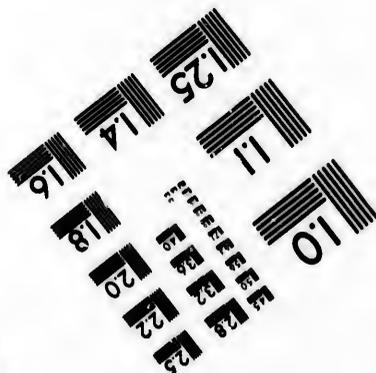
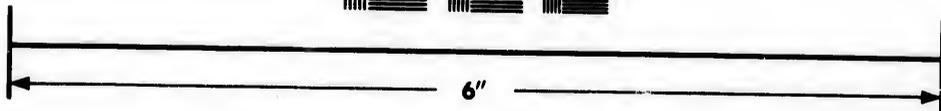
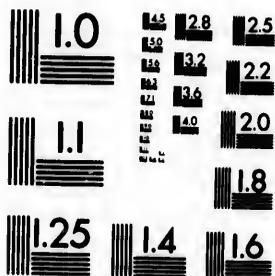


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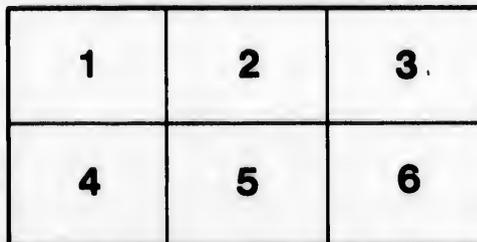
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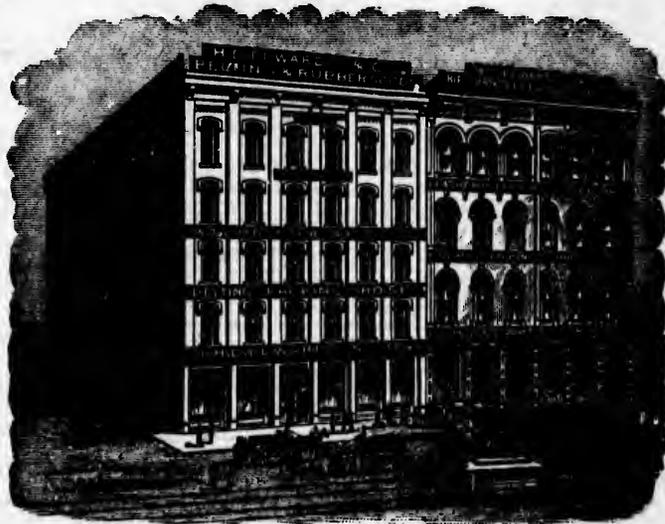
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LAKE ONTARIO.

Charity Shoal Buoy, at the entrance to the St. Lawrence River, is changed from a red to a red and black, horizontally striped buoy.

GENESEE LIGHT-STATION.—During thick or foggy weather, a 6-inch steam whistle will sound blasts of three seconds' duration, separated by silent intervals of fifty-seven seconds at Genesee Light Station, New York, thus:

<u>Blast</u>	<u>Silent interval</u>	<u>Blast</u>	<u>Silent interval</u>
3 sec.	57 sec.	3 sec.	57 sec.

The fog signal is situated on the old light-house crib on the W. side of the West Pier, and about 1,000 feet from its outer end, entrance to Charlotte Harbor, mouth of Genesee River, Lake Ontario, New York. The bell will be discontinued as a fog signal unless the steam whistle should be disabled, when it will be struck by machinery every thirty seconds, as heretofore.

Nine Mile Point Steam Fog Horn.—From and after the opening of navigation in the spring of 1894, the fog bell heretofore maintained at Nine Mile Point light-station, on the west extremity of Simcoe Island, at the east end of Lake Ontario, in the County of Frontenac, Ontario, will be discontinued, and replaced by a steam fog horn which will give blasts of 8 seconds' duration, with intervals of 22 seconds between the blasts. The fog alarm building is a square wooden building painted white, with a brown roof, and stands immediately north-west of the light-house tower. The horns point out to the south-west, and are elevated 16 feet above the level of the lake. The machinery is in duplicate, so that in the event of one horn or boiler becoming inoperative the other may be put in operation.

LAKE ERIE.

Niagara River (near Buffalo).—Two spar buoys will be placed opposite and above the water works crib, on the Canada side.

Seneca Shoal.—A black spar buoy, in seventeen feet of water, has been placed on Seneca Shoal.

BUFFALO BREAKWATER (N. end) LIGHT-STATION.—During thick or foggy weather, a 10-inch steam whistle will be sounded at Buffalo Breakwater (north end) Light-Station, Lake Erie, New York, giving blasts of three seconds' duration, separated by silent intervals of twenty-seven seconds, thus:

<u>Blast</u>	<u>Silent interval</u>	<u>Blast</u>	<u>Silent interval</u>
3 sec.	27 sec.	3 sec.	27 sec.

The bell will be discontinued as a fog signal unless the steam whistle should be disabled, when the bell will be struck by machinery a triple blow every 30 seconds.

Presque Isle Bay.—The north pier has been extended and the light house moved out.

ASHTABULA LIGHT-STATION.—During thick or foggy weather, a 6-inch steam whistle will sound blasts of three seconds' duration, separated by alternate silent intervals of twelve and forty-two seconds at Ashtabula Light-Station, Ohio.

The fog signal is situated on the outer end of the West Pier, entrance to Ashtabula Harbor, Lake Erie, Ohio.

Fairport.—The range lights have been started.

Black River Range Light.—Three fixed lights, two red and one white, arranged vertically 4 feet apart, with the white light in the middle, will be shown from lens lanterns suspended from a triangular, pyramidal, skeleton iron tower, located near the shore end of the west pier, and about 1,170 feet from its outer end, entrance to Black River harbor, Lake Erie, Ohio.

The lights in connection with the light on the outer end of the west pier form a range on the centre line of the pier, and the range, therefore, marks the west side of the channel to the harbor.

Toledo Harbor, Straight Channel through the Maumee Bay.—The straight channel into the Maumee Bay was buoyed and the buoys in the old channel discontinued.

Bar Point Shoal Light-Vessel.—Formerly moored about 1½ miles to the southward and westward of Bar Point, mouth of Detroit River, Michigan, will be moved about 400 feet to the westward to a position approximately the same as that occupied by the private light-vessel formerly maintained there.

True bearings of prominent objects are:

Bois Blanc Lighthouse (Canadian), N. by E. ½ E., 18,200 feet.

Detroit River (Bar Point) Lighthouse, S. ½ W., 13,800 feet.

The vessel lies about 600 feet to the westward of a line drawn from Bois Blanc, (Canadian) Lighthouse to Detroit River (Bar Point) Lighthouse.

DETROIT RIVER.

Limekiln Crossing Light-Vessels.—Two small light-vessels placed to mark Limekiln Crossing, Detroit River, Michigan

The vessels are flat-bottomed scows, with trunk cabins. The hulls are painted white, marked with red letters on each side, respectively, "LIMEKILN CROSSING (SOUTH)" and "LIMEKILN CROSSING (NORTH)."

The vessels each show one fixed white light from a lens lantern suspended 19 feet above the water from a crane on an upright rising 3 feet above a tripod.

During thick or foggy weather a bell will be struck by hand.

True bearings and distances of prominent objects:—

For Limekiln Crossing (South) Light-Vessel:

Texas Dock, N., 4,580 feet.

Head of Bois Blanc Island Range Light (front), S. by W. ½ W., 3,600 feet.

East end of railroad pier on Stony Island (Canada Southern), N. W. by N., 4,200 feet.

For Limekiln Crossing (North) Light-Vessel:

Texas Dock, N. ½ E., 2,000 feet.

Head of Bois Blanc Island Range Light (front), S. by W., 6,100 feet.

East end of railroad pier on Stony Island (Canada Southern), W. N. W., 2,400 feet.

Ballard's Reef Light-Vessel.—A flat-bottomed scow with trunk cabin. The hull is painted lead color, with the words "BALLARD'S REEF" in black letters on each side, moored in about 18 feet of water off the easterly end of Ballard Reef, making off from Grosse Isle, west side of Detroit River, Michigan.

The vessel shows one fixed red lens-lantern light at a height of 19 feet above the water, suspended from a cross-arm on an upright rising three feet above a square platform surmounting a tripod.

During thick or foggy weather a bell will be struck by hand.
 Fort Maiden Range, front light (Canadian), S. by E. $\frac{1}{4}$ E. (S. $16^{\circ} 27'$ E. true).
 Grosse Isle, Lower Range, front light, N. by W. $\frac{1}{4}$ W. (N. $13^{\circ} 26'$ W. true).
 Mamajuda Lighthouse, N. $\frac{1}{4}$ W. (N. $5^{\circ} 05'$ W. true).

LAKE ST. CLAIR.

Light for Triangulation Purposes.—A fixed white lens-lantern light was established, and will be maintained until further notice, by the U. S. Engineers for triangulation purposes, on the structure recently erected in $3\frac{1}{4}$ feet of water near the mouth of the Old Cut, and about 800 feet north-westerly from the range line marked by the St. Clair Flats Range Lights, Lake St. Clair, Michigan.

The light is shown at a height of 20 feet from a pole rising from a platform 6 feet above the water, supported on a cluster of piles.

From the light, St. Clair Flats Canal (Upper) Light-house bears N. 84° E. (E. $\frac{1}{4}$ N.), and St. Clair Flats Canal (Lower) Light-house bears S. $58^{\circ} 08'$ E. (S. E. by E. $\frac{1}{4}$ E.) 7,900 feet.

LAKE HURON.

Lake Huron Light-Vessel.—Moored in about 20 feet of water, in the southern end of Lake Huron, to the northward and westward of North-west Shoal, and shows at the foremast head a group of 3 fixed white lens-lantern lights. The focal plane of the light is 40 feet above lake level, and visible, in clear weather, $13\frac{1}{4}$ miles.

The vessel has two masts, schooner rigged, no bowsprit, and has a black circular cage-work day mark at the foremast head. The hull is straw-colored, with "LAKE HURON" in large black letters on each side and "No. 61" on each bow.

The fog signal is a 6-inch steam whistle, and in thick or foggy weather sounds blasts of 2 seconds' duration, followed by a silent interval of 10 seconds.

Fort Gratiot Light-house S. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles.

The vessel is anchored with a mushroom anchor, and passing vessels should not approach nearer than 200 feet.

FORT GRATIOT LIGHT-STATION.—This light has been changed from a fixed white light varied by a white flash every two minutes, to a fixed white light varied by a white flash every minute.

STRAITS OF MACKINAC.

Poe Reef Light-Vessel.—Moored in about 30 feet of water in the eastern entrance to the Strait of Mackinac, on the eastern end of Poe Reef, north side of the south channel of the Strait.

The vessel shows at the foremast head a group of 3 fixed white lens-lantern lights, 40 feet above lake level, and visible, in clear weather, $13\frac{1}{4}$ miles.

The vessel has two masts, schooner rigged, no bowsprit, and has a black circular cage work day mark at foremast head. The hull is painted red, with "Poe Reef" in large black letters on each side and "No. 02" on each bow.

The fog signal is a 6-inch steam whistle, and in thick and foggy weather sounds blasts of 5 seconds' duration, followed by a silent interval of 10 seconds.

Northeast point of Bois Blanc Island, N. $\frac{1}{4}$ E. Spectacle Reef Light-house, N. E. by E. $\frac{1}{4}$ E. Forty-Mile Point, S. E. by E. Cheboygan Light-house, S. W. $\frac{1}{4}$ W., $3\frac{1}{4}$ miles.

CHEBOYGAN LIGHT-STATION.—This light has been changed from a fixed white light varied by white flashes every 90 seconds, to a fixed white light varied by a white flash every minute.

GEORGIAN BAY.

Bustard Rocks Main Light.—The main light-house on the Bustard Rocks, at the mouth of French River, Georgian Bay, District of Algoma, Ontario, has been replaced by a new tower built 20 feet N.E. $\frac{1}{4}$ E. from the old one.

The new building is a square wooden tower, painted white, surmounted by a hexagonal iron lantern painted red. The height of the tower from its base to the vane on the lantern is 37 feet.

The light will be as heretofore, fixed white. It will be elevated 48 feet above the level of the Bay, and should be visible 12 miles from all points of approach, except over the dangerous rocks and shoals to the N. Eastward and Eastward. The illuminating apparatus will be dioptric, of the 7th order.

Besides serving as a back tower for the two ranges described below, this light is intended for a coast light.

Bustard Rocks, Front Light of Inner Range.—The front range light-house on the Bustard Rocks has been replaced by a new tower, built near the site of the old one, 229 feet N.E. $\frac{1}{4}$ E. from the main light building. It is a square wooden tower, painted white, surmounted by a square wooden lantern painted red, and is 28 feet high from its base to the vane on the lantern.

The light will be as heretofore, fixed white, catoptric, elevated 39 feet above the water, and will be visible 6 miles in, and over a small arc on each side of, the line of range.

The above described two lights in range lead in, from a point just clear of the north Bustard Rock, to the intersection of this range with the French River range.

Bustard Rocks, Front Light of Outer Range. (New Light.)—An additional range light-house has been erected on the Bustard Rocks, 193 feet W. by S. from the main tower. The building is a square wooden tower, painted white, surmounted by a square wooden lantern painted red, and is 28 feet high from the base to the vane on the lantern.

The light will be fixed white, catoptric, elevated 27 feet above the level of the Bay, and should be visible 10 miles in, and over a small arc on each side of, the line of range.

This light, in one with the light in the main tower, leads in E. by N. from deep water clear of Isabel Rock on the north, and of all the shoals south-west of Bustard Rocks on the south.

French River Back Range Light.—The back range tower of the French River range has been replaced by a new tower, built in the village 340 feet back, or N.E. by N., from the old tower.

The new tower is a square wooden building, painted white, surmounted by a square wooden lantern painted red, and is 33 feet high from its base to the vane on the lantern.

The light will be, as heretofore, fixed red, catoptric, and should be visible 6 miles in, and over a small arc on each side of, the line of range. It is elevated 37 feet above the level of the Bay.

The French River range will, as heretofore, lead in, from its intersection with the inner Bustard range, to Lefroy Island, clear of all obstructions.

Giants Tomb Light-House.—A light-house established by the Government of Canada on the southern extremity of Giants Tomb Island, in the south-east portion of the Georgian Bay, in the East Riding of Simcoe, Ontario, was put in operation on the opening of navigation this year.

The light is fixed white, elevated 40 feet above the level of the Bay, and should be visible 11 miles from all points of approach by water. The illuminating apparatus is dioptric of the 7th order.

The light-house stands on the boulder and gravel beach at the southern extremity of the island, close to the water. It consists of a square wooden tower, with dwelling attached, painted white, the tower surmounted by an iron lantern painted red. The height of the building, from its base to the vane on the lantern, is 37 feet.

LAKE SUPERIOR.

WHITEFISH POINT LIGHT-STATION.—This light has been changed from a fixed white to a fixed white varied by a red flash every 20 seconds.

Ontonagon Pierhead Beacon Light, on the west pier at Ontonagon, will be moved about 430 feet nearer the outer end of the pier. The elevation and characteristics of the light will remain unchanged.

SUPERIOR PIERHEAD LIGHT-STATION.—During thick or foggy weather, a 6-inch steam whistle will sound blasts of 3 seconds' duration, separated by silent intervals of 12 seconds, at Superior Pierhead Light-station, Lake Superior, Wisconsin.

The fog signal is situated on the South Pier, about 45 feet in rear of light-tower, and serves as a guide into Superior and Allouez Bay.

Superior Bay.

The following described post lights will be established in Superior Bay, Wisconsin and Minnesota:

Superior Bay Entrance Range Post Lights.—Two fixed white lens-lantern lights, each on an upright on Wisconsin Point. Front light 18 feet above lake level, just inside the entrance to the southeasterly end of Superior Bay. Rear light 24 feet above lake level, 320 feet S. W. $\frac{1}{4}$ W. from front light. The range will guide into the southeasterly end of Superior Bay through the natural channel from Lake Superior.

Superior Bay Range Post Lights.—Two fixed white lens-lantern lights, each on an upright on Wisconsin Point, just inside the entrance to the southeasterly end of Superior Bay. Front light 16 feet above lake level, 380 feet E. of Superior Bay entrance front range. Rear light 21 feet above lake level, 290 feet S. E. $\frac{1}{4}$ E. from Superior Bay front light. The range will guide up Superior Bay from inside the entrance past the old dock on Minnesota Point to the entrance to the dredged channel to Quebec dock.

Quebec Channel Post Light.—A fixed red lens-lantern light, 13 feet above lake level, on an upright rising from a square pyramidal cluster of piles in the west angle of the intersection of the main channel of Superior Bay and the dredged channel to Quebec dock, marking the channel through Superior Bay.

Superior Bay Channel (Lower) Post Light.—A fixed white lens-lantern light, 13 feet above lake level, on an upright rising from a square pyramidal cluster of piles on the northeasterly side of the channel, and about 3,500 feet from Quebec channel post light.

Superior Bay Channel (Lower Middle) Post Light.—A fixed white lens-lantern light, 13 feet above lake level, on an upright rising from a square pyramidal cluster of piles on the northeasterly side of the channel, about 3,800 feet from Superior Bay Channel (lower) post light.

Superior Bay Channel (Upper Middle) Post Light.—A fixed white lens-lantern light, 13 feet above lake level, on an upright rising from a square pyramidal cluster of piles about midway of the Middle Ground, northeasterly side of the channel, and about 4,700 feet from Superior Bay channel (lower middle) post light.

Superior Bay Channel (Upper) Post Light.—A fixed white lens-lantern light, 13 feet above lake level, on an upright rising from a square pyramidal cluster of piles on the northwesterly end of the Middle Ground, abreast of the lumber docks southeasterly of Connors Point, northeasterly side of the channel, and about 2,000 feet from Superior Bay channel (upper middle) post light.

Connors Point Range Post Lights.—Two fixed lens-lantern lights, front light white, 13 feet above lake level, about $\frac{1}{4}$ mile E. of Connors Point; rear light red, 18 feet above lake level, about 590 feet N. E. by E. $\frac{1}{4}$ E. from Connors Point front light. Each shown from an upright rising from a square pyramidal

cluster of piles southeasterly of Rice Point, Superior Bay. The range will guide in the channel from the Northern Pacific Railroad bridge, St. Louis Bay, past Connors Point into Superior Bay.

Rice Point Range Post Lights.—Two fixed lens-lantern lights, front light white, 13 feet above lake level, 590 feet N. W. by N. $\frac{1}{4}$ N. from Rice Point rear light; rear light red. Each shown from an upright rising from a square pyramidal cluster of piles southeasterly of Rice Point, Superior Bay. (The rear light of this range is the rear light of the Connors Point range.) The range will guide in the channel along the northeasterly side of Rice Point from its southeasterly point nearly to the Ohio Central coal dock.

Ohio Central Coal Dock Post Light.—A fixed red lens-lantern light, 13 feet above lake level, on an upright rising from a square pyramidal cluster of piles southeasterly of the northeasterly end of the Ohio Central coal dock, northerly end of Superior Bay. The light marks the turning point from the northerly part of Duluth harbor into the channel marked by the Rice Point range.

North Channel, East Range, Post Lights.—Two fixed white tubular-lantern lights, each on uprights on a platform, natural color, supported by a square pyramidal cluster of black piles, standing in 7 or 8 feet of water to the westward of Rice Point and at the easterly end of the north channel. The focal plane of the front light is 13 feet above the water and of the rear light 18 feet above the same level. The rear light is about 600 feet north, $46^{\circ} 30'$ east (N. E. $\frac{1}{4}$ E.) from the front light, and the range guides in the easterly part of the channel to the west range.

North Channel, West Range, Post Lights.—Two fixed white tubular-lantern lights, each on uprights on a wooden platform, natural color, supported on a square pyramidal cluster of black piles, standing in 7 or 8 feet of water, near the lumber dock, West Duluth, at the westerly end of the north channel. The focal plane of the front light is 13 feet above the water and of the rear light 18 feet above the same level. The rear light is about 550 feet south, $46^{\circ} 30'$ west (S. W. $\frac{1}{4}$ W.) from the front light, and the range guides in the westerly part of the channel to the east range.

South Channel, West Range, Post Lights.—Two fixed white tubular-lantern lights, each on uprights on a wooden platform, natural color, supported on a square pyramidal cluster of black piles, standing in from 7 to 9 feet of water, near the lumber dock, West Duluth, at the westerly end of the south channel. The focal plane of the front light is 13 feet above the water, and of the rear light 18 feet above the same level. The rear light is about 950 feet south, 70° west (W. S. W. $\frac{1}{4}$ W.) from the front light (is also the rear light for the north channel, west range), and the range guides in the westerly part of the channel.

LAKE MICHIGAN.

Frankfort Pierhead Beacon Light.—A fog-bell struck by machinery, a double and a single blow alternately at intervals of 20 seconds. The bell-tower is situated 8 feet in rear of light-tower.

Kewaunee Pierhead Light.—The tubular-lantern pierhead light at Kewaunee, west shore of Lake Michigan, Wisconsin, was moved out to the outer end of the recently extended pier.

The light is shown from an inclosed glazed end of a conduit extending from the light-tower a distance of 335 feet, the focal plane being 23 feet above lake level.

CHICAGO LIGHT-STATION.—This station has been discontinued.

CHICAGO HARBOR LIGHT-STATION.—A flashing red and white light alternately every 10 seconds; 3d order, visible 16 miles; light $67\frac{1}{4}$ feet above lake level; conical iron tower, painted red with black trimmings, standing on a rectangular rock-faced masonry pier, inside of and near the south-east extremity of the outer breakwater. A coast and harbor light.

Fog-signal building alongside of tower. During thick and foggy weather, a 10-inch steam whistle sounds blasts of 5 seconds' duration, followed by a silent interval of 25 seconds.

Gray's Reef Light Vessel Fog signal sounds thus:

Silent		Silent		Silent	
<u>Blast.</u>	<u>interval.</u>	<u>Blast.</u>	<u>interval.</u>	<u>Blast.</u>	<u>interval.</u>
3 sec.	10 sec.	1 sec.	10 sec.	1 sec.	35 sec.

WAUGOSHANCE LIGHT-STATION.—Painted red and white horizontal bands.

Fox Island Shoal (Middle).—Red and black, horizontal stripes, spar buoy in 17 feet of water. Marks two shoal spots lying in a N. W. and S. E. direction, about 250 yards apart, with 13 feet least depth of water. The buoy is on the south edge of the N. W. spot. In thick or foggy weather, vessels should avail the five fathom line. South Fox Island Light-House, N. $\frac{1}{2}$ E. $6\frac{1}{2}$ miles. Fox Island Shoal outside, S. by E. $\frac{1}{2}$ E. $\frac{1}{2}$ mile.

Calumet Entrance (South).—Black spar buoy in 18 feet of water. Marks the south bank of the channel leading into Calumet River. Calumet Pierhead Light-Station, W. 165 yards. S. E. end of Illinois Steel Co's pier, N. N. W. $\frac{1}{4}$ W. $\frac{1}{4}$ of a mile.

Calumet Entrance (North).—Red spar buoy in 18 $\frac{1}{2}$ feet of water. Marks the north bank of the channel leading into Calumet River. Calumet Pierhead Light-Station, S. W. by W. 275 yards. East end of Illinois Steel Co's pier, N. W. by N. $\frac{1}{4}$ N. $\frac{1}{4}$ of a mile.

Hyde Park Water Works Crib (Outer).

Hyde Park Water Works Crib (Inner).—Both in course of construction.

South Park Shoal.—Red and black, horizontal stripes, 2d class can buoy in 28 feet of water. Marks the south side of a 6-foot shoal off South Park, city of Chicago. Calumet Pierhead Light-Station, S. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles. Chicago Pierhead Light-Station, N. N. W. $\frac{1}{4}$ W. $7\frac{1}{8}$ miles.

Madison Park Shoal.—Red and black, horizontal stripes, spar buoy in 16 feet of water. Marks the center of a small shoal off Madison Park, Chicago. Vessels will clear the shoal by giving the buoy a berth of 300 feet. 16 feet least depth of water. Hyde Park Hotel, W. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles. Chicago Breakwater Light-Station (South), N. N. W. $\frac{1}{4}$ W. $5\frac{1}{8}$ miles.

Hyde Park Shoal (Outside).—Red and black, horizontal stripes, 3d class nun buoy in 18 feet of water. Marks the north side of a small 11-foot shoal off Hyde Park, city of Chicago, 2 miles from the beach. Calumet Pierhead Light-Station, S. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles. Chicago Pierhead Light-Station, N. N. W. $\frac{1}{4}$ W. $6\frac{1}{8}$ miles.

Hyde Park Shoal (Inside).—Red and black, horizontal stripes, spar buoy in 17 feet of water. Marks the north side of shoal. Least depth of water, 12 feet. E. end of Casino pier, S. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles. Chicago Breakwater Light-Station (South), N. N. W. $\frac{1}{4}$ W. $5\frac{1}{8}$ miles.

Morgan's Reef (Outside).—Black spar buoy in 13 feet of water. Marks the east side of Morgan's Reef, off the city of Chicago. Hyde Park Hotel, S. W. $\frac{1}{4}$ W. 1 mile. Chicago Breakwater Light-Station (South), N. N. W. $4\frac{1}{2}$ miles.

Morgan's Reef (Inside).—Red spar buoy in 12 feet of water. Marks the west side of Morgan's Reef, off the city of Chicago. There is but 12 feet of water in the channel to the westward of this buoy. E. end of Casino pier, S. S. E. $\frac{1}{2}$ E. 2 miles. Chicago Breakwater Light-Station (South), N. by W. $\frac{1}{4}$ W. $4\frac{1}{2}$ miles.

Oakland Shoal.—Black second class nun buoy in 26 feet of water. Marks the easterly end of Oakland Shoal, off the city of Chicago. Chicago Water Works Crib (4 mile), N. N. E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles. Douglas Monument, N. W. by W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles.

Oakland Shoal (Inside.)—Red spar buoy in 16 feet of water. Marks the westerly edge of Oakland Shoal, off the city of Chicago. Chicago Water Works Crib (4-mile), N. E. $\frac{1}{4}$ N. $4\frac{1}{8}$ miles. Douglas Monument N. W. $\frac{1}{4}$ W. 1 mile.

Chicago Water Works Crib (2-Mile).—In course of construction. A course steered from the Chicago Water Works Crib (4-mile) to the Hyde Park Water Works Crib (outer), leads to the east of Hyde Park and South Park shoals, clearing $\frac{1}{2}$ and $\frac{1}{4}$ of a mile respectively; and from the Chicago Water Works Crib

(2-mile) to Hyde Park Water Works Crib (inner), leads between Hyde Park outer and inner shoals and between Madison Park and South Park shoals, clearing South Park shoal $\frac{1}{4}$ of a mile. Hyde Park Water Works Crib (outer) S. $\frac{1}{4}$ E. $5\frac{1}{2}$ miles. Chicago Breakwater Light Station (south) W. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles. Chicago Water Works Crib (4-mile) E. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles. Hyde Park Water Works Crib (inner) S. by E. $\frac{1}{2}$ E. $6\frac{1}{8}$ miles.

Randolph Street Viaduct.—Red and black, horizontal stripes, spar buoy in 16 feet of water. Marks a wreck in Chicago harbor, near Randolph street viaduct, with but $7\frac{1}{2}$ feet of water over it.

Lakeview Water Works Crib (Outer) Building.—Chicago Water Works Crib S. by E. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles. Outer breakwater (northwest end) S. $\frac{1}{2}$ E. $4\frac{1}{2}$ miles.

Lakeview Water Works Crib (Inner) Building.—Lakeview Water Works Crib (outer) E. $\frac{1}{2}$ N. $\frac{1}{2}$ mile. Chicago Harbor Light-Station S. by E. $\frac{1}{2}$ E. 5 miles.

GREEN BAY.

Eleven-Foot Shoal Light-Vessel.—Moored in about 60 feet of water off the southward and westward of Corona and Eleven-Foot Shoals.

The vessel shows at the foremast head a group of 3 fixed white lens-lantern lights, 40 feet above lake level and visible in clear weather $13\frac{1}{2}$ miles.

The vessel has two masts, schooner-rigged, and has a black circular cage-work day mark at the foremast head. The hull is painted black, with "Eleven-Foot Shoal" in large white letters on each side, and "No. 60" on each bow.

The Fog Signal is a 6-inch steam whistle, and in thick and foggy weather sounds blasts of 5 seconds' duration, followed by an interval of 10 seconds.

The vessel marks the shoals and the turning point for vessels bound into Little Bay de Noquet.

Eleven-Foot Shoal Buoy N. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. Point Peninsular Light N. by E. $\frac{1}{2}$ E. in range. Corona Shoal Buoy E. N. E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. Burnt Bluff (left tangent) E. N. E. $\frac{1}{2}$ E. (in range). Escanaba Light N. by W. $\frac{1}{2}$ W., $9\frac{1}{2}$ miles.

Changes to be Made on the Opening of Navigation, 1894.

Waugoshance.—From fixed white varied by white flash every 90 seconds, to fixed white varied by white flashes every 45 seconds.

Porte des Morts.—From fixed red to fixed white varied by white flash every 15 seconds, 4th order.

Eagle Harbor, Mich.—From fixed white varied by a white flash every 2 minutes, to fixed white varied by a white flash every minute.

Raspberry Island, Wis.—From fixed white varied by white flash every 90 seconds, to fixed white varied by white flash every minute.

St. Mary's Falls Canal, N. Pier.—From fixed red 6th order, to 5th order white light varied by red flash every minute.

Manistee, Mich.—Change to a coast light on keeper's dwelling, fixed white 5th order, varied by red flashes 45 seconds, 8th February, 1894. Light-House Board. Post light and fog signal to be transferred from S. to N. pier.

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SCOTT'S NEW COAST PILOT.

ADDITIONS AND CHANGES,

CORRECTED TO THE OPENING OF NAVIGATION, 1893.

LAKE ONTARIO.

BARRIFIELD COMMON RANGE LIGHTS, KINGSTON HARBOR—Front Light.—A fixed white light, 48 feet above the lake level, 370 feet east of the end of bridge over Great Cataraqui Creek.

Rear Light.—A fixed white light, 75 feet above the lake level, 1,500 feet N. E. from the Front light. These lights are shown from locomotive head-light lanterns, hoisted to the top of iron skeleton towers, triangular in plan, with oval slotted targets or beacons at their top, and sheds at their base. The beacons are white, the iron framework red, and the sheds brown. The lights are visible 12 miles, over a small arc on each side of line of range. The range leads inside Caruthers and Point Frederick shoals, to guide between Four-Mile Point and Kingston Harbor. Passing between Four-Mile Point, and Snake Island light, steer for the south side of the docks about N. E. $\frac{1}{4}$ E. This course leads between Penitentiary shoal on the port hand and the Myles shoal to starboard, these shoals are marked with square platform buoys, with frame-work beacons. Approaching the docks get on the range of the above lights N. E., which will lead inside the Caruthers and Point Frederick shoals. See page 48.

Bay of Quinte Bridge Lights.—A highway bridge having been constructed across the Bay of Quinte, immediately west of Belleville, vessels will require to be cautious in approaching the draw both by day and night. The centre pier of the swing span is 195 feet from the south or Prince Edward County side of the bridge, and there is a channel 100 feet wide both north and south of this central pier, either of which can be used by vessels. The bridge is straight, and runs N. $\frac{1}{4}$ W. (N. $18^{\circ} 30'$ W. true), and S. $\frac{1}{4}$ E.

The following lights have been established for the guidance of Mariners at the pivot or draw span of the said bridge:—One fixed white light shown from a lens lantern hoisted 18 feet above the level of the Bay, at the south of the southern opening, and one similar fixed white light at the north of the northern opening. When the draw is closed against navigation a red light, elevated 18 feet above the water, will show at each end of the draw span, or close to the two fixed white lights above described, and showing both up and down the Bay. When the draw is open two green lights at an elevation of 18 feet above the water will be visible from each end of the draw span, facing east and west, indicating the position of the rest piers. There will then appear to a vessel approaching from either direction when the draw is open, two green lights flanked by two white lights in a line north and south.

All these lights should be visible a distance of three miles in clear weather, both up and down the Bay.

Light on Potters Island.—A mast light has been temporarily established by the Government of Canada on the outer point of Potters Island, opposite Nigger Island, on the south shore of the Bay of Quinte, Province of Ontario.

Weller's Bay Lights, Change.—The range lights at Weller's Bay, on the north shore of lake Ontario, have been moved, and the colors of the lights changed.

The Front Light tower now stands on the shore of the bay, at the southwest end of the Carrying Place road, 843 feet N. $\frac{1}{4}$ W. from its previous position.

The light has been changed from fixed red to fixed white; it is elevated 26 feet above the level of the lake, and should be visible 10 miles in the line of range and to the eastward until cut off by Bald Head and to the westward until cut off by Presqu'ile Point.

The Back Light tower has also been moved to a new site distant 508 feet N. E. $\frac{1}{4}$ E. (N. 46° E. true), from the front one. The light has been changed from fixed white to fixed red, and is elevated 37 feet above the lake level; it should be visible 7 miles in, and over a small arc on each side of the line of range. Vessels approaching from the westward will not open this light until nearly reaching the alignment, as it is screened by trees.

The two light buildings are unchanged in character.

There is a bar with about 10 feet on it across the mouth of the Bay, at a distance of two nautical miles from the front light. The new alignment leads over this bar, at or near its narrowest part, in practically the best water, and also leads clear of the extremity of the spit off Bald Head, which is 3,300 feet inside the bar. Vessels entering can now pick up the alignment in the deep water of the lake, cross the bar on the alignment, N. E. $\frac{1}{4}$ E., and keep it until the extremity of Bald Head spit is passed at a distance of about 150 feet, when they will be in the deep water of the bay, inside of all dangers.

The tripod beacon marking the end of Bald Head spit, has been washed away, and will not be replaced at present. See page 45.

Port Hope Pierhead Light, Change.—The light is now fixed white, instead of a fixed red and white. White, square wooden tower, 110 feet from the outer end of breakwater protecting the east side of the harbor. Light 40 feet above the level of the lake, visible 4 miles. Formerly the tower stood 250 feet from the end of the pier, and within 60 feet of the end a red lantern light was exhibited. When the lighthouse was moved to its present position, the red lantern was dispensed with. See page 45.

Fort Niagara Life-Saving Station.—A Life-Saving Station has been established on the Military Reservation, east bank of Niagara River, near its mouth.

LAKE ERIE.

Long Point Light-Station.—A fog horn operated by steam and compressed air has been established at Long Point, East End, Light Station. The horn will sound blasts of seven seconds' duration, with silent intervals of 30 seconds. The fog alarm building is situated about 200 yards south of the lighthouse and about 400 yards from the shore. It is of wood painted white. The horn is elevated 20 feet above the level of the lake and faces toward the east. See page 80.

Conneaut Pierhead Light.—A fixed white light is shown from a lens lantern suspended from a post 20 feet above lake level, on the outer end of the west pier at Conneaut. The light is visible, in clear weather, about 5 miles. For many years the harbor at Conneaut has been in ruins, virtually closed to commerce. Last season the P. B. & C. R. Co. temporarily repaired the piers and dredged a narrow channel between them. The Government has made an appropriation to improve the harbor. The present project is to relocate the channel, and dredge to a depth of 17 feet and construct new piers. See page 61.

Cleveland Light Station, Discontinued.—At the opening of Navigation, 1893, the fixed white light, 3 $\frac{1}{2}$ order, shown from the lighthouse on the hill, east side of Cleveland Harbor, will be discontinued. See page 62.

TOLEDO HARBOR, STRAIGHT CHANNEL THROUGH MAUMEE BAY.—The channel is now open to navigation with a depth of 15 $\frac{1}{2}$ feet at the ordinary stage of water, throughout the entire length, which is about 7 $\frac{1}{2}$ miles, and a width of 200 feet on the bottom, except in one section outside the main crib-lights where it is only 175 feet and 1,300 feet of the Turnout subdivision, the

width is only 170 feet. The new channel is now wider and is thought to be better than the old one.

Range Lights and Pile-Protection Work.—The main and east crib lights of the Maumee Bay range, are situated in the axis of the channel, about 1,000 feet apart, direction about S. W. by W. $\frac{1}{2}$ W. from seaward. To prevent vessels from colliding with the cribs, a pile protection has been constructed. At present the Turn-out channel is on the north side of the main and east crib lights, but the project is to have a channel on either side of the lights.

Buoys.—The New or Straight channel will be buoyed on the opening of navigation, and the buoys in the Old channel will be removed. See page 72.

Raisin Point.—The black 2d class can buoy marking this point will be removed on the opening of navigation, 1893.

Point Mouille.—The black 2d class can buoy marking this point, will be removed on the opening of navigation, 1893.

DETROIT RIVER.

Bois Blanc Range Lights.—The wooden structures from which the range lights at the head of Bois Blanc Island were exhibited, have been replaced by iron skeleton towers, triangular in plan, with oval slotted targets, or beacons at their tops. The character of the lights is the same as heretofore. The front tower is 70 feet high, painted white. The rear tower is 90 feet high, painted red; it stands 450 feet S. by W. $\frac{1}{2}$ W. from the front tower. See page 88.

ST. CLAIR RIVER.

Black River Shoal.—A black spar buoy in 15 feet of water on the easterly edge of the Middle Ground off the mouth of Black River, Port Huron. The lower side of grain elevator S. W. $\frac{1}{2}$ S. Lower end of dock, upper side of mouth of Black River N. W. by W. $\frac{1}{2}$ W. 650 yards. Fort Gratiot lighthouse N. by W.

Fort Gratiot Range Light.—The rear light is now shown from a white pyramidal, open frame-work tower, with day mark 14 feet long and 10 feet wide. The focal plane of the light is 80 feet above the lake level. See page 97.

LAKE HURON.

Weather Signals at Thunder Bay and Middle Islands.—On the opening of navigation, storm, cautionary and wind-direction signals will be displayed from or near the Life-Saving Stations on the above named islands. Submarine cables will be laid from the islands to the mainland, and connected by wire with Alpena.

ST. MARY'S RIVER.

Detour Reef.—A 2d class black can buoy in 18 feet of water, on the easterly side of the reef off Detour Point. Frying Pan Island lighthouse N. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles, Tangent N. W. side of Drummond Island N. N. E. $\frac{1}{2}$ E. Detour lighthouse N. W. by W. $\frac{1}{2}$ W. 1,800 yards.

The Following Described Lights Have Been Established on St. Mary's River:

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Sweet's Point.—A fixed white lens-lantern light, showing through 360° of arc, on a crib structure standing in 7 feet of water. Marks the turning point in the channel, and guides up the river to the northward and westward.

Round Island Light.—A fixed white lens-lantern light, visible 4 miles. The focal plane is 40 feet above the lake level. Square, wooden tower, black lantern, rising in the front of a 1½ story frame dwelling. The tower and dwelling are painted buff, with white trimmings, red roof, with background of trees 90 feet high on the E. side of Round Island. There are two fixed red sectors.

The white sector lies between and is bounded radially by the two red sectors, and illuminates 180° of the horizon, extending from N. ¼ E. through eastward to S. ¼ W. The southerly red sector covers, and its easterly edge guides clear of, the shoals to the southward and westward of Round Island.

The red sector to the north marks the turning point at its intersection with Winter Point range, foot of Mud Lake.

Pilot Island Range Lights.—Two fixed red lantern lights.

Front light on a white post 27 feet above the lake level, on Pilot Island.

Rear light shown from an iron skeleton tower 42 feet above lake level, on pile cluster 1,500 feet S. by W. ¼ W. from front light, visible 5½ miles.

The range intersects the Winter Point range at the can buoy in Mud Lake, and leads up to Sailors' Encampment.

Winter Point Range.—Two fixed white lens-lantern lights, showing through 270° of arc. The front light is shown from an upright on a cluster of piles and the rear light from an iron skeleton tower on the southern end of Neebish Island. The range guides up to or down from the mid-channel buoy in Mud Lake. The lights are 1,500 feet apart, direction N. W. ¼ W.

Encampment Crib.—A fixed red tubular-lantern light, shown from an upright on a crib in 8 feet of water, off the southern end of Sailors' Encampment. Marks a shoal and the western side of the entrance to Sailors' Encampment passage.

East Range, Dark Hole.—Two fixed red tubular-lantern lights, shown from uprights on the upper end of Sailors' Encampment. The range intersects with Point of Woods Range to mark the turning point in the channel, and leads to or from an intersection with the channel marked by the West Range, Dark Hole. The lights are 231 feet apart, direction S. by E.

West Range, Dark Hole.—Two fixed white lens-lantern lights, shown from uprights on the upper end of Sailors' Encampment. The range intersects with East Range, Dark Hole, to mark the turning point in the channel, and leads to or from abreast the second black spar buoy below Harwood's Point. The lights are 750 feet apart, direction S ¼ E.

Point of Woods Range.—Two fixed red tubular-lantern lights, shown from uprights on the eastern side of Neebish Island. This range guides through the Dark Hole passage, and by its intersection with the West Range, Dark Hole, marks the turning point to or from the lower reach of Little Mud Lake. The lights are 296 feet apart, direction N. W. ¼ W.

Hen and Chickens (Neebish Island) Range.—Two fixed red tubular-lantern lights, shown from uprights. The front light is on the most easterly of the small group of islands known as the Hen and Chickens, and the rear light is on the northeasterly shore of Neebish Island, 1,700 feet S. W. ¼ W. from front light. The range guides through the passage between Sugar Island and St. Joseph Island (Canadian).

Harwood's Point Range Lights.—Two fixed white tubular-lantern lights, shown from uprights. On S. E. end of Sugar Island, the rear light is 725 feet N. ¼ W. from the front one. The range intersects with Dark Hole West Range at Little Mud Lake buoy, black No. 13 to the intersection with Hen and Chickens Range off Stribbling's Point. The N. W. point of St. Joseph's Island.

East Neebish Range.—Two fixed red tubular-lantern lights, on uprights on Sugar Island at the foot of East Neebish. The range guides through the upper reach of East Neebish, and its intersection with Indian Point range marks the turning point. The lights are 233 feet apart, direction S.

Indian Point Range.—Two fixed white tubular-lantern lights, on uprights on Indian Point, East Neebish. The range guides through the lower reach of East Neebish and its intersection with East Neebish Range marks the turning point. The lights are 274 feet apart, direction N. W. by N.

Duck Island Range.—Two fixed red tubular-lantern lights, on uprights near the water's edge on the channel side of the lower end of Duck Island, above East Neebish. The range shows upstream towards the lower Lake George crib-light, and the range between these may be followed from the crib down to abreast of the head of Duck Island. The lights are 663 feet apart, direction S. $\frac{1}{2}$ E.

Lower Lake George.—A fixed white tubular-lantern light, on an upright rising from a crib 50 feet from the east side of the lower end of the main Lake George Channel. Marks the lower end of channel.

Middle Lake George.—A fixed red tubular-lantern light, on top of a dwelling resting on a crib 50 feet from the east side of the main Lake George Channel, at the elbow. Buff dwelling 20 feet square, with red roof on crib in 5 feet of water.

Upper Lake George.—A fixed red lens-lantern light, on an upright rising from a crib 50 feet from the east side of the upper end of the main Lake George Channel, and marks the northerly entrance into the dredged cut. Crib in 12 feet of water.

NOTE.—The three Lake George lights mark the entrance into, the elbow of, and the outlet from the main channel of Lake George.

Churchs Point.—A fixed white lens-lantern light, on an upright rising from a crib in 14 feet of water, at the head of Lake George. Marks the approach to the passage between Sugar and Squirrel Islands and is to be left to the westward by vessels bound either way.

Churchville Point.—Fixed white lens-lantern light, with two red sectors, on post rising from center of square lamp house. On Churchville Point, east point of Sugar Island. The southerly red sector covers the black spar buoy No. 49, off Churchville Point crib, marks the turning point to and from the channel between Squirrel Island and Churchs Point. The northerly sector cuts the southerly red sector from Manhattan Shoal light, and marks the turn midway in the bend. The white arc is about 198°.

Manhattan Shoal.—A fixed white lens-lantern light, with two red sectors, on an upright rising from a crib on a 10-foot shoal off the N. E. end of Sugar Island. The light shows red up and down stream and white between. The down stream line between the white and red light marks the turn to the eastward to be made midway in the bend, and the like line up stream shows where the deflection is to be made to pass into or from the Garden River reach.

Catholic Mission Range.—Two white fixed tubular-lantern lights on uprights on the south shore of Little Lake George, north end of Sugar Island. The range marks the upper reach of Little Lake George, and its intersection with Farmers Ridges Range marks the turning point. The lights are 810 feet apart, direction S. E. $\frac{1}{2}$ E.

Payment Range.—Two fixed red tubular-lantern lights, on uprights on the south shore of Little Lake George, north end of Sugar Island. The range marks the lower reach of Little Lake George, and its intersection with the Catholic Mission Range marks the turning point. The lights are 756 feet apart, direction W. by S. $\frac{1}{2}$ S.

Palmers Point.—A fixed white lens lantern light, with two fixed red sectors, on an upright rising from a crib on the channel bank off Palmers Point, upper end of Little Lake George. The northerly edge of the eastern red sector cuts the first black buoy below the light and the northerly edge of the western red sector cuts the first black buoy above Wilson's Wharf thus marking the two turning points.

Farmers Ridges Range.—Two fixed red tubular-lantern lights, on uprights on the northwest side of Sugar Island. The range guides through the Farmers Ridges passage. The lights are 734 feet apart, direction N. E. by E.

Partridge Point Range.—Two fixed red tubular-lantern lights, on uprights on the northwestern side of Sugar Island. The range intersects with Farmers Ridges range to mark the turning point in the channel abreast of Brusants Point. The lights are 600 feet apart, direction S. by W. $\frac{1}{2}$ W.

Topsail Island Range.—Two fixed red tubular-lantern lights on uprights on the northwest side of Sugar Island. The range intersects with Sault Range to lead clear of the shoal extending southward from Topsail Island, and also intersects with Farmers Ridges range at the turning point in the channel.

NOTE.—One light serves for the front light of the Topsail Island range, and the rear light of Partridge Point range.

Bayfield Rock Range.—Two fixed white tubular-lantern lights, on uprights on the northwestern side of Sugar Island. The range leads past Bayfield Rock to the lower end of the canal, intersecting with Sault range to mark the channel clear of Topsail Island shoal. The lights are 945 feet apart, direction E. S. E $\frac{1}{2}$ E.

Sault Range.—Two fixed red tubular-lantern lights, on uprights on shore below the city of Sault Ste. Marie. Intersects with Bayfield Rock range to mark the channel to intersection of Topsail Island range, and also marks the turning point in the channel on the Bayfield Rock range leading up to the lower entrance to the canal. The front light is 160 feet from the shore, about one mile below the city; the rear light is on the shore 535 feet W. by S. from the front one.

STRAITS OF MACKINAC.

OLD MACKINAC POINT LIGHT STATION.—A flashing red light every 10 seconds, 4th order, visible $15\frac{1}{2}$ miles. Buff-brick tower forming the N. W. corner of Keeper's dwelling which is buff brick with red roof. It stands 90 feet to the westward and a little in the rear of the fog-signal, on Old Mackinac Point. The light is visible from N. W. $\frac{1}{2}$ W. through the northward to E. $\frac{1}{2}$ S. The focal plane is 60 feet above the level of the lake. Cheboygan lighthouse S. E. by E. $\frac{1}{2}$ E. $16\frac{1}{2}$ miles. McGulpin's Point lighthouse W. $2\frac{1}{2}$ miles. St. Helena lighthouse N. W. $\frac{1}{2}$ W. 8 miles. See page 161.

WAUGOSHANCE LIGHT STATION, CHANGE.—The color of the tower, dwelling and fog-signal has been changed from a dull brown to a bright red and white, painted in alternate horizontal bands in such a way that the band immediately under the lantern gallery is white, and that lower down the band of red covers the roof of the dwelling, tower and fog-signal house below the edge of the roof white.

The first band immediately under the gallery is 8 feet wide, painted white; the second band 8 feet wide, painted red; the third band 9 feet wide, painted white, and the fourth band 11 feet wide, painted red, and will cover the roof of the dwelling. The gallery deck and lantern will remain black as heretofore. See page 162.

Waugoshance Sixteen-Foot Shoal.—A 2d class black nun buoy in 23 feet of water, about 15 yards N. W. of a small shoal of gravel and boulders, recently located about 900 yards W. $\frac{1}{2}$ S. of the Waugoshance Eighteen-Foot Shoal, the least depth of water over which is 15 feet 10 inches. St. Helena lighthouse E. N. E $\frac{1}{2}$ E. $12\frac{1}{2}$ miles; Waugoshance Lighthouse, S. E. by S. $1\frac{1}{2}$ miles; Gray's Reef Light-Vessel, W. S. W. $\frac{1}{2}$ W. 4 miles; White Shoal Light-Vessel N. W. by N. $2\frac{1}{2}$ miles. The buoy is on a line between Waugoshance Lighthouse and the White Shoal Light-Vessel and a little northerly of a line between St. Helena Lighthouse and Gray's Reef Light-Vessel, which ranges should be useful in turning this buoy at night.

Waugoshance Eighteen-Foot Shoal.—The 2d class nun buoy, red and black horizontal stripes, has been discontinued.

Beaver Island Channel.—A black spar buoy in 15 feet of water, about 1,100 yards N. N. E. $\frac{1}{2}$ E. from the N. E. point of Beaver Island. The shoal is nearly dry about 20 yards to the southward and westward of the buoy, the N. W. point of island W. $\frac{1}{2}$ S. This channel is good at the present stage of water for a draft of $18\frac{1}{2}$ feet. The shoalest water extends from N. E. of Beaver Island through the 17-foot patch on the chart, apparently all the way across to Garden Island. There are 6 fathoms close to the buoy.

Whiskey Island Shoal.—A red spar buoy in 17 feet of water, on the extreme south point of the shoal, lying to the southward and westward of Whiskey Island, N. W. point of Beaver Island S. E. by E., N. W. point of Trout Island W. S. W. $\frac{1}{2}$ W.

LAKE MICHIGAN.

WHITE RIVER LIGHT-STATION, CHANGE.—This light has been changed from a fixed white light varied by a red flash every minute, to a fixed white light varied by a red flash every 40 seconds. See page 170.

GRAND HAVEN LIGHT-STATION, CHANGE.—This light has been changed from a fixed white light varied by a white flash every ninety seconds, to a fixed white light varied by a white flash every minute. See page 171.

Kalamazoo Pierhead Beacon-Light, Change.—This light has been discontinued as a pierhead light, and re-established without change of characteristic as a coast light in the old light-tower surmounting the Keeper's dwelling, on the N. side of the mouth of the Kalamazoo river. The focal plane is 53 feet above the lake level and the light is visible in clear weather 14½ miles. See page 173.

St. Joseph Pierhead Range Light.—The fixed red tubular range light, which was discontinued in 1891, owing to the shifting of the channel over the outer bar, has been re-established on a post 25 feet high, on the outer end of the N. pier. The light should be visible on a clear night 2 or 3 miles and with the St. Joseph Pierhead Beacon-Light forms a range, showing the direction of the pier, and the course for entering the harbor. See page 173.

ST. JOSEPH LIGHT-STATION, CHANGE.—The light on the bluff has been changed from fixed white, varied by a white flash every ninety seconds, to fixed white varied by a white flash every 45 seconds. The order of the light has not been changed. See page 173.

St. Joseph Channel Buoy, Change.—The black spar buoy that formerly marked the north side of the channel, has been removed, and a red spar buoy placed in 12 feet of water on the northwest point of the shoal, on the south side of channel. See page 175.

Chicago Outer Breakwater Light, Change.—The fixed white lens-lantern on the N. W. end of the outer breakwater, has been removed to the Emergency Intake Water Works crib, an extension northwesterly of the outer breakwater. The focal plane of the light is now 45 feet above the level of the lake. Light shown from a post attached to S. E. side of building on crib, rising 8 feet above house. See page 179.

KENOSHA, OR SOUTHPORT LIGHT-STATION, CHANGE. This light has been changed from a fixed white light varied by a white flash every 90 seconds, to a fixed white light varied by a white flash every 45 seconds. See page 180.

MILWAUKEE LIGHT-STATION, CHANGE.—This light has been changed from a fixed white light, varied by a white flash every two minutes, to a fixed white light varied by a white flash every 45 seconds. See page 184.

Sheboygan Pierhead Range Light.—A fixed red lens-lantern range light has been established on a post 22 feet high on the outer end of the North Pier. The light should be visible in clear weather 2 or 3 miles, and with the Pierhead Beacon light forms a range showing the direction of the piers and the course for entering the harbor. See page 184.

AHNAPEE PIERHEAD BEACON-LIGHT.—A fixed red lens-lantern light, visible 8½ miles. White, open frame tower, square in plan, upper part enclosed. Near the outer end of north pier, at the entrance to Ahnapee harbor. The focal plane is 37 feet above the lake level. See page 187.

Ahnapee Pierhead Range Light.—A fixed red lens-lantern range light visible 2 to 3 miles in clear weather. On a post 22 feet high on the outer end of the north pier. This light, with the Pierhead Beacon light, forms a range showing the direction of the pier and the course for entering the harbor. A Life Saving Station has been established in this harbor.

Poverty Island Passage, Change of Buoys.—The black spar buoy on Gravelly Island 17-foot shoal, has been removed, and a black second-class can buoy put in its place. Poverty Island light E. by S. ½ S. 3¼ miles. See page 191.

Poverty Island Shoal.—The black and red horizontal stripes spar buoy on Poverty Island 15-foot shoal has been removed. A red second-class can buoy has been placed in 20 feet of water, marks a narrow rocky ledge with 23 feet of water over it, extending about 500 yards S. by E. from this buoy. Poverty Island light S. E. by E. $\frac{1}{2}$ E., 2 $\frac{1}{2}$ miles. Gravelly Island S. W. $\frac{1}{2}$ S., 1 $\frac{1}{2}$ miles.

SQUAW ISLAND LIGHT-STATION.—A fixed red light varied by a red flash every 15 seconds, 4th order, visible 15 $\frac{1}{2}$ miles. Red brick tower 48 feet high, square at base, and octagonal above, and forming the N. W. corner of red brick dwelling with red roof. On the northerly end of Squaw Island, the most northerly of the Beaver Island group. The light illuminates the entire horizon. The focal plane is 60 feet above the lake level. During thick or foggy weather a 10-inch steam whistle sounds blasts of 5 seconds' duration, separated by alternate silent intervals of 20 and 40 seconds. The fog-signal house stands about 200 feet N. by E. from the light tower, it is a red brick structure with corrugated iron roof painted brown. A coast light marks the turning point into Lake Michigan; Garden Island N.; Tangent, E. by S. $\frac{1}{2}$ S. 3 $\frac{1}{2}$ miles. Seul Choix Pointe lighthouse, W. by N. $\frac{1}{2}$ N. 16 $\frac{1}{2}$ miles; Scott's Point N. W. by N. $\frac{1}{2}$ N. 9 $\frac{1}{2}$ miles. See page 191.

Squaw Island Shoal.—Black, 2d-class nun buoy in 23 feet of water. Marks the northerly end of shoal making off from the N. E. end of Squaw Island; Squaw Island lighthouse S. by W. $\frac{1}{2}$ W. 1 $\frac{1}{2}$ miles; Garden Island shoal buoy E. $\frac{1}{2}$ S. 3 $\frac{1}{2}$ miles; Lansing buoy N. 5 $\frac{1}{2}$ miles. See page 191.

Lansing Shoal.—A red 2d-class nun buoy in 28 feet of water. Marks the S. E. end of a shoal N. $\frac{1}{2}$ E. from Squaw Island light. There is a spot with 19 $\frac{1}{2}$ feet 700 yards N. W. $\frac{1}{2}$ W. and another with 23 feet 1500 yards W. $\frac{1}{2}$ N. from this buoy. Seul Choix Pointe lighthouse, W. $\frac{1}{2}$ N. 16 $\frac{1}{2}$ miles; Squaw Island lighthouse, S. $\frac{1}{2}$ W. 4 $\frac{1}{2}$ miles; Squaw Island buoy, S. 3 $\frac{1}{2}$ miles; Simmons Reef light-vessel E. 17 $\frac{1}{2}$ miles. This buoy is intended to cover an extensive shoal.

Garden Island Shoal.—A red and black horizontal striped spar buoy in 15 feet of water. Stands in the center of small shoal N. from Garden Island; Squaw Island buoy W. $\frac{1}{2}$ N. 3 $\frac{1}{2}$ miles; W. end of Garden Island S. S. W. $\frac{1}{2}$ W. 2 $\frac{1}{2}$ miles. See page 191.

GREEN BAY.

Sherwood's Point Light-Station.—A fog bell tower has recently been erected on Sherwood's Point, the south side of the entrance to Sturgeon Bay from Green Bay, from which a bell is scudded in thick and foggy weather. The bell is struck by machinery a single blow every 12 seconds. The tower is a square pyramidal structure, 25 feet high, the lower part painted white, upper part buff, roof bright red. It is situated 13 feet N. N. E. of the light tower.

CHANGE IN PILOT RULES.

At a meeting of the Board of Supervising Inspectors held in Washington, D. C. January 31st, 1893, Section 8 of Pilot Rules was changed so as to read as follows: (For rules see page 253).

1st. When steamers are running in the same direction, and the pilot of a steamer which is astern shall desire to pass on the right or starboard hand of the steamer ahead, he shall give one short blast of the steam whistle, as a signal of such desire and intention, and shall put his helm to port, or if he shall desire to pass on the left or port side of the steamer ahead, he shall give two short blasts of the steam whistle as a signal of such desire and intention, and shall put his helm to starboard. And the pilot of the steamer ahead shall answer by the same signals, or if he does not think it safe for the steamer astern to attempt to pass at that point, he shall immediately signify the same by giving several short and rapid blasts of the steam whistle, and under no circumstances shall the steamer astern attempt to pass the steamer ahead until such time as they have reached a point where it can be safely

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done, when said steamer ahead shall signify her willingness by blowing the proper signals. The boat ahead shall in no case attempt to cross the bow or crowd upon the course of the passing steamer.

2d. That in the navigable channels of the Great Lakes and their tributary and connecting waters less than 500 feet in width, no steam vessel shall pass another going in the same direction, unless the steam vessel ahead be disabled and signify her willingness that the steam vessel astern shall pass, when the steam vessel astern may pass at a rate of speed not exceeding five miles per hour.

3d. And when steam vessels, running in opposite directions, are about to meet in such channels, both such vessels shall be slowed down to a speed not exceeding five miles per hour.

4th. That in such channels the descending steam vessel shall have the right of way. The pilot of such descending steamer shall signify his desire and intention by giving the proper signal before the steamers have arrived at a distance of one-half mile of each other.

This rule when approved to take effect May 1, 1893.

WATER TABLES.

Showing in feet and decimals the mean elevation of the surface of Lake Huron and Lake Michigan, above the mean tide at New York; from observations made at Port Austin and Sand Beach. The high water of 1888 is 584.84 feet above mean tide at New York City:

Date.	May.	June.	July.	August.	September.	October.	November.
1891	580.45	580.40	580.43	580.33	580.14	579.77	579.46
1892	579.33	580.16	580.45	580.53	580.96	580.15	579.82

By subtracting the figures in the above table for the year 1891, from 534.84, it will be found to correspond with the figures in the table for that year on page 284.

TABLE showing in feet and decimals the mean elevation of the surface of Lake Superior, above mean tide at New York City, from observations made above the locks at St. Mary's Falls Canal:

Date.	May.	June.	July.	August.	September.	October.	November.
1891	601.231	601.180	601.292	601.304	601.238	601.294	601.185
1892	600.940	601.300	601.440	601.451	601.509	601.400	600.123

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d shoal buoy E. $\frac{1}{4}$ S.

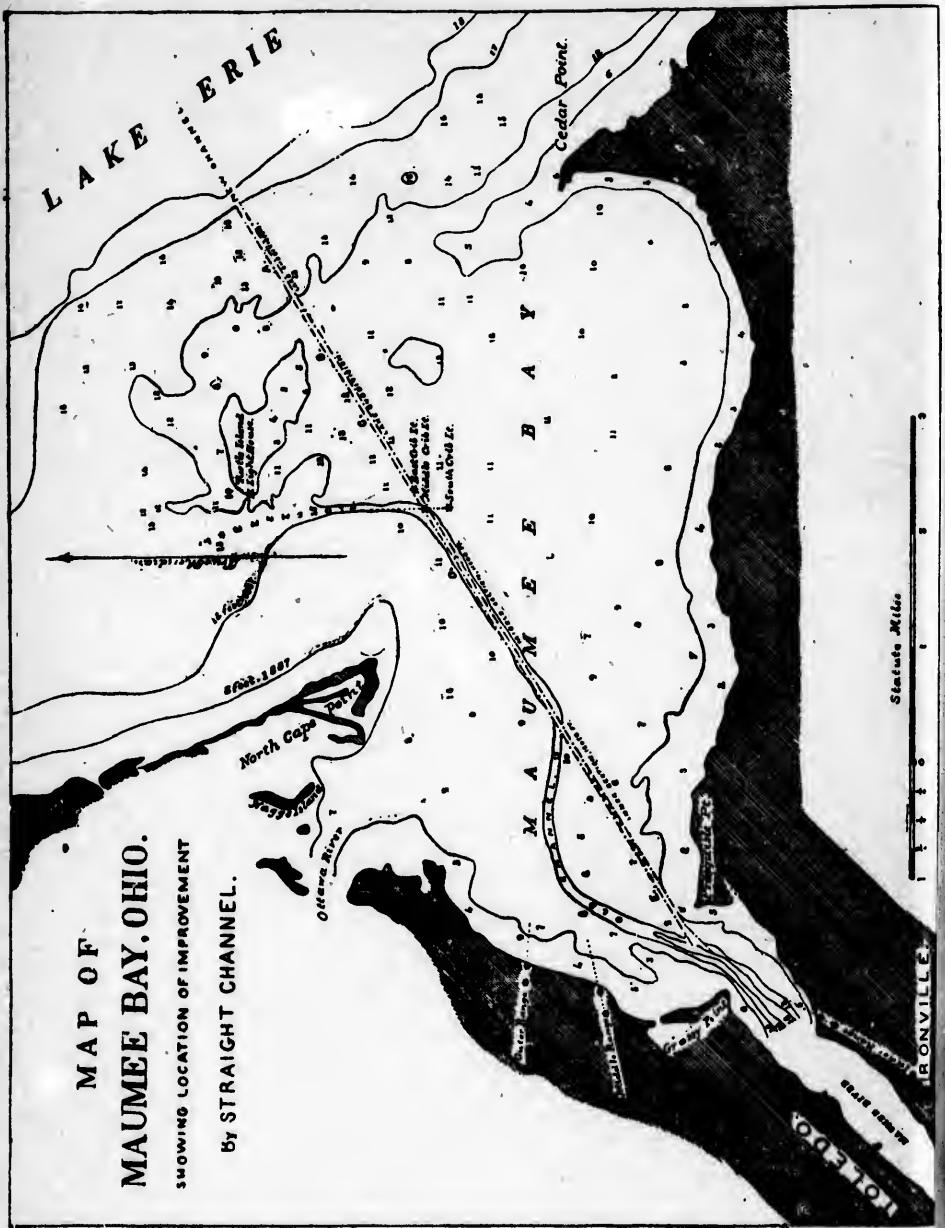
of water. Marks the
a spot with 19 $\frac{1}{2}$ feet
 $\frac{1}{4}$ N. from this buoy.
lighthouse, S. $\frac{1}{4}$ W.
vessel E. 17 $\frac{1}{2}$ miles.

striped spar buoy in
Garden Island; Squaw
S. W. $\frac{1}{4}$ W. 2 $\frac{1}{2}$ miles.

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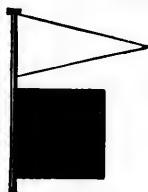
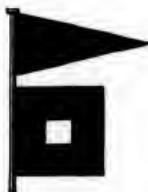
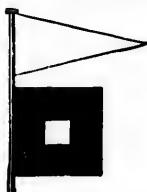
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STORM, CAUTIONARY AND WIND-DIRECTION SIGNALS.

The square flags indicate the character of the storm, whether moderate or severe.

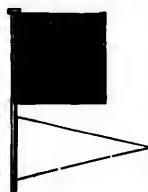
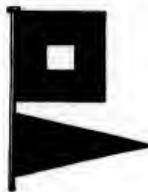
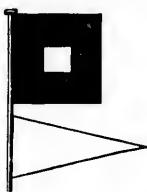
MODERATE STORM.

SEVERE STORM.



Northwesterly winds. Northeasterly winds.

Northwesterly winds. Northeasterly winds.



Southwesterly winds. Southeasterly winds.

Southwesterly winds. Southeasterly winds.

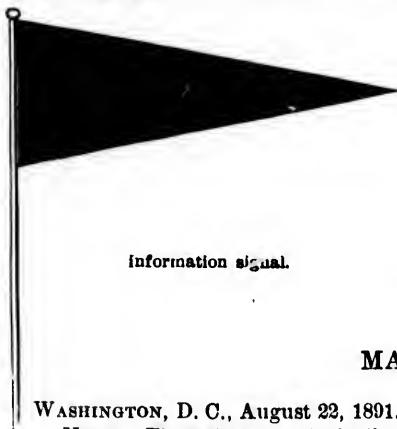
A red flag with a white center indicates that the winds expected will not be so severe, but well-found, sea-worthy vessels can meet them without danger.

A red flag with a black center indicates that the storm is expected to be of marked violence.

The pennants displayed with the flags indicate the direction of the wind; red, easterly (from northeast to south); white, westerly (from southwest to north). The pennant above the flag indicates that the wind is expected to blow from the northerly quadrant; below, from the southerly quadrant.

By night a red light will indicate easterly winds, and a white light above a red light will indicate westerly winds.

Hoisting signals for each quadrant is an opinion only, offered to aid the public.



Information signal.

The "Information Signal" consists of a red pennant of the same dimensions as the red and white pennants (direction signals), and when displayed indicates that the local observer has received information from the central office of a storm covering a limited area, dangerous only for vessels about to sail to certain points. The signal will serve as a notification to shipmasters that the necessary information will be given them upon application to the local observer.

MARK W. HARRINGTON,

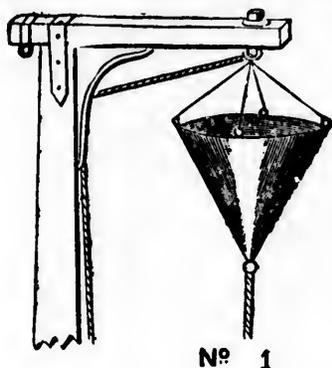
Chief of Weather Bureau.

WASHINGTON, D. C., August 23, 1891.

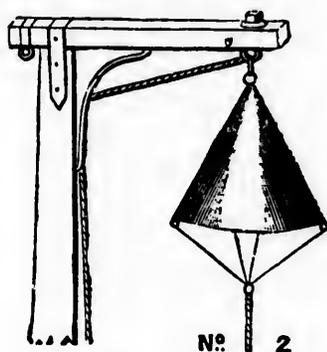
NOTE —These signals, principally for the information of maritime interests, are distinct from the system of weather, temperature and rain signals displayed throughout the country.



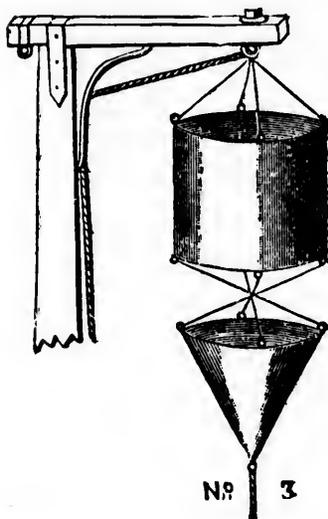
STORM SIGNAL CODE AS EMPLOYED AT CANADIAN LAKE STATIONS.



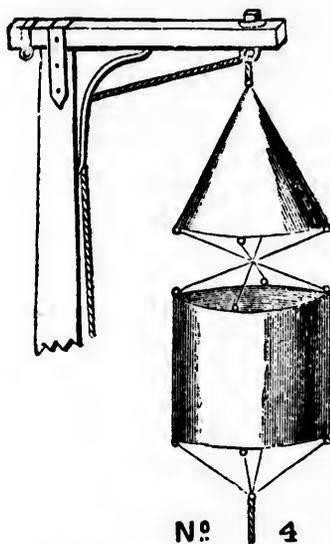
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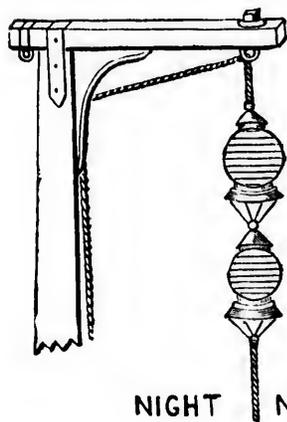
Nº 2



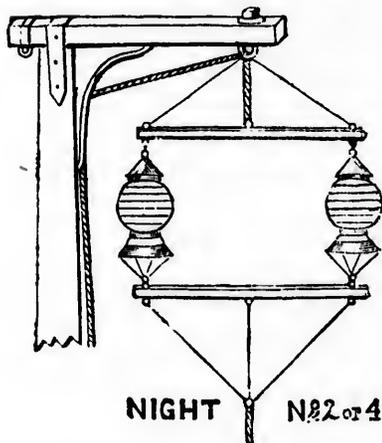
Nº 3



Nº 4



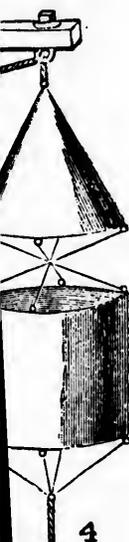
NIGHT Nº 1 or 2



NIGHT Nº 2 or 4

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Directions to Mariners, with Reference to Canadian Storm Warnings issued for the Lakes.

FIG. No. 1.—This signal, if displayed on Lakes Superior, Erie or Ontario indicates “moderate gale is expected, at first from an *Easterly* direction.” If displayed on Lake Huron or Georgian Bay, indicates a “moderate gale is expected, at first from a *Southerly* direction.”

FIG. No. 2.—If displayed on Lakes Superior, Erie or Ontario, indicates “moderate gale is expected, at first from a *Westerly* direction.” If displayed on Lake Huron or Georgian Bay, indicates “moderate gale is expected, at first from a *Northerly* direction.”

FIG. No. 3.—If displayed on Lakes Superior, Erie or Ontario, indicates that a “heavy gale is expected, at first from an *Easterly* direction.” If displayed on Lake Huron or Georgian Bay, indicates “heavy gale is expected, at first from a *Southerly* direction.”

FIG. No. 4.—If displayed on Lakes Superior, Erie or Ontario, indicates “heavy gale is expected, at first from a *Westerly* direction.” If displayed on Lake Huron or Georgian Bay, indicates “heavy gale is expected, at first from a *Northerly* direction.”

The *Cone*, when hoisted by itself, indicates that it is expected that the wind will attain a velocity of 25 miles an hour, but will not exceed 35 miles, and it is not intended that an ordinary well found vessel should stay in port, but simply as a warning to mariners that strong winds are expected from the quarter indicated.

The *Drum* will always be hoisted when the velocity of the wind is expected to exceed 35 miles an hour.

The night signal corresponding to Nos. 1 and 3 is two lanterns *hanging perpendicularly*.

Night signal corresponding to Nos. 2 and 4 is two lanterns *hanging horizontally*.

NOTE I.—Mariners will be able to obtain further information from Storm Signal Agents, or by consulting the daily probabilities.

NOTE II.—Mariners must always bear in mind that the storm signals are merely *cautionary*, and do not necessarily mean that a storm will occur at the place where the signal is displayed, but that one is expected either there or within such a distance that vessels leaving port would be liable to be caught in it.

NOTE III.—October and November are the months in which severe storms most frequently occur on the Lakes. In these fall storms on Lakes Erie and Ontario, the wind almost invariably commences at the S. E., works round through South to West and North-West, the time of the hardest blow being usually when the barometer begins to rise as the wind gets around to the West. On Lake Huron and the Georgian Bay, the wind—though for the most part changing as on the Lower Lakes—not unfrequently changes with great suddenness, chopping after a lull from S. S. E. to N. W., and blowing hardest, as a rule, from the N. W.

CANADIAN STORM SIGNAL STATIONS.

KINGSTON,	OAKVILLE,	PELÉE ISLAND,	TOBERMORY,
PICTON,	HAMILTON,	AMHERSTBURG,	PRESQUE ISLE.
DESERONTO,	PORT DALHOUSIE,	SARNIA,	OWEN SOUND,
COBOURG,	PORT COLBORNE,	BAYFIELD,	COLLINGWOOD,
PORT HOPE,	PORT DOVER,	GODERICH,	MIDLAND,
TORONTO,	PORT BURWELL,	KINCARDINE,	PERRY SOUND,
PORT CREDIT,	PORT STANLEY,	SAUGEEN,	SAULT STE. MARIE,
		PORT ARTHUR.	

Explanation of the Signals adopted by the United States Weather Bureau.

1. The Weather Bureau furnishes, when practicable, for the benefit of the general public and those interests dependent to a greater or less extent upon weather conditions, the "Forecasts," which are prepared at this office daily, at 10 a. m. and 10 p. m., for the following day. These weather forecasts are telegraphed to observers at stations of the Weather Bureau, railway officials, and many others, and are so worded as to be readily communicated to the public by means of flags or steam whistles. The flags adopted for this purpose are five in number, and of the form and dimensions indicated below.

Explanation of Flag Signals.



Number 1, white flag, six feet square, indicates clear or fair weather. Number 2, blue flag, six feet square, indicates rain or snow. Number 3, white and blue flag (parallel bars of white and blue), six feet square, indicates that local rains or showers will occur, and that the rainfall will not be general. Number 4, black triangular flag, four feet at the base and six feet in length, always refers to temperature; when placed above numbers 1, 2 or 3, it indicates warmer weather; when placed below numbers 1, 2 or 3, it indicates colder weather; when not displayed, the indications are that the temperature will remain stationary, or that the change in temperature will not vary more than four degrees from the the temperature of the same hour of the preceding day from March to October, inclusive, and not more than six degrees for the remaining months of the year. Number 5, white flag, six feet square, with black square in centre, indicates the approach of a *sudden* and *decided* fall in temperature. This signal is not to be displayed unless it is expected that the temperature will fall to forty-two degrees or lower, and is usually ordered at least twenty-four hours in advance of the cold wave. When number 5 is displayed, number 4 is always omitted.

FULL STATIONS.

ALPENA.	DULUTH.	MARQUETTE.	ROCHESTER.
BUFFALO.	ERIE.	MILWAUKEE.	SAULT STE. MARIE.
CHICAGO.	GRAND HAVEN.	OSWEGO.	SANDUSKY.
CLEVELAND.	GREEN BAY.	PORT HURON.	TOLEDO.
DETROIT.	MANISTEE.		

DISPLAY STATIONS.

AHNAPPEE.	DUNKIRK.	LUDINGTON.	SAND BEACH.
ASHLAND.	EAST TAWAS.	MACKINAC CITY.	SHEBOYGAN.
ASHTABULA.	ESCANABA.	MANITOWOC.	SODUS POINT.
BAY CITY.	FAIR HAVEN.	MENOMINEE.	SOUTH HAVEN.
BAYFIELD.	FRANKFORT.	MUSKEGON.	ST. JOSEPH.
CAPE VINCENT.	GLENN HAVEN.	OSCODA.	STURGEON BAY.
CHARLEVOIX.	KREWAUNEE.	PETOSKEY.	TONAWANDA.
CHARLOTTE.	KENOSHIA.	RACINE.	WHITE FISH POINT.
CHEBOYGAN.			

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Cold Wave.

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EON BAY.
WANDA.
E FISH POINT.

SCOTT'S

NEW COAST PILOT

FOR THE LAKES,

CONTAINING A COMPLETE LIST OF ALL THE

Lights and Light-Houses, Fog Signals and Buoys,

ON BOTH THE AMERICAN AND CANADIAN SHORES,

WITH A FULL DESCRIPTION OF ALL THE

HARBORS AND BREAKWATERS COMPLETED AND IN PROGRESS,
WITH DIRECTIONS FOR ENTERING THEM, A LIST
OF ALL THE LIFE SAVING STATIONS, AND
OTHER USEFUL INFORMATION;

ALSO

Courses (corrected for Magnetic Variation of the Compass), Distances

And Sailing Directions for all Lakes and Rivers, and Directions for Correcting Courses
and Bearings for Magnetic Variation and Deviation of the Compass.

WITH TABLES OF DISTANCES FOR EACH OF THE LAKES.

Compiled from the most reliable sources, and from personal notes and observations of over forty years
experience on the Lakes.

BY GEORGE SCOTT, DETROIT, MICHIGAN,
LICENSED PILOT OF ALL THE LAKES.

FOURTH EDITION, REVISED AND ENLARGED,

WITH MAPS, DIAGRAMS AND ILLUSTRATIONS.

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PREFACE.

In presenting the *Fourth Edition* of Scott's New Coast Pilot to the public, the author desires to say that the former Editions have been carefully revised and corrected and many additions made.

The publication of a New Edition of the Coast Pilot at this time is rendered necessary by the many changes that have taken place in the Aids to Navigation and the improvements made to the Rivers and Harbors within the last two years, or since the last Edition of the Coast Pilot was published.

Among the many new Aids to Navigation that have been established, and changes made during the last year may be mentioned the lights on Devil island, Two Harbors, Seul Choix pointe, Chicago breakwater, Windmill Point ranges, and Grosse Isle ranges; the light-vessels on Simmon's reef, White shoals, and Gray's reefs; and the change in the character of the lights on Point Betsey, Porte des Morts, Saginaw river, Tawas, and Portage river, Lake Superior. Fog-signals on Devil island, Two Harbors, Lapoint, and Point Betsey; and changes at Evanston and Mississagua straits (Canadian); buoys at Squaw island, Garden island, at the north end of Lake Michigan, and in the Strawberry passage, Green Bay; and the removal of the iron buoys on Simmon's reef, White shoals, and Gray's reefs, and change from spar buoys to iron buoys on Vienna and Waugoshance shoals. The straight channel in Maumee Bay has been cut from the Bay ranger into the mouth of the river. Many lights have been established by the Canadian Government, and the canal connecting the Bay of Quinte with Presque Isle bay is completed—all of which have been carefully noted.

The St. Mary's River range lights and beacons are now in the course of construction, and it is thought they will be in operation before the close of the season.

A little map of Port Arthur and Fort William, and the Storm Signal Code, as employed at Canadian Lake Stations, with directions to mariners with reference to their use, has been introduced.

A new Magnetic Chart for the year 1890, showing the lines of equal magnetic declinations (called Isogonic lines), is given. This chart shows the variation of the compass in the vicinity of the Lakes, and it is very important when we consider that all the courses taken from the charts of the Lake Survey, and the courses and bearings given in the U. S. Lighthouse and Buoy lists are true, and require to be corrected for variation before being used.

The Depth of Water given in the harbors are not always to be relied on, owing partly to the fluctuations of the water surface of the Lakes, but more particularly to the formation of sand bars between or in advance of the piers. The only remedy for these obstructions is the extension of the piers and annual dredging.

It is confidently believed that the "Coast Pilot" is now much improved, and will be of service to Vessel Masters as a ready reference. Bad mistakes are frequently made, not from a want of knowledge on the subject, but from a temporary incorrectness of thought; this is frequently the case in applying variation, and deviation, in correcting compass errors. It will also be of service to those who are not gifted with retentive memories. The work is particularly recommend to the young sailor who desires to succeed in his calling, who by carefully studying the charts, and the "Coast Pilot," can acquire a knowledge of the Lakes in a short time, what others have been years learning by personal observation.

VARIATION OF THE COMPASS.

The True Meridian.—A line drawn direct from the north pole to the south pole, cutting the equator at right angles, is a *true* meridian.

The Magnetic Meridian.—The direction taken by the north end of a freely suspended magnet (compass needle) is the *magnetic* meridian.

The Magnetic Equator.—The term magnetic equator is applied to those places where the needle has no inclination or dip, but rests in a horizontal direction. The line of no dip (magnetic equator) nearly coincides with the geographical equator; proceeding northward the north end of the needle is drawn downward at an increasing angle, called the *dip*, until it becomes vertical; but proceeding southward the south end of the needle dips in the same manner. The lines of equal dip are nearly parallel.

The Magnetic Pole.—The term magnetic pole is generally applied to those positions on the earth's surface where the horizontal force disappears and a freely suspended needle becomes vertical.

Variation.—The angle included between the true meridian and the magnetic meridian is called the *variation of the compass*. The error from the variation of the compass being entirely independent of the ship, affects every point of the compass to the same extent. This angle varies in different localities, and there is a small annual change; the easterly variation is decreasing, and the westerly variation is increasing at the rate of from 3' to 5' annually. A magnetic chart is given in this work showing the lines of equal variation, and tables of magnetic declinations, showing the variation of the compass at the most important points on each of the great lakes. These tables have been carefully selected from a chart and table of magnetic declinations in Professional Papers, Corps of Engineers, U. S. Lake Survey, corrected to the year 1890.

TO CORRECT A COMPASS COURSE FOR VARIATION.

Case I.—In this case, suppose the course has been steered and it is desired to find the true course made good.

If the Variation is Easterly, that is if the north point of the compass is drawn to the eastward, or right hand, *allow it to the right*. If the variation is *westerly*, that is if the north point of the compass is drawn to the westward or left hand, *allow it to the left*.

Note.—All courses and bearings given on the charts of the Lake Survey are True, and require to be corrected for variation and deviation where it exists.

EXAMPLE 1. The compass course steered E. by S. $\frac{1}{4}$ S. or S. $73^{\circ} 7'$ E. with variation $5^{\circ} 37'$ E. gives the true or chart course S. $67^{\circ} 30'$ E. or E. S. E.

EXAMPLE 2. The compass course steered S. W. by W. or S. $56^{\circ} 15'$ W. with variation 4° W. gives the true or chart course S. $52^{\circ} 15'$ W. or S. W. $\frac{1}{4}$ W. nearly.

EXAMPLE 3. The compass course steered N. E. or N. 45° E. with variation $8^{\circ} 26'$ E. gives the true or chart course N. $53^{\circ} 26'$ E. or N. E. $\frac{1}{4}$ E.



TO CORRECT A COMPASS BEARING FOR VARIATION.

The correction is precisely the same as in Case I. for correcting a compass course for variation.

EXAMPLE 1. An object bears S. E. or S. 45° E. the variation is $5^{\circ} 37'$ W. the true bearing will be S. $50^{\circ} 37'$ E. or S. E. $\frac{1}{4}$ E.

EXAMPLE 2. An object bears W. by N. or N. $78^{\circ} 45'$ W. the variation is $11^{\circ} 15'$ E. the true bearing will be N. $67^{\circ} 30'$ W. or W. N. W.

Note.—With easterly variation the true bearing is always to the right of the magnetic bearing, and with westerly variation to the left. But if the true bearing is given to find the magnetic, the rule must be reversed.

TO SHAPE A COMPASS COURSE CORRECTED FOR VARIATION.

Case II. It is required in this case to correct the course for variation before steering; it is the reverse of Case I.

If the variation is easterly, allow it to the left. If the variation is westerly, allow it to the right gives compass course.

EXAMPLE 1. The true or chart course from Devil island to Duluth, Lake Superior, is W. by S. $\frac{3}{4}$ S. or S. $70^{\circ} 19'$ W. the variation at Devil island is about 8° E. and at Duluth 10° E.; one-half the sum of these variations 9° E. is the mean variation, which is approximately equal to $\frac{1}{2}$ of a point of the compass; as the variation is easterly, the correction is made by applying the 9° or $\frac{1}{2}$ of a point to the left hand, making the corrected compass course S. W. by W. $\frac{1}{4}$ W. or S. $61^{\circ} 19'$ W.

EXAMPLE 2. The true, or chart course from Port Dalhousie to the Ducks, on Lake Ontario, is E. by N. $\frac{1}{2}$ N. or N. $70^{\circ} 19'$ E.; the variation at Port Dalhousie is 4° W. and at the Ducks about 7° W.; one-half the sum of these variations $5\frac{1}{2}^{\circ}$ W. is the mean variation, which is practically equal to $\frac{1}{2}$ a point of the compass, as the variation is westerly, the correction is made by applying the $5\frac{1}{2}^{\circ}$ or $\frac{1}{2}$ a point to the right hand, making the corrected compass course E. by N. $\frac{1}{4}$ N. or N. $75^{\circ} 58'$ E.

EXAMPLE 3. The true or chart course from Chicago to Pilot island, entrance to Green bay, is N. 8° E. or N. $\frac{1}{4}$ E. nearly, the variation at Chicago is $4^{\circ} 12'$ E. and at Pilot island $3^{\circ} 28'$ E.; one-half the sum of these variations $3^{\circ} 50'$ E. is the mean variation, which is practically equal to $\frac{1}{2}$ of a point of the compass, as the variation is easterly the correction is made by applying the $\frac{1}{2}$ of a point, or $3^{\circ} 50'$ to the left hand, making the corrected compass course N. $4^{\circ} 10'$ E. or N. $\frac{1}{4}$ E. nearly.

DEVIATION OF THE COMPASS ON IRON AND STEEL SHIPS.—Extracts from Naval Professional Papers, by T. A. Lyons, Lieut. Commander U. S. N. The Sailor's Pocket Book, by Capt. F. G. D. Bedford, R. N., and the Reports of the Liverpool Compass Committee.

The Magnet.—The characteristic features of a magnet are two poles of equal strength but of different nature; they are separated by a neutral ground.

Induction.—The production of magnetic power in iron by the action of an external magnet is called "induction." The magnet pole

by induction produces a pole of opposite character in the nearest part of the iron.

THE COMPASS NEEDLE is a freely suspended magnet, that is free to move horizontally.

Polarity.—The influence that gives directive force to the compass needle, causing it to point to the magnetic north, is called polarity.

It is customary to regard the polarity which exists in the north end of the compass needle "north" (red) polarity, whence it follows that "south" (blue) polarity must pervade the regions of the terrestrial north, because it is a law of nature that bodies similarly magnetized will repel, while those dissimilarly magnetized will attract each other.

Soft Iron, as regards magnetism, is iron which becomes instantly magnetized to its full capacity, when exposed to the influence of any magnetized body, and which loses its magnetism instantly when the influencing body is removed.

Hard Iron, is iron which does not become magnetized by ordinary induction, but which, when magnetized, retains its magnetism, unaffected by the influence of other magnetic bodies; it becomes magnetic by induction aided by percussion; permanent magnets are necessarily made of hard iron.

Supposing south (blue) polarity to pervade the northern hemisphere, then if a bar of "soft" iron be held in a vertical position, it becomes magnetic through the inductive agency of the earth's vertical force, the lower end will be magnetized with "north" (red) polarity, and the upper end with "south" (blue) polarity; turn the bar end for end, and the polarity is instantly reversed; the upper end of the bar will attract the north end of the compass needle, and the lower end will repel it. If the bar is laid horizontally in the meridian it will become magnetic through the inductive agency of the earth's horizontal force, the north end will be magnetized with "north" (red) polarity, and the other end with "south" (blue) polarity; if the bar is turned transverse to the meridian, that is east and west, it will lose its magnetism.

THE DEVIATION of the compass on board an iron or steel ship is composed of three parts, namely, the *Semicircular Deviation*, the *Quadrantal Deviation*, and the *Heeling Error*. Some persons use the terms *Variation* and *Deviation* of the compass, as if they were of the same meaning. The well informed seaman makes a great distinction between the two, for the following reasons: The error from *Variation* of the compass, arises from the magnetic north not coinciding with the true north; it is always the same at the same place and time; it is independent of the ship entirely, and affects every point of the compass to the same extent. But it is not so with *Deviation* of the compass, which is caused by the iron in the ship, and which varies on almost every point of the compass.

THE SEMICIRCULAR DEVIATION, so called because all the phases occur in a semicircle, is due chiefly to the permanent magnetism acquired while the ship was being built; the ship has become a magnet partly by the inductive agency of the earth's magnetism, and partly by the great amount of hammering she has received. The direc-

tion of the magnetism of the ship as affecting the compass may be inferred from the direction in which her head was while building. The direction of the ship's magnetic force coincides nearly with the line drawn on deck in a magnetic north and south direction, and the points of maximum semicircular deviation are at right angles to the direction of the ship's head in building.

In iron ships the north end of the compass is invariably drawn towards that part of the ship, which was furthest from the north while the ship was building.

In an iron ship, built with her head to the north, the bow becomes magnetized with "north" (red) polarity, and the stern with "south" (blue) polarity, and when she lies with her head in a north or south direction, there is no apparent attraction of the needle towards either side, because the attraction is in the direction of the needle, but with her head in all other directions there is a strong attraction towards the stern.

With ships built with head to the south, the same principle will apply, the deviation being then towards the bow.

When built with head to the east, the deviation is towards the starboard side (the south in building), and when built with head to the west, to the port side (the south in building).

In ships built in intermediate positions the proceeding characteristics are combined, thus: If built with head to the N. E., the attraction will be aft and to starboard; with head to the N. W., aft and to port. If the head be S. E. or S. W., the attraction will be forward and to starboard, or forward and to port respectively.

The amount of original magnetism appears to have relation to the size of the vessel, or the quantity of iron used in her construction, in a ship of 400 tons built head to east, if a compass be carried fore and aft on a center line three or four feet from deck the deviation may be 10° or 12° when her head is north or south. In a ship 1000 tons it may, under the same circumstances, be 25° or 30° .

It is convenient to regard the magnetism of a ship as taking effect in three disturbing forces, the one acting *fore and aft*, one acting *athwartship*, and the third *vertical*. The one acting in a fore and aft direction produces a deviation named B, the one acting in an athwartship direction producing a deviation named C; therefore B and C constitute the semicircular deviation. The vertical force will produce no deviation when, as we here suppose, the ship is on an even keel.

The only way of destroying the effect of one magnetic disturbing force, is to introduce another magnetic disturbing agent, whose force follows the same laws and has the same magnitude, but which acts in the opposite direction, or in other words the effects of hard iron must be corrected by hard iron, and the effects of soft iron by soft iron. If, therefore, in the semicircular deviation B and C are known, the direction in which the counteracting force should be introduced can readily be determined, and the deviation corrected.

TO CORRECT A COMPASS BY TWO MAGNETS.—

This is the method mostly used in the merchant service. Bring the ship's head east or west magnetic; then place a magnet in a fore and aft direction, with the middle of the magnet's length in the vertical plane, passing athwartship through the center of the compass card; move the magnet nearer or farther off until the compass points correctly; that

part of the semicircular deviation called B (produced by the fore-and-aft force) is thus corrected. Similarly with the ship's head north or south magnetic, place a magnet athwartship parallel to the deck, with the middle of the magnet's length in the vertical plane, passing fore and aft through the center of the compass; move the magnet near or farther off until the compass points correctly; that part of the semicircular deviation called C (produced by the athwartship force of the ship) is thus corrected. The B or fore and aft magnet may be placed either on the port or starboard side of the compass, and the C magnet either before or abaft the compass, but neither magnet should be in the same horizontal plane as the card, nor should either be within twice the length of the compass needle from the center of the compass card.

The magnets can be secured to the sides of the binnacle or to the deck, but care should be taken that they be not reversed if taken up for any purpose.

The semicircular deviation of the compass in an iron ship alters when the vessel has lain a long time on the same course, or has been a long time alongside a wharf, or in a dry dock with her head in one direction.

It is important that every new ship, after launching, should be turned around and kept with her head in the opposite direction from which she was built, in order that she may lose as much as possible of the magnetism, which has not been firmly hammered into her, before adjusting the compasses.

THE QUADRANTAL DEVIATION of the compass, so called because all its phases occur in a quadrant, is caused solely by the "soft" iron in the ship; it does not change by the lapse of time, or change of geographical position. The earth's magnetic force which produces the greatest force when the ship is on the quadrantal points, viz: N. E., S. E., S. W. and N. W., and no effect when she is on the cardinal points, viz: north, east, south and west. This will appear evident when we consider that when a ship heads north or south the attraction is in the direction of the needle; and when heading east or west the soft iron loses its magnetism. Such deviation is caused chiefly by the iron beams of the ship, and generally is easterly when the ship's head points in the N. E. and S. W. quadrants, and westerly when it points in the N. W. and S. E. quadrants. Its amount does not usually exceed two or three degrees except in Iron Clads. To find the amount of the quadrantal deviation, take $\frac{1}{2}$ the algebraic sum of the N. E. and S. W. points; thus in the English iron clad ship Achilles the deviation at the N. E. is $24^{\circ} 10'$ east (marked +), the deviation at S. W. is $10^{\circ} 30'$ west (marked -) half the algebraic sum of these two $6^{\circ} 50'$. To find the quadrantal deviation from the deviations on the N. W. and S. E. points, the signs of both quantities must be changed; thus in the Achilles the deviation at N. W. is $19^{\circ} 30'$ west (or -) at S. E. 6° east (or +); half the algebraic sum of $+ 19^{\circ} 30'$ and $- 6^{\circ}$ is $+ 6^{\circ} 45'$.

As the deviation is caused by "soft" iron, we must use "soft" iron to correct it, and this is not easy in practice, owing to the difficulty of getting iron magnetically "soft" or free from permanent magnetism, and also from the close proximity to the compass which the correctors must occupy. On this account, as well as from the fact that the quadrantal deviation is unvarying, and usually of moderate amount, correction for quadrantal deviation is not often applied. The object of mechanical

correction of the compass being not an attempt at rigorous accuracy, but to bring the deviation within manageable limits.

For the correction of large quadrantal deviations, cast-iron cylinders, from nine to twelve inches long, are placed on a level with the compass needle; for smaller errors, boxes containing small iron chain or pieces of annealed wire are used, one on each side of the compass.

THE HEELING ERROR is caused (1) by the vertical force of the ship's magnetism which was acquired while building; (2) by vertical induction in vertical soft iron; and (3) by vertical induction in the beams, which are also soft iron. The mechanical correction is made by a magnet placed in a vertical position under the center of the compass card at such a distance as shall be found suitable. This distance may be determined by heeling the ship about 10° with her head in the direction which was north by compass when she was upright. Then place the magnet very accurately in its position perpendicular to the ship's deck—with windward heeling error the north end of the magnet should be uppermost, with leeward error the south end. Raise or lower the magnet until the compass points correctly. Heeling Error applies principally to iron sailing and steam ships when heeled over by a press of canvas, and as there are no iron sailing ships on the lakes at the present time, and steamers do not carry sufficient sail to heel them over, the whole subject of heeling error, as far as lake navigation is concerned, might be dismissed from view.

DEVIATION OF THE COMPASS ON WOODEN SHIPS.—In wooden sailing ships the points of maximum deviation of the compass are at east and west; their deviation, which is small, arises from induced magnetism in vertical iron, the effects of which vary as the tangent of the dip. In the northern hemisphere the deviation is easterly on easterly courses, and westerly on westerly courses.

In wooden steam ships where the smoke pipe and machinery and boilers are forward of the compass, the deviation will be easterly on easterly courses, and westerly on westerly courses; but if the smoke pipe, etc., are abaft the compass and near enough to influence it, the conditions will be reversed.

When the compass in a wooden ship, sailing continually in about the same latitude, has been properly adjusted, it is permanent, unless some change takes place in her smoke pipe or machinery.

[In the foregoing remarks on the deviation of the compass, directions have been given for its correction by the application of magnets.

The methods appear to be easy, the operation being entirely mechanical; still, to meet all the conditions that may arise, it requires skill and experience, and the placing the magnets should be done only by a practical compass adjuster, the cost of which is trifling when compared with its importance,—PUBLISHER.]

As the correction of the compass for deviation by magnets does not always remove quite all the error, and as the magnetism particularly in new iron ships is liable to change, the deviation should be frequently ascertained *by swinging the ship* around so as to bring her head on every point of the compass; and as her head approaches each of the points to check her way, in order to prevent the swinging of the compass card; when she is quite steady, and her head exactly on any point, the exact bearing of some distant object (whose magnetic direction is known, and

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whose distance should not be less than 8 miles) is to be taken with the standard compass and noted in a table she should be hauled around in the same manner to the next point, and when steady on it, the bearings of the same object is again observed and recorded, and so on until the bearings of the distant object has been taken successively on every point of the compass and recorded.

The bearings of the distant object can be ascertained by taking the standard compass on shore to some place where the distant object and the ship is in line, and there observe its bearings. Or by footing up all the bearings, if taken by degrees, and dividing the sum by the number of observations this would give the mean bearing; theoretically, this is the more correct method.

When it is not convenient to swing the ship, it is a good plan to take the standard compass on shore whenever an opportunity occurs, and take the bearings of some object in line with the binnacle, and then take the bearings when the compass is restored to the binnacle and note the difference; of course this would give the deviation only on that point, and for the standard compass only.

Another method is to watch the courses she makes when running on compass courses that are well known, and note the difference for that particular course.

FORM GENERALLY USED FOR REGISTERING BEARINGS WHEN SWINGING SHIP.

NOTE.—The following are actual bearings taken of the Lower Lighthouse at the St. Clair Flats Canal from a point in Lake St. Clair, nine miles distant:

CORRECT MAGNETIC BEARING N. 28½° E., OR N. N. E. ½ E. NEARLY.

Head by Standard Compass.	Bearings of Lighthouse by Standard Compass.	Deviation of Standard Compass.	Head by Standard Compass.	Bearings of Lighthouse by Standard Compass.	Deviation of Standard Compass.
North.	N. 24¼° E.	4° E.	South.	N. 32¼° E.	4° W.
N. by E.	N. 22° E.	6¼ E.	S. by W.	N. 34½ E.	6° W.
N. N. E.	N. 19° E.	9¼ E.	S. S. W.	N. 36¼ E.	8° W.
N. E. by N.	N. 17¼ E.	11° E.	S. W. by S.	N. 38¼ E.	10° W.
N. E.	N. 17° E.	11¼ E.	S. W.	N. 39° E.	10½ W.
N. E. by E.	N. 16° E.	12¼ E.	S. W. by W.	N. 40° E.	11° W.
E. N. E.	N. 16° E.	12¼ E.	W. S. W.	N. 41° E.	12° W.
E. by N.	N. 16¼ E.	12° E.	W. by S.	N. 41° E.	12½ W.
East.	N. 17° E.	11¼ E.	West.	N. 40¼ E.	12° W.
E. by S.	N. 18° E.	10¼ E.	W. by N.	N. 39° E.	10½ W.
E. S. E.	N. 19¼ E.	9° E.	W. N. W.	N. 38° E.	9½ W.
S. E. by E.	N. 21¼ E.	7° E.	N. W. by W.	N. 36¼ E.	8° W.
S. E.	N. 24° E.	4¼ E.	N. W.	N. 34° E.	5½ W.
S. E. by S.	N. 28° E.	2¼ E.	N. W. by N.	N. 32¼ E.	4° W.
S. S. E.	N. 28¼ E.	0°	N. N. W.	N. 30° E.	1½ W.
S. by E.	N. 30¼ E.	2° W.	N. by W.	N. 27° E.	1½ E.

The sum of all the bearings 914° ÷ 32 = 28¼° E. nearly.

DEVIATION TABLE FOR THE STANDARD COMPASS.

Ship's Head.	Deviation.	Correct Mag- netic Course.	Ship's Head.	Deviation.	Correct Mag- netic Course.
	°	°		°	°
N.	4 E.	N. 4 E.	S.	4 W.	S. 4 E.
N. by E.	6½ E.	N. 17½ E.	S. by W.	6 W.	S. 5¼ W.
N. N. E.	9½ E.	N. 32 E.	S. S. W.	8 W.	S. 14¼ W.
N. E. by N.	11 E.	N. 44½ E.	S. W. by S.	10 W.	S. 23½ W.
N. E.	11½ E.	N. 56½ E.	S. W.	10½ W.	S. 34½ W.
N. E. by E.	12½ E.	N. 68½ E.	S. W. by W.	11½ W.	S. 44½ W.
E. N. E.	12½ E.	N. 80 E.	W. S. W.	12½ W.	S. 55 W.
E. by N.	12 E.	S. 89¼ E.	W. by S.	12½ W.	S. 66¼ W.
E.	11½ E.	S. 78½ E.	W.	12 W.	S. 78 W.
E. by S.	10½ E.	S. 68½ E.	W. by N.	10½ W.	N. 89¼ W.
E. S. E.	9 E.	S. 58½ E.	W. N. W.	9½ W.	N. 77 W.
S. E. by E.	7 E.	S. 49½ E.	N. W. by W.	8 W.	N. 64¼ W.
S. E.	4½ E.	S. 40½ E.	N. W.	5½ W.	N. 50½ W.
S. E. by S.	2½ E.	S. 31½ E.	N. W. by N.	4 W.	N. 37½ W.
S. S. E.	0	S. 22½ E.	N. N. W.	1½ W.	N. 24 W.
S. by E.	2 W.	S. 18½ E.	N. by W.	1½ E.	N. 9¼ W.

DIRECTIONS FOR CORRECTING A COMPASS COURSE FOR DEVIATION.

Case III. In this case suppose the course has been steered, and it is desired to find the correct magnetic course made good.

If the deviation is easterly, *allow it to the right.*

If the deviation is westerly, *allow it to the left.*

NOTE 1. The deviation is said to be easterly when the north point of the compass is drawn to the eastward or right hand, and westerly when the north point of the compass is drawn to the westward or left hand.

NOTE 2. If the deviation table is in degrees the course should be expressed in degrees, otherwise in points and fractions of a point. In reading the compass by degrees, it is the custom on shipboard to read from north to 90° east or west, and from south to 90° east or west.

EXAMPLE 1. The compass course steered E. N. E. or N. 67° 30' E. with deviation by the table 12° 30' E. gives the correct magnetic course N. 80° E. or E. ¼ N. nearly.

EXAMPLE 2. The compass course steered S. W. or S. 45° W. with deviation by the table 10° 30' W. gives the correct magnetic course S. 34° 30' W. or S. W. ¼ S. nearly.

EXAMPLE 3. The compass course steered E. S. E. or S. 67° 30' E. with deviation by the table 9° E. gives the correct magnetic course S. 58° 30' E. or E. S. E. ¼ S. nearly.

EXAMPLE 4. The compass course steered W. by N. or N. 78° 45' W. with deviation by the table 10° 30' W. gives the correct magnetic course N. 89° 15' W. or W. ¼ N. nearly.

TO CORRECT COMPASS BEARINGS FOR DEVIATION.

The correction is applied in the same manner as in case III, except that the deviation in the direction of the ship's head is applied, and not the deviation on the bearing.

EXAMPLE 1. The ship's head by standard compass is E. N. E. the deviation when heading on that point of the compass as shown in the

deviation table is 12° 30' E. a light bears N. 67° 30' W. or W. N. W. the correct magnetic bearing will be N. 55° W. or N. W. $\frac{1}{4}$ W. nearly.

EXAMPLE 2. The ship's head by standard compass is S. W. the deviation when heading on that point of the compass as shown in the deviation table is 10° 30' W. a light bears N. 22° 30' E. or N. N. E. the correct magnetic bearing will be N. 12° E. or N. by E. $\frac{1}{4}$ E. nearly.

NOTE. With easterly deviation the correct magnetic bearing is always to the right of the compass bearing, and with westerly deviation to the left. This rule is to be reversed when the correct magnetic bearing is given to find the compass bearing.

TO SHAPE A COMPASS COURSE CORRECTED FOR DEVIATION.

Case IV. It is required in this case to correct the compass course for deviation before steering; it is the reverse of case III.

If the Deviation is easterly, allow it to the left. If the deviation is westerly allow it to the right.

EXAMPLE 1. The correct magnetic course is E. with deviation by the table 11° 30' E. gives compass course corrected for deviation N. 78° 30' E. or E. by N. nearly.

EXAMPLE 2. The correct magnetic course is W. S. W. or S. 67° 30' W. with deviation by the table 12° 30' W. gives compass course corrected for deviation S. 80° W. or W. $\frac{1}{4}$ S. nearly.

EXAMPLE 3. The correct magnetic course is N. N. E. or N. 22° 30' E. with deviation by the table 9° 30' E. gives compass course corrected for deviation N. 13° E. or N. by E. $\frac{1}{4}$ E. nearly.

EXAMPLE 4. The correct magnetic course is N. W. or N. 45° W. with deviation by the table 5° 30' W. gives compass course corrected for deviation N. 39° 30' W. or N. W. $\frac{1}{4}$ N. nearly.

TO CORRECT A COMPASS COURSE AT ONCE FOR BOTH VARIATION AND DEVIATION.

As in case I for correcting a compass course for variation, and also in case III for correcting a compass course for deviation, it is supposed the course has been steered, and it is desired to find the true course made good.

If both the deviation and variation are of the same name, that is both east or both west, add them together and apply them jointly according to their name.

EXAMPLE. The compass course steered is E. N. E. or N. 67° 30' E. the deviation by the table is 12° 30' E. and the variation 10° E. their sum is 22° 30' E. being applied to the right hand of E. N. E. gives the true course N. 90° E. or east.

But if one be E. and the other W. take their difference, give it the name of the greater and apply it according to that name.

EXAMPLE. Take the same course E. N. E. or N. 67° 30' E. and let us suppose the deviation is 12° 30' W. but the variation still 10° E. their difference will be 2° 30' W. being applied to the left hand of E. N. E. gives the true course N. 65° E. or N. E. by E. $\frac{1}{4}$ E. nearly.

SS.

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• E.
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41 1/2 W.
31 1/2 W.
21 1/2 W.
11 1/2 W.
1 1/2 W.

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TO SHAPE A COMPASS COURSE CORRECTED AT ONCE FOR DEVIATION AND VARIATION.

(When the variation is small.)

The correction is applied in the same manner as in case II for shaping a compass course corrected for variation, and in case IV for shaping a compass course corrected for deviation before steering.

If both the deviation and variation are of the same name, that is both east or both west, add them together and apply them jointly according to their name.

Take the 3d example in case IV, the true or chart course from Chicago to Pilot Island is N. 8° E. or N. $\frac{1}{4}$ E. nearly; the deviation in that course by the table is $6^{\circ} 30'$ E. and the mean variation $3^{\circ} 50'$ E. their sum is $10^{\circ} 20'$ E. or nearly $\frac{1}{4}$ of a point of the compass, being applied to the left hand gives the correct compass course N. $2^{\circ} 20'$ W. or N. $\frac{1}{4}$ W. nearly.

But if one be E. and the other W. take their difference, give it the name of the greater and apply it according to that name.

Take the 1st example in case IV. The true or chart course from Devil island to Duluth is W. by S. $\frac{1}{4}$ S. or S. $70^{\circ} 19'$ W. the deviation on that course by the table is $12^{\circ} 30'$ W. or $1\frac{1}{4}$ points of the compass nearly, the mean variation is 9° E. their difference $3^{\circ} 30'$ W. which being applied to the right hand gives the correct compass course S. $73^{\circ} 49'$ W. or W. by S. $\frac{1}{4}$ S. nearly.

NOTE. In shaping a course when the variation is large, the correction for the variation should be applied first to the true course to get the correct magnetic course, and then the deviation for that point taken from the deviation table and applied to the correct magnetic course to get the compass course. The reason for applying the variation first is that the deviation changes according to the direction of the ship's head, while the variation is the same on all points of the compass. This rule gives only an approximate compass course, particularly when the deviation is large. There are several Graphic Methods for reducing courses which give accurate results, a curve of deviations constructed upon the Napier method, or the straight line method of Archibald Smith are considered the best.

TABLE
FOR CONVERTING POINTS OF THE COMPASS AND THEIR FRACTIONAL PARTS
INTO DEGREES.

North to East.	Points.	Degrees, &c.			Points.	North to West.
North.	0	0	0	0	0	North.
N. ¼ E.	¼	1	24	22	¼	N. ¼ W.
N. ½ E.	½	2	48	45	½	N. ½ W.
N. ¾ E.	¾	4	18	7	¾	N. ¾ W.
N. by E.	1	5	37	30	1	N. by W.
N. by E. ¼ E.	1 ¼	7	1	52	1 ¼	N. by W. ¼ W.
N. by E. ½ E.	1 ½	8	26	15	1 ½	N. by W. ½ W.
N. by E. ¾ E.	1 ¾	9	50	37	1 ¾	N. by W. ¾ W.
N. N. E.	2	11	15	0	2	N. N. W.
N. N. E. ¼ E.	2 ¼	12	39	22	2 ¼	N. N. W. ¼ W.
N. N. E. ½ E.	2 ½	14	3	45	2 ½	N. N. W. ½ W.
N. N. E. ¾ E.	2 ¾	15	28	7	2 ¾	N. N. W. ¾ W.
N. E. by N.	3	16	52	30	3	N. E. by N.
N. E. ¼ N.	3 ¼	18	16	52	3 ¼	N. E. ¼ N.
N. E. ½ N.	3 ½	19	41	15	3 ½	N. E. ½ N.
N. E. ¾ N.	3 ¾	21	5	37	3 ¾	N. E. ¾ N.
N. E.	4	22	30	0	4	N. E.
N. E. ¼ E.	4 ¼	23	54	22	4 ¼	N. E. ¼ E.
N. E. ½ E.	4 ½	25	18	45	4 ½	N. E. ½ E.
N. E. ¾ E.	4 ¾	26	43	7	4 ¾	N. E. ¾ E.
N. E. by E.	5	28	7	30	5	N. E. by E.
N. E. by E. ¼ E.	5 ¼	29	31	52	5 ¼	N. E. by E. ¼ E.
N. E. by E. ½ E.	5 ½	30	56	15	5 ½	N. E. by E. ½ E.
N. E. by E. ¾ E.	5 ¾	32	20	37	5 ¾	N. E. by E. ¾ E.
E. N. E.	6	33	45	0	6	E. N. E.
E. N. E. ¼ E.	6 ¼	35	9	22	6 ¼	E. N. E. ¼ E.
E. N. E. ½ E.	6 ½	36	33	45	6 ½	E. N. E. ½ E.
E. N. E. ¾ E.	6 ¾	37	58	7	6 ¾	E. N. E. ¾ E.
E. by N.	7	39	22	30	7	E. by N.
E. ¼ N.	7 ¼	40	46	52	7 ¼	E. ¼ N.
E. ½ N.	7 ½	42	11	15	7 ½	E. ½ N.
E. ¾ N.	7 ¾	43	35	37	7 ¾	E. ¾ N.
East.	8	45	0	0	8	East.
		46	24	22		
		47	48	45		
		49	18	7		
		50	37	30		
		52	1	52		
		53	26	15		
		54	50	37		
		56	15	0		
		57	39	22		
		59	3	45		
		60	28	7		
		61	52	30		
		63	16	52		
		64	41	15		
		66	5	37		
		67	30	0		
		68	54	22		
		70	18	45		
		71	43	7		
		73	7	30		
		74	31	52		
		75	56	15		
		77	20	37		
		78	45	0		
		80	9	22		
		81	33	45		
		83	58	7		
		84	22	30		
		85	46	52		
		87	11	15		
		88	35	37		
		90	0	0		

TABLE

FOR CONVERTING POINTS OF THE COMPASS AND THEIR FRACTIONAL PARTS INTO DEGREES.

South to East.	Points.	Degrees, &c.			Points.	South to West.
South.	0	0	0	0	0	South.
S. ¼ E.	¼	1	24	22	¼	S. ¼ W.
S. ½ E.	½	2	48	45	½	S. ½ W.
S. ¾ E.	¾	3	72	67	¾	S. ¾ W.
S. by E.	1	4	96	90	1	S. by W.
S. by E. ¼ E.	1 ¼	5	120	112	1 ¼	S. by W. ¼ W.
S. by E. ½ E.	1 ½	6	144	135	1 ½	S. by W. ½ W.
S. by E. ¾ E.	1 ¾	7	168	157	1 ¾	S. by W. ¾ W.
S. S. E.	2	8	192	180	2	S. S. W.
S. S. E. ¼ E.	2 ¼	9	216	202	2 ¼	S. S. W. ¼ W.
S. S. E. ½ E.	2 ½	10	240	225	2 ½	S. S. W. ½ W.
S. S. E. ¾ E.	2 ¾	11	264	247	2 ¾	S. S. W. ¾ W.
S. E. by S.	3	12	288	270	3	S. W. by S.
S. E. ¼ S.	3 ¼	13	312	292	3 ¼	S. W. ¼ S.
S. E. ½ S.	3 ½	14	336	315	3 ½	S. W. ½ S.
S. E. ¾ S.	3 ¾	15	360	337	3 ¾	S. W. ¾ S.
S. E.	4	16	384	360	4	S. W.
S. E. ¼ E.	4 ¼	17	408	382	4 ¼	S. W. ¼ W.
S. E. ½ E.	4 ½	18	432	405	4 ½	W. ½ W.
S. E. ¾ E.	4 ¾	19	456	427	4 ¾	S. W. ¾ W.
S. E. by E.	5	20	480	450	5	S. W. by W.
S. E. by E. ¼ E.	5 ¼	21	504	472	5 ¼	S. W. by W. ¼ W.
S. E. by E. ½ E.	5 ½	22	528	495	5 ½	S. W. by W. ½ W.
S. E. by E. ¾ E.	5 ¾	23	552	517	5 ¾	S. W. by W. ¾ W.
E. S. E.	6	24	576	540	6	W. S. W.
E. S. E. ¼ E.	6 ¼	25	600	562	6 ¼	W. S. W. ¼ W.
E. S. E. ½ E.	6 ½	26	624	585	6 ½	W. S. W. ½ W.
E. S. E. ¾ E.	6 ¾	27	648	607	6 ¾	W. S. W. ¾ W.
E. by S.	7	28	672	630	7	W. by S.
E. ¼ S.	7 ¼	29	696	652	7 ¼	W. ¼ S.
E. ½ S.	7 ½	30	720	675	7 ½	W. ½ S.
E. ¾ S.	7 ¾	31	744	697	7 ¾	W. ¾ S.
E. S.	8	32	768	720	8	West.
East.	8	32	768	720	8	

TABLE OF DISTANCES

AT WHICH OBJECTS CAN BE SEEN AT SEA, ACCORDING TO THEIR RESPECTIVE ELEVATIONS AND THE ELEVATION OF THE EYE OF THE OBSERVER.

Heights in feet.	Distance in Statute miles.	Distance in Nautical miles.	Heights in feet.	Distance in Statute miles.	Distance in Nautical miles.	Heights in feet.	Distance in Statute miles.	Distance in Nautical miles.
5	2.968	2.565	70	11.067	9.598	250	30.915	18.14
10	4.184	3.626	75	11.456	9.935	300	32.913	19.57
15	5.123	4.443	80	11.822	10.26	350	34.748	21.46
20	5.916	5.130	85	12.168	10.57	400	36.457	22.94
25	6.614	5.786	90	12.549	10.88	450	38.062	24.33
30	7.245	6.393	95	12.893	11.18	500	39.580	25.65
35	7.826	6.977	100	13.228	11.47	550	41.024	26.90
40	8.366	7.555	110	13.574	12.03	600	42.408	28.10
45	8.874	7.996	120	14.490	12.56	650	43.736	29.26
50	9.354	8.412	130	15.083	13.08	700	45.000	30.38
55	9.811	8.809	140	15.652	13.57	800	47.416	32.45
60	10.246	9.186	150	16.201	14.22	900	49.836	34.54
65	10.665	9.549	200	18.708	16.22	1000	41.833	36.36

EXAMPLE.—A tower 200 feet high will be visible to an observer whose eye is elevated 15 feet above the water 23.82 statute miles, thus from the table:

15 feet elevation distance visible 5.12 statute miles.
 200 " " " " 18.70 " "

 23.82

Directions for passing buoys placed by the authority of the Light House Establishment :

1. In approaching the channel, &c., from seaward, RED BUOYS, with EVEN NUMBERS, will be found on the STARBOARD side of the channel, and must be left on the STARBOARD hand in passing in.

2. In approaching the channel, &c., from seaward, BLACK BUOYS, with ODD NUMBERS, will be found on the PORT side of the channel, and must be left on the PORT hand in passing in.

3. 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.

4. BUOYS painted with WHITE and BLACK PERPENDICULAR STRIPES will be found in MID-CHANNEL, and must be passed close-to to avoid danger.

HAND LEAD LINE.

The weight of a hand-lead is from 7 to 10 lbs. The line is 20 fathoms in length, and divided into Marks and Deepes.

Marks. Fathoms.	Deepes. Fathoms
.....	1
2 A piece of leather with 2 strips.	
3 A piece of leather with 3 strips.	
.....	4
5 A piece of white rag.	
.....	6
7 A piece of red rag.	
.....	8
.....	9
10 A piece of leather with a hole in it.	
.....	11
.....	12
18 A piece of blue rag.	
.....	14
15 A piece of white rag.	
.....	16
17 A piece of red rag.	
.....	18
.....	19
20 Two knots.	

DEEP SEA LEAD LINE.

The weight of a deep sea lead is from 30 to 40 lbs. The line is usually marked the same as a hand lead line up to 20 fathoms, then a strip of leather at 25 fathoms, three knots at 30 fathoms, then a strip of leather at 35 fathoms, four knots at 40 fathoms, and so on up to 100 fathoms.

29

TABLES

FOR CONVERTING STATUTE MILES INTO NAUTICAL MILES, AND NAUTICAL MILES INTO STATUTE MILES.

