapeake Bay.

SEVERN RIVER TO PATAPSCO RIVER

[Charts 1225, 1226, and 549]

The cove between Greenbury Point and Hackett Point has depths of 10 to 14 feet (3 to 4.2 m.) in the north end. The channel at the entrance is narrow and leads between extensive flats, and is marked on the eastern side by a red buoy. The cove and the creeks at the head are frequented by motor boats and small vessels carrying farm and wood products. **Mill Creek** has a depth of 10 feet (3 m.) at the entrance in a very narrow unmarked channel and 8 feet (2.4 m.) to near the head. **White Hall Creek** has a depth of 12 feet (3.6 m.) at the entrance and 7 feet (2.1 m.) to near the head; the channel at the entrance is narrow and crooked and is usually marked by a post or bush stake. **Crabbing Point Creek** has a very narrow entrance, with a depth of about 2 feet (0.6 m.) and deeper water inside.

Sandy Point Lighthouse (group flashing white) is a red dwelling on brown cylindrical base. A red sector of the light covers the shoal water westward of the light. The fog signal is given on a horn, blast 3 seconds, silent 7 seconds. A bell is struck by hand if horn is disabled. Deep-draft vessels should pass ⅛ mile or more eastward of this light.

Magothy River, westward of Baltimore Lighthouse, has a depth of 13 feet (3.9 m.) at the entrance and for a distance of 5½ miles above, but has many shoal spits and middle grounds of less depth close to the channel. The usual draft of boats using it is 3 to 5 feet (0.9 to 1.5 m.) and deepest draft 10 feet (3 m.). There are no wharves except for small craft. **Deep Creek,** on the south side just inside the entrance, has a depth of 7 to 9 feet (2.1 to 2.7 m.) in midchannel and is sometimes used as an anchorage for small craft. **Mountain Point,** on the north side at the entrance, is a high, wooded bluff with a bare sandy point outside of it. A privately marked channel with 12 feet (3.6 m.) of water, leads into Magothy Narrows east of the middle ground in Tarcoat Cove. The Gibson Island Yacht Club on the north side of the island of that name is reached through the above channel. There are many excellent anchorages for small boats in the numerous tributaries to Magothy River, and this locality is a favorite cruising ground for local yachts.

The entrance to Magothy River is narrow, but is marked. **Approaching the entrance from northward,** a 226° true (SW. ¾ W. mag.) course from buoy No. 3C on the Craighill Channel will lead ¾ mile westward of Baltimore Lighthouse and to the buoy at the entrance. **Approaching from southward,** strangers should pass eastward of Sandy Point Lighthouse and give the shore

on the southwest side a berth of ½ mile until up to the red buoy at the entrance. Either course leads through an area of possible fish traps. Pass 100 yards southward of the buoy and steer northwestward into the river, passing northward of Persimmon Point Lighthouse (flashing white). There are only a few private marks above the entrance, but strangers should have no trouble in taking a draft of 6 feet (1.8 m.) for 5 miles by keeping in mid-channel and giving the point a good berth.

Baltimore Lighthouse (flashing white), on the western side at the entrance of the dredged channel leading to Baltimore, is a white octagonal house on brown pier.

PATAPSCO RIVER AND BALTIMORE HARBOR

[Charts 1226, 545, and 549]

Patapsco River, on the west side of Chesapeake Bay 136 miles above the entrance, is the approach to the city of Baltimore. The river is 3½ miles wide at the mouth, but the entrance is obstructed by extensive shoals. A channel 35 feet (10.7 m.) deep and 600 feet wide has been dredged from the 35-foot (10.7 m.) depth southward of the entrance of the river to Fort McHenry, at the entrance of the basin at Baltimore, the total length of the dredged channel being 16 miles. The controlling depth to Baltimore was 35 feet (10.7 m.) in 1929. **Craighill** and **Cutoff Channels** lead through the shoals southward of the entrance to the river, and **Brewerton** and **Fort McHenry Channels** lead from the mouth of the river to Fort McHenry. The channels have been widened at the turns and two anchorage basins 600 feet wide and 35 feet (10.7 m.) deep have been dredged on the southwest side of the Fort McHenry Channel.

Bodkin Point, on the south side at the entrance, is low and covered with scattered trees. A chimney in Bodkin Creek is prominent. A shoal extends northward from the point to the edge of the dredged channel.

Bodkin Creek, just westward of Bodkin Point, has a depth of 11 feet (3.3 m.) at the entrance and 7 to 9 feet (2.1 to 2.7 m.) inside for a considerable distance into all of its three branches. The channel at the entrance is very narrow and leads between extensive shoals. It is marked by buoys as far as the fork, and the narrowest part of the channel at the entrance is also usually marked by bush stakes. The chimney of a garbage disposal plant on the point between **Main Creek** and **Back Creek** is prominent. The draft of boats using the creek does not usually exceed 6 feet (1.8 m.), and strangers should not enter with a greater draft. From the black spar buoy at the outer end of Rock Point Shoal a 138° true (SE. ⅞ S. mag.) course for 2½ miles will lead to the outer buoy. In entering, be guided by the buoys and bush stakes, leaving them at a distance of about 25 yards.

North Point, on the north side of Patapsco River at the entrance, is wooded and marked by a large and a small water tank. A recreation park just eastward of the entrance to Shallow Creek is marked by a pier with pavilion at the end.

Old Road Bay, just westward of North Point, has a depth of 7 to 14 feet (2.1 to 4.2 m.). A rock, nearly bare at low water, near the

middle of the entrance is marked by a horizontally striped buoy, and above this point the only mark is a black buoy on the point of shoal east off Cut-off Channel rear range light.

North Point Creek and **Jones Creek**, emptying into the bay from northward, have depths of 6 to 8 feet (1.8 to 2.4 m.), but are unmarked and frequented only by small produce and pleasure boats. The bridges crossing both creeks near their entrances have draw openings 40 feet wide.

Sparrows Point, a town on the north side 2¼ miles west-northwestward of North Point, is the site of large iron and steel works and a shipbuilding plant. Several factory buildings and many chimneys and tanks are prominent. A channel, dredged to a depth of 36 feet (11 m.) and marked by a lighted range and buoys, leads to the wharves on the south side on a 354° true (N. ⅛ E. mag.) course. Channels have also been dredged to several wharves on the west side. The depths in these are from 20 to 23 feet (6.1 to 7.0 m.), and they are well marked. Sparrows Point is the terminus of a railroad.

Bear Creek, just westward of Sparrows Point, has a depth outside of the dredged channels leading to the docks at Sparrows Point of 12 feet (3.6 m.) for 3½ miles above the entrance. The principal shoals for a distance of 1½ miles above the entrance are marked by buoys. There are no marks above, and the shoals extend for a considerable distance from many of the points. The creek is frequented principally by small produce and pleasure boats. There are no wharves except for small boats. Two bridges, each having center-pier draws, cross the creek just above the entrance; the least width of opening is 68 feet and least high-water clearance is 5 feet. A proposed bridge is to cross the creek from just south of Long Point to the opposite side. A highway bridge having a draw opening crosses the creek 2¼ miles above the entrance.

The main entrance to the creek is just north of gas and bell buoy No. 4 M in the dredged channel. Thence up the channel on the lighted range, course 38° true (NE. mag.), to buoys Nos. 5 and 6, thence either to the docks at the north end of Sparrows Point or to the draw span of the first bridge.

Humphreys Creek, a tributary of Bear Creek just above the lower bridges, has a depth of 13 feet (3.9 m.) in the entrance and 7 feet (2.1 m.) in mid-channel for 1¼ miles.

Rock Creek, on the south side of Patapsco River 4 miles above Bodkin Point, has a depth of 11 feet (3.3 m.) to near the head, except at the narrows westward of Fairview, where the channel has a depth of 8 feet (2.4 m.) and width of only 75 to 100 feet. The channel at this point is marked by buoys, and the mid-channel is clear above. A rock with 5 feet (1.5 m.) over it lies just west of the red buoy at the narrows.

White Rocks, on the eastern side of the entrance to the creek, show about 15 feet (4.5 m.) above high water, and are prominent when entering from eastward. Boats of 6 feet (1.8 m.) or more draft should pass northward of them. The creek is frequented by many pleasure boats in summer. Gasoline may be obtained at Fairview. To enter Rock Creek from northwestward, a 160° true (S. by E. ⅛ E. mag.) course from the black gas buoy at the intersection of Brewerton and Fort McHenry Channels will lead to the red buoy on the

western side at the entrance. From there favor the western shore to the narrows and be guided by the buoys, leaving them close-to.

Stony Creek, 1 mile northwestward of Rock Creek, has a depth of 10 to 14 feet (3 to 4.2 m.) to near the head, and the same depth to near the head of **Nabbs Creek,** the principal tributary. The entrance is obstructed by shoals, the one extending westward from **Stony Point** having several rocks bare at all times. The channel around the western end of this shoal has a depth of 15 feet (4.5 m.) and width of 70 yards and is marked by buoys. Above this point the mid-channel is clear to the head. Steamers from Baltimore of 6 to 7½ feet (1.8 to 2.2 m.) draft are the deepest entering. The creek has several landings and summer resorts and is frequented by many pleasure boats in summer. A highway bridge having a center-pier draw, each opening 50 feet wide, with a headroom of 6 feet (1.8 m.) at high water, crosses it ¾ mile above the entrance. Gasoline may be obtained from a wharf above the bridge.

Fort Carroll is a stone and concrete structure with Fort Carroll Light (flashing white) white structure, on the southwest side. The center of Fort McHenry Channel leads 400 yards southwestward of the light.

Hawkins Point is marked by a water tank and a large pile of slab. **Leading Point** is the site of the quarantine station. A buoyed channel leads to the quarantine wharf in Thomas Cove.

Curtis Bay and Curtis Creek, on the southwest side of Patapsco River 1¾ miles west-northwestward of Fort Carroll, are the approaches to large coal and oil wharves and several industrial plants at **South Baltimore,** and to the Coast Guard depot on Arundel Cove. A channel 250 feet wide and 33½ feet (10 m.) deep, with a turning basin at the head, has been dredged from the main channel of Patapsco River across Curtis Bay to the wharves at South Baltimore, where are located the coal piers of the Baltimore & Ohio Railroad, having a depth of 28 to 34 feet (8.5 to 10.3 m.) alongside, and several other wharves with depths of 25 to 35 feet (7.6 to 10.6 m.). The channel is marked by buoys on each side and a lighted range, which is hard to pick up during the day.

Curtis Creek has a natural depth of 20 feet (6.1 m.) to abreast the entrance of Arundel Cove, 1¾ miles above South Baltimore, and 16 feet (4.8 m.) for a farther distance of 2 miles into Marley Creek. A highway bridge having a center pier draw, with a headroom of 5 feet (1.5 m.) at high water eastward of the draw, crosses the creek ¾ mile above the head of Curtis Bay. The channel above Curtis Bay has ample width and is easily followed with the aid of the chart. Shoals extend southeastward from **Ferry Point** on the north side of Cabin Branch, and northwestward from **Walnut Point** just below the bridge; except at these points the mid-channel is clear for 3 miles above Curtis Bay. A channel dredged to 24 feet (7.3 m.) leads from just above the drawbridge to the piers opposite Arundel Cove, but there are depths of less than 19 feet (5.8 m.) to the docks.

Cabin Branch, on the west side of Curtis Creek just above South Baltimore, has a depth of 14 feet (4.2 m.) to a fixed bridge, 11 feet wide in the openings, ⅜ mile above the entrance. There are depths of 14 to 18 feet (4.2 to 5.5 m.) at the industrial wharves on the north

side. In entering, vessels should pass southward of the buoy marking the end of the shoal extending south-southwestward from Ferry Point, and head in on a 293° true (NW. by W. ⅜ W. mag.) course through the dredged channel to the wharves, thence favoring the northern side to the bridge.

Arundel Cove is the site of the Coast Guard depot. There is a depth of 17 feet (5.1 m.) at the wharf just outside the cove, and 16 feet (4.8 m.) to the wharves inside. The entrance to the cove is marked by several buoys.

To enter Curtis Bay, pass southward of gas buoy No. 7M and buoy No. 2A, and steer 267° true (W. ⅜ N. mag.) in the Curtis Bay channel, leaving the buoys at a distance of 50 yards; the coal piers and a brick chimney at South Baltimore will be ahead on this course. There is a lighted range ahead on this course, but it is hard to see in the day. Anchorage can be had eastward or east-northeastward of the coal piers in depths of 24 to 30 feet (7.3 to 9.1 m.), being careful to give the north shore a berth of 300 yards, or in mid-channel southward of the coal piers in depths of 23 to 26 feet (7 to 7.9 m.). If bound up Curtis Creek, pass midway between **Sledds Point** and the ends of the coal piers, favor the eastern side of Curtis Creek until past Ferry Point, then the western side to the bridge. Pass through either side of the draw and eastward of the red buoy just southward of it and follow a general mid-channel course above. An 18-foot (5.5 m.) spot lies 200 yards true north of buoy No. 12, off Stahl Point.

Colgate Creek, on the north side of Patapsco River, northeastward of Curtis Bay, has a depth of 6 feet (1.8 m.) in a narrow channel to a drawbridge (headroom—6 feet), ¾ mile above the entrance. A bridge having a draw opening 40 feet wide and a headroom of 4 feet crosses the creek at the entrance. The draw will be opened on a signal of three blasts at any time between 6 a. m. and 6 p. m. from December to March, inclusive, and at any time between 6 a. m. and 10 p. m. during the remainder of the year. **Point Breeze,** on the west side of the entrance, is a pleasure park, and has several prominent buildings. Enter Colgate Creek between buoys Nos. 1 and 6 and pass close eastward of No. 1, heading just outside of Dundalk wharves. From abreast of the wharves steer for the draw span of the bridge.

The **Northwest Branch** of Patapsco River, also known as **The Basin,** forms the main part of Baltimore Harbor. The entrance leads between Fort McHenry on the west and Lazaretto Point on the east. **Fort McHenry** is on a point, marked on the east side by Fort McHenry Lighthouse (flashing white), steel skeleton tower. **Lazaretto Point** is marked by Lazaretto Point Lighthouse (fixed red), white skeleton tower. Northwest Branch has depths of 20 to 35 feet (6.1 to 10.7 m.) in the eastern end and 21 feet (6.4 m.) to the head, with a few areas of less depth near the shores. The best water favors the southwest side from the entrance to Locust Point, and the northeast side from Locust Point to the head. There are depths of 16 to 35 feet (4.8 to 10.7 m.) at the principal wharves. The Baltimore & Ohio Railroad wharves, extending from Fort McHenry northwestward for ¾ mile, have depths of 20 to 36 feet (6.1 to 11.0 m.)

and the Pennsylvania Railroad wharves, northward of Lazaretto Point, have depths of 27 to 35 feet (8.2 to 10.7 m.). The wharves along the western side at the head of the harbor are used by passenger and freight steamers to points on Chesapeake Bay. The wharves from the northwest corner of the harbor eastward to Jones Falls are municipal wharves and have depths of 19 to 22 feet (5.8 to 6.7 m.) alongside, the three easterly ones being public wharves and used for the discharge of lumber, sea food, and produce.

Middle Branch of Patapsco River, also called **Spring Garden Channel,** extends from southward of Fort McHenry westward and northward for a distance of 3 miles. It has been improved by dredging. **Ferry Bar Channel,** marked by a lighted range and buoys, leads westward through the middle of the branch, with a depth of 34 feet (10.3 m.) in May, 1929, for 1 mile. At this point a dredged channel with 35 feet (10.7 m.) leads northwestward to the Western Maryland Railway piers. Ferry Bar Channel continues westward with 29 feet (8.8 m.) depth to Ferry Bar Point, thence 27 feet (8.2 m.) deep through Hanover Street bridge and Old Spring Garden Channel. These channels are all well marked by buoys. Another channel, also well marked, leads from the entrance to Ferry Bar Channel, to the dredged area in front of the Western Maryland Railway piers. It has a controlling depth along the center line of 25 feet (7.6 m.). A dredged channel leads from just above the Hanover Street bridge to the docks in Smith Cove and has a depth of 12 feet (3.6 m.). The principal wharves have depths of 11 to 35 feet (3.3 to 10.7 m.), the deepest draft being found at the Western Maryland Railroad wharves (Port Covington). The channel is used by many barges, large schooners, and steamers.

Directions, Ferry Bar Channel.—Enter between gas buoy No. 3 and buoy No. 2, passing up the channel on a 270° true (W. ⅝ N. mag.) course between the buoys, range ahead, to east of the front range light, then 298° true (NW. ⅞ W. mag.) to the draw span of Hanover Street Bridge, then 316° true (NW. ¾ N. mag.) through Spring Garden Channel, passing close southward of buoy No. 4 to between buoys Nos. 6 and 9, then steer 4° true (N. by E. mag.) through the draw span of the railroad bridge and on to the head of navigation.

To go to the wharves of the Western Maryland Railroad Co., Port Covington, leave Ferry Bar Channel between a horizontally striped buoy and gas buoy No. 6, and steer northwesterly, being guided by the buoys.

Middle Branch is crossed by two bridges. Hanover Street Bridge, ⅜ mile above Ferry Bar Point, has a draw opening 150 feet wide and a headroom of 33 feet at high water. Western Maryland Railroad bridge, 1 mile above Hanover Street Bridge, has a center-pier draw, each opening 83.5 feet wide, with a headroom of 8 feet at high water when closed. The draw of the Hanover Street Bridge will be opened upon notice by 3 blasts of a whistle or horn blown on the vessel at any time between 5 a. m. and 9 p. m. At any other time notice of intention to pass through the draw should be given the superintendent of the bridge by telephone or otherwise, either at the bridge before 9 p. m. or at his residence thereafter.

Anchorage.—Vessels anchoring in Baltimore Harbor are subject to the rules and regulations of the harbor board and the orders of the harbor master.

The quarantine anchorage is on the southwest side of the main channel, opposite the quarantine station at Leading Point. It is 3,500 feet long and 600 feet wide inside of channel limits.

Fort McHenry anchorage is located south of Fort McHenry near the upper end of the main channel and southward thereof. It is 3,500 feet long and 400 feet wide outside of channel limits.

Anchorage No. 1 lies to the northwestward of the American Sugar Refining Co.'s wharf. It is a rectangular area approximately 1,300 feet long and 425 feet wide, covering about 12½ acres, with an available depth of 13 feet (3.9 m.).

Anchorage No. 2 is situated to the southeastward of Hendersons Wharf, Fells Point. It is an irregularly shaped basin, with a maximum length and width of 1,800 feet and 900 feet, respectively, covering an area of approximately 20 acres. A dredged depth of 16 feet (4.8 m.) is maintained over the entire area.

Anchorage No. 3 is located in Canton Hollow, southeast of anchorage No. 2, in front of the piers along Boston and Clinton Streets. It is a triangular basin approximately 2,000 feet along the base, with an extreme width of 2,100 feet, covering about 50 acres. A part of the anchorage extends over the 35-foot (10.7 m.) dredged channel in front of the Clinton Street piers, while a depth of 18 feet (5.5 m.) is maintained over the remaining portion.

These three anchorages lie in sheltered sections of the inner harbor. There is additional good but less-protected anchorage in from 18 to 24 feet (5.5 to 7.3 m.) of water along both sides of the Fort McHenry Channel above Fort Carroll. Vessels using this must keep at least 300 feet from the dredged channel.

General regulations.—The port is open at all hours for the transaction of business. Vessels are usually received between sunrise and sunset, but under extraordinary circumstances they are permitted to enter at other times. The official visits to the vessel are made in the channel opposite quarantine. Following inspection by Public Health Service officials, the vessel is boarded by an officer of customs and an officer of the Immigration Service.

The usual hours for the clearance of vessels are between 9 a. m. and 4.30 p. m., but under extraordinary conditions a vessel will be cleared outside of these hours and on Sundays and holidays. The formal clearance is effected by the collector of customs within office hours, but the vessel is permitted to sail at any time during the day or night.

Quarantine.—The quarantine station is situated at Leading Point, on the west shore of the Patapsco River at the mouth of Curtis Bay, about 7 miles below the center of the city. The station is thoroughly modern and is equipped with hospital facilities for the detention of contagious and infectious disease cases removed from vessels. Service is maintained from sunrise to sunset and is extended to midnight when necessary.

Hospitals.—In addition to the quarantine station, the Public Health Service operates a marine hospital and a dispensary. The former is United States Marine Hospital No. 1 and is located at Remington Avenue and Thirty-first Street, in the northern section of the city about 3 miles from the water front. The dispensary is located in the basement of the customhouse, within a few hundred feet of the Pratt Street piers.

The city of Baltimore is amply provided with public and private hospitals and dispensaries.

Custom Service.—The customhouse is located at the corner of Gay and Lombard Streets, less than 500 feet from the north shore of the basin, where, however, there is but little foreign shipping. The majority of foreign commerce is carried on at Locust Point, Port Covington, Canton, Lower Canton, Curtis Bay, and Sparrows Point, where the principal overseas terminals are situated. The customhouse may be reached from any of these sections by street-railway service.

The customhouse is open from 9 a. m. to 4.30 p. m. on all days but Saturday and Sunday. On Saturday it is open from 9 a. m. until the business of the day is completed, which is usually about 1 p. m. If business demands an extension of these hours for the benefit of the shippers and merchants, it is granted. The working hours established for customs inspectors are from 8 a. m. to 5 p. m. These hours are extended upon request to any time during the night and Sundays and holidays, but extra compensation is charged by the inspector rendering the service.

Dry docks and marine railways.—There are 4 floating dry docks, 2 graving docks, and 12 marine railways at Baltimore, including 2 privately owned railways which are not available for general public use. Both graving docks are owned by the Bethlehem Shipbuilding Corporation. The largest floating dry dock in the harbor is located at Sparrows Point Works of the Bethlehem Shipbuilding Corporation. It is 600 feet long over all and has a lifting capacity of 20,000 tons. There is another floating dry dock at this yard moored alongside of outfitting Pier No. 4, adjacent to the large dry dock.

The 12 marine railways at the port have lifting capacities ranging from 300 tons to 1,800 tons and are equipped to undertake general woodwork, bottom painting, scraping, caulking, and ceiling.

Wrecking and salvaging.—Wrecking and salvaging facilities are limited. Several companies have equipment for this work, but as a general rule it is assigned to other work and is available for duty in wrecking and salvaging only in emergencies.

Railroads.—The Pennsylvania, Baltimore & Ohio, and the Western Maryland Railroad each have several piers. These railroads are interconnected by a municipal belt-line railroad.

Commerce.—A large quantity of ore, petroleum products, and molasses form the bulk of the imports. Exports consist of grain, flour, coal, coke, iron, steel, copper, lumber, tobacco, and petroleum products. Domestic coastwise commerce is large in fertilizers, lumber, sugar, dry goods, petroleum, coal, iron, steel, and canned goods.

Internal commerce with Chesapeake Bay ports consists of heavy shipments of general merchandise, and a large trade in vegetable

food products and animal food products, principally oyster and oyster shells.

Pilots.—Pilotage for the port of Baltimore is compulsory for foreign vessels, vessels from a foreign port, and all vessels sailing under register, except American vessels laden either in whole or in part with coal or coke mined in the United States. Pilotage fees are given on page 102.

Supplies.—All kinds of supplies are obtainable in Baltimore Harbor. Coal in unlimited quantities can be obtained from wharves equipped for rapid coaling or from lighters, and water can be obtained from the wharves or from water boats.

Storm warnings of the United States Weather Bureau are displayed from the American Building and from the Anchorage Building, corner of Broadway and Thames Street.

A United States Branch Hydrographic Office is established at the customhouse. Bulletins are posted here giving information of value to seamen, 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 Superintendent of Lighthouses for the fifth district has offices in the customhouse. Mariners are requested to report direct to him by radio or other prompt means defects or deficiencies in aids to navigation affecting the waters of Chesapeake Bay and tributaries and the outer coast between Cape Henlopen and Cape Henry, described in this volume. Recommendations as to aids to navigation or their improvement may be submitted to him or to the Commissioner of Lighthouses at Washington, D. C. Light List and Buoy Lists of the United States Lighthouse Service may be purchased here.

Ice.—Baltimore Harbor and Patapsco River are frozen over during severe winters, but steamers and ice boats keep the dredged channels open so that vessels assisted by steam can always enter the harbor. The smaller tributaries of Patapsco River are often closed by ice for extended periods. Ice in the main channel is most often met with in the vicinity of Seven Foot Knoll Lighthouse, where ice packs are of frequent occurrence.

Tides.—The mean range of tides is 1.1 feet.

Regulations for passing dredges.—Steamers passing dredges engaged in improving the channels shall not have a speed greater than 6 statute miles an hour, and their propelling machinery shall be stopped when abreast of the dredges.

Vessels drawing less than 12 feet of water must keep outside of the buoys marking the ends of mooring lines of dredges.

Vessels must not anchor on the ranges of stakes or other marks placed for the guidance of dredges, nor in such a manner as to obstruct the channel for other vessels.

Dredges and operating plant in the prosecution of the work must not obstruct any part of the channel unnecessarily.

Vessels must not run over or disturb stakes or other marks placed for the guidance of dredges.

The position of breast and stern anchors of the dredges shall be marked by buoys plainly visible to passing vessels.

While vessels are passing the dredges in the channel all lines running across the channel from the dredges on the passing side must be entirely slacked.

Speed regulations.—No vessel shall move in the harbor at a greater rate of speed than 7 nautical miles an hour westward of a line from Hendersons Wharf (Fells Point) to the foot of Hull Street (Locust Point), and 9 nautical miles an hour eastward of said line, and no vessel shall move in the Patapsco River or tributaries within a distance of 300 feet from any pier or bulkhead at a greater rate of speed than 8 nautical miles an hour.

EASTERN SHORE, CAPE CHARLES TO CHESCONESSEX CREEK

[Charts 1222 and 1223]

The eastern side of Chesapeake Bay from the entrance northward to the south end of Pocomoke Sound is indented by numerous small creeks, most of them obstructed by bars at the entrances. The creeks are frequented by many small craft engaged in oystering and fishing and the transportation of produce, and a few of them by passenger steamers engaged in the bay trade. Strangers seldom enter except in small boats. The shore is low and without prominent natural landmarks except Butlers Bluff, about midway between Fisherman Island and Old Plantation Flats Lighthouse, which shows bare, bluff faces when viewed from the bay. Cape Charles, Harborton, and Onancock are the principal towns, and there are numerous other post villages and landings. Fish weirs are numerous in season but are prohibited in water more than 18 feet (5.5 m.) in depth.

Fish-trap limits are shown on Charts 1222 and 1223.

The whole of the northern point of the entrance to Chesapeake Bay is generally known as **Cape Charles.** It includes Smith Island, Fisherman Island, The Isaacs, and the south point of the mainland.

Smith Island and **Cape Charles Lighthouse** are described under "Coast from Cape Henlopen to Cape Charles," on pages 86 and 87.

Fisherman Island is low. Several low buildings and a flagstaff are on the northwest side. A flashing white light is exhibited from the end of the wharf.

The Isaacs is a bare, marshy island.

The south point of the mainland is low and bare on the extreme south end but high and wooded back of the point.

Fisherman Inlet is described under "Inside waters, Cape Henlopen to Cape Charles," on page 100.

Old Plantation Creek, 2½ miles southward of the town of Cape Charles and 1½ miles eastward of Old Plantation Flats Lighthouse (fixed white), has a depth of 1½ feet (0.5 m.) across the bar at the entrance and for a distance of 2 miles above, and is frequented by local boats of 3½ feet (1 m.) draft at high water. The channel is narrow, and there are many bars and middle grounds, which usually show discolored. It is usually marked by bush stakes, but is difficult without local knowledge. The best water across the flats is about ⅜ mile southward of the mouth. The opening in the thick woods at the mouth and a shanty on an island inside the mouth are the only marks visible from outside.

Cherrystone Inlet, on the eastern side of Chesapeake Bay 9 miles northward of Fisherman Island, is the approach to the town of Cape Charles and to several small creeks farther north. It is marked by **Old Plantation Flats Lighthouse** (white house on piles) and by several other lights and buoys. The mean range of tides is 2.3 feet.

A channel 16 feet (4.8 m.) deep and 200 feet wide, marked by a lighted range, has been dredged across the bar a little northward of Old Plantation Flats Lighthouse, and northward along Cherrystone Inlet to the entrance of Cape Charles Harbor. The channel is exposed to westerly winds but is partially protected by the flats westward and is seldom too rough for entrance by motor boats. Owing to the limited space in the channel and harbor small boats are sometimes exposed to injury by the steamers and tows. The tidal currents set across the entrance to the channel south of the entrance to Cape Charles Harbor, but follow the general direction of the channel above. Ice does not interfere with navigation.

Cape Charles is the terminus of the New York, Philadelphia & Norfolk Railroad and is connected with Old Point Comfort and Norfolk by passenger steamers. It has a large trade carried in steamers, car floats, and barges, mostly between Cape Charles and Norfolk, and is also an important shipping point for sea food and produce brought here in motor boats and small vessels. Gasoline and provisions are obtainable, and there is water on the wharf.

Cape Charles Harbor is an artificially dredged basin, 300 yards long and 200 yards wide, on the south side of the town. A jetty extends 1,600 feet westward from the north side of the entrance. The harbor is owned by the railroad company, but is open to general navigation. In 1929 the harbor was redredged, and had a depth of 17 feet (5.1 m.) in the entrance and 18 feet (5.5 m.) in the harbor, except in the immediate approaches to the car-ferry slips.

Steamers and small boats load and discharge at the wharf on the north side, and motor boats make fast to the bulkhead on the south side and at the eastern end. Small craft seeking shelter in the harbor should anchor so as not to interfere with the steamers, tugs, and barges of the railroad company.

Cherrystone Inlet has a depth of 8 feet (2.4 m.) for 3 miles above the entrance of Cape Charles Harbor, above which the depths are 2 to 4 feet (0.6 to 1.2 m.). It is used by fish steamers up to 10 feet (3 m.) draft as far as the fish factory on **Cherrystone Island** and by local oyster and produce boats above, their draft seldom exceeding 6 feet (1.8 m.). The channel is marked by beacons to Cherrystone Island, and is sometimes marked by bush stakes above, but the channel is narrow and difficult without local knowledge. Boats of 3 feet (0.9 m.) draft can cross the bar at low water into Cherrystone Inlet anywhere between the outer end of the north jetty at Cape Charles Harbor and Cherrystone Island, but the bar between Cherrystone Island and **Wescott Point** is often bare at low water.

Kings Creek, east-southeastward of Cherrystone Island, has a depth of 3½ feet (1 m.) across the bar at the mouth and for 1 mile above, and is frequented by boats of 2 to 5 feet (0.6 to 1.5 m.) draft. There is a long wharf with a house on the end on the south point at the entrance, and an incompleted bridge just inside, with a single clear opening 22 feet wide. There is a shoal, bare at low water and

sometimes marked by bush stakes, on the north side outside the entrance. The best water in entering leads from Cherrystone Island southeastward to within 300 yards of shore, then northeastward close along the end of the wharf on the south side, and then favors the north side to the opening in the bridge. There is a railway on the creek capable of hauling out boats of 40 feet length and 4 feet (1.2 m.) draft.

Directions, Cherrystone Inlet.—Cherrystone Inlet can be entered from southward, 2 miles below Old Plantation Flats Lighthouse, with a depth of 16 feet (4.8 m.); from westward through the dredged channel north of the lighthouse with the same depth, and across the bar anywhere between Old Plantation Flats Lighthouse and a point ½ mile northward in depths of 12 feet (3.6 m.).

The dredged channel across the bar is marked by a lighted range and has a 55° true (NE. by E. ⅜ E. mag.) trend, leading 520 yards northwestward of Old Plantation Flats Lighthouse. Having crossed the bar on the range, steer 19° true (NNE. ¼ E. mag.) for the flashing white light (red structure) on the south side of the entrance to Cape Charles Harbor in range with the white light on a post with slatted daymark on the middle of the north jetty. This course leads westward of a red buoy, 180 yards eastward of a black bell buoy, and to a position 120 yards eastward of Cherrystone Bar Light (skeleton tower, fog bell). Then steer 6° true (N. by E. mag.), passing eastward of a white light on a black pile structure (No. 1) and midway between the light (red structure) on the east side, and the light (single pile with black daymark No. 3) on the west side, just southward of the end of the north jetty. Then turn eastward for the entrance to the harbor, passing midway between the light on the end of the north jetty (fog bell) and the red buoy southward. Pass 70 yards southward of the light near the inner end of the north jetty and enter the harbor in mid-channel.

Hungers Creek, on the eastern side of Chesapeake Bay 8 miles northward of Cape Charles, has a depth of about 4 feet (1.2 m.) in a narrow channel for 2 miles above the mouth. It is entered through a narrow channel which commences in front of a large red-roofed house 2½ miles southward of the mouth of the creek, and follows close along the eastern shore to the mouth. There is a shoal, bare in places at low water, along the western side of the channel. The channel is usually marked by bush stakes but requires local knowledge. The flats are covered by marsh grass in summer. The creek has no wharves, but there are several landings from which produce is shipped in boats of 2 to 5 feet (0.6 to 1.5 m.) draft.

The Gulf, emptying into the channel leading to Hungers Creek, has a depth of about 1 foot (0.3 m.) to near the head and is little used. There are no wharves.

Mattawoman Creek, emptying into Hungers Creek from eastward, has a depth of about 4 feet (1.2 m.) for 1 mile in a narrow crooked channel and 2 feet (0.6 m.) to the head of navigation. The best water in entering lies close along the eastern shore, northward and eastward of an island marked by two shanties.

Nasawaddox Creek, on the eastern side of Chesapeake Bay 12½ miles northward of the town of Cape Charles, has a depth of 4 feet

(1.2 m.) across the bar at the entrance and deeper water inside for several miles. The channel at the mouth is marked by an entrance buoy. The channel above the entrance is narrow and unmarked, the flats on each side are nearly bare at low water, are covered by marsh grass in summer, and are usually well defined. The creek is frequented by local craft of 5 feet (1.5 m.) or less draft. The landings are **Bayford,** 1½ miles above the entrance, and **James** and **Stewarts Wharves,** on opposite sides of the creek 4 miles above the entrance. There is a depth of 4 feet (1.2 m.) to the upper wharves. There is a store and post office at Bayford and gasoline is obtainable. The mean range of tides is 1.8 feet.

Church Creek, on the south side of Nasawaddox Creek, has a depth of about 2 feet (0.6 m.) to the head and is little used.

Warehouse Creek, on the south side of Nasawaddox Creek, has a depth of 3 feet (0.9 m.) to within 1 mile of the post village of **Franktown.** The best water leads close around the point on the east side at the entrance.

Occohannock Creek, on the eastern side of Chesapeake Bay 18 miles above the town of Cape Charles, has a depth of 6 feet (1.8 m.) across the bar at the entrance, 6 feet (1.8 m.) inside to **Shields Wharf** and post office 5½ miles above the entrance, and 3 feet (0.9 m.) for a farther distance of ½ mile to a fixed bridge. Steamers from Baltimore drawing 5 to 7 feet (1.5 to 2.1 m.) make regular trips to three wharves in the creek, and they are the deepest draft entering. The channel across the bar at the mouth is marked by buoys and bush stakes, but is narrow and changeable, and difficult without local knowledge. The channel above the entrance is also narrow and difficult, but the ends of the shoals are marked by buoys to near Concord Wharf. There is a store and post office at **Concord Wharf,** on the south side 2 miles above the entrance, and a post office and store at **Davis Wharf,** on the north side 4 miles above the entrance; gasoline is obtainable here, and there is artesian water on the wharf. **Morley Wharf** is directly opposite. In approaching the creek a bell buoy and a clump of trees on the north side standing well away from the main woods are the only aids. There is a grassy islet on the north side, just outside the mouth. The mean range of tides is 1.8 feet.

Craddock Creek, just northward of Occohannock Creek, has a depth of 3 feet (0.9 m.) across the flats at the entrance and 4 or 5 feet (1.2 to 1.5 m.) inside to near the head. The best water lies along the south shore in approaching the entrance and along the north side of the creek in entering, then in mid-channel to the head. There are no commercial wharves.

Nandua Creek, on the eastern side of Chesapeake Bay, 9 miles southward of Watts Island Lighthouse, has a depth of 8 feet (2.4 m.) in a dredged channel across the flats at the mouth, the same depth in a natural channel to **Cedar View Wharf,** 2¾ miles above, and 6 feet (1.8 m.) to the post village of **Nandua,** 4 miles above the mouth. It is navigable for a farther distance of 1 mile, but is shoal and little used. Steamers from Baltimore of 5½ to 7 feet (1.6 to 2.1 m.) draft make regular landings at Cedar View Wharf and Nandua. The channel across the flats at the entrance is narrow and shifting and is marked by buoys, and by bush stakes maintained by the steamboat company. The flats usually show discolored water. The bend in

the channel westward of Cedar View Wharf and the approach to Nandua Wharf are also generally marked by bush stakes. There is a store at Nandua at which some provisions are obtainable. The only aids in approaching the entrance are a bell buoy, and a prominent clump of pine trees standing clear on the south side. The mean range of tides is 1.7 feet. In entering, strangers should be guided by the buoys and bush stakes, but local knowledge is required to carry the best water.

Butchers Creek, 2 miles northward of Nandua Creek, has a depth of 2 feet (0.6 m.) at the entrance and deeper water inside. There are no wharves, and the creek is little used.

Pungoteague Creek, on the eastern side of Chesapeake Bay, 7 miles southward of Watts Island Lighthouse, has a depth of 10 feet (3 m.) to the town of **Harborton,** 4 miles above the mouth, and 7 feet (2.1 m.) to **Boggs Wharf,** 5 miles above the mouth, above which it shoals rapidly. Steamers from Baltimore of 6 to 8 feet (1.8 to 2.4 m.) draft make regular trips to these landings and to **Evans Wharf,** on the north side ½ mile eastward of Harborton. There is a fish factory at Harborton, to which steamers of 10 feet (3 m.) draft go. Gasoline and provisions are obtainable at Harborton. The channel as far as Harborton is crooked, but is well marked by buoys and lights. Posts, upon which lights are maintained during the fishing season, are maintained by the fish factory owners in places. The mean range of tides is 1.7 feet.

The best water in approaching the entrance is from southwestward, eastward of the black bell buoy off the mouth of Nandua Creek, but a depth of 7 feet (2.1 m.) can be carried across the flats at the mouth, heading for **Pungoteague Creek Light** (flashing white), black cylindrical tower, on any course eastward of 130° true (SE. mag.).

In entering, pass 200 yards southward and eastward of Pungoteague Creek Light and steer northeastward for **Hack Neck Shoal Light** (red pile structure), passing 100 yards westward and northward of it. Then steer eastward, passing southward of a black buoy; then steer 65° true (E. by N. ⅝ N. mag.) to leave red buoy No. 8 a little on the starboard hand; then steer eastward for ½ mile. Then steer 105° true (ESE. ⅛ E. mag.) for ⅝ mile, passing close southward of the next buoy. The course then leads 75° true (E. ¾ N. mag.) for ⅜ mile, passing close northward of the next buoy, and then follows a general mid-channel course to Harborton. The channel between Harborton and Boggs Wharf is marked by bush stakes, but is narrow and difficult without local knowledge.

There is a depth of about 4 feet (1.2 m.) at high water from Pungoteague Creek to Onancock Creek, close along shore eastward of the marshy islands between them, but the channel is difficult without local knowledge.

Onancock Creek, on the eastern side of Chesapeake Bay 4 miles 149° true (SSE. ¼ E. mag.) from Watts Island Lighthouse, has a depth of 10 feet (3 m.) to the town of **Onancock,** at the head of navigation 5½ miles above the mouth. Steamers from Baltimore drawing 7 feet (2.1 m.) make regular trips to Onancock, and to **Finneys Wharf,** on the south side, and **Poplar Cove Wharf,** on the north side, 1 and 2¼ miles, respectively, below Onancock. Finneys wharf is on the eastern side of a point having a shoal making northward

from it and must be approached from eastward. Gasoline and provisions are obtainable at Onancock. The mean range of tides is 1.7 feet.

Directions, Onancock Creek.—The channel across the flats at the entrance had a depth of 11 feet (3.3 m.) in 1927. The creek is marked by a bell buoy, a light (flashing white), buoys, and beacons. The channel leads from close southward of the light in an east-southeasterly direction, passing south of a black buoy, north of buoy No. 2A., thence southeasterly, passing south of beacon No. 5, thence east-northeasterly in a broad stretch of the creek at the end of which the channel becomes narrow and makes a sharp turn. The beacons are so close together and numerous here that strangers should proceed slowly to avoid being confused. Above here the beacons are easily followed to the wharves at Onancock.

Chesconessex Creek, 3½ miles 118° true (SE. by E. mag.) from Watts Island Lighthouse, has a depth of 12 feet (3.6 m.) to south of **Tobacco Island,** 5 feet (1.5 m.) for a farther distance of 1 mile to the village of **Chesconessex,** and 2 to 3 feet (0.6 to 0.9 m.) for ¾ mile above Chesconessex. The creek is frequented by many small local boats and an occasional schooner up to 7 feet (2.1 m.) draft to Chesconessex.

The channel has ample width at the entrance, gradually contracting to a narrow slough at Chesconessex, and has extensive flats on each side. The entrance is marked by buoys, and the channel above is sometimes marked by bush stakes at the turn, but is difficult without local knowledge. Strangers should be guided by the chart and the aids. Some provisions are obtainable at Chesconessex. The mean range of tides is 1.7 feet.

Pompco Creek, on the north side of Chesconessex Creek, northwestward of Tobacco Island, has a depth of 6 feet (1.8 m.) for 2 miles above its junction with Chesconessex Creek; it has no wharves, and is frequented only by small local boats. A draft of 3 feet (0.9 m.) at high water can be taken from the head around the eastern side of Tobacco Island into Chesconessex Creek.

POCOMOKE SOUND

[Charts 1223 and 1224]

is on the eastern side of Chesapeake Bay, 48 miles northward of the entrance. Extensive flats occupy most of the sound, though a channel, wide and deep at the south end and shoal at the north end, leads from southward to the entrance of Pocomoke River, the most important tributary. The sound is separated from Tangier Sound on the western side by a string of marshy islands and large shoals, marked near their southern end by **Watts Island Lighthouse** (flashing white), white cylindrical tower. The shores of the sound are low, and there are no prominent natural landmarks. The most prominent shoals along the main channel are marked by buoys from the entrance to the mouth of Pocomoke River. The boundary between Maryland and Virginia is indicated by a line of white buoys. The sound is frequented by many local oyster and fishing boats, by steamers from Baltimore, and by a few schooners and barges, the deepest draft being 9 feet (2.7 m.). Small boats can enter through Broad Creek. The mean range of tides is about 2 feet.