(THE STATUTE MILE=5280 FEET. THE NAUTICAL MILE=6080 FEET.)

line is 20

Deep.
Fathoms

... 1

... 4

... 6

... 8

... 9

... 11

... 12

... 14

... 16

... 18

... 19

the line is
ms, then a
a strip of
up to 100

Statute Miles.	Nautical Miles.						
1.00	0.868	8.25	7.164	15.50	13.460	22.75	19.756
1.25	1.085	8.50	7.381	15.75	13.677	23.00	19.973
1.50	1.302	8.75	7.598	16.00	13.894	23.25	20.190
1.75	1.519	9.00	7.815	16.25	14.111	23.50	20.407
2.00	1.736	9.25	7.032	16.50	14.328	23.75	20.625
2.25	1.953	9.50	8.250	16.75	14.546	24.00	20.842
2.50	2.171	9.75	8.467	17.00	14.763	24.25	21.059
2.75	2.388	10.00	8.684	17.25	14.980	24.50	21.276
3.00	2.605	10.25	8.901	17.50	15.197	24.75	21.493
3.25	2.822	10.50	9.118	17.75	15.414	25.00	21.710
3.50	3.039	10.75	9.335	18.00	15.631	25.25	21.927
3.75	3.256	11.00	9.552	18.25	15.848	25.50	22.144
4.00	3.473	11.25	9.769	18.50	16.065	25.75	22.361
4.25	3.690	11.50	9.986	18.75	16.282	26.00	22.578
4.50	3.907	11.75	10.203	19.00	16.500	26.25	22.796
4.75	4.124	12.00	10.421	19.25	16.717	26.50	23.013
5.00	4.342	12.25	10.638	19.50	16.934	26.75	23.230
5.25	4.559	12.50	10.855	19.75	17.151	27.00	23.447
5.50	4.776	12.75	11.072	20.00	17.368	27.25	23.664
5.75	4.993	13.00	11.289	20.25	17.585	27.50	23.881
6.00	5.210	13.25	11.506	20.50	17.802	27.75	24.098
6.25	5.427	13.50	11.723	20.75	18.019	28.00	24.315
6.50	5.644	13.75	11.940	21.00	18.236	28.25	24.532
6.75	5.861	14.00	12.157	21.25	18.453	28.50	24.750
7.00	6.078	14.25	12.375	21.50	18.671	28.75	24.967
7.25	6.296	14.50	12.592	21.75	18.888	29.00	25.184
7.50	6.513	14.75	12.809	22.00	19.105		
7.75	6.730	15.00	13.026	22.25	19.322		
8.00	6.947	15.25	13.243	22.50	19.539		

Nautical Miles.	Statute Miles.						
1.00	1.151	7.25	8.348	13.50	15.545	19.75	22.742
1.25	1.439	7.50	8.636	13.75	15.833	20.00	23.030
1.50	1.729	7.75	8.924	14.00	16.121	20.25	23.318
1.75	2.015	8.00	9.212	14.25	16.409	20.50	23.606
2.00	2.303	8.25	9.500	14.50	16.696	20.75	23.893
2.25	2.590	8.50	9.787	14.75	16.984	21.00	24.181
2.50	2.878	8.75	10.075	15.00	17.272	21.25	24.469
2.75	3.166	9.00	10.363	15.25	17.560	21.50	24.757
3.00	3.454	9.25	10.651	15.50	17.848	21.75	25.045
3.25	3.742	9.50	10.939	15.75	18.136	22.00	25.333
3.50	4.030	9.75	11.227	16.00	18.424	22.25	25.621
3.75	4.318	10.00	11.515	16.25	18.712	22.50	25.909
4.00	4.606	10.25	11.803	16.50	18.999	22.75	26.196
4.25	4.893	10.50	12.090	16.75	19.287	23.00	26.484
4.50	5.181	10.75	12.378	17.00	19.575	23.25	26.772
4.75	5.469	11.00	12.666	17.25	19.863	23.50	27.060
5.00	5.757	11.25	12.954	17.50	20.151	23.75	27.348
5.25	6.045	11.50	13.242	17.75	20.439	24.00	27.636
5.50	6.333	11.75	13.530	18.00	20.727	24.25	27.924
5.75	6.621	12.00	13.818	18.25	21.015	24.50	28.212
6.00	6.909	12.25	14.106	18.50	21.303	24.75	28.500
6.25	7.197	12.50	14.393	18.75	21.590	25.00	28.788
6.50	7.484	12.75	14.681	19.00	21.878		
6.75	7.772	13.00	14.969	19.25	22.166		
7.00	8.060	13.25	15.257	19.50	22.454		

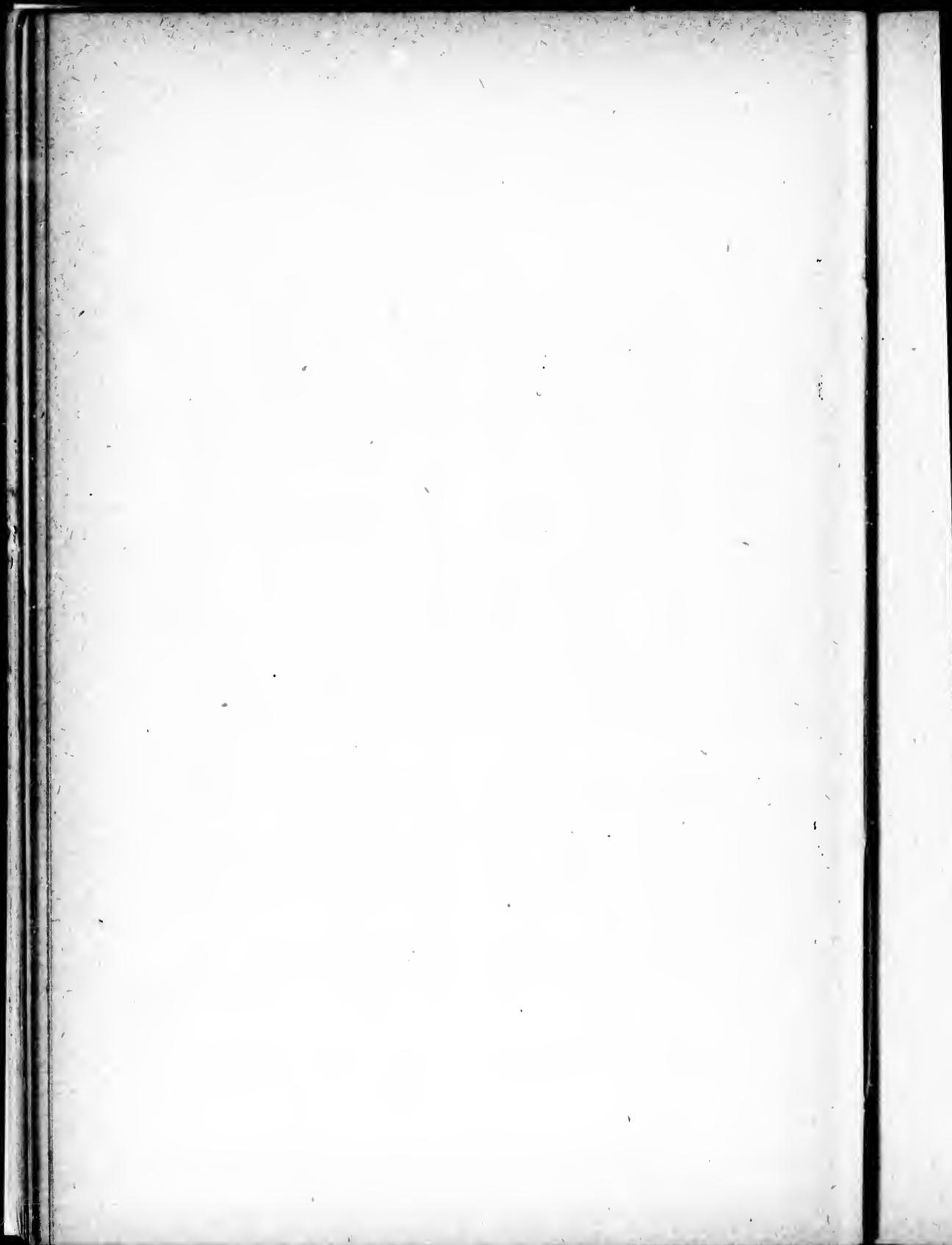
0.5/60
10.6

28.78
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28.8
29.1
29.4
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30.0

28.78
28.79
57.775
63.5



SCOTT'S NEW COAST PILOT.

Throughout this work all courses and bearings have been corrected for magnetic variation. The distances are expressed in statute miles.

ST. LAWRENCE RIVER.

West or Main Channel into Ogdensburgh River.

Sailing Directions.—A straight course may be steered from buoy to buoy, on either side. The red buoys should be kept well aboard, as the current sets directly across the channel at the rate of about $1\frac{1}{2}$ miles per hour. The outer edge of the shoal on lower side of channel lies parallel with the shore (N. E. $\frac{1}{4}$ E.) for one-half mile, from the Ogdensburgh Shoal buoy, and then curves in to the outer end of the Central Vermont Railway and Steamer wharves, at the lower end of the city, which are built out to deep water. Between these wharves and to the mouth of the Oswegatchie river, and lying close to the shore, is a 7 to 9 foot natural channel, 300 yards wide at the entrance, and narrowing to 75 yards near the river mouth. Through this channel a "cut" has been made, 150 feet wide and 12 feet deep, in a straight line S. W. $\frac{1}{4}$ W. from the outer end of the Central Vermont wharves to the upper end of Parish's lumber wharf, and thence along the ends of the wharves, to the harbor, in the mouth of the river. A bridge, crossing the river 435 yards above the inner buoy, is the terminus of the harbor. Bottom of harbor and channel, soft; shoals, stony or rocky. The current of Oswegatchie river is about 1 mile per hour.

OGDENSBURGH LIGHT-STATION.—A fixed white light, 4th order, visible $12\frac{1}{2}$ miles. Gray, square, limestone tower, 40 feet high, with dwelling attached, lantern black. On a low rocky islet, 200 feet above the channel, and 100 yards from the shore, with which it is connected by a side track of the R., W. & O. R. R., extending beyond the station to the 12-foot curve, from whence its cars are ferried across the river. Flats extend beyond the light-house at this point nearly half way across the St. Lawrence, and vessels bound up or down should keep over toward the Canadian shore. The dredged channel into Ogdensburgh harbor passes the light-house islet, on its lower side, at a distance of 67 yards.

Ogdensburgh Shoal, Outer Buoy, No. 1.—Black spar buoy, in 30 feet of water, lower side of entrance to channel, and marks the upper end and outer edge of the shoal on that side. The buoy stands in

deep water, 40 yards from the curved corner of the shoal. Ogdensburgh light-house, S. $\frac{1}{4}$ E., 600 yards.

West Entrance, No. 2.—Red spar buoy, in 12 feet of water, marks the upper side of the entrance, and the outer point of the shoal on that side. Ogdensburgh light-house, S. $\frac{1}{4}$ E., 470 yards. North end of steam elevator, E. $\frac{1}{4}$ N.

Light-house Buoy, No. 4.—Red spar buoy in 12 feet of water, in the channel, close to the steep, west bank, and nearly opposite the light-house. A straight course may be made from this buoy to the lower corner of the R., W. & O. R. R. wharf, on the west side of the river. Ogdensburgh light-house, northeast corner of tower, S. W. by W. East Bank buoy, E. $\frac{1}{4}$ N., 200 feet.

East Bank Buoy, No. 3.—Black spar buoy, in 12 feet of water, on the east side, just inside the light-house buoy. Ogdensburgh light-house, S. W. by W. $\frac{1}{4}$ W. Lower corner of R., W. & O. R. R. wharf, S. by E. $\frac{1}{4}$ E.

Inner Buoy, No. 5.—Black spar buoy in 18 feet of water, east side of channel at the inner end. Stands 25 yards off the 10-foot point of the shoal. Passing it, the wharves on either side of the harbor may be steered for. From this buoy the shoal trends E. by S. $\frac{1}{4}$ S., 90 yards, (half-way to shore,) to the entrance to the channel along the north front of the city. Ogdensburgh light-house, W. N. W., 270 yards. Lower corner of R., W. & O. R. R. wharf, S. $\frac{1}{4}$ E., 140 yards.

Channel South of Brock's Group, standing up the St. Lawrence River.

This channel is buoyed for 12 feet draught of water.

Sailing Directions.—Good anchorage in from 3 to 7 fathoms, soft bottom throughout the channel, the best abreast or just above the Lower buoy, and on the edge of the bight of the south shore opposite the Upper buoy; except at these points, the bottom, in three fathoms or less, is generally rocky. Approaching from below, pass (on about a S. W. $\frac{1}{4}$ S. course) south of Macnair's islands, and the island near the American shore, $1\frac{1}{4}$ miles above, giving the latter a berth of at least 100 yards, (the opposite shore is bold,) and steer for the Lower buoy of this channel, thence for Middle buoy, Foul-Ground buoy, and Upper buoy in turn. From Upper buoy steer for Mid-Channel Reef buoy.

Lower Buoy.—Red spar buoy, 25 feet long in 16 feet of water, on north side of entrance to channel. Stands in soft bottom, and marks the southeast point of a 9-foot shoal 400 yards long. The ranges from this buoy to the North Shoal buoy and to the end of the Brockville wharf clear the south and east edges respectively of this shoal. Shoal water extends from the south shore nearly half-way, or to within 300 yards of this buoy. Steer for the Middle buoy, passing the North Shoal buoy to the southward; the point of the south shore opposite the latter buoy should be given a berth of at least 100 yards. It is cleared by the range between the Lower and Middle buoys, (S. W. by W. $\frac{1}{4}$ W., $1\frac{1}{4}$ miles). East end of lower island, north side of channel, W. N. W. $\frac{1}{4}$ W., $\frac{1}{4}$ mile. South end of island, $\frac{1}{4}$ mile below channel, N. E. by E. North Shoal buoy, W. by S. $\frac{1}{4}$ S., $\frac{1}{4}$ mile.

North Shoal.—Red spar buoy in 16 feet of water, on north side of channel. Stands about midway between the lower group of islands and the south shore, and marks the end of a shoal making out from the group. Ranges from the buoy to the ends of this group mark the upper and lower sides of the shoal. Between this shoal and the foul ground north of the middle buoy, there is good water up to the islands, north side of the channel. A range from this buoy to the end of the Brockville wharf guides through a "north" entrance to this channel, $\frac{1}{4}$ mile wide. End of Brockville wharf, N. E. by N., $1\frac{1}{2}$ miles. Middle buoy, S. W. $\frac{1}{4}$ W., 1 mile.

Middle Buoy.—Black spar buoy in 18 feet of water. On south side of channel, pass the buoy close to, channel 125 yards wide. The lower edge of foul ground lying between the channel and the islands to the northward, opposite and above this buoy is cleared by a range, from the buoy to the lower end of the middle group of islands. Lower end of middle group of islands, N. $\frac{1}{2}$ E., $\frac{1}{2}$ mile. South end of upper island of channel, S. W. by W. $\frac{1}{4}$ W.

Foul-Ground Buoy.—Red spar buoy in 13 feet of water. North side of channel, abreast the upper island and nearly midway between the latter and the south shore, marks the outer point of the foul ground lying between channel and islands. The outer points of the American shore, below, in range, mark the position of a 9-foot spot, opposite this buoy, and a little south of mid-channel. Lower end of upper island of channel, N. by W. $\frac{1}{4}$ W., 333 yards. Upper buoy, S. W. $\frac{1}{4}$ W., 780 yards.

Upper Buoy.—Red spar buoy in 15 feet of water. Marks the outer (southeast) point of a small $9\frac{1}{2}$ -foot shoal, north side of channel at its head. Steer for the Oak Point Shoals buoy, passing south of the Cole's Ferry Shoal and Mid-channel Reef buoys. Cole's Ferry light-house (Canadian), W. $\frac{1}{4}$ S. Oak Point Shoal buoy, S. W. $\frac{1}{4}$ W., 3 miles.

Main, or West Channel, standing up the St. Lawrence River.

The river is buoyed for 12 feet draught of water.

Sailing Directions.—The bottom of the St. Lawrence river is either soft or rocky, and very irregular, varying in depth, in mid-channel and within short distances, from 7 to 30 fathoms. Good anchorage may be had at many points in the bights or bays along the shore and among the islands. Unless otherwise stated, the shoals marked by buoys are rocky. The current is from 1 to 2 miles per hour (except at certain points specially mentioned), depending upon the width of the river. Both the current and depth of water vary with the winds on Lake Ontario, being increased by south-westerly and decreased by northeasterly winds. Passing the Ogdensburg Shoal buoy, the course to Macnair's islands is S. W. $\frac{1}{4}$ W., $10\frac{1}{2}$ miles. No dangers in this reach. Either shore may be approached within 300 yards; average width of river rather more than a mile. Pass north of Macnair's islands, and steer S. W. $\frac{1}{4}$ W., 2 miles, for the entrance to the channel north of Brock's group; a reef, partly bare, lies on the south side of the channel, nearly in mid-river, opposite Brockville, Canada. The channel north of the group is

3 miles long, 150 to 300 yards wide, bold on both sides, with a 3 to 4-mile current. The only danger is a rock, 7 feet under water, lying 600 yards below the head of the group, and one-third way across from the north side of channel. Foul ground extends from the head of the group (south of the range to the Cole's Ferry Shoal buoy) more than half way to that buoy.

Cole's Ferry Shoal.—Black spar buoy in $11\frac{1}{2}$ feet of water. South side of main channel, and marks the upper and outer (northwest) edge of a 5-foot shoal, 200 yards across, lying in mid-river. The range (E. $\frac{1}{4}$ N.) between this and the upper buoy of the channel south of Brock's group clears the lower edge of this reef and the upper end of the foul ground at the head of Brock's group, furnishing a guide through to the head of the south channel. Steer for the channel between the Bay State and Oak Point Shoals buoys, passing the Mid-channel Reef buoy on either side. No dangers along the north side of this stretch except a small reef, just covered, one-half mile above the Cole's Ferry light-house and 300 yards off shore; also a 7-foot spot between that reef and the light-house. Cole's Ferry light-house (Canadian), W. $\frac{1}{2}$ S., three-fourths mile. Mid-channel Reef buoy, S. W. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles.

Mid-channel Reef.—Red and black horizontal striped spar buoy in $11\frac{1}{2}$ feet of water. Stands at the lower side and near the northwest end of a narrow $9\frac{1}{2}$ -foot reef, 60 yards long, lying athwart the channel, nearly in mid-river; can be passed on either side. Cole's Ferry light-house (Canadian), N. $\frac{1}{4}$ E., three-fourths mile. Cross-over Island light-house, S. W. $\frac{1}{2}$ S., $2\frac{1}{2}$ miles.

Oak Point Shoal.—Black spar buoy in 14 feet of water. South side of channel, three-quarters mile above Oak Point, and marks the outer edge and lower end of a small $10\frac{1}{2}$ -foot shoal, 400 yards off Whale's Back shoal. The outer edge of a reef, just under water, 600 yards below this buoy, is marked by this and the Bay State Shoal buoy in range and the range between this and the Whale's Back Shoal buoy (S. by W. $\frac{1}{2}$ W., 1,100 yards) clears a 7-foot ledge lying about midway between the two. Cross-over Island light-house, S. W. $\frac{1}{2}$ S., 1 mile. Bay State Shoal buoy, S. W. $\frac{1}{4}$ W., one-third mile.

Bay State Shoal.—Red spar buoy in 12 feet of water, marks the outer (southeast) edge of a small 5-foot shoal, one-half mile below Cross-over island, on the north side of channel. No dangers between this buoy and Cross-over island, or west of it to the group of islands near the Canadian shore, except a 5-foot spot 200 yards off the lower island of that group. Cross-over island light-house, S. S. W. $\frac{1}{2}$ W. Upper end of outer island on Whale's Back shoal, E. $\frac{1}{2}$ S., 700 yards.

Whale's Back Shoal.—Black spar buoy in $11\frac{1}{2}$ feet of water. South side of channel, and marks the outer edge of a small 8-foot shoal, lying 250 yards off the upper end of Whale's Back shoal. Some rocks, just under water, lie 200 yards off shore, three-fourths mile above this buoy (marked by this buoy in range with the Oak Point Shoal buoy). Except at that point, the south shore, up to the Superior Shoal buoy, may be approached to within 100 yards. Cross-over Island light-house, W. S. W. $\frac{1}{2}$ W., 700 yards. Outer rock of group near south shore, one-half mile above, S. $\frac{1}{2}$ W. Chippewa point, S. S. W. $\frac{1}{2}$ W.

CROSS-OVER ISLAND LIGHT-STATION.—A fixed white light, 6th order, visible $12\frac{1}{2}$ miles. Iron circular tower, brown

color, lantern black, 114 feet eastward of dwelling, light 35 feet above sea level, $6\frac{1}{2}$ miles below Sister Islands light, on Cross-over island, west side of channel, which is here but one-half mile wide. Reefs extend from the upper end of island, between south and east, to a distance of 150 yards; passing these, the range between the light-house and Oneida Shoal buoy marks the northern limit of channel. The range between this and Cole's Ferry light (S. S. W. $\frac{1}{4}$ W.) leads up from the latter light to Cross-over island, and the range between Cole's Ferry light and Chippewa point (S. S. W. $\frac{1}{4}$ W.) leads from abreast Cross-over, and up the "reach" above it, until the Sister Islands light is opened to the southward of Round island, about the width of that island, when the latter light may be steered for (S. W. $\frac{3}{4}$ S.). The Cross-over and Cole's Ferry lights in range mark mid-channel abreast of Chippewa point.

Oneida Shoal.—Red spar buoy in $9\frac{1}{2}$ feet of water. Stands 40 feet from lower end and outer edge of a reef, just covered on the north side of channel, $1\frac{1}{4}$ miles above Cross-over island. A course S. W. $\frac{1}{4}$ S. leads from mid-channel, abreast this buoy, up to the Sister Islands light-house, $5\frac{1}{2}$ miles above. The channel (southeast) side of Round island is bold. A 12-foot spot, marked by buoy, lies 300 yards from and opposite its upper end. Cross-over Island light-house, N. N. E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles. Superior Shoal buoy, S. S. W. $\frac{1}{4}$ W., 1 mile.

Pridgeon Shoal.—Red and black horizontal stripes, 25-foot spar buoy in $16\frac{1}{2}$ feet of water. Marks a shoal spot in the channel, about 300 yards from the south shore and 1 mile below Chippewa point. The reef marked by this buoy is about 100 yards long, in a direction from S. W. by S. to N. E. by N., with a width of from 15 to 20 yards. Least water found, near lower end of shoal, $16\frac{1}{2}$ feet. Cross-over Island light-house, N. $\frac{1}{4}$ E. Lower end of Shoemaker's island, W. by N. $\frac{1}{4}$ N., about 1 mile.

Superior Shoal.—Black spar buoy in $11\frac{1}{2}$ feet of water. Stands at the outer edge and near the lower end of a long narrow ledge, on the south side of channel, 150 yards off Chippewa point. The reef extends S. S. W. from the buoy to 100 yards above Chippewa point; least water on it, 3 feet, close to the buoy. Reefs make out from the head of Chippewa point to abreast the upper end of Round Top island. In the reach between Round island and the Sisters, the islands on either side of channel may be approached within 100 yards, and the only unmarked dangers are a reef, a quarter mile long, at the head of Cedar islands, and another extending 350 yards into the channel from the lower end of Oak island. Upper end of Chippewa point, S. by E. $\frac{3}{4}$ E., 220 yards. Scow Island Shoal buoy, S. W. $\frac{3}{4}$ S., $2\frac{1}{4}$ miles.

Round Island Shoal.—Red and black horizontal stripes, spar buoy in 14 feet of water. Marks the middle of the lower side of a small 12-foot shoal between Round island and Cedar island, 300 yards from Round island. It stands almost in the direct course of vessels up to Sister islands and may be passed on either side. The channel side of Round island is bold. Lower end of Round island, N. $\frac{3}{4}$ W. Lower end of Cedar island, E. Scow Island Shoal buoy, S. W. $\frac{3}{4}$ S., $1\frac{1}{2}$ miles.

Tent Island Shoal.—Red and black horizontal stripes, spar buoy in 13 feet of water. Marks the middle of a small 12-foot shoal in mid-channel, about 700 yards from Tent island. The range between Sister island and the middle of Round island passes about 500 feet to westward of this shoal, and the range between Pilot island and Chippewa point

directly over it. Lower end of Cedar island, N. E. $\frac{1}{4}$ E. Lower end of Tent island, N. W. $\frac{1}{4}$ N.

Scow Island Shoal.—Black spar buoy in 12 feet of water. Marks the northwest edge of a 6-foot shoal, 80 yards long, abreast Scow island, and about midway between the islands on either side of channel. Half-way between this buoy and Scow island is a small 10-foot shoal. Sister Islands light-house, S. W. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles. Pilot Shoal buoy, S. W. $\frac{1}{4}$ W., $1\frac{1}{4}$ miles.

Pilot Shoal.—Red and black horizontal stripes, spar buoy in $11\frac{1}{2}$ feet of water. Marks the north end of a narrow 10-foot ledge, 25 yards in length (in a N. N. E. and S. S. W. direction), lying in the channel 500 yards below the Sister islands. Pass on either side. The Sister and Lone Brother islands in range lead north of this shoal. Pilot island, north side of channel, a quarter mile below, may be passed close-to, and a straight course made thence to the Empire Shoal buoy. Sister Islands light-house, S. W. $\frac{1}{4}$ S. Sister Islands buoy, S. W. $\frac{1}{2}$ W.

Empire Shoal.—Red spar buoy in $11\frac{1}{2}$ feet of water. Marks the outer edge and upper end of an 8-foot shoal, 90 yards long, on the north side of channel, just below the Sister Islands light-house. Sister Islands light-house, S. by W., 350 yards. Sister Islands buoy, S. by W. $\frac{1}{4}$ W., 280 yards.

Sister Islands.—Black spar buoy in 12 feet of water. Stands opposite the lower end of Sister islands, and marks the outer edge of the shoal north side of those islands. The range between this buoy and Scow island clears this shoal below the buoy, and the buoy in range with east side of Pilot island clears the upper end of shoal, and also some foul ground lying between the Sister and Lone Brother islands, as well as a narrow reef extending 300 yards from the head of the latter island. From this buoy a south-west course leads up to the Sunken Rock light-house, 6 miles above. Sister Islands light-house, S. by E. $\frac{1}{4}$ E., 100 yards. Scow island, E. N. E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles.

SISTER ISLANDS LIGHT-STATION.—A fixed white light, 6th order, visible $12\frac{1}{2}$ miles. Square gray tower rising from limestone dwelling, light 40 feet above ground. South side of channel, on the lower of the Sister islands, three small islands connected by causeways. A good channel, 500 yards wide, to the southward, between these islands and Third Brother island and south of Lone Brother island. Passing Pilot island (north side of channel, one-half mile below) close-to, steer midway between this light-house and the low rocky point of the Grenadier Island shore, opposite, until abreast the light-house, when steer for Sunken Rock light-house (S. W.); after passing Lone Brother island, the range between the two lights may be entered. Cross-over Island light-house, closed behind Pilot island, furnishes another guide through the narrow channel, north of the Sister islands. A small 10-foot shoal lies in the channel, 500 yards below this light-house, just south of the range between this and Cross-over Island light-house. Lower end of Half-way island, E. $\frac{1}{4}$ S., seven-eighths mile. Sunken Rock light-house, 6 miles.

Ironsides Shoal.—Black spar buoy in $11\frac{1}{2}$ feet of water. Marks the N. W. side of a 5-foot shoal 80 yards across, lying opposite the upper end of the Ironsides island south side of channel. West end of Lone Brother island, N. E. $\frac{1}{4}$ N., $\frac{1}{2}$ mile.

SUNKEN ROCK LIGHT-STATION.—A fixed white light, 6th order, visible $11\frac{1}{2}$ miles. Circular iron tower, brown, lantern black, light 28 feet above sea level. A wooden wharf and boat house at base of tower, on Sunken rock, St. Lawrence river, south side of main channel, one-half mile below Alexandria bay. When abreast the upper end of Hart island, bring the Sister Islands light in range with or open a little to the northward of this light, which course leads past Alexandria bay and up to the first island above on the south side of the channel. The latter island should be passed close to, and avoid Pullman's shoal, lying nearly in mid-river opposite. Rock Island light, 7 miles.

Sunken Rock.—Black spar buoy in 12 feet of water. South side of main channel, and marks the outer (west) edge of a reef, just under water, and 100 yards in length, lying one-quarter mile above the light-house. The channel here is 200 yards in width, and the island opposite is bold. Sunken Rock light-house, N. E. $\frac{1}{2}$ E. Lower point of Alexandria bay, S. E., 350 yards.

Frontenac Shoal.—Red spar buoy in 12 feet of water. Marks the outer edge of a shoal north side of channel, opposite Alexandria bay. The islands along the north side of channel above are bold. Sunken Rock light-house, N. E. by E. $\frac{1}{2}$ E., one-half mile. Pullman Shoal buoy, S. W. $\frac{1}{2}$ S., one-half mile.

Squaw Island.—Black spar buoy in 12 feet of water. Marks the outer point of a reef at the foot of Squaw island, south side of channel off the upper end of Alexandria bay; the head of the island is bold. The range from the buoy to the "Thousand Island House" wharf clears the lower edge of the reef. Frontenac Shoal buoy, N. $\frac{1}{2}$ W., 400 yards.

Pullman Shoal.—Red spar buoy in $11\frac{1}{2}$ feet of water. Marks the outer edge of a 5-foot shoal, 40 yards long, on the north side of channel, one-third mile above Alexandria bay; a narrow channel north of this shoal. From this point to the Rock Island light-house, $5\frac{1}{2}$ miles above, the channel is from 200 to 300 yards wide, and current 2 to 3 miles per hour; both sides of the reach are bold, except in the deep bights. Sunken Rock light-house, N. E. $\frac{1}{2}$ E., 1 mile.

Niagara Shoal.—Black spar buoy in 12 feet of water. Marks the lower end and outer edge of a 5-foot shoal, 200 feet long, on the south side of channel, three-fourths mile below Rock Island light-house. Rock Island light-house, S. W. by W. $\frac{1}{2}$ W., $\frac{1}{2}$ mile.

Granite State Shoal.—Red spar buoy in 12 feet of water. Marks the lower end and outer edge of a reef three-fourths mile long, on the north side of channel, at the head of the "Narrows." Rock Island light-house, S. by W. $\frac{1}{2}$ W. 350 yards.

ROCK ISLAND LIGHT-STATION.—A fixed white light, 6th order, visible $12\frac{1}{2}$ miles. Circular iron tower, painted brown, lantern black, light $39\frac{1}{2}$ feet above sea level. Light is obscured by keeper's dwelling in passing for about 75 yards above and below. A white lantern light is shown from veranda of the keeper's dwelling, toward Thousand Island Park dock, during the hotel season. On Rock island, St. Lawrence river, south side of channel, at the head of the "Narrows." The group of which this island is one, may be passed below the light-house within 50 yards. Keep the north shore well aboard until passed Niagara Shoal buoy, and then steer directly for the light (about S. W.)

until close up with it (good water to within 50 yards of the shore, and channel here but 200 yards wide), when steer S. W. by W. $\frac{1}{4}$ W. for North Colborne island. These directions clear the long reef on north side of channel, at the head of the "Narrows," as well as the reef at the upper end of Rock island. Above North Colborne island, this light, closed behind that island, leads south of Chapman's shoal, and up past the Calumet islands. Tibbett's Point light, 23 miles.

Rock Island Reef.—Black spar buoy in 11 feet of water. Stands at the outer edge and close to the upper end of the reef at the head of Rock island. After passing Rock Island Reef buoy, steer directly for North Colborne island, S. W. by W. $\frac{1}{4}$ W., passing it close to, and, as soon as abreast of it, steer for bluff just above Clayton until abreast of Calumet island; this will clear Chapman's shoal, a reef partly bare, lying in mid-channel, 500 yards west of North Colborne island. From the Calumet islands steer W. S. W. $\frac{1}{2}$ W., $6\frac{1}{2}$ miles, past Linda island (lying near the south shore), thence W. $\frac{1}{2}$ S., $5\frac{1}{2}$ miles, along the north side of Carleton island. In this stretch the channel is from three-fourths to $1\frac{1}{2}$ miles wide, and free from dangers; good water to within 200 yards of either shore. Rock Island light-house, E. N. E. $\frac{1}{4}$ E., 200 yards.

Hinckley's Point Spit.—Red spar buoy in 14 feet of water, west side of channel, opposite the head of Carleton island, and nearly in mid-river. Stands at the outer edge and 450 yards from the lower end of a spit, extending $2\frac{1}{2}$ miles below Hinckley's point, Long island. Below the buoy the shoal trends N. $\frac{1}{2}$ W. to the end, on which is 9 feet of water. The range from this buoy to Tibbett's point clears the edge of the spit above the buoy. Good water carried across this spit into Button bay with the head of Carleton island bearing about east. Shoals make out from Mud island (west side of channel, $1\frac{1}{2}$ miles below) one-fourth way across to Carleton island. The west side of Carleton island is bold. Point of trees at south end of Carleton island, E. $\frac{1}{4}$ S., 1,670 yards. Hinckley's point, S. W. $\frac{1}{4}$ S. Tibbett's point, S. S. W. $\frac{1}{4}$ W., 5 miles.

Feather-Bed Shoal.—Black, 3d class can buoy in 17 feet of water. Marks the edge of Feather-bed shoal, east side of channel, between Carleton island and Cape Vincent, and stands 540 yards W. S. W. of a rocky part of the shoal, just covered. The range between this buoy and the eastern ruined chimney on Carleton island (N. E. $\frac{1}{4}$ N.) clears the shoal below the buoy, and the range between buoy and "elevator" at lower end of Cape Vincent (S. by W. $\frac{1}{4}$ W.) clears it above. One-third mile above this buoy the shoal trends S. S. E. to the shore. A course S. S. W. $\frac{1}{4}$ W., 4 miles, leads in mid-channel, past the west side of Carleton island, between this shoal and the spit opposite, and up to Cape Vincent; course thence to the lake S. W. by W. $\frac{1}{4}$ W., 4 miles. Above Cape Vincent there are no dangers; good water to within 200 yards of either shore. Hinckley's Point Spit buoy, N. by W. $\frac{1}{4}$ W., 1 mile.

TIBBETT'S POINT LIGHT-STATION.—A fixed white light, 4th order, visible 15 miles. Gray, round tower 67 feet above sea level, lantern black, dwelling to northward, on Tibbett's point, south side of head of St. Lawrence river, base of old tower, on extremity of point. Reefs extend 200 yards from the point. Pigeon Island light-house (Canadian), W. $\frac{1}{4}$ S., 9 miles. Sackett's Harbor light-house, 20 miles. Galloo Island light-house, S. S. W. $\frac{1}{4}$ W., 15 miles. Charity shoal, S. W. by W. $\frac{1}{4}$ W., about $7\frac{1}{2}$ miles.

Channel South of Carleton Island, Entering from Below.

This channel lies between Carleton island and Feather-bed shoal. The buoys stand in sandy bottom, and mark the edge of the shoal at the narrowest part of the channel, near the head of the island. Above and below the buoys the shoal trends away from the range between them, which thus furnishes a guide for approaching from either direction. The channel decreases in width from two-thirds mile at the entrance to 270 yards at a point mid-way between the buoys; it is $2\frac{1}{4}$ miles long, being a mile shorter than by the north side of island. Shoal water extends to a distance of 400 yards from the lower end of island.

Lower Buoy.—Black spar in 16 feet of water. South side of channel, $1\frac{1}{4}$ miles above the foot of Carleton island. Below this buoy the Carleton Island shore should not be approached nearer than 250 yards; the buoys in range guide near the south side of the channel. Good water to within 70 yards of the point of the north shore, midway between this and the upper buoy. A straight course may be steered between the buoys. Tower of elevator at Cape Vincent., S. W. $\frac{1}{4}$ S. Upper buoy, W. $\frac{1}{8}$ N., 640 yards.

Upper Buoy.—Black spar in $16\frac{1}{2}$ feet of water. South side of channel, opposite the upper end of bay at head of Carleton island; good water part way into that bay, and the head of island above is very bold. This buoy, in range with the foot of Carleton island, clears the edge of shoal above buoy. When the range between the Feather-bed Shoal buoy and the eastern ruined chimney on Carleton island is reached, the main channel is entered. Hinckley's point, S. W. by W. $\frac{1}{4}$ W. Feather-bed Shoal buoy, S. W. $\frac{3}{8}$ W., 1 mile.

LAKE ONTARIO.

Light Houses, Buoys and Harbors, along the East and South Shores of Lake Ontario, from the St. Lawrence River to Welland Canal.

Northeast gales lower the water at the east end of the lake about a foot, and those from the southwest raise it nearly twice as much. From Stony point, 2 miles south of Tibbett's point, a reef makes out $\frac{1}{4}$ of a mile, and is just cleared by the range (S. by W. $\frac{1}{4}$ W., $4\frac{1}{2}$ miles) from the latter point to the west side of Grenadier island. Shoals extend $\frac{1}{4}$ mile from the southwest end of Grenadier island and Point Peninsula, the latter $7\frac{1}{2}$ miles S. E. $\frac{1}{4}$ S. of Grenadier island.

Charity Shoal.—Red 2d-class can buoy in 18 feet of water, on the eastern side and 300 yards from the southern end of a narrow rocky shoal, three-fourths of a mile long (in a northeast and southwest direction) and 350 yards wide; the shoalest water, 5 feet, is north of the

buoy; N. E. by E. $2\frac{1}{2}$ miles, is the Allen Otty shoal, a narrow reef, 700 yards long, with 15 to 18 feet of water on it. A line drawn from the middle of Charity shoal to Hinckley's point crosses the west side of the Allen Otty shoal. It lies 400 yards north of the range between this buoy and Tibbett's Point light-house, and should be avoided in rough weather. Pigeon Island light-house, (Canadian), N. W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles. Tibbett's Point light-house, N. E. by E. $\frac{1}{2}$ E., $7\frac{1}{2}$ miles. Galloo Island light-house, S. $\frac{1}{2}$ E. $10\frac{1}{2}$ miles.

SACKETT'S HARBOR LIGHT-STATION.—A fixed white light, 5th order, visible $13\frac{1}{2}$ miles. Square, red brick tower, attached to dwelling, lantern black, light 49 feet above sea level, on Horse island, south side of entrance to Black River bay; shoal water to a distance of 800 yards on the southwest and 200 yards on the north and east sides of island; a narrow spit, visible at low water, between the island and mainland. The shore between Horse island and Sackett's harbor is bold; entering the latter harbor, the Ship-house point may be rounded close-to, and the eastern wharves of the town steered for. A narrow sand-bar extends from the Ship-house point two-thirds way to the southern wharves. Point Peninsula, W. N. W. $\frac{1}{2}$ W., 7 miles. Sackett's harbor, E. N. E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. Tibbett's Point light, 20 miles. Stony Point light, 11 miles.

Chaumont Bay.—The entrance to this excellent harbor is between Point Peninsula and Pillar point; it is 15 miles in a southeasterly direction from Tibbett's point, and $4\frac{1}{2}$ miles W. N. W. from Sackett's Harbor light. There is 4 to 6 fathoms of water in the bay, with mud bottom; the entrance is $\frac{1}{4}$ mile wide, with bold shores. To enter the bay, steer in about N. E. by N., and come to on the N. W. side of Cherry island, or to the eastward in Guffin bay.

Black River Bay.—This bay extends in a N. E. direction, the entrance is between Horse island and Bull Rock point; the bay is $5\frac{1}{2}$ miles in length, and about 1 mile in width, the depth of water from 7 to 10 fathoms, mud bottom. Shoal water extends from the head of the bay $1\frac{1}{2}$ miles. Sackett's harbor is on the south side of this bay.

Henderson Bay is between Horse island and Six Town point; Gull island and Snake island, two small islands lying in the middle of the entrance, are connected with shoal water, and there are shoals off the ends of these islands extending from one-fourth to half a mile. In the bay the water is from 5 to 7 fathoms deep, with mud bottom.

Galloo Island Shoal.—Black 2d-class nun buoy in 18 feet of water, on the west side and 100 yards from the southern end of a rocky shoal, $1\frac{1}{2}$ miles northwest of the south point of Galloo island. The shoal is 620 yards long and 300 yards wide, least water, 6 feet, near the northeast end. Pass to the westward; good channel also between the shoal and island. Galloo Island light-house, S. E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. North end of Galloo island, E. N. E. $\frac{1}{2}$ E., $3\frac{1}{2}$ miles. Oswego, S. by W. $\frac{1}{2}$ W., 30 miles.

GALLOO ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible $14\frac{1}{2}$ miles. Conical gray tower, connected by covered way with dwelling, lantern black, light 62 feet above sea level. On the southwest end of Galloo island. The straight sides of the island are bold, but at the ends reefs make out nearly one-half mile. A reef extends 500 yards from south end of Little Galloo island, between this

and Stony island; good channels between these islands. A shoal, N. W., and distant $1\frac{1}{2}$ miles from the light, is marked by a black can buoy. Stony Point light-house, S. E. by E. $\frac{1}{4}$ E., 8 miles. Oswego light, S. by W. $\frac{1}{4}$ W., 30 miles.

Calf Island Spit.—Second-class nun buoy, black, in 15 feet of water. Marks the extremity of a narrow rocky spit, extending $1\frac{1}{2}$ miles southwest from Calf island; not less than 10 feet of water on the spit for three-quarters of a mile inside the buoy; shoal water between Calf and Stony islands, also to a distance of one-third mile from south end of the latter island. Galloo Island light-house, N. W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles. East side of Stony island, E. N. E. $\frac{2}{3}$ E.

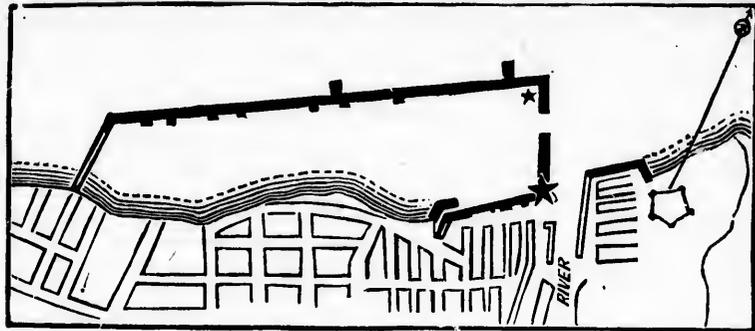
STONY POINT LIGHT-STATION.—A fixed white light, varied by white flashes at intervals of 2 minutes; 5th order, visible 13 miles. Square gray tower attached to dwelling, lantern black, light 45 feet above sea level, on Stony point, east shore of lake; reefs make out one-quarter mile from the point. A reef, with 4 feet of water on it, lies three-quarters of a mile off shore, $4\frac{1}{2}$ miles to the southward and eastward. Galloo Island light-house, N. W. by W. $\frac{1}{2}$ W., 8 miles. Oswego, S. S. W. $\frac{3}{4}$ W., 28 miles. A buoy marking the end of a spit extending $1\frac{1}{2}$ miles S. W. from Calf island bears N. W. by W. $\frac{1}{4}$ W., $4\frac{1}{2}$ miles.

Oswego Beacon Light.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. Octagonal brown iron tower, dome of lantern black, light 39 feet above sea level. On crib in angle of west breakwater, Oswego harbor, mouth of Oswego river. In the harbor west of this beacon, behind the new breakwater, there are 3 fathoms of water, shoaling to 2 fathoms two-thirds way to the shore at the east and west ends, and one-quarter way to shore in the middle; hard bottom. The opening between the east end of the west breakwater and the north end of the light-house pier is 350 feet. In approaching this harbor from eastward or westward, with a free wind, care should be taken not to fall to leeward of the range between the beacon and main lights. Fog-signal is a bell attached to north face of beacon, struck by machinery, single blows at intervals of 12 seconds. Fair Haven light, 13 miles.

NOTE.—The east breakwater has been entirely removed and there are now 21 feet of water in the position it occupied. There has been two spurs built extending in a northerly direction from the west breakwater. Depth of water abreast of beacon 21 feet, there are 16 feet abreast of the main light, and from thence to abreast of the North Western elevator 14 feet can be safely carried. The best water is in mid-channel.

The Life Saving Station is on the east side of the entrance to the harbor.

OSWEGO LIGHT-STATION.—A fixed white light, 3d order, visible $15\frac{1}{2}$ miles. Gray octagonal tower, and oil room attached, lantern black. Near the inner end of pier west side of entrance to river harbor, 1,250 feet from the beacon; the entrance is 100 yards wide. The end of this pier, formerly occupied by the beacon, will be kept painted white to distinguish it at night. Standing up the river, the widest channel and best water is east of the middle-ground piers. A rocky 6-foot ledge extends 100 yards from the lower end of the middle-ground pier at the draw-bridge. During northerly gales a heavy swell sets through the entrance, rendering berths in the lower harbor insecure. Direction of piers, N. N. W. $\frac{1}{4}$ W.



OSWEGO.

FAIR HAVEN LIGHT-STATION.—A fixed white light, 4th order, visible $11\frac{1}{2}$ miles. Pyramidal tower, brown below and white above, square in plan, 27 feet high; elevated walk along pier to shore. Dwelling on bluff west of harbor, drab color. On outer end of west pier, entrance to Little Sodus bay, width between piers, 235 feet; direction of piers, north. The piers have been extended to the 12-foot curve in extreme low water, and the channel between them dredged to a depth of 12 feet low water. The dredged channel has never been carried beyond the outer ends of the piers, and a shoal nearly 1,000 feet in width, carrying 12 to 14 feet at low water intervenes between deep water in the lake and the channel between the piers. The point of land west of the light-house may be passed within one-fourth mile in 12 feet of water. Little Sodus bay is 2 miles long (in a southerly direction); average width one-half mile, 4 to 6 fathoms deep, clay bottom; bold shores, except in the bights, and no dangers except a shoal, one-quarter mile long, and marked by rushes growing in its centre, lying near the west shore, one-half mile inside the entrance, a narrow channel between shoal and shore. This light, opened *brightly*, leads past the point of land a mile to the westward in 2 fathoms of water; farther inshore the naked light shows dimly. Fog-signal is a bell striking a double blow every 20 seconds. Nine-mile point, N. E. $\frac{1}{4}$ E., 6 miles. Outer point of shore to the westward, W. $\frac{1}{4}$ S., 1 mile. Big Sodus light, 15 miles.

Fair Haven Range Light.—A fixed white light, visible 9 miles. A lantern shown from a white mast $14\frac{1}{2}$ feet above sea level, near the inner end of the west pier, serves as a guide within the bay and as a range to enter between the piers from inside the bay.

Big Sodus Beacon-light.—(Outer.) A fixed white light, 6th ord., visible $11\frac{1}{2}$ miles. Pyramidal tower, brown below and white above, square in plan, 27 feet high; elevated walk along pier to shore. On outer end of west pier, entrance to Big Sodus bay; width between piers, 450 feet; direction of piers, N. $\frac{1}{4}$ E. A channel about 100 feet in width is being dredged to a depth of 16 feet. A 7-foot spot lies one-third mile off shore, $2\frac{1}{4}$ miles to the eastward. Point of shore a mile west of Fair Haven light-house, E. N. E. $\frac{1}{4}$ E., 13 miles. Outer point of shore to the westward, W. N. W. $\frac{1}{4}$ W., $6\frac{1}{2}$ miles.

Big Sodus Beacon-light.—(Inner.) A fixed red light, 6th order, visible $10\frac{1}{4}$ miles. Octagonal tower, 18 feet high, brown below



and white above. At elbow of west pier entering the bay, and 450 yards from the outer beacon. Big Sodus bay extends 6 miles in a southeasterly direction; width (west of the islands), 1 mile, narrowing to one-half mile near the head; $3\frac{1}{2}$ to 7 fathoms deep; soft bottom; 12 feet of water may be carried to within one or two hundred yards of the shore, except between the east shore and the islands. The range between the beacon and the middle of Islay island (S. E. $\frac{1}{4}$ S.) clears a shoal making out southwest from the elbow of the east pier and guides up the middle of the channel (400 yards wide) between Charles point and Sand point; the end of the latter is very bold. Eight feet of water can be carried through the channel east of Islay and Arran islands. A small 6-foot shoal, marked by reeds, lies 300 yards off the point of the east shore, a mile north of Glasgow. This light serves only as a guide within the bay, and as a range to enter between the piers. Sand point, S. by E. $\frac{1}{4}$ E., one-half mile. North end of Arran island, S. E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles.

BIG SODUS LIGHT-STATION.—A fixed white light, varied by white flashes, at intervals of 2 minutes, 4th order, visible 15 miles. Square gray tower 45 feet high, with dwelling attached, lantern black, light 68 feet above sea level. At Sodus Point, on the lake bluff three-fifths mile west of entrance to Big Sodus bay, Genesee light-house, 32 miles to the westward.

Pultneyville, at the mouth of Salmon creek, is $10\frac{1}{2}$ miles to the westward of the piers at Big Sodus; and 21 miles to the eastward of the piers at the mouth of Genesee river. It has no light-house. The harbor works consist of a pier running easterly from the west shore, and thence northerly into the lake, with an east pier parallel to and about 200 feet from the northerly arm of the west pier. Length of west pier from the shore arm, 558 feet. Length of east pier, 572 feet; the west pier extends about 300 feet further into the lake than the east pier. Depth at low water, 6 feet.

GENESEE LIGHT-STATION.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. Square pyramidal tower, brown below and white above, 27 feet high; elevated walk along the pier to the shore; light 31 feet above sea level. About 20 feet from the outer end of west pier entrance to Charlotte harbor, mouth of Genesee river; width between piers, 450 feet; 14 feet of water carried through into the river; best water $\frac{1}{2}$ way from west pier. Passing the hotel on west beach, vessels drawing more than 12 feet of water should keep nearest the east pier; sandy bottom. Six to 9 feet of water, stony bottom, alongside the outer half of both piers; further in, alongside the old piling, showing at surface of water, there is from 11 to 13 feet. The fog-signal is a bell, struck by machinery at intervals of 30 seconds. Five miles west of Braddock's point, a spit, with 9 feet of water near the end, makes out two-thirds mile from the shore; and three-fourths mile east of Devil's Nose, a 10-foot spot lies nearly one-half mile off shore. Direction of piers, N. E. $\frac{1}{4}$ N. Outer point of shore to the eastward, E. $\frac{1}{4}$ N., 13 miles. Braddock's point, N. W. $\frac{1}{4}$ W., 7 miles.

Genesee Range Light. (For entering Charlotte harbor.) Three fixed lights, two red and one white, shown vertically with white light in the middle, lens lanterns suspended from a white mast at the shore end of elevated walk on the west pier. Lights 60 feet above lake

level, and form a range with the light on the outer end of the pier on a line with the direction of the piers.

The Life Saving Station is at the east side of the entrance to the harbor.

Braddock Point. Light-house to be built.

OAK ORCHARD LIGHT-STATION.—A fixed white light, 4th order, visible $11\frac{1}{2}$ miles. Pyramidal tower, brown below and white above. Square in plan, 27 feet high; an elevated walk along pier to shore. On outer end of west pier, entrance to Oak Orchard harbor; width between piers, 175 feet; channel 100 feet wide and 12 feet deep is being dredged next to east pier. An eleven-foot spot lies one-half mile off shore, $1\frac{1}{2}$ miles to the eastward, bearing E. N. E. $\frac{1}{4}$ E. from the light-house. Direction of piers, N. $\frac{3}{4}$ E. Outer point of shore to the eastward, E. $\frac{1}{2}$ S., $1\frac{1}{4}$ miles. Outer point of shore to the westward, W. $\frac{3}{8}$ N., 9 miles. Thirty-mile Point light-house, W. $\frac{1}{4}$ N., 15 miles.

THIRTY-MILE POINT LIGHT-STATION.—A flashing white light, 3d order, visible $15\frac{1}{2}$ miles; interval between flashes 90 seconds. Dark gray tower, square in plan, 54 feet high, rising from the north front of dwelling; watch-room, black. Lantern black, light 78 feet above sea level. On a slight projection of the lake coast, 30 miles east of the mouth of Niagara river. The building stands close to the water, with thick woods near by on both sides. A white out-house on the east side. A shoal, a mile in length, lies one-half mile off shore, $2\frac{3}{4}$ miles (the west end) east of this light-house; least water on shoal, 8 feet; narrow channel inside. Outer point of shore to the eastward, E. $\frac{1}{4}$ S., 6 miles. Outer point of shore to the westward, W. $1\frac{3}{8}$ miles. Olcott light-house, W. $\frac{5}{8}$ S., 12 miles.

OLCOTT LIGHT-STATION.—A fixed white light, 6th order, visible $11\frac{1}{2}$ miles. Pyramidal tower, brown below and white above; square in plan, 27 feet high; an elevated walk along pier to shore. On outer end of west pier, entrance to Olcott harbor, mouth of Eighteen-mile creek; width between piers, 175 feet. Work in progress to obtain a channel 11 feet deep. Direction of piers, N. $\frac{1}{4}$ W. Outer point of shore to the eastward, E. by N., $4\frac{1}{8}$ miles. Outer point of shore to the westward, W. by S., 6 miles. Fort Niagara Shoal buoy, W. by S., $18\frac{1}{2}$ miles.

Wilson's Harbor, at the mouth of Twelve-mile creek, is $12\frac{1}{2}$ miles E. by N. $\frac{3}{8}$ N. from Fort Niagara, and W. by S. $\frac{1}{4}$ S., 6 miles from Olcott. It has no light-house. The harbor consists of two parallel piers of navigable width extending to the 8-foot curve in the lake; direction of piers, N. $\frac{1}{4}$ E., depth at low water, 9 feet. The best water is near the west pier.

Niagara River Below the Falls.

Two and three-fourth miles off shore, just beyond the national boundary, and bearing N. by W. $\frac{1}{2}$ W. from Fort Niagara light-house, is the middle of a reef with 13 feet of water on it, extending two-thirds mile in an east and west direction S. W. $\frac{3}{4}$ S., $1\frac{1}{2}$ miles from the middle of this reef, and N. W. $\frac{1}{4}$ N. from Fort Niagara light-house, is a small 11-foot shoal. The width of the Niagara between its mouth and Lewiston,

N. Y., 6 miles above, is about 500 yards; depth, 5 to 12 fathoms; muddy or rocky bottom; banks bold and high, and no dangers. At Lewiston, which is half-way to the Falls, and at the head of navigation, the current is about 4 miles per hour, decreasing to 3 at the mouth of the river, and to one-fourth mile at a distance of 2 miles off shore. The strength of the river current and depth of water in mouth of river and west end of lake, generally, are materially affected by winds blowing up or down the lake; the former decrease the current and raise the water, and the latter produce the contrary effect. The difference in water-level is sometimes as much as three feet each way.

Bell Buoy.—A bell buoy (Canadian) painted red, in 20 feet of water. Off the west side of the mouth of Niagara river. The buoy is of the "Brown patent" pattern, and is rung automatically by the action of the waves. In smooth water the bell does not sound. This buoy replaces the wooden spar buoy heretofore placed on the bar that extends from the mouth of the river. Vessels entering the Niagara river can run close up to the bell buoy, leaving it to starboard. There is a 13-foot shoal one-third mile northeastward of the buoy on the port side of the entrance. From the buoy Fort Niagara light-house bears S. E. by S. $\frac{1}{4}$ S., 2.6 miles. Fort Mississauga bears S. by E., and Four Mile point, S. W. $\frac{1}{4}$ S., and a course $2\frac{1}{2}$ miles S. S. E. $\frac{1}{8}$ E. will lead up to the steamboat wharf at Niagara on the lake.

NOTE.—In consequence of the establishment of this bell buoy, the fog bell rung by machinery, on the north rampart of Fort Mississauga at the mouth of the river, has been discontinued.

Fort Niagara Shoal.—Black spar buoy in 14 feet of water marks the northern and western point of a rocky shoal, east side of entrance to Niagara river, and stands two-thirds mile from the shore and a quarter mile inside the 18-foot curve of the bottom. The water shoals gradually inside the buoy to a depth of 6 feet close to the shore. Abreast the outer face of Fort Niagara, a spur of the reef projects a little beyond the range between the buoy and the outer corner of the Fort Niagara wharf. Fort Niagara wharf, S. S. E. $\frac{1}{4}$ E., three-quarters mile. Outer point of shore to the westward, W. by S., 3 miles.

FORT NIAGARA LIGHT-STATION.—A fixed white light, 4th order, visible $15\frac{1}{2}$ miles. Gray octagonal tower 49 feet high, with oil room attached, light 78 feet above sea level, on the high east bank of the river, one-fourth mile from its mouth. Only the upper half of the tower is visible from the lake. Port Dalhousie, entrance to Welland canal, 11 miles to the westward.

To Enter Niagara River.—Bring the light to bear S. E. $\frac{1}{4}$ E., one mile distant, when steer S. E. by S., keeping a little outside the line of the wharves under the Fort, and when past the wharves, keep up the middle of the river.

NOTE.—Steering S. $\frac{3}{4}$ E., heading on Fort Niagara light, leads to the eastward of the reefs off the mouth of Niagara river.

Port Dalhousie (Canadian light).—Revolving white light, visible 13 miles. White circular wooden tower, light 53 feet above high water. On the east pier, 339 feet from outer end, at the eastern entrance to Welland canal. Shows from E. to W. by S. Interval of revolution, one minute.

Port Dalhousie (South light).—A fixed white light. White,

square, wooden tower. On end of east pier, 315 feet S. $\frac{1}{4}$ W. from main light. The piers are 200 feet apart, about 2,000 feet in length, direction N. $\frac{1}{4}$ E. Depth of water 14 feet at low water. The north side of the outer reef off the mouth of Niagara river, N. E. by E. $\frac{1}{4}$ E., 11 miles. Burlington Eay light, W. by N. $\frac{3}{4}$ N., 27 miles. Gibraltar light, N. $\frac{3}{4}$ W., 28 miles. One lamp shows N. $\frac{1}{2}$ E., one N. W. and one S. W., or up the harbor.

NOTE.—There are ranges for ascertaining compass errors at this port. Particulars can be obtained at canal office.

Compass Courses and Distances on the South Shore of Lake Ontario.

Cape Vincent to Niagara and Port Dalhousie.—When abreast of Cape Vincent and $\frac{1}{2}$ a mile from the shore, steer S. W. by W. $\frac{1}{4}$ W., 28 miles to a point, 4 miles S. $\frac{5}{8}$ W. of False Ducks light, passing $\frac{1}{2}$ mile north of Charity shoal; when steer W. by S. $\frac{1}{4}$ S., 121 miles to a point, 4 miles N. $\frac{5}{8}$ W. from Fort Niagara light, or 131 miles to a point, 4 miles N. $\frac{3}{8}$ E. of Port Dalhousie.

Cape Vincent to Charlotte.—When at a point 4 miles S. $\frac{5}{8}$ W. of False Ducks light, as in the course from Cape Vincent to Niagara, steer S. W. $\frac{3}{8}$ W., 56 $\frac{1}{2}$ miles, to a point 3 miles N. E. from Genesee light.

Cape Vincent to Big Sodus.—When abreast of Cape Vincent and $\frac{1}{2}$ a mile from shore, steer S. W. by W. $\frac{1}{4}$ W., 4 miles, until Tibbett's Point light bears E. $\frac{1}{4}$ S., 1 $\frac{1}{4}$ miles distant, then S. W. $\frac{3}{4}$ S., 62 miles, until in range of the two beacons and 2 miles N. $\frac{1}{4}$ E. from the outer beacon.

Cape Vincent to Gibraltar Point.—When at a point 4 miles S. $\frac{5}{8}$ W. of False Ducks light, as in the course from Cape Vincent to Niagara, steer W. by S. 19 $\frac{1}{2}$ miles to a point 3 miles S. $\frac{5}{8}$ W. of Point Peter light, thence W. $\frac{1}{4}$ S. 113 miles to a point 1 mile south of Gibraltar Point light. See Toronto range lights.

Cape Vincent to Kingston.—When abreast of Cape Vincent and $\frac{1}{2}$ a mile from shore, steer S. W. by W. $\frac{1}{4}$ W. 6 $\frac{1}{2}$ miles, until Bear point bears N. $\frac{1}{4}$ E., 1 mile distant, thence W. $\frac{3}{4}$ N. 4 $\frac{1}{2}$ miles to a point 1 $\frac{1}{4}$ miles N. E. by E. of Pigeon Island light, and in line with the light and Long point on Wolfe island, thence N. by W. $\frac{3}{8}$ W. 5 $\frac{1}{2}$ miles to a point $\frac{3}{4}$ mile W. $\frac{3}{4}$ N. from Simcoe Island light, when steer N. E. $\frac{3}{8}$ N. 1 $\frac{1}{2}$ miles to a point 1 mile N. $\frac{1}{4}$ E. from Simcoe Island light, and in range with it and Pigeon Island light, when steer N. $\frac{1}{4}$ E. 2 $\frac{1}{2}$ miles, keeping Pigeon Island and Simcoe Island lights in range, until Snake Island light bears S. E. $\frac{1}{4}$ S. 1 $\frac{1}{2}$ miles distant, when steer E. by N. 4 miles, keeping within $\frac{1}{2}$ of a mile of the north shore until abreast of Kingston.

Cape Vincent to Oswego.—When at a point W. $\frac{3}{4}$ N., 1 $\frac{1}{2}$ miles from Tibbett's Point light, as in the course from Cape Vincent to Big Sodus, steer S. S. W. $\frac{3}{4}$ W. 16 miles to a point 3 $\frac{1}{2}$ miles W. $\frac{5}{8}$ N. of Galloo Island light, when steer S. $\frac{1}{4}$ W., 28 $\frac{1}{2}$ miles to a point 1 mile N. $\frac{1}{4}$ E. of Oswego beacon-light.

Kingston to Niagara River and Port Dalhousie.—When abreast of Kingston and $\frac{1}{2}$ mile from shore, steer W. by S., 4 miles

until Snake Island light bears S. E. $\frac{3}{4}$ S., $1\frac{1}{2}$ miles distant, when steer S. $\frac{1}{2}$ W. on a range of Simcoe and Pigeon Island lights for $2\frac{1}{2}$ miles until within 1 mile of Simcoe Island light, when steer S. W. $\frac{1}{4}$ S., $22\frac{1}{2}$ miles to a point, 4 miles S. $\frac{1}{4}$ W. of False Ducks light, when steer W. by S. $\frac{1}{4}$ S., 121 miles to a point, 4 miles N. $\frac{1}{4}$ W. from Fort Niagara, or 131 miles to a point 4 miles N. $\frac{3}{8}$ E. of Port Dalhousie light.

NOTE.—When running on the course S. $\frac{1}{2}$ W. on a range of Simcoe and Pigeon Island lights, the course leads very close to the west side of a 15-foot shoal $1\frac{1}{2}$ miles N. $\frac{3}{8}$ E. from Simcoe Island light.

Kingston to Oswego.—When 1 mile N. $\frac{1}{2}$ E. from Simcoe Island light, and in range with it and Pigeon Island light, as in the course from Kingston to Niagara river, steer S. W. $\frac{3}{8}$ S., $1\frac{1}{2}$ miles to a point $\frac{3}{4}$ mile W. $\frac{3}{4}$ N. of Simcoe Island light, thence S. $\frac{3}{8}$ W., $46\frac{1}{2}$ miles to a point 1 mile N. $\frac{3}{8}$ E. of Oswego beacon light.

Sackett's Harbor to Charlotte.—When $\frac{1}{2}$ a mile north of Sackett's Harbor light, steer W. S. W. 9 miles to a point 3 miles N. $\frac{3}{4}$ E. of Stony Point light, when steer W. S. W. $\frac{3}{8}$ S. $75\frac{1}{2}$ miles to a point 3 miles N. E. from Genesee light.

Sackett's Harbor to Big Sodus.—When at a point 3 miles N. $\frac{3}{4}$ E. of Stony Point light as in the course from Sackett's harbor to Charlotte, steer S. W. $\frac{1}{2}$ W., 52 miles, until in range of the two beacon lights at Big Sodus, and 2 miles N. $\frac{1}{4}$ E., from the outer beacon.

Sackett's Harbor to Oswego.—When $\frac{1}{2}$ a mile north of Sackett's Harbor light, steer W. S. W. 9 miles to a point 3 miles N. $\frac{3}{4}$ E. of Stony Point light, when steer S. S. W. $\frac{1}{2}$ W., 30 miles to a point 1 mile N. $\frac{3}{8}$ E. of Oswego beacon light.

Sackett's Harbor to Kingston.—When $\frac{1}{2}$ mile north of Sackett's Harbor light, steer W. $\frac{3}{4}$ N. 7 miles, passing $\frac{3}{4}$ mile south of Point Peninsular until the west side of the point bears N. $\frac{3}{4}$ E., then steer N. W. $\frac{1}{2}$ W., 15 miles to a point $1\frac{1}{2}$ miles N. E. by E. of Pigeon Island light and in line with the light and Long point, on Wolfe island, thence N. by W. $\frac{3}{8}$ W., $5\frac{1}{2}$ miles to a point $\frac{3}{4}$ mile W. $\frac{3}{4}$ N. of Simcoe Island light, then N. E. $\frac{3}{8}$ N., $1\frac{1}{2}$ miles to a point 1 mile N. $\frac{1}{2}$ E. of Simcoe Island light, and in range with it and Pigeon Island light; thence N. $\frac{1}{2}$ E., $2\frac{1}{2}$ miles, keeping Pigeon Island and Simcoe Island lights in range until Snake Island light bears S. E. $\frac{3}{4}$ S., $1\frac{1}{2}$ miles distant, when steer E. by N. 4 miles, until abreast of Kingston, keeping a $\frac{1}{2}$ of a mile from the north shore.

Sackett's Harbor to Point Peter.—When $\frac{1}{2}$ mile north of Sackett's Harbor light steer W. S. W. $12\frac{1}{2}$ miles to a point 3 miles west of Stony Point light, thence W. $\frac{3}{8}$ N. 41 miles to a point 3 miles S. $\frac{3}{8}$ W. of Point Peter light.

Sackett's Harbor to Points on the north shore east of Toronto. See Courses and Distances on the north shore from Long Point, or Point Peter.

Sackett's Harbor to Gibraltar Point.—When at a point 3 miles west of Stony Point light as in the course from Sackett's Harbor to Point Peter, steer due west 152 miles to a point 1 mile south of Gibraltar light. This course should lead about 4 miles south of Point Peter light.

Sackett's Harbor to Burlington Bay.—When at a point

3 miles west of Stony Point light as in the course from Sackett's Harbor to Point Peter, steer W. $\frac{1}{4}$ S. 175 $\frac{1}{2}$ miles to the piers.

Oswego to Niagara River and Port Dalhousie.—When 1 mile N. by W. of Oswego light, steer W. $\frac{1}{4}$ N. 99 miles, until Thirty-mile Point light bears S. $\frac{1}{4}$ W., 6 $\frac{1}{2}$ miles distant, when steer W. by S. $\frac{1}{4}$ S., 32 miles to a point 4 miles N. $\frac{1}{2}$ W. from Fort Niagara light, or 42 miles to a point 4 miles N. $\frac{1}{2}$ E. of Port Dalhousie.

Little Sodus Bay to Sackett's Harbor.—When 1 $\frac{1}{2}$ miles N. $\frac{1}{2}$ E. of Fair Haven light, steer N. E. $\frac{1}{4}$ N., 41 miles to a point 3 miles N. $\frac{1}{4}$ E. of Stony Point light, when steer E. N. E., 9 miles to a point $\frac{1}{2}$ a mile north of Sackett's Harbor light.

Little Sodus Bay to Cape Vincent.—When 1 $\frac{1}{2}$ miles N. $\frac{1}{2}$ E., of Fair Haven light, steer N. N. E., 37 miles to a point 3 $\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from Galloo Island light, thence N. N. E. $\frac{1}{2}$ E., 16 miles until Tibbett's Point light bears E. $\frac{1}{4}$ S., 1 $\frac{1}{2}$ miles distant, thence N. E. by E. $\frac{1}{4}$ E., 4 miles until abreast of Cape Vincent.

Little Sodus Bay to Kingston.—When 1 $\frac{1}{2}$ miles N. $\frac{1}{2}$ E. of Fair Haven light, steer N. $\frac{1}{2}$ E. 40 miles until False Ducks light bears W. $\frac{1}{2}$ N. 4 $\frac{1}{2}$ miles distant, when steer N. E. by N. 15 miles to a point $\frac{1}{2}$ mile W. $\frac{1}{4}$ N. from Simcoe Island light, when steer N. E. $\frac{1}{2}$ N., 1 $\frac{1}{2}$ miles to a point 1 mile N. $\frac{1}{4}$ E. from Simcoe Island light, and in range with it and Pigeon Island light, when steer N. $\frac{1}{2}$ E., 2 $\frac{1}{2}$ miles, keeping Pigeon Island and Simcoe Island lights in range, until Snake Island light bears S. E. $\frac{1}{4}$ S. 1 $\frac{1}{2}$ miles distant, when steer E. by N. 4 miles, keeping within $\frac{1}{2}$ of a mile of the north shore until abreast of Kingston. (See note under the course from Kingston to Niagara river.)

Little Sodus to Gibraltar Point.—When 1 $\frac{1}{2}$ miles N. $\frac{1}{2}$ E. of Fair Haven light, steer W. by N. $\frac{1}{4}$ N. 136 miles to a point 1 mile south of Gibraltar Point light.

Little Sodus Bay to Niagara River and Port Dalhousie.—When 1 $\frac{1}{2}$ miles N. $\frac{1}{2}$ E. of Fair Haven light, steer W. $\frac{1}{2}$ N. for 89 $\frac{1}{2}$ miles to a point 2 miles N. $\frac{1}{4}$ E. of Thirty-Mile Point light, thence W. $\frac{1}{2}$ S., 30 miles to a point 4 miles N. $\frac{1}{2}$ W. of Fort Niagara light, when steer W. by S. $\frac{1}{4}$ S. 10 miles, or until Port Dalhousie light bears S. $\frac{1}{2}$ W., 4 miles distant.

Little Sodus to Charlotte.—When 1 mile N. $\frac{1}{2}$ E. of Fair Haven light, steer W. 1° S. 45 miles to a point 1 mile N. E. of Genesee light.

Big Sodus to Sackett's Harbor.—When 2 miles N. $\frac{1}{4}$ E. from the outer beacon, and in range with the two beacons at Big Sodus, steer N. E. $\frac{1}{2}$ E. 52 miles to a point 3 miles N. $\frac{1}{4}$ E. from Stony Point light when steer E. N. E., 9 miles to a point $\frac{1}{2}$ a mile north of Sackett's Harbor light.

Big Sodus to Kingston.—When 2 miles N. $\frac{1}{4}$ E. from the outer beacon and in range of the two beacons at Big Sodus, steer N. N. E. $\frac{1}{2}$ E., 61 $\frac{1}{2}$ miles to a point $\frac{1}{4}$ of a mile W. $\frac{1}{4}$ N. of Simcoe Island light, when see course from Little Sodus bay to Kingston.

Big Sodus to Niagara River and Port Dalhousie.—When 2 miles N. $\frac{1}{4}$ E. from the outer beacon, and in range of the two beacons, steer W. by N. $\frac{1}{2}$ N., 62 miles to a point 2 miles N. $\frac{1}{2}$ E. of Oak Orchard, thence W. $\frac{1}{2}$ N., 15 miles to a point 2 miles N. $\frac{1}{2}$ E. of Thirty-

mile Point light, whence see the course from Little Sodus bay to Niagara river and Port Dalhousie.

Big Sodus to Gibraltar Point.—When two miles N. $\frac{1}{2}$ E. from the outer beacon and in range of the two beacons, steer W. by N. $\frac{3}{4}$ N., 123 miles to a point 1 mile south of Gibraltar Point light.

Big Sodus to Cape Vincent.—When 2 miles N. $\frac{1}{2}$ E. from the outer beacon, and in range of the two beacons, steer N. E. $\frac{1}{4}$ N. 62 miles to a point $1\frac{1}{2}$ miles W. $\frac{1}{4}$ N. of Tibbett's Point light, thence N. E. by E. $\frac{1}{2}$ E. 4 miles until abreast of Cape Vincent.

Charlotte to Kingston.—When 3 miles N. E. $\frac{1}{4}$ N. from Genesee light, steer N. E. $\frac{1}{4}$ E., 56 $\frac{1}{2}$ miles to a point 4 miles S. $\frac{3}{4}$ W. from False Ducks light, when steer N. E. $\frac{3}{4}$ N., 22 $\frac{1}{2}$ miles to a point 1 mile N. $\frac{1}{4}$ E., from Simcoe Island light and in range with it and Pigeon Island light, when see course from Little Sodus bay to Kingston.

Charlotte to Oswego.—When 3 miles N. E. $\frac{1}{4}$ N., from Genesee light, steer E. $\frac{1}{4}$ N. 55 miles to a point 1 mile N. by W. of Oswego beacon-light.

Charlotte to Niagara River and Port Dalhousie.—When 2 miles N. $\frac{1}{2}$ E., from Genesee light, steer N. W. $\frac{1}{4}$ W., 10 miles or until the point 3 miles west of Braddock's point bears S. $\frac{1}{2}$ W., 2 miles distant, when follow along the shore W. by N., 21 $\frac{1}{2}$ miles or until Oak Orchard light bears S. $\frac{3}{4}$ W., 2 miles distant, thence W. $\frac{5}{8}$ N., 15 miles or until Thirty-mile Point light bears S. $\frac{3}{4}$ W., 2 miles distant, when see course from Little Sodus bay to Niagara river and Port Dalhousie.

Charlotte to Gibraltar Point.—When 2 miles N. $\frac{1}{2}$ E., from Genesee light, steer N. W. $\frac{1}{2}$ W., 10 miles or until the point 3 miles west of Braddock's point bears S. $\frac{1}{2}$ W., 2 miles distant, when steer W. by N. $\frac{3}{4}$ N., 83 miles to a point 1 mile south of Gibraltar Point light.

Charlotte to Whitby.—When 2 miles N. $\frac{1}{2}$ E. of Genesee light, steer N. W. $\frac{1}{2}$ W. 10 miles or until the point 3 miles west of Braddock's point bears S. $\frac{1}{2}$ W., 2 miles distant, then N. W. by W. 65 miles to a point 1 mile south of Whitby light.

Charlotte to Burlington Bay.—When Thirty-mile Point light bears S. $\frac{3}{4}$ W., 2 miles distant as in the course from Charlotte to Niagara, steer W. 65 $\frac{1}{2}$ miles to the piers at Burlington Bay.

Oak Orchard to Cape Vincent.—When 2 miles N. $\frac{3}{4}$ E. of Oak Orchard light, steer E. N. E. $\frac{1}{2}$ E., 77 $\frac{1}{2}$ miles to a point 4 miles S. $\frac{3}{4}$ W., of False Ducks light, when steer N. E. by E. $\frac{1}{2}$ E., 28 miles to abreast of Cape Vincent and $\frac{1}{2}$ mile from shore. Passing $\frac{1}{2}$ mile N. W. of Charity shoal.

Oak Orchard to Niagara River and Port Dalhousie.—When 2 miles N. $\frac{3}{4}$ E. of Oak Orchard light, steer W. $\frac{5}{8}$ N., 15 miles to a point 2 miles N. $\frac{3}{4}$ E. from Thirty-mile Point light, whence see the course from Little Sodus bay to Niagara river and Port Dalhousie.

Oak Orchard to Kingston.—When 2 miles N. $\frac{3}{4}$ E. of Oak Orchard light, steer E. by N. $\frac{1}{4}$ N. 77 $\frac{1}{2}$ miles to a point 4 miles S. $\frac{3}{4}$ W. of False Ducks light, when see course from Port Dalhousie to Kingston.

Oak Orchard to Gibraltar Point.—When 2 miles N. $\frac{3}{4}$ E. of Oak Orchard light, steer W. by N. $\frac{1}{2}$ N. 61 $\frac{1}{2}$ miles to a point 1 mile south of Gibraltar Point light.

Thirty-mile Point to Oswego.—When 3 miles N. $\frac{3}{8}$ E. of Thirty-mile Point light, steer E. $\frac{1}{4}$ S. 99 miles, to a point 1 mile N. by W. of Oswego beacon-light.

Thirty-mile Point to Niagara and Port Dalhousie.—When 2 miles N. $\frac{3}{8}$ E. of Thirty-mile Point light, steer W. $\frac{5}{8}$ S. 30 miles to a point 4 miles N. $\frac{5}{8}$ W. of Fort Niagara light, when steer W. S. W., $\frac{1}{4}$ S. 10 miles or until Port Dalhousie light bears S. $\frac{5}{8}$ W. 2 miles distant; this course leads close to the reefs off Niagara river.

Port Dalhousie to Kingston.—When 4 miles N. $\frac{3}{8}$ E. of Port Dalhousie light, steer E. by N. $\frac{1}{4}$ N., 131 miles to a point 4 miles S. $\frac{5}{8}$ W. of False Ducks light, when steer N. E. $\frac{5}{8}$ N. 22 $\frac{1}{2}$ miles, to a point 1 mile N. $\frac{1}{4}$ E. of Simcoe Island light, and in range with it and Pigeon Island light; thence N. $\frac{1}{4}$ E. 2 $\frac{1}{2}$ miles, keeping Pigeon Island and Simcoe Island lights in range until Snake Island light bears S. E. $\frac{3}{4}$ S., 1 $\frac{1}{2}$ miles distant, when steer E. by N., 4 miles until abreast of Kingston, keeping $\frac{1}{4}$ of a mile from the north shore. (See note under the course from Kingston to Niagara river.)

Port Dalhousie to Cape Vincent.—When 4 miles S. $\frac{5}{8}$ W. of False Ducks light, as in the course from Port Dalhousie to Kingston, steer N. E. by E. $\frac{1}{4}$ E., 28 miles, to abreast of Cape Vincent, and $\frac{1}{4}$ mile from shore, passing $\frac{1}{2}$ mile north of Charity shoal.

Port Dalhousie to Oswego.—When 4 miles N. $\frac{3}{8}$ E. of Port Dalhousie light, steer E. by N. $\frac{5}{8}$ N. 29 miles, to a point 4 $\frac{1}{2}$ miles N. $\frac{5}{8}$ E. of Olcott light, when steer E. $\frac{1}{4}$ S. 111 miles, to a point 1 mile N. by W. of Oswego beacon-light.

Port Dalhousie to Burlington Bay.—When 1 mile N. $\frac{3}{8}$ E. of Port Dalhousie light, steer W. by N. $\frac{1}{4}$ N. 27 miles to Burlington Bay light.

Port Dalhousie to Gibraltar Point.—When 1 mile N. $\frac{3}{8}$ E. of Port Dalhousie light, steer N. by W., 27 miles, to a point 1 mile southwest of Gibraltar Point light.

Port Dalhousie to Whitby.—When 1 mile N. $\frac{3}{8}$ E. of Port Dalhousie light, steer N. N. E. $\frac{5}{8}$ E., 44 $\frac{1}{2}$ miles, to a point 1 mile south of Whitby Harbor light.

Port Dalhousie to Port Hope.—When 1 mile N. $\frac{3}{8}$ E. of Port Dalhousie light, steer N. E. $\frac{1}{4}$ E., 69 miles, to a point 1 mile south of Port Hope light.

Port Dalhousie to Presque Isle.—When 2 miles N. $\frac{3}{8}$ E. of Port Dalhousie light, steer E. N. E. $\frac{1}{4}$ N., 94 miles, to a point 2 miles S. $\frac{1}{4}$ W. from Presque Isle light; this course leads 1 mile south of the 10-foot spot, 5 miles S. W. by W. $\frac{1}{4}$ W. from Presque Isle light.

Compass Bearings and Distances from Lights on the South Shore to Lights on the North Shore.

Stony Point to Point Peter.....	W. $\frac{1}{4}$ N.	43 Miles.
Stony Point to Gibraltar Point.....	W.	155 $\frac{1}{2}$ "
Stony Point to Burlington Bay.....	W. $\frac{1}{4}$ S.	178 $\frac{1}{2}$ "
Oswego to False Ducks.....	N. by W. $\frac{1}{4}$ W.	96 "
Oswego to Point Peter.....	N. W. $\frac{1}{4}$ N.	42 "
Oswego to Port Hope.....	N. W. by W. $\frac{1}{4}$ W.	93 "
Oswego to Gibraltar Point.....	W. $\frac{1}{4}$ N.	145 "
Oswego to Whitby.....	W. by N. $\frac{1}{4}$ N.	123 $\frac{1}{2}$ "
Charlotte to Point Peter.....	N. E. by N.	45 $\frac{1}{2}$ "
Charlotte to Presque Isle.....	N. $\frac{1}{4}$ E.	49 "
Charlotte to Port Hope.....	N. N. W. $\frac{1}{4}$ W.	56 $\frac{1}{2}$ "
Big Sodus Beacon to Point Peter.....	N. $\frac{1}{4}$ W.	40 "
Big Sodus Beacon to Port Hope.....	N. W. $\frac{1}{4}$ W.	78 $\frac{1}{2}$ "
Big Sodus Beacon to Whitby.....	N. W. by W. $\frac{1}{4}$ W.	105 "
Oak Orchard to Point Peter.....	N. E. by E. $\frac{1}{4}$ E.	61 "
Oak Orchard to Port Hope.....	N.	38 $\frac{1}{2}$ "
Oak Orchard to Whitby.....	N. W.	48 "
Oak Orchard to Gibraltar Point.....	W. N. W. $\frac{1}{4}$ W.	62 $\frac{1}{2}$ "
Thirty-mile Point to Gibraltar Point.....	N. W. by W. $\frac{1}{4}$ W.	48 "
Thirty-mile Point to Burlington Bay.....	W.	65 $\frac{1}{2}$ "
Thirty-mile Point to Point Peter.....	E. N. E.	73 $\frac{1}{2}$ "
Thirty-mile Point to Port Hope.....	N. by E. $\frac{1}{4}$ E.	39 $\frac{1}{2}$ "
Thirty-mile Point to Presque Isle.....	N. E. $\frac{1}{4}$ E.	58 "
Olcott to Gibraltar Point.....	N. W. by W. $\frac{1}{4}$ W.	88 "
Olcott to Port Hope.....	N. E. by N.	46 $\frac{1}{2}$ "
Fort Niagara to Whitby.....	N. by E. $\frac{1}{4}$ E.	40 "
Fort Niagara to Port Hope.....	N. E.	61 $\frac{1}{2}$ "
Fort Niagara to Presque Isle.....	N. E. by E. $\frac{1}{4}$ E.	85 $\frac{1}{2}$ "
Fort Niagara to Point Peter.....	E. N. E. $\frac{1}{4}$ E.	103 "
Fort Niagara to Gibraltar Point.....	N. W. by N. $\frac{1}{4}$ N.	20 "

N. B.—A good opportunity is afforded masters of vessels to test the working of their compasses, while on their course north of Simcoe Island light, or by dropping upon the range of the lights of Pigeon and Simcoe islands, about two miles to the south of Pigeon island and sailing upon the range of the two lights. The true range of the two lights is N. 3° W. The magnetic variation on shore in that vicinity is about 8° W. When sailing upon this range the course, as indicated by the needle, should either be N. 5° E. or S. 5° W., which is practically N. $\frac{1}{4}$ E. and S. $\frac{1}{4}$ W.

Magnetic Declinations in degrees and tenths, corrected to the year 1890:

Kingston.....	8.0 W.
Oswego.....	8.0 W.
False Ducks.....	7.8 W.
Big Sodus.....	7.2 W.
Charlotte.....	5.9 W.
Thirty-mile Point.....	5.8 W.
Niagara.....	4.8 W.
Toronto.....	4.6 W.
Burlington Bay.....	4.3 W.

Sailing Distances on the St. Lawrence River, Lake Ontario, and Welland Canal.

	Ogdensburg.	Cape Vincent.	Kingston.	Oswego.	Fair Haven.	Big Sodus.	Charlotte.	Oak Orchard.	Thirty-mile Point.	Olcott.	Niagara.	Fort Dalhousie.	Presque Isle.	Port Hope.	Whitby.	Toronto.	Oakville.	Hamilton.	Fort Colborne.
Montreal	136	196	201	245	254	264	263	308	316	339	349	359	271	299	330	359	370	393	357
Ogdensburg	60	65	109	118	128	147	167	180	193	213	223	135	163	194	223	234	247	251	
Cape Vincent		24	48	58	68	87	107	120	133	153	163	75	103	134	163	174	187	191	
Kingston			55	64	71	88	108	121	134	154	164	76	104	135	164	175	188	192	
Oswego				14	27	57	85	99	112	135	145	68	93	122	148	158	170	173	
Fair Haven					15	47	76	90	103	125	135	65	88	116	138	149	160	163	
Big Sodus						33	63	77	92	112	123	60	78	106	126	136	149	151	
Charlotte							35	48	62	82	92	49	57	72	98	107	119	120	
Oak Orchard								15	29	50	61	49	39	46	65	75	86	89	
Thirty-mile Pt									13	34	44	58	40	38	50	59	70	73	
Olcott										20	32	68	46	35	40	47	59	60	
Niagara											16	57	62	40	31	33	42	44	
Pt. Dalhousie												98	71	46	30	25	31	32	
Presque Isle													33	65	95	108	121	126	
Port Hope														35	65	78	92	99	
Whitby															32	46	61	74	
Toronto																18	33	58	
Oakville																	16	53	
Hamilton																		59	
Pt. Colborne																			0

Canadian Light Houses, Buoys and Harbors along the North Shore of Lake Ontario, from Brockville to the Welland Canal.

COLE SHOAL LIGHT-STATION.—A fixed white light, visible 6 miles. White, square wood tower, 37 feet high. On pier, 5 miles west of Brockville, three-fourths mile from the north shore of the river St. Lawrence.

GRENADIER ISLAND LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower, 37 feet high, light 55 feet above high-water mark. On southwest point of island, north side of channel, 2 miles below Rockport.

LINDOE ISLAND LIGHT-STATION.—A fixed white light, visible 7 miles. White, square wood tower, 26 feet high, light 40 feet above high-water mark. On northwest point of island, south side of channel, 5 miles west of Rockport.

GANANOQUE NARROWS LIGHT-STATION.—A fixed white light, visible 7 miles. White, square wood tower, 37 feet high. On northeast end of Little Stave island, south side of channel, 5 miles below Gananoque.

JACKSTRAW SHOAL LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower, 29 feet high. On north side of channel, 2 miles below Gananoque. On a pier in river.

Beacon.—A small pier, surmounted by a red drum on a mast, 700 feet southeast, one-half east from the light, marks the south edge of the channel.

SPECTACLE SHOAL LIGHT-STATION.—A fixed white light, visible 9 miles. White, square wood tower 26 feet high. On north side of channel, 1½ miles west of Gananoque. On a pier in river.

RED HORSE ROCK LIGHT-STATION.—A fixed white light, visible 9 miles. White, square wood tower. On a pier at head of an island, southeast side of channel, 1 mile above Spectacle shoal.

BURNT ISLAND LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower, 26 feet high, light 64 feet above high-water mark. On southeast part of island, north side of channel, one-half mile above Red Horse Rock.

WOLFE ISLAND LIGHT-STATION.—A fixed white light, visible 6 miles. White, square wood tower. On Quebec, or east point of island.

BROWN'S OR KNAPP'S POINT LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower, 20 feet high. On north side of Wolfe island, 4 miles below Kingston.

KINGSTON LIGHT-STATION.—A fixed white light, visible 17 miles. Wooden tower, on stone building, city clock. Light 96 feet from the base. Kingston has one of the best harbors on Lake Ontario. There are three channels by which it can be entered from the lake. The north channel is generally preferred. To enter by this channel, when three-fourths mile W. ¼ N. from Simcoe Island light, steer N. E. ¾ N., 1½ miles to a point 1 mile N. ¼ E. from Simcoe Island light, and in range with it and Pigeon Island light, when steer N. ¼ E., keeping the lights in range 2½ miles, until Snake Island light bears S. E. ¼ S., 1½ miles distant, when steer E. by N. 4 miles, to abreast of Kingston and one fourth of a mile from shore. Good anchorage off the shipyard. The depth of water in the harbor and at the landing piers and wharves varies from 12 to 15 feet. The rocky bed of the river at the entrance is being deepened to 15 feet.

SNAKE ISLAND LIGHT-STATION.—A fixed red light, visible 6 miles. Square tower, 35 feet high, stone dwelling attached. On a pier on bar about 550 yards S. E. ¼ E. from Snake island, and 4 miles from Kingston. There is a dangerous shoal with only 4 feet of water on it, 2½ miles W. by S. ¼ S. from Snake Island light. Simcoe Island light S. S. W. ¼ W., 2½ miles from Snake Island light. Shoal water connects Snake island and Snake Island light.

SIMCOE ISLAND LIGHT-STATION.—A fixed white light, visible 13 miles. White, circular stone tower, 40 feet high, light 45 feet above high-water mark. On southwest point of Simcoe island. There is a shoal, least water 4 feet, N. N. W. ¼ W. 2½ miles from this light. A fog bell, struck by machinery, sounds 4 times each minute, in thick or foggy weather. False Ducks light S. W. ¼ W., 18½ miles. Pigeon Island light, S. ¾ W., 5½ miles.

PIGEON ISLAND LIGHT-STATION.—A revolving white light, visible 13 miles, period of revolution, 70 seconds. White tower,

ntario,

	Hamilton.	Port Colborne.
383	387	
247	251	
187	191	
188	192	
170	173	
160	163	
149	151	
119	120	
86	89	
70	73	
59	60	
42	44	
31	33	
21	23	
02	09	
61	74	
33	58	
16	53	
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41 feet high, light 46 feet above high water. On Pigeon island, S. W. $\frac{1}{4}$ W., 4 miles from Long point. Charity Shoal buoy, S. E. $\frac{1}{2}$ E., $3\frac{1}{2}$ miles. False Ducks light, S. W. by W. $\frac{3}{8}$ W., $14\frac{1}{2}$ miles. Galloo Island light, S. by E. $\frac{1}{4}$ E., $13\frac{1}{2}$ miles. Tibbett's Point light, E. $\frac{1}{2}$ N., $9\frac{1}{2}$ miles.

FALSE DUCKS LIGHT-STATION.—A fixed white light, 3d order, visible 16 miles. White tower, 62 feet high, light 68 feet above high water. On the east point of False Ducks island. Pleasant Point light, N. $\frac{1}{2}$ W. 9 miles. Stony Point light, E. S. E. $\frac{1}{2}$ S., 26 miles. West point of the main Duck, E. by S. $\frac{1}{2}$ S., 8 miles. A shoal with $12\frac{1}{2}$ feet of water over it, lies S. W. $\frac{1}{4}$ W. $3\frac{1}{2}$ miles.

SOUTH BAY POINT LIGHT-STATION.—A fixed red light, visible 11 miles. White, square wood tower, with dwelling attached, light 36 feet above high water. On Point Traverse.

CENTRE BROTHER ISLAND LIGHT-STATION.—A fixed white light, visible 12 miles. White, square, wood tower, kitchen attached, red iron lantern. On the northeast point of Centre Brother island, at the east entrance to the north channel, between Amherst island and the north shore of Lake Ontario. About $7\frac{1}{2}$ miles to the westward of Kingston.

POINT PLEASANT LIGHT-STATION.—A fixed white light, visible $10\frac{1}{2}$ miles. Octagonal tower 52 feet high. West point of entrance to Bay of Quinte. Pigeon Island light E. by S., 14 miles. South Bay Point light, S. by W. $\frac{3}{8}$ W., 9 miles.

DESERONTO LIGHT-STATION.—A fixed white light, visible 11 miles. White, square wood tower. On the roof of the freight shed of the Bay of Quinte Railway near the outer end of Company's wharf. Lit by gas. Will guide to Deseronto from Belleville, Picton, and Napanee.

TELEGRAPH ISLAND LIGHT-STATION.—A fixed white light, visible 12 miles. White, square wood tower, on dwelling, light 46 feet above high-water mark. On north side of Bay of Quinte, 7 miles from Belleville.

BELLEVILLE LIGHT-STATION.—A fixed white light, visible 11 miles. White, square wood tower, on octagonal pier. On southeast edge of shoal, at entrance of Harbor, 450 feet west from end of Grand Junction Railway wharf.

POINT PETER, OR LONG POINT LIGHT-STATION.—Flashing white light, interval of flash 35 seconds, visible $15\frac{1}{2}$ miles. White, circular stone tower, 60 feet high, light 62 feet above sea level on Long point. Steam fog-horn, 16 feet above water, gives blasts of 9 seconds, with silent intervals of 28 seconds. The fog alarm building is of wood, white, with brown roof, stands close in front of tower. A spit extends from this point nearly south $1\frac{1}{2}$ mile. Salmon Point light N. W. by W. $\frac{1}{4}$ W., 4 miles. Galloo Island light, E. $\frac{1}{4}$ S., 36 miles.

SALMON, OR WICKED POINT LIGHT-STATION.—A fixed red light, visible $12\frac{1}{2}$ miles. White, square tower on dwelling, light 40 feet above sea level. On point 4 miles to westward of Long point. Scotch Bonnet, W. by N. $\frac{1}{4}$ N., $13\frac{1}{2}$ miles. A spit extends W. S. W. $2\frac{1}{2}$ miles from the point.

SCOTCH BONNET, OR EGG ISLAND LIGHT-STATION.—A fixed white light, visible 12 miles. White stone tower, light

54 feet above sea level. On small island 1 mile southwest of Nicholson's island. Cobourg, W. by N. $3\frac{1}{2}$ miles. Presque Isle light, N. W. $\frac{1}{4}$ W., 10 miles.

Presque Isle Main Light.—A fixed white light, visible $15\frac{1}{2}$ miles. White, octagonal stone tower, 63 feet high, light 67 feet above sea level. On East point $24\frac{1}{2}$ miles to the eastward of Cobourg. There is a shoal spot with 3 feet of water over it, E. $\frac{1}{4}$ S., nearly 2 miles from the main light, and another S. W. by W. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles with 10 feet of water over it.

Murray Canal and approaches, including aids to navigation. The Murray canal is a straight cut (tangent) $6\frac{1}{2}$ statute miles long between extremities of piers, 80 feet wide on the bottom, and $12\frac{1}{2}$ feet deep below the ordinary low water level of Lake Ontario, or the zero of the Toronto gauge, joining the head of the Bay of Quinté with Presqu'île Bay in Lake Ontario. It has no locks but is crossed by 8 highway bridges and 1 railroad bridge. At each end of the canal cribwork piers have been built out on both sides into the shallow water, and beyond them a dredged channel 200 feet wide has been continued until water of the same depth as that in the canal is reached. The dredged cut at the east end extends 2,300 feet beyond the piers, and is for its whole length in the axis of the canal, viz.: E. by N. $\frac{1}{4}$ N.; at the west end the dredging follows the axis of the canal W. by S. $\frac{1}{4}$ S. 6,520 feet; it is then deflected 10° to the southward and runs straight on the bearing of S. W. by W. $\frac{1}{4}$ W. a distance of 3,820 feet, where deep water in Presqu'île bay is reached. From this point a bearing of S. E. $\frac{1}{4}$ S. and distance of 4,150 feet lead to the entrance of the dredged channel from Presqu'île bay into Lake Ontario. This channel bears S. E. by E. $\frac{1}{4}$ E., is 9,200 feet long and leads past Calf Pasture shoal and Salt Point lights, the former being left 560 feet and the latter 300 feet distant on the starboard hand going out. After passing Salt point the channel gradually widens to 1,000 feet until deep water in Lake Ontario is reached.

The canal was opened for traffic on April 14, 1890, and completed in August, 1890. Its approaches have been marked by a system of buoys and lighted beacons, as follows:

Buoys. 1. Approaching the canal from the eastward, or Bay of Quinté side, a red spar buoy 16 feet long has been moored in 10 feet water on the east end of a shoal which extends from Indian island, in the Bay of Quinté. From this buoy the centre pier of the swing of Trenton bridge bears N. W. by N. distant 11,040 feet, the single tall pine tree on Indian island W. by S., distant 6,000 feet, and the east entrance of the canal S. W. by W. $\frac{1}{4}$ W., distant 11,360 feet. This buoy is only about 1,300 feet from the Prince Edward County shore, but the best channel is to the south of it.

2. A similar buoy has been moored in 13 feet water near the east end, and on the north side of the dredged channel leading from deep water of the Bay of Quinté to the eastern entrance of the canal. This buoy is distant 1,640 feet from the end of the cribwork at the east end of the canal. The middle of the dredged channel is 100 feet south of the buoy.

3. In Presqu'île bay 3 red spar buoys, 16 feet long, moored in 13 feet water on the south edge of the dredged channel which is parallel with the axis of the canal, and respectively 2,260, 4,420 and 6,500 feet distant from the west end of the canal cribwork. The last described of these buoys (No. 20) is placed at the angle between that part of the dredged cut which bears W. by S. $\frac{1}{4}$ S. and the part which bears S. W. by W. $\frac{1}{4}$ W., and from it Brighton range light No. 3 is distant W. $\frac{1}{4}$ S. 700 feet.

4. A red spar buoy, No. 18, in 13 feet on the south side of the channel bearing S. W. by W. $\frac{1}{4}$ W., and midway between Nos. 20 and 16.

5. A red spar buoy, No. 16, in 13 feet at the west extremity and on the south side of the last named dredged channel. From this buoy range light No. 1 bears S. W. by W. $\frac{1}{4}$ W., distant 1,400 feet.

6. A red spar buoy, No. 14, in 13 feet water on the north side and at the west extreme of the dredged channel bearing S. E. by E. $\frac{1}{4}$ E., which leads from Presqu'île bay to Lake Ontario. From this last named buoy outwards the sides of the dredged cut are marked by six black and six red spar buoys.

Canal Lights.—There are 6 lights, maintained by the canal authorities on the pierheads and bridges as follows:

1. A fixed red light visible 4 miles from all points of approach by water, shown from a lenticular lantern, elevated 19 feet above the water, standing on a square

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pyramidal open frame 30 feet from the end of the north pier at the east entrance of the canal. The frame is 12 feet high above the pier and is painted brown.

2. A light visible 6 miles up and down the canal is shown from a lenticular lantern, elevated 35 feet above the water, and placed over the swing pier of the Carrying Place highway bridge, which is 4,725 feet up the canal from the last described light. The lantern is so arranged that when the swing is open for vessels a white light is shown over the southern edge of the swing pier, and when closed a red light is shown directly over the middle of the pier.

3. A similar light to the last described, but only 20 feet above the water, on the swing pier of the Central Ontario Railway bridge, which is 1,500 feet westerly from the Carrying Place bridge.

4. A light similar in every respect to No. 2 on the Smithfield bridge, which crosses the canal near the middle of its length or 6,600 feet westerly from the railway bridge.

5. A similar light on Lovatt's bridge, which crosses the canal 6,490 feet from the western extremity of the western piers or 7,700 feet from the last named.

6. A fixed red light, visible 4 miles from all points of approach by water is shown from a lenticular lantern elevated 14 feet above the water, standing within a square pyramidal open frame 30 feet from the outer end of the north pier at the west entrance of the canal. The frame is 12 feet high above the pier and is painted brown.

Brighton Range Lights.—A range light which will be known as Brighton Range Light, No. 3, established by the government of Canada. The tower is a square wooden building painted white, and 30 feet high from its base to the vane on the lantern. It stands upon an octagonal cribwork pier sunk in 15 feet water in the axis of the canal and on the north side of the channel which bears S. W. by W. $\frac{1}{4}$ W. It is distant 7,200 feet from the end of the canal piers and 3,920 feet from Brighton wharf. The light is fixed white, elevated 29 feet above the water, and visible 3 miles down the canal and in the direction of No. 1 range light. In one with No. 2 light it leads up from the canal through the centre of the channel and is to be left 100 feet on the starboard hand in passing up. After being passed if brought directly astern with No. 1 directly ahead it will guide through the remainder of the dredged channel.

A range light which will be known as the Brighton Range Light No. 2, established under similar circumstances, stands 5,360 feet W. by S. $\frac{1}{4}$ S. from No. 3 or 1,440 feet from Brighton wharf. The light is fixed red, elevated 45 feet above the water, and should be visible 6 miles down the canal in alignment with No. 3, or from W. by S. $\frac{1}{4}$ S. and through the dredged channel, through Salt Point and Calf Pasture shoals in alignment with No. 1, or N. W. by W. $\frac{1}{4}$ W. The tower is a square wooden building, painted white, 47 feet high, and stands on a square cribwork pier sunk Presqu'île bay in 7 feet water.

A range light, which will be known as Brighton Range Light, No. 1, stands 1,420 feet S. E. by E. $\frac{1}{4}$ E. from No. 2, and 1,100 feet from Brighton wharf. The light is fixed white, elevated 28 feet above the water, and should be visible 6 miles in alignment with No. 2, and also toward No. 3 light. The tower is a square wooden building, painted white, with iron lantern red, is 30 feet high, and stands on an octagonal cribwork pier sunk in Presqu'île bay in 14 feet water.

Calf Pasture Shoal Light.—(Discontinued.)

Salt Point Back Range Light.—(Discontinued.)

Sailing Directions.—Vessels approaching the canal from the eastward should keep the Prince Edward shore close on board after passing the Nigger Island buoys, until the Indian Island buoy is passed, when they can bear up S. W. by W. $\frac{1}{4}$ W. towards the canal entrance until the centre line of the canal is reached. By day the centres of the swings of the bridges, by night the lights on the same (white if swings are open, red if closed), in one will indicate with sufficient accuracy the middle of the dredged channel and of the canal, and are to be kept in alignment. Each bridge is passed to the south of the swing, which is somewhat to the northward of the axis.

In leaving the canal going westward, the same marks in rear will give the middle of the first portion of the dredged channel, while No. 3 and No. 2 Brighton light in one in front show the same alignment. The middle of this channel is only 100 feet distant from the three red buoys marking its south edge. A conspicuous point of rushes at No. 23 buoy runs out into deep water and should be passed close to instead of being given a wide berth as is usual. This course, W. by S. $\frac{1}{4}$ S., is

kept until No. 3 light is only 200 feet ahead, when the vessel should bear up S. W. by W. $\frac{1}{2}$ W., for No. 1 Brighton light. As soon as buoy No. 16 is passed, she should bear up S. E. $\frac{1}{2}$ S. until lights Nos. 1 and 2 are brought in one bearing N. W. by W. $\frac{1}{2}$ W. astern. This alignment leads out through the middle of the dredged channel through Calf Pasture and Salt Point shoals, and as soon as Presqu'ile main light W. bears the vessel is in Lake Ontario clear of all shoals.

The bearings are magnetic. The variation of the magnet for 1891 is about 7° westwardly.

Weller's Bay, Rear Light.—A fixed white light. White, square, open frame-work, wood tower 37 feet high. Near the west end of Quinte's Carrying Place.

The rear light tower at Weller's Bay has been moved 37 feet westwardly so as to bring the two lights in line with the extremity of the Spit off Bald Head. In this position they show the best water over Weller's Bar, which lies about 3,300 feet outside of Bald Head Spit. Vessels entering should bring the lights in range bearing N. E. by E., and should find 10 feet water on the bar on this line. Inside the bar they will have to open the lights to the westward to clear the spit, which is marked by a white-washed tripod 16 feet high. Good water will be found on the line of range inside the spit until in line with Pine Point.

Weller's Bay, Front Range Light.—A fixed red light. White square wood tower 27 feet high, 520 feet S. W. by W. from rear light.

Cobourg East Pier.—A fixed white light. White, square wood tower, visible 8 miles. On east pier. This is a corporation light and not under the Marine Department. Lighted with gas.

Cobourg, East Pierhead Light.—A fixed white light, on a mast. On the east pierhead, S. by W. $\frac{1}{2}$ W., 380 feet outside of the Corporation light.

Cobourg, West Pierhead Light.—A fixed red light. Shown from a lantern on a mast 20 feet above the pier. Oswego light, E. S. E. $\frac{1}{2}$ S., 88 $\frac{1}{2}$ miles. Port Dalhousie light, S. W. $\frac{1}{2}$ W., 74 miles. Gibraltar Point light, W. by S. $\frac{1}{2}$ S., 66 miles. Harbor piers 130 feet apart, direction of piers south.

PETER ROCK, OR GULL ROCK LIGHT-STATION.—A fixed white light, visible 10 miles. Octagonal stone tower 48 feet high. On a rock off the point, about 3 miles W. by S. from Cobourg light, and about 2 $\frac{1}{2}$ miles east of Port Hope light.

Port Hope Pierhead Light.—A fixed red and white light. On pierhead east side shows a red light to the south and a white light to the east and west. Long Point light, E. by S. 55 miles. Burlington Bay light, S. W. by W. $\frac{1}{2}$ W., 87 $\frac{1}{2}$ miles. The shore line, 10 miles to the westward, bears W. by S. $\frac{1}{2}$ S.

The direction of harbor piers south. The breakwater, 300 feet in length, is completed; depth of water in the new harbor, 11 feet, and in the old harbor 9 $\frac{1}{2}$ feet. The elevation in the water fluctuates from 6 to 12 inches.

Newcastle Pierhead Light.—A fixed white light visible 10 miles. Small wooden tower rising from the roof of storehouse. On the outer end of the easterly pier. The harbor is located about 5 miles to the eastward of Port Darlington, at the Point marked on the Admiralty charts "Bond Head," and now known as Newcastle harbor. It was

originally a marsh through which ran a stream. The entrance is protected by two breakwater piers.

Darlington Pierhead Light.—A fixed white light. On a stone house on the east pier, 20 miles to the westward of Port Hope and 15 to the eastward of Whitby. Point Peter, or Long Point light, E. $\frac{1}{2}$ S., 74 miles. Port Dalhousie light, S. W. $\frac{1}{2}$ S., 54 $\frac{1}{2}$ miles. The harbor piers are 150 feet apart; direction of piers south.

Oshawa Pierhead Light.—A fixed white light on pierhead. There is only one pier, six miles to the eastward of Whitby.

Whitby Pierhead Light.—A fixed white light. On a square, wood tower on the west pier. Gibraltar Point light, S.W. by W. $\frac{3}{4}$ W., 28 miles. Long Point light, E. $\frac{3}{4}$ S., 87 $\frac{1}{2}$ miles. The harbor piers are 250 feet apart; direction of piers S. by E. The west pier is 645 feet in length, and the east pier 390 feet. To enter the harbor run straight in, and when past the end of the west pier haul to the westward and come to anchor, or run to the wharves. Depth of water between the piers, 12 feet.

Frenchman's Bay, or Pickering Pierhead Light.—A fixed green light, visible 10 miles. White octagonal wood tower 47 feet high on the east pierhead. Direction of piers about S. by E. $\frac{1}{2}$ E. The east pier is 685 feet in length and the west pier 835 feet. Pickering is about 20 miles to the north, and east of Gibraltar point.

GIBRALTAR POINT LIGHT-STATION.—Revolving white light, interval of revolution 45 seconds, visible 16 miles. White, hexagonal stone tower, 62 feet high, keeper's dwelling near, light 66 feet above sea level. Fog whistle building of wood, white, with brown roof. On the southwest side of Gibraltar point 1 $\frac{3}{4}$ miles south of Toronto. During thick and foggy weather a fog horn, operated by compressed air, sounds blasts of 7 seconds' duration, with intervals of 90 seconds; established 1886. Fog signal house 1150 feet S. W. by S. from the light-house. Burlington Bay light, S. W. $\frac{1}{2}$ W., 28 $\frac{1}{2}$ miles. Long Point light, E. $\frac{3}{4}$ N., 113 miles. Presque Isle light, E. by N. 90 miles.

Toronto Range Lights, Front Light.—A fixed white light, visible 9 miles, white, hexagonal wood tower, 23 feet high. On west end of Queen's wharf; 37 feet from extreme end, visible over an arc of 180°. Fog bell rung by hand attached to tower.

Back Range Light.—A fixed red light, visible 8 miles, red octagonal wood tower, 35 feet high. On an extension shoreward of the wharf, 200 feet N. E. by N. $\frac{1}{2}$ N., from front light, visible over an arc of 180°. The two lights in range lead clear of the point of the bar.

A storm signal apparatus, established in 1874, is located close to the front range light tower.

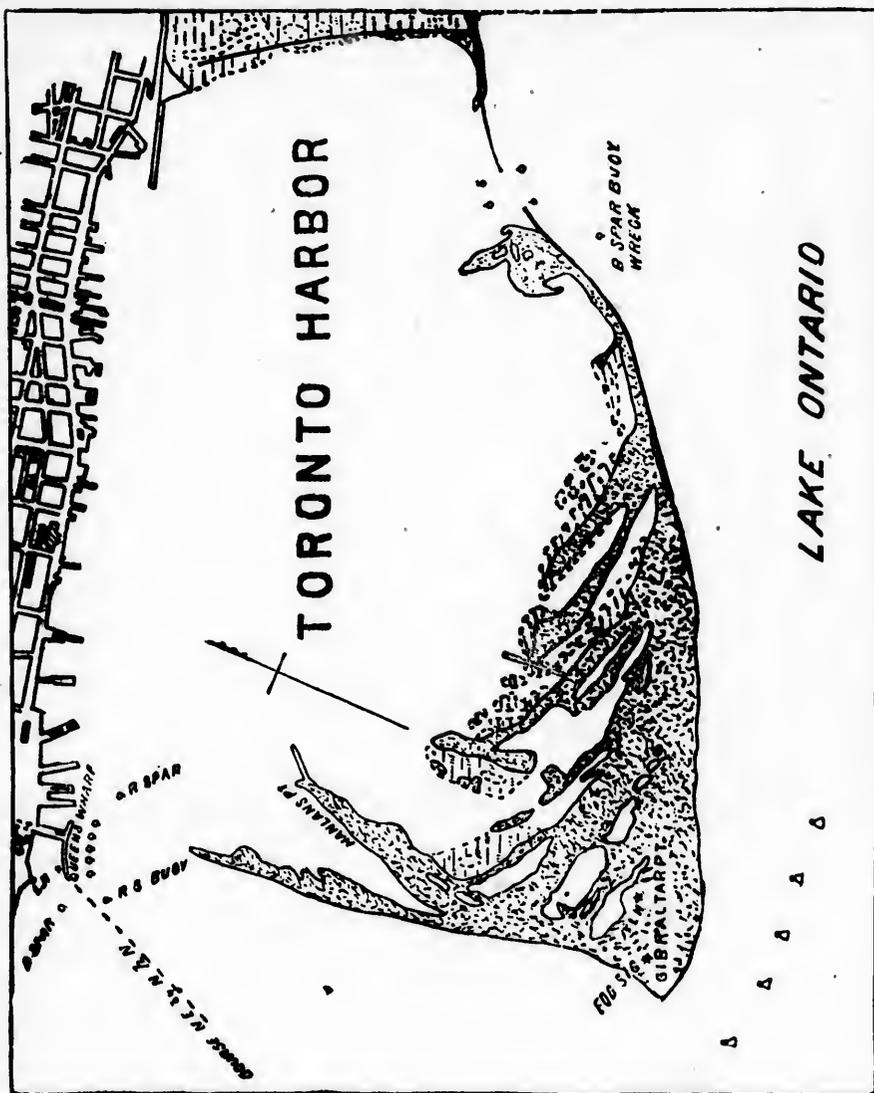
The following described buoys are placed off Gibraltar point to mark the bank to the south and southwest of the light-house point:

One iron can buoy painted red, with black ring, and black ball on the end, the point light-house bears from it N. W. by N. $\frac{3}{4}$ N.

A bell buoy (red), the light bears N. N. W. $\frac{1}{2}$ W.

Another red can buoy, the light bears N. $\frac{3}{4}$ W.

Another red can buoy, the light bears N. by E.



Another red can buoy (with white ring around it and white ball on the end), the light bears N. E. $\frac{1}{4}$ E.

A red spar buoy stands on the northwest point of the bank, N. W. $\frac{1}{4}$ N. from the can buoy, with white ring and white ball on the end. The lighthouse bears E. N. E., and the cupola on the Central Prison N. W. by N. $\frac{1}{4}$ N. The can buoys are placed in eight fathoms of water and the spar buoy in 17 feet. Vessels should not pass inside of them, as the bank rises very abruptly.

An additional spar buoy painted red has been placed on the north-west point of the island in 17 feet of water.

West Channel.—A red spar buoy, No. 16, placed in 13 feet of water, at the entrance of the west channel, on the southwest point of the bar.

A black spar buoy, No. 1, on the north side and western extremity of the channel. Between these two buoys is the dredged channel, about fourteen feet deep forming the western entrance to the harbor. The range of lights leads in between them, N. E. by N. $\frac{1}{4}$ N.

There are six red spar buoys in 9 feet of water on the face of the bank to the eastward of No. 16, defining the southern limit of the dredged channel, which is about 300 feet wide. The northern limit of the channel is defined by the wharves.

East Channel.—The buoys in the east channel are placed thus, namely: Two black spar buoys on the west or port side coming into the bay, and two red spar buoys on the east or starboard side. There are 6 feet of water mid-channel between the buoys. Landmarks on coming into the East Channel are, the cupola of the St. Lawrence Hall, in range with steeple of the Methodist Church (with four spires on the top) on Church street. The course by compass coming in is N. W. by N. A spar buoy is placed on the boiler, or to the south of the Gap. Vessels should not go to the N. W. of it.

Port Credit Pierhead Light.—A fixed white light, visible 11 miles. White, square wood tower, 36 feet high. At the outer end of north breakwater pier, visible from all points of approach. Gibraltar Point light E. by N. $\frac{1}{4}$ N., 10 miles. Port Dalhousie light S. E. by S. $\frac{3}{4}$ S., 28 miles.

Oakville Pierhead Light.—A fixed white light, visible 11 miles. White wood tower, 39 feet above lake level. On a crib $6\frac{1}{2}$ feet above the level of the east pier. The center of the tower is 31 feet from the southern extremity of the pier, and 14 feet from the inner or western edge, and about 330 feet outside the shore line. Port Dalhousie light S. E. $\frac{1}{4}$ E., 26 miles. Burlington Bay light S. W. $\frac{1}{4}$ S., 11 miles. Gibraltar light N. E. $\frac{1}{4}$ E., 17 miles.

BURLINGTON BAY LIGHT-STATION.—A fixed white light, visible 15 miles. White stone building, light 70 feet above sea level. On the shore near the middle of the south pier.

Burlington Bay Pierhead Light.—A fixed white light, visible 10 miles. White, wood tower, light 30 feet above sea level. Near the outer end of south pier. Gibraltar Point light, N. E. $\frac{1}{4}$ E., 28 $\frac{1}{2}$ miles. Port Dalhousie light, E. by S. $\frac{1}{4}$ S., 27 miles.

Burlington Bay is at the west end of Lake Ontario; it is formed by a narrow neck of land $5\frac{1}{2}$ miles in length, connecting the north and south shores of the lake. A channel has been cut through this neck $1\frac{1}{2}$ miles from the north shore, connecting the deep water in the lake with the deep water in the bay. The sides of the channel are protected by two piers nearly parallel. The south pier is 2,850 feet long and the north pier 2,430 feet in length. Width between the piers, at the lake ends, 170 feet, narrowing to 116 feet at the shore lines. Direction of piers, N. E. $\frac{1}{4}$ E. The least water is midway between the two lights, average depth 12 feet, with 17 feet at the entrance from the lake.

To enter the harbor from the lake, bring the lights to bear

southwest when they should be in range, and run for them, approaching the pier, open the lights a little to port, and run in. On a dark night, keep the south pier close on board, to avoid the end of the north pier, which is 420 feet inside the end of the south pier; this precaution is also necessary because the south pier, when opposite the end of the north pier, diverges a little to the northward. Burlington Bay is one of the best harbors on the lake; there are from 5 to 10 fathoms of water over mud and clay bottom. There is a rush-bed, with from 4 to 5 feet of water on it, S. W. by S. from the piers, about 600 feet from the shore, and 300 feet east of the H. & N. W. elevator, marked with a black barrel buoy on the northwest end in 8 feet of water. Another rush-bed off the foot of James street, Hamilton, extends about 900 feet into the bay, which is marked with a black spar buoy in 9 feet of water on the northwest end of it, bears S. W. by W. $\frac{1}{4}$ W. from the piers. Vessels bound to the city wharves, or the G. T. R. R. wharves, will pass this buoy to port. Course from the pier to the city S. W. by W. $\frac{1}{4}$ W., $4\frac{1}{2}$ miles.

PORT DALHOUSIE LIGHT-STATION.—Revolving white light, visible 13 miles. White circular wooden tower, light 53 feet above high water. On the east pier, 339 feet from the outer end, at the eastern entrance to Welland canal, shows from E. to W. by S. Interval of revolution, 1 minute.

NOTE.—The Welland canal (new) is 28 miles in length, with 28 locks, the locks are 270 feet long and 45 feet wide and capable of locking a vessel 250 feet long and 44 feet beam, the depth of water is from $12\frac{1}{2}$ to 14 feet.

Port Dalhousie (South light).—A fixed white light. White, square wood tower. On end of east pier, 315 feet S. $\frac{1}{4}$ W. from main light. The piers are 200 feet apart, about 2,000 feet in length, direction N. $\frac{1}{4}$ E. Depth of water 14 feet at low water. The north side of the outer reef off the mouth of Niagara river, N. E. by E. $\frac{1}{4}$ E., 11 miles. Burlington Bay light, W. by N. $\frac{1}{4}$ N., 27 miles. Gibraltar light, N. $\frac{1}{4}$ W., 28 miles. One lamp shows N. $\frac{1}{2}$ E., one N. W., and one S. W., or up the harbor.

N. B.—There are ranges for ascertaining compass errors at this port. Particulars can be obtained at the canal office.

Niagara Fog Bell.—On the north rampart of Fort Mississagua has been discontinued. A bell buoy has been placed on the reef off the mouth of the Niagara river. See page 35.

Compass Courses and Distances on the North Shore of Lake Ontario.

Kingston to Long Point or Point Peter.—When abreast of Kingston and one-fourth mile from shore, steer W. by S., 4 miles, until Snake Island light bears S. E. $\frac{1}{4}$ S., $1\frac{1}{2}$ miles distant, when steer S. $\frac{1}{4}$ W., on a range of Simcoe and Pigeon Island lights $2\frac{1}{2}$ miles, until within 1 mile of Simcoe Island light, when steer S. W. $\frac{1}{4}$ S., $22\frac{1}{2}$ miles, to a point 4 miles S. $\frac{1}{4}$ W. of False Ducks light, when steer W. by S., $19\frac{1}{4}$ miles to a point 3 miles S. $\frac{1}{4}$ W. of Long Point light.

NOTE.—When running on the course S. $\frac{1}{4}$ W. on a range of Simcoe

and Pigeon Island lights, the course leads very close to the west side of a 15-foot shoal $1\frac{1}{2}$ miles N. $\frac{1}{4}$ E. from Simcoe Island light.

Long Point to Presque Isle.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer W. N. W. $\frac{1}{4}$ N., 18 miles, to a point 1 mile S. $\frac{1}{2}$ W. from the Scotch Bonnet light, when steer N. W. $\frac{1}{4}$ N. heading on Presque Isle light for 9 miles, or to within $1\frac{1}{2}$ miles of it, when steer about north until in range of the Harbor light and Salt Point light.

Long Point to Port Hope.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer W. by N. $\frac{1}{4}$ N., 55 miles, to a point 1 mile south of Port Hope light. This course leads close to the south side of a reef with 18 feet of water over it, 4 miles S. $\frac{1}{4}$ W. from the Scotch Bonnet light.

Long Point to Whitby.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer W. $\frac{1}{2}$ N., $87\frac{1}{2}$ miles, to a point 1 mile south of Whitby.

Long Point to Gibraltar Point.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer W. $\frac{1}{4}$ S., 113 miles, to a point 1 mile south of Gibraltar Point light.

Long Point to Burlington Bay.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer W. $\frac{1}{4}$ S., 136 miles, to within 1 mile of the beacon at Burlington Bay.

Long Point to Niagara River.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer W. by S. $\frac{1}{4}$ S., $102\frac{1}{2}$ miles, to a point 1 mile N. W. $\frac{1}{4}$ W. from Fort Niagara; see course from Gibraltar to Fort Niagara.

Long Point to Cape Vincent.—When 3 miles S. $\frac{1}{2}$ W. of Long Point light, steer E. by N. $19\frac{1}{4}$ miles, to a point 4 miles S. $\frac{1}{2}$ W. of False Ducks light, when steer N. E. by E. $\frac{1}{4}$ E. 28 miles to abreast of Cape Vincent, and $\frac{1}{2}$ a mile from shore. Passing $\frac{1}{2}$ mile north of Charity shoal.

Compass Bearings and Distances from Point Peter light to lights on the south shore:

To Stony Point.....	E. $\frac{1}{4}$ S.....	43 miles.
" Oswego.....	S. E. $\frac{1}{4}$ S.....	42 "
" Charlotte.....	S. W. by S.....	45 $\frac{1}{2}$ "
" Big Sodus.....	S. $\frac{1}{4}$ E.....	40 "
" Oak Orchard.....	S. W. by W. $\frac{1}{4}$ W.....	61 "
" Thirty-mile Point.....	W. S. W.....	73 $\frac{1}{2}$ "
" Fort Niagara.....	W. S. W. $\frac{1}{4}$ W.....	103 "

Presque Isle to Gibraltar Point.—When 3 miles S. $\frac{1}{2}$ W. from Presque Isle light, steer W. $\frac{1}{4}$ S., 89 miles, to a point 1 mile south of Gibraltar Point light.

Presque Isle to Port Dalhousie.—When 2 miles S. $\frac{1}{2}$ W. from Presque Isle light, steer W. S. W. $\frac{1}{4}$ S., 94 miles, to a point 2 miles N. $\frac{1}{4}$ E. of Port Dalhousie light.

Presque Isle to Charlotte.—When 1 mile S. E. from main light, steer S. $\frac{1}{4}$ W., $47\frac{1}{2}$ miles, to a point 1 mile N. E. $\frac{1}{4}$ N. from Genesee light.

Presque Isle to Oswego.—When 1 mile S. E. from main light, steer S. E. $\frac{1}{4}$ S., $9\frac{1}{2}$ miles, to a point 1 mile S. $\frac{1}{4}$ W. from the Scotch Bonnet light, thence S. E. $\frac{1}{4}$ E., 57 miles, to a point 1 mile N. by W. of Oswego beacon-light.

Presque Isle to Big Sodus.—When 2 miles S. $\frac{1}{2}$ W. from main light, steer S. E. by S. $\frac{1}{4}$ S., 57 $\frac{1}{2}$ miles, to a point 1 mile N. $\frac{1}{4}$ E. from the piers and in line with the range lights.

Cobourg to Gibraltar Point.—When 1 mile south of Cobourg lights, steer W. by S. $\frac{3}{8}$ S., 66 miles, to a point 1 mile south of Gibraltar Point light.

Cobourg to Long Point.—When 1 mile south of Cobourg lights, steer E. by S. $\frac{3}{8}$ S., 50 $\frac{1}{2}$ miles, to a point 3 miles S. $\frac{3}{8}$ W. of Long Point light. This course leads across the south end of the 3 fathom shoals south of the Scotch Bonnet light. In rough weather it would be well to keep a little farther to the southward.

Cobourg to Oswego.—When 1 mile south of Cobourg lights, steer E. S. E. $\frac{1}{4}$ S., 88 miles, to a point 1 mile N. by W. from Oswego beacon light.

Port Hope to Port Dalhousie.—When 1 mile south of Port Hope light, steer S. W. $\frac{1}{2}$ W., 69 miles, to a point 1 mile north of Port Dalhousie light.

Port Hope to Whitby.—When 1 mile south of Port Hope light, steer W. by S. $\frac{7}{8}$ S., 10 miles, thence W. $\frac{1}{8}$ S., 24 miles, to a point 1 mile south of Whitby light.

Port Hope to Gibraltar Point.—When 1 mile south of Port Hope light, steer W. by S. $\frac{7}{8}$ S., 10 miles, thence W. by S. $\frac{3}{8}$ S., 51 miles, to a point 1 mile south of Gibraltar Point light.

Port Hope to Burlington Bay.—When 1 mile south of Port Hope light, steer W. S. W. $\frac{1}{8}$ S., 87 miles, to the piers.

Whitby to Gibraltar Point.—When 1 mile south of Whitby light, steer W. S. W. $\frac{3}{8}$ S., 28 miles, to a point 1 mile south of Gibraltar Point light.

Whitby to Fort Niagara.—When 1 mile south of Whitby light, steer S. by W. $\frac{3}{8}$ W., 38 $\frac{1}{2}$ miles, to a point 1 mile N. W. $\frac{1}{2}$ W. from Fort Niagara light.

Whitby to Charlotte.—When 1 mile south of Whitby light, steer S. E. by E. $\frac{1}{4}$ E., 66 miles, or until the point 3 miles west of Braddock's point bears S. $\frac{1}{2}$ W. 2 miles distant, thence S. E. $\frac{1}{4}$ E. 10 miles, or until Genesee light bears S. $\frac{1}{2}$ W., 2 miles distant.

Whitby to Little Sodus.—When 1 mile south of Whitby light, steer E. by S. $\frac{1}{4}$ S., 115 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles N. $\frac{3}{8}$ E. of Fair Haven light.

Gibraltar Point to Long Point, and Kingston.—When one mile south of Gibraltar Point light, steer E. $\frac{1}{8}$ N., 113 miles, to a point 3 miles S. $\frac{3}{8}$ W. of Long Point light, thence E. by N., 19 $\frac{1}{2}$ miles, to a point 4 miles S. $\frac{3}{8}$ W. of False Ducks light, when steer N. E. $\frac{3}{8}$ N., 22 $\frac{1}{2}$ miles, to a point 1 mile N. $\frac{1}{4}$ E. of Simcoe Island light, and in range with it and Pigeon Island light; thence N. $\frac{1}{4}$ E. 2 $\frac{1}{2}$ miles, keeping Pigeon Island and Simcoe Island lights in range until Snake Island light bears S. E. $\frac{3}{4}$ S., 1 $\frac{1}{2}$ miles distant, when steer E. by N., 4 miles, until abreast of Kingston, keeping $\frac{1}{4}$ of a mile from the north shore.

NOTE.—When running on the course N. $\frac{1}{4}$ E. on a range of Simcoe and Pigeon Island lights, the course leads very close to the west side of a 15-foot shoal which lies N. $\frac{3}{8}$ E., 1 $\frac{1}{2}$ miles from Simcoe Island light.

Gibraltar Point to Fort Niagara.—When 1 mile south of Gibraltar Point light, steer S. E. $\frac{1}{4}$ S., 25 miles, to a point N. $\frac{1}{2}$ W. $3\frac{1}{4}$ miles from Fort Niagara light, then steer S. $\frac{1}{2}$ W. with Fort Mississagua a little to starboard for 3 miles, or until Fort Niagara light bears S. E. by S. distant 1 mile, when steer about S. E. by S. $\frac{1}{4}$ S., keeping a little outside the range of the wharves under the Fort until past the wharves, when keep up the middle of the river, 6 miles to Lewiston; no dangers in the river.

Gibraltar Point to Burlington Bay.—When 1 mile west of Gibraltar Point light, steer S. W. $\frac{1}{2}$ W., 28 miles, to the pier head light.

Burlington Bay to Oswego.—When $\frac{1}{2}$ mile east of the beacon light, steer E. $\frac{1}{4}$ N., 65 miles, to a point 2 miles N. $\frac{1}{2}$ E. of Thirty-mile Point light, thence E. $\frac{1}{2}$ S., $99\frac{1}{2}$ miles, to a point 1 mile N. by W. from Oswego beacon light.

Burlington Bay to Niagara River.—When $\frac{1}{2}$ mile east of the beacon light, steer E. $\frac{1}{4}$ S., 35 miles, to a point N. $\frac{1}{2}$ W., $3\frac{1}{4}$ miles from Fort Niagara light, when see course from Gibraltar Point to Fort Niagara.

NIAGARA RIVER.

Light-Houses and Buoys Standing up the River above the Falls.

Sailing Directions.—There is no good anchorage in this river, owing to the strong current and the character of the bottom, which is rocky throughout. Southwest gales in Lake Erie raise the water at the head of the river from 3 to 5 feet, and increase the current; further down, the effect is not so great; northeast winds produce a contrary effect. The Rapids begin a mile above the Falls and just below Chippewa, Canada. On the American side, foul ground commences three-fourths mile below Grand island, and extends more than half-way across the river. The channel west of Grand island, up to the head of Strawberry island, is known as the "Chippewa" channel; it is 10 miles long, 650 to 1,150 yards in width (only 450 at Navy island), and 2 to 6 fathoms deep.

Tonawanda Channel.—This channel lies on the south and east sides of Grand island, and the east of Frog and Strawberry islands; length, 8 miles from foot of Tonawanda island to head of Strawberry island; width, 350 to 1,000 yards. It is not safe to attempt to take more than 12 feet draught between Tonawanda and Grand islands; best water on the Grand island side, above Tonawanda to Strawberry island, 3 to 5 fathoms; 14 feet of water east of Strawberry island. The east shore of channel is bold throughout, also the west shore, until up with the Mink Island Shoal buoy; current, 3 to 5 miles per hour, depending on width of channel.

Sailing Directions.—From channel east of Tonawanda island, round Buoy No. 1, close aboard, or pass around Iron-works Shoal buoy,

as may be most convenient; then, standing up the channel, pass the red buoys in order, leaving them to the starboard, and giving them a fair berth. After passing Nice's Shoal buoy, No. 4, keep in mid-channel, favoring, if anything, the Grand Island shore, until up with the foot of Frog island, when take the eastern shore and pass the buoys in order. From Strawberry Island buoy, No. 10, steer for the draw-pier of the International Railroad bridge. From this bridge up, see directions for main channel.

Iron-works Shoal.—Spar buoy, red and black horizontal stripes, in 12 feet of water. On a small shoal, southeast corner of Iron-works wharf, E. $\frac{3}{4}$ S.

Tonawanda Spit.—Black spar buoy in 11 feet of water, on north point of spit making out from Tonawanda island. Southwest corner of Iron-works wharf, N. N. E. $\frac{1}{4}$ E.

West Bank.—Red spar buoy in 13 feet of water, on west bank of channel between Grand island and Tonawanda island. Cupola of iron-works, N. E. $\frac{3}{4}$ E.

East Bank.—Black spar buoy in 13 feet of water, on east bank of channel between Grand island and Tonawanda island. Cupola of iron-works, N. by E. $\frac{1}{4}$ E.

Nice's Shoal.—Red spar buoy in 13 feet of water, on west bank of channel between Grand island and Tonawanda island, above Tonawanda island. Northeast corner of Capstan-house on Grand island, N. $\frac{3}{4}$ W.

Mink Island Shoal.—Red, 3d-class can buoy in 13 feet of water, west side of channel, and marks the outer edge of a rocky spit, extending out from Strawberry island, just below Mink island. Draw-pier of International bridge, S. $\frac{3}{4}$ E.

Elbow.—Red spar buoy in 12 feet of water, marks the elbow of the shoal at the head of Strawberry island, and stands about midway between the island and the main land. A straight course may be made between this and the Strawberry Island Shoal buoy, bearing S. by W. $\frac{1}{4}$ W. Mink Island Shoal buoy, N. by W. $\frac{1}{4}$ W.

Strawberry Island Shoal.—Red, 2d-class nun buoy in 13 feet of water, on the west side and at the head of Tonawanda channel; it stands 350 yards from the American, and 770 yards from the Canadian shore, and marks the end of a rocky shoal extending one-third mile from the upper end of Strawberry island. Draw-pier of International bridge, S. $\frac{3}{4}$ E.

Grand Island Channel.

Sailing Directions.—This channel lies between Grand island, on the west, and Frog and Strawberry islands, on the east; it is a mile long, 250 yards in width, and 12 feet of water may be carried through. Shoal water extends from Grand island nearly half-way across to the opposite side; Frog island and the islet above are bold. A spit makes out 100 yards into the channel from the lower end of Strawberry island. The channel east of Strawberry island should be taken in preference to this, except by those thoroughly acquainted with the locality. The navigation of this channel should not be attempted except by those well

acquainted with it, as the bottom is irregular, solid rock, and the current very strong.

Grand Island Shoal.—Red, 2d-class nun buoy in 13 feet of water. West side of channel, near its head, and marks the eastern edge of a shoal extending 500 yards southeast from the head of Grand island. It stands close to the end of the shoal. Hell's Half-Acre buoy, S. E.

Hell's Half-Acre.—Black, 2d-class nun buoy in 13 feet of water. On the east side of channel, at its head, and marks the outer edge of a small reef, with 4 feet of water on it, extending to westward from Strawberry island, near its middle. Twelve feet water can be carried between these buoys. Draw-pier of International bridge, S. S. E. $\frac{3}{4}$ E.

Main Channel Above Strawberry Island.

Sailing Directions.—The reach, known as the "Narrows," beginning at the lower end of Squaw island, is 2 miles long, one-third mile wide, and from 3 to 6 fathoms deep; good water to within 150 yards of either side; current 5 miles per hour, increasing to 7 at the head; at the latter point, a little east of mid-channel, is the Buffalo water-works crib, which may be passed on either side, good water close to the Black Rock Harbor pier for one-third mile above and below the crib. Black Rock harbor is a canal, $3\frac{1}{2}$ miles long and 100 to 800 feet wide, formed along the river-front of Buffalo by Squaw island and a pier extending from its upper end. This canal is used by light-draught vessels bound up, to avoid the strong current of the Narrows; 7 feet of water may be carried through; a lock near the lower end. No danger.

International Bridge.—This bridge spans the river near the middle of Squaw island. The draw is nearest the east shore, and is lighted at night by a stationary *red* light on each end of the draw piers, low down on the free end of each protection pier, and on each side of the pivot pier where it is crossed by the axis of the bridge. Three square lanterns, each 15 feet above the top of the draw span, mark its ends and middle, and show *red* up and down stream when the draw is closed; but when the draw is open, the lanterns show three *green* lights in line up and down stream, with the stationary, low *red* lights marking the width of the openings. The signal to open the draw (a continuous whistle of at least 30 seconds' duration) should be made on entering the river. Pass through the draw on west side of swing-pier. If, for any reason, the draw cannot be opened, a red flag is hoisted on the "swing."

Buffalo Water-works Inlet Pier is on the east side of the channel, at the head of the "Narrows" of the Niagara river, and $1\frac{1}{2}$ miles below the Horseshoe Reef light-house; is marked at night by a *red* light 22 feet above the water.

Niagara River Range Beacon (front).—A fixed white light, shown from a white mast 50 feet high, surmounted by circular gridiron day-mark, with slats painted alternately black and white. On the outer bank of the Erie canal, 800 feet E. by S. from the Buffalo Water-works Inlet pier, and is 33 feet above the water-level of the canal.

Niagara River Range Beacon (rear).—A fixed white light, shown from a triangular skeleton pyramid painted brown, carrying near the top, on the side facing the channel, an elliptical gridiron day-mark 8 feet by 12 feet, with slats painted alternately black and white. Light 103 feet above lake level. In Niagara street, City of Buffalo, 976 feet from the front light. Horseshoe Reef light S. S. W., 2

miles. The above lights are locomotive head-lights. This range is designed for crossing Lime-kiln reef, and intersects the channel on the east side of the water-works crib about 1,000 feet above the crib. Heavy tows, after passing the lower buoy, will probably have to keep well up on this range in order to make the turn without being carried too close to the crib by the strong current.

Bird Island Reef.—Black spar buoy in 14 feet of water. On the east side of channel, and marks the western point of a reef making out from the corner of Black Rock Harbor pier, near its upper end; 4 to 9 feet of water between the buoy and pier; 17 feet in the channel between this and the red buoy opposite. The range between this and the Emerald Channel buoy (S. $\frac{3}{4}$ W.) clears the west side of reef. Horseshoe Reef light-house, S. by W. $\frac{3}{4}$ W. Buffalo light-house, S. E. $\frac{1}{2}$ S., 1 $\frac{1}{2}$ miles.

Lime Kiln Reef.—Red 2d-class nun buoy in 14 feet of water. Stands about 700 yards from the Canadian shore, nearly opposite to the Bird Island Reef buoy, and marks the eastern point of a reef with 8 to 10 feet of water on it; current, 4 miles per hour. The range from this buoy to the west shore at the head of the "Narrows" marks the west side of the channel between. Bird Island Reef buoy, E. by S.

Middle Reef.—Black spar buoy in 13 feet of water. Marks the west point of Middle reef. Above the buoy the reef trends S. $\frac{1}{2}$ E., 250 yards, and then makes in towards the light-house. Channel at this point one-third mile wide; shoal water makes out from the Canadian shore opposite, rather more than a third way across. Current, 1 $\frac{2}{3}$ miles per hour. Horseshoe Reef light-house, S. E. $\frac{1}{2}$ S., 350 yards.

HORSESHOE REEF LIGHT-STATION.—A fixed white light, varied by white flashes at intervals of 90 seconds, 4th order, visible 12 $\frac{1}{2}$ miles. White square one-story beacon, elevated 10 feet above a masonry pier; pier protected on south and west sides by a crib-work ice-breaker. Light 43 feet above water. Dome of lantern black. On Middle reef, at the entrance (from Lake Erie) to Niagara river. This reef separates the main or Canadian channel from the Emerald channel, and lies one-third way from the Canadian to the American shore; the light-house stands 250 yards from the south end of the reef. The range between this light-house and Point Abino, 10 miles to the westward, clears shoals west of the entrance to river. Buffalo light-house, E. by S., 1 $\frac{1}{2}$ miles. Buffalo Breakwater light-house, E. S. E. $\frac{1}{2}$ E., seven-eighths mile. Point Abino (Canada), W. S. W. $\frac{1}{2}$ W.

Waverly Shoal.—Red and black horizontal stripes, 2nd class can buoy, in 13 feet of water, near the northeast end of shoal, stony bottom. This shoal extends about 700 feet in a N. E. and S. W. direction, and about 100 feet wide; least water 12 feet, about S. W. from the buoy 400 feet distant. Horseshoe Reef light-house N. E., 1 $\frac{1}{2}$ miles. Buffalo light-house, E. N. E. $\frac{3}{4}$ E., 2 $\frac{1}{4}$ miles. Windmill point (Canada), W. $\frac{1}{4}$ N., 3 $\frac{1}{2}$ miles.

Emerald Channel.

Sailing Directions.—This channel is used by vessels bound to and from Buffalo and Niagara river, and lies between Middle reef on the west, and Bird island and Horseshoe reefs on the north and east sides, respectively. The range between the Lime-kiln Reef buoy and the Breakwater light-hous (S. E. by S.) guides between Bird island and Middle reefs, in mid-channel and best water (14 feet), and leads up to and past the Horseshoe Reef buoy. The north end of Horseshoe reef bears E. 700 yards from the Emerald Channel buoy. This channel should only

be attempted by light-draught vessels, as the current sets strong across it.

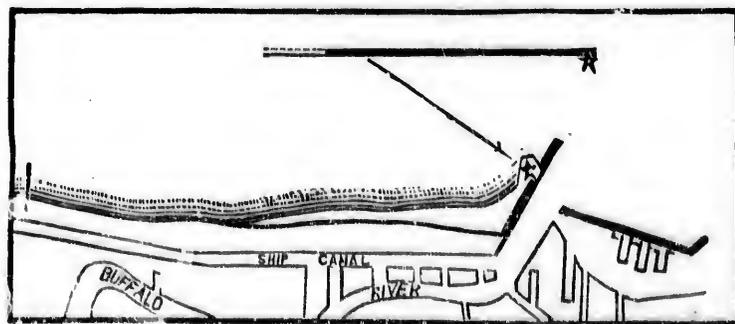
Emerald Channel.—Red 3d-class can buoy in 14 feet of water. South side of entrance to channel, and marks the north end of Middle reef. The north side of entrance to channel is on the range, and midway (300 yards) between this and the Bird Island Reef buoy. Current, $1\frac{1}{2}$ miles per hour. Horseshoe Reef light-house, S. by W. $\frac{1}{4}$ W., 1,000 yards.

Horseshoe Reef.—Black spar buoy in 17 feet of water, east side of head of channel, and marks the southwest point of Horseshoe reef, lying between Middle reef and the American shore; the west side of the reef trends N. by W. from this buoy. Current, 1 mile per hour. Buffalo Breakwater light-house, S. E. 500 yards. Buffalo light-house, E. S. E. $\frac{1}{4}$ E., three-fourths mile.

LAKE ERIE.

Light-Houses, Buoys, and Harbors, on the South Shore, Standing to the Westward.

Buffalo.—Southwest gales raise the water in Buffalo harbor from 3 to 6 feet, and gales from the opposite direction lower it as much. The new breakwater is parallel with and two-thirds mile from the shore south of the harbor piers; length of breakwater (to date), 8,350 feet; direction, S. S. E. $\frac{1}{4}$ E.; entrance by either end; good anchorage behind it, in 3 to 5 fathoms; clay and sand bottom. At and near (to the southward) the south pier of harbor, shoal water extends beyond the pier-head; further south there is 12 feet of water to within 250 yards of the shore. North of the river harbor is Erie basin, behind a stone breakwater, 700 yards long; best water by south entrance (100 yards wide) between breakwater and north pier at mouth of river; narrow, dredged channel, 12 feet deep, along the wharves inside basin, shoal near the breakwater; the shore to the northward may be followed up to the entrance to Black Rock harbor, 1,000 yards distant.



BUFFALO.

BUFFALO BREAKWATER LIGHT-STATION.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. White, square, one-story beacon, 9 feet above the crib on which it is built. Light, 37 feet above water. On south side of entrance to harbor, behind the north end of new breakwater; the latter may be passed close-to. In thick or foggy weather, a bell, rung by machinery, is struck three blows in quick succession, at intervals of 30 seconds. North end of Erie Basin breakwater, N. E. $\frac{1}{4}$ E., two-thirds mile. Buffalo light-house, E. $\frac{1}{4}$ S., one-half mile. Dunkirk light-house, S. W. $\frac{1}{4}$ S., 36 miles.

BUFFALO LIGHT-STATION.—A fixed white light, 3d order, visible $14\frac{1}{2}$ miles. Gray octagonal tower, 51 feet high, lantern black. On south pier of entrance to harbor, 125 yards from the outer end. The south pier projects 350 yards beyond the north; width between piers, 200 feet; 16 feet of water in mid-channel; 13 to 14 feet alongside north pier, and 8 feet alongside south pier; soft bottom. To enter the harbor, pass 100 yards north of the breakwater light, and steer for Buffalo light, which course will be in range with the south pier. In September, 1889, $15\frac{1}{2}$ feet could be carried in at low water.

The Life Saving Station is on the south side of the entrance to the harbor.

Channel into Dunkirk Harbor.

Sailing Directions.—Making this harbor from the eastward, steer for the entrance, between the Dunkirk beacon and the Day-Beacon buoy, with the latter well open to the southward of the pier of former—that is, nothing in-shore of a S. W. $\frac{1}{4}$ S. course. Entering from the westward, the Day-Beacon buoy and south end of east breakwater in range leads past Point Gratiot in good water; between the Point and the west pier of harbor the water shoals gradually to the shore. A channel, excavated in rocky bottom to a depth of 12 feet (has a tendency to fill at inner end, only 11 feet there at present) and 170 feet in width, leads from between the beacon and Day-Beacon buoy in a direct line (E. S. E), for the entrance to the Erie Railway Company's dock, until good water is reached, about midway between the breakwater and the city docks. Anchorage in 12 feet, off the docks, with northern limit nearly two-thirds way to the line of the breakwater, eastern limit a little beyond the East dock to the eastward, the water shoals gradually to the shore. East part of anchorage, hard bottom; middle and west part, soft bottom. In the docks, 11 to 12 feet of water at entrance, shoaling toward the head; soft bottom near entrance, sandy bottom inside. During northerly gales a heavy swell sets into the harbor, past the east end of breakwater, rendering berths in the docks insecure; 9 feet of water may be carried into this harbor east of the breakwater, with the elevator on the Erie Railway west dock bearing S. S. W. Winds up the lake lower, and winds down the lake raise the water in the harbor.

DUNKIRK LIGHT-STATION.—A fixed white light, 3d order, varied by white flashes at intervals of 90 seconds, visible $16\frac{1}{2}$ miles. A reddish-gray, square tower, 52 feet high, with dwelling connected by covered way; white dwelling near by, to the eastward. Lantern black. On Point Gratiot, a bluff 740 yards west of entrance to

harbor. Buildings partly hidden by trees. Erie light, S. W. by W. $\frac{1}{4}$ W., 42 $\frac{1}{2}$ miles. Presque Isle Beacon light-house, S. W. by W. $\frac{1}{4}$ W., 44 miles.

Dunkirk Beacon-light.—A fixed white light, 6th order, visible 12 $\frac{1}{2}$ miles. Octagonal brown tower; light, 38 feet above water; elevated walk along pier to shore. Lantern black. On a square, masonry pier, which rises 10 feet above the water, at the outer end of west pier of harbor; south side of entrance to channel. A sunken crib, about 25 feet wide, lies in the channel alongside the beacon pier. The pier extends N. E. by E. $\frac{1}{4}$ E., 1,100 feet from W. shore of harbor. The dredged channel into the harbor enters between this beacon and a black spar buoy, which marks the site formerly occupied by day-beacon, 100 yards E. N. E. of this, and leads E. S. E. past the S. W. end of the new breakwater, until good water is reached, about half way up to the city docks. Inside the breakwater the dredged channel is marked by two red buoys on the south side close to bank. This light is shown whenever the weather is such that it can be reached. Dunkirk light-house, W. by N., 740 yards.

Day-Beacon Buoy.—Black spar buoy in 17 feet of water. North side of entrance to channel. May be rounded on the west side within 50 yards. Marks the point formerly occupied by Dunkirk day-beacon, portions of which still show above water. Dunkirk beacon, W. S. W., 300 feet. South end of breakwater, E. S. E., 500 feet.

Outer Buoy.—Red spar buoy in 14 feet of water. In the channel close to the south side, and marks the outer end of a ledge of rocks, just covered, extending along the south bank of channel nearly to the Inner buoy. A straight course may be steered between this and the inner buoy, 400 yards beyond. South end of breakwater, E. $\frac{1}{4}$ N., 310 feet. Dunkirk beacon, W. N. W. $\frac{3}{4}$ W., 400 feet.

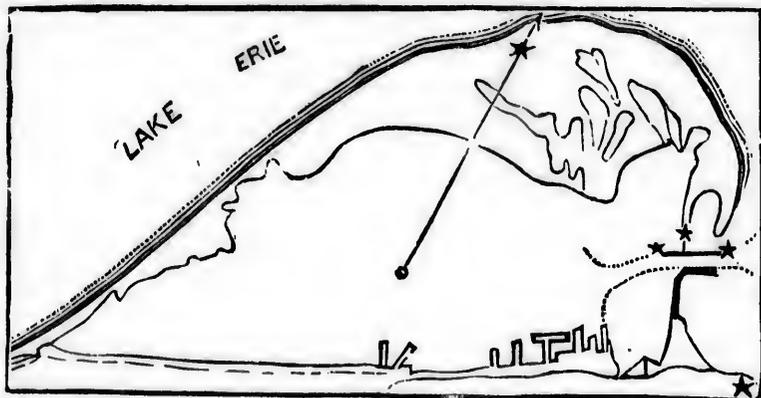
Breakwater.—A crib-work breakwater, in process of construction across the front of the harbor. It extends from the north side of channel, in an E. N. E. direction, about 400 yards (to date). The end resting on channel may be passed close-to. The ruins of an old breakwater, a few feet under water, lie about 60 yards outside of the present breakwater, along its entire length, and between its south end and the Day-beacon buoy. Inside the breakwater, there is 6 to 8 feet of water close-to, deepening gradually to the anchorage.

Inner Buoy.—Red spar buoy in 10 $\frac{1}{2}$ feet of water. South side of excavated channel, at the inner end. Between this buoy and the entrance to west dock there is not less than 10 $\frac{1}{2}$ feet of water, shoaling gradually to the south shore. Dunkirk water-works crib, S. S. W. $\frac{1}{4}$ W., 480 yards. Outer corner of west dock, S. E., 260 yards.

Channel into Erie, Presque Isle Bay.

Sailing Directions.—The 16-foot curve of the bottom passes through the station of the Outer buoy, black, and follows the trend of the shore on both sides of the harbor entrance, passing the Erie light-house at a distance of one-third mile, and Presque Isle point at a distance of 300 yards; inside this curve the water shoals gradually to the shore. Width between piers, 350 feet, sandy bottom. Both piers ripped

inside. Strong currents are produced between these piers when the water level outside is changed by winds blowing up or down the lake. The buoys on the banks of this channel are placed a few feet back from the edge, and a straight course may be steered between them, on either side. Last season the north pier was extended, and the beacon moved out to within 30 feet of the outer end. Vessels not drawing more than 6 feet of water may stand across the flats on the south side of channel, keeping north of the range between the inner end of north pier and west side of the elevators in Erie. The general depth of water in Presque Isle bay is from 3 to 5 fathoms, mud, clay, or sand bottom, chiefly mud in deep water, and sand on the shoals; three fathoms of water can be carried to within 500 yards of the north and south shores of the bay, except opposite the railroad wharf at west end of city, where a shoal makes out from the north shore, one-third way across the bay, its extremity bearing W. S. W. $\frac{3}{4}$ W., nearly a mile, from the Inner buoy (north). The Outer buoy, red, may be approached from the eastward on any course between S. S. W. and S. W. by W. $\frac{1}{4}$ W. The range to carry through between the piers W. S. W. is formed by the beacon-light on east end of north pier (red) and the white range-light on west end of same pier. From the west end of north pier a straight channel 200 feet wide and with not less than 16 feet of water leads to the deep water of the inner bay. Continue on the course which leads between piers until the range beacon on west end of pier is brought on with the beacon near southwest corner of keeper's dwelling; take this range until Inner Black buoy, No. 7, is passed. From this point steer for docks.



ERIE.

ERIE LIGHT-STATION.—A fixed white light, 3d order, visible 19 miles. Light gray conical tower, 60 feet high, with oil-room attached, lantern black. Detached dwelling. On the high bluff of the lake shore, to the eastward and just outside Presque Isle bay; buildings partly hidden by trees. End of north pier of entrance to bay, N. W. $\frac{1}{4}$ N., 1 mile. Light 128 feet above lake level. The apparatus is arranged to illuminate 180 degrees of the horizon, between the bearings E. N. E. $\frac{1}{4}$ E. by northward to W. S. W. $\frac{1}{4}$ W., but the light is obscured through the greater part of the arc between N. W. by W. $\frac{1}{4}$ W. and W. $\frac{1}{4}$ N. by woods on Presque Isle.

Outer Buoy.—Black spar buoy in 16 feet of water. Marks the south side of entrance to channel. It stands in sandy bottom, on the prolongation of the south pier, and 250 yards outside the end of north pier. Not less than 13 feet of water, on either side of harbor entrance, between this buoy and end of north pier. Presque Isle point, N. N. W. $\frac{1}{8}$ W., three-fourths mile. Erie light-house, S. E. $\frac{7}{8}$ S., seven-eighths mile.

Outer Buoy.—Red 3d-class can buoy in 18 $\frac{1}{2}$ feet of water. On the prolongation of inner face of north pier, and marks the northern side of entrance to channel. Heavy draught vessels should not attempt to pass to the northward of this buoy. Presque Isle Beacon W. S. W. 450 yards.

Presque Isle Beacon Light.—A fixed red light, 4th order, visible 12 $\frac{1}{4}$ miles. White pyramidal tower, with brown trimmings, 30 feet high. Dwelling brown, on the peninsula, back of pier, with small white out-houses in rear of it. Lantern and gallery black. On east end of north pier. Brown life-saving station and two white sheds stand behind pier west of dwelling. A bell is struck by machinery, at intervals of 20 seconds, in thick or foggy weather, by fog-signal in base of beacon. *The Life Saving Station* is on the north side of the entrance to the harbor.

Erie Range Beacon No. 1.—White octagonal lantern on a skeleton base, near west end of north pier.

Erie Range Beacon No. 2.—White mast beacon with oval black day-mark. Fixed white lights, visible 8 $\frac{1}{4}$ miles. No. 1, on west end of north pier; No. 2, near southwest corner of keeper's dwelling. Presque Isle beacon forms a range with No. 1 for approaching and passing between the piers. The range between No. 1 and No. 2 guides through the newly-dredged channel into harbor. Lights 900 feet apart, bearing from each other, S. W. by W. and N. E. by E.

North Bank.—Red spar buoy in 10 $\frac{1}{2}$ feet of water. On the north bank of dredged channel.

South Bank (outer).—Black spar buoy in 10 $\frac{1}{2}$ feet of water. At the outer angle of the south bank of dredged channel 100 yards inside the north bank buoy.

Middle.—Red spar buoy in 13 $\frac{1}{2}$ feet of water. Stands on the north bank close to channel.

South Bank (inner).—Black spar buoy in 10 $\frac{1}{2}$ feet of water. On the south bank of channel.

Inner Buoy (north).—Red, 2d-class, nun buoy in 16 feet of water. Stands on the north bank at the inner end of the dredged channel.

Inner Buoy (south).—Black spar buoy in 16 feet of water. Stands on the inner end of dredged channel, south side, 185 yards from the South Bank buoy (inner). Passing this buoy, steer for the city docks (11 to 14 feet of water alongside) or find anchorage in the bay. A straight course may be made from this buoy to the "Anchor line" wharf in Erie. Inner end of north pier, N. E. $\frac{3}{8}$ E. Center of Public dock, S. $\frac{5}{8}$ W., 1,000 yards.

Standing Westward along the South Shore of Lake Erie.

PRESQUE ISLE LIGHT-STATION.—A flashing red and white light, at intervals of 10 seconds, 4th order, visible 14 miles. Red square tower, 45 feet high, with dwelling attached. Lantern black, light 57 feet above sea level. On north shore of peninsula, 400 feet from the lake, three-fifths mile west of the most northern projection of peninsula, and 3 miles, by water, west of entrance to Presque Isle bay, Pennsylvania. Dwelling partly hidden by trees. Conneaut light-house, S. W. by W. $\frac{1}{2}$ W., 26 miles. Long point, N. $\frac{1}{4}$ E., 26 $\frac{1}{2}$ miles. Rondeau point, W. $\frac{1}{2}$ N., 93 miles.

CONNEAUT LIGHT-STATION.—A fixed white light, 6th order, visible 11 $\frac{1}{2}$ miles. Brown below and white above, pyramidal tower, 27 feet high, square in plan. On bluff west side of mouth of river, near keeper's dwelling. Remnants of the old piers still remain, but the harbor is entirely closed, and the light is only useful as a coast light. Ashtabula light-house, W. S. W. $\frac{3}{4}$ W., 13 $\frac{1}{2}$ miles. Pelée Spit light W. $\frac{1}{4}$ S., 101 miles. Marblehead light W. by S. 115 miles. Long Point light N. E. $\frac{1}{4}$ N., 48 miles.

ASHTABULA LIGHT-STATION.—A fixed white light, varied by white flashes, at intervals of 2 minutes, 5th order, visible 11 $\frac{1}{2}$ miles. Brown below and white above, pyramidal tower, 27 feet high, square in plan. An elevated walk along pier to shore. Dwelling, cream-color, on the west side of mouth of river. Near the outer end of west pier, entrance to Ashtabula harbor, Ohio; width between piers, 160 feet. Work is progress to excavate a channel through the outer bar to a depth of 18 feet and full width. The channel between the piers is being dredged to a depth of 17 feet. The east pier in front of the canal leading to the railroad company's slips is being removed. As now constructed the west pier extends about 150 feet beyond the east pier. The project is to remove the east pier, and re-locate the same 45 feet to the eastward of its present position. Direction of piers north. Outer point of shore to the westward, W. S. W. $\frac{3}{4}$ W., 11 miles. Fairport light-house, 27 miles to the westward. Rondeau light-house W. N. W. $\frac{1}{4}$ N., 63 miles. Marblehead light-house, W. by S. $\frac{1}{4}$ S., 112 miles. Long Point light-house N. E. $\frac{1}{4}$ N., 58 miles.

Ashtabula Range Light.—Three fixed lights shown from lens lanterns, two red and one white, arranged vertically, with the white light in the middle, suspended from a triangular skeleton iron pyramid 60 feet high, painted brown. On the inner end of the west pier. Forms a range with the main pierhead light, which must be left on the starboard hand on entering.

FAIRPORT LIGHT-STATION.—A fixed white light, 3d order, visible 17 $\frac{1}{2}$ miles. Gray conical tower 60 feet high, connected with dwelling by covered way. Lantern black, light 100 feet above sea-level. On the bluff east side of mouth of Grand River, at Fairport. Cleveland light-house, 28 $\frac{1}{2}$ miles to the westward.

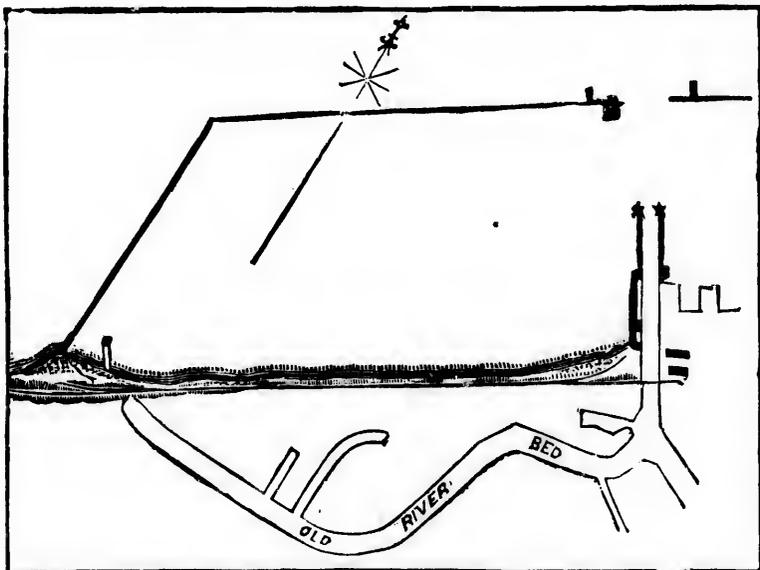
Fairport Beacon Light.—A fixed white light, 6th order, visible 12 miles. Brown below and white above, pyramidal wooden tower 27 feet high, square in plan. An elevated walk along pier to shore. On crib at outer end of east pier, entrance to Fairport harbor, mouth of Grand River. *The Life Saving Station* is on the west side of the entrance to the harbor. Outer point of shore to the eastward, E. N. E. Outer point of shore to the westward, S. W. by W. $\frac{1}{4}$ W., 3 $\frac{1}{2}$ miles. Rondeau light-house N. W. $\frac{1}{4}$ N., 48 miles. Port Burwell light-house N. N. E., 65 miles.

Fairport Range Light.—Three fixed lights, shown from lens lanterns, two red and one white, arranged vertically, with the white light in the middle, suspended from a triangular skeleton iron pyramid 60 feet high, painted brown. On the inner end of the east pier. Forming a range with the beacon light on the outer end of the east pier which must be left on the port hand on entering.

The harbor works consist of two parallel piers connecting the deep water in Lake Erie with the deep water in Grand River. Width between piers

200 feet, direction of piers N. $\frac{3}{4}$ W. Depth of water, last summer there was $15\frac{1}{2}$ feet over the bar and 16 feet between the piers. Dredging was in progress to give 16 feet over the bar. The west pier extends 40 feet further into the lake than the east pier.

CLEVELAND LIGHT-STATION.—A fixed white light, $3\frac{1}{2}$ order, visible $20\frac{1}{2}$ miles. Red octagonal tower 84 feet high, connected with dwelling by covered way; structure of brick, with stone finish and foundation. Lantern black, light 154 feet above lake level. At Cleveland, Ohio, on the hill east side of harbor. The upper half of the tower only is visible above the surrounding buildings. Black River light-house, 25 miles to the westward.



CLEVELAND.

Cleveland Breakwater (West Arm).—A crib breakwater starts from the lake shore at a point about 700 feet west of the extremity of the old bed of Cuyahoga river, running into the lake nearly due north a distance of 3,130 feet, thence to the eastward about parallel with the lake shore 4,000 feet, its eastern extremity being nearly in the prolongation of the west pier. Vessels entering with westerly winds should keep well to windward, as a strong set makes along the breakwater with westerly winds. Sail vessels should keep a good press of canvas until inside the entrance, as a strong current (with the wind off the lake) sets out of the entrance.

Cleveland Breakwater (East Arm).—The East Arm of the breakwater commences 500 feet from the east end of the West Arm, and will extend in the same direction about E. N. E., 900 feet, thence east about 3,600 feet, terminating in over 20 feet of water, so that vessels may enter safely from the eastward. There is now completed

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2,080 feet of the East Arm, with a spur of 118 feet long similar in all respects to the one on the West Arm. The spurs have a riprap-ping of stone on both sides and angles nearly to the surface, and extending to the entrance.

A Red Light is exhibited from a lantern on a pole 20 feet high and 15 feet from the west end of the East breakwater.

Unfinished work at the east end is not marked by light or day signal.

Depth of Water.—There is from 15 ft. 8 in. to 17 feet in mid-channel and from 13 to 14 feet alongside the piers. Westerly winds lower the water from 6 to 12 inches. *The Life-Saving Station* is on the west side of entrance to the harbor.

Cleveland Breakwater Light.—A flashing red and white light, at intervals of 10 seconds, 4th order, visible 12 miles. Brown octagonal iron tower, surmounted by a black lantern and railing. The focal plane is 27 feet above the base of the tower and 36 feet above the lake level. On crib 24 feet south of the east end of the West breakwater. During thick and foggy weather there will be sounded at this station a 10-inch steam whistle giving a blast of 3 seconds followed by a silent interval of 27 seconds.

Distress Signal.—In case of shipwreck there will be displayed from the fog-signal house adjoining the tower a red light at night and a white flag in the day time, for the information of the Life-Saving crew.

Water-works crib, W. ¼ N., 1½ miles. Rondeau light-house N. by W., 53 miles.

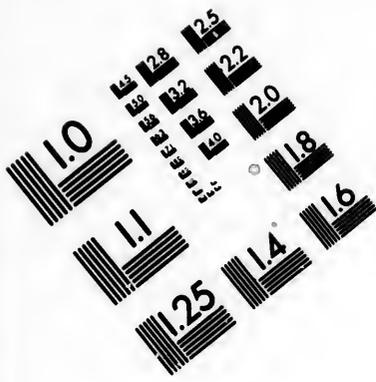
Cleveland Beacon-light (East).—A fixed red light, 6th order, visible 12½ miles. Square pyramidal wood tower, brown below and white above, 30 feet high, light 37 feet above water. An elevated walk along the pier to the shore. Beyond the arc of illumination, to the eastward, the lights show dimly, and warn vessels that they are too far inshore. On outer end of east pier, entrance to Cleveland harbor, Ohio. Width between piers, 200 feet; direction of piers N. N. W. ¾ W. Outer point of shore to the eastward, N. E. ¾ E., 18 miles.

Cleveland Beacon-light (West).—A fixed white light, 6th order, visible 13½ miles. Pyramidal wooden tower 40 feet high, brown below and white above, square in plan. Elevated walk along pier to shore. On the outer end of west pier. Outer point of shore to the westward, W. ¼ N., 15½ miles.

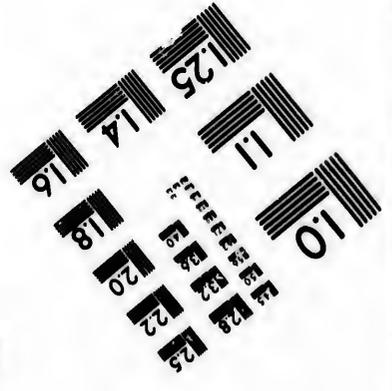
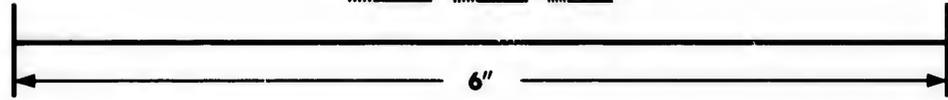
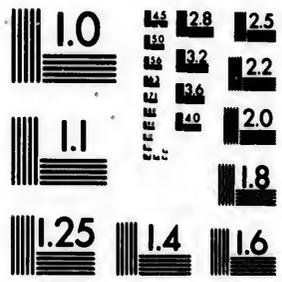
Signals to open the Bridges.—Lake Shore Bridge, 1 long, and 2 short whistles; River Bed Bridge, 1 long, 1 short, 1 long, 1 short whistle; Main St. Bridge, 2 long whistles; Viaduct Bridge, 3 long whistles; Valley R. R. Bridge, 4 long whistles; All bridges above the Viaduct, 4 long whistles. White light over center of R. R. bridges when closed, Red when open, City Bridges red light when open.

BLACK RIVER LIGHT-STATION.—A fixed white light, 4th order, visible 13 miles. Pyramidal wooden beacon 40 feet high, brown below; white above, square in plan. Elevated walk along pier to shore. On the outer end of west pier, entrance to Black River harbor. The harbor works consist of two parallel piers 200 feet apart, direction northwest, connecting the mouth of Black River with the deep water in Lake Erie. Last summer the east pier was extended 102 feet, and the channel dredged to a depth of 16 feet to the ore docks. Vermillion light house, W. S. W. ¾ W., 11 miles. Outer point of shore to the eastward, E. N. E. ¼ E., 2½





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miles. Long Point light-house, N. E. by E. $\frac{1}{2}$ E., 182 miles. Middle of South Passage, N. W. by W. $\frac{1}{4}$ W., to abreast of Marblehead light, 19 $\frac{1}{2}$ miles.

Black River Range Light.—Three fixed lights shown from lens lanterns, two red and one white, arranged vertically, with the white light in the middle, suspended from a triangular skeleton iron pyramid 60 feet high, painted brown. On the inshore end of the west pier, forming a range with the pierhead light, which must be left on the starboard hand on entering.

VERMILLION LIGHT-STATION.—A fixed red light, 5th order, visible 11 $\frac{1}{2}$ miles. Brown octagonal tower 27 feet high. Elevated walk along pier to shore. Lantern black. Near outer end of west pier, entrance to Vermillion harbor, Ohio. Width between piers, 125 feet; 10 feet of water can be carried through, in mid-channel, into the mouth of the river; sand and rock bottom; direction of piers, N. $\frac{1}{2}$ W. Huron light-house, W. by S., 9 $\frac{1}{2}$ miles. Pelée Spit light-house, N. by W. $\frac{1}{4}$ W., 82 miles. Fairport, E. N. E., 60 $\frac{1}{2}$ miles.

HURON LIGHT-STATION.—A fixed white light, 4th order, visible 12 $\frac{1}{2}$ miles. Brown iron skeleton tower 80 feet high; lantern black. Elevated walk along pier to shore. On crib at outer end of west pier, entrance to Huron harbor, Ohio. The harbor improvements consist of two parallel piers running out into the lake in a northeast direction, 140 feet apart. Last summer the west pier was extended 120 feet, and the channel dredged to a full depth of 16 feet throughout, and the full width of 140 feet. Cedar point light, 9 $\frac{1}{2}$ miles. Outside buoy of Sandusky bay, N. W., 9 $\frac{1}{2}$ miles. Vermillion light-house, E. by N., 9 $\frac{1}{2}$ miles. Marblehead light-house, N. W. $\frac{1}{4}$ N., 12 $\frac{1}{2}$ miles.

Main Channel of Sandusky Bay.

Sailing Directions.—This channel consists of an outer dredged channel across the bar at the entrance to the bay, a natural channel between the Sand Point and Cedar Point shoals, and an inner dredged channel, in three straight reaches, lying north and west of Horseshoe shoal, and leading up to the city of Sandusky. Channel 4 miles long, bottom and banks sandy, (until up with the inner reach, where both are soft), and 15 feet of water carried through. The outer two reaches of the dredged channel in the bay are 200 feet in width, and the inner bank curved at the elbows; the inner reach, and also the dredged channel across the bar at the entrance to the bay, will, when completed, be the same width. The spar buoys on the banks of the dredged part of channel stand within a few feet of the edge.

The dredged channel terminates 100 yards from the city wharves; 10 to 12 feet of water beyond and alongside the wharves; 12 feet of water (unless unusually low water) on both sides of the inner reach (until past the inner buoy) to a distance of one mile on the east side and one-third of a mile on the west; best anchorage on east side, behind Horseshoe shoal; the Inner Elbow buoy, in range with the south end of Johnson's island, marks the northern limit of anchorage. The outer edges of the Sand Point and Cedar Point shoals trend N. W. $\frac{1}{4}$ W. and S. by E., respectively, from the outside buoy, until within a third of a mile of the shore; 6 feet of water can be carried across the outer end of Sand Point shoal, east of the range between Marblehead light-house and Cedar Point beacon, and across the Cedar Point shoal to within a third of a mile of the shore.

When up with Cedar point, vessels drawing not more than 6 feet may take the east channel, shortening the distance to the city three-

quarters of a mile; from the entrance, between Cedar Point and the Point of Horseshoe shoal buoy, stand along the west side of Cedar Point 100 to 200 yards from the shore, until it trends sharply to the eastward, half a mile below the light-house, then steer S. S. W. for the eastern wharves of the city. This course leads across the south arm of Horseshoe shoal in not less than 6 feet of water.

NOTE.—The dredging of a straight channel from Cedar point to the B. & O. R. R. docks to a depth of 13 feet is in progress. The proposed final depth for the straight channel is 17 feet.

The Outer Bar buoy may be approached from the eastward on any course between N. W. and S. E. by E. It is just to northward of the Cedar Point range. From it steer S. W. $\frac{1}{4}$ W., on the range past Bar buoy, No. 4, to South Shoal buoy, No. 1, then haul to westward to pass Cedar Point buoy, No. 3, to northward, take up the West Sandusky Bay range and follow it to Curve-of-Bank buoy, No. 11. The west side of this curve is marked by buoys Nos. 11, 13, and 15, when the North Sandusky Bay range is reached and followed until Inner Elbow buoy, No. 20, is reached from which the West beacon of Sandusky Bay ranges bear N. by W. $\frac{1}{4}$ W. The range between this beacon and City Hall clock tower (illuminated) leads mid-channel to its end.

Outside Buoy.—Red, 2d-class can buoy in 13 feet of water. At north side of entrance to dredge channel across the bar. Channel, 150 feet wide; best water on the range. Cedar Point Range beacon, S. W., 1 mile. Marblehead light-house, N. W. by N., 3 miles. Bar buoy, S. W., one-quarter mile.

Cedar Point Range Beacon-light.—A fixed red light, 6th order, visible 11 miles. White, shed-roofed frame building, with long panelled front to traverse the light at pleasure. Hight of light above water, 28 feet. On crib at outer side of Cedar point, 200 yards south of channel, and same distance northeast of Cedar Point light-house. The lantern window of the beacon (between parallel black stripes from crib to eaves), in range with the tower of the light-house (S. W.), guides across the bar. This light should not be approached nearer than one-third mile on the range, nor passed entering the bay nearer than 200 yards.

CEDAR POINT LIGHT-STATION.—A fixed white light, 5th order, visible 12 $\frac{1}{2}$ miles. White dwelling, surmounted by a low tower; light, 21 feet from the ground, on Cedar point, south side of channel, which passes the point at a distance 75 yards. Frame buoy-house, with jetty wharf, on inner shore of the point, near the light-house. Marblehead light, 4 miles N. by W. $\frac{1}{4}$ W.

Sandusky Bay Ranges.

North Beacon-light.—Brown cylinder, 30 feet high, 20 inches in diameter, with octagonal watch-room at base; crib in 10 feet of water.

Main Beacon-light.—White, square, one-story building, elevated 11 feet above its crib, lighted with gas; light exhibited from southeast corner of building; crib in 12 feet of water. Cedar Point light-house, E. $\frac{1}{4}$ N. City Hall clock, S. $\frac{1}{4}$ E.

West Beacon-light.—Brown cylinder, 30 feet high, 20 inches in diameter, with octagonal watch-room at base; crib in 12 feet of water. Connected with Main Beacon-light by a pile bridge.

The Sandusky Bay ranges are fixed with white lights on cribs, the Main beacon at the elbow on the outer (N. W.) bank, and touching the channel and the North and West beacons 1,000 feet to the northward and westward, respectively, of the Main beacon. The West beacon, in range with the south side of Main beacon (E. by N. $\frac{1}{2}$ N.) guides through the west reach, in mid-channel, to Cedar point, $1\frac{1}{2}$ miles distant. The North beacon, in range with the east side of Main beacon (S. $\frac{1}{2}$ W.) guides through the south reach, in mid-channel, to the inner elbow, one-half mile distant. The range between the West beacon and the City Hall clock (S. by E.) leads through the inner reach, in mid-channel.

Standing Westward through Kelley's and Bass Islands.

Kelley's Island.—Along the east and southeast sides of the island, shoal water extends $\frac{1}{2}$ to $\frac{3}{8}$ of a mile from shore, with smooth flat-rock bottom. The bay on the south side of the island affords excellent protection from north, northeast and easterly gales. To make a lee, coming from the eastward, haul around the south point of the island, giving it a berth of not less than $\frac{1}{2}$ a mile, and come to off the docks in $3\frac{1}{2}$ fathoms; good holding ground. There is a submarine telegraph cable laid between the island and Marblehead, the shore end on the island is a little to the east of the most easterly dock, where a large sign is put up. The shore end on Marblehead is at the light-house. Vessels should not come to on that range.

Kelley's Island Reef.—Black, 2d-class nun buoy in 16 feet of water, marks the east end of a reef northeast of Kelley's island. The reef extends W. by S. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles from the buoy, and is 600 yards across its widest part. The west end is 1,500 yards northeast from the bold northeast point of Kelley's island. Least water on reef, 6 feet. Deep water 50 yards east of the buoy; 16 feet of water can be carried between this buoy and Gull Island Shoal buoy. Marblehead light-house, S. S. W. $\frac{1}{2}$ W., 8 miles. Gull Island Shoal buoy, N. W., $2\frac{1}{4}$ miles.

Gull Island Shoal.—Black, 2d-class can buoy in 16 feet of water, stands in rocky bottom on northeast point of Gull Island shoal. The water shoals gradually inside the buoy until rocks show above water 1,500 yards S. W. $\frac{1}{2}$ S. of buoy. Middle Island light-house (Canadian), N. $\frac{1}{2}$ W., 1 mile. North end of Ballast island, W. $\frac{3}{4}$ N., $5\frac{1}{2}$ miles. Ballast Island Channel buoy, W. $\frac{1}{2}$ N.

Ballast Island Channel (outer).—Black spar buoy in 15 feet of water, stands in rocky bottom at the south side of eastern entrance to a channel, with 14 or 15 feet of water, to the southward, and within 220 yards of Ballast island. Least width of channel, 130 yards opposite Ballast island. The south side of channel extends 650 yards W. N. W. from the buoy, and its western end is passed when the range between the southeast point of Ballast island and the east side of Gibraltar island is reached. The north side of Ballast island may be passed close-to. East end of Ballast island, N. $\frac{1}{2}$ W., 800 yards. South end of Middle Bass island, W. $\frac{1}{2}$ S.

Ballast Island Channel (inner).—Black spar buoy in 16 feet of water, stands on the south side at inner end of channel. South end of Middle Bass island, W. $\frac{1}{2}$ S. East end of South Bass island, S. $\frac{1}{2}$ W. Outer buoy, S. S. E., 700 yards.

Entering Put-in-Bay, South Bass Island, from the Westward.

Peach Orchard Point.—Red spar buoy in 12 feet of water, marks the elbow of a rocky shoal extending 375 yards northeast from Peach Orchard point (west side of bay), and thence 170 yards in towards Gibraltar island; western edge of shoal lies 140 yards outside the point. Northeast point of Gibraltar island, S. S. E. $\frac{1}{2}$ E., 500 yards. West side of South Bass island, S. W. by W. $\frac{1}{2}$ W. Pass the buoy to the northward (deep water close-to), and steer to round the bold northeast end of Gibraltar island. Good anchorage and secure harbor inside.

Standing Westward Along the South Shore of Lake Erie, Between Sandusky and Maumee Bays.

MARBLEHEAD LIGHT-STATION.—A fixed white light, 4th order, visible 14 $\frac{1}{2}$ miles. White conical tower, 55 feet high, with detached dwelling. Lantern black. On the northeast end of Marblehead, and south side of eastern entrance to channel between the Kelley's and Bass islands and the mainland. *The Life Saving Station* is near the Quarry docks to the westward of the light. The shore is low and rocky, with deep water 300 yards distant. Good water to within 400 yards of Kelley's island, opposite. Four and three-quarter miles to the westward, and just south of the range between this light-house and Mouse island, is a rocky 4-foot shoal; a channel, 500 yards wide between the shoal and shore. The range between Marblehead light and Green Island light (N. W. $\frac{1}{2}$ W., 11 miles) guides between Starve Island reef, on the north side of channel, and Scott's Point shoal and Mouse Island reef on the south. Range between it and east end of Kelley's island leads directly over middle of Kelley's Island reef. North end of Mouse island, N. W. by W. $\frac{1}{2}$ W., 7 $\frac{1}{2}$ miles. Scott's Point Shoal buoy, N. W. $\frac{1}{2}$ W., 6 $\frac{1}{2}$ miles. Rondeau light-house N. E. $\frac{1}{2}$ N., 63 $\frac{1}{2}$ miles. Fairport light-house E. by N., 76 miles.

Scott's Point Shoal.—Black, 2d-class can buoy in 16 feet of water. Marks the northeast point of a rocky shoal on the south side of the channel south of the Kelley and Bass islands. The shoal stretches towards and half-way to Mouse island, and is 400 yards wide; least water in it 12 feet near the buoy, a channel 1,000 yards wide, between the shoal and Mouse island; the latter and the headland southwest of it are bold. North side of Mouse island W. S. W. $\frac{1}{2}$ W., 1 $\frac{1}{2}$ miles. Green Island light-house, N. W. $\frac{1}{2}$ W., 4 $\frac{1}{2}$ miles. Mouse Island Reef buoy, N. W. by W. $\frac{1}{2}$ W., 1 $\frac{1}{2}$ miles.

Starve Island Reef.—Red, 2d-class nun buoy in 14 feet of water. Marks the southwest point of a reef, 400 feet in diameter, lying on the north side of channel, very near the track of vessels bound

through; exactly on range of Green Island light-house, and southwest point of South Bass island. When Green island can be seen clear of South Bass island, vessels are clear of the shoal to southward; least water on reef, 11 feet. Two-thirds way from this reef to Starve island, is a rocky patch, with 11 feet of water on it. A reef extends from South Bass island to Starve island, leaving a narrow channel between. Twelve feet of water within 30 feet of buoy to the southward and eastward. Scott's Point Shoal buoy, S. E. $\frac{3}{4}$ S., 2,000 yards. Starve island, N. by W., 1 mile. East end of Mouse island, S. S. W. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles. Bold south end of South Bass island, N. W. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles.

Mouse Island Reef.—Black, 3d-class can buoy in 16 feet of water. Marks the north side of a small reef, 1 mile north of Mouse island; least water on reef, 12 feet. Shoalest water S. W. by W. from buoy, about 150 yards. Green Island light-house, N. W. $\frac{1}{4}$ N., 3 miles. Moore's Point, S. S. W. $\frac{1}{4}$ W. $2\frac{1}{2}$ miles. Starve Island Reef buoy, E. N. E. $\frac{1}{4}$ E., seven-eighths mile. Niagara Reef buoy, N. W. by W. $\frac{1}{4}$ W., 8 miles.

GREEN ISLAND LIGHT-STATION.—A fixed white light, 4th order, varied by red flashes at intervals of one minute, visible 14 miles. Gray, square tower, 43 feet high, attached to dwelling, lantern black. On the west end of Green Island, Lake Erie; a rocky, wooded island, 15 acres in extent, one mile west of South Bass island; shores bold; shut in by woods from N. E. by E. $\frac{1}{4}$ E. by E'd to S. E. by E. West Sister Island light-house, N. W. by W. $\frac{1}{4}$ W., 14 miles. This light, open S. of South Bass island, just clears Starve Island reef on S. side. The range between this and West Sister Island light (N. W. by W. $\frac{1}{4}$ W., 14 miles) passes about 1 mile N. of Niagara reef. Kept open on W. end of Rattlesnake island, clears Hen and Chickens one-half mile.

Niagara Reef.—Black, 2d-class can buoy in 14 feet of water. Marks the north side of a small reef, with 7 feet of water on it and deep close-to, lying $1\frac{1}{4}$ miles south of the range between Green Island and West Sister Island light-houses. There is much foul ground between this reef and the south shore, and strangers should not attempt the passage on that side. Shoalest spot, southwest from buoy, 200 yards. North end of West Sister island, N. W. $\frac{1}{4}$ W., $8\frac{1}{2}$ miles. Green Island light-house, E. S. E. $\frac{1}{4}$ E., $5\frac{1}{2}$ miles.

WEST SISTER ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible $13\frac{1}{2}$ miles. White, conical tower, 44 feet high, connected to dwelling by covered way; light 51 feet above lake level. On the southwest end of West Sister island, Lake Erie; area of island, about 100 acres. A reef extends one-third mile from the southeast side of the island; bold, rocky shore on other sides. A red light shown from the station in place of the usual white light, is to be understood as a distress signal. On N. E. side of island, the light is obscured by trees through an arc of about $1\frac{1}{4}$ points. Passing the island one-half mile to the southward, the course to Turtle Island Shoal buoy is W. $\frac{1}{4}$ N., $14\frac{1}{2}$ miles. Green Island light-house, S. E. by E. $\frac{1}{4}$ E., 14 miles. Turtle Island light, W. $\frac{1}{4}$ N., $14\frac{1}{2}$ miles.

Port Clinton.—Light discontinued and buoys removed.

Maumee Bay.

Main or West Channel of Maumee Bay.—This channel is dredged from the Turtle Island Shoal buoy, in six straight reaches (following the deepest water) across the bay, to within three-fourths of a mile of the mouth of the Maumee river, where a deep natural channel, about 200 yards wide, is reached, leading up the river to the city of Toledo. The dredged channel is 200 feet in width, widened at the elbows to from 300 to 400 feet, and the inner bank rounded; bottom, mud or clay throughout, and 15 to 17 feet of water can be carried through; the elbows are marked by buoys, which stand in the channel close to the outer bank, and exactly at the angle; the spar buoys on the banks are placed a few feet back from the channel; a straight course may be steered from buoy to buoy on either side. The five inner "reaches" of the dredged channel of the bay, and the natural channel beyond, into the mouth of the river as far as Grass point, are marked by range lights, two to each range; the first three in entering (after passing Turtle island and Bend-of-Channel buoy, No. 11), viz.: South and Long reaches and the Outer reach are marked by *white* lights, and the Middle and Inner reaches by *red* lights. Ranges intersect each other. Care must be taken not to mistake the "middle" for the "outer" range, the prolongation of the former being crossed by vessels entering before the outer range is reached. The bottom of the bay is mud, clay, or sand throughout, except some gravel bottom along the west shore, near the mouth of the river. Northeast gales raise the water of the bay 3 to 4 feet above the ordinary level, and southwest gales lower it as much. Turtle Island Shoal buoy (the outer bar) may be approached from the eastward on any course between N. W. and S. S. W. Pass the buoy on either side close-to and steer S. W. for No. 2 Outside Elbow buoy. Two spar buoys at equal intervals between these buoys mark the east bank of dredged channel. Passing Outside Elbow buoy, No. 2, to eastward, you take up the South Reach range, passing close to Turtle Island buoy, No. 9, thence S. through this reach to the Main beacon and Long Reach Turning buoy, No. 10, taking up Long Reach range, thence S. W. by W. through this reach to No. 21, Outer Range Elbow buoy, thence W. $\frac{1}{4}$ N., to No. 26, Middle Range Elbow buoy. This reach is marked by the range beacons on shore also. From Middle Range Elbow buoy steer W. S. W. to No. 28, Inner Range Elbow buoy (Range-beacons on shore mark this channel), thence S. S. W. $\frac{1}{4}$ W., on Inner Range to No. 37, End-of-Range buoy. From this point steer to pass close to Ironville wharf, thence to draw of Wheeling and Lake Erie Railroad bridge and passing Middle Ground buoy, No. 32, steer for draw to Pennsylvania Railroad bridge and to docks.

NOTE.—*Dredging is in progress for a straight channel 17 feet deep from the mouth of the Maumee river to the lake.*

Turtle Island Shoal.—Black, 2d-class oan buoy in 16 feet of water. Stands in soft bottom, at the east side of entrance to dredged channel. The 12-foot point of Turtle Island shoal bears S. by E. $\frac{1}{4}$ E., 1,000 yards from this buoy, and is further marked by the range from the light-house to North Cape point. Fifteen feet of water near this reach of channel, on the west side, and not less than 14 half-way to the west shore of lake. Turtle Island light-house, S. S. W. $\frac{1}{4}$ W., $1\frac{1}{2}$

miles. East end of woods on Cedar point, S. S. E. $\frac{1}{2}$ E., 4 miles. Raisin Point buoy, N. N. E., $7\frac{1}{2}$ miles.

Outside Elbow, No. 2.—Red spar buoy in 16 feet of water. Marks the first elbow of the channel; pass it to the eastward. Between this buoy and the Twelve-foot Curve buoys there is 13 to 14 feet of water on the west side of channel, shoaling to 12 feet at a distance of one-third mile from the channel; also the same water on the east side of the channel, when 200 yards inside of Turtle island. Turtle Island light-house, S. S. E. $\frac{3}{4}$ E., 725 yards. North Cape point, S. W. $\frac{1}{2}$ S., 2 miles.

TURTLE ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible $13\frac{1}{2}$ miles. Yellow, square tower, 44 feet high, attached to dwelling, black lantern. On Turtle island, a small, low island at the entrance to the bay, east side of channel and 150 yards from it. The light-house stands near the north end of the island. This light, bearing S. by E., is obscured by the chimney of the dwelling. The channel in, passes the light at a distance of 200 yards. North end of Turtle Island shoal, N. E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. East end of woods on Cedar point, S. E., $3\frac{1}{2}$ miles. Detroit River light-house (Bar point), N. E. $\frac{3}{4}$ N., $21\frac{1}{2}$ miles.

South and Long Reach Range Lights.

Main Beacon-light.—Light exhibited from a platform on extreme north corner of buoy shed on crib. Keeper's dwelling to the right, painted white. Turtle island, N. $\frac{1}{2}$ E. Cedar point, E. S. E.

East Beacon-light.—Brown iron tube, with octagonal lantern.

South Beacon-light.—Brown iron tube, with octagonal lantern.

The South and Long Reach Range lights are fixed white lights on cribs, the main beacon exactly at the elbow of the South and Long reaches, and the east and south beacons, 1,000 feet to the southward and eastward, respectively, of the main beacon. The south and main beacons in range guide from Buoy No. 11 to the latter beacon, and the east and main beacons in range guide to the outer range.

Turning Buoy No. 10.—Red spar buoy in 11 feet of water. On the west bank, exactly at the turning point, and opposite the main beacon.

Outer Reach Range.

Outer Range Elbow No. 21.—Black, 2d-class nun buoy in $13\frac{1}{2}$ feet of water. Marks the elbow of channel, entering the Outer Range reach, nearly 1 mile in length. Pass it to the northward. The Outer Range beacons, in line, serve, together with the buoys, to guide in this reach. Outer Range beacons, W. $\frac{3}{4}$ N., $2\frac{1}{2}$ miles. North Cape point, N. by E. $\frac{3}{4}$ E., $1\frac{1}{2}$ miles.

Outer Range Beacon-light (front).—Square tower, 13 feet high, red above and white below.

Outer Range Beacon-light (rear).—Square tower, 24 feet high, painted white. Detached brown dwelling behind.

The outer range lights are fixed white lights, visible $9\frac{1}{2}$ and 11 miles. On the west shore of the bay, $1\frac{1}{2}$ miles north of the mouth of the river. Distance between beacons, 630 feet.

Middle Range Reach.

Middle Range Elbow No 26.—Red spar buoy in $12\frac{1}{2}$ feet of water. This buoy marks the elbow of channel entering the Middle range reach, 1,100 yards in length. Pass to southward of the buoy. The Outer and Middle Beacon ranges intersect in this elbow; the latter range, together with the buoys, guides up the reach. Outer range beacon, W. $\frac{1}{2}$ N., $1\frac{1}{2}$ miles. West end of Nagg's island, N. $\frac{1}{2}$ E.

Middle Range Beacon-light (front).—Square wooden tower, 12 feet high, red above and white below.

Middle Range Beacon-light (rear).—A white, shed-roofed, frame building, with long panelled front, to traverse the light at pleasure; a black stripe, from ground to eaves, on each side of lantern window; height of light, 21 feet.

The Middle range beacon lights are fixed red lights, visible $9\frac{1}{2}$ and 11 miles. On the west shore of the bay, two-thirds of a mile north of the mouth of the river. Distance between beacons, 1,250 feet.

Inner Range Reach.

Inner Reach Elbow No. 28.—Red, 3d-class can buoy, in 14 feet of water. Marks the elbow of channel entering the Inner range reach, $1\frac{1}{2}$ miles in length. Pass the buoy to the eastward. The Middle and Inner beacon ranges intersect in this elbow; the latter range, together with the buoys, guides up the reach. From 200 yards above this buoy to the end of dredged channel, 12 to 13 feet of water is found on the west side and within 100 yards of the channel. Front beacon, Outer range, N. W. by W. Inner range beacons, S. S. W. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles.

Inner Range Beacon-light (front).—Square tower, 12 feet high, red above, white below.

Inner Range Beacon-light (rear).—A white, shed-roofed building, with long panelled front, to traverse the light at pleasure; a black stripe, from ground to eaves, on each side of lantern window; height of light, 21 feet.

The Inner Range beacon-lights are fixed red lights, visible 10 and $11\frac{1}{2}$ miles. On the east bank of the Maumee river, $1\frac{1}{2}$ miles above its mouth. Distance between beacons, 730 feet.

Middle Ground.—Red spar buoy in 14 feet of water; the last buoy stands in clay bottom, at the upper end and outer edge of the Middle ground; pass it to the eastward. Along this stretch, flats with only 5 feet of water in places make out from the east bank, one-half to two-thirds way across the river. Draw-pier of Pennsylvania Railroad bridge, S. W. $\frac{1}{2}$ W., seven-eighths mile. Draw-pier of Wheeling and Lake Erie Railroad bridge, N. E. $\frac{1}{2}$ E.

Straight Channel in Maumee Bay.

The inner end of the **Straight Cut** is completed, and with the Long reach forms a straight channel from Grassy point to the Maumee Bay ranges, about $4\frac{1}{2}$ miles in length. It enters the Long reach at its intersection with the Outer Range reach, which was marked at the elbow with black can buoy No. 21. This buoy has been moved to the south side of the Straight cut, but still marks the turning point of the old channel. From thence to Grassy point the new cut is marked with 8 buoys, 4 on each side, and numbered from 1 to 8. Bound in the first buoy is No. 2 red, and the last one, marking the turn into the main river, is No. 7 black. Buoy No. 7, new cut, has been moved out nearly opposite to No. 8.

Standing North along the West Shore of Lake Erie, and into the Detroit River.

Note.—Southwest gales lower the water at this end of the lake from 2 to 3 feet, and northeast gales raise it about as much.

Raisin Point.—Black, 2d-class nun buoy in 15 feet of water. Marks the end of a shoal extending $1\frac{1}{2}$ miles from Raisin point; hard sand bottom. Monroe light-house, N. N. W. $\frac{3}{4}$ W., $1\frac{1}{2}$ miles. Stony point, N. E. by N. $\frac{1}{2}$ N., 5 miles.

MONROE LIGHT-STATION.—A fixed red light, 4th order, visible 13 miles. White, square low tower on white dwelling, lantern black. On crib at outer end of north pier of entrance to the ship canal leading into the River Raisin, Michigan, $1\frac{1}{2}$ miles above its mouth. The crib is partially enclosed for the protection of the buildings. The 12-foot curve of the bottom lies about one-fourth mile outside the pierhead; best water is found by standing in in line with the straight (inner) section of the north pier (W. N. W. $\frac{1}{2}$ W). On this course 10 feet of water may be carried in. Width between piers, 200 feet at outer end, 100 feet inside. Sandy bottom between and outside the piers; north pier projects 140 feet beyond the south. A straight course may be made from the Raisin point buoy to the point outside for entering this harbor. Stony point to the northward may be passed within one-fourth mile. Stony point, N. E. $\frac{1}{2}$ E., $4\frac{1}{2}$ miles. Detroit River light-house N. E. $\frac{1}{2}$ E., $12\frac{1}{2}$ miles.

Point Mouillé.—Black, 2d-class can buoy in 14 feet of water. Marks the end of a shoal extending $1\frac{1}{2}$ miles southeast from Point Mouillé; hard sand bottom. Stony point, S. W. $\frac{1}{2}$ W., 6 miles. Gibraltar light-house, N. $\frac{1}{2}$ W., $7\frac{1}{2}$ miles.

DETROIT RIVER LIGHT-STATION.—A fixed white for one minute, followed by six consecutive white flashes, at intervals of 10

seconds; 4th order, visible 14 miles. Brown, iron, circular tower, lantern black. Focal plane 56 feet above the level of the lake. On a masonry pier 11 feet above water and in 23 feet water. There is also on the pier a fog-signal house, of corrugated iron, the same color as the tower. During thick and foggy weather there will be sounded at this station a 10-inch steam fog-whistle, giving a blast of 5 seconds' duration, followed by an interval of 25 seconds. Entering Detroit river, keep on the line joining Detroit River light and Bois Blanc light until within $1\frac{1}{2}$ miles of it, when steer N. by E. $\frac{1}{4}$ E. until abreast of the light, when keep in the middle of the river. A straight channel into the river is buoyed by the Canadian Government. Bois Blanc light, N. by E., $6\frac{1}{4}$ miles. Monroe light, S. W. $\frac{1}{4}$ W., $12\frac{1}{4}$ miles. West Sister light, S. $\frac{1}{4}$ E., $18\frac{1}{4}$ miles. North side of Middle Sister, S. E. $\frac{1}{4}$ S., $12\frac{1}{4}$ miles.

Compass Courses and Distances on the South Shore of Lake Erie.

Note.—Courses and bearings corrected for magnetic variation. Distances in statute miles.

Buffalo to Long Point, Pelée Spit, and Detroit River Light.—When at the north end of breakwater, steer W. by S. $\frac{1}{4}$ S., $63\frac{1}{2}$ miles, to a point 2 miles south of Long Point light, thence W. by S. $\frac{1}{4}$ S., 134 miles, to a point $1\frac{1}{2}$ miles south of the Spit light. When steer W. by N. $\frac{1}{4}$ N., $34\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile N. by E. from Detroit River light, and in range with it and Bois Blanc light, passing 1 mile north of Colchester Reef light, and $\frac{1}{2}$ mile south of Bar Point red buoy, which marks the position formerly occupied by the lightship. For further directions see sailing directions for Detroit river.

Buffalo to Long Point, Pelée Spit, and Toledo.—When $1\frac{1}{2}$ miles south of Pelée Spit light, as in the previous course, steer W. by N. $\frac{1}{4}$ N., $2\frac{1}{2}$ miles, thence W. by S. $\frac{1}{4}$ S., with the Spit light directly astern, passing close to the middle ground, $29\frac{1}{2}$ miles, to a point 1 mile north of West Sister Island light, passing $\frac{1}{2}$ mile south of East Sister island; thence W. $\frac{1}{4}$ N., $13\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles N. E. by N. $\frac{1}{4}$ N. from Turtle Island light. Whence see directions for entering Maumee Bay.

Buffalo to Dunkirk.—When at the north end of breakwater, steer S. W. $\frac{1}{4}$ W., $34\frac{1}{2}$ miles, to a point 1 mile northwest of beacon-light.

Buffalo to Erie.—When at the north end of breakwater steer S. W. $\frac{1}{4}$ W., $76\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles northeast from Presque Isle beacon-light.

Buffalo to Ashtabula.—When at the north end of breakwater, steer S. W. by W. $\frac{1}{4}$ W., 117 miles, to a point 1 mile north of Ashtabula light.

Buffalo to Fairport.—When at the north end of breakwater, steer S. W. by W. $\frac{1}{4}$ W., 143 miles, to a point $2\frac{1}{2}$ miles north of Fairport beacon-light.

Buffalo to Cleveland.—As in the course to a point $2\frac{1}{2}$ miles north of Fairport, thence S. W. $\frac{1}{4}$ W., 29 miles, to a point 1 mile north of breakwater light.

Buffalo to Black River.—When at the north end of breakwater, steer S. W. by W. $\frac{1}{4}$ W., 193 $\frac{1}{2}$ miles, to a point 1 mile north of light.

Buffalo to Sandusky.—When at the north end of breakwater, steer W. S. W. $\frac{1}{4}$ S., 216 miles, to the red can buoy, 1 mile N. E. of Cedar Point Range beacon, whence see sailing directions for entering Sandusky bay.

Buffalo to South Passage.—When at the north end of breakwater, steer W. S. W., 216 miles, to a point 1 $\frac{1}{4}$ miles north of Marblehead light, whence see course from Sandusky to Green island. The course from Buffalo to South passage leads 3 $\frac{1}{4}$ miles south of Long Point light.

Buffalo to Middle Passage.—When at the north end of breakwater, steer W. by S. $\frac{1}{4}$ S., 210 miles, to a point $\frac{1}{4}$ mile south of Middle Island light. Passing 2 $\frac{1}{2}$ miles south of Long Point light.

NOTE.—The magnetic variation at Buffalo is 4° .2 W.; at Middle island there is no variation. The mean variation on this course is 2° .1 W., or practically $\frac{1}{2}$ of a point of the compass, which is applied to the right hand. The True or Chart course is W. S. W.

Buffalo to Port Colborne.—When at the north end of breakwater, steer W. by S. $\frac{1}{4}$ S., 10 $\frac{1}{2}$ miles, to a point 1 mile south of Point Abino, then W. by N. $\frac{1}{4}$ N., 8 $\frac{1}{2}$ miles, to a point 1 mile S. by W. from Main light.

Buffalo to Port Dover.—When at the north end of breakwater, steer W. by S. $\frac{1}{4}$ S. 10 $\frac{1}{2}$ miles, to a point 1 mile south of Point Abino, then W. 56 miles, to a point 1 mile S. by E. from the light at Port Dover.

Dunkirk to Erie.—When 1 mile N. W. by N. from beacon-light, steer S. W. by W. $\frac{1}{8}$ W., 43 miles, to a point 1 $\frac{1}{4}$ miles N. E. from Presque Isle beacon-light.

Dunkirk to Fairport and Cleveland.—When 1 mile N. W. by N. from beacon-light, steer W. S. W. $\frac{1}{4}$ S., 110 miles to a point 2 $\frac{1}{2}$ miles north of Fairport beacon, thence S. W. $\frac{1}{4}$ W., 29 miles, to a point 1 mile north of breakwater light.

Dunkirk to South Passage.—When 1 mile N. W. by N. from beacon-light, steer W. S. W. $\frac{1}{8}$ W., 184 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{4}$ miles north of Marblehead light.

Dunkirk to Pelée Spit.—When 1 mile N. W. by N. from beacon-light, steer W. by S. $\frac{1}{4}$ S., 168 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{4}$ miles south of the Spit light.

Erie to Fairport and Cleveland.—When 1 $\frac{1}{4}$ miles northeast from Presque Isle beacon-light, steer N. W. $\frac{1}{4}$ W., 3 miles, then W. S. W., 66 $\frac{1}{2}$ miles, to a point 2 $\frac{1}{4}$ miles north of Fairport beacon-light, thence S. W. $\frac{1}{4}$ W., 29 miles, to a point 1 mile north of breakwater light.

Erie to South Passage.—When 1 $\frac{1}{4}$ miles northeast from Presque Isle beacon-light, steer N. W. $\frac{1}{4}$ W., 3 miles, then steer W. by S. $\frac{1}{4}$ S., 141 miles, to a point 1 $\frac{1}{4}$ miles north of Marblehead light, whence see course from Sandusky to Green island.

Erie to Middle Passage.—When 1 $\frac{1}{4}$ miles northeast from Presque Isle beacon-light, steer N. W. $\frac{1}{4}$ W., 3 miles, thence W. by S. $\frac{1}{4}$

S., 137 miles, to a point $\frac{1}{2}$ mile south of Middle Island light. See course from Middle Passage to Bar Point, etc.

Erie to Point Pelée.—When $1\frac{1}{2}$ miles northeast from Presque Isle beacon-light, steer N. W. $\frac{1}{2}$ W., 3 miles, thence W. $\frac{1}{2}$ S., 126 miles, to a point $1\frac{1}{2}$ miles south of the Spit light. See course from Buffalo to Long Point, etc.

Erie to Port Stanley.—When $1\frac{1}{2}$ miles northeast from Presque Isle beacon-light, steer N. W. by W. $\frac{1}{2}$ W., 68 miles, to a point $\frac{1}{2}$ mile south of Port Stanley light.

Erie to Rondeau.—When $1\frac{1}{2}$ miles northeast from Presque Isle beacon-light, steer N. W. $\frac{1}{2}$ W., 3 miles, thence W. $\frac{1}{2}$ N. a little northerly, 94 miles, to a point 2 miles south of main light.

Ashtabula to Fairport and Cleveland.—When 2 miles N. W. of Ashtabula light, steer W. by S. $\frac{1}{2}$ S., 25 miles, to a point $2\frac{1}{2}$ miles north of Fairport beacon-light, thence S. W. $\frac{1}{2}$ W., 29 miles to a point 1 mile north of breakwater light.

Ashtabula to South Passage.—When 2 miles N. W. of Ashtabula light, steer W. by S. $\frac{1}{2}$ S., 101 miles to a point $1\frac{1}{2}$ miles north of Marblehead light. Whence see courses from Sandusky to Green island, and Green Island light to Bar point, etc.

Ashtabula to Pelee Spit.—When 1 mile north of Ashtabula light, steer W. $\frac{1}{2}$ S., 88 miles to a point $1\frac{1}{2}$ miles south of Spit light.

Ashtabula to Port Stanley.—When 1 mile north of Ashtabula light, steer N. by W. $\frac{1}{2}$ W., 54 miles, to a point $\frac{1}{2}$ mile south of Port Stanley light.

Ashtabula to Buffalo.—When 1 mile north of Ashtabula light, steer N. E. by E. $\frac{1}{2}$ E., 117 miles, to the north end of the breakwater.

Ashtabula to Rondeau.—When 1 mile north of Ashtabula light, steer W. N. W., $62\frac{1}{2}$ miles to a point 1 mile south of main light.

Ashtabula to Long Point.—When 1 mile north of Ashtabula light, steer N. E. 56 miles to a point 2 miles south of Long Point light.

Fairport to Cleveland.—When $1\frac{1}{2}$ miles northwest from Fairport beacon-light, steer S. W. $\frac{1}{2}$ W., $27\frac{1}{2}$ miles, to a point 1 mile north of breakwater light.

Fairport to Black River.—When $1\frac{1}{2}$ miles northwest from Fairport beacon-light, steer W. S. W., 50 miles, to a point 1 mile north of Black River light.

Fairport to South Passage.—When $1\frac{1}{2}$ miles northwest from Fairport beacon-light, steer W. $\frac{1}{2}$ S., $74\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles north of Marblehead light. See course from Sandusky to Green Island, etc.

Fairport to Pelée Spit.—When $1\frac{1}{2}$ miles northwest from Fairport beacon-light, steer W. $\frac{1}{2}$ N., $62\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles south of the Spit light.

Fairport to Port Stanley.—When 1 mile north from Fairport beacon-light, steer N. $\frac{1}{2}$ E., $60\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile south of Port Stanley light.

Fairport to Rondeau.—When 1 mile north from Fairport beacon-light, steer N. W., 46 miles, to a point 1 mile south of Rondeau main light.

Fairport to Buffalo.—When $2\frac{1}{2}$ miles north of Fairport beacon-light, steer N. E. by E. $\frac{1}{2}$ E., 143 miles, to the north end of Buffalo breakwater.

Cleveland to Black River, Vermilion, and Huron.—When $1\frac{1}{2}$ miles N. W. by W. from Cleveland Breakwater light, steer W. $\frac{3}{4}$ N., 14 miles, to a point 1 mile north of Avon point, thence W. by S. $\frac{1}{4}$ S., $9\frac{1}{2}$ miles, to a point 1 mile north of Black River light, or same course $19\frac{1}{2}$ miles to a point 1 mile north of Vermilion light, or W. by S. $\frac{1}{2}$ S., $28\frac{1}{2}$ miles, or until Huron light bears S. W. 1 mile distant.

Cleveland to Sandusky.—When $1\frac{1}{2}$ miles N. W. by W. from the breakwater light, steer W. $\frac{3}{4}$ N., 14 miles, to a point 1 mile north of Avon point, thence W. $\frac{1}{2}$ S., 35 miles, to Outer buoy, 1 mile northeast from Cedar Point Range beacon.

Cleveland to South Passage.—When $1\frac{1}{2}$ miles N. W. by W. from the breakwater light, steer W. $\frac{1}{2}$ N., 51 miles, to a point $1\frac{1}{2}$ miles north of Marblehead light. This course leads close to Avon point. See course from Sandusky to Green island and Detroit river.

Cleveland to Middle Passage.—When at the breakwater light, steer W. by N. $\frac{1}{2}$ N., 51 miles, to a point $\frac{1}{2}$ mile south of Middle Island light. See course from Middle passage to Bar point.

Cleveland to Pelée Spit and Detroit River Light.—When at the breakwater light, steer N. W. by W. $\frac{3}{4}$ W., 47 miles, to a point $1\frac{1}{2}$ miles south of the Spit light, thence W. by N. $\frac{3}{4}$ N., $34\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile N. by E. from Detroit River light, and in range with it and Bois Blanc light, passing 1 mile north of Colchester Reef light, and $\frac{1}{2}$ mile south of Bar Point red buoy.

Cleveland to Port Stanley.—When at the breakwater light, steer N. by E. $\frac{1}{2}$ E., 82 miles, to a point $\frac{1}{2}$ mile south of Port Stanley light.

Cleveland to Port Colborne.—When 1 mile north of breakwater light, steer N. E. $\frac{1}{2}$ E., 29 miles, to a point $2\frac{1}{2}$ miles north of Fairport beacon-light; thence N. E. by E., 127 miles, or until Port Colborne main light bears N. by E., 1 mile distant.

Cleveland to Buffalo.—When 1 mile north of breakwater light, steer N. E. $\frac{1}{2}$ E., 29 miles, to a point $2\frac{1}{2}$ miles north of Fairport beacon-light; thence N. E. by E. $\frac{1}{2}$ E., 143 miles, to the north end of Buffalo breakwater.

Cleveland to Rondeau.—When 1 mile north of breakwater light, steer N. by W. 51 miles to a point 1 mile south of Rondeau main light.

Black River to South Passage.—When 1 mile north of pierhead light, steer W. by N., $27\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles north of Marblehead light-house, whence see course from Sandusky to Green Island light, and Detroit river.

Black River to Middle Passage.—When 1 mile north of pierhead light, steer N. W. by W. $\frac{3}{4}$ W., $28\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile south of Middle Island light, passing $\frac{1}{2}$ mile north of Gull Island Shoal buoy. Whence see course from Middle Passage to Detroit River light.

Black River to Pelée Spit.—When 1 mile north of pierhead light, steer N. W. by N., 30 miles, to a point $1\frac{1}{2}$ miles south of the Spit light.

Vermillion to South Passage.—When 1 mile north of pierhead light, steer W. N. W. $\frac{1}{2}$ N., 19 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles north of Marblehead light-house. Whence see course from Sandusky to Green Island light.

Vermillion to Avon Point.—When 1 mile north of pierhead light, steer E. by N. $\frac{3}{4}$ N., 19 $\frac{1}{2}$ miles, or until the point bears south distant 1 mile.

Huron to South Passage.—When 1 mile north of pierhead light-house, steer N. W. $\frac{3}{4}$ N., 12 $\frac{3}{4}$ miles, to a point 1 $\frac{1}{2}$ miles north of Marblehead light-house.

Huron to Point Avon.—When 1 mile northeast of pierhead light-house, steer E. by N. $\frac{1}{2}$ N., 28 $\frac{1}{2}$ miles, or until the point bears south 1 mile distant.

Sandusky to Green Island and Detroit River Light.—When 1 $\frac{1}{2}$ miles northeast of Cedar Point light and in range of beacon, steer N. W. by N. $\frac{1}{2}$ N., 4 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles north of Marblehead light; thence N. W. by W., for 9 $\frac{1}{2}$ miles, to a point 1 mile south of Green Island light. Then N. W. by N. $\frac{1}{2}$ N., 30 miles, to a point 1 mile N. by E. from Detroit River light.

Sandusky to Buffalo.—When 1 $\frac{1}{2}$ miles northeast of Cedar Point light and in range of beacon, steer N. E. by E. $\frac{1}{2}$ E., 216 miles to the north end of breakwater.

Green Island to Detroit River Light.—When 1 mile south of light, steer N. W. by N. $\frac{1}{2}$ N., 30 miles, to a point 1 mile N. by E. from Detroit River light, and in range with it and Bois Blanc light, passing $\frac{1}{2}$ mile west of Middle Sister island, and about $\frac{1}{2}$ of a mile east of Detroit River light.

Green Island to Entrance to Maumee Bay.—When 1 mile south of Green Island light, steer N. W. by W., for 15 miles to a point 1 mile north of West Sister Island light, then steer W. $\frac{1}{2}$ N., 13 $\frac{1}{2}$ miles, to Turtle Island Shoal buoy, or until Turtle Island light bears S. W. by S. $\frac{1}{2}$ S., 1 $\frac{1}{2}$ miles.

To pass south of West Sister island, when 1 mile south of Green Island light, steer N. W. by W., for 6 $\frac{1}{2}$ miles, to a point 1 mile north of Niagara Reef buoy and in line with Green island and West Sister lights, when steer W. by N. $\frac{1}{2}$ N., 21 $\frac{1}{2}$ miles, to north side of Turtle Island Shoal buoy.

Green Island to Monroe.—When 1 mile south of light, steer N. W. $\frac{1}{4}$ W., 29 miles, to a point 1 mile east of Monroe light.

Entrance to Maumee Bay to Pelée Spit.—When 1 $\frac{1}{2}$ miles N. E. by N. $\frac{1}{2}$ N. from Turtle Island light, west side of black can buoy, steer E. $\frac{1}{2}$ S., 13 $\frac{1}{2}$ miles, to a point 1 mile north of West Sister Island light, thence E. by N. $\frac{1}{2}$ N. for 29 $\frac{1}{2}$ miles, ranging on Pelée Spit light, and to within 2 $\frac{3}{4}$ miles of it, when steer E. by S. $\frac{1}{2}$ S., for 2 $\frac{3}{4}$ miles to a point 1 $\frac{1}{2}$ miles south of Spit light. This course leads close to the north end of Middle ground.

Entrance to Maumee Bay to Detroit River Light.—When 1 $\frac{1}{2}$ miles N. E. by N. $\frac{1}{2}$ N. from Turtle Island light, steer N. E. $\frac{1}{4}$ N. 19 miles to a point 1 mile S. by W. of Detroit River light and in range with it and Bois Blanc Island light.

Entrance to Maumee Bay to Marblehead and Buffalo.—Round Turtle Island Shoal buoy, and steer E. by S. $\frac{3}{4}$ S. 21 $\frac{1}{2}$ miles to a point 1 mile north of Niagara Reef buoy, and in range of West Sister island and Green Island lights, when steer S. E. by E., 16 miles, to a point 1 $\frac{1}{2}$ miles north of Marblehead light, passing between the buoys on Mouse Island reef and Starve Island reef. When steer E. N. E., 216 miles, to the north end of Buffalo breakwater.

Middle Passage to Bar Point, Detroit River light.—When $\frac{1}{2}$ mile south of Middle Island light steer W. $\frac{3}{4}$ miles, or until the west end of Middle Island bears N., when steer N. W. by W. 19 miles, until the east side of Middle Sister bears N. 1 $\frac{1}{2}$ miles, passing $\frac{3}{4}$ mile north of North Bass island, when steer N. W. by N. $\frac{3}{4}$ N., 14 $\frac{1}{2}$ miles, to a point 1 mile N. by E. from Detroit River light, and in range with Bois Blanc light.

Middle Passage to the Entrance of Maumee Bay.—When $\frac{1}{2}$ mile south of Middle Island light, steer W. $\frac{3}{4}$ mile or until the west end of Middle island bears north, when steer N. W. by W. 7 $\frac{1}{2}$ miles, or until the middle of North Pass island bears south distant one mile, when steer W. $\frac{1}{4}$ N. 28 $\frac{1}{2}$ miles to Turtle Island Shoal buoy, or until Turtle Island light bears S. W. by S. $\frac{1}{2}$ S. 1 $\frac{1}{2}$ miles. This course passes 1 $\frac{1}{2}$ miles north of West Sister Island light.

Middle Passage to Put-in-Bay.—When $\frac{1}{2}$ mile south of Middle Island light steer W. $\frac{1}{4}$ N., 5 $\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile north of Ballast island, thence S. W. 2 $\frac{1}{2}$ miles to the dock in Put-in-Bay.

Marblehead to Detroit River Light, passing between Middle Bass and South Bass Islands.—When 1 $\frac{1}{2}$ miles north of Marblehead light, steer N. W. by N. $\frac{1}{4}$ N., 3 $\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile west of the west point of Kelley's island, then steer N. by W. $\frac{3}{4}$ W., 5 $\frac{1}{2}$ miles, to a point $\frac{1}{4}$ mile east of Ballast island, haul around the island until its west side bears south $\frac{1}{2}$ mile distant, then steer S. W., heading on Gibraltar Island, 1 $\frac{1}{2}$ miles, when steer west with the north point of South Bass island directly astern 4 miles, then steer N. W. by N. $\frac{1}{4}$ N., 27 $\frac{1}{2}$ miles, to a point 1 mile N. by E. from Detroit River light and in range with Bois Blanc light. Passing $\frac{1}{4}$ mile west of Middle Sister island.

Put-in-Bay to Detroit River Light, passing between Snake and Middle Bass Islands.—When $\frac{1}{2}$ mile east of Gibraltar island steer N. W. by N., 29 $\frac{1}{2}$ miles, to a point N. by E. 1 mile from Detroit River light, and in range with Bois Blanc Island light. This course leads north of Middle island $\frac{1}{2}$ of a mile.

Put-in-Bay to Entrance to Maumee Bay.—When close to the east side of Gibraltar island, steer N. N. W. $\frac{1}{4}$ W., $\frac{1}{2}$ mile to clear Peach Orchard buoy, when steer W. by N. $\frac{3}{4}$ N., 29 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles N. E. by N. $\frac{1}{4}$ N. from Turtle Island light, passing 1 mile south of West Sister Island light.

Detroit River Light to Pelée Spit.—When $\frac{1}{2}$ mile N. by E. from Detroit River light and in range with Bois Blanc light, steer E. by S. $\frac{3}{4}$ S., passing $\frac{1}{2}$ mile south of Bar Point red buoy, and 1 mile north of Colchester Reef light house, 34 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles south of the Spit light.

Detroit River Light to Monroe.—When $\frac{1}{2}$ mile south of

Detroit River light, steer S. W. $\frac{1}{2}$ W., 11 $\frac{1}{2}$ miles, to a point 1 mile east of Monroe light, passing close to Stony point.

Monroe to Pelée Spit.—When 1 mile east of Monroe light, steer E. $\frac{1}{2}$ S., 41 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles south of the Spit light.

Magnetic Declinations in degrees and tenths, corrected to the year 1890:

Buffalo	4° .8 W.
Port Colborne.....	4° .6 W.
Long Point.....	3° .8 W.
Erie.....	3° .6 W.
Fairport.....	2° .3 W.
Cleveland.....	1° .6 W.
Black River.....	1° .0 W.
Cedar Point.....	0° .5 W.
Pelée Island.....	0° .8 W.
Kelley's Island.....	0° .6 W.
Toledo.....	0° .0
Kingsville.....	0° .8 W.
Bois Blanc Island.....	0° .5 W.

Canadian Light-Houses, Buoys, and Harbors on the North Shore of Lake Erie Standing to the Westward.

PORT COLBORNE LIGHT-STATION.—Main light. A fixed white light, visible 12 miles. Open, wood, frame tower, light 70 feet above lake level. On west pierhead, at the Lake Erie entrance to Welland canal.

Port Colborne Range Light.—A fixed red light. White, square, wood tower, light 38 feet above lake level. On the E. side of entrance, on crib, 2030 feet N. by E. $\frac{1}{2}$ E., from main light. The two lights, in range, give deepest water to entrance of canal clear of Sugar Loaf reef. In entering main light must be passed to port, back one on starboard side. Fog horn sounds blasts of 11 seconds every 1 $\frac{1}{2}$ minutes.

Port Colborne Beacon.—A vertically striped red and white beacon, surmounted by a globe, stands on the outermost crib of east pier, not lighted.

To enter the harbor, bring the lights in range, heading about N. by E. $\frac{1}{2}$ E., and when near the end of the west pier port so as to clear it, and follow it into the basin; 16 feet can be carried in.

Sugar Loaf hill, 1 $\frac{1}{2}$ miles west of Port Colborne, is a good mark for vessels bound down the lake. A reef extends from the east side of the entrance, in a southerly direction, an 11-foot spot near its outer end bears S. by E. $\frac{1}{2}$ E. from the main light 1,000 yards distant; from 12 $\frac{1}{2}$ to 14 feet can be carried through the Welland canal.

MOHAWK ISLAND LIGHT-STATION.—A revolving white light, showing 3 bright flashes with intervals of 30 seconds between their points of greatest brilliancy, followed by an eclipse of 75 seconds, or making a complete revolution in 2 $\frac{1}{2}$ minutes, visible 15 miles. White, circular, stone tower, 60 feet high, light 64 feet above lake level. On an island 1 mile southwest of main land, and 3 $\frac{1}{2}$ miles S. E. by E. from the entrance to Port Maitland, and 14 miles west of the entrance to

the Welland canal. Good protection from S. W. and W. gales can be had by anchoring under the lee of a reef which extends in a southeast direction about $2\frac{1}{2}$ miles from the light, come to in about $3\frac{1}{2}$ fathoms with the light bearing west. Shoal water extends to the westward of Point Selkirk, which is $2\frac{1}{2}$ miles east of the light.

PORT MAITLAND LIGHT-STATION.—A fixed white light, visible 13 miles. White, open frame, wood tower, light 51 feet above lake level. On west pier at the entrance to Grand river.

Grand River, or Port Maitland, is a good harbor and easy to make, the piers are 1,500 feet in length. To enter the harbor run straight in, keeping the west pier well on board; depth of water at the entrance, 11 to 12 feet. To come to anchor, run above the entrance to canal, which is on the east side of the river.

PORT DOVER LIGHT-STATION.—A fixed white light, visible 8 miles. White, hexagonal, wood tower, 20 feet high. On the west pier. The piers are 1,020 feet in length, with from 11 to 12 feet at the entrance. Long Point light bears S. by E. $\frac{1}{2}$ E., $18\frac{1}{2}$ miles.

LONG POINT LIGHT-STATION.—A revolving white light, interval of revolution 1 minute, visible 15 miles. Octagonal wood tower, light 65 feet above lake level. On the east extremity of Long point.

Fog Signal.—A steam fog horn is to be established at the east end of Long point, and the contract for the necessary buildings has been let.

Port Colborne light N. E. by E. $\frac{1}{4}$ E., 47 miles. Dunkirk light E. $\frac{1}{4}$ S., 36 miles. Presque Isle light S. $\frac{1}{2}$ W., $26\frac{1}{2}$ miles. Long point affords good protection and shelter from all southerly and westerly gales. To make a lee, haul around the low sandy point, giving the light a berth of seven-eighths of a mile and come to between the point and Big Bluff in from 4 to 6 fathoms, good anchorage. Shoal water extends from Bluff point, which is 3 miles to the westward of the light, to the northward and westward, $2\frac{1}{2}$ miles.

WEST END OF LONG POINT LIGHT-STATION.—A revolving red light, interval of revolution 1 minute, visible 12 miles. White, square, wood tower, dwelling attached. On the east side of new channel. Visible from all points seaward. When lifeboat is required the light will be obscured towards Port Rowan.

Port Burwell, or Big Otter Creek.—A fixed white light, visible 12 miles. Octagonal wood tower, 333 yards in-shore. The west pier extends into the lake 850 feet, and the east pier 570 feet; width between piers, 170 feet; depth of water at entrance, 10 to 11 feet. The light is on the hill east side, the focal plane is 96 feet above lake level. Presque Isle light, S. E., 49 miles. Fairport light S. S. W., 65 miles. Rondeau point S. W. by W. $\frac{1}{4}$ W., 60 miles.

Port Bruce, or Catfish Creek.—A fixed white light. On a pole. The west pier is 750 feet in length, and the east pier 700 feet. Port Bruce is 10 miles west of Port Burwell and about the same distance east of Port Stanley.

PORT STANLEY LIGHT-STATION.—A fixed white light. White, square, wood tower. On west pier, visible from all points seaward. The west pier is 1,870 feet in length, and the east pier 1,150 feet. Depth of water at entrance, 11 to 14 feet. Rondeau point, S. W. $\frac{1}{4}$ W., 43 miles. Ashtabula light S. by E. $\frac{1}{4}$ E., 56 miles.

RONDEAU LIGHT-STATION (Main Light).—A revolving light showing alternate red and white flashes every $1\frac{1}{2}$ minutes, visible 16 miles. Octagonal wooden tower, white, on a steel-faced cylindrical base, built up from the pier and painted brown. Focal plane of light 70 feet above the lake level. On the eastern breakwater 780 feet N. by E. $\frac{1}{2}$ E. from the front range light.

Rondeau Harbor (Front Light).—A fixed white light visible 18 miles, over a small arc on each side of the range. White, square, wooden, open framework tower. On a cribwork block upon the outer end of the east breakwater pier. The position formerly occupied by the main light. The two lights in range N. by E. $\frac{1}{2}$ E. lead up to the outer end of the east pier, and the light must be left on the star-board hand on entering.

Rondeau Harbor is on the south side of Point aux Pins, W. $\frac{1}{2}$ S., 98 miles from Long point. It is a natural basin, enclosed by Point aux Pins, with a cut through the neck, or sand bank; the sides of the cut are protected by two parallel piers 788 feet in length, and 250 feet apart, direction north and south. Depth of water at the entrance, 18 to 21 feet. Pelée Spit light S. W. $\frac{1}{2}$ W., 40 miles. Cleveland light S by E., 53 miles. Fairport light S. E. $\frac{1}{2}$ S., 48 miles. The east side of Point aux Pins affords a good shelter from westerly gales, good anchorage in 6 to 7 fathoms, clay bottom. Vessels frequently come to west of the harbor for shelter in north-east gales.

PELÉE SPIT LIGHT-STATION.—A revolving white light, visible 15 miles. White, octagonal, wood tower, 61 feet high, light 76 feet above lake level. On a crib $2\frac{1}{2}$ miles south of the point. Fog horn operated by compressed air has been established at this station. The horn projects horizontally from the S. E. face of the pier, and is 20 feet above lake level. It sounds blasts of 7 seconds' duration, with intervals of 45 seconds. Pelée Island light bears W. S. W. $7\frac{1}{2}$ miles. Colchester Reef light W. by N., $20\frac{1}{2}$ miles. The west side of Point Pelée affords excellent shelter from all northeast and easterly gales, and the east side from northwest or westerly gales. To make a lee on the west side, coming from the eastward, run past the light, give it a berth of $\frac{1}{2}$ to $\frac{1}{4}$ a mile, and haul up N. by W. for from 3 to 5 miles, when come-to in about 6 fathoms, clay bottom. There are shoal spots from $1\frac{1}{2}$ to $1\frac{3}{4}$ miles E. to E. S. E. from the light; least water 13 feet. The north end of the middle ground bears W. by S. $\frac{3}{4}$ S., $4\frac{1}{2}$ miles, and the south end S. W. by W. $\frac{1}{2}$ W., $4\frac{1}{2}$ miles, and a range between Pelée Spit and Pelée Island lights, passes a little north of the middle of the shoal.

Shoals near Point Pelée Light.—The Deputy Minister of Marine of Canada has issued the following Notice to Mariners, dated October 25, 1888: "Notice is hereby given that a spot with only 13 feet of water is reported on the shoals lying about $1\frac{1}{2}$ miles to the eastward of Point Pelée light-house, which shoals are shown on the American chart of the lake. Also that the wrecked schooner 'Walter H. Oades' lies about 400 feet southwest of the 13-foot spot, in 21 feet of water, with only 6 feet of water over her."

PELÉE ISLAND LIGHT-STATION.—A fixed white light, visible 12 miles. White, circular, stone tower, 46 feet high, light 45 feet above lake level. On the northeast point of Pelée island. The north end of Middle ground bears N. E. by E. $\frac{3}{4}$ E., $3\frac{1}{2}$ miles, and the south end E. $\frac{1}{2}$ N. 3 miles. Colchester Reef light N. W. by W. $\frac{1}{2}$ W., $14\frac{1}{2}$ miles. South side of East Sister island W. $\frac{1}{2}$ S., $11\frac{1}{2}$ miles. A reef extends from the light 1 mile, in a northeast direction. There is good anchorage on the west side of the island, and protection from easterly gales. The

east side of Pelée island should not be approached nearer than $1\frac{1}{2}$ miles. Chickenolee reef is $2\frac{3}{4}$ miles from southeast point of island.

MIDDLE ISLAND LIGHT-STATION.—A fixed red light, visible 12 miles. White, square, wood tower, 49 feet high; light 70 feet above sea level. This light is between Pelée and Kelley's island, and marks the channel between them. Gull Island Shoal buoy S. $\frac{1}{2}$ E., 1 mile; the best channel is between this buoy and the light. There is a shoal, least water 10 feet, E. N. E. $\frac{1}{2}$ N., $\frac{1}{2}$ mile. To pass north of Middle island, bring the light to bear E., and run for it on that course to within $\frac{1}{2}$ of a mile, when steer W. N. W. $\frac{1}{2}$ N., 8 miles, to a point $\frac{1}{2}$ mile north of North Bass island.

LEAMINGTON LIGHT-STATION.—A fixed white light, visible 12 miles. White, square, wood tower; light 48 feet above lake level. On shore near the pier. Pelée Spit light S. S. E. $\frac{1}{2}$ E., 12 miles. Colchester Reef light W. S. W. $\frac{1}{2}$ S., 16 miles.

KINGSVILLE LIGHT-STATION (Front Light).—A fixed red light, lantern on a pole, 27 feet above the level of the lake. On the outer end of the east breakwater pier.

Back Light.—A fixed white light, visible 12 miles, light 55 feet above lake level. Square, white wooden tower, lantern red. On the bank of the lake at the head of the east pier 1,060 feet N. by W. from Front light. The two lights in range lead up to the entrance. The front light to be left on the right hand or starboard side in entering.

Kingsville is situated $6\frac{1}{2}$ miles west of Leamington, and 10 miles to the eastward of Little's point. The harbor works consist of two piers. The east pier is 880 feet in length and extends south; the west pier diverges so as to inclose a basin in the form of the letter V. Pelée Spit light S. E. $\frac{1}{2}$ E., $15\frac{1}{2}$ miles. Colchester Reef light S. W. $\frac{1}{2}$ W. $10\frac{1}{2}$ miles.

COLCHESTER REEF LIGHT-STATION.—A fixed white light, 3d order, visible 14 miles, illuminates the entire horizon. Circular stone pier 20 feet above the lake, surmounted by a hexagonal wood tower painted white. The vane of the lantern is 60 feet above the pier. The structure stands near the southeastern edge of the reef, in 13 feet of water, with 19 feet of water within 1,000 feet of it on every side. The lightship is removed. Visible all around the horizon. A fog bell struck by machinery, is placed in a belfry on south side of tower, 55 feet above the lake level, and in thick and foggy weather will sound one stroke every 15 seconds. Middle Sister S. W., $8\frac{1}{2}$ miles. Dock at Little's point, N. W. by N., 4 miles.

Bar Point Lightship.—Removed, the position is marked by a large, red, spar buoy in 18 feet of water, N. E. by E. $\frac{1}{2}$ E. 1 mile from the Detroit River light, 100 yards south of the west end of reef. Bois Blanc light N., $5\frac{1}{2}$ miles. Vessels passing inside should give the buoy a berth of $\frac{1}{2}$ a mile, and heavy draught vessels should pass to the southward.

To Enter Detroit River, north of the red spar buoy, where the lightship was formerly moored.—When $1\frac{1}{2}$ miles south of Little's point steer W. N. W. to a point three-quarters of a mile northeast from buoy, thence steer N. W. by N. heading on Celeron island, until in range with Detroit river and Bois Blanc lights, when steer for Bois Blanc light, until within $1\frac{1}{2}$ miles of it, thence N. by E. $\frac{1}{2}$ E. into the river. Only light draught vessels should attempt this passage.

*Compass Courses and Distances on the North Shore of
Lake Erie.*

Port Colborne to Dunkirk.—When 1 mile S. by W. from main light, steer S. by W. $\frac{3}{4}$ W., 25 miles, to a point 1 mile N. W. by N. from beacon-light.

Port Colborne to Erie.—When 1 mile S. by W. from main light, steer S. W. $\frac{1}{4}$ S., 63 miles, to a point $1\frac{1}{2}$ miles northeast from Presque Isle beacon-light.

Port Colborne to Ashtabula.—When 1 mile S. by W. from main light, steer S. W. $\frac{1}{4}$ W., 102 miles to a point 1 mile north of Ashtabula light.

Port Colborne to Fairport and Cleveland.—When 1 mile S. by W. from main light, steer S. W. by W. 127 miles, to a point $2\frac{1}{2}$ miles north of Fairport beacon-light, when steer S. W. $\frac{1}{4}$ W., 29 miles, to a point 1 mile north of Cleveland breakwater light.

Port Colborne to Long Point.—When 1 mile S. by W. from main light, steer S. W. by W. $\frac{3}{8}$ W., 47 miles, to a point 2 miles south of light.

Port Colborne to Sandusky.—When 2 miles south of Long Point light, as in the course from Port Colborne, steer S. W. by W. $\frac{1}{4}$ W., 152 miles, to a point $1\frac{1}{2}$ miles northeast of Cedar Point light, and in range with beacon.

Port Colborne to South Passage, and Toledo.—When 2 miles south of Long Point light, as in the course from Port Colborne, steer S. W. by W. $\frac{1}{4}$ W., $151\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles north of Marblehead light, when steer N. W. by W., 16 miles, to a point 1 mile north of Niagara Reef buoy, and in line with Green island and West Sister Island lights, when steer W. by N. $\frac{3}{8}$ N. $21\frac{1}{2}$ miles, to a point $1\frac{3}{8}$ miles N. E. by N. $\frac{1}{4}$ N. from Turtle Island light.

Port Colborne to Middle Passage, Detroit and Toledo.—When 2 miles south of Long Point light as in the course from Port Colborne, steer W. S. W., $146\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile south of Middle Island light; thence W. $\frac{3}{4}$ mile, or until the west end of Middle island bears north, when steer N. W. by W., 19 miles, until the east side of Middle Sister bears N. $1\frac{1}{2}$ miles, passing $\frac{2}{3}$ mile north of North Bass island, when steer N. W. by N. $\frac{3}{8}$ N., $14\frac{1}{2}$ miles, to a point 1 mile N. by E. from Detroit River light and in range with Bois Blanc light.

Or when $\frac{1}{2}$ mile south of Middle Island light, steer west $\frac{3}{4}$ mile, or until the west end of Middle island bears north, when steer N. W. by W. $7\frac{1}{2}$ miles, or until the middle of North Bass island bears south distant one mile, when steer W. $\frac{3}{8}$ N. $28\frac{1}{2}$ miles to Turtle Island Shoal buoy or until Turtle Island light bears S. W. by S. $\frac{1}{4}$ S. $1\frac{1}{2}$ miles passing $1\frac{1}{2}$ miles north of West Sister Island light.

Port Colborne to Detroit River Light.—When 2 miles south of Long Point light, as in the course from Port Colborne, steer W. by S. $\frac{3}{8}$ S., 134 miles, to a point $1\frac{1}{2}$ miles south of the Spit light, when steer W. by N. $\frac{1}{4}$ N., $34\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile N. by E. from Detroit River light, and in range with it and Bois Blanc light, passing 1 mile north of Colchester Reef light, and $\frac{1}{2}$ mile south of Bar Point red buoy. The position formerly occupied by the Bar Point light-ship.

Port Colborne to Port Maitland.—When 1 mile S. by W. from main light, steer S. W. by W. $\frac{3}{8}$ W., 8 miles, then steer W. $\frac{3}{8}$ N., 9

miles, to a point S. W. $\frac{1}{4}$ W., 3 miles from Mohawk light; thence N. by W. 2 miles, or until in range of west pier. Entering keep the west pier well on board and follow it up into the river.

Port Colborne to Port Dover.—When 1 mile S. by W. from the main light, steer S. W. by W. $\frac{1}{2}$ W., 8 miles; thence west 41 miles, to a point 1 mile S. by E. from the light.

Port Maitland to Port Dover.—When 1 mile south of light, steer S. W. by W. for 7 miles, then steer W. $\frac{1}{4}$ N., 26 miles, to a point 1 mile S. by E. from the light.

Port Maitland to Long Point.—When 1 mile south of light, steer S. W. $\frac{1}{2}$ W., 33 miles, to a point 2 miles south of light.

Port Dover to Long Point.—When 1 mile south of pier, steer S. S. E. $\frac{1}{4}$ E., 18 miles, to a point $1\frac{1}{2}$ miles east of Long Point light.

Long Point to Buffalo.—When 2 miles south of Long Point light, steer E. by N. $\frac{1}{4}$ N. $63\frac{1}{2}$ miles, to the north end of the Buffalo breakwater.

Long Point to Erie.—When two miles south of Long Point light, steer S. $\frac{1}{4}$ W., 24 miles, to a point $1\frac{1}{2}$ miles northeast of Presque Isle beacon-light.

Long Point to Fairport and Cleveland.—When 2 miles south of light, steer S. W. $\frac{1}{4}$ W., 80 miles, to a point $2\frac{1}{2}$ miles north of Fairport beacon-light; thence S. W. $\frac{1}{2}$ W., 29 miles, to a point 1 mile north of Cleveland breakwater light.

Long Point to South Passage.—See course from Port Colborne to Toledo.

Long Point to Middle Passage.—See course from Port Colborne to Middle Passage.

Long Point to Pelée Spit.—When 2 miles south of light, steer W. by S. $\frac{1}{2}$ S., 134 miles, to a point $1\frac{1}{2}$ miles south of spit light.

Long Point to Rondeau.—When 2 miles south of light, steer W. $\frac{1}{2}$ S., 98 miles, to a point 2 miles south of main light.

Long Point to Port Burwell.—When 2 miles south of light, steer W. $\frac{1}{4}$ N., $28\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles south of Clear creek; thence W. N. W. $\frac{1}{2}$ N., $11\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles south of piers.

Long Point to Port Stanley.—When 2 miles south of light, steer W. $\frac{1}{4}$ N., $28\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles south of Clear creek; thence W. by N. $\frac{1}{4}$ N., $31\frac{1}{2}$ miles, to a point 1 mile south of light.

Port Burwell to Port Stanley.—When 1 mile south of the piers, steer W. $\frac{1}{4}$ N., 20 $\frac{1}{2}$ miles, to a point 1 mile south of light; this course leads very close to Port Bruce.

Port Stanley to Rondeau and Pelée Spit.—When 1 mile south of light, steer S. W. $\frac{1}{4}$ W., 45 miles, to a point 3 miles S. E. $\frac{1}{4}$ S. from main light; thence S. W. $\frac{1}{2}$ W. 41 miles, to a point $1\frac{1}{2}$ miles south of Pelée Spit light.

Rondeau to Pelée Spit.—When 1 mile south of light, steer S. W. $\frac{1}{2}$ W., 40 miles, to a point $1\frac{1}{2}$ miles south of Spit light.

Pelée Spit to Detroit River Light.—See course from Port Colborne to Detroit River light.

Pelée Spit to Erie.—When $1\frac{1}{2}$ miles south of the Spit light, steer E. $\frac{1}{4}$ N. 126 miles, to a point 2 miles N. by E. $\frac{1}{4}$ E. from Presque Isle light; thence S. E. $\frac{1}{4}$ E., 3 miles, or until Presque Isle beacon-light bears S. W. $1\frac{1}{2}$ mile.

Pelée Spit to Long Point, and Buffalo.—When $1\frac{1}{2}$ miles south of the Spit light, steer E. by N. $\frac{1}{4}$ N., 134 miles, to a point $1\frac{1}{2}$

miles south of Long Point light; thence E. by N. $\frac{1}{2}$ N., 63 $\frac{1}{2}$ miles, to the north end of Buffalo breakwater.