Watts Island is marshy and sparsely wooded and has no prominent marks. The channel through the flats northward of it has a depth of 3 feet (0.9 m.) and is sometimes marked by bush stakes, but is difficult without local knowledge. Watts Island lighthouse is on an islet, with conspicuous trees, just southward of the island.

Little Fox Island consists of a group of bare, marshy islands. Great Thoroughfare, northward of Little Fox Island, has a least depth of 4 feet (1.2 m.) at high water and is sometimes used by local boats, but is difficult without local knowledge.

Great Fox Island is low and marked by a single prominent poplar tree. There is a group of small red oyster houses on the eastern side.

Cedar Straits, northward of Great Fox Island, has a depth of 3½ feet (1 m.) at high water through a narrow unmarked channel, and is little used even by local boats.

Deep Creek is a shallow, unimportant creek on the southeast side of Pocomoke Sound. The main entrance between the shoals is 3½ miles east-northeastward of Watts Island Lighthouse. It has a depth of 7 feet (2.1 m.) for 5 miles above the main channel of Pocomoke Sound to the mouth of the creek, through a crooked channel with extensive flats on each side, and 2 feet (0.6 m.) to the head of the creek. There are no wharves, and it is used only by small local boats, many of which come from Hunting Creek through the **Notch,** good for a draft of 3 feet (0.9 m.) at high water. The channel is marked by a flashing white light at the entrance and by buoys for 5 miles above.

Hunting Creek, on the southeast side of Pocomoke Sound, has a depth of 7 feet (2.1 m.) to the mouth of **Bagwell Creek,** 2 miles above the mouth, and 4 feet (1.2 m.) to the wharf at the post village of **Hopkins,** on the southern branch. It is frequented by many small local boats and a few schooners, the deepest draft being 7 feet (2.1 m.). The approach to the creek from the main channel of Pocomoke Sound leads eastward along the south side of **Guildford Flats** for 3½ miles, then southward for 1½ miles to the mouth, and is marked by Guildford Flats light (flashing white) and several buoys.

In entering, approach the light on a northeasterly course to avoid a 6-foot (1.8 m.) spot ¼ mile westward of it, pass ¼ mile southward of the light and steer 82° true (E. ⅛ N. mag.) for 1⅝ miles until ⅜ mile past buoy No. 1, then steer 158° true (S. by E. ⅜ E. mag.) for 1¾ miles to the buoys at the entrance. Above the entrance the mid-channel is clear for about 1 mile, above which it is narrow and is usually marked by posts with arms or by bush stakes, but is difficult without local knowledge.

Guildford Creek is 2½ miles northeastward of the mouth of Hunting Creek, with which it has a common approach from the main channel of Pocomoke Sound. There is a depth of 7 feet (2.1 m.) to the entrance and 2 to 5 feet (0.6 to 1.5 m.) inside. There are no wharves, and it is frequented only by local boats of 2 to 4 feet (0.6 to 1.2 m.) draft. The channel is marked by a buoy at the entrance and sometimes by bush stakes above.

Messongo Creek, on the eastern side of Pocomoke Sound, southward of Saxis Island, has a depth of 6 feet (1.8 m.) for 5 miles above its junction with the main channel of Pocomoke Sound, shoaling gradually to about 1 foot (0.3 m.) at the village of **Marsh Market,**

2½ miles above. The creek is frequented only by small local boats. It is marked by buoys at the entrance. To enter, pass ½ mile north-northwestward of Guildford Flats Light and steer 53° true (NE. by E. ¼ E. mag.) for 3 miles to the first buoy. Above the buoys the mid-channel is clear to the head.

A draft of 2½ to 3 feet (0.7 to 0.9 m.) at high water can be taken from the mouth of Messongo Creek, northwestward through **Starling Creek** to the south end of the village of Saxis, and many local boats frequently use this passage. The cove at the northwest end of Starling Creek has a depth of 1 to 2 feet (0.3 to 0.6 m.) and is much used as an anchorage by small boats.

Saxis, a village on **Saxis Island,** at the northeast end of Pocomoke Sound, is the center of a considerable oystering and fishing industry. There is a wharf on the western side of the town which can be reached only at near high water. Gasoline and provisions are obtainable.

Pocomoke River, at the northeast end of Pocomoke Sound, has a depth of 4½ feet (1.3 m.) across the flats at the mouth (called the **Muds**), though the bottom is very soft and vessels run with their keels 1 to 1½ feet (0.3 to 0.4 m.) in the mud. The river is navigable for vessels to the town of Snow Hill, 25 miles above the mouth. After passing the "Muds" the channel has ample depth and width and is easy of navigation for a distance of 20 miles, above which it has been improved by dredging to a present depth of 8 feet (2.4 m.) and width of 100 to 130 feet as far as Snow Hill, with several cut-offs. The channel in the upper end is unmarked, is narrow and crooked, and some local knowledge is required to carry the best water. The water is fresh above Rehoboth and can be used in boilers.

The mean range of tides is about 2.2 feet at the entrance, 2.8 feet at Pocomoke City, and 3 feet at Snow Hill, but is considerably affected by the winds. Freshets cause a rise of 1 to 5 feet (0.3 to 1.5 m.) at Snow Hill but are not dangerous.

Shelltown is a post village on the west bank of Pocomoke River, 2 miles above Williams Point. There is a store and gasoline is obtainable.

Rehoboth is a post village on the west bank, 9 miles above the entrance.

Pocomoke City is a town with railroad communication, 17 miles above the mouth. All kinds of supplies are obtainable, and there is a railway capable of hauling out vessels of 200 tons, 125 feet length, and 7 feet (2.1 m.) draft. Three bridges cross the river at this point. Two are swing and the other a bascule bridge. The least width of opening is 61 feet. The best water leads through the western openings of the swing spans.

Snow Hill is a town with railroad communication. A fixed bridge having a headroom of 4 feet at high water crosses the river just above the wharves, and the river is navigable for 2 miles above for boats that can pass under the bridge.

Marumsco Creek, at the northern end of Pocomoke Sound, 2½ miles north-northeastward of Saxis Pier, has a depth of 2 feet (0.6 m.) for 1 mile above the mouth and is little used.

East Creek, 2½ miles northward of Saxis, has a depth of 1 to 2 feet (0.3 to 0.6 m.) and is little used.

Apes Hole Creek, 4 miles west-northwestward of Saxis, has a depth of 2 feet (0.6 m.) to the head. There are small wharves on the northwest side at which small boats from the north end of Pocomoke Sound make landings for Crisfield, 2 miles northwestward.

Broad Creek, a crooked thoroughfare connecting the north end of Pocomoke Sound with Little Annemessex River, has a depth of 5½ feet (1.6 m.) in a dredged channel and is extensively used by local boats. There is an oyster house on the east side at the southern entrance and one in mid-channel just inside the entrance. There is a light at each entrance.

Directions, Pocomoke Sound and River

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color white unless otherwise indicated]

	Course		Distance, nautical miles
	True	Magnetic	
	°	*Points*	
1. From southward, steer for Watts Island Light (Fl.) to position 0.6 mile west-northwest of buoy No. 2A.	27	NE. by N	
From northward, keep south of the shoals and fish trap limits and direct course to enter the sound between buoys Nos. 1 and 2A.			
2. To 0.8 mile, 120° true, from buoy No. 3	60	ENE	3.2
3. To 0.6 mile, 54° true, from buoy No. 5, passing 0.2 mile west of Beach Island Shoal Light (Fl.).	25	NNE. ⅞ E	5.0
If bound for Guildford or Hunting Creeks, leave course 3 when south-southeastward of buoy No. 5 and steer toward Guildford Flats Light (Fl.) following directions on page 205. If bound for Messongo Creek, steer 54° true (NE. by E. ⅜ E. mag.) from the end of course 3, to the entrance buoys.			
4. To 0.3 mile northwest of Tunnel Island Spit Light (Fl.).	2	N. ¾ E	2.7
5. To 0.5 mile southeast of white buoy No. C.	37	NE. ⅛ N	2.4
6. To 0.2 mile southeast of buoy No. 9, off Saxis.	58	NE. by E. ¾ E.	3.0
7. To Pocomoke River Light (F.)	48	NE. ⅞ E	1.6
8. To 0.2 mile north-northwest of buoy No. 8, light astern.	91	E. ¾ S	1.7
9. To buoy No. 11	128	SE	0.7
10. To buoy No. 13	47	NE. ¾ E	0.6
From this position follow the west bank at a distance of 200 yards for ⅜ mile until up with a white house, then gradually work off to mid-channel. The mid-channel is clear to within 5 miles of Snow Hill.			

TANGIER SOUND

[Charts 1223 and 1224]

on the eastern side of Chesapeake Bay, with its southern entrance about 48 miles above the entrance to the bay, is 30 miles long and 3 to 5 miles wide. It forms the approach to several important tributaries and is frequented by bay steamers and schooners, the deepest draft being 12 feet (3.6 m.) and usual draft 6 to 8 feet (1.8 to 2.4 m.). It is also frequented by a large number of boats engaged in the oystering and fishing industry. The sound is separated from Chesapeake Bay by a row of marshy islands and flats, through which several thoroughfares lead.

The main entrance is from southward and is marked by **Tangier Sound Lighthouse** (fixed white), white house on piles, and Watts Island Lighthouse (white tower). A broad and deep channel leads from the south end to the tributaries at the north end. It is bordered by extensive flats, but the most prominent dangers are marked by buoys and lights, and the channel is easily followed by day with the aid of the charts. In the tributaries local knowledge or a pilot is necessary. The sound is also entered by vessels through Hooper and Kedges Straits and by small boats from Pocomoke Sound through Broad Creek and Little Annemessex River.

The islands and thoroughfares on the east side from Watts Island northward to Cedar Straits, are described under "Pocomoke Sound."

Tangier Island is low, sparsely wooded in the center, and bare on the north and south ends. A church spire near the center is prominent. There is a village **(Tangier post office)** in the center of the island and several smaller settlements, all composed of people engaged in oystering and fishing. Steamers from Baltimore make landings at a detached pier in the center of the cove at the south end of the island, with which there is communication with the shore by small boats. Just northward of the pier are the ruins of a long wharf.

There is a depth of 7 feet (2.1 m.) at the pier and this depth can be carried to it from anywhere eastward. The usual landing for small boats is on the southwest side of the cove near the center of the island, westward of the large island on the east side. A channel 5 feet (1.5 m.) deep and 50 feet wide has been dredged from Tangier Sound through the cove to Tangier. It had a depth of 4½ feet (1.3 m.) in the summer of 1929.

It is entered from northward between Horseshoe Islet and a crab house 400 yards westward and leads to an anchorage basin 400 feet square in front of the town. The channel is marked by bush stakes, maintained by private parties, and lighted beacons. Gasoline, Diesel oil, and provisions are obtainable, and there is communication with Crisfield by motor boat and steamer. Near the southern point of the island there is a fish factory and wharf.

The flats between Tangier Island and Smith Island are usually bare at low water, and there is no thoroughfare through them except for small boats at high water.

Smith Island is the name applied to a large group of marshy islands separated by narrow thoroughfares; none of the islands are

connected by bridges, and travel is entirely by boat. **Tylerton, Ewall,** and **Rhodes Point** are three small post villages on the island, all on the interior channels. All of the people are engaged in the oystering and fishing industry. There are stores at all of the villages, and gasoline is obtainable.

A draft of 5 feet (1.5 m.) at low water can be carried from Tangier Sound to Tylerton from southward. The best water leads across the flats about 1⅞ miles southward of **Horse Hammock Point** (marked by two shanties). In entering, head for **Herring Island** (marked by three shanties) on a west-southwesterly course until ½ mile from it, then follow the slough northward along Tylers Creek to Tylerton. The channel is sometimes marked by bush stakes, but is difficult without local knowledge.

A channel has also been dredged 4 feet (1.2 m.) deep and 25 feet wide from Tangier Sound through **Big Thoroughfare** and **Tylers Ditch** to Tylerton. It is marked by a light and usually by bush stakes but is difficult to follow without local knowledge. There are several thoroughfares, navigable by small boats at high water, leading from the interior of Smith Island westward into Chesapeake Bay. The principal entrance is marked by a light, but local knowledge is necessary to follow them.

Little Annemessex River, on the eastern side of Tangier Sound, 13 miles northward of the entrance, is the approach to the town of **Crisfield,** a railroad terminus and important shipping point for sea food. It is frequented by a large number of boats of 2 to 6 feet (0.6 to 1.8 m.) draft engaged in the oystering and fishing industry, by steamers from Baltimore drawing 6 to 8 feet (1.8 to 2.4 m.) and by some schooners, the deepest draft being 12 feet (3.6 m.). A channel has been dredged 12 feet (3.6 m.) deep and 425 feet wide from the entrance to Somers Cove Lighthouse, and the same depth and 266 feet wide to the steamboat wharf. A basin with a depth of 12 feet (3.6 m.) lies off the wharves, and there is a channel 100 feet wide and 10 feet (3 m.) deep from there to the docks on the northwest side of the town. The channel is marked by lights and buoys and is easily followed.

Janes Island Lighthouse (fixed white), at the entrance, is a white house on piles. A fish factory and stack on the north point at the entrance, and the ice plant and other buildings on the water front are prominent. Gasoline, Diesel oil, fuel oil, ice, water, and provisions are obtainable. The mean range of tides is 1.9 feet.

There is a marine railway at Crisfield capable of hauling out vessels of 125 tons, 6 feet (1.8 m.) draft, and 100 feet length, and there is a machine shop for ordinary repairs to motors.

Anchorage at Crisfield can be had in a depth of 12 feet (3.6 m.) in the anchorage basin, the western limit being 150 yards westward of the end of the steamboat wharf and 120 yards westward of the end of the ice factory wharf (marked by triple stacks). Small boats make fast to the wharves or anchor anywhere outside the channel. There are depths of 7 to 12 feet (2.1 to 3.6 m.) in the cove on the south side of the steamboat wharf and 4 to 8 feet (1.2 to 2.4 m.) in the basin eastward of the drawbridge at the eastern end of the cove, which is considerably used as an anchorage. The bridge has a draw opening 24 feet wide. The river above the wharves at Crisfield, out-

side of the 100-foot wide dredged channel, has a depth of 2 to 5 feet (0.6 to 1.5 m.) and is used only as an anchorage for small craft.

Big Annemessex River, on the eastern side of Tangier Sound, 5 miles northward of Janes Island Lighthouse, has a depth of 8 feet (2.4 m.) for 5½ miles above the mouth and 4 feet (1.2 m.) for a farther distance of 2 miles, above which it is shoal. The river is frequented by small oyster and fishing boats and some schooners, the deepest draft being 8 feet (2.4 m.). The mean range of tides is about 2 feet. **Fords Wharf** is on the north side, at the foot of a road 1½ miles from the post village of **Fairmont.** A depth of 6 feet (1.8 m.) can be taken to it. Two white buildings on the wharf are prominent. There is a wharf and some oyster and crab packing houses on the south side of **Jones Creek,** and a small village (**Colburn Landing**) on the east side of **Colburn Creek,** where there is a store and gasoline is obtainable.

The entrance to Big Annemessex River is marked by a light (flashing white) on the north side and by buoys. Shoals make off for a long distance from many of the points, but are marked by buoys as far as **Long Point.**

To enter, pass ⅜ mile southward of the light and steer 90° true (E. ½ S. mag.) for ¾ mile to a position midway between buoys Nos. 1 and 2, then steer 77° true (E. ⅝ N. mag.) for 2¼ miles until the white buildings on Fords Wharf bear north-northwestward, distant ½ to ¾ mile, then bring them astern on a south-southeasterly course and be guided by the chart, and the buoys.

Manokin River, on the eastern side of Tangier Sound, 17 miles northward of Tangier Sound Lighthouse and eastward of Kedges Straits, is navigable to **Princess Anne,** a town on the railroad, 14 miles above the main channel of Tangier Sound. There are several small villages and landings in the tributaries in the lower end, and this part is frequented by many local fishing and oyster boats. The upper end has some trade in small boats and schooners, the deepest draft being 7 feet (2.1 m.). The mean range of tides is about 2.5 feet.

The entrance is broad, but is obstructed by extensive shoals. The main channel, entering along the southeast side, is narrow and crooked and has ample depth at the entrance, gradually shoaling to 7 feet (2.1 m.) at **Locust Point,** 9 miles above. It is well marked by buoys and beacons to within 3 miles of Locust Point. For a distance of 2 miles above Locust Point a channel 6 feet (1.8 m.) deep and 100 feet wide has been dredged, but is subject to considerable shoaling. The dredged channel is sometimes marked by bush stakes, but leads between mud flats nearly bare at low water and is difficult to follow without local knowledge. From the upper end of the dredged channel the river has a depth of 5 feet (1.5 m.) or more in mid-channel to **Dashiells Wharf,** ¾ mile below Princess Anne, above which it is shoal.

Inverness is a post village on the south side of Manokin River between **Broad** and **Wolf Trap Creeks. Champ** is a post village a little northward of Locust Point.

Little Island Channel, entering Manokin River along the northwest side, has ample depth, but a middle ground having a depth of 5 feet (1.5 m.) must be crossed to reach the main channel of

Manokin River. It is buoyed but is narrow and crooked, and difficult without local knowledge.

Little Island is low. There are oysterhouses and a lighted range on the north end. A clubhouse on the western side, just south of the range, is also prominent.

Deal Island, on the eastern side of Tangier Sound between Manokin and Wicomico Rivers, is the center of a considerable oystering and fishing industry. Deal Island at the north end and **Wenona** at the south end are post villages. Steamers from Baltimore make landings at a long wharf at the north end, which has a depth of 8 feet (2.4 m.) at the end. The flats between the end of the wharf and the main channel of Tangier Sound have depth of 10 to 14 feet (3 to 4.2 m.) and are used as an anchorage by small local vessels. A fixed red light marks the western extremity of the 6-foot (1.8 m.) curve northwestward of the wharf. The island is connected with the mainland by a fixed bridge. Gasoline and provisions are obtainable at Wenona or Deal Island.

Lower Thoroughfare, between Little Island and the south end of Deal Island, has been improved by dredging a channel 80 feet wide, with a present depth of 5 feet (1.5 m.), from westward to the wharf at Wenona, widened to 180 feet in the upper ¼ mile to form an anchorage. From the entrance buoy the channel leads to buoy No. 3, on a lighted range ahead, both lights fixed red, course 80° true (E. ⅜ N. mag.), then east-northeastward toward the north end of Little Island until 180 yards from it, and then northward with the wharf a little on the port bow. There is a depth of 1 foot (0.3 m.) around the northeast end of **Little Island.**

Laws Thoroughfare, between Deal Island and the mainland has a depth of 2 feet (0.6 m.) from southward as far as the cove eastward of the northern end of the island, but navigation from northward is obstructed by a fixed bridge having a headroom of 3 feet (0.9 m.) at high water and a depth underneath it of 1 foot (0.3 m.) at low water.

Kedges Straits is described under a separate heading on page 216.

South Marsh, on the north side of Kedges Straits, is a low marsh with scattered clumps of trees and no buildings except a few oysterhouses.

Holland Island is low and sparsely wooded and has a prominent church spire. There is a village on the island composed entirely of oystermen and fishermen. The small wharves on the eastern side can be reached through Holland Straits. There are stores, but supplies are usually obtained from Deal Island, with which there is communication by motor boat.

Holland Straits, leading between Holland and Bloodworth Islands on the west and north and South Marsh on the south, is seldom used all of the way through, but is considerably used by local oyster and fishing boats from both ends as far as Holland Island. The usual draft using it is 2 to 5 feet (0.6 to 1.5 m.) and the deepest draft 8 feet (2.4 m.) It has a depth of 11 feet (3.3 m.) from southward to abreast Holland Island and 4 feet (1.2 m.) from Holland Island northward and eastward into Tangier Sound. The channel is narrow in places and unmarked, and is difficult without local

knowledge. **Spring Island** is low and marked by a shanty and a single tree on the north end.

Bloodworth Island is a marsh with scattered clumps of trees and has a few oyster and crab houses on the eastern side. There are no prominent marks. The waters surrounding it are frequented by many small local boats.

Wicomico River, emptying into the northeast end of Tangier Sound, is navigable for a distance of 20 miles above the entrance to the town of Salisbury. It is frequented by regular steamers drawing 6 to 8 feet (1.8 to 2.4 m.) and many freight schooners, the deepest draft being 10 feet (3 m.). The lower end is also frequented by oyster and fishing boats.

The entrance is 1½ miles wide and is obstructed by extensive shoals, through which a narrow, crooked channel with a least depth of 8½ feet (2.5 m.) leads. It is marked by **Great Shoals Lighthouse** (fixed white), white house on piles, and by lights and buoys as far as Mount Vernon, 7½ miles above its junction with the main channel of Tangier Sound; but the channel is difficult, and strangers of a deeper draft than 6 feet (1.8 m.) are advised to take a pilot. Strangers of a less draft can enter with the aid of the chart and the aids. Steamers make stops at Mount Vernon, Widgeon, and White Haven. The mean range of tides is 2.5 feet at the entrance, and 3 feet at Salisbury.

Directions.—Enter from Tangier Sound 250 yards north of buoy No. 10 and steer 67° true (ENE. ⅝ E. mag.) to 400 yards from buoy No. 2, passing close southward of buoy No. 1A, then steer 97° true (ESE. ¾ E. mag.) to 200 yards south-southeastward of Great Shoals Light (fixed white), passing southward of buoys Nos. 1 and 3, then head for Wingate Point Light (fixed red) on course 23° true (NNE. ⅝ E. mag,) passing westward of buoy No. 6 and eastward of buoy No. 5. The chart will serve as a guide beyond the light.

From Mount Vernon to within 2 miles of Salisbury the river has a depth of 10 feet (3 m.) or more and ample width. From there to Salisbury the channel has been improved by dredging to a depth of 9 feet (2.7 m.), with a turning basin of the same depth 360 feet wide and 650 feet long at the upper end. The controlling depth to Salisbury in 1928 was 8.5 feet (2.5 m.). There are extensive flats bare at low water between Mount Vernon and Salisbury, but they are covered by marsh grass in summer. Ice usually forms on the river as far down as White Haven. In ordinary winters the channel is usually kept open by the regular steamers, except for short periods of time, but in severe winters it is often closed to navigation for extended periods. Vessels entering Wicomico River enter strong tidal currents setting across the channel at the Mouth of Monie Bay, and in winter heavy ice from it is a source of danger.

Dames Quarter is a post village on the south side of Wicomico River, just inside the mouth.

Monie Bay, a cove on the south side of Wicomico River, just inside the mouth, has a depth of 5 feet (1.5 m.) in the entrance and 3 feet (0.9 m.) in mid-channel to the head. It is frequented only by small local boats. Monie and Little Monie Creeks at the head are unimportant.

Mount Vernon is a small village on the south side of Wicomico River, 3 miles above Great Shoals Lighthouse. **Mount Vernon Wharf,** at which the steamers land, is 1½ miles east-northeastward of the village.

White Haven is a post village on the north side of Wicomico River 6½ miles above Great Shoals Lighthouse. It has several oyster-packing houses and is frequented by many oyster and fishing vessels. Gasoline and provisions are obtainable, and there is a marine railway capable of hauling out vessels of 150 tons, 75 feet length, and 6 feet (1.8 m.) draft.

Wicomico Creek, on the south side of Wicomico River, 8½ miles above Great Shoals Lighthouse, is navigable for small craft for several miles and is sometimes used by motor boats and small schooners to the farm landings. In entering the creek the best water leads northward of a shoal making northward from the south side of the entrance, then southward of an islet in the mouth.

Salisbury, at the head of navigation on Wicomico River, has trade in steamers and schooners up to 10 feet (3 m.) draft. The river forks at the south end of the town. The north branch has been dredged 9 feet (2.7 m.) deep and 100 feet wide to a milldam ⅜ mile above the fork, with a turning basin at the head. It is crossed by a bascule bridge just above the fork having a clear width of 40 feet. The east branch has been dredged by private enterprise, 80 feet wide and 9 feet (2.7 m.) deep, to the head of navigation ½ mile above the fork. It is crossed by two bascule bridges having a least clear width of 40 feet. All kinds of supplies are obtainable at Salisbury, and there is a railway capable of hauling out vessels of 175 tons, 125 feet length, 5 feet (1.5 m.) draft forward and 10 feet (3 m.) aft, and shops for ordinary repairs to motors. Regulations prescribed for the bridges crossing both forks of the river at Salisbury require that they shall be opened to all vessels unable to pass under them within 3 minutes after a signal of 3 blasts at any time between 6 a. m. and 9.30 p. m., except between 6.30 and 7 a. m., 8.30 to 9 a. m., 12 m. and 1 p. m., and 6 and 6.30 p. m., when they will remain closed.

Nanticoke River, emptying into the northern end of Tangier Sound, has a depth of 9 feet (2.7 m.) to the town of Seaford, Del., at the head of navigation, 36 miles above the entrance. There is no steamer on the river now above the town of Nanticoke. A draft of 12 feet (3.6 m.) can be taken to Seaford at high water. Pilots can be obtained at Roaring Point. Ice forms on the river in winter, but ordinarily there is enough traffic to keep the channel open. Spring freshets do not interfere with navigation.

The river from the mouth to Wetipquin Creek, a distance of 8 miles, is wide and is obstructed by extensive shoals, most of which are marked by buoys, but some local knowledge is required to keep in the best water. The channel has a least depth of 20 feet (6.1 m.) for 5 miles to Ragged Point. Between Ragged Point and Wetipquin Creek is an extensive middle ground with channels on either side. The main channel is on the western side and has ample width and a least depth of 9 feet (2.7 m.) and should be used by strangers. The channel eastward of the middle ground has a depth of 7 feet (2.1 m.) and is used by those having local knowledge.

From the mouth of Wetipquin Creek to Sharptown, 28 miles above the mouth, the river has ample width and depth and is easily followed, the mid-channel being clear. From Sharptown to Seaford there is a least depth of 9 feet (2.7 m.), and the channel is narrow and difficult in places and is unmarked. For a distance of 1¾ miles below Seaford a channel has been dredged 9 feet (2.7 m.) deep and 100 feet wide, with a turning basin at the head. The water is fresh above Vienna and can be used in boilers.

Sandy Point, on the west side, at the entrance, is marked by a prominent clump of trees.

Nanticoke is a post village on the east side, 3½ miles above Clay Island Shoal Light. **Nanticoke Wharf,** on the south side of Roaring Point, ¾ mile from Nanticoke, is visited by the regular steamers.

Bivalve is a post village on the east side, 6½ miles above Clay Island Shoal Light. There is a wharf there, with a shoal westward and northward of it, to which vessels drawing 7 feet (2.1 m.) can be taken by those having local knowledge.

Oyster Bar Light (flashing white) is located off Newfoundland Point, on a black slatted post.

Wetipquin Creek, on the east side, 8 miles above Clay Island Shoal Light, has been improved by dredging a channel with a present depth of 6 feet (1.8 m.) and 120 feet wide from Nanticoke River to the wharf at the post village of **Tyaskin,** on the south side, just inside the mouth. A turning basin of the same depth has been dredged off the wharf. Gasoline and provisions are obtainable. The channel is sometimes marked by bush stakes. The course in the channel is 135° true (SE. ⅝ S. mag.), heading for the white buildings on the wharf.

Wetipquin is a post village on the east side of Nanticoke River, 1½ miles above Wetipquin Creek. **Sandy Hill Landing** is at the foot of the road ½ mile from Wetipquin.

Quantico Creek, on the east side, 13 miles above Clay Island Shoal Light, is shoal at the mouth but is navigable for several miles and used by small boats to the farm landings and mills near the head.

Rewastica Creek, on the east side, just above Quantico Creek, is navigable for small boats for several miles, but is little used.

Vienna is a village and railroad station on the west side, 22 miles above the mouth. A railroad bridge having a center pier draw, each opening 60 feet wide, crosses the river at this point.

Riverton is a post village on the east side, just below the junction of Nanticoke River and Marshyhope Creek.

Marshyhope Creek (northwest fork of Nanticoke River) empties into the river 26 miles above the mouth. It has a depth of 5 feet (1.5 m.) for 14 miles above the mouth to within ½ mile of the town of **Federalsburg,** the upper 4¼ miles having been improved by dredging to a present depth of 5 feet (1.5 m.) and width of 60 feet, with a turning basin at the head. The creek has some trade in small vessels, the deepest draft being 8 feet (2.4 m.). The lower part is easy of navigation, but the upper end is difficult without local knowledge. **Brookview** is a post village 5 miles above the mouth, and there are several other small villages. Two bridges with draw openings 52 feet wide cross the creek between the mouth and Federalsburg.

Sharptown is a town on the east side of Nanticoke River, 28 miles above the mouth. It has several mills and canneries and considerable trade in schooners. There is a shipyard, and a marine railway capable of hauling out vessels of 1,000 tons, 200 feet length, 7 feet (2.1 m.) draft forward and 13 feet (3.9 m.) aft. A bridge having a center pier draw, each opening 75 feet wide with a headroom of 6 feet at high water when closed, crosses the river at Sharptown.

Broad Creek, emptying into Nanticoke River from eastward 3½ miles above Sharptown, has been improved by dredging a channel with a depth of 7 feet (2.1 m.) in 1928, and 70 feet wide to the head of navigation at Laurel, a town on the railroad 6½ miles above the mouth. Laurel has several mills and considerable trade in schooners and other vessels, the deepest draft being 9 feet (2.7 m.). A railroad bridge, having a draw opening 40 feet wide and a height of about 16 feet when closed, crosses the creek at the lower end of the town. The dredged channel extends 230 yards above the railroad bridge, and small boats can go to a milldam ¼ mile above.

Bethel is a village on Broad Creek, 2½ miles below Laurel. It has a marine railway capable of hauling out vessels of 100 tons and 6 feet (1.8 m.) draft. A highway bridge having a draw opening 52 feet wide crosses the river at Bethel.

Seaford is a town on Nanticoke River, 36 miles above the mouth. It has several mills and canneries and considerable trade in steamers and schooners, the deepest draft being 12 feet (3.6 m.). A railroad drawbridge, having a center-pier draw with one opening 60 feet wide a headroom of 4 feet (1.2 m.) at high water when closed, crosses the river near the lower end of the town. There is a strong cross current through the bridge. The dredged channel extends for 600 yards above the railroad bridge to a highway drawbridge having a single opening 40 feet wide. There is a depth of about 7 feet (2.1 m.) for 1½ miles above the highway bridge, and small boats can go to a milldam about 5 miles above the bridge, but there is little business above Seaford. The marine railway, capable of hauling vessels 155 feet long, was not in operation in 1929. Two plants were in operation, however, building yachts and steel barges. Gasoline and provisions are obtainable and there is water on the wharves.

Tides.—The mean range of tides is 2.5 feet at the entrance, 3 feet at Vienna, 2.6 feet at Marshyhope Creek, 3 feet at Laurel, and 3.4 feet at Seaford.

Fishing Bay, at the north end of Tangier Sound, has a depth of 11½ feet (3.4 m.) in a narrow partially marked channel to **Fishing Point,** 6 miles above the entrance, and 7 feet (2.1 m.) can be carried anywhere in mid-channel to this point. Above Fishing Point the bay shoals rapidly to 3 feet (0.9 m.) in the upper end. **Elliott** is a post village on Fishing Point. Pilots for Fishing Bay and the tributaries at the head can be had at Bishop Head or Fishing Point.

Blackwater River, at the northern end of Fishing Bay, has a depth of about 2 feet (0.6 m.) at the mouth and deeper water inside. It is said to be navigable for 15 miles or more, and is used by small vessels carrying produce and canned goods.

Transquaking River, emptying into the northern end of Fishing Bay, has a depth of about 2 feet (0.6 m.) at the entrance and deeper

water inside for about 6 miles to a fork. The northern branch is called Transquaking River and the eastern branch **Chicacomico River;** both are said to be navigable for several miles and are frequented by small vessels carrying produce.

KEDGES STRAITS

[Chart 1224]

connecting Tangier Sound and Chesapeake Bay between Smith Island and South Marsh, has a least depth of 10 feet (3 m.), and is used by many vessels of 6 to 9 feet (1.8 to 2.7 m.) draft bound from northward to points on Tangier Sound southward of Manokin River. It is marked by **Holland Island Bar Lighthouse** (white house on piles), **South Marsh Spit Light** (black slatted pile structure), and **Solomons Lump Lighthouse** (white house on pier), and by buoys, and is easy of navigation by day with the aid of the chart. The islands adjacent to it are low and present no prominent marks. The mean range of tides is 1.7 feet, but the range is considerably affected by winds, easterly winds raising the water, and northwesterly winds lowering it sometimes as much as 2 feet (0.6 m.) below the normal. Floating ice in the winter makes the navigation of the straits dangerous, tugs from Baltimore being often employed to tow local vessels through the ice.

HOOPER STRAIT

the most northerly entrance to Tangier Sound, leads between Hooper Island and **Bishop Head** on the north and Bloodworth Island on the south. It is used by all of the vessels from northward to the tributaries in the north end of Tangier Sound. It has a depth of 12 feet (3.6 m.) in a narrow, crooked channel, but there are shoals with little depth close to it, and it is seldom used by vessels of a greater draft than 9 feet (2.7 m.), the deepest draft usually passing through at high water. It is marked by Hooper Strait and Sharkfin Shoal Lighthouses, Bishop Head Shoal Light, and by buoys, and strangers should be able to enter in the daytime by following the directions closely. The mean range of tides is 1.7 feet at Hooper Strait Lighthouse and 2.2 feet at Sharkfin Shoal Lighthouse. The tidal currents have considerable velocity, and in winter sailing vessels are in danger from running ice.

In Tangier Sound the general direction of the tidal currents is north and south, following the channel and diverging slightly off the entrances of the tributaries and straits. The velocity is greatly influenced by the force and direction of the wind. In the fall and winter long-continued northerly winds may lower the water as much as 2 feet (0.6 m.) below the normal and this is important to vessels passing through Kedges and Hooper Straits and into Crisfield Harbor.

Directions, Tangier Sound

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color white unless otherwise indicated]

	Course		Distance, nautical miles
	True	Magnetic	
	°	*Points*	
1. From Chesapeake Bay main channel to 0.5 mile southwest of Tangier Sound Light (F.).	45	NE. ⅝ E	
2. To gas and bell buoy No. 2A, passing 250 yards east of buoy No. 9.	10	N. by E. ½ E	7. 4
3. To 150 yards west of buoy No. 4 off Janes Island Light (F.).	8	N. by E. ⅜ E	3. 8
4. To 0.5 mile beyond buoy No. 11, Porpoise Point Light (Fl.) ahead.	18	NNE ¼ E	2. 5
5. To 2.8 miles, 53° true, from Solomons Lump Light (F.), passing 0.4 mile southwestward of buoy No. 6.	329	NNW. ⅛ W	5. 0
6. To 1.5 miles from Sharkfin Shoal Light (F.), Haines Point Light (F. R.), bearing 101° true, Sharkfin Shoal Light ahead, passing westward of gas and bell buoy No. 8.	353	North	6. 1
7. To 1.2 miles from Clay Island Shoal Light (F.), Sharkfin Shoal Light bearing 267° true, Clay Island Shoal Light ahead.	36	NE. ⅛ N	1. 9
8. To 0.6 mile east of Clay Island Light, 300 yards west of buoy 2.	52	NE. by E. ¼ E	1. 6
9. To 0.4 mile from Roaring Point Light (Fl.), true west from the wharf on the south side of the point, light ahead.	10	N. by E. ½ E	2. 3
10. To midway between Gravelly Point and the horizontally striped buoy off it.	354	N. ⅛ E	1. 8
11. To 0.2 mile west of buoy No. 8	0	N. ⅝ E	0. 5
12. To 200 yards east of Oyster Bar Light (Fl.) off Newfoundland Point, passing 100 yards westward of buoy No. 8A.	29	NE. ¾ N	2. 0
13. To 0.4 mile westward of buoy No. 10	42	NE. ⅜ E	1. 1
14. To wharf at Tyaskin, heading through the 6-foot (1.8 m.) dredged channel for the white building on the wharf.	135	SE. ⅝ S	1. 1
If bound for Crisfield, leave course No. 3 above when the channel bell buoy in the mouth of Little Annemessex River bears 55° true and follow the courses below:			
1*a*. To 250 yards from Great Point Light (F.), channel buoy and light on range.	55	NE. by E. ½ E	1. 6
2*a*. Round the light at a distance of 250 yards to north of it.		Various	0. 25
3*a*. To 75 yards north of buoy No. 4	90	E. ⅝ S	0. 6
4*a*. To 175 yards south of Somers Cove Light (Fl.).	105	ESE	0. 6
5*a*. To position between buoys Nos. 5 and 10, warehouse on railroad wharf bearing 25° true.	43	NE. ½ E	0. 6

Directions, Tangier Sound—Continued

	Course		Distance, nautical miles
	True	Magnetic	
	°	*Points*	
6*a*. To off the railroad wharf, Crisfield	25	NNE. ⅞ E	0. 3
If going up Big Annemessex River continue course No. 4 above to position 0.5 mile from Porpoise Point Light, then proceed eastward, following directions on page 210. If bound up Manokin River leave course 5 above when off the northwest end of Smith Island and follow courses given below.			
1*b*. To 300 yards southeastward of buoy No. 1, passing the same distance southeastward of a horizontally striped buoy, 1.5 miles off Porpoise Point Light.	39	NE. ⅛ E	2. 5
2*b*. To 0.7 mile north-northeastward of buoy No. 1, buoy No. 3 ahead.	1	N. ¾ E	0. 7
3*b*. To 0.5 mile northward of buoy No. 2, buoy No. 1 astern.	14	N. by E. ⅞ E	1. 5
4*b*. To 1 mile from St. Pierre Island, island ahead.	41	NE. ¼ E	1. 4
5*b*. To 350 yards southeastward of beacon No. 7 Piney Island astern.	78	E. ½ N	1. 1
6*b*. To east-northeastward of St. Pierre Island.	1	N. ¾ E	0. 7
7*b*. To 0.3 mile north-northwest of Cormal Point, St. Pierre Island astern.	69	ENE. ¾ E	0. 8
8*b*. To Inverness Wharf	98	ESE. ⅝ E	1. 0
If bound up the Wicomico River leave course No. 7 when west of buoy No. 10 and follow directions on page 212. To enter Fishing Bay, put buoy No. 10 astern and steer 333° true (N. by W ¾ W. mag.) into the bay. See page 215. If going through Kedges Strait, leave course 5 above when Solomons Lump Light (F.) and Holland Bar Light (F.) are in range and steer 293° true (NW. by W. ⅜ W. mag.) until north of buoy No. 2, then westerly to Chesapeake Bay, passing southward of Holland Island Bar Light. See page 216. If going through Hooper Strait, leave course 333° true, leading into Fishing Bay, when northeastward of horizontally striped buoy off Sharkfin Shoal and follow the courses given below:			
1*c*. To 0.3 mile beyond buoy No. 8. passing close northward of it.	280	WNW. ½ W	1. 2

Directions, Tangier Sound—Continued

	Course		Distance, nautical miles
	True	Magnetic	
	°	*Points*	
2c. To 0.25 mile southeast of Bishop Head Shoal Light (Fl.), buoy No. 2 astern, passing 250 yards northwestward of buoy No. 6.	230	SW. by W. ⅛ W.	1. 2
3c. Round the light at a distance of 250 yards until west of the bell buoy.	------	Various	0. 4
4c. To 300 yards northeastward of buoy No. 4, Hooper Strait Light (F.) ahead.	306	NW. ⅛ W.	1. 5
5c. To ⅓ mile westward of the light	292	NW. by W. ⅜ W.	1. 3
6c. To Chesapeake Bay, Hooper Strait Light astern.	256	W. ⅝ S.	------
If bound for Honga River, leave course No. 6c. above, steering to pass 300 yards eastward of Honga River Light (F.) on a 342° true (N. by W. mag.) course and be guided by the chart. See below.			

HONGA RIVER TO LITTLE CHOPTANK RIVER

[Charts 1224 and 1225]

Honga River, on the eastern side of Chesapeake Bay, north of the western end of Hooper Strait, has a depth of 18 feet (5.5 m.) in a narrow crooked channel, marked by lights and buoys, for 11 miles above the mouth, above which it shoals rapidly to a depth of 2 to 4 feet (0.6 to 1.2 m.) at the head. Light-draft vessels may navigate as follows: From midway between **Wroten Island** and **Long Point** a northeasterly course leads, in 20 feet (6.1 m.), to post light No. 7. From this point about 3 feet (0.9 m.) at low water can be carried northwesterly to post light No. 5, and about the same depth from here southwesterly to Fishing Creek drawbridge. Honga River is frequented by regular steamers in the lower end and local oyster and produce boats in the upper end. The mean range of tide is 1.6 feet.

Fox Creek, on the eastern side of Honga River, 3 miles above the mouth, has a depth of 8 feet (2.4 m.) to **Wingate Point Wharf,** at which steamers from Baltimore land. The channel is marked by a light at the entrance, a day beacon with prismatic reflector on the point of shoal off **Paul Point,** and sometimes by bush stakes maintained by the steamboat company. **Wingate** is a post village 1 mile from the wharf.

Hooper Island consists of a row of three low islands separating Honga River from Chesapeake Bay. The islands are connected with the mainland and with each other by highway bridges, the two northern ones having draw openings, and the southern one being

fixed. Steamers from Baltimore stop at the wharf at Hoopersville, where there is a depth of 12 feet (3.6 m.) at mean low water.

There are three villages on the islands, with a total population of about 1,500. The towns are **Applegarth** on the southern end, **Hoopersville** on the middle island, and **Fishing Creek** on the northern island. This is one of the most important sea-food shipping centers on Chesapeake Bay, hundreds of boats being engaged in the trade. There are several packing plants, general stores, churches, schools, three boat yards, and one marine railway. The latter is located on **Back Creek**, a small estuary of Honga River, which can be entered with local knowledge.

Gasoline, oil, provisions, and some ship chandlery may be obtained on the island.

Barren Island Gaps Channel has 4 feet (1.2 m.) depth at mean low water. Enter on a 90° true (E. ⅝ S. mag.) course to close northward of Barren Island Light (fixed red), red pile structure, then steer to pass close southward of Tar Bay Light (fixed white), black structure, then southeasterly for 200 yards. From this point a gradual turn should be made to close southward of Tar Bay Light No. 3, passing through a narrow, shallow channel when near the light. From light No. 3 to light No. 4 (fixed red) a straight course leads in 6 to 9 feet (1.8 to 2.7 m.) depths. Pass just north of light No. 4, and be guided by the bush stakes, which should be held close on the starboard hand, until up to Fishing Creek drawbridge. Local pilots can be obtained at Fishing Creek.