Pelée Spit to Dunkirk.—When 1 $\frac{1}{2}$ miles south of the Spit light, steer E. by N. $\frac{1}{4}$ N., 168 $\frac{1}{2}$ miles, to a point 1 mile N. W. by N. from Dunkirk beacon-light.

Pelée Spit to Ashtabula.—When 1 $\frac{1}{2}$ miles south of the Spit light, steer E. $\frac{1}{4}$ N., 98 miles, to a point 1 mile north of Ashtabula light.

Pelée Spit to Fairport.—When 1 $\frac{1}{2}$ miles south of the Spit light, steer E. $\frac{3}{4}$ S., 62 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles northwest from Fairport beacon-light.

Pelée Spit to Cleveland.—When 1 $\frac{1}{2}$ miles south of the Spit light, steer S. E. by E. $\frac{1}{4}$ E., 47 miles, to the Cleveland breakwater light.

Pelée Spit to Black River.—When 1 $\frac{1}{2}$ miles south of the Spit light, steer S. E. by S., 30 miles, to a point 1 mile north of Black River light.

Pelée Spit to Entrance of Maumee Bay.—When 1 $\frac{1}{2}$ miles south of the Spit light, steer W. by N. $\frac{1}{4}$ N., 2 $\frac{1}{2}$ miles, thence W. by S. $\frac{1}{4}$ S., with the Spit light directly astern, passing close to the Middle ground, 29 $\frac{1}{2}$ miles to a point 1 mile north of West Sister light, passing $\frac{1}{2}$ mile south of East Sister Island; thence W. $\frac{1}{4}$ N., 13 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles N. E. by N. $\frac{1}{4}$ N. from Turtle Island light. Whence see directions for entering Maumee bay.

Buoys of the Dominion Government at the Entrance to Detroit River.

Red Barrel Buoy.—In 16 feet of water. Marks the south side of a small shoal near the shore, to the southeastward of Bar point. Detroit River light bears W. S. W. $\frac{1}{4}$ S., 3 $\frac{1}{2}$ miles.

Light Ship Buoy.—A 30-foot red spar buoy in 18 feet of water. Marks the position formerly occupied by the Bar Point light-ship. Detroit River light bears W. by S. $\frac{1}{4}$ S., $\frac{1}{4}$ mile.

Red Spar Buoy.—In 16 feet of water. Marks a shoal spot on east side of channel, between the Detroit River and Bois Blanc lights. Detroit River light bears S. by W. $\frac{1}{4}$ W., 1 $\frac{1}{2}$ miles.

Black Spar Buoy.—In 19 feet of water. Marks a shoal spot on the west side of channel. Detroit River light bears S. by E., 1 $\frac{1}{2}$ miles.

Red Spar Buoy.—In 16 feet of water. Marks a shoal spot on the east side of channel. Detroit River light S. by W. $\frac{3}{4}$ W., 1 $\frac{1}{2}$ miles.

Black Spar Buoy.—In 14 feet of water. Marks a shoal spot on the west side of channel. Detroit River light S. $\frac{3}{4}$ E., 1 $\frac{1}{2}$ miles.

Black Spar Buoy.—In 16 feet of water. Marks a shoal spot with 13 $\frac{1}{2}$ feet of water over it, on the west side of the channel. From this buoy the light-house at Gibraltar is just closed with southwest side of Celeron island. THE LIGHT-SHIP is moored at this buoy. Detroit River light, S. $\frac{1}{4}$ W., 2 $\frac{1}{2}$ miles.

Light-ship.—Gray, with white bulwarks. "Bar Point Light-ship" in black letters on the bulwarks. Two lights are shown vertically from lens lanterns, hoisted in a frame amidships, red over white. Moored

in 16 feet of water on eastern edge of shoals, on the west side of channel between Detroit River and Bois Blanc lights.

Red Spar Buoy.—In 18 feet of water. Marks a shoal spot on the east side of channel nearly opposite the black buoy and light-ship. Detroit River light S. by W., nearly $2\frac{1}{4}$ miles.

Red Barrel Buoy.—In 20 feet of water on the east side of channel. This was the lower buoy off Bar point moved further out into the channel. Bois Blanc light N. $\frac{1}{4}$ E., $2\frac{1}{8}$ miles. Bar point N. E. by E., $\frac{1}{8}$ mile.

Red Barrel Buoy.—In 14 feet of water on the east side of channel. Bois Blanc light N., $\frac{1}{4}$ mile.

Black Barrel Buoy.—In 14 feet of water, on the west side of channel. Marks the lower end of spit off the foot of Bois Blanc island. The light bears N. by E. nearly, $\frac{1}{4}$ mile.

Red Barrel Buoy.—Marks the channel bank on east side of channel opposite the lower end of spit off the foot of Bois Blanc island. The light bears N. $\frac{1}{8}$ W. nearly, $\frac{1}{4}$ mile.

Red and Black Striped Spar Buoy.—Marks a shoal spot in the middle of the channel with only $14\frac{1}{2}$ feet of water over it. There is a good channel 500 feet wide on either side of the buoy.

Black Barrel Buoy.—In 14 feet of water, on west side of channel. Marks the edge of the spit off the foot of Bois Blanc island, about midway between its lower end and the light. The light bears N. $\frac{1}{8}$ E., $\frac{1}{4}$ mile.

Standing up Detroit River Main Channel above Bois Blanc Island Light.

Black Spar Buoy.—In 16 feet of water, on the west side of channel. Marks an elbow in the channel bank nearly abreast the light.

Black Spar Buoy.—In 12 feet of water, on west side of channel. Marks a shoal spot with deep water inside of it, $\frac{1}{4}$ mile above the S. E. point of Bois Blanc island. This shoal is nearly one-third the distance across the river, called the Boston shoal.

Red Spar Buoy.—In 14 feet of water. Marks a shoal spot on the east side of channel with deep water inside of it, a little above the last-described buoy, called the Spokane shoal.

Amherstburg Range Lights.—Two red lights shown from lens lanterns to guide into the river. Front tower white, open frame, 50 feet high, and 80 feet from the water edge, 2,300 feet north of Fraser's dock. Rear tower red, open frame structure, 80 feet high, N. by E. $\frac{1}{4}$ E., 475 feet from Front light; both towers are slatted on the side facing the range.

Black Spar Buoy.—In 13 feet of water on the west side of channel, 400 feet east of the head of Bois Blanc island, called Milwaukee shoal.

Red Spar Buoy.—In 14 feet of water, on the east side of channel. Marks the point of the shoal off Fort Malden.

Black Barrel Buoy.—In 14 feet of water on west side of

DETROIT RIVER.

Light Houses and Buoys Standing up the Main or East Channel.

Southwest gales of any duration lower the water in Detroit river from 1 to 3 feet, and northeast gales raise it about as much. Current from 1 to 2½ miles per hour. Until the Lime-kilns have been crossed, this channel is in Canadian waters.

Entering Detroit river from Lake Erie, pass Detroit River light-house on either side, get on the line joining it and Bois Blanc light, N. 19½° E., or N. by E. nearly, keeping the red buoys to starboard, and black to port, until within 1½ miles of Bois Blanc light, when haul in N. by E. ½ E. on the Amherstburg ranges (see list of Canadian buoys, page 85). Keep in the middle of the river until abreast of Amherstburg, when haul over a little towards the head of Bois Blanc island, to clear the red buoy off Fort Malden. When past the head of the island, get on the Bois Blanc ranges, which lead to the lower end of the Lime-kiln cut, when take up the Lime-kiln Crossing ranges on Canadian shore, which leads through the centre of the cut. There are also range lights above the cut on the Texas dock, kept by the pilots.

After passing the Lime-kilns, get on the range of the Grosse Isle Range lights N. by W. ½ W., which leads to the range of Mamajuda and Grassy Island lights. Haul up on this range N. ½ E. (A good opportunity is afforded vessel masters while running on this range to test the working of their compasses; the course is between N. ½ E. and N. ¼ E.) When within about 300 yards of the light-house, bear to eastward slightly to clear Mamajuda shoal, and when 700 yards above the light, the range between it and Grassy island may again be taken. Arriving within one-half mile of Grassy Island light, haul to eastward to clear it, and when 600 yards above, again take the range until upper end of Fighting island is reached, when steer up river in mid-channel.

BAR POINT LIGHT-SHIP.—Two fixed lights, shown vertically, red over white. Wooden barge, hull gray, bulwarks white, with "Bar Point Light-ship" in black letters; moored in 16 feet of water, on the eastern edge of shoals, on the west side of channel, near the narrowest point between Detroit River and Bois Blanc lights.

BOIS BLANC, OR AMHERSTBURG LIGHT-STATION.—A fixed white light, visible 14 miles. White, circular stone tower, 40 feet high, light 56 feet above lake level. On lower end of Bois Blanc island.

Amherstburg Range Lights.—Two red lights shown from lens lanterns to guide into the river. Front tower white, open frame, 50 feet high, and 80 feet from the water edge, 2,300 feet north of Fraser's dock. Rear tower red, open frame structure, 80 feet high, N. by E. ½ E., 475 feet from Front light; both towers are slatted on the side facing the range.

Bois Blanc Range (front).—A fixed white light. White, square, open-framed tower, light 26 feet above lake level. On northeast point of island.

Bois Blanc Range (rear).—A fixed red light. Lantern on a mast surmounted by a red barrel, 150 yards S. by W. ½ W. from front light.

Lime-kiln Crossing Range Lights.—**Front light** is a fixed white light, visible 2 miles. Iron skeleton tower, 30 feet high. On crib in 6 feet of water, opposite Fort Malden.

Rear light is a fixed red light, visible 2 miles. Iron skeleton tower, 50 feet high. On crib in 4 feet of water, 390 feet S. ¼ E. from the Front light. The alignment of these lights can be kept from its intersection with the alignment of Bois Blanc Island range, northward to its intersection with the alignment of range lights at the head of Grosse Isle.

The Straight Cut at the Lime-kiln Crossing.—This very important improvement is nearly completed. It is 2,500 feet in length, 20 feet deep, and fully 440 feet wide.

Fort Malden Range Lights.—To mark the best channel from the head of the Lime-kiln Crossing cut to the foot of Fighting island. Front light fixed white, shown from an open frame tower, painted white, 50 feet high, opposite the lower end of the Lime-kiln Crossing cut. Rear light fixed red, shown from an open frame tower, 80 feet high, painted red. On the east side of the street, about S. by E. $\frac{1}{4}$ E., 646 feet from front tower. The light is 108 feet above water. The towers are slatted on the side facing the range to make them conspicuous day marks.

Main or East

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24 miles per hour.

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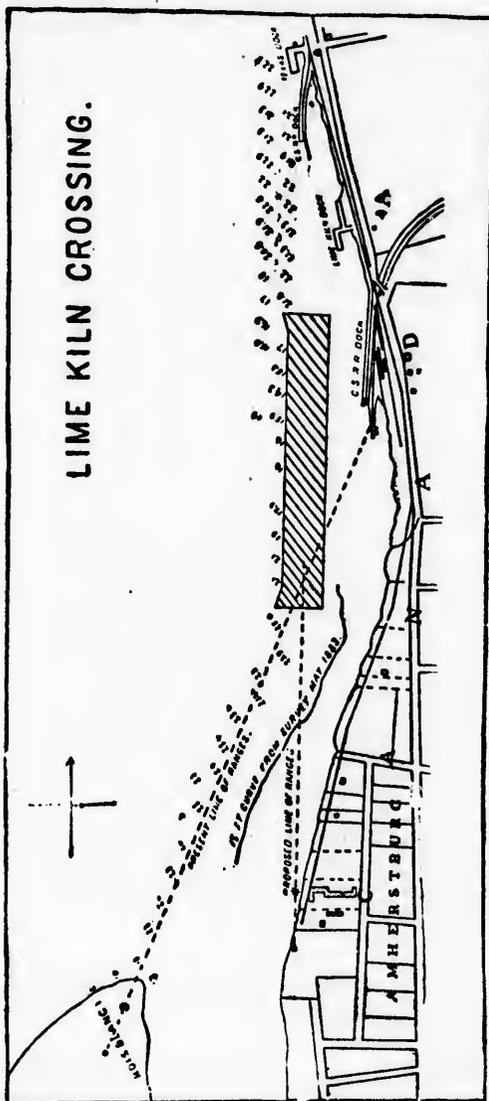
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Grosse Isle Flats.—Black spar buoy in 14 feet of water. Stands in sandy bottom, at the elbow of the flats, west side of channel, $2\frac{1}{2}$ miles above Lime-kiln crossing. Width of channel in this stretch, $\frac{1}{2}$ to $\frac{1}{2}$ mile. Mamajuda light-house, N. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles.

Ballard Reef Light.—A fixed red light shown from a *small red scow*, moored just inside the above described buoy. This light is maintained by vessel owners.

Fighting Island.—A red spar buoy in $9\frac{1}{2}$ feet of water stands on the east side of channel, and marks the outer edge of the bank, at lower end of Fighting island; soft bottom; deep water close-to. The edge of the bank, for a quarter mile above and below the buoy, is nearly straight, trending about N. by W. and S. by E., then curves to the eastward. Mamajuda light-house, N. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles.

Grosse Isle Range Lights.—Two fixed white, lens lantern lights, shown from brown, triangular, skeleton iron pyramidal towers, front tower 71 feet, and rear tower 103 feet high. The upper 25 feet of each tower is covered with white slats, and the lights are exhibited 14 feet below the tops of the structures.

Front light on crib at the north end of Grosse Isle. Mamajuda light-house, N. E. by N.

Rear light on crib 1,493 feet N. by W. $\frac{1}{2}$ W. from the Front light. The range leads from the center of the Lime-kiln crossing cut, and clears a small patch of bowlders a little above the cut. The range line is 150 feet to the westward of the Fort Malden range lights, and intersects the range of Grassy Island and Mamajuda Island lights $1\frac{1}{2}$ miles below Mamajuda light.

MAMAJUDA LIGHT-STATION.—A fixed red light, 4th order, visible 12 miles. White dwelling with low, square tower on top; pile foundation. Light 32 feet above foundation. Station connected with fishing-station, on north side, by a short footbridge. On Mamajuda shoal, west side of channel; 200 feet from channel, and 700 yards from the lower end of shoal. Good water within 60 feet of the small pile wharf abreast the light-house. Between this point and the upper Fighting Island buoy, the channel is one-quarter mile wide. Grassy Island light-house, N. $\frac{1}{2}$ E., $2\frac{1}{2}$ miles.

East Bank.—Red spar buoy in $11\frac{1}{2}$ feet of water. East side of channel, about midway between the two light-houses, and marks the outer point of the Fighting Island bank. It stands in soft bottom with deep water close-to. In the bight of the channel opposite, the range between the two light-houses serves as a channel-guide for a distance of two-thirds of a mile above and below this buoy. Grassy Island light-house, N. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles.

GRASSY ISLAND LIGHT-STATION.—A fixed white light, varied by white flashes at intervals of one minute, 5th order, visible $11\frac{1}{2}$ miles. Cream-colored dwelling, with tower, 29 feet high attached; stone foundation. On Grassy Island shoal, west side of channel. Stands at the elbow of the shoal, seven-eighths mile from upper end of shoal, and 500 feet from channel. Seven miles below Detroit. Mamajuda light-house, S. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles.

Grassy Island.—Black spar buoy in 14 feet of water. Marks the elbow of the Grassy Island shoal. It stands abreast the light-house, in sandy bottom. The light-house range may be entered 600 yards above this buoy, and leads past the upper Fighting Island buoy, a little to the westward of mid-channel. The range between this buoy and Mud Island Shoal buoy just clears the head of Grassy Island shoal. Grassy Island light-house (upper side of new structure), W. $\frac{1}{2}$ S. 500 feet.

Fighting Island.—Red spar buoy in $11\frac{1}{2}$ feet of water. Marks the elbow of the flats at the upper end of Fighting island. It stands in soft bottom, with deep water close-to. This buoy, in range with Grassy Island light-house, just clears the flat between the buoy and the head of Fighting island. Grassy Island light-house (new structure), S. by W. $\frac{1}{2}$ W., 1,600 yards.

Mud Island Shoal.—Black spar buoy in 19 feet of water. Stands in sandy bottom at the southeast point of Mud Island shoal, and marks the west side of main channel, and north side of eastern entrance

to a channel between Mud Island and Grassy Island shoals. Grassy Island light-house, S. $\frac{3}{4}$ E. 1 mile.

Sandwich Point.—A red barrel buoy in 14 feet of water. Marks the position of the piles driven in the river to protect the feeding pipe at the Government Fish Hatchery at Sandwich. The buoy is about 125 feet from shore, opposite the hatchery. The piles are in 11 feet of water, and inside the channel bank.

The Detroit River, between Fighting island and Belle Isle, is free from obstructions. Belle Isle divides the river into two channels. The main channel is on the Canadian side. A shoal extends from the lower end of Belle Isle about seven-eighths of a mile, and is marked with a spar buoy. The main channel is free from obstructions until the east end of Belle Isle is reached, which can be passed close-to, then starboard and get on the line of the *Windmill Point range lights*, heading about N. E. for $1\frac{1}{2}$ miles, or to within about one-third mile of the shore. This course leads between the shoals extending from the head of Belle Isle and the foot of Isle aux Péches, the ends of which are marked by spar buoys. Then haul up the river, keeping the north shore best on board, and when abreast of Windmill Point light and about one-third the distance across the river, steer E. N. E., heading between Grosse Pointe beacon and the black spar buoy $2\frac{3}{4}$ miles, passing about 500 feet to the northward of the beacon, steer about N. E. $\frac{3}{4}$ E. $1\frac{1}{2}$ miles, passing midway between the light-ship and black spar buoy; when haul up N. E. for the entrance to the St. Clair Flats canal $13\frac{1}{2}$ miles.

In the American Channel, between Belle Isle and the mainland an iron bridge spans the river from the Boulevard to a point on the island about 1,000 feet from its southwest point, the draw is near the main shore. The signal to open the draw is three blasts of the whistle. The passage ways are 125 feet wide on each side of the pivot pier. Above the bridge there is a shoal—SCOTT'S MIDDLE GROUND—extending in a northeast and southwest direction $1\frac{1}{2}$ miles, which is marked on its northern and western sides by three red spar buoys, and vessels should not attempt to pass between the shoal and Belle Isle. In using the American channel, leave the buoy on the southwest end of Belle Isle on the starboard hand; keeping nearer to the north shore, pass through the draw of the bridge, and to the northward of the buoys on Scott's Middle ground, and when the middle buoy, which is opposite the Hamtramck House, and near the middle of the shoal, is reached, steer for Windmill Point light, with a large elm tree directly over the stern until up to the north point of Belle Isle, when steer E. $\frac{1}{2}$ S., with the north point of Isle aux Péches open on the starboard bow, until the range of Windmill Point and Belle Isle lights are reached.

Belle Isle.—Red and black horizontal stripes, spar buoy in 13 feet of water. Marks the end of the shoal off the foot of Belle Isle. There are 3 fathoms of water close to the buoy. Walker's mill (Canada), S. S. E. 800 yards.

BELLE ISLE LIGHT-STATION.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. Red, square tower, $36\frac{1}{2}$ feet high, with dwelling attached, both of red brick. On the southeast point, head of Belle Isle, Detroit river. Marks the head of Belle Isle, and the channel between it and the foot of Isle aux Péches. Windmill Point light, N. E. $\frac{1}{2}$ E. 2 miles.

Belle Isle.—Red and black horizontal stripes, spar buoy in 14 feet of water. Marks the extreme easterly point of the shoal off the head of Belle Isle, and the dividing point of the channels on each side of the Island. Windmill point light, N. E. by E. $\frac{1}{4}$ miles.

Isle aux Péches.—Red spar buoy, in 11 feet of water, marks the extreme point of the shoal off the west end of Isle aux Péches. The five-fathom channel between the islands is about 350 yards wide. Windmill Point light, N. E. $\frac{1}{4}$ miles.

WINDMILL POINT RANGE LIGHTS.—Two fixed red lights. The front light is a lens lantern, and the rear light a 6th order lens; they are 487 feet apart, on a line nearly S. W. The structures are square, pyramidal, wooden skeletons, upper part enclosed, lanterns black. The front tower is red, and the rear tower is white. The front tower is 34 feet and the rear tower 49 feet above the lake level. The lights are a guide between Belle Isle and Isle aux Péches. The range passes about 600 feet southeasterly of Belle Isle light.

WINDMILL POINT LIGHT-STATION.—A fixed white light, varied every fifteen seconds by a red flash, 4th order, visible 14 miles. White, brick tower, 51 feet high, connected by covered way with red brick dwelling. On the north side of the Detroit river entrance to Lake St. Clair.

Grosse Pointe Beacon.—Two lights shown vertically, red over white, from lens lanterns, suspended from a mast about 34 feet above lake level. Pile cluster 13 feet in diameter, 11 feet high, surmounted by a white wooden house 8 feet square and 10 feet high, above which rises a mast, and day-mark 8 feet square, both painted white. On the S. E. side of the head of the Detroit river, in 15 feet of water, and in the position formerly occupied by the lower light-ship and since by a red spar buoy. Vessels should pass to the northward, and between it and the black spar buoy. In connection with the Grosse Pointe light-ship this beacon forms a range to cross the Grosse Pointe flats.

Head of Detroit River.—Black spar buoy, in $15\frac{1}{2}$ feet of water, at the head of the *River Bed*, on the north side of channel, and where the Grosse Pointe flats commence. Windmill Point light, W. by S. $\frac{1}{4}$ S., $2\frac{1}{2}$ miles. Grosse Pointe church, N. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles.

LAKE ST. CLAIR.

Light-Houses and Buoys on both Shores of Lake St. Clair.

Grosse Point Light-ship.—A fixed white light, 25 feet above level of the lake, shown from a lantern hoisted on a mast, surmounted with a black cage. The light-ship is red, with name painted on each side, and has 1 mast. During thick and foggy weather a bell will be rung by hand. Windmill Point light, W. S. W. $\frac{1}{4}$ S., $3\frac{3}{4}$ miles. Milk River point, N. $\frac{1}{4}$ W., $5\frac{1}{2}$ miles. Passing down through the St. Clair Flats Ship canal, S. W. $\frac{1}{4}$ S., when $\frac{1}{2}$ mile past the lower light, steer S. W. $12\frac{1}{2}$ miles, to the north side of light-ship about 350 feet, then steer well up for the red buoy, leave it to port about 350 feet, when steer for the middle of Belle Isle.

Grosse Pointe.—Black spar buoy in 15 feet of water. Marks the edge of a 15-foot patch 700 feet N. W. of light-ship. There is from 17 to 18 feet midway between this buoy and light-ship.

Thames River (Canadian) Main Light.—Fixed white light, visible 12 miles. White, circular, stone tower, light 34 feet above lake level. At mouth of river, south shore.

Thames River Range Light.—Fixed white light, visible 6 miles. Square, wood tower, red, 15 feet high, 450 yards N. W. $\frac{1}{4}$ N. from main light. These lights in range lead over the bar.

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Windmill Point to Clinton River.—When $\frac{1}{2}$ of a mile east of the light, steer N. E. $\frac{1}{2}$ N., 2 miles, to abreast of Club-House dock, then N. N. E. $\frac{1}{2}$ E., $14\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of Point Huron, and note that a range line from the upper canal light and the St. Clair Flats beacon-light crosses the south end of the spit to the south and eastward of Point Huron in 6 feet of water; thence N. $\frac{1}{2}$ W., 2 miles, to a point $\frac{1}{2}$ of a mile east of the old light-house, when follow the buoys in, passing south of and close to a crib, north of the dredged channel.

Windmill Point to New Baltimore.—When $1\frac{1}{2}$ miles east of Point Huron, as in the course to Clinton river, steer N. by E., 8 miles, to the dock at New Baltimore.

Mouth of the Thames River to St. Clair Flats Ship Canal.—When $1\frac{1}{2}$ miles N. W. $\frac{1}{2}$ N. from main light, and in range of the two lights, steer N. W. $\frac{1}{2}$ N., 16 miles, to a point 1 mile south of light on the lower end of west pier, when haul up gradually until the lights are in range.

Mouth of Thames River to Mouth of Clinton River.—When $1\frac{1}{2}$ miles N. W. $\frac{1}{2}$ N., from the main light, and in range of the two lights, steer N. W., 21 miles, heading on Point Huron, to within $1\frac{1}{2}$ miles of it, when steer N. $3\frac{1}{2}$ miles, to a point $\frac{1}{2}$ miles east of the old light-house; when see course from Windmill point to Clinton river.

St. Clair Flats, Old Cut.

To Enter the St. Clair River through the old out.—From the light-ship, steer N. E. $\frac{1}{2}$ N., $12\frac{1}{2}$ miles, or until in range of the lights, and $1\frac{1}{2}$ miles from the beacon, when haul up on the range, bearing N. E. by E., which course will lead through the center of the channel, the north-west side of entrance to which is marked by black buoy No. 1. Keep the light and beacon in range, following the buoys until near the beacon, when haul gradually to E. S. E., bringing the stern of the vessel on the beacon, and steering a little to the southward of the upper canal-light, or keeping the light a little open on the port bow. When midway between the two black buoys, Nos. 3 and 5, haul gradually to the northward for the middle of south channel of St. Clair river. The old cut and channel through the St. Clair flats, from Lake St. Clair to abreast the upper light of the ship-canal, is about $2\frac{1}{2}$ miles in length, and from 50 to 60 yards wide in its narrowest part; it is now used only by small craft under sail and tugs towing rafts.

St. Clair Flats Beacon-light.—A fixed white light, 6th order, visible 11 miles. Yellow brick tower, 23 feet high. On a crib, 1,000 feet S. W. by W. from main light. This beacon, with the main light, forms the range for the old cut. St. Clair Flats Canal lower light, S. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles.

ST. CLAIR FLATS LIGHT-STATION.—A fixed white light, 4th order, visible 13 miles. Yellow brick tower, 37 feet high, con-

ned with dwelling by a covered way. On a pier foundation. At the head of the old cut through the St. Clair flats. Guide to and through this cut. St. Clair Flats Canal upper light, E. S. E. $\frac{1}{4}$ E., $1\frac{1}{4}$ miles.

St. Clair Flats Ship Canal.

To Enter the St. Clair River through the ship canal, steer N. E. $13\frac{1}{4}$ miles, from the Grosse Pointe light-ship, which course will lead to the lower entrance of the canal, and after passing through the canal, take the mid-channel. Steamers in passing through the canal will slow down to a speed of four miles per hour.

The Canal through the St. Clair flats is 7,300 feet in length, and 300 feet in width. On either side of the canal is a dike, which consists of timber cribs resting upon piles, and filled with material dredged from the canal. Willow trees have been set out, and the banks are covered with grass. A double row of sheet piles has been driven and the channel dredged the entire width to a depth of 18 feet; the entrance to the canal at each end has been deepened. Direction of the canal, N. E. $\frac{1}{4}$ N.

ST. CLAIR FLATS CANAL LOWER LIGHT-STATION.—A fixed red light, 4th order, visible 13 miles. Red brick tower, 40 feet high, rising from corner of dwelling. Marks the lower end of the west pier of the ship-canal through the St. Clair flats.

ST. CLAIR FLATS CANAL UPPER LIGHT-STATION.—A fixed red light, 4th order, visible 13 miles. Red brick tower, 40 feet high, rising from corner of dwelling. Marks the upper end of the west pier of the ship-canal through the St. Clair flats.

ST. CLAIR RIVER.

Light-Houses and Buoys Standing up the St. Clair River.

The St. Clair River from the upper end of the ship canal to Fort Gratiot light-house, is $39\frac{1}{4}$ miles in length. After leaving the canal follow the mid-channel until abreast of the Star Island House, when take up the range of Lights Nos. 1 and 2, which guide through the lower reach, and leads up to the foot of the Southeast bend; when get on the back range of Lights Nos. 2 and 3, which leads up through the South east bend, when haul to the eastward passing Lights Nos. 4, 5, and 6, which mark the north side of the channel, and when up to the Canadian Club House, take up the range of Lights Nos. 8 and 9, which leads up to the foot of Herson's island, and past the flat off the west side of Squirrel island; then get on the back range of Lights Nos. 7 and 8, which leads up to Lacroix's dock (Fish's); then take up the range of Lights

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Nos. 10 and 11, which leads up to the south-east side of Russell's island, the range of Lights Nos. 11 and 12 leads clear of the shoal at the head of the island, and about 100 feet to the eastward of Russell Island buoy. The last two Lights, 11 and 12, are not for a range to run on, but more to indicate a line that should be crossed above the shoal by vessels bound down, before hauling down by Russell's island. There are shoals at the head and foot of Woodtick island, marked at the ends by buoys, and there is a channel-way on either side of the island, but the one on the American side is the most frequently used. After passing the upper Woodtick Island buoy, keep in mid-channel until near St. Clair city, when haul to either shore to avoid the St. Clair middle ground, the ends of which are marked by buoys. When above the upper buoy follow mid-channel until within a mile of Stag island, and then the channel on either side of it may be taken, but the Canadian is generally preferred. Avoid the shoals extending from the head and foot of the island, the ends of which are marked by buoys, and when above the upper buoy take the mid-channel until a mile below the Port Huron and Lake Michigan Railroad depot, when haul to the Canadian shore to avoid the shoal ground off Port Huron, until abreast the Great Western depot at Sarnia; then steer N. W. by N. $\frac{1}{4}$ N. 1 mile, after which take mid-channel until abreast of Fort Gratiot light-house.

NOTE.—The shoal ground off Port Huron, formed by the Black river, which was dredged to a depth of 16 feet, is making again; deep draught vessels should be careful to avoid it.

Lights on the St. Clair River between the St. Clair Flats Canal and the upper end of Russell's Island.

No. 1. A fixed white light suspended, about 12 feet above the water-level, from a cluster of piles on the west shore in the first bend above St. Clair Flats canal, and about $2\frac{1}{4}$ miles from St. Clair Flats Canal Upper light. This light forms a range with No. 2 for about $1\frac{1}{4}$ miles, in line with the west gable of Star Island Hotel, to guide through the lower reach.

No. 2. A fixed red light suspended, about 25 feet above the water-level, from a tripod erected in the marsh about 900 feet back of Light No. 1, and 1,000 feet back of Light No. 3, and forms a range with each.

No. 3. A fixed white light suspended, about 12 feet above the water-level, from a cluster of piles near the west bank, and forms, with Light No. 2, a range for about $1\frac{1}{4}$ miles, to guide between the lower bend and Southeast bend. The range terminates near Light No. 4.

No. 4. A fixed red and white light suspended, about 12 feet above the water-level, from a cluster of piles near the west shore. The light will show *white* down the range made by Lights Nos. 2 and 3, and change to *red* at about the point where the range should be left by vessels ascending and taken up by vessels descending the river.

No. 5. A fixed red light suspended, about 12 feet above the water-level, from a cluster of piles on the west bank. A guide in running Southeast bend.

No. 6. A fixed red and white light. The light will show *white* up the stream and change to *red* at about the point where the Herson's Island

range (Nos. 8 and 9) should be left by vessels descending and taken up by vessels ascending the river.

No. 7. A fixed red light shown, about 20 feet above the water-level, from a tripod erected in the marsh near the lower end of Herson's island. Forms a range with No. 8 for about 1 mile to guide between that point and Fish's dock.

No. 8. A fixed white light suspended, about 12 feet above the water-level, from a cluster of piles near the shore in the water below Herson's island. This light forms a range with Nos. 7 and 9, being about 1,050 feet distant from the former, and 1,200 feet from the latter.

No. 9. A fixed red light shown, about 25 feet above water-level, from a tripod standing at the edge of the timber near the lower end of Herson's island. Forms a range with No. 8 for about $1\frac{1}{2}$ miles between Herson's island and Southeast bend. The range terminates above No. 6, in the vicinity of the end of the Canadian Club wharf on the east shore.

No. 10. A fixed white light suspended, about 12 feet above the water-level, from a tripod in the marsh near the lower end of Russell's island. Forms a range with No. 11 for about $2\frac{1}{4}$ miles between Russell's island and Fish's dock.

No. 11. A fixed white and red light shown, about 25 feet above the water-level, from a mast supported by a cluster of piles in the water abreast the point of woods on Russell's island. Forming ranges with Nos. 10 and 12, distant about 1,800 feet from the former and 1,500 feet from the latter. The light will show *white* down stream toward Fish's dock, and *red* up stream toward Baby's Point on the Canadian shore.

No. 12. A fixed red light shown, about 12 feet above water level, from a tripod on the shore near the upper end of Russell's island. Forms a range with No. 11 for about $1\frac{1}{2}$ miles, to guide clear of the shoals at the upper end of the island. The range passes about 100 feet to the eastward of the black and red buoy, and to keep well clear of the shoal vessels should cross the range above the buoy.

Buoys on the St. Clair River above the Canal.

Squirrel Island.—Red spar buoy in 12 feet of water. Marks edge of the flat off the west side of Squirrel island, in the south channel of the St. Clair river, and is 6 miles above the St. Clair Flats Canal upper light. Head of Bassett's channel, S. by W. $\frac{1}{4}$ W., 1 mile.

Squirrel Shoal.—Red spar buoy in 18 feet of water. On the western edge of the northern end of a shoal near mid-channel, abreast of the centre of Squirrel island, on which as little as 13 feet has been found. Fisher's dock, N. E. $\frac{3}{4}$ N., 1,300 yards.

Russell Island.—Red and black horizontal stripes, spar buoy in 16 feet of water. Marks the dividing point of the north and south channels of the St. Clair river, and is on the northeast point of the shoal at the head of Russell island.

Woodtick Island.—Red and black horizontal stripes, spar buoy in 11 feet of water. Marks the extreme point of the shoal extending to the southward of Woodtick island. There is a channel-way on either side of the island; the American, being the straightest and widest, is the one most frequently used.

Woodtick Island.—Red and black horizontal stripes, spar buoy in 16 feet of water. On the shoal extending to the northward of Woodtick island. The shoal extends further to the northward, but with 16 and 18 feet of water on it.

St. Clair Middle Ground.—Red and black horizontal stripes, spar buoy in 17 feet of water. Marks the south end of the middle ground off St. Clair city. The shoal is about 2,000 yards in length, extending in a N. N. E. and S. S. W. direction, and is 230 yards wide. It divides the river into two channels, the Canadian being the widest and most frequently used. The lowest depth of water on the shoal is 3 feet.

St. Clair Middle Ground.—Red and black horizontal stripes, spar buoy in 16 feet of water. On the north end of the middle ground. Shoal water extends some distance to the northward of it, but not less than 17 feet of water will be found.

Stag Island.—Red and black horizontal stripes, spar buoy in 11 feet of water. Marks the end of the shoal extending to the southward of Stag island, on either side of which there is a channel way, the Canadian being the one most frequently used.

Stag Island.—Red and black horizontal stripes, spar buoy in 16 feet of water. On the shoal extending to the northward of Stag island. The shoal extends a short distance to the northward of the buoy, but with not less than 17 feet of water on it.

Corunna Range Lights (Canadian).—Two fixed white lights, shown from white, square, wooden, skeleton towers, 40 feet high. The sides facing the range are slatted to make day-marks.

Front Light is near the old wharf at the foot of Fane street in the village of Corunna. The focal plane is 50 feet above the water level.

Rear Light 563 feet S. 13° E. from the front one, elevated 68 feet above the water.

The two lights in range indicate the best water in the Canadian channel, and lead between the shoals off the head of Stag island on the west, and the shoal off the mouth of Talford's creek on the east side.

Fort Gratiot Range Lights.—Two fixed red lights, shown from masts, surmounted by small triangles for day-marks, in the rear of the lower freight shed of the Grand Trunk R. R. on the American side. The range guides into the river on a bearing of S. S. W. $\frac{1}{4}$ W. nearly. These lights are now maintained by the U. S. Light House Est.

LAKE HURON.

Light Houses, Buoys, and Harbors on the American Shore.

FORT GRATIOT LIGHT-STATION.—A fixed white light varied by a white flash at intervals of two minutes, 3d order, visible 16 miles. White tower, 76 feet high, red brick dwelling detached. On the west side of the St. Clair river at the southern extreme of Lake Huron, and marks the west side of the entrance from the lake into the river. During thick or foggy weather, there is sounded a steam whistle, giving every minute a blast of 8 seconds' duration, followed by an interval of 52 seconds. The fog-signal in duplicate.

Buoys on the Flat above Fort Gratiot.

Corsica Shoal.—Red and black horizontal striped spar buoy in 16 feet of water. Marks a shoal spot of hard gravel $1\frac{1}{4}$ miles N. E. by N. from Fort Gratiot light, and in line with west side of the dock at Point Edwards and the middle of Botsford's large elevator. Northwest

Shoal buoy bears N. by W. 700 yards. Harlem Shoal buoy E. by N. $\frac{1}{2}$ N. 435 yards.

Harlem Shoal.—Red and black horizontal stripes spar buoy in 18 feet of water. Marks a shoal spot N. E. $\frac{1}{2}$ N. 2,451 yards from Fort Gratiot light. Northwest Shoal buoy, N. W. $\frac{1}{2}$ N. 800 yards. Corsica Shoal buoy, W. by S. $\frac{1}{2}$ S. 435 yards. The east side of the passenger depot at Point Edwards, and east side of the most easterly elevator in line.

Northwest Shoal.—Red and black horizontal stripes spar buoy in 16 feet of water. Marks a shoal spot of gravel of about 100 feet diameter inside the 18-foot curve, N. N. E. $\frac{1}{2}$ E. 2,700 yards from Fort Gratiot light. Corsica Shoal buoy S. by E. 700 yards. Harlem Shoal buoy 800 yards S. E. $\frac{1}{2}$ S. The chimney of the G. T. Repair shop is open to the east of lighthouse about 1 diameter of the lantern.

Range Lights to Guide into St. Clair River.

Point Edwards Range.—Two fixed lights, lens lanterns, white over red, shown from high, open frame-work towers, which are conspicuous day marks. On Point Edwards, about $\frac{1}{2}$ mile east of the entrance to St. Clair river. The range leads 450 feet to the westward of the Northwest shoal, which is the most westerly of the shoal spots. Heavy draught vessels entering the river should run for Fort Gratiot light, bearing about S. S. W., and when within about 2 $\frac{1}{2}$ miles and in 4 fathoms of water, haul in for the upper end of Huronia Beach until the range on Point Edwards is taken up, then haul down on the range about S. $\frac{3}{4}$ E. until the Fort Gratiot range is taken, when steer for the entrance on the range about S. S. W. $\frac{1}{2}$ W. The Point Edwards range lights are maintained by American vessel owners.

To enter St. Clair River from Lake Huron, independent of the Ranges.—Bring the light a little on the starboard bow heading S. W. by S. $\frac{1}{2}$ S. and run in on that course, keeping a lookout for the spit extending 133 yards east of the light-house and the spit off Point Edwards, on the opposite side. The lights at the Grand Trunk R. R. wharves mark the channel on each side. When past the rapids keep the American side on board, until near the docks at Port Huron, when heavy draught vessels should cross over towards the Canadian shore to avoid the middle ground off the mouth of Black River. In coming to anchor small sailing vessels should come to well over in Sarnia bay in order to leave the channel clear for long tows; large sail vessels should run down about $\frac{1}{2}$ mile below the Sarnia elevator and haul over to the American side, and come to off the Port Huron and Michigan R. R. dock, below the middle ground.

PORT SANILAC LIGHT-STATION.—A fixed red light, 4th order, visible 15 $\frac{1}{2}$ miles. Octagonal brick tower, whitewashed, 62 feet high, connecting to brick dwelling. A coast-light. In the village

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of Port Sanilac, $30\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from Fort Gratiot light. Above Port Sanilac the coast is rocky, and should not be approached within half a mile.

The Coast south of Sand Beach, as far as Blue Ledge, is rock, with rocky spits, and shoal spots extending from $\frac{1}{4}$ to $\frac{3}{4}$ of a mile from shore.

Sand Beach Harbor of Refuge.—This harbor is an artificial one, formed by breakwaters, situated on the west shore of Lake Huron, 59 miles to the northward of Fort Gratiot light-house. The breakwater commences near the shore, three-quarters of a mile above the dock at Sand Beach, and extends out in an E. by S. $\frac{1}{4}$ S. direction, 700 yards, to deep water; then in a S. E. $\frac{1}{2}$ S. direction, three-quarters of a mile; then south 100 yards to the northern side of eastern entrance, which is 200 yards wide.

In the breakwater extending out from the shore there is an opening 100 yards wide, at a distance of 100 yards from the angle, to allow vessels to enter the harbor from the northward.

The southern breakwater extends in a north and south direction, from the southern side of the eastern entrance, for a distance of 1,900 feet. The two principal lights are shown from the north side of the eastern entrance and the east side of the northern entrance, respectively; and, in addition to these, red lights are shown from iron tripods on the south side of the eastern entrance and west side of northern entrance.

The main light at the eastern entrance is shown from a circular iron tower, painted brown; the lantern painted black. The main light at the northern entrance is shown from an open frame-work tower, painted white. To enter the harbor from the southward and eastward, bring the main light (flashing red and white alternately every 5 seconds) to bear anywhere to the westward of N. N. W. $\frac{1}{2}$ W. When bearing N. W. $\frac{1}{4}$ N., it should range with the fixed white light at the north entrance. On reaching the entrance, pass close to the main light, leaving it on the starboard hand, and haul at once to the northward, to make fast to the snubbing-posts on the breakwater.

To enter the harbor from the northward, bring the main light at that entrance (fixed white) to bear nothing to the southward of S. W. $\frac{1}{4}$ S., and head for the light. On reaching the entrance, leave the main light close aboard on the port hand, and haul at once to the eastward, to make fast to the snubbing-posts on the breakwater. Vessels desiring to anchor will find good anchorage in from 4 to $4\frac{1}{2}$ fathoms of water inside of and close to the breakwater.

The best anchorage is north of the outer end of Jenk's dock, outside the range of the buoys. Small vessels will find good anchorage about S. S. E. from 5 to 8 hundred feet from outer end of the dock in 17 feet of water.

Jenk's Dock is nearly opposite the eastern entrance, and bears from it W. by N., about 1,000 yards. A light on the dock shows red from the east, and white from the north and south; there are 16 feet of water for one boat's length at the outer end. Coal is kept on the dock for sale. The obstructions off the end of the dock, as appears on the chart of the Lake Survey, have all been removed. Life Saving station at the inner end of dock.

Buoys in Position.—Black spar buoy in 12 feet of water, south

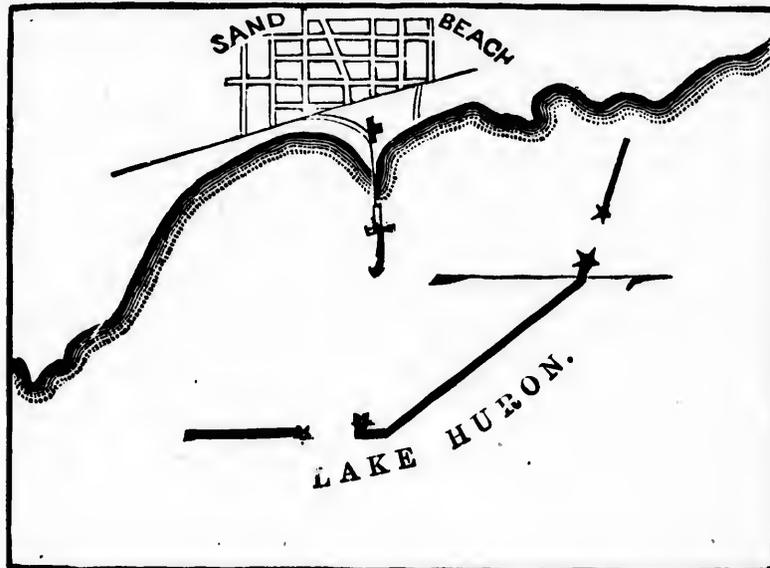
side of eastern entrance, bears S. W. $\frac{1}{4}$ W., about 500 yards from main light.

Another Black Spar Buoy.—In 12 feet of water, S. by E. $\frac{1}{4}$ E., about 750 yards from the end of Jenk's dock.

Three Spar Buoys.—In 14 feet of water, placed at about equal distances, and nearly in line with the outer end of Jenk's dock and the west side of northern entrance.

Two Spar Buoys.—In 14 feet of water, outside the northern entrance, to be left on the starboard side on entering.

Sailing Vessels making the harbor for refuge, from the northward, when there is not too much sea, will find it most convenient to enter at the north entrance, particularly when the wind is northwest; light vessels would be safe to enter on a bearing of S. W. by S.



Sail vessels making the harbor by the eastern entrance, with northerly winds, should carry a good press of canvas, keeping well to windward, and directly they pass the main light, haul up by the wind and stand over for the anchorage to the northward of Jenk's dock, and if necessary beat up to it. Vessels frequently enter at the eastern entrance without sufficient canvas, and the sheets off, when they fall off to the leeward and are compelled to let go their anchors on the rocky bottom in shoal water; in such cases they have to employ a tug, at considerable expense, to tow them to the anchorage.

A custodian, or harbor-master, has been appointed by the government. All vessels are required to take such berths as he may direct. The general rule is given that "all steam craft will, when practicable, make fast to the snubbing-posts in the breakwater. Sailing craft will so locate themselves that they will not lie in the way of other vessels entering the harbor, or in any way interfere with the work of construction or repairs that may be in progress at the time."

SAND BEACH LIGHT-STATION.—Main light flashing red and white, alternating at intervals of 5 seconds, and will illuminate the entire horizon, visible $13\frac{1}{2}$ miles. The focal plane is $44\frac{1}{2}$ feet above the base of the tower, and $54\frac{1}{2}$ feet above the level of the lake. Brown, iron, circular tower; lantern black; standing on a rectangular crib on the north side of the main entrance. There is also on the crib a fog-signal house of corrugated iron, painted the same color as the tower. During thick and foggy weather there will be sounded at this station a 10-inch steam fog-whistle, giving a blast of 5 seconds' duration, followed by an interval of 25 seconds.

The South Side of the Main Entrance is marked by a red light, illuminating the entire horizon, exhibited from a lantern at the top of an iron skeleton tripod, $27\frac{1}{2}$ feet above the level of the lake. Point Clark light-house (Canadian), E. N. E. $\frac{1}{2}$ E., $47\frac{1}{2}$ miles. Goderich light-house (Canadian), E. $\frac{1}{2}$ S., $47\frac{1}{2}$ miles. Fort Gratiot light-house, S. $\frac{1}{2}$ E., 59 miles.

Northern Entrance.—The east side of the northern entrance is marked by a fixed white light of the 5th order, illuminating the entire horizon, exhibited from an open frame-work tower painted white; focal plane 42 feet above the level of the lake; visible $12\frac{1}{2}$ miles.

The West Side of the Northern Entrance is marked by a red light, illuminating the entire horizon, exhibited from a lantern at the top of an iron skeleton tripod, $27\frac{1}{2}$ feet above the level of the lake.

Pointe aux Barques Reef.—Black, 1st-class bell buoy in $5\frac{1}{2}$ fathoms of water. Marks the reef extending off the shore to the eastward of Pointe aux Barques light. Vessels should not pass inside of the buoy. There is a 12-foot patch about 1 mile S. by E. $\frac{1}{2}$ E. Pointe aux Barques light W. $\frac{1}{2}$ N. 2.4 miles. Stafford's elevator S. by E. $\frac{1}{2}$ E., $5\frac{1}{2}$ miles.

POINTE AUX BARQUES LIGHT-STATION.—A flashing white light, 3d order, visible $16\frac{1}{2}$ miles; the interval between flashes is 10 seconds. White, circular tower, 76 feet high, light 89 feet above lake level. On the Michigan shore of Lake Huron, 75 miles to the northward of Fort Gratiot light, and marks the turning-point into Saginaw bay. Between Sand Beach and Pointe aux Barques lights, shoal water extends out from the land from 1 to 2 miles, and vessels should be careful in approaching the land in this locality. The soundings off the point are even and gradual, and the frequent use of the lead in thick or foggy weather is of great importance. Life Saving station a little south of light house.

PORT AUSTIN LIGHT-STATION.—A fixed white light for 1 minute, followed by 5 consecutive red flashes, with an interval of 12 seconds between flashes, visible 16 miles. White, open frame-work tower, 57 feet high, on a crib, light 80 feet above sea level. On reef off Old Pointe aux Barques, south side of entrance to Saginaw bay, about $1\frac{1}{2}$ miles from the main land and 500 feet from the end of the reef. Vessels in passing the light should leave it one-half of a mile to the southward. There is no passage-way between it and the main land. A first-class steam-siren (in duplicate), sounded in thick and foggy weather, giving blasts of 7 seconds at intervals of 30 seconds. There are ledges and detached rocky spots between Pointe aux Barques and Port Austin lights,

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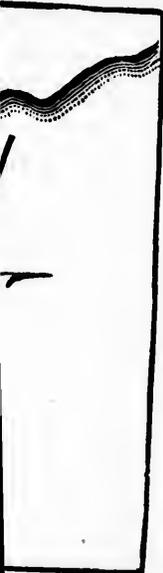
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rendering the coast dangerous within $1\frac{1}{2}$ miles. There is a flat off Port Austin wharf, which extends one-half a mile to the northwest. Shoal ground off Flat Rock point extends one-half a mile out, and continues out this distance along the coast to the westward as far as Portage river.

To run into Port Austin, bring the dock at the mouth of Bird creek to bear south and run in on the course, keeping a lookout for a rocky spot to the northwest of the end of the dock.

Life Saving Station, 1 mile northwest of Grind Stone City.

Wild Fowl Bay.—To enter the bay from the east. When $1\frac{1}{2}$ miles north of Port Austin light, steer W. S. W. 23 miles, until Oak point bears east, and Sand point due south, when haul up west $4\frac{1}{2}$ miles, until the light-house on Charity island is in range with the west end of Little Charity island, then steer due south, till Sand point bears east, when steer E. S. E. into the bay. The channel south of Charity island was buoyed by the Government a few years ago, but as it was intricate and seldom used, there being less than 10 feet of water, the buoys were removed.

Charity Island.—Black, 2d-class can buoy, in 17 feet of water. Marks the northwest point of the shoal off Charity island. Charity Island light-house, S. E. by E. $\frac{1}{2}$ E., $2\frac{1}{2}$ miles. West end of Little Charity island, S. $\frac{1}{4}$ E., $3\frac{1}{4}$ miles. Vessels bound into Saginaw bay, from the southward of Pointe aux Barques, will pass at least one-half of a mile to the northward of Port Austin light, then steer W. $\frac{1}{2}$ S., for 25 miles, which will lead to the northward of the buoy, being careful on approaching it to keep it well open on the port bow, to avoid the shoal ground extending $1\frac{1}{2}$ miles to the northward of Charity island light. The passage-way to the southward of the island should not be attempted by strangers. After passing the buoy, steer S. W. by S. for the Saginaw river, leaving the Gravelly Point buoy on the starboard hand.

CHARITY ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible 13 miles. White, brick tower, 39 feet high, connected by a covered way with frame dwelling. On the northwest point of Charity island, Saginaw bay. Main channel is to the westward of the light. Strangers should not attempt to pass to the eastward of the light. Tawas light N., 15 miles. Point aux Gres, W. by S. $\frac{1}{2}$ S., $12\frac{1}{2}$ miles. There are shoals extending $1\frac{1}{2}$ miles to the northward and the same distance to the eastward of the light-house. A flat extends for 1 mile to the westward of the Big Charity, and there is a rocky spot $1\frac{1}{2}$ miles southeast of the Little Charity.

Gravelly Point.—Red, 1st-class nun buoy in 18 feet of water. Marks the extreme point of the shoal extending in a south-easterly direction from Gravelly point, Saginaw bay. Vessels should not attempt to pass between the point and buoy. Gravelly point N. W. by W., $2\frac{1}{2}$ miles. Charity Island light-house E. $\frac{3}{4}$ N., $4\frac{1}{2}$ miles. A good lee can be made under the point, and protection from all northerly gales. Come to in 4 fathoms with the point bearing N. E.

Saginaw River.

The Mouth of Saginaw River is obstructed by a bar, through which a channel has been dredged to the 13-foot curve of the bay on the range lights, extending in a N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. direction, about $1\frac{1}{2}$

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miles. The depth of water at the mouth of the river is increased from 7 to 15 inches with north and northeast winds, and decreased from 2 to 8 inches with south and southwest winds. At the ordinary stage of water, 14 feet, can be carried in to the river. To enter the river from Saginaw bay, bring the lights in range when $2\frac{1}{2}$ miles from the front light, and steer in on the range S. $\frac{1}{2}$ W., passing between the can and spar buoys at the entrance to the cut, which are about 2 miles from the front light. Keep on the range, following the buoys, until within $\frac{3}{8}$ of a mile from the front light and buoys Nos. 11 and 12 have been passed, when change course to S. $\frac{1}{2}$ E. (nothing to the eastward until abreast beacon-light); then follow mid-channel until near Bangor, when haul to the north shore to avoid the shoal ground on the south shore, opposite to Lord's mill, after which there is no obstruction until the first drawbridge is reached. The signal to open the draw is four blasts of the whistle.

The bridges at Bay City are lighted at night according to the system adopted by the Light-house Board, viz.: a stationary *red* light on each end of the draw-piers, low down on the free end of each protection-pier, and on each side of the pivot-pier where it is crossed by the axis of the bridge. Three square lanterns, each 15 feet above the top of the draw-span, mark its ends and middle, and show *red* up and down stream when the draw is closed, but when the draw is open the lanterns show three *green* lights in line up and down stream, with stationary low *red* lights, marking the width of the openings.

Entrance Buoy.—Red, 2d class, nun buoy, in 13 feet of water. Marks the east side of the entrance into the cut. Front range light S. $\frac{1}{2}$ W., $2\frac{1}{4}$ miles.

Entrance Buoy.—Black spar buoy, in 13 feet of water. Marks the west side of the entrance into the cut.

There is good anchorage northeast $2\frac{1}{2}$ miles from these buoys in $3\frac{1}{2}$ fathoms.

Saginaw River Range Lights.—Front light, fixed red, 6th order, visible $12\frac{1}{2}$ miles. Rear light, fixed red, 4th order, visible $14\frac{1}{2}$ miles. Front tower, open framework, 30 feet high, painted red, on a crib. Rear tower on northeast corner of dwelling, 53 feet high, built of Milwaukee brick. On the west side of the entrance into Saginaw river, and when in range, guide vessels through the cut in the bar at the mouth of the river. Lights 2,310 feet apart. N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W.

TAWAS, OR OTTAWA POINT LIGHT-STATION.—A fixed white light for 25 seconds, followed by an eclipse of five seconds, between N. W. by E'd to S. W., 4th order, visible 15 miles. White tower $61\frac{1}{2}$ feet high, connected by a covered way with red dwelling, both brick. On the southwest end of Ottawa Point, easterly side of Tawas bay. A sand flat extends nearly a mile to the southward and westward from the light.

A Red Sector covers this flat, between the bearings of S. W. by W'd to N. W., the light will show as fixed red for 25 seconds, followed by an eclipse of 5 seconds. The northwesterly edge of the sand flat is very abrupt, dropping from 6 to 24 feet in a vessel's length. Port Austin light-house, S. E. by E. $\frac{1}{4}$ E., 26 $\frac{1}{2}$ miles. *The Life-Saving Station* is $\frac{1}{4}$ mile N. E. of the light-house.

Ottawa Point.—Red, 2d class nun buoy, in 33 feet of water. Placed off the extreme southwest point of the shoal extending to the southward and westward of Ottawa point. Tawas (Ottawa point) light-

house, N. E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. Mill at Tawas city, N. W. by W. $\frac{1}{2}$ W., 3 miles.

Ottawa Shoal Buoy.—A red 25-foot spar buoy in 18 feet of water. Marks the extreme northwest point of the shoal. Entering pass the buoy, and haul up N. N. E. for about $\frac{1}{2}$ mile and come to with the light bearing about S. S. E., in 4 fathoms water. Tawas light E. S. E. $\frac{1}{2}$ S., $\frac{1}{2}$ mile. Ottawa Point buoy S. by W., $1\frac{1}{4}$ miles.

Tawas Harbor.—To anchor in Tawas harbor, vessels from the northward will bring the buoy and mill at Tawas city in range, bearing N. W. by W. $\frac{1}{2}$ W., then haul up for Tawas city, passing to the southward of the buoy. When the buoy has been passed $\frac{1}{2}$ of a mile haul up to the north for little more than a mile to abreast the red spar buoy, light bearing E. S. E. $\frac{1}{2}$ S., when steer N. N. E.; see Ottawa Shoal buoy. Care must be taken not to approach too close to the shoal ground, which extends nearly a mile to the northwestward of Ottawa point.

To enter the Harbor from the southward, steer north from abreast of Charity Island buoy, and when the Ottawa Point buoy bears S. E. by E. $\frac{1}{2}$ E., distant $1\frac{1}{2}$ miles, change the course to N. E., and anchor in $4\frac{1}{2}$ or 5 fathoms of water, clay bottom, with the light bearing from S. E. to S. S. E.

To enter Tawas Bay at night from the northward.—When 3 miles east of Point Sable, in 9 fathoms, steer S. W. $\frac{1}{2}$ W., 10 miles, until Ottawa Point light bears N. W., 1 mile distant, and in 6 to 7 fathoms of water, then steer W. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles, or until the light bears N. E., $1\frac{1}{2}$ miles, keeping a sharp lookout for the end of the spit, which is very abrupt, dropping off suddenly from 1 to 4 fathoms, then haul up N. W. by W., for $1\frac{1}{2}$ miles, until the light bears E. by N., when steer N. E. into the bay, and come to in $3\frac{1}{2}$ fathoms, with the light bearing about southeast.

Note.—Observe that when the bearing of N. E. is crossed the *red sector* will be entered, that is the fixed part of the light will be red, instead of white, the line is just outside the buoy.

NOTE.—The light is not where it is indicated on the chart. It is near the end of the low sandy point, about $\frac{2}{3}$ of a mile S. W. by S. from the old light-house site.

Au Sable Pierhead Beacon-light.—A fixed red light, 5th order, visible $11\frac{1}{2}$ miles. White, open frame-work tower, 27 feet high. On a small crib outside of the north pier at the mouth of the Au Sable river, Michigan. A guide into the river. The harbor works consist of two parallel piers 100 feet apart, extending in an easterly direction; the south pier has a pile revetment extension 700 feet in length. Depth of water, at the present time 9 feet, can be carried across the bar and up to the Swing bridge. The channel across the bar is 120 feet wide. It is expected that this channel will soon fill up again. Vessels load at pile piers. There is good anchorage off the piers in $4\frac{1}{2}$ to 5 fathoms.

NOTE.—A Sand spit sits off the shore south of the mouth of the Au Sable river in a northeast direction. Heavy draught vessels should not cross the spit until the light bears west; on this bearing the end of the spit is about $1\frac{1}{2}$ mile from the light.

Point Sable, $5\frac{1}{2}$ miles south of the Au Sable river, affords shelter

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Harrisville is $3\frac{1}{2}$ miles south of Sturgeon point. It has a harbor of limited capacity, protected by piers.

STURGEON POINT LIGHT-STATION.—A fixed white light, $3\frac{1}{2}$ order, visible 15 miles. White tower, 65 feet high, connected with dwelling by covered way. A coast-light on the west shore of Lake Huron, on the most easterly point between Saginaw and Thunder bays. Thunder Bay Island light-house, N. by E., $23\frac{1}{2}$ miles. Port Austin light-house, S. by E. $\frac{1}{2}$ E., $46\frac{1}{2}$ miles. Life Saving station close to the light-house.

The Shore.—There are rocky shoals and spits, from Au Sable river to Sturgeon point. A 10-foot spot, 1 mile from shore, 7 miles north of Au Sable river. A spit off Sturgeon point extends 1 mile E. N. E. Rocky spots extending $1\frac{1}{2}$ miles east of Black river. Foul ground around Black River island, extending E. N. E., $\frac{1}{2}$ of a mile, and from thence to the main shore.

Black River.—Vessels wishing to enter Black River should not approach the shore nearer than 2 miles until the buildings at the mouth of the river bear W. S. W., then steer for the most southerly wharf. The bottom is rocky and uneven, shoaling to 12 feet of water at about 600 yards from the mouth of the river.

NOTE.—The buoys off Black River have been removed.

Thunder Bay.—Foul ground around South point and islands. The shore is shoal from thence to Devil river; 6-foot spot three-quarters of a mile northward of Sulphur island; 11-foot shoal $1\frac{1}{2}$ miles northeast of Partridge point. Flat in bay west of Whitefish point; 12 foot spot 1 mile southeast of North point, marked by a red can buoy. Foul ground and rocky lumps between Sugar island and the main land. Spits extending southeast of Sugar island. The shores of Thunder bay are generally good holding ground. Excellent anchorage is found along the north shore, and protection from all winds, except southeasters. Protection from south and south-southeast winds can be found between Devil river and Scarecrow island.

THUNDER BAY RIVER LIGHT-STATION.—A fixed red light, 4th order, visible $13\frac{1}{2}$ miles. White, open frame-work tower, $44\frac{1}{2}$ feet high. On a crib, 57 feet east of and in a line with Gilchrist's wharf, on the northern side of the entrance into Thunder Bay river. Serves as a guide into the river and bay. The piers at the mouth of Thunder Bay river extends S. E. $\frac{1}{2}$ E. Width of dredged channel, 150 feet. Depth of water, 18 feet. The channel is straight in. A red light is shown from the draw of the bridge. Entering keep the light on the bridge open to the southward of the main light.

The fog-signal at Thunder Bay river, or Alpena, is a bell struck by machinery, gives a single blow every 10 seconds.

Devil River.—When abreast of South point and distance 5 miles due west, steer W. N. W. $\frac{1}{2}$ N., $6\frac{1}{2}$ miles, or until Scarcrow island bears due south and 1 mile distant, then haul up W. $\frac{1}{2}$ N., 4 miles, until abreast of houses at Devil river.

To make Thunder Bay River.—When abreast of South point and 5 miles distant due west, steer N. W. $\frac{1}{2}$ N., 16 miles, to a point 1 mile southeast of light. To make an anchorage between Thunder bay and Sugar island, steer in north midway between the two islands. The

chart shows 14 feet, but at the present stage of water 10 to 11 feet is all that can be found. Come-to off the fish houses on Sugar island. Entering, keep a sharp lookout for the spit extending southeast from Sugar island, and spit off the west side of Thunder Bay island, northwest from the Life Saving station.

To make Thunder Bay River from the North.—

When one-half a mile southeast from the south point of Thunder Bay island, steer W. S. W. $\frac{1}{2}$ S., 4 miles, passing south of the can buoy on the spit off North point, when haul up W. N. W., 8 miles, to a point 1 mile southeast of the light.

To make Devil River from the North.—

When one-half mile southeast from the south point of Thunder Bay island, steer S. W. by W. $\frac{1}{2}$ W., 13 miles. Come-to off the houses in 3 fathoms.

North Point.—Red, 2d-class can buoy in 18 feet of water. Marks the extreme end of the shoal extending in a southeasterly direction from North point in Thunder bay. Vessels should not attempt to pass to the northward of the buoy. East end of North point, N. by W. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles. Thunder Bay Island light-house, N. E. by E., 3 7-16 miles. Thunder Bay River light, N. W. by W. $\frac{1}{2}$ W., $9\frac{1}{2}$ miles.

THUNDER BAY ISLAND LIGHT-STATION.—

A flashing white light, 4th order, interval between flash 90 seconds, visible $14\frac{1}{2}$ miles. Yellow tower, rubble-stone base, brick above, 56 feet high, connected by covered way with dwelling of Milwaukee brick. On the east shore of Thunder Bay island, and about 400 yards from its southeast end. Vessels should not attempt to pass between the island and the main-land. During thick or foggy weather there is sounded a steam-whistle, giving a blast of 8 seconds, followed by an interval of 10 seconds; then a blast of 2 seconds followed by an interval of 40 seconds, alternating in this way every minute. Sturgeon Point light-house, S. by W., $23\frac{1}{2}$ miles. Detour light-house, N. N. W. $\frac{1}{2}$ W., $73\frac{1}{2}$ miles. A spit extends southeast one-quarter mile from southeast point of island. To make a lee under Sugar Island, haul around Thunder Bay island, giving it a berth of one-half mile, when steer W. by N., $1\frac{1}{2}$ miles, until the middle of Sugar island bears north. Come-to in 5 or 6 fathoms, with Thunder Bay Island light bearing about E. by N. The Life Saving station is on the S. W. side of the island, and a watch-house on the S. E. point.

Middle Island.—Red, 2d-class nun buoy in 21 feet of water.

Placed outside the shoal off the southeast point of Middle island. To anchor between the island and the main-land, vessels from the northward will pass outside the buoy one-half mile, and when it is in range with the southeast point of the island, haul up to W. S. W. $\frac{1}{2}$ W., and when the west point of the island bears N. by W., haul up for it, anchoring in 4 or $4\frac{1}{2}$ fathoms of water, about one-half mile from the island, which forms a lee for northeast winds. To make a lee in southeast gales, haul around the north side of the island and come-to on the northwest side, be careful not to stand in too far. Southeast point of Middle island, W. N. W. $\frac{1}{2}$ W., seven-eighths of a mile. Thunder Bay Island light-house, S. S. E. $\frac{1}{2}$ E., $11\frac{1}{2}$ miles. The Life Saving station is on the N. W. point of the island, and watch-house on the S. E. point.

False Presque Isle is 9 miles southeast of Presque Isle light; it has good anchorage and shelter from all winds, except those from E.

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outtheast gales,
the northwest
Middle island,
Island light-
s on the N. W.

que Isle light;
those from E.

to S. E. To make the anchorage, steer in northwest, run well up in the bay, keeping on the north side. Come-to in 3½ fathoms.

Presque Isle Harbor Range-Lights.—Two, 6th order, fixed white lights, visible 6 and 8 miles. Front tower painted white, 16 feet high. Rear light on white frame dwelling, 25 feet high. Lights 1,000 feet apart, bearing E. ¼ S. and W. ¼ N. On the west shore of Presque Isle harbor. To enter the harbor, bring the lights in range W. ¼ N., with the old light-house on the north point bearing W. by N., 1½ miles distant. Run in on the range. A bar extends from the north to the south points of the harbor. When crossing this bar on the range there are at the present time not more than 13½ feet of water; when over it the water deepens suddenly to 20 feet; the old light-house should bear a little abaft the beam, when haul up S. S. W. for the wood dock, or come-to abreast of it in 3½ fathoms; soft bottom. There is a rocky shoal, least water 8 feet, 1,000 yards E. ¼ S. from the old tower; running in on the range the course leads close to the south side of it. The wood dock is in a very dilapidated condition, and at present is not safe to lie to.

PRESQUE ISLE LIGHT-STATION.—A fixed white light, 3d order, visible 18½ miles. White tower, 100 feet high, connected by a covered way with dwelling. About 500 yards from the northern end of Presque Isle. Detour light-house, N. N. W. ¼ W., 47 miles. Spectacle Reef light-house, N. W. ¼ W., 42½ miles. In the bay west of Presque Isle the bottom is rocky.

The fog-signal is a 10-inch steam whistle giving blasts of 5 seconds, with silent interval of 25 seconds. The fog-signal house is on the beach 1,240 feet N. by W. from the light-house.

The Shore from Thunder Bay island to the Straits of Mackinac. Shoal ¼ mile S. E. of Middle island, marked with buoy. Flats ¼ mile from S. W. point and ¼ mile from N. W. point of Middle island. Middle ground between Middle island and the main-land, 10 feet spot ¼ mile N. W. of first point below Presque Isle harbor; 10 feet spot ¼ mile S. E. of the old light-house at the entrance to Presque Isle harbor; 5 feet spot 1 mile S. E. from Adams point.

SPECTACLE REEF LIGHT-STATION.—A flashing light, showing alternately a red and white flash. The interval between flashes is 30 seconds, 2d order, visible 16½ miles. Gray tower, 86 feet high. A square wooden crib, 12 feet above water, surrounds the tower. On the westerly edge of Spectacle reef. The reef is about seven-eighths of a mile in extent north and south, and one-fourth of a mile east and west. The soundings are irregular near the reef, with 5 and 12 fathoms close-to. During thick or foggy weather, a steam-whistle is sounded, giving a blast of 3 seconds, then an interval of 12 seconds; then another blast of 3 seconds, followed by an interval of 42 seconds, and so on. Bois Blanc light-house, W. by N., 14 miles. Cheboygan light-house, S. W. by W. ¼ W., 15½ miles. Detour light-house, N. E. ¼ N., 16½ miles.

Thirteen-foot Shoal.—Red and black horizontal stripes, 2d class can buoy in 17 feet of water. Marks a dangerous shoal between Bois Blanc and Spectacle reef. Should not be approached nearer than one-fourth of a mile. The shoal extends in an east and west direction; the buoy is near the middle of the shoal on the north side. Spectacle

Reef light-house, E. $\frac{1}{4}$ S., $3\frac{1}{2}$ miles. Bois Blanc light-house, W. N. W. $\frac{1}{4}$ W., $10\frac{1}{2}$ miles. Cheboygan light-house, S. W. $\frac{1}{2}$ W., $12\frac{1}{2}$ miles.

Martin's Reef.—Black, 1st-class can buoy in 18 feet of water. Placed off the southeasterly end of Martin's reef, on which the steamer "Garden City" was lost. Vessels should pass to the southward of the buoy. Between Martin's reef and the main-land there are several reefs extending in a northwesterly direction with channel-ways between them which should not be attempted by strangers. Spectacle Reef light-house, S. $\frac{1}{2}$ E., $9\frac{1}{2}$ miles. Detour light-house, E. N. E. $\frac{1}{2}$ E., $11\frac{1}{2}$ miles. Beaver-tail point N. by W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles. Bois Blanc light-house, S. W. by W. $\frac{1}{2}$ W., 15 miles.

Scammon's Harbor.—The entrance to this harbor is $11\frac{1}{2}$ miles N. E. by N. from Bois Blanc light, and N. W. by N. $\frac{1}{2}$ N., 15 miles from Spectacle Reef light. It is between Boot island on the east and Isle William on the west. Off the southeast end of Isle William there is a small rocky islet, from which a spit extends three-eighths of a mile in a southeasterly direction, with large boulders on it, and there is a rocky flat on the northeast side of this islet. When inside there is plenty of room, and protection from all winds. The water is deep in the entrance, but strangers should be very cautious in making it. To enter the harbor, bring the passage to bear N. W. by N., and run in on that bearing. Keep the starboard side best on board, about one-third the distance across the channel, and when a little past the west point of Boot island, haul to the north to clear a spit off a little point on the opposite side of the channel, and when into the bay, haul to the northwest and come-to in 7 fathoms, mud and clay bottom.

DETOUR LIGHT-STATION.—See Straits of St. Marie.

Scammon's Cove.—Red, 3d-class nun buoy in 21 feet of water on the outer end or south point of Scammon's Cove reef. Point Smith, S. E. by E. $\frac{1}{2}$ E., $7\frac{1}{2}$ miles. East side of entrance to Scammon's cove, N. W. by N. $\frac{1}{4}$ N., $1\frac{1}{2}$ miles. Spectacle reef, W. S. W., 27 miles.

There is a saw-mill at Scammon's cove, and considerable trade in cedar posts, ties, etc. From 10 to 11 feet can be carried into the harbor; a tug is generally in readiness to tow vessels in and out of the harbor.

Compass Courses and Distances on the American side of Lake Huron.

Fort Gratiot to the Straits of Mackinac.—When 1 mile N. E. by N. from Fort Gratiot light, steer N. $\frac{1}{2}$ W., $58\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of main light at Sand Beach, thence N. by W. $\frac{1}{4}$ W., $87\frac{1}{2}$ miles, to a point 2 miles east of Thunder Bay Island light, thence N. N. W. $\frac{1}{2}$ W., $26\frac{1}{2}$ miles, to a point 5 miles E. N. E. from Presque Isle light, thence to the south channel N. W. by W. $\frac{1}{2}$ W., 47 miles, or until Spectacle Reef light bears N. E. 8 miles and the east point of Bois Blanc island N. W. $\frac{1}{4}$ N. the same distance, when steer due west 8 miles to a point three-quarters of a mile north of Cheboygan light. To pass through the north channel when 5 miles E. N. E. from Presque Isle light, steer N. W. by W. $\frac{1}{4}$ W., 58 miles, to a point one-half mile north of Bois Blanc light, thence W. $\frac{1}{4}$ N., $9\frac{1}{2}$ miles to Mackinac.

Fort Gratiot to Detour Passage.—When 5 miles E. N. E.

house, W. N. W.
12½ miles.

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the north channel
W. by W. ¼ W.,
light, thence W. ¼

5 miles E. N. E.

from Presque Isle light, as in the course from Fort Gratiot to Mackinac, steer N. N. W. ¼ W., 45 miles, ranging on Detour light, to within two miles of it and in range with Frying Pan island and Pipe Island lights, when haul up on this range heading N. ¼ W. nearly. See directions for entering Straits of St. Mary.

Fort Gratiot to Saginaw River.—When 1 mile N. E. by N. from Fort Gratiot light, steer N. ½ W., 58½ miles, to a point 1½ miles east of main light at Sand Beach, thence N. N. W. ¼ W., 15 miles, to a point 3 miles E. N. E. from Point aux Barques light, not approaching the shore nearer than 1½ miles, then N. W. by W., 9 miles, until Port Austin light bears W. S. W., 5 miles, thence W. ¼ S., 30 miles, to a point 3 miles northwest of Charity Island light and half a mile north of the buoy, thence S. W. by S., 33 miles, to the outer buoys at the north entrance to the cut. In daylight when abreast of Sand Beach follow the coast around, not approaching it nearer than 1½ miles, until Port Austin light bears W. S. W., 5 miles distant, when proceed as above.

Fort Gratiot to Thunder Bay River.—When 1½ miles east of main light at Sand Beach, as in the course from Fort Gratiot to Saginaw river, steer N. N. W. ¼ W., 93 miles, to a point 1 mile southeast of the light. Dark nights or in a fog this course should be watched, as it leads close to Scarecrow island. The soundings are gradual.

Fort Gratiot to Lexington.—When 1 mile N. E. by N. from Fort Gratiot light, steer N. by W ¼ W., 18 miles, to a half mile east of pier.

Fort Gratiot to Port Sanilac.—When 1 mile N. E. by N. from Fort Gratiot light steer N. ¼ W., 29½ miles, to a point 1 mile east of the dock.

Fort Gratiot to Forestville.—When 1 mile N. E. by N. from Fort Gratiot light, steer N. ¼ W., 46 miles, to a point one mile east of the dock.

Fort Gratiot to Port Hope.—When 1½ miles east of Sand Beach main light as in the course from Fort Gratiot to Saginaw river, steer N. N. W. ¼ W., 7½ miles, to a point 1 mile east of Stafford's dock.

Fort Gratiot to Point aux Barques.—See course from Fort Gratiot to Saginaw river.

Fort Gratiot to Port Austin.—When 3 miles E. N. E. from Point aux Barques light as in the course from Fort Gratiot to Saginaw river, steer W. N. W., 10 miles, to a point 2 miles north of Burnt Cabin point, thence W. ¼ S., 3½ miles, passing ¼ mile north of Port Austin light and ¼ mile past it, when haul in due south, keeping a lookout for the rocky spot N. W. of the end of the dock.

Sand Beach to Goderich.—From main entrance steer E. by S., 46 miles, to 1 mile west of front range light.

Sand Beach to Entrance to Georgian Bay.—From main entrance steer N. N. E. ¼ E., 111 miles, to a point 3 miles W. ¼ N. of Cove Island light.

Sand Beach to Southampton.—From main entrance steer N. E. ¼ E., 76 miles, to a point 2 miles northwest of Chantry Island light.

Point aux Barques to Saginaw River, Passing South of Charity Island.—When 3 miles E. N. E. from Point aux Barques

light, steer N. W. by W. $\frac{1}{2}$ W., $11\frac{1}{2}$ miles, thence W. S. W., 25 miles, passing $1\frac{1}{2}$ miles N. of Port Austin light, until Oak point bears east and Sand point due south, when haul up west for $4\frac{1}{2}$ miles until the light on Charity island is in range with the west side of Little Charity island, then steer S. W. $\frac{1}{2}$ S., $27\frac{1}{2}$ miles, to the outer buoys at the entrance to the cut into Saginaw river. Buoys in channel south of Charity island removed.

Point aux Barques to Tawas.—When 3 miles E. N. E. of Point aux Barques, steer N. W. by W., 9 miles, until Port Austin light bears W. S. W., 5 miles, thence W. by N. $\frac{3}{4}$ N., $30\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles southwest of Tawas light. For directions to enter the harbor, see Tawas Light Station.

Point aux Barques to Au Sable.—When 3 miles E. N. E. of Point aux Barques light, steer N. W. $\frac{1}{2}$ W., 38 miles, to a point 1 mile east of light.

A sand bar makes out from the south side of the entrance to Sable river, from which a spit extends in a northeast direction about $1\frac{1}{2}$ miles. This shoal seems to be extending rapidly, probably from the present low stage of water. Heavy draft vessels bound to Au Sable should not cross the spit, until the light-house at Au Sable bears west, the end of the spit is a little more than one mile from the harbor piers.

Point aux Barques to Harrisville.—When 3 miles E. N. E. of Point aux Barques light, steer N. W. by N. $\frac{3}{4}$ N., $50\frac{1}{2}$ miles, to a point 1 mile east of Harrisville.

Saginaw to Point aux Gres.—From the buoys at the north entrance to the cut, steer N. N. E. $\frac{1}{2}$ E., $22\frac{1}{2}$ miles, to a point 1 mile southeast of point.

Saginaw River to Point Sable and Thunder Bay Island.—From the buoys at north entrance to the cut, steer N. E. by N., 52 miles, until Sable point bears N. W. 4 miles distant, thence N. $\frac{3}{4}$ E., 52 miles, to a point 2 miles east of Thunder Bay Island light. See course from Fort Graciot to Mackinac and St. Mark's river.

Saginaw River to Georgian Bay.—From the buoys at the north entrance to the cut, steer N. E. by N., 33 miles, until Charity Island light bears southeast 3 miles, thence northeast 120 miles, to a point 3 miles W. $\frac{3}{4}$ N. of Cove Island light.

Saginaw River to Goderich.—When 3 miles northwest from Charity Island light, steer E. $\frac{1}{2}$ N., 30 miles, until Port Austin light bears W. S. W., 5 miles, and Point aux Barques S. E. $\frac{1}{2}$ S., $7\frac{1}{2}$ miles, when steer E. S. E. $\frac{1}{2}$ S., 63 miles, to a point 1 mile west of front range light.

Saginaw River to Wild Fowl Bay.—From the buoys at the north entrance to cut, steer N. E. $\frac{1}{4}$ E. $25\frac{1}{2}$ miles, ranging on Sard point until within 2 miles of it, when haul in E. S. E., passing three-quarters of a mile to the northward of North island.

Saginaw River to Tawas Bay.—From the buoys at the north entrance to the cut, steer N. E. by N., 33 miles, until Charity Island light bears southeast 3 miles, when steer north $12\frac{1}{2}$ miles, into the middle of the bay.

Tawas Bay to Sable Point and Thunder Bay River.—When $1\frac{1}{2}$ miles southwest of Ottawa Point light, and a little south of the

S. W., 25 miles, point bears east and until the light on the Charity island, the entrance to the Charity island re-

miles E. N. E. of Port Austin light miles, to a point 1½ enter the harbor, see

en 3 miles E. N. E. miles, to a point 1

the entrance to Sable Point about 1½ miles. From the present low water should not cross the end of the spit

-When 3 miles E. N. E. N., 50½ miles, to a

the buoys at the north end, to a point 1 mile

Thunder Bay cut, steer N. E. by S. distant, thence N. ½ E. to Cove Island light. See the river.

From the buoys at the north end, until Charity Island light, 120 miles, to a point

en 3 miles northwest until Port Austin light S. E. ½ S., 7½ miles, west of front range

-From the buoys at the north end, ranging on Sable Island light, S. E., passing through the

om the buoys at the north end, until Charity Island light, 12½ miles, into the

Thunder Bay River.—From the buoys at the north end, and a little south of the

buoy, steer E. ½ N., 1½ miles, until the light bears N. W., 1 mile, thence N. E. ¼ E., 10 miles, to a point 3 miles east of Sable point, thence N. ¼ E., 30 miles, to a point 5 miles northeast of Sturgeon Point light, thence N. N. W. ¾ W., 23 miles, to a point 1 mile southeast of Thunder Bay River light. This course leads close to Scarecrow island, and should be watched carefully.

Tawas Bay to Au Sable.—When 1 mile southeast of light, as in the course to Thunder Bay island, steer northeast 8½ miles, to a point 1 mile east of Sable point, then N. ¼ E., 5½ miles, to 1½ mile east of Au Sable light; this course leads close to Sable point and close to the sand spit off Au Sable river.

Tawas Bay to Port Austin.—When 1½ miles southwest of light, steer S. E. by E. ¾ E., 27 miles, to the dock at Port Austin.

Au Sable to Sturgeon Point and Thunder Bay River.—When 2 miles east of light, steer N. ¼ E., 21½ miles, to a point 2 miles east of Sturgeon Point light, thence N. ¼ W., 3½ miles, to a point 2 miles east of Black River island, thence N. N. W. ¾ W., 18 miles, to 1 mile southeast of light.

Au Sable to Thunder Bay Island.—When 2 miles east of light, steer N. ¾ E., 44 miles, to a point 2 miles east of Thunder Bay Island light. When see courses from Fort Gratiot to Straits of Mackinac, and Detour.

Au Sable to Goderich.—When 2 miles east of light, steer S. E. by E. ¼ E., 90½ miles, to a point 1 mile west of front range light.

Au Sable to Cove Island.—When 2 miles east of light, steer N. E. ½ E., 97 miles, to a point W. ¾ N., 3 miles from Cove Island light.

Thunder Bay River to Thunder Bay Island.—When 1 mile S. E. of the light, steer E. S. E., 8½ miles, passing ¼ mile south of the red can buoy on the end of shoal off North point, thence E. N. E. ¼ N., 3½ miles, to a point ¼ mile southeast from the south point of Thunder Bay island.

Thunder Bay River to Saginaw.—When 1 mile S. E. of the light, steer S. E. ¼ S., 15 miles, to a point 5 miles east of the South point; thence S. ¼ W., 41½ miles, to a point 4 miles S. E. of Sable point; thence S. W. by S., 52 miles, to the buoys at the mouth of Saginaw river, and in range of the two lights.

Thunder Bay River to Fort Gratiot.—When 1 mile S. E. of the light, steer S. E., by S. ¼ S., 10 miles, to 1 mile N. E. of Scarecrow island; thence S. E. by S. ¼ S., for 83 miles, to a point 1½ miles east of main light at Sand Beach; thence S. ¾ E., 58½ miles, to a point 1 mile N. E. by N. from Fort Gratiot light-house.

Thunder Bay River to Goderich.—When 1 mile S. E. of the light, steer S. E. ¾ S., 124 miles, to a point 1 mile west of front range light.

Thunder Bay River to Southampton.—When 1 mile S. E. of the light, steer E. S. E., 8 miles, passing south of North Point buoy; thence E. S. E., 95 miles, to a point 2½ miles northwest of Chantry Island light.

Thunder Bay Island to Georgian Bay.—When 2 miles east of light, steer E. by N. ¼ N., 89 miles, to a point 3 miles W. ¾ N. of Cove Island light.

Thunder Bay Island to Southampton.—When 2 miles east of light, steer E. S. E. $\frac{1}{4}$ S., $91\frac{1}{2}$ miles, to a point $2\frac{1}{2}$ miles northwest of Chantry Island light.

Thunder Bay Island to Point Clark.—When 2 miles east of light, steer southeast, $98\frac{1}{2}$ miles, to Point Clark light.

Thunder Bay Island to False Presque Isle.—When 2 miles east of the light, steer N. N. W. $\frac{1}{4}$ W., $18\frac{1}{2}$ miles, to a point 2 miles east of False Presque Isle point, passing $1\frac{1}{2}$ miles east of Middle Island buoy.

Thunder Bay Island Light to the Light on the Great Ducks.—N. by E. $\frac{3}{4}$ E., $42\frac{1}{2}$ miles.

False Presque Isle to Presque Isle.—When 2 miles east of False Presque Isle point, steer N. W. $\frac{1}{4}$ N., 8 miles, to a point 2 miles east of Presque Isle light.

Presque Isle Light to Duck Island Light.—N. E. by E., 32 miles.

Presque Isle Light to Manitoulin Light.—On the east side of the Straits of Mississagua, N. by E. $\frac{1}{4}$ E., 39 miles.

Detour to Mackinac.—When 1 mile east of light, and in range of Frying Pan island, and Pipe Island lights, steer W. by S. $\frac{1}{4}$ S., $26\frac{1}{2}$ miles, to a point 2 miles north of Bois Blanc light; thence west $9\frac{1}{2}$ miles, to the middle of Mackinac harbor. This course leads $\frac{1}{4}$ mile south of 1st-class black can buoy, on Martin's or Garden City reef. In foggy weather or dark nights it would be advisable to keep a sharp lookout.

Detour to Spectacle Reef Light.—When 1 mile east of light and in range of Frying Pan island, and Pipe Island lights, steer S. W., 18 miles, to a point 1 mile west of light.

Detour to Cheboygan.—When 1 mile east of light, and in range of Frying Pan island, and Pipe Island lights, steer, S. W. $\frac{3}{4}$ W., heading on Cheboygan light for 30 miles, or to within 2 miles of it; thence W. by S., 3 miles, to a point $1\frac{1}{2}$ miles from Cheboygan River pierhead light, and in line with the range lights. This course leads to the westward and very close to Thirteen-foot shoal, $3\frac{1}{2}$ miles, W. $\frac{1}{4}$ N. from Spectacle Reef light; heavy draught vessels should keep more to the eastward until abreast of Spectacle reef, and then haul up for Cheboygan light.

Spectacle Reef to Cheboygan.—With the light directly astern, steer W. S. W., a little southerly, until in range with the Cheboygan range lights, and main light S. E. by E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles, when haul up for St. Helena light, N. W. by W. $\frac{1}{4}$ W., with Cheboygan light over the stern.

Cheboygan to Georgian Bay.—When three-quarters of a mile north of Cheboygan light, steer east 8 miles; thence E. by S. $\frac{1}{4}$ S., 124 miles, to a point three-quarters of a mile north of Cove Island light.

Mackinac to Georgian Bay.—From the middle of the harbor, steer E. $\frac{3}{4}$ S., $9\frac{1}{2}$ miles, to a point one-half mile north of Bois Blanc light, then E. S. E., 15 miles, to a point two miles south of Spectacle Reef light, when steer E. by S. $\frac{3}{4}$ S., 119 miles, to a point three-quarters of a mile north of Cove Island light.

Magnetic Declinations in degrees and tenths, corrected to the year 1890.

Lakeport.....	2.0 W.
Lexington.....	2.0 W.
Sanilac.....	2.1 W.
White Rock.....	2.2 W.
Port Austin.....	2.0 W.
Mouth of Saginaw River.....	0.8 W.
Point aux Gres.....	0.5 W.
Tawas Point.....	0.8 W.
Harrisville.....	1.2 W.
Alpena.....	1.0 W.
North Point of Thunder Bay.....	1.3 W.
Middle Island.....	1.3 W.
Hammond's Bay.....	0.2 W.
Cheboygan.....	0.1 E.
Detour L. H.....	1.2 W.
Drummond's Island, east side.....	2.0 W.
Duck Island Light-house.....	2.6 W.
Cove Island.....	5.2 W.
Chantry Island.....	4.5 W.

Light Houses and Harbors on the Canadian Shore of Lake Huron.

GODERICH LIGHT-STATION.—A fixed white light, visible 21 miles. White, square, stone tower, with dwelling attached. On high bank south of entrance to harbor; light 150 feet above lake level.

Front Range Light.—A fixed red light, visible 5 miles. White square, open-frame tower. On north pier; light 45 feet above lake level.

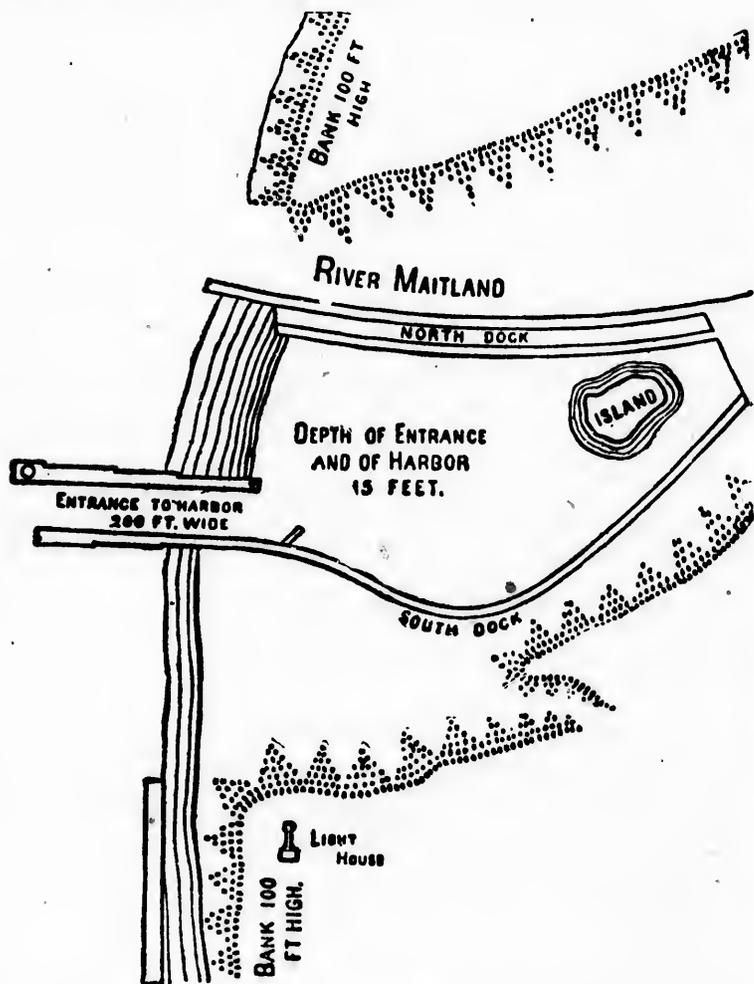
Back Range Light.—A fixed green light, visible 5 miles. White, square, wood tower. On north pier; 1,209 feet E. by S. from front light. These lights in range lead to head of north pier.

A Steam Fog Whistle in connection with the water works during thick weather will give blasts of 10 seconds, with intervals of 50 seconds between them. The water-works building is on the beach S. E. by E., 1,200 feet from the outer end of the north pier. It is of red brick, with unpainted roof, with high brick chimney. It is partially hidden from the lake by an old wooden storehouse. The 8-inch whistle rises from the roof, and is 30 feet above the level of the lake.

Goderich is a harbor of refuge.—It is an enclosed basin, with a channel out through the beach, connecting it with the deep water in Lake Huron. The sides of the channel are protected with piers extending into the lake about W $\frac{1}{2}$ N. The north pier is 1,320 feet in length, and the south pier, 1,520 feet; width between piers 200 feet. *Depth of water.*—There are 15 feet at the entrance, which depth can be carried through the piers and into the basin, except around the island where there are only 12 feet. There is an artificial bank, between the harbor and the River Maitland; the river discharges into the lake through the north beach and not through the harbor. There are high clay banks (100 feet) on each side of the harbor. Good anchorage off

the piers, clay bottom. To enter the Harbor, bring the pier lights, red and green, in range E. by S., and run for them; approaching the north pier port and run straight in between the piers, E. $\frac{1}{4}$ S., and into the basin. Point aux Barques, W. N. W., 58 miles. Cape Ipperwash, S. S. W. $\frac{3}{4}$ W., 39 $\frac{1}{2}$ miles.

There is a Life Saving Station at Goderich.



GODERICH.

Bayfield is 12 miles south of Goderich. It has a harbor composed of two piers and basin. The north pier is 820 feet and the south pier 975 feet long. Width between piers 200 feet at entrance. Depth of water, 10 to 12 feet at entrance. No light.

POINT CLARK LIGHT-STATION.—A revolving white light, 2d order, intervals between revolutions half a minute, visible 15

f, bring the pier
nem; approaching
piers, E. $\frac{1}{4}$ S., and
iles. Cape Ipper-

miles. White, circular stone tower, 87 feet high. A coast-light on Point Clark, 23 miles north of Goderich. A reef extends west from the point, which, together with a detached shoal, requires that it should be given a berth of two miles; the shore from Point Clark to Chantry island is rocky and dangerous, and should not be approached by strangers nearer than $1\frac{1}{2}$ miles. Three miles south of Point Clark a reef extends out $1\frac{1}{2}$ miles. Pointe aux Barques light bears W. $\frac{1}{4}$ S., 52 miles. Point Douglas N. N. E. $\frac{1}{4}$ E., 19 miles.

Kincardine Front Light.—A fixed red light, visible 8 miles in the direction of the range. White, square, wood tower, 37 feet above sea level. On north pier, 1,185 feet W. by N. $\frac{3}{4}$ N. from main light.

Kincardine Back Range and Main Light.—Alternate white and red flash every 20 seconds; visible 14 miles. Fawn color, octagonal wood tower, dwelling attached, on high stone foundation. In town, on hillside. The range leads somewhat to the northward of the head of the north pier, visible from all points seaward. Point Douglas, N. by E. $\frac{1}{4}$ E., 10 miles. Thunder Bay Island light, N. W. $\frac{1}{4}$ W., 97 miles.

Inverhuron is 9 miles north of Kincardine. It has one pier 450 feet in length with 14 feet at the outer end. It has no light.

PORT ELGIN LIGHT-STATION.—A fixed white light, lantern on a pole from corner of a shed. On the outer end of Government wharf. Port Elgin is 4 miles from Chantry island, and 24 miles from Kincardine.

CHANTRY ISLAND LIGHT-STATION.—A fixed white light, visible 15 miles. White, circular, stone tower, 86 feet high, 2d order, coast-light. About $2\frac{1}{2}$ miles to the westward of Saugeen.

Southampton Harbor Range Lights, Front Light.—A fixed red light to the north, white in the harbor, visible 7 miles. White, square tower. On the east end of west breakwater, 933 yards from Chantry Island light, N. E. by E.

Back Light.—A fixed white light, visible 10 miles. White, square wood tower, light 34 feet above lake level. On shore south of landing pier 2,100 yards S. $\frac{3}{4}$ E. from the front light. These lights in range lead to the opening in breakwater at north end of harbor.

Chantry Island is a small rocky island about half a mile long; $1\frac{1}{2}$ miles W. S. W. from the mouth of Saugeen river. **The Harbor** consists of a breakwater 1,600 feet long, extending in an easterly direction from the old breakwater at the northern end of the island. A breakwater 2,000 feet long, on a curved line from the main-land to within 400 feet of the end of the breakwater, extending from Chantry island. A landing pier has been built in the inner harbor, where a quantity of boulder stone has been removed from a shoal adjoining the anchorage ground. The breakwaters are built of crib work, filled with stone. The depth of water in channel, reported about 14 feet, is not sufficient to make navigation safe for heavy draught vessels.

Saugeen Light.—A fixed green light, visible 7 miles. Lantern on mast, with brown shed at base, on a crib or breakwater. On the north side of mouth of river. To guide fishing boats into Saugeen river. Chief's point bears N. by E. $\frac{1}{4}$ E., 13 miles. Cape Hurd, N. by W. $\frac{3}{4}$ W., 53 miles.

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LYAL ISLAND LIGHT-STATION.—A revolving white light, visible 12 miles; interval between revolutions, 15 seconds. White, square wood tower, 57 feet high, attached to keeper's dwelling. On the west side of Lyal island. The light, besides being a general lake coast light, will serve as a guide into the harbor of Stokes' bay, but as there are shoals in the entrance it must not be attempted without local knowledge. Chantry Island light, S. $\frac{1}{2}$ W., 32 miles.

ISLE OF COVES LIGHT-STATION.—See lights in Georgian bay.

MICHAEL'S POINT LIGHT-STATION.—A fixed white light, visible 13 miles. White, square wood tower, light 40 feet above lake level. On Michael's point, south side of Michael's bay. A reef extends from the point about W. by S. $\frac{1}{4}$ S., 2 $\frac{1}{2}$ miles from the light. Cove Island light, S. E. $\frac{1}{4}$ S., 24 miles. Michael's bay is on the south side of Manitoulin island.

GREAT DUCK ISLAND LIGHT-STATION.—A revolving red and white light, one red and two white flashes every two minutes. Greatest brilliancy every 40 seconds. Visible 15 miles. White, square wood tower, with dwelling attached, light 64 feet above lake level. On southwest point of island. The fog-horn, operated by steam during thick and foggy weather, will give blasts of 8 seconds' duration, with intervals of 35 seconds. The fog signal is 150 feet southeasterly from the light-house, built of wood, painted white, with brown roof. A reef extends 1 $\frac{1}{2}$ miles in a southerly direction from the southeast point of the island, and a reef extends 1 $\frac{1}{4}$ miles in the same direction from the south point of Outer Duck island, lying east of the south end of the Great Duck. There is a good channel south of Western and Inner Duck. Spectacle Reef light, W. by N., 58 miles. Detour light, N. W. by W. $\frac{1}{4}$ W., 52 miles. Presque Isle light, S. W. by W., 32 miles.

MISSISSAGUA STRAITS LIGHT-STATION.—A fixed white light, visible 13 miles. White, square wood tower, light 46 feet above lake level. On southwest point of the west end of Great Manitoulin island. For guiding vessels through Mississagua straits for either entrance. The fog-signal is a steam whistle, giving blasts of 8 seconds duration, with silent intervals of 2 minutes. The whistle is usually called a "wildcat" whistle; it is fitted with a piston which changes the tone of the blast, beginning low, rising to a screech, and again sinking to a low note at the end. Presque Isle light, S. S. W. 30 miles.

Mississagua Straits is between the Grand Manitoulin and Cockburn islands. The passage is about 8 miles in length and 2 miles wide at the narrowest part. Depth of water from 10 to 30 fathoms. To make the passage, bring the middle of it to bear N. by E. $\frac{1}{4}$ E., and run through on that course.

The Magnetic Reefs, on the west side of the entrance from Lake Huron, extend around the southeast coast of Cockburn island 2 $\frac{1}{2}$ miles from the shore and are very dangerous. On the east side of the entrance reefs extend from the southwest point of Manitoulin island in a south and southwest direction for 1 mile.

False Detour Channel is between Drummond and Cockburn islands. It is about 7 miles in length and a little over a mile wide at the southern entrance. Run through the passage from Lake Huron, heading N. E. by N. Keep the west side of the entrance best on board. On the east side of the entrance from the south there is a small island with shoal water to the west of it.

*Compass Courses and Distances on the Canadian Side of
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Fort Gratiot to Cape Ipperwash.—When 1 mile N. E. by N. from the light, steer N. E. by E., 24 miles, ranging on the point.

Fort Gratiot to Bayfield.—When 1 mile N. E. by N. from the light, steer northeast, 52 miles, to a point 1 mile west of the piers.

Fort Gratiot to Goderich.—When 1 mile N. E. by N. from the light, steer N. E. $\frac{1}{4}$ N., 61 $\frac{1}{2}$ miles, to a point 1 mile west of front range light.

Fort Gratiot to Point Clark.—When 1 mile N. E. by N. from the light, steer N. N. E. $\frac{1}{4}$ E., 79 $\frac{1}{2}$ miles, to a point 2 miles west of light.

Fort Gratiot to Kincardine.—When 2 miles W. of Point Clark, steer N. N. E. $\frac{1}{4}$ E. 4 miles, then N. E. $\frac{1}{4}$ E. 6 miles, to a point 1 mile west from front light.

Fort Gratiot to Southampton.—When 2 miles W. of Point Clark, steer N. N. E. $\frac{1}{4}$ E., 17 miles, to a point 3 miles west of Inverhuron, thence N. E. $\frac{1}{4}$ N., 19 miles, to a point 2 miles northwest of Chantry Island light.

Fort Gratiot to Entrance to Georgian Bay.—When 1 mile N. E. by N. from the light, steer N. by E. $\frac{1}{4}$ E., 163 miles, to a point 3 miles W. $\frac{3}{8}$ N. of Cove Island light, giving Gat point a berth of 1 $\frac{1}{2}$ miles.

Fort Gratiot to Great Duck Island Light.—When 1 mile N. E. by N. from the light, steer N. $\frac{1}{4}$ W., 182 $\frac{1}{2}$ miles, to the light.

Bayfield to Goderich.—When 1 $\frac{1}{2}$ miles west of Bayfield, steer north, 12 miles, to a point 1 mile west of Goderich.

Goderich to Kincardine.—When 1 mile west of front range light, steer N. $\frac{1}{4}$ W., 23 miles, to a point 2 miles west of Point Clark light, thence N. N. E. $\frac{1}{4}$ E., 4 miles, when steer N. E. $\frac{1}{4}$ E., 6 miles, to a point 1 mile west of front light on north pier.

Goderich to Entrance to Georgian Bay.—When 2 miles west of Point Clark, as in the course to Kincardine, steer N. $\frac{1}{4}$ E., 88 miles, to a point 3 miles W. $\frac{3}{8}$ N. from Cove Island light.

Goderich to Inverhuron and Southampton.—When 2 miles west of Point Clark, as in the course to Kincardine, steer N. N. E. $\frac{1}{4}$ E., 17 miles, to a point 3 miles west of Inverhuron, thence N. E. $\frac{1}{4}$ N., 19 miles, to a point 2 miles northwest of Chantry Island light.

Goderich to the Straits of Mackinac and St. Mary's River.—When 1 mile west of front range light, steer N. W. by N., 140 miles, to a point 5 miles E. N. E. from Presque Isle light, thence to the south channel N. W. by W. $\frac{5}{8}$ W., 47 miles, or until Spectacle Reef light bears N. E. 8 m^{ts} and the east point of Bois Blanc island N. W. $\frac{1}{4}$ N. the same distance, when steer due west, 8 miles, to a point three-quarters of a mile north of Cheboygan light. To pass through the north channel, when 5 miles E. N. E. from Presque Isle light, steer N. W. by W. $\frac{1}{2}$ W., 58 miles, to a point one-half mile north of Bois Blanc light, thence W. $\frac{1}{4}$ N., 9 $\frac{1}{2}$ miles, to Mackinac. When 5 miles E. N. E. from Presque Isle light, steer N. N. W. $\frac{1}{4}$ W., 45 miles, ranging on Detour light to

within 2 miles of it, and in range with Frying Pan Island light and Pipe Island light, when haul up on this range heading N. $\frac{1}{4}$ W. nearly. When see directions for entering Straits of St. Mary.

Goderich to Straits of Mississagua.—When 1 mile west of front light, steer N. W. by N. $\frac{3}{4}$ N., 165 miles, until the light bears northeast 2 miles distant.

Kincardine to Saginaw River.—When 1 mile west of front light, steer W. $\frac{1}{4}$ S., 91 miles, to a point 3 miles northwest of Charity Island light, passing $1\frac{1}{2}$ miles north of Port Austin light, then S. W. by S., 33 miles, to the buoys at the entrance to the cut.

Kincardine to Straits of Mackinac.—When 1 mile west of front light, steer N. W. $\frac{1}{8}$ N., 120 miles, to a point 5 miles E. N. E. of Presque Isle light, when see course from Goderich to the Straits of Mackinac.

Kincardine to Detour Passage.—When 1 mile west of front light, steer N. W. $\frac{1}{4}$ N., 164 miles, to a point 2 miles S. S. E. $\frac{1}{4}$ E. of Detour light. See directions for entering St. Mary's river.

Kincardine to Entrance to Georgian Bay.—When 1 mile west of front light, steer N. $\frac{1}{8}$ W., 80 $\frac{1}{2}$ miles, to a point 3 miles W. $\frac{3}{8}$ N. of Cove Island light.

Kincardine to Fort Gratiot.—When 2 miles west of front light, steer S. W. $\frac{1}{4}$ S., 9 miles, to a point 2 miles west of Point Clark light; thence S. S. W. $\frac{1}{4}$ W., 79 $\frac{1}{2}$ miles, or until Fort Gratiot light bears S. W. by S., 1 mile distant.

Kincardine to Sand Beach.—When 2 miles west of front light, steer W. S. W. $\frac{1}{8}$ S., 52 miles, to a point 1 mile east of main light.

Southampton to Entrance to Georgian Bay.—When 2 $\frac{1}{2}$ miles northwest of Chantry Island light, steer N. by W. $\frac{3}{8}$ W., 58 $\frac{1}{2}$ miles, to a point 3 miles W. $\frac{3}{8}$ N. of Cove Island light.

Southampton to Detour.—When 2 $\frac{1}{2}$ miles N. W. of Chantry Island light, steer N. W. $\frac{1}{4}$ W., 155 miles, ranging on Detour light and within $1\frac{1}{2}$ miles and in range of Frying Pan Island and Pipe Island lights, when haul in on the range.

Southampton to Straits of Mackinac.—When 2 $\frac{1}{2}$ miles northwest of Chantry Island light, steer N. W. by W., 113 miles, to a point 5 miles E. N. E. of Presque Isle light, when see course from Goderich to Straits of Mackinac.

Southampton to Saginaw River.—When 2 $\frac{1}{2}$ miles northwest of Chantry Island light, steer W. by S. $\frac{3}{8}$ S., 106 miles, to a point 3 miles northwest of Charity Island light, thence S. W. by S. 33 miles to the buoys at the entrance to the cut.

Southampton to Sand Beach.—When 2 $\frac{1}{2}$ miles northwest of Chantry Island light, steer S. W. $\frac{1}{4}$ W., 76 miles, to the main entrance to the harbor.

Entrance to Georgian Bay to Straits of Mackinac.—When $\frac{1}{4}$ mile N. of Cove Island light, steer W. by N. $\frac{1}{4}$ N., 124 miles, or until Spectacle Reef light bears N. E. 8 miles, and the east point of Bois Blanc island N. W. $\frac{1}{4}$ N. the same distance, when steer due west 8 miles, to a point $\frac{1}{4}$ mile north of Cheboygan light.

Entrance to Georgian Bay to Detour Passage.—

GEORGIAN BAY.

Light-Houses, Buoys and Harbors.

ISLE OF COVES LIGHT-STATION.—A revolving white light, interval of revolutions 7 seconds, 2d order, visible 15 miles. White, circular stone tower, 85 feet high. On Gig point, the north extremity of Cove island, entrance to Georgian bay. In thick and foggy weather a fog horn, operated by compressed air, will give blasts of 10 seconds' duration, with intervals of 110 seconds between the blasts. Fog signal stands about 200 yards westward of light. Northeastward 200 yards from the light is a rock 2 feet high, which, as well as the remainder of Gig point, may be approached to within 100 yards. The shore from Gig to Gat point is fairly bold, and the light, kept well open of Gat point, leads to the northwestward of the shoal water extending in a southwesterly direction 300 yards from Gat point. N. E. point of Flower Pot island, E. by S. $\frac{1}{2}$ S., 6 miles. S. W. point of Echo island, S. E. by E., $2\frac{1}{2}$ miles. Gat point, W. S. W. $\frac{1}{4}$ S., $2\frac{1}{2}$ miles. S. side of Snake island, E. $\frac{1}{4}$ N., $5\frac{1}{2}$ miles.

MAIN CHANNEL, or principal entrance into Georgian bay from Lake Huron, lies between Cove and Lucas islands.

Bad Neighbor Rock.—Black spar buoy, in $5\frac{1}{2}$ fathoms of water, on the southern portion of the rock. This buoy is situated close to a patch of 11 feet, and bears S. by W. $\frac{1}{2}$ W., distant 400 yards from the north and shallowest end of the rock, which has only 3 feet on it. The buoy bears also N. N. W. $\frac{1}{2}$ W., distant $2\frac{1}{2}$ miles from Cove Island light. A vessel may pass close to the southward of the buoy, but if passing northward it should receive a berth of half a mile. The north end of the shoal bears N. N. W., $2\frac{1}{2}$ miles, from Cove Island light, and S. $\frac{1}{4}$ E., nearly 2 miles, from the south point of Lucas island. This reef rises abruptly from the bottom on the east and south sides, there being 30 fathoms within 150 yards. To pass southwestward of this rock, keep Eagle point on the north side of Cove island, in range with northeast extreme of Gig point, S. E. $\frac{1}{4}$ S.

West Sister and East Sister are two rocky patches, on each of which there is a depth of 21 feet. They bear N. W. 4 and $3\frac{1}{2}$ miles respectively from Cove Island light. To pass between them and Bad Neighbor, keep Eagle point of Cove island in line with the north extremity of Gig point, S. E. $\frac{1}{4}$ S. To pass southward of the Sisters, bring the south end of Echo island to touch Cove Island light-house, S. E. by E. Vessels of heavy draught in bad weather should use the latter range, as Echo island is more easily recognized than Eagle point, and the sea will probably be more regular.

Eagle Point, bluff and steep-to, is situated half-way between North Otter island and Cove Island light-house. In the large bight formed between Eagle point and North Otter island, sailing vessels may find shelter from southerly and westerly winds in 16 fathoms sand and mud, half a mile from shore. A sailing vessel should not anchor nearer Cove island than this distance, so that in the event of a shift of wind to the northward, she may have good room to get under way; more espec-

ally as the water does not materially lessen its depth until within 200 yards of the shore.

GREAT BARRIER.—Snake island is a narrow ridge of small boulders, elevated 5 feet above the bay, and forming the southeastern terminus of an extensive rocky bank on the Georgian bay side of the entrance known as Great Barrier. This narrow, dry ridge, called Snake island, is nearly 600 yards long, the southeast end being bare and white, while the opposite end has upon it two conspicuous bushes. Scattered dry stones lie northwestward of the latter a distance of 350 yards.

Snake Island Bank, under the depth of 18 feet, extends westward 1 mile from this bushy end of Snake island, and from the bare extreme is continued 200 yards further, making the total length of the shoal $1\frac{1}{2}$ miles, with an average width of a little over one-third of a mile.

Confiance Shoal, with 19 feet of water over it, lies with its nearest part distant 500 yards, W. S. W., from the west extreme of Snake island bank. This shoal is rather more than one-third of a mile long northwest and southeast, and 600 yards broad. The fall of Cabot head, in range with the south extreme of Bear's Rump, E. S. E., leads south of Confiance Shoal. The southwest end of Fitzwilliam island, in one with the northeast side of Yeo island, N. W. $\frac{1}{4}$ N., leads across the south end of it, in 23 feet of water.

White Shingle, is the name given to a collection of stones formerly 2 or 3 feet above, but now covered by 1 foot of water. The center bears from Cove Island light N. E. by E. $\frac{1}{4}$ E., distant 4 miles, and under the depth of 4 feet it is 500 yards long, N. N. W. and S. S. E. At this distance due east from its center, is another shoal spot with 5 feet over it. The whole of White Shingle bank under the depth of 12 feet is nearly half a mile long, east and west, by one-fourth of a mile in width. A vessel may stand towards this bank, and to the whole of the Great Barrier from the southwestward, until the southwest extreme of Fitzwilliam island is in line with the northeast extreme of Yeo island bearing N. W. N. The Great Barrier may be crossed between Snake Island bank and White Shingle by keeping the east side of Echo island in line with the west fall (not the extreme point) of North Otter island, S. W. $\frac{1}{4}$ S., with not less than 21 feet. The west side of Echo island touching northeast point of Cove island (Otter island channel), S. S. W. $\frac{1}{4}$ W., leads between the same two banks, with the least depth of $5\frac{1}{2}$ fathoms.

Tilton Reef, with depth varying from 11 to 21 feet, is one mile long in a northwest and southeast direction, with an average breadth of half a mile. It is the next shoal northwest of White Shingle bank, being separated therefrom by a narrow lane of water, with a depth of 5 fathoms. To cross the Great Barrier over the western part of Tilton reef, with not less than 21 feet, keep the whole of North Otter island a little open westward of Echo island S. $\frac{1}{4}$ W. The southwest extreme of Fitzwilliam island in line with the northeast end of Yeo island, N. W. $\frac{1}{4}$ N., leads southwest; and the south point of Bear's Rump touching Snake island bushes, S. E. $\frac{1}{4}$ E., leads northwest of Tilton reef.

Anderson Ledge, the northwesternmost shoal on the Great Barrier, its shoalest spot of 13 feet bears E. $\frac{1}{4}$ S., nearly $1\frac{1}{2}$ miles from the northeast part of Lucas island. The southwest extreme of Yeo island, in line with the northwest end of Lucas island, W. by N. $\frac{1}{4}$ N., leads southeast of this shoal spot. In thick weather, or at night, the portion

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Lucas Island, 100 feet high, is situated N. by W. $\frac{1}{2}$ W., distant a little more than $4\frac{1}{2}$ miles from Cove Island light-house. The west and south sides of this island are steep-to.

Lucas Island Reef, with depths under 6 feet, extends in an east southeasterly direction from the northeast part of the island, 450 yards. To pass eastward of this reef, keep the east fall of Fitzwilliam island open the breadth of James island, eastward of the latter, N. by E. $\frac{1}{2}$ E. The southwest extreme of Yeo island touching the south end of Lucas island, N. W. by W. $\frac{1}{2}$ W., leads south of Lucas Island reef. To pass northward of it, keep the whole of Yeo island well open northwest of Lucas island.

Lucas Channel.—There is a deep passage between Lucas island and Anderson ledge (the northwest end of the Great Barrier), over three-quarters of a mile wide, with depths varying from 5 to 20 fathoms. To pass through this channel from the southward, keep the south end of Long beach (Fitzwilliam island) in line with the east side of James island, N. by E., until the southeast side of Yeo island appears on end, bearing W. by S. when a vessel may haul to the northeastward, being well clear of the Great Barrier.

TOBERMORY LIGHT-STATION.—A fixed red light, visible 8 miles. White, hexagonal wood tower, light 40 feet above lake level. Red iron lantern. On the southeast extreme of Light-house point. At water's edge, west side of entrance.

Tobermory Harbor is situated at the northwest extremity of Saugeen peninsula, and contains perfect shelter from all winds. Both it and the approach thereto are free from danger. The best shelter is in the southwest arm, making fast to the western shore, which is steep-to.

The Southwest Arm extends from Light-house point W. by S. $\frac{1}{2}$ S., 900 yards, with an average width of 100 yards; 7 to 8 fathoms over mud bottom will be found all over this arm, excepting near the bottom, when a muddy flat extends 120 yards to the depth of 18 feet. The harbor being too narrow for vessels to lie at anchor they are compelled to make fast to the shore, for which purpose the Government has had ring-bolts sunk into the rocks.

Eastern Arm.—From North point shoal water extends 70 yards southwestward, and thence to Rixton rock in Shoal light; vessels proceeding to Eastern arm should give it the necessary berth. Rixton's rock is S. E. $\frac{1}{2}$ E., nearly $1\frac{1}{2}$ cables from the westerly extreme of North point. It is 2 feet high.

Middle Point is the name given to the land dividing the two arms, and on the eastern side of it is an indentation known as Fisherman cove. From this cove shoal water extends half way across Eastern arm, but may be avoided by keeping the eastern shore on board.

Bear's Rump is the name given to an island having somewhat the outline of that animal. Its northeast end is faced by a steep cliff, 80 feet high, the summit of the island being considerably higher. The southwest side is low, and from it extends for a quarter of a mile a reef known as

Bear's Rump Shoal.—To pass south of this reef keep Cove

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Island light shut in with the north end of Flower-pot island, an especially good mark at night. The northwest side of Doctor island, touching the east side of Middle island W. S. W., leads southeastward of this shoal; and to pass northwestward of it, keep the same part of Doctor island in one with the southeast side of Flower-pot island, S. W. by W. $\frac{1}{2}$ W.

Flower-pot Island derives its name from two isolated rocks on its east shore. The castle is a detached cliffy portion of this island, at the northeast extremity, elevated 200 feet. A spit extends off the south point of the island 200 yards, and a bar of rocks lies across the mouth of Beachy cove, on the southeast side of Flower-pot island; the remainder of the shores of the island is bold.

Middle Island, small and round, lies between Flower-pot island and Tobermory harbor, and is steep-to on all sides.

Echo Island, 140 feet high, $1\frac{1}{4}$ miles westward of Flower-pot island, is steep-to on all sides.

Otter Islands are separated from northeast point of Cove island by Otter island channel, which has deep water, with the exception of a small rock with 10 feet on it; 100 yards westward of North Otter, and nearly 200 yards from its southwest extreme.

Doctor Island, lying between the north extreme of Russell island and Tobermory harbor, has deep water close to all but its northeast side, whence a reef extends 100 yards.

Half-Moon Island, 12 feet high, is 650 yards long, N. W. by W. and S. E. by E., and about 100 yards wide. It lies about 8 miles N. E. by N. from the Bear's Rump, and the same distance south of Lonely island. It is composed of small stones, with a few small trees in two clumps. The north and east sides may be approached to 200 yards, but from the east and west points and the south side there extends out to the southwestward for a distance of 2 miles, a large area of shallow water with depth under 10 fathoms, known as Half-moon bank; nearly 1 mile, S. S. W., from the east point of the island there is a depth of $3\frac{1}{2}$ fathoms, and a third of a mile nearer, only 10 feet. The west side of Lonely island open east of Half-moon island N. $\frac{1}{2}$ W. leads eastward of the shoal.

Cabot Head may be easily identified by its three limestone cliffs, known as Boulder, Middle, and West bluffs, the last of which is 310 feet high. The eastern one derives its name from the huge moss-covered stone near the edge.

Darling's Reef.—A rock with 17 feet of water over it, which will be known as Darling's reef, has been discovered by Commander Boulton, R. N. in the Georgian bay. It lies approximately N. E. by E., distant $2\frac{1}{4}$ miles from Cape Chin, and 2 miles inside the line joining Cabot Head and Cape Croker.

Surprise Shoal, which lies 8 miles N. N. W. $\frac{1}{2}$ W. from the east point of Cape Croker, is marked with a black spar buoy, placed near a shoal spot with eight feet of water on it. The McNab rock, with 13 feet of water over it, lies E. $\frac{1}{2}$ S., a little more than half a mile from the buoy on Surprise shoal. At McNab rock Cape Croker is in line with the middle of Griffith's island; and the west extreme of Barrier island is under the foot of the high bluff of Cape Dundas. A vessel passing

northeastward of both of these dangers should keep the whole of Griffith's island open of Cape Croker. The line joining Cabot head and Cape Croker leads inside or southwestward of the same.

GRIFFITH'S ISLAND LIGHT-STATION.—A fixed white light, 3d order, visible 17 miles. White circular stone tower. On the northeast end of the island, 20 miles from Owen Sound. Point Rich bears S. E. $\frac{1}{4}$ E., 16 miles. Cape Croker N. by W. $\frac{3}{4}$ W., 8 miles. The shores of the island are steep-to.

WIARTON LIGHT-STATION.—A fixed red light, visible 6 miles. Lens lantern suspended from a mast 15 feet high with a white shed at the base. Near the outer end of the breakwater at Wiarton, at the head of Colpo's bay. The breakwater is 380 feet long and 25 feet in width, near the head of the harbor on the west side, good anchorage at the head of the bay in from 3 to 5 fathoms. The bay is protected at its mouth by three large islands, and is free from obstructions, except Gundersen's shoal, with three feet of water over it, $1\frac{1}{2}$ miles W. by S. $\frac{1}{4}$ S. from Kid's point, southwest point of White Cloud island. Wiarton is the terminus of the Georgian Bay and Lake Erie Branch of the Grand Trunk Railway. It is 30 miles to the northwestward of Owen Sound.

McKENZIE'S WHARF LIGHT-STATION.—A fixed white light, visible 12 miles. White, square, wood tower, light 35 feet above lake level. On Presque Isle. Owen Sound range lights bear S. by W. $\frac{1}{4}$ W., $8\frac{1}{2}$ miles.

OWEN SOUND.—Front light fixed, red, visible 6 miles. White with vertical red stripe facing channel; square wood tower, 22 feet high. On block on starboard side of dredged channel, about 300 yards outside the end of west pile-work embankment at mouth of river.

Owen Sound.—Back light, fixed white, visible 11 miles. White, with vertical red stripe facing channel; light 39 feet above lake level. On west pile work, 1,520 feet S. W. $\frac{1}{4}$ S. from front light. In range lead to dredged channel at mouth of river, and are left on the starboard hand in entering the harbor.

The Town of Owen Sound is situated on Sydenham river, which flows into the head of Owen Sound, an arm of Georgian Bay. It is the terminus of the Toronto, Grey and Bruce Railway.

The harbor works consist of two parallel rows of pile-work, 200 feet apart, extending from the shore a distance of 600 feet, together with about 1,000 feet of bank protection; and the dredging of the channel of the river, from the upper end of the steamboat wharf to its mouth, and from thence to 18 feet of water; 14 feet can be carried to the steamboat dock.

Ranges, for ascertaining compass errors, have been established at Owen Sound, by which vessels navigating the sound can ascertain the errors of their compasses.

On the northwest shore of the sound, and about half a mile beyond Findlay's mill, are erected four posts. That nearest the shore is surmounted by a plain white triangle. The remaining three back beacons have marked on them in black letters S. W., W. and N. W. These brought in line with the aforesaid triangular-top beacon will point out respectively the southwest, west, and northwest correct magnetic lines.

A similar set to be ranged in the same manner is erected on the southeast shore, on a clearing between the French village and Squaw point. These posts indicate the east, southeast and south lines. The southeast side of Griffith's island just in sight open of the shore near Cape Commodore bears N. $\frac{3}{4}$ E.; Point William and Squaw point in one may be taken for the N. E. line.

Each of these ranges should be kept exactly ahead for a short interval until the difference between their correct bearing and the ship's course is noted as the error on that particular course.

MEAFORD LIGHT-STATION.—A fixed white light, visible 13 miles. White, square, wood tower, light 42 feet above lake level. On end of pier. Point Rich bears N. by W. $7\frac{1}{2}$ miles. Christian Island light, E. N. E. $\frac{1}{4}$ N., $25\frac{1}{2}$ miles.

The Town of Meaford is situated on Georgian Bay, 18 miles to the westward of Collingwood. The pier is on the west bank of the Big Head river; extends out 660 feet, with an arm 200 feet in an easterly direction to afford protection against northeast winds. A breakwater 410 feet long is built on the east side of the river. The least water now is 14 feet at the outer end and 11 feet in the inner harbor.

THORNBURY HARBOR LIGHT-STATION.—A fixed red light, shown from a lens lantern hoisted on a mast, 32 feet above lake level, visible 7 miles. On the outer end of the west breakwater pier at the entrance to harbor.

Thornbury is situated at the mouth of Beaver river, which empties into Georgian bay, 13 miles from Collingwood. A channel 14 feet deep has been opened through the shoal or bar off the wharf, and the cut alongside the pier deepened for a distance of 300 feet.

NOTTAWASAGA ISLAND LIGHT-STATION.—A flashing white light, 2d order, interval between flashes 30 seconds, visible 15 miles. White, circular, stone tower, 85 feet high. About 2½ miles northwest of Collingwood.

A red sector is shown in the light on Nottawasaga island, over an arc of 30 degrees, from Fisherman's point southwesterly, covering the whole of Collingwood harbor and the dangerous shoals between Nottawasaga island and the harbor. Vessels approaching Collingwood harbor from the northwestward should keep the breakwater pier light well open northeastward of Nottawasaga Island light, to clear the Mary Ward ledges, and after passing Nottawasaga island should keep north of the red sector, with the white light in sight, until the breakwater light bears S. W., when it should be steered for on that bearing.

Vessels leaving Collingwood should steer N. E. from the breakwater pier light until the red sector of Nottawasaga Island light changes to white, when they may haul to the northwestward.

CAUTION.—Masters of heavy draught vessels must remember, that in addition to the continuous rocky bank connecting Nottawasaga island and the breakwater pier, for the avoidance of which this red sector has been established, there exist two reefs with 12 and 13 feet water on them, the former being known as Lafferty's Home, bearing E. by S. ¼ S., 2 miles, and the other called George Rock, lying E. by N. ¼ N. one-third of a mile, from Nottawasaga Island light-house.

Collingwood Breakwater Light.—A fixed red light, visible 8 miles. Framework tower, or breakwater pier. Lafferty's Home shoal bears N. N. E. ¼ E. 1½ miles, with 12 feet of water on it. Entering pass about 150 feet east of the breakwater, when steer for the inner light on crib; pass it on the east side, when steer for the lights at the railway freight depot with the inner light on crib over the stern. There is good water at the railway docks.

Collingwood Inner Light.—A fixed red light, shown from a mast, with white shed at base, on crib. At the turn of dredged channel in harbor. Only required to show in the harbor.

Collingwood is situated on the southern shore of Georgian bay, and is 90 miles from Toronto by rail. It is the terminus of the Northern and Northwestern railway. The harbor works consist of an outer breakwater, 700 feet long, extending in a northeasterly direction from the west point of the bay; and a breakwater 1,200 feet long extending in a north-

westerly direction from the north wharf, in the direction of, and to within 600 feet of the east end of the outer breakwater. The present channel is 270 feet wide and $14\frac{1}{2}$ deep at low water. There are 5 red buoys on the edge of the channel, west side, one just outside the breakwater, three between the breakwater and the crib, on which the inner light is placed, and one inside the crib. And there are 6 black buoys on the east channel bank, one outside the east breakwater and 5 inside.

CHRISTIAN ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible 15 miles. White, circular tower, 60 feet high. On the southeast end of island, about 2 miles from main-land. Nottawasaga light S. S. W., $18\frac{1}{2}$ miles. A 10-foot spot bears S. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles. This shoal is 1 mile from mainland, and nearly in range of Point Cockburn. There is good anchorage in the bay north of the light. Keep about mid channel. Depth of water 13 to 15 feet.

HOPE ISLAND LIGHT-STATION.—A revolving white light, interval of revolution 1 minute, visible 12 miles. White, square, wood tower, with dwelling attached. On northeast point of island. Gin Rock light E. by S. $\frac{1}{4}$ S., $14\frac{1}{2}$ miles. The most westerly of the Western islands N. W. $\frac{1}{4}$ W., $13\frac{1}{2}$ miles. The shores of the island are rocky, and should not be approached on the north side nearer than three-fourths of a mile.

GIN ROCK LIGHT-STATION.—A fixed white light, visible 10 miles. White, square, wood tower. Entrance to Gloucester Bay. For guiding vessels into Penetanguishene and Midland harbors. Whiskey Island light S. S. W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles.

WHISKEY ISLAND LIGHT.—A fixed white light, visible 11 miles. White, square wood tower. At entrance to Penetanguishene harbor. To point out the island and shoals adjacent.

PENETANGUIHENE LIGHT-STATION.—A fixed white light, visible 8 miles. White, square wood tower. On a block built on the outer end of the shoal running north from the Reformatory point, this block is connected with the shore by a long pier, now much out of repair. It is on the south side, and must be left on the port hand in entering the harbor.

LONE ROCK BELL BUOY.—A Bell Buoy painted red has been moored in 48 feet of water 300 feet from the Lone Rock, in the Waubuno Channel, Georgian Bay. The buoy is of the "Brown patent" pattern, and the bell is rung automatically by the action of the waves. In very smooth weather the bell may not sound. The buoy must be kept on the starboard hand in going up the bay to the northward, as there is good water on the west side of the rock, but on the east side it is shoal. This buoy replaces the red barrel buoy.

PARRY SOUND LIGHT-STATION.—A fixed white light, visible 13 miles. White, octagonal wood tower on pier. On Red Rock. The channel up to the harbor is marked by buoys and day beacons. Cabot head W. $\frac{1}{4}$ S., 46 miles. Owen Sound lights S. S. W. $\frac{1}{4}$ W., 61 miles.

Clark Rock, with 9 feet of water over it, lies $1\frac{1}{2}$ miles S. $\frac{1}{2}$ E. from Red Rock light-house; there is also another rock with 14 feet over it 1 mile from the same on the same bearing.

Point au Baril Range Lights.—Front or Outer light. A

fixed white light, visible 10 miles, white, square wooden tower, 32 feet high. On the southern extremity of Point au Baril, close to the edge of the water, visible from all points seaward.

Rear or Inner Light.—A fixed red light, visible 10 miles, 60 feet above the level of the bay, visible over a small arc on each side of the line of range. Square open frame tower surmounted by an enclosed room and lantern; the frame is brown, the enclosed part white, 44 feet high. On the summit of an island in the inner channel, 4,800 feet E. by S. $\frac{1}{2}$ S. from front light. The two lights in range lead through the channel between the shoals which lie off the point. The outer light is to be left on the port hand in entering, the inner on starboard hand.

Day Beacons at Point au Baril.—Two white beacons have been erected on the shore 2 miles northwestward of Point au Baril front range light-house, on the east shore of the Georgian bay. Kept in line bearing N. E. $\frac{1}{2}$ E., they will lead a vessel northwest of the shoals between the Black Bills and Point au Baril. This range will be found serviceable in daylight, to a vessel proceeding to Point au Baril harbor from the southeastward. It intersects the line of the Point au Baril range light-houses, at $2\frac{1}{2}$ miles distant from the front one of the latter.

Day Beacons in inside channel, between Point au Baril and Parry Sound.—Fifteen beacons (6 red and 9 white) have been erected between Twin island, Sha-wa-na-ga bay and Point au Baril, to assist in the navigation of part of the inside channel leading to Parry sound, on the east side of Georgian bay. These beacons are not placed as ranges to clear shoals, nor is it intended that a vessel should rigidly steer from one to the other, but like the larger beacons in Parry sound itself, they are for the purpose of affording to a stranger an indication of the route among the numerous islands off this shore.

In proceeding towards Parry sound, a vessel should keep the red beacons on her starboard hand.

A few directions are now given, with a description of these beacons, which may assist a stranger drawing not more than $10\frac{1}{2}$ feet in getting through.

The inside channel between Twin Island and Point au Baril may be divided into three parts or reaches, the southern, widest and longest, being a part of Sha-wa-na-ga bay; the northern and narrowest division may be termed the Point au Baril reach, the remaining portion being considered the middle reach.

Of the beacons, four are erected in Sha-wa-na-ga bay, viz.: a red one surmounted by a white square on the southeast point of Twin island, a similar one on the southeast extremity of Grave or Bald island, a white beacon and triangle on the summit of Lloyd island (situated near the latter), and another of the same character on Turning island at the junction of Sha-wa-na-ga bay with middle reach. To reach clear of the dangers between Twin and Grave islands, Turning island should be kept its breadth open of Grave island. Between the last mentioned islands, a vessel may steer from one beacon to the other.

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In the middle reach, there are three beacons, which includes that on Turning island; the little rock on which the center one is placed being named Pym rock. The western white beacon is placed on Sedgewick point near the junction of the middle and Point au Baril reaches. Between Pym rock and Sedgewick point beacons a vessel should keep nearer the north shore to avoid a rock with 6 feet of water over it, lying on the south side of the channel.

In the Point au Baril reach there are 9 beacons, 4 of which are red, to be kept as before stated, on the starboard hand when proceeding to Parry sound.

The two southernmost red beacons are upon Abbott and Passage islands, between the latter of which and Sedgewick point is the narrow channel generally used, although (as will be seen when the chart is published) the channel between the next island and Abbott island is broader and deeper.

If using the narrow channel keep rather nearer Sedgewick point than Passage island, and a vessel will carry 15 feet of water and avoid a shallow rocky spur making out from Passage island.

When through these narrows, the first white beacon come to marks the south point of a bight, the coast of which a vessel should follow round, in order to avoid a rock with 8 feet of water over it, abreast of and connected with an island with a pole on it.

In the bottom of this bight a pair of small white beacons should be kept in line to lead east of this danger, and between the shoals 155 yards north of it, with 14 feet of water.

From this to Point au Baril harbor a vessel has only to keep in the middle of the channel pointed out by the remaining beacons.

When past the northern white beacon on Sidney island, the front light-house may be steered for; and if going out into Georgian bay, care must be taken to avoid the rock with 4 feet of water on it, lying in the middle of the passage north of Double island, by keeping close to its north point marked by the fishermen with a pole and red barrel.

Kennedy's Bank.—A spar buoy marked with white and black horizontal bands, has been placed in $6\frac{1}{2}$ fathoms of water on Kennedy's bank, which has 9 feet of water over it. The buoy bears west and is distant $3\frac{2}{10}$ miles from the highest Black Bill island. The water is good close to the northeast side of the buoy, but a vessel passing southwest should give it a berth of half a mile.

Morden Rock.—A spar buoy, marked with white and black horizontal bands, has been placed in $6\frac{1}{2}$ fathoms 100 yards southwestward of Morden rock, with 8 feet of water on it, situated 3 miles southward of the line of the Byng Inlet range lights, on the same coast.

The buoy bears S. W. by W. $\frac{1}{2}$ W., and is distant $2\frac{1}{2}$ miles from red rock of Byng inlet.

Although there is deep water all around this rock it is advisable for a vessel to pass southwestward of it and the buoy.

BYNG INLET LIGHT-STATION.—A fixed white light, visible 12 miles. White, square wood tower, 47 feet high. On Gereaux

island; to guide in to Byng Inlet. Point Wingfield S. W. $\frac{1}{4}$ W., 48 miles. Bustard Rocks light N. W. $\frac{3}{4}$ W., 17 $\frac{1}{2}$ miles.

Byng Inlet Range Lights. Front Light.—A fixed red light, 34 feet above water, visible 8 miles over a small arc on each side of the range. Square, white, wooden tower, stands close to the channel, on its south side $\frac{3}{4}$ mile N. E. by E. $\frac{1}{4}$ E. from the light on Gereaux island.

Rear Light.—A fixed white light, 60 feet above water, visible 18 miles over a small arc on each side of the range. E. by N. 1,520 feet from the Front light. Square, white, open frame wooden tower, the lantern and upper story are enclosed, and the side facing the range is slatted for a day mark.

The two lights in range, bearing E. by N., lead in to the mouth of Byng inlet through the best water, clear of the Maganatawan ledges on the south and Burton bank on the north side.

Rock in the Approach to French River.—Staff-Commander Boulton, R. N., reports that a rock with 9 feet over it at mean water (8 feet at the present time), lies W. $\frac{1}{4}$ S., half a mile from the southwest dry rock of the Bustards, in the approach to French river.

From the rock the main light-house appears midway between the pine tree and the small red light-house.

This is doubtless the reported rock referred to in Notice to Mariners No. 33 of 1888.

BUSTARD ROCKS Range Light.—Main or back light, fixed white, visible 11 miles. White, square wood tower. On a rocky islet at entrance to French river. A 16-foot spot bears S. W. by W. $\frac{1}{4}$ W., 1 $\frac{1}{2}$ miles.

Front Range Light.—A fixed white light, visible 6 miles. Red, square, open-frame wood tower, 77 yards N. E. $\frac{1}{4}$ E. from the last described light. After rounding the Bustard Rocks these two lights should be kept in range bearing S. W. $\frac{1}{4}$ W. until the two range lights in the river are brought into line, bearing N. E. by N. East fall of Cabot head S. S. W. $\frac{1}{4}$ W., 49 miles. South side of the east Papoose Island W. $\frac{1}{4}$ S., 15 $\frac{1}{2}$ miles.

French River Range Light.—Front light fixed white, visible 6 miles. White, square, open-frame tower. On Lefroy island west side of mouth of river.

French River Range Light.—Back light fixed red, visible 6 miles. White, square, open-frame wood tower. Near the creek, E. side of river N. E. by N. $\frac{3}{4}$ mile from Lefroy Island light.

LONELY ISLAND LIGHT-STATION.—A fixed white light, visible 20 miles. White, square wood tower, attached to dwelling. On the edge of cliff, 300 yards back from the north shore of the island, light 195 feet above lake level. Towards Cabot head the light is obscured by the southeastern portion of the island, when bearing northward of N. N. W. $\frac{1}{4}$ W. The light is also cut off by the western and southern portion of the island.

Lonely Island is almost circular in form; greatest diameter 1 $\frac{1}{2}$ miles. It lies in direct line between Cabot head and Cape Smyth, the east extreme of the island bearing N. by W. $\frac{1}{4}$ W., distant 20 $\frac{1}{2}$ miles from Cabot head, and S. by E. $\frac{1}{4}$ E. 15 miles from Cape Smyth. A bank

extends from the north and northeast sides of the island. There are not more than 18 feet, at 400 yards; the bight in the south shore is shoal to the line of its points. The remainder of the island can be approached to within 300 yards.

Dawson Rock.—A black spar buoy is placed in $5\frac{1}{2}$ fathoms near the north extremity of Dawson rock. A vessel may pass close northeastward of the buoy, but on all other sides it should receive a berth of not less than $1\frac{1}{4}$ miles. Lonely Island light bears W. S. W., 11 miles. This shoal is 1 mile in length and three-quarters of a mile in width. The least water is on the eastern side of the reef, varying from 4 feet on the southern part to 10 feet on the north extremity. Young Squaw islet, situated one-half mile northeast from the entrance of Squaw Island harbor, bears N. N. W. $\frac{1}{4}$ W., $16\frac{1}{2}$ miles from the north end of the reef, and Lonely Island light W. by S. $\frac{1}{2}$ S., 11 miles from the south end.

Northeast Shingle is the name given to a narrow bank, the shallowest part of which, 800 yards long N. N. E. and S. S. W. is composed of boulders, on which there is only 2 to 5 feet of water. This northern portion bears from Lonely Island light N. E. $\frac{1}{2}$ E., distant 4 miles and generally breaks. In addition to this very shallow patch, dangerously shoal water extends from it in a N. E. and S. S. W. direction, half a mile and 1 mile respectively, making the total length of the shoal $1\frac{1}{2}$ miles. The southern extreme, with a depth of 12 feet, bears N. E. by E., distant a little over 3 miles from the light-house. The summit of Fitzwilliam island, in line with the northwest extremity of Lonely island, W. by S., leads 1 mile southward of Northeast Shingle. The southeast visible extreme of Fitzwilliam island touching the same part of Lonely island, bearing W. S. W., leads a quarter of a mile southeast of it, with 5 fathoms. The northwest side of Fitzwilliam island in line with the same side of Club island, W. by S. $\frac{1}{2}$ S., leads northwestward of this shoal.

In thick weather a vessel should not approach the southeast and west sides of Northeast Shingle to a less depth than 20 fathoms. On the north end and east sides she may shoal to 10 fathoms.

Club Island is two miles long N. N. E. and S. S. W., with a maximum breadth of one mile, the northwest, north and east sides are fairly steep to, but from South point, Club Island ledge extends in a general S. W. by S. direction, $\frac{2}{3}$ of a mile, at which distance there is a depth of $3\frac{1}{2}$ fathoms. To pass eastward of this ledge, keep the point of Club island, which is north of the harbor, well open east of South point, bearing N. N. E.

The east extreme of Rabbit island in line with the same side of Erie shingle, N. $\frac{1}{2}$ W., leads west.

The south end of White cliff (Manitoulin island) in line with northeast point of Fitzwilliam island, W. by N. $\frac{1}{2}$ N. leads $1\frac{1}{2}$ miles south of Club Island ledge.

From the south point of Club island, the stony shore trends in a N. N. W. direction, nearly $1\frac{1}{2}$ miles to Back cove (a shallow indentation into which a boat may carry 6 feet of water).

From this shore of Club island, shoal water extends an average distance of one-third of a mile. From Back cove, the coast trends northeastward, and is steep-to.

CLUB ISLAND HARBOR, with its entrance on the east side of the island contains excellent, although limited, anchorage in $3\frac{1}{2}$ fathoms.

The entrance is obstructed by two rocky ledges, known as **North shoal** and **South spit**, between which not less than 15 feet may be carried in.

North Shoal, with depth varying from 4 to 9 feet, extends 250 yards from the north shore of the entrance.

South Spit, with the same depth, makes off 100 yards from the northeast part of Fishery point (as the south entrance is called). The western gravelly part of this point is steep-to, close to the dry stones, and not less than 12 feet water will be had at a radius of 230 yards from this gravelly point, right around to North shoal. At a greater distance, the water rapidly shoals to the shores. The anchorage under Fishery point is confined to a space of about 6 acres.

Day Beacons.—On Fishery point are erected two white beacons, which in line, S. W. by W. $\frac{1}{4}$ W., lead southeast of North shoal. On the western shore of the harbor stand a couple more, which in line, W. $\frac{1}{4}$ S., lead between North shoal and South spit, with the least water of 15 feet. In approaching the harbor, therefore, the back one of the Fishery point beacons should be kept south of its fellow, until the West beacons are in line, when proceed in; turn sharp around Fishery point and anchor in the middle of the cove, with the entrance points in line.

Erie Shingle is the name of a narrow bank of small stones elevated 7 feet above water, 300 yards in length, N. W. and S. E. The northeast side is steep-to, but shoal water extends in every other direction. Westward, it makes out nearly half a mile, where there is not more than 12 feet. Rather more than that distance southward there is but 15 feet, with 5 feet 400 yards northeast of it.

A detached patch, with 16 feet on it, lies S. W. by S., a little more than $1\frac{1}{2}$ miles from Erie shingle.

To pass westward of Erie bank, keep Church hill (James bay) open westward of Rabbit island half the breadth of the latter, N. $\frac{1}{4}$ W. The south end of Owen island (Manitoulin), touching the northwest side of Wall island, W. by S. $\frac{1}{4}$ S., leads a $\frac{1}{2}$ of a mile northwest of it. Lonely island light-house open north of Club island, E. $\frac{1}{2}$ S., leads north.

OWEN CHANNEL (North Passage) is the name given to the passage into Georgian bay from Lake Huron, between Manitoulin island and Fitzwilliam island, being in the narrowest part a little over a mile wide from shore to shore. A description of the dangers will now be given.

Little Rock, with 13 feet water on it, as the name indicates, is a small patch lying N. by E. $\frac{1}{4}$ E., distant $1\frac{1}{2}$ miles from the southwest extreme of Perseverance island. A rock, with 19 feet water, lies N. by E., nearly $1\frac{1}{2}$ miles, and another, with 21 feet, N. N. E. $\frac{1}{4}$ E., a little more than that distance from the same island.

These are the shallowest outlying spots between Perseverance island and Phœbe point.

Shoal water extends from the latter to the depth of 18 feet, W. by S. $\frac{1}{4}$ S., one-third of a mile.

Channel Rock, 6 feet above the water, and sufficiently separated from the shore of Fitzwilliam island, as to render it conspicuous, is situated one-third of a mile northeastward from the northwest part of

Phoebe point. Between the latter and Channel rock, shoal water extends from the shore, 300 yards.

Stewart Rock, with 4 feet on it, bears N. W. $\frac{1}{2}$ W., 600 yards from Channel rock. From Stewart rock the bank continues in a south-westerly direction, half a mile, with a depth of from 12 to 18 feet.

Ship Bank is the name given to an extensive piece of shoal ground, separated from Stewart rock by a narrow lane of 4 fathoms. The least water on Ship bank is 10 feet. The length of the shoal, under the depth of 18 feet, is rather more than half a mile east and west, by a quarter of a mile in breadth.

A Patch of 4 fathoms lies N. N. W., 350 yards from the northwest angle of ship bank.

Owen Island is 200 yards long north and south, and separated from the Manitoulin shore by a similar distance. It is the only small island on this shore of Owen channel, and therefore easily recognizable.

Owen Island Bank, with depths varying from 12 to 18 feet, extends on all sides from Owen Island; the depth of 13 feet being found at half a mile due East of the south extremity, and the same depth S. by W., 400 yards. This bank renders the shore of Manitoulin island shoal for three-quarters of a mile from Owen island towards Georgian bay, and the same distance in the direction of Lake Huron.

At half a mile N. E. by E. $\frac{1}{2}$ E. from the south end of Owen island, is the southern edge of a rocky spit, having 7 feet of water on it, extending 500 yards from the shore abreast.

The coast of Manitoulin island $1\frac{1}{2}$ miles westward of Owen island takes a more northerly turn, forming

Hungerford Point.—This most southerly extreme of Manitoulin island may be known by its small white stony beaches. Scattered stones and shallow water extend from this point, and from the shore westward of it, a distance of a quarter of a mile, leaving a fairly steep shore between it and Owen island bank, for one-third of a mile.

Beach Point, of Fitzwilliam island, derives its name from the fact of its being the northeasterly termination of a long stony beach, with four small sharp points of rock jutting out on it. This point is important, as being the boundary between the shallow and deep waters on this side of Owen channel.

Beach Point Flat is the name given to an extensive rocky bank, with 12 to 15 feet over it, fronting the beach just alluded to. It commences at Beach point, and its north edge runs W $\frac{1}{2}$ N., for half a mile. Thence, under the name of the Ridge, it joins Owen Island bank with not less than 17 feet water. The northeast side of the ridge rises abruptly from a depth of 10 fathoms.

The edge of Beach point flat will be found stretching 400 yards off the southwest end of the beach whence it derives its name. Hence, it continues almost straight to Channel rock, before described.

DIRECTIONS FOR TAKING OWEN CHANNEL.—In approaching this channel from the westward or northwestward, in Lake Huron, bring the north fall of Fitzwilliam island (near Rattlesnake harbor) in line with the eastern part of Beach point bearing E. $\frac{1}{2}$ N. This range leads through the **North Passage** (as the deep water between Ship bank and Hungerford point is called) as far as Beach point;

shoal water extends

$\frac{1}{2}$ W., 600 yards continues in a south-
west to 18 feet.

A piece of shoal
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Manitoulin island shoal
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CHANNEL.—
thwestward, in
near Rattlesnake
bearing E. $\frac{1}{2}$ N.
deep water be-
as Beach point;

with 7 fathoms in North passage, 5 fathoms southward of Owen Island bank, and across the ridge with not less than 17 feet. If wishing to proceed along the east coast of Manitoulin island, as soon as the southwest end of Perseverance Island is in line with Phoebe point, bearing S. W. by S., the Ridge may be crossed on this range, or anywhere between this range and the original one, with not less than 17 feet of water.

SOUTH PASSAGE of Owen channel divides Stewart rock from the shallow shore of Fitzwilliam island; its least breadth being 350 yards and depth 4 fathoms.

To take this passage from Lake Huron, bring the right or south extreme of Wall island trees in line with the northwest side of Fitzwilliam Island N. E. by E. $\frac{1}{2}$ E. Keep this range, crossing the bank extending southwestward from Stewart rock, with not less than 21 feet water, until the southwest end of Perseverance island is in line with Phoebe point, when keep the latter marks on to cross the ridge as before directed.

In approaching the entrance to Owen channel from the southwestward the southwest extreme of Perseverance island should not be brought to bear southward of S. S. E. until (if wishing to take the South Passage) the marks for that channel come on. Or (if preferring the North Passage) until the west side of Owen island is open the least thing south-eastward of the Manitoulin shore, bearing N. E. by E. This range should be kept, to lead westward of Ship bank, until the regular North Passage leading mark comes on.

In thick weather, the west side of Fitzwilliam island should not be approached to a less depth than 20 fathoms.

Northeast Point Reef.—From Northeast point (as the extremity of Fitzwilliam island is called), a shoal, with from 6 to 15 feet water over it, makes off in the same direction 500 yards.

Wall Island lies, with its low, narrow south extremity, bearing N. N. E. $\frac{1}{2}$ E., and is distant nearly 1 mile from Northeast point.

The Wall.—From the south end of Wall island, a reef, named the Wall (on account of the steepness of its eastern side), extends S. $\frac{1}{2}$ E., 1 mile. It is a very dangerous reef, having only 7 feet water near its southern end. A detached spot, of $3\frac{1}{2}$ fathoms, lies S. E. by E. $\frac{1}{2}$ E., 600 yards from Northeast point.

The east fall of Cape Smith shore in line with the east extreme of Rabbit island, N. by E. $\frac{1}{2}$ E., leads $\frac{1}{2}$ mile eastward of the Wall.

On the west side of Wall island are two small islets, separated from the main island by a distance of 200 yards.

West Flat.—From these two islands, sunken rocks and shoal water extend nearly $\frac{1}{2}$ of a mile, to pass northward of which, keep the whole of Club island open north of Wall island, E. by S. $\frac{1}{2}$ S.

Northeast point of Fitzwilliam island, touching any part of Flowerpot island, leads west of this shoal. The north side of Wall island is steep-to, and the east side fairly so.

RATTLESNAKE HARBOR.—The north entrance point of this excellent harbor is situated three-quarters of a mile southwestward from northeast point of Fitzwilliam island. It contains shelter from all winds in from 3 to 5 fathoms over mud. Little island is a good mark in approaching the harbor. A narrow ridge of dry stones extends from the island, E. N. E., 200 yards; from the end of these stones, shoal water continues in a northeasterly direction, 200 yards further.

From the north entrance point of Rattlesnake harbor a spit extends in a westerly direction, 200 yards, leaving a passage between it and the shoal water from Little island, before alluded to, 400 yards in width, through the middle of which 4 fathoms may be carried in the harbor.

Little Island, and the shore of Fitzwilliam island for $\frac{1}{2}$ a mile westward of it, should not be approached nearer than 300 yards; thence to Beach point (previously described) the shore is steep-to.

FITZWILLIAM CHANNEL is the name given to the passage between Fitzwilliam and Yeo islands, the dangers in which will now be described.

YEO ISLAND is $1\frac{1}{2}$ miles long, by $\frac{3}{4}$ of a mile in breadth. It has two summits, each about 100 feet high; the northeasternmost, known as Black summit, falling steeply to the bay. The northeast, east and southeast sides of Yeo island are fairly steep-to, but from the north gravelly point, 200 yards northwest of Black summit, a rocky spit with less than 6 feet water over it, makes out in a N. by E. $\frac{1}{2}$ E. direction, 400 yards, under the name of

Yeo Island Spit.—To pass northward of this spit, keep Cove Island light-house in sight (and at night, the light), S. by E.

Indian Harbor Point is the name given to the southern extreme of Fitzwilliam or, as it is usually called, Horse island.

It forms also the eastern entrance point to Indian harbor; a boat cove, much resorted to by the Manitoulin Indians, during the trawling season for trout, in the fall of the year.

The point is at present well marked by a large stone cairn.

Indian Harbor Reef is a dangerous rocky ledge, extending in a southwesterly direction, over three-quarters of a mile from the above-mentioned point, with depths on it varying from 4 to 18 feet.

To pass southeastward of this reef, with 22 feet least water, keep the south extreme of Club island a little open southeast of Fitzwilliam island, N. E. by E.

McLelan Rock, with 12 feet of water over it, is the worst obstruction in Fitzwilliam channel. It is 300 yards long in an E. N. E. and W. S. W. direction, by 200 yards broad. The centre of the shoal bears S. S. W. $\frac{1}{4}$ W., distant a little more than a mile from Indian harbor point. The passage, between this rock and Indian harbor reef is nearly one-third of a mile wide and 7 to 9 fathoms deep.

Smith Shoal is a small rocky patch with three fathoms over it, lying south nearly $1\frac{1}{2}$ miles from Indian Harbor point.

A bank with 6 to 9 fathoms joins this and McLelan rock, from which it is separated by a distance of half a mile.

This passage however cannot be safely used by strangers of large draught, on account of there being no leading mark.

The Best Passage through Fitzwilliam Channel is between Smith shoal and Yeo island, by keeping the southeast fall of Lonely island in line with the northwest side of James island, N. E. by E. $\frac{1}{2}$ E.

This mark also leads northwest of Manitoba ledge, but requires clear weather to discern Lonely island.

When the north end of Flower-pot island appears northward of Yeo

land, steer N. E. by E., midway between the south point of Club island and the northwest extremity of Lonely island.

This course shall lead between James Island reef and McCarthy point ledge.

If wishing to proceed in the direction of Cape Smith, when past James island, steer N. N. E., keeping a little to the eastward of a line joining the east sides of James and Rabbit islands.

McCarthy Ledge.—The eastern edge of this danger runs from McCarthy point (which is on the east side and about the middle of Fitzwilliam island) in a general S. W. by S. direction, 2 miles, where it terminates in a small rocky isolated patch, with 13 feet water over it.

To pass east of this danger, keep the east fall of Fitzwilliam island (near Rattlesnake harbor) in line with Pavement point N. N. E.

James Island, 2½ miles south of McCarthy point, is 9 feet high, and nearly 400 yards long north and south, by half that distance in breadth. Its north side is fairly steep-to, but a rocky ledge extends southwestward from it any depth under 15 feet, for a distance of rather more than 1 mile.

James Island Reef, as this shoal is called, has a channel between it and Yeo island spit, ¼ mile in width, and 4 to 8 fathoms in depth; to pass through which, keep the west extreme of Lucas island locked with the east point of Yeo island S. by W.

RABBIT ISLAND, situated due south, 4½ miles from the entrance to James bay, may be approached on its northwest, north and east sides, to 100 yards; but from the southwest low shore an extensive bank spreads out, known as

Rabbit Island Bank.—W. by S. ¼ S., a little more than a third of a mile from the west point of the island, there is only 7 to 9 feet of water, while from the southeast extreme it runs off equally shoal, S. by W., nearly a quarter of a mile.

A patch, with 15 feet over it, is situated with its south end bearing S. W. ½ S., nearly a mile from the west extremity of Rabbit island.

Another spot, with 3½ fathoms on it, lies S. W. by W. ¼ W., distant 1½ miles from the same. South point of Club island open south of Erie shingle, S. E. ¼ S., crosses Rabbit island bank, southwest of these shoals, with 4 fathoms. Northeast point of Fitzwilliam island in line with the very west extreme of Wall island, S. by W., leads westward of these shoals, with 4½ fathoms. Horsburgh point well open east of Rabbit island, bearing north, leads eastward of this bank.

The Coast of Manitoulin Island trends from Little bluff, N. E. ¼ N., 5½ miles, to Red Cliff bight (so called from a small, low earth cliff of that color); and for the first 3 miles is steep-to. Thence, across the bight above mentioned, to the southwest part of Tamarack point, the shore is foul.

Tamarack Cove runs in north of the latter point one-third of a mile, but on account of there being only 6 to 7 feet water, and that over a rocky bottom, it is only fit for boats.

From the southwest part of Tamarack point, the coast is again steep-to, for a couple of miles, as far as the south point of Shallow cove, from the north point of which a shoal extends in a S. by W. direction, nearly one-third of a mile.

From the north point of Shallow cove the coast continues foul to the extent of 300 yards, as far as the last of these indentations, known as North cove. Hence, to within one mile of the turn in, to James bay, the straight shore may be approached to 200 yards.

HORSBURGH POINT (Manitoulin island) is the name given to the southern point of James bay, and has good water on the northeast side, but from the east shore, for $1\frac{1}{2}$ miles southward of the turn in, to James bay, shoal water extends a distance of 300 yards.

James Bay is a wide, open indentation northward of Horsburgh point, with a sandy beach nearly three-quarters of a mile broad. On the northern side of the bay is snugly situated one of the Ojibbewa Indian reserve villages, called Wekwemikongsing. The church stands upon the rising ground, nearly half a mile back from the village, and is conspicuous from the bay.

Church Hill.—Northwestward, nearly three-quarters of a mile from the church, is a hill 300 feet high, rendered conspicuous by its steep fall to the northeastward, and long slope in the opposite direction.

James bay is shallow, not more than 12 feet being found, 400 yards from the north and west shore.

Clay-cliff is the name given to a remarkable bank of white clay and gravel, 260 feet in height, which with the lower cliffs of the same character on either side of it, presents a conspicuous object to the mariner.

From these cliffs, shoal water extends for a distance of 400 yards, and so continues $3\frac{1}{2}$ miles, until one-third of a mile from an isolated patch of dry stones, known as the Nest. Hence to the northeast extreme of Cape Smith, the shores may be approached to 200 yards.

Cape Smith to Clapperton Island, including Gull Islands and Collins Inlet.

Cape Smith forms the south entrance point to Smith bay, at the head of which is situated the Indian village Wekwemikong. The cape is rendered conspicuous by the sudden termination of the clay bank. The bank culminates here in a height of 370 feet, including the trees. The northeast extreme of the cape bears N. by W. $\frac{1}{4}$ W., and is $17\frac{1}{4}$ miles from the east point of Lonely island, and S. S. W. $\frac{1}{4}$ W., 12 miles, from Killarney east light-house. This part of the cape may be passed at a distance of 200 yards in a depth of 5 fathoms.

Campbell Rock, with 12 feet of water over it, lies N. E. $\frac{1}{4}$ E., $2\frac{1}{4}$ miles from the northeast point of Cape Smith, and W. $\frac{1}{4}$ S., $3\frac{1}{4}$ miles, from the west rock of Squaw island. For a large draught vessel in a southeast sea, this is a formidable danger. The eastern part of Cape Smith bearing south, will lead $1\frac{1}{2}$ miles west of Campbell rock. If proceeding to Killarney, an excellent mark is afforded by keeping Horsburgh point just open of Clay cliff, S. W. by S., which will lead a vessel half a mile eastward of Campbell rock. A vessel will be northward of this danger when Papoose island passes northward of Young Squaw island, E. $\frac{1}{4}$ N. When the same island is touching north point of Squaw island, E. by N., a vessel will be south of the danger.

From the northwest prong of Cape Smith the shore trends in a south-
west direction, $\frac{3}{4}$ mile, to East Red cliff, and $1\frac{1}{2}$ miles to West Red cliff.

Red Cliff Flat.—Between the northeast and northwest prongs of
the cape, the coast is shoal about 300 yards out, and westward of this it
deepens, when N. W. $\frac{1}{4}$ N., nearly $\frac{1}{2}$ of a mile from East Red cliff, with
12 feet water over it.

Gold-Hunter's Bank, with 6 feet of water on it, lies N. W. by
W. $\frac{1}{4}$ W., nearly $1\frac{1}{4}$ miles from the northeast extremity of Cape Smith.
It is a circular patch of small boulders, 200 yards in diameter. Cape
Smith points in range leads south of it, E. by S. $\frac{1}{4}$ S. The top of Badgely
island, in line with the east side of Big Burnt island, N. by E. $\frac{1}{4}$ E.,
leads west of Gold-hunter bank.

Wekwemikong is situated on the rising ground in the north-
west corner of Smith bay.

William or Whiskey Island is on the northern side of Smith
bay. It is 800 yards long northeast and southwest, and 200 yards wide.

Pelkie Rock, with 8 feet on it, is in the track of vessels entering
the bay from the north. It is $\frac{1}{2}$ mile long northeast and southwest, and
200 yards wide; its southern end bears E. $\frac{1}{4}$ S., $1\frac{1}{2}$ miles, from the south
point of William island. The summit of Badgely island well open east
of Big Burnt island, N. by E. $\frac{1}{4}$ E., leads east of it.

Big Burnt Island is the largest and easternmost of the group
of islands, is $1\frac{1}{2}$ miles long, and $\frac{1}{2}$ mile wide, its northeast point is N. $\frac{1}{4}$
W., $5\frac{1}{2}$ miles from the east point of Cape Smith.

Bernard Rock.—Red and black horizontally striped spar buoy
placed on it lying between George and Big Burnt islands. The rock,
with 10 feet of water over it, bears S. W. $\frac{1}{4}$ S., distant 5 miles from Kil-
larney East light. The summit of Badgely island, over the end of Ko-
nnongwi, leads east, and over the west end of the island, leads west, and
Killarney East light, shut in with George island, leads north of it. The
south fall of Sheguiandah hill in line with Bold point, Manitoulin island,
W. $\frac{1}{4}$ N., leads 200 yards south of Bernard rock.

Northwest Burnt Island is situated half a mile northwest-
ward from Big Burnt island. It is next in size to the latter, being a
little more than $\frac{1}{2}$ mile long.

Burnt Island Bank is a dangerous shoal extending northward
and eastward from Northwest Burnt island; the total length of the shoal
being $1\frac{1}{2}$ miles in an east and west direction. The western part is the
shallowest, with only 1 foot of water on it and generally breaks, but the
eastern part, with 6 feet on it, is the most dangerous, being the turning
point into the North channel of Lake Huron. To pass eastward of it,
keep the Lion's Head (a sharp and conspicuous hill between Badgely
island and Frazer bay) in line with the east end of High beach (on the
south shore of Badgely island), bearing N. $\frac{1}{4}$ W. And to pass north-
ward of it, bring Ead's bush (Little Current) to the northward of the
summit of Heywood island, and in line with the south shore of Partridge
island, W. by N.

Skull Point, on Manitoulin island bears W. $\frac{1}{4}$ N., $1\frac{1}{2}$ miles from
the north point of Northwest Burnt island.

SKULL POINT REEF extends in a direction a little east-
ward of north, $\frac{1}{2}$ mile; least water on it three feet; between this reef and

Burnt Island bank there is deep water for $\frac{1}{2}$ a mile. Indian Dock point, just in sight W. S. W. leads northwestward of this shoal. The middle of Kokanongwi island in line with the south point of Badgely island N. by N. $\frac{1}{4}$ N. also leads clear on the same side.

Bold Point, with good water close-to, is $\frac{3}{4}$ mile northwestward of Skull point. It is the most northerly point of this peninsula.

SQUAW ISLAND.—Its south point bears E. $\frac{1}{2}$ S. $5\frac{1}{2}$ miles from Cape Smith, the island itself is low, but its thick and fairly high timber makes it visible a considerable distance. It is an important fishing station. The island is $1\frac{1}{2}$ miles long, greatest breadth 1,200 yards.

Young Squaw islet is N. E. by E. $\frac{1}{2}$ mile from the north point of Squaw island, and is connected to it by a rocky bar, with 6 feet of water on it.

Annie Rock, with three feet, lies N. W., $\frac{1}{2}$ mile from Young Squaw, and shoal water extends the same distance in the opposite direction.

West Rock is a small bank of limestone gravel 5 feet high, W. S. W. one mile from north point of Squaw island, it is separated from the latter by a narrow channel with 4 to 5 fathoms, but should not be attempted by strangers.

North Spit extends in a N. $\frac{1}{4}$ W. direction $\frac{1}{2}$ mile from West Rock, at which distance there is 13 feet. West Rock should not be approached from the westward nearer than 600 yards, while S. by W. $\frac{1}{2}$ W., $\frac{1}{2}$ mile from West Rock, is the southern termination of the bank, with the depth of 3 fathoms, which shoals rapidly as West Rock is approached.

Ragged Point is situated about the middle of the west side of Squaw island, which is fringed with boulders and shoal water for a distance of $\frac{1}{4}$ mile, while off this point, a bank extends W. S. W. half a mile, with less than 3 fathoms.

South Point is the southerly terminatⁿ of the island; shallow water extends 600 yards from it.

The Bar is the name given to the shallow, rocky bank, just east of the entrance of the harbor, with depth from 6 to 12 feet. To clear the northeast side of it, Lion's Head should be kept open of Young Squaw, N. W. $\frac{1}{4}$ N. To lead southeast of it, keep Clay cliff (Cape Smith shore) open southeast of Squaw island, S. W. by W.

Squaw Island Harbor is on the north east side of the island, and contains shelter from south winds, as indeed from all winds, depth from 12 to 15 feet over mud. No vessel drawing over 8 feet should attempt to enter it; the larger vessels should anchor with the southeast point of entrance W. N. W., about $\frac{1}{2}$ mile.

Directions for Entering Squaw Island Harbor.—If from the southward, bring the Lion's Head in line with north point of Squaw island, N. W. $\frac{1}{4}$ N., proceed to the southeast entrance point on this mark; round the point closely, and anchor in the middle of the harbor or run to the dock. If from the northwestward, give the ground about Annie rock a good berth; after passing Young Squaw, keep Lion's Head open northeast of it, until Clay cliff is seen open of south point of Squaw island; steer on this mark until the low southeast entrance point of the harbor bears N. W. by W. $\frac{3}{4}$ W., when the latter point may be steered for.

Alec Clark Rock, with 3 fathoms of water on it, is a narrow bank $\frac{1}{2}$ mile long, N. N. W. and S. S. E., and lies with the north extremity bearing N. E. $\frac{1}{4}$ E., two-thirds of a mile from Young Squaw, and in this position will be found only 13 feet. There is from 4 to 6 fathoms between this rock and Young Squaw.

Matheson Rock, with $3\frac{1}{2}$ fathoms, lies E. $\frac{1}{4}$ S., nearly 2 miles from Young Squaw.

Azov Ledges are very dangerous rocks, S. W. by W. $\frac{1}{4}$ W., nearly 2 miles and $1\frac{1}{4}$ miles respectively from South point of Squaw island. These shoals are separated from Squaw island $\frac{3}{4}$ mile, with 5 to 7 fathoms, but its passage should not be attempted by strangers. The N. W. side of Green island, touching the southeast extreme of Squaw island, N. E. $\frac{1}{4}$ E., leads 200 yards S. E. of Azov ledges. The north extreme of Cape Smith, in line with the southwest end of Wekwemikong clay bank, W. by N. $\frac{1}{4}$ N., leads $\frac{3}{4}$ of a mile south of the Azov ledges. In thick weather do not shoal to less than 10 fathoms around Squaw island and its shoals.

Papoose Island, 10 feet high, bears W. $\frac{3}{4}$ N., distant $3\frac{1}{2}$ miles from Gull island. It is one-third mile long east and west, quite narrow, and divided into two parts by a boat channel. A few huts are erected on the western and larger portion. The east, north and northwest sides of Papoose island may be approached to 200 yards, but from the south side a dangerous rocky ledge extends $\frac{1}{2}$ mile. To pass southwestward of this reef, keep Broad hill in line with Killarney East light-house, N. W. by N.

Gull Island lies E. by S. $\frac{1}{4}$ S., 16 miles from the eastern entrance to the North channel of Lake Huron, and S. S. E. $\frac{1}{4}$ E., $4\frac{1}{2}$ miles, from the east side of Green island. It is 10 feet high, 350 yards long north-east and southwest, and 100 yards wide, the southern portion having on it a few stunted trees and bushes. Shoal water extends 200 yards from the southeast side, and 250 yards from the southwest side; the rest of the shores are bold.

Green Island, so called on account of its trees. It is composed of limestone from 10 to 15 feet high, and over $\frac{1}{2}$ mile in diameter. It bears S. E. by E. $\frac{1}{4}$ E., and is distant $8\frac{1}{2}$ miles from Killarney East light-house, and may be said to mark the northern limit of the deep water in this locality. It is $3\frac{1}{2}$ miles from the coast of Phillip Edward island, and $6\frac{1}{2}$ miles from the east entrance to Collins inlet. Shoal water extends from the southwest and west sides of the island a distance of 300 to 400 yards; the remainder of the island may be approached to 200 yards.

Steele Rock, with 11 feet water on it, is a small spot W. $\frac{1}{4}$ N., $\frac{3}{4}$ mile from the west point of Green island, and between is a good passage of 10 or 11 fathoms.

Single Rock is a solitary stone 4 feet high, E. $\frac{3}{4}$ S., $\frac{3}{4}$ mile from Scarecrow island, and it may be approached on all sides to 50 yards.

Scarecrow Island, fairly wooded, 6 feet high, lies due west nearly 2 miles from Green island, and S. E. $\frac{1}{4}$ E., $7\frac{1}{2}$ miles from Killarney East light-house. It is 200 yards in its greatest length, composed of limestone gravel. Its north side may be approached to 150 yards, but on its other sides shoal water stretches off under the name of

Scarecrow Island Bank.—This rocky bank extends from the

island 400 yards in a S. E. direction, and to the S. W. half a mile. To pass westward of it, keep Red rock in line with Killarney peak N. N. W. $\frac{1}{4}$ W., and to pass northeastward of the bank keep the gap westward of Leading-mark hill in line with Red rock N. W. $\frac{1}{4}$ N.

Smooth Rock, 18 feet high, N. by E. $\frac{1}{4}$ mile from the north gravelly point of Green island, the water is deep close-to on all sides. The passage is good between Green island and Smooth rock, but strangers should not attempt to pass through any of the channels between the islands north of Smooth rock.

Southwest Hawk Island is the name given to an island 38 feet high, situated N. N. W. $\frac{1}{4}$ W., a little over three quarters of a mile from the northwest extremity of Green island. It is the most southerly and westerly of the group of islands north of Green island. It has a few trees on its summit, and is steep-to on its west and southwest sides.

Le Haye Rock, small and just above the surface, lies N. W. $\frac{1}{4}$ N. $1\frac{1}{2}$ miles from the west point of Green island. The water is bold on its south and west sides.

The Triangle is three sunken rocks, with 4, 7 and 8 feet water over them. The southwestern rock of the three, with 7 feet water on it, lies with the east end of Papoose island open westward of Scarecrow, the breadth of the latter, and bears from the west point of Green island N. W. by W. $3\frac{1}{4}$ miles.

West Fox Island is the most westerly of a group of islands $1\frac{1}{2}$ miles northwestward of Hawk islands. It is from 70 to 80 feet in height, fairly wooded and nearly a quarter of a mile long north and south; dry rocks lie 400 yards off its south and southwest sides. The west point of West Fox island bears N. W. by N., and is distant $3\frac{1}{4}$ miles from the west point of Green island.

Nicholson Rock, with 5 feet water upon it, lies half a mile southwestward from this island.

The Brothers are two small rocks, 5 feet in height, $\frac{3}{4}$ mile west-northwestward from West Fox island. They bear E. by S. 2 miles from Red rock.

Harty Patches are the names of two small rocks, with 6 and 13 feet on them, lying half a mile westward of the Brothers. The northeast and shallower one bears E. by S. $1\frac{1}{4}$ miles from Red rock.

Red Rock, a bare islet of that color E. by S. $\frac{1}{4}$ S., $3\frac{1}{2}$ miles from Killarney east light-house, and N. W. $\frac{1}{4}$ N. $4\frac{1}{4}$ miles from Scarecrow island; it is 11 feet high, and by its isolation is conspicuous. It is a good guide to the approaches of the western entrance to Collins inlet.

A Rock with 10 feet over it, lies 150 yards northwestward of Red rock, and a spot with 13 feet on it, lies N. by W. $\frac{1}{4}$ W., 250 yards from the same; Red rock is otherwise bold-to.

Alexander Rock, with 9 feet on it, lies S. E., $1\frac{1}{2}$ miles, from Red rock.

Halkett Rock, with 5 feet over it, lies E. by N. $\frac{1}{4}$ N., $\frac{1}{2}$ mile from Red rock.

To pass southward of all these dangers, a vessel should not proceed farther eastward than to bring Red rock in line with the gap westward of Leading-mark hill, N. W. $\frac{1}{4}$ N. This mark leads but 200 yards southwestward of Alexander rock.

COLLINS INLET is the name given to the water which separates Philip Edward island from the main shore; it can be entered on either side of the island, but the eastern entrance is an indifferent one, and has fallen into disuse. A considerable lumber business is carried on by the Midland and North Shore Lumber Co. Vessels drawing less than 10 feet can proceed to the mill about 11 miles from the western entrance, which is $4\frac{1}{2}$ miles east-northeastward from the east entrance to Killarney, where it is recommended that strangers should procure a pilot.

GEORGE ISLAND, which may be said to be the north entrance point of the North channel of Lake Huron, is of a triangular shape, the length of each of the sides being about $1\frac{1}{2}$ miles, the northeast side forming the south shore of Killarney harbor. The southeast coast from northeast point is bold-to.

Petley Rock, with 1 foot of water on it, lies 150 yards from the south extreme of George island, and shoal water continues from it 400 yards in a W. S. W. direction. The shore here should be given a berth of $\frac{1}{2}$ of a mile.

George Rock, the top of which is just covered, lies N. by W. $\frac{1}{4}$ W., a little over $\frac{1}{2}$ mile from Sandy cove ledge, and $\frac{1}{4}$ of a mile from the nearest part of George island.

Sandy Cove Ledge, 2 feet high, lies 250 yards from the mouth of the cove, S. W. point of George island; from it the water falls off deep to the westward and southward; there is no passage between it and the shore. The west side of George island to Fish point, its N. W. extremity, is rugged and fringed with a rocky bank extending for an average distance, $\frac{1}{4}$ mile from shore.

Gull Roost, 11 feet high, is the highest of the granite rocks which skirt the shore.

Fish Point is the northwestern extremity of George island; it is composed of two low, bare islets, 5 feet high.

Ann Long Bank.—A depth of 7 feet will be found 500 yards in a westerly direction from Fish point; to lead west of it, keep the west lighthouse in line with the highest part of Leadingmark hill, N. E. $\frac{1}{4}$ N.

KILLARNEY EAST LIGHT-STATION.—A fixed white light, visible 12 miles. White, square wood tower, light 42 feet above lake level. The old reflectors have been replaced by a lens apparatus. The light shows with equal intensity in all directions, and is visible in the bay to the eastward of the station where the old light did not show. It is situated on Red Rock point (close to which there is deep water), on the north side of the eastern entrance to the harbor. One mile east of Killarney.

Entrance Rocks, 6 feet high, lie 150 yards northward of the northeast point; they are 100 yards in extent northwest and southeast; not more than 8 feet can be carried between them and George island, but they are steep-to on the north side.

Jackman Rock, a small lump with 8 feet least water over it, lies E. by S. 200 yards from Entrance rock. Fish point closed with the docks on the north shore W. by N. $\frac{1}{4}$ N., leads north of this obstruction.

Killarney Harbor is a narrow strait dividing George island from the main shore, and affords excellent shelter from all winds, least depth in the channel being 21 feet, the north shore of the harbor is in-

dented by three coves, the easternmost of which runs in immediately westward of the east light-house.

Range Lights.—To be built.

Directions for Entering Killarney Harbor from the Southeastward.—Bring the east light-house under the highest part of Leading-mark hill bearing N. $\frac{1}{4}$ E., at night keep the light on this bearing, and proceed for it thus to avoid Jackman rock, until Fish point is closed with the wharves at the village bearing W. by N. $\frac{1}{2}$ N. This mark will lead northward of Jackman rock. After passing the entrance rocks, which can generally be made out on a dark night, keep the George Island shore on board to avoid a shallow stone, lying fifty yards off a point on the north shore immediately opposite the Bayfield bluff.

Le Hayes Point.—The southwest extremity of the main-land shore, and the north point of entrance from the westward. This point has a rock 6 feet high, lying 40 yards, together with a small dry stone 100 yards west of it; the channel here being only 70 yards wide. The south shore of the harbor, between Northeast and Fish points although straight on the whole, is broken by several coves.

KILLARNEY WEST, OR PARTRIDGE ISLAND LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower. On the south point of an island, N. N. W. $\frac{1}{4}$ W., a little more than $\frac{3}{4}$ of a mile from the western entrance of Killarney harbor. (Range lights are to be erected.)

Directions for Entering Killarney Harbor from the Westward.—If from the North channel, Lake Huron, the most direct track is between Kokanongwi and Badgely islands; and the west light-house is to be steered for in line with the highest part of Leading-mark hill, N. E. $\frac{1}{4}$ N., to lead east of Double Island ledges, and west of Ann Long bank. The vessel's head may be turned more eastward when Badgely rocks, (hereafter described) come in line with Lion's Rump, W. $\frac{1}{2}$ S. Run on the latter mark until the northeast part of George island is touching, or slightly closed with Le Hayes point, E. S. E. The most water that a vessel can carry into the harbor by western entrance is 17 feet. Entering from the eastward, not less than 4 fathoms can be carried to the wharves. A stranger should not attempt either of the entrances to Killarney by night.

Badgely Rocks, about 10 feet above water, lie N. E. by N., half a mile from Maxwell point, the N. E. extreme of Badgely island.

BADGELY ISLAND has a total length of $3\frac{1}{2}$ miles, greatest breadth $1\frac{1}{2}$ miles; the highest part is situated $\frac{1}{4}$ mile from its N. E. extreme; greatest elevation, 370 feet.

Twin Islands, 30 feet high, consist of two high bare rocks, $\frac{1}{2}$ mile southeastward of Maxwell point, deep water on their east and south sides. The southeast side of Badgely island as far as High beach is steep-to.

Linter Rock, with 14 feet least water on it, lies S. $\frac{1}{4}$ E., a little more than $\frac{1}{2}$ mile from the southern Twin island, N. N. E. $\frac{1}{4}$ E., a little more than that distance from the north part of Kokanongwi island. The west light-house and Leading-mark hill range before alluded to, leads westward of this shoal also.

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is $\frac{1}{2}$ mile long, northeast and southwest, and 400 yards wide. It lies $\frac{1}{2}$ mile southeastward from the center of Badgely island. Shoal water extends 300 yards south and west from the southwest point, leaving its northwest and north sides steep-to. A large rocky flat extends from the southeast side one-third of a mile, almost joining the shoal water from

Kokanongwi Shingle.—A bank of stones 5 feet high, bearing E. by S. $\frac{1}{4}$ S., $\frac{1}{2}$ mile from the north point of Kokanongwi island. A shallow spit extends from it in a northeast direction 200 yards and a bank runs from it S. S. W. $\frac{1}{4}$ W., $\frac{1}{2}$ mile, leaving a channel 200 yards wide between it and the bank from Kokanongwi island.

Evans Point is the southwest projection of Badgely island, off it shoal water extends 200 yards.

CENTER ISLAND is the next large island westward of Badgely island, the east extremity is composed of three islets, the eastern of which, Harris island, is 200 yards in diameter, and separated from Underhill point (the west point of Badgely island), by a deep channel 300 yards wide.

Center Island Bank, least water 7 feet, extends from west end of the island in a southeasterly direction $\frac{3}{4}$ mile, this bank extends $\frac{3}{4}$ mile from the shore and narrows the channel between it and Skull point reef to a little over $\frac{1}{2}$ a mile. The southeast corner of this extensive rocky bank bears W. by S. $1\frac{1}{8}$ miles from the southwest point of Badgely island, and the southwest extremity of the bank bears E. by S., $1\frac{1}{8}$ miles from the western part of Partridge island. The south extreme of Kokanongwi island open south of Badgely island, E. by N., leads south of Center island bank and Bayfield reef.

Partridge, or Round Island is the western one of the three, separated from Center island by a deep but narrow channel; the summit of the island is 190 feet above water.

Partridge Island Rocks are two small rocky patches having 12 feet of water on them, one S. E. by E. $\frac{1}{4}$ mile, the other E. by S. $\frac{1}{4}$ S., $\frac{1}{2}$ mile from the southwest point of Partridge island. Shoal water fringes the south shore of the island an average distance of 200 yards.

HEYWOOD, OR RAT ISLAND is the next large island west of Partridge island; it is $2\frac{1}{2}$ miles long east and west, average width $\frac{1}{2}$ of a mile, and 178 feet high; the water on the south shore is good to the line of points. Southeast point, the name given to that point, is steep-to.

Watts Rock, with one foot of water on it, lies $\frac{1}{2}$ mile east of the eastern point of Heywood island. A spur of three fathoms makes off in a northeast direction nearly 200 yards. The summit of Badgely island in line with the north side of Partridge island, E. by N. $\frac{1}{4}$ N., leads south of this danger.

Oxley Point is the western extremity of Heywood island, a flat with three fathoms, extends 400 yards in a northwest direction.

Wharton Point is the southwest point of Heywood island, a narrow spit makes out 150 yards, at which distance there is 8 feet of water.

MANITOWANING BAY, OR HEYWOOD SOUND, the next indentation westward of Smith bay, is a fine sheet of water 11 miles long, and free from outlying dangers; at the bottom of the bay is situated the town of Manitowaning, with a population of about 400.

Indian Dock Point is the eastern point of entrance to Manitowaning bay. Shoal water extends from the shore on either side of this point 400 yards.

Rabbit Island, a low wooded island, S. W. $\frac{1}{2}$ W., $2\frac{3}{4}$ miles from Indian Dock point; shoal water between them extends $\frac{1}{2}$ mile from shore. The west fall of Leading-mark hill, Killarney, seen over the eastern extremity of Center island, N. E. $\frac{1}{4}$ E., leads northwestward of all these reefs.

Rabbit Island Rock, with 5 feet of water over it, lies S. W. 800 yards from the west side of Rabbit island. To avoid it, keep Indian Dock point open northwestward of Rabbit island, N. E. $\frac{1}{4}$ E.

Phipp's Point Shoal, a rocky patch with 9 feet least water on it, lies 400 yards westward from the southern part of Phipp's point. Strangers should pass westward of it, by keeping Fanny island in Manitowaning harbor, touching Town point S. $\frac{1}{4}$ W.

MANITOWANING LIGHT-STATION.—A fixed white light, visible 14 miles. White, square wood tower, light 80 feet above lake level. In the village of Manitowaning, about 250 yards northward of the Government wharf and 50 yards from the shore.

Gibraltar Cliff, a rather remarkable rocky bluff, $\frac{1}{2}$ mile back from the beach at the head of the bay, and as this cliff is just in sight when on Phipp's point shoal, care should be taken on approaching or leaving Manitowaning, that it is well open of the eastern shore.

Manitowaning Harbor, a good anchorage between Fanny island and the docks, in 3 to 5 fathoms, the nearer the town the better; but the whole of the bay to the east and southeast of the light is an excellent harbor, good anchorage in any depth under 10 fathoms.

SHEGUIANDAH BAY is a deep indentation between Manitowaning and Little current.

Loon Island is a low and wooded island 250 yards long and 100 yards wide, situated N. by W., $1\frac{1}{2}$ miles from Ten-mile point (the western entrance point of Manitowaning bay). From the south point a shoal extends in a S. S. W. direction 400 yards. Its other sides are fairly steep-to.

LOON ISLAND REEF, with 7 feet least water on it, is a dangerous obstruction, lying with its northern edge E. $\frac{1}{2}$ N., $\frac{1}{4}$ mile from the north point of Loon island. The south edge of the reef bears E. by S. from the same. To pass east of Loon island reef, keep the southeast fall of Cloche bluff in line with the west point of Heywood island, N. by E. $\frac{1}{4}$ E., as this mark leads close, care must be taken not to open the bluff. To pass 200 yards westward of the reef, keep the rock (an eminence 166 feet high, $\frac{1}{4}$ mile back of the village of Manitowaning) in line or closed with Ten-mile point, S. $\frac{1}{4}$ W. From the southward it should not be approached nearer than the line of the south points of King William and Loon islands in range, W. by N. To lead north of the reef, keep the foot of Sheguiandah hill in line with the south point of Strawberry island, W. by N.

STRAWBERRY ISLAND is $4\frac{1}{4}$ miles long, in a nearly north and south direction, with greatest width $1\frac{1}{2}$ miles. Its coast line is indented by numerous deep coves; South point is the most southerly extremity of the island. The depth of 16 feet will be found 350 yards

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Beaver Island is a narrow island, 1,200 yards long, low and thickly
wooded. Its eastern shore may be approached to 200 yards, but from its
south point shoal water extends in a southwest direction $\frac{1}{2}$ mile, with
depth from 15 to 18 feet over it. The north end of Beaver island is con-
nected with Strawberry by a bar with 9 feet over it.

East Point is the name given to the eastern extremity of the island;
there are 3 fathoms to within $\frac{1}{2}$ mile of the point.

To enter Sheguiandah northward of Loon Island.—
Keep the foot of Sheguiandah hill in line with South point of Strawberry
island; when past King William island, do not shut in the north point of
Loon island behind the former, until Leech Island reef is past; when
steer for the wharf, or anchor at the head of the bay.

Leech Island is a narrow bank of stones, thickly wooded; its
north end bears W. by S. $\frac{1}{2}$ S., 1 mile from the north end of King William
island.

Leech Island Reef extends N. E., 850 yards, at which distance
17 feet will be found; the north points of King William and Loon islands
in line, E. $\frac{1}{2}$ S., lead north of this reef.

Langevin Rock, with 11 feet of water on it, is N. $\frac{1}{2}$ W., $\frac{1}{2}$ mile
from East point of Strawberry island. To clear this patch, keep the
whole of Loon island open east of East point, S. $\frac{1}{2}$ W.

Caron Point is $\frac{3}{4}$ mile S. E. of Strawberry Island light-house.

Caron Reef. This shoal has a depth varying from 9 feet on the
inner, to 17 feet on its outer part. To pass eastward of it, keep the east
point of Loon island open of East point of Strawberry island due south.
The north point of Beauty island in line with Strawberry Island light,
N. W. by W. $\frac{1}{2}$ W., leads northeastward of the reef.

STRAWBERRY ISLAND LIGHT-STATION.—A fixed
white light, visible 11 miles. White, square wood tower, attached to
dwelling. On the northernmost point of island, which is steep-to at the
light-house point.

Garden Island.—Is a barren limestone island, 9 feet high, lying
800 yards northward of Strawberry island light-house; it is 600 yards
long by 250 yards wide.

Garden Island Bank is a dangerous rocky flat extending from
the south shore of Garden island to within 350 yards of Strawberry Is-
land light-house. There is as little as 3 feet on the southeastern part of
the bank, but the northeast, north and northwest sides of Garden island
are steep-to.

Beauty Island is 70 or 80 feet high at its northern extremity, is
situated on the north side of the eastern approach to Little Current, and
northeastward $\frac{1}{2}$ mile from Gibbons point (the south side of the eastern
approach). Its southeast point is fairly bold to, but from the south shore
a rocky bank extends a quarter of a mile from the island, to avoid which
in approaching or leaving Little Current, keep the inner or southern
lighthouse at that place in line with or closed with Shut-in point, W. by
N. $\frac{1}{2}$ N. This mark will serve for day or night leading over not less than
17 feet water.

LITTLE CURRENT, or Shaftesbury occupies an important position as being the narrow channel through which all vessels must pass, when navigating this part of the North Channel of Lake Huron. The passage lies between the north shore of Manitoulin island on the south, and Goat island on the north, the western part having been excavated to a depth of 17 feet.

The western entrance points are Magazine point (the west point of Goat island) and Spider island.

Griffith's Point is 600 yards to the westward of Gibbons point, and between them a shallow bank extends 100 yards from the south shore. The remainder of the shore is fairly steep-to. It is one mile to the eastward of the southern light-house.

Twelve-Foot Rock.—This small lump is situated with the eastern wharf in line with the southern lighthouse, and eastward of the former 250 yards, with deeper water between it and the south shore.

Current.—The stream through this cutting runs in either direction, very strong at times, requiring when contrary a good head of steam and careful steering.

Shaftesbury or Little Current Range Lights.—Two fixed white lights, visible 6 miles. White, square wood towers, 22 and 24 feet high. To guide through the Little Current. They bear from each other N. $\frac{1}{4}$ W. and S. $\frac{1}{4}$ E., 450 yards apart. The southern light stands near the shore between the docks. The northern one is on the east point of Spider island.

Directions.—In proceeding through Little Current from the eastward, after passing Gibbons point keep rather nearer the south shore than the Goat island shore; pass close to the docks, keeping in the line of the lights, and give the northern light a berth of 50 yards. When the buoys are in position, keep the red buoys on the starboard, and black on port hand, when proceeding in this direction.

The whole of the north shore from Goat island to Flat island, a distance of $2\frac{1}{2}$ miles, is shallow for a long way out, and should be carefully avoided, by keeping the islands on the Manitoulin shore on board.

Flat Island may be considered the southwest extremity of Great Cloche island.

Spider Island is low and flat; it is 250 yards in length east and west, and 70 yards wide. Shoal water extends 100 yards into the channel from the west end. The northern light stands on the east point.

Low Island, of the same character, lies next west of Spider island, separated by a shallow passage 200 yards wide. This island is 400 yards in diameter, and its north point is steep-to. The ship channel here is about that number of yards wide.

Picnic Island lies with its west extremity 1 mile northwestward from Spider Island light-house; it is $\frac{1}{2}$ mile long, by nearly 400 yards wide. The channel here is less than 400 yards wide, and the deepest water that can be carried past the northwest point is 21 feet. To avoid the shoal on the north side of the channel westward of Picnic island, a vessel should keep the north end of Low island in line with or closed behind the north extremity of Picnic island, E. S. E.

A Cluster of stones, $\frac{1}{2}$ mile W. by S. $\frac{1}{4}$ S., from the northwest point

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NARROW ISLAND LIGHT-STATION.—A fixed white light, visible 11 miles. Square, white, wooden tower, with kitchen attached. The tower is surmounted by an iron lantern, painted red. On the west end of Narrow island, in the channel north of Great Manitoulin island, about 3 miles to the westward of Little Current. North side of Foster bank W. $\frac{1}{4}$ N. $4\frac{1}{2}$ miles; west side of Halfway islands N. by E. $\frac{1}{4}$ E. $3\frac{1}{2}$ miles.

Narrow Island is $\frac{1}{4}$ mile long east and west, and very little breadth. The northwest point of this island bears W. $\frac{1}{4}$ N., $1\frac{1}{4}$ miles, from the same extremity of Picnic island, and no vessel should go to the southward of this line.

Narrow Island is important as marking the south entrance point of the western approach to Little Current, and unlike flat island on the opposite side, its channel shore may be approached to 150 yards.

Two Rocks, with 7 feet water on them, lie 400 yards westward of Narrow island, the northern one bearing due west from the northwest extremity of that island. To lead north of this danger, the whole of Picnic island should be kept open northward of Narrow island, E. by S. $\frac{1}{4}$ S.

East Rous Island is the next large island west of Great Cloche.

Mink Island is the largest and eastermost of a group of islands south of East Rous island.

Blake Island, 10 feet high, is the southermost of this group. The south side of this island may be approached to 200 yards.

West Rous Island is the next large island west of East Rous island; it is shoal on all sides except the north.

BEDFORD ISLAND is the next large island westward of the Rous islands, its greatest diameter being $3\frac{1}{4}$ miles.

Straubenzee Point is the name given to the southwest extremity, and from it a dangerous reef extends $\frac{1}{4}$ mile in a southwest direction, with as little as 3 feet of water on it.

Foster Bank, with seven feet least water on it, lies with its eastern and shallowest end bearing S. by E., $1\frac{1}{2}$ miles, from Straubenzee point; from this position the bank runs westward, nearly half a mile.

Eleven-foot Rock, with that depth of water over it, is 400 yards westward of Foster bank. It bears S. S. W. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles, from Straubenzee point.

James Foote Patch, with $3\frac{1}{4}$ fathoms on it, lies $\frac{1}{4}$ mile southward of the last mentioned shoals.

Vessels must pass south of these shoals, by keeping the north end of Picnic island in line with, or south, of the south side of Narrow island due east. The northeast side of Elm island touching the southwest shore of Amedroz island, N. W. $\frac{1}{4}$ N., leads southwest of Eleven-foot rock.

The northwest fall of the spur from Mt. McBean, in line with the southwest point of Bear's Back island, N. N. W. $\frac{1}{4}$ W., leads west of Eleven-foot spot.

Bear's Back Island lies midway between the southern portion of Bedford and Amedroz islands. It is $\frac{1}{4}$ mile long. Its east and south-east sides are steep-to, but from the west low side of the island.

Bear's Back Shoal makes out $\frac{1}{4}$ of a mile, to the depth of 3 fathoms. The northeast extremity of Clapperton island in line with the southwest side of Amedroz island, N. W. by W. $\frac{1}{4}$ W., leads south of this reef.

Elm Island, so called from a single tree of that kind, which it still preserves, is a narrow bank of stones, 7 feet high and 200 yards long, distant one mile southwestward from the west extreme of Bear's Back island.

Elm Island Bank, with 6 to 12 feet over it, extends 400 yards in a N. N. E. and N. W. direction from Elm island; its other sides may be approached to 200 yards.

Lansdowne and Lone Rocks, with 17 feet of water on them, lie respectively S. E. by E. $\frac{1}{2}$ mile, and E. $\frac{1}{2}$ N., $\frac{3}{4}$ mile from Elm island.

The bare, rocky summit of Wilson point (Croker island) open west of Amedroz island N. W. $\frac{3}{4}$ N. leads southwestward to Elm Island bank.

AMEDROZ ISLAND lies eastward of Clapperton island, and the greatest diameter is three miles.

Carleton Point.—This low south extremity of the island, and the shore eastward of it for $\frac{2}{3}$ of a mile are fringed with shoal water for a distance of 300 yards.

Magee Point is situated $\frac{1}{2}$ of a mile northwestward from the last mentioned, enclosing between them a deep shallow indentation, known as Reedy bay.

Magee Bank is the name of the rocky flat extending nearly $\frac{1}{2}$ mile from these islets and Carleton point. Croker island open westward of Amedroz island N. N. W., leads west of this bank. The central and gravelly projection of Magee point should be given a berth of 200 yards. From the north part of this point, the northwest side of Amedroz island runs in a northeasterly direction to Robinson point, the most northerly projection of Amedroz island. This coast is fairly steep-to; and may be approached to 200 yards.

CLAPPERTON ISLAND.—This island is one of the longest in this part of the North Channel of Lake Inveruron, being $5\frac{1}{2}$ miles in length from the light-house to South point, and forms part of the eastern boundary of the open water of the North channel.

South Point.—A very shoal rocky spit makes off from the end of this point, in a southerly direction 400 yards, and a bank terminating in a rock with 10 feet on it, extends $\frac{1}{2}$ mile east of this point.

Baker Point is 2 miles northward of South point of Clapperton island, and to within $\frac{1}{2}$ mile of South point the coast may be approached to 300 yards.

Carling Point.—This point is situated nearly 600 yards southwestward of the islet on the south side of Logan island, and may be approached from the eastward to 250 yards.

Carling Bay is contained between Carling and Baker points.

Logan Island lies 1 mile southeastward from Cartwright point, being separated from the main island on the northwest by a barrier of sunken rocks. The north side of this island is shoal for 300 yards, and its eastern side for 150 yards, while $\frac{1}{3}$ of a mile in the latter direction, is a spot with a depth of $3\frac{1}{2}$ fathoms, falling down suddenly to 20.

Logan Bay is a double indentation at the back of the island of that name, and although shallow, is fairly level. Temporary anchorage may be had in 15 to 18 feet between the outer part of Logan island and the south entrance point of the bay.

CLAPPERTON ISLAND LIGHT-STATION.—A fixed white light, visible 8 miles. White, square wood tower, 35 feet high. On the north point of the island. Marks the channel between Clapperton and Croker islands. Gore Bay light, W. S. W. $\frac{1}{2}$ S., 14 miles. The range leads over foul ground.

From the southeastward, this light is not visible until bearing W. $\frac{1}{2}$ S.

Robertson Rock, with 8 feet water over it, lies N. E. $\frac{1}{2}$ E., $\frac{1}{2}$ mile from Clapperton Island light-house, and to avoid this obstruction vessels should keep pretty close to the Clapperton Island shore, or when passing it, the south end of Amedroz island should not be opened northward of Cartwright point (the N. E. point of Clapperton island) bearing S. E. by E. $\frac{1}{2}$ E. From the light-house to Cartwright point, $1\frac{3}{8}$ miles to the eastward, the shore line has deep water close-to.

Croker Island is separated from Clapperton island by a channel $1\frac{1}{2}$ miles wide.

Wilson point is the southern extremity of Croker island; it is surmounted by a bare peaked rock 125 feet in height. The water is deep close-to.

Clapperton Channel.

Var. 4° West.

West (Honora) Bay is $8\frac{1}{2}$ miles deep, the breadth between Wabos island and Francis point on the west being 6 miles.

Wabos Island.—This island lies two-thirds of a mile west of Freer point, and marks the east entrance point of West bay. It is low, narrow and wooded, $\frac{1}{4}$ of a mile long in a northeast and southwest direction; its northwest coast may be approached to within 100 yards, shoal water between it and Freer point.

Tamarack Point.—The southern part is $5\frac{1}{2}$ miles from the head of the bay; may be coasted at a distance of 150 yards.

Sounding Cave.—At the south part of Tamarack point the coast turns abruptly to the eastward, forming a bay known as Sounding Cove, in which vessels may find good shelter from north winds in from 5 to 7 fathoms, mud bottom, keeping not less than 300 yards from the north shore of the cove.

Dutchman's Head is the name given to a steep bluff 180 feet high $6\frac{1}{2}$ miles from the head of West bay, on the west side; the shore on the west side may be approached to 200 yards.

The Tooth is the name given to a small sharp rock 3 feet high, two-thirds of a mile northward of the shore under Dutchman's head, and $\frac{1}{4}$ mile from the west shore of the bight; it should not be approached from the eastward within 150 yards; shoal water between it and the shore.

Francis Point is the name given to the northeast extremity of the promontory dividing West and Mudge bays. It is the south entrance point to Clapperton channel from the eastward; the east side is tolerably steep-to, but shoal water extends off the point $\frac{1}{4}$ mile to the northeastward, and $\frac{1}{2}$ of a mile to the northward called Taché Island reef.

McRae Patch, with $3\frac{1}{2}$ fathoms over rock, lies N. E. $\frac{1}{4}$ E., nearly one mile from Francis point.

Clapperton Channel separates Manitoulin island from Clapperton island. Between South point of Clapperton island and Francis point on the east, and Courtney island and the western part of Maple point on the west, and may be navigated in clear weather, at daylight, by vessels drawing 12 feet of water. The north shore of the channel between South point and Courtney island will first be described.

South Point is the southern extremity of Clapperton island; it is low and narrow; a shoal extends from it S. $\frac{1}{4}$ E. 350 yards with less than 6 feet of water on it.

Mowat Island lies with its southern extremity W. by N. $\frac{1}{2}$ N., $\frac{1}{4}$ mile from South point. From this extremity, shoal water extends in a southwesterly direction 200 yards to a depth of 15 feet. The passage between Mowat island and Clapperton island is only fit for boats.

Meredith Island is the next island northwestward of Mowat island. It is the largest of the five islands in this locality; it is separated from Clapperton island by a shallow boat channel full of rushes. From the west point of this island a rocky ridge extends in a S. W. by S. direction, nearly $\frac{3}{4}$ mile, terminating in a bank of boulders with but 1 foot of water on them and called the

Meredith Rock.—This rock has deep water close to its southwest and eastern sides. The southwest point of Courtney island, touching the northern Spilsbury island, N. W., leads southward of Meredith rock. The east side of Harbor island touching the west side of Burbidge island N. N. E. $\frac{3}{4}$ E., clears the west side of the whole of *The Ridge*. Sailing vessels may stand from the eastward towards Meredith rock and *The Ridge* until the west side of Meredith island touches the east side of Harbor island N. $\frac{3}{4}$ E.

Burbidge Island lies nearly 400 yards westward from Meredith island, the passage between them containing a depth of 9 feet. A bank extends westward from Burbidge island 350 yards with as little as one foot of water in one place.

Clapperton Harbor is on the south shore of Clapperton island, it is a semicircular bay in which excellent anchorage and shelter from all winds can be found. Sandfield point forms the western point of the bay and 350 yards southeastward from it lies

Beverly Island.—A low, round little island of less than 150 yards in diameter, and separated from Sandfield point by a boat channel. The eastern side of the island is fairly steep-to. A patch with two feet water on it lies W. $\frac{1}{4}$ S. 600 yards from Beverly island.

Harbor Island is the northernmost of the group. Its north and west sides are bold, but from its southeast extremity a bar extends across to Panet point with depth from 4 to 10 feet. The best anchorage in Clapperton harbor is under the northeast point of and about 200 yards from Harbor island in 5 fathoms over clay.

Vankoughnet Island is the largest of the two islands at the southwest extremity of Clapperton island. Its length 1 mile, and breadth nearly $\frac{1}{2}$ mile. Between it and Clapperton island there is a passage known as Indian channel through which 6 feet may be carried.

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Secord Point is the most westerly point of Clapperton island, being $1\frac{1}{2}$ miles north of Sandfield point.

Secord Bank is the name of the shallow rocky bank stretching southward from Secord point to within 150 yards of Vankoughnet island, leaving a passage of 12 feet water close to the latter.

Spilsbury Islands, two in number and small, lie nearly $\frac{1}{2}$ of a mile from the south shore of Vankoughnet island, and are joined together by boulders. A narrow and crooked channel with a depth of 12 feet water exists between these small islands and Vankoughnet island. The water is fairly good on the west side of Spilsburg islands, 12 feet being found at 200 yards, but in a southeasterly direction extends a dangerous rocky bank known as

Boulder Bank.—This shoal extends in the above direction about 1 mile with depth ranging from one to seven feet.

Courtney Island forms the north entrance point to Clapperton channel from the westward, and with the exception of the northeast side it is surrounded with shoal water, and joined to Vankoughnet island by a bank of dry stones.

Courtney Bank.—This dangerous and extensive bank of boulders is situated at a distance of half a mile westward of Courtney island. It is over one-third of a mile long northeast and southwest by a quarter of a mile wide, with depth from a few inches to six feet.

Griffin Bank, the least depth on which is 8 feet, lies north of the Courtney bank, and N. W. by W. rather more than half a mile from the northwest extremity of Courtney island.

Miall Patch, with least depth of 12 feet, is situated W. by S. $\frac{1}{2}$ S. $\frac{1}{4}$ mile from the southwest point of Courtney island, being separated from Courtney bank by about the same depth of water.

Western Reef, so-called from being the westernmost of all the patches lying near the west entrance to Clapperton channel, lies W. $\frac{1}{2}$ N. about $1\frac{1}{2}$ miles from the southwest point of Courtney island. It is about 100 yards in diameter, and has 11 feet water over it. It is nearly in the track from Clapperton light-house to Gore bay. A good channel 3 to 9 fathoms in depth and $\frac{1}{2}$ mile wide, separates it from the nearest of the shoals previously described.

Range.—The Clapperton light-house in the hollow of the hills at Fort La Cloche, N. E. by E. $\frac{1}{2}$ E. leads 400 yards northwest of this shoal. The southwest point of Innis island, touching the north point of Dareh island, N. N. W. leads $\frac{1}{2}$ mile southwestward of Western reef.

North Shoal is the northermost of the three banks which front the western entrance to the Clapperton channel, is a rocky bank over a third of a mile long in an E. by N. and W. by S. direction and 200 yards wide, with least depth 4 feet, its western extremity bearing S. W. $\frac{1}{2}$ W. and distant about 1 mile from the southwest extreme of Courtney island.

Middle Bank, with 4 feet over it, is the most dangerous obstruction in the west entrance to Clapperton channel. It is 300 yards long east and west, by 200 in width and is composed of boulders. Its south side bears W. N. W. one mile from the north extremity of Maple point. It is separated from North shoal by a five fathom channel 400 yards wide, but as it is not buoyed it cannot be used.

To Pass Westward of Griffin bank, Courtney bank, Miall patch, North shoal and Middle bank, keep the western extremity of the next island west of Croker island in line with the N. W. end of the spur from Mt. McBean N. N. E. $\frac{1}{2}$ E.

Description of the south side of Clapperton channel commencing from the westward.

Maple Point is the name of the promontory which may be considered the south entrance point from the westward, Johnson's point is about $\frac{1}{4}$ of a mile in a west southwesterly direction from Maple point.

South Spit extends $\frac{1}{4}$ mile northward of Johnson's point at which distance there is a depth of 12 feet. A dry stone lies 350 yards northeastward from Johnson's point. Between South spit and Middle bank **is the channel** a quarter of a mile wide and 5 fathoms deep, and to lead between these shores keep South point of Clapperton island in line with the north fall of Manitoulin island E. by S.

Little Island is a low, narrow, wooded islet 80 yards long, lying 800 yards eastward of the east shore of Maple point.

Little Island Sand Bank is a large flat sand bank extending $1\frac{1}{2}$ miles from the east shore of Maple point at which distance there is only 8 feet.

Sutherland Shoal with 15 feet water on it lies S. by E. $\frac{1}{2}$ mile from Little island.

Gooseberry Island, 250 yards long north and south, low and narrow, its north end bears N. W. by W. $\frac{1}{4}$ W., a little over a mile from Francis point, its north end should receive a berth of 200 yards.

Martin Reef lies on the same bearing from Francis point, $\frac{1}{2}$ mile from Gooseberry island. It is composed of dry stones 2 feet high and should not be approached from the northward nearer than 300 yards.

McInnis Bank lies N. W. by W. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles from the north point of Gooseberry island, least water on it 16 feet, and in line with Kagawong light and west side of Clapperton harbor.

Taché Island is the first island westward of Francis point, $\frac{1}{2}$ mile distant from it. A patch of dry and sunken rocks extend from it in a northeasterly direction about $\frac{1}{2}$ mile, called the Taché Island reef.

Directions for taking the Clapperton Channel from the Westward.—Before the west end of the island next west of Croker island (Benjamin island) passes to the westward of the N. W. end of the spur from Mt. McBean, bring South point of Clapperton island under the north fall of Manitoulin island, E. by S., which range will be a little open of Maple point. This mark kept on, will lead between South spit and Middle bank, in not less than 4 fathoms water.

As Maple point is approached, open the north fall of Manitoulin island sufficiently to the northward of South point of Clapperton island, to clear the flat which extends 100 yards from Maple point. After the northern part of this point is passed, the leading mark should again be brought on exactly, and kept on until nearly abreast of the eastern extreme of Little Island Sand bank, which position will be indicated by northern Spilsburg island touching the southwest point of Courtney island bearing N. W. The latter mark should now be kept on astern until Meredith rock is passed, or when Meredith island touches Harbor

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island, N. $\frac{3}{4}$ E. From the intersection of the ranges an E. $\frac{1}{4}$ S. course will take a vessel in the direction of Little Current, or if proceeding to West bay, she may continue with the Spilsburg island mark astern, which will also clear the shoals off Francis point.

In proceeding to Mudge bay, a vessel may turn to the southward off the Spilsburg island mark, when Burbidge island appears *its own width* east of Harbor island.

Taking Clapperton Channel from the Eastward.—If from Little Current a W. $\frac{1}{2}$ S. course from Narrow island should carry a vessel nearly half a mile south of Foster bank (the north side of Picnic island in line with south side of Narrow island, bearing due east leads clear of Foster bank) and nearly $\frac{3}{4}$ of a mile from the shoal off south point of Clapperton island. Bring the northern Spilsbury island to touch the southwest point of Courtney island N. W., this mark kept ahead will lead between Meredith rock and Little Island Sand bank. As soon as south point of Clapperton island comes in line with the north fall of Manitoulin island, E. by S., keep it so astern. As Maple point is approached bring the north fall of Manitoulin island northward of south point of Clapperton island, sufficiently to pass 200 yards from northern part of Maple point, when past it, starboard again so as to bring the leading mark exactly on, which will lead out between South spit and Middle bank. If a vessel wishes to haul to the northward she may do so on the Mt. McBean spur range, which kept on ahead will, as before remarked, lead west of all the shoals excepting Western reef, which it passes more than $\frac{1}{2}$ mile eastward of.

Entering Clapperton Harbor.—If for any reason a vessel wishes to enter the harbor from the eastward, she should keep on the Spilsbury Island range, until the east side of Harbor island touches the west side of Burbidge island, bearing N. N. E. $\frac{3}{4}$ E. From this position a N. $\frac{1}{4}$ E. course will lead west of the Burbidge Island shoal. After passing the latter, the course may be changed more to the eastward, rounding Harbor island at a distance of 200 yards, and anchoring under the northeast point at about that distance therefrom.

Entering Clapperton Harbor from the Westward.—When upon the leading mark—South point of Clapperton island in line with the north fall of Manitoulin island; as soon as the Spilsbury island range comes on, steer N. E. for the northwest point of Harbor island; give it a berth of 200 yards, and anchor as before directed. A vessel may cross **The Ridge** with 13 feet water, by keeping the north fall of Manitoulin island its own height open *north* of South point of Clapperton island.

KAGAWONG LIGHT-STATION.—A fixed white light, visible 11 miles. Lantern on a mast with white shed at base, 40 feet above lake level. At the foot of Mudge bay, N. shore of Manitoulin island, 75 feet back from shore, and 100 feet west from the dock.

GORE BAY LIGHT-STATION.—A fixed white light, visible 11 miles. White, square wood tower, with dwelling attached. On the west point of entrance to Janet's cove. There is a wood dock at the head of the bay, west side, behind a little point, with good water, protected from all winds.

CAPE ROBERT LIGHT-STATION.—A fixed white light, visible 12 miles. White, wood tower, square in plan, 41 feet high,

with dwelling attached. On the northern extremity of the cape, north shore of Manitoulin island.

A Newly Discovered Rock.—A rocky bank has been discovered by Staff Commander Boulton. It lies two miles east of the two low flat islands, which are situated $5\frac{1}{2}$ miles due north of Cape Robert. On the bank there are two spots with 9 feet and 13 feet water only.

SPANISH RIVER MILLS LIGHT-STATION.—A fixed red light, visible 7 miles. White, square, wooden tower, 39 feet high. On a small rocky islet about two miles southeasterly from Spanish River mills, near the channel leading into the mills and the mouth of the river from the eastward. Lantern and gallery painted red.

MISSISSAGUA ISLAND LIGHT-STATION.—A revolving white light, visible 12 miles. White, square wood tower, attached to dwelling, visible except where obscured by trees. On the south point of the island. Gore Bay light E. S. E. $\frac{1}{4}$ S., $27\frac{1}{2}$ miles. Northwest point of Manitoulin island, S. W. $\frac{1}{4}$ S., $13\frac{1}{2}$ miles.

SULPHUR ISLAND LIGHT-STATION.—A fixed white light, visible 12 miles. White, square wood tower, light 45 feet above lake level. On west end of island. East point of Drummond island, S. S. E. $\frac{1}{4}$ E., $12\frac{1}{2}$ miles. Point au Gravier, N. W. $\frac{1}{4}$ W., $13\frac{1}{2}$ miles.

THESSALON RIVER LIGHT-STATION.—A fixed white light, visible 7 miles. White, square wood tower. East side of mouth of river.

NORTH SISTER ROCK LIGHT-STATION.—A fixed white light, visible 11 miles, illuminates the entire horizon. White, hexagonal wood tower, 30 feet high. On square crib pier, 7 feet high, on small bare rock. North side of channel, Canadian entrance to St. Mary's river, north of St. Joseph's island. To guide through narrow channel.

Wilson's Channel Starboard Beacon.—A day beacon of crib work, rising 4 feet out of water, surmounted by an iron tripod surrounded by hoops, and bearing on the top a globe of slat-work. The whole superstructure is painted red, and is $17\frac{1}{2}$ feet high above the crib. On the outer edge of the shoal near the western entrance to, and on the north side of Wilson's channel. The crib stands in 3 feet of water, but the depth increases rapidly on the channel side. This beacon is about half a mile below Wilson's Channel light.

WILSON'S CHANNEL LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower, 34 feet high, with dwelling attached. On a rocky islet, north side of channel, a short distance above the narrow passage of Wilson's channel, and guides from Richard's landing, $2\frac{1}{4}$ miles above, to the channel.

SHOAL POINT LIGHT-STATION.—A fixed white light, visible 11 miles. White, square wood tower, 34 feet high, with dwelling attached. On an islet of rock on the south side of channel, about 2 miles above Richard's landing, and guides therefrom.

Compass Courses and Distances in Georgian Bay and North Channel.

NOTE.—The Courses are magnetic; Distances in statute miles.

Cove Island to Collingwood.—When $\frac{1}{2}$ mile north of Cove Island light, steer for the north side of Flower Pot island, E. by S. $\frac{3}{4}$ S., $6\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile north of the Castle, haul around the point to the southeastward until the Cove Island light is closed behind the N. E. point of Flower Pot island, when steer E. by S. $\frac{1}{2}$ S., keeping the light closed as above for 2 miles, until past Bear's Rump shoal, when steer E. by S. $\frac{3}{4}$ S., $14\frac{1}{2}$ miles, to a point 1 mile northeast of Point Wingfield, when steer S. E. $\frac{1}{2}$ S., 73 miles, to a point 1 mile north of Collingwood Breakwater light. Passing $1\frac{1}{2}$ miles northeast of Surprise shoal; in thick and foggy weather, keep a little more to the eastward until past the shoal.

To pass north of Bear's Rump Island.—When $\frac{1}{2}$ mile north of Cove Island light, steer E. by S. $\frac{3}{4}$ S., ranging on the south point of Bear's Rump island for $5\frac{1}{2}$ miles, until Tobermory light is closed with the west end of Flower Pot island (and note that the fall of Cabot Head in line with the south extreme of Bear's Rump, E. S. E., leads south of Confidence shoal); thence E. $\frac{1}{2}$ N., $3\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile north of the north point of Bear's Rump island; when steer E. S. E., $14\frac{1}{2}$ miles, to 1 mile northeast of Point Wingfield.

Cove Island to Owen Sound.—When 1 mile northeast of Point Wingfield, as in the course from Cove island to Collingwood, steer S. E. $\frac{1}{2}$ S., 30 miles, to a point 5 miles E. $\frac{3}{4}$ S. of Cape Croker, passing $1\frac{1}{2}$ miles to the northeast of Surprise shoal; thence S. $\frac{1}{2}$ W., $18\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of McKenzie's Wharf light; thence steer up the middle of the sound about S. S. W. $\frac{1}{2}$ W., $7\frac{1}{2}$ miles, for the range lights at the mouth of Sydenham river.

Cove Island to French River.—When $\frac{1}{2}$ of a mile north of Bear's Rump, as in the course to Collingwood, steer E. N. E. $\frac{1}{2}$ N., 15 miles, until the east side of Cabot head bears S. $\frac{3}{4}$ W., $12\frac{1}{2}$ miles, and Half-moon island W. $\frac{3}{4}$ N., $8\frac{1}{2}$ miles; thence N. N. E. $\frac{3}{4}$ E., 36 miles, to a point 2 miles west of Bustard Rocks light, keeping a lookout for the 10-foot spot lying about $1\frac{1}{2}$ miles S. W. by W. $\frac{1}{2}$ W. from the main light.

Cove Island to Byng Inlet.—When $\frac{1}{2}$ of a mile north of Bear's Rump, as in the course of Collingwood, steer N. E. by E. $\frac{3}{4}$ E., 49 miles, to a point 4 miles west of Byng Inlet light. Tugs are generally in readiness to tow vessels to the mills.

Cove Island to Parry Sound.—When $\frac{1}{2}$ of a mile north of Bear's Rump, as in the course to Collingwood, steer east 56 miles to a point 2 miles west of Parry Sound light.

Cabot Head to Hope Island and Giant's Tomb Island.—When 1 mile northeast of Point Wingfield, steer E. S. E. $\frac{1}{2}$ S., 61 miles, to a point 1 mile north of Hope Island light, passing 3 miles south of the Western islands; thence S. E. by E. $9\frac{1}{2}$ miles, to a point 1 mile south of the south point of Giant's Tomb island.

Owen Sound to Collingwood.—When 3 miles N. by E. $\frac{3}{4}$ E. from front range light, steer N. E. $\frac{1}{2}$ N. 11 miles, until Point William

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bears southeast 2 miles; thence E. $\frac{3}{4}$ S. $9\frac{1}{2}$ miles, until Point Rich bears southwest 2 miles; whence steer S. E. $\frac{1}{2}$ E. 23 miles, to a point 2 miles north of Collingwood Breakwater light.

Owen Sound to Christian Island Light.—When 2 miles northwest from Point William, as in the course to Collingwood, steer east 32 miles to a point 1 mile south of light.

Owen Sound to Parry Sound.—When 3 miles N. by E. $\frac{3}{4}$ E. from front range light, steer N. N. E. $\frac{1}{2}$ E., 57 miles, to a point 2 miles W. S. W. from Parry Sound light.

Owen Sound to Byng Inlet.—When 3 miles N. by E. $\frac{1}{4}$ E. from the front range light, steer N. N. E. $\frac{1}{2}$ E., 11 miles, to a point 4 miles S. E. $\frac{1}{2}$ E. of Cape Commodore and in range of it and Point William; when steer N. $\frac{3}{4}$ E., $67\frac{1}{2}$ miles, to a point 4 miles W. by S. from Byng Inlet light.

Owen Sound to French River.—When 4 miles S. E. $\frac{1}{2}$ E. from Cape Commodore, as in the last course, steer N. $\frac{1}{2}$ W., 78 miles, to a point 2 miles west of Bustard Rocks light, keeping a lookout for the 10-foot shoal 2 miles S. W. by W. $\frac{1}{2}$ W. from the main light.

Owen Sound to Little Current.—When 3 miles N. by E. $\frac{1}{4}$ E. from front range light, steer N. N. E. $\frac{1}{2}$ E., 11 miles, to a point 4 miles S. E. $\frac{1}{2}$ E. from Cape Commodore and in line with it and Point William; when steer N. $\frac{3}{4}$ E., $12\frac{3}{4}$ miles, until the east point of Cape Croker bears W. $\frac{3}{4}$ N., $5\frac{1}{2}$ miles distant, thence N. N. W. $\frac{1}{4}$ W., 55 miles, to a point $1\frac{1}{4}$ miles north of Lonely Island light, passing about three-fourths of a mile from the northeast point of the island, keeping a lookout for the south end of Northeast shingle; when steer N. by W., 15 miles, to a point $1\frac{1}{2}$ miles east of the north point of Cape Smith, then keep the west and highest beach on Badgely island in line with the first hill left of the Lion's head (a sharp and conspicuous bare hill on the main land behind Badgely island), the same course N. by W., $7\frac{1}{2}$ miles, passing $\frac{3}{4}$ mile east of Burnt island, and $\frac{1}{2}$ mile east of Burnt Island bank until Ead's bush (Little Current) is seen to the northward of the summit of Heywood island and in line with the south shore of Partridge island W. by N. and the highest part of Leading-mark hill in line with Killarney West light N. E. $\frac{1}{2}$ N., then steer W. $\frac{1}{2}$ N. for the hill on Strawberry island, passing $\frac{1}{4}$ mile south of Center Island bank, keeping the south point of Kokanongwi island open of Badgely island, which range leads south of it; this course should lead one-third of a mile south of Heywood island; haul around its southwest point (Wharton point), giving it a berth of not less than 300 yards, then steer N. N. W. $\frac{3}{4}$ W. to clear Caron reef, with Strawberry Island light on port bow and east point of Garden island ahead, when the light bears N. W. by W. $\frac{1}{2}$ W. and in line with north point of Beauty island; haul up on that course round the light-house point, fairly close-to, and steer for Gibbons point W. $\frac{1}{2}$ N. Before Beauty island is abeam see that the southern light-house at Little Current (or Miller's House) is in line with Shut-in point, on the south shore of Little Current, W. by N. $\frac{1}{4}$ N. At night the light may be kept opening and shutting to make sure of the range. When see directions for proceeding through Little Current.

Collingwood to Christian Island.—When 2 miles north of breakwater light, steer N. by E. $\frac{3}{4}$ E., $16\frac{1}{2}$ miles, to a point 1 mile south of the light.

Collingwood to Parry Sound.—When 2 miles north of

breakwater light, steer N. $\frac{1}{2}$ W., 35 miles, to a point 2 miles west of the Western islands, thence N. $\frac{1}{2}$ W., 22 $\frac{1}{2}$ miles, to a point 2 miles W. S. W. from Parry Sound light.

Collingwood to Byng Inlet.—When 2 miles north of breakwater light, steer N. by W. $\frac{1}{2}$ W., 85 miles, to a point 5 miles W. by S. from Byng Inlet light, passing about 3 miles west of the Limestone islands, and 1 $\frac{1}{2}$ miles west of a shoal 4 miles S. W. by W. of Byng Inlet light, when haul up to within 2 miles of the light, where a pilot or tug should be taken.

Collingwood to French River.—When 2 miles north of breakwater light, steer N. by W. $\frac{3}{4}$ W., 100 miles, to a point 2 miles west of Bustard Rocks light, keeping a lookout for the 10-foot shoal about 2 miles S. W. by W. $\frac{1}{2}$ W. from the main light.

Collingwood to Little Current.—When 2 miles north of breakwater light, steer N. W. $\frac{3}{4}$ N., 95 miles, to a point 1 $\frac{1}{2}$ miles north of Lonely Island light, passing about 1 mile from the northeast point of the island, and keeping a lookout for the south end of Northeast shingle, when see course from Owen Sound to Little Current.

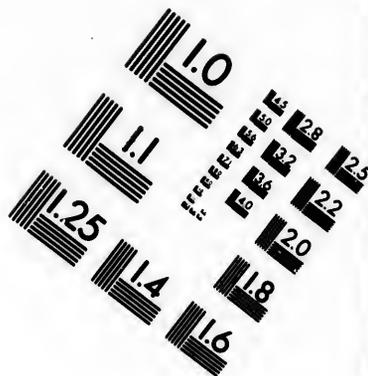
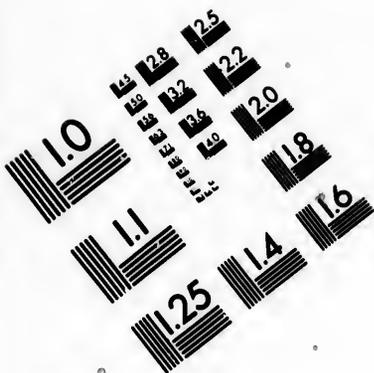
Collingwood to Cove Island Passage.—When 1 mile north of breakwater light, steer N. W. $\frac{1}{2}$ N., 73 miles, to a point 1 mile northeast of Point Wingfield, passing 1 $\frac{1}{2}$ miles east of Surprise shoal; thence W. by N. $\frac{3}{4}$ N., ranging on the north end of Flower-pot island for 15 $\frac{1}{2}$ miles, to within $\frac{1}{2}$ mile (keeping Cove Island light just closed with it to clear Bear's Rump shoal), when haul around to the northward; give Castle point a berth of $\frac{1}{2}$ mile, and steer W. by N. $\frac{3}{4}$ N., 6 $\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile north of Cove Island light.

Collingwood to Killarney.—When 2 miles north of breakwater light, steer N. W. by N. $\frac{3}{4}$ N., 106 miles, to a point $\frac{1}{2}$ mile east of Papoose island. (This course should lead 4 miles east of Dawson rock, which lies S. by E., 16 miles from east side of Papoose island); then steer N. W. $\frac{1}{2}$ N., 10 miles, to a point $\frac{1}{2}$ mile S. $\frac{1}{4}$ W. of Killarney East light, and in range with it and Leading-mark hill, when see directions for entering Killarney from the southeastward.

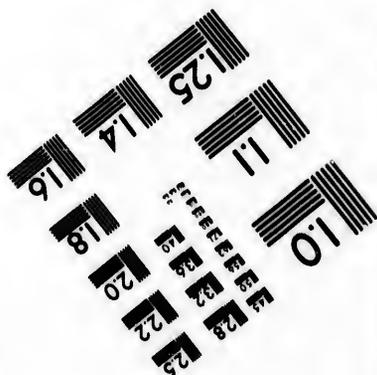
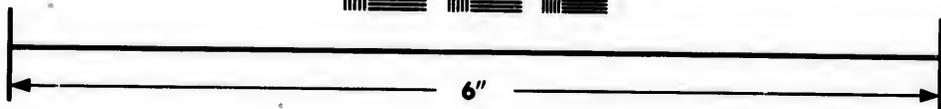
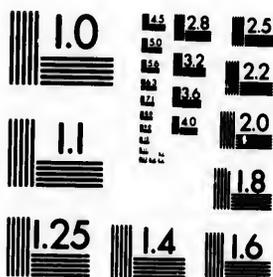
French River to Killarney.—When at the Bustard Rocks range lights, steer W., 18 $\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile north of Papoose island, passing north of Gull island; then N. W. $\frac{1}{2}$ N., 9 miles, passing south of Scarecrow Island bank, to a point $\frac{1}{2}$ mile S. $\frac{1}{4}$ W. of Killarney East light, and in range with it and Leading-mark hill.

To Enter Smith Bay from the North Channel.—When northward of Burnt Island bank, haul to the southeastward; keep Lion's Head (a sharp and conspicuous hill between Badgely island and Frazer bay) in line with the east end of High beach (on the south shore of Badgely island) bearing N. $\frac{1}{2}$ W. After passing Big Burnt island, which may be passed close on the east side, keep the summit of Badgely island well open east of Big Burnt island, N. by E. $\frac{1}{2}$ E., to lead eastward of Pelkey rock, and when East Mound (a little gravelly bank 2 feet above the water, lying $\frac{1}{2}$ mile eastward from the north point of William island) comes in line with the Spur, N. W. $\frac{3}{4}$ N., steer S. W. by W. $\frac{1}{2}$ W., up the bay. Or, if wishing to anchor under Cape Smith, edge a little to the westward, so as to bring the summit of Badgely island in line or closed with the southeast point of Big Burnt island in order to lead westward of Gold-hunters bank.





**IMAGE EVALUATION
TEST TARGET (MT-3)**



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23 WEST MAIN STREET
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10
16
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

10
11
1.2
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2.0

To enter Smith Bay from the Southward.—Follow around Cape Smith about a $\frac{1}{4}$ mile distant, in order to pass south of Gold-hunters bank, and when abreast of the northwest point of the cape, bring the center of the village of Wekwemikong about a point on the starboard bow, in order to get the points of Cape Smith in line E. by S. $\frac{1}{4}$ S. This range should be on astern before the west end of Bushy clump and the east end of West Red cliff are touching, but not before East Red cliff bears south. Keep the points of the cape in line until the summit of Badgely island is in line with the southeast point of Burnt island, when Gold-hunters bank and the outer part of Red Cliff flat will be passed. A vessel may anchor off West Red cliff on the last mentioned clearing mark as before directed, or proceed further up the bay. A vessel will find less than 10 fathoms over mud anywhere inside the line joining Cape Smith and William island.

To enter the bay northward of Gold-hunters bank, the Spur should not be brought to the eastward of the middle of William island, N. N. W. $\frac{1}{4}$ W., until the summit of Badgely island is over the southeast point of Big Burnt island, when a vessel may haul towards the cape shore and anchor, or proceed up the bay. In doing the latter she will probably pass close to Doyle shoal, the least water on which is 22 feet.

To enter Manitowaning Bay from the Eastward.—Bring the west fall of Leading-mark hill Killarney over the eastern extreme of Center island, N. E. $\frac{1}{4}$ E., directly astern, and proceed on that range until the northeast point of Strawberry island is open of the southwest point of Heywood island, N. W. $\frac{1}{4}$ N., when steer for the Rock $\frac{1}{4}$ mile westward of the village of Manitowaning S. W. by S. $\frac{1}{4}$ S., 8 miles, to a point $\frac{1}{4}$ mile west of Phipps point shoal (see Gibraltar cliff), keep on the above course until Fanny island, Manitowaning harbor, is in line with Town point, S. $\frac{1}{4}$ W. See Manitowaning harbor.

To enter Manitowaning Bay from the Westward.—Passing north of Loon island reef, note that the south point of Strawberry island, in line with foot of Sheguiandah hill, W. by N., leads north; and southeast fall of Cloche bluff in line with the west point of Heywood island, N. by E. $\frac{1}{4}$ E., leads 200 yards to the eastward of it. Bring the southwest point of Heywood island over the stern and steer for the village of Manitowaning, S. $\frac{1}{4}$ W.

Killarney to Little Current.—Continue with the west light-house in line with the highest part of Leading-mark hill, N. E. $\frac{1}{4}$ N.; give High beach, near the southeast extreme of Badgely island, a berth of 200 yards or more, and keep the south end of Kokanongwi well open of Badgely island to lead south of Center island bank. When the north side of Heywood island comes open of Partridge island, haul to the northward to pass a quarter of a mile westward of the latter; steer thence for Heywood rock, and after passing 200 yards northeast of it, bring it in line with the southwest extremity of Partridge island to clear Shoal island spit. When the north point of Shoal island bears S. S. E., Strawberry Island light-house may be steered for, N. W. by W. $\frac{1}{4}$ W. On reaching the light-house, proceed as directed in the course from Owen Sound to Little Current.

Manitowaning to Little Current.—Leaving the village, steer for the southwest point of Heywood island, N. $\frac{1}{4}$ E., to within $\frac{1}{4}$ of a mile, when see course from Owen Sound to Little Current.

thward.—Follow
to pass south of
at point of the cape,
out a point on the
with in line E. by S.
end of Bushy clump
not before East Red
line until the summit
of Burnt island, when
it will be passed. A
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A vessel will find
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When the north
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ears S. S. E., Straw-
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course from Owen

leaving the village,
 $\frac{1}{2}$ E., to within $\frac{1}{2}$ of
Current.

From Little Current to Clapperton Island.—Give Spider island a berth of 150 yards; pass 100 yards north of Low island, from 50 to 100 yards northward of Picnic island, 200 yards north of the west extremity of Narrow island. Thence steer W. $\frac{1}{2}$ S. to bring the south side of Narrow island in line with the north side of Picnic island bearing due east (the south fall of Frazer hill will be seen also on this range). This leading-mark leads south of Eleven-foot rock and Foster bank, when Elm island touches Amedroz island N. W. $\frac{1}{2}$ N. steer to pass westward of the former, in which position a vessel will know herself to be when the rocky summit of Wilson point (Croker island) comes open west of Amedroz island. When steer for Cartwright point, the north-east extreme of Clapperton island. Round the point close-to, and keep the shore close on board as far as the light-house. When abreast the bluff point $\frac{1}{2}$ mile eastward of the light-house, see that Amedroz island is closed with Cartwright point to avoid Robertson rock.

Clapperton Island to Innis Island.—When $\frac{1}{2}$ mile north of Clapperton Island light, steer W. by S. $\frac{3}{4}$ S., 5 $\frac{1}{2}$ miles, ranging on Blackstock point until the south point of Innis island bears north, distant 1 mile.

Innis Island to Point Mildram.—When 1 mile south of Innis island, steer W. $\frac{1}{2}$ N., 23 miles, to a point 1 mile north of Cape Robert light, when steer W. $\frac{3}{4}$ S., 18 miles, to a point 1 mile north of Mildram point, the northeasterly point of entrance to the Straits of Mississagua from the North Channel. This course should lead about 1 mile north of Crescent island. See Straits of Mississagua, Lake Huron, page 116.

Innis Island to False Detour.—When 1 mile south of Innis island, steer W. $\frac{3}{4}$ N., 48 miles, to a point 1 $\frac{1}{2}$ miles north of Thompson point, the north point of Cockburn island, and the northeasterly point of entrance to the False Detour channel. See page 116.

Innis Island to Sulphur Island.—When 1 mile south of Innis island, steer W. $\frac{1}{2}$ N., 23 miles, until Cape Robert light bears south 2 miles; then W. by N. $\frac{1}{2}$ N., 38 miles, to a point 1 mile south of Sulphur Island light.

Clapperton Channel to Cape Robert.—When 1 $\frac{1}{2}$ miles W. by N. from Maple point, and in range with South point of Clapperton island, steer W. $\frac{3}{4}$ N., 23 miles, to a point 1 mile north of Cape Robert light.

Clapperton Channel to Gore Bay.—When 1 $\frac{1}{2}$ miles W. by N. from Maple point, as in the preceding course, steer W. by S. $\frac{1}{2}$ S. ranging on Janet Head for 6 $\frac{1}{2}$ miles, until Town point bears S. $\frac{1}{2}$ W., when haul up on that course about 2 $\frac{1}{2}$ miles, keep about midway between Town point and the east shore, and when past the point haul in for the wood dock. Vessels can lie at the dock with northerly winds with safety.

STRAITS OF MACKINAC.

Light Houses, Buoys and Harbors Standing to the Westward.

NOTE.—The Straits of Mackinac embrace those waters commencing at the east point of Isle Bois Blanc and extending to the south point of Beaver Island.

Bois Blanc Island.—A *Life Saving Station* has been established near the middle of the east end of the island.

BOIS BLANC LIGHT-STATION.—A fixed white light, 4th order, visible $13\frac{1}{2}$ miles. Yellow tower, 38 feet high, rising from yellow dwelling. On the northeast point of the narrow neck of land extending to the northward from the easterly end of Bois Blanc island. A guide into the north channel of the Straits of Mackinac. Detour light-house, N. E. by E. $\frac{1}{2}$ E., $26\frac{1}{2}$ miles. Spectacle Reef light-house, E. by S., 14 miles. Fort Mackinac, W. N. W. $\frac{3}{4}$ W., $9\frac{1}{2}$ miles.

In the Bay south of the light there is good anchorage and protection from all winds, except those from W. S. W. by the westward and northward to N. N. E. The shore is bold from the east point of the island to the light. A spit extends from the light-house point in a W. N. W. direction from one-half to five-eighths of a mile. To make the anchorage from the eastward: When half a mile north of the light steer west for three-fourths of a mile, thence south three-fourths of a mile, when haul up E. S. E. for about half a mile and come-to in about 6 fathoms with the light bearing N. N. E.

NOTE.—There is a shoal spot between $\frac{1}{4}$ and $\frac{3}{4}$ of a mile N. W. of the light, on which at the present low stage of water there is not more than $15\frac{1}{2}$ feet, heavy draft vessels should keep outside of it.

Poe's Reef.—Red, 2d-class can buoy in 17 feet of water. Placed on the southeast point of Poe's reef, $1\frac{1}{2}$ miles from the southeast end of Bois Blanc island. The reef extends in an easterly and westerly direction about 2,000 yards, with the least depth of water on it of 12 feet. There is a narrow channel on the north side of it, which should not be attempted by strangers. Spectacle Reef light house, E. N. E. $\frac{1}{2}$ E., 12 miles. Cheboygan light-house, S. W. $\frac{3}{4}$ S., $3\frac{1}{2}$ miles.

Cheboygan Reef.—Black, 2d-class nun buoy in 16 feet of water. This buoy marks a dangerous shoal on which there is not more than 14 feet of water, it is about 350 yards long in an east and west direction. Cheboygan Main light bears S. S. W. $\frac{1}{4}$ W., $\frac{1}{2}$ mile.

CHEBOYGAN LIGHT-STATION.—A fixed white light, 5th order, varied by white flashes every 90 seconds, visible $12\frac{1}{2}$ miles. White tower, 33 feet high, rising from dwelling. On the north point of the land to the eastward of McLeod's bay, south channel of the Straits of Mackinac. A guide into the south channel. A fog signal has been established at this station, it is a 10-inch steam whistle, during thick or foggy weather it will sound blasts of 5 seconds with intervals of 25 seconds. Poe's Reef buoy, N. E. $\frac{1}{4}$ N., $3\frac{1}{2}$ miles. St. Helena light, N. W. by W. $\frac{1}{4}$ W., 25 miles. South point of Bois Blanc island N., $3\frac{1}{2}$ miles.

Cheboygan Pierhead Crib Light.—A fixed red light, 4th order, visible 12 miles. Red, iron, octagonal tower, 35 feet high. On

isolated crib off the entrance into the Cheboygan river, Michigan. Vessels bound into Cheboygan should pass the crib close to on east side and steer in on the range. Spectacle reef, N. E. by E. $\frac{1}{4}$ E., $17\frac{1}{2}$ miles. Point St. Ignace, N. W., $17\frac{1}{2}$ miles. Good anchorage off the light in 3 to 4 fathoms.

McLeod's Bay has good anchorage and protection from all winds. To enter it, when one-fourth of a mile N. E. by N. from Cheboygan crib light, steer S. E. by E. 1 mile, heading a little outside the lumber docks at Duncan City. Come to abreast the lumber docks in $3\frac{1}{2}$ fathoms.

Cheboygan River Ranges.—Two fixed red lights, on the west side of the Cheboygan river. Front light, 42 feet above the lake, in tower rising from frame dwelling; rear light 68 feet above the lake, in open framework tower. Towers 850 feet apart, on the prolongation of the center line of the cut, and a range for passing through it. The cut was completed in 1887; it is 200 feet wide and 15 feet deep from the 15-foot curve in the straits up to the steamboat landing.

Zela Shoal.—Red, 3d-class can buoy in 18 feet of water. On the extreme west end of the shoal, extending 2 miles W. N. W. from Zela point, south side of Bois Blanc island. There is no passage way between the buoy and the island. West point of Mackinac island, N. W. $\frac{1}{4}$ N., $7\frac{1}{2}$ miles. Cheboygan light-house, S. E. $\frac{1}{4}$ E., $9\frac{1}{2}$ miles. Point au Sable, S. $\frac{1}{4}$ E., $4\frac{1}{2}$ miles.

Major's Shoal.—Red and black horizontal stripes, 2d class can buoy in 19 feet of water. On the middle of the shoal. The general direction of the shoal is N. W. and S. E., and it is about 1,200 feet long. There is a 14-foot spot about 400 feet southeast of this buoy. East side of Mackinac island N. E. $3\frac{1}{2}$ miles. West side of Mackinac island N. $\frac{1}{4}$ E. $3\frac{1}{2}$ miles. From the buoy the west side of Grosse Isle St. Martin is just open by the west side of Mackinac island, and the north point of St. Helena is in line with Point La Barbe.