Fishing Creek is connected with Cambridge (on the railroad) by a good road.

Golden Hill is a post village at the northern end of Honga River, and can be reached by boats of 2 feet (0.6 m.) draft at low water.

A draft of 3 or 4 feet (0.9 to 1.2 m.) at high water can be carried from the northern end of Honga River through **Great Marsh Creek, Lower Keene Broad,** and **Upper Keene Broad** into Slaughter Creek, a tributary of Little Choptank River, but the passage should not be attempted by strangers. It is crossed by two fixed bridges having a headroom of about 4 feet (1.2 m.) at high water. This thoroughfare can be entered from Chesapeake Bay through a narrow thoroughfare about 3 miles northward of the northern end of Tar Bay; the entrance has a depth of about 3 feet (0.9 m.) at high water and is crossed by a fixed bridge having a headroom of about 4 feet (1.2 m.) at high water.

LITTLE CHOPTANK RIVER

on the eastern side of Chesapeake Bay, 4½ miles southward of Sharps Island, is frequented by local boats, the deepest draft being 9 feet (2.7 m.). The river is obstructed by shoals, but has a depth of 14 feet (4.2 m.) in a narrow, crooked channel for 8 miles above the mouth and 6 feet (1.8 m.) for a considerable distance into most of the tributaries. Some of the shoals are marked by buoys, but strangers may have trouble in taking a greater draft than 6 feet (1.8 m.) above the mouth of Slaughter Creek. The channels in the principal tributaries are usually marked by bush stakes, but are narrow and crooked and difficult without local knowledge.

Oyster Bay, on the south side of Little Choptank River, just inside the entrance, has a depth of 3 feet (0.9 m.) in mid-channel to near the head, but is little used. There is a depth of 1 foot (0.3 m.) at low water through the thoroughfare between **James Island** and the mainland. James Island is subject to rapid erosion.

Slaughter Creek, on the south side of Little Choptank River, has been improved by dredging a channel 5 feet (1.5 m.) deep and 100 feet wide across the bar at the entrance and has a depth of 6 feet (1.8 m.) in a narrow channel to the post village of **Taylor Island,** 2½ miles above the entrance, where there are two wharves. It is used by schooners up to 7½ feet (2.2 m.) draft. The dredged channel is marked by lights, buoys, and bush stakes. There are also bush stakes above the entrance, but local knowledge is required to keep in the channel. A drawbridge having a clear opening 25 feet wide crosses the creek at Taylor Island; the creek shoals rapidly above the bridge, though small boats can pass through into Honga River at high water. (See p. 220.) Gasoline, water, and provisions are obtainable at Taylor Island.

Brooks Creek, on the north side of Little Choptank River, has a depth of 6 feet (1.8 m.) in a narrow, unmarked channel to within ¾ mile of the head. It is frequented only by small local craft.

Hudson Creek, on the north side of Little Choptank River, 6½ miles above the entrance, has a depth of 7 feet (2.1 m.) to near the head.

Vessels drawing 6 feet (1.8 m.) may go to **Speddens Wharf** near the head, ½ mile from the post village of **Hudson.** The channel is generally marked by bush stakes but is difficult without local knowledge. Gasoline, water, and provisions may be obtained at Speddens Wharf.

Madison Bay, on the southeast side, opposite Hudson Creek, has general depths of 6 to 8 feet (1.8 to 2.4 m.) and about 5 feet (1.5 m.) at the wharf at the post village of **Madison.** Gasoline can be obtained at the village.

Fishing Creek, on the south side of Little Choptank River, 8 miles above the entrance, has a depth of 6 feet (1.8 m.) in a narrow channel for 4 miles above the mouth. There are no wharves on the creek, but it is extensively used by boats bound to Church Creek, the principal tributary. The channel is marked by buoys and bush stakes.

Church Creek, emptying into Fishing Creek, 2½ miles above the entrance, has a depth of 7 feet (2.1 m.) to **Milton Wharf,** near the post village of **Woolford,** 1½ miles above the mouth, and 3 feet (0.9 m.) for a farther distance of ½ mile to the foot of a road ½ mile from the post village of **Church Creek.** It is used by schooners of 6 feet (1.8 m.) draft as far as Milton Wharf. Gasoline and provisions may be obtained at Milton Wharf and Church Creek.

Phillips, Beckwiths, Carey, and **Lees Creeks,** tributaries of Little Choptank River above the entrance of Fishing Creek, have no commercial wharves and little business by water except in small local boats.

Anchorage.—There is good anchorage in a depth of 12 to 18 feet (3.6 to 5.5 m.) in the bight between James Island and Hooper Point if the shores be given a berth of ½ mile or more.

Tides.—The mean range of tides in Little Choptank River is 1.5 feet.

Directions, Little Choptank River.—Keep clear of the fish-trap area along the east shore of Chesapeake Bay, shown on the chart by dashed lines, proceeding to a position 2 miles 74° true from gas and bell buoy No. 18A. Then steer 105° true (ESE. mag.) toward the north end of Ragged Island passing 0.2 mile southward of bell buoy No. 1A, and 0.4 mile northward of buoy No. 4 to a position 0.7 mile beyond it, the buoy and the little island off James Point on range. Then steer 209° true (SW. ¾ W. mag.) passing ¼ mile northwestward of buoy No. 3, to an anchorage east of James Island or round the buoy to the southward being guided up the river by the chart.

CHOPTANK RIVER

Choptank River, on the eastern side of Chesapeake Bay, 102 miles above the entrance and 43 miles below Baltimore, is navigable for a distance of 55 miles above the entrance to the town of Greensboro. The river and its tributaries are frequented by many oyster and fishing boats and steamers and schooners engaged in the bay trade, the usual draft of boats being 5 to 8 feet (1.5 to 2.4 m.) and the deepest draft 15 feet (4.5 m.).

Fish-trap limits are shown on chart No. 1225.

Channels.—The main entrance to Choptank River leads southward and eastward of Sharps Island. It has a least depth of 28 feet (8.5 m.) and is broad and easy of access. The channel, clear of fish traps, northward of Sharps Island Lighthouse has a least depth of 12 feet (3.6 m.), and is used by vessels of 10 feet (3 m.) draft from northward bound to or from Choptank and Little Choptank Rivers. To keep clear of fish traps, pass just southward of perpendicularly striped buoy No. 8B, 2½ miles west of Tilghman Island, and steer 138° true (SE. ⅞ S. mag.) to a position between gas buoy No. 3 and the horizontally striped buoy southward of it, then 76° true (E. ⅝ N. mag.) to 100 yards north of bell buoy No. 2B.

The channel is marked by lights and buoys from the mouth to the town of Choptank, 27½ miles above, and is easily followed with the aid of the chart. There are no marks above Choptank, but the mid-channel is clear to the mouth of Tuckahoe Creek, and the channel is easily followed if the points be given a good berth. Between the mouth of Tuckahoe Creek and Greensboro the channel is narrow and crooked and is difficult without local knowledge.

Steamers from Baltimore make regular landings at all the principal wharves on the river as far as Windy Hill, 30 miles above the mouth. There is railroad communication at Oxford, Easton, Cambridge, Denton, Greensboro, and Hillsboro.

Sharps Island, a low island marked by a single tree, lies in Chesapeake Bay off the entrance, and Sharps Island Lighthouse (fixed white), brown tower on pier, 1 mile north-northwestward of Sharps Island, is the principal guide to the entrance. The island is subject to rapid erosion.

Tilghman Island, on the north side of the entrance to Choptank River, is the center of a large oystering, crabbing, and fishing industry. There are three post villages on the island—**Fairbank,** near

the southern end, and **Avalon** and **Tilghman,** near the northern end. The western side is subject to rapid erosion. **Blackwalnut Cove,** at the southern end of Tilghman Island, has a general depth of 2 feet (0.6 m.), and a depth of 3 feet (0.9 m.) in a narrow channel to Fairbank at the head. The Cove is extensively used as an anchorage by small craft. There is a small railway at Fairbanks.

Tilghman Island Harbor, on the eastern side of the island, has a depth of 10 feet (3 m.) to the steamboat wharf at Avalon. Steamers from Baltimore drawing 8 feet (2.4 m.) make regular trips to the wharf, and the harbor is also frequented by many local boats of 3 to 7 feet (0.9 to 2.1 m.) draft. The approach to the steamboat wharf is marked by buoys.

In entering, leave buoy No. 1, 100 to 400 yards on the port side, buoy No. 2 (light marks 6-foot (1.8 m.) spot northward), 80 yards on the starboard side, then head for the end of the wharf. Gasoline, water, and provisions may be obtained at Tilghman, and there is a railway there and at Knapps Narrows.

Knapps Narrows, at the northern end of Tilghman Island, has a depth of 3 feet (0.9 m.) at high water. The channel is usually marked by bush stakes but is difficult without local knowledge. It is crossed by a retractile bridge having a vertical clearance of 7 feet (2.1 m.) when closed.

Harris Creek, on the north side of Choptank River, just inside the entrance, has a depth of 12 feet (3.6 m.) in a narrow, crooked channel for 5½ miles above the mouth, 6 feet (1.8 m.) for a farther distance of 2 miles, and 1 foot (0.3 m.) to **McDaniel** railroad station at the head. It is frequented by oyster and produce boats and small craft bound to the railroad station at McDaniel. The channel is marked by buoys for 3 miles above the mouth, above which the mid-channel is clear if the points be given a good berth. **Sherwood** is a post village on the west side, 4 miles above the entrance.

Tripps Bay, on the south side of the entrance to Choptank River, 4½ miles east-southeastward of Sharps Island, is shoal and little used, except by small oyster and fishing boats.

Broad Creek, on the north side of Choptank River, 7 miles northeastward of Sharps Island, has a depth of 18 feet (5.5 m.) for 5 miles above the mouth and 6 feet (1.8 m.) to near the heads of most of the tributaries. There is a depth of 3 feet (0.9 m.) to **St. Michaels,** a town with railroad communication and with its main waterfront on Miles River. The creek is frequented only by local oyster and produce boats and boats bound to St. Michaels. The channel is marked by buoys at the entrance, and some local knowledge is required to keep in the best water above. **Balls Creek,** on the west side, just inside the entrance, has a depth of 6 feet (1.8 m.) to the head; the entrance is narrow and is usually marked with posts and barrels on each side. **Neavitt Wharf** is on the south side, just inside the entrance, and **Neavitt** is a post village at the head.

Irish Creek, just eastward of the entrance to Broad Creek, has a depth of 8 feet (2.4 m.) in the entrance and 6 feet (1.8 m.) to near the head. The entrance is narrow and is usually marked by bush stakes, but is difficult without local knowledge. The creek is frequented only by small local craft.

Tred Avon River, on the north side of Choptank River, 9 miles above Sharps Island, has a depth of 16 feet (4.8 m.) for 5 miles above the mouth and 12 feet (3.6 m.) for a farther distance of 2 miles, above which it has been improved by dredging a channel 8 feet (2.4 m.) deep and 150 feet wide to **Easton Point,** 1 mile from the town of **Easton.** The river is frequented by steamers to Oxford and by schooners and motor boats.

Choptank River Lighthouse (fixed white), white house on piles, is in mid-channel off the entrance. A draft of 12 feet (3.6 m.) at low water can be taken into the entrance on either side of the lighthouse by giving it a berth of 400 yards or more, but the channel eastward of the lighthouse is the wider and deeper. There are no marks above the entrance except bush stakes maintained by the steamboat company, and the channel in the upper end is difficult without local knowledge.

Oxford is a town on the east side of Tred Avon River, 1½ miles above the entrance. There is a depth of 15 feet (4.5 m.) at the wharves on the north side of the town and 6 to 9 feet (1.8 to 2.7 m.) at the railroad wharf at the south end. The town has railroad communication. Storm warnings are displayed here. A white water tank stands well above the trees and can be seen for a considerable distance.

Town Creek, on the eastern side of Oxford, has a depth of 8 feet (2.4 m.) in midchannel for ¼ mile above the entrance and is extensively used as an anchorage by local craft. There is a railway on the creek capable of hauling out boats of 3 feet (0.9 m.) draft forward and 5 feet (1.5 m.) aft. Gasoline may be had in Town Creek.

Bellevue is a village on the west side of Tred Avon River, ¾ mile northward of Oxford. Several oyster-packing houses are prominent. There is a depth of 8 feet (2.4 m.) at the wharf.

Double Mills is a landing on the western side, 3 miles above Oxford.

Island Creek, 1¼ miles eastward of Choptank River Lighthouse (fixed white), has a depth of 7 feet (2.1 m.) in a narrow unmarked channel through the entrance, and this depth can be taken to near the head. The best water favors the eastern side at the entrance.

A white water tank and several large buildings at **Castlehaven** on the south side of the Choptank are prominent.

Lecomptes Bay, on the south side of Choptank River, 3 miles above Choptank River Lighthouse, has a depth of 8 feet (2.4 m.) to **Travers Wharf,** a steamer landing at the south end.

La Trappe Creek, on the north side of Choptank River, 3½ miles above Choptank River Lighthouse, has been improved by dredging a channel 10½ feet (3.2 m.) deep and 150 feet wide across the bar at the entrance and 8 feet (2.4 m.) deep and 75 feet wide to the head of navigation at **Trappe Landing,** 3 miles above the mouth, with a turning basin at the head. It is frequented by schooners up to 9 feet (2.7 m.) draft. The channel is marked by two lights at the entrance. In entering, leave the outer light 100 feet on the port side, the inner light 100 feet on the starboard side, then follow a mid-channel course to the head. **Trappe** is a post village 1½ miles from Trappe Landing.

Dickinsons Bay, just eastward of **Howells Point,** which is marked by a light, has depths of 3 to 5 feet (0.9 to 1.5 m.) and is little used.

Off Hambrooks Bar there is a flashing white light and in the cove east of it there is a good small-boat anchorage.

Cambridge, a town with railroad connections, on the south side of Choptank River, 17 miles above the mouth, has considerable trade in bay steamers and schooners and is the center of a large oystering and fishing industry. The deepest draft going to the town is 13 feet (3.9 m.).

Cambridge Harbor is a creek ⅔ mile long on the eastern side of the town. A channel has been dredged to a depth of 12 feet (3.6 m.) from Choptank River to the bridge, and 10 to 12 feet (3 to 3.6 m.) to the head of the harbor.

The bridge is a center-pier draw, each opening 50 feet wide, with a headroom of 3 feet at high water when closed. The entire harbor is considerably congested by small boats during the oyster season. Two marine railways are located at Cambridge, the larger one having a capacity for vessels up to 100 feet long, 9 feet (2.7 m.) draft, and 150 tons. Gasoline, Diesel oil, and provisions may be purchased.

The channel into Cambridge Harbor is marked by buoys and a lighted range. There is a strong current across the channel on both ebb and flood.

To enter, bring the bell buoy astern on a 245° true (WSW. ⅜ W. mag.) course, following the range to the steamboat wharf (marked by red wharf house). The front range is on a white box and is plainly visible by day a little to the left of the steamboat wharf, but the rear range is not conspicuous by day. Pass 50 yards southeastward of the steamboat wharf and enter the creek in mid-channel.

Bolingbroke Creek, on the north side of Choptank River, 1¾ miles eastward of Cambridge, has a depth of 3 feet (0.9 m.) across the bar at the mouth and 6 feet (1.8 m.) inside to the head. There are no wharves except for small boats.

Warwick River, on the east side of Choptank River, 5 miles above Cambridge, has been improved by dredging a channel 10 feet (3.0 m.) deep and 100 feet wide from Choptank River to **Secretary Landing,** a post village at the head of navigation, 1 mile above the mouth, and had a depth of 9 feet (2.7 m.) in 1926. It is frequented by many local craft of 8 feet (2.4 m.) draft. There is a red buoy on the south side of the entrance and a black buoy and bush stakes further in, but the channel is difficult without local knowledge.

Cabin Creek, on the east side of Choptank River, 7 miles above Cambridge, has a depth of 6 feet (1.8 m.) for ¾ mile above the mouth and 2 feet (0.6 m.) for a further distance of ¾ mile. There are no wharves, and it is frequented only by a few grain schooners and small local craft.

Hunting Creek, on the east side of Choptank River, just below the village of Choptank, has a depth of 4 feet (1.2 m.) in the entrance and about 2 feet (0.6 m.) to near the village of **Ellwood,** 2½ miles above the entrance. It is little used.

Choptank is a village on the east side of Choptank River, 10½ miles above Cambridge. It is visited by steamers from Baltimore

and schooners, the deepest draft being 10 feet (3 m.). **Windy Hill** is a steamboat landing on the west side of the river, 1 mile above Choptank.

A railroad bridge, having a center-pier draw with one clear opening 60 feet wide, crosses the river 7 miles above Choptank. A highway bridge having a center-pier draw, each opening 60 feet wide, with a headroom of 3 feet at high water when closed, crosses the river ¾ mile above; the eastern opening is the one generally used. **Dover Bridge** has a landing on the west side, just below the highway bridge.

Tuckahoe Creek, on the west side of Choptank River, 41 miles above the mouth, has a depth of 8 feet (2.4 m.) to **Waymans Wharf,** 8½ miles above the entrance. The channel from Waymans Wharf to **Rolph Landing,** 1 mile above, has been improved by dredging to a depth of 8 feet (2.4 m.) and width of 50 feet, with a present depth of 6 feet (1.8 m.), and there is a depth of about 1 foot (0.3 m.) at low water and 3 feet (0.9 m.) at high water to **Hillsboro,** a town on the railroad 1¾ miles above Rolph Landing. There is very little business on the river. The channel is not marked and is crooked and difficult in places without local knowledge. The flats are covered with marsh grass in summer. A highway bridge having a single-draw opening 39.6 feet wide crosses the creek 1 mile above the entrance.

The water is fresh above Choptank and can be used in boilers.

Two Johns and **Williston** are small settlements on the east side of Choptank River, 1¾ and 2¼ miles, respectively, above Tuckahoe Creek.

Denton is a town on the east side of Choptank River, 48 miles above the mouth. There is a depth of 5½ feet (1.6 m.) to the town, and the deepest draft going to it is 8 feet (2.4 m.). **West Denton** is on the west side of the river opposite Denton, and all of the wharves are on that side. Two drawbridges cross the river at Denton; the lower, a highway bridge, has a single lift opening 43 feet wide and 4 feet headroom at high water, and the upper, a railroad bridge, has a center-pier draw, both openings about 62 feet wide, with a headroom of 5 feet at high water.

There is considerable business in oil tankers to Denton, from which point it is distributed to the surrounding country.

Greensboro is a town at the head of navigation 7 miles above Denton. It has very little trade at present by water.

Pilots.—There are no regular pilots for Choptank River, but a pilot for the lower end of the river or the tributaries can be obtained from Tilghman Island, and for the upper end from Cambridge. Pilots for the tributaries can also usually be obtained near their entrances.

Supplies.—Coal and water can be obtained on the wharves at Cambridge, and coal in limited quantities at Oxford and Denton. Gasoline and provisions are obtainable at Tilghman Island, Oxford, Cambridge, Secretary Landing, Choptank, Denton, and Greensboro, and there are stores at several other places where some supplies are obtainable.

Tides.—The mean range of tides is 1.3 feet at the entrance, 1.9 feet at Cambridge, and 2.5 feet at Denton.

Directions, Choptank River

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color white unless otherwise indicated]

	Course		Distance in nautical miles
	True	Magnetic	
For vessels of 12 feet (3.6 m.) draft (deeper draft vessels should take a pilot).	°	*Points*	
1. From gas and bell buoy No. 18A, southwestward of Sharps Island to 400 yards westward of buoy No. 2A.	49	NE. by E.	5. 1
2. To 0.7 mile westward of bell buoy No. 2B.	31	NE. ⅝ N.	2. 5
3. To 0.9 mile from Choptank River Light (F.), light ahead, passing northward of buoy No. 2B.	85	E. ¼ S.	5. 1
4. To 300 yards northeast of buoy No. 4A, passing 150 yards northward of buoy No. 4.	118	SE. ⅞ E.	2. 5
5. To 0.7 mile from LaTrappe Creek rear range light (F. R.), light ahead.	104	ESE. ⅛ E.	1. 2
6. To 0.3 mile south-southwestward of buoy No. 9.	173	South.	1. 4
7. To 0.3 mile south-southeastward of buoy No. 11, passing close southward of the buoy.	107	SE. by E. ⅞ E.	1. 8
8. To 0.2 mile north of Hambrooks Bar Light (F.).	91	E. ¾ S.	0. 6
9. To abeam of bell buoy No. 2 off entrance to Cambridge.	133	SE. ½ S.	1. 6
10. To steamboat wharf, bell buoy No. 2 astern, range ahead.	245	WSW. ⅜ W.	0. 7
Vessels should take a pilot if bound above Cambridge, or be guided by the chart.			

EASTERN BAY AND MILES RIVER

[Chart 1225]

Eastern Bay, on the eastern side of Chesapeake Bay, 34 miles below Baltimore, is the approach to Miles River and several less important tributaries and to the towns of Claiborne and St. Michaels. It is frequented by a large number of oyster and fishing boats and schooners carrying grain and produce. Regular steamers go to Claiborne, just inside the entrance. The deepest draft of boats entering the bay is 13 feet (3.9 m.) and this draft is taken above St. Michaels.

The bay is obstructed by extensive shoals, but a broad channel with a least depth of 30 feet (9.1 m.) leads through it to the mouths of most of the tributaries. The channel is well marked by buoys and lights through Eastern Bay and Miles River to a drawbridge 5½ miles above St. Michaels, and strangers should have little trouble in following the channel with the aid of the chart to near the bridge. The other tributaries are not well marked and are seldom entered by strangers except in small craft. The shores are low and present few prominent marks. Pilots for Eastern Bay and tributaries can

be obtained from Claiborne, or from local boats which can always be found working in the bay.

The **main entrance** to Eastern Bay, between the south end of Kent Island and Poplar Island, has a broad and unobstructed channel with ample depth. **Bloody Point Bar Lighthouse** (fixed white), brown cylindrical tower, is the principal guide to the entrance. Vessels of 6 feet (1.8 m.) draft can also enter through Poplar Island Narrows and boats of 7 feet (2.1 m.) draft through Kent Island Narrows.

Poplar Island, on the south side of the main entrance to Eastern Bay, is low and sparsely wooded and has no prominent marks. **Poplar Island Harbor,** on the eastern side, has a depth of 5 feet (1.5 m.) in the entrance, and there is secure anchorage inside in a depth of 3 to 7 feet (0.9 to 2.1 m.).

Poplar Island Narrows, between Poplar Island and the mainland, has a depth of 9 feet (2.7 m.), but there are unmarked shoals with little depth close to the channel, and 6 feet (1.8 m.) is the deepest draft using it.

To enter it, give the western side of Tilghman Island a berth of ⅝ mile to Poplar Island Narrows Light (fixed white), pass 400 yards eastward of it and steer 7° true (N. by E. ¼ E. mag.) to a position ⅓ mile westward of Haddaway Cove Light (fixed white), then steer 25° true (NNE. ⅞ E. mag.), giving the eastern shore a berth of at least ½ mile to bell buoy No. 2A off Claiborne.

~~Haddaway~~ Cove, 2 miles eastward of Poplar Island, has a depth of 6 feet (1.8 m.) in mid-channel to **Lows Wharf** at the head. It is used extensively as an anchorage by local craft.

To enter, pass 100 yards southward of the fixed light on the north side at the entrance and steer for the end of the wharf on a 96° true (ESE. ⅞ E. mag.) course. **Sherwood** is a post village ½ mile from the wharf.

Claiborne is a village and summer resort on the southeast side of Eastern Bay, 5 miles eastward of Bloody Point Bar Lighthouse. It is the terminus of a railroad to Ocean City, Md., and intermediate points; steamers from Baltimore and Annapolis make connections with the trains. There is a railroad pier extending 800 feet west-southwestward from the shore and a jetty extending 750 feet west-southwestward from the end of the pier. A channel has been dredged 12 feet (3.6 m.) deep and 300 feet wide, east-northeastward along the south side of the jetty to the end of the pier, and 10 feet (3 m.) deep and 195 feet wide along the south side of the pier to the ferry wharf 250 feet south of the railroad pier. The railroad wharf is little used. A black water tank, a white church and spire, and the hotel and railroad buildings are prominent objects at Claiborne. Gasoline, water, and provisions are obtainable.

In entering, pass northward and eastward of bell buoy No. 2 A and steer 127° true (SSE. mag.), with the buoy astern, to southwestward of the flashing white light on the end of the jetty, then head for the end of the pier.

Cox Creek, on the north side of Eastern Bay and the southeast side of Kent Island, has a depth of 10 feet (3 m.) for 5 miles above **Long Point** on the western side at the entrance and 6 feet (1.8 m.) for some distance into the three tributaries at the head. It is

frequented by oyster boats and schooners carrying produce and grain, the deepest draft being 8 feet (2.4 m.). There are several farm landings but no villages. The shoals are unmarked and local knowledge is required to avoid them.

Crab Alley Bay, on the north side of Eastern Bay, 2½ miles northward of Tilghmans Point, has a depth of 21 feet (6.4 m.) into the entrance and 6 feet (1.8 m.) to near the head of navigation in both branches. The shoals are unmarked and local knowledge is required to avoid them. **Bodkin Island,** on the western side, is thickly wooded and has no buildings visible. **Parsons Island,** on the eastern side, is sparsely wooded, giving it a ragged appearance, and has an unpainted barn showing clear of the woods and a white house visible at times.

Kent Island Narrows, a narrow slough connecting the northern end of Eastern Bay with Chester River between Kent Island and the mainland, was dredged and buoyed in 1929. It has a depth of 7 feet (2.1 m.) at low water and is extensively used by local craft. It is crossed by two drawbridges—a railroad bridge having a single clear opening 38 feet wide and a highway bridge having a single clear opening 44 feet wide. There is a railroad station at the bridges **(Narrows Station)** from which considerable sea food is shipped. Gasoline is obtainable here. The signal for both bridges is three blasts of a whistle or horn, to be answered by three blasts from the bridges if they can be opened immediately, or one blast if they can not be opened immediately. The draws will be opened at all times between one hour before sunrise and one hour after sunset unless a train is approaching or passing.

To enter Kent Island Narrows from Eastern Bay, pass 0.3 mile eastward of Parsons Island and steer 354° true (N. ⅛ E. mag.), passing 0.2 mile westward of Hoods Point and the land north of it to the buoy at the south end of the dredged channel. Then steer about a north-northwest course keeping to the eastward of the buoys, pass through the bridge spans and follow a mid-channel course to the north end of the Narrows, then steer about east-northeast to the first buoy and follow along the south side of the buoys to north of Long Point and into the main channel of Chester River.

Tilghmans Creek, on the eastern side of **Tilghmans Point,** has a depth of 7 feet (2.7 m.) in the entrance and 11 to 13 feet (3.3 to 3.9 m.) inside and is extensively used as a harbor for small local vessels. The entrance is very narrow and is marked by buoys.

Greenwood Creek, on the eastern side of Eastern Bay, 2¾ miles east-northeastward of Tilghmans Point, has a depth of 6 feet (1.8 m.) for 2 miles above the mouth. The best water leads along the eastern shore in approaching the entrance.

Miles River, the most important tributary of Eastern Bay, has a depth of 18 feet (5.5 m.) to abreast the town of St. Michaels 6 miles above Tilghmans Point, 9 feet (2.7 m.) to a drawbridge 5½ miles above St. Michaels, and 6 feet (1.8 m.) for a farther distance of 2 miles. The river has considerable trade carried in small boats and schooners, the deepest draft being 13 feet (3.9 m.). The channel is well marked by lights and buoys as far as the bridge, and strangers should have little trouble in following the channel to the bridge, above which some local knowledge is necessary.

St. Michaels, a town with railroad communication on the southwest side of Miles River, 14 miles above the entrance to Eastern Bay, is the center of a large oystering and fishing industry. Gasoline and provisions are obtainable. The long wharf on the north side of the entrance to the harbor has a depth of 6 feet (1.8 m.) at the end and is marked by red and gray oysterhouses and a brick stack. The short wharf on the north side of the inner harbor, known as the steamboat wharf, has a depth of 7 feet (2.1 m.) and is marked by white wharf houses. There is a depth of 10 feet (3 m.) in mid-harbor to near the head.

To enter, pass eastward and southward of the red buoy ¾ mile northeastward of the wharves, and bring the southern end of Fairview Point (thickly wooded) astern on a 240° true (SW. by W. ⅞ W. mag.) course, heading for the red houses on the wharf and passing between the flashing red light and the black buoy off the wharf. If entering the inner harbor pass 60 yards southeastward of the ends of the wharves. The Miles River Yacht Club is located in the harbor. Many yachts anchor in the inner harbor and it is frequently crowded.

Leeds Creek, on the northeast side of Miles River, 1 mile eastward of St. Michaels, has a depth of 8 feet (2.4 m.) in mid-channel to the small village of **Tunis Mills,** 2½ miles above the entrance. Schooners of 6 to 8 feet (1.8 to 2.4 m.) draft go to Tunis Mills. The channel at the entrance is marked by buoys, and above the entrance the mid-channel is clear.

A large red Moorish-type dwelling is located about ¾ mile north of the mouth of Leeds Creek and is prominent for vessels coming up Miles River.

Hunting Creek, on the north side of Miles River, 3 miles above St. Michaels, has a depth of 8 feet (2.4 m.) for 1½ miles above the entrance but is little used. There are no marks, but the mid-channel is clear.

The highway drawbridge crossing Miles River, 5½ miles above St. Michaels has a lift opening 40 feet wide, with a headroom of 5 feet at high water underneath the span when closed.

Wye River is on the north side of Miles River, 2½ miles southeastward of Tilghmans Point. The river has several branches, which are frequented by small local boats and grain and produce schooners up to 9 feet (2.7 m.) draft. There are several farm landings on the creek. The main entrance is eastward of **Herring Island** (a small spot of marsh and sand nearly submerged at high water) and has ample depth and width. There is also a depth of 9 feet (2.7 m.) across the shoal ⅜ mile northward of Herring Island. The entrance is marked by buoys. There are no marks above, but strangers should have no trouble by keeping in mid-channel and giving the points a good berth.

The river forks 2 miles above Herring Island. The north branch (Wye River) has a depth of 13 feet (3.9 m.) for 3 miles above the fork to the western end of Wye Narrows and 8 feet (2.4 m.) for a further distance of 3 miles. The eastern branch **(Wye East River)** has a depth of 12 feet (3.6 m.) for 5 miles above the fork to the eastern end of Wye Narrows. **Wye Narrows,** connecting Wye East River with Wye River, has a least depth of 7 feet (2.1 m.). It

is crossed by an unused bridge having an opening 40 feet wide, which is left open, and a highway drawbridge with a single opening 40 feet wide and a headroom of 5 feet at high water.

Woodland Creek, just eastward of the mouth of Wye River, can be entered only by small boats at high water and is not used.

Tides.—The mean range of tides is 1.2 feet at Poplar Island and 1.3 feet at St. Michaels.

Directions, Eastern Bay and Miles River to St. Michaels

[Abbreviations for lights: F., fixed; Fl., flashing; R., red. Color white unless otherwise indicated]

	Course		Distance, nautical miles
	True	Magnetic	
From Southward	°	*Points*	
1. From gas and bell buoy No. 20 A, to position where the north end of Popular Island bears 100° true, Bloody Point Bar Light (F.) ahead.	22	NNE. ⅝ E	2.1
2. To 150 yards north of Tilghman Point gas buoy, passing 0.3 mile southeast of the gas and bell buoy off Kent Point, 0.3 mile northwest of Claiborne bell buoy and close southward of buoy No. 3.	54	NE. by E. ½ E	9.4
From Northward			
Steer 114° true (SE. by E. ¼ E. mag.) to pass ¼ mile southward of Bloody Point Bar Light, 150 yards southward of Kent Point gas and bell buoy to a junction with course No. 2 above.			
3. To buoy No. 5	117	SE. by E	0.9
4. To 0.3 mile, 78° true, from buoy No. 6, Herring Island Light (Fl.) ahead.	160	S. by E. ⅛ E	1.7
5. To 0.3 mile northwest of buoy No. 7	220	SW. ¼ W	0.8
6. To 150 yards northeast of buoy No. 8, passing close southward of No. 7.	123	SE. ⅜ E	0.8
7. To 200 yards southeast of buoy No. 10	152	S. by E. ⅞ E	1.2
8. To 75 yards west of Fairview Point Light (F.).	188	S. by W ⅜ W	0.5
9. To 250 yards southeast of buoy No. 12	158	S. by E. ¼ E	0.5
10. To wharf, St. Michaels, passing between buoy No. 1 and the light near it.	239	SW. by W. ⅞ W	0.7

CHESTER RIVER

[Charts 1225, 1226, and 548]

on the east side of Chesapeake Bay 21 miles below Baltimore, is navigable for a distance of 40 miles above the entrance and is the approach to the railroad terminus at Love Point and the towns of Queenstown, Centerville, Chestertown, and Crumpton, and many landings. It is frequented by schooners carrying grain and produce, besides many smaller boats, the deepest draft being 13 feet (3.9 m.).

The main entrance to Chester River is from northward and leads between the northern end of Kent Island and East Neck Island. **Love Point Lighthouse** (fixed white), white house on piles, is the principal guide to the entrance. The entrance has a depth of 24 feet (7.3 m.) in a narrow channel, and the width of the channel with a depth of 18 feet (5.5 m.) is 1 mile. The river can also be entered through Kent Island Narrows.

The main channel of Chester River has a depth of 18 feet (5.5 m.) for 22 miles above Love Point Lighthouse to within 4 miles of Chestertown, 11 feet (3.3 m.) to Chestertown, and 7 feet (2.1 m.) for a farther distance of 8 miles to Crumpton. The river above Crumpton has been improved by dredging a channel 6 feet (1.8 m.) deep and 60 feet wide for a distance of 5 miles to within ¾ mile of the town of Millington; in 1928 the channel had a controlling depth of 5 feet (1.5 m.) to Jones Landing. There is a depth of 1 foot (0.3 m.) at low water and 3½ feet (1 m.) at high water to Millington.

Steamers from Baltimore meet the trains at Love Point. A gas boat makes trips up the river as far as Crumpton.

Love Point, at the north end of Kent Island, is a summer resort. It has railway connections with Cape Charles, Wilmington, and Lewes, Del. There are two long wharves; the southern wharf is the landing for steamers from Baltimore.

Stevensville is a town on the railroad 3 miles southward of Love Point, and **Chester** is a village and railroad station 1½ miles eastward of Stevensville.

Macum and **Piney Creeks,** on the northeast side of Kent Island, are shoal and used only as anchorages for small local craft.

Kent Island Narrows is described on page 229.

Jackson Creek, on the south side of Chester River, 1¼ miles eastward of Kent Island Narrows, has a depth of 4 feet (1.2 m.) to the wharf at the south end and is used as an anchorage by oyster boats. The channel is marked by buoys.

Winchester Creek, 1¼ miles eastward of Long Point, has a very narrow entrance nearly bare at low water and a depth 5 to 8 feet (1.5 to 2.4 m.) inside. It is used as an anchorage by local craft. **Winchester** is a village and railroad station ¼ mile from the head of the creek.

East Neck Island, on the east side of Chester River at the entrance, is sparsely wooded, the only prominent mark being a clump of trees on the end of **Hail Point** at the southeast end. **East Neck Island Narrows,** at the northern end, has a depth of about 1 foot (0.3 m.), is crossed by a fixed bridge, and is little used.

Queenstown Harbor, on the southeast side of Chester River, 7½ miles above Love Point Lighthouse, has been improved by dredging a channel with a present depth of 10 feet (3 m.) and 200 feet wide across the bar at the entrance and has a depth of 10 feet (3 m.) to the freight wharf. The railroad wharf north of it has fallen in and will not be repaired. The dredged channel is marked by a buoy, a beacon, and a flashing white light.

To enter.—From 150 yards north-northeastward of buoy No. 2, off the entrance, steer 139° true (SSE. ⅞ E. mag.), to 75 feet south of a black beacon, then steer 152° true (S. by E. ¾ E. mag.) to 75 feet south of a light, then head for the wharf.

Tilghman Creek, on the eastern side of Chester River, 1 mile northward of Queenstown Harbor, has a depth of 1½ feet (0.4 m.) across the bar close along the western end of the island in the mouth and 6 to 8 feet (1.8 to 2.4 m.) inside. It is seldom entered.

Reed Creek and **Grove Creek** have a common entrance on the eastern side of Chester River, 12 miles above Love Point Lighthouse. There is a depth of 10 feet (3 m.) in the entrance, 8 feet (2.4 m.) in Reed Creek for 1 mile above the fork, and 6 feet (1.8 m.) in Grove Creek for ½ mile above a very narrow entrance. Schooners of 6 to 8 feet (1.8 to 2.4 m.) draft enter the creeks, but the channels are not marked and local knowledge is necessary. A house and barn on the east side at the entrance are prominent.

Corsica River, on the east side of Chester River, 13 miles above Love Point Lighthouse, has a depth of 7 feet (2.1 m.) to **Centerville Landing,** 5 miles above the entrance and ¾ mile from the town of Centerville. The river for a distance of 1 mile below Centerville Landing has been improved by dredging a channel with a present depth of 7 feet (2.1 m.) and 100 feet wide. The shoalest place, except in the dredged channel, is off **Town Bar Point,** just inside the entrance, where the channel is narrow and has a depth of 7½ feet (2.2 m.). There are buoys to mark the principal shoals, and the river is easy of navigation as far as the beginning of the dredged channel, above which there are no marks and navigation is difficult without local knowledge.

Enter midway between buoy No. 8 and the horizontally striped buoy east of it, and steer 108° true (SE. by E. ¾ E. mag.) to the red buoy off Town Bar Point. Pass close northward of the buoy and follow a general mid-channel course, giving the points a good berth, to the beginning of the dredged channel just above Fort Point. From here the best water leads 200 feet off the end of Sycamore Point and the same distance off the ends of the two points on the south side above Sycamore Point, then southward along the wharves.

Centerville, ¾ mile from Centerville Landing, has railroad communication. Gasoline can be obtained at the wharves and provisions from the town.

Church Creek, on the west side of Chester River, at the eastern end of East Neck Island Narrows, has a depth of 4 feet (1.2 m.) in the entrance and 6 feet (1.8 m.) inside to near the head, but is little used.

Greys Inn Creek, on the west side of Chester River, 12 miles above Love Point Lighthouse, has a depth of 8 feet (2.4 m.) to a small settlement on the western side 2½ miles above the entrance. It is frequented by schooners up to 8 feet (2.4 m.) draft. There are shoals on both sides at the entrance and a middle ground 1 mile above. These can be avoided by passing close eastward of the black buoy off the entrance and heading for the end of the wharf at **Spring Point,** on the south side, on a 315° true (NW. ⅝ N. mag.) course until ¼ mile from it, and then shaping the course to pass 50 yards off the wharf. There are no marks above the entrance, but the mid-channel is clear above Spring Point.

Langford Creek, on the northwest side of Chester River, 12 miles above Love Point Lighthouse, has a depth of about 12 feet (3.6 m.)

across the bar at the entrance and deeper water to the fork 2½ miles above. **East Fork** has a depth of 10 feet (3 m.) for 3 miles and 6 feet (1.8 m.) for a farther distance of 1½ miles, and **West Fork** a depth of 10 feet (3 m.) for 2¾ miles and 6 feet (1.8 m.) for a farther distance of ¾ mile into either of the two branches at the head. There are no villages on Langford Creek or its tributaries, but there are several farm landings, from which produce and grain are shipped in motor boats and schooners. The principal shoals in the creek as far as the fork are marked by buoys, and strangers of 6 feet (1.8 m.) or less draft should have no trouble in following the channel with the aid of the chart. There are no marks above the fork. An unmarked shoal extends from **Cacaway Island,** at the fork, southwestward to mid-channel, and above this the mid-channel is clear in both branches if the points be given a good berth.

Cliffs Point, on the northwest side of Chester River, 1½ miles northeastward of the entrance to Corsica River, is marked by a symmetrical clump of trees on the end and a wharf on the east side. There is a depth of 8 feet (2.4 m.) at the wharf, and the best water in approaching it is from southward, passing a little eastward of the black buoy off the point. Gasoline freight boats make landings at **Upper Spaniard Point Wharf,** opposite Cliffs Point, and at numerous other wharves between that point and Chestertown.

Southeast Creek, on the east side of Chester River, 21 miles above Love Point Lighthouse, has a depth of 4 feet (1.2 m.) in the entrance and 3 feet (0.9 m.) for 2 miles above to within 300 yards of a landing at the fork, 2 miles from the village of **Church Hill.** It is used by motor boats and a few small vessels of 3 to 5 feet (0.9 to 1.5 m.) draft. The best water in entering is along the north side. **Island Creek,** on the south side ½ mile above the entrance, has a depth of 3½ feet (1 m.) in the entrance and 6 feet (1.8 m.) inside to a bridge 2 miles above.

Chestertown is a town on the west side of Chester River, 26 miles above Love Point Lighthouse. It is visited by gasoline freight boats and schooners up to 10 feet (3 m.) draft. A drawbridge having a center-pier draw, the east opening 52 feet wide and the west opening 38 feet wide, crosses the river here.

Morgan Creek, on the northwest side of Chester River, 2 miles above Chestertown, has a narrow, crooked channel with a depth of 6 feet (1.8 m.) for 2¾ miles above the mouth. The channel at the mouth is a narrow slough leading between flats nearly bare at low water and is usually marked by bush stakes. Above the entrance the mid-channel is clear. The creek is crossed by a drawbridge ¾ mile above the mouth. It is entered by schooners of 5 to 7 feet (1.5 to 2.1 m.) draft.

Crumpton, on the south side of Chester River, 34 miles above Love Point Lighthouse, is visited by gasoline freight boats and schooners, the deepest draft being 8 feet (2.4 m.). A drawbridge having a center-pier draw, either opening 35 feet wide with a headroom of 4 feet (1.2 m.) at high water, crosses the river here.

Millington, a village and railroad station at the head of navigation on Chester River, 40 miles above the mouth, can be reached only by small motor boats and has little business by water. Boats of 5 feet (1.5) draft can go to within ¾ mile of the town at low water.

Supplies.—Gasoline and provisions can be obtained at Queenstown, Centerville, Chestertown, and Crumpton. There is water on the wharf at Chestertown, and coal in limited quantities can be obtained there.

Towboats are used only during the fruit season.

Pilots.—There are no regular pilots for Chester River or tributaries, but many of the local boatmen are competent pilots.