Mackinac Harbor.—Red, 3d-class can buoy in 12 feet of water. Marks the end of the spit extending off the south point of Mackinac island; this spit extends in a southeasterly direction. A spit extends in a similar direction from the east point of the island, which with the bay between the two points form Mackinac harbor. The harbor is safe from all winds, except from the east. Large steamers can lie at the piers in any weather. Vessels should not attempt to pass between the buoy and the island, at the same time taking care to avoid the shoal to the northwest of Round island. To make the harbor from the west, get McGulpin's Point light astern, and the east fall of Mackinac island in range E. N. E. $\frac{1}{4}$ N., until Bois Blanc light opens by Round island, when haul up slowly for it, keeping a lookout for the spit off Round island, and when well past it, haul up for the piers at Mackinac on a bearing of N. W. $\frac{1}{4}$ W., with the east end of Round island a little on the port quarter.

South Graham Shoal.—Red, 1st-class automatic bell buoy in 24 feet of water. On the southeasterly edge of South Graham shoal. The Graham shoals bear N. N. E. and S. S. W., respectively, from each other three-fourths of a mile. Between the shoals and Point St. Ignace there is a channel which should not be attempted by strangers. The currents in the vicinity of the Graham shoals and the Straits of Mackinac are often strong and irregular. After fresh gales, vessels anchored in the straits often trend to windward. The least water on the South Graham is 6 feet. McGulpin's Point light-house, S. W. $\frac{1}{4}$ W., $4\frac{1}{2}$ miles. Point St. Ignace, N. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles. Point La Barbe, W. N. W. $\frac{1}{4}$ W., $2\frac{1}{2}$ miles.

North Graham Shoal.—Red, 2d-class can buoy in 12 feet of water. Placed on the southeast point of the shoal. Least water on shoal, 8 feet. Rabbit's Back peak, N. by W. $\frac{1}{4}$ W., $5\frac{1}{2}$ miles. North point of Mackinac island, N. E. $\frac{1}{4}$ N., 4 miles. South Graham Shoal buoy, S. S. W. $\frac{1}{4}$ W., 1,400 yards. Range lines from the north side of

Isle St. Helena and Point La Barbe, and from Grosse Point and Point St. Ignace, intersect each other on the South Graham shoal.

Point St. Ignace is the terminus, on the north side of the straits, of the Detroit, Mackinac and Marquette Railroad. To make St. Ignace from Mackinac harbor, haul around the south point of the island, and steer W. by N. $\frac{1}{4}$ N., $4\frac{1}{2}$ miles, to the docks. Vessels coming from the west should range Old Point Mackinac and the west point of Mackinac island, N. E. by N., until in range with the south side of Round island and the dock at Point St. Ignace, when haul up on the range W. N. W. $\frac{1}{4}$ N. There is good water at either of the docks.

Carp River, in St. Martin's bay, is 12 miles north of Point St. Ignace. There is good anchorage off the mouth of the river; vessels can lie there in any weather. To make the anchorage from the west side of Mackinac island, steer north in mid-channel between Grosse Isle St. Martin and Grosse point, and when past the point, steer N. $\frac{1}{4}$ W. $3\frac{1}{2}$ miles. Come to in $3\frac{1}{2}$ fathoms off the mouth of the river. A spit extends in an easterly direction from Grosse point one-half mile. To make the mouth of Carp river from the east, when half a mile north of Bois Blanc light, steer N. W. $\frac{1}{4}$ W., 15 miles, keeping Grosse point a little open on the starboard bow, and when the middle of the channel between Grosse Isle St. Martin and Grosse point bears north, haul up on that bearing, and when past the point steer N. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles, to abreast the mouth of the river. Shoal water extends off the south point of Grosse Isle St. Martin half a mile, and off the south point of Little St. Martin's island nearly 1 mile. To run through between the islands, bring the middle of the passage to bear north and run through on that bearing. To run through between Little Isle St. Martin and Point St. Martin, bring the middle of the channel to bear N. by W., and run through on that bearing. A detached shoal off St. Martin's point extends east and west one mile in length. Vessels should give the point a berth of one mile. A spit extends off the east point of Grosse Isle St. Martin three-eighths of a mile in an easterly direction.

Goose Island Shoal lies in range of Fort Mackinac and the middle of Goose island, and also in the range of Bois Blanc light and west side of Point St. Martin, N. N. W. $\frac{1}{4}$ W., $6\frac{1}{2}$ miles, from Bois Blanc light and S. W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles from the north point of Goose island. Least water, 5 feet.

Goose Island Spit extends in a S. S. E. direction 1 mile from south end of the island. The south end of the spit bears N., $6\frac{1}{2}$ miles from Bois Blanc light.

Marquette Bay has good anchorage and protection from all winds, and is easy of access. The east point of entrance is N. $\frac{1}{4}$ W., $2\frac{1}{2}$ miles from the north end of Goose island. To enter the bay, haul around the east point of entrance, giving it a berth of 300 yards, and come to in 4 or 5 fathoms. There is a good channel between Goose Island and Isle Marquette. Shoal water extends from Isle Marquette in the direction of Goose island $\frac{1}{2}$ mile.

Old Fort Mackinac is the terminus on the south side of the straits of the Detroit, Mackinac & Marquette Railroad. There is a large railroad wharf, with deep water alongside. Good anchorage in the bay east of Old Point Mackinac, and protection from all westerly winds. To make the anchorage from the west, haul around the point and stand into

Point and Point
shoal.

North side of the straits,
To make St. Ignace
point of the island, and
vessels coming from the
west point of Mackinac
side of Round island
the range W. N. W.

North of Point St.
the river; vessels can
from the west side of
Green Grosse Isle St.
point, steer N. $\frac{1}{2}$ W. $3\frac{1}{2}$
the river. A spit
one-half mile. To
half a mile north of
Point Grosse point a
middle of the channel
runs north, haul up on
a buoy, $3\frac{1}{2}$ miles, to abreast
south point of Grosse
point of Little St. Martin's
islands, bring the middle
point bearing. To run
St. Martin, bring the
middle on that bear-
ing east and west one
mile. A buoy three-eighths of

Mackinac and the
Bois Blanc light and
islands, from Bois Blanc
point of Goose island.

Distance 1 mile from
Point bears N., $6\frac{1}{2}$ miles

protection from all
directions is N. $\frac{1}{2}$ W., $2\frac{1}{2}$
the bay, haul around
the islands, and come to in
front of Round Island and Isle
St. Ignace in the direction

South side of the
islands. There is a large
anchorage in the bay
from easterly winds. To
steer and stand into

the bay, until past the range of the point and St. Helena light, and come to. Further
up in the bay the water is shoal.

OLD MACKINAC POINT FOG-SIGNAL STATION.—The signal
is a 10-inch steam whistle, gives blasts of 5 seconds, alternate silent intervals of 17
and 33 seconds. Brown corrugated iron fog-house, gable facing the lake. On the
north side of Old Mackinac point. McGulpin's Point light W. $2\frac{1}{2}$ miles. St. Helena
light N. W. $\frac{1}{2}$ W. 8 miles. Cheboygan Main light S. E. by E. $\frac{1}{2}$ E. $16\frac{1}{2}$ miles.

Light-house to be built.—The light will be fixed white, varied by a white
flash at intervals of 10 seconds.

Good anchorage on the south side of the straits between Point Sable and Old
Point Mackinac.

Excellent holding ground and protection from northeast gales can be found south
of Round island and off the west end of Bois Blanc island.

McGULPIN'S POINT LIGHT-STATION.—A fixed white
light, 3 $\frac{1}{2}$ order, visible $17\frac{1}{2}$ miles. Yellow tower, 38 feet high, rises from
dwelling. On McGulpin's point, south side of the Straits of Mackinac,
about 2 miles west of Old Fort Mackinac point. The light is situated on
a bluff, which is about 70 feet above the level of the lake. Old Fort
Mackinac point, E. $\frac{3}{4}$ N., 2 miles. South Graham Shoal buoy, N. E. $\frac{1}{2}$ E.,
 $4\frac{1}{2}$ miles. St. Helena light-house, N. W. $\frac{1}{2}$ N., $6\frac{3}{8}$ miles.

ST. HELENA LIGHT-STATION.—A fixed red light, 3 $\frac{1}{2}$
order, visible $15\frac{1}{2}$ miles. White tower, 65 feet high, connected by a
covered way with red brick dwelling. On the southeast point of St.
Helena island. A guide to vessels making a lee under St. Helena island,
and also a leading mark to vessels bound westward through the south
channel of the Straits of Mackinac. In entering St. Helena harbor from
the westward, when three-quarters of a mile north of Waugoshance
light, steer E. by N. $\frac{1}{4}$ N., 12 miles, to a point three-quarters of a mile S.
E. $\frac{1}{2}$ S. from St. Helena light, and in range with it and McGulpin's Point
light, when haul to the northward, keeping a lookout for the spit which
extends half a mile to the southward and eastward of the light, and marked
by a 25 foot black spar buoy in 18 feet of water. Come to off the dock on
the east side of the island, in from 6 to 8 fathoms. To pass to the north-
ward of the island, when three-quarters of a mile north of Waugoshance
light, steer E. N. E. $\frac{3}{4}$ N., $11\frac{1}{2}$ miles, to a point one-quarter of a mile
north of the island, passing about half a mile south of St. Helena Shoal
buoy, when haul to the southeastward and come to off the dock. Vessels
approaching from the south channel of the straits should bring McGul-
pin's Point light astern, and steer N. W. $\frac{1}{2}$ N., which will lead to the an-
chorage. Waugoshance light-house, S. W. by W. $\frac{1}{2}$ W., $11\frac{1}{2}$ miles.

St. Helena Southeast Shoal.—Black spar buoy in 18 feet
of water. On the southeast end of shoal extending 1,000 yards south-
east of St. Helena light-house. In entering St. Helena harbor from the
eastward, give the buoy a berth of 100 yards. St. Helena light-house,
N. W. $\frac{1}{2}$ W., 1,000 yards.

St. Helena Shoal.—Red and black horizontal stripes, 2d-class
can buoy. On the south side of the center of St. Helena shoal, which
lies $1\frac{1}{2}$ miles west of the northwest end of St. Helena island. The shoal
is about 750 yards in extent northwest and southeast, and 500 yards
northeast and southwest, with 8 feet of water on its shoalest part. The
soundings are irregular; bottom rocky, with 3 to 4 fathoms close to.
North point of St. Helena island, E. $\frac{3}{4}$ N., 2 miles. McGulpin's Point
light-house, S. E. $\frac{1}{2}$ E., $8\frac{1}{2}$ miles. Waugoshance light-house, S. W. by
W., $9\frac{1}{2}$ miles.

Manitou Paymen Shoal.—Red and black horizontal stripes, 2d-class nun buoy in 18 feet of water. Off the south point of Manitou Paymen shoal, the center of which is about 4 miles from the north shore. The shoal is about three-fourths of a mile in extent northeast and southwest, and 800 yards northwest and southeast. Least water on it, 6 feet. Waugoshance light-house, S. $\frac{1}{2}$ W., 11 $\frac{1}{2}$ miles. Point Epoufette, N. W. $\frac{1}{2}$ W., 8 $\frac{1}{2}$ miles. Simmons reef, S. W. by W. $\frac{1}{2}$ W., 6 $\frac{1}{2}$ miles.

Simmons Reef Light-Vessel.—Moored in about 26 feet of water to the southeastward of the reef, and shows at each masthead a group of three fixed red lens lantern lights. The focal plane of each group is 80 feet above the lake, and the lights are visible in clear weather 8 $\frac{1}{2}$ miles. The vessel has two masts, schooner rigged, and no bowsprit. The hull is painted red, with "Simmons Reef" in large white letters on each side, and "No. 55" in white figures on the stern. The lantern masts are painted yellow, and abaft of each there is a trysail mast; two black smoke pipes, and the fog-signal are between the masts.

The fog-signal is a 6-inch steam whistle, and in thick or foggy weather will sound blasts as follows:

Blast.	Silent interval.	Blast.	Silent interval.	Blast.	Silent interval.
1 second.	10 seconds.	3 seconds.	10 seconds.	1 second.	35 seconds.

Simmons Reef is composed of 4 shoals extending in an easterly and westerly direction 1 $\frac{1}{2}$ miles, and about 800 yards in a northerly and southerly direction. Least water, 3 feet. Waugoshance light-house, S. S. E. $\frac{1}{2}$ E., 9 $\frac{1}{2}$ miles. Hat Island (left tangent), S. W. $\frac{1}{2}$ S., 8 miles.

White Shoal Light-Vessel.—Moored in about 26 feet of water, to the northeastward of the shoal, and shows at each masthead a group of three fixed white lens-lantern lights. The focal plane of each group is 80 feet above the lake, and the lights are visible in clear weather 11 $\frac{1}{2}$ miles. The vessel has two masts, schooner rigged, and no bowsprit. The hull is painted white, with "White Shoal" in large black letters on each side, and "No. 56" in black figures on the stern. The lantern masts are painted yellow, and abaft of each there is a trysail mast. Two black smoke pipes, and the fog-signal are between the masts.

The fog-signal is a 6 inch steam whistle, and in thick or foggy weather will sound blasts as follows:

Blast.	Silent interval.	Blast.	Silent interval.	Blast.	Silent interval.
1 second.	10 seconds.	1 second.	10 seconds.	3 seconds.	35 seconds.

Waugoshance light-house, S. S. E. $\frac{1}{2}$ E., 4 $\frac{1}{2}$ miles. Hat Island (left tangent), W. by S. $\frac{1}{2}$ S., 8 miles. St. Helena light-house, E. $\frac{1}{2}$ N., 1 $\frac{1}{2}$ miles.

White Shoal (southwest end).—A 1st-class red and black horizontal stripes spar buoy in 18 feet of water.

The White Shoals are composed of irregular rocky reefs extending $\frac{1}{2}$ mile in a northeasterly and southwesterly direction. Least water, 3 feet.

WAUGOSHANCE LIGHT-STATION.—A fixed light, varied by white flashes at intervals of 90 seconds, 4th order, visible 15 $\frac{1}{2}$ miles. Tower 65 feet high, attached to dwelling, both painted brown, surrounded by a square crib. On the extreme point of the shoal extending to the northwestward of Waugoshance island, and marks the turning point from the Straits of Mackinac into Lake Michigan, between Beaver island and the main-land. There is a passage-way to the eastward and close to the light, but it should not be used unless familiar with the locality. During thick or foggy weather there is sounded a steam whistle, giving blasts of 5 seconds at intervals of 25 seconds. St. Helena Shoal buoy, N. E. by E., 9 $\frac{1}{2}$ miles. Manitou Paymen buoy, N. $\frac{1}{2}$ E., 11 $\frac{1}{2}$ miles. Simmons Reef light-ship, N. N. W. $\frac{1}{2}$ W., 9 $\frac{1}{2}$ miles. White Shoal light-ship, N. N. W. $\frac{1}{2}$ W., 4 $\frac{1}{2}$ miles. Gray's Reef light-ship, W. 4 $\frac{1}{2}$ miles. Hog's Island Reef buoy, W. S. W. $\frac{1}{2}$ W., 12 $\frac{1}{2}$ miles. Skilligallee light-house, S. S. W. $\frac{1}{2}$ W., 8 $\frac{1}{2}$ miles.

Waugoshance 15-Foot Shoal.—A 2d-class red and black horizontal stripes nun buoy in 17 $\frac{1}{2}$ feet of water. Marks a large boulder, on which the light-house tender "Dahlia" found but 17 $\frac{1}{2}$ feet of water. Waugoshance light-house, S. by E. $\frac{1}{2}$ E., 1 $\frac{1}{2}$ miles.

Vienna Shoal.—Red and black horizontal stripes, 2d-class can buoy, in 16 feet of water. Marks the northwest point of the Vienna shoal, which has an extent of 800 yards from east to west, and 175 yards north to south. The large boulder was blown up last year by the U. S. Engineers, but there are still a number of small ones near the center of the shoal with 16 feet of water over them. Waugoshance light, E. by N. $\frac{1}{2}$ N. 1 $\frac{1}{2}$ miles. Skilligallee light, S. by W. $\frac{1}{2}$ W., 7 $\frac{1}{2}$ miles.

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"Gray's Reef" in large white letters
The lantern masts are
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3 seconds.	10 seconds.

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GRAY'S REEF LIGHT-VESSEL.—Moored in about 26 feet of water, to the eastward of the reef, and shows a group of three fixed white lens-lantern lights at the foremast head, and three fixed red lens-lantern lights at the mainmast head. The focal plane of each group is 30 feet above the lake, and the white light is visible in clear weather 11½ miles. The vessel has two masts, schooner rigged, and no bowsprit. The hull is painted red up to the bulwarks. The bulwarks are painted white, with "Gray's Reef" in large black letters on each side, and "No. 57" in black figures on the stern. The lantern masts are painted yellow, and abaft of each there is a trysail mast. Two black smoke pipes, and the fog signal are between the masts. The fog-signal is a 6-inch steam whistle, and in thick or foggy weather will sound blasts as follows:

Blast.	Silent interval.	Blast.	Silent interval.	Blast.	Silent interval.
3 seconds.	10 seconds.	1 second.	10 seconds.	1 second.	10 seconds.

Gray's reef, which is composed of a series of shoals extending east and west about 3½ miles, and about 1½ miles north and south. Least water, 6 feet. The soundings between the reef and Hat Island are irregular and foul. Waugoshance light-house, E. 4½ miles. Skilligallee light-house, S. ¼ E., 7½ miles. St. Helena light-house, E. by N. ¼ N., 16½ miles.

SKILLIGALLEE SHOAL.—Black, 3d-class nun buoy, in 18 feet of water. Marks the end of a shoal extending in a northwesterly direction from Skilligallee light-house, and vessels should not attempt to pass between the buoy and the light. Skilligallee light-house, S. E. by E. ¼ E., ¼ of a mile.

SKILLIGALLEE LIGHT-STATION.—A fixed white light, 4th order, visible 14 miles. White brick tower, 52 feet high, connected by a covered way with dwelling, all white. On Skilligallee rock (Isle aux Galets), between Beaver Island and the main-land, and 5½ miles from the latter. A guide to and from the Straits of Mackinac. During thick or foggy weather, a 10-inch steam whistle will sound blasts of 5 seconds, with alternate intervals of 10 and 40 seconds.

Waugoshance light-house, N. N. E. ¼ E., 8½ miles. Gray's Reef buoy, N. by W. ¼ W., 7½ miles. Hog Island reef buoy, W. N. W. ¼ W., 8½ miles.

There is a detached shoal 1½ miles, the middle of it bearing E. N. E. ¼ N. from Skilligallee light, with only 12 feet of water, rocky bottom. The shoal is half a mile in length and an eighth mile wide, and extends in a northeast direction.

Hog Island Reef.—Red and black horizontal stripes, 2d-class can buoy, in 18 feet of water. Off the southeast end of Hog Island reef. The greatest extent of the reef is east and west three-eighths of a mile, and north and south 220 yards. The shoalest spot, 6 feet, is on the west end of the reef, with soundings to the westward, close to, of 4 and 5 fathoms. Skilligallee light-house, E. S. E. ¼ E., 8½ miles. Waugoshance light-house, E. N. E. ¼ E., 12½ miles. Gray's Reef light vessel, N. E. by E. ¼ E., 8½ miles. Beaver Island Harbor light-house, W. ¼ N., 8½ miles.

BEAVER ISLAND HARBOR LIGHT-STATION.—A fixed red light, 4th order, visible 12½ miles. White tower, 34 feet high, connected by a covered way with dwelling, all white. On the north side of the entrance into Beaver harbor. A guide into the harbor. Vessels entering must be careful to avoid the shoal on the north side of entrance. With the light-house ahead, bearing N. W. by W., distant 1 mile, open the light a little on the starboard bow, heading about W. N. W., which will lead into the harbor. Pass the light-house, giving it a berth of about 200 yards. Good anchorage can be found on a line between the inner and outer docks. Skilligallee light-house, E. S. E. ¼ E., 17 miles. Hog Island Reef buoy, E. ¼ S., 8½ miles. Life-Saving Station about 165 feet west of light-house.

BEAVER ISLAND LIGHT-STATION.—A fixed white light, varied by white flashes at intervals of 1 minute. 4th order, visible 17½ miles. Yellow tower, 40 feet high, connected by a covered way with dwelling, all of yellow brick. On the bluff, about 60 feet high, at the south end of Beaver island. A guide through the channel, 9½ miles wide, between Beaver and North Fox islands. The fog-signal is a 1st class steam-siren. The fog-signal house is on a point 650 feet S. W. by W. ¼ W. from the light-house. In thick and foggy weather there will be

sounded blasts of 7 seconds with intervals of 42 seconds. North point of North Fox island, S. W. by W. $\frac{1}{2}$ W., 11 $\frac{1}{2}$ miles. Grand Traverse light-house, S. $\frac{3}{4}$ E., 25 $\frac{1}{2}$ miles. Shoal water extends off the south and southwest points of the island $\frac{3}{4}$ of a mile.

LITTLE TRAVERSE LIGHT-STATION.—A fixed red light, 4th order, visible 12 $\frac{1}{2}$ miles. Red brick tower, 41 feet high, attached to dwelling; lantern black. On the extremity of Harbor point. Marks the entrance to Little Traverse bay. Beaver Island light-house, W. N. W., 31 miles. South Fox Island light-house, W. $\frac{3}{4}$ S., 42 miles. To enter the harbor from the westward, haul close around Harbor point, which is steep-to, and run to the docks in the head of the bay, or come to on the north side. In the middle of the bay the water is too deep to anchor.

CHARLEVOIX PIERHEAD LIGHT-STATION.—A fixed red light, 5th order, visible 9 $\frac{1}{2}$ miles. White, square, open-frame tower. On the outer end of the north pier at the entrance to the harbor of Charlevoix.

The harbor improvement consists of a dredged channel connecting Pine lake with Lake Michigan, and protected on both sides by revetments and piers extending into Lake Michigan. The piers are 160 feet apart, and extend out W. N. W. $\frac{1}{2}$ N. The north pier is 40 feet longer than the south pier. A bar has formed outside the end of the south pier, and reduced the depth to 10 $\frac{1}{2}$ feet at the entrance from Lake Michigan.

LAKE MICHIGAN.

Light-Houses, Buoys and Harbors Standing South Along the East Coast of Lake Michigan and Islands.

SOUTH FOX ISLAND LIGHT-STATION.—A fixed red light, varied by red flashes at intervals of 2 minutes, 4th order, visible 15 miles. Yellow tower, 39 feet high, rises from yellow dwelling. On the southern extremity of South Fox island. A guide through the channel between South Fox and North Manitou islands. A shoal extends to the southward of South Fox island for the distance of 9 $\frac{1}{2}$ miles, with two spots on it with 13 and 16 feet of water, respectively, marked by buoys. Grand Traverse light-house, S. E. $\frac{3}{4}$ E., 18 $\frac{1}{2}$ miles. Northwest point of North Manitou island, S. S. W. $\frac{1}{2}$ W., 19 miles. From the north point of the South Fox island a spit extends 1 mile in a northwest direction, and another from the south point in a southwest direction $\frac{1}{2}$ mile. The North Fox can be approached within half a mile except on the southwest side, where shoal water extends nearly 1 mile. The holding ground around the Foxes is very good, and they afford shelter from all winds except from the northwest and southeast. On the east side the water is deep and vessels come-to in from 15 to 22 fathoms.

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Fox Island Shoal (inside).—Second-class nun buoy, red and black horizontal stripes, in 20 feet of water. To the southward, and close to the inner spot on the reef extending to the southward of South Fox island, distant $4\frac{1}{2}$ miles from South Fox Island light. The chart gives 13 feet as the least depth of water at this point, but rocks with only 11 feet on them have been found. The bottom near the buoy is rocky; the soundings are irregular, and deeply-laden vessels should be careful in navigating in this vicinity when the weather is thick or foggy. In clear weather the buoy may be passed on either side at a distance of a quarter of a mile. South Fox island light-house, N. $\frac{1}{4}$ E., $4\frac{1}{2}$ miles. Outer Shoal buoy, S. $\frac{1}{4}$ E., $3\frac{1}{2}$ miles.

NOTE.—Vessels bound down through this passage, to avoid this shoal should keep the highest land on North Fox island closed with the south point of South Fox island until within two miles of the point, when steer N. E. $\frac{1}{4}$ E. for Wangoshance.

Fox Island Shoal (outside).—Third-class can buoy, red and black horizontal stripes, in 20 feet of water. To the southward, and close to the outer shoal spot on the reef extending to the southward of South Fox island, distant $7\frac{3}{4}$ miles from South Fox Island light. The chart gives 16 feet as the least depth of water at this point, but spots have been found with only 12 feet of water on them. This locality should be avoided in thick weather, but when the buoy can be seen, it may be passed within a quarter of a mile. Inner Shoal buoy, N. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles. South Fox Island light-house, N. $\frac{1}{4}$ E., $7\frac{3}{4}$ miles.

Grand and Little Traverse Bays.

From Middle Village to the Foot of the East Arm of Grand Traverse Bay.—The coast as far as Little Traverse can be approached within half a mile. There are detached rocks and rocky spots within one-third of a mile from shore. From Little Traverse to Big Rock point the coast can be approached safely within one-fourth of a mile, the shallow water being in the indentations of the shore. From Pine River point a rocky flat extends one-fourth of a mile to the west and north. Dangerous reefs extend to the north and northwest for almost a mile from Fisherman's island. From this island to the foot of the east arm of the bay are many detached rocky spots and ledges and numerous spits extending from shore, but not less than 12 feet of water will be found on any part within half a mile from the general direction of the shore, except at the foot of the bay, where 12 feet are found in spots three-fourths of a mile from shore.

From the Foot of the East Arm to Traverse City.—From the foot of the bay to the village of Old Mission the coast can be approached within 1,000 feet everywhere, but half a mile south of the village a flat extends 1,500 feet into the bay. From the point opposite, and east of the village, a spit runs out in a southeasterly direction. A dangerous rocky flat extends from Old Mission point north and west for $1\frac{1}{2}$ miles from the shore. From Old Mission point to Tucker's point several spits extend from the shore, making navigation unsafe within half a mile from the coast. From Tucker's point a rocky spit runs out south for half a mile. A rocky spit extends from the south point of Hog island for more than half a mile to the south-

west, and a smaller one in a northeasterly direction from its northern point. From Bower's harbor to Traverse City the shore can be approached within one-fourth of a mile.

From Traverse City to Light-house Point.—Two miles north of the dock at Traverse City, a dangerous 9-foot spit extends half a mile from the shore. The coast from here to Lee's point is safe within half a mile. From Lee's point a spit extends to the south for three-fourths of a mile. North of Lee's point a flat runs almost half a mile from shore, half-way to Sutton's point. From this point a rocky spit extends three-eighths of a mile to the northward. The western shore of Sutton's bay is shallow within half a mile. The coast from Pishaube's village to Northport is generally good, but a lookout should be kept for a rocky spit extending for almost a mile N. by E. from the northern end of New Mission point. There is shoal water for one-fourth of a mile to the north and east of Bellow's island. Two dangerous shoals with 6 and 8 feet of water on them lie between Northport point and Northport. A rocky spit runs out in a southeasterly direction for half a mile from a point three-fourths of a mile north of Northport point. From thence to Light-house point the shore can be safely approached within half a mile, but at the Light-house point a rocky spit extends almost half a mile to the northward.

Petoskey is on the south side of Little Traverse bay, S. by E. $\frac{1}{2}$ E., 3 miles, from Little Traverse light. It has a dock and considerable trade. It is the terminus of the Grand Rapids and Indiana R. R., and has become important as a summer resort. It has no light-house.

GRAND TRAVERSE LIGHT-STATION.—A fixed white light, 4th order, visible $12\frac{1}{2}$ miles. Black lantern on yellow brick dwelling, 34 feet high. On the northwest point of Lighthouse point, at the entrance of Grand Traverse bay. A guide into the bay and to the passage between the main land and the Manitous. South Fox Island light-house N. W. $\frac{1}{2}$ W., $18\frac{1}{2}$ miles. Northwest point of North Manitou, W. by S., $24\frac{1}{2}$ miles.

MISSION POINT LIGHT-STATION.—A fixed white light, 5th order, visible $13\frac{1}{2}$ miles. Black lantern on white frame dwelling, 35 feet high. On the northeast point of Old Mission point, Grand Traverse bay. A guide into the east and west arms of Grand Traverse bay. Reefs extend off this point from W. to N. by E. of light-house, $1\frac{1}{2}$ miles. Dock at Northport, N. W. $\frac{1}{2}$ N., $11\frac{1}{2}$ miles. New Mission point, N. W. $\frac{1}{2}$ W., $5\frac{1}{2}$ miles.

Northport Bay is 6 miles south of Grand Traverse point. It has good anchorage and protection from all winds. To enter the harbor from the northward, haul around Northport point; give it a berth of three-eighths of a mile, when steer W. $\frac{1}{2}$ S., $2\frac{1}{2}$ miles, to the docks, keeping a lookout for two shoals nearly in range with Northport point and the docks.

Sutton's Bay is on the west side of the West arm of the bay, 6 miles west of Mission Point light-house; has good anchorage and easy of access. The bay is open from the northeast.

Bower's Harbor is on the east side of the West arm of the bay, 10 miles N. N. E. from Traverse City. Good anchorage and protection from all winds. To enter the harbor from the north, run in between Tucker's point and Hog island, keeping a little nearer to Hog island. A

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Old Mission Bay is on the west side of the East arm of the bay, $2\frac{1}{2}$ miles south from Mission Point light-house; it has good anchorage and protection from all winds. To enter the harbor from the north, haul around the point, giving it a berth of half a mile to clear the spit extending southeast from the point, and come to off the village in 6 fathoms.

New Mission Point, or Dougherty's Harbor, is $5\frac{1}{2}$ miles N. W. $\frac{1}{2}$ W. from Mission Point light.

Elk Rapids is on the east side of the East arm of the bay, 7 miles S. S. E. $\frac{1}{4}$ E. from Mission Point light.

Standing South on the East Shore of Lake Michigan.

From Light-house Point to Point Betsey.—Between the light-house and Cat Head point two spits extend over half a mile from shore.—From Cat head to Carp river the coast can be approached within half a mile, but there are two 12-foot detached rocky spots 4 miles N. E. $\frac{1}{4}$ N. from the dock at Carp river, $1\frac{1}{2}$ miles from shore.—In Good Harbor bay are several shoals with only 8 feet of water on them. One of these will be found bearing N. E. $\frac{1}{4}$ N. from the dock at Unity, and distant 4 miles; the shoal is directly on the line joining Carp River and Pyramid points. Another 8-foot spot bears from Unity dock N. E. $\frac{1}{4}$ E., distant $3\frac{1}{2}$ miles, and is a little inside the line joining Unity dock and Carp River point.—Southeast from the last spot, and half a mile distant, is a 10-foot spot.—Three miles south of Pyramid point a rocky spit runs half a mile from shore, and shoal water extends for one mile towards Sleeping Bear.—From thence to Point Betsey the shore is bold, and can be approached within one-fourth of a mile, except at Platte River point, where a spit extends to the north, having only 6 feet of water over it three-fourths of a mile from shore.

Cat Head Point and Bay afford shelter in southerly winds. Good holding ground under Pyramid point. Unity dock affords protection in all winds, except those from the north and northeast.

Glen Arbor in the bay between Sleeping Bear point and Pyramid point has good shelter from all winds, from the west round by the south to northeast.

SOUTH MANITOU ISLAND LIGHT-STATION.—A fixed white light, 3d order, visible $17\frac{1}{2}$ miles. White tower, 91 feet high, connected by a covered way with yellow brick dwelling. On the southeast point of South Manitou island. A guide into Manitou harbor and through the channel to the eastward of the Manitous. During thick or foggy weather, a steam whistle is sounded, giving a blast of 8 seconds' duration each minute. The fog-signal houses are 34 yards to the northeast of the light. Southeast point of North Manitou, N. E. by E., $7\frac{1}{2}$ miles. Point Betsey light-house, S. by W. $\frac{1}{4}$ W., $23\frac{1}{2}$ miles.

South Manitou Harbor is protected from all winds, with good holding ground. The water is deep in the middle of the bay; the best anchorage is on the west side, about one-third the distance from the south dock to the Light-house point.

South Manitou Island can be approached within a quarter of a mile everywhere, except on the south and southwest sides, where shoal water extends half a mile from shore. There is also a rock, with only 3 fathoms of water over it, S. S. W. $\frac{1}{4}$ W. from the southwest point of Manitou island, $2\frac{1}{2}$ miles.

North Manitou Island can be approached with safety within a quarter of a mile on the north side, and within half a mile on the east and west sides, but there extends in a southerly direction a rocky spit more than three-quarters of a mile from the southwest point of the island. Good shelter can be had in the bight on the east side of the island from winds from the southwest to northwest. The water is deep—from 14 to 20 fathoms.

POINT BETSEY LIGHT-STATION.—A flashing white light; interval of flash, 10 seconds; 4th order, visible $13\frac{1}{2}$ miles. Yellow tower, 34 feet high, with brick dwelling attached. On Point Betsey (Pointe aux Bees Scies), east shore of Lake Michigan. Marks the turning point for vessels bound to and from the south end of Lake Michigan when passing through the channel to the eastward of the Manitous. South Manitou Island light-house, N. by E. $\frac{1}{2}$ E., $23\frac{1}{2}$ miles. From Point Betsey to Big Point Sable the shore is bold, and can be approached anywhere to within 2,000 feet; sand bottom. The Life Saving Station is a little south of the light-station. The fog-signal is a 10-inch steam whistle giving blasts of 5 seconds duration, separated by alternate silent intervals of 10 and 40 seconds. The fog-signal house is about 175 feet N. E. by N. from the light-tower. It is a corrugated iron structure painted dark brown.

FRANKFORT PIERHEAD BEACON-LIGHT.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. White, open frame-work tower, 25 feet high; 76 feet from the outer end of the south pier at Frankfort, Michigan, $4\frac{1}{2}$ miles from Point Betsey light. Width between piers, 200 feet. The harbor improvement consists of a dredged channel connecting Lake aux Bees Scies with Lake Michigan. The channel is protected on both sides by revetments and parallel piers extending west into Lake Michigan. The south pier extends 200 feet beyond the north pier.

The Life Saving Station is at the inner end of the south pier.

PORTAGE LAKE PIERHEAD LIGHT-STATION.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. Square, white, pyramidal; open frame-work tower, upper part enclosed. Near the outer end of north pier.

Range Light.—A fixed red light shown from a lens lantern, on a post at the outer end of the north pier. This light with the pierhead light forms a range showing the direction of the piers, and the course for entering the harbor.

Portage Lake Harbor is 23 miles south of Point Betsey, and 24 miles N. N. E. $\frac{1}{4}$ E. from Big Point Sable. The project is to make it a harbor of refuge, with a navigable channel 370 feet wide, with not less than 18 feet of water. The piers extend into the lake W. $\frac{1}{4}$ N., and are parallel. The north pier is 650 feet in length, and the south pier 500 feet. A channel has been dredged 75 feet wide and 11 feet deep, but it is thought that it will soon fill up again.

MANISTEE PIERHEAD BEACON-LIGHT.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. White, open frame-work tower, 27 feet high. Near the outer end of the south pier. The fog signal is a

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HT-STATION.—
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LIGHT.—A fixed
frame-work tower, 27
The fog signal is a

10-inch steam whistle in duplicate; during thick and foggy weather it will sound blasts, at the pierhead light-station, of 5 seconds, with intervals of 25 seconds. Width between piers, 180 feet. The north pier extends 100 feet beyond the south pier. Grande Pointe au Sable light-house, S. S. W. $\frac{1}{4}$ W., 15 $\frac{1}{2}$ miles. The harbor improvements consist of a dredged channel connecting Manistee river with Lake Michigan. The channel on both sides is protected by revetments and parallel piers extending into the lake W. by N. $\frac{1}{4}$ N.

Range Light.—A fixed red light shown from a tubular lantern on a post 25 feet above the level of the lake. On the outer end of the south pier. This light will be visible in clear weather 2 to 3 miles, and will form with the main pierhead light a range showing the direction of the pier and the course for entering the harbor.

The Life Saving Station is near the inner end of the north pier at Manistee.

GRANDE POINTE AU SABLE LIGHT-STATION.—A fixed white light, 3d order, visible 17 $\frac{1}{2}$ miles. Yellow tower, 100 feet high, connected by a covered way with dwelling, all of yellow brick. A coast light on Grande Pointe au Sable, east shore of Lake Michigan. Petite Pointe au Sable light-house, S. 28 $\frac{1}{2}$ miles. Point Betsey light, N. by E. $\frac{1}{4}$ E., 46 miles.

The Life Saving Station is close to the light-house on the south side.

Hamlin is 2 miles south of Big Point au Sable; it has a small pier.

Lincoln is 5 $\frac{1}{2}$ miles to the southward of Big Point au Sable, and 2 $\frac{1}{2}$ miles north of Ludington. It has a harbor of very limited capacity.

LUDINGTON PIERHEAD BEACON-LIGHT.—A fixed red light, 5th order, visible 8 $\frac{1}{2}$ miles. A white, open, frame-work tower, 29 feet high, near the end of the south pier at Ludington, Michigan, outlet of Pere Marquette lake. The harbor works consist of two parallel piers and a dredged channel between them, connecting the deep water in Pere Marquette lake with the deep water in Lake Michigan. Width between piers, 250 feet at the outer end; as now constructed the south pier extends 350 feet beyond the north pier. Direction of the piers about W. $\frac{1}{4}$ N. Ludington is the terminus of the Flint & Pere Marquette Railroad, which keeps its boats running throughout the year. A fog-signal is to be established at this station.

Range Light.—A fixed red light shown from a tubular lantern on a post 25 feet above the level of the lake. On the outer end of the south pier in front of the main pierhead light. This light will be visible in clear weather 2 to 3 miles, and with the pierhead light will form a range showing the direction of the pier and the course for entering the harbor.

Ludington North Pierhead.—A fixed white light shown from a tubular lantern suspended from a post at the outer end of north pier.

Life Saving Station near the inner end of north pier. Pent-water Pierhead light, S. $\frac{1}{4}$ E., 11 $\frac{1}{2}$ miles.

PENT WATER PIERHEAD BEACON-LIGHT.—A fixed red light, 6th order, visible 8 $\frac{1}{2}$ miles. White, open frame-work tower, 25 feet high. On the end of the south pier at Pent Water, Michigan, outlet of Pent Water lake and river. Width between piers, 150 feet. Grande Pointe au Sable, N. by W. $\frac{1}{4}$ W., 19 miles. The harbor improvement consists of a dredged channel connecting the deep water in Lake Michigan with the deep water in Pent Water lake. The sides of the channel are protected with revetments and parallel piers extending into Lake Michigan in a W. N. W. direction. The north pier projects

650 feet and the south pier about 600 feet beyond the shore line; the north pier projects about 150 feet beyond the south pier. At the present time a bar extends about 100 feet from the outer end of the south pier in the direction of the north pier. Entering, keep close to the north pier until inside, when keep in the middle; about 10½ feet can be carried in. Close to the north pier, in places, there is not more than one foot of water. In southerly gales, vessels can make a good lee 5 or 6 miles N. E. by N. of Little Point au Sable. Come to close in shore.

Range Light.—A fixed red light, shown from a tubular lantern on a post 25 feet above the level of the lake. On the outer end of the south pier at Pentwater. This light is visible in clear weather 2 to 3 miles, and will form with the pierhead light a range showing the direction of the pier and the course for entering the harbor. Life Saving Station near the inner end of north pier.

PETITE POINTE AU SABLE LIGHT-STATION.—A fixed white light, varied by white flashes, 3d order, visible 18 miles. The interval between flashes is 30 seconds. A coast light on Petite Pointe au Sable. Red tower, 100 feet high, connected by a covered way with red dwelling. Grande Pointe au Sable light-house, N., 28½ miles. The tower and dwelling as seen from the lake are projected against a background of sand hills, partially covered with light timber.

Benona, 6½ miles to the southward of Little Point au Sable, has a pier at the outlet of Stony lake.

WHITE RIVER LIGHT-STATION.—A fixed white light, varied by red flashes, 4th order, visible 14 miles. The interval between flashes is 1 minute. Yellow, square tower, 38 feet high, rising from the northwest corner of yellow dwelling. A coast and harbor light on the south bank at the entrance into White lake and river.

White River Pierhead Beacon-light.—A fixed red light, 5th order, visible 8½ miles. White, open frame work tower, 27 feet high. Near the end of the south pier at the entrance to White lake. Width between piers, 200 feet. The south pier extends 250 feet beyond the north pier. The shore line south of Little Point au Sable bears N. N. W. The harbor improvements consist of a dredged channel connecting the deep water in White lake with the deep water in Lake Michigan. The sides of the channel are protected with piers extending W. ¼ S. into Lake Michigan. As now constructed the north pier extends 450 feet into Lake Michigan, and the south pier 700 feet. Depth of water, last summer a channel was dredged 48 feet wide and 12 feet deep.

The Life Saving Station is on the north pier.

Duck Lake is 2½ miles S. S. E. from White river.

MUSKEGON LIGHT-STATION.—A fixed white light, 4th order, visible 13 miles. Lantern on white frame dwelling, 37 feet high. A coast and harbor light on the south bank, at the entrance into Muskegon lake and river, about 100 yards from lake Michigan, and 12½ miles to the northward of Grand Haven.

Muskegon Pierhead Beacon-light.—A fixed red light, 6th order, visible 8½ miles. White, open frame-work tower, 27 feet high. On the end of the south pier, at the entrance into Muskegon lake. Width between piers, 300 feet. During thick or foggy weather, a fog-bell, struck by machinery, is sounded, giving one blow every 15 seconds. Grand Haven Pier light, S. S. E. ¼ E., 12½ miles. The shore line of Duck lake bears N. N. W. ¼ W. The harbor improvements consist of revetments on each side of the old channel connecting Muskegon lake with Lake Michigan, and the prolongation of these revetments by piers extending

line; the north pier projects a bar extends about the section of the north pier deep in the middle; about 100 feet, there is not more than 5 or 6 miles N. E.

tubular lantern on a post 25 feet above the level of the lake. On the outer end of the south pier at Pentwater. This light will be visible in clear weather 2 to 3 miles, and will form with the pierhead light a range showing the direction of the pier and the course for entering the harbor.

HT-STATION.—

4th order, visible 18 miles. This light will be visible in clear weather 2 to 3 miles, and will form with the pierhead light a range showing the direction of the pier and the course for entering the harbor.

Point au Sable, has a

A fixed white light, 4th order, visible 18 miles. The interval between flashes is 90 seconds. White tower, 24 feet high, attached to dwelling, lantern black. Light 70 feet above lake level. A coast and harbor light on the bluff at the south side of the entrance into Grand Haven, Michigan.

A fixed red light, 6th order, visible 18 miles. White tower, 27 feet high. Width between piers, 400 feet. During thick or foggy weather there is sounded a steam-siren, giving blasts of 5 seconds at intervals of 30 seconds. The fog-signal house is on the pier adjoining and inside of the beacon. Signal in duplicate. Muskegon Pier Light, N. N. W. $\frac{1}{4}$ W., 12 $\frac{1}{2}$ miles. Kalamazoo Pier light, S. $\frac{1}{4}$ E., 27 $\frac{1}{2}$ miles. The harbor works consist of two parallel piers with a dredged channel connecting the deep water in Lake Michigan with the deep water in Grand Haven. As now constructed the north pier projects about 1,150 feet beyond the shore line, and the south pier about 1,350 feet. The shoalest water on the bar last fall was 14 feet, by keeping near the south pier 15 to 16 feet could be carried in.

A fixed white light, 4th order, visible 18 miles. The interval between flashes is 90 seconds. White tower, 24 feet high, attached to dwelling, lantern black. Light 70 feet above lake level. A coast and harbor light on the bluff at the south side of the entrance into Grand Haven, Michigan.

A fixed red light, 6th order, visible 18 miles. White tower, 27 feet high. Width between piers, 400 feet. During thick or foggy weather, a fog-bell, every 15 seconds. The harbor works consist of two parallel piers with a dredged channel connecting the deep water in Lake Michigan with the deep water in Grand Haven. As now constructed the north pier projects about 1,150 feet beyond the shore line, and the south pier about 1,350 feet. The shoalest water on the bar last fall was 14 feet, by keeping near the south pier 15 to 16 feet could be carried in.

into Lake Michigan. Direction of piers, S. W. by W. Formerly the width between piers was 200 feet, but in 1881 the width of the entrance was increased to 300 feet by locating the extension of the north pier about 100 feet further to the north. The south pier from the outer end extends straight in; the north pier from the outer end is parallel to the south pier for a distance of 450 feet; it then converges towards the south pier so as to contract the width between the piers to about 185 feet.

The Life Saving Station is on the north pier.

Range Light.—A fixed red light shown from a tubular lantern on a post, 25 feet above the level of the lake. On the outer end of the south pier. This light will be visible in clear weather 2 to 3 miles, and will form with the pierhead light a range showing the direction of the pier, and the course for entering the harbor.

Bank Point, Lake Muskegon.—Black can buoy in 12 feet of water. Marks the extreme point of the shoal, extending three-fourths of a mile to the southward of Bank point, in Lake Muskegon, and also marks the turning point of the lake. There is no passageway to the northward of the buoy. Vessels bound to Muskegon will steer E. $\frac{1}{4}$ S. on leaving the out and pass to the southward of the buoy, then haul up to N. E. $\frac{1}{4}$ N. until abreast of the docks. Entrance to the out bears from the buoy west 1 $\frac{1}{2}$ miles. Good anchorage in from 4 to 8 fathoms.

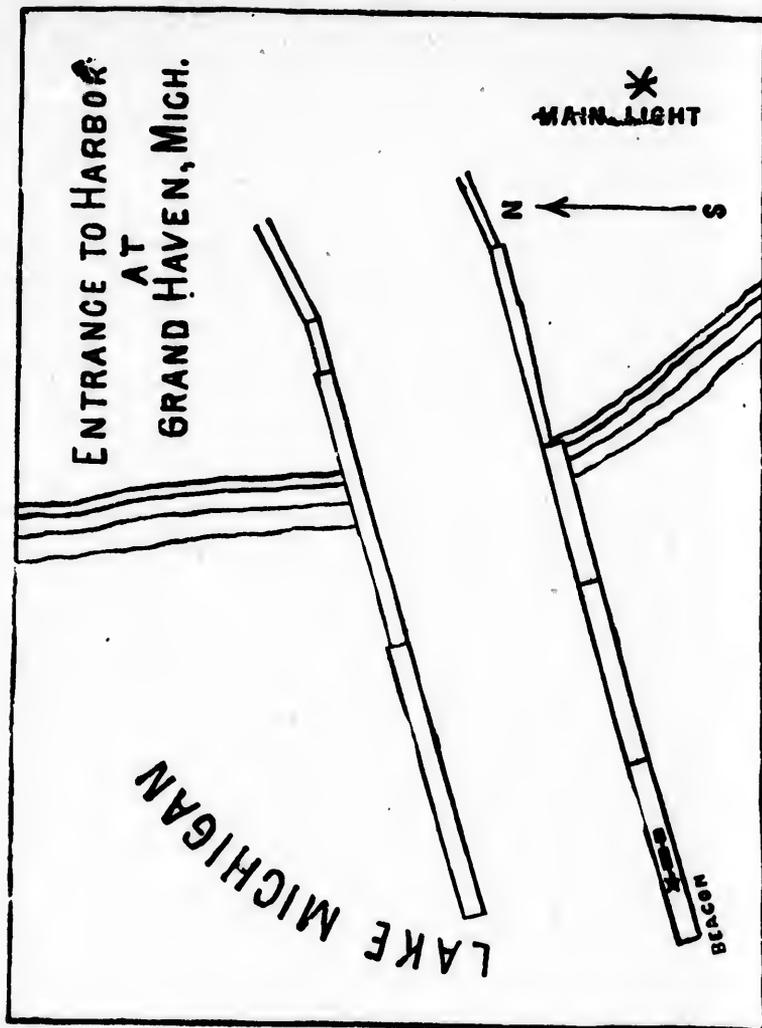
Black Lake, or the Crimea, is 4 $\frac{1}{2}$ miles S. E. by S. $\frac{1}{4}$ S. from Muskegon. There are two slab piers, but not sufficient water to enter. Vessels load outside.

The shore from Big Point au Sable to St. Joseph is bold, and can be approached at any place to within 2,000 feet.

GRAND HAVEN LIGHT-STATION.—A fixed white light, varied by white flashes, 4th order, visible 15 $\frac{1}{2}$ miles. The interval between flashes is 90 seconds. White tower, 24 feet high, attached to dwelling, lantern black. Light 70 feet above lake level. A coast and harbor light on the bluff at the south side of the entrance into Grand Haven, Michigan.

Grand Haven Pierhead Beacon-light.—A fixed white light, 6th order, visible 8 $\frac{1}{2}$ miles. White, open frame-work tower, 25 feet high; 300 feet from the outer end of the south pier at the entrance to Grand Haven. Width between piers, 400 feet. During thick or foggy weather there is sounded a steam-siren, giving blasts of 5 seconds at intervals of 30 seconds. The fog-signal house is on the pier adjoining and inside of the beacon. Signal in duplicate. Muskegon Pier Light, N. N. W. $\frac{1}{4}$ W., 12 $\frac{1}{2}$ miles. Kalamazoo Pier light, S. $\frac{1}{4}$ E., 27 $\frac{1}{2}$ miles. The harbor works consist of two parallel piers with a dredged channel connecting the deep water in Lake Michigan with the deep water in Grand Haven. As now constructed the north pier projects about 1,150 feet beyond the shore line, and the south pier about 1,350 feet. The shoalest water on the bar last fall was 14 feet, by keeping near the south pier 15 to 16 feet could be carried in.

Range Lights.—A fixed red light shown from a tubular lantern on a post, 25 feet above the level of the lake. On the outer end of the south pier. This light will be visible in clear weather 2 to 3 miles, and will form with the pierhead light a range showing the direction of the pier and the course for entering the harbor. Grand Haven is the best



harbor on the east shore of Lake Michigan. In heavy gales from the south or southwest a strong current sets down the shore and across the entrance, and the same in heavy gales from the northwest a strong current sets to the south. The same condition is noticeable all along the east shore. In such cases vessels should be careful to keep well to windward. Grand Haven is the western terminus of the Detroit, Grand Haven & Milwaukee R. R., which keeps their steamers running throughout the year.

The Life Saving Station is on the north pier inside the shore line.

HOLLAND, OR BLACK LAKE PIERHEAD BEACON-LIGHT.—A fixed red light, visible $11\frac{1}{2}$ miles, 5th order. White, open frame-work tower, 27 feet high. Near the outer end of the south



heavy gales from the shore and across the northwest a strong current is perceptible all along the shore to keep well to windward of the Detroit, Grand Haven and other piers running through-

the shore line.

PIERHEAD BEACON LIGHT.—A fixed white light, 5th order. White, open frame-work tower, 27 feet high. Near the outer end of the south pier, at the entrance to Kalamazoo river.

at the entrance to Black lake, Michigan. Width between piers, 200 feet. Grand Haven Pier light, N. $\frac{1}{2}$ W., 19 $\frac{1}{2}$ miles. Kalamazoo Pier light, S. $\frac{1}{2}$ E., 7 $\frac{1}{2}$ miles. The harbor improvements consist of two parallel piers, with a dredged channel connecting the deep water in Black lake with the deep water in Lake Michigan. The piers extend into Lake Michigan about 700 feet from the shore line. Direction of piers, west. Depth of water, on the bar just outside the piers and at the entrance, there are 12 feet, but between the piers for a distance of 300 feet there are only 6 feet. A cut 25 feet wide and 12 feet deep was made last July but it filled up again in the fall. The channel has been dredged out frequently, but owing to a leakage of sand through the piers, and that blown about by the winds from the sand hills, the depth cannot be maintained.

Range Light.—Fixed red light, tubular lantern suspended on a post, 25 feet above the level of the lake. On outer end of south pier, and forms with the pierhead light, a range showing the direction of the harbor entrance.

Life Saving Station near inner end of south pier.

Pigeon Lake is 9 miles north of Holland.

KALAMAZOO PIERHEAD BEACON-LIGHT.—A fixed white light, 5th order, visible 11 $\frac{1}{2}$ miles. White, open frame-work tower, 27 feet high. Near the outer end of the south pier, at the entrance to Kalamazoo river. Width between piers, 225 feet. Holland Pier light, N. $\frac{1}{2}$ W., 7 $\frac{1}{2}$ miles. Chicago main light, S. W. $\frac{3}{4}$ W., 90 miles. The harbor works consist of two parallel piers and a dredged channel between them connecting Lake Michigan with the Kalamazoo river. The south pier extends 288 feet beyond the north pier. The direction of the pier is W. by S. In September, last there was a narrow channel dredged across the outer bar 12 feet deep, but in the fall there was scant 8 feet; the best water was on a line with the south pier close-to.

SOUTH HAVEN PIERHEAD BEACON-LIGHT.—A fixed red light, visible 11 $\frac{1}{2}$ miles, 5th order. White, open frame-work tower, 27 feet high. Near the outer end of the South pier, at South Haven, entrance of South Black river. Width between piers, 180 feet. The north pier extends 50 feet beyond the south pier. St. Joseph Pier light, S. S. W. $\frac{1}{2}$ W., 22 $\frac{1}{2}$ miles. Chicago main light, S. W. by W. $\frac{3}{4}$ W., 7 $\frac{1}{2}$ miles. The improvement at this harbor consists of two parallel piers, extending from the mouth of South Black river into Lake Michigan. Direction of piers, W. $\frac{1}{2}$ S. On the bar outside, the depth of water last summer was 12 $\frac{1}{2}$ feet, between the ends of the piers 13 to 14 feet, and farther up not more than 10 feet. The Life Saving station is on the north pier.

Signal-Service Station on light-house reservation.

Between South Haven and St. Joseph there are several piers at which vessels of light draught can load.

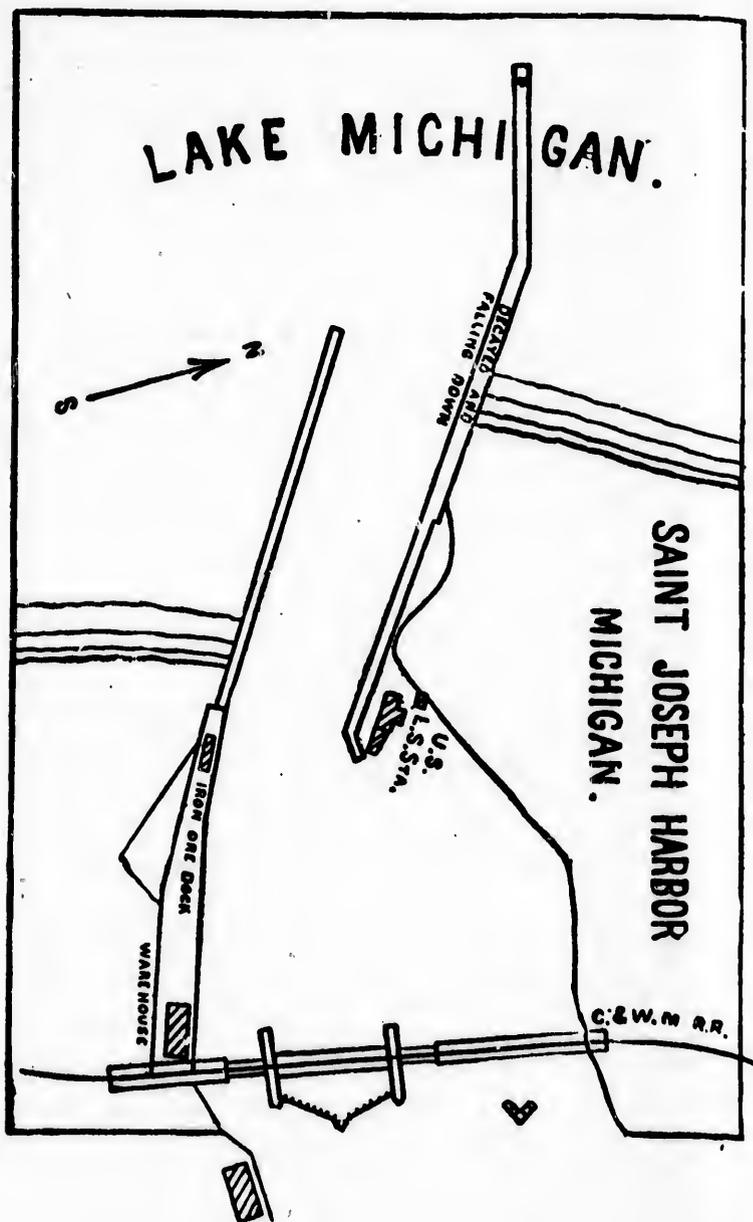
ST. JOSEPH LIGHT-STATION.—A fixed white light, varied by white flashes at intervals of 90 seconds, 4th order, visible 17 miles. Lantern on white frame-work, 43 feet high, on the bluff south of the harbor in the city of St. Joseph.

Signal-Service Station 400 yards north of light-house.

St. Joseph Pierhead Beacon-light.—A fixed red light, 5th order, visible 9 $\frac{1}{2}$ miles. White, open frame-work tower, light 50 feet above lake level. Near the outer end of the north pier, at the entrance to St. Joseph river, Michigan. A bell, struck by machinery, at the pierhead light, during thick and foggy weather will give 1 stroke at intervals of 80 seconds. Width between piers, 240 feet. Michigan City Pier light, S. W. $\frac{1}{2}$ S., 84 $\frac{1}{2}$ miles. Kalamazoo Pier light, N. by E. $\frac{1}{2}$ E., 41 miles. Chicago main light, W. S. W. $\frac{1}{2}$ W., 61 miles.

The harbor improvement consists of two piers connecting St. Joseph river with Lake Michigan. Direction of piers, N. W. by W. $\frac{1}{2}$ W. Depth of water: Last

June, on the bar outside the piers, there was 15 feet, between the pier and to the ore docks 16 feet, and thence to Benton harbor 13 feet. In the fall not more than 13 feet was to be found at the entrance. A sand bar had formed at the break in the north pier. The Life Saving Station is on the inner end of the north pier. Good anchorage off the piers in 6 fathoms of water.



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Range Light.—Owing to the formation of a bar outside of the north pier, the fixed red tubular lantern range light shown from a post at the outer end of the south pier has been temporarily *discontinued*.

Channel Buoy.—Black 20-foot spar buoy marks the north side of the channel, at the end of the shoal making out from the north pier. Pierhead light-house, E. $\frac{1}{4}$ N., 360 yards. The red buoy has been removed from the opposite side of the channel. As regards the depth of water at this harbor, no reliable information can be given, owing to sudden formation of sand deposits both inside and outside of the piers, caused by heavy gales.

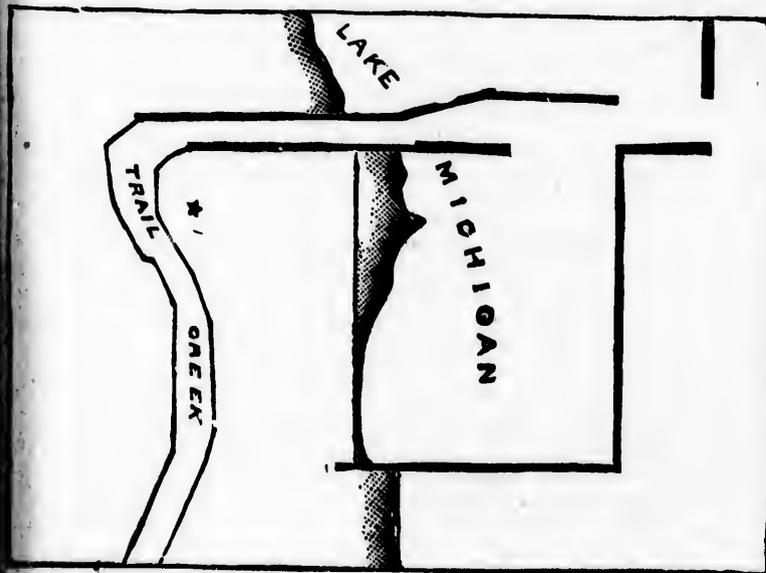
The Shore from St. Joseph to Michigan City is bold, and can be approached to within 2,000 feet, except for a short distance south of the piers at St. Joseph, where a shoal extends 3,000 feet.

There are several piers between St. Joseph and Michigan City. At Grand Marais, 8 miles; Greenbush, 17 $\frac{1}{4}$ miles; Chickaming, 19 miles; Wilkinson, 20 $\frac{1}{4}$ miles, and Union 22 miles, all of which bear about S. S. W. $\frac{1}{4}$ W. from St. Joseph beacon-light.

New Buffalo is 9 $\frac{1}{4}$ miles N. E. by E. from Michigan City. There is no light at New Buffalo and the harbor is not available for commerce.

MICHIGAN CITY MAIN LIGHT.—A fixed white light, visible 13 $\frac{1}{2}$ miles, 5th order, tower rising from yellow brick dwelling 34 feet high. Near the east side of entrance to the harbor. Chicago main light, W. N. W. $\frac{1}{4}$ W., 38 $\frac{1}{4}$ miles. St. Joseph pierhead light, N. E. $\frac{1}{4}$ N., 35 miles.

Beacon Lights.—A fixed red light near the outer end of the breakwater pier and a fixed white light near the inner end of the breakwater pier. These two lights form a range for entering the harbor. A fixed red light on the easterly end of the outer breakwater, and a



MICHIGAN CITY.

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SAINT JOSEPH HARBOR
MICHIGAN.

C. & W. M. R.R.

fixed white light on the outer end of the west harbor pier; these lights are all shown from tubular lanterns suspended on masts. They are maintained by the U. S. engineer in charge of the harbor works. The two lights on the breakwater pier, red and white, are 320 feet apart, and bear from each other N. by W. $\frac{1}{4}$ W. and S. by E. $\frac{1}{4}$ E.

Michigan City harbor improvements consist of an inner harbor and an outer basin. The inner harbor, at the mouth of the creek, has been widened and dredged. The upper ending basin is completed.

The Outer Basin.—A pier starts from the shore at a point 1,400 feet east of the entrance to the inner harbor and extends about N. N. W. into the lake 1,100 feet, connecting with a "breakwater" which runs in a W. S. W. direction to within 200 feet of the outer end of the west pier, from this point a pier "called the breakwater pier" which is now completed, projects into the lake in a N. by W. $\frac{1}{4}$ W. direction 500 feet. There is an opening between the inner end of the breakwater pier and the outer end of the old east pier of 480 feet. The basin enclosed has an area of about 35 acres, but it has not been dredged to a sufficient depth to be of much service.

Outer Breakwater.—The east end of the Outer Breakwater begins at a point 400 feet W. S. W. from the outer end of the breakwater pier, (500 feet of which is now under contract), and is to extend in a westerly direction 1,000 feet to the angle, this part is called the east arm, thence in a direction about S. S. W. 1,000 feet to within 450 feet of the 18-foot curve of the shore, this part will be known as the west arm. If completed as proposed it will afford an area of protection against northerly winds of about 30 acres. Entering the harbor run straight in, S. by E. $\frac{1}{4}$ E., keeping a look out for the end of the west harbor pier. There is good anchorage off the harbor in from 6 to 8 fathoms. The Life Saving Station is on the old east pier near the shore line.

The Shore around the south end of the lake as far as the Calumet is bold, with the exception of two 18-foot spots, which bear S. E. by E. $\frac{1}{4}$ E. from the Calumet Pierhead light, 6 $\frac{1}{2}$ miles.

Stamling North Along the West Shore of Lake Michigan.

Calumet Pierhead Beacon-Light.—A fixed red light, 4th order, visible 11 $\frac{1}{2}$ miles. Gray, open framework tower, 30 feet high. An elevated walk along the pier to the shore. On the outer end of the north pier at the entrance to the Calumet river, 11 miles to the south-eastward of the Chicago breakwater. Chicago Water Works crib, N. by W. $\frac{1}{4}$ W., 12 $\frac{1}{2}$ miles. Michigan city harbor piers E. $\frac{1}{4}$ N., 32 $\frac{1}{2}$ miles. The harbor improvements consist of two parallel piers, 300 feet apart, projecting from the shore in a N. E. by E. direction into Lake Michigan. The north pier is 3,640 feet in length and projects 1,320 feet from the shore line; the south pier is 2,020 feet in length and projects about 1,500 feet into the lake from the C. and C. and D. Co's. breakwater. The north pier extends into the lake 1,600 feet beyond the south pier. Depth of water: Last July, the channel was dredged to 16 feet, but in the fall not more than 15 feet could be carried to the

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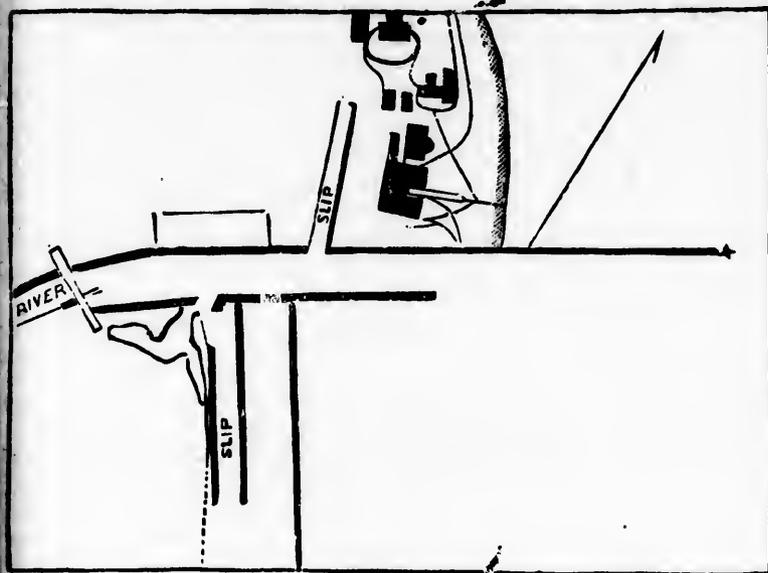
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The Life Saving Station is inside the piers on the north side of the river.



CALUMET.

Clark's Point Shoal (off Calumet).—Red spar buoy, in 18 feet of water. Marks the east side of Rocky reef, $1\frac{1}{2}$ miles from Calumet Pier light, and by keeping 300 feet outside of this buoy, and heading 200 yards east of pier light, no less than 18 feet of water will be found. No vessel should attempt to pass between this buoy and the shore. Calumet Pier light, S. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles.

South Park Shoal.—Red and black horizontal stripes, 2d-class buoy in 18 feet of water. Marks the east end of the 11-foot shoal off South Park. This shoal is nearly 2 miles from the beach, and inside it and the Hyde Park buoy there is a channel $\frac{1}{4}$ of a mile wide. Vessels using it must keep half a mile to the westward of the buoy. Calumet Pier light, S. by E. $\frac{1}{4}$ E., $4\frac{1}{2}$ miles. Chicago Pier light, N. W. N., $7\frac{1}{4}$ miles.

Hyde Park Shoal.—Red and black horizontal stripes, 3d-class buoy in 18 feet of water. Marks the east side of a small 15-foot shoal off Hyde Park, Ill., 2 miles from the beach. Calumet Pier light, by E. $\frac{1}{4}$ E., $5\frac{1}{2}$ miles. Chicago Pier light, N. W. $\frac{1}{4}$ N., $6\frac{1}{2}$ miles.

Morgan's Point.—Black, 16-foot spar buoy in 11 feet of water. Marks the west side of a small 6-foot shoal outside the wharves at Hyde Park, Ill. Small vessels keeping close to the shore, between Chicago and South Chicago, should pass between it and the shore. Chicago Pier light-station, N. by W. $\frac{1}{4}$ W., $6\frac{1}{2}$ miles.

Chicago Breakwater Beacon-light (south).—A fixed red light, 5th order, visible 10 miles. White, open frame-work tower, 80

feet high. On the north side of the southern opening in the breakwater forming the outer harbor of Chicago. The breakwater commences on the south side of the entrance into the Chicago river, and extends ~~E. by S. 20 yards,~~ and has an opening 250 yards in width, 83 yards from its southern end, where it turns toward the shore, extending 680 yards in a S. W. by S. $\frac{1}{2}$ S. direction, protecting the harbor from south-easterly gales. There is also an entrance, 250 yards wide, from the river into the harbor on its north side. The area enclosed is 455 acres, between the dock line (which is 2,000 feet west of the breakwater and parallel to it) and the breakwater there is an area of 270 acres, which is dredged to a depth of 16 feet. To enter the harbor from the southward, bring the southern breakwater light to bear west, or nearly so, and steer in through the opening, and as you pass the beacon haul up to the northward for an anchorage close to the breakwater. Chicago light-house, N. by W. $\frac{3}{4}$ W., seven-eighths of a mile.

Chicago Breakwater Beacon-light (north).—A fixed white light, lens lantern, visible 5 mile. Shown from a white post, 19 feet high. On the northeast angle of the breakwater, and the south side of the entrance into the harbor. A guide into the river. Chicago light-house, W. N. W. $\frac{1}{2}$ W., 404 yards.

Chicago Pierhead Beacon-Light.—A fixed white light, 4th order, visible 12 miles. White, open frame-work tower, 27 feet high. About 40 feet from the end of the north pier at the entrance into the Chicago river. The width between the piers at the entrance into the river is about 500 feet, and narrows as you ascend the river. The north pier extends out into the lake beyond the breakwater about 200 yards. During thick and foggy weather, there is sounded a fog-bell, struck by machinery at intervals of 20 seconds, double and single blows alternately. Direction of piers, east. Chicago light house, W. $\frac{1}{4}$ S., 525 yards. Chicago Water-works crib, N. E. $\frac{1}{4}$ N., 2,900 yards. Southeast end of outer breakwater, N. E. by E. $\frac{1}{4}$ E., 1,717 yards.

Range Light.—A fixed red light, shown from a tubular lantern on a post 30 feet above the lake level. On outer end of the north pier. This light will form with the pierhead light a range showing the direction of the pier, and the course for entering the harbor.

CHICAGO LIGHT-STATION.—A fixed white light, 3d order, visible 16 $\frac{1}{2}$ miles. Black iron-pile tower, 72 feet high, connected by a covered way with a gray frame dwelling. A coast and harbor light on the inner pier at the north side of entrance to the Chicago river. Michigan City light-house, E. S. E. $\frac{1}{4}$ E., 38 $\frac{1}{2}$ miles. Chicago Water-works crib, N. E. $\frac{1}{4}$ N., 2 miles. Entering the harbor this light in range with the pierhead light W. $\frac{1}{4}$ S. leads to the end of the north pier; 16 feet can be carried in at the ordinary stage of water.

The Harbor Improvements at Chicago consist of an outer harbor adjoining the entrance to the Chicago river, on the south side; and a harbor of refuge, protected by the new breakwater, affording good anchorage in deep water, and safe access to the outer harbor and mouth of the river.

The New Breakwater, now practically completed is about midway between the Chicago Water Works Inlet crib and the outer end of the north harbor pier. Commencing at a point 4,958 feet N. $\frac{3}{4}$ W. from the Chicago Pierhead Beacon light in about 21 feet of water, it is projected in a S. E. by E. $\frac{1}{4}$ E. direction 5,436 feet, and terminates in 32 feet of water. The outer end bears from the Pierhead Beacon light N. E. by E. $\frac{1}{4}$ E., 5,200 feet, or about 1 mile. From the outer end of the breakwater the Water Works Inlet crib bears N. $\frac{1}{4}$ E., 4,350 feet. Mak-

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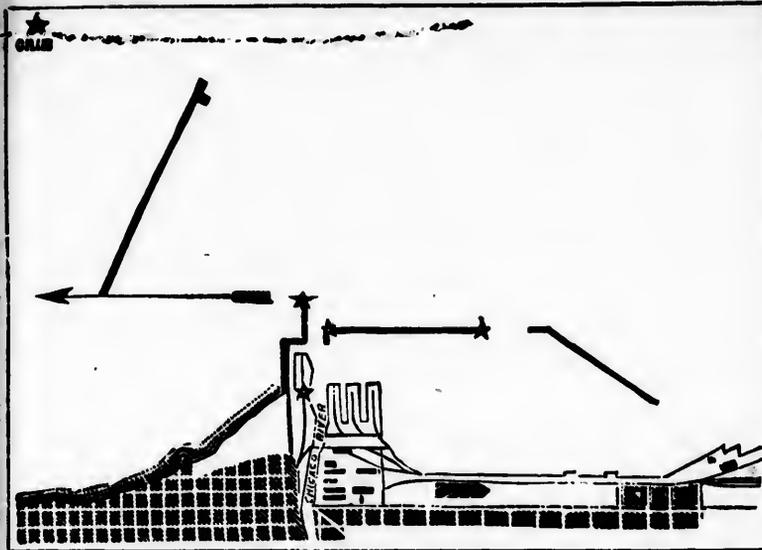
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ing the harbor from the north and east, pass to the eastward of the Water-works crib, keeping nothing to the west of south until the North Pierhead beacon bears W. S. W., and then run for the entrance. Approaching along the land from the northward and intending to pass between the western end of the breakwater and the shore, bring the North Pierhead beacon to bear S. by E. and run through on that course.

Outer Breakwater Light.—The Light-house establishment is erecting a light house on a crib 60 feet inside the outer end of the breakwater, to be completed in 1892. It will be a 3d-order, red and white flash, interval between flashes, 10 seconds. Pending its completion, it will be marked by two lights shown vertically, red above white, from tubular lanterns on a post about 35 feet above the lake level at the outer end of the breakwater, and a fixed white light shown from a lens lantern on a post at the inner end of the breakwater.

Chicago Water-works Crib.—A fixed white light on the Water-works crib, 4,350 feet N. $\frac{1}{4}$ E., from east end of outer breakwater. During thick and foggy weather a bell is struck by machinery about 12 times every minute. The station is maintained by the city of Chicago.

Chicago Inshore Water Works Crib.—A fixed blue electric light. White lantern on brown frame-work tower on stone crib. On auxiliary Water-works crib, 700 feet from shore, and 3,000 feet S. W. by W. $\frac{1}{4}$ W. from inner, or westerly end of outer breakwater. In foggy or thick weather a bell is struck by machinery 8 times every minute. This station is maintained by the city of Chicago.

The New Water-works Crib for the new tunnel south of the harbor piers have been placed as follows:

The Outer crib has been placed at a point 4 miles due east from Peck court, and will bear E. by S. $\frac{3}{4}$ S., about 3 $\frac{1}{4}$ miles, from the Pierhead beacon-light. The Middle crib has been placed at a point about 800 feet south of a point 2 $\frac{1}{4}$ miles due east of Peck court and in line with the

Outer crib and Park row, and will bear S. E. $\frac{1}{4}$ E. about $2\frac{1}{2}$ miles from the Pierhead beacon-light. Both cribs will be lighted by fixed white lantern lights placed aloft, and also by the lights used to carry on the work.

Chicago Life Saving Station is on the south harbor pier, opposite the main light.

GROSSE POINTE LIGHT-STATION.—A fixed white light, varied by red flashes, visible $18\frac{1}{2}$ miles, 2d order. The interval between flashes is 3 minutes. Yellow tower, 99 feet high, connected by a covered way with brick dwelling. A coast-light on Grosse Pointe, $12\frac{1}{2}$ miles from the Chicago light-house. During thick and foggy weather a 10-inch steam whistle will sound blasts of 5 seconds at intervals of 20 and 40 seconds. Focal plane $119\frac{1}{2}$ feet above lake level. Chicago light-house, S. by E. $\frac{1}{4}$ E., $12\frac{1}{2}$ miles. Waukegan light-house, N. N. W. $\frac{1}{4}$ W., $21\frac{1}{2}$ miles.

Evanston is pleasantly situated on Grosse Pointe. It has two pile piers, with from 10 to 11 feet of water at each.

The Life Saving Station is on the Northwestern University grounds.

Highland Park, 10 miles north of Grosse Pointe, on the Northwestern Railroad, has a pier extending 1,000 feet into the lake in an easterly direction; 14 to 16 feet of water.

WAUKEGAN LIGHT-STATION.—A fixed white light, visible 14 miles, 5th order. White tower, rising from frame dwelling, 35 feet high. On the bluff, south side of Little Fort river, in the town of Waukegan, Illinois, about 300 yards from the beach. There is good anchorage in 4 fathoms northeast from the outer end of the old pile pier. The point north of Waukegan protects the anchorage from northwest winds.

Waukegan Harbor works in progress. The works are located a little north of the old pile pier. The project is to enclose a small basin by projecting piers into the lake, and obtaining additional room by dredging a channel from the basin through the low ground between the lake and bluffs. The south pier, as now constructed is 900 feet long and extends into the lake E. $\frac{1}{4}$ N. The north pier extends into the lake 530 feet from the angle, direction E. by S. $\frac{1}{4}$ S., thence E. $\frac{1}{4}$ N. 392 feet. The north pier extends 200 feet beyond the south pier. Width between the outer ends of the piers 220 feet. In consequence of the large deposit of sand in the vicinity of the harbor it will be difficult to maintain any considerable depth of water.

KENOSHA, OR SOUTHPORT LIGHT-STATION.—A fixed white light, varied by white flashes; the interval between flashes is 90 seconds, 4th order, visible $15\frac{1}{2}$ miles. Yellow tower, 55 feet high; yellow dwelling detached. A coast and harbor light on the north side of the entrance to Kenosha harbor, about 100 yards from the beach, and 10 miles to the southward of Racine, Wind Point (Racine Point) light-house, N. $\frac{1}{4}$ E., $13\frac{1}{2}$ miles.

Kenosha Pierhead Beacon-light.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. White, open frame-work tower, 30 feet high. Near the end of the north pier, at the entrance to Kenosha harbor. Width between the piers, 170 feet.

The harbor improvements consist of two parallel piers, extending into the lake E. $\frac{1}{4}$ N., with a dredged channel between them, connecting Pike creek with the deep water in Lake Michigan. As now constructed the north pier extends 270 feet into the lake beyond the south

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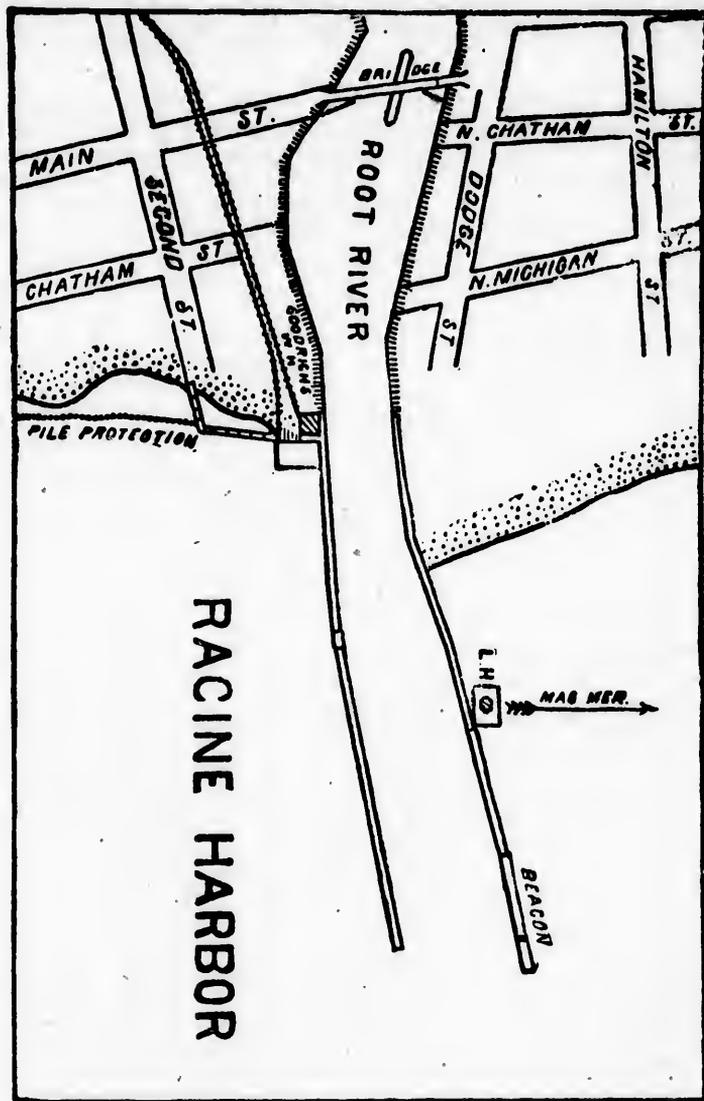
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RACINE LIGHT-STATION.—A fixed white light, 4th order, visible $13\frac{1}{4}$ miles. Yellow tower, 36 feet high, rising from brick dwelling. On the north pier, at the entrance into Root river, Racine, about 210 yards inside of the outer end of the pier. This light kept open to the north-

ward of Pierhead light insures clearing Racine reef. Wind Point (Racine Point) light-house, N. by E. $\frac{1}{2}$ E., $3\frac{3}{8}$ miles.

Racine Pierhead Beacon-light.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. White, open frame-work tower, 30 feet high. Near the outer end of the north pier at the entrance into Racine harbor. Width between the piers, 270 feet. Main light bears W. $\frac{1}{2}$ S. 650 feet.

Racine Harbor.—The improvements consist of two piers and a dredged channel between them, connecting the mouth of Root river with the deep water of Lake Michigan. The north pier as now constructed extends 50 feet farther into the lake than the south pier. Direction of piers E. by N. The two lights in range lead to the end of the north pier, and is a guide to enter the harbor at night. Depth of water: Owing to the formation of sand bars at the outer ends of the piers no reliable information can be given. The Life Saving Station is inside the harbor.

Racine Reef.—Red, 1st-class can buoy, in 17 feet of water. On the westerly edge of Racine reef, and about 500 yards S. W. by W. from its shoalest spot, which lies E. by S., $1\frac{1}{2}$ miles from Racine light-house. The reef extends in an E. N. E. and W. S. W. direction about five-eighths of a mile, and north and south about three-eighths of a mile, with 8 feet of water on its shoalest part. The channel between the reef and the city has a depth of water from 3 to 6 fathoms; sand and clay. Racine Pier light, W. N. W. $\frac{3}{4}$ W., $1\frac{1}{2}$ miles. Wind Point light-house (Racine Point), N. by W., $3\frac{1}{2}$ miles. This reef is covered by a red light, displayed from the watch room in the tower at Wind Point light-station.

Racine Reef, East End.—Red spar buoy, 25 feet long, in 18 feet of water. Marks the eastern point of Racine reef, least depth of water between the buoys is 8 feet. Racine Pierhead light, W. $\frac{3}{4}$ N., $2\frac{1}{2}$ miles. Wind Point light, N. by W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles.

WIND POINT, OR RACINE POINT, LIGHT-STATION.—A flashing white light, 3d order, visible 18 miles; interval between flashes, 30 seconds. In addition to the 3d-order light there is displayed from the watch-room window of the same tower, immediately under the main light, a small fixed red light of the 6th order, with an arc of illumination covering Racine reef, a dangerous ledge of rocks, lying S. by E. $\frac{1}{2}$ E., 4 miles distant from the light-house. This red light is visible between the bearings N. $\frac{1}{2}$ W. and N. N. W. $\frac{1}{2}$ W., from seaward. Yellow tower, 102 feet high, connected by a covered way with brick dwelling, both yellow. On Wind Point, $3\frac{1}{2}$ miles north of Racine light, Wisconsin. During thick and foggy weather, there is sounded at this station a 10-inch steam fog-whistle, giving a blast of 3 seconds, followed by an interval of 26 seconds; then a blast of 5 seconds, followed by an interval of 26 seconds. Milwaukee (North point) light-house, N. by W. $\frac{3}{4}$ W., $20\frac{1}{2}$ miles. Grosse Pointe light-house, S. $\frac{1}{2}$ E., 50 $\frac{1}{2}$ miles.

Milwaukee Pierhead Beacon-light.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. White, open frame-work tower, 32 feet high. On the outer end of the north pier, at the entrance into Milwau-

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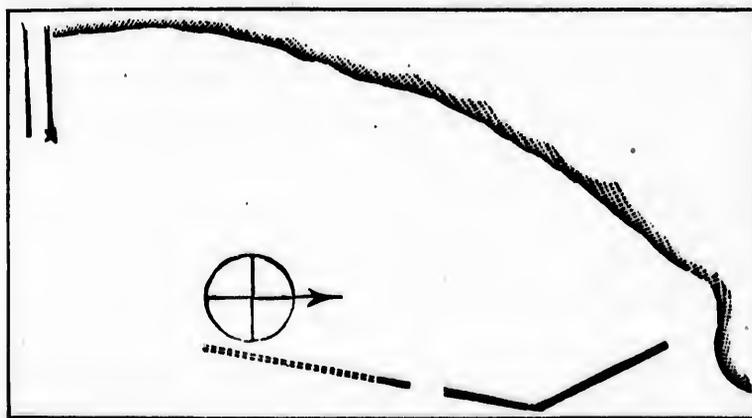
kee river. Width between piers, 286 feet. During thick or foggy weather, a steam-whistle is sounded, giving blasts of 5 seconds at intervals of 55 seconds. The fog-signal house is on the pier, inside of and adjoining the beacon-light. The keeper's dwelling, with the tower of the old discontinued light attached, both built of Milwaukee brick, is on the north pier, inside of the Pierhead light. Milwaukee light-house, N. by E. $\frac{1}{4}$ E., 3 miles.

Milwaukee Harbor.—This improvement consists of two parallel piers and a dredged channel between them, known as the "North cut," connecting the deep water in Milwaukee river with the deep water in Milwaukee bay. The piers are of equal length, about 1,800 feet. Direction, E. $\frac{1}{4}$ N. Depth of water: The channel between the piers for a width of 100 feet, is 16 feet deep. The Life Saving Station is near the inner end of the south pier.

Harbor of Refuge, in Milwaukee bay, in process of construction. The project is to construct a breakwater, the north arm of which commences near North point at a distance of about 600 feet from the north shore of the bay, in a depth of 8 feet of water, and extends S. S. E. $\frac{1}{4}$ E., 2,450 feet to the north angle. From this point the direction of the main arm of the breakwater is changed to S. $\frac{1}{4}$ W. for the proposed distance of 5,200 feet, with an opening of 400 feet at a distance of 1,000 feet from the angle to provide a fair weather entrance and exit for vessels.

Present Condition of the Work.—The north arm of the breakwater, 2,450 feet is completed, and 1,000 feet of the main arm of the breakwater to the 400 feet opening is completed, and the main arm south of the 400 feet opening has been extended 400 feet. A light-ship, painted red, is anchored at the south end of the unfinished breakwater, just inside with room to swing. A red and white light is shown vertically, white above red.

Depth of water: The 18-foot curve of the bottom extends from about the middle of the north arm of the breakwater to the outer end of the harbor piers, and about a uniform distance from the shore, nearly



MILWAUKEE.

2,000 feet. The average depth along the south arm of the breakwater is 34 feet. From the south end of the breakwater, as it now exists, to the east end of the harbor piers is 7,200 feet, bearing S. W. by S. $\frac{3}{4}$ S.

Dangers.—About 4 miles southeast from Milwaukee Pierhead light there are shoal spots three-fourths of a mile from shore, with from 13 to 15 feet of water over them. A 9-foot spot lies half a mile east from Fox point, 7 miles north of Milwaukee light, and a 14-foot spot two-thirds of a mile from shore, $3\frac{1}{2}$ miles north of Fox point. With the above exceptions the shore in the vicinity of Milwaukee bay is bold, and can be approached within half a mile from shore. There is no reef off Milwaukee North point.

MILWAUKEE LIGHT-STATION.—A fixed white light, varied by white flashes, at intervals of 2 minutes, 4th order, visible $18\frac{1}{2}$ miles. Brown tower, 28 feet high, attached to white frame dwelling, light 122 feet above lake level. A coast-light, on the extreme north point of Milwaukee bay, 3 miles to the northward of the entrance into the harbor. Milwaukee Pier light, S. by W. $\frac{3}{4}$ W., 3 miles. Wind Point (Racine Point) light-house, S. by E. $\frac{1}{4}$ E., $20\frac{1}{2}$ miles.

Uiao, $4\frac{1}{2}$ miles south of Port Washington, has a pile pier. South of the pier there are shoal spots with 11 feet over them half a mile from shore, and a 9-foot spot 500 feet east from the pier.

PORT WASHINGTON LIGHT-STATION.—A fixed white light, visible $18\frac{1}{2}$ miles, 4th order. Lantern on yellow brick dwelling, 40 feet high. A coast-light, on the bluff in the north part of the town of Port Washington, about 23 miles to the northward of Milwaukee, and $27\frac{1}{2}$ miles to the southward and westward of Sheboygan.

Port Washington Pierhead Beacon-light.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. White, open frame-work tower, lantern black with brown parapet, upper part of tower inclosed for a watch room. On the outer end of the north pier at the entrance to the harbor of Port Washington. Milwaukee North point, S. $\frac{1}{4}$ E., 23 miles. Little Point Sable light, E. N. E., 70 miles.

Port Washington Harbor.—This improvement consists of two parallel piers, about 150 feet apart, extending from the shore line into 14 feet of water. The north pier is 920 feet long, and extends 100 feet beyond the south pier. Together with the formation of two interior basins, with an area of $2\frac{1}{2}$ and 3 acres respectively. Depth of water: In September, 1889, there was a channel 75 feet wide and 12 feet deep adjacent to the north pier, and a navigable channel of the same depth on the east and west sides of the north basin, and the north side of the west basin. Along the south pier, for about 60 feet therefrom, the depth is from 5 to 8 feet. Boulders and parts of a wreck make it dangerous near the south pier.

Rouksville, $10\frac{1}{2}$ miles, and **Amsterdam**, $12\frac{1}{2}$ miles, north of Port Washington, have pile piers extending into deep water.

The shore from Uiao to Sheboygan is bold, and can be approached at any place within one-third to half a mile.

Sheboygan Pierhead Beacon-Light.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. White, open frame-work tower, 25 feet high. On the outer end of the north pier at the entrance to the Sheboygan river, about 50 miles to the northward of Milwaukee. Width between piers, 255 feet. Sheboygan light-house, N. $\frac{3}{4}$ E., 1 mile.

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The Harbor improvements consist of two piers connecting the mouth of the Sheboygan river with the deep water in Lake Michigan, and a dredged channel between them, and deepening the river inside the piers. The north pier projects 1,725 feet into the lake from the shore line, and 50 feet beyond the south pier. As regards the depth of water in the channel, no reliable information can be given. The Life Saving Station is in the harbor on the east side. Direction of the piers, east, their width increases from 190 feet at the shore line to 255 at their outer ends.

Sheboygan Reef (south end).—Red, 3d class can buoy in 24 feet of water. Off the south end of Sheboygan reef, the center of which lies N. E. $\frac{1}{4}$ N., seven-eighths of a mile from Sheboygan Pier light. The reef is 600 yards in extent, north and south, with 7 feet of water on its shoalest part. There is a narrow passage-way about 300 yards wide, between the reef and the land, but this should not be attempted by strangers. Sheboygan Pier light, S. W. $\frac{3}{4}$ W., 1,400 yards. Sheboygan light-house, N. W. $\frac{1}{4}$ N., five-eighths of a mile.

Sheboygan Reef (north end).—Red, 3d class can buoy in 24 feet of water. Off the northeast end of Sheboygan reef. Least depth of water between the buoys, 7 feet. Sheboygan light-house, W. N. W. $\frac{1}{4}$ W., 800 yards.

SHEBOYGAN LIGHT-STATION.—A fixed white light, 5th order, visible 16 miles. Lantern on white dwelling, 34 feet high. On a point 1 mile to the northward of the entrance into Sheboygan river, Wisconsin.

Linzville, 8 $\frac{1}{2}$ miles N. by W. $\frac{1}{4}$ W. from Sheboygan light, has a pile pier extending into deep water.

Centerville, 10 $\frac{1}{2}$ miles N. by W. from Sheboygan light, has two pile piers.

Yorkville, 12 $\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Sheboygan light, has two pile piers.

Nordheim, 15 $\frac{1}{2}$ miles N. $\frac{1}{4}$ W. from Sheboygan light, has two pile piers.

There are many shoals and rocky spots along the shore, from Sheboygan to the south point of Manitowoc bay, rendering navigation dangerous within three-fourths to seven-eighths of a mile from shore, particularly in the vicinity of Yorkville and Centerville. Outside in from 4 to 5 fathoms the bottom is generally clay with a light covering of sand.

MANITOWOC PIERHEAD BEACON-LIGHT.—A fixed red light, 8th order, visible 8 $\frac{1}{2}$ miles. White, open frame-work tower, 29 feet high. Near the end of the north pier, at the entrance into Manitowoc river. Width between piers, 250 feet. The old light-house is in the town of Manitowoc, near the inner end of the north pier. A bell is struck by machinery, two blows in quick succession at intervals of 30 seconds, during thick or foggy weather. Twin River Point light-house, N. E. $\frac{1}{4}$ N., 10 $\frac{1}{2}$ miles.

The Harbor improvements consist of two piers, with a dredged channel connecting the mouth of the Manitowoc river with the deep water of Lake Michigan. They are 228 feet apart at the shore line, and 250 at the outer end, direction E. $\frac{1}{4}$ N. Depth of water: In May, last year,

there was 16 feet at the entrance, and a channel midway between the piers about 100 feet wide with a depth of 14 feet. There is no outer bar. The pier ends are opposite to each other.

Manitowoc Bay has good anchorage, and affords protection from all winds, except from northeast by the eastward to south. The shore is bold, and can be approached within one-third of a mile.

TWO RIVERS PIERHEAD BEACON-LIGHT.—A fixed red light, visible $8\frac{1}{2}$ miles. On the outer end of the north pier, harbor of Two Rivers. White open frame tower, the upper part enclosed for a watch room. Lantern black, light $35\frac{1}{2}$ feet above lake level. Sheboygan light-house, Wis., S. by W., $27\frac{1}{2}$ miles; Manitowoc Pierhead light, Wis., S. W., $5\frac{1}{2}$ miles; Grande Pointe au Sable light-house, Mich., E., 53 miles.

Two Rivers Harbor.—The improvements consist of two parallel piers and a dredged channel between them, connecting the mouth of the river with the deep water in Lake Michigan. The north pier is 1,810 feet long, and the south pier 1,710. Width between piers at the outer end, 250 feet. Depth of water: The channel is midway between the piers, 90 feet wide and 12 feet deep. Direction of piers, S. E. $\frac{1}{4}$ S. The Life Saving Station is at the entrance on the north side.

TWIN RIVER POINT LIGHT-STATION.—A fixed white light, varied by white flashes every 30 seconds, 3d order, visible 18 miles. White tower, 100 feet high, connected by a covered way with dwelling. A coast light, on Rawley's point, about 5 miles to the northward of Twin rivers. The light stands on a low sandy shore. Pine barrens to the north, south and west. The fog-signal is a 10-inch steam whistle, giving blasts of 5 seconds duration at alternate intervals of 10 and 40 seconds. Fog signal house is on the beach 225 feet southeast of the light-house. Grande Pointe au Sable light, E. $\frac{1}{4}$ S., 50 miles. Petite Pointe au Sable light, S. E. by E., 62 miles.

Good anchorage and shelter from S. and S. S. E. gales can be found in the bight $6\frac{1}{2}$ miles north of Twin River point. Come-to in 4 or 5 fathoms of water.

Two Creeks, 7 miles north of Twin River Point light, has a pile pier.

Dean's Pier is 13 miles to the northward of Twin River Point light.

KEWAUNEE PIERHEAD BEACON-LIGHT.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. Red, square frame-work tower, black lantern, with brown parapet. The upper part of the tower is inclosed for a watch room. On the outer end of the north pier, at the entrance to the harbor of Kewaunee. Entrance to Ahnepee river, N. by E. $\frac{1}{4}$ E., 11 miles. Twin River Point light-house, S. $\frac{1}{4}$ E., $17\frac{1}{2}$ miles.

Range Light.—A fixed red light, shown from a tubular lantern suspended 25 feet above the lake level from a post set at the outer end of the north pier. This light will form with the main pierhead light a range showing the direction of the pier and the course into the harbor.

Kewaunee Harbor.—The improvement consists in the formation of a channel, from a point about 2,000 feet south of the mouth of the Kewaunee river, through a spit 300 feet wide, connecting the river with the deep water in Lake Michigan. The piers have been extended, the pierhead light moved out, and the channel dredged. Width between

midway between the
There is no outer bar.

and affords protection
eastward to south. The
third of a mile.

MACON-LIGHT.—A
end of the north pier,
the upper part enclosed
above lake level. She-
s; Manitowoc Pierhead
Sable light-house, Mich.,

ents consist of two par-
n, connecting the mouth
igan. The north pier is
th between piers at the
nnel is midway between
tion of piers, S. E. $\frac{3}{4}$ S.
e north side.

STATION.—A fixed
onds, 3d order, visible 18
by a covered way with
out 5 miles to the north-
low sandy shore. Pine
signal is a 10-inch steam
alternate intervals of 10
ch 225 feet southeast of
E. $\frac{3}{4}$ S., 50 miles. Petite

S. E. gales can be found
point. Come-to in 4 or 5

er Point light, has a pile

rd of Twin River Point

DN-LIGHT.—A fixed
square frame-work tower,
er part of the tower is
f the north pier, at the
ce to Ahnepee river, N.
ouse, S. $\frac{1}{4}$ E., 17 $\frac{1}{2}$ miles.
from a tubular lantern
ost set at the outer end
e main pierhead light a
course into the harbor.
t consists in the forma-
south of the mouth of
le, connecting the river
ers have been extended,
edged. Width between

piers, 200 feet. Direction of piers, E. S. E. As now constructed, the north pier extends about 70 feet beyond the south pier.

The shore from Twin River point to Ahnepee is generally bold, and can be approached at any place to within one-half to five-eighths of a mile.

About 1 $\frac{1}{2}$ miles S. S. E. from the dock at Dean's, and nearly half a mile from shore, there is a shoal with only 3 feet of water on it.

There is a 6-foot spot about 1,000 feet N. E. from the outer end of the north harbor pier at Kewaunee.

Ahnepee is 28 miles N. $\frac{1}{4}$ E. from Twin River Point light. Pier-head light-house to be built.

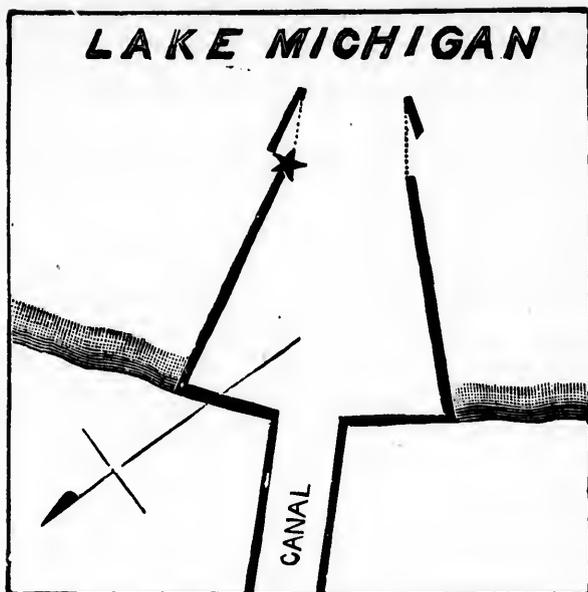
Harbor Improvement.—The first project was for the formation of a small harbor connecting with the lake by a channel, to be formed by the construction of two piers 100 feet apart. Also for blasting and dredging rock from the river bed. The original project was modified so that in extending the piers they were placed 50 feet further from the center line of the channel than the old piers, making the channel at the entrance 200 feet wide, narrowing to 100 feet. Direction of piers, S. E. by E.

Along the shore from Ahnepee to within 2 miles of Sturgeon Bay Ship-canal, shoal water extends from three-quarters to 1 $\frac{1}{2}$ miles from shore. There is a shoal 1 $\frac{1}{2}$ miles, E. $\frac{1}{2}$ N. of the piers at Ahnepee, with 17 feet of water on it; another E. N. E. $\frac{1}{2}$ N., half a mile from the outer end of the piers and one-quarter of a mile from shore, with 12 feet of water over it. From 2 to 4 miles south of the piers at Sturgeon Bay Ship-canal there are several shoal spots 1 $\frac{1}{2}$ miles from shore, with from 13 to 15 feet of water over them.

STURGEON BAY CANAL PIERHEAD LIGHT.—A fixed red light, 6th order, visible 8 $\frac{1}{2}$ miles. White, open frame-work tower, 29 feet high. On the end of the north pier, at the entrance to Harbor of Refuge and Sturgeon Bay Ship-canal. During thick and foggy weather there is sounded a 10-inch steam-whistle, giving blasts of 5 seconds' duration at intervals of 25 seconds. Fog signals adjoining light-house on north pier. Point Betsey light, E. $\frac{3}{4}$ S., 53 miles. South Fox Island light, N. E. by E. $\frac{1}{2}$ E., 83 miles. In passing through Sturgeon bay from the eastward, black buoys will be left on the starboard hand and red buoys to port.

Harbor of Refuge at the Entrance of Sturgeon Bay Ship-canal.—The harbor works consist of two piers 1,200 feet long, 850 feet apart at the shore line, and 235 feet apart at the outer ends, inclosing a basin of 10 acres, at the lake entrance to the canal. Beyond the piers are two detached piers, each 150 feet long and 335 feet between their outer ends, which are in 18 feet of water. Each detached pier is connected to the main pier by a double row of fender piling. Depth of water, last September, there was 16 feet at the entrance, thence to the canal on the center line between the piers there was a depth of 15 $\frac{1}{2}$ to 16 feet for a width of 75 feet. In the southwest corner of the basin, 100 feet from the channel leading into the canal, there are rocks with only 11 $\frac{1}{2}$ feet of water over them. Entering the harbor steer straight in between the piers and into the canal N. W. $\frac{1}{4}$ W. Life Saving Station on eastern entrance of canal, north end.

White Fish Point.—Red spar buoy, in 17 feet of water. Marks the end of the shoal off the point. From White Fish point to Sturgeon



STURGEON BAY CANAL.

Bay Ship-canal, the coast trends in a southwesterly direction; there are shoals and rocky spits, rendering the coast dangerous to a distance of over 1 mile from shore. Sturgeon Bay Canal light, S. W. $\frac{1}{2}$ W., $7\frac{1}{2}$ miles. The range leads over foul ground. White Fish point N. W. $\frac{1}{2}$ W., 1 mile.

BAYLEY'S HARBOR RANGE LIGHTS.—Front Light, fixed white, 6th order, visible $10\frac{1}{2}$ miles. White tower, 17 feet high.

Rear Light, fixed white, 5th order, visible 12 miles, lantern on white frame dwelling, 24 feet high, on the north shore of Bayley's harbor, a little north of the village of Bayley's Harbor. To anchor in the harbor, bring the towers in range when 4 miles from the beacon; stand in on the range and anchor in $3\frac{1}{2}$ or 4 fathoms of water, when between the old light-house and the village, being careful to avoid the shoal which extends about a mile to the southward of the old light-house. The entrance between the shoals at the mouth of the harbor is about three-fourths of a mile wide. The beacon and rear light are in range N. N. W. and S. S. E., and are distant from each other 950 feet. There are three pile piers on the west side of Bayley's harbor with from 8 to 10 feet of water at them. On the west side of the bay the bottom is sand and rock, on the east side near the old light-house the bottom is mud and clay. Vessels seeking shelter in southerly gales should stand in on the ranges until nearly abreast of the old light house, when haul up for it, and come-to in about $3\frac{1}{2}$ fathoms of water close in, and avoid the swell that sets into the harbor.

Bayley's Harbor Middle Ground.—Black 24-foot spar buoy, in 18 feet of water. Marks the southeastern point of the middle ground shoal in the entrance to Bayley's harbor. Front range light, N. $\frac{1}{2}$ W., $8\frac{1}{2}$ miles. White Fish Point buoy, S. by W. $\frac{1}{2}$ W., 12 miles.

Bayley's Harbor Entrance (North Side).—Red 24-foot spar buoy, in 18 feet of water. Marks the southwestern point of the shoal making out from the eastern point of entrance at Bayley's harbor. Front range light, N. N. W. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles. Middle Ground buoy, S. S. W. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles.

GAN

Mud Bay is midway between the old light-house at Bayley's harbor and Cana island; it has good anchorage and protection from all winds except from the southeast. To make the anchorage, stand in for the middle of the bay heading about N. W. by N., and come to in about 3½ fathoms well into the bay. Vessels have laid in Mud bay through the heaviest southeasters.

CANA ISLAND LIGHT-STATION.—A fixed white light, 3d order, visible 16½ miles. Yellow brick tower, 80 feet high, connected by a covered way with brick dwelling. A coast light, on Cana island, 14½ miles S. by W. ¼ W. of the Porte des Morts entrance to Green bay, and 4 miles to the northward of the entrance to Bayley's harbor. White Fish point S. S. W. ¼ W., 17 miles.

North Bay Entrance (south side).—Black spar buoy in 14 feet of water. Marks the extreme point of the shoal extending to the northeastward from the south side of the entrance to North bay, which is about 7 miles to the northward of Bayley's harbor. To enter the harbor, which is small, pass midway between the buoys and round to under either point, according to the direction of the wind. Care must be taken not to run too far in, as the anchorage ground is only three-fourths of a mile deep from the entrance buoys. The width of the entrance between the buoys is about three-eighths of a mile. Cana Island light-house, S. ¾ E., 2½ miles. Wood dock north side of bay N. ¼ W., ¼ mile.

North Bay Entrance (north side).—Red spar buoy, in 24 feet of water. Marks the point of the shoal extending to the southward from the north side of the entrance into North bay. Cana Island light-house, S. ¼ W., 3 miles.

Rawley's Bay, Four-Foot Shoal.—Red 24-foot spar buoy, in 18 feet of water. Marks the southeastern point of the shoal. Cana Island light-house, S. S. W. ¼ W., 5½ miles. Outer Shoal buoy, N. N. E. ¼ E., 6½ miles.

Rawley's Bay or False Door.—The head of this bay is 6 miles north of the entrance to the North bay; strangers should be careful to avoid the shoals, which extend in a southerly direction from the point on the east side of the bay. To make the head of the bay, when one-half mile east of the point north of the entrance to North bay, steer N. ¾ W., 4½ miles, until Spider island bears east, when come to in 4½ fathoms of water. This course leaves the Hog's back reef, on which there is only 4 feet of water, to the eastward.

Outer Shoal.—Red 2d-class nun buoy in 21 feet of water. Off the southeast end of the extreme easterly shoal between Gravel and Spider islands, south side of the entrance into Porte des Morts passage. Vessels bound through the passage from the southward will pass one-half mile to the eastward of the buoy, and when abreast of it, haul up to N. N. W. ¼ W. until abreast of Nine-foot Shoal buoy, Porte des Morts passage, when change course to N. W. ¼ W., which will lead fair into Green bay. Porte des Morts light-house, N. ¼ E., 3½ miles. Gravel islands, N. W. ¾ W., 2 1-16 miles. Spider island (middle) S. W. ¼ W., ¾ miles.

The Coast from White Fish point to Porte des Morts, is rocky and dangerous, with large indentations fringed with rocky spits and detached shoals; all of which may be avoided when bound to the northward by steering N. N. E. when 3 miles east of White Fish point.

PORTE DES MORTS LIGHT-STATION.—A fixed red light, 4th order, visible 12½ miles. Lantern on yellow brick dwelling, 44 feet high, on Pilot island, in the Porte des Morts passage, between Lake Michigan and Green bay. During thick and foggy weather there

terly direction; there are dangerous to a distance of al light, S. W. ¼ W., 7½ white Fish point N. W. ¼

LIGHTS.—Front es. White tower, 17 feet

miles, lantern on white frame harbor, a little north of the r, bring the towers in range and anchor in 3½ or 4 fathoms allage, being careful to avoid of the old light-house. The or is about three-fourths of a N. W. and S. S. E., and are plers on the west side of Bay. On the west side of the bay old light-house the bottom is ales should stand in on the haul up for it, and come to ell that sets into the harbor.

24-foot spar buoy, in 18 feet ground shoal in the entrance es. White Fish Point buoy,

—Red 24-foot spar buoy, in shoal making out from the ge light, N. N. W. ¼ W., 2½

is sounded a steam-siren, giving blasts of 5 seconds at intervals of 30 seconds. Cana Island light-house, S. by W. $\frac{1}{4}$ W., $14\frac{1}{2}$ miles. Rocky spits extend from this island to the southeast and southwest for one quarter of a mile.

Nine-foot Shoal (Porte des Morts Passage).—Black 2d-class nun buoy in 18 feet of water. Marks the southeast end of the 9-foot shoal in the Porte des Morts passage, on the southwest side of the channel. Vessels bound through the passage from Lake Michigan can steer N. W. $\frac{1}{4}$ W. when abreast this buoy. Porte des Morts light-house, N. E. by E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles. Northwest point of Plum island, N. $\frac{1}{4}$ W., $2\frac{5}{8}$ miles. Outer Shoal buoy, S. S. E. $\frac{1}{4}$ E., 3 miles.

To Enter Green Bay through Death's Door (Porte des Morts) passage, when 2 miles S. S. E. $\frac{1}{4}$ E. of Pilot Island light, steer N. W. $\frac{1}{4}$ W. until fairly into the bay.

Detroit Island Passage.—Red spar buoy in 11 feet of water. On the southwest point of the shoal, which lies in the passage-way between Detroit and Plum islands. The charts give 12 feet as the least depth of water on the shoal, but spots have been found with only 10 feet of water on them. The anchorage between Detroit and Plum islands is a safe one, and is frequently used, during eastern gales, by vessels bound from Green bay into Lake Michigan. The range between the west point of Washington island and Pilot Island light leads fair between this buoy and Plum Island buoy, and in good water.

Porte des Morts Range Lights.—To be built on the southwest side of Plum island.

Plum Island.—Black spar buoy in 14 feet of water. Marks the northeast point of the shoal extending to the northward from Plum island. It can be passed close-to from the northward, but on approaching it from the westward it should be given a berth of at least a half of a mile. Northwest end of Plum island, S. W. $\frac{1}{4}$ W., $\frac{1}{2}$ mile.

Nine-foot Shoal (Rock Island Passage).—Red, 3d-class can buoy in 21 feet of water. On the southwest side of the small 9-foot shoal in the passage into Green bay, between Rock and St. Martin's island, about 2 miles distant from the south end of St. Martin's Island and $2\frac{1}{2}$ miles from Rock island. The shoal is of small extent, with deep water close-to. The usual passage-way is between the buoy and Rock island, and, unless familiar with the locality, vessels should not pass to the northward of the buoy. Pottawatomie light-house, S. W. by W. $\frac{1}{4}$ W., 3 miles. Southeast point of St. Martin's island, N. by E. $\frac{1}{4}$ E., $2\frac{1}{2}$ miles. Fish island (awash), S. by E., $3\frac{5}{8}$ miles.

POTTAWATOMIE, OR ROCK ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible $19\frac{1}{2}$ miles. Lantern on gray stone dwelling, 34 feet high, light 137 feet above lake level. On the north point of Rock island. A guide into the passage between Rock and St. Martin's islands. Off the southeast point of Rock island there are two dangerous reefs, with rocks above water or awash, bearing from the point E. by S. $\frac{1}{4}$ S. and S. S. E. $\frac{1}{4}$ E., distant respectively about $2\frac{1}{4}$ and $3\frac{1}{4}$ miles. There is a passage-way between these shoals and Washington and Rock islands. Vessels from Lake Michigan for Green bay can bring the light to bear, in 18 fathoms water, from W. $\frac{1}{4}$ N. to W. by S. $\frac{1}{4}$ S., and stand for it, hauling half a mile to the northward as they approach the light, with the light abeam when standing for the westward. Southeast point of St. Martin's island, N. E. $\frac{1}{4}$ N., $4\frac{1}{4}$ miles.

onds at intervals of 30
W., 14½ miles. Rocky
and southwest for one

Passage).—Black 2d.
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the southwest side of the
om Lake Michigan can
e des Morts light-house,
Plum island, N. ½ W.,
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Door (Porte des Morts)
nd light, steer N. W. ½

buoy in 11 feet of water.
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et of water. Marks the
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ward, but on approach-
rth of at least a half of
W., ½ mile.

Passage).—Red, 3d-class
side of the small 9-foot
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AND LIGHT-STA-
9½ miles. Lantern on
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standing for the west-
N. E. ¾ N.; 4½ miles.

North point of Boyer's bluff, W. ¾ S., 5½ miles. Point Peninsula light-house, N. N. W. ¼ W., 17½ miles.

POVERTY ISLAND LIGHT-STATION.—A flashing red light, 4th order, visible 15½ miles; the interval between flashes is 15 seconds. White tower, 65 feet high, connected by a covered way with white dwelling. On the south point of Poverty island. A guide to the passage into Green bay, between the Gull islands and Poverty island. Heavy draught vessels bound into Green bay should keep at least ¾ of a mile south of Poverty Island light, then steer midway between the buoys on Gravelly Island and Poverty Island shoals about N. W. ½ W., and when past Gravelly Shoal buoy W. by N. ¾ N. to clear Corona shoal. The fog-signal is a 10-inch steam whistle, giving a blast of 5 seconds duration, followed by an interval of 45 seconds, then a blast of 3 seconds, followed by an interval of 10 seconds. Point Peninsula light-house N. W. by W. ¼ W., 17½ miles. Pottawatomie light-house S. W. ¼ W., 10½ miles.

Gravelly Island Shoal.—Black, 25-foot spar buoy in 18 feet of water. Marks a small shoal with 17 feet of water over it 1½ miles north of Gravelly island. There is a small 14-foot patch ¾ of a mile north of the island; therefore only light-draught vessels should pass to the southward of the buoy. Poverty Island Shoal buoy, N. E. ¼ E., 1½ miles. Poverty Island light-house, E. by S. ¾ S., 3½ miles.

Poverty Island Shoal.—Red and black horizontal stripes spar buoy, 25 feet long, in 18 feet of water. Marks the southwestern point of a small shoal to the westward of Summer island. Least water is 15 feet. Gravelly Island Shoal Buoy, S. W. ¼ W., 1½ miles. Poverty Island light-house, S. E. ½ E., 2½ miles.

POINTE SEUL CHOIX LIGHT-STATION.—A fixed white light, 4th order, visible 16 miles. Open frame-work tower 47 feet high, surmounted by an octagonal wooden lantern painted black. On the extremity of Seul Choix Pointe. Poverty Island light, S. W. ¾ W., 46 miles. St. Helena light, E. ¼ S., 51 miles. North point of Squaw island, E. by S. ¾ S., 16½ miles. In the bay to the north and eastward of the light there is good anchorage, and protection from all winds except from the south and east. Come-to with the light about S. S. W. 1½ miles distant. Keep a lookout for trap nets.

Squaw Island.—A light-house and fog-signal (to be built early this season, for which an appropriation is available).

Squaw Island Shoal.—Black 2d-class nun buoy in 22 feet of water, on the north end of Squaw Island shoal. The western edge of Whiskey island slightly open to the west of Squaw island. Northwest end of Squaw island S. S. W. ¼ W., 2½ miles. East tangent of Garden island, S. E. ¼ E.

Garden Island Shoal.—A red and black horizontal stripes spar buoy in 15 feet of water, known on the chart as the 18-foot spot, N. E. by N. ¼ N., 2½ miles from the northwest end of Garden island.

Light Houses, Buoys and Harbors Standing to the Northward in Green Bay.

Drisco's Shoal.—Red and black horizontal stripes, 2d-class can buoy in 21 feet of water. Off the northeast end of Drisco's shoal, in the north end of Green bay. The shoal is a dangerous one, lying nearly in the track of vessels bound from Porte des Morts to Escanaba, and is about one-quarter of a mile in extent in a northeast and southwest direction. The charts indicate 6 and 7 fathoms of water in its position,

and the least depth of water found by the light-house steamer "Dahlia," in many soundings, was 12 feet on the northeast end of the shoal. It is possible that there may be spots with less water on them, and in thick weather the locality of the shoal should be avoided. When clear, the buoy may be passed within one-eighth of a mile to the eastward, and one-half a mile to the westward. Mill at mouth of Ford river, N. W. $\frac{3}{4}$ W., 12 $\frac{1}{2}$ miles. Point Peninsula light-house, N. $\frac{1}{4}$ W., 7 $\frac{1}{4}$ miles. Rock Island light-house, S. E. $\frac{3}{4}$ S., 10 $\frac{1}{2}$ miles. Center of Boyer's bluff, S. $\frac{3}{4}$ E., 9 $\frac{1}{2}$ miles.

Corona Shoal.—Red and black horizontal stripes spar buoy in 18 feet of water. Marks the southern point of Corona shoal, which has its greatest extent, 275 yards, in a N. N. E. and S. S. W. direction. The least water, 15 feet, is about 100 yards northeast of the buoy. Heavy-draught vessels in a sea should pass at least three-eighths of a mile south of the buoy. Point Peninsula light-house, N. $\frac{3}{4}$ W. 3 $\frac{1}{2}$ miles. Ten-foot Shoal buoy, N. W. $\frac{1}{4}$ W. 1 $\frac{1}{2}$ miles.

Ten-foot Shoal (off Point Peninsula).—Red 2d-class nun buoy in 18 feet of water. On the south side of the 10-foot shoal off Point Peninsula. Unless perfectly familiar with the locality, vessels must not attempt to pass to the northward of the buoy. There is a small shoal spot, with 16 feet of water on it, one-half of a mile E. $\frac{1}{2}$ N. from the buoy. Point Peninsula light-house, N. by E. $\frac{3}{8}$ E., 2 $\frac{3}{8}$ miles. Escanaba light-house, N. N. W. $\frac{1}{4}$ W., 8 miles. Mouth of Ford river, W. N. W. $\frac{1}{2}$ W., 8 $\frac{1}{2}$ miles.

Point Peninsula Shoal.—Red spar buoy. Marks the south end of the shoal extending in a southerly direction from Peninsula point. One mile to the southwestward of this buoy there is a 10-foot shoal, marked by a 2d-class can buoy, with a passage-way between the buoys, which, however, should not be attempted by strangers. Point Peninsula light-house, N. $\frac{3}{8}$ E., 1 $\frac{3}{8}$ miles. Ten-foot Shoal buoy, S. S. W. $\frac{3}{4}$ W., 1 mile.

POINT PENINSULA LIGHT-STATION.—A flashing white light, 4th order, visible 12 $\frac{1}{2}$ miles, interval between flashes 30 seconds. Yellow tower, 36 feet high, rises from brick dwelling. On the extreme south point of Point Peninsula. Marks the approach to Little and Big Bays de Noquette. A shoal extends to the southward of the light, 1 $\frac{3}{8}$ miles, and there is a dangerous 10-foot spot, marked by a buoy, 2 $\frac{1}{4}$ miles to the southward and westward of Peninsula point, which should be passed to the southward. Escanaba (Sand Point) light-house, N. W. $\frac{3}{8}$ N., 6 $\frac{3}{8}$ miles. Poverty Island light-house, S. E. by E. $\frac{1}{4}$ E., 17 $\frac{1}{4}$ miles.

Sand Point (off Escanaba).—Black spar buoy. Marks the end of the shoal extending in a northeasterly direction from Sand point, and should be passed to the eastward. Escanaba light-house, S. W. by W. $\frac{3}{8}$ W., $\frac{3}{8}$ mile. Iron dock (Escanaba), W. $\frac{3}{8}$ S., $\frac{1}{4}$ mile. Ten-foot shoal buoy, off Point Peninsula, S. S. E. $\frac{1}{4}$ E., 8 miles. When well past this buoy, haul up for the steamboat landing, or the iron ore docks. Good anchorage and protection from all winds in the bay north of Escanaba.

ESCANABA LIGHT-STATION.—A fixed red light, 4th order, visible 13 miles. Yellow brick tower rises from brick dwelling. Near the end of Sand Point (Escanaba). A shoal extends three-eighths of a mile to the northeastward of Sand point. A guide into the harbor of Escanaba and Little Bay de Noquette. Point Peninsula light-house, S. E. $\frac{3}{8}$ S., 6 $\frac{3}{8}$ miles. Saunders point, N. by E. $\frac{1}{4}$ E., 7 $\frac{1}{4}$ miles.

Little Bay de Noc Shoal.—Red 3d-class can buoy in 18 feet of water. Marks the southwestern point of the shoal on the eastern side of Little Bay de Noquette. Escanaba light-house, S. W. $\frac{1}{4}$ S. 1 $\frac{3}{8}$ miles. Point Peninsula light-house, S. S. E. $\frac{1}{4}$ E., 6 $\frac{1}{4}$ miles. Ten-foot Shoal buoy, S. by E. $\frac{3}{8}$ E. 8 $\frac{3}{8}$ miles.

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Ten-foot Shoal buoy,

Saunders Point Shoal.—Red 3d-class nun buoy in 18 feet of water. Marks the eastern point of the shoal making out from Saunders point (Gladstone). Escanaba light-house, S. by W. $\frac{1}{2}$ W., $7\frac{1}{2}$ miles. Squaw point, S. S. W. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles. End of wharf at Saunders point, S. W. by W. $\frac{1}{2}$ W., 260 yards.

Saunders Point Shoal (inside).—Black spar buoy in 17 feet of water. Marks the northern edge of the shoal making out from Saunders point (Gladstone). End of wharf at Saunders point, S. by E., 420 yards. Saunders Point buoy, S. E. by E., 430 yards.

Standing to Southward in Green Bay.

Whale's Back Shoal (east end).—Red 27-foot spar buoy in 18 feet of water. Marks the southeastern point of Whale Back shoal, which extends in a north-westerly and southeasterly direction $1\frac{1}{2}$ miles, and northeasterly and southwesterly $\frac{1}{2}$ mile, with its shoalest spot midway between the ends, and awash, or nearly so. The soundings in the proximity of the shoal are irregular; bottom, stone, sand, and gravel. Great care should be observed in approaching its locality, except in clear weather. Porte des Morts light-house, E. by S. $\frac{1}{2}$ S., $13\frac{1}{2}$ miles. Chambers Island light-house, S. W. $\frac{1}{4}$ S., $14\frac{1}{2}$ miles.

Whale's Back Shoal (west end).—Black 27-foot spar buoy in 18 feet of water. Marks the northwestern point of the Whale's Back shoal. Chambers Island light-house, S. W. by S. $\frac{1}{2}$ S., $14\frac{1}{2}$ miles. Whale's Back Shoal buoy (east end), S. E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles.

Cedar River Pierhead Beacon-Light.—A fixed white light, 4th order, visible 15 miles. White, square wooden tower, focal plane 66 feet above the level of the bay, black iron lantern, with brown parapet. The lower part of the tower is open frame-work, the upper part is inclosed for a watch-room. Near the outer end of the east pier at the entrance to Cedar river, Green bay. Point Peninsula light-house, N. E. $\frac{1}{2}$ N., 26 miles. Pilot Island light-house, E. by S. $\frac{1}{4}$ S., 23 miles. Whale's Back shoal, E. by S. $\frac{1}{4}$ S., $8\frac{1}{2}$ miles. Chambers Island light-house, S., $14\frac{1}{2}$ miles.

Cedar River Range Lights.—Front light, lantern on south corner of Cedar River light-house; rear light, lantern suspended from a post on inner end of pier, 500 feet from front light. Two fixed red lights, on channel side of the east pier, visible 2 or 3 miles. Form a range that shows the direction of the harbor entrance and carries clear of the rock 555 yards from the light-house and nearly in the line of direction of the west pier.

Cedar River is on the west shore of Green bay, 25 miles W. $\frac{1}{4}$ S. from Rock Island light, and the same distance about N. E. by N. from the Menomonee river. The harbor improvements consist of two parallel piers 200 feet apart, extending about S. by E. $\frac{1}{4}$ E. from the mouth of Cedar river.

Cedar River Entrance.—Black spar buoy in 14 feet of water. Marks a rock, with 14 feet of water over it, 555 yards from the light-house, and nearly in the line of direction of the west pier. Cedar River light-house, N. $\frac{1}{2}$ E., 555 yards.

Horse Shoe Reef.—Red 2d-class can buoy in about 5 fathoms of water nearly $\frac{1}{2}$ mile E. N. E. from a rock with 4 feet of water over it, at the northeastern end of the Horseshoe reef. This was formerly the black buoy that marked the north-east end of the reef. It has been moved to the eastward one half mile from its former position and painted red. Death's Door bluff, N. E. $\frac{1}{2}$ E., $8\frac{1}{2}$ miles. Eagle Bluff light-house, S. S. W. $\frac{1}{2}$ W., $4\frac{1}{2}$ miles. North point of Chambers island, W. by S. $\frac{1}{4}$ S., 7 miles. East end of Whale's Back reef, N. $\frac{1}{2}$ E., $8\frac{1}{2}$ miles.

Eagle Harbor and Horseshoe Island.—There is good anchorage in Eagle harbor, and anchorage and protection from all winds can be found on the south side of Horseshoe island. Come to close to the island in 5 fathoms of water. Mud bottom. The shores of the island are bold.

Strawberry Island Reef.—Red spar buoy. Marks the easterly side of the north end of the Strawberry Island reef. It is located 1 mile northwest of Eagle Bluff light-house.

EAGLE BLUFF LIGHT-STATION.—A fixed white light, 3 $\frac{1}{2}$ order, visible $15\frac{1}{2}$ miles. Yellow tower, 38 feet high, rises from the corner of brick dwelling. On the extreme westerly point of Eagle bluff, $2\frac{1}{4}$ miles to the northward of the village of Fish Creek. A guide through the Strawberry passage between the islands and the main shore. Strangers should not attempt to pass between the Strawberries and Chambers island. Chambers Island light-house, W. N. W. $\frac{1}{2}$ W., $6\frac{1}{2}$ miles. Green Island light-house, S. W. by W., $14\frac{1}{2}$ miles.

Strawberry Island Reef (south end).—Red spar buoy. Marks the

southeast edge of the Strawberry Island reef. Eagle Bluff light-house, N. E. by N. $\frac{1}{2}$ N., $1\frac{1}{2}$ miles. East side of Hat island, S. W. $\frac{1}{4}$ S., $4\frac{1}{2}$ miles.

CHAMBERS ISLAND LIGHT-STATION.—A fixed white light, varied by white flashes at intervals of 1 minute, 4th order, visible 15 miles. Yellow tower, 38 feet high, rises from the corner of brick dwelling. On the western point of Chambers island, and is a guide through the western passage (6 miles wide) between the island and the main-land. A reef extends off the north point of the island three-quarters of a mile. Strangers should not attempt the passage between Chambers island and the Strawberries. Green Island light-house, S. S. W. $\frac{1}{4}$ W., $11\frac{1}{2}$ miles. Whale's Back Shoal buoy, N. E. $\frac{1}{2}$ N., $13\frac{1}{2}$ miles. Boyer's bluff, N. E. $\frac{1}{4}$ E., $25\frac{1}{2}$ miles.

There is good anchorage on the south side of Chambers island, and protection from all winds from north to east. Shoal water extends from the west side of the island $1\frac{1}{2}$ miles. A spit extends from the southeast point of the island in a southeast direction nearly 2 miles.

MENOMONEE PIERHEAD BEACON-LIGHT.—A fixed red light, 4th order, visible $11\frac{1}{2}$ miles. White, conical iron tower, 29 feet high. On the outer end of the north pier, at the entrance to the Menomonee river. A guide into the Menomonee river. Green Island light-house, S. E. by E. $\frac{1}{4}$ E., 5 miles. Chambers Island light-house, N. E. by E., 13 miles.

Menomonee Harbor improvements consist of two parallel piers, and a dredged channel connecting the mouth of the river with the deep water in Green bay. The north pier is 1,854 feet in length, terminating in 16 feet of water, and the south pier is 2,710 feet long, and extends 100 feet beyond the north pier. The piers are 400 feet apart. Direction of piers about E. N. E. Depth of water: Last July, there was $16\frac{1}{2}$ feet at the entrance, thence to the inner end of north pier there was a channel 130 feet wide with a depth of 14 feet, thence to the bridge 13 feet.

GREEN ISLAND LIGHT-STATION.—A fixed white light, visible 14 miles, 4th order. Lantern on white dwelling, 40 feet high. Near the southeast point of Green island. Reefs extend off from the western and southeastern ends of the island, three-quarters and one-half mile respectively. The usual channel way is to the eastward of the island. Peshtigo Shoal buoy, S. S. W. $\frac{1}{2}$ W., 8 miles. Chambers Island light-house, N. N. E. $\frac{3}{4}$ E., 11 miles.

There is good anchorage on the southwest side of the island, and protection from north and northeasterly gales. Come to close to the island in 4 fathoms. Rounding the southeast point, give it a good berth to clear the end of the reef.

Entering into Sturgeon Bay from Green Bay.

To enter Sturgeon bay from Green bay, after passing in by Sherwood's point, and with the right-hand shore close aboard, bring the lights on Dunlap reef nearly in range, keeping the rear light just open or visible to westward of front light, until surely past Black buoy No. 3, and between that and the N. W. Middle ground, red-and-black buoy,—that is, about three-fourths mile from the front light—when open the lights more, giving them a berth of about 250 yards, and pass on either side of reef. After this, if bound through the canal, the best water will be found in mid-channel.

SHERWOOD'S POINT LIGHT-STATION.—A fixed white light, varied by a red flash every 20 seconds, 4th order, visible 14 miles. Red tower, 32 feet high, with dwelling attached, both of brick. On the south side of the entrance into Sturgeon bay. Eagle bluff, N. N. E., $21\frac{1}{2}$ miles. Chambers island, west side, N. $\frac{1}{4}$ E., 21 miles. Green island, N. N. W. $\frac{1}{2}$ N., $11\frac{1}{2}$ miles.

uff light-house, N. E. by N. miles.

N.—A fixed white light, visible 15 miles. Yellow flag. On the western point of the passage (6 miles wide) is off the north point of the attempt the passage between light-house, S. S. W. $\frac{1}{2}$ W., 5 miles. Boyer's bluff, N. E.

Chambers island, and protection from the west side of the island in a southeast

LIGHT.—A fixed red light, 29 feet high. On the outer side of the river. A guide into the bay, S. E., 5 miles. Chambers

consist of two parallel channels of the river with the width 54 feet in length, terminating 2,710 feet long, and extending 400 feet apart. Distance: Last July, there was a break in the end of north pier there, thence to the bridge

N.—A fixed white light, dwelling, 40 feet high. Lights extend off from the quarters and one-half mile to the eastward of the island. Chambers Island

side of the island, and is close to the island, it a good berth to

Green Bay.

When passing in by Sherburne board, bring the lights just open or visible. Black buoy No. 3, and red-black buoy,—that when open the lights pass on either side of the best water will be

N.—A fixed white light, 32 feet high. Red tower, 32 feet high. Side of the entrance into the island, west side, N. $\frac{1}{2}$

Quarry Point (Sturgeon Bay).—Red 20-foot spar buoy in 15 feet of water. Marks the eastern side of a small shoal with only 6 feet of water over it, off the entrance to Sawyer's harbor. Dunlap's Reef Range front light, S. S. E. $\frac{1}{2}$ E., $3\frac{1}{2}$ miles. Northern point of entrance to Sawyer's harbor, N. by W. $\frac{1}{2}$ W., 650 yards.

Hill's Point (outside).—Black, 20-foot spar buoy in 15 feet of water. Marks the western edge of the shoal ground that extends nearly across Sturgeon bay from the east shore, leaving a narrow channel between it and Hill's point on the west shore. Vessels bound into Sturgeon bay should keep to the westward of this buoy, and of Nos. 3 and 5 as well, and when near the buoy on the northwest end of the Middle ground (Dunlap reef), the channel on either side may be taken. Hill's point, S. W. $\frac{1}{2}$ S., 400 yards.

Hill's Point.—Black, 2d-class nun buoy in 14 feet of water. Marks the western edge of the same shoal as No. 1. Hill's point, W. $\frac{1}{2}$ N., 220 yards.

Hill's Point (inside).—Black, 20-foot spar buoy in 14 feet of water. Marks the southwest point of the same shoal. Hill's point, N. W. $\frac{1}{2}$ N., 550 yards.

Middle Ground (northwest end).—Red and black horizontal stripes, spar buoy in 13 feet of water. Marks the northwest end of the middle ground, which lies in mid-channel. Dunlap's Reef Front light, S. S. E. $\frac{1}{2}$ E., 300 yards.

DUNLAP REEF RANGE LIGHTS.—Front light, fixed white, 6th order, visible $9\frac{1}{2}$ miles. Red wooden tower, 14 feet high, on a crib.

Rear Light.—Fixed white, 5th order, visible $12\frac{1}{2}$ miles. Lantern on keeper's white frame dwelling, 35 feet high, on a crib. These lights are 680 feet apart, bearing S. S. E. $\frac{1}{2}$ E., and N. N. W. $\frac{1}{2}$ W. A guide through narrow channel abreast Hill's point, Sturgeon bay. At present the best water is found in the channel by keeping the rearlight just open to the westward of the front light.

West Channel Buoy.—Black spar buoy in 12 feet of water. Marks the west point of the middle ground, and is a guide through the west channel. Buoy on northwest end of the middle ground, N. by W. $\frac{1}{2}$ W., 430 yards. East channel buoy, E. $\frac{1}{2}$ S., 333 yards.

East Channel Buoy.—Red spar buoy, in 18 feet of water. Marks the northeast edge of the middle ground, and is a guide through the east channel. Buoy on northwest end of middle ground, N. W. $\frac{3}{4}$ W., 600 yards. West channel buoy, W. $\frac{1}{2}$ N., 333 yards.

Middle Ground (southeast end).—Red and black horizontal stripes, spar buoy, bushy top, in 13 feet of water. Marks the southeast point of the middle ground (Dunlap reef). Wharf foot of Portage street, Sturgeon bay, E. S. E. $\frac{1}{2}$ E., 900 yards.

Bridge.—Just above the middle ground, near the foot of St. John's street, in the city of Sturgeon Bay, a bridge spans the bay. The draw is near the city end of the bridge.

Standing to the Southward in Green Bay.

Little Sturgeon Bay is 6 miles W. S. W. from the southwest point of entrance to Big Sturgeon bay. The shore between the two bays is rocky with spits and detached rocky shoals 2 miles from shore.

Peshtigo Shoal.—Red, 2d-class can buoy, in 21 feet of water. Off the extreme point of the shoal, which extends in a southeasterly direction from Peshtigo point. Vessels should not attempt to pass between the buoy and the point, and when bound to Peshtigo river from the northward will pass the buoy three-fourths of a mile before heading for the mouth of the river. Peshtigo point, N. W. by W. $\frac{3}{4}$ W., 3 miles. Green Island light-house, N. N. E. $\frac{3}{4}$ E., 8 miles.

Oconto River.—The mouth of the river is 12 miles W. S. W. from the extremity of Peshtigo shoal. There is a pile pier extending into 12 feet of water, about 2,000 feet north of the harbor piers. There is no light-house at Oconto.

Oconto Harbor.—The project for the improvement of this harbor consists in extending the slab piers built by the city of Oconto at the mouth of the river into 10 feet of water, the piers to be parallel, 150 feet apart, direction N. E. $\frac{1}{4}$ E. A channel to be dredged between them 100 feet wide to a depth of 8 feet at the shore line and 10 feet at the outer ends. The present condition: The north pier is 1,600 feet in length, and the south pier is 2,150 feet. The south pier extends into the bay 875 feet beyond the north pier.

Pensaukee Shoal.—Red spar buoy, in 13 feet of water. Marks the extreme end of the shoal, which extends in a southeasterly direction from the land, between the Oconto and Pensaukee rivers. The least water on the shoal is 5 feet. Mouth of the Pensaukee river, W. N. W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles. Peshtigo Shoal buoy, N. E., 16 miles.

Oconto Bank.—This shoal is 2 miles in length, and about $\frac{1}{4}$ mile in width at the widest part; it lies about 3 miles from shore between the mouth of the Oconto river and Pensaukee point. The outer end of the harbor piers at Oconto bears N. W. $2\frac{1}{2}$ miles from the north end of the bank, and the Pensaukee Shoal buoy bears S. W. $\frac{1}{4}$ S., $3\frac{1}{2}$ miles from the south end. The general direction of the bank is north and south, least water is $6\frac{1}{2}$ feet.

Pensaukee River.—The mouth of the river is 16 miles N. by E. $\frac{1}{4}$ E. from Tail Point light, and $3\frac{1}{2}$ miles W. by N. from Pensaukee Shoal buoy.

Pensaukee Harbor.—The project for the improvement of this harbor consists in the construction of a single pier into 10 feet of water, with a dredged channel 100 feet wide and 10 feet deep. Present condition: 1,300 feet of the proposed 2,500 feet is built, and a channel 25 feet wide and 10 feet deep. The business of Pensaukee being entirely suspended, the further prosecution of the work has been discontinued. A storm destroyed the pier built by private enterprise, and the channel has filled up; there is about 2 feet depth.

Big and Little Suamico Rivers are 3 and 7 miles respectively from Tail Point light. Vessels load at anchor. There is good holding ground off both places.

The west shore of Green bay from Peshtigo point to Tail point, at the head of the bay, is shallow, with sandy bottom. Shoals extend from 2 to 3 miles from shore, which require a sharp lookout and frequent use of the lead.

TAIL POINT LIGHT-STATION.—A fixed white light, 4th order, visible 14 miles. Lantern on white dwelling, 56 feet high, near

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the south end of Long Tail point, at the head of Green bay, and $4\frac{1}{2}$ miles from the mouth of Fox river. A guide to the entrance of the river. Grassy Island outer light, S. $\frac{3}{4}$ W., $2\frac{1}{2}$ miles. Red Banks, E. by N., 6 miles. The fog-signal is a bell struck by machinery at intervals of 10 seconds.

Green Bay Harbor.—To enter the Fox river from Green bay, bring the Tail Point light-house to bear N. W. $\frac{1}{4}$ W., distant 1 mile, then steer in S. W. by W. $\frac{1}{4}$ W., leaving the Long Tail Point buoy on the starboard hand close-to, and when the Sable Point buoy bears a little abaft the beam, steer S. $\frac{1}{4}$ E. for the outer entrance buoy of the new cut; then, as this buoy is approached, haul up and pass close to it, to the eastward, on the course S. by W. $\frac{3}{4}$ W., which will lead fair into the cut. Follow the buoys until the deep water at the mouth of the river is reached and the inner buoy is passed, when the mid-channel may be taken for Green Bay city. The cut, with the channel dredged, commences near the head of deep water, at the mouth of the river, and extends 3,850 feet in a N. $\frac{1}{4}$ E. direction, then turns to the eastward in a N. by E. $\frac{3}{4}$ E. direction, extending 6,900 feet to 13 feet of water in the channel north of Grassy island. It is 200 feet in width, and at usual stages of water the depth is $12\frac{1}{2}$ feet. Where the cut passes through Grassy island there is close piling with a light at each end, on the east side, and the keeper's frame dwelling on the island between them. These lights are not intended to be used as ranges, and if so used will lead vessels ashore, but they mark the ends of the piling. At the mouth of the Fox river northeast gales usually raise the water from 1 to 2 feet, and southwest gales lower it about the same.

Long Tail Point.—Red, 2d-class can buoy, in 16 feet of water. At the southeast point of the shoal off Long Tail point, and is the first buoy as the mouth of Fox river is approached. Tail Point light-house, N. N. W. $\frac{3}{4}$ W., 1,720 yards. Sable Point buoy, S. W. $\frac{3}{4}$ S., 1,130 yards.

Sable Point.—Black, 3d-class nun buoy, in 15 feet of water. Marks the end of the spit which extends in a westerly direction $3\frac{1}{2}$ miles from Sable point, and is S. $\frac{1}{4}$ W., $1\frac{1}{10}$ miles from Tail Point light. Long Tail Point buoy, N. N. E. $\frac{1}{4}$ E., 1,130 yards. Grassy Island outer light, S. $\frac{1}{4}$ W., 2,370 yards.

Outer Buoy.—Red spar buoy, in 12 feet of water. Marks the west side of the outer entrance into the new cut at Grassy island, mouth of Fox river, Wisconsin. Grassy Island outer light, S. by W. $\frac{1}{4}$ W., 780 yards. Sable point, E. N. E. $\frac{1}{4}$ E., $3\frac{1}{4}$ miles.

Second Buoy.—Red spar buoy in 12 feet of water. Marks the West Channel bank of the new cut, between the outer entrance buoy and Grassy Island outer light. Outer buoy N. by E. $\frac{3}{4}$ E., 410 yards. Grassy Island outer light, S. $\frac{3}{4}$ W., 370 yards.

GRASSY ISLAND LIGHT-STATION (upper).—A fixed white light, 6th order, visible $12\frac{1}{2}$ miles. White, open frame-work tower, 29 feet high. On the north end of the close-piling on the east side of the new cut through Grassy island, at the entrance to Fox river. The keeper's frame dwelling is situated on the island, between the outer and inner lights. Tail Point light-house, N. $\frac{3}{4}$ E., $2\frac{1}{2}$ miles. Sable Point N. E. by E. $\frac{1}{4}$ E., $4\frac{1}{10}$ miles.

GRASSY ISLAND LIGHT-STATION (lower).—A fixed white light, 6th order, visible $11\frac{1}{2}$ miles. White, open frame-work

tower, 22 feet high. On the south end of the close-piling on the east side of the new cut through Grassy island. Grassy Island outer light, N. by E. $\frac{3}{4}$ E., 676 feet.

From the lower light in the cut to the mouth of Fox river, the distance is about 2,500 yards. The cut is 200 feet wide and marked with 5 red buoys, placed on the channel bank, about 500 yards apart, and are in plain sight from one to another.

Compass Courses and Distances in the Straits of Mackinac.

Cheboygan Light to Waugoshance.—When three-quarters of a mile north of light, steer W. 1 mile, thence N. W. by W. $\frac{1}{4}$ W., 16 miles, with Cheboygan light directly astern and St Helena light ahead, to a point 1 mile north of the railroad dock at Old Fort Mackinac, thence W., 18 $\frac{1}{2}$ miles, to a point 1 mile northwest of Waugoshance light, passing three-quarters of a mile north of it.

Cheboygan River Light to Mackinac.—Run out on the ranges half a mile past the light, when steer N. W. $\frac{1}{4}$ N., 9 miles, to a point three-quarters of a mile W. S. W. of the buoy on Zela shoal (and note that the Rabbit's Back peak, open on the west side of Mackinac island, leads clear of this shoal), thence N. W. by N. $\frac{1}{4}$ N., 5 $\frac{1}{2}$ miles, then E. by N. $\frac{3}{4}$ N., mid-channel between Mackinac and Round islands, when see directions for entering Mackinac harbor from the west.

Cheboygan River Light to Point St. Ignace.—Run out on the ranges half a mile past the light, when steer N. W. $\frac{3}{8}$ N., 17 $\frac{1}{2}$ miles, to the railroad wharf.

Cheboygan to Detour.—Run out on the range 1 $\frac{1}{2}$ miles, thence E. by N. 3 miles, when steer N. E. $\frac{3}{8}$ E., with Cheboygan Main light directly astern for 30 miles, to a point 1 mile east of Detour light and in range of Frying Pan and Pipe Island lights. This course should lead to the westward but very close to the Thirteen-foot shoal W. $\frac{1}{4}$ N. 3 $\frac{1}{2}$ miles from Spectacle Reef light. Heavy draught vessels should steer N. E. by E. $\frac{3}{8}$ E., to a point 1 mile west of Spectacle reef, and then haul up about N. E. for Detour.

Cheboygan to Georgian Bay.—See courses on Lake Huron, page 112.

Cheboygan to Presque Isle, etc.—See courses on Lake Huron, "Fort Gratiot to the Straits of Mackinac," page 108, which reverse.

Mackinac to Waugoshance.—From the middle of the harbor, steer W. by S. $\frac{1}{4}$ S., 4 $\frac{1}{2}$ miles, and past the range of Rabbit's Back peak and Point St. Ignace, thence W. $\frac{3}{8}$ S., 20 miles, to a point 1 mile northwest of the light.

Mackinac to Detour.—From the middle of the harbor, steer E. 9 $\frac{1}{2}$ miles to a point 2 miles north of Bois Blanc light, then E. by N. $\frac{1}{4}$ N., 26 $\frac{1}{2}$ miles, to a point 1 mile east of Detour light and in range with Frying Pan and Pipe Island lights. This course should lead about $\frac{1}{2}$ a mile south of the 1st class can buoy on Martin's reef, in thick or foggy weather, or at night, it would be well to watch this course closely.

Mackinac to Georgian Bay.—From the middle of the har-

close-piling on the east
assy Island outer light,

h of Fox river, the dis-
wide and marked with 5
yards apart, and are in

Straits of Mackinac.

—When three-quarters
N. W. by W. $\frac{1}{4}$ W., 16
Helena light ahead, to
Fort Mackinac, thence
Waugoshance light, pass-

ac.—Run out on the
W. $\frac{1}{4}$ N., 9 miles, to a
roy on Zela shoal (and
west side of Mackinac
N. $\frac{1}{4}$ N., 5 $\frac{1}{2}$ miles, then
Round islands, when
he west.

St. Ignace.—Run
steer N. W. $\frac{3}{4}$ N., 17 $\frac{1}{2}$

range 1 $\frac{1}{2}$ miles, thence
boyan Main light di-
f Detour light and in
course should lead to
hoal W. $\frac{3}{4}$ N. 3 $\frac{1}{2}$ miles
should steer N. E. by
nd then haul up about

urses on Lake Huron,

ee courses on Lake
page 108, which re-

e middle of the har-
ge of Rabbit's Back
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bor, steer E. $\frac{1}{4}$ S., 9 $\frac{1}{2}$ miles, to a point $\frac{1}{2}$ mile north of Bois Blanc light, then steer E. S. E. 15 miles to a point 2 miles south of Spectacle Reef light, when steer E. by S. $\frac{3}{4}$ S., 119 miles, to a point $\frac{3}{4}$ miles north of Cove Island light.

Straits of Mackinac to Poverty Island Passage, north of the Beaver Group.—When 1 mile north of the railroad dock at Old Fort Mackinac, steer W. by N. $\frac{3}{4}$ N., 13 $\frac{1}{2}$ miles, passing 1 mile southwest of St. Helena shoal, until the north side of St. Helena island bears east, 5 miles distant, and Point aux Chenes northeast the same distance, when steer due west, 29 miles, to a point 2 $\frac{1}{4}$ miles north of Squaw island, passing midway between the White shoals and Simmons' reef, when steer W. S. W. $\frac{1}{2}$ S., 58 miles, to a point three-quarters of a mile south of Poverty Island light.

Straits of Mackinac to Seul Choix Point and Manistique River.—When 5 miles west of St. Helena, as in the course to Poverty Island passage, steer W. $\frac{1}{2}$ N., 45 miles, passing about midway between the White shoals and Simmons' reef, to a point 1 $\frac{1}{2}$ miles south of Seul Choix point, thence W. $\frac{3}{4}$ N., 16 miles, to 1 mile south of the entrance to Manistique river.

St. Helena to Waugoshance.—Haul around the southeast point of the island, giving the buoy a good berth, when steer W. by S. $\frac{3}{4}$ S., 12 $\frac{1}{2}$ miles, to a point 1 mile northwest of Waugoshance light, keeping a lookout for the 18-foot shoal.

Waugoshance to Chicago (South Passage).—When 1 mile northwest of the light, steer S. W. $\frac{3}{4}$ S., 65 $\frac{1}{2}$ miles, until the southeast point of North Manitou island bears northwest 1 mile, when steer the same course, 32 miles, to a point 4 $\frac{1}{2}$ miles west of Point Betsey light, thence S. by W. $\frac{1}{4}$ W., 207 miles, to a point 2 $\frac{1}{2}$ miles east of Chicago light.

NOTE.—The courses given on the charts lead south of Waugoshance light, but at the present time not more than 10 feet can be carried through that channel with safety. There is a shoal spot N. by W. $\frac{1}{4}$ W., 1 $\frac{1}{2}$ miles from the light. The chart gives 18 feet of water over it, but the present stage of water is not more than 16 feet. It is marked with a spar buoy. The Vienna shoal bears W. S. W. from the light 1 $\frac{1}{2}$ miles, marked with a red and black horizontal stripes, 2d class can buoy. The rock on which there was only 13 feet has been removed, but the buoy is continued to mark other shoal spots in the vicinity.

Waugoshance to Milwaukee (Middle Passage).—When 1 mile northwest of the light, steer S. W. $\frac{3}{4}$ W., 47 miles, until the South Fox Island light bears north 1 $\frac{1}{2}$ miles, thence the same course, 15 miles, until the west side of North Manitou island bears south, and the extreme north point, 4 $\frac{1}{2}$ miles distant, when steer S. W. by S. $\frac{3}{4}$ S., 177 miles, to a point 3 miles east of Milwaukee Pierhead light.

Waugoshance to Sheboygan (West Passage).—When 1 mile northwest of the light, steer S. W. $\frac{1}{4}$ W., 27 miles, until Beaver Island light bears northwest, distant 2 miles, thence W. by S. $\frac{3}{4}$ S., 19 $\frac{1}{2}$ miles, to a point 2 $\frac{1}{2}$ miles northwest from the north point of South Fox island, then steer S. W. by S., 148 miles, to a point 1 $\frac{1}{2}$ miles east of Sheboygan Pierhead light.

Waugoshance to Green Bay.—When 2 miles southeast of Beaver Island light, as in the preceding course to West Passage, steer

W. $\frac{1}{4}$ S., 63 miles, to a point one-fourth of a mile north of Rock Island light, keeping a lookout for the buoy on 9-foot shoal, $2\frac{1}{2}$ miles S. by W. $\frac{1}{4}$ W., from southeast point of St. Martin's island. Or W. $\frac{1}{4}$ S., 55 miles to a point $\frac{1}{4}$ of a mile south of Poverty Island light. Or W. by S. $\frac{1}{4}$ S., 70 miles, to a point 2 miles S. S. E. of Pilot Island light. When see courses in Green Bay.

Waugoshance to Northport and Traverse City.—When 1 mile northwest of the light, steer S. W. by S. $\frac{1}{4}$ S., 10 miles, until Skilligallee light bears east 2 miles, then S. S. W. $\frac{1}{4}$ S., $41\frac{1}{2}$ miles, until Northport point bears N. W. $1\frac{1}{2}$ miles, thence to Traverse city, S. $\frac{1}{4}$ W., $24\frac{1}{2}$ miles to the dock. To make the dock at Northport, see Northport, Harbor, Grand Traverse bay.

Waugoshance to Little Traverse.—When 1 mile northwest of the light, steer S. $\frac{1}{4}$ W., 17 miles, to a point 1 mile west of Middle village, passing 1 mile east of the shoal lying $1\frac{1}{2}$ miles E. N. E. of Skilligallee light, when follow the shore around, giving it a berth of 1 mile, for 15 miles to Little Traverse point. See Little Traverse light, page 164.

Waugoshance to Beaver Harbor.—When 1 mile northwest of the light, steer W. by S. $\frac{1}{4}$ S., 12 miles, to a point 1 mile north of the buoy on Hog Island reef; thence W. $\frac{1}{4}$ S., 8 miles, to the entrance of the harbor. See Beaver Harbor light, page 163. At night it would be safer to steer S. W. by W., 12 miles, when haul up W. by N. $\frac{1}{4}$ N., $8\frac{1}{2}$ miles, on the range of the lights at Skilligallee and Beaver harbor. This range leads 1 mile south of the buoy on Hog Island reef.

Waugoshance to Seul Choix Point and Manistique River.—When three-fourths of a mile north of the light, steer W. by N. $\frac{1}{4}$ N., $10\frac{1}{2}$ miles, to a point 2 miles north of Hat island, thence W. $\frac{1}{4}$ N., 30 miles, until Seul Choix point bears north $1\frac{1}{2}$ miles, when steer W. $\frac{1}{4}$ N., 16 miles, to a point 1 mile south of the entrance to the river.

Waugoshance to Poverty Island Passage.—When 2 miles north of Hat island, as in the course to Seul Choix point, steer W. $\frac{1}{4}$ N., 14 miles, until Squaw island bears south $2\frac{1}{2}$ miles, when steer W. S. W. $\frac{1}{4}$ S., 58 miles, to a point three-fourths of a mile south of Poverty Island light.

NOTE.—The route from St. Helena and Waugoshance to Green bay north of the Beaver group, will be found very convenient when blowing hard from the northward. By taking this route vessels can keep in smooth water. The distances are about equal.

Waugoshance to Sturgeon Bay and Cross Village.—Passing between the light and Waugoshance island, with St. Helena light-house directly astern, steer W. S. W. $\frac{1}{4}$ S., passing $\frac{1}{4}$ mile south of Waugoshance light (keeping a lookout for the reef extending in an easterly direction from it), and when in range with Waugoshance and Skilligallee lights, haul up on that bearing S. S. W. $\frac{1}{4}$ W., until the west point of Waugoshance island bears E. N. E. distant $2\frac{1}{2}$ miles; when steer S. E. $\frac{1}{4}$ E., 8 miles, to the middle of Sturgeon bay; or S. E. by S. $\frac{1}{4}$ S., the same distance to Cross Village. This route is not recommended for vessels drawing over 9 feet of water.

Sturgeon Bay is a good harbor for small vessels; it is $3\frac{1}{2}$ miles in a northeasterly direction from Cross Village. On the west side of the bay, a point with shoal water extends $\frac{1}{4}$ mile into the lake which protects

of Rock Island
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 W. $\frac{1}{2}$ S., 55 miles
 Dr W. by S. $\frac{1}{4}$ S.,
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it from southwest winds. The sand hills terminate a little to the north-ward of the bay, which affords a good leading mark at night.

NOTE.—The light-houses at Waugoshance and Skilligallee afford a good opportunity for vessel masters to test their compasses, by hauling up on the range for a mile or two. The compass course is S. S. W. $\frac{1}{4}$ to $\frac{1}{2}$ W.

Beaver Island.—There is good anchorage in the bight on the east side of the island, and protection from all westerly gales. Large sailing vessels prefer it to Beaver harbor, on account of having more sea room to get away. Vessels frequently come to off the harbor in from 6 to 8 fathoms with the light bearing about W. N. W.

High Island, lying west of the north end of Beaver island, has a good harbor on its northeast end, with good holding ground and protection from all winds, except from the south. To make the anchorage from the south: When midway between Beaver island and the south end of High island, steer about north until abreast of the bay, and haul in W. by N. $\frac{1}{4}$ N. Come to well in the bay, in about 6 fathoms. There is a flat on the south side of the bay.

Gull Island Reef.—This very dangerous shoal, with only 5 feet of water, and shoal spots to the south and east of it, bears S. S. E. $\frac{1}{4}$ E., 4 miles, from the south point of Gull island, and in range with the southeast point of High island and a hill, the nearest one to the northwest point of Beaver island. Gull island is the most westerly island of the Beaver group.

Beaver Island Harbor to Little Traverse.—When 1 mile E. S. E. of the light, steer S. E. $\frac{1}{4}$ E., 31 miles, to within 1 mile of the shore, then E. by S., 3 miles along the shore, giving it a berth of 1 mile, to abreast of Harbor point. See Little Traverse Light-station, page 164.

Beaver Island Harbor to Waugoshance.—When 1 mile E. S. E. of the light, steer E. by S. $\frac{1}{4}$ S., on a range of the lights at Beaver harbor and Skilligallee, 8 $\frac{1}{2}$ miles, passing 1 mile south of Hog Island reef, and observe that Hog Island reef lies in the range of the south point of Garden island and the middle of Whiskey island, when steer N. E. by E., 12 miles, to a point 1 mile northwest of Waugoshance light.

Beaver Island Harbor to Middle Passage.—When 2 miles E. S. E. from the light, steer S. $\frac{3}{4}$ E., 9 miles, passing close to a flat off the east side of the island, thence S. W. $\frac{1}{4}$ W., 24 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles south of the South Fox Island light, thence S. W. $\frac{3}{4}$ W., 15 miles, until the west side of North Manitou island bears south, and the extreme north point 4 $\frac{1}{2}$ miles distant.

Beaver Island Harbor to South Passage.—When 2 miles E. S. E. from the light, steer S. $\frac{3}{4}$ E., 9 miles, passing close to a flat off the east side of the island, thence S. W. by S. $\frac{1}{4}$ S., 44 $\frac{1}{2}$ miles, until the southeast point of North Manitou island bears N. W. 1 mile, when steer S. W. $\frac{3}{4}$ S., 32 miles, to a point 4 $\frac{1}{2}$ miles west of Point Betsey light.

Beaver Island Harbor to Green Bay.—When 2 miles E. S. E. from the light, steer S. $\frac{3}{4}$ E., 9 miles, thence S. W. $\frac{1}{4}$ W., 5 miles, until Beaver Island light bears northwest, 2 miles distant, when see course from Waugoshance to Green bay.

Compass Courses and Distances on Lake Michigan.

NOTE.—Courses and bearings corrected for magnetic variation. Distances in statute miles.

Little Traverse to South Passage.—When one-quarter of a mile south of the light, steer W. by S. $\frac{1}{4}$ S., 11 $\frac{1}{2}$ miles, to a point 1 mile north of Big Rock point, then S. W. by W. $\frac{3}{8}$ W., 24 miles, until Cat Head point bears southeast 2 miles, when steer southwest 29 $\frac{1}{2}$ miles, until Sleeping Bear point bears southeast, 1 $\frac{1}{2}$ miles, when steer S. W. $\frac{3}{4}$ S., 20 $\frac{1}{2}$ miles, to a point 4 $\frac{1}{2}$ miles west of Point Betsey light.

Little Traverse to South Fox Island.—When one-quarter of a mile south of light, steer W. $\frac{3}{8}$ S., 41 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles south of South Fox Island light.

Northport to Point Betsey.—When 1 mile southeast from Northport point, steer N. N. E., 4 $\frac{1}{2}$ miles, keeping 1 mile from shore, then steer N. N. W. $\frac{1}{4}$ W., 3 $\frac{1}{2}$ miles, until Grand Traverse light bears S. W. by S., 1 $\frac{1}{2}$ miles; thence W. by S. $\frac{1}{4}$ S., 5 $\frac{1}{2}$ miles, until Cat Head point bears southeast, 2 miles, when steer southwest, 29 $\frac{1}{2}$ miles, until Sleeping Bear point bears southeast 1 $\frac{1}{2}$ miles, when steer S. W. $\frac{3}{4}$ S., 20 $\frac{1}{2}$ miles, to a point 4 $\frac{1}{2}$ miles west of Point Betsey light.

South Manitou to Beaver Island Harbor.—With the light astern, steer E. N. E. $\frac{1}{4}$ N., 8 miles, until the southeast point of North Manitou island bears northwest, 1 mile distant, when sea course from Beaver island harbor to South passage.

Middle Passage to Chicago.—When 1 $\frac{1}{2}$ miles south of South Fox Island light, steer S. W. $\frac{3}{8}$ W., 21 miles, or until the west side of South Manitou island bears south, when steer S. by W. $\frac{1}{4}$ W., a little southerly, 240 $\frac{1}{2}$ miles, to a point 2 $\frac{1}{2}$ miles east of Chicago light.

Point Betsey to Chicago.—When 4 $\frac{1}{2}$ miles west of Point Betsey light, steer S. by W. $\frac{1}{4}$ W., 207 miles, to a point 2 $\frac{1}{2}$ miles east of Chicago light.

Point Betsey to Manistee.—When 2 miles west of Point Betsey light, steer S. $\frac{1}{4}$ W., 31 $\frac{1}{2}$ miles, to a point 2 miles west of Manistee Pierhead light.

Point Betsey to Grand Haven.—When 4 $\frac{1}{2}$ miles west of Point Betsey light, steer S. by W., 45 miles, until Big Point Sable light bears east, 2 miles distant, thence due south, 30 $\frac{1}{2}$ miles, until Little Point Sable light bears northeast, 3 miles, passing 2 miles west of it; thence S. by E. $\frac{1}{4}$ E., 41 $\frac{1}{2}$ miles, to a point in range with Grand Haven lights, and 2 $\frac{1}{2}$ miles distant.

Point Betsey to Sturgeon Bay Ship-Canal.—From light to light, W. $\frac{3}{8}$ N., 52 $\frac{1}{2}$ miles.

Point Betsey to Milwaukee.—When 4 $\frac{1}{2}$ miles west of light steer S. W. by S. $\frac{3}{8}$ S., 139 miles, to a point 3 miles east of Milwaukee Pierhead light.

Point Betsey to Michigan City.—When 4 $\frac{1}{2}$ miles west of light, steer S. by W., 45 miles, until Big Point Sable light bears east, 2 miles, when steer S. $\frac{3}{8}$ W., 164 miles, to a point 1 $\frac{1}{2}$ miles northwest of the pierhead light at Michigan City.

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Frankfort to Milwaukee.—When 1½ miles west of light, steer S. W. by S. ¼ S., 135 miles, to a point 3 miles east of Milwaukee Pierhead light.

Frankfort to Manitowoc and Two Rivers.—When 1½ miles west of light, steer S. W. by W. ¼ W., 74 miles, to a point 4½ miles east of Manitowoc Pierhead light.

Frankfort to Green Bay.—When 1½ miles west of light, steer N. W. ¼ N., 53 miles, to a point 2 miles S. S. E. of Pilot Island light.

Manistee to Sheboygan.—When 2 miles west of pierhead light, steer S. W. by W. ¼ W., 73 miles, to a point 1½ miles east from Sheboygan Pierhead light.

Manistee to Manitowoc and Two Rivers.—When 2 miles west of light, steer W. by S. ¼ S., 60 miles, to a point 4½ miles east of Manitowoc Pierhead light.

Manistee to Green Bay.—When 2 miles west of light, steer N. N. W., 73 miles, to a point 2 miles S. S. E. from Pilot Island light.

Manistee to Michigan City.—When 2 miles west of light, steer S. W. by S. ¼ S., 16 miles, to a point 2 miles west of Big Point Sable, when see course from Point Betsey to Michigan City.

Big Point Sable to Little Point Sable.—When 2 miles west of Big Point Sable light, steer due S., 28½ miles, to a point 2 miles west of Little Point Sable light.

Ludington to Big Point Sable.—When 1½ miles west of Pere Marquette light, steer N. N. W. ¼ W., 7½ miles, to a point 1½ miles west of Big Point Sable light.

Ludington to Little Point Sable.—When 1½ miles west of Pere Marquette light, steer S. ¼ W., 21 miles, to a point 1½ miles west of Little Point Sable light.

Ludington to Manitowoc and Two Rivers.—When 1½ miles west of Pere Marquette light, steer W. ¼ N., 55 miles, to a point 4½ miles east from Manitowoc Pierhead light.

Ludington to Kewaunee.—When 1½ miles west of Pere Marquette light, steer N. W. by W. ¼ W., 60 miles, to a point 1 mile E. S. E. from the end of north pier at Kewaunee.

Ludington to Sheboygan.—When 1½ miles west of Pere Marquette light, steer W. by S. ¼ S., 61 miles, to a point 1½ miles east of Sheboygan Pierhead light.

Pentwater to Little Point Sable.—When 1½ miles west of Pentwater light, steer S. S. W. ¼ W., 10½ miles, to a point 1½ miles west of Little Point Sable light.

Pentwater to Manitowoc and Two Rivers.—When 1½ miles west of Pentwater light, steer W. by N. ¼ N., 59 miles, to a point 4½ miles east of Manitowoc Pierhead light.

Pentwater to Sheboygan.—When 1½ miles west of Pentwater light, steer W. ¼ S., 60 miles, to a point 1½ miles east of Sheboygan Pierhead light.

Pentwater to Milwaukee.—When 1½ miles west of Pentwater light, steer S. W. ¼ W., 86 miles, to a point 3 miles east of Milwaukee Pierhead light.

White Lake to Sheboygan.—When $1\frac{1}{2}$ miles west of White River Pierhead light, steer W. by N. $\frac{1}{4}$ N., 66 miles, to a point $1\frac{1}{2}$ miles east of Sheboygan Pierhead light.

Muskegon to Sheboygan.—When $1\frac{1}{2}$ miles west of Muskegon Pierhead light, steer N. W. by W. $\frac{1}{4}$ W., $74\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of Sheboygan Pierhead light.

Muskegon to Milwaukee.—When $1\frac{1}{2}$ miles west of Muskegon Pierhead light, steer W. by S. $\frac{1}{4}$ S., 75 miles, to a point 3 miles east of Milwaukee Pierhead light.

Muskegon to Chicago.—When $1\frac{1}{2}$ miles west of Muskegon Pierhead light, steer S. W. by S. $\frac{1}{4}$ S., 110 miles, to a point $2\frac{1}{2}$ miles east of Chicago light.

Muskegon to St. Joseph.—When $1\frac{1}{2}$ miles west of Muskegon Pierhead light, steer S. $\frac{1}{4}$ W., 78 miles, to a point $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light.

Grand Haven to Manitowoc.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer N. W., 96 miles, to a point 3 miles east of Manitowoc Pierhead light.

Grand Haven to Sheboygan.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer N. W. by W. $\frac{1}{4}$ W., $83\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of Sheboygan Pierhead light.

Grand Haven to Milwaukee.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer W. $\frac{1}{4}$ S., $77\frac{1}{2}$ miles, to a point 3 miles east of Milwaukee Pierhead light.

Grand Haven to Racine.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer W. by S. $\frac{1}{4}$ S., $77\frac{1}{2}$ miles, to a point 1 mile E. by N. $\frac{1}{4}$ N. of Racine Pierhead light.

Grand Haven to Michigan City.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer S. by W. $\frac{1}{4}$ W., 98 miles, to a point $1\frac{1}{2}$ miles northwest from the pierhead light.

Grand Haven to Green Bay.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer N. N. W., $41\frac{1}{2}$ miles, until Little Point Sable light bears northeast 3 miles, when steer N. by W., $116\frac{1}{2}$ miles, to a point 2 miles S. S. E. of Pilot Island light.

Grand Haven to Chicago.—When in range of the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer S. W. $\frac{1}{4}$ S., $103\frac{1}{2}$ miles, to a point $2\frac{1}{2}$ miles east of Chicago light.

Grand Haven to Waukegan.—When in range with the two lights at Grand Haven, and $2\frac{1}{2}$ miles off, steer S. W. $\frac{1}{4}$ W., 90 miles, to a point $1\frac{1}{2}$ miles east of Waukegan light.

South Haven to Sheboygan.—When $1\frac{1}{2}$ miles W. $\frac{1}{4}$ N. from South Haven light, steer N. W. $\frac{1}{4}$ N., 116 miles, to a point $1\frac{1}{2}$ miles east of Sheboygan Pierhead light.

South Haven to Waukegan.—When $1\frac{1}{2}$ miles W. $\frac{1}{4}$ N. from South Haven light, steer W. $\frac{1}{4}$ S., $76\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of Waukegan light.

St. Joseph to Green Bay.—When $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light, steer N. $\frac{1}{4}$ W., $215\frac{1}{2}$ miles, to a point 2 miles S. S. E. of Pilot Island light.

St. Joseph to Point Betsey.—When $1\frac{1}{2}$ miles northwest from the beacon-light, steer N. $\frac{3}{4}$ W., 107 miles, to a point 2 miles west of Little Point Sable light; thence due N., $28\frac{1}{2}$ miles to a point 2 miles west of Big Point Sable light, thence N. by E., 45 miles, to a point $4\frac{1}{2}$ miles west of Point Betsey light.

St. Joseph to Waukegan.—When $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light, steer W. by N., $67\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles east of Waukegan light.

St. Joseph to Chicago.—When $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light, steer W. by S. $\frac{1}{4}$ S., $56\frac{1}{2}$ miles, to a point $2\frac{1}{2}$ miles east of Chicago light.

Michigan City to Green Bay.—When $1\frac{1}{2}$ miles northwest from the beacon-light, steer N. $\frac{1}{2}$ W., 242 miles, to a point 2 miles S. S. E. from Pilot Island light.

Michigan City to St. Joseph.—When $1\frac{1}{2}$ miles northwest from the beacon-light, steer N. E. $\frac{3}{4}$ N., 34 miles, to a point N. W. by W., $1\frac{1}{2}$ miles from St. Joseph Pierhead light.

Michigan City to Milwaukee.—When $1\frac{1}{2}$ miles northwest from the beacon-light, steer N. W. by N. $\frac{1}{2}$ N., 100 miles, to a point 3 miles east of Milwaukee Pierhead light.

Michigan City to Chicago.—When $1\frac{1}{2}$ miles northwest from the beacon-light, steer W. by N. $\frac{1}{2}$ N., $34\frac{1}{2}$ miles, to a point $2\frac{1}{2}$ miles east of Chicago light.

Chicago to Waugoshance.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. by E. $\frac{1}{2}$ E., 207 miles, to a point $4\frac{1}{2}$ miles west of Point Betsey light; thence N. E. $\frac{3}{4}$ N., $97\frac{1}{2}$ miles, to a point 1 mile northwest of Waugoshance light, passing 1 mile southeast of the southeast point of North Manitou island.

Chicago to Green Bay.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. $\frac{1}{2}$ E., 238 miles, to a point 2 miles S. S. E. from Pilot Island light. For directions to enter the bay, see Pilot Island light.

Chicago to South Haven.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. E. by E. $\frac{1}{2}$ E., $73\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from South Haven light.

Chicago to Saugatuck.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. E. $\frac{1}{2}$ E., 86 miles, to a point $1\frac{1}{2}$ miles west of Kalamazoo light.

Chicago to Holland.—When $2\frac{1}{2}$ miles east of Chicago light, steer northeast, 91 miles, to a point $1\frac{1}{2}$ miles west of Holland light.

Chicago to Grand Haven.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. E. $\frac{1}{2}$ N., $103\frac{1}{2}$ miles, to a point $2\frac{1}{2}$ miles from the piers, and in range of the two lights at Grand Haven.

Chicago to Muskegon.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. E. by N. $\frac{1}{2}$ N., 110 miles, to a point $1\frac{1}{2}$ miles west of Muskegon Pierhead light.

Chicago to White Lake.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. E. by N. $\frac{1}{2}$ N., 117 miles, to a point $1\frac{1}{2}$ miles west of White River Pierhead light.

Chicago to Pentwater.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. N. E. $\frac{1}{2}$ N., 131 miles, until Little Point Sable light bears east 3

miles, when steer N. E. by N. $\frac{1}{4}$ N., 11 miles, to a point $1\frac{1}{2}$ miles west of Pentwater Pierhead light.

Chicago to Ludington.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. by E. $\frac{3}{8}$ E., 153 miles, to a point $1\frac{1}{2}$ miles west of Pere Marquette Pierhead light.

Chicago to Manistee.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. by E. $\frac{3}{8}$ E., 159 miles, to a point 2 miles west of Big Point Sable light; thence N. E. by N. $\frac{1}{4}$ N., 16 miles, to a point 2 miles west of Manistee Pierhead light.

Chicago to Frankfort.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. by E. $\frac{3}{8}$ E., 200 miles, passing 2 miles west of Big Point Sable light, to a point $1\frac{1}{2}$ miles west of Frankfort Pierhead light.

Chicago to Calumet.—When 1 mile east of Chicago Pierhead light, steer S. E. by S., $6\frac{1}{2}$ miles, to a point 1 mile east of buoy on Hyde Park shoal, then S. by E. $5\frac{1}{4}$ miles, to a point 1 mile east of Calumet Pierhead light.

Chicago to Waukegan.—From the east end of the outer breakwater, steer N. by W. $\frac{1}{4}$ W., 12 miles, to a point $1\frac{1}{2}$ miles east of Grosse Pointe light, thence N. N. W. $\frac{1}{4}$ W., 22 miles, to a point $1\frac{1}{2}$ miles east of Waukegan light.

Chicago to Kenosha.—From the east end of the outer breakwater, steer N. by W. $\frac{3}{8}$ W., $49\frac{1}{2}$ miles, to a point 1 mile E. by S. $\frac{1}{4}$ S. from Kenosha Pierhead light, passing inside Chicago Water-works crib.

Chicago to Racine.—From the east end of the outer breakwater, steer N. by W. $\frac{1}{4}$ W., 59 miles, to a point half a mile east of Racine Pierhead light, passing inside the Racine shoal. See Racine reef, page 182.

Chicago to Milwaukee.—From the east end of the outer breakwater, steer N. $\frac{1}{4}$ W., 62 miles, to a point 2 miles east of Wind Point light, passing $1\frac{1}{2}$ miles east of Racine shoal, then N. N. W. $\frac{1}{4}$ W., 18 miles, to a point 3 miles east of Milwaukee Pierhead light.

Chicago to Sheboygan.—From the east end of the outer breakwater, steer N. $\frac{1}{4}$ W., 129 miles, to a point $1\frac{1}{2}$ miles east of Sheboygan Pierhead light.

Chicago to Manitowoc and Two Rivers.—From the east end of the outer breakwater, steer N. $\frac{1}{4}$ W., 154 miles, to a point 3 miles east of Manitowoc Pierhead light.

Chicago to Twin River Point, Kewaunee and Ahnepee.—From the east end of the outer breakwater, steer N. $\frac{1}{4}$ W., 162 miles, to a point 2 miles east of Twin River Point light, thence N. $\frac{3}{8}$ W., 17 miles, to a point 1 mile E. S. E. from the pierhead light at Kewaunee, or N. $\frac{1}{4}$ E., $27\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles E. S. E. from the harbor piers at Ahnepee.

Chicago to Sturgeon Bay Ship-Canal.—When $2\frac{1}{2}$ miles east of Chicago light, steer north, 205 miles, to a point $1\frac{1}{2}$ miles southeast from Sturgeon Bay Canal Pierhead light.

Chicago to Bayley's Harbor.—When $2\frac{1}{2}$ miles east of Chicago light, steer N. $\frac{1}{4}$ E., 221 miles, to a point 4 miles S. S. E. $\frac{1}{4}$ E. from the Bayley's Harbor range-lights, and in range of them.

Chicago to Manistique River.—When $2\frac{1}{2}$ miles east of Chic-

ago light, steer N. $\frac{1}{2}$ E., 292 miles, to a point 1 mile south of entrance to Manistique river, passing 1 mile east of the shoal east of Wiggins point.

Waukegan to Michigan City.—When $1\frac{1}{2}$ miles east of Waukegan light, steer S. E. $\frac{3}{4}$ E., $61\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles northwest from Michigan City Pierhead light.

Waukegan to Point Betsey and South Passage.—When $1\frac{1}{2}$ miles east of Waukegan light, steer N. N. E. $\frac{1}{2}$ N., $178\frac{1}{2}$ miles, to a point $4\frac{1}{2}$ miles west of Point Betsey light, when see course from Chicago to Waughoshance.

Waukegan to Little Point Sable.—When $1\frac{1}{2}$ miles east of Waukegan light, steer N. N. E. $\frac{1}{2}$ E., 110 miles, to a point 2 miles west of Little Point Sable light.

Kenosha to Michigan City.—When 1 mile E. by S. $\frac{1}{2}$ S. from Kenosha Pierhead light, steer S. E. $\frac{3}{4}$ S., $73\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles northwest of the pierhead light at Michigan City.

Kenosha to South Haven.—When 1 mile E. by S. $\frac{1}{2}$ S., from Kenosha Pierhead light, steer E. $\frac{1}{2}$ S., $76\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from South Haven light.

Kenosha to Grand Haven.—When 1 mile E. by S. $\frac{1}{2}$ S., from Kenosha Pierhead light, steer E. N. E. $\frac{3}{4}$ N., 82 miles, to a point $2\frac{1}{2}$ miles off, and in range of the two lights at Grand Haven.

Kenosha to Point Betsey.—When 1 mile E. by S. $\frac{1}{2}$ S. from Kenosha Pierhead light, steer N. N. E. $\frac{1}{2}$ E., 163 miles, to a point $4\frac{1}{2}$ miles west of Point Betsey light.

Racine to Michigan City.—When 1 mile S. E. by S. from Racine Pierhead light, steer S. E. $\frac{3}{4}$ S., $80\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles northwest of pierhead light at Michigan City. This course leads inside the Racine shoal. The buoy is on its western edge.

Racine to St. Joseph.—When 1 mile S. E. by S. from the pierhead light at Racine, steer S. E. by E. $\frac{1}{2}$ E., 76 miles, to a point $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light. Avoid the extensive shoal E. by S., $1\frac{1}{2}$ miles from Racine light.

Racine to Manistee.—When 1 mile E. by N. $\frac{1}{2}$ N. from Racine Pierhead light, steer N. E. by N. $\frac{1}{2}$ N., 127 miles, to a point 2 miles west of Manistee light. Observe that the main light kept open to the northward of the pierhead light leads clear of Racine shoals.

Racine to Waughoshance.—When 1 mile E. by N. $\frac{1}{2}$ N. from Racine Pierhead light, steer N. N. E. $\frac{1}{2}$ E., 152 miles, to a point $4\frac{1}{2}$ miles west of Point Betsey light, when steer N. E. $\frac{3}{4}$ N., $97\frac{1}{2}$ miles, to a point 1 mile northwest of Waughoshance light, passing 1 mile southeast of the southeast point of North Manitou island.

Racine to Green Bay.—When 1 mile E. by N. $\frac{1}{2}$ N. from Racine Pierhead light, steer N. by E. $\frac{1}{2}$ E., $3\frac{1}{2}$ miles to a point 1 mile east of Wind Point light, when steer N. $\frac{1}{2}$ E., 176 miles, to a point 2 miles S. E. of Pilot Island light.

Milwaukee to St. Joseph.—When 3 miles east of Milwaukee Pierhead light, steer S. E. $\frac{1}{2}$ E., $91\frac{1}{2}$ miles, to a point N. W. by W. $1\frac{1}{2}$ miles from St. Joseph Pierhead light.

Milwaukee to South Haven.—When 3 miles east of Mil.

waukee Pierhead light, steer S. E. by E. $\frac{3}{4}$ E., 88 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles W. $\frac{1}{4}$ N. from South Haven light.

Milwaukee to Grand Haven.—When 3 miles east of Milwaukee Pierhead light, steer E. $\frac{1}{4}$ N., 77 $\frac{1}{2}$ miles, to a point 2 $\frac{1}{2}$ miles from the piers, and in range of the two lights at Grand Haven.

Milwaukee to Muskegon.—When 3 miles east of Milwaukee Pierhead light, steer E. by N. $\frac{1}{4}$ N., 75 miles, to a point 1 $\frac{1}{2}$ miles west of Muskegon Pierhead light.

Milwaukee to Ludington.—When 3 miles east of Milwaukee Pierhead light, steer N. E., 93 miles, to a point 1 $\frac{1}{2}$ miles west of Pere Marquette light.

Milwaukee to White Lake.—When 3 miles east of Milwaukee Pierhead light, steer E. N. E., 75 miles, to a point 1 $\frac{1}{2}$ miles west of White River Pierhead light.

Milwaukee to Manistee.—When 3 miles east of Milwaukee Pierhead light, steer N. E. $\frac{3}{8}$ N., 111 $\frac{1}{2}$ miles, to a point 2 miles west of Manistee light.

Milwaukee to Saugatuck.—When 3 miles east of Milwaukee Pierhead light, steer E. by S. $\frac{1}{4}$ S., 84 miles, to a point 1 $\frac{1}{2}$ miles west of Kalamazoo light.

Milwaukee to Frankfort.—When 3 miles east of Milwaukee Pierhead light, steer N. E. by N. $\frac{1}{4}$ N., 135 miles, to a point 1 $\frac{1}{2}$ miles west of Frankfort.

Milwaukee to Point Betsey and Waugoshance.—When 3 miles east of Milwaukee Pierhead light, steer N. E. by N. $\frac{3}{8}$ N., 139 miles, to a point 4 $\frac{1}{2}$ miles west of Point Betsey light, when steer N. E. $\frac{3}{8}$ N., 97 $\frac{1}{2}$ miles, to a point 1 mile northwest of Waugoshance light, passing 1 mile from the southeast point of North Manitou island.

Milwaukee to North Manitou and Waugoshance.—When 3 miles east of Milwaukee Pierhead light, steer N. E. by N. $\frac{3}{8}$ N., 174 miles, to a point 4 $\frac{1}{2}$ miles from the most northerly point of North Manitou island, and in range of its west side; thence N. E. $\frac{3}{8}$ E., 15 miles, until the South Fox Island light bears north 1 $\frac{1}{2}$ miles, thence the same course N. E. $\frac{3}{8}$ E., 47 miles, to a point 1 mile northwest of Waugoshance light.

NOTE.—Vessels bound down through this passage should keep the highest land on North Fox closed with the southern point of South Fox until within 2 miles of this point, to avoid the 13-foot shoal 4 $\frac{1}{2}$ miles S. $\frac{3}{4}$ W. from South Fox Island light. A rocky spit extends in a southwest direction from the south end of South Fox island one-half mile.

Milwaukee to Sheboygan.—When 3 miles east of Milwaukee Pierhead light, steer N. $\frac{1}{4}$ E., 50 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles east of Sheboygan Pierhead light, passing 1 mile from the point south of Sheboygan.

Milwaukee to Twin River Point and Sturgeon Bay Ship-Canal.—When 3 miles east of Milwaukee Pierhead light, steer N. $\frac{3}{4}$ E., 84 miles, to a point 2 miles east of Twin River Point light; thence the same course 40 $\frac{1}{2}$ miles to a point 1 $\frac{1}{2}$ miles southeast from the Ship-canal Pierhead light, passing close to the rocky spots south of entrance to canal.

Milwaukee to Bayley's Harbor.—When 3 miles east of

Milwaukee Pierhead light, steer N. by E., 142 miles, to a point 4 miles S. S. E. $\frac{1}{2}$ E. from the beacon, and in line with the range lights. When see Bayley's Harbor range lights.

Milwaukee to Green Bay.—When 3 miles east of Milwaukee Pierhead light, steer N. by E. $\frac{1}{2}$ E., 159 $\frac{1}{2}$ miles, to a point 2 miles S. S. E. from Pilot Island light. See Pilot Island light.

Milwaukee to Manistique River.—When 3 miles east of Milwaukee Pierhead light, steer N. by E. $\frac{3}{4}$ E., 214 miles, to a point 3 miles S. S. E. from the entrance to Manistique river.

Port Washington to Manistee.—When 1 mile S. E. by E. from Port Washington light, steer N. E. $\frac{1}{2}$ E., 94 $\frac{1}{2}$ miles, to a point 2 miles west of Manistee Pierhead light.

Port Washington to North Manitou and Waugoshance.—When 1 mile S. E. by E. from Port Washington light, steer N. E. by N. $\frac{1}{2}$ N., 154 miles, to a point 4 $\frac{1}{2}$ miles from the most northern point of Manitou island, and in range with its west side; thence N. E. $\frac{3}{4}$ E., 62 miles, to a point 1 mile northwest of Waugoshance light. See course from Milwaukee to Waugoshance.

Port Washington to Grand Haven.—When 1 mile S. E. by E. from Port Washington light, steer E. by S. $\frac{1}{2}$ S., 81 miles, to a point 2 $\frac{1}{2}$ miles from the piers, and in range of the two lights at Grand Haven.

Port Washington to Green Bay.—When 3 miles east from Port Washington light, steer N. by E. $\frac{1}{2}$ E., 135 $\frac{1}{2}$ miles, to a point 2 miles S. S. E. of Pilot Island light.

Port Washington to Muskegon.—When 1 mile S. E. by E. from Port Washington light, steer E. $\frac{1}{2}$ S., 76 miles, to a point 1 $\frac{1}{2}$ miles west of Muskegon Pierhead light.

Port Washington to St. Joseph.—When 1 mile S. E. by E. from Port Washington light, steer S. E. $\frac{3}{4}$ S., 110 miles, to a point 1 $\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light.

Port Washington to Milwaukee.—When 1 mile S. E. by E. from Port Washington light, steer S. $\frac{3}{4}$ E., 22 miles, to a point 1 mile east of Milwaukee North Point light, then S. by W. $\frac{1}{4}$ W., 2 miles, to a point 1 mile east of Milwaukee Pierhead light.

Sheboygan to North Manitou and Waugoshance.—When 1 $\frac{1}{2}$ miles east from Sheboygan Pierhead light, steer N. E. $\frac{1}{2}$ N., 128 miles, to a point 4 $\frac{1}{2}$ miles from the most northern point of North Manitou island, and in range of its west side, when see course from Milwaukee to North Manitou and Waugoshance.

Sheboygan to St. Joseph.—When 1 $\frac{1}{2}$ miles east of Sheboygan Pierhead light, steer S. E. by S. $\frac{1}{2}$ S., 126 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light.

Sheboygan to Twin River Point and Sturgeon Bay Ship-Canal.—When 1 $\frac{1}{2}$ miles east of Sheboygan Pierhead light, steer N. by E. $\frac{1}{2}$ E., 33 $\frac{1}{2}$ miles, to a point 2 miles east of Twin River Point light; thence see course from Milwaukee to Twin River point and Sturgeon Bay ship-canal.

Sheboygan to Green Bay.—When 1 $\frac{1}{2}$ miles east of Sheboygan

Pierhead light, steer N. by E. $\frac{1}{4}$ E., 111 miles, to a point 2 miles S. S. E. of Pilot Island light.

Sheboygan to Waugoshance (west passage).—When $1\frac{1}{2}$ miles east of Sheboygan Pierhead light, steer N. E. by N., 148 miles, to a point $2\frac{1}{2}$ miles northwest of the north point of South Fox island; thence E. by N. $\frac{3}{4}$ N., $19\frac{1}{2}$ miles, until Beaver Island light bears northwest, 2 miles distant, when steer N. E. $\frac{1}{2}$ E., 27 miles, to a point 1 mile northwest of Waugoshance light.

NOTE.—This route is often preferred in the spring and fall, when heavy westerly winds prevail. Vessels holding on to the west shore until arriving in the vicinity of Bayley's harbor, will keep in smooth water, and if the wind should haul to the northwest, they can fetch the passage and not be exposed to a very heavy sea.

Manitowoc to North Manitou and Waugoshance.—When $4\frac{1}{2}$ miles east from Manitowoc Pierhead light, steer N. E. $\frac{1}{4}$ N., 108 miles, to a point $4\frac{1}{2}$ miles from the most northerly point of North Manitou island, and in range with its west side, when see course from Milwaukee to North Manitou and Waugoshance.

Manitowoc to Michigan City.—When 3 miles east of Manitowoc Pierhead light, steer S. by E. $\frac{3}{4}$ E., 168 miles, to a point $1\frac{1}{2}$ miles northwest from the beacon-light at Michigan City.

Manitowoc to St. Joseph.—When 3 miles east of Manitowoc Pierhead light, steer S. S. E. $\frac{1}{4}$ E., 148 miles, to a point $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light.

Manitowoc to Sturgeon Bay Ship-Canal.—When $4\frac{1}{2}$ miles east from Manitowoc Pierhead light, steer N. E. by N. $\frac{3}{4}$ N., $9\frac{1}{2}$ miles, to a point 2 miles east of Twin River Point light, when see course from Milwaukee to Twin River point and Sturgeon Bay ship-canal.

Manitowoc to South Haven.—When 3 miles east from Manitowoc Pierhead light, steer S. E. by S. $\frac{1}{2}$ S., 134 miles, to a point $1\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from South Haven Pierhead light.

Manitowoc to Muskegon.—When 3 miles east from Manitowoc Pierhead light, steer S. E. $\frac{3}{4}$ E., 85 miles, to a point $1\frac{1}{2}$ miles west of Muskegon Pierhead light.

Manitowoc to Green Bay.—When 2 miles east of Twin River Point light, as in the course from Manitowoc to Sturgeon Bay ship-canal, steer N. by E. $\frac{3}{4}$ E., 76 miles, to a point 2 miles S. S. E. from Pilot Island light.

Manitowoc to Sheboygan.—When $1\frac{1}{2}$ miles east of Manitowoc Pierhead light, steer S. $\frac{1}{2}$ W., 24 miles, to a point $1\frac{1}{2}$ miles east of Sheboygan Pierhead light. See courses from Chicago and Milwaukee to Sheboygan.

Kewaunee to North Manitou and Waugoshance.—When 1 mile E. S. E. from the Kewaunee Pierhead light, steer N. E. $\frac{3}{4}$ E., 88 miles, to a point $4\frac{1}{2}$ miles from the most northerly point of North Manitou island, and in range with its west side; thence see course from Milwaukee to North Manitou and Waugoshance.

Kewaunee to Manistee.—When 1 mile E. S. E. from the Kewaunee Pierhead light, steer E. by S., $56\frac{1}{2}$ miles, to a point 2 miles west of Manistee Pierhead light.

Kewaunee to Grand Haven.—When 1 mile E. S. E. from

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the Kewaunee Pierhead light, steer S. E. $\frac{1}{2}$ S., 112 miles, to a point $2\frac{1}{2}$ miles from the Pierhead light, and in range of the two lights at Grand Haven.

Kewaunee to St. Joseph.—When 1 mile E. S. E. from the Kewaunee Pierhead light, steer S. by E. $\frac{1}{4}$ E., 169 miles, to a point $1\frac{1}{2}$ miles N. W. by W. from St. Joseph Pierhead light.

Kewaunee to Chicago.—When 2 miles E. S. E. from the Kewaunee Pierhead light, steer S. $\frac{1}{4}$ E., 179 miles, to a point $2\frac{1}{2}$ miles east of Chicago light.

Kewaunee to Green Bay.—When 1 mile E. S. E. from the Kewaunee Pierhead light, steer N. N. E. $\frac{1}{2}$ E., $61\frac{1}{2}$ miles, to a point 3 miles S. S. E. from Pilot Island light.

NOTE.—There are rocky spits, detached shoals, and rocky spots along the shore from Kewaunee to Death's Door, rendering navigation dangerous in places 2 miles from shore. The soundings are gradual, and in thick weather or on dark nights the frequent use of the lead is necessary.

Kewaunee to Twin River Point.—When 1 mile E. S. E. of the Kewaunee Pierhead light, steer S. $\frac{3}{8}$ E., 17 miles, to a point 2 miles east of Twin River point, when see courses from Milwaukee and Chicago.

Ahnepee to Twin River Point.—When $1\frac{1}{2}$ miles E. S. E. from the harbor piers, steer S. $\frac{1}{4}$ W., $27\frac{1}{2}$ miles, to a point 2 miles east of Twin River Point light.

Ahnepee to North Manitou and Waugoshance.—When $1\frac{1}{2}$ miles E. S. E. from the harbor piers, steer N. E. $\frac{1}{4}$ E., 79 miles, to a point $4\frac{1}{2}$ miles from the most northerly point of North Manitou island, and in range with its west side; whence see course from Milwaukee to North Manitou and Waugoshance.

Ahnepee to Grand Haven.—When $1\frac{1}{2}$ miles E. S. E. from the harbor piers, steer S. E. by S. $\frac{1}{4}$ S., 119 miles, to a point $2\frac{1}{2}$ miles from the Pierhead light, and in range of the two lights at Grand Haven.

Ahnepee to Manistee.—When $1\frac{1}{2}$ miles E. S. E. of the harbor piers, steer E. by S. $\frac{1}{2}$ S., $56\frac{1}{2}$ miles, to a point 2 miles west of Manistee Pierhead light.

Ahnepee to St. Joseph.—When $1\frac{1}{2}$ miles E. S. E. from the harbor piers, steer S. by E. $\frac{3}{8}$ E., 178 miles, to a point $1\frac{1}{2}$ miles N. W. by W. from the pierhead light at St. Joseph.

Ahnepee to Sturgeon Bay Ship-Canal.—When 2 miles E. S. E. from the harbor piers, steer N. by E. $\frac{1}{4}$ E., $13\frac{1}{2}$ miles, to a point 2 miles southeast from Sturgeon Bay Canal light. This course leads close along the shore and requires watching.

Sturgeon Bay Ship Canal to Michigan City.—When $1\frac{1}{2}$ miles southeast of the pierhead light, steer S. $\frac{1}{4}$ E., 212 miles, to a point $1\frac{1}{2}$ miles northwest from the beacon-light at Michigan City.

Sturgeon Bay Ship-Canal to Racine.—When $1\frac{1}{2}$ miles southeast of the pierhead light, steer S. $\frac{3}{8}$ W., 142 miles, to a point 1 mile east of Wind Point light; thence S. by W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles, to a point 1 mile E. by N. $\frac{1}{4}$ N. from Racine Pierhead light.

Sturgeon Bay Ship-Canal to Grand Haven.—When $1\frac{1}{2}$ miles southeast of the pierhead light, steer S. S. E. $\frac{1}{4}$ E., 128 miles, to

a point $2\frac{1}{2}$ miles from the pierhead light, and in range with the two lights at Grand Haven.

Sturgeon Bay Ship-Canal to Manistee.—When $1\frac{1}{2}$ miles southeast of the pierhead light, steer S. E. $\frac{1}{4}$ E., 58 miles, to a point 2 miles west of Manistee Pierhead light.

Sturgeon Bay Ship-Canal to Waugoshance, passing south of Fox islands.—When $1\frac{1}{2}$ miles southeast of the pierhead light, steer N. E. by E. $\frac{1}{2}$ E., $81\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles south of South Fox island light, when see course from Milwaukee to Waugoshance.

Sturgeon Bay Ship-Canal to Traverse City.—When $1\frac{1}{2}$ miles southeast of the pierhead light, steer N. E. by E. $\frac{1}{2}$ E., $66\frac{1}{2}$ miles, to a point 2 miles from the most northern point of North Manitou island, and in range with its west side; thence E. $\frac{1}{4}$ N., 26 miles, to a point $1\frac{1}{2}$ miles N. E. by N. from Grand Traverse light; thence S. S. E. $\frac{1}{2}$ E., $2\frac{1}{2}$ miles, when steer S. $\frac{1}{4}$ W., 30 miles, to the docks at Traverse City.

Sturgeon Bay Ship-Canal to South Manitou.—When $1\frac{1}{2}$ miles southeast of its pierhead light, steer E. by N. $\frac{1}{4}$ N., $60\frac{1}{2}$ miles, to a point 2 miles south of South Manitou Island light.

Bayley's Harbor to Green Bay.—Run out on the ranges S. S. E. $\frac{1}{2}$ E., 3 miles from the front light, then steer E. N. E., 3 miles, when steer N. N. E. $\frac{1}{2}$ E., $16\frac{1}{2}$ miles, to a point 2 miles S. S. E. from Pilot Island light. See note to course from Kewaunee to Green Bay.

Bayley's Harbor to South Manitou.—Run out on the ranges S. S. E. $\frac{1}{2}$ E., 3 miles from the front light, then E. $\frac{1}{2}$ S., 49 miles, to a point $2\frac{1}{2}$ miles south of South Manitou Island light.

Bayley's Harbor to Waugoshance, north of the Fox islands. Run out on the ranges 3 miles from the front light, S. S. E. $\frac{1}{2}$ E.; thence N. E. by E. $\frac{1}{2}$ E., 65 miles, to a point $2\frac{1}{2}$ miles northwest of the north point of South Fox island, when see course from Sheboygan to Waugoshance.

Porte des Morts (Death's Door).—Entering Green bay through this passage—When 2 miles S. S. E. from Pilot Island light, steer N. W. $\frac{1}{2}$ W., $4\frac{1}{2}$ miles, until the northwest side of Plum island bears northeast, passing 1 mile south of Pilot Island light.

Porte des Morts (Death's Door) to Ludington.—When 2 miles S. S. E. from Pilot Island light, steer S. by E. $\frac{1}{2}$ E., 84 miles, to a point $1\frac{1}{2}$ miles west of Big Point Sable; thence S. S. E., $7\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles west of Pere Marquette Pierhead light.

Porte des Morts (Death's Door) to Waugoshance.—When 2 miles S. S. E. from Pilot Island light, steer E. by N. $\frac{1}{2}$ N., 70 miles, to a point 2 miles southeast of Beaver Island light; thence N. E. $\frac{1}{2}$ E., 27 miles, to a point 1 mile northwest of Waugoshance light.

Porte des Morts (Death's Door) to South Manitou Island.—When 2 miles S. S. E. from Pilot Island light, steer E. S. E. $\frac{1}{2}$ S., 41 miles, until the southwest point of South Manitou island bears north 2 miles; then steer east 3 miles, until South Manitou Island light bears north 2 miles.

Rock Island Passage into Green Bay, between Rock and St. Martin's island. See Pottawatomic light.

Rock Island Passage to Chicago.—When 2 miles E. $\frac{1}{2}$ S.

from Rock Island light, steer S. $\frac{1}{2}$ W., 246 miles, to a point $2\frac{1}{2}$ miles east of Chicago light, passing inside the Fishing Island shoals.

Poverty Island Passage into Green Bay, between Poverty island on the east side and Gull islands and Gravelly island on the west.—For directions to enter the bay by this passage, see Poverty island light.

Poverty Island to Chicago.—When three-quarters of a mile south of Poverty Island light, steer S. $\frac{3}{4}$ W., 256 miles, to a point $2\frac{1}{2}$ miles east of Chicago light.

Poverty Island to Michigan City.—When three-quarters of a mile south of Poverty Island light, steer S. $\frac{1}{2}$ E., 262 miles, to a point $1\frac{1}{2}$ miles northwest from the beacon-light at Michigan City.

Poverty Island to Waugoshance.—When three-quarters of a mile south of Poverty Island light, steer E. $\frac{1}{2}$ N., 55 miles, to a point 2 miles southeast of Beaver Island light; thence N. E. $\frac{1}{2}$ E., 27 miles, to a point 1 mile northwest of Waugoshance light.

Poverty Island to the Straits of Mackinac, north of the Beaver group.—When three-quarters of a mile south of Poverty Island light, steer N. E. by E. $\frac{1}{2}$ E., 58 miles, to a point $2\frac{1}{2}$ miles north of Squaw island; thence east 29 miles, ranging on north side of St. Helena, passing about midway between the White shoals and Simmons' reef, to a point 5 miles west of the north side of St. Helena, and the same distance southwest from Point aux Chenes; thence E. by S. $\frac{3}{4}$ S., $13\frac{1}{2}$ miles, to a point 1 mile north of the railroad dock at Old Fort Mackinac, passing 1 mile south of St. Helena shoal and the light on St. Helena island.

Magnetic Declinations in degrees and tenths, corrected to the year 1890.

McGulpin's Point.....	0.5 E.
Waugoshance.....	0.7 E.
Beaver Island Light.....	1.3 E.
South Fox Island.....	1.0 E.
South Manitou Island.....	2.0 E.
Manistee.....	2.3 E.
Little Point au Sable.....	2.6 E.
Grand Haven.....	2.0 E.
St. Joseph.....	2.2 E.
Michigan City.....	2.7 E.
Chicago.....	3.3 E.
Racine.....	3.7 E.
Milwaukee.....	4.0 E.
Sheboygan.....	4.1 E.
Twin River Point.....	4.0 E.
Bayley's Harbor.....	3.3 E.
Rock Island.....	2.0 E.
Seul Choix Point.....	1.4 E.

Compass Courses and Distances in Green Bay.

Rock Island Passage to Green Bay.—When one-fourth of a mile north of Rock Island light, steer W. $\frac{1}{2}$ S., 6 miles, until Boyer's bluff bears E. S. E. 1 mile; thence S. W. $\frac{1}{2}$ S., $22\frac{1}{2}$ miles, keeping Eagle Bluff light a little open on the port bow, until it bears S. S. E. $\frac{1}{2}$ E., half a mile distant; thence S. by W. $5\frac{1}{2}$ miles, heading a little inside the point

north of Egg harbor (passing the light give the shore a berth of 500 yards), until Hat island bears W. $\frac{1}{2}$ S., when steer S. W. $\frac{1}{2}$ S., 49 miles, with Grassy Island lights open a little on the port bow until Long Tail Point light bears N. W. $\frac{1}{2}$ W., 1 mile. See directions to enter Fox river.

Rock Island Passage to Menominee.—When one-fourth of a mile north of Rock Island light, steer W. $\frac{1}{2}$ S., 6 miles, until Boyer's bluff bears E. S. E., 1 mile; thence S. W. $\frac{1}{2}$ W., 26 $\frac{1}{2}$ miles, until Chambers Island light bears E. $\frac{1}{2}$ N., 1 $\frac{1}{2}$ miles, when steer S. W., 10 $\frac{1}{2}$ miles, to a point 1 mile E. N. E. of Menomonee Pierhead light.

Rock Island Passage to Escanaba.—When one-fourth of a mile north of Rock Island light, steer N. W. $\frac{3}{4}$ N., 16 miles, until Point Peninsular light bears N. E. by N. $\frac{1}{2}$ N., 3 miles, and the buoy on 10-foot shoal E. N. E. $\frac{1}{2}$ N., 1 mile, when steer N. by W. $\frac{1}{2}$ W., 8 $\frac{1}{2}$ miles, to a point 1 mile east of Sand Point light.

Rock Island Passage to Cedar River.—When one-fourth of a mile north of Rock Island light, steer W. $\frac{1}{2}$ S., 6 miles, until Boyer's bluff bears E. S. E. 1 mile; thence W. $\frac{3}{4}$ S., 18 $\frac{1}{2}$ miles, to a point 1 mile southeast of the Cedar River Pierhead light.

Rock Island Passage to Burnt Bluff, Garden Bluff, and the Head of Bay de Noquette.—When one-fourth of a mile north of Rock Island light, steer N. by E. $\frac{1}{2}$ E., 18 miles, to a point one-fourth of a mile west of Burnt bluff; thence N. N. E. $\frac{1}{2}$ E., 8 miles, to a point one-fourth of a mile west of Garden bluff; thence the same course, 5 $\frac{1}{2}$ miles, to the head of the bay in 3 $\frac{1}{2}$ fathoms, and 2 $\frac{1}{2}$ miles west of Jack's bluff.

Poverty Island Passage to Escanaba.—When three-fourths of a mile south of Poverty Island light, steer W. N. W., 18 $\frac{1}{2}$ miles, until Point Peninsula light bears N. E. by N. $\frac{3}{4}$ N., 3 miles, and the buoy on 10-foot shoal bears E. N. E. $\frac{1}{2}$ N., 1 mile, when steer N. by W. $\frac{1}{2}$ W., 8 $\frac{1}{2}$ miles, to a point 1 mile east of Sand Point light. Heavy-draught vessels when about $\frac{1}{2}$ mile south of the light should steer N. W. $\frac{1}{2}$ W., 3 $\frac{1}{2}$ miles, to a point about midway between the buoys on Gravelly Island and Pilot Island shoals, then steer W. by N. $\frac{1}{2}$ N. 14 $\frac{1}{2}$ miles, passing $\frac{1}{2}$ mile south of the Corona shoal, when steer as above.

Poverty Island Passage to Big Bay de Noquette.—When three-fourths of a mile south of Poverty Island light, steer N. W. $\frac{1}{2}$ W., 5 $\frac{1}{2}$ miles, until Rock Island light is open by the west side of St. Martin's Island; thence N. $\frac{1}{2}$ E., 8 miles, to a point one-fourth of a mile west of Big Burnt bluff; thence N. N. E. $\frac{1}{2}$ E., 13 $\frac{1}{2}$ miles, until Jack's bluff bears east 2 $\frac{1}{2}$ miles distant.

Burnt Bluff.—In the bay north of Burnt bluff there is good anchorage and protection from all winds; to make the anchorage, haul around the bluff and steer E. $\frac{1}{2}$ N. about 1 mile, and come-to in 5 fathoms of water.

Ogontz Bay is on the northwest side of Big Bay de Noquette. To enter Ogontz bay: Get the west side of Burnt bluff astern, and steer N. $\frac{1}{2}$ W., 10 $\frac{1}{2}$ miles, from it to the head of the bay, passing 1 mile east of Isle St. Vital, and the same distance west of a 9-foot spot 2 $\frac{1}{2}$ miles E. N. E. $\frac{1}{2}$ N. from Round island, and in range with it and Garden bluff.

Garden Bay is on the east side of Garden bluff. It has good anchorage and protection from all winds. To make the anchorage: Haul around the bluff, and steer E. by N. $\frac{1}{2}$ N., 1 $\frac{1}{2}$ miles, and come-to in 3 fathoms of water. Just east of the bluff the water is shoal.

Porte des Morts (Death's Door) to Escanaba.—When 2 miles S. S. E. of Pilot Island light, steer N. W. $\frac{1}{2}$ W., 4 $\frac{1}{2}$ miles, until the

northwest side of Plum island bears N. E. 1 mile, when steer N. $\frac{3}{4}$ W., 30 $\frac{1}{2}$ miles, to a point 1 mile east of Sand Point light, passing 1 $\frac{1}{2}$ miles west of buoy on Ten-foot shoal. When well past the buoy on Sand point, haul up for the docks at Escanaba.

Porte des Morts (Death's Door) to Big Bay de Noquette.—When the northeast side of Plum island bears N. E. 1 mile, steer N. $\frac{1}{4}$ E., 3 miles, until the north point of Boyer's bluff bears east 1 mile; thence N. E. by N. $\frac{3}{8}$ N., 21 $\frac{1}{2}$ miles, to a point one-half mile west of Burnt bluff; thence the same course 8 miles until Garden bluff bears east $\frac{1}{4}$ mile.

Porte des Morts (Death's Door) to Cedar River.—When the northwest side of Plum island bears N. E. 1 mile, steer west 4 $\frac{1}{2}$ miles; thence W. by N. $\frac{7}{8}$ N., 14 $\frac{1}{2}$ miles, with the north point of the Door bluff directly astern, to a point 1 mile southeast of the Cedar River Pierhead light, passing three-fourths mile south of buoy on the Whale's Back shoal.

Porte des Morts (Death's Door) to Green Bay.—When the northwest side of Plum island bears N. E. 1 mile, steer west, 5 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles W. N. W. $\frac{1}{4}$ N. from the north point of the Door bluff; thence S. W. $\frac{3}{4}$ S., 12 miles, until Eagle Bluff light bears S. S. E. $\frac{1}{4}$ E., $\frac{1}{2}$ mile, when see course from Rock island to Green bay.

Porte des Morts (Death's Door) to Menomonee.—When the northwest side of Plum island bears N. E. 1 mile, steer west 5 $\frac{1}{2}$ miles to a point 1 $\frac{1}{2}$ miles W. N. W. $\frac{1}{4}$ N. from the north point of the Door bluff; thence W. S. W. $\frac{1}{4}$ S., 17 $\frac{1}{2}$ miles, until Chambers Island light bears E. $\frac{3}{8}$ N., 1 $\frac{3}{4}$ miles, when steer southwest, 10 $\frac{1}{2}$ miles, to a point 1 mile E. N. E. of Menomonee Pierhead light.

Porte des Morts (Death's Door) to Green Bay, passing West of Chambers Island.—When Chambers Island light bears E. $\frac{3}{8}$ N., 1 $\frac{3}{4}$ miles, as in the course to Menomonee, steer S. $\frac{3}{4}$ W., 12 $\frac{1}{2}$ miles, until Green Island light bears N. W. $\frac{3}{8}$ W., 2 $\frac{1}{4}$ miles; thence S. W. $\frac{7}{8}$ S., 39 $\frac{1}{2}$ miles, until Long Tail Point light bears N. W. $\frac{1}{4}$ W. 1 mile.

Porte des Morts (Death's Door) to Peshtigo.—When Green Island light bears N. W. $\frac{3}{8}$ W., 2 $\frac{1}{4}$ miles, as in the course from Death's Door to Green Bay, steer S. W. $\frac{1}{4}$ S., 8 miles, until the buoy on Peshtigo shoal bears N. W. $\frac{3}{8}$ W., $\frac{1}{4}$ mile distant; continue the same course three-fourths mile to clear the shoal, when haul up W. by N. $\frac{3}{8}$ N., 3 $\frac{1}{4}$ miles, to a point 1 mile south of the mouth of Peshtigo river.

Porte des Morts (Death's Door) to Oconto.—When the buoy on Peshtigo shoal bears N. W. $\frac{3}{8}$ W., $\frac{1}{4}$ mile, as in the course to Peshtigo, steer W. S. W., 12 miles, to a point one-half mile northeast of the harbor piers.

Porte des Morts (Death's Door) to Fayette.—When one-half mile west of Burnt bluff, as in the course from Death's Door to Big Bay de Noquette, steer N. E. $\frac{1}{4}$ N., heading on Snake island for 3 $\frac{1}{2}$ miles, until the houses in Snail Shell harbor bears S. by E. $\frac{1}{4}$ E., when haul in mid-channel.

Porte des Morts (Death's Door) to Washington Harbor.—When the northwest side of Plum island bears northeast 1 mile, steer N. $\frac{1}{4}$ E., 8 miles, until the north point of Boyer's bluff bears east 1 mile, when haul around the bluff point, giving it a berth of one-

third of a mile, until the head of the bay bears S. by E., when run to the dock on the west side, or come-to in the head of the bay in 10 fathoms of water. There is good anchorage and protection from all winds except from N. N. W. by the northward to N. E. The shores are bold and can be approached close-to.

Escanaba to Green Bay.—When 1 mile east of Sand Point light, steer S. $\frac{1}{4}$ E., $5\frac{1}{2}$ miles, until Point Peninsular light bears E. $\frac{1}{4}$ N., distant 3 miles; thence S. W. by S. $\frac{3}{8}$ S., 37 miles, until Chambers Island light bears E. $\frac{3}{8}$ N., $1\frac{1}{4}$ miles; when see course from Death's Door to Green Bay west of Chambers island.

Escanaba to Cedar River.—When 1 mile east of Sand Point light, steer S. $\frac{1}{4}$ E., $5\frac{1}{2}$ miles, until Point Peninsular light bears E. $\frac{1}{4}$ N., distant 3 miles; thence S. W. $\frac{1}{4}$ S., $23\frac{1}{2}$ miles, to a point 1 mile southeast of the Cedar River Pierhead light.

Cedar River to Green Bay.—When 1 mile southeast of the Cedar River Pierhead light, steer S. $\frac{1}{4}$ W., $13\frac{1}{2}$ miles, until Chambers Island light bears E. $\frac{3}{8}$ N., $1\frac{1}{2}$ miles, when see course from Death's Door to Green Bay west of Chambers island.

Cedar River to Menomonee.—When 1 mile southeast of the Cedar River Pierhead light, steer S. by W. $\frac{3}{8}$ W., $8\frac{1}{2}$ miles, until Point Rochereau bears W. N. W., 2 miles, when steer S. W. by S. $\frac{3}{8}$ S., $14\frac{1}{2}$ miles, to a point 1 mile E. N. E. of Menomonee Pierhead light.

Sturgeon Bay to Menomonee.—When 1 mile east of Sherwood's Point light, steer N. N. W. $\frac{1}{4}$ W., $16\frac{1}{2}$ miles, to a point 1 mile E. N. E. of Menomonee Pierhead light, passing $1\frac{1}{2}$ miles west of the northwest point of Green island, and the same distance east of the shoal S. S. E. of the entrance to Menomonee river.

Sturgeon Bay to Green Bay.—When 1 mile east of Sherwood's Point light, steer W. N. W., 2 miles; thence west, 4 miles, until the west point of entrance to Little Sturgeon bay bears S. $\frac{1}{4}$ W., 4 miles, when steer S. W. $\frac{3}{8}$ S., 30 miles, until Long Tail Point light bears N. W. $\frac{1}{4}$ W., 1 mile.

Sturgeon Bay to Peshtigo.—When 1 mile east of Sherwood's Point light, steer W. N. W., 2 miles; thence W. by N. $\frac{1}{4}$ N., $10\frac{1}{2}$ miles, to a point 1 mile south of the mouth of Peshtigo river.

Sturgeon Bay to Oconto.—When 1 mile east of Sherwood's Point light, steer W. N. W., 2 miles; thence W. $\frac{3}{8}$ S., 17 miles, to a point half a mile northeast of the harbor piers.

Sturgeon Bay to Escanaba.—When 1 mile east of Sherwood's Point light, steer N. $\frac{1}{4}$ W., $21\frac{1}{2}$ miles, until Chambers Island light bears E. $\frac{3}{8}$ N., $1\frac{1}{2}$ miles, passing close to the shoal off the west side of Chambers island; thence N. E. by N. $\frac{3}{8}$ N., 37 miles, until Point Peninsular light bears E. $\frac{1}{4}$ N., 3 miles, when steer N. $\frac{1}{4}$ W., $5\frac{1}{2}$ miles, to a point 1 mile east of Sand Point light.

Sturgeon Bay to Cedar River.—When $1\frac{1}{2}$ miles W. $\frac{3}{8}$ S. from Chambers Island light, as in the course from Sturgeon bay to Escanaba, steer N. $\frac{1}{4}$ E., $13\frac{1}{2}$ miles, to a point 1 mile southeast of the Cedar River Pierhead light.

Sturgeon Bay to Pensaukee.—When 1 mile east of Sherwood's Point light, steer W. N. W., 2 miles; thence W. S. W. $\frac{1}{4}$ S., $19\frac{1}{2}$

miles, to a point half a mile southeast from Pensaukee Shoal buoy, when see Pensaukee river.

Sturgeon Bay to Egg Harbor.—When 1 mile east of Sherwood's Point light, steer N. $\frac{1}{4}$ E., $7\frac{1}{2}$ miles, ranging on the west side of Chambers island, until Green Island light bears northwest, 6 miles; thence northeast 7 miles, heading on the point 2 miles north of Egg harbor, until in range with Hat island and the wood dock on the west side of Egg harbor, when run to the dock. There is good anchorage in Egg harbor, but the bay is open to the northwest.

Egg Harbor to Fish Creek.—Run out on the range of Hat island $1\frac{1}{2}$ miles, then N. by E. $\frac{1}{4}$ E., heading on Eagle Bluff light, $5\frac{1}{2}$ miles, until the dock at Fish Creek bears southeast, when haul in for it.

Fish Creek to Escanaba.—Run out on the range of the dock and the South Strawberry island, until a little past the range of the bluff bank, 1 mile south of Fish creek and Eagle Bluff light, when haul up about N. by E., heading a little outside Eagle Bluff light, to a point one-third of a mile west of it. And note that about 1 mile north of the dock at Fish creek, a rocky flat extends from the main shore about 400 yards. A rocky shoal extends from the South Strawberry island three-quarters of a mile in a southeast direction. The channel is between these shoals, and is about one-third of a mile wide. When one-third of a mile west of Eagle Bluff light, steer N. E. $\frac{1}{4}$ N., 9 miles, until Sister bluff bears S. E., $1\frac{1}{2}$ miles, when steer N. $\frac{1}{4}$ E., $27\frac{1}{2}$ miles, until Point Peninsular light bears E. $\frac{1}{4}$ N., 3 miles; thence N. $\frac{1}{4}$ W., $5\frac{1}{2}$ miles, to a point 1 mile east of Sand Point light.

Magnetic Declinations, in degrees and tenths, corrected to the year 1890:

Head of Green Bay.....	4° .5 E.
Green island.....	3° .9 E.
Menomonee harbor.....	4° .0 E.
Sturgeon bay.....	3° .9 E.
Egg harbor.....	3° .4 E.
Plum island.....	2° .9 E.
Little Bay de Noquette.....	3° .0 E.

Detour, on the west side of the Detour passage, and a guide into the passage. During thick or foggy weather, a steam-whistle is sounded, giving a blast of 8 seconds, followed by an interval of 52 seconds, during every minute. Spectacle Reef light-house, S. W. $\frac{1}{2}$ S., $16\frac{1}{2}$ miles. Bois Blanc light-house, S. W. by W. $\frac{1}{4}$ W., $26\frac{1}{2}$ miles. Martin's Reef buoy, W. S. W. $\frac{3}{8}$ W., $11\frac{1}{2}$ miles.

Detour Shoal.—Black spar buoy in 16 feet of water. Marks a shoal on the west side of the entrance to St. Mary's river. Vessels running on the range of Frying Pan Island light, and Pipe Island light pass about $\frac{1}{2}$ mile to the eastward of this shoal. Frying Pan island, N. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles. Detour light-house, S. W. by W. $\frac{1}{4}$ W., $\frac{3}{4}$ mile.

FRYING-PAN ISLAND LIGHT-STATION.—A fixed red light, visible $5\frac{1}{2}$ miles. Conical iron tower, dark red, 15 feet high. On Frying-Pan Island, mouth of St. Mary's river. This light kept in line with Pipe Island light, bearing nearly N. $\frac{1}{4}$ W., distant 2 miles, guides into Detour Passage. Detour light-house, S. S. W. $\frac{1}{8}$ W., $2\frac{1}{2}$ miles.

PIPE ISLAND LIGHT-STATION.—A fixed red light, 5th order, visible 10 miles. Red brick tower, lantern black; detached white frame dwelling; light $37\frac{1}{2}$ feet above lake level. On the S. W. end of Pipe island, $4\frac{1}{2}$ miles above Detour light. This light forms a range with Frying-Pan Island light, and marks the channel down from Lime island. The shores of Pipe island are fairly bold, except on the north side, where it is connected to a small islet with shoal water; five-foot shoal buoy, S. $\frac{3}{8}$ E., 1,400 yards.

St. Mary's Falls Canal Range (North Pier) Beacon.—A fixed red light, visible 14 miles. Upper half white, lower half black. Triangular open-frame iron tower, 50 feet high. Upper half slatted. On the north pier, about 450 feet from the outer end. Forms a range with the following light for the channel approaching the canal. St. Mary's Falls Canal Pierhead light-station (end of south pier), W. S. W. $\frac{3}{8}$ W., 1,650 feet.

ST. MARY'S FALLS CANAL PIERHEAD LIGHT-STATION.—A fixed red light, visible $11\frac{1}{2}$ miles. Brown, circular iron tower, 25 feet high, black lantern. On the outer end of south pier. Vessels leaving or approaching the canal will bring this light in range with the one on the north pier, bearing E. by N. $\frac{3}{8}$ N. This range passes close to Red buoy No. 68, which is placed about 500 yards south of Vidal shoal. Pointe aux Pins light-house (Canada), S. W. by W. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles. St. Mary's Falls Canal range, north pier beacon, E. N. E. $\frac{3}{8}$ E., 1,650 feet.

St. Mary's Falls Canal.—All vessels wishing to use the locks of this canal must give the following signal, viz.: Two long and two short blasts of the steam-whistle.

The International Bridge, which spans the St. Mary's river at the head of the Falls, crosses the canal near the upper end.

After leaving the canal get on range of the lights at the head of the canal, which guide through the dredged channel southward of Vidal shoal about 1 mile above the canal, and when well past the shoal, which is marked at the lower end by a red buoy, haul a little to the westward, W. by S. $\frac{1}{8}$ S., until Big point, the first prominent point above the canal

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on the south side, bears south; thence S. W. by W. till Point aux Pins bears N. W.; thence S. W. $\frac{1}{2}$ S. until Point aux Pins light bears north about 200 yards distant, when steer for the point below the Mission, about W. S. W.; get on the line of the range lights to guide through the cut below Round island, W. by S. $\frac{1}{2}$ S., and keep on this range until up to Round island, when take up the range lights to guide through the cut between Round island and Point Iroquois, W. N. W. $\frac{3}{4}$ N., until the Mission bears southwest, when steer N. W. $\frac{1}{2}$ N. for White Fish point.

To pass to the southward and westward of the Middle ground and Waiska Bay shoal: When abreast of Round island, with the light-house bearing S. by E. $\frac{1}{2}$ E., steer W. S. W. $\frac{1}{2}$ S., heading on Waiska Bay point for two miles, when steer N. W. $\frac{1}{2}$ N. for White Fish point.

Foote's Dock Beacon-Light.—A fixed red light shown from a lens lantern hoisted on a mast on the shore end of the dock, visible 5 miles in clear weather. A guide to clear the shoals on the south side of the river.

Point aux Pins (Canadian light).—A fixed white light, visible 8 miles. White, square wood tower, 23 feet high. On Point aux Pins, at the north side of entrance to St. Mary's River.

ROUND ISLAND RANGE LIGHT (Lower Range).—Two fixed red lights; front one visible 10 $\frac{1}{2}$ and rear light 12 miles.

Front light, 6th order, white, square frame tower, 18 feet high.

Rear light, 5th order, white pyramidal tower, square in plan, 33 feet above the lake level, lanterns black. White frame dwelling near front light. On south side of entrance to St. Mary's river, nearly opposite Point aux Pins. This range guides through the cut below Round island, W. by S. $\frac{1}{2}$ S., marked by 2 spar buoys.

ROUND ISLAND RANGE LIGHTS (Upper Range).—Two fixed white lights; front one visible 10 $\frac{1}{2}$ miles, and rear light visible 12 miles.

Front light, 6th order, white, square frame tower, 21 feet high.

Rear light, 5th order, white pyramidal tower, square in plan, 36 feet above lake level, lanterns black. White frame dwelling near front light. On the main land, about 1 mile E. S. E. from Round island. This range guides through the cut between Round Island and Point Iroquois, N. W. by W. $\frac{3}{4}$ W.

ROUND ISLAND LIGHT (Discontinued).—Gray tower, 35 feet high, rising from the corner of stone dwelling. Near the north point of Round island. Point Iroquois N. W. by W. $\frac{1}{2}$ W., 6 $\frac{1}{2}$ miles.

Opposite Middle Ground.—Black spar buoy, bushy top, in 17 feet of water, marks the south side of the cut between Round island and Point Iroquois, and must be left on the port hand in passing out of the river. Round Island light-house, S. E. by E. $\frac{1}{2}$ E., 2,130 yards. Point Iroquois, N. W. by W. $\frac{1}{2}$ W., 4 $\frac{1}{2}$ miles.

Middle Ground.—Red spar buoy, bushy top, in 17 feet of water. On the north side of the cut between Round island and Point Iroquois, and must be left on the starboard hand in passing up the river.

Waiska Bay.—Red, 3d-class can buoy in 24 feet of water. Three hundred and fifty yards south of a group of three shoals west of Round island, and should be left on the starboard hand in passing into Waiska bay from the eastward. Vessels should not attempt to pass between this buoy and the black Middle Ground buoy No. 79. Round Island light-house, E. $\frac{1}{2}$ S., 1,800 yards. Point Iroquois light-house, N. W. by W. $\frac{1}{2}$ W., 5 $\frac{1}{2}$ miles.

Waiska Bay is a good harbor, but of limited capacity. It is 3 miles W. S. W. $\frac{1}{2}$ S. from mid-channel opposite Round island, and $4\frac{1}{2}$ miles S. E. by S. from Point Iroquois. To enter the harbor haul close around the point, and alongside the dock which is just inside the point. Or come to anchor a little inside the range of the point; further in the bay the water is shoal. Vessels generally come to outside the point, between it and the Mission, in from 4 to 5 fathoms, where there is good anchorage and protection from all winds except from the northwest; but the shoal water between the Mission and Point Iroquois prevents any heavy sea making, when the wind is in that direction.

Channel North of the Middle Ground off the Mission.—Buoys have been placed by authority of the Light House Establishment, as follows:

A red and black horizontal striped spar buoy in 17 feet water, at the lower end of the middle ground. Round Island light-house bears S. E. by E. $\frac{1}{2}$ E., $2\frac{3}{8}$ miles.

A red and black horizontal striped spar buoy on the 14-foot spot near the middle of the middle ground.

A red and black horizontal striped spar buoy at the upper end of the middle ground in 18 feet of water. Point Iroquois light-house bears W. by N., 2 miles.

The above described buoys mark the middle ground, which extends about $1\frac{1}{2}$ miles N. W. from the lower buoy, the shoal varies in depth from 14 to 18 feet.

On the Canadian side of this channel there are two buoys, as follows:

A red spar buoy in 18 feet of water. Round Island light-house bears S. E. $\frac{1}{2}$ E., $2\frac{3}{8}$ miles.

A red spar buoy in 19 feet of water. This is the upper buoy and bears N. N. W., 1,100 yards from the lower red buoy. These two buoys mark the narrowest part of the channel, which is in no place less than $\frac{1}{2}$ a mile wide.

After passing the buoys in the cut near Round island, haul a little to the northward and steer N. W. This will carry through the center of channel with nothing less than five fathoms. This channel is broader, deeper and straighter than the course usually steered.

LAKE SUPERIOR.

Light-Houses, Buoys and Harbors Standing Westward along the South Shore of Lake Superior.

POINT IROQUOIS LIGHT-STATION.—A flashing white light, 4th order, visible $15\frac{1}{4}$ miles, interval between flashes 30 seconds. White tower, 55 feet high, connected by a covered way with white dwelling, on Point Iroquois. A guide to and from St. Mary's river. The fog-signal is a 10-inch steam whistle, in duplicate, which will sound a blast of 5 seconds followed by an interval of 25 seconds. Gros Cap

(Canada), N. N. E. $\frac{1}{2}$ E., $3\frac{1}{2}$ miles. White Fish Point light-house, N. W. $\frac{1}{2}$ N., $25\frac{1}{2}$ miles. Parisian Island, N. N. W., 12 miles.

WHITE FISH POINT LIGHT-STATION.—A fixed white light, 3d order, visible $15\frac{1}{2}$ miles. *This light is ordered to be changed to a fixed white light varied by red flashes at intervals of 20 seconds; the order of the light will not be changed.* Brown iron pile structure, 70 feet high, connected by a covered way with the dwelling. A coast light on White Fish point, and a guide to and from White Fish bay, southeast extremity of Lake Superior. During thick or foggy weather a steam-whistle is sounded, giving a blast of 5 seconds, followed by an interval of 13 seconds; then a blast of two seconds, followed by an interval of 40 seconds. Point Iroquois light-house, S. E. $\frac{1}{2}$ S., $25\frac{1}{2}$ miles. North point of Parisian island, E. S. E. $\frac{3}{4}$ E., $11\frac{1}{2}$ miles. There is good anchorage in the bay south of the light, and protection from north and westerly gales; the water is deep, and it is necessary to come to close to the shore; the best anchorage is a little south of the dock. To make a lee from the westward haul around the point, giving it a berth of three-fourths of a mile, and steer in W. S. W., about 1 mile south of the light. Storm, cautionary, and wind signals are displayed from a mast near the fog-signals.

Grand Marais (Mich.) is 49 miles about W. $\frac{1}{2}$ S. from White Fish point, and $8\frac{1}{2}$ miles east of Big Sable light.

Grand Marais Harbor.—The project for a harbor of refuge at this place consists in the construction of two parallel piers, 500 feet apart, extending into 22 feet of water in Lake Superior, and connected with the deep water in the bay of Grand Marais, by a cut through the sand spit which separates the bay from the lake, making a channel 20 feet deep and 300 feet wide. Direction of piers, north.

Present Condition.—1,300 feet of the north pier is completed and about 800 feet of the east pier. Last summer a channel was dredged into the harbor, midway between the piers, 175 feet wide and 17 feet deep, but it is thought it will soon fill up again unless the piers are extended.

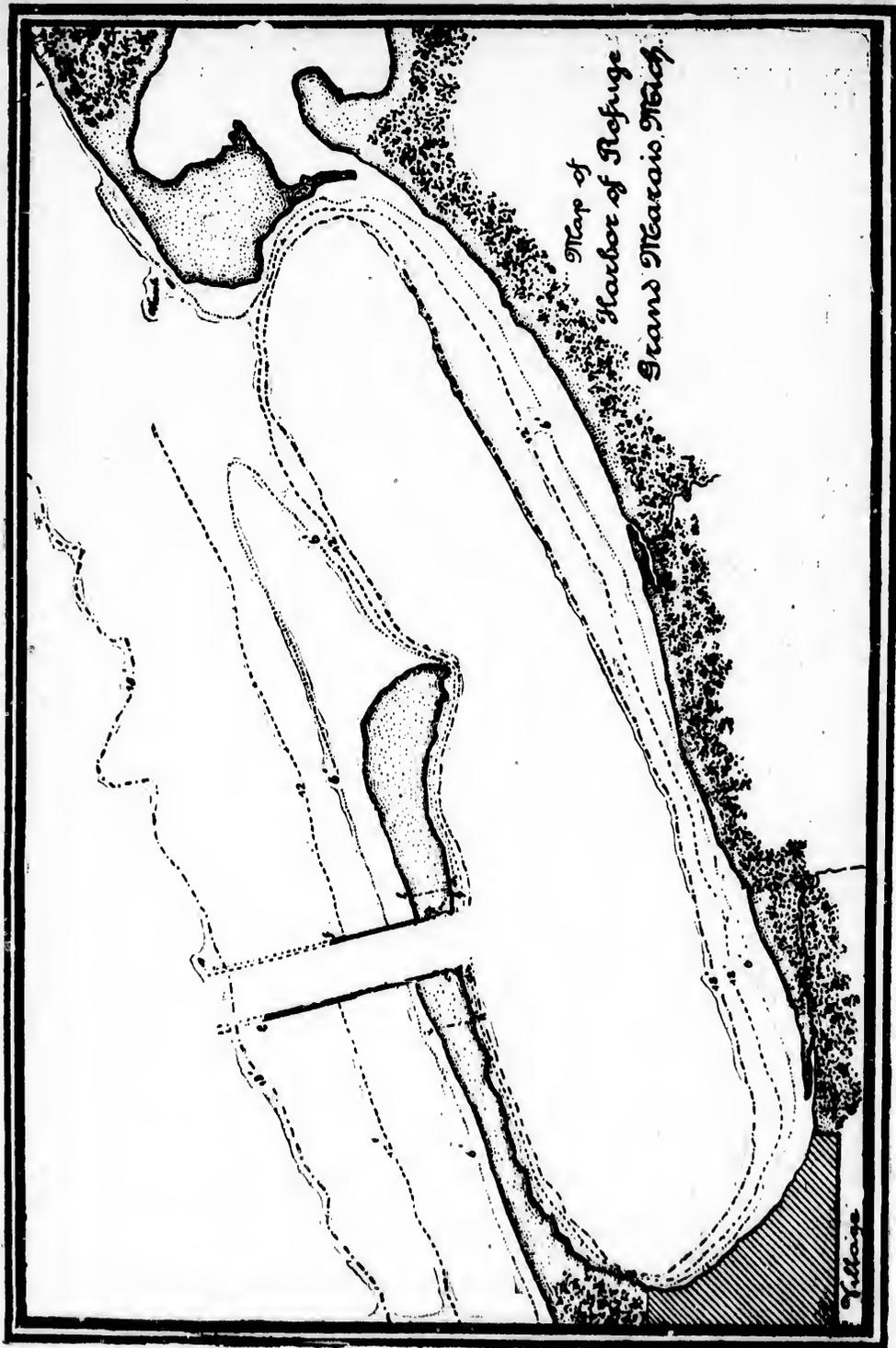
BIG SABLE LIGHT-STATION.—A fixed white light, 3d order, visible $17\frac{1}{2}$ miles. White tower connected by covered way with dwelling, light 107 feet above lake level. A coast light on Point au Sable, 57 miles to the westward of White Fish point. Grand Island light-house, W. S. W. $\frac{3}{4}$ W., 27 miles. A rocky spit extends from the light $1\frac{1}{2}$ miles, in a N. N. W. direction.

The Shore from White Fish point to Big Point Sable, is fairly bold with sandy beach, and can be approached safely to within 1 mile.

Grand Sable.—A stupendous dune of Sand between Big Sable light and Grand Marais, extends $4\frac{1}{2}$ miles, and reaches an elevation of 400 feet, making an excellent landmark.

The Pictured Rocks.—After passing the Rocky spit off Big Point Sable, the shore is bold with a sandy beach for about 16 miles, when the famous Pictured Rocks are reached; they extend from the Chappel rock to within $2\frac{1}{2}$ miles of Sand point, a distance of nearly 10 miles; the shore along the Pictured Rocks is bold, and can be approached close-to; their greatest height is 170 feet.

GRAND ISLAND LIGHT-STATION.—A fixed light, varied by white flashes, interval between the flashes 90 seconds, 4th order, visible $19\frac{1}{2}$ miles. Yellow tower, rising from brick dwelling, light 205 feet above lake level. On the westward, one of the two north points of



Map of
Harbor of Refuge
Sand Narrows, Mich.

T. Gillson

Grand island. A coast-light and guide into Grand Island harbor. Big Sable light-house, E. N. E. $\frac{3}{4}$ E., 27 miles.

Grand Island Harbor.—Red spar buoy, in 12 feet of water. Marks the extreme end of shoal off Grand Island Harbor light-house. Grand Island Harbor light-house, W. $\frac{1}{4}$ S., distant 350 yards.

GRAND ISLAND HARBOR LIGHT-STATION.—A fixed white light, visible $13\frac{1}{2}$ miles. White tower, on frame dwelling. On a low sand point on the southeast extreme of Grand island, at the narrowest point of the channel between the island and the main-land. Sand point, E. by S., 1,200 yards. Powell's point, S. W. $\frac{3}{4}$ W., $11\frac{1}{2}$ miles.

To Enter Grand Island Harbor from the Eastward.—When half a mile north of the Grand Portal, steer S. W. $\frac{1}{4}$ S., passing one-quarter of a mile outside of Castle point. On approaching the narrows, keep the red buoy on the shoal 350 yards E. $\frac{1}{4}$ N. of the beacon, a little open on the starboard bow, and passing, give it a berth of 150 yards, keeping a lookout for the shoal off Sand point.

Making this harbor from the northward, give Trout point, the most easterly point of Grand island, a good berth, and avoid the shoal extending northeast two-thirds of a mile, and another detached shoal $1\frac{1}{2}$ miles southeast from it, and do not haul up for the entrance until the light opens out by the shore, when bring it to bear a little on the starboard bow, heading S. W. $\frac{1}{4}$ S., and proceed as above. When abreast of the light, steer S. W. by S. $\frac{3}{4}$ S. for the anchorage at the head of South bay, or stand on until Williams' landing bears west, when haul up on that bearing, and on approaching it haul to the northward, and come to off the houses on the west shore off the North bay, in 6 to 8 fathoms. Good anchorage and protection from all winds.

Munising, on the east side of the south bay, has a dock at present very much out of repair, and an iron furnace, which is out of blast, and business is almost entirely suspended.

Williams' Landing Shoal.—Red spar buoy, in 12 feet of water. On the south point of the 12-foot curve of the shoal south of Grand island. Williams' landing, N. E. $\frac{1}{4}$ E., 740 yards. Grand Island Harbor Range light (front), S. W. $\frac{1}{4}$ S., 1,490 yards.

Grand Island Harbor Range Lights.—Two fixed white lights; front light visible $10\frac{1}{2}$ miles; rear light, $12\frac{1}{2}$ miles. Front light, wooden beacon, 19 feet high. Rear light, tower on frame dwelling, 32 feet high. Both painted white. On the south shore, at the western entrance into Williams' harbor and South bay. They are guides for entering the western channel. The lights are in range N. by W. $\frac{1}{4}$ W. and S. by E. $\frac{3}{4}$ E., distant from each other 500 feet.

To Enter Grand Island Harbor from the Westward.—When 1 mile N. E. $\frac{3}{4}$ N. of the North point of Wood island, and in line with the northwest side of Grand island, steer in on the ranges S. by E. $\frac{3}{4}$ E., and when a little past the range of the two lower points of Grand island, haul up to E. $\frac{1}{4}$ S., heading for Powell's point, and passing to the southward of the buoy; and when the southwest point of Grand island and the south point of Williams' island are in range, haul up to northeast for an anchorage in Williams' harbor, or stand on, following the shore around Powell's point, not approaching it nearer than 400 yards, for an anchorage in South bay. Or stand in on the ranges until within



a little less than half a mile of the front light, until the water shoals to 8 fathoms, when haul up E. $\frac{1}{4}$ N. about half a mile, and come to south of the red buoy, where there is good anchorage and protection from all winds, in 10 to 12 fathoms of water.

NOTE.—Strangers should not attempt the passage south of Williams' island or between Williams' and Wood islands.

The shore from Grand Island harbor to Shot point is generally rocky and dangerous. There are numerous rocks and sand spits between the south point of Williams' island and the main shore to the south of it. A rocky spit extends nearly half a mile N. N. W. from the north end of Wood island; rocky shoals $1\frac{1}{2}$ miles north of Train point; a rocky shoal N. N. W., 1 mile from the north end of Train island, and rocky spits extending in a northern direction from Laughing Fish point and Shot point.

From Shot point to Marquette the shore is bold, with sand and gravel beach.