Ice.—The river is usually closed to navigation for extended periods during ordinary winters. During mild winters the channel is kept clear by the regular steamers during most of the time.

Tides.—The mean range of tides is 1.1 feet at the entrance, 1.3 feet at Queenstown, 1.9 feet at Chestertown, and 2.4 feet at Crumpton. The water is fresh above Chestertown and can be used in boilers.

Directions, Chester River.—The channel is marked by buoys as far as Crumpton. From the mouth to the entrance of Corsica River, 13 miles above, the channel has ample width and is easily followed.

Chesapeake Bay to Corsica River

[For vessels of 15 feet (4.5 m.) draft to Queenstown and 10 feet (3 m.) draft to Corsica River]

	Course		Distance, nautical miles
	True	Magnetic	
	°	*Points*	
From Chesapeake Bay enter on any course between 81° and 146° true to keep clear of the fish traps as shown on Chart No. 1226, to position ¼ mile north of Love Point shoal buoy No. 2, then round it at that distance to ¼ mile east of the buoy.			
1. To 350 yards west of buoy No. 1	187	S. by W. ¼ W	1.9
2. To 300 yards northeast of buoy No. 4	147	SSE. ¼ E	2.1
3. To 400 yards south of buoy No. 5	120	SE. ⅝ E	1.9
To Queenstown Wharves			
4*a*. To 150 yards north-northeastward of buoy No. 2, off the entrance. Thence follow directions given on page 232.	63	ENE. ¼ E	2.0
To Corsica River			
4. From position, end of course No. 3 above, to 700 yards east-southeastward of buoy No. 7 off Hail Point.	48	NE. ⅞ E	1.8
5. To 200 yards west of buoy No. 6	338	N. by W. ¼ W	2.3
6. To ⅜ mile northward of the buoy, with Overton Wharf astern.	5	N. by E. ⅛ E	0.4
7. To 150 yards southeast of the H. S. buoy off Grays Inn Creek.	36	NE. ⅛ N	1.9
8. To 150 yards northward of buoy No. 8, entrance to Corsica River, Cliffs Point ahead. Directions for Corsica River are given on page 233.	45	NE. ⅝ E	0.9

From Corsica River to Chestertown the channel is narrow in places, and there are unmarked shoals close to it. Strangers of a greater draft than 8 feet (2.4 m.) are advised to take a pilot if going above Corsica River. Between Chestertown and Crumpton the channel is very narrow in places, with broad flats on either side nearly bare at low water. It is marked by buoys, but it is difficult without local knowledge; the channel is more easily followed at low water. There are no marks above Crumpton, and local knowledge is required.

SWAN CREEK AND ROCK HALL HARBOR

[Chart 548]

Swan Creek is on the eastern side of Chesapeake Bay, 5 miles northeastward of Love Point Lighthouse. The approach, which is also the approach to Rock Hall Harbor, is from southward, eastward of Swan Point Bar. It has a depth of 10 feet (3 m.) to **Deep Landing (Gratitude post office)** on the east side of the entrance to the creek and 6 feet (1.8 m.) for 1¼ miles above in a narrow unmarked channel. The channel is marked by a lighted range and by buoys as far as Deep Landing. A channel 10 feet (3 m.) deep has been dredged across Swan Point Bar about ⅜ mile southward of Swan Point. The channel is subject to rapid shoaling, and strangers are advised to use the main entrance around the south end of Swan Point Bar.

Rock Hall Harbor, on the eastern side of the approach to Swan Creek, has been improved by dredging a channel 12 feet (3.6 m.) deep and 150 feet wide to **Rock Hall Wharf** at the head of the harbor, but no further work is being done and the channel has shoaled to a depth of about 8 feet (2.4 m.). It is marked by two buoys. The harbor is used by many motor boats and small vessels of 3 to 6 feet (0.9 to 1.8 m.) draft. **Rock Hall** is a village ½ mile eastward of the wharf.

Huntingfield Creek, just southward of Rock Hall Harbor, has depths of 1 to 3 feet (0.3 to 0.9 m.) and is used only as an anchorage for small craft.

Tavern Creek, just eastward of Swan Point, has a depth of 2½ feet (0.7 m.) on the bar at the entrance and 6 feet (1.8 m.) inside for ½ mile. The best water in entering leads along the western side of Little Neck Island.

Directions, Swan Creek.—From Chesapeake Bay steer any course between 81° and 147° true to a position, from ¼ to 1 mile, northward of Love Point buoy No. 2. Then steer eastward until Love Point light (fixed white) bears 213° true, and then change course to 33° true (NE. ⅜ N. mag.) and, with Love Point light astern, proceed to Swan Creek lighted range. Head along the range on course 349° true (N. ¼ W. mag.), passing close westward of buoy No. 2, off Huntingfield Point, and eastward of buoy No. 5, until the wharf at Deep Landing shows to the left of buoy No. 4, when it may be steered for.

Courses may be laid for Rock Hall Harbor, leaving Swan Creek lighted range when abeam of the red entrance buoy and steering 55° true (NE. by E. ⅝ E. mag.) to pass 50 feet northwest of buoy No. 2 and the same distance southeast of buoy No. 1.

CHESAPEAKE BAY ABOVE PATAPSCO RIVER

[Charts 549 and 1226]

Chesapeake Bay extends for 30 miles above the entrance of Patapsco River to the mouth of Northeast and Susquehanna Rivers. It is frequented by passenger and freight steamers and tugboats and barges from Baltimore to landings on the tributaries, besides many vessels bound through the Chesapeake & Delaware Canal, the approach to which is through Elk River and Back Creek. The usual draft of boats frequenting this part of the bay is 5 to 8 feet (1.5 to 2.4 m.) and the deepest draft 12 feet (3.6 m.). All of the tributaries in the upper end of the bay are usually closed to navigation by ice for extended periods during the winter. There are no regular pilots, but local boatmen can usually be obtained at the entrances of the tributaries who are competent to act as pilots. **Towboats** can be obtained from Baltimore.

There are extensive shoal areas in the northern end of the bay, many of them having fish weirs on them in season. Many of the shoals northward of Pooles Island are rocky and should be avoided even by small craft. A broad channel, with a least depth of 18 feet (5.5 m.) and well marked by buoys, leads along the eastern side of the bay from Chester River entrance to the mouth of Elk River. Another channel, leading from the mouth of the Patapsco River east-northeasterly, joins this channel east of Pooles Island.

The least depth by this route is 12 feet (3.6 m.), but it leads close to 10 and 11 foot (3 and 3.3 m.) spots. Directions from Chesapeake City to Baltimore and southward are given under "Inside Route, New York to Norfolk," on page 258.

Fish weirs are prohibited at a greater distance from shore than 800 yards northward of Gunpowder River on the western side and Sassafras River on the eastern side. Between Gunpowder River and the channel leading to Baltimore on the western side, and between Sassafras River and Tolchester Beach on the eastern side, they are prohibited in water exceeding 20 feet (6.1 m.) in depth. The limits of fish-trap areas are shown on chart 1226 by broken lines.

Tolchester Beach is a recreation park on the eastern side of Chesapeake Bay, 5 miles north-northeastward of Swan Point and 7¼ miles, 77° true (E. ½ N. mag.), from Craighill Channel range front light. It is connected with Baltimore by steamer in summer. With local knowledge a draft of 10 feet (3 m.) can be taken across the shoals from the eastern end of Brewerton Channel northward of Craighill Channel range front light to the wharf, but strangers should not follow this route with a greater draft than 6 feet (1.8 m.). It leads across an area of possible fish traps.

Fairlee Creek, on the eastern side of Chesapeake Bay, 2¾ miles east-southeastward of Pooles Island, had a depth, by the last survey, of about 6 feet (1.8 m.) across the bar at the entrance and for 1 mile above. It is frequented only by produce boats of 3 to 5 feet (0.9 to 1.5 m.) draft, and by boats which obtain sand and gravel there. Several old boats have been sunk off the point on the western side of the entrance to serve as a breakwater. The entrance is very narrow and has very strong tidal currents. There are no marks for entering.

Worton Creek, on the eastern side of Chesapeake Bay, 3½ miles eastward of Pooles Island, has a depth of 9 to 12 feet (2.7 to 3.6 m.) in the broad bight at the mouth and 7 feet (2.1 m.) in the creek to **Buck Neck Landing,** 1½ miles above the entrance. The channel is narrow in the upper part of the creek and is unmarked. A flashing white light is located on the north side of the entrance. **Gales Wharf** just inside the entrance on the north side is now in poor condition and is not used. Freight boats and barges in season go to Green Point and Buck Neck Landing for tomatoes and farm produce. The Tri-State Yacht Club is located at Buck Neck. The channel off Gales Wharf (Worton Manor) affords good anchorage in easterly winds for vessels of 10 feet (3 m.) draft.

Still Pond, a bight on the eastern side of Chesapeake Bay, 6 miles above Pooles Island, has depths of 8 to 11 feet (2.4 to 3.3 m.) and is a safe anchorage for small craft in easterly winds. **Stillpond Creek,** emptying into the bight from eastward, has a depth of 1½ feet (0.4 m.) across the bar at the entrance and 6 feet (1.8 m.) inside for some distance. **Church Creek,** emptying into the bight from southward, has a depth of 3 feet (0.9 m.) in the entrance and deeper water inside. Both creeks are used by small produce boats.

The wharf 1½ miles northeastward of Still Pond is now in ruin.

Sassafras River, on the eastern side of Chesapeake Bay, 10 miles above Pooles Island, is the approach to the towns of Betterton, Frederick, and Georgetown, and has trade in steamers, schooners, and barges, the deepest draft being 10 feet (3 m.). It has a depth of 12 feet (3.6 m.) to Frederick, 8½ miles above **Grove Point** on the north side at the mouth, 8 feet (2.4 m.) for a farther distance of 1½ miles to **Wilson Point Wharf,** and 5 feet (1.5 m.) to a landing 1 mile above. The channel is broad and straight for a distance of 3 miles above Betterton, above which it is crooked and narrow in places, but the principal shoals are marked by buoys as far as Frederick, and strangers of 6 feet (1.8 m.) or less draft should have no trouble in following the channel with the aid of the chart. Strangers of deeper draft should take a pilot at Betterton. The channel above Frederick is narrow in places and unmarked and is difficult without local knowledge. The mean range of tides is 1.9 feet at Betterton and 2.3 feet at Georgetown.

Betterton is a summer resort on the south side of Sassafras River, 2¼ miles eastward of Howell Point. It is connected with Baltimore, Havre de Grace, and Philadelphia by steamer. There are depths of 11 feet (3.3 m.) at the outer ends of the two steamboat wharves and the approach is clear. The buildings on the shore and wharves are prominent. Gasoline and provisions are obtainable.

Lloyds Creek, on the south side of Sassafras River, 2 miles east-southeastward of Betterton, has depths of 1 to 3 feet (0.3 to 0.9 m.) inside and is seldom entered. It is separated from Sassafras River by a low sand spit.

Turner Creek, on the south side of Sassafras River, 4½ miles above Betterton, has a depth of 7 feet (2.1 m.) to a landing at the foot of a road just inside the mouth and 6 feet (1.8 m.) in a narrow channel for ½ mile above. Some produce is shipped from here in schooners and barges. The entrance is narrow and unmarked.

Back Creek, on the north side of Sassafras River, 6 miles above Betterton, has a depth of 7½ feet (2.2 m.) in the entrance and 5 feet (1.5 m.) in a narrow unmarked channel for 1½ miles above. It is little used.

Island Creek, on the south side of Sassafras River, 7½ miles above Betterton, has a depth of 6 feet (1.8 m.) in a narrow unmarked channel for ½ mile above the entrance. There are no wharves and little business by water.

Frederick and **Georgetown** are towns on opposite sides of Sassafras River, 9½ miles above Betterton. They are connected by a highway bridge having a lift span with an opening 40 feet wide, with a headroom of 5 feet at high water. Gasoline and provisions are obtainable at both places. Tockwock Yacht Club is located at Frederick. There are depths of 7 feet (2.1 m.) at the wharves at Frederick and 12 to 18 feet (3.6 to 5.5 m.) at Georgetown.

The ruins of an old wharf north of Grove Point are prominent.

Pond Creek and **Pearce Creek,** 3½ and 5 miles, respectively, northeastward of the entrance to Sassafras River, can be entered only by small boats at high water and are not used.

Elk River, emptying into the head of Chesapeake Bay from northeastward, 16 miles above Pooles Island, is important as the approach to the western end of the Chesapeake & Delaware Canal. It has a depth of 16 feet (4.8 m.) for 7 miles to the mouth of Back Creek and 7 feet (2.1 m.) for a farther distance of 6½ miles to the intersection of Elk and Little Elk Rivers, 1 mile below Elkton. Above the fork there is a depth in the Elk River of 6 feet (1.8 m.) at low water through a dredged channel 80 feet wide to the paper mill at Elkton. Little Elk River has a controlling depth of 4 feet (1.2 m.) to the fixed bridge at the head of navigation.

The channel in Elk River from the mouth to Back Creek is broad and easily followed. Above Back Creek it is crooked and narrow in places. It is marked by buoys for a distance of 5 miles above the mouth of Back Creek, above which it leads between flats, bare at low water and covered by marsh grass in summer. Strangers should have no trouble in taking a draft of 5 feet (1.5 m.) at low water to the junction of Elk and Little Elk Rivers with the aid of the chart. Above that point local knowledge is necessary.

Elkton, at the head of navigation on Elk River, is on the main line of the Pennsylvania Railroad. It has several industrial plants and some trade in schooners and barges up to 8 feet (2.4 m.) draft. Gasoline, provisions, water, and coal in limited quantities are obtainable. A fixed bridge having a clear headroom of 9 feet (2.7 m.) at high water crosses the river at Elkton. Motor boats anchor just above and below the bridge in a depth of 3 to 5 feet (0.9 to 1.5 m.), and there is no navigation above.

The mean range of tides is 2.1 feet at the entrance and 2.6 feet at Elkton Landing.

Turkey Point, on the west side, at the entrance to Elk River, is a sparsely wooded bluff with abrupt slopes on the south end. The most prominent mark is Turkey Point Lighthouse, a white tower on the highest part of the bluff.

Bohemia River, on the east side of Elk River, 4 miles above the entrance, has a depth of 7 feet (2.1 m.) for 3¾ miles to the junction

of Little Bohemia and Great Bohemia Creeks and 6 feet (1.8 m.) for a distance of 1½ miles in **Little Bohemia Creek** and 2½ miles in **Great Bohemia Creek.** A highway drawbridge crosses the river ½ mile below the fork. The channel is broad and easily followed for a distance of 2 miles above the entrance, above which it is narrow and crooked and difficult without local knowledge. The river and the creeks at the head are frequented by grain and produce boats, the deepest draft being 9 feet (2.7 m.) and usual draft 3 to 6 feet (0.9 to 1.8 m.)

Town Point Wharf is on the eastern side of Elk River, 5½ miles above the entrance. There is a depth of 10 feet (3 m.) at the end.

Back Creek is the approach to the western end of the Chesapeake & Delaware Canal at Chesapeake City, and is described on page 251. Directions for Back Creek and Elk River are given on page 258.

Northeast River empties into the northern end of Chesapeake Bay 5 miles north-northeastward of Turkey Point. The approach to the river leads westward of Turkey Point and between the western side of **Elk Neck** (high and thickly wooded) and the extensive flats westward. There is a depth of 12 feet (3.6 m.) to the mouth of the river and 12 feet (3.6 m.) in a dredged channel, buoyed on the east side, to a long wharf one mile west of the town of Northeast.

The mean range of the tides is 2.5 feet.

Charlestown is a village and railroad station on the western side of Northeast River, 2½ miles above the entrance. Gasoline may be obtained.

Northeast is a town with railroad communication at the head of navigation on Northeast River, 4½ miles above the entrance. Gasoline and provisions are obtainable, and there is a railway capable of hauling out boats of 40 feet length and 4 feet (1.2 m.) draft.

To enter Northeast River, pass ½ mile westward of Turkey Point and steer 21° true (NNE. ½ E. mag.) to the entrance buoy of the dredged channel, then 16° true (NNE. mag.) through the channel westward of the buoys to Hance Point, then 31° true (NE. ¼ N. mag.), passing westward of the buoys, to the last red spar buoy, then 2° true (N. ¾ E. mag.) to the wharf.

Susquehanna River, emptying into the head of Chesapeake Bay from northwestward, is the approach to the towns of Havre de Grace and Port Deposit.

The approach from southward has a depth of 12 feet (3.6 m.) in a dredged channel above Locust Point. Above Havre de Grace there is a controlling depth of 12 feet (3.6 m.) to Port Deposit. Directions from Chesapeake Bay to Havre de Grace are given on page 242. Above Havre de Grace there are no marks, but the channel is easily followed with the aid of the chart.

Ice gorges and **freshets** are of frequent occurrence in Susquehanna River during the breaking up of the ice in the spring, the water at Port Deposit sometimes rising to a height of 15 to 18 feet (4.5 to 5.5 m.) above the normal high water and causing considerable damage. The position and depth of the channels are subject to considerable change through these causes. The river is usually entirely closed to navigation for a period of about three months in winter. The mean range of tides is 2.1 feet.

Fishing Battery Lighthouse (flashing white), 350 yards eastward of the dredged channel near the lower end, is a light on a skeleton tower near a white dwelling, with another building and a few trees near it and a large area of marsh grass around it. A shallow dredged basin leads in toward the light from the west side.

Havre de Grace, on the western side, at the entrance to Susequehanna River, is on the main line of the Pennsylvania and Baltimore & Ohio Railroads and is connected with Betterton and Baltimore by steamer. There are depths of 6 to 10 feet (1.8 to 3 m.) at the wharves. Gasoline, Diesel oil, provisions, water, and coal in limited quantities are obtainable. There is a small marine railway for repairing motor boats at Havre de Grace.

A rock with a depth of 5½ feet (1.6 m.) over it, and marked by a red and black horizontal striped buoy at its southern end, lies ⅛ mile off the wharves at Havre de Grace and about ¼ mile below the lower bridge. The generally used channel for vessels bound through the bridges leads about 100 yards eastward of the buoy. There are said to be several rocks between this rock and the wharves westward, which require local knowledge to avoid.

Bridges.—Three bridges cross Susquehanna River in the vicinity of Havre de Grace. The lower one, a highway bridge ¾ mile northward of Havre de Grace Lighthouse, has a center pier draw across the channel on the western side of Garrett Island, each opening 98 feet wide, with a headroom of 23 feet at high water when closed. The bridge is fixed on the eastern side of Garrett Island and has a headroom of 23 feet at high water.

The Pennsylvania Railroad bridge, 150 feet above the highway bridge, has a center pier draw across the channel on the western side of Garrett Island, each opening 100 feet wide with a headroom of 52.4 feet at high water when closed. The bridge is fixed on the eastern side of Garrett Island and has a headroom of 52.4 feet at high water. The east opening in both draws is generally used by vessels bound north and the west opening by vessels bound south. A towboat is stationed at Havre de Grace by the railroad company to assist sailing vessels through the bridges.

The Baltimore & Ohio Railroad bridge, ¾ mile above the Pennsylvania Railroad bridge, is fixed on both sides of Garrett Island and has a headroom of 87 feet at high water. The main channel leads through the second opening from the western side of Garrett Island.

Perryville is a town on the eastern side of Susquehanna River, opposite Havre de Grace. A draft of about 10 feet (3 m.) at low water can be carried from the main channel off Havre de Grace, across the middle ground anywhere from 200 yards to ½ mile southward of the lower bridge, into the channel leading to Perryville, and this is the course usually followed by all vessels bound to Perryville that can pass under the lower bridges. Buildings of the United States Public Health Service Hospital, including the twin stacks of a power house, near the southern point of the town, are prominent. A short dredged channel leads to a Government landing ¼ mile below the highway bridge, and there is a private wharf just south of the same bridge.

Garrett Island, just above Havre de Grace, is high and wooded, with no prominent marks.

Port Deposit is a town on the northeast side of Susquehanna River, 3½ miles above Havre de Grace. It has railroad communication and is connected with Baltimore by steamer. There is a depth of 12 feet (3.6 m.) to abreast the town and 6 to 9 feet (1.8 to 2.7 m.) at the wharves. Gasoline and provisions are obtainable. The deepest draft of vessels going there are tugboats and barges up to 12 feet (3.6 m.) draft carrying stone from the quarries in this vicinity. Small boats can go a short distance above Port Deposit, but the channel is obstructed by rocks and should not be attempted by a stranger.

Directions, Susquehanna River.—From a position 300 yards east of the perpendicularly striped buoy off Turkey Point, steer 321° true (NNW. ¾ W. mag.) to a point 300 yards east of Locust Point gas buoy, passing eastward of buoy No. 1. Then steer 280° true (WNW. ⅜ W. mag.), passing 100 yards north of the gas buoy and heading for buoy No. 3, to a position 100 yards east of the latter buoy.

Then steer 325° true (NNW. ⅜ W. mag.) to close eastward of buoy No. 5; 343° true (N. ¾ W. mag.) to 50 yards eastward of buoy No. 7; and then 350° true (N. ⅛ W. mag.) to 100 yards eastward of buoy No. 9 (reflector). From buoy No. 9 steer 7° true (N. by E. ⅜ E. mag.) to abreast the wharves at Havre de Grace, passing close eastward of buoys Nos. 13 and 15, and 300 yards eastward of the light (fixed red) on Concord Point.

Swan Creek, on the western side of Chesapeake Bay, 3½ miles below Havre de Grace, has a depth of about 5 feet (1.5 m.) in a narrow, unmarked channel to near the head, and is little used.

Spesutie Narrows, between Spesutie Island and the mainland westward, has a least depth of 2½ feet (0.7 m.) and is considerably used by small local craft. The best water leads eastward of an islet near the northern end, and southward of it the mid-channel is clear.

Romney Creek, on the west side of Chesapeake Bay, 6 miles northeastward of Pooles Island, has a depth of 6 feet (1.8 m.) in a narrow unmarked channel for 3 miles above the mouth and 2 feet (0.6 m.) for a farther distance of 1½ miles. It is used only by small boats. A clump of trees on **Taylor Island** and a house and barn on the western side of **Little Romney Creek** are the only prominent marks. There is an unmarked rocky patch, with a least depth of ½ foot (0.1 m.) ¾ mile south-southeastward of the entrance, and the best water in approaching the entrance leads westward of it. A 7° true (N. by E. ⅜ E. mag.) course from Worton Point Shoal gas buoy will lead clear of all dangers to the entrance.

Bush River, on the western side of Chesapeake Bay, 3 miles north-northeastward of Pooles Island, has a depth of 6 feet (1.8 m.) to a railroad drawbridge 7 miles above the entrance and is frequented only by small produce and pleasure boats. The principal shoals inside the entrance are marked by buoys, and above these the mid-channel is clear and easy of navigation to the bridge. The bridge has a draw opening 35 feet wide and a headroom of 12 feet at high water. The river is shoal and little used above. Bush River is a railroad station at the bridge. The mean range of tides is 1.5 feet.

Pooles Island, on the western side of Chesapeake Bay, 10 miles above the mouth of Patapsco River, is low and covered with trees. **Pooles Island range** (skeleton towers, white daymarks, black round

center in front mark), on the southeast end of Pooles Island, is a guide for crossing the middle ground eastward of the island and is used by all vessels bound northward from Baltimore.

The channel westward of Pooles Island is marked by buoys and has a least depth of 7½ feet (2.2 m.) although there is an unmarked 6-foot (1.8 m.) spot 600 yards northwestward of Pooles Island Lighthouse (flashing white). It is used only by small craft from the tributaries on the western side or boats seeking shelter from westerly winds.

Gunpowder River, Middle River, and Back River have a common entrance westward of Pooles Island, leading between Spry Island on the north and Miller Island on the south. They are frequented mostly by small produce and pleasure boats and an occasional small tugboat, the deepest draft being 7 feet (2.1 m.) and usual draft 2 to 4 feet (0.6 to 1.2 m.). The mean range of tides is 1.2 feet.

Gunpowder River has a depth of 11 feet (3.3 m.) for 2 miles above **Spry Island** in the mouth, 6 feet (1.8 m.) to within 1 mile of a railroad bridge 6½ miles above Spry Island, and 4 feet (1.2 m.) to the bridge. The bridge has a draw opening, but the river is shoal and there is no navigation above. Spry Island is a bare marsh marked by two shanties. The main entrance leads southward and westward of the island, and is narrow as far as Carroll Point, 1 mile above, with shoals of 3 to 6 feet (0.9 to 1.8 m.) depth close to the channel.

Buoys mark the points of shoals from eastward of Miller Island to Carroll Point. Navigation to this point is difficult without local knowledge for anything except small craft. Above this point the mid-channel is clear to the bridge if the points be given a good berth. A draft of 2 feet (0.6 m.) at low water can be carried into the river from northward, close around the end of Ricketts Point.

Harewood Park is a railroad station at the western end of the bridge across Gunpowder River. **Magnolia** is a post village and railroad station 1 mile eastward of the bridge.

Aberdeen Proving Ground—Navigation prohibited.—For the protection of life and property during target practice in the waters adjacent to Aberdeen Proving Ground, near the head of Chesapeake Bay, navigation is prohibited in the following areas:

Northeastward of a line extending northwestward from the southwest point of Pooles Island and touching the southwest point of Spry Island, and Lower Island and Brier Points at the entrance to Hawthorn Cove.

Northwestward of a line touching the southeast tangent of Pooles Island and extending 39° true to Black Island Point near the south entrance to Spesutie Narrows; thence in mid-channel through Spesutie Narrows. This includes Romney Creek, Bush River up to a line extending from Fairview Point to Chelsea, and Gunpowder River up to a line extending from Olivers Point to Reardons Inlet.

Seneca Creek, 2½ miles northward of Miller Island, has a depth of 8 feet (2.4 m.) in the entrance and 5 feet (1.5 m.) in mid-channel to near the head. It is frequented only by small craft.

Middle River, 2¼ miles 297° true (NW. by W. mag.) from the black buoy east-northeastward of Miller Island, has a depth of 8 feet (2.4 m.) for 3 miles above the entrance and 2½ feet (0.7 m.) for a farther distance of ½ mile to the head of navigation. Unmarked

shoals extend off both points at the entrance and from many of the points above the entrance, but the mid-channel is clear if the points be given a good berth. Middleriver is a village and summer resort at the head of navigation; it is on the railroad and is the terminus of an electric road to Baltimore. The river has many tributaries, the most important being **Frog Mortar Creek**, which has a depth of 6 feet (1.8 m.) to near the head.

Hawk Cove, northwestward of Miller and Hart Islands, is the main aproach to Back River and affords secure anchorage in depths of 8 to 10 feet (2.4 to 3 m.). A shoal extends half way across the entrance from the northwest side.

Miller Island is a bare marsh without prominent marks. A shoal extending northeastward is marked off its end by a black buoy.

Hart Island is marshy and marked by a thick clump of trees in the center and scattered trees near the northeast end.

The thoroughfare between the southwest end of Hart Island and the mainland has a depth of 1½ feet (0.4 m.) at low water and 2½ to 3 feet (0.7 to 0.9 m.) at high water and is considerably used. Craighill Channel range rear light (skeleton tower) is on the east side.

Back River has a depth of 6 feet (1.8 m.) for a distance of 5½ miles above the entrance and 5 feet (1.5 m.) for a farther distance of 1 mile to an electric-railway bridge. The bridge has a draw opening 25 feet wide, and small boats can go about 1 mile above in either branch at high water, but boats seldom go above the bridge. The river is unmarked, but above the entrance the mid-channel is clear for vessels of 4 feet (1.2 m.) draft to the bridge. The best water leads westward of an unmarked middle ground 3 miles above the entrance. A row of piles extends ⅜ mile eastward from the mouth of **Bread and Cheese Creek,** ¾ mile below the bridge. The main approach to the river is through Hawk Cove, but small craft from southward usually enter through the thoroughfare westward of Hart Island.

INSIDE ROUTE, NEW YORK TO NORFOLK

From New York Upper Bay the generally used passage is through Kill van Kull and Arthur Kill and thence around Great Beds Lighthouse to the entrance of Raritan River; but strangers frequently take the more open passage through New York Lower Bay and Raritan Bay to Raritan River. Thence the passage leads up Raritan River to New Brunswick, and thence through the Delaware & Raritan Canal to Bordentown. Thence down Delaware River to the entrance to the Chesapeake and Delaware Canal at Reedy Point, and thence through this canal to Chesapeake City. Thence down Back Creek and Elk River to the head of Chesapeake Bay at Turkey Point and thence down Chesapeake Bay and through Hampton Roads and Elizabeth River to Norfolk.

A draft of 7 feet (2.1 m.) can be taken through the passage from New York Bay to Delaware Bay, and 12 feet (3.7 m.), by taking advantage of the tide, from Delaware Bay to Chesapeake Bay, and these are the limiting drafts. The controlling width of 23⅓ feet is found at the locks in the Delaware & Raritan Canal. The speed of vessels passing through the Delaware & Raritan Canal is limited to 6 statute miles per hour. A vessel with a speed of 10 miles, run-

ning in daytime only, can make the passage in three and one-half to four days under favorable conditions. It is advisable to inquire beforehand whether the Delaware & Raritan Canal is open for navigation. *It is always closed on Sundays and at night.* (See page 246.)

Supplies.—Coal in limited quantities can be obtained at numerous places, but the best and most convenient coaling places are Perth Amboy, Philadelphia, Baltimore, and Norfolk. Gasoline, provisions, and water can be obtained at most of the towns or cities along the route, also at a number of the locks in the Delaware & Raritan Canal.

Pilots can be obtained at Perth Amboy, New Brunswick, Bordentown, Delaware City, Chesapeake City, and Baltimore for either the whole or parts of the passage. A fisherman or pilot may sometimes be obtained at the mouth of Back Creek competent to pilot a vessel to Chesapeake City. The fees are not prescribed by law.

Ice sufficient to interfere with the navigation of small craft may be expected at any time between December and April and is most severe during January and February. The canals are kept open as long as navigation is possible and are opened as soon as navigation is possible in the spring. During mild winters local vessels use them throughout most of the winter, but strangers should make inquiries about their condition before attempting the passage.

KILL VAN KULL AND ARTHUR KILL

[Chart 369]

These passages have a combined length of 17 miles from Robbins Reef Lighthouse to Ward Point, the southern end of Staten Island, and a width varying from 600 yards to less than 200 yards. There is considerable shipping, especially through Kill van Kull. Strangers should have no difficulty in making the passage with a draft of 10 feet (3 m.) with the aid of the chart and the directions. The Baltimore & Ohio Railroad crosses Arthur Kill about ½ mile southward of Elizabethport. There is a clear width of 202 feet on each side of the center pier of the draw; the eastern channel has the deeper water and is generally used. There is a high-water clearance when the draw is closed of 31 feet. Two fixed bridges with high-water clearances of 135 feet and span widths of 664 and 675 feet cross Arthur Kill below the Baltimore & Ohio Railroad bridge.

Anchorage is not permitted in the channel of Kill van Kull and Arthur Kill, anchorage limits being prescribed by regulation. The anchorage on the western side of Arthur Kill off Perth Amboy is good and convenient; its eastern limit is a line running northward from the horizontally striped buoy to the Lehigh Valley coal docks.

Tides.—The mean range of the tides at Shooters Island is 4.6 feet; tides (high and low) occur ¼ hour later than at Governors Island. At South Amboy the mean range is 5.3 feet, and tides occur ¼ hour later than at Sandy Hook.

RARITAN RIVER

[Chart 375]

has a length of 10½ miles from South Amboy to New Brunswick, a width varying from ½ mile to 125 yards, and is crooked in places.

Dredging has been done to obtain a channel 200 feet wide and 15 feet (4.6 m.) deep to the north end of South River Canal, thence 200 to 100 feet wide and 10 feet (3 m.) deep to New Brunswick. In June, 1929, these depths prevailed to Lawrence Creek from which point the depth to New Brunswick was 9 feet (2.7 m.). At high water the marshy banks are generally covered, making it difficult for a stranger to follow the channel. Two drawbridges cross the river near its entrance at South Amboy.

A concrete-arch bridge having a high-water clearance of 100 feet and a width between fenders of 200 feet, crosses the river 1½ miles below New Brunswick.

Anchorage can be made off South Amboy north of a line from the anchorage buoy to the center pier of the first bridge. The river channel above South Amboy is too narrow to permit any vessels other than small boats to anchor.

New Brunswick is an important city at the entrance to the Delaware & Raritan Canal from Raritan River. The canal forms a basin abreast the city, which is the harbor of New Brunswick. At high water of spring tides a draft of 8 feet (2.4 m.) has been taken into the basin through the entrance lock of the canal, but 7 feet (2.1 m.) is the deepest draft for which the canal company will be responsible. The size of vessels entering the basin is limited to the size of the canal lock. Coal, water, and provisions can be had in the basin, and there are marine railways of sufficient size to haul out vessels navigating the canal.

Sailing vessels, which are not going to tow down the Raritan River, are advised to remain in the basin at New Brunswick until the wind serves for them to sail down the river. There is no place for some distance below New Brunswick at which a vessel of 7-foot (2.1 m.) draft can make fast outside of the basin without lying aground at low water, and the river channel is too narrow for vessels to anchor.

Towboats.—A towboat can be obtained at Perth Amboy and South Amboy and sometimes at New Brunswick and can always be had at New Brunswick by telephoning to Perth Amboy.

Tides.—At New Brunswick high water is ¾ hour later and low water 1½ hours later than at Sandy Hook; the mean range of tides is 6 feet.

DELAWARE & RARITAN CANAL

This canal is 39 miles long from its eastern entrance at New Brunswick on the Raritan River to its western entrance at Bordentown on the Delaware River. The canal is usually closed about the third week in December, unless sooner on account of ice conditions, and opens in March. It is also closed on Sundays throughout the year from 12.01 a. m. to 11.59 p. m. and each night from 6 p. m. to 6 a. m. (standard time, except at Trenton, where daylight saving time is used during the summer). The drawbridge at New Brunswick is closed for a short period at noon, and two bridges at Trenton near the Roebling plant are closed for one-half hour each morning and noon just before the factory opens.

When bound through the canal, the north and west banks (old towpath) throughout the entire length of the canal should be followed carefully at a distance of from 25 to 30 feet in order to carry

the maximum draft, and when approaching the arched stone bridge at New Brunswick (overhead clearance 50 feet in the middle) hold the same distance off the towpath passing north of the bridge pier. If these directions are followed, no difficulties should be encountered.

The principal places on the canal and their distances, in nautical miles, from New Brunswick are: New Brunswick Outlet Lock No. 14, 00.00; Lock No. 13 (Deep Lock), 0.8 (1.0 statute mile); Lock No. 12, 5.4 (6.25 statute miles); Bound Brook, 6.1 (7.0 statute miles); Bound Brook Lock No. 11, 6.7 (7.75 statute miles); Lock No. 10 (Ten Mile Lock), 8.9 (10.25 statute miles); Millstone, 12.1 (14.0 statute miles); Griggstown Lock No. 9, 17.5 (20.25 statute miles); Kingston Lock No. 8, 21.0 (24.25 statute miles); Trenton Basin, Lock No. 7, 32.8 (38.0 statute miles); Lock No. 6, 33.6 (38.8 statute miles); Lamberton Lock No. 4, 34.2 (39.8 statute miles); Lock No. 3, 34.7 (40.0 statute miles); Lock No. 2, 36.2 (41.75 statute miles); Bordentown Lock No. 1, 38.2 (44.0 statute miles). The **dimensions of each lock** are 210 feet long, 23 feet 4 inches wide, and 7 feet (2.1 m.) deep. Vessels drawing over 7 feet (2.1 m.) and not over 7½ feet (2.3 m.) are allowed to pass through upon condition that the owner or master assume all responsibility for damage to the vessel or the property of the canal company. Masted vessels are limited to masts less than 50 feet (15.2 m.) above canal level by the arched stone bridge at New Brunswick, which has a clear height of 50 feet in the middle. Coal in limited quantities may be obtained from local dealers at the principal places on the canal, but steamers will find it more convenient to coal at Perth Amboy and Philadelphia than along the canal. The water in the canal is fresh but is not good for drinking purposes. Gasoline may be obtained conveniently at New Brunswick, Lock No. 13 (Deep Lock), and at Lock No. 11.

Toll rates, which are subject to change, are charged by the canal company and are collected at the entrance where the vessel is given clearance. The present rate is $2 per lock for vessels without cargo; vessels carrying cargo are charged toll on a mileage-tonnage-cargo classification basis. Towage can be arranged for at either entrance to the canal.

The following information is taken from the **Rules and Regulations Governing the Delaware & Raritan Canal,** published by the company:

When under way at night a small green signal light shall be carried on the stem. A steamer shall carry in addition a white light at the end of her flagstaff or, if towing other boats, two white lights at the end of her flagstaff; no other lights or reflectors shall be carried. No vessel shall carry sail in the canal. The speed shall not exceed 6 miles (statute) per hour. When a vessel overtakes another, the slower shall give the inner track to the faster, unless within 300 yards of a lock or bridge. When in danger of meeting at a bridge or where both can not pass, the one going westward shall lie to. Everything towed by horses or mules, and rafts, on meeting steamboats shall keep on the side next the towpath; in all other cases everything meeting shall keep to the right. When approaching a lock or bridge notice shall be given on arriving within 300 yards of the same by a horn, bell, or whistle. Steamboats passing other boats or vessels, either in motion or at stopping places, shall "slow-up" till entirely past, especially in passing Coalport. Steamboats must not check headway by backing while in the locks nor blow out their boilers while passing locks or bridges. The signal at night that a lock is ready will be two whistles from the lock engine for boats bound west and four for those bound east. No stones, rubbish, dead carcasses, or other offensive matter shall be thrown or dropped into the water.

DELAWARE RIVER, FROM BORDENTOWN TO THE ENTRANCE TO CHESAPEAKE & DELAWARE CANAL

[Charts 294, 295, and 296]

The distance is 62 miles from Bordentown to the entrance to the Chesapeake & Delaware Canal at Reedy Point, and the channel generally has ample width and is easily followed; but extra caution is required in the first ½ mile from Bordentown, where there is a depth of 6 feet (1.8 m.), in a narrow channel. This is the shoalest place in the channel. A stranger, proceeding with caution in the narrow parts of the river and using the lead, should have little difficulty in making the passage from Bordentown to Reedy Point with the aid of the chart and the directions. Channels have been dredged 12 feet (3.7 m.) deep and 200 feet wide from Philadelphia to Trenton. Depths in the dredged channel below Philadelphia are always ample for vessels that can use the inside route. Many of the shoals in the river are bare at or before low water and are generally covered with marsh grass, which makes them usually well defined. The water in the river above Chester is fresh and suitable for boilers. Coal can be obtained conveniently at the larger cities along the river.

Anchorage.—Except for ½ mile below Bordentown, there is a sufficient width at most places in the channel for anchorage, for which the chart must be the guide. Between Port Richmond and Marcus Hook anchorages are prescribed by regulation. Those most convenient to the city of Philadelphia are on the east side of the river at Port Richmond, Cooper Point, and Greenwich Point, and are marked by anchorage buoys. Below Marcus Hook suitable anchorages may be selected well off the ranges. Convenient anchorage for yachts can be found off the Keystone Yacht Club at Tacony, north of Philadelphia. Public landings where vessels may tie up for a short time are located at the foot of Vine Street and at the foot of Dock Street in Philadelphia. There are a number of piers at Philadelphia at which vessels may lie for which wharfage charges are made, pier No. 57 north and Nos. 30 and 34 south being convenient to the city.

Tides.—The mean range of tides at Bordentown is 4.9 feet; Burlington, 4.9; Philadelphia, 5.2; Chester, 5.4; and Delaware City, 5.7. Tides occur at Bordentown 2¼ hours and at Burlington 1½ hours later than at Philadelphia, and at Chester 1¼ hours and at Delaware City 3 hours earlier than at Philadelphia.

CHESAPEAKE & DELAWARE CANAL

This canal is 12 miles long from its eastern entrance at Reedy Point on the Delaware River to its western entrance at Chesapeake City on Back Creek. Its eastern entrance lies between two stone jetties. It is a sea-level canal, owned and maintained by the United States. There are no **toll charges.**

A section of the old canal, extending from Delaware City to a junction with the new canal about 2 miles west of Reedy Point, is maintained as a branch of the main canal. Its present controlling depth is about 3½ feet (1.0 m.).

Traffic control.—As an aid to navigation in the canal, a dispatching system has been established with a dispatcher on duty at the Chesapeake City office at all times. Each boat is reported as it enters the canal and a log of its name, length, beam, draft, and speed of travel is kept, and the dispatcher, with this information and knowledge of the tide and channel conditions, is able to dispatch traffic safely over shoals. The cooperation of the canal users is essential to the successful handling of traffic, especially in the matter of information as to length, beam, and draft of vessels; visibility of draft numerals; and the strict observance of existing rules and regulations for the use of the waterway.

Depth.—The project depth is 12 feet (3.6 m.), but frequent shoaling occurs. To meet this condition, the United States Engineer Office at Sixth and King Streets, Wilmington, Del., obtains centerline soundings throughout the canal and Back Creek once each two weeks and issues a brief notice relative to sections of the waterway that are less than project depth. This notice will be mailed to any regular user of the canal upon application to the above office. The approximate depth at any time can be obtained by telephone from the dispatcher at Chesapeake City (call Chesapeake City—43).

Width.—The bottom width is 90 feet. The width of a vessel or of a tug and barge being towed abreast must not exceed 46 feet unless special arrangements are made.

Tows.—Tows are limited to two loaded or three light barges in single file.

Turning basins.—Basins at which wide vessels may pass each other, or long craft turn around, are provided 2,500 feet east of St. George Bridge and 1,500 feet west of Chesapeake City Bridge.

Bridges.—The canal is crossed by five drawbridges as described in the regulations given below. The headroom under bridges, when open, is limited to 140 feet, but the bridge at Summit, having a clearance of 67 feet when closed, is opened only by special arrangement. Vessels requiring headroom of more than 65 feet and less than 140 feet can arrange to pass through the canal between 8 a. m. and 4 p. m., eastern standard time (Sundays included), by giving three hours' notice to the assistant in charge of the canal, who can be reached at the canal office, Chesapeake City, Md., by telephone (Chesapeake City—43), or by telegraph.

Aids to navigation.—The outer end of the north jetty at the eastern entrance is marked by a flashing red light and the outer end of the south jetty by a flashing white light. A number of lights and buoys mark the sides of the canal throughout its length.

Aids are installed for entering from seaward through the western entrance so that red buoys and lights are found on the port side when southbound.

Current.—The maximum current in the canal under the effect of normal tides is estimated to be about 2 knots but during strong winds from the easterly or westerly quadrants the currents are reported to reach a velocity of 5 knots, conforming with the wind in direction and continuing in the same direction throughout the duration of the wind. Under such conditions tows usually have difficulty

in making headway against the current. At times there is considerable current across the jettied entrance which must be guarded against, especially when passing other vessels in the entrance.

General.—Gasoline and supplies can be obtained at Chesapeake City, St. Georges Bridge, and Delaware City. There is a marine railway at Chesapeake City. There are tie-up places in the canal at Chesapeake City in 12 feet (3.6 m.), St. Georges Bridge in 8 feet (2.4 m.), and Delaware City in 6 feet (1.8 m.).

Regulations for this waterway have been prescribed by the Secretary of War as follows. It should be noted that they cover Back Creek as well as the canal.

1. *Limits.*—The Inland Waterway from Delaware River to Chesapeake Bay, Del. and Md., is defined as that channel partly natural and partly artificial extending from the outer extremities of the stone jetties at Reedy Point in Delaware River, via an artificial cut, the former bed of St. Georges Creek, another artificial cut, Broad Creek, and Back Creek to its mouth in Elk River, a tributary of Chesapeake Bay. It also includes the branch canal extending from Delaware City, Del., to the former bed of St. Georges Creek.

2. *Authority of waterway officers.*—The movement of all boats, or craft of every description, in the waterway, shall be subject to the supervision of the district engineer, an officer of the United States Engineer Department at large, in general charge of Federal waterway improvements in the locality.

3. *Draft.*—No vessel of greater draft than 12 feet should attempt to enter the waterway.

4. *Projections from vessels.*—No vessel carrying a deck load which overhangs or projects over the sides of said vessel will be permitted to enter or to pass through any of the narrow parts of the waterway.

5. *Speed.*—No vessel in any part of the waterway shall exceed in speed 6 miles per hour. In the narrow parts of the waterway all vessels upon approaching other vessels or craft proceeding in an opposite direction or tied to the bank shall slacken speed to not exceeding 3 miles per hour so as to allow them to pass in safety and without collision.

6. *Handling of tows.*—All boats engaged in towing through the waterway vessels not equipped with a rudder, whether light or laden, shall use two towlines, and shall shorten them to the greatest extent possible so as to have full control of their tows and thereby avoid accident. Boats that are towing vessels provided with rudders need use but one towline, but the line between towing boat and vessel being towed must not exceed 100 feet in length.

7. *Rafts.*—Rafts will be permitted to be built and assembled, or to navigate the waterway, only by special permission of and in the manner prescribed by the district engineer.

8. *Right of way.*—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 to interfere with the free use of the waterway by other craft.

9. *Bridges.*—The vertical clearances of bridges crossing the waterway when fully opened are 140 feet above the established plane of mean low water. The bridges have a horizontal clearance of 175 feet between fenders. When closed, the vertical clearances above the mean high water are as follows:

	Feet
Reedy Point Bridge	6
St. Georges Bridge	16
Pennsylvania Railroad Bridge	45
Summit Bridge	67
Chesapeake City Bridge	9

When at any time during the day or night any vessel or water craft approaches one of those bridges under which it can not pass, the lawful signal of the desire of the master of the vessel or craft to pass through the draw opening shall be three blasts of a whistle or horn blown on the vessel or craft, or notice given in any other convenient manner to the bridge tender of the desire of the master to pass the bridge.

The draw in each and every bridge, upon the signal or notice above prescribed, shall be promptly opened at any and all hours of the day or night for the passage of such vessel.

If at the time of receiving the signal or notice above prescribed a car, train of cars, or other vehicle is approaching any draw so closely that it can not be safely stopped before reaching such draw, two blasts of a whistle or horn shall be blown on the bridge. As soon thereafter as such draw shall be cleared it shall be promptly opened and three blasts of a whistle or horn blown on the bridge to indicate such clearance. At night the navigation lights at the center of the vertical lift draw span will show red when the draw span is closed to navigation and green when it is open.

10. *Stopping in waterway.*—Vessels may, when and as desired, stop and tie up in the canal east of Reedy Point Bridge, at and west of Chesapeake City, Md., and at St. Georges, Del., provided that they shall not interfere with the operation of any bridge in so doing.

Whenever a vessel stops in these or any other portions of the waterway, it shall be securely fastened to one bank and as close to the bank as possible; this shall be done at such place and under such conditions as will not obstruct or prevent the passage of other vessels or craft.

When thus tied up all vessels must be moored by not less than two lines each, and shall not be tied up more than one abreast. Sufficient crew to care properly for such vessels shall remain on board at all times.

Such stoppages in portions of the waterway not designated above shall be only for such period as may be necessary, and no vessel or craft will be allowed to use any of the undesignated portions of the waterway as a permanent or semipermanent place of mooring without the permission of the district engineer.

Vessels may anchor in Back Creek, but shall be so placed as not to obstruct the channel, and during the night shall display lights as required by navigation rules covering such cases.

11. *Refuse.*—The placing of any ashes or refuse or any material liable to cause an obstruction in the waterway or upon the banks or right of way thereof is prohibited.

12. *Trespass upon waterway property.*—Trespass upon waterway property or injury to the waterway, lands, banks, bridges, jetties, piers, fences, houses, trees, telephone lines, or to any other property of the United States pertaining to the waterway is prohibited.

13. *Fish and game.*—The fish and game laws of the United States and of the States of Delaware and Maryland, within their respective bounds, will be enforced upon the waters and lands pertaining to the waterway owned by the United States. The use of traps and nets upon the property is forbidden except upon written permission from the district engineer.

14. *When regulations become effective.*—The rules and regulations regulating the use and administration of this waterway prescribed December 23, 1921, and effective January 1, 1922, are hereby revoked, effective February 28, 1927. The rules and regulations hereinabove prescribed shall take effect and be in force from and after March 1, 1927.

BACK CREEK AND ELK RIVER

[Chart 1226]

Back Creek has a length of 3¼ miles from Chesapeake City to Elk River. A channel 12 feet (3.7 m.) deep and 150 feet wide has been dredged through this creek and is well marked by lights and buoys. A pilot may be obtained on inquiry at Chesapeake City and sometimes at the entrance to the creek. The channel in the creek is too narrow for anchorage. Gasoline and provisions are obtainable at Chesapeake City, and there is a shipyard and marine railway.

Elk River has a length of nearly 8 miles from Back Creek to the entrance of the river at Turkey Point. The channel is wide and easily followed.

Tides.—In Back Creek tides occur about 2¼ hours after tides at Baltimore, and the mean range of tides is 2.6 feet.

The channel in Chesapeake Bay is well marked and easily followed by the class of vessels using the inland waterway. Coal, gasoline, repairs, and supplies of all kinds can be best obtained at Baltimore and Norfolk. Some supplies and gasoline can be had at numerous places on the tributaries of the bay, the best places near the sailing route being Annapolis, Solomons on the Patuxent River, and Cockrells Creek (Reedville) on the Great Wicomico River. There are small marine railways at Annapolis, Solomons, Reedville, and Carter Creek on the Rappahannock River.

Caution.—For the protection of life and property during target practice in the waters adjacent to **Aberdeen Proving Ground,** near the head of Chesapeake Bay, navigation is prohibited in certain areas. (See page 243.)

Anchorage can be had at numerous places on the shores of the bay and its tributaries, depending on the direction of the wind. Those most frequently used and easiest of access are:

Patapsco River.—Light-draft vessels usually anchor in Old Road Bay or off the mouth of Stony Creek, depending on the wind and sea. Anchorages in the vicinity of Baltimore are prescribed by regulations; they are on the northeast side of the harbor between Canton and Fells Point and in the cove on the southerly side east of Federal Hill.

Severn River, at Annapolis in the mouth of Spa Creek, depth 13 feet (4 m.); also in Annapolis Roads southeastward of Greenbury Point Shoal Lighthouse.

Patuxent River.—Small vessels usually anchor on the north side between Drum Point Lighthouse and the horizontally striped buoy ⅝ mile westward of the lighthouse, and small craft frequently anchor in the cove on the north side of Solomons Island (1⅝ miles westward of Drum Point Lighthouse).

Cornfield Harbor, on the west side of Point Lookout, entrance of Potomac River, is occasionally used; it is sheltered only from northerly and northeasterly winds.

Great Wicomico River and the mouth of Cockrell Creek is a good and convenient harbor. The fish stakes, off the entrance, may give trouble at times to vessels entering. The depths at the anchorage are 15 to 20 feet (4.6 to 6.1 m.).

Rappahannock River.—Anchorage, exposed to southeasterly winds, can be selected in the entrance.

Mobjack Bay is exposed to southerly and southeasterly winds, and except toward its head or in the arms it is exposed to northwest winds also.

Hampton Roads.—Small craft usually anchor in what is locally known as Mother Hawkins Hole, on the north side of the eastern part of Hampton Bar. The entrance is between the wharf at Old Point Comfort and the horizontally striped buoy close westward of it. Small craft usually seek shelter in Hampton Creek in bad weather. Small vessels frequently anchor on the northerly part of Craney Island Flats westward of the dredged channel leading to Norfolk;

also on the shoals eastward of that channel between the Virginian Railroad pier and the piers 1½ miles southward.

The anchorages for small vessels near Norfolk are on the northeast side of the channel opposite Hospital Point, on the west side of the channel between Hospital Point and Portsmouth, and on the south side of the Eastern Branch between Norfolk and Berkley. Smith Creek, locally known as "The Hague," which is opposite Hospital Point, is frequented by yachts and small boats.

There is a public wharf at the head of the slip on the north side of the Merchant & Miners Transportation Co. wharf where small vessels may tie up. The space is limited, as there are usually a number of vessels moored here. Other docks are available but wharfage is charged.

Tides.—The mean range of tides at Baltimore is 1.1 feet; Rappahannock River entrance, 1.2; Old Point Comfort, 2.5; and Norfolk, 2.8.

DIRECTIONS, INSIDE ROUTE NEW YORK TO NORFOLK

These directions are good in the daytime for a draft of 7 feet (2.1 m.) to Philadelphia, and for a draft of 12 feet (3.7 m.) from Philadelphia to Chesapeake Bay. Strangers are advised not to run at night.

The directions in Chesapeake Bay are intended for vessels of 12 feet (3.7 m.) or less draft that use the inland route, but are good for vessels of greater draft in most places. With westerly winds small vessels can follow with advantage the western shore more closely, being guided by the chart, but care should be taken at night to avoid the fish traps which extend long distances from shore in places, especially on the shoals between Great Wicomico River and Old Point Comfort.

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
NEW YORK TO SOUTH AMBOY				
(Via Kill Van Kull and Arthur Kill)	°	*Points*		
1. Battery to 600 yards southward of Robbins Reef Light.	------	Mid-channel	3¾	------
2. To 220 yards south of Bergen Point Light.	------	do	3⅞	------
Course leads 300 yards off northeast point of Staten Island and 100 yards south of a red buoy east of the light.				
3. To west end of Shooters Island bearing N.	267	W. ⅝ N.[1]	⅝	------
4. To midway between black buoy and HS buoy, passing close southward of a red buoy.	------	Mid-channel	½	------
5. To southward of a red buoy	276	WNW. ½ W.[1]	¼	------

[1] Approximate mid-channel course.

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
NEW YORK TO SOUTH AMBOY—Contd.	°	*Points*		
6. To either opening of railroad bridge southward of Elizabethport (east opening has deeper water).	------	Mid-channel	1⅛	10
7. To east of Buckwheat Island (small and grassy).	------	do	⅞	------
8. To mid-channel off southwest point of Pralls Island.	185	S. by W. ⅜ W.[1]	1⅛	------
9. To 150 yards south of Tufts Point. Hold about 150 yards off western shore until near the point; then hold off 200 yards.	------	Various	3¼	------
10. To ⅛ mile past Smoking Point	274	WNW. ¾ W	½	------
11. To 200 yards westward of lighted beacon No. 6. Follow northwest shore at a distance of about 300 yards, passing northward and westward of beacons and buoys.	------	Various	1¼	------
12. To 100 yards east of HS buoy off Perth Amboy. Follow western shore, 200 yards off, to Perth Amboy.	------	do	2¾	------
13. To close eastward of HS buoy, passing 100 yards west of Ward Point.	153	S. by E. ½ E.[1]	⅞	------
14. To 200 yards south of Great Beds Light. Haul southward and round light at a distance of 200 yards.	------	Various	⅜	21
(*Via Raritan Bay*)				
1a. Battery to bell buoy ¾ mile north of West Bank Light. Follow chart 369; pass close east and south of buoy.	------	Optional	9½	------
2a. To ¼ mile north of Conaskonk Point gas buoy No. 5. Course leads ½ mile northward of Old Orchard Shoal light and close southward of a red buoy.	239	WSW. ⅛ W	7½	------
3a. To 200 yards south of Great Beds Light. Course leads between black buoy and a lighted beacon.	269	W. ⅞ N	3⅜	21
SOUTH AMBOY TO NEW BRUNSWICK				
(*Raritan River*)				
15. Great Beds Light to 75 yards south of lighted beacon.	269	W. ⅞ N	⅜	------
16. To south draw of railroad bridge	303	NW. ⅛ W	1⅛	

[1] Approximute mid-channel course.

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
SOUTH AMBOY TO NEW BRUNSWICK—continued	°	*Points*		
7. To 100 yards south of light No. 2	------	Various	2⅛	------
Follow north bank, passing 200 feet off Sandy Point, through a second drawbridge and 200 to 300 feet off the ends of the wharves.				
18. To abreast southwest end of Raritan Arsenal dock, on northwest bank ½ mile southwest of light No. 3.	------	do	1⅛	26
Avoid buoyed channel leading southward opposite light No. 2 and follow northwest bank, 200 feet off.				
19. To 100 yards north of light No. 5	------	Mid-channel	¾	------
20. To 125 yards southeast of light No. 6.	------	Various	½	------
Bring light No. 5 astern and cross over to north bank.				
21. To light No. 7 near entrance to Washington Canal.	------	do	1⅛	------
Hold over to east bank and follow this and the south bank, 200 feet off, past Sayreville brick works and the light.				
22. To light No. 9 at entrance to South River.	------	Mid-channel	1⅛	------
Pass east of light No. 8 and favor south bank when approaching light No. 9.				
23. To light No. 10	------	Various	½	------
Favor south bank for ¼ mile, then work over to east bank and pass east of the light.				
24. To Lawrence Creek	------	Mid-Channel	⅝	------
25. To Martins Landing	------	Various	½	31
Favor south bank until river bends westward, then hold to mid-channel.				
26. To New Brunswick	------	do	1⅝	33
Favor north bank for ¼-mile, then hold to mid-channel, passing under high arch span of highway bridge, until approaching rocky bluff on south bank, then favor well the south bank to canal lock.				
NEW BRUNSWICK TO BORDENTOWN				
(*Delaware and Raritan Canal*)				
27. Lock into canal at New Brunswick and proceed in accordance with canal regulations (see description on p. 246).	------	Various	39	72

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
BORDENTOWN TO PHILADELPHIA				
(*Delaware River*)	°	*Points*		
28. To 400 yards westward of Bordentown Light (white post light on south bank). Lock out at Bordentown, pass 125 feet westward of wharf on east bank, and head about for the light to pass between black buoy No. 1 and red buoy No. 2 (do not confuse these buoys with Trenton Channel buoys). Then haul southwestward and pass 100 feet southward of the south shore of a marsh island (only grass can be seen at high water) and a HS buoy.	------	Various	⅝	------
29. To mid-channel 600 yards northeastward of east point of Newbold Island. Course at first leads 100 yards off the southeast bank.	229	SW. by W. ¼ W	⅞	------
30. To 500 yards SW. by W. of Penn Manor Light. Haul gradually westward, give north bank a berth of over 150 yards and pass north of Newbold Island.	------	Mid-channel	1⅛	------
31. To off clubhouse wharf at Roebling. Course heads for Kinkora Light with Penn Manor Light astern. Pass south of black and north of red buoys.	228	SW. by W. ⅛ W	⅞	75
32. To mid-channel off Tullytown Light. Haul westward to follow buoys and pass 150 yards off sand wharf and south bank past Florence.	------	Various	2¼	------
33. To 100 yards off yacht club wharf at Bristol. Round bend at Florence in mid-channel, then keep 150 yards off west bank to north end of shipyard, then keep 100 yards off.	------	do	2⅛	79
34. To 300 yards southwest of Bristol Ferry landing. Course leads between Burlington Island and Bristol.	------	Mid-channel	⅝	------
35. To mid-channel off Burlington. Course leads between a red and a black buoy with the ferry landing astern.	206	SW. ⅞ S	¾	81
36. To between buoys Nos. 17C and 18C.	256	W. ½ S	1⅛	------
37. To between buoys Nos. 17B and 18B off Edgewater Park.	248	WSW. ¾ W	1	------

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
BORDENTOWN TO PHILADELPHIA—contd.	°	Points		
38. To between buoys Nos. 17A and 18A.	256	W. ½ S	½	------
39. To 150 yards southeast of old wharf on north bank. Course leads between buoys Nos. 17 and 18 northwestward from the wharves at Beverly.	272	W. by N	¾	------
40. To east end Mud Island dredged channel. On this course Torresdale Wharf is a little on the starboard bow and a concrete tower and chimney a little on the port bow.	239	WSW. ⅛ W	1¾	------
41. To 300 yards northwest of buoy No. 2. Pass through dredged channel, marked by buoys, with lighted range astern.	235	SW by W. ¾ W	1½	------
42. To ½ mile northeastward of Riverton Light. On this course Riverton Light and a prominent clubhouse at Riverton are a little on the port bow.	222	SW. ½ W	1⅝	------
43. To ⅜ mile west of Riverton Light. Gradually haul to westward and pass 250 yards north of the light.	------	Various	¾	90
44. To south of black buoy No. 1. On this course Riverton Light is astern.	262	W. ⅛ N	⅞	------
45. To 150 yards west of red buoy No. 2. Follow west bank, 300 yards off.	------	Various	⅞	------
46. To draw in bridge (50 feet above high water).	202	SSW. ¾ W	1¼	------
47. To suspension bridge	------	Mid-channel	3⅝	96
PHILADELPHIA TO ENTRANCE TO CHESAPEAKE AND DELAWARE CANAL				
(*Delaware River*)				
48. To abreast Gloucester ferry landing	------	Mid-channel	3⅝	------
49. To east of gas and bell buoy No. 37. Horseshoe ranges, east group, ahead.	206	SW. ⅞ S	⅞	------
50. To 300 yards ENE. of red buoy No. 46. On Eagle Point range.	244	WSW. ½ W	½	------
51. To gas and bell buoy No. 44. On Horseshoe ranges, west group.	274	WNW. ⅞ W	1⅞	------
52. To gas buoy No. 1F. On Fort Mifflin Bar range (seen over ferry landing ahead). Course leads 300 yards west of Block Island Light.	234	SW. by W. ⅝ W	2⅞	------

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
PHILADELPHIA TO ENTRANCE TO CHESAPEAKE AND DELAWARE CANAL—contd.	°	*Points*		
53. To gas buoy No. 5T	250	W. by S	1⅛	------
54. To gas buoy No. 2T Tinicum range astern.	272	W. by N	3⅛	------
55. To gas buoy No. 6C	244	WSW. ½ W	⅞	------
56. To gas and bell buoy No. 2C Chester Range astern.	230	SW. by W. ¼ W	2	------
57. To west of gas and bell buoy No. 2M Marcus Hook range ahead.	237	SW. by W. ⅞ W	4⅜	------
58. To gas buoy No. 2B, abreast Edgemoor rolling mill. Bellevue range ahead.	215	SW. ⅛ S	3⅛	------
59. To gas and bell buoy No. 1C Cherry Island range astern.	197	SSW. ¼ W	4¼	------
60. To ¼ mile northward of buoy No. 2B. Deepwater Point range astern.	222	SW. ½ W	3¾	------
61. To ¼ mile past buoy No. 2B and on New Castle range.	189	S. by W. ½ W	½	------
62. To nun buoy No. 4N New Castle range astern.	154	S. by E. ⅝ E	3⅛	------
63. To jettied entrance, Chesapeake & Delaware Canal. Haul southward, pass close to HS buoy off south end of Pea Patch Shoal and then haul west-north-westward to head for entrance.	------	Various	1⅛	134
REEDY POINT TO CHESAPEAKE CITY *(Chesapeake & Delaware Canal)*				
64. Enter canal between jetties at Reedy Point and proceed in accordance with canal regulations (see description on page 248).	------	Various	12	146
CHESAPEAKE CITY TO TURKEY POINT *(Back Creek and Elk River)*				
65. To black can buoy No. 11 Pass through drawbridge and favor north bank, passing 75 feet off wharf ruins on south side.	305	NW. ⅛ W	¼	------
66. To 25 yards south of black can buoy No. 9. Head for bushy tree on ridge east of Long Creek and pass about 30 yards off point on south side.	278	WNW. ⅝ W	⅛	------
67. To 25 yards north of red nun buoy No. 10. Pass 50 feet south of end of wharf at entrance to Long Creek.	285	WNW	½	------
68. To mid-channel north of red nun buoy No. 8. Head for white tree trunk on the shore ahead.	237	SW. by W. ¾ W	¼	------

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
CHESAPEAKE CITY TO TURKEY POINT—continued	°	Points		
69. To between a lighted beacon and nun buoy No. 6. Pass 25 yards south of Emily Point can buoy No. 5.	274	W. by N	¾	------
70. To between Groves Bar Light and can buoy No. 3.	261	W. ⅛ S	⅜	------
71. To 50 yards north of Randall Wharf Light.	274	W. by N	¼	------
72. To between can buoy No. 1 and nun buoy No. 4. Round Randall Wharf Light 50 yards off.	212	SW. ½ S	¼	------
73. To 30 yards north of Back Creek Light.	238	SW. by W. ⅞ W	¼	------
74. To close southward of a black buoy southeastward from Oldfields Point. Pass northward of Courthouse Point Light.	230	SW. by W. ⅛ W	1⅜	------
75. To 350 yards north of Town Point Wharf Light.	256	W. ½ S	1	------
76. To mid-channel west of Town Point Wharf Light. Haul southward gradually.	------	Various	¼	------
77. To mid-river off Turkey Point. Pass northward of buoy No. 2 westward of Town Point.	225	SW. ¾ W	5¼	157
TURKEY POINT TO SANDY POINT (*Chesapeake Bay*)				
For directions via Baltimore see directions Nos. 79a to 95a				
78. To ¼ mile northwest of Worton Point Shoal gas and bell buoy. Course leads close southeastward of an HS buoy southwestward of Turkey Point, ⅜ mile off Howell Point Light, and 3/10 mile northwest of Plum Island Shoal buoy.	235	SW. by W. ⅝ W	11¼	------
79. To 300 yards east of black buoy off Tolchester Beach.	202	SSW. ⅝ W	7½	------
80. To Craighill Channel front range light bearing WNW.	218	SW	3⅝	------
81. To ¾ mile east of Sandy Point Light	198	SSW. ¼ W	9⅝	189
TURKEY POINT TO BALTIMORE				
(See information relative to Aberdeen Proving Ground, p. 243)				
From end of course 78 above.				
79a. To ¼ mile southeast of bell buoy No. 3.	209	SW. ¾ S	3½	------

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
TURKEY POINT TO BALTIMORE—contd.	°	Points		
80*a*. To 100 yards northwest of red buoy No. 4. On Pooles Island range (slatted day marks).	261	W. ⅛ S	1	------
81*a*. To 150 yards southeast of Pooles Island Bar Light.	226	SW. ¾ W	1½	------
82*a*. To Brewerton Channel gas and bell buoy No. 3B. Course leads ⅜ mile northwest of a red buoy and ¾ mile northwest of Craighill Channel front range light.	238	SW. by W. ⅞ W	9⅛	------
83*a*. To gas and bell buoy No. 12B. In dredged channel on Brewerton Channel range.	291	NW. by W. ½ W	3¼	------
84*a*. To gas and bell buoy No. 4M	307	NW	⅝	------
85*a*. To Lazaretto Point	320	NNW. ⅞ W	4¼	------
86*a*. To Baltimore. Haul northward and pass between Lazaretto Point and Fort McHenry.	------	Various	1⅝	193
BALTIMORE TO SANDY POINT				
87*a*. To Lazaretto Point	------	Various	1⅝	------
88*a*. To gas and bell buoy No. 4M	140	SSE. ⅞ E	4¼	------
89*a*. To gas and bell buoy No. 12B	127	SE	⅝	------
90*a*. To gas and bell buoy No. 3B	111	SE. by E. ½ E	3¼	------
91*a*. To gas and bell buoy No. 13K	131	SE. ¼ S	¾	------
92*a*. To gas and bell buoy No. 5K. Cut-off Channel range astern.	149	SSE. ⅛ E	2¼	------
93*a*. To gas and bell buoy No. 9C	161	S. by E	1⅝	------
94*a*. To 350 yards east of Baltimore Light. Craighill Channel range astern.	180	S. ⅝ W	3⅜	------
95*a*. To ¾ mile east of Sandy Point Light.	154	S. by E. ⅝ E	2¾	------
SANDY POINT TO NORFOLK (*Chesapeake Bay*)				
82. To 1 mile east of Thomas Point Shoal Light.	197	SSW. ⅛ W	7⅜	196
83. To Poplar Island Shoal gas and bell buoy. Course leads 1½ miles west of Bloody Point Bar Light.	186	S. by W. ⅛ W	9	205
84. To Sharps Island gas and bell buoy. Course leads 2½ miles west of Sharps Island Light.	177	S. ⅜ W	11¾	217
85. To 1 mile east of Smith Point Light. Course leads 1 mile east of Cove Point Light, 1¼ miles east of Cedar Point gas and bell buoy, 2½ miles west of Hooper Island Light, and 1½ miles east of Point No Point Light.	163	S. ⅞ E	42⅛	259

	Course		Distance in nautical miles	Distance from New York
	True	Magnetic		
SANDY POINT TO NORFOLK—continued.				
	°	*Points*		
86. To 1 mile east of Wolf Trap Light. Course leads close to Tangier Island Shoal Lump gas and bell buoy, 3¼ miles east of Windmill Point Light, and 1¼ miles east of Rappahannock Spit gas buoy.	180	S. ½ W	29⅜	288
87. To 1 mile eastward of Thimble Shoal Light. Course crosses the Horseshoe in a depth of about 15 feet (4.5 m.).	186	S. by W	22½	311
88. To 300 yards south of Thimble Shoal Light. When approaching the light haul westward gradually.	------	Various	1	------
89. To midway between Old Point Comfort Light and Fort Wool. Course leads ¼ mile north of gas buoy No. 17.	251	WSW. ⅞ W	3¼	315
90. To 200 yards east of gas and bell buoy No. 3.	229	SW. ⅞ W	1¾	317
91. To dredged channel between gas buoy No. 3A and gas and bell buoy No. 2.	196	SSW	1	318
92. To gas and bell buoy No. 3BB. In dredged channel well marked by buoys.	183	S. ¾ W	2½	320
93. To Lambert Point piers	172	S. ⅛ E	2¾	323
94. To wharves at Norfolk	131	SE. ⅛ S	2	325

APPENDIX

COAST PILOTS AND FIELD STATIONS OF THE COAST AND GEODETIC SURVEY

COAST PILOTS

	Price
U. S. Coast Pilot, Atlantic Coast, Section A, from St. Croix River to Cape Cod	$0.75
U. S. Coast Pilot, Atlantic Coast, Section B, from Cape Cod to Sandy Hook, including Long Island Sound	.75
U. S. Coast Pilot, Atlantic Coast, Section C, Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays	.75
U. S. Coast Pilot, Atlantic Coast, Section D, Cape Henry to Key West	.75
U. S. Coast Pilot, Gulf Coast, From Key West to the Rio Grande	.75
U. S. Coast Pilot, West Indies, Porto Rico, and Virgin Islands	.75
Inside Route Pilot, coast of New Jersey	.30
Inside Route Pilot, New York to Key West	.30
Inside Route Pilot, Key West to the Rio Grande	.50
U. S. Coast Pilot, Pacific Coast, California, Oregon, and Washington	.75
U. S. Coast Pilot, Alaska, Part I, from Dixon Entrance to Yakutat Bay	.75
U. S. Coast Pilot, Alaska, Part II, Yakutat Bay to Arctic Ocean	.75
U. S. Coast Pilot, Hawaiian Islands	.50
U. S. Coast Pilot, Philippine Islands, Part I, Luzon, Mindoro, and Visayas	.75
U. S. Coast Pilot, Philippine Islands, Part II, Palawan, Mindanao, and Sulu Archipelago	.75
Distances between United States Ports	.10

FIELD STATIONS

Boston, Mass., 92 State Street.
New York, N. Y., 311–312, Maritime Exchange Building, 78 Broad Street.
New Orleans, La., room 314, Customhouse.
San Francisco, Calif., room 510, Customhouse.
Seattle, Wash., room 202, Burke Building.
Manila, P. I., Intendencia Building.

At these stations complete files of the United States Coast and Geodetic Survey charts, Coast Pilots, Tide Tables, Current Tables, and other publications relating to navigation may be consulted and information affecting navigation obtained without charge. Light Lists, Buoy Lists, and Notices to Mariners are kept for sale or for free distribution to mariners. The field stations are also sales agencies for the Coast and Geodetic Survey publications. A chart catalogue, giving lists of charts, Coast Pilots, Tide Tables, and agencies of the Coast and Geodetic Survey, can be obtained from any of the field stations or will be sent, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C. Frequent changes occur in the agencies, and the list of agencies is published in the first notice each month of the Notice to Mariners.

HARBOR REGULATIONS

ANCHORAGE GROUNDS IN HAMPTON ROADS AND THE HARBORS OF NORFOLK AND NEWPORT NEWS, VA., AND RULES AND REGULATIONS RELATING THERETO

THE ANCHORAGE GROUNDS

[All azimuths are referred to a true meridian]

Under authority of the provisions of section 7 of the river and harbor act approved March 4, 1915, the following anchorage grounds for vessels in Hamp-

ton Roads and the harbors of Norfolk and Newport News, Va., are hereby defined and established, and the following rules and regulations relating thereto are adopted.

TEMPORARY ANCHORAGE A

Hampton Bar.—To the westward of a line bearing 8° from a point ("A") determined by the following cross bearings: Old Point Comfort light, bearing 31°; flagstaff on Fort Wool, bearing 100°; to the northward of a line bearing 229° from point "A" to a point ("B"), 425 yards distant; to the northeastward of a line bearing 289° from point "B."

NOTE.—This area is reserved for the use of vessels while undergoing examination by quarantine, customs, and immigration authorities. Upon completion of these examinations vessels shall move promptly to a regular anchorage area.

The master of every steam vessel using this temporary anchorage shall keep his vessel in condition to move promptly under her own power upon notification by the captain of the port, and, when any such vessel is in charge of a pilot, the pilot shall remain on board until the vessel is safely anchored in a designated anchorage area. No sailing vessel using this anchorage shall be left unattended by a steam tugboat while undergoing examination by any of the authorities mentioned in paragraph two hereof, except when her stay is likely to be of several hours' duration, when she shall be anchored in the western part of this temporary anchorage out of the way of other vessels before the tug and pilot leave her.

No master of a vessel awaiting or undergoing quarantine inspection shall release any part of the crew until the vessel has been passed by the proper quarantine officials and safely anchored or moored in one of the designated areas.

ANCHORAGE B

Naval anchorage.[1]—To the southward of a line bearing 289° from point "B" defined under Temporary Anchorage A; to the westward of a line bearing 229° from point "B" defined under Temporary Anchorage A; to the northward of a line bearing 292° from the northernmost of the two towers on the west side of the Jamestown Exposition Pier, Naval Operating Base, Sewell Point.

NOTE.—This area is reserved for the use of naval vessels, but, in the absence of the fleet, the captain of the port may, in his discretion, permit it to be used by merchant vessels. Upon receiving word that any part of the fleet is expected, the captain of the port shall cause a sufficient area in this anchorage, and also in Anchorage C, to be vacated to accommodate the number of vessels scheduled to arrive.

ANCHORAGE C

Newport News Bar.[1]—To the southward of the southern boundary of Anchorage B; to the westward of an extension of the line forming the eastern boundary of Anchorage B; to the northward of a line running through the red buoys marking the 35-foot dredged channel to Newport News; to the eastward of a line bearing north through red gas buoy No. 8, at the western entrance to the old Newport News channel.

ANCHORAGE D

The area inclosed by lines drawn as follows: From gas buoy No. 1 at the entrance to the Newport News dredged channel to bell buoy No. 2, at the entrance to Norfolk dredged channel; thence 229° to a point where buoy S 25H bears 250°; then on that bearing until Newport News Middle Ground Light

[1] The established anchorages for naval vessels having been found inadequate at times when an especially large number of vessels are gathered for parade or other purpose, and the Navy Department having requested the establishment of a numbered series of anchorages for such occasions in order that a naval vessel may be ordered to proceed to a designated numbered anchorage in the harbor, the following arrangements have been made: A key chart for naval anchorages in Hampton Roads, which provides for the emergent anchorage of naval vessels in Anchorages A, C, E, and G, and also in the vicinity of Thimble Shoal, marked Anchorage "X" on the key chart, has been prepared. These designated anchorages, with the exception of those in Naval Anchorage B, 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 certain of these specially numbered anchorages, he will authorize the use by naval vessels of the requested 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 officers making the request, and if other numbers can be agreed upon he will authorize their use; otherwise he will communicate the request to the Secretary of War with a statement of the circumstances and with his recommendations.

bears 3°; thence bearing 3° for a distance of 775 yards to anchorage buoy E; thence bearing 49° on a line in extension of the southeast boundary of Anchorage B to intersection with the first line.

NOTE.—This area is to be used by deep-draft vessels, wind-bound vessels from Lambert Point and Sewall Point, and vessels awaiting turn for docking. Other vessels may use this anchorage when permitted by the captain of the port.

ANCHORAGE E

Middle Ground Anchorage.—To the southward of a line running through the black buoys marking the southern edge of the 35-foot dredged channel to Newport News; to the westward of the northwest boundary line of Anchorage D; to the northeastward of a line bearing 310° from the southwest end of the northwest boundary line of Anchorage D.

ANCHORAGE F

Anchorage for explosives and other dangerous articles.—To the southward of a line, bearing 310°, through two points determined by the following cross bearings: Easterly point, Newport News Middle Ground Light, bearing 20°; Craney Island Light, bearing 131°; Nansemond River Light, bearing 243°; westerly point, Newport News Middle Ground Light, bearing 89°; Nansemond River Light, bearing 219°; northern red light on the railroad pier at Newport News, bearing 327° 45′. To the westward of a line bearing 183° through the above easterly point; to the eastward of a line bearing 183° through the above westerly point. The southwesterly limit of Anchorage E is the northern boundary of the forbidden area around Anchorage F.

NOTE.—All vessels are forbidden to anchor between the northern boundary line of Anchorage F and the southwestern boundary line of Anchorage E or within a zone 425 yards wide on the eastern and the western sides of Anchorage F.

ANCHORAGE F–1

Anchorage for vessels carrying explosives and other dangerous articles and having drafts too great to permit them to use Anchorage F.—An area within Anchorage C to the westward of the eastern boundary of Anchorage C; to the northward of a line bearing 292° from the southeasterly corner of Anchorage C 1,800 yards; to the eastward of a line bearing 49° to a point in the northern boundary of Anchorage C 1,800 yards distant from the easterly corner of Anchorage C; to the southward of the northern boundary of Anchorage C.

NOTE.—When Anchorage F–1 is not occupied by vessels carrying explosives, it may be used as a general anchorage in the same manner as other portions of Anchorage C, except that it must be vacated upon notice from the captain of the port when a vessel of a draft too great to permit it to use Anchorage F carrying explosives desires to anchor.

When Anchorage F–1 is occupied by a vessel carrying explosives, vessels shall not anchor in Anchorages B or C within a zone 425 yards wide on all sides of the area. No vessel carrying explosives shall be anchored in area F–1 so as to swing within 500 yards of the Newport News dredged channel.

ANCHORAGE G

Newport News.—To the southward of the following lines: From Fishing Point to black can buoy No. 3 off Naseway Shoal; thence to a point fixed by the following cross bearings: Northern red light on railroad pier, Newport News, bearing 135°; Nansemond River Light, bearing 180°; thence to a point determined by the following cross bearings: Northern red light on railroad pier, Newport News, bearing 45°; Newport News Middle Ground Light, bearing 119°; Nansemond River Light, bearing 189° 35′; thence 145° to intersect an extension of the line marking the northern boundary of Anchorage E; thence easterly to the westerly point of Anchorage E. To the westward of a line parallel to and 425 yards west of the western boundary of Anchorage F.

ANCHORAGE G–1

James River.—To the northwestward of a line bearing 60° through can buoy No. 3 off Naseway Shoal; to the northward of a line bearing 121° through White Shoal Light; to the eastward of a line bearing 30° through White Shoal Light.

ANCHORAGE H

Craney Island Flats.—To the southward of the lines forming the southern boundary of Anchorage D; to the westward of a line passing through the red buoys marking the western side of the channel to Norfolk; to the northward of a line passing through Craney Island Light and tangent to the north shore of Craney Island; to the eastward of a line parallel to and 425 yards easterly of the eastern boundary of Anchorage F.

ANCHORAGE H-1

West Norfolk.—To the southward of the line forming the southern boundary of Anchorage H; to the westward of a line passing through the red buoys marking the westward side of the channel to Norfolk; to the northwestward of a line through beacon No. 2 and nun buoy No. 2 on the north side of the Western Branch Channel; to the northeastward of a line passing through beacon No. 2 and high stack in West Norfolk.

NOTE.—No vessel after receiving its load shall remain more than 12 hours in this anchorage, except by special permit from the captain of the port.

ANCHORAGE J

Sewall Point.—To the southward of a line bearing 87° from gas buoy 3A at the northern entrance of the channel to Norfolk; to the northward of a line bearing 282° from the northwestern corner of the submarine basin, naval operating base; to the eastward of a line through the black buoys marking the eastern side of the channel to Norfolk.

ANCHORAGE K

Bush Bluff Shoal.—To the southward of lines running 87° and 220°, respectively, from spar buoy No. 2, marking the southern edge of the channel to Virginian Railway coal pier at Sewall Point; to the northward of a line bearing 112° from black spar buoy No. 9A off Lambert Point; to the eastward of a line through the black buoys and bell buoy 3BB marking the eastern side of the channel to Norfolk.

ANCHORAGE L

Lambert Point.—To the southeast of a line bearing 51° from black spar buoy No. 11-L off Lambert Point; to the northwestward of a line bearing 51° from black spar buoy No. 13 off Lambert Point Creek; to the northeastward of a line through black spar buoys No. 11-L and No. 13 marking the eastern side of channel to Norfolk.

ANCHORAGE M

To the southeastward of a line bearing 47°, 75 yards southeastward of the southernmost pier of the Norfolk & Western Railway on the east side of the channel to Norfolk; to the northeastward of two lines, one through the black spar buoys marking the eastern side of the channel to Norfolk and the other bearing 109° from black spar buoy No. 15.

ANCHORAGE N

Atlantic City.—To the northeastward of a line running from the westerly end of the New York, Philadelphia & Norfolk Railroad pier in Norfolk to the southerly end of the pier at Fort Norfolk; and between two lines at right angles to above line, one passing 200 feet northward of the Chesapeake & Ohio Railroad pier in Norfolk and the other passing 109 feet southeast of the Nottingham & Wrenn pier; and to the southward of a line drawn 100 feet north of and parallel to an extension of the north side of West Freemason Street.

ANCHORAGE N-1

Smith Creek.—Mowbray Arch: Between Mowbray Arch and a line described as follows: Beginning at Ghent Bridge, 150 feet from Mowbray Arch, and con-

tinuing westerly the same distance therefrom to the intersection of the prolongation of the east side of Colonial Avenue; thence in a straight line to a point on the south side of Mill Street prolonged and 70 feet from Mowbray Arch; thence parallel to and 70 feet from Mowbray Arch to the south side of Pembroke Avenue prolonged; thence along the prolongation of the south side of Pembroke Avenue prolonged; thence along the prolongation of the south side of Pembroke Avenue to a point 50 feet from Mowbray Arch; thence in a straight line to a point on the south side of Fairfax Avenue prolonged and 40 feet from Mowbray Arch. The Hague: Between the wall on the west side of the Hague and the straight line joining the point 40 feet easterly thereof in the south side of Fairfax Avenue prolonged, with the point 70 feet easterly from the wall in the perpendicular to the wall at the south end thereof.

NOTE.—No floats, rafts, lighters, houseboats, or craft laid up for any reason shall be permitted within the Smith Creek anchorages, except by permission of the captain of the port. No vessel shall anchor or moor alongside any wharf or pier on Smith Creek so as to extend more than 40 feet beyond the pierhead line, except in the authorized anchorages.

ANCHORAGE O

Hospital Point.—To the southwestward of a line through the red buoys marking the western side of the channel to Norfolk; to the southward of a line bearing 242° from north tower elevators at Atlantic City.

ANCHORAGE P

Port Norfolk.—To the southeastward of a line bearing 37° from the northeast corner of the New York, Philadelphia & Norfolk Railroad piers at Port Norfolk; to the southwestward of a line through the red buoys marking the southwestern side of channel to Norfolk; to the northwestward of the outside bulkhead at the north end of Pinner Point and its northeasterly extension.

ANCHORAGE Q

The area known as Spotico Creek Flats landward of the United States pierhead line and not within 200 feet of wharves or other permanent improvements.

ANCHORAGE R

The area landward of the United States pierhead lines on the south side of the Eastern Branch of the Elizabeth River extending from a point 700 feet to the eastward from the Norfolk & Western Railway bridge to a point 250 feet from the Virginian Railway bridge and not within 200 feet of permanent improvements: *Provided*, That no vessel shall anchor within 100 feet of the eastern and western entrances of Steamboat Creek or in a position that will obstruct passage thereto.

ANCHORAGE S

The area landward of the United States pierhead lines on the northern side of the Eastern Branch of the Elizabeth River, and from a point 250 feet from the Campostella Bridge to the western entrance of Broad Creek, and not within 200 feet of permanent improvements.

THE RULES AND REGULATIONS

1. Except in cases of great emergency, no vessel shall be anchored in Hampton Roads or the harbors of Newport News and Norfolk, Va., outside of the anchorage areas hereby defined and established, nor be made fast to the exterior end of any pier, nor to any vessel lying at the exterior end of any pier, or along any bulkhead in such manner as to obstruct or endanger the passage of any vessels to or from the adjacent wharf property, or impede the movements of any vessels entering or leaving adjacent slips.

2. Whenever, in the opinion of the captain of the port, such action may be necessary, that officer may require any or all vessels in any designated anchorage area to moor with two or more anchors.