MARQUETTE LIGHT-STATION.—A fixed white light, 4th order, visible $15\frac{1}{2}$ miles. Yellow tower, 33 feet high, rising from brick dwelling. Light, 77 feet above lake level. A coast and harbor light, about 130 yards from the end of the north point of Marquette harbor. During thick or foggy weather a steam-whistle is sounded, giving 2 blasts each minute, with equal intervals between them: duration of each blast, 5 seconds. The signal-house is situated close to the end of the point. Grand Island light-house, E. $\frac{1}{4}$ N., 33 miles. To the eastward of the light, about one-quarter of a mile, there are rocks awash and shoal spots.

Marquette Breakwater Beacon-Light.—A fixed red light, 6th order, visible $8\frac{1}{2}$ miles. Brown skeleton iron tower, square in plan. On the outer end of the breakwater protecting Marquette harbor. Marquette light-house, N. by E., 956 yards from the beacon.

The Life Saving Station is at the north end of the breakwater. The breakwater commences at the bluff point, 410 yards inside, or to the westward of Light-house point, and extends out from the land S. $\frac{3}{4}$ E., 670 yards. Vessels intending to anchor in the harbor will pass the southern end of the breakwater, and haul up to the northward, anchoring in 4 or $4\frac{1}{2}$ fathoms of water, 150 or 200 yards from it; or run alongside the breakwater.

Presque Isle is a rocky point $3\frac{1}{2}$ miles north of Marquette light, the shore on the point is steep-to. A little less than five-eighths of a mile east of the point, there are three large rocks which rise abruptly from the bottom; the northerly one is the largest, being about 20 feet high. There is a good wide channel between the rocks and the point. Vessels passing Presque Isle point on a dark night, should not haul up for Marquette until the red light on the breakwater opens to the eastward of the main light, as the two lights in range lead to the eastward and clear of the rocks. And observe that the beacon in range with the cupola on the Marquette rolling mills clears the rocks off the Marquette main-light.

GRANITE ISLAND LIGHT-STATION.—A fixed white light, varied by red flashes, at intervals of 90 seconds, 4th order, visible 17 miles, light 93 feet above lake level. Granite tower, 34 feet high,

rising from granite dwelling. On Granite island, about $12\frac{1}{2}$ miles to the northward of Marquette. During thick or foggy weather, a fog-bell, struck by machinery, is sounded, giving 5 strokes a minute. Granite rock has an area of about 1 acre, and is steep-to on all sides. Presque Isle point, S. by E. $\frac{1}{2}$ E., 9 miles. Grand Island light-house, E. S. E. $\frac{1}{4}$ E., $36\frac{1}{2}$ miles.

STANNARD ROCK LIGHT-STATION.—A flashing white light, visible $17\frac{1}{2}$ miles, 2d order, interval between flashes 30 seconds. Gray, circular, cut stone tower, $78\frac{1}{2}$ feet high, on circular pier $23\frac{1}{2}$ feet above the lake. Marks northern end of dangerous outlying reef, extending in a N. by W. and S. by E. direction, 970 yards, and about 500 yards wide. The fog-signal is a 10-inch steam whistle (in duplicate), giving a blast of 3 seconds' duration, followed by an interval of 10 seconds; then a blast of 5 seconds' duration, followed by an interval of 42 seconds. Marquette light-house, S. $\frac{1}{2}$ W., distant about $44\frac{1}{2}$ miles. Manitou light-house, N. W. $\frac{1}{2}$ W., $24\frac{1}{2}$ miles. Vessels passing north of the reef should give the light a berth of 800 yards. Shoal water extends in a northwesterly direction 350 yards, and there is a small shoal, least water 19 feet, three-fourths to seven-eighths of a mile, about W. by N. from the light. The 3-foot spot reported to be one-half mile northwest of the light, and the 2 detached rocks with 8 feet of water 1,400 feet west of the beacon, have no existence in those localities.

Stannard Rock Day Beacon.—Cut stone beacon 8 feet high, 9 feet diameter at base, surmounted by a wrought iron shaft. On the south shoal of Stannard's reef, about 40 yards from its extreme south end. Stannard's Rock light-house, N. N. W., 730 yards. Vessels can pass close to the beacon on the south side.

HURON ISLAND LIGHT-STATION.—A fixed white light, $3\frac{1}{2}$ order, visible $22\frac{1}{2}$ miles. Granite tower 34 feet high, rising from granite dwelling; light 197 feet above the level of the lake. A coast light, on the north side and nearly midway between the two ends of West Huron island. During thick or foggy weather a steam-whistle is sounded, giving a blast of 8 seconds, followed by an interval of 52 seconds. Fog signal on the northwest end of the island. Stannard's Rock light-house, N. E. by E. $\frac{1}{2}$ E., $39\frac{1}{2}$ miles. Manitou Island light-house, N. N. E. $\frac{1}{2}$ E., $37\frac{1}{2}$ miles. The shores of Huron islands are bold and can be approached close-to; except off the east end of East Huron, where there are two small patches of rock awash. There is a good channel between the East and West Huron islands, and a channel $2\frac{1}{2}$ miles wide between the islands and the main shore.

The shore from Presque Isle to Point Abbaye is rocky, with bays, points and islands. A spit extends one-half mile north from a point 1 mile east from Little Iron river. From Big Bay point a dangerous spit with only 8 feet of water extends 1 mile to the north. A large shoal extending $1\frac{1}{2}$ miles northeast from Huron River point has to be carefully avoided; and note that a range line from Huron Island light, touching the north side of a small bushy island a little north of the east end of East Huron island, just clears the north end of this shoal.

Huron Bay.—There is good anchorage and shelter from all winds in the bay south of Sand point, which is about half way up Huron bay on the east side. The tower formerly used for a light on Sand point, and the dock and buildings used for a depot, while building Stannard Rock

light-house, mark the point. The Slate Quarry dock is near the head of the bay on the east side. To enter the bay, bring the narrow entrance to bear W. S. W. $\frac{3}{4}$ S. and run in on that bearing, with Huron Island light directly astern, and when in mid-channel abreast the first low sandy point on the east side of the bay, steer S. W. $\frac{3}{4}$ W., 2 miles, to abreast of Sand point, which can be passed close-to. To make the slate dock at the head of the bay, steer up mid-channel $3\frac{1}{2}$ miles from Sand point, when keep the west side best on board for three-fourths of a mile to the dock. There is a sand-bar with only 2 feet of water on it off the mouth of Valley creek, which extends half way across the bay, and one-half mile along the shore; the extreme point of the shoal is outside the range of the end of the dock.

A Railroad is being built from the iron mines to Huron bay, and the ore docks are being constructed on the east side of the bay near the slate dock.

Point Abbaye Shoal.—This shoal is about 1 mile in length from north to south, and seven-eighths of a mile from east to west; least water, 7 feet. The middle of the shoal is about $1\frac{1}{4}$ miles east of the east point of Point Abbaye; and a line joining the north point of Point Abbaye and the west point of West Huron island, crosses the reef one-quarter of a mile from its northern limit. The buoy formerly on the north point of this shoal has been removed. Strangers should not attempt the passage between this shoal and Point Abbaye.

SAND-POINT LIGHT-STATION.—A fixed red light, 5th order, visible $12\frac{1}{2}$ miles. Red brick tower, rising from brick dwelling, 32 feet high. On a low sandy point, three-eighths of a mile northward of Sand point, west side of L'Anse bay, head of Keweenaw bay. Portage River light-house, N. $\frac{1}{2}$ E., $13\frac{1}{2}$ miles. Church at Methodist Mission, N. E. by E., $2\frac{1}{4}$ miles.

The bay west of Sand point, at the head of Keweenaw bay, is one of the best harbors on the lake. To make the harbor: When one-quarter of a mile east of Sand Point light, steer S. W. by S. three-quarters of a mile, when haul up about W. by N. $\frac{1}{2}$ N. for half a mile, and come-to off Baraga; and note that a sand spit extends from Sand point in a southwest direction, 300 yards.

L'Anse is situated on the east side of the head of Keweenaw bay. The docks bear S. by E. $\frac{3}{4}$ E., $1\frac{1}{2}$ miles from Sand Point light. It has a merchandise dock, and an elevated iron ore dock. It is on the Marquette, Houghton & Ontonagon Railroad, and the seat of Baraga county.

Pe-qu-a-qua-wa-ming Point, on the east shore of Keweenaw bay, is $5\frac{1}{2}$ miles N. N. E. $\frac{1}{2}$ E. from Sand Point light, and S. by E. $\frac{1}{2}$ E., 9 miles from Portage entry. In the bay eastward of the point there is good anchorage and protection from all winds, particularly north and northeast winds. A rocky spit extends about one-third of a mile in a southwesterly direction from the point. Hibbard's extensive lumber mill and shingle factory are located there. When in operation they are lighted by electricity, which marks the point. Entering the bay from the northward, the only precaution necessary is to avoid the spit. Come-to in 4 fathoms, with the mills bearing northwest, or run to the slab piers.

PORTAGE RIVER LIGHT-STATION.—A fixed light, varied with red flashes, at intervals of 1 minute, 5th order, visible 12 miles. White stone tower, 45 feet high, connected by a covered way with red brick dwelling. Nearly 1 mile to the eastward of the entrance into Portage river, west shore of Keweenaw bay. North point of Point Abbaye, E., $12\frac{1}{2}$ miles. Sand Point light-house, S. $\frac{1}{2}$ W., $13\frac{1}{2}$ miles.

Portage Range Lights.—Two fixed white lights, visible 10½ and 11 miles. Front light, wooden beacon, 19 feet high. Rear light, lantern on frame dwelling, 25 feet high, both painted white. On the west side of Portage river, near its mouth, and a guide into the cut. Distance between the lights, 500 feet. On range N. by W. and S. by E.

The harbor works consist of a cut connecting the deep water in Portage river with Keweenaw bay. The outer end of the cut is protected by a pier on the east side, extending S. by E., 900 feet, into the bay. The dredged channel extends about 250 yards beyond the pier, and is marked with a red buoy on the east side at the outer end; depth of water, 14 feet. The range lights are on the west side of the river, on the prolongation of the center line of the cut. There is no light on the pier.

In heavy gales from the northeast it is not a safe harbor to make with deep laden vessels. Good shelter can be found in Pe-qua-qua-waming bay, S. by E. ¼ E., 9 miles from the outer end of the cut.

Bete Grise Bay is 35 miles N. E. ½ N. from Portage River light. There is good anchorage in the west end of the bay, and protection from all winds except from E. N. E. by the eastward to S. S. E. The north shore of the bay is bold. A ship-canal connects the bay at its west end with Lac La Belle. There are piers at the entrance to the canal from Bete Grise bay. On the south side of the bay there is a large shoal which extends 1 mile into the lake and around Point Isabelle, the south point of the bay. A few years ago business was suspended at Mendota, the light was discontinued by the Government, and a sand bar formed between the piers. The mining companies dredged a channel between the piers, but the light has not been re-established. The light-keeper's yellow brick dwelling is on the south side of the entrance. The beacon was removed from the pier.

MANITOU LIGHT-STATION.—A fixed white light, varied by white flashes, 3d order, visible 16 miles; interval between the flashes is one minute. Brown, iron cylinder, 70 feet high, on piles, connected with frame dwelling. A coast light on the east point of Manitou island, 6 miles to the eastward of Keweenaw point. During thick and foggy weather a steam-whistle is sounded, giving blasts of 3 and 5 seconds, with intervals of 26 seconds. Stannard's Rock light-house, S. E. ¾ E., 24½ miles. Huron Island light-house, S. S. W. ¼ W., 37½ miles.

Gull Rock Shoal.—Red spar buoy, in 12 feet of water. Marks a recently discovered gravelly shoal near Gull Rock light-house, on which there is less than 12 feet of water. Gull Rock light-house, N. ¾ W., distant seven-eighths of a mile. Southern end of Manitou island, E. ¾ N.

GULL ROCK LIGHT-STATION.—A fixed red light, 4th order, visible 13½ miles. Yellow tower, 39 feet high, rising from keeper's dwelling. On Gull rock, between Manitou island and Keweenaw point and a guide through the passage. Huron island light-house, S. S. W., 35½ miles. Portage River light-house, S. W., 46½ miles. Granite Island light-house, S. by E. ¼ E., 50½ miles.

COPPER HARBOR MAIN LIGHT.—A fixed white light, 4th order, visible 14½ miles. Yellow tower rising from brick dwelling. About 50 yards from the east point of the entrance into Copper harbor. Copper Harbor Range light (front), S. S. W. ¾ W., 980 yards.

COPPER HARBOR RANGE LIGHTS.—Two fixed white

lights, visible $10\frac{1}{2}$ and $12\frac{1}{2}$ miles. Front light, wooden beacon, 16 feet high. Rear light, lantern on frame dwelling, 26 feet high, both painted white. On the south shore of Copper harbor. A guide into the harbor. To enter the harbor: Bring the lights in range, when three-quarters of a mile distant from the front light, and stand in on the range S. $\frac{1}{2}$ W. until well past a patch of rocks, awash on the starboard hand at the entrance, when haul up due west for the west end of the bay and come to about half way between the two docks, and nearest to the north shore, where there is good anchorage and protection from all winds.

Agate Harbor has been entirely deserted for many years; the warehouse and docks were burnt; the target still remains. But, since Range lights were established at Copper harbor and Eagle harbor, Agate harbor is not used as a harbor of refuge.

EAGLE HARBOR LIGHT-STATION.—A fixed light, varied by white flashes at intervals of 2 minutes; 4th order, visible $14\frac{1}{2}$ miles. Red tower, 38 feet high, rising from corner of brick dwelling. On the west point at the entrance into Eagle harbor. Eagle Harbor Range light (front) S. E. $\frac{1}{2}$ E., 750 yards. A steam fog signal to be established at this station.

Eagle Harbor Range Lights.—Two fixed white lights, visible 10 and $11\frac{1}{2}$ miles. Front light, wooden beacon, 19 feet high. Rear light, lantern on frame dwelling, 27 feet high, both painted white. The lights are 1,000 feet apart. On range S: S. E. $\frac{1}{2}$ E. and N. N. W. $\frac{1}{2}$ W. On the south side of the harbor to the westward of the mouth of Cedar creek. To enter the harbor: Bring the lights in range when three-quarters of a mile distant from the front light, and stand in on the range, passing between the two bulkheads which have been constructed across the bar at the entrance to the harbor in line with the range, and when inside of the bulkheads haul to the westward and run to the dock on north side of the bay, or come to off the front range light in the widest part of the harbor. There are only 10 feet at the dock on the south side. The bulkheads or guiding piers are 130 feet apart. The buoys to mark the reef off the entrance have been removed. The bowlders that obstructed the channel between the guiding piers have been removed, and there are now 14 feet in the channel.

The shore from Point Abbaye to Eagle River.—From Pe-qua-qua-wa-ming point a spit extends one-third of a mile to the southwest. A flat fills up most of the bay at Portage entry. Shoal water extends for a mile to the south, to the east and to the north from Point Isabelle. There is a 3-foot spot one-fourth of a mile south of Keeweenaw point. A rocky flat extends from Manitou island to Gull Rock light and for half a mile to the northwest; from Eagle harbor to Eagle river a succession of reefs extend along the coast in a southwest direction, from one-eighth to three-fourths of a mile from shore.

EAGLE RIVER LIGHT-STATION.—A fixed white light, visible 13 miles, 6th order. Lantern on keeper's yellow dwelling, 24 feet high. In the town of Eagle River, and on the west bank of the river, about one-quarter of a mile from the end of the pier. There are two shoals off the river, which commence at a point N. W. by W. $\frac{1}{2}$ W. from its mouth, and extend about 2 miles in a northeasterly direction, parallel to the shore, and distant from it about five-eighths of a mile, with a passage-way between them. To approach the dock through this passage,

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steer S. $\frac{1}{2}$ W. for the end of it, when a mile and a half distant, and the course will lead fair between the shoals. Least water on the shoals, 6 to 10 feet. To approach the dock from the westward of the shoal: Bring the north end of it to bear E. by S. $\frac{1}{2}$ S. and run for it on that bearing, and nearing it haul to the northward in order to range the dock.

At the present time the dock is in a most dilapidated condition, the channel on both sides is filled up with sand, and the shipping business seems to be entirely suspended.

PORTAGE LAKE SHIP-CANAL LIGHT-STATION.—

A fixed white light, visible 14 miles, 3 $\frac{1}{2}$ order. Red tower, 33 feet high, attached to brick dwelling. A coast and harbor light on the west bank of the entrance into Portage Lake ship-channel. Rock of Ages N. W. $\frac{3}{4}$ N., 54 miles. Passage Island light, N. $\frac{1}{2}$ E., 69 miles.

Portage Lake Ship-Canal Pierhead Beacon-light.—

A fixed red light, 6th order, visible 11 $\frac{1}{2}$ miles. White tower, 18 feet high, on an open frame-work foundation, with an iron lantern on top. Elevated walk along the pier to the shore. On the end of the west pier, at the entrance to the Portage Lake ship-channel. The light marks the end of the pier, and is not intended as a range light with the main one. During thick and foggy weather a fog-bell struck by machinery will be sounded—a single blow at intervals of 20 seconds. The bell is on the end of the west pier, connected to the beacon-light tower.

Portage Lake Ship Canal Harbor of Refuge.—The harbor works consist in the construction of two crib piers 1,000 feet in length, enclosing the Lake Superior entrance to the canal. The piers are 250 feet apart at the outer ends; the east pier is straight; direction, N. W. $\frac{1}{2}$ N. The west pier diverges so as to enclose a small basin, which is not dredged. Depth of water usually from 12 to 14 feet. This depth is not always reliable, owing to the formation of a sand bar between the piers, but the bar does not extend far beyond the outer ends of the piers.

To enter the harbor: Bring the lights in range about S. E. by S., and when about one-fourth of a mile from the beacon open the main light a little to the eastward of it, and run in mid-channel; follow the east pier, giving it a berth of about 110 feet, which will lead into the canal. The channel is not dredged close to the piers.

Portage Lake ship-canal connects the head of Portage lake with Lake Superior. The canal is 2 $\frac{1}{2}$ miles in length, 100 feet in width at the narrowest point, and 160 feet in Lily pond, the widest part. Depth of water, 13 feet. The sides of the canal are protected by a pile revetment with a double row of sheet piling.

The Portage Lake Canals have been sold and transferred to the United States, and extensive improvements are contemplated.

The Life Saving Station is on the east bank of the canal about $\frac{1}{2}$ mile from the piers.

ONTONAGON LIGHT-STATION.—A fixed white light, 5th order, visible 13 $\frac{1}{2}$ miles. Yellow tower, 39 feet high, rising from brick dwelling. A coast and harbor light, on the west bank of the mouth of Ontonagon river. La Point light-house, W. S. W. $\frac{3}{4}$ W., 71 miles. Michigan Island light-house, W. $\frac{1}{2}$ S., 55 $\frac{1}{2}$ miles.

Ontonagon Pierhead Beacon-light.—A fixed red light, 6th order, visible 7 miles. White open frame-work tower, 22 feet high,

and at present about 450 feet from the outer end of the west pier. An elevated walk along the pier to the shore. The two lights in range lead to the end of the west pier, although not intended for range lights.

Ontonagon harbor consists of two parallel piers 250 feet apart, extending in a N. W. $\frac{1}{4}$ N. direction from the mouth of the Ontonagon river. As now constructed the west pier extends into the lake 1,700 feet from the shore line, and projects 150 feet beyond the east pier; the outer 150 feet is without superstructure, and vessels entering at night should look out for the submerged eribs. The east pier projects 1,950 feet into the lake beyond the shore line (the shore lines are not opposite each other). The bar outside the piers continues to advance, and the channel across it is uncertain and shifting. Last season the depth of water was from 12 to 13 feet.

The Shore from Eagle River to Ontonagon.—One mile north of the Portage Lake ship-canal there is a spit extending one-half mile to the north, and from 14-mile point there extends also a spit to the north for one-half a mile.

OUTER ISLAND LIGHT-STATION.—A flashing white light, 3d order, visible $19\frac{1}{2}$ miles; interval between flashes is 90 seconds. White brick tower, 78 feet high, connected by a covered way with red brick dwelling. Height of light above lake level, 130 feet. On the north point of Outer island, Apostle group. During thick and foggy weather a steam-whistle is sounded, giving a blast of 8 seconds, with an interval of 52 seconds. Fog signals on the bluff about 300 feet west of the tower. Grand Marais, Minn., N. $\frac{1}{4}$ W., 47 miles. North point of Devil island, W. $\frac{1}{4}$ S., $14\frac{1}{2}$ miles. Good anchorage in the bight on the west side of Outer island, and protection from easterly gales; a sand spit extends from the south point of the island about one-fourth mile with deep water close-to; a shallow spot 1 mile N. by E. $\frac{1}{2}$ E. from the light.

DEVIL ISLAND LIGHT-STATION.—A fixed red light, 4th order, visible 13 miles. Black lantern surmounting a white open frame-work tower, 60 feet high. The upper part is enclosed for a watch-tower. The focal plane is 87 feet above lake level. Red brick dwelling in rear of tower. On the north point of Devil island, the most northerly of the Apostle group. The fog-signal is a 10-inch steam whistle, and in thick or foggy weather will sound blasts of 5 seconds duration with alternate silent intervals of 10 and 40 seconds. The fog-signal house is located on a point about 500 feet northwest from the light-tower. The island is steep-to on all sides. Sand Island light, S. W. $\frac{3}{4}$ W., $11\frac{1}{2}$ miles. Outer Island light, E. $\frac{1}{4}$ N., $14\frac{1}{2}$ miles. Two Harbors light, W. by S. $\frac{1}{4}$ S., $44\frac{1}{2}$ miles.

MICHIGAN ISLAND LIGHT-STATION.—A fixed white light, 3 $\frac{1}{2}$ order, visible $19\frac{1}{2}$ miles. White stone tower, 44 feet high, stone dwelling attached. Light 129 feet above lake level. On the south point of Michigan island, and a guide between Michigan, Magdalene, and Stockton islands to Bayfield and La Pointe. Ontonagon light-house, E. $\frac{1}{4}$ N., $55\frac{1}{2}$ miles. There is a rocky islet three-fourths of a mile north-east of Michigan island with shoal water between it and Michigan island; shoal water extends along the south shore of the island; two dangerous spots lie nearly three-fourths mile south of the light. A spit extends from the northeast point of Magdalene island in an easterly direction nearly three-fourths of a mile. Entering the channel between Michigan and Magdalene islands, bring Michigan Island light to bear N. E. $\frac{3}{4}$ N., 2 miles distant, when steer W. N. W., 5 miles, to a point three-fourths mile north of the northern point of Magdalene island; thence S. W. $\frac{1}{4}$ W., 10 miles, to a point three-fourths of a mile east of Bayfield.

Presque Isle Harbor.—There is good anchorage in the bay on the west side of Presque Isle, and protection from all winds. To make the harbor from the southward, when Michigan Island light bears N. E.

$\frac{3}{4}$ N., distant 2 miles, steer N. W. by N. $4\frac{1}{2}$ miles, when haul up east into the bay and come-to in 7 fathoms.

LA POINTE LIGHT-STATION.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. Lantern on white frame dwelling, light 42 feet above lake level. Near the north end of Chaquamegan point at the south channel entrance into Chaquamegan bay. Ontonagor light house, E. N. E. $\frac{1}{2}$ E., 71 miles. From the southwest point of Magdalene island a 4-foot spit extends in a southeasterly direction for one-half a mile.

The Fog-Signal is a 10-inch steam whistle, gives blasts of 5 seconds with silent intervals of 25 seconds. The signal is on the beach about three-fourths of a mile to the eastward of the light-house.

Entering the South Channel to Bayfield, steer W. by S. $\frac{3}{4}$ S., keeping the south side best on board until La Pointe light bears S. E. $\frac{1}{2}$ E., 1 mile distant, when steer N. $\frac{1}{2}$ W., $4\frac{1}{2}$ miles, to Bayfield; or S. by W. $\frac{1}{2}$ W., 7 miles, thence about S. by W. for the outer end of breakwater.

La Pointe is in the bight on the west end of Magdalene island, $3\frac{1}{2}$ miles to the northward of La Pointe light; it has a safe harbor with good anchorage in 4 fathoms of water off the old dock. At present the dock is in a dilapidated condition and the shipping business entirely suspended.

Bayfield is on the main shore, opposite La Pointe. It has two good docks, with deep water alongside of them. It has an important trade in fish and lumber. In heavy gales from the northeast vessels cannot lie at the docks in Bayfield; at such times La Pointe affords excellent shelter.

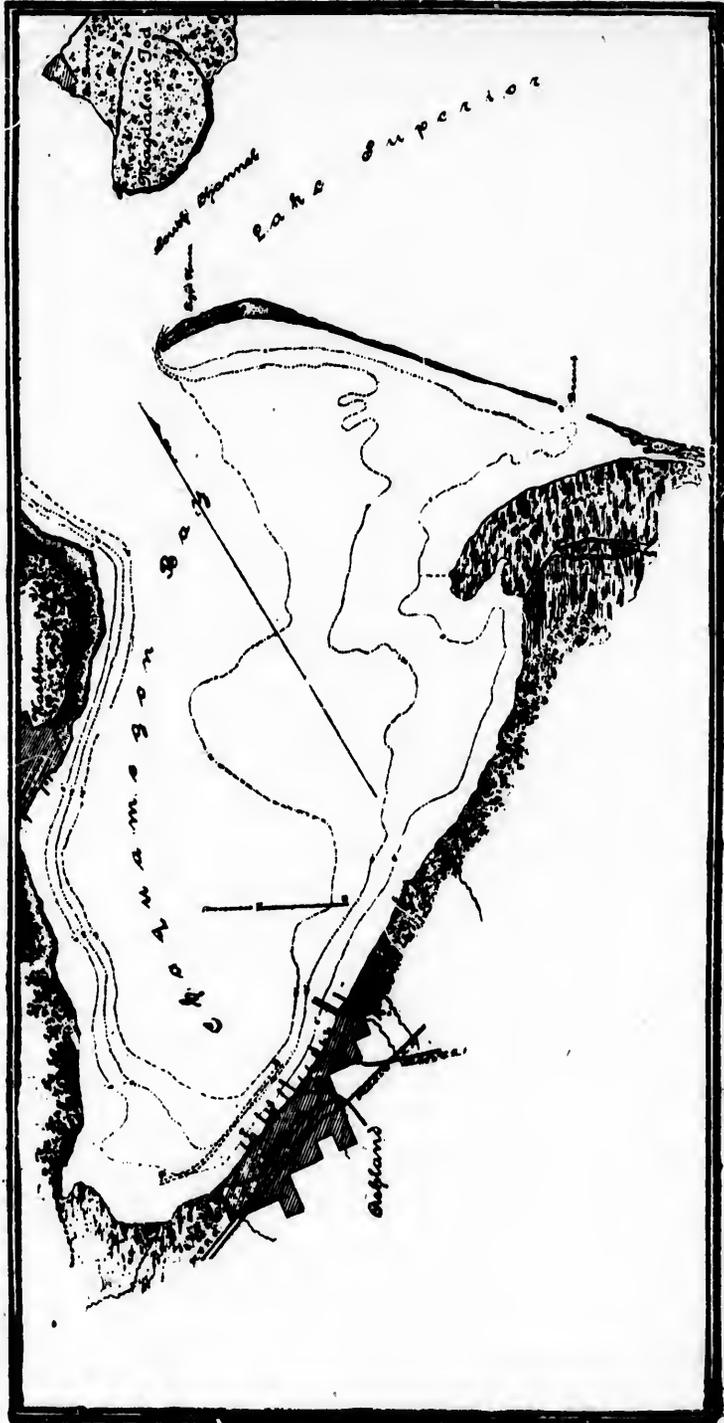
Chaquamegan Bay.—In the bay the 12-foot curve extends 2 miles westward from Oak point. In the head of the bay the 12-foot curve extends $1\frac{1}{2}$ miles from shore. Towards the north, along the west coast of the bay, and as far as Point Detour, there is deep water close to the shore.

Good anchorage and protection from all winds can be found almost anywhere inside the Apostle island.

Washburn is situated on the west shore of Chaquamegan bay, about two miles to the southwestward of Houghton point. It has become quite an important shipping point. It is the lake terminus of the Chicago, St. Paul, M. & O. R. R. There are two docks with deep water alongside of them, one is the general merchandise dock with warehouse on it, and the other is the grain elevator dock; there is a bulkhead connecting the two docks, used for unloading cargoes of coal. At night there is a red light shown from each dock, one on the end of the warehouse, and the other from a window in the elevator.

Ashland is situated near the head of Chaquamegan bay, and is now one of the most important shipping points on Lake Superior.

Harbor Improvements.—The present project is the construction of a breakwater to protect the wharves of the city from the action of the north and northeast storms, and to afford protection to the shipping while loading and unloading, and also for dredging in front of the dock line to provide for vessels drawing 16 feet. As now constructed the breakwater commences in about 12 feet of water and extends in a W. N. W. direction 4,650 feet into the bay, and about 1,000 feet to the eastward of the iron ore docks.



ASHLAND.

Rocky Island and **South Twin island** are connected by shoal water. **North Twin island** has a spit extending half a mile to the southwest. **York island** has a spit extending half a mile to the south. The passage between **Sand island** and the main shore ought not to be attempted by vessels drawing more than 6 feet.

RASPBERRY ISLAND LIGHT-STATION.--A fixed light varied by white flashes, at intervals of 90 seconds, 5th order, visible 15 miles. Lantern on white frame dwelling, light 77 feet above lake level. On the southwest point of **Raspberry island**, **Apostle group**. A guide for the channel between main-land and **Raspberry island**.

To enter **Raspberry Island** passage, bring **Raspberry Island** light to bear S. E. $\frac{1}{2}$ E., and run for it on that course, until **Sand Island** light bears S. W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles, when haul up southeast, 11 miles, until the southwest point of **Oak island** bears N. $\frac{1}{2}$ W., $1\frac{1}{4}$ miles, passing about half a mile southwest of **Raspberry Island** light. Good anchorage on south side of **Raspberry island** and protection from all winds.

SAND ISLAND LIGHT-STATION.—A fixed white light, 4th order, visible 14 miles. Red sandstone tower, 37 feet high, rising from sandstone dwelling. On the north point of **Sand island**.

The shore on the south side of **Lake Superior** from the **Apostle islands** to the head of the lake is bold, and can be approached anywhere within half a mile.

Minnesota Point Light-house (light discontinued).—White stone tower, 45 feet high, connected by covered way with dwelling. On the south end of **Minnesota point**, at the south entrance into **Superior bay** and bay of **Allouez**.

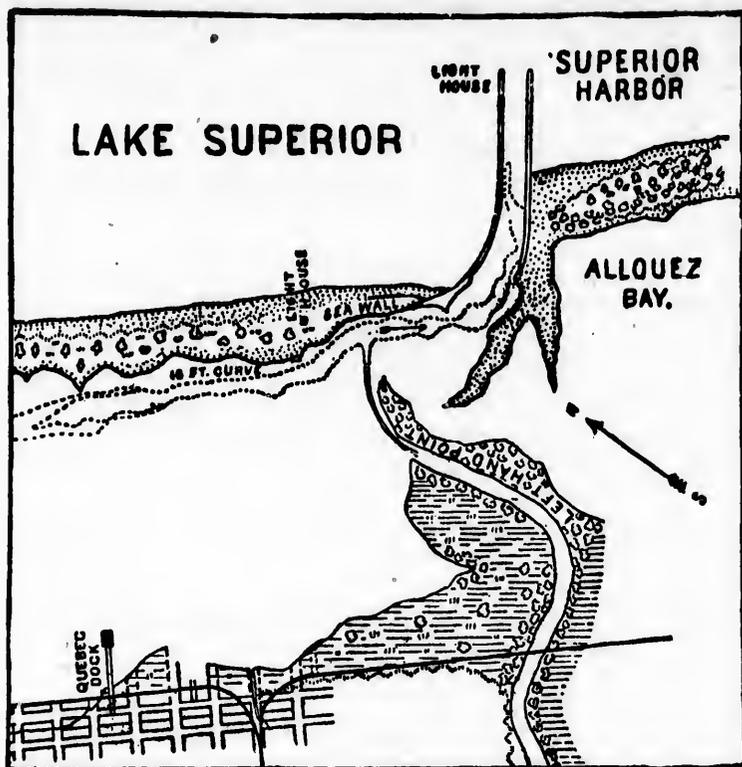
ST. LOUIS RIVER PIERHEAD BEACON-LIGHT.—A fixed white light, 5th order, visible $13\frac{1}{2}$ miles. White frame tower, light 53 feet above lake level. On the outer end of the north pier, at the south entrance to **Superior** and **Allouez** bays.

The harbor works consist of two parallel piers connecting the south end of **Superior bay** with **Lake Superior**, with a dredged channel between them. The piers are 2,500 feet in length and 300 feet apart, extending N. E. $\frac{1}{2}$ E. Present depth of water: On lake approach, 16 feet; entry between the piers, 16 feet; in the **St. Louis River** channel from the entry to **Connor's point**, 16 feet; from **St. Louis River** channel to **North-ern Pacific dock**, 16 feet; in front of **Quebec dock**, 16 feet. The channels are all well buoyed by private enterprise.

Entering the harbor keep straight in midway between the piers, when about half way up, keep nearest the south pier until up to its end, giving it a fair berth, then port slowly and head up just outside the dock opposite the old light house, keeping between the buoys. In northeasterly gales a strong current generally sets out of the piers, and vessels should have good headway until inside the piers.

Tugs are generally at the piers to assist heavy draught vessels to the different points in the bay.

DULUTH PIERHEAD BEACON-LIGHT.—A fixed red light, 4th order, visible $12\frac{1}{2}$ miles. White, open frame-work tower, 37 feet high. On the outer end of the south pier, at the entrance into **Duluth harbor**. During thick and foggy weather a steam-whistle is sounded,

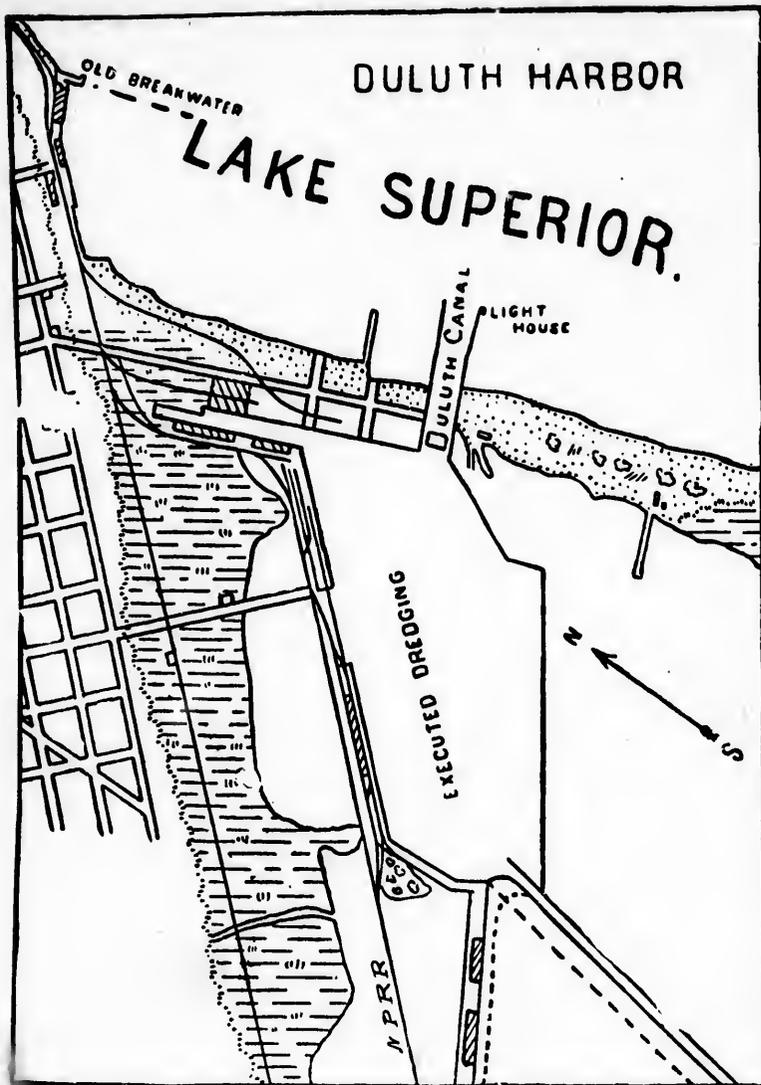


ST. LOUIS.

giving blasts of 5 seconds, followed by an interval of 30 seconds. Fog-signal-house of corrugated iron, connected to the tower. Elevated walk along the pier to the shore. St. Louis River light, S. E. $\frac{1}{2}$ E., $6\frac{1}{4}$ miles.

DULUTH MAIN LIGHT.—A red flashing light, 4th order, giving a red flash every 6 seconds, visible 13 miles. White, square, wooden tower, 64 feet above the lake level, black lantern with brown parapet. The lower part of the tower is open frame-work, the upper part is enclosed for a watch room. On the inner end of the south pier at the entrance to Duluth. This light with the beacon-light forms a range showing the direction of the pier, and the course to be followed in entering the harbor. Beacon-light, N. E. by E., 1,100 feet.

The Harbor of Duluth consists of a canal cut through Minnesota point, connecting Superior bay with Lake Superior. The sides of the canal are protected by piers 300 feet apart, and 1,150 feet in length, extending into the lake N. E. by E. Depth between the piers at the entry, 17 feet, in the harbor 16 feet, in the Blast Furnace channel to a point opposite Elevator E 16 feet. From point opposite Elevator E through dredged channel along east side of Rice's point to the St. Louis river 16 feet. In channel on north shore of St. Louis bay, for a distance of 7,300 feet, there is a depth of 16 feet. Entering the harbor, vessels



should give the end of the south pier a berth of at least 20 feet to avoid rip-rapping. In northeasterly gales a strong current generally sets out of the harbor, or across the end of the piers, when vessels entering require to keep good headway.

TWO HARBORS LIGHT-STATION.—A fixed red light, 4th order, visible 13 miles. Red brick tower, 43 feet high, forms a corner of a two-story red brick dwelling, with red roof. The focal plane is 78 feet above the level of the lake. On the point of land between Agate and Burlington bays. The fog-signal is a 10-inch steam whistle; during thick and foggy weather it will sound blasts of 5 seconds duration, with

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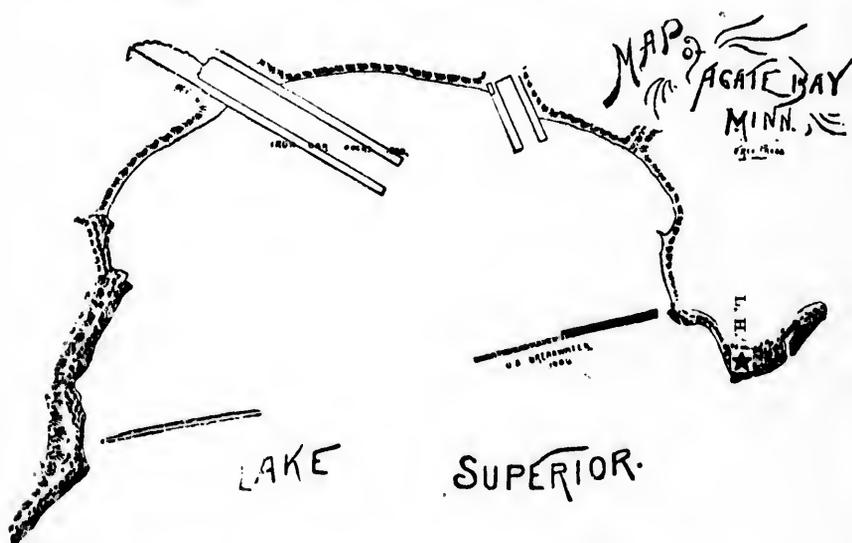
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alternate silent intervals of 17 and 33 seconds. The fog-signal house is located about 100 feet southwest from the light tower, it is an iron structure, painted dark brown. Sand Island light-house E. $\frac{1}{2}$ N. $84\frac{1}{2}$ miles. Isle aux Roches, S. W. $\frac{1}{2}$ S., 7 miles. Devil Island light-house, E. by N. $\frac{1}{2}$ N., $44\frac{1}{2}$ miles.

Two Harbors, or Agate Bay.—Two Harbors is on the north shore of Lake Superior, 27 miles N. E. by N. $\frac{1}{4}$ N. from the St. Louis River Pierhead light, and 45 miles W. by S. $\frac{1}{2}$ S. from a point $1\frac{1}{2}$ miles north of Devil island. It has two elevated iron ore docks with a dredged slip between, where vessels load, the docks extend E. S. E. There are two merchandise docks to the eastward of the ore docks; they extend into the lake S. S. E., and have deep water alongside. The shore around the point between Agate and Burlington bays is bold. Anchorage off the ore docks; vessels must come to close in, as the water is very deep,



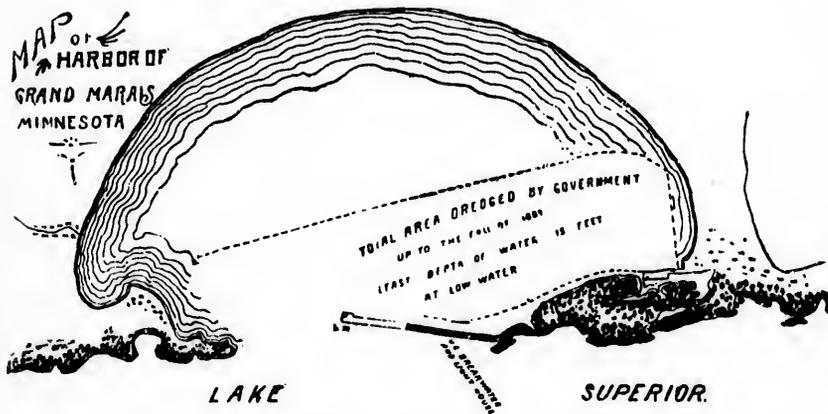
From Duluth to Two Harbors, run out in line with the piers $\frac{1}{4}$ of a mile, when steer N. E. $\frac{1}{4}$ E., 18 miles, until Granite point bears N. W. 1 mile distant; thence N. E. $\frac{1}{4}$ N., 7 miles, to abreast the docks. It is said that vessels can lie at the docks in heavy northeasters.

Breakwater.—The present project for the improvement of this harbor, adopted in 1887, consists in the construction of two breakwater piers extending from the eastern and western points of the bay, the east breakwater to be 1,000 feet in length, and the west 900 feet long, and on a line with each other, leaving an opening of 1,340 feet between the outer extremities and enclosing an area of 109 acres; 750 linear feet of the east breakwater has been completed.

Gooseberry River Reef.—This is a small rocky shoal with only 13 feet of water over it in its shoalest place. Its greatest length is

north and south, being about 400 feet inside the 18-foot curve of the bottom. It does not appear on the chart of the lake survey, and its existence is not generally known. It lies one mile south of Gooseberry river, $\frac{1}{2}$ mile from shore, $1\frac{1}{2}$ miles from Castle Danger reef, and 13 miles north-east of Two Harbors.

GRAND MARAIS (MINN.) PIERHEAD BEACON-LIGHT.—A fixed white light, 5th order, visible $12\frac{1}{2}$ miles. White, square pyramidal tower, lantern black, light 38 feet above lake level. On the outer or west end of breakwater. A fog-bell, struck by machinery, will be sounded from the beacon during thick and foggy weather, giving a double blow at intervals of 30 seconds. Minnesota point, S. W. $\frac{3}{8}$ S., 107 miles. Ontonagon, S. E., 77 miles. Outer Island light, S. $\frac{1}{4}$ E., 47 miles.



Grand Marais Harbor consists of a small bay about 2,500 feet from east to west and 1,400 feet from north to south, semicircular in form, and protected by a breakwater extending from the east point 350 feet W. $\frac{1}{4}$ N. The project is to extend the breakwater 350 feet more, and dredge the entire harbor area within the 5-foot curve of the bottom. At present there is a dredged area of 22 acres 16 feet deep. To enter the harbor: Run in heading from N. E. to N. N. E., haul around the west end of breakwater, giving it a berth of 100 feet, and steer for the dock about E. N. E. The water is deep at the west end of the breakwater, but shoal on the inside caused by rip-rapping. There is 16 feet of water up to the dock.

The north shore of Lake Superior from Duluth to Portage bay is rocky and bold, and can be approached with safety within $\frac{1}{4}$ of a mile. Grand Marais is the only harbor of refuge and the only light between those points.

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Light-Houses and Harbors on Isle Royale and Passage Island.

ISLE ROYALE (MENAGERIE ISLAND) LIGHT-STATION.—A fixed white light, 4th order, visible $15\frac{1}{4}$ miles. White tower, 55 feet high, connected by a covered way with dark-brown dwelling, all stone. On the eastern end of Menagerie island, at the south side of the entrance into Siskiwit bay, Isle Royale. A coast light, and marks the entrance into Siskiwit bay. Manitou light, S. E. by E. $\frac{3}{4}$ E., 66 miles. Portage Lake ship-canal, S. by E., $50\frac{1}{2}$ miles. To make an anchorage in the bay: When half of a mile north of the light, steer W. S. W. $\frac{1}{4}$ S., 11 miles, to near the head of the bay, and come-to in 6 or 7 fathoms nearest to south shore. Good holding ground and protection from all winds except from the northeast.

Dangers.—There are two small patches of rock bearing N. E. by E. from the light, one 950 yards with 8 feet, and the other 1,200 yards with 5 feet of water over it.

Rock Harbor Light-house (light discontinued).—Drab tower, 70 feet high, of mixed stone and brick, connected by a passage-way with brick dwelling. On the west side of the west entrance into Rock harbor, Isle Royale, and about 10 miles from the northeast end of the island. To enter the harbor: Bring the west passage to bear N. W. by W. $\frac{1}{4}$ W., and run in on that course, mid-channel, between the light-house and a group of small islands (Middle islands). The channel is deep but narrow. A rocky ledge extends nearly half-way across the channel from the old light-house, or about 250 feet east of it. When through the passage haul to the west and come-to in 7 or 8 fathoms on the north side of the harbor; the water shoals rapidly; good anchorage, and protection from all winds. Leaving Rock harbor bound to the northward, keep the inside passage N. E. $\frac{3}{4}$ E., about 10 miles, mid-channel; passing out of the channel, look out for the 5-foot spot 1 mile east of Blake's point, the northeast extremity of Isle Royale.

PASSAGE ISLAND LIGHT-STATION.—A fixed red light, 4th order, visible 17 miles. Gray tower, 37 feet high, rising from stone dwelling. Light 97 $\frac{1}{2}$ feet above sea level. On the southwest point of Passage island. A guide through the channel between Isle Royale and Passage island. During thick and foggy weather a 10-inch steam-whistle is sounded, giving blasts of 5 seconds' duration, followed by intervals of 25 seconds. Fog-signal adjoining tower. Five-foot spot 1 mile east of the northeast extreme of Isle Royale, S. S. W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles. The southwest point of Passage island is steep-to. Vessels should keep this side of the passage best on board.

Siskiwit Bay.—In southwest end protection will be found from all winds except from the northeast, also good holding ground $1\frac{1}{2}$ miles south of Wright's island. See Menagerie Island light.

Washington and Grace Harbors are good, giving protection from all except south winds, with generally good holding ground.

Todd's Harbor will afford good protection, except in northerly winds; but care should be taken to avoid the 1-foot spit in the middle of the harbor.

Tobin's Harbor gives protection from all winds, with excellent holding ground. Care should be taken to anchor in the middle, as there is not much room to swing. The entrance is narrow, but the shores are steep-to.

Dangers to be Avoided.

The 6 and 12-foot shoals one-half and one mile to the southwest and south of Rock of Ages should be avoided; also the 8 and 14-foot spits, 1 mile northeast of Rock of Ages, should not be approached without due caution.

The south coast of Isle Royale from Siskiwit bay to the most southern point of Isle Royale should not be approached nearer than 2 miles from shore, as it abounds in ledges and rocky spots, rendering this coast very dangerous.

There is a 3-foot spit three-fourths mile southwest from Washington island, near the entrance to Grace harbor. The coast from Washington harbor to McCargoe's cove shows some detached rocks from one-fourth to one-half mile from shore.—3-foot spit three-fourths mile W. S. W. of Cancee rocks.—5-foot shoal 1 mile east of Blake's point.—9-foot reef $2\frac{1}{2}$ miles W. N. W. of Gull islands.—1 and 3-foot spots one-half a mile south of Gull islands.—3-foot spot one-third mile east of Batteau rocks. Foul ground within one-half mile around Wright's island in Siskiwit bay.

Compass Courses and Distances on Lake Superior.

NOTE.—Courses and bearings corrected for magnetic variation. Distances in statute miles.

Point Iroquois to White Fish Point.—When $1\frac{1}{2}$ miles northeast of Point Iroquois light, steer N. W. $\frac{3}{4}$ N., $25\frac{1}{2}$ miles, until White Fish Point light bears southwest $1\frac{1}{2}$ miles distant, when follow around the point 1 mile until the light bears south $1\frac{1}{2}$ miles distant.

White Fish Point to Duluth.—When $1\frac{1}{2}$ miles north of the light, steer W. by N. $\frac{3}{4}$ N., $145\frac{1}{2}$ miles, to a point 2 miles north of Copper Harbor main light, passing about 12 miles to the northward of Stannard Rock light, and $1\frac{1}{2}$ miles north of Manitou light; thence W. 7 miles, thence W. by S. 8 miles to a point 2 miles off Eagle Harbor main light, and in line of the range lights, keeping two miles off shore; thence steer W. by S. $\frac{1}{2}$ S., 124 miles, to a point $1\frac{1}{2}$ miles N. $\frac{3}{4}$ W. of Devil island, passing about 5 miles north of Outer Island light; thence W. S. W. $\frac{1}{2}$ S., 68 miles, to within $\frac{1}{2}$ mile of the beacon, and in range of the two lights at Duluth.

White Fish Point to Ashland.—When 2 miles off Eagle Harbor main light as in the course to Duluth from White Fish point, steer S. W. by W. $\frac{1}{2}$ W., 135 miles, to a point 1 mile N. W. $\frac{3}{4}$ W. from La Point light, thence S. by W. $\frac{1}{2}$ W., 8 miles, to the outer end of the proposed extension of the breakwater at Ashland.

White Fish Point to Two Harbors.—When 2 miles off Eagle Harbor main light as in the course from White Fish point to Duluth, steer W. by S. $\frac{1}{2}$ S., keeping a little to the westward, for 168

miles, to a point 1 mile south of the breakwater at Agate bay or Two Harbors, passing 8 miles north of Outer Island light and 5 miles north of Devil Island.

White Fish Point to Grand Marais.—When $1\frac{1}{2}$ miles north of the light, steer W. $\frac{1}{2}$ S., 15 miles, until past Point Vermilion; thence W. $\frac{3}{4}$ S., 34 miles, to a point 1 mile north of the piers.

White Fish Point to Grand Island Harbor.—When $1\frac{1}{2}$ miles north of the light, steer W. $\frac{1}{2}$ S., $56\frac{1}{2}$ miles, until Big Sable light bears south distant 2 miles; when steer S. W. $\frac{3}{4}$ W., $18\frac{1}{2}$ miles, to a point one-half mile north of Grand Portal; thence S. W. $\frac{1}{2}$ S., $10\frac{1}{2}$ miles, to abreast of the beacon. See Grand Island Harbor Beacon for further directions.

White Fish Point to Marquette.—When $1\frac{1}{2}$ miles north of the light, steer W. $\frac{1}{2}$ S., $56\frac{1}{2}$ miles, until Big Sable light bears south 2 miles distant; when steer W. by S. $\frac{1}{2}$ S., 60 miles, to the beacon on breakwater. This course leads $4\frac{1}{2}$ miles north of Grand Island light.

White Fish Point to Portage Entry.—When $1\frac{1}{2}$ miles north of the light, steer W. $\frac{1}{4}$ N., 145 miles, to a point $1\frac{1}{2}$ miles N. $\frac{3}{8}$ W. of Huron Island light; whence steer W. $\frac{1}{2}$ S., 20 miles, or until the lights at the entry are in range, passing three-fourths of a mile south of Portage River light.

White Fish Point to Mendota (Lac La Belle).—When $1\frac{1}{2}$ miles north of the light, steer W. by N. $\frac{3}{8}$ N., 146 miles, ranging on Mt. Bohemia, and passing 4 miles north of Stannard's Rock light, until Mendota light-house (light discontinued) bears W. $\frac{3}{8}$ S., when haul up on that bearing for the canal, 2 miles distant.

White Fish Point to Copper Harbor.—When $1\frac{1}{2}$ miles north of the light, steer W. by N. $\frac{3}{8}$ N., $145\frac{1}{2}$ miles, passing $1\frac{1}{2}$ miles north of Manitou light, until abreast of Copper harbor, $1\frac{1}{2}$ miles distant, and in line of the range lights.

White Fish Point to Rock Harbor (Isle Royale).—When $1\frac{1}{2}$ miles north of the light, steer N. W. by W. $\frac{5}{8}$ W., $192\frac{1}{4}$ miles, ranging on the light-house to within one-half mile of it, when see Rock Island light-house for further directions.

White Fish Point to Silver Islet Landing.—When $1\frac{1}{2}$ miles north of the light, steer N. W. by W. $\frac{3}{8}$ W., 187 miles, to a point 1 mile south of Passage Island light; thence W. by N. $\frac{1}{2}$ N., $22\frac{1}{2}$ miles, to the north entrance to the landing, passing two-thirds mile northward of Silver islet. Silver Island landing is on the main shore behind Burnt island. To make the landing from the southward, when 1 mile south of Passage island light, steer W. by N. $\frac{1}{2}$ N., 22 miles, to a point one-fourth mile W. $\frac{1}{2}$ S. of the crib on Silver islet, thence about N. W. $\frac{1}{4}$ W., until the passage between Burnt island and the main shore is fairly open, when steer in mid-channel about N. E. $\frac{1}{4}$ E., keeping a lookout for patches of rocks on each side; there are two high posts of the wharf on which range lights are sometimes placed to guide to the dock at night.

White Fish Point to Port Arthur.—When 1 mile south of Passage Island light, as in the course to Silver islet, steer W. $\frac{5}{8}$ N. $28\frac{1}{2}$ miles, until Thunder Cape light bears N. E. $\frac{1}{2}$ N., distant 2 miles, thence N. W. $\frac{3}{4}$ W., $9\frac{1}{2}$ miles, to a point three fourths mile northeast of the Welcome islands; thence N. W. $\frac{1}{4}$ W., 6 miles, to the dock at Port Arthur.

White Fish Point to Caribou Island.—When $1\frac{1}{2}$ miles north of the light, steer N. W. $\frac{1}{2}$ W., $55\frac{1}{2}$ miles, to a point 4 miles southwest of the south point, and avoid the extensive reef which spreads out from the southwest point of the island.

White Fish Point to Nepigon Bay.—When $1\frac{1}{2}$ miles north of the light, steer N. W. $\frac{1}{2}$ N., 183 miles, to a point 1 mile south of Battle Island light, passing $2\frac{1}{2}$ miles to the northeastward of the north point of Caribou island.

White Fish Point to Michipicoten Island.—When $1\frac{1}{2}$ miles north of the light, steer N. W. by N., 74 miles, to a point 3 miles southwest of Michipicoten Island light.

White Fish Point to Michipicoten River.—When 2 miles east of White Fish Point light, steer N. $\frac{1}{2}$ W., 56 miles, to a point $3\frac{1}{2}$ miles west of Cape Choyye, passing $1\frac{1}{2}$ miles west of Cape Gargantua; thence N. E. by N. $\frac{1}{2}$ N., $17\frac{1}{2}$ miles, to a point 3 miles southwest of the entrance to the river.

White Fish Point to Montreal River.—When 2 miles east of White Fish Point light, steer N. by E. $\frac{1}{2}$ E., 30 miles; thence northeast, $5\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles west of the entrance to the river.

Grand Marais to Marquette.—When 1 mile north of the piers, steer W. $\frac{1}{2}$ N., 8 miles, to a point 2 miles north of Big Sable light, when see course from White Fish point to Marquette.

Grand Marais to Manitou Island and Copper Harbor.—When 1 mile north of piers, steer N. W. by W. $\frac{1}{2}$ W., 92 miles, to a point $1\frac{1}{2}$ miles north of Manitou light; thence W. by N. $\frac{1}{2}$ N., 13 miles, to a point $1\frac{1}{2}$ miles off, and in range of the lights, to guide into the harbor.

Grand Marais to Portage Entry.—When 1 mile north of the piers, steer W. $\frac{1}{2}$ N., 98 miles, to a point $1\frac{1}{2}$ miles north of Huron Island light, whence see course from White Fish point to Portage entry.

Grand Island Harbor to Marquette.—Run out on the range lights N. by W. $\frac{1}{2}$ W., about 6 miles, to a point 1 mile N. E. $\frac{1}{2}$ N. from the north point of Wood island, when steer W. $\frac{1}{2}$ N., 131 miles, until Laughing Fish point bears south, distant 1 mile, thence W. $\frac{1}{2}$ S., 17 miles, to the beacon-light at Marquette.

Grand Island Harbor to Copper Harbor.—When 1 mile N. E. $\frac{1}{2}$ N. from the north point of Wood island, as in the last course, steer N. W. $\frac{1}{2}$ N., 75 miles, to a point $1\frac{1}{2}$ miles north of Manitou light, when see course from Grand Marais to Manitou and Copper harbor.

Grand Island Harbor to Portage Entry.—Run out on the ranges N. by W. $\frac{1}{2}$ W., about 8 miles, until Grand Island light bears E. $\frac{1}{2}$ N., 3 miles distant, when steer W. N. W. $\frac{1}{2}$ N., 66 miles, to a point $1\frac{1}{2}$ miles north of Huron Island light, when see course from White Fish point to Portage entry.

Marquette to Portage Entry.—When 1 mile east of Marquette light, steer N. $\frac{1}{2}$ W., $4\frac{1}{2}$ miles, until the north point of Presque Isle bears southwest, 2 miles distant, passing one-quarter of a mile east of the rocks extending five-eighths of a mile east of the north end of Presque Isle, when steer N. W. $\frac{1}{2}$ N., 22 miles, until Big Bay point bears S. W. $\frac{1}{2}$ S., 2 miles, thence W. N. W., 18 miles, to a point $1\frac{1}{2}$ miles N. $\frac{1}{2}$ W. of

Huron Island light, when see course from White Fish point to Portage entry.

To Run Inside the Rocks off Presque Isle.—When abreast the pierhead beacon-light, steer N. E. by E., about 1 mile, until Granite Island light opens by Presque Isle, when haul up for it N. by W. $\frac{1}{4}$ W., 6 miles, passing mid-channel between Presque Isle and the rocks, when steer N. W. $\frac{1}{4}$ N., 20 miles, until Big Bay point bears S. W. $\frac{1}{4}$ S., 2 miles, whence see preceding course to Portage entry.

Marquette to Mendota (Lac La Belle).—When 2 miles northeast of Presque Isle, as in the course to Portage entry, steer N. W. by N. $\frac{3}{8}$ N., 60 miles, ranging on Mt. Houghton, until the light-house (discontinued) at the entrance to the canal bears W. $\frac{3}{8}$ S., 2 $\frac{1}{2}$ miles distant, when steer for it.

Marquette to Manitou Passage.—When 2 miles northeast of Presque Isle, as in the course to Portage entry, steer N. by W. $\frac{3}{4}$ W., 57 $\frac{1}{2}$ miles, passing half a mile east of Granite Island light, until Gull Rock light bears N. E. $\frac{1}{4}$ N., 1 $\frac{1}{2}$ miles, or about midway between it and the southeast extreme of Keweenaw point, when follow around the coast, keeping 1 mile from shore for 11 $\frac{1}{2}$ miles to Copper harbor.

Marquette to Stannard Rock.—When 1 mile east of main light, steer N. $\frac{3}{8}$ E., 44 miles, to a point one-eighth of a mile west of day beacon.

Huron Island to L'Anse.—When 1 $\frac{1}{2}$ miles N. $\frac{3}{8}$ W. of Huron Island light, steer W. $\frac{1}{4}$ S., 10 miles, passing three-quarters of a mile north of Pointe Abbaye, thence S. W. $\frac{3}{8}$ W., 13 miles, until Pe-quaw-ming point bears E. S. E., 1 $\frac{1}{2}$ miles, thence S. $\frac{1}{2}$ W., 7 miles, to the railroad wharf at L'Anse.

L'Anse to Portage Entry.—From the merchandise dock steer N. $\frac{1}{8}$ E., 14 $\frac{1}{2}$ miles, to a point three-quarters of a mile S. by E. $\frac{3}{8}$ E. of the pier at the entry, and in line of the range lights.

Portage River.—All the dangers are marked with buoys. Running up, keep about the middle of the river and cuts. Generally the buoys can be seen from one to another. Some precaution is necessary to prevent meeting steamers or tows in narrow water. Leave red buoys to starboard and black to port. Least water in channel, 13 feet. From the entry to the head of river is 6 miles. Passing into Portage lake, steer N. by W. $\frac{3}{8}$ W., 4 $\frac{1}{2}$ miles, until a point three-quarters of a mile below Dollar bay bears E. $\frac{3}{8}$ N., one-quarter of a mile; thence N. $\frac{3}{8}$ W., five-eighths of a mile, until Dollar bay is seen through the middle of the passage to it; when steer W. by N. $\frac{1}{4}$ N., in mid-channel, 2 $\frac{1}{2}$ miles until past the old dock at the Isle Royale stamp mill; thence in mid-channel half a mile to the docks at Houghton, on the south side, or to Hancock, on the north. The signal to open the bridge is 4 blasts of the whistle. From Hancock to the Portage Lake ship-canal the distance is 7 $\frac{1}{2}$ miles; good wide channel.

There is a shoal which extends off the Quincy dump about 300 feet. The shoalest spot is nearly in the center line of the north opening in the bridge and about 600 feet above the bridge.

Portage Entry to Mendota (Lac La Belle).—When 2 miles E. by S. from Portage River light, steer N. E. $\frac{3}{4}$ N., 34 $\frac{1}{2}$ miles, until Mt. Houghton bears N. W. by N. $\frac{3}{8}$ N., and the entrance to the

canal N. W. by W. $\frac{3}{8}$ W., when steer N. W. by N. $\frac{3}{8}$ N., until the entrance bears W. $\frac{3}{8}$ S., 2 miles distant, when run for it on that bearing.

Portage River to Manitou Passage.—When 2 miles E. by S. from Portage River light, steer N. E. $\frac{1}{8}$ N., 45 miles, ranging on Gull Rock light until within $1\frac{1}{2}$ miles of it, and in mid-channel, when follow around the coast, keeping about 1 mile from shore for $11\frac{1}{2}$ miles, to Copper harbor.

Manitou Island to Passage Island.—When 1 mile north-east of the light, steer N. W. $\frac{3}{4}$ N., 66 miles, to a point 1 mile south of Passage Island light.

Manitou Island to Rock Harbor.—When 1 mile northeast of the light, steer N. W. $\frac{3}{8}$ W., 65 miles, until the light-house (discontinued) bears N. W. by W. $\frac{1}{2}$ W. See directions for entering the harbor.

Manitou Island to Copper Harbor.—When 1 mile north east of the light, steer W. by N. $\frac{3}{8}$ N., 11 miles, thence W. $\frac{1}{8}$ N., 3 miles to a point 1 mile off, and in line of the range lights.

Manitou Island Passage to Ontonagon and Intermediate Ports.—When $1\frac{1}{2}$ miles S. W. $\frac{1}{8}$ S. from Gull Rock light, follow around the coast at a distance of not less than one mile for 33 miles, to a point 2 miles N. W. $\frac{3}{8}$ W. from Eagle River light, keeping a lookout for the reefs extending along the coast from Eagle harbor to Eagle river; thence S. W. $\frac{3}{8}$ W., $60\frac{1}{2}$ miles, until the two lights at Ontonagon are in range, distant $1\frac{1}{2}$ miles from the beacon.

Copper Harbor to Rock Harbor (Isle Royale).—When 1 mile N. $\frac{5}{8}$ E. from front beacon, and in line of the range lights, steer N. W. $\frac{1}{4}$ N., 53 miles, until the light-house (discontinued) bears N. W. by W. $\frac{1}{2}$ W. See directions for entering the harbor.

Copper Harbor to Passage Island.—When 1 mile N. $\frac{5}{8}$ E. from the front beacon, and in line of the range lights, steer N. N. W. $\frac{3}{8}$ W., 56 miles, to a point 1 mile south of Passage Island light. See course from White Fish point to Port Arthur and Silver islet.

Copper Harbor to Eagle Harbor.—When 1 mile N. $\frac{5}{8}$ E. from front beacon, and in line of the range lights, steer W. 7 miles, thence W. by S. $7\frac{3}{4}$ miles, to a point $1\frac{1}{2}$ miles from Eagle harbor and in line of the range lights, keeping 1 mile from shore.

Eagle Harbor to Rock Harbor (Isle Royale.)—When $1\frac{1}{2}$ miles from front beacon, and in line of the range lights, steer N. N. W. $\frac{1}{2}$ W., $46\frac{1}{2}$ miles, until the light-house (discontinued) bears N. W. by W. $\frac{1}{2}$ W., about 1 mile distant.

Eagle Harbor to Passage Island.—When $1\frac{1}{2}$ miles from front beacon, and in line of the range lights, steer N. by W. $\frac{1}{4}$ W., $52\frac{1}{2}$ miles, to a point 1 mile south of Passage Island light.

Eagle Harbor to Devil Island and Duluth.—When 2 miles N. N. W. $\frac{3}{8}$ W. from front beacon, and in line of the range lights, steer W. by S. $\frac{1}{2}$ S., 124 miles, to a point $1\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Devil island, thence W. S. W. $\frac{1}{2}$ S., 68 miles, until Duluth light bears S. W. by W., distant half a mile, when see Duluth harbor.

Eagle Harbor to Bayfield.—When 2 miles N. N. W. $\frac{5}{8}$ W. from front beacon, and in line of the range lights, steer W. S. W. $\frac{1}{4}$ S., 123 miles, to a point three-fourths mile north of the north point of Mag-

dalene island, passing $1\frac{1}{2}$ miles north of Michigan island and one-half mile south of Presque Isle point, thence S. W. $\frac{1}{2}$ W., 10 miles, to a point three-fourths of a mile east of Bayfield.

Eagle Harbor to La Pointe.—When 2 miles N. N. W. $\frac{5}{8}$ W. from front beacon, and in line of the range lights, steer S. W. by W. $\frac{1}{2}$ W., 135 miles, to a point 1 mile N. W. $\frac{5}{8}$ W. of La Pointe light; thence N. $\frac{5}{8}$ W., $4\frac{1}{2}$ miles, to Bayfield.

Eagle Harbor to Eagle River.—When $1\frac{1}{2}$ miles N. N. W. $\frac{5}{8}$ W. from front beacon, and in line of the range light, steer W. S. W., $7\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles N. W. $\frac{1}{2}$ N. from Eagle River light, not approaching the shore within 1 mile. Eagle Harbor light kept open to the northward of the shore west of it, leads north of the reef off Eagle river.

Eagle River to Portage Lake Ship-Canal.—When $1\frac{1}{2}$ miles N. W. $\frac{1}{2}$ N. from Eagle River light, steer S. W. $\frac{5}{8}$ W., 20 miles, until Portage Lake Ship-Canal Pierhead light bears S. E. by S., distant 2 miles.

Eagle River to Ontonagon.—When $1\frac{1}{2}$ miles N. W. $\frac{1}{2}$ N. from Eagle River light, steer S. W. $\frac{5}{8}$ W., $61\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles northwest of Ontonagon Pierhead beacon-light.

Portage Lake Ship-Canal to Devil Island and Superior City.—When 2 miles N. W. by N. of pierhead beacon-light, steer W. by S., $98\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Devil island; thence S. W. by W., 66 miles, to a point 1 mile N. E. $\frac{1}{4}$ E. from St. Louis River Pierhead light.

Portage Lake Ship-Canal to Bayfield.—When 2 miles N. W. by N. of pierhead beacon-light, steer W. by S. $\frac{7}{8}$ S., 97 miles, to a point three-fourths mile north of the most northerly point of Magdalene island; thence S. W. $\frac{1}{2}$ W., 10 miles, to a point three-fourths mile east of Bayfield.

Portage Lake Ship-Canal to Port Arthur and Silver Island.—When 2 miles N. W. by N. of pierhead beacon-light, steer N. $\frac{5}{8}$ E., 68 miles, to a point 1 mile south of Passage Island light, when see course from White Fish point to Port Arthur and Silver islet. Or when 2 miles N. W. by N. of pierhead beacon, steer N. W., 55 miles, to a point 3 miles W. $\frac{1}{2}$ S. from Rock of Ages, keeping a lookout for shoal spots southwest of it, when steer N. N. E. $\frac{1}{4}$ E., 35 miles, until Thunder Cape light bears N. $\frac{1}{2}$ W., 3 miles, thence N. W. $\frac{5}{8}$ W., $11\frac{1}{2}$ miles, to a point three-fourths mile northeast of Welcome islands, when steer N. W. $\frac{7}{8}$ W., 6 miles, to the dock at Port Arthur.

Portage Lake Ship-Canal to Ontonagon.—When 2 miles N. W. by N. of pierhead beacon-light, steer S. W. $\frac{5}{8}$ W., $41\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles northwest of Ontonagon Pierhead beacon-light.

Portage Lake Ship-Canal to Grand Marais.—When 2 miles N. W. by N. of pierhead beacon-light, steer W. by N. $\frac{5}{8}$ N., $85\frac{1}{2}$ miles, to a point 1 mile south of beacon-light.

Portage Lake Ship-Canal to Ashland.—When 2 miles N. W. by N. of pierhead beacon-light, steer S. W. by W. $\frac{1}{4}$ W., 109 miles, to a point 1 mile N. W. $\frac{5}{8}$ W. from La Pointe light, thence S. by W. $\frac{1}{4}$ W., 8 miles, to the outer end of the proposed extension of the break-water at Ashland.

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Ontonagon to Bayfield.—When 1 mile northwest from pierhead beacon-light, steer W. $\frac{3}{4}$ S., $56\frac{1}{2}$ miles, ranging on the east end of Magdalene island until Michigan Island light bears N. E. $\frac{5}{8}$ N., distant 2 miles, when steer W. N. W., 5 miles, to a point three-fourths mile north of the northern point of Magdalene island; thence S. W. $\frac{1}{2}$ W., 10 miles, to a point three-fourths mile east of Bayfield.

Ontonagon to Duluth and Superior City, passing between the Apostle Islands.—When 2 miles S. W. $\frac{5}{8}$ S. from Michigan Island light, as in the last course, steer W. N. W. $\frac{1}{2}$ W., 7 miles, until the west end of Stockton island bears N. $\frac{3}{8}$ W.; whence steer W. $\frac{3}{8}$ S., 4 miles, until the southwest point of Oak island bears N. $\frac{3}{4}$ W., 1 mile distant, when steer northwest 11 miles until Sand Island light bears S. W. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles, passing one-half mile southwest of Raspberry Island light, when steer S. W. by W. $\frac{3}{4}$ W., $59\frac{1}{2}$ miles, until Duluth light bears S. W. by W., distant one-half mile; or steer S. W. by W. $\frac{1}{2}$ W., 57 miles, to a point 1 mile N. E. $\frac{1}{2}$ E. from St. Louis River Pierhead light.

Ontonagon to Duluth and Superior City, passing north of the Apostle Islands.—When 1 mile northwest from pierhead beacon-light, steer W. by N., $52\frac{1}{2}$ miles, until Outer Island light bears S. S. W. $\frac{1}{2}$ S., $2\frac{1}{2}$ miles; thence W. $\frac{5}{8}$ S., $15\frac{1}{2}$ miles, to a point $1\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Devil island; whence see course from Eagle harbor to Devil island and Duluth, and from Portage Lake ship-canal to Devil island and Superior City.

Ontonagon to Bayfield (south channel).—When 1 mile northwest from pierhead beacon-light, steer W. by S. $\frac{3}{8}$ S., keeping $\frac{1}{2}$ mile from shore along the Porcupine mountains for $71\frac{1}{2}$ miles, until La Pointe light bears S. E. $\frac{3}{8}$ E., 1 mile, when steer N. $\frac{3}{8}$ W., $4\frac{1}{2}$ miles to Bayfield.

Ontonagon to Grand Marais.—When 1 mile northwest from pierhead beacon-light, steer northwest 75 miles until Grand Marais (Minn.) light bears northeast 1 mile distant.

Ontonagon to Port Arthur and Silver Islet.—When 1 mile northwest from pierhead beacon-light, steer N. $\frac{3}{4}$ W., 68 miles, to a point 3 miles W. $\frac{1}{2}$ S. of Rock of Ages, when see courses from Portage Lake ship-canal to Port Arthur. To make Silver islet when 3 miles W. $\frac{1}{2}$ S. from Rock of Ages, steer N. N. E. $\frac{3}{4}$ E., 37 miles, until Thunder Cape light bears N. W. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles, when steer N. E. $\frac{1}{2}$ E., $5\frac{3}{8}$ miles to Silver Islet landing.

Bayfield to Bay City and Ashland.—When abreast of dock close-to, steer S. $\frac{5}{8}$ E., $4\frac{3}{4}$ miles, until La Pointe light bears S. E. $\frac{5}{8}$ E., 1 mile distant, when steer S. by W. $\frac{1}{2}$ W., 8 miles, to the outer end of the proposed extension of the breakwater.

Bayfield to Duluth and Superior City.—When three-fourths of a mile east of Bayfield, steer N. by E. $\frac{5}{8}$ E., 7 miles, until the southwest point of Oak island bears N. $\frac{3}{4}$ W., 1 mile; when see course from Ontonagon to Duluth and Superior city, passing between the Apostle islands.

Bayfield to Grand Marais.—When three-fourths of a mile east of Bayfield, steer N. E. $\frac{1}{2}$ E., 10 miles, to a point three-fourths of a mile north of the most northerly point of Magdalene island, thence E. N. E. $5\frac{1}{2}$ miles, passing half a mile south of Presque Isle point, until the east point of Stockton island bears N. $\frac{5}{8}$ W., $3\frac{1}{2}$ miles; thence N. $\frac{1}{2}$ E., 12

miles, passing half a mile east of Stockton island and 1 mile west of Outer island, until Outer Island light bears E. $\frac{3}{4}$ N., distant $2\frac{1}{2}$ miles, when steer N. $\frac{1}{2}$ E., $46\frac{1}{2}$ miles, until Grand Marais Pierhead light, bears northeast 1 mile distant.

Bayfield to Silver Islet Landing and Port Arthur.—

When $3\frac{1}{2}$ miles S. $\frac{3}{4}$ E. of the east point of Stockton island, as in the last course, steer N. N. E. $\frac{1}{4}$ E., 85 miles, to a point 3 miles W. $\frac{1}{2}$ S. from Rock of Ages; thence N. N. E. $\frac{1}{4}$ E., 37 miles, until Thunder Cape light bears N. W. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles, when steer N. E. $\frac{1}{2}$ E., $5\frac{3}{4}$ miles, to Silver Islet landing. Or to make Port Arthur, when 3 miles W. $\frac{1}{2}$ S. of Rock of Ages, steer N. N. E. $\frac{1}{4}$ E., 35 miles, until Thunder Cape light bears N. $\frac{1}{2}$ W., 3 miles; thence N. W. $\frac{3}{4}$ W., $11\frac{1}{2}$ miles, to a point three-fourths of a mile northeast of Welcome islands, when steer N. W. $\frac{1}{2}$ W., 6 miles, to the docks at Port Arthur.

Sand Island to Beaver Bay.—When the light bears S. W. $\frac{1}{2}$ W., distant $3\frac{1}{2}$ miles, steer N. W. by W. $\frac{1}{2}$ W., 25 miles, to the bay.

Superior City to Two Harbors.—When 1 mile N. E. $\frac{1}{2}$ E. from St. Louis River Pierhead light, steer N. N. E. $\frac{1}{4}$ E., 25 miles, to a point 1 mile south of the breakwater at Two Harbors.

Superior City to Beaver Bay.—When 1 mile N. E. $\frac{1}{2}$ E. from St. Louis River Pierhead light, steer N. E. $\frac{1}{4}$ N., 50 miles, to a point 1 mile south of the bay.

Superior City to Grand Marais.—When 1 mile N. E. $\frac{1}{2}$ E. from St. Louis River Pierhead light, steer N. E. $\frac{3}{4}$ N., 105 miles until Grand Marais Pierhead light bears northeast, 1 mile distant.

Superior City to Silver Islet Landing and Port Arthur.—When 1 mile N. E. $\frac{1}{2}$ E. from St. Louis River Pierhead light, steer N. E. $\frac{1}{2}$ E., 146 miles, to a point 3 miles W. $\frac{1}{2}$ S. from Rock of Ages; when see course from Bayfield to Silver Islet landing and Port Arthur.

Superior City to Duluth.—Run out in a line with the piers, half a mile, and haul up northwest, 6 miles, until Duluth light bears S. W. by W., half a mile distant.

Duluth to Two Harbors.—When $\frac{1}{2}$ mile outside the beacon and in line of the two lights at Duluth, steer N. E. $\frac{1}{2}$ E., 18 miles, or until Granite Point bears N. W., 1 mile, thence N. E. $\frac{1}{2}$ N., 7 miles, to a point 1 mile south of the breakwater at Two Harbors.

Duluth to Beaver Bay.—When $\frac{1}{2}$ mile outside the beacon and in line of the two lights at Duluth, steer N. E. $\frac{1}{2}$ E., 27 miles, until the point on the east side of Agate bay bears west, $2\frac{1}{2}$ miles; thence N. E. $\frac{3}{4}$ N., $23\frac{1}{2}$ miles, to a point 1 mile south of the bay.

Duluth to Grand Marais.—When $\frac{1}{2}$ mile outside the beacon and in line of the two lights at Duluth, steer N. E. $\frac{1}{2}$ E., 18 miles, until Granite point bears N. W., 1 mile; thence N. E. $\frac{1}{4}$ N., 87 miles, until Grand Marais Pierhead light bears northeast, distant 1 mile.

Duluth to Port Arthur and Silver Islet Landing.—When $\frac{1}{2}$ mile outside the beacon and in line of the two lights at Duluth, steer N. E. $\frac{3}{4}$ E., 171 miles, passing 2 miles southeast of Lucille island until the highest peak on the west end of Pie island bears N. W. $\frac{1}{2}$ W., 7 miles distant; thence N. N. E. $\frac{1}{4}$ E., $9\frac{1}{2}$ miles, until Thunder Cape light bears N. $\frac{1}{2}$ W., 3 miles; thence N. W. $\frac{3}{4}$ W., $11\frac{1}{2}$ miles, to a point three-

fourths of a mile northeast of Welcome islands, when steer N. W. $\frac{1}{2}$ W., 6 miles, to the docks at Port Arthur. To make Silver Islet landing: When the highest peak of Pie island bears N. W. $\frac{1}{2}$ W., 7 miles, steer N. N. E. $\frac{1}{4}$ E., 11 $\frac{1}{2}$ miles, until Thunder Cape light bears N. W. $\frac{1}{2}$ W., 1 $\frac{1}{2}$ miles; thence N. E. $\frac{1}{2}$ E., 5 $\frac{1}{2}$ miles, to Silver Islet landing.

Two Harbors to Bayfield.—When 1 mile south of the breakwater, steer E. $\frac{1}{4}$ N., 37 $\frac{1}{2}$ miles, or until Sand Island light bears S. W. by W., 3 $\frac{1}{2}$ miles, and the west side of York island S. $\frac{1}{2}$ E., 2 $\frac{1}{2}$ miles, when steer S. E., 11 miles, until the southwest point of Oak island bears N. $\frac{1}{4}$ W., 1 mile, when steer S. by W. $\frac{1}{2}$ W., 7 miles, to a point $\frac{1}{2}$ mile east of Bayfield.

Two Harbors to Devil Island and Portage Lake Ship Canal.—When 1 mile south of the breakwater, steer E. by N. $\frac{1}{4}$ N., 45 miles, to a point 1 $\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from the north point of Devil island; thence E. by N., 98 $\frac{1}{2}$ miles, to a point 2 miles N. W. by N. from the beacon-light at Portage Lake Ship canal.

Beaver Bar to Grand Marais.—When 1 mile east of the bay steer N. E. $\frac{1}{4}$ E., 55 miles, until Grand Marais Pierhead light bears north-east, distant 1 mile.

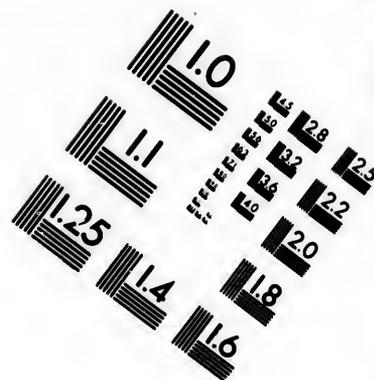
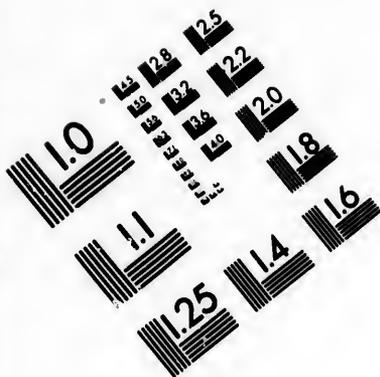
Grand Marais to Port Arthur and Silver Islet Landing.—When 1 mile south of the beacon-light, steer E. N. E., 14 $\frac{1}{2}$ miles, until the mouth of Brule river bears north 1 mile; thence E. N. E. $\frac{1}{4}$ N., 25 $\frac{1}{2}$ miles, to a point 2 miles southeast of Lucille island; thence N. E. $\frac{1}{2}$ E., 27 $\frac{1}{2}$ miles, until the highest peak on the west end of Pie island bears N. W. $\frac{1}{2}$ W., 7 miles distant, when see course from Duluth to Port Arthur and Silver Islet landing.

Grand Marais to Copper Harbor and White Fish Point.—When 1 mile south of the beacon-light, steer E. $\frac{1}{4}$ S., 117 miles, to a point 2 miles N. $\frac{1}{2}$ E. from the front light, and in line of the range lights at Copper harbor, when steer E. by S. $\frac{1}{2}$ S., 145 $\frac{1}{2}$ miles, to a point 1 $\frac{1}{2}$ miles north of White Fish Point light, passing 1 $\frac{1}{2}$ miles north of Manitou Island light.

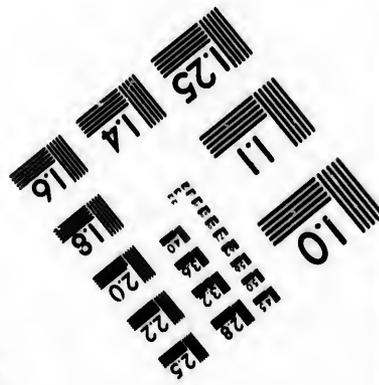
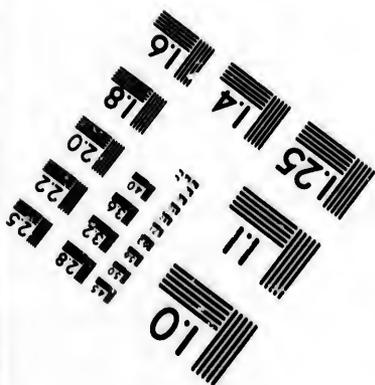
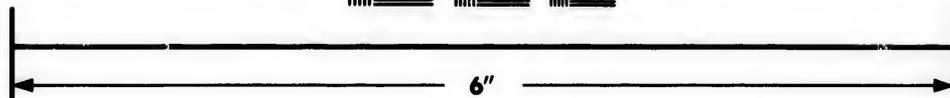
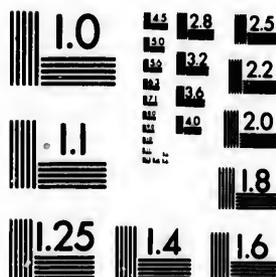
Magnetic Declinations in degrees and tenths corrected to the year 1890:

White Fish Point.....	0.5 W.
Grand Island, L. H.....	2.1 E.
Marquette.....	3.0 E.
Manitou Island.....	3.0 E.
Head Keweenaw Bay.....	4.5 E.
Copper Harbor.....	3.4 E.
Ontonagon.....	5.4 E.
Magdalene island.....	7.0 E.
Minnesota Point.....	9.7 E.
Agate bay.....	9.0 E.
Grand Marais, north shore.....	7.0 E.
Washington Harbor, Isle Royale.....	5.2 E.
Siskiwit point.....	4.5 E.



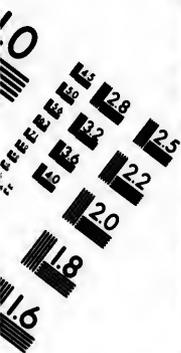


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Sailing Distances on Lake Superior.

	White Fish Point.	Gd. Marais, Mich.	Marquette.	L'Anse.	Portage Entry.	Copper Harbor.	Eagle Harbor.	Portage Lake Ship-Canal.	Ontonagon.	Bayfield.	Ashland.	Port Arthur.	Gd. Marais, Minn.	Two Harbors.	Duluth.
Sault Ste Marie.....	41	90	158	216	207	187	202	231	271	286	347	273	305	371	394
White Fish Point.....	49	117	175	166	146	161	190	231	295	306	281	264	330	358	
Grand Marais, Mich.....		68	129	120	106	121	149	191	256	267	199	224	289	318	
Marquette.....			76	67	75	9	*90	*132	*200	*211	173	*78	*236	*259	
L'Anse.....				15	71	86	*88	*81	*143	*160	*148	*126	*185	*207	
Portage Entry.....					60	75	*23	*66	*123	*144	*130	*111	*169	192	
Copper Harbor.....						15	44	83	149	161	100	117	184	207	
Eagle Harbor.....							28	70	121	145	97	108	169	192	
Portage Lake Ship-Canal.....								48	110	121	108	87	144	169	
Ontonagon.....									74	83	121	78	115	137	
Bayfield.....										16	154	75	66	78	
Ashland.....											160	89	72	94	
Port Arthur.....												94	173	197	
Grand Marais, Minn.....													81	106	
Two Harbors.....														28	
Duluth.....															0

*Via Portage Lake.

Light-Houses on the Canadian Shore of Lake Superior.

POINT AUX PINS LIGHT-STATION.—A fixed white light, visible 8 miles. White, square wood tower, light 30 feet above lake level. St. Mary's river, 6 miles above the Sault.

CORBAY POINT LIGHT-STATION.—A fixed white light, visible 16 miles. White octagonal wood tower, with dwelling attached, light 77 feet above lake level. On the north point of the entrance to Batchewana bay.

CARIBOU ISLAND LIGHT-STATION.—A revolving white light, interval of revolution, 10 seconds, visible 15 miles. White, octagonal wood tower, 78 feet high. Red lantern, dwelling attached. Fog-signal building, white with brown roof. On a small island, on the southwest side of Caribou island. Fog-signal 100 feet south of light. During thick or foggy weather it will give blasts of 5 seconds' duration, with intervals of 25 seconds. A large rocky flat extends in a south-westerly direction for a distance of nearly 3 miles; the northwest side of the island is shoal, and a reef extends from the north point $1\frac{1}{4}$ miles; the east side of the island is fairly bold.

GARGANTUA LIGHT-STATION.—A fixed white light, visible 15 miles. Hexagonal wooden tower, painted white, iron lantern painted red, tower 48 feet high, focal plane 97 feet above the level of the lake. On the summit of a small island in the mouth of Gargantua harbor on the northeast coast of Lake Superior. South point of Caribou island W. by S. $\frac{1}{4}$ S., 42 $\frac{1}{2}$ miles. White Fish Point light south 55 $\frac{1}{2}$ miles.

MICHIPICOTEN ISLAND LIGHT-STATION.—A fixed white light, visible 15 miles. White, square wood tower, light 56 feet above lake level. On the south point of the island. A fog-bell at this station.

	Cd. Marais, Minn.	Two Harbors	Duluth
395	371	394	
264	330	353	
224	289	313	
*178	*236	*259	
*126	*185	*207	
*111	*169	193	
117	184	207	
108	169	193	
87	146	169	
76	115	137	
73	56	79	
89	72	94	
94	173	197	
.....	81	106	
.....	26	
.....	0	

AGATE ISLAND LIGHT-STATION.—A fixed white light, visible 10 miles. White, square wood tower, light 32 feet above lake level. In Quebec harbor, near Michipicoten Island harbor.

PENINSULAR HARBOR LIGHT-STATION.—A revolving white light, greatest brilliancy every 30 seconds, visible 16 miles. White, square wood tower, with white dwelling attached. Focal plane 105 feet above the level of the lake. Lantern painted red. Coast light and marks the entrance to Peninsular harbor. On the south end of the island opposite the Peninsular. Vessels entering the harbor should leave it about one-third of a mile distant on the port hand, but there is good water throughout the entrance between island and the Peninsular.

BATTLE ISLAND LIGHT-STATION.—Alternate red and white flash, greatest brilliancy every $\frac{1}{2}$ minute, visible 18 miles. White, square wood tower, light 105 feet above lake level. Entrance to Nepigon bay.

LAMB ISLAND LIGHT-STATION.—A fixed white light, visible 17 miles. White, square wood tower, with dwelling attached. Western entrance to Nepigon bay.

PORPHYRY POINT LIGHT-STATION.—A fixed white light, visible 14 miles. White, square wood tower, light 56 feet above lake level. Entrance to Black bay, Edward island, Algoma.

THUNDER CAPE LIGHT-STATION.—A revolving white light; period of revolution, 1 minute; visible 12 miles. White, square wood tower, 45 feet above lake level, dwelling attached. Fog-signal building white, with brown roof, 50 yards south of light-house. Entrance to Thunder bay. Fog-horn, operated by compressed air, gives blasts of 5 seconds' duration, with intervals of 25 seconds.

KAMINISTQUIA REAR RANGE LIGHT.—A fixed white light, visible 10 miles. White, square wood tower, dwelling attached. On the north shore of the river, near Fort William.

Kaministiquia Front Range Light.—A fixed white light visible 8 miles. Open frame tower, 293 yards E. N. E. from rear light. These two lights in one lead through the dredged channel at mouth of river.

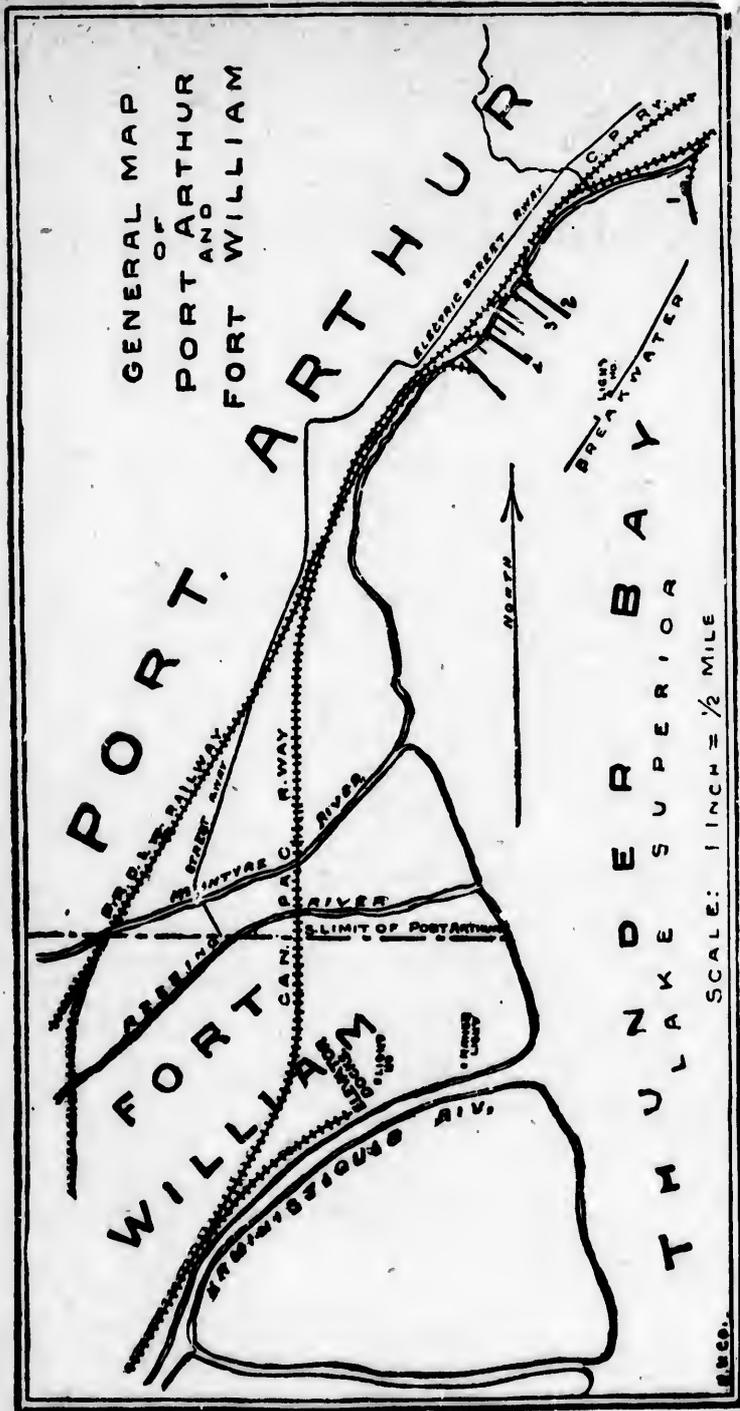
PORT ARTHUR LIGHT-STATION.—A fixed white light, visible 11 miles. White, square wood tower, light 43 feet above sea level. On the westernmost end of the breakwater, built out in the bay to protect the harbor, 2,320 feet S. E. $\frac{1}{4}$ S., from its former position on the end of the C. P. R. wharf. The light is 31 feet from the extreme end of the breakwater. Vessels running for shelter of the breakwater, will leave it on their starboard hand in passing.

VICTORIA ISLAND LIGHT-STATION.—A fixed white light, visible 15 miles. White, square wood tower. Lantern red, white frame dwelling, on lower ground southwest of the tower. The light is 78 feet above the lake level, and is visible all around the horizon, except where intercepted by trees on the north and east sides of the island. The light stands on a high rock rising abruptly from the low ground near the western extremity of the island.

Superior.
 A fixed white
 80 feet above
 d white light,
 elling attached,
 e entrance to
 —A revolving
 niles. White,
 elling attached.
 island, on the
 outh of light.
 nds' duration,
 ds in a south-
 rthwest side of
 t $1\frac{1}{4}$ miles; the
 l white light,
 ce, iron lantern
 he level of the
 argantua har-
 nt of Caribou
 outh 55 $\frac{1}{2}$ miles.
ATION. — A
 tower, light 56
 A fog-bell at

Port Arthur.....

* Via Portage Lake.



1—C. P. R. R. Elevator. 2—C. P. R. R. Passenger and Merchandise Dock. 3—Thomas Marks & Co. 4—Coal Dock.

THE FOLLOWING WAS ADOPTED

— BY THE —

GRAND LODGE of the E. M. B. A.

— AT —

CLEVELAND, AT THEIR LAST MEETING.

THAT in going through all narrow channels or shoal waters, when boats are meeting head to head, the descending boat should have the right of way; that the ascending boat should on all occasions check, and if necessary stop, especially if signaled to do so by the usual check whistle of the descending boat. We deem the Lime Kiln Crossing, Grosse Pointe, St. Clair canal, Sailors Encampment, foot of Sugar Island, Neebish cut, Lake George Flats (especially Collision Bend), Squirrel Island and Topsail Island, to be among the very dangerous passing points.

In the case of passing boats going the same way, especially tows, steamers should check to as slow a speed as possible to pass, and the boat or boats being passed should also check, so as to allow the faster boat to pass them as quickly as is practicable in consistence with safety.

Rule

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APPENDIX.

PILOT-RULES FOR LAKE AND SEABOARD.

Rules and Regulations for the government of pilots navigating seas, gulfs, lakes, bays, sounds, or rivers, except rivers flowing into the Gulf of Mexico, and their tributaries. Revised and adopted by the Board of Supervising Inspectors June 10, 1871, as authorized by act of Congress "to provide for the better security of life on board of vessels propelled in whole or in part by steam, and for other purposes," approved February 28, 1871, to take effect January 1, 1872. (Amended January, 1875, 1881, and 1882.)

RULE I.—When steamers are approaching each other "head and head," or nearly so, it shall be the duty of each steamer to pass to the right, or port side of the other; and the pilot of either steamer may be first in determining to pursue this course, and thereupon shall give, as a signal of his intention, one short and distinct blast of his steam-whistle, which the pilot of the other steamer shall answer promptly by a similar blast of his steam-whistle, and hereupon such steamers shall pass to the right, or port side of each other. But if the course of such steamers is so far on the starboard of each other as not to be considered by pilots as meeting "head and head," or nearly so, the pilot so first deciding shall immediately give two short and distinct blasts of his steam-whistle, which the pilot of the other steamer shall answer promptly by two similar blasts of his steam-whistle, and they shall pass to the left, or on the starboard side, of each other.

NOTE.—In the night, steamers will be considered as meeting "head and head" so long as both the colored lights of each are in view of the other.

RULE II.—When steamers are approaching each other in an oblique direction (as shown in diagram of the fourth situation), they shall pass to the right of each other, as if meeting "head and head," or nearly so, and the signals by whistle shall be given and answered promptly as in that case specified.

RULE III.—If, when steamers are approaching each other, the pilot of either vessel fails to understand the course or intention of the other, whether from signals being given or answered erroneously, or from other causes, the pilot so in doubt shall immediately signify the same by giving several short and rapid blasts of the steam-whistle; and if the vessels shall have approached within half a mile of each other, both shall be immediately slowed to a speed barely sufficient for steerage-way until the proper signals are given, answered, and understood, or until the vessels shall have passed each other.

RULE IV.—When steamers are running in a fog or thick weather, it shall be the duty of the pilot to cause a long blast of the steam-whistle to be sounded at intervals not exceeding one minute.

Steamers, when DRIFTING or at ANCHOR, in the fair way of other vessels in a fog or thick weather, shall *ring their bells* at intervals of not more than two minutes.

RULE V.—Whenever a steamer is nearing a short bend or curve in the channel, where, from the heights of the banks or other cause, a steamer approaching from the opposite direction cannot be seen for a distance of half a mile, the pilot of such steamer, when he 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 the pilot of any approaching steamer that may be within hearing. Should such signal be so answered by a steamer upon the farther side of such bend, then the usual signals for the meeting and passing shall immediately be given and answered; but if the first alarm-signal of such pilot be not answered, he is to consider the channel clear and govern himself accordingly.

RULE VI.—The signals, by the blowing of the steam-whistle, shall be given and answered by pilots, in compliance with these rules, not only when meeting "head and head," or nearly so, but at all times when passing or meeting at a distance within half a mile of each other, and whether passing to the starboard or port.

RULE VII.—Relates only to steamers navigating the East river, New York.

RULE VIII.—When steamers are running in the same direction, and the pilot of the steamer which is astern shall desire to pass on the right or starboard hand of the steamer ahead, he shall give one short blast of the steam-whistle as a signal of such desire and intention, and shall put his helm to port; and the pilot of the steamer ahead shall answer by the same signal, or, if he prefers to keep on his course, he shall give two short and distinct blasts of the steam-whistle, and the boat wishing to pass must govern herself accordingly, but the boat ahead shall in no case attempt to cross her bow or crowd upon her course.

N. B.—The foregoing rules are to be complied with in all cases except when steamers are navigating in a crowded channel, or in the vicinity of wharves; under such circumstances steamers must be run and managed with great caution, sounding the whistle, as may be necessary, to guard against collision or other accidents.

SECTION 4233, REVISED STATUTES.—*Rule twenty-four.* In construing and obeying these rules, due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case rendering a departure from them necessary in order to avoid immediate danger.

RULE IX.—All double-ended ferry-boats on lakes and seaboard shall carry a central range of clear, bright, white lights, showing all around the horizon, placed at equal altitudes forward and aft, also such side-lights as specified in section 4233, Revised Statutes, Rule Three, paragraphs B and C.

Local inspectors in districts having ferry-boats 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 distinguish such lines from each other, which light shall be carried on a flag-staff amidship, fifteen feet above the white range-lights.

The line dividing jurisdiction between Pilot-Rules on Western Rivers and Lakes and Seaboard at New Orleans shall be the lower limits of the city.

EXTRACTS FROM REVISED STATUTES.

SEC. 4233. The following rules for preventing collisions on the water shall be followed in the navigation of vessels of the Navy, and of the mercantile marine of the United States:

STEAM AND SAIL VESSELS.

RULE ONE. Every steam vessel which is under sail, and not under steam, shall be considered a sail-vessel; and every steam vessel which is under steam, whether under sail or not, shall be considered a steam-vessel.

LIGHTS.

RULE TWO. The lights mentioned in the following rules, and no others, shall be carried in all weather, between sunset and sunrise:

RULE THREE. All ocean-going steamers, and steamers carrying sail, shall, when under way, carry—

(A) At the foremast head, a bright white light, of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least five miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of twenty points of the compass, and 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.

(B) On the starboard side a green light, of such character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of ten points of the compass, and so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side.

(C) On the portside, a red light, of such character as to be visible on a dark night, with a clear atmosphere, at a distance of at least two miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of ten points of the compass, and so fixed as to throw the light from right ahead to two points abaft the beam on the port side.

The green and red lights shall be fitted with inboard screens, projecting at least three feet forward from the lights, so as to prevent them from being seen across the bow.

RULE FOUR. Steam-vessels, when towing other vessels, shall carry two bright white mast-head lights vertically, in addition to their side-lights, so as to distinguish them from other steam vessels. Each of these mast-head lights shall be of the same character and construction as the mast-head lights prescribed by Rule Three.

RULE FIVE. All steam vessels, other than ocean-going steamers, and steamers carrying sail, shall, when under way, carry on the starboard and port sides lights of the same character and construction and in the same position as are prescribed for side-lights by Rule Three, except in the case provided in Rule Six.

RULE SIX. Relates only to steamers navigating waters flowing into the Gulf of Mexico.

RULE SEVEN. All coasting steam-vesse's, and steam-vessels other than ferry-boats and vessels otherwise expressly provided for, navigating the bays, lakes, rivers, or other inland waters of the United States except those mentioned in Rule Six, shall carry the red and green lights, as prescribed for ocean-going steamers; and, in addition thereto, a central range of two white lights; the after light being carried at an elevation of at least fifteen feet above the light at the head of the vessel. The head light shall be so constructed as to show a good 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 after light so as to show all around the horizon. The lights for ferry-boats shall be regulated by such rules as the board of supervising inspectors of steam-vessels shall prescribe.

DIAGRAMS.

The following diagrams are intended to illustrate the workings of the foregoing system of colored lights, and are to be used by pilots in connection with the rules, as sailing directions on meeting or nearing other steamers:

FIRST SITUATION.

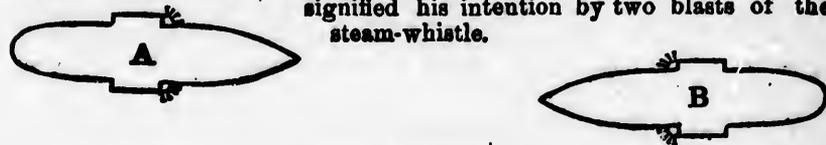
Here the two colored lights, visible to each, will indicate their direct approach ("head and head") toward each other. In this situation it is a



standing rule that both shall put their helms to port and pass to the right, each having previously given one blast of the steam-whistle.

SECOND SITUATION.

Here the green light only will be visible to each, the screens preventing the red light from being seen. They are therefore passing to starboard, which is rulable in this situation, each pilot having previously signified his intention by two blasts of the steam-whistle.



THIRD SITUATION.

A and B see each other's red light only, the screens preventing the green lights from being seen. Both vessels are evidently passing to port, which is rulable in this situation, each pilot having previously signified his intention by one blast of the steam-whistle.



FOURTH SITUATION.

This is a situation requiring great caution; the red light of B in view to A, and the green light of A in view to B, will inform both that they are approaching each other in an oblique direction. A should put his helm to port, and pass astern of B, while B should continue on his course, or port his helm, if necessary to avoid collision, each having previously given one blast of the steam-whistle, as required by the rules when passing to the right.



FIFTH SITUATION.

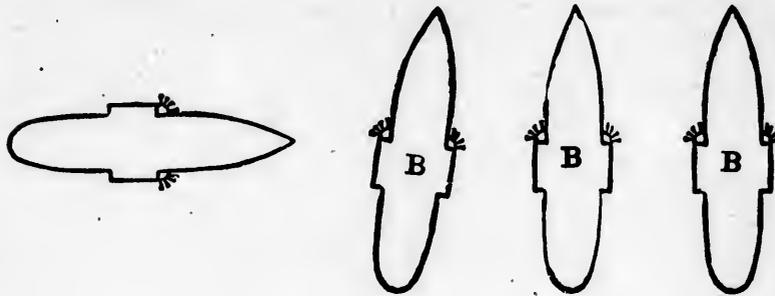
This is a situation requiring great caution; the red light of A in view to B, and the green light of B in view to A, will inform both that they are approaching each other in an oblique direction. B should put his helm to port, and pass astern of A, while A should continue on his course, or port his helm, if necessary to avoid collision, each having previously given one blast of the steam whistle, as required by the rules when passing to the right.



SIXTH SITUATION.

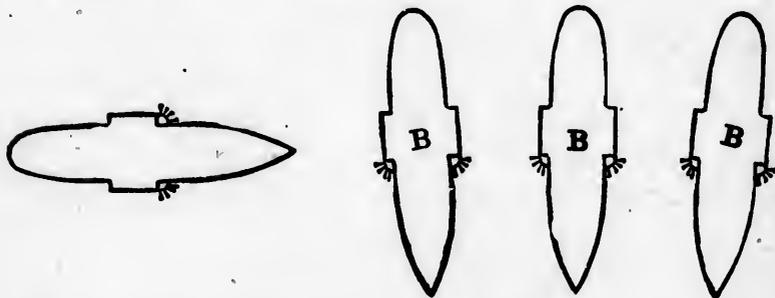
In this situation the steamer A will only see the red light of the steamer B in whichever of the three positions the latter may happen to be, because the green light will be hid from view; A will be assured that the port side of B is toward him, and the latter is therefore crossing the

bows of A in some direction to port; A will therefore (if so near as to fear a collision) port his helm with confidence and pass clear. On the other hand, the steamer B, in either of the three positions, will see both the red and green lights of A, by which the former will know that a steamer is approaching directly toward him; B will act accordingly, and keep away if necessary.



SEVENTH SITUATION.

In this situation the steamer A will only see the green light of the steamer B in whichever of the three positions the latter may happen to be, because the red light will be hidden from view; A will be assured that the starboard side of B is toward him, and that the latter is therefore crossing the bows of A in some direction to starboard; A will therefore (if so near as to fear a collision) starboard his helm with confidence and pass clear. On the other hand, the steamer B, in either of the three positions, will see both the red and green lights of A, by which the former will know that a steamer is approaching directly toward him; B will act accordingly, and keep away if necessary.



The manner of fixing the colored lights should be particularly attended to. They will require to be fitted each with a screen, of wood or canvas, on the inboard side, and close to the light, in order to prevent both being seen at the same moment from any direction but that of right ahead to two points abaft the beam.

This is important, for without the screens any plan of bow-lights would be ineffectual as a means of indicating the direction of steering. This will be readily understood by a reference to the preceding illustrations, where it will appear evident that in any situation in which two vessels may approach each other in the dark, the colored lights will instantly indicate to both the relative course of each; that is, each will know whether the other is approaching directly, or crossing the bows either to starboard or port.

This intimation, with the signals by whistle, as provided, is all that is required to enable vessels to pass each other in the darkest night with almost equal safety as in broad day. If at anchor, all vessels, without distinction, must exhibit a bright white light at least twenty feet above the surface of the water.

RULES OF THE ROAD AT SEA.

AID TO MEMORY, IN FOUR VERSES, BY THOMAS GRAY.

1. TWO STEAM-SHIPS MEETING.

When both side-lights you see ahead,
Port your helm, and show your RED.

2. TWO STEAM-SHIPS PASSING.

GREEN to GREEN, or RED to RED—
Perfect safety—Go ahead!

3. TWO STEAM-SHIPS CROSSING.

NOTE.—This is the position of greatest danger; there is nothing for it but good lookout, caution, and judgment, with prompt action.

If to your starboard RED appear,
It is your duty to keep clear;
To act as judgment says is proper;—
To Port—or Starboard—Back—or Stop her!

But, when upon your Port is seen
A steamer's starboard light of GREEN,
There's not so much for you to do,
For GREEN to port keeps clear of you.

4. ALL SHIPS MUST KEEP A GOOD LOOKOUT, AND STEAM-SHIPS MUST STOP AND GO ASTERN IF NECESSARY.

Both in safety and in doubt
Always keep a good lookout;
In danger, with no room to turn,
Ease her!—Stop her!—Go astern!

RULES

RECOMMENDING CERTAIN FOG-SIGNALS TO BE OBSERVED BY STEAMERS,
SAILING-VESSELS, AND OTHER CRAFT.

Every steamer, when under way, shall use a steam-whistle. Sailing vessels, and all other craft propelled by sails, shall use a fog-horn.

Whenever there is a fog, whether by day or night, the fog-signals described below shall be sounded.

Sailing-vessels and every craft propelled by sails upon the ocean, lakes, and rivers, shall, when on their starboard tack, sound one blast of their fog-horn; when on their port tack, they shall sound two blasts of their fog-horn; when with the wind free, or running large, they shall sound three blasts of their fog-horn; when lying-to or at anchor, they shall sound *the bell*. In each instance the above signals shall be sounded at intervals of not more than two minutes.

Sailing-vessels, when not under way, and anchored or moored in the channel or fair-way of commerce, shall sound *the bell* signal at intervals of not more than two minutes; and all steamers navigating in a fog or thick weather shall, by the rules governing pilots, sound their steam-whistle at intervals of not more than one minute.

Sailing-vessels shall at all times, on the approach of any steamer during the night-time, show a lighted torch upon that point or quarter to which such steamer shall be approaching. And upon any craft navigating rivers without being in tow of a steamer, such as rafts, flat-boats, wood boats and other like craft, they shall sound a fog-horn at intervals of not more than two minutes.

It shall at all times be the duty of steamers to give to the sailing-vessel, or other craft propelled by sails, every advantage, and keep out of her way.

FOG-SIGNALS FOR TOWING-BOATS.

All steam-vessels, when engaged in towing during fog or thick weather, shall sound *three* distinct blasts of their steam-whistles in quick succession, repeating at intervals not exceeding one minute.

Approved March 1, 1884.

CHAS. J. FOLGER,
Secretary.

STEERING AND SAILING RULES.

RULE XVI.—If two sail-vessels are meeting end on, or nearly end on, so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other.

RULE XVII.—When two sail-vessels are crossing so as to involve risk of collision, then, if they have the wind on different sides, the vessel with the wind on the port side shall keep out of the way of the vessel with the wind on the starboard side, except in the case in which the vessel with the wind on the port side is close-hauled, and the other vessel free, in which case the latter vessel shall keep out of the way. But if

they have the wind on the same side, or if one of them has the wind aft, the vessel which is to windward shall keep out of the way of the vessel which is to leeward.

RULE XVIII.—If two vessels under steam are meeting end on, or nearly end on, so as to involve risk of collision, the helms of both shall be put to port, so that each may pass on the port side of the other.

RULE XIX.—If two vessels under steam 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.

RULE XX.—If two vessels, one of which is a sail-vessel and the other a steam-vessel, are proceeding in such directions as to involve risk of collision, the steam-vessel shall keep out of the way of the sail-vessel.

RULE XXI.—Every steam-vessel, when approaching another vessel, so as to involve risk of collision, shall slacken her speed, or, if necessary, stop and reverse; and every steam-vessel shall, when in a fog, go at a moderate speed.

RULE XXII.—Every vessel overtaking any other vessel, shall keep out of the way of the last-mentioned vessel.

RULE XXIII.—Where, by Rules XVII, XIX, XX, and XXII, one of two vessels shall be kept out of the way, the other shall keep her course, subject to the qualifications of Rule XXIV.

RULE XXIV.—In construing and obeying these rules, due regard must be had to all dangers of navigation, and to any special circumstances which may exist in any particular case rendering a departure from them necessary in order to avoid immediate danger.

CROSS-SIGNALS.

Extract from circular issued by the Supervising Inspector-General, and approved by the Secretary of the Treasury, June 21, 1888. Referring to Rule III, it says: The rule quoted qualifies all the others, and is the only qualification that can be permitted with safety when steamers are meeting in such positions as to render collisions possible. There is no authority in the rules and regulations for what has become technically known among pilots as "cross-signals"—that is, answering one whistle by two, and answering two whistles with one. In all cases, and under all circumstances, when a pilot receiving either of the whistle signals provided in the rules, which for any reason he deems injudicious to comply with, instead of answering it with a cross-signal, as is now so much the custom to do, it is his imperative duty to at once observe the provisions of Rule III, *namely*, give the alarm signal whistle and at once slow his engine and reduce speed to bare steerage-way; and the opposing vessel, immediately on hearing the alarm-signal whistle, should also slow down, and stop if necessary, till the danger of collision is passed.

In investigating collision cases, inspectors of steam-vessels would be justified in considering any pilot who gives a cross-signal instead of complying with Rule III *prima facie* guilty of neglect of duty. So, also, of the pilot giving the first signal, who fails to slow or stop his boat immediately after he discovers his signal whistles are answered otherwise than as given by himself.

Rule 2 of the Pilot-Rules for Western Rivers has the same applica-

tion to those rules that Rule III of the Pilot-Rules for Lakes and Seaboard has to the latter rules, and it must be observed in the same manner. It is desirable that all pilots should thoroughly understand that when whistles are blown as passing signals it is a rule, never to be deviated from, that one whistle means that the vessel giving such signal is or intends putting her *helm*; two whistles, that the vessel giving it is or intends putting her *helm* to starboard.

GENERAL RULE FOR STEAM-SHIPS MEETING,

AND

PARTICULAR RULE FOR STEAM-SHIPS CROSSING.

(FROM THE SAILORS' POCKET BOOK, BY CAPT. F. G. D. BEDFORD, R. N.)

The *general* rule of the road for steamers is precisely the same as the general rule of the pavement for foot passengers in London and in all our large towns, viz., that in all ordinary cases two steamers, like two pedestrians, meeting face to face, or "end on or nearly end on," so as to involve risk of collision, shall port, that is to say, shall keep to the right, so that each may pass on the port (left) side of the other. Nothing can be more simple than this; but the man who will persist in crossing right over the pavement, if, when proceeding along the left hand side, he sees another man coming along to his own right on the other side, cannot justify his proceeding by the rule. He will obviously get in the way of the other.

The *particular* rule of the road for steamers is, that if they are crossing, then the steamer that has another steamer on her own right hand side shall get out of her way.

Steam-ships crossing so as to involve risk of collision always show to each other a different colored light—green to red, and red to green; unless, therefore, a steamer sees another steamer's green light on her own port side, or another steamer's red light on her own starboard side, there is no danger so far as steamers crossing are concerned.

There are only six cases in which it is your duty to alter course to avoid risk of collision—

1. In a steamer meeting a steamer end on or nearly end on.
2. In a steamer, nearing a sailing-vessel.
3. In a steamer, approaching another on your starboard side.

NOTE.—This case should be carefully considered, as it is one requiring the most caution and judgment.

4. If under sail on the port tack, nearing a vessel under sail—on the starboard tack.
5. If under sail going free, nearing a vessel under sail—close-hauled.
6. If under sail going free, and nearing another vessel to leeward—going also free.

In the *first case only* is it right to port the helm without further consideration.

In the other five cases the course should not be altered until—either by bearings taken with an interval between them, or by bringing the vessel on with some part of the rigging, and watching whether she draws aft or forward—it is ascertained that the vessels are converging on one point, and which is the best way to alter it, to avoid collision.

Seamen are to be found who port at every light seen ahead, or nearly ahead; but if they port when they should not—for example with a green light, say two points on their starboard bow, and say they do it because the light is nearly ahead or nearly end on with them—that is no fault of the rule, and has no reference to the rule, for the rule does not apply in cases where there is no risk of collision; and there is no risk of collision as has already been admitted, if a green light is seen ahead or anywhere on the starboard side.

One of the most fruitful causes of collision is, that the ship that has by the rules to alter course, does not do so promptly and sufficiently to show to the other ship clearly, and evidently, that she knows her duty and is performing it. When this is not done, the other ship is often led to adopt some wrong course to avoid collision, and thus bring it to pass. If under steam, a slight yaw with the helm will serve to show the direction you intend to take; if under sail and about to tack, let fly the jib sheet; if to bear up, start the after sheets.

So long as you keep a green light opposed to a green light, or a red light opposed to a red light, no collision can happen between passing ships.

The reckless use of port helm leads to collision.

THE RULE OF THE ROAD should be so thoroughly mastered that there would be no hesitation in the action to be taken in meeting or passing vessels, by night or day, whether under steam or sail. The sailor should be as familiar with these laws as he is with the points of the compass, so as to enable him to move his ship as instinctively as he moves his own body. The state of the bow lights as well as that of the masthead lights should be the constant care, not only of the officer of the deck, but also of the lookout man.

THE LEAD.—Above all, the sailor's attention is most earnestly called to that simple but important instrument, to that best of all inventions for saving life at sea, viz.: *the lead*; the neglect of which may be said to have been the great cause of many of the modern disasters to shipping. The deep sea lead as well as the hand lead, should never be lost sight of, and the crew made familiar with the method of "passing the line along," so as to obtain a deep sea cast with as little delay as possible.

CODE OF ENGINE-SIGNALS FOR THE EIGHTH AND NINTH SUPERVISING INSPECTION DISTRICTS.

The attention of *Masters, Pilots and Engineers* is directed to the code of signals adopted by the Board of Supervising Inspectors of Steam-Vessels, and approved by the Secretary of the Treasury, February 18, 1885, for use on steam-vessels navigating the following-named waters:

EIGHTH DISTRICT—All the waters of the lakes north and west of Lake Erie, with their tributaries, and the upper portion