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

4. Anchors must not be placed outside the anchorage areas, nor shall any vessel be so anchored that any portion of the hull or rigging shall at any time extend outside the boundaries of the anchorage area.

5. Any vessel anchoring under the circumstances of great emergency outside of the anchorage areas must be placed near the edge of the channel and in such position as not to interfere with the free navigation of the channel, nor obstruct the approach to any pier nor impede the movement of any boat, and shall move away immediately after the emergency ceases, or upon notification by the captain of the port.

6. The captain of the port shall assign berths in the anchorages to all vessels applying. He may grant permits for habitually maintaining and using the same mooring place in an anchorage area, and no vessel shall occupy a permanent berth in an anchorage area, except under authority of such permit, which may be revoked at any time.

7. A vessel upon being notified to move into the anchorage limits or to shift its position on anchorage grounds must get under way at once or signal for a tug and must change position as directed with reasonable promptness.

8. Except as provided in rule 10, 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 the anchorage area F and F–1 only, described above under the heading "The Anchorage Grounds." Anchorage F is reserved for this special purpose and is not to be used by vessels carrying other classes of freight except in cases of emergency.

Any vessel carrying explosives and desiring to proceed to the anchorage provided therefor must first obtain a written permit from the captain of the port; 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 stevedores' boats, engaged or used in connection with loading explosives on vessels in anchorage areas must carry written permits from the captain of the port and must show these permits whenever required by the captain of the port or his properly authorized agents.

9. Whenever any water craft not fitted with mechanical power anchors in Anchorage F while carrying explosives, the captain of the port may require the attendance of a tug upon such water craft, when in his judgment such action is deemed necessary.

10. The district engineer in charge of works of river and harbor improvement is empowered to authorize, in writing, the anchoring in or near the vicinity of such a work of a single scow carrying explosives for use on the work, but only in quantities considered by him safe and necessary. The district engineer shall prescribe the conditions under which this explosive shall be stored and handled and shall in each case furnish the captain of the port with a copy of the written permit to anchor explosives on the work and a copy of the rules and regulations for its storage and handling.

11. Municipal ash scows may be anchored in such places as the captain of the port may designate.

12. Whenever the maritime or commercial interests of the United States so require, the captain of the port is hereby empowered to shift the position of any vessel anchored within the anchorage areas, of any vessel anchored outside the anchorage areas, of any vessel which is so moored or anchored as to impede or obstruct vessel movements in any channel or obstruct or interfere with range lights, and of any vessel which, lying at the exterior end of a pier or alongside an open bulkhead, obstructs the passage of vessels to or from adjacent wharf property or impedes the movements of vessels entering or leaving adjacent slips.

13. Permits to anchor in channels within the limits of Hampton Roads and the harbors of Norfolk and Newport News, Va., may be granted by the captain of the port to wrecking plants legally engaged in recovering sunken property, when the application for such anchorage is approved by the district engineer in charge of works of river and harbor improvements.

14. Nothing in these rules and regulations shall be construed as relieving the owner or person in charge of any vessel 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, fog signals, or for otherwise violating law.

REGULATIONS GOVERNING THE USE AND NAVIGATION OF THE WATERS OF HAMPTON ROADS AND THE HARBORS OF NORFOLK AND NEWPORT NEWS, VA., AND THE HANDLING OF EXPLOSIVES THEREIN BY VESSELS OTHER THAN COMMON CARRIERS CARRYING EXPLOSIVES

Under authority of section 7 of the river and harbor act approved August 8, 1917, the following regulations are prescribed to govern the use and navigation of the waters of Hampton Roads and the harbors of Norfolk and Newport News, Va., by vessels, other than common carriers, carrying explosives:

1. The officer of the Coast Guard designated "Captain of the port" shall have immediate supervision of the enforcement of these regulations.

2. Vessels carrying explosives shall be at all times in charge of competent persons and must display by day a red flag of at least 16 square feet at the masthead, or at least 10 feet above the upper deck, if the vessel has no mast; at night a red light will be displayed in the same positions specified for the red flag. For use in emergencies each barge must be provided with a suitable anchor, ground tackle, and equipment, to be approved by the captain of the port; with an adequate supply of fire extinguishers, and fire pails filled with water, and with a suitable fog-horn and bell.

3. No smoking will be permitted on or near any vessel, barge, or scow carrying explosives, and no person under the influence of liquor will be allowed on board, nor to approach such vessels. Every person having business on board vessels which are being loaded with explosives, other than members of the crew, must have a pass from the captain of the port in such form as the captain of the port shall determine.

4. Vessels carrying explosives shall not carry inflammable liquids, inflammable solids, oxidizing materials, mineral acids, as defined in Interstate Commerce Commission regulations for the transportation of explosives, or articles likely to ignite spontaneously, or to give off inflammable gases, unless the explosives are stored in separate rooms or are otherwise so separated as to effectually prevent danger to the explosive from any of these articles, or from the vapor thereof. Where blasting caps, detonating fuses, and fulminate of mercury in bulk are loaded on the same vessel with high explosives, they must be in a different compartment, the distance in a straight line from the compartment containing them to the explosives to be not less than 25 feet.

5. No unnecessary fires shall be permitted on vessels carrying explosives, and those fires which are deemed necessary must be properly safeguarded and must be left in constant charge of some one individual of the crew during the entire period that they are burning. Cabins on barges or lighters carrying explosives of any, or all, descriptions, in which oil lights or stoves are used must be protected by covering—the wooden walls, partitions, floors, and ceilings with two thicknesses of one-quarter inch asbestos board placed with joints broken and covered with No. 26 gage metal. This protection must also be applied to doors, and the doors from the cabin into other parts of the boat must be provided with substantial springs, making them self-closing. The stoves must be at least 18 inches from all partitions, and a sheet-metal shield 5½ feet in height, securely fastened to the floor and the wall, must be placed midway between the walls and the stove. The stove must be at least 6 inches from the floor of the cabin, supported either on legs permanently and securely fastened to the stove and the floor, or on 6 inches of hollow tile securely fastened in place. The hole in the roof of the cabin where the stovepipe passes through shall be 18 inches larger in circumference than the stovepipe, and a substantial metal plate shall be placed in the opening surrounding the pipe to hold it in place. The stovepipe shall also be tied into the walls so that it will not shift. The smokestack must be provided with substantial screens of fine mesh or other satisfactory spark arrester. All oil lamps must be held in marine brackets. Safety matches of wooden-stick type rather than the paper type must be used exclusively and kept in proper receptacles. Oils and lamps must be kept on deck in a box lined with metal in such position that it can be readily thrown overboard. No artificial light shall be permitted in the holds or compartments of any vessel that contains explosives except electric flashlights or electric lanterns or an approved electric lighting of the vessel. Crews must not have or carry matches, firearms, or cartridges on their persons. Electric flashlights must be provided for the attendants.

6. No explosives will be allowed to be placed aboard a vessel until the rest of the cargo has been placed aboard and the vessel trimmed. All work of con-

struction of floors, partitions, and other conditioning of the vessel, and the removal of any other combustibles from that part of the hold in which the explosives are to be stored, shall be completed before loading of the explosives is commenced. All rubbish, shovelings, old oil, paint cans, oil rags, rope ends, and other litter must be kept cleared out of the holds. Such lumber as is allowed to remain in the holds for use as firewood must be securely piled. Floors must be kept broom clean. All decks, gangways, and holds over which explosives must be passed in loading must be freed from all loose metal or tools and carefully swept before loading is commenced and after loading has ceased.

7. All explosives must be handled carefully. No metal tools shall be used in loading, unloading, or handling explosives. Men engaged in loading, unloading, or handling explosives must not have or carry on their persons metal tools or bale hooks, matches, firearms, or cartridges, and they must not wear boots or shoes shod or strengthened with iron nails or any metal, unless such boots or shoes are covered with leather, felt, or some other such material. Packages of explosives must not be thrown, dropped, rolled, dragged, or slid over each other or over the decks. Dynamite boxes must be stowed topside up. Powder kegs should be loaded with seams up.

8. The term "high explosives in bulk" shall be construed to mean high explosives packed in boxes, barrels, or kegs, and not loaded in ammunition or shells. The standard definition of the term "high explosives" will be that contained in paragraph 1503 of the regulations of the Interstate Commerce Commission for the transportation of explosives by rail, viz: "High explosives are all explosives more powerful than ordinary black powder, except smokeless powders and fulminates. Their distinguishing characteristic is their susceptibility to detonation by a blasting cap. Examples of high explosives are dynamite, picric acid, picrates, chlorate powders, nitrate of ammonia powders, dry trinitrotoluol, dry nitrocellulose (gun cotton), dry tetranitroaniline, dry tetranitromethylaniline and fireworks that can be exploded en masse." Unless they are loaded in the same vessel with articles enumerated in the rule quoted above, picric acid 10 per cent wet, and trinitrotoluol 10 per cent wet, and nitrocellulose (gun cotton) 20 per cent wet, will not be classified as high explosives. The term "high explosives in bulk" does not include such articles as benzol, toluol, smokeless powder, black powder, small-arms ammunition, ammunition for cannon with explosive projectiles, explosive projectiles or torpedoes, percussion fuzes, time fuzes, combination fuzes, tracer fuzes, cordeau detonant, primers for cannon and small arms, blasting caps, detonating fuzes, and fulminate of mercury in bulk. Blasting caps, detonating fuzes, and fulminate of mercury in bulk will be considered as constituting a distinct class by themselves and must be stowed and handled with special care.

9. In transferring high explosives in bulk, blasting caps, detonating fuzes, and fulminate of mercury from one vessel to another they must be handled by hand or regulation chute and mattress. If difference in elevation between vessels or condition of weather renders it impossible to transfer or load by hand or chute, mechanical hoists and a special crate or basket may be used. Explosives transferred in this manner must not be handled roughly. They must be hoisted and lowered carefully and be deposited or lowered on a mattress.

10. When an inclined chute is employed, such chute shall be constructed of 1-inch planed boards with side guards 4 inches high, extending 3 inches above top face of bottom of chute and throughout its length fastened with brass screws. D-shaped strips or runners not more than 6 inches apart and running lengthwise of the chute must be fastened to the upper surface of the bottom part by means of glue and wooden pegs extending through the bottom part and runners. Chutes must be occasonally wiped down with waste moistened with machine oil when dynamite packages are being handled. A stuffed mattress 4 feet wide by 6 feet long and not less than 4 inches thick, or a heavy jute or hemp mat of like dimensions, must be placed under the discharging end of the chute. The incline of the chute should be such that the velocity of the packages sliding will not be great enough to cause violent shock when coming in contact with other packages or when reaching the bottom of slide, or men must be stationed alongside the chutes to retard the velocity of the packages and prevent violent shocks when packages come in contact with each other or reach bottom of chute.

11. Broken or seriously damaged packages of explosives may be recoopered when it is practicable and not dangerous. A broken box of dynamite that can

not be recoopered should be reinforced by stout drapping paper and twine, placed in another strong box, and surrounded by dry, fine sawdust, or dry and clean cotton waste, or elastic wads made from dry newspaper. A ruptured can or keg should be inclosed in a grain bag of good quality and boxed or crated. Injured packages thus protected and properly marked may be forwarded. Packages too seriously damaged to be recoopered should not be forwarded, but set aside and the shipper notified to make disposition of them. In removing broken cases or kegs of explosives from vessels care must be taken to remove any particles of loose explosives.

12. The transportation of high explosives by water and the transfer of explosives to and from water craft in Hampton Roads and the harbors of Norfolk and Newport News shall be made under the direct supervision of such special inspectors as may be assigned for the purpose by the captain of the port, but this is not to be construed as charging the captain of the port with any responsibility in connection with the navigation of such water craft. Owners or agents of water craft transferring or carrying such cargoes will be required to provide subsistence, when crews are subsisted on board, and, when necessary, suitable sleeping accommodation for special inspectors and for guards placed on board by the captain of the port, and for such periods as he may specify. When crews are not subsisted on board, subsistence for inspectors and guards will not be required, but every opportunity will be afforded to them to use such cooking facilities as are provided for the crews.

13. In any case of violation of the regulations in regard to the handling of explosives, the captain of the port is empowered to remove any vessel, or any man or men from the waters to which these regulations pertain, or to stop the loading or unloading of explosives in said waters.

14. Nothing in the foregoing shall be construed as relieving the master of any vessel carrying explosives from the responsibility of making frequent inspections, both by day and night, to see that these rules are complied with.

PORT OF PHILADELPHIA

1. It shall be the duty of the master of every ship or vessel, within 24 hours next after the arrival of any ship or vessel at the port of Philadelphia, to make a report to the board of commissioners of navigation of the name of such ship or vessel, her draft of water, and where any such ship or vessel shall be outward bound the master of such ship or vessel shall make known to the said board of commissioners of navigation her name and her draft of water at that time; and it shall be the duty of the president of the said board of commissioners of navigation to have entered every such ship or vessel in a book, to be kept by them for that purpose, without fee or reward; and if the master of any ship or vessel shall fail to make such report he shall forfeit and pay the sum of $10.

2. It shall be unlawful for any vessel to anchor on the range line of any range lights established by the United States Lighthouse Board in this State; and the master of any vessel so anchoring shall be deemed guilty of a misdemeanor, and upon conviction thereof before any court of competent jurisdiction shall be punished by a fine not exceeding $50, one-half the fine in such case to be paid the informer and one-half to the State.

3. War vessels of the United States and of foreign nations and pleasure yachts, with permission of the commissioners of navigation, may anchor in such location as not to interfere with the navigation of the river.

Vessels must not anchor at any place in the channel of the River Schuylkill nor lie at any wharf in that river more than two abreast without the permission of the commissioners of navigation.

4. All vessels at anchor in the port of Philadelphia shall keep their sails furled during the night and regulation riding lights exhibited.

5. Vessels going into the stream after discharging and expecting to remain more than five running days will be required to report to the commissioners of navigation for anchorage berth and will have to moor if directed.

6. Permits may be granted by the commissioners of navigation to wrecking plants to anchor outside the anchorage limits of the port of Philadelphia for the purpose of recovering sunken property, subject to supervision. Such plants must comply with the navigation laws in regard to lights, signals, etc., and must, if possible, move in ample time to give safe and clear passage to arriving and departing vessels.

7. If the commissioners of navigation direct the removal of any vessel which lies in the harbor of Philadelphia, and the vessel is not promptly moved as directed, they may cause the vessel to be moved at the expense of the master or owners thereof; and if said master or owners neglect or refuse on demand to pay such an expense, the commissioners of navigation may recover the amount in an action of contract.

8. A vessel under 150 feet register length when at anchor shall carry forward where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light in a lantern so constructed so as to show a clear, uniform, and unbroken light, visible all around the horizon at a distance of at least 1 mile.

9. A vessel of 150 feet or upward in register length when at anchor shall carry in the forward part of the vessel, at height of not less than 20 and not exceeding 40 feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall not be less than 15 feet lower than the forward light, another such light.

10. Should any of the prescribed anchorages in the port of Philadelphia become congested, vessels may be required to moor and, if necessary, to make fast alongside of other vessels already anchored.

11. Vessels hauled into any wharf or dock or alongside of other vessels lying at any wharf or dock must be made fast to the shore with proper lines, with sufficient fenders between them and the inside vessel, and shall, when so ordered by the commissioners of navigation, have their jib booms, booms, yards, davits, and bumpkins, if any, rigged in, their lower yards topped, and anchors either a cockbill or at the hawse pipe, as most convenient.

12. When fasts of vessels extend across a dock so as to obstruct passing vessels, the captain or person in charge shall, when so ordered by the commissioners of navigation, cause the fasts to be slackened or cast off.

13. Vessels lying at the ends of piers, so as to obstruct the passage to the adjoining docks, must move or slack their lines as necessary to accommodate other vessels entering or leaving the docks.

14. Vessels lying alongside of a wharf and not taking in or discharging cargo must make way for and permit other vessels that want to load or unload cargo to come inside next to wharf.

15. No dock shall be unnecessarily obstructed by a vessel so as to prevent the loading or unloading of cargo by another vessel.

16. Vessels that increase their width by using ballast logs, pontoons, or other devices of like nature, must move to accommodate other vessels, when so ordered by the commissioners of navigation, and shall pay the expense of moving such other vessels that have to be moved to allow the vessel with the above appliances to enter or leave the dock.

17. All seagoing vessels at anchor, or when discharging, loading, laying up, or being repaired at any wharf in the port of Philadelphia, are required to have and maintain a safe and convenient ladder, gangplank, or side steps for the use of persons having business on board such vessel.

18. Steamers or sailing vessels loaded with petroleum, benzine, benzol, or naphtha, made fast to any wharf in the city of Philadelphia, and vessels not so loaded, lying within 150 feet of such steamer or sailing vessel, so loaded, and made fast to or lying within that distance of a wharf where petroleum is kept or stored, are not allowed to have aboard any fire or light, lighted cigar, or pipe of any kind whatever, unless by the written permission, duly signed by the owner, lessee, or superintendent of the wharf at which the vessel is lying, setting forth particularly the lights and fires that may be used and the manner of using them.

19. Tows of seagoing barges must be bunched above the mouth of the Schuylkill River. (Regulation, Department of Commerce and Labor, December 7, 1908.)

20. Vessels lying in berths in the port of Philadelphia in positions where they extend beyond the line of the pier do so at their own risk, and may be held responsible for any damage that may occur by reason of their projecting into the stream.

21. Vessels discharging ballast or any loose material must have tarpaulins from the ship's rail to the wharf or lighter, as the case may be, to prevent such material finding its way into the river or dock.

22. Vessels anchored in the harbor of the port of Philadelphia requiring the assistance of the police or fire boats shall display their national flag, union down.

23. The signal for the commissioners of navigation's tender shall be the international code letter N, set in the rigging or hoisted in a conspicuous place, or three short blasts and one long blast of steam whistle, to be continued until answered.

SPEED REGULATIONS

[For vessels navigating the Delaware River between Bristol and Marcus Hook]

1. Vessels shall not be worked or navigated in the Delaware River between the Point House Wharf and Pier G, Port Richmond, at a greater rate of speed than 8 nautical miles an hour, and such vessels shall navigate as far as is practicable from the pierhead line. This rule will not apply to river craft when they are proceeding at more than 300 feet from the pierhead line.

2. Vessels shall not be worked or navigated in the Delaware River in front of the navy yard, between red buoy No. 44, off mouth of Schuykill River, and red buoy No. 46, off Eagle Point, at a greater rate of speed than 12 nautical miles an hour.

3. Vessels passing craft anchored in the stream between Marcus Hook and Bristol, loading, discharging, or bunkering, shall not navigate at a greater rate of speed than 8 nautical miles an hour.

4. Vessels shall not be worked or navigated in the Delaware River off Chester or Marcus Hook at a greater rate of speed than 12 nautical miles an hour.

5. When vessels are moored to the ends of piers at Marcus Hook, lying parallel with the river, passing vessels shall not exceed a speed of 8 nautical miles an hour.

Penalty.—That every master, officer, or other person or persons having charge of any vessel navigating the Delaware River and its navigable tributaries who shall violate any rule regulating the speed of vessels, made and promulgated by the said commissioners, he or they so offending, shall forfeit and pay a sum not exceeding $50 for the first offense and not less than $75 nor more than $100 for each subsequent offense, to be sued for and recovered with costs of suit, by the president of said commissioners, for the use of the Commonwealth, before any magistrate of the city of Philadelphia or justice of the peace of the proper county.

REGULATIONS GOVERNING TWIN-SCREW VESSELS

From and after the passage of this regulation all steamships fitted with twin screws, while occupying berths in the port of Philadelphia, shall either display continuously on each quarter a sign, which shall be illuminated at night, marked "Danger, keep off, this vessel has twin screws," or float a spar boom around the stern which shall entirely inclose the space occupied by the propellers.

REGULATIONS FOR PASSING DREDGES

The following are extracts from regulations prescribed by the Secretary of War for Delaware River:

1. Steamers without tows passing the dredges shall not have a speed greater than 6 miles an hour, and their propelling machinery shall be stopped when immediately abreast of the dredges and while passing over the breast and quarter lines of the dredge.

Steamers with tows passing the dredges shall not have a speed greater than 6 miles an hour, and their propelling machinery shall be stopped while passing over the breast and quarter lines of the dredge; but they may start their propelling machinery if necessary between these lines.

3. Vessels drawing less than 12 feet of water must keep outside of the buoys marking the ends of mooring lines of dredges.

4. Vessels must not anchor on the ranges of stakes or other marks placed for the guidance of the dredges.

5. Vessels must not run over or disturb stakes or other marks placed for the guidance of dredges.

6. Dredges and operating plant in the prosecution of the work must not obstruct any part of the channel unnecessarily.

8. The breast and stern anchors of the dredges shall be marked or buoyed so as to be plainly visible to passing vessels.

9. While vessels in the channel are passing, all lines running across the channel from the dredge on the passing side must be entirely slacked.

YACHT CLUBS

[In region covered by this volume]

Adelphia Yacht Club, Lemon Hill Mansion, Fairmont Park, Philadelphia, Pa.
Alpha Boat Club, foot of Welsh Street, Chester, Pa.
Anchor Yacht Club, Bristol, Pa.
Annapolis Roads Yacht Club, Annapolis, Md.
Arundel Boat Club, Hanover Street, Bridge Road, Baltimore, Md.
Atlantic City Yacht Club, head of New Hampshire Avenue, Atlantic City, N. J.
Baltimore Corinthian Yacht Club, Ferry Bar, Baltimore, Md.
Barnegat Bay Motor Boat Club, Barnegat Bay, N. J.
Bay Head Yacht Club, Bayhead, N. J.
Bayonne City Yacht Club, Bayonne, N. J.
Beach Haven Yacht Club, Beachhaven, N. J.
Brandywine Boat Club, Wilmington, Del.
Bridesburg Yacht Club, Bridesburg, Philadelphia, Pa.
Camden Yacht Club, Camden, N. J.
Cape May Yacht Club, Schellingers Landing, Cape May, N. J.
Capital Yacht Club, foot of Ninth Street, Washington, D. C.
Cedar Yacht Club, Island Heights, N. J.
Chelsea Yacht Club, Atlantic City, N. J.
Chesapeake Bay Yacht Club, Easton, Md.
Chesapeake Cruising Club, Chesapeake City, Md.
Columbia Yacht Club, Garden Street, Bridesburg, Pa.
Corinthian Yacht Club of Philadelphia, Essington, Delaware County, Pa.
Corinthian Yacht Club of Cape May, Yale Avenue, Cape May, N. J.
Egg Harbor Yacht Club, Beachhaven, N. J.
Farragut Sportsmen's Association, foot of Twenty-fifth Street, Camden, N. J.
Gibson Island Club, Magothy River, Md.
Hampton Roads Yacht Club, Norfolk, Va.
Independent Yacht Club, Red Bank, N. J.
Keyport Yacht Club, Keyport, N. J.
Keystone Yacht Club, Tacony, Philadelphia, Pa.
Lulu Temple Yacht Club, Venice Park, Atlantic City, N. J.
Lavallette Yacht Club, Lavallette, N. J.
Longsport Yacht Club, Longsport, N. J.
Manasquan River Yacht Club, Brielle, N. J.
Mantoloking Yacht Club, Mantoloking, N. J.
Maryland Yacht Club, foot of Hanover Street, Baltimore, Md.
Maryland Motor Boat Club, foot of Hanover Street, Baltimore, Md.
Miles River Yacht Club, St. Michaels, Md.
New Brunswick Boat Club, New Brunswick, N. J.
Norfolk Boat Club, foot of Freemason Street, Norfolk, Va.
Ocean City Yacht Club, Bay and Battersea Roads, Ocean City, N. J.
Ocean City Motor Boat Club, Ocean City, N. J.
Ocean Gate Yacht Club, Ocean Gate, N. J.
Players Boat Club (Inc.), Fairhaven, N. J.
Rahway Yacht Club, Rahway, N. J.
Raritan Yacht Club, Perth Amboy, N. J.
Royal Swan Club, Sassafras River, Md.
Roebling Yacht Club, Roebling, N. J.
Sandy Hook Bay Yacht Club, Atlantic Highlands, N. J.
South Amboy Yacht Club, South Amboy, N. J.
Tockwock Yacht Club, Frederick, Md.
Toms River Yacht Club, Toms River, N. J.
Townsend Inlet Motor Boat Club, Townsend Inlet, N. J.
Tri-State Yacht Club, Bucksneck, Md.
Virginia Yacht Club, Hampton, Va.
Wildwood Yacht Club, North Wildwood, N. J.

NAVIGATIONAL AIDS AND THE USE OF CHARTS

The **Coast and Geodetic Survey** is charged with the survey of the coasts, harbors, and tidal estuaries of the United States and its insular possessions and issues the following publications relating to these waters as guides to navigation: Charts, Coast Pilots, Tide Tables, Current Tables, a catalogue of

these publications, and Notices to Mariners, the last-named published weekly by the Bureau of Lighthouses and Coast and Geodetic Survey.

Charts bear three dates, which should be understood by persons using them: (1) The date (month and year) of the edition, *printed* on the late charts below the border in a central position; (2) the date of the latest correction to the chart plates, *printed* in the lower left-hand corner below the border; (3) the date of issue, *stamped below* the border and just to the left of the subtitle. Charts show all necessary corrections as to lights, beacons, buoys, and dangers, which have been received to the *date of issue*, being hand corrected since the latest date printed in the lower left-hand corner. All small but important corrections occurring subsequent to the *date of issue* of the chart are published in Notices to Mariners and should be applied by hand to the chart immediately after the receipt of the notices. The date of the edition of the chart remains unchanged until an extensive correction is made on the plate from which the chart is printed. The date is then changed and the issue is known as a new edition. When a correction, not of sufficient importance to require a new edition, is made to a chart plate, the year, month, and day are noted in the lower left-hand corner. All the notes on a chart should be read carefully, as in some cases they relate to the aids to navigation or to dangers that can not be clearly charted. The charts are various in character, according to the objects which they are designed to subserve. The most important distinctions are the following:

1. Sailing charts, mostly on a scale of approximately 1 : 1,200,000, which exhibit the approaches to a large extent of coast, give the offshore soundings, and enable the navigator to identify his position as he approaches from the open sea.
2. General charts of the coast, on scales of 1 : 400,000 and 1 : 200,000, intended especially for coastwise navigation.
3. Coast charts, on a scale of 1 : 80,000, by means of which the navigator is enabled to avail himself of the channels for entering the larger bays and harbors.
4. Harbor charts, on larger scales, intended to meet the needs of local navigation.

Note.—General charts of the Philippine Islands are on scales 1 : 1,600,000, 1 : 800 000, and 1 : 400,000; coast charts are on scales 1 : 100,000 and 1 : 200,000.

Coast Pilots, relating to surveyed waters of the United States, Porto Rico, Virgin Islands, Alaska, Hawaiian Islands, and the Philippine Islands, contain full nautical descriptions of the coasts, harbors, dangers, and directions for coasting and entering harbors. At intervals of about one year supplements are issued, containing the more important corrections since the publication of the volume. The supplements are printed on one side of the paper only, so that they may be cut and pasted in the appropriate places in the volume. Supplements and other corrections for any volume can be furnished, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C., or any of its field stations, provided the volume itself has not been superseded by a subsequent edition.

Tide Tables.—The Coast and Geodetic Survey Tide Tables are issued annually in advance of the year for which the predictions are made and contain the predicted times and heights of the tide for each day in the year at the principal ports of the world, including the United States and its possessions. A table of tidal differences is given by means of which the tides at about 3,500 intermediate ports may be obtained. Separate reprints from the general Tide Tables are issued for the Atlantic and Pacific coasts of the United States and its dependencies.

Current Tables, which have heretofore been issued as a part of the Tide Tables, are now published separately as Current Tables, Atlantic Coast of the United States, and Current Tables, Pacific Coast of the United States.

Agencies for the sale of the Charts, Coast Pilots, Tide Tables, and Current Tables of the Coast and Geodetic Survey are established in many ports of the United States and in some foreign ports. These publications can also be purchased in the Office of the Coast and Geodetic Survey, Washington, D. C., or any of the field stations. If ordered by mail, prepayment is obligatory. Remittances should be made by postal money order or express order, payable to the Coast and Geodetic Survey. Postage stamps, checks, and drafts can not be accepted. The sending of money in an unregistered letter is unsafe. Only catalogue numbers of charts need be mentioned. The catalogue of charts and

other publications of the survey can be obtained free of charge on application at any of the sale agencies or to the Coast and Geodetic Survey, Washington, D. C.

Other publications.—Lists of Lights, Buoys, and other Day Marks of the United States, its insular possessions, and the Great Lakes are published by the Bureau of Lighthouses and may be purchased from its sale agencies or from the Superintendent of Documents, Washington, D. C. Notices to Mariners, relating to the same waters, is published weekly by the Bureau of Lighthouses and Coast and Geodetic Survey; this publication can be obtained free of charge on application to the Division of Publications, Department of Commerce, Washington, D. C.

REMARKS ON THE USE OF CHARTS

Accuracy of charts.—The value of a chart depends upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become. In these respects the source from which the information has been compiled is a good guide. This applies particularly to the charts of the Alaska Peninsula, Aleutian Islands, Arctic Ocean, and part of Bering Sea, and the Philippine Islands. The early Russian and Spanish surveys were not made with great accuracy, and until they are replaced by later surveys these charts must be used with caution.

With respect to these regions, the fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail. A wide berth should, therefore, be given to every rocky shore or patch, and this rule should invariably be followed, viz. that instead of considering a coast to be clear unless it is shown to be foul the contrary should be assumed.

With respect to a well-surveyed coast, only a fractional part of the soundings obtained are shown on the chart, a sufficient number being selected to indicate clearly the contour of the bottom. When the bottom is uneven the soundings will be found grouped closely together, and when the slopes are gradual fewer soundings are given. Each sounding represents an actual measure of depth and location at the time the survey was made. Shores and shoals where sand and mud prevail, and especially bar harbors and the entrances of bays and rivers exposed to strong tidal currents and a heavy sea, are subject to continual change of a greater or less extent, and important ones may have taken place since the date of the last survey. In localities which are noted for frequent and radical changes, such as the entrance to a number of estuaries on the Atlantic, Gulf, and Pacific coasts, notes are printed on the charts calling attention to the fact.

It should also be remembered that in coral regions and where rocks abound it is always possible that a survey with lead and line, however detailed, may have failed to find every small obstruction. For these reasons, when navigating such waters, the customary sailing lines and channels should be followed and those areas avoided where the irregular and sudden changes in depth indicate conditions which are associated with pinnacle rocks or coral heads.

Dredged channels.—These are generally shown on the chart by two broken lines to represent the side limits of the improvement, 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 redredging. These changes are often of frequent occurrence, therefore when vessels' drafts approximate the charted depth of a dredged channel, local information as to conditions should be obtained before entering.

Danger curves.—The depth curves will be found useful in giving greater prominence to outlying dangers. It is a good plan to trace out with a colored pencil the curve next greater than the draft of the vessel using the chart and regard this as a "danger curve," which is not to be crossed without precaution. Isolated soundings shoaler than surrounding depths should be avoided, as there is always the possibility that the shoalest spot may not have been found.

Caution in using small-scale charts.—It is obvious that dangers to navigation can not be shown with the same amount of detail on small-scale charts as on those of larger scale; therefore in approaching the land or dangerous banks regard should be had to the scale of the chart, and the largest scale chart available should be used. A small error in laying down a position means

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

Distortion of printed charts.—The paper on which charts are printed directly from copper plates has to be dampened. On drying, distortion takes place from the inequalities in the paper, which varies with the paper and the amount of the original dampening; but usually it is not sufficient to affect ordinary navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted upon the chart, especially if the lines to objects be long. The longer the chart the greater the amount of this distortion.

All Coast and Geodetic Survey charts are now printed by lithography on dry paper and have little, if any, distortion. A lithographed chart may be distinguished from a plate-printed chart by the feel of the surface, the former being smooth while the latter is rough. Lithographed charts also are usually tinted in colors, while the others are in black and white.

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

Gas buoys and other unwatched lights can not be implicity relied on; the light may be altogether extinguished or, if intermittent, the apparatus may get out of order.

Lights.—The distances given in the Light Lists, Coast Pilots, and on the charts for the visibility of lights are computed for a height of 15 feet (4.6 m.) for the observer's eye. The table of distances of visibility due to height, published in the Light List, affords a means of ascertaining the effect of a greater or less height of the eye. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances. As the range of visibility increases with the elevation of the observer, it is often possible to obtain a bearing before the light is sighted from the bridge by sighting the light from aloft, noting a star in range with it, and then obtaining a bearing of the star with compass or pelorus.

The actual power of a light should be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen. The power of a light can be estimated by its candlepower as given in the Light Lists and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the wind, large areas of silence have been found in different directions and at different distances from the origin of the sound signal, even in clear weather. Therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal may require some time before it is in readiness to act. A fog often creeps imperceptibly toward the land and is not observed by those at a lighthouse until it is upon them, whereas a vessel may have been in it for many hours while approaching the land. In such a case no signal may be sounded. When sound travels against the wind it may be thrown upward; in such a case a man aloft might hear it when it is inaudible on deck. The conditions for hearing a signal will vary at the same station within short intervals of time. Mariners must not, therefore, judge their distance from a fog signal by the force of the sound and must not assume that a signal is not sounding because they do not hear it. Taken together, these facts should induce the utmost caution when nearing the land or danger in fog. The lead is generally the only safe guide and should be faithfully used. In regions where the shores are high and rocky the echo of the whistle frequently gives warning of too close an approach to shore. In narrow passages it is often possible to keep in mid-channel by

directing course so that the echoes from both shores are heard at approximately the same time.

Submarine bells, installed on many lightships and buoys, have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus can determine the approximate bearing of the signal. These signals can be heard also on vessels not equipped with receiving apparatus by observers below the water line, but a bearing of the signal can not then be readily determined.

Radio-compass bearings.—The large number of radio fog signals and radio-compass stations now available along the coasts of the United States provide the mariner with an invaluable means of locating his vessel during thick weather and should be used to the fullest possible extent for this purpose.

Tides.—A knowledge of the tide, or vertical rise and fall of the water, is of great and direct importance whenever the depth at low water approximates or is less than the draft of the vessel and, wherever docks are constructed so as to be entered and left near the time of high water.

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

It should be remembered that whatever plane of reference is used for a chart there may be times when the tide falls below it. When the plane is mean low water or mean lower low water, there will generally be as many low waters or lower low waters below those planes as above them; also the wind may at times cause the water to fall below the plane of reference.

Tidal currents.—In navigating coasts where the tidal range is considerable special caution is necessary. It should be remembered that there are indrafts into all bays and bights, although the general set of the current is parallel to the shore, and that the effect of a cross current is greater on a vessel running slowly than when at full speed. The turn of the tidal current offshore is seldom coincident with the time of high and low water on the shore.

At the entrance to most harbors without important tributaries or branches the current turns at or soon after the times of high and low water within. The diurnal inequality in the velocity of current will be proportionately but half as great as in the height of the tides. A swift current often occurs in narrow openings between two bodies of water because the water at a given instant may be at different levels. Along most shores not seriously affected by bays, tidal rivers, etc., the current usually turns soon after high and low waters.

The swiftest current in straight portions of tidal rivers is usually in the mid-channel, but in curved portions the strongest current is toward the outer edge of the curve. Countercurrents and eddies may occur near the shore of straits, especially in bights and near points.

Tide rips and swirls occur in places where strong currents occur, caused by a change in the direction of the current, and especially over shoals or in places where the bottom is uneven. Such places should be avoided if exposed also to a heavy sea, especially with the wind opposing the current. When these conditions are at their worst, the water is broken into heavy, choppy seas from all directions, which board the vessel and also make it difficult to keep control, owing to the baring of the propeller and rudder.

Current arrows on charts show only the usual or mean direction of a tidal stream or current. It must not be assumed that the direction of the current will not vary from that indicated by the arrow. In the same manner the velocity of the current constantly varies with circumstances, and the rate given on the chart is a mean value corresponding to an average range of tide. At some stations but few observations have been made.

The Current Tables published by the Coast and Geodetic Survey give the predicted times of slack water, predicted times and velocities of maximum current, and other current data for a number of places on the Atlantic and Pacific coasts of North America.

Fixing position.—The most accurate method available to the navigator for fixing a position relative to the shore is by plotting with a protractor, sextant

angles between well-defined objects on the chart. This method, based on the "3-point problem" of geometry, should be in general use.

In many narrow waters also where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore. For its successful employment it is necessary, first, that the objects be well chosen; and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice.

Near objects should be used either for bearing or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn. On the other hand, distant objects should be used for direction because less affected by a small error or change of position. The 3-arm protractor consists of a graduated circle with one fixed and two movable radial arms. The zero of the graduation is at the fixed arm, and by turning the movable arms each one can be set at any desired angle with reference to the fixed arm.

To plot a position the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges in case of a metal instrument, or the radial lines in the case of a transparent or celluloid instrument, pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole. The tracing-paper protractor, consisting of a graduated circle printed on tracing paper, can be used as a substitute for the brass or celluloid instrument. The paper protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through the three objects, it will be indeterminate, as it will plot all around the circle. An approach to this condition, which is called a "revolver," must be avoided. In case of doubt select from the chart three objects nearly in a straight line or with the middle object nearest the observer. Near objects are better than distant ones, and, in general, up to 90°, the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer, the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation. A single angle and a range give, in general, an excellent fix, easily obtained and plotted.

The compass.—It is not intended that the use of the compass to fix the position should be given up. There are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. Where accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal or of additions to a chart, as fresh soundings or new buildings. In such cases angles should be taken to several objects, the more the better; but a good number is five objects, as the four angles thus obtained prevent any errors. When only two objects are visible, a sextant angle can be used to advantage with the compass bearings and a better fix obtained than by two bearings alone.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called bow and beam bearing, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy and is an excellent fix for a departure but does not insure safety, as the object observed and any dangers off it are abeam when the position is obtained. By taking the bearing at two points and four points on the bow, a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, al-

lowing for current. Taking afterwards the beam bearing gives, with slight additional trouble, the distance of the object when abeam. Such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in case of being suddenly shut in by fog. A graphic solution of the problem for any two bearings of the same object is frequently used. The two bearings are drawn on the chart, and the course is then drawn by means of the parallel rulers, so that the distance as measured from the chart between the lines is equal to the distance made good by the vessel between the times of taking the bearings.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, charts compiled from early Russian and Spanish sources, referred to in a preceding paragraph, should not be used.

Soundings.—In thick weather, when near or approaching the land or danger, soundings should be taken continuously and at regular intervals and, with the character of the bottom, systematically recorded. By marking the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship and then moving the paper over the chart parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined. Echo sounding instruments, the use of which is increasing rapidly, provide the mariner with a most valuable aid to navigation.

Sumner's method.—Among astronomical methods of fixing a ship's position the great utility of Sumner's method or one of its many modifications should be well understood, and this method should be in constant use. The Sumner line—that is, the line drawn through the two positions obtained by working the chronometer observation for longitude with two assumed latitudes, or by drawing through the position obtained with one latitude a line at right angles to the bearing of the body as obtained from the azimuth tables—gives at times invaluable information, as the ship must be somewhere on that line, provided the chronometer is correct. If directed toward the coast, it marks the bearing of a definite point; if parallel with the coast, the distance of the latter is shown. Thus, the direction of the line may often be usefully taken as a course. A sounding at the same time with the observation may often give an approximate position on the line. A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The Sumner lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day, and in combination with the sun gives an excellent fix.

Position line by Marc St. Hilaire or calculated altitude method.—By this method the altitude of the celestial body is calculated for the assumed position, and the difference between the observed and calculated altitudes is laid off toward or away from the assumed position, according to sign, along the azimuth of the observed body. The line of position is then drawn through the new point in a direction normal to the azimuth of the celestial body. This method has certain advantages, the principal one being that the solution is strong even when the body is near the meridian. Full description of this method will be found in any epitome of navigation.

Position line by means of tables.—The Sumner line of position furnished ready to lay down on the chart may be derived from the tables of Simultaneous Hour Angle and Azimuth of Celestial Bodies, published by the Hydrographic Office as publication No. 203. By means of these tables all calculations are avoided, but they are not recommended for use within an hour of the meridian, when the Marc St. Hilaire Method of Ex-Meridian Tables should be substituted.

Radiocompass bearings and positions are especially valuable at night and during fog or thick weather when other observations are not obtainable. For practical navigating purposes radio vibrations may be regarded as traveling in a straight line from the sending station to the receiving station. Instruments for determining the bearing of this line are now available. The necessary observations may be divided into two general classes: First, where the bearing of the ship's radio call is determined by one, two, or more radio stations on shore and the resulting bearing or position is reported to the vessel (see p. 13, "radio service"); secondly, where the bearing of one or more known radio

stations is determined on the vessel itself and plotted as a line of position or as cross bearings. Experiments show that these bearings can be determined with a probable error of less than 2°, and the accuracy of the resulting position is largely dependent on the skill and care of the observer. It must be remembered, however, that these lines are parts of great circles, and, if plotted as straight lines on a Mercator chart, a considerable error may result when the ship and shore stations are a long distance apart. The bearings may be corrected for this distortion as explained on page 13.

Radio bearings may be combined with position lines obtained from astronomical observations and used in ways very similar to the well-known Sumner line when avoiding dangerous shoals or when making the coast.

Change of variation of the compass.—The gradual change in the variation must not be forgotten in laying down positions by bearings on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are replotted for every new edition if the error is appreciable. Means for determining the amount of this error are provided by printing the date of constructing the compass and the annual change in variation near its edge.

The change in the magnetic variation in passing along some parts of the coast of the United States is so rapid as to affect materially the course of a vessel unless given constant attention. This is particularly the case in New England and parts of Alaska, where the lines of equal magnetic variation are close together and show rapid changes in magnetic variation from place to place, as indicated by the large differences in variation given on neighboring compass roses.

Local magnetic disturbance.—The term "local magnetic disturbance" or "local attraction" has reference only to the effects on the compass of magnetic masses external to the ship. Observation shows that such disturbance of the compass in a ship afloat is experienced only in a few places. Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centers near together. The law which has hitherto been found to hold good as regards local magnetic disturbances is that north of the magnetic Equator the north end of the compass needle is attracted toward any center of disturbance; south of the magnetic Equator it is repelled. It is very desirable that whenever an area of local magnetic disturbances is noted the position should be fixed and the facts reported as far as they can be ascertained.

USE OF OIL FOR MODIFYING THE EFFECT OF BREAKING WAVES

Many experiences of late years have shown that the utility of oil for this purpose is undoubted and the application simple. The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil skillfully applied may prevent such damage both to ships (especially of the smaller classes) and to boats by modifying the action of breaking seas. The principal facts as to the use of oil are as follows:

1. On free waves—that is, waves in deep water—the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances, but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, and generally waste oil from the engines, have great effect.
4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, either when running or lying to or in wearing.

6. No experiences are related of its use when hoisting a boat at sea or in a seaway, but it is highly probable that much time would be saved and injury to the boat avoided by its use on such occasions.

7. In cold water the oil, being thickened by the lower temperature and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to facilitate leakage of the oil. The oil is also frequently distributed from canvas bags or oakum inserted in the closet bowls. The positions of these bags should vary with the circumstances. Running before the wind, they should be hung on either bow; that is, from the cathead and allowed to tow in the water. With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter. Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, using sufficient line to permit them to draw to windward while the ship drifts.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, will appear to be the best plan. As before remarked, under these circumstances the effect can not be so much trusted. On a bar with the ebb tide running it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat and the bag readily hauled on board for refilling if necessary.

USE OF SOUNDING TUBES

Although of undoubted value as a navigational instrument, the sounding tube is subject to certain defects which, operating singly or in combinations, may give results so misleading as to seriously endanger vessels whose safety is entirely dependent upon an accurate knowledge of the depths. Efforts have been made from time to time by the Coast and Geodetic Survey to utilize various commercial tubes for surveying operations, but the results obtained have not been satisfactory. A tube designed by the bureau, however, has been tested extensively by field parties and, as it gives results exceeding in accuracy any other type of tube, has been adopted for survey work. Even with this tube great care is necessary in order to obtain satisfactory results. There are various types of tubes in common use which are too well known to require detailed description here. They are all based on the general principle that air is elastic and can be compressed, and that if a column of air in a tube be lowered into the water in such a way that the air can not escape, yet at the same time the pressure of the water can be transmitted to it, the amount by which the air is compressed furnishes a measure of the depth to which it was lowered. Theoretically this principle is sound, but when we come to apply the theory to actual practice certain elements enter which results in errors in the depth determination. Actual experiments show that errors of 10 to 12 per cent are not uncommon, and that considerably greater errors may occur. It is important to note that the amount of these errors depends on the depth—the greater the depth the greater the numerical value of the error.

These errors are due chiefly to uneven bore of tube, variation of barometric pressure from normal, difference in temperature of air and water, uneven thickness of caps used to close one end of the tube, leakage of water, accumulated salt in the tube, and leakage or failure of gaskets and valves used in the construction of some types of tube.

In order to avoid serious errors tubes should therefore be used with greatest care. A type that can be used more than once should be adopted, and the tubes

to be used for sounding to make a landfall should be tested beforehand by stopping for an up-and-down cast, sending them down on the sounding wire to any desired depth, and comparing their readings with the actual depth to which they were submerged. Additional tests of this nature from time to time during the sounding operations are also valuable. Special care should be taken to prevent leakage by making sure that the cap fits tightly or that the valve and gaskets are water-tight and are working properly. In using the valve type of tube it is very important to make sure that the tube does not submerge after it once clears the water.

INSTRUCTIONS TO MARINERS IN CASE OF SHIPWRECK, AS PUBLISHED BY THE UNITED STATES COAST GUARD

GENERAL INFORMATION

Life-saving stations and houses of refuge are located upon the Atlantic and Pacific seaboards of the United States, the Gulf of Mexico, and the Lake coasts.

All stations on the Atlantic coast are manned throughout the year by crews of experienced surfmen; upon the Lake coasts the stations are manned from the opening until the close of navigation, with the exception of the one on Beaver Island, Lake Michigan, which depends on a volunteer crew; and upon the Pacific coast they are open and manned throughout the year.

All life-saving stations are fully supplied with boats, wreck guns, beach apparatus, restoratives, clothing provided by the Women's National Relief Association for the shipwrecked requiring it, etc.

Houses of refuge are supplied with boats, provisions, and restoratives, but not manned by crews; a keeper, however, resides in each, who is required to make extended excursions along the coast after every storm, with a view of ascertaining if any shipwreck has occurred and finding and succoring any persons that may have been cast ashore.

Houses of refuge are located exclusively upon the Florida coast, where the requirements of relief are widely different from those of any other portion of the seaboard.

The life-saving stations are provided with the International Code of Signals, and vessels can, by opening communication, be reported; or obtain the latitude or longitude of the station, where determined; or information as to the weather probabilities in most cases; or, where facilities for the transmission of messages by telephone or telegraph are available, requests for a tug or Coast Guard cutter will be received and promptly forwarded.

All services are performed by the life-saving crews without other compensation than their wages from the Government.

Destitute seafarers are provided with food and lodging at the nearest station by the Government as long as necessarily detained by the circumstances of shipwreck and, if needed, with clothing provided by the Women's National Relief Association.

The station crews patrol the beach from 2 to 4 miles each side of their stations between sunset and sunrise, and if the weather is foggy the patrol is continued through the day. A continuous lookout is also maintained at every station night and day.

Each patrolman carries Coston signals. Upon discovering a vessel standing into danger he ignites one of these, which emits a brilliant red flame of about two minutes' duration, to warn her off, or, should the vessel be ashore, to let her crew know that they are discovered and assistance is at hand.

If the vessel is not discovered by the patrol immediately after striking, rockets, flare-up lights, or other recognized signals of distress should be used. If the weather be foggy, some recognized sound signal should be made to attract attention, as the patrolman may be some distance away at the other end of his beat.*

Masters are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, to remain on board until assistance arrives, and under no circumstances should they attempt to land through the surf in their own boats until the last hope of assistance from the shore has vanished. Often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore, and the surf when viewed from a vessel never appears as dangerous as it is. Many lives have been lost unnecessarily

by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

The difficulties of rescue by operations from the shore are greatly increased in cases where the anchors are let go *after entering the breakers*, as is frequently done, and the chances of saving life correspondingly lessened.

RESCUE WITH THE LIFEBOAT OR SURFBOAT

The patrolman, after discovering your vessel ashore and burning a Coston signal, hastens to his station or the telephone for assistance. If the use of a boat is practicable, either the large lifeboat is launched from its ways in the station and proceeds to the wreck by water or the lighter surfboat is hauled overland to a point opposite the wreck and launched, as circumstances may require.

Upon the boat reaching your vessel the directions and orders of the keeper (who always commands and steers the boat) should be implicitly obeyed. Any headlong rushing and crowding should be prevented, and the captain of the vessel should remain on board, to preserve order until every other person has left.

Women, children, helpless persons, and passengers should be passed into the boat first.

Goods or baggage will positively not be taken into the boat until all are landed. If any be passed in against the keeper's remonstrance, he is fully authorized to throw the same overboard.

RESCUE WITH THE BREECHES BUOY OR LIFE CAR

Should it be inexpedient to use either the lifeboat or surfboat, recourse will be had to the wreck gun and beach apparatus for the rescue by the breeches buoy or the life car.

A shot with a small line attached will be fired across your vessel. Get hold of the line as soon as possible and haul on board until you get a tailblock with a whip or endless line rove through it. The tailblock should be hauled on board as quickly as possible to prevent the whip drifting off with the set or fouling with wreckage, etc. Therefore if you have been driven into the rigging, where but one or two men can work to advantage, cut the shot line, and run it through some available block, such as the throat or peak-halyards block, or any block which will afford a clear lead, or even between the ratlines, that as many as possible may assist in hauling.

Attached to the tailblock will be a tally board with the following directions in English on one side and French on the other:

"Make the tail of the block fast to the lower mast, well up. If the masts are gone, then to the best place you can find. *Cast off shot line, see that the rope in the block runs free*, and show signal to the shore."

The above instruction being complied with, the result will be as shown in Figure 1.

As soon as your signal is seen a 3-inch hawser will be bent onto the whip and hauled off to your ship by the life-saving crew.

If circumstances permit, you can assist the life-saving crew by manning that part of the whip to which the hawser is bent and hauling with them.

When the end of the hawser is got on board, a tally board will be found attached, bearing the following directions in English on one side and French on the other:

"Make this hawser fast about 2 feet above the tailblock, see all clear and that the rope in the block runs free, and show signal to the shore."

These instructions being obeyed, the result will be as shown in Figure 2.

Take particular care that there are no turns of the whip line round the hawser. To prevent this, take the end of the hawser up between the parts of the whip before making it fast.

When the hawser is made fast, the whip cast off from the hawser, and your signal seen by the life-saving crew, they will haul the hawser taut and by means of the whip will haul off to your vessel a breeches buoy suspended from a traveler block, or a life car, from rings running on the hawser.

Figure 3, below, represents the apparatus rigged, with the breeches buoy hauled off to the ship.

If the breeches buoy be sent, let one man immediately get into it, thrusting his legs through the breeches. If the life car, remove the hatch, place as many

persons therein as it will hold (four to six), and secure the hatch on the outside by the hatch bar and hook, signal as before, and the buoy or car will be hauled ashore. This will be repeated until all are landed. On the last trip of the life car the hatch must be secured by the inside hatch bar.

In many instances two men can be landed in the breeches buoy at the same time by each putting a leg through a leg of the breeches and holding onto the lifts of the buoy.

Children, when brought ashore by the buoy, should be in the arms of older persons or securely lashed to the buoy. Women and children should be landed first.

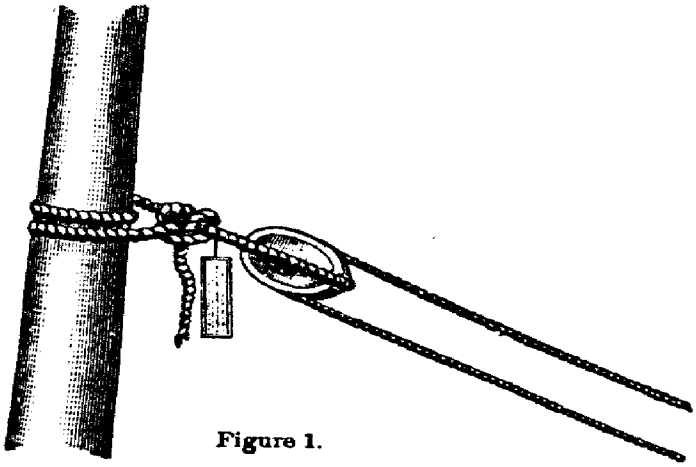


Figure 1.

In signaling as directed in the foregoing instructions, if in the daytime, let one man separate himself from the rest and swing his hat, a handkerchief, or his hand; if at night, the showing of a light and concealing it once or twice will be understood; and like signals will be made from the shore. (See also, "Signals," on p. 285.)

Circumstances may arise, owing to the strength of the current or set or the danger of the wreck breaking up immediately, when it would be impossible to

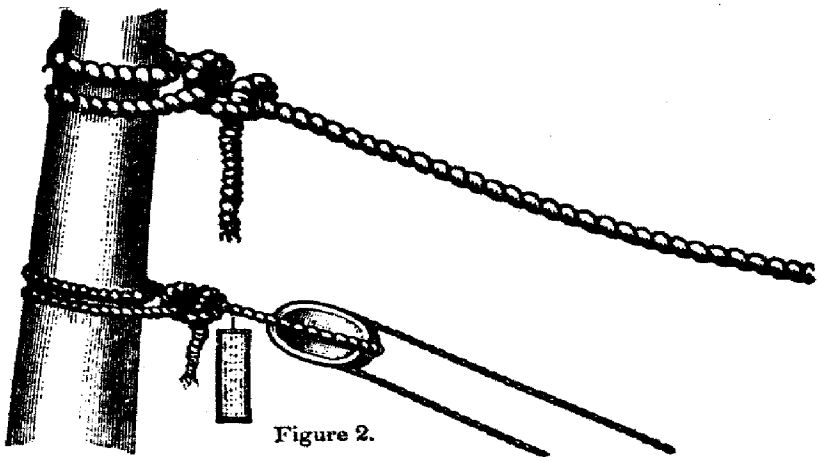


Figure 2.

send off the hawser. In such a case a breeches buoy or life car will be hauled off instead by the whip or sent off to you by the shot line, and you will be hauled ashore through the surf.

If your vessel is stranded during the night and discovered by the patrolman—which you will know by his burning a brilliant red light—keep a sharp lookout for signs of the arrival of the life-saving crew abreast of your vessel.

From one to four hours may intervene between the burning of the light and their arrival, as the patrolman may have to return to his station, perhaps 3 or 4 miles distant, and the life-saving crew draw the apparatus or surfboat through the sand or over bad roads to where your vessel is stranded.

Lights on the beach will indicate their arrival, and the sound of cannon firing from the shore may be taken as evidence that a line has been fired across your vessel. Therefore, upon hearing the cannon, make strict search aloft, fore and aft, for the shot line, for it is almost certain to be there. Though the movements of the life-saving crew may not be perceptible to you, owing to the darkness, your vessel will be a good mark for the men experienced in the use of the wreck gun, and the first shot seldom fails.

IMPORTANT

Remain by the wreck until assistance arrives from the shore, or as long as possible. If driven aloft, the inshore mast is the safest.

If not discovered immediately by the patrol, burn rockets, flare-up, or other lights, or if the weather be foggy, fire guns or make other sound signals.

Make the shot line fast on deck or to the rigging to prevent its being washed into the sea and possibly fouling the gear.

Take particular care that there are no turns of the whip line round the hawser before making the hawser fast.

Send the women, children, helpless persons, and passengers ashore first.

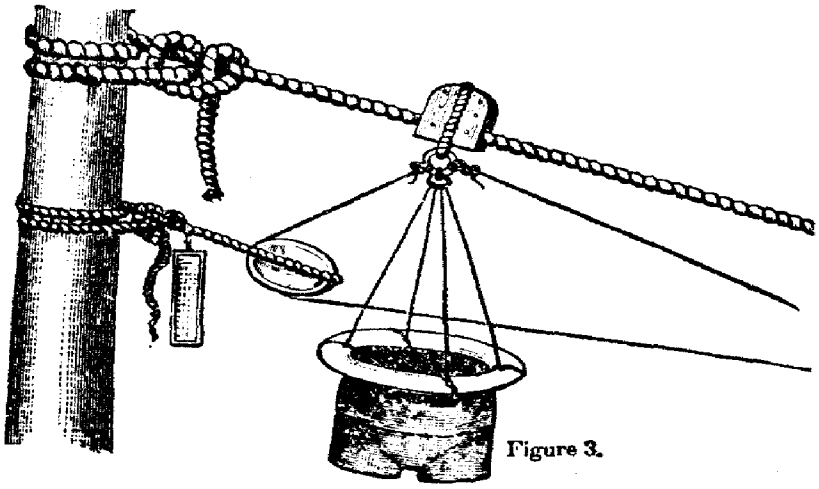


Figure 3.

Make yourself thoroughly familiar with these instructions, and remember that on your coolness and strict attention to them will greatly depend the chances of success in bringing you and your people safely to land.

WRECK SIGNALS

The following signals, approved by the International Marine Conference convened at Washington in October, 1889, have been adopted by the Coast Guard Service and will be used and recognized by the officers and employees as occasion may require:

"Upon the discovery of a wreck by night, the life-saving force will burn a red pyrotechnic light or a red rocket to signify, '*You are seen; assistance will be given as soon as possible.*'

"A red flag waved on shore by day, or a red light, red rocket, or red Roman candle displayed by night, will signify '*Haul away.*'

"A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket, or white Roman candle fired by night will signify, '*Slack away.*'

"Two flags, a white and red, waved at the same time on shore by day, or two lights, a white and a red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify, '*Do not attempt to land in your own boats;' it is impossible.*'

"A man on shore beckoning by day, or two torches burning near together by night, will signify, '*This is the best place to land.*'

"Any of these signals may be answered from the vessel as follows: In the daytime, waving a flag, a handkerchief, a hat, or even the hand; at night, by

firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwale for a short time and then concealing it."

BOUNDARY LINES OF THE HIGH SEAS

The following lines divide the high seas from rivers, harbors, and inland waters described in this volume. Waters inshore of the lines here laid down are "inland waters," and upon them the inland rules and pilot rules given on page 293 apply. Upon the high seas—viz. waters outside of the lines here laid down—the international rules given below apply.

All bearings are in degrees true and points magnetic; distances in nautical miles, and are given approximately.

New York Harbor.—A line drawn from Rockaway Point Coast Guard Station 159½° (S. by E.), 6¼ miles, to Ambrose Channel Light Vessel; thence 238½° (WSW. ⅛ W.), 8¼ miles, to Navesink (southerly) Lighthouse.

Philadelphia Harbor and Delaware Bay.—A line drawn from Cape May Lighthouse 200° (SSW. ½ W.), 8½ miles, to Overfalls Light Vessel; thence 246¼° (WSW. ½ W.), 3⅛ miles to Cape Henlopen Lighthouse.

Baltimore Harbor and Chesapeake Bay.—A line drawn from Cape Charles Lighthouse 179½° (S. ½ W.), 10½ miles, to Cape Henry Gas and Whistling Buoy, 2; thence 257° (W. ⅝ S.), 5 miles, to Cape Henry Lighthouse.

RULES OF THE ROAD—INTERNATIONAL RULES TO PREVENT COLLISIONS OF VESSELS

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following regulations for preventing collisions at sea shall be followed by all public and private vessels of the United States upon the high seas in all waters connected therewith navigable by seagoing vessels:

PRELIMINARY

In the following rules every steam vessel which is under sail and not under steam is to be considered a sailing vessel, and every vessel under steam, whether under sail or not, is to be considered a steam vessel.

The words "steam vessel" shall include any vessel propelled by machinery.

A vessel is "under way," within the meaning of these rules, when she is not at anchor, or made fast to the shore or aground.

RULES CONCERNING LIGHTS, AND SO FORTH

The word "visible" in these rules when applied to lights shall mean visible on a dark night with a clear atmosphere.

ARTICLE 1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

ART. 2. A steam vessel when under way shall carry—(a) On or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than twenty feet, and if the breadth of the vessel exceeds twenty feet, then at a height above the hull not less than such breadth, so, however, that the light need not be carried at a greater height above the hull than forty feet, a bright white light, so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such a character as to be visible at a distance of at least five miles.

(b) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw

the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

(d) The said green and red side lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(e) A steam vessel when under way may carry an additional white light similar in construction to the light mentioned in subdivision (a). These two lights shall be so placed in line with the keel that one shall be at least fifteen feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

ART. 3. A steam vessel when towing another vessel shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than six feet apart, and when towing more than one vessel shall carry an additional bright white light six feet above or below such lights, if the length of the tow measuring from the stern of the towing vessel to the stern of the last vessel towed exceeds six hundred feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in article 2 (a), excepting the additional light, which may be carried at a height of not less than fourteen feet above the hull.

Such steam vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

ART. 4. (a) A vessel which from any accident is not under command shall carry at the same height as a white light mentioned in article 2 (a), where they can best be seen, and if a steam vessel in lieu of that light two red lights, in a vertical line one over the other, not less than six feet apart, and of such a character as to be visible all around the horizon at a distance of at least two miles; and shall by day carry in a vertical line one over the other, not less than six feet apart, where they can best be seen, two black balls or shapes, each two feet in diameter.

(b) A vessel employed in laying or in picking up a telegraph cable shall carry in the same position as the white light mentioned in article 2 (a), and if a steam vessel in lieu of that light three lights in a vertical line one over the other not less than six feet apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all around the horizon at a distance of at least two miles. By day she shall carry in a vertical line, one over the other, not less than six feet apart, where they can best be seen, three shapes not less than two feet in diameter, of which the highest and lowest shall be globular in shape and red in color, and the middle one diamond in shape and white.

(c) The vessels referred to in this article, when not making way through the water shall not carry the side lights, but when making way shall carry them.

(d) The lights and shapes required to be shown by this article are to be taken by other vessels as signals that the vessel showing them is not under command and can not therefore get out of the way.

These signals are not signals of vessels in distress and requiring assistance. Such signals are contained in article 31.

ART. 5. A sailing vessel under way and any vessel being towed shall carry the same lights as are prescribed by article 2 for a steam vessel under way with the exception of the white lights mentioned therein, which they shall never carry.

ART. 6. Whenever, as in the case of small vessels under way during bad weather, the green and red side lights can not be fixed, these lights shall be kept at hand, lighted and ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the color of the light they respectively contain, and shall be provided with proper screens.

ART. 7. Steam vessels of less than forty, and vessels under oars or sails of less than twenty tons gross tonnage, respectively, and rowing boats, when under way, shall not be required to carry the lights mentioned in article 2 (a), (b),

and (c), but if they do not carry them they shall be provided with the following lights:

First. Steam vessels of less than forty tons shall carry—

(a) In the fore part of the vessel, or on or in front of the funnel, where it can best be seen, and at a height above the gunwale of not less than nine feet, a bright white light constructed and fixed as prescribed in article 2 (a), and of such a character as to be visible at a distance of at least two miles.

(b) Green and red side lights constructed and fixed as prescribed in article 2 (b) and (c), and of such a character as to be visible at a distance of at least one mile, or a combined lantern showing a green light and a red light from right ahead to two points abaft the beam on their respective sides. Such lanterns shall be carried not less than three feet below the white light.

Second. Small steamboats, such as are carried by seagoing vessels, may carry the white light at a less height than nine feet above the gunwale, but it shall be carried above the combined lantern mentioned in subdivision 1 (b).

Third. Vessels under oars or sails of less than twenty tons shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which, on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

Fourth. Rowing boats, whether under oars or sail, shall have ready at hand a lantern showing a white light which shall be temporarily exhibited in sufficient time to prevent collision.

The vessels referred to in this article shall not be obliged to carry the lights prescribed by article 4 (a) and article 11, last paragraph.

ART. 8. Pilot vessels when engaged on their station on pilotage duty shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all around the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side lights lighted ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

A pilot vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may, instead of the colored lights above mentioned, have at hand ready for use, a lantern with green glass on the one side and red glass on the other, to be used as prescribed above.

Pilot vessels when not engaged on their station on pilotage duty shall carry lights similar to those of other vessels of their tonnage.

A steam pilot vessel, when engaged on her station on pilotage duty and in waters of the United States, and not at anchor, shall, in addition to the lights required for all pilot boats, carry at a distance of eight feet below her white masthead light a red light, visible all around the horizon and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles, and also the colored side lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty and in waters of the United States, and at anchor, she shall carry in addition to the lights required for all pilot boats the red light above mentioned, but not the colored side lights. When not engaged on her station on pilotage duty, she shall carry the same lights as on other steam vessels.

ART. 9. Fishing vessels and fishing boats, when under way and when not required by this article to carry or show the lights hereinafter specified shall carry or show the lights prescribed for vessels of their tonnage under way.

(a) Open boats, by which is to be understood boats not protected from the entry of sea water by means of a continuous deck, when engaged in any fishing at night, with outlying tackle extending not more than one hundred and fifty feet horizontally from the boat into the seaway, shall carry one all-around white light.

Open boats, when fishing at night, with outlying tackle extending more than one hundred and fifty feet horizontally from the the boat into the seaway, shall carry one all-around white light, and in addition, on approaching or being approached by other vessels, shall show a second white light at least three feet below the first light and at a horizontal distance of at least five feet away from it in the direction in which the outlying tackle is attached.

(b) Vessels and boats, except open boats as defined in subdivision (a), when fishing with drift nets, shall, so long as the nets are wholly or partly in the water, carry two white lights where they can best be seen. Such lights shall be placed so that the vertical distance between them shall be not less than six feet and not more than fifteen feet, and so that the horizontal distance between them, measured in a line with the keel, shall be not less than five feet and not more than ten feet. The lower of these two lights shall be in the direction of the nets, and both of them shall be of such a character as to show all around the horizon, and to be visible at a distance of not less than three miles.

Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing vessels of less than twenty tons gross tonnage shall not be obliged to carry the lower of these two lights. Should they, however, not carry it, they shall show in the same position (in the direction of the net or gear) a white light, visible at a distance of not less than one sea mile, on the approach of or to other vessels.

(c) Vessels and boats, except open boats as defined in subdivision (a), when line fishing with their lines out and attached to or hauling their lines, and when not at anchor or stationary within the meaning of subdivision (h), shall carry the same lights as vessels fishing with drift nets. When shooting lines, or fishing with towing lines, they shall carry the lights prescribed for a steam or sailing vessel under way, respectively.

Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea, sailing fishing vessels of less than twenty tons gross tonnage shall not be obliged to carry the lower of these two lights. Should they, however, not carry it, they shall show in the same position (in the direction of the lines) a white light visible at a distance of not less than one sea mile on the approach of or to other vessels.

(d) Vessels when engaged in trawling, by which is meant the dragging of an apparatus along the bottom of the sea—

First. If steam vessels, shall carry in the same position as the white light mentioned in article 2 (a) a tricolored lantern so constructed and fixed as to show a white light from right ahead to two points on each bow, and a green light and a red light over an arc of the horizon from two points on each bow to two points abaft the beam on the starboard and port sides, respectively; and not less than six nor more than twelve feet below the tricolored lantern a white light in a lantern, so constructed as to show a clear, uniform, and unbroken light all around the horizon.

Second. If sailing vessels, shall carry a white light in a lantern, so constructed as to show a clear, uniform, and unbroken light all around the horizon, and shall also, on the approach of or to other vessels, show where it can best be seen a white flare-up light or torch in sufficient time to prevent collision.

All lights mentioned in subdivision (d) first and second shall be visible at a distance of at least two miles.

(e) Oyster dredgers and other vessels fishing with dredge nets shall carry and show the same lights as trawlers.

(f) Fishing vessels and fishing boats may at any time use a flare-up light in addition to the lights which they are by this article required to carry and show, and they may also use working lights.

(g) Every fishing vessel and every fishing boat under one hundred and fifty feet in length, when at anchor, shall exhibit a white light visible all around the horizon at a distance of at least 1 mile.

Every fishing vessel of 150 feet in length or upward, when at anchor, shall exhibit a white light visible all around the horizon at a distance of at least 1 mile, and shall exhibit a second light as provided for vessels of such length by article 11.

Should any such vessel, whether under 150 feet in length or of 150 feet in length or upward, be attached to a net or other fishing gear, she shall on the approach of other vessels show an additional white light at least three feet below the anchor light, and at a horizontal distance of at least five feet away from it in the direction of the net or gear.

(h) If a vessel or boat when fishing becomes stationary in consequence of her gear getting fast to a rock or other obstruction, she shall in daytime haul down the day signal required by subdivision (k); at night show the light or lights prescribed for a vessel at anchor; and during fog, mist, falling snow, or heavy rainstorms make the signal prescribed for a vessel at anchor. (See subdivision (d) and the last paragraph of article 15.)

(i) In fog, mist, falling snow, or heavy rainstorms drift-net vessels attached to their nets, and vessels when trawling, dredging, or fishing with any kind of dragnet, and vessels line fishing with their lines out, shall, if of twenty tons gross tonnage or upward, respectively, at intervals of not more than one minute make a blast; if steam vessels, with the whistle or siren, and if sailing vessels, with the foghorn, each blast to be followed by ringing the bell. Fishing vessels and boats of less than twenty tons gross tonnage shall not be obliged to give the above-mentioned signals; but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

(k) All vessels or boats fishing with nets or lines or trawls, when under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket or other efficient signal where it can best be seen. If vessels or boats at anchor have their gear out, they shall, on the approach of other vessels, show the same signal on the side on which those vessels can pass.

The vessels required by this article to carry or show the lights hereinbefore specified shall not be obliged to carry the lights prescribed by article 4 (a) and the last paragraph of article 11.

ART. 10. A vessel which is being overtaken by another shall show from her stern to such last-mentioned vessel a white light or a flare-up light.

The white light required to be shown by this article may be fixed and carried in a lantern, but in such case the lantern shall be so constructed, fitted, and screened that it shall throw an unbroken light over an arc of the horizon of twelve points of the compass, namely, for six points from right aft on each side of the vessel, so as to be visible at a distance of at least one mile. Such light shall be carried as nearly as practicable on the same level as the side lights.

ART. 11. A vessel under one hundred and fifty feet in length when at anchor shall carry forward, where it can best be seen, but at a height not exceeding twenty feet above the hull, a white light, in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of at least one mile.

A vessel of one hundred and fifty feet or upwards in length when at anchor shall carry in the forward part of the vessel, at a height of not less than twenty and not exceeding forty feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall not be less than fifteen feet lower than the forward light, another such light.

The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

A vessel aground in or near a fairway shall carry the above light or lights and the two red lights prescribed by article 4 (a).

ART. 12. Every vessel may, if necessary in order to attract attention in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that can not be mistaken for a distress signal.

ART. 13. Nothing in these rules shall interfere with the operation of any special rules made by the government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners, which have been authorized by their respective governments and duly registered and published.

ART. 14. A steam vessel proceeding under sail only, but having her funnel up, shall carry in daytime, forward, where it can best be seen, one black ball or shape two feet in diameter.

SOUND SIGNALS FOR FOG, AND SO FORTH

ART. 15. All signals prescribed by this article for vessels under way shall be given.

First. By "steam vessels" on the whistle or siren.

Second. By "sailing vessels" and "vessels towed" on the foghorn.

The words "prolonged blast" used in this article shall mean a blast of from four to six seconds' duration.

A steam vessel shall be provided with an efficient whistle or siren sounded by steam or by some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient foghorn, to be sounded by mechanical means, and also with an efficient bell. In all cases where the rules

require a bell to be used a drum may be substituted on board Turkish vessels, or a gong where such articles are used on board small seagoing vessels. A sailing vessel of twenty tons gross tonnage or upward shall be provided with a similar foghorn and bell.

In a fog, mist, falling snow, or heavy rainstorms, whether by day or night, the signals described in this article shall be used as follows, namely:

(*a*) A steam vessel having way upon her shall sound, at intervals of not more than two minutes, a prolonged blast.

(*b*) A steam vessel under way, but stopped, and having no way upon her, shall sound, at intervals of not more than two minutes, two prolonged blasts, with an interval of about one second between.

(c) A sailing vessel under way shall sound at intervals of not more than one minute, when on the starboard tack, one blast; when on the port tack, two blasts in succession; and when with the wind abaft the beam, three blasts in succession.

(d) A vessel when at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

(e) A vessel when towing, a vessel employed in laying or in picking up a telegraph cable, and a vessel under way, which is unable to get out of the way of an approaching vessel through being not under command, or unable to maneuver as required by the rules, shall, instead of the signals prescribed in subdivisions (a) and (c) of this article, at intervals of not more than two minutes, sound three blasts in succession, namely: One prolonged blast followed by two short blasts. A vessel towed may give this signal and she shall not give any other.

Sailing vessels and boats of less than twenty tons gross tonnage shall not be obliged to give the above-mentioned signals, but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

SPEED OF SHIPS TO BE MODERATE IN FOG, AND SO FORTH

ART. 16. Every vessel shall, in a fog, mist, falling snow, or heavy rainstorms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERING AND SAILING RULES

PRELIMINARY—RISK OF COLLISION

Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

ART. 17. When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other, as follows, namely:

(a) A vessel which is running free shall keep out of the way of a vessel which is close-hauled.

(b) A vessel which is close-hauled on the port tack shall keep out of the way of a vessel which is close-hauled on the starboard tack.

(c) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(d) When both are running free, with the wind on the same side, the vessel which is to the windward shall keep out of the way of the vessel which is to the leeward.

(e) A vessel which has the wind aft shall keep out of the way of the other vessel.

ART. 18. When two steam vessels are meeting end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This article only applies to cases where vessels are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two vessels which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are when each of the two vessels is end on, or nearly end on, to the other; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each vessel is in such a position as to see both the side lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course; or by night, to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

ART. 19. When two steam vessels are crossing, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.

ART. 20. When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision, the steam vessel shall keep out of the way of the sailing vessel.

ART. 21. Where, by any of these rules, one of two vessels is to keep out of the way, the other shall keep her course and speed.

NOTE.—When, in consequence of thick weather or other causes, such vessel finds herself so close that collision can not be avoided by the action of the giving-way vessel alone, she also shall take such action as will best aid to avert collision. (See articles 27 and 29.)

ART. 22. Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

ART. 23. Every steam vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

ART. 24. Notwithstanding anything contained in these rules, every vessel overtaking any other shall keep out of the way of the overtaken vessel.

Every vessel coming up with another vessel from any direction more than two points abaft her beam—that is, in such a position, with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side lights—shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel can not always know with certainty whether she is forward of or abaft this direction from the other vessel she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

ART. 25. In narrow channels every steam vessel shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such vessel.

ART. 26. Sailing vessels under way shall keep out of the way of sailing vessels or boats fishing with nets, or lines, or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing vessels or boats.

ART. 27. In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

SOUND SIGNALS FOR VESSELS IN SIGHT OF ONE ANOTHER

ART. 28. The words "short blast" used in this article shall mean a blast of about one second's duration.

When vessels are in sight on one another, a steam vessel under way, in taking any course authorized or required by these rules, shall indicate that course by the following signals on her whistle or siren, namely:

One short blast to mean, "I am directing my course to starboard."

Two short blasts to mean, "I am directing my course to port."

Three short blasts to mean, "My engines are going at full speed astern."

NO VESSEL UNDER ANY CIRCUMSTANCES TO NEGLECT PROPER PRECAUTIONS

ART. 29. Nothing in these rules shall exonerate any vessel, or the owner or master or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

RESERVATION OF RULES FOR HARBORS AND INLAND NAVIGATION

ART. 30. Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbor, river, or inland waters.

DISTRESS SIGNALS

ART. 31. When a vessel is in distress and requires assistance from other vessels or from the shore the following shall be the signals to be used or displayed by her, either together or separately, namely:

In the daytime: First. A gun or other explosive signal fired at intervals of about a minute.

Second. The international code signal of distress indicated by N C.

Third. The distance signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball.

Fourth. A continuous sounding with any fog-signal apparatus.

At night: First. A gun or other explosive signal fired at intervals of about a minute.

Second. Flames on the vessel (as from a burning tar barrel, oil barrel, and so forth).

Third. Rockets or shells throwing stars of any color or description, fired one at a time, at short intervals.

Fourth. A continuous sounding with any fog-signal apparatus.

RULES OF THE ROAD—INLAND RULES TO PREVENT COLLISION OF VESSELS

AN ACT To adopt regulations for preventing collisions upon certain harbors, rivers, and inland waters of the United States

Whereas the provisions of chapter 802 of the laws of 1890, and the amendments thereto, adopting regulations for preventing collisions at sea, apply to all waters of the United States connected with the high seas navigable by seagoing vessels, except so far as the navigation of any harbor, river, or inland waters is regulated by special rules duly made by local authority; and

Whereas it is desirable that the regulations relating to the navigation of all harbors, rivers, and inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal and the Red River of the North and rivers empting into the Gulf of Mexico and their tributaries, shall be stated in one act: Therefore

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following regulations for preventing collision shall be followed by all vessels navigating all harbors, rivers, and inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal and the Red River of the North and rivers emptying into the Gulf of Mexico and their tributaries, and are hereby declared special rules duly made by local authority:

PRELIMINARY

In the following rules every steam vessel which is under sail and not under steam is to be considered a sailing vessel, and every vessel under steam whether under sail or not is to be considered a steam vessel.

The words "steam vessel" shall include any vessel propelled by machinery.

A vessel is "under way," within the meaning of these rules, when she is not at anchor, or made fast to the shore, or aground.

RULES CONCERNING LIGHTS, AND SO FORTH

The word "visible" in these rules, when applied to lights, shall mean visible on a dark night with a clear atmosphere.

ARTICLE 1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

ART. 2.[2] A steam vessel when under way shall carry—(a) On or in front of the foremast, or, if a vessel without a foremast, then in the fore part of the vessel, a bright white light so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the lights ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such a character as to be visible at a distance of at least five miles.

(b) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

(d) The said green and red side lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(e) A seagoing steam vessel when under way may carry an additional white light similar in construction to the light mentioned in subdivision (a), These two lights shall be so placed in line with the keel that one shall be at least fifteen feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

(f) All steam vessels (except seagoing vessels and ferryboats) shall carry in addition to green and red lights required by article 2 (b), (c), and screens as required by article 2 (d), a central range of two white lights; the afterlight being carried at an elevation at least fifteen feet above the light at the head of the vessel. The headlight shall be so constructed as to show an unbroken light through twenty points of the compass, namely, from right ahead to two points abaft the beam on either side of the vessel, and the afterlight so as to show all around the horizon.

ART. 3. A steam vessel when towing another vessel shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than three apart, and when towing more than one vessel shall carry an additional bright white light three feet above or below such lights, if the length of the tow, measuring from the stern of the towing vessel to the stern of the last vessel towed, exceeds six hundred feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in article 2 (a) or the afterrange light mentioned in article 2 (f).

Such steam vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

ART. 5. A sailing vessel under way or being towed shall carry the same lights as are prescribed by article 2 for a steam vessel under way, with the exception of the white lights mentioned therein, which they shall never carry.

ART. 6. Whenever, as in the case of vessels of less than ten gross tons under way during bad weather, the green and red side lights can not be fixed, these lights shall be kept at hand, lighted and ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light

[2] Article 2 is amended by act of Congress approved June 9, 1910, effective on and after July 9, 1910, in rules for lights required to be carried by every vessel propelled by machinery and not more than 65 feet in length, except tugboats and towboats propelled by steam. See p. 302.

on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy the lanterns containing them shall each be painted outside with the color of the light they respectively contain, and shall be provided with proper screens.

ART. 7. Rowing boats, whether under oars or sail, shall have ready at hand a lantern showing a white light which shall be temporarily exhibited in sufficient time to prevent collision.

ART. 8.[3] Pilot vessels when engaged on their station on pilotage duty shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all around the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side lights lighted, ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

A pilot vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may, instead of the colored lights above mentioned, have at hand, ready for use, a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

Pilot vessels, when not engaged on their station on pilotage duty, shall carry lights similar to those of other vessels of their tonnage.

ART. 9. (a) Fishing vessels of less than ten gross tons, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the colored side lights; but every such vessel shall, in lieu thereof, have ready at hand a lantern with a green glass on one side and a red glass on the other side, and on approaching to or being approached by another vessel such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

(b) All fishing vessels and fishing boats of ten gross tons or upward, when under way and when not having their nets, trawls, dredges, or lines in the water, shall carry and show the same lights as other vessels under way.

(c) All vessels when trawling, dredging, or fishing with any kind of drag-nets or lines shall exhibit, from some part of the vessel where they can be best seen, two lights. One of these lights shall be red and the other shall be white. The red light shall be above the white light, and shall be at a vertical distance from it of not less than 6 feet and not more than 12 feet; and the horizontal distance between them, if any, shall not be more than 10 feet. These two lights shall be of such a character and contained in lanterns of such construction as to be visible all around the horizon, the white light a distance of not less than 3 miles and the red light of not less than 2 miles.

(d) Rafts or other water craft not herein provided for navigating by hand power, horsepower, or by the current of the river, shall carry one or more good white lights, which shall be placed in such manner as shall be prescribed by the board of supervising inspectors of steam vessels.

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[3] An act relating to lights on steam pilot vessels

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a steam pilot vessel, when engaged on her station on pilotage duty and in waters of the United States, and not at anchor, shall, in addition to the lights required for all pilot boats, carry at a distance of eight feet below her white masthead light a red light, visible all around the horizon and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles, and also the colored side lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty and in waters of the United States, and at anchor, she shall carry in addition to the lights required for all pilot boats the red light above mentioned, but not the colored side lights.

When not engaged on her station on pilotage duty, she shall carry the same lights as other steam vessels.

SEC. 2. That this act shall be construed as supplementary to article eight of the act approved June 7, 1897, entitled "An act to adopt regulations for preventing collisions upon certain harbors, rivers, and inland waters of the United States," and to article eight of an act approved August 19, 1890, entitled "An act to adopt regulations for preventing collisions at sea."

SEC. 3. That this act shall take effect on June 13, 1900.

Approved, February 19, 1900.

ART. 10. A vessel which is being overtaken by another, except a steam vessel with an after range light showing all around the horizon, shall show from her stern to such last-mentioned vessel a white light or a flare-up light.

ART. 11. A vessel under one hundred and fifty feet in length when at anchor shall carry forward, where it can best be seen, but at a height not exceeding twenty feet above the hull, a white light, in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of at least one mile.

A vessel if one hundred and fifty feet or upward in length when at anchor shall carry in the forward part of the vessel, at a height of not less than twenty and not exceeding forty feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall be not less than fifteen feet lower than the forward light, another such light.

The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

ART. 12. Every vessel may, if necessary in order to attract attention, in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that can not be mistaken for a distress signal.

ART. 13. Nothing in these rules shall interfere with the operation of any special rules made by the government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners which have been authorized by their respective governments and duly registered and published.

ART. 14. A steam vessel proceeding under sail only, but having her funnel up, may carry in daytime, forward, where it can best be seen, one black ball or shape 2 feet in diameter.

SOUND SIGNALS FOR FOG, AND SO FORTH

ART. 15. All signals prescribed by this article for vessels under way shall be given:

1. By "steam vessels" on the whistle or siren.
2. By "sailing vessels" and "vessels towed" on the foghorn.

The words "prolonged blast" used in this article shall mean a blast of from four to six seconds' duration.

A steam vessel shall be provided with an efficient whistle or siren, sounded by steam or by some substitute for steam, so placed that the sound may not be intercepted by an obstruction, and with an efficient foghorn; also with an efficient bell. A sailing vessel of 20 tons gross tonnage or upward shall be provided with a similar foghorn and bell.

In fog, mist, falling snow, or heavy rainstorms, whether by day or night, the signals described in this article shall be used as follows, namely:

(a) A steam vessel under way shall sound, at intervals of not more than one minute, a prolonged blast.

(c) A sailing vessel under way shall sound, at intervals of not more than one minute, when on the starboard tack, one blast; when on the port tack, two blasts in succession, and when with the wind abaft the beam, three blasts in succession.

(d) A vessel when at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

(e) A steam vessel when towing shall, instead of the signals prescribed in subdivision (a) of this article, at intervals of not more than one minute, sound three blasts in succession, namely, one prolonged blast followed by two short blasts. A vessel towed may give this signal and she shall not give any other.

(f) All rafts or other water-craft, not herein provided for, navigating by hand power, horsepower, or by the current of the river, shall sound a blast of the foghorn, or equivalent signal, at intervals of not more than one minute.

SPEED OF SHIPS TO BE MODERATE IN FOG, AND SO FORTH

ART. 16. Every vessel shall, in a fog, mist, falling snow, or heavy rainstorms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained shall, so far as the circum-

stances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERING AND SAILING RULES

Preliminary—Risk of collision.—Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

ART. 17. When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows, namely:

(a) A vessel which is running free shall keep out of the way of a vessel which is close-hauled.

(b) A vessel which is close-hauled on the port tack shall keep out of the way of a vessel which is close-hauled on the starboard tack.

(c) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(d) When both are running free, with the wind on the same side, the vessel which is to the windward shall keep out of the way of the vessel which is to the leeward.

(e) A vessel which has the wind aft shall keep out of the way of the other vessel.

ART. 18. RULE I. When steam vessels are approaching each other head and head—that is, end on, or nearly so—it shall be the duty of each to pass on the port side of the other; and either vessel shall give, as a signal of her intention, one short and distinct blast of her whistle, which the other vessel shall answer promptly by a similar blast of her whistle, and thereupon such vessels shall pass on the port side of each other. But if the courses of such vessels are so far on the starboard of each other as not to be considered as meeting head and head, either vessel shall immediately give two short and distinct blasts of her whistle, which the other vessel shall answer promptly by two similar blasts of her whistle, and they shall pass on the starboard side of each other.

The foregoing only applies to cases where vessels are meeting end on, or nearly end on, in such a manner as to involve risk of collision; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own, and by night to cases in which each vessel is in such position as to see both the side lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course, or by night to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light or a green light without a red light is seen ahead, or where both green and red lights are seen anywhere but ahead.

RULE III. If, when steam vessels are approaching each other, either vessel fails to understand the course or intention of the other, from any cause, the vessel so in doubt shall immediately signify the same by giving several short and rapid blasts, not less than four, of the steam whistle.

RULE V. Whenever a steam vessel is nearing a short bend or curve in the channel, where, from the height of the banks or other cause, a steam vessel approaching from the opposite direction can not be seen for a distance of half a mile, such steam vessel, when she shall have arrived within half a mile of such curve or bend, shall give a signal by one long blast of the steam whistle, which signal shall be answered by a similar blast, given by any approaching steam vessel that may be within hearing. Should such signal be so answered by a steam vessel upon the farther side of such bend, then the usual signals for meeting and passing shall immediately be given and answered; but, if the first alarm signal of such vessel be not answered, she is to consider the channel clear and govern herself accordingly.

When steam vessels are moved from their docks or berths, and other boats are liable to pass from any direction toward them, they shall give the same signal as in the case of vessels meeting at a bend, but immediately after clearing the berths so as to be fully in sight they shall be governed by the steering and sailing rules.

RULE VIII. When steam vessels are running in the same direction, and the vessel which is astern shall desire to pass on the right or starboard hand of

the vessel ahead, she shall give one short blast of the steam whistle as a signal of such desire, and if the vessel ahead answers with one blast, she shall put helm to port; or if she shall desire to pass on the left or port side of the vessel ahead, she shall give two short blasts of the steam whistle as a signal of such desire, and if the vessel ahead answer with two blasts, shall put her helm to starboard; or, if the vessel ahead does not think it safe for the vessel astern to attempt to pass at that point, she shall immediately signify the same by giving several short and rapid blasts of the steam whistle, not less than four and under no circumstances shall the vessel astern attempt to pass the vessel ahead until such time as they have reached a point where it can be safely done, when said vessel ahead shall signify her willingness by blowing the proper signals. The vessel ahead shall in no case attempt to cross the bow or crowd upon the course of the passing vessel.

RULE IX. The whistle signals provided in the rules under this article, for steam vessels meeting, passing, or overtaking, are never to be used except when steamers are in sight of each other, and the course and position of each can be determined in the daytime by a sight of the vessel itself, or by night by seeing its signal lights. In fog, mist, falling snow, or heavy rainstorms, when vessels can not so see each other, fog signals only must be given.

ART. 19. When two steam vessels are crossing, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.

ART. 20. When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision, the steam vessel shall keep out of the way of the sailing vessel.

ART. 21. Where, by any of these rules, one of the two vessels is to keep out of the way, the other shall keep her course and speed.

ART. 22. Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

ART. 23. Every steam vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

ART. 24. Notwithstanding anything contained in these rules every vessel, overtaking any other, shall keep out of the way of the overtaken vessel.

Every vessel coming up with another vessel from any direction more than two points abaft her beam, that is, in such a position, with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side-lights, shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel can not always know with certainty whether she is forward of or abaft this direction from the other vessel she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

ART. 25. In narrow channels every steam vessel shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such vessel.

ART. 26. Sailing vessels under way shall keep out of the way of sailing vessels or boats fishing with nets, or lines, or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing vessels or boats.

ART. 27. In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

SOUND SIGNALS FOR VESSELS IN SIGHT OF ONE ANOTHER

ART. 28. When vessels are in sight of one another a steam vessel under way whose engines are going at full speed astern shall indicate that fact by three short blasts on the whistle.

NO VESSEL UNDER ANY CIRCUMSTANCES TO NEGLECT PROPER PRECAUTIONS

ART. 29. Nothing in these rules shall exonerate any vessel, or the owner, or master or crew thereof, from the consequences of any neglect to carry lights

or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

ART. 30. The exhibition of any light on board of a vessel of war of the United States or a revenue cutter may be suspended whenever, in the opinion of the Secretary of the Navy, the commander in chief of a squadron, or the commander of a vessel acting singly, the special character of the service may require it.

ART. 31. When a vessel is in distress and requires assistance from other vessels or from the shore the following shall be the signals to be used or displayed by her, either together or separately, namely:

In the daytime.—A continuous sounding with any fog-signal apparatus, or firing gun.

At night.—First. Flames on the vessel, as from a burning tar barrel, oil barrel, and so forth.

Second. A continuous sounding with any fog-signal apparatus, or firing a gun.

RULES FOR LIGHTS FOR CERTAIN CLASSES OF VESSELS NAVIGATING THE HARBORS, RIVERS, AND INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, AND THE RED RIVER OF THE NORTH, AND RIVERS EMPTYING INTO THE GULF OF MEXICO, AND THEIR TRIBUTARIES

The following rules for lights to be carried by ferryboats, rules for lights for barges and canal boats in tow of steam vessels, rules for lights for rafts and other water craft navigating by hand power, horsepower, or by the current of the river, rule relating to use of searchlight, rule prohibiting unnecessary sounding of the steam whistle, rule prohibiting the carrying of unauthorized lights on steam vessels, and rules relating to drawbridges over navigable water of the United States were adopted by the Board of Supervising Inspectors, Steamboat Inspection Service, and approved by the Secretary of Commerce.

These rules concerning lights shall be complied with in all weathers from sunset to sunrise.

RULES FOR LIGHTS TO BE CARRIED BY FERRYBOATS NAVIGATING THE HARBORS, RIVERS, AND INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, AND THE RED RIVER OF THE NORTH, AND RIVERS EMPTYING INTO THE GULF OF MEXICO, AND THEIR TRIBUTARIES [4]

Ferryboats propelled by machinery and navigating the harbors, rivers, and other inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal, and the Red River of the North, and rivers emptying into the Gulf of Mexico, and their tributaries, shall carry the range lights and the colored side lights required by law to be carried on steam vessels navigating those waters, except that *double-end ferryboats* shall carry a central range of clear, bright, white lights, showing all around the horizon, placed at equal altitudes forward and aft, also on the starboard side a green light, and on the port side a red light, of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 2 miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, and so fixed as to throw the light from right ahead to 2 points abaft the beam on their respective sides.

The green and red lights shall be fitted with inboard screens projecting at least 3 feet forward from the lights, so as to prevent them from being seen across the bow.

Local inspectors in districts having ferryboats shall, whenever the safety of navigation may require, designate for each line of such boats a certain light, white or colored, which shall show all around the horizon, to designate and

[4] See act of Congress approved June 9, 1910, effective on and after July 9, 1910, prescribing lights that shall be carried by certain classes of vessels of not more than 65 feet in length, amendatory to these rules, p. 302.

distinguish such lines from each other, which lights shall be carried on a flagstaff amidship, 15 feet above the white range lights.

RULES FOR LIGHTS FOR BARGES AND CANAL BOATS IN TOW OF STEAM VESSELS AND FOR LIGHTS AND DAY SIGNALS FOR DREDGES, VESSELS WORKING ON WRECKS, ETC., NAVIGATING THE HARBORS, RIVERS, AND OTHER INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, AND THE RED RIVER OF THE NORTH, AND RIVERS EMPTYING INTO THE GULF OF MEXICO, AND THEIR TRIBUTARIES

Lights for barges and canal boats in tow of steam vessels on certain inland waters on the seaboard, except the Hudson River and adjacent waters and Lake Champlain.—On the harbors, rivers, and other inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal, and the Red River of the North, and rivers emptying into the Gulf of Mexico, and their tributaries, and except on the waters of the Hudson River and its tributaries from Troy to the boundary lines of New York Harbor off Sandy Hook, as defined pursuant to section 2 of the act of Congress of February 19, 1895, the East River, and Long Island Sound (and the waters entering thereon, and to the Atlantic Ocean), to and including Narragansett Bay, R. I., and tributaries, and Lake Champlain, barges (except scows) and canal boats in tow of steam vessels shall carry lights as follows:

Barges and canal boats towing astern of steam vessels, when towing singly, or what is known as tandem towing, shall each carry a green light on the starboard side and a red light on the port side, and a white light on the stern, except that the last vessel of such tow shall carry two white lights on her stern, athwartship, horizontal to each other, not less than 5 feet apart, and not less than 4 feet above the deck house, and so placed as to show all around the horizon.

When two or more boats are abreast, the colored lights shall be carried at the outer sides of the bows of the outside boats. Each of the outside boats in last tier of a hawser tow shall carry a white light on her stern.

The white light required to be carried on stern of a barge or canal boat carrying red and green side lights shall be carried in a lantern so constructed that it shall show an unbroken light over an arc of the horizon of 12 points of the compass, namely, for 6 points from right aft on each side of the vessel, and shall be of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 2 miles.

Barges or canal boats towing alongside a steam vessel shall, if the deck, deck houses, or cargo of the barge or canal boat be so high above water as to obscure the side lights of the towing steamer when being towed on the starboard side of the steamer, carry a green light upon the starboard side; and when towed on the port side of the steamer, a red light on the port side of the barge or canal boat; and if there is more than one barge or canal boat abreast, the colored lights shall be displayed from the outer side of the outside barges or canal boats.

The colored side lights referred to in these rules for barges and canal boats in tow shall be fitted with inboard screens, so as to prevent them from being seen across the bow, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, and so fixed as to throw the light from right ahead to 2 points abaft the beam on either side. The minimum size of the glass globes shall not be less than 6 inches in diameter and 5 inches high in the clear.

Scows when being towed by steam vessels on the waters covered by the first paragraph of these rules shall carry a white light at each end of each scow, except that when such scows are massed in tiers, two or more abreast, each of the outside scows shall carry a white light on its outer bow, and the outside scows in the last tier shall each carry in addition a white light on the outer part of the stern. The white light shall be carried not less than 8 feet above the surface of the water, and shall be so placed as to show an unbroken light all around the horizon, and shall be of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 5 miles.

RULES FOR LIGHTS AND DAY SIGNALS TO BE CARRIED BY VESSELS, DREDGES OF ALL TYPES, AND VESSELS WORKING ON WRECKS OR OTHER OBSTRUCTIONS TO NAVIGATION, OR MOORED FOR SUBMARINE OPERATIONS, OR MADE FAST TO A SUNKEN OBJECT WHICH MAY DRIFT WITH THE TIDE OR BE TOWED [5]

Rule for signals to be displayed by a towing vessel when towing a submerged or partly submerged object upon a hawser when no signals are displayed upon the object which is towed.—The vessel having the submerged object in tow shall display by day, where they can best be seen, two shapes, one above the other, not less than 6 feet apart, the lower shape to be carried not less than 10 feet above the deck house. The shapes shall be in the form of a double frustum of a cone, base to base, not less than 2 feet in diameter at the center nor less than 8 inches at the ends of the cones, and to be not less than 4 feet lengthwise from end to end, the upper shape to be painted in alternate horizontal stripes of black and white, 8 inches in width, and the lower shape to be painted a solid bright red.

By night the towing vessel shall display the regular side lights, but in lieu of the regular white towing lights shall display four lights in a vertical position not less than 3 feet nor more than 6 feet apart, the upper and lower of such lights to be white, and the two middle lights to be red, all of such lights to be of the same character as is now prescribed for the regular towing lights.

Rule for steamers, derrick boats, lighters, or other types of vessels made fast alongside a wreck, or moored over a wreck which is on the bottom or partly submerged or which may be drifting.—Steamers, derrick boats, lighters, or other types of vessels made fast alongside a wreck, or moored over a wreck which is on the bottom or partly submerged, or which may be drifting, shall display by day two shapes of the same character and dimensions and displayed in the same manner as required by the foregoing rule, except that both the shapes shall be painted a solid bright red; but where more than one vessel is working under the above conditions, the shapes need be displayed only from one vessel on each side of the wreck from which it can best be seen from all directions.

By night this situation shall be indicated by the display of a white light from the bow and stern of each outside vessel or lighter not less than 6 feet above the deck, and in addition thereto there shall be displayed in a position where they may best be seen from all directions two red lights carried in a vertical line not less than 3 feet nor more than 6 feet apart, and not less than 15 feet above the deck.

Rule for dredges which are held in stationary position by moorings or spuds.—Dredges which are held in stationary position by moorings or spuds shall display by day two red balls not less than 2 feet in diameter and carried in a vertical line not less than 3 feet nor more than 6 feet apart, and at least 15 feet above the deck house and in such a position where they can best be seen from all directions. By night they shall display a white light at each corner, not less than 6 feet above the deck, and in addition thereto there shall be displayed in a position where they may best be seen from all directions two red lights carried in a vertical line not less than 3 feet nor more than 6 feet apart, and not less than 15 feet above the deck. When scows are moored alongside a dredge in the foregoing situation they shall display a white light on each outboard corner, not less than 6 feet above the deck.

Rules for self-propelling suction dredges under way with their suctions on the bottom.—Self-propelling suction dredges under way with their suction on the bottom shall display by day the same signals as are used to designate any steamer not under control; that is to say, two black balls not less than 2 feet in diameter and carried not less than 15 feet above the deck house, and where they may best be seen from all directions.

By night they shall carry, in addition to the regular running lights, two red lights of the same character as the masthead light, in the same vertical plane and underneath the masthead light, the red lights to be not less than 3 feet nor more than 6 feet apart and the upper red light to be not less than

[5] Adopted by executive committee of Board of Supervising Inspectors on July 22, 1914, and approved by Secretary of Commerce on July 28, 1914. Adopted by Board of Supervising Inspectors on Jan. 20, 1915, and approved by the Secretary of Commerce on Apr. 12, 1915.

4 feet and not more than 6 feet below the white masthead light, and on or near the stern two red lights in the same vertical plane not less than 4 feet nor more than 6 feet apart, to show through 4 points of the compass; that is, from right astern to 2 points on each quarter.

Rule for vessels which are moored or anchored and engaged in laying pipe or operating on submarine construction or excavation.—Vessels which are moored or anchored, and engaged in laying pipe or operating on submarine construction or excavation shall display by day, not less than 15 feet above the deck, where they can best be seen from all directions, two balls not less than 2 feet in diameter, in a vertical line not less than 3 feet and not more than 6 feet apart, the upper ball to be painted in alternate black and white vertical stripes 6 inches wide, and the lower ball to be painted a solid bright red. By night they shall display three red lights, carried in a vertical line not less than 3 feet nor more than 6 feet apart and not less than 15 feet above the deck, and in such position as may best be seen from all directions.

All the lights required by these special rules for dredges, wrecking boats, lighters, etc., shall be of such size and character as to be visible on a dark night with a clear atmosphere for a distance of at least 2 miles.

Rule for vessels which are moored or at anchor.—Vessels of more than 300 gross tons propelled by machinery when moored or anchored in a fairway or channel where traffic is liable to congestion or confusion shall display between sunrise and sunset on the forward part of the vessel where it can best be observed from other vessels one black ball or shape not less than 2 feet in diameter.

RULES FOR LIGHTS FOR RAFTS AND OTHER WATER CRAFT NAVIGATING BY HAND POWER, HORSEPOWER, OR BY THE CURRENT OF THE RIVER, ON THE HARBORS, RIVERS, AND OTHER INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL AND THE RED RIVER OF THE NORTH AND RIVERS EMPTYING INTO THE GULF OF MEXICO AND THEIR TRIBUTARIES

Any vessel, except rafts and rowing boats under oars, navigating by *hand power, horsepower, or by the current of the river*, shall carry one white light forward, not less than 8 feet above the surface of the water.

Rafts propelled by hand power or by the current of the river, or which shall be anchored or moored in or near a channel or fairway, shall carry white lights, as follows: Rafts of one crib and not more than two in length shall carry one white light. Rafts of three or more cribs in length and one crib in width shall carry one white light at each end of the raft. Rafts of more than one crib abreast shall carry one white light on each outside corner of the raft, making four lights in all.

The *white light* required by these rules for rafts and other water craft shall be carried, from sunset to sunrise, in a lantern so fixed and constructed as to show a clear, uniform, and unbroken light, visible all around the horizon and of such intensity as to be visible on a dark night with a clear atmosphere at a distance of at least 1 mile. The lights for rafts shall be suspended from poles of such height that the lights shall not be less than 8 feet above the surface of the water.

Rule prohibiting the carrying of unauthorized lights on steam vessels.—Any master or pilot of any steam vessel who shall authorize or permit the carrying of any light, electric or otherwise, not required by law, on the outside structure of the cabin or hull of the vessel that in any way will interfere with distinguishing the signal lights shall, upon conviction thereof before any board of inspectors having jurisdiction, be deemed guilty of misconduct and shall be liable to have his license suspended or revoked.

REGULATION OF MOTOR BOATS

AN ACT To amend laws for preventing collision of vessels and to regulate equipment of certain motor boats on the navigable waters of the United States

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the words "motor boat" where used in this act shall include every vessel propelled by machinery and not more than sixty-five feet in length, except tugboats and towboats propelled

by steam. The length shall be measured from end to end over the deck, excluding sheer: *Provided*, That the engine, boiler, or other operating machinery shall be subject to inspection by the local inspectors of steam vessels, and to their approval of the design thereof, on all said motor boats, which are more than forty feet in length, and which are propelled by machinery driven by steam.

SEC. 2. That motor boats subject to the provisions of this act shall be divided into classes as follows:

Class 1. Less than twenty-six feet in length.

Class 2. Twenty-six feet or over and less than forty feet in length.

Class 3. Forty feet or over and not more than sixty-five feet in length.

SEC. 3. That every motor boat in all weathers from sunset to sunrise shall carry the following lights, and during such time no other lights which may be mistaken for those prescribed shall be exhibited.

(a) Every motor boat of class 1 shall carry the following lights:

First. A white light aft to show all around the horizon.

Second. A combined lantern in the fore part of the vessel and lower than the white light aft showing green to starboard and red to port, so fixed as to throw the light from right ahead to two points abaft the beam on their respective sides.

(b) Every motor boat of classes 2 and 3 shall carry the following lights:

First. A bright white light in the fore part of the vessel as near the stem as practicable, so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side. The glass or lens shall be of not less than the following dimensions:

Class 2. Nineteen square inches.

Class 3. Thirty-one square inches.

Second. A white light aft to show all around the horizon.

Third. On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side. On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side. The glasses or lenses in the said sidelights shall be of not less than the following dimensions on motor boats of—

Class 2. Sixteen square inches.

Class 3. Twenty-five square inches.

On and after July 1, 1911, all glasses or lenses prescribed by paragraph (b) of section 3 shall be fresnel or fluted. The said lights shall be fitted with inboard screens of sufficient height and so set as to prevent these lights from being seen across the bow and shall be of not less that the following dimensions on motor boats of—

Class 2. Eighteen inches long.

Class 3. Twenty-four inches long: *Provided*, That motor boats as defined in this act when propelled by sail and machinery or under sail alone, shall carry the colored lights suitably screened, but not the white lights prescribed by this section.

SEC. 4. (a) Every motor boat under the provisions of this act shall be provided with a whistle or other sound-producing mechanical appliance capable of producing a blast of two seconds or more in duration, and in the case of such boats so provided a blast of at least two seconds shall be deemed a prolonged blast within the meaning of the law.

(b) Every motor boat of class 2 or 3 shall carry an efficient fog horn.

(c) Every motor boat of class 2 or 3 shall be provided with an efficient bell, which shall be not less than eight inches across the mouth on board of vessels of class 3.

SEC. 5. That every motor boat subject to any of the provisions of this act, and also all vessels propelled by machinery other than by steam more than sixty-five feet in length, shall carry either life preservers or life belts or buoyant cushions, or ring buoys, or other device, to be prescribed by the Secretary of Commerce, sufficient to sustain afloat every person on board and so placed as to be readily accessible. All motor boats carrying passengers for hire shall carry one life preserver of the sort prescribed by the regulations of the Board of Supervising Inspectors for every passenger carried, and no such

boat while so carrying passengers for hire shall be operated or navigated except in charge of a person duly licensed for such service by the local board of inspectors. No examination shall be required as the condition of obtaining such a license, and any such license shall be revoked or suspended by the local board of inspectors for misconduct, gross negligence, recklessness in navigation, intemperance, or violation of law on the part of the holder, and if revoked the person holding such license shall be incapable of obtaining another such license for one year from the date of revocation: *Provided*, That motor boats shall not be required to carry licensed officers except as required in this act.

SEC. 6. That every motor boat and also every vessel propelled by machinery other than by steam, more than sixty-five feet in length, shall carry ready for immediate use the means of promptly and effectually extinguishing burning gasoline.

SEC. 7. That a fine not exceeding $100 may be imposed for any violation of this act. The motor boat shall be liable for the said penalty and may be seized and proceeded against, by way of libel in the district court of the United States for any district within which such vessel may be found.

SEC. 8. That the Secretary of Commerce shall make such regulations as may be necessary to secure the proper execution of this act by collectors of customs and other officers of the Government. And the Secretary of the Department of Commerce may, upon application therefor, remit or mitigate any fine, penalty, or forfeiture relating to motor boats except for failure to observe the provisions of section six of this act.

SEC. 9. That all laws and parts of laws only in so far as they are in conflict herewith are hereby repealed: *Provided*, That nothing in this act shall be deemed to alter or amend acts of Congress embodying or revising international rules for preventing collisions at sea.

SEC. 10. That this act shall take effect on and after thirty days after its approval.

Approved, June 9, 1910.

Meteorological tables compiled by the United States Weather Bureau

NEW YORK, N. Y.

Month	Barometer at 32° F. and mean sea level				Air temperature, in °F.							Average relative humidity	Average amount of clouds 0-10	Precipitation (inches)			Wind											Number of days with winds of 33 miles or over	Number of days dense fog
	Mean	Extremes			Mean				Extremes								Statute miles		Average number of times (observations at 8 a. m. and 8 p. m.) from—										
	For month	Highest	Lowest	Range	For month	Mean maximum	Mean minimum	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours	Average hourly velocity	Highest velocity	North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm		
January	30.10	31.01	28.61	2.40	30.9	37.4	24.5	12.9	67	−6	73	74	6	3.66	12	2.48	18	72	4	7	4	3	5	8	14	16	1	12	3
February	30.08	31.00	28.70	2.30	31.3	38.4	24.2	14.2	69	−7	76	66	6	3.82	10	3.25	18	77	5	5	4	2	4	6	13	17	0	10	3
March	30.00	30.95	28.38	2.57	37.7	45.4	30.2	15.2	80	3	77	65	6	3.64	12	3.60	18	74	4	8	7	4	6	6	10	17	0	13	3
April	30.00	30.68	29.14	1.54	49.4	57.2	41.6	15.6	91	12	79	62	6	3.23	11	3.72	16	67	4	7	7	5	7	5	9	16	0	10	2
May	29.99	30.52	29.13	1.39	60.6	68.5	52.6	15.9	95	34	61	64	6	3.24	11	4.17	14	72	3	6	10	7	9	9	7	11	0	6	2
June	29.98	30.56	29.34	1.22	68.8	77.0	60.5	16.5	97	45	52	66	6	3.33	10	3.88	13	61	4	7	5	6	10	8	8	9	3	5	1
July	29.98	30.51	29.46	1.05	73.8	81.7	65.9	15.8	99	50	49	69	6	4.24	12	3.80	12	71	4	5	3	5	12	11	10	12	0	4	1
August	30.00	30.44	29.28	1.16	73.1	80.1	66.2	13.9	102	51	51	69	6	4.33	10	5.05	12	61	4	8	7	6	12	8	7	10	0	3	(1)
September	30.08	30.61	29.19	1.42	66.8	73.7	59.8	13.9	100	39	61	70	5	3.39	9	6.17	13	64	5	7	8	6	10	8	6	10	0	3	1
October	30.06	30.66	29.06	1.60	56.3	63.7	49.0	14.7	88	29	59	67	5	3.53	9	9.40	14	67	6	8	4	6	6	7	12	13	0	7	2
November	30.09	30.80	28.70	2.10	44.2	51.0	37.3	13.7	74	7	67	67	6	2.96	9	3.62	17	62	4	5	3	1	5	6	17	19	0	10	2
December	30.09	30.93	28.96	1.97	35.0	41.2	28.8	12.4	68	−13	81	68	6	3.62	10	2.93	17	72	4	6	3	2	5	9	15	18	0	12	3
Mean	30.04				52.3	59.6	45.0	14.6				67	6				15												
Total														42.99	125				51	79	65	53	91	91	128	168	4	96	24

[1] Less than 1.

Wind velocity data reduced to 3-cup anemometer standard

Meteorological tables compiled by the United States Weather Bureau—Continued

ATLANTIC CITY, N. J.

Month	Barometer at 32° F. and mean sea level: Mean: For month	Barometer: Extremes: Highest	Barometer: Extremes: Lowest	Barometer: Extremes: Range	Air temperature, in °F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Mean: Range	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Air temperature: Extremes: Range	Average relative humidity	Average amount of clouds 0-10	Precipitation (inches): Average fall	Precipitation: Number of days 0.01 inch or more	Precipitation: Maximum fall in 24 hours	Wind: Statute miles: Average hourly velocity	Wind: Statute miles: Highest velocity	Wind: Average number of times (observations at 8 a. m. and 8 p. m.) from—: North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm	Number of days with winds of 33 miles or over	Number of days dense fog
January	30.11	30.98	28.80	2.18	32.5	39.4	25.7	13.7	68	−4	72	79	6	3.49	12	2.98	16	64	9	6	3	3	4	13	9	15	0	7	2
February	30.11	30.97	28.79	2.18	33.6	40.6	26.5	14.1	71	−7	78	76	5	3.36	1	2.66	15	67	8	5	2	2	4	8	10	17	0	5	2
March	30.02	30.93	28.76	2.17	38.6	45.2	32.0	13.2	79	8	71	78	6	3.60	13	2.63	16	71	7	8	4	4	8	12	5	14	0	7	2
April	30.00	30.68	29.14	1.54	47.8	54.4	41.3	13.1	85	15	70	77	5	2.99	11	3.15	16	72	6	7	3	5	8	14	5	12	0	6	2
May	29.98	30.58	29.08	1.50	58.1	64.8	51.5	13.3	95	33	62	80	5	3.05	11	3.06	14	43	5	9	5	5	8	15	6	9	0	3	3
June	29.98	30.51	29.40	1.11	66.6	72.7	60.4	12.3	97	45	52	82	5	3.04	10	2.93	13	44	5	8	4	6	9	17	6	5	0	2	2
July	29.98	30.50	29.55	0.95	72.1	78.0	66.3	11.7	100	52	48	82	5	3.93	10	5.41	12	46	5	7	4	4	10	22	5	5	0	2	1
August	30.00	30.45	29.30	1.15	72.5	78.4	66.6	11.8	104	48	56	82	5	4.49	10	8.97	12	58	6	8	6	5	10	16	5	6	0	2	1
September	30.07	30.60	29.19	1.41	66.8	72.9	60.7	12.2	94	37	57	80	5	2.65	8	4.64	13	66	9	7	7	5	8	11	6	7	0	2	1
October	30.07	30.81	29.06	1.75	56.9	63.7	50.2	13.5	90	29	71	78	5	3.20	9	9.21	14	66	11	7	5	4	6	9	8	12	0	3	2
November	30.10	30.84	28.74	2.10	45.6	52.7	38.5	14.2	77	10	67	76	5	2.82	9	3.70	15	58	7	3	3	3	3	9	14	18	0	4	1
December	30.10	30.90	28.97	1.93	36.4	43.1	29.6	13.5	68	−7	75	78	6	3.94	10	4.46	15	57	8	5	2	2	4	8	14	19	0	5	2
Mean	30.04				52.3	58.8	45.8	13.1				79	5				14												
Total														40.56	124				86	80	48	48	82	154	93	139	0	48	21

Wind velocity data reduced to 3-cup anemometer standard. (Elevation of anemometer changed from 48 feet to 172 feet Dec. 17, 1921.)

PHILADELPHIA, PA.

Month	Barometer at 32° F. and mean sea level: Mean: For month	Barometer: Extremes: Highest	Barometer: Extremes: Lowest	Barometer: Extremes: Range	Air temperature, in °F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Mean: Range	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Air temperature: Extremes: Range	Average relative humidity	Average amount of clouds 0-10	Precipitation (inches): Average fall	Precipitation: Number of days 0.01 inch or more	Precipitation: Maximum fall in 24 hours	Wind: Statute miles: Average hourly velocity	Wind: Statute miles: Highest velocity	Wind: Average number of times (observations at 8 a. m. and 8 p. m.) from—: North	Wind: Northeast	Wind: East	Wind: Southeast	Wind: South	Wind: Southwest	Wind: West	Wind: Northwest	Wind: Calm	Number of days with winds of 33 miles or over	Number of days dense fog.
January	30.11	30.97	28.67	2.30	32.6	39.4	25.7	13.7	72	5	77	73	6	3.30	12	3.33	10	49	8	7	3	6	7	11	6	16	0	1	2
February	30.10	30.99	29.01	1.98	33.9	40.9	26.8	14.1	75	6	81	71	6	3.32	11	3.86	10	40	7	6	2	4	4	9	7	18	0	1	1
March	30.02	30.92	28.80	2.12	40.8	48.6	33.0	15.6	86	5	81	69	6	3.39	12	2.79	11	49	9	8	4	7	7	8	5	14	0	[1] 0	1
April	30.01	30.69	29.19	1.50	52.1	60.9	43.2	17.7	93	14	79	64	6	3.05	11	2.77	10	47	9	4	4	8	8	8	6	13	0	[1] 0	([1])
May	29.99	30.56	29.23	1.33	62.9	72.0	53.9	18.1	96	35	61	68	6	3.26	11	3.16	9	49	7	7	5	6	8	10	6	11	0	[1] 0	([1])
June	29.98	30.54	29.38	1.16	71.4	80.2	62.6	17.6	100	46	54	69	6	3.24	10	3.43	9	44	6	6	5	7	8	11	6	9	0	[1] 0	([1])
July	29.98	30.51	29.48	1.03	76.2	84.5	67.9	16.6	103	54	49	69	6	4.15	11	3.18	9	44	6	5	4	9	9	13	5	11	0	[1] 0	([1])
August	30.00	30.45	29.34	1.11	74.8	82.6	67.0	15.6	106	51	55	72	6	4.62	11	5.89	8	45	8	9	5	9	10	10	4	7	0	[1] 0	1
September	30.08	30.61	29.32	1.29	68.0	76.0	59.9	16.1	102	40	62	74	5	3.14	9	5.62	9	48	10	8	4	9	7	10	5	9	0	[1] 0	1
October	30.07	30.66	29.03	1.63	57.8	65.7	49.8	15.9	91	29	62	71	5	2.81	9	3.70	9	60	8	9	4	7	6	9	5	15	0	[1] 0	2
November	30.10	30.84	29.88	.96	45.7	52.5	38.8	13.7	77	8	69	71	6	2.70	9	2.59	9	40	6	5	2	3	6	12	9	16	0	[1] 0	2
December	30.11	30.93	29.03	1.90	36.3	42.9	29.8	13.1	70	5	75	71	6	3.43	10	3.78	10	51	6	7	2	3	6	11	8	18	0	[1] 0	2
Mean	30.05				54.4	62.2	46.5	15.7				70	6				9												
Total														40.41	126				90	81	44	78	86	122	72	157	0	2	12

[1] Less than 1.

Wind velocity data reduced to 3-cup anemometer standard.

Meteorological tables compiled by the United States Weather Bureau—Continued

BALTIMORE, MD.

Month	Barometer at 32° F. and mean sea level: Mean: For month	Barometer: Extremes: Highest	Barometer: Extremes: Lowest	Barometer: Extremes: Range	Air temperature, in °F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Mean: Range	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Air temperature: Extremes: Range	Average relative humidity	Average amount of clouds 0-10	Precipitation (inches): Average fall	Precipitation: Number of days 0.01 inch or more	Precipitation: Maximum fall in 24 hours	Wind: Statute miles: Average hourly velocity	Wind: Statute miles: Highest velocity	Wind: Average number of times (observations at 8 a. m. and 8 p. m.) from—: North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm	Number of days with winds of 33 miles or over	Number of days dense fog.
January	30.12	31.02	28.80	2.22	33.8	40.6	27.0	13.6	74	−6	80	70	6	3.50	12	3.27	7	47	10	6	4	6	8	10	6	11	1	[1] 0	3
February	30.11	30.94	28.96	1.98	35.4	42.5	28.3	14.2	78	−7	85	68	5	3.39	11	3.48	7	37	10	5	3	4	5	10	5	14	0	[1] 0	2
March	30.03	30.92	28.94	1.98	42.3	50.2	34.5	15.7	88	5	83	66	6	3.71	12	3.51	8	44	8	8	5	5	10	9	5	11	1	[1] 0	2
April	30.01	30.75	29.07	1.68	53.6	62.4	44.8	17.6	94	15	79	62	5	3.34	11	3.69	8	49	9	6	5	6	10	7	5	12	0	[1] 0	1
May	29.99	30.56	29.00	1.56	64.4	73.3	55.5	17.8	98	34	64	66	5	3.54	11	2.99	7	36	8	7	6	6	10	10	5	10	0	[1] 0	([1])
June	29.99	30.50	29.38	1.12	72.7	81.3	64.0	17.3	101	46	55	68	5	3.88	11	4.47	6	37	8	7	5	5	11	12	4	8	0	[1] 0	([1])
July	29.98	30.38	29.58	0.80	77.2	85.6	68.8	16.8	104	55	49	69	5	4.64	12	4.02	6	57	8	7	4	3	14	13	4	8	1	[1] 0	([1])
August	30.01	30.47	29.44	1.03	75.5	83.5	67.5	16.0	105	51	54	72	5	4.37	11	4.36	6	38	10	9	6	5	13	11	4	4	0	[1] 0	([1])
September	30.08	30.62	29.27	1.35	68.5	76.7	60.2	16.5	101	39	62	74	5	3.37	8	6.07	6	47	11	9	7	3	11	7	3	8	1	[1] 0	1
October	30.08	30.84	29.11	1.73	58.2	66.5	49.8	16.7	92	30	62	71	5	2.89	9	5.30	6	40	11	8	5	3	7	10	6	11	1	[1] 0	2
November	30.11	30.84	28.99	1.85	46.3	53.6	39.0	14.6	79	15	64	70	5	2.56	9	3.34	6	40	8	5	4	2	6	14	7	14	0	[1] 0	2
December	30.13	30.92	28.74	2.18	37.2	43.7	30.6	13.1	73	−3	76	70	6	3.37	11	3.16	6	44	8	7	3	3	5	13	9	13	1	[1] 0	3
Mean	30.05				55.4	63.3	47.5	15.8				69	5				7												
Total														42.56	128				109	84	57	51	110	126	63	124	6	1	16

[1] Less than 1.

Wind velocity data reduced to 3-cup anemometer standard.

RICHMOND, VA.

Month	Barometer at 32° F. and mean sea level: Mean: For month	Barometer: Extremes: Highest	Barometer: Extremes: Lowest	Barometer: Extremes: Range	Air temperature, in °F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Mean: Range	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Air temperature: Extremes: Range	Average relative humidity	Average amount of clouds 0-10	Precipitation (inches): Average fall	Precipitation: Number of days 0.01 inch or more	Precipitation: Maximum fall in 24 hours	Wind: Statute miles: Average hourly velocity	Wind: Statute miles: Highest velocity	Wind: Average number of times (observations at 8 a. m. and 8 p. m.) from—: North	Wind: Northeast	Wind: East	Wind: Southeast	Wind: South	Wind: Southwest	Wind: West	Wind: Northwest	Wind: Calm	Number of days with winds of 33 miles or over	Number of days dense fog.
January	30.14	31.00	28.87	2.13	37.9	46.3	29.4	16.9	78	−1	79	72	5	3.21	10	2.66	8	50	9	8	2	6	16	10	4	7	0	12	2
February	30.11	30.89	29.00	1.89	39.6	48.4	30.8	17.6	76	−3	79	68	5	3.17	10	3.30	8	50	9	9	3	5	9	8	5	8	0	12	1
March	30.04	30.90	28.96	1.94	47.2	57.1	37.3	19.8	94	14	80	72	5	3.68	12	3.59	9	44	8	10	5	7	13	8	3	8	0	19	1
April	30.02	30.73	29.16	1.57	56.6	67.0	46.2	20.8	96	19	77	64	5	3.49	10	5.33	8	43	8	7	4	8	15	8	4	6	0	14	(1)
May	29.99	30.58	29.15	1.43	66.5	76.9	56.2	20.7	96	35	61	67	5	3.79	12	2.39	7	44	7	9	4	11	13	9	3	6	0	6	(1)
June	30.01	30.47	29.40	1.07	74.1	83.8	64.4	19.4	100	46	54	71	5	3.90	12	3.26	6	49	6	10	5	10	13	8		6	0	7	(1)
July	30.01	30.39	29.62	0.77	78.5	88.1	68.8	19.3	100	54	46	73	5	4.73	11	3.94	6	37	7	8	4	10	17	10	2	4	0	6	(1)
August	30.01	30.45	29.49	0.96	76.5	85.6	67.4	18.2	107	49	58	75	5	4.42	12	4.00	6	45	7	10	5	11	16	6	2	4	1	5	1
September	30.07	30.58	29.44	1.14	70.5	80.1	60.9	19.2	100	41	59	78	4	3.25	8	3.98	6	37	10	14	4	8	10	6	2	5	1	1	1
October	30.08	30.59	29.30	1.29	59.6	69.7	49.6	20.1	94	28	66	76	5	2.88	8	2.95	7	43	12	11	4	6	10	8	3	7	1	4	3
November	30.12	30.73	29.12	1.61	48.3	57.9	38.6	19.3	82	19	63	72	4	2.21	7	2.77	7	38	8	6	2	5	14	11	4	9	1	5	2
December	30.14	30.88	29.27	1.61	39.8	48.2	31.3	16.9	77	−2	79	74	5	3.29	11	2.52	8	44	7	9	2	8	11	9	5	10	1	14	1
Mean	30.06				57.9	67.4	48.4	19.0				72	5				7												
Total														42.02	123				98	111	44	95	157	101	39	80	5	105	12

[1] Less than 1.

Wind velocity data reduced to 3-cup anemometer standard.

Meteorological tables compiled by the United States Weather Bureau—Continued

NORFOLK, VA.

Month	Barometer at 32° F. and mean sea level: Mean: For month	Barometer: Extremes: Highest	Barometer: Extremes: Lowest	Barometer: Extremes: Range	Air temperature, in °F.: Mean: For month	Air temperature: Mean: Mean maximum	Air temperature: Mean: Mean minimum	Air temperature: Mean: Range	Air temperature: Extremes: Highest	Air temperature: Extremes: Lowest	Air temperature: Extremes: Range	Average relative humidity	Average amount of clouds 0-10	Precipitation (inches): Average fall	Precipitation: Number of days 0.01 inch or more	Precipitation: Maximum fall in 24 hours	Wind: Statute miles: Average hourly velocity	Wind: Statute miles: Highest velocity	Wind: Average number of times (observations at 8 a. m. and 8 p. m.) from—: North	Northeast	East	Southeast	South	Southwest	West	Northwest	Calm	Number of days with winds of 33 miles or over	Number of days dense fog
January	30.13	30.95	28.88	2.07	40.6	48.7	32.6	16.1	80	5	75	71	6	3.10	11	2.22	13	54	10	10	4	5	11	10	6	6	0	4	2
February	30.11	30.83	29.04	1.79	42.7	50.7	34.7	16.0	81	2	79	70	5	3.22	11	3.45	13	51	10	11	3	5	9	6	6	6	0	3	2
March	30.03	30.91	28.84	2.07	48.2	56.5	39.9	16.6	92	14	78	67	5	3.77	12	2.78	14	49	7	12	4	8	13	8	5	5	0	4	1
April	30.01	30.71	29.02	1.69	56.8	65.9	47.7	18.2	95	23	72	65	5	3.23	10	5.15	13	52	8	7	3	8	16	9	5	4	0	3	(1)
May	30.00	30.58	29.23	1.35	66.2	75.3	57.2	18.1	98	38	60	67	5	3.81	11	3.78	12	60	7	8	5	7	17	10	4	4	0	2	1
June	30.00	30.46	29.39	1.07	74.4	82.6	66.2	16.4	102	49	53	70	5	4.22	11	5.97	11	61	4	10	4	11	14	11	3	3	0	2	1
July	30.00	30.38	29.61	.77	78.7	86.5	71.0	15.5	102	57	45	73	5	5.75	12	3.60	10	54	4	6	5	8	17	15	4	3	0	2	(1)
August	30.00	30.41	29.37	1.04	77.4	84.8	70.0	14.8	105	56	49	73	5	5.22	12	6.03	10	51	5	9	6	11	17	9	3	2	0	1	(1)
September	30.06	30.56	29.35	1.21	71.6	78.8	64.4	14.4	100	40	60	73	4	3.23	8	4.23	10	53	8	16	5	8	10	8	3	2	0	1	1
October	30.07	30.60	29.35	1.25	62.5	69.8	55.2	14.6	91	31	60	71	4	3.04	8	6.29	11	49	11	15	5	4	12	6	4	5	0	1	2
November	30.11	30.72	29.15	1.57	51.4	58.9	44.0	14.9	81	17	64	69	4	2.16	8	5.48	12	47	11	7	3	4	12	8	8	7	0	2	2
December	30.13	30.83	29.26	1.57	43.1	50.8	35.4	15.4	76	5	71	72	5	3.34	10	2.52	13	60	12	8	3	6	9	9	7	8	0	3	2
Mean	30.06				59.5	67.4	51.5	15.9				70	5				12												
Total														44.09	124				97	119	50	85	157	109	58	55	0	28	14

[1] Less than 1.

Wind-velocity data reduced to 3-cup anemometer standard.

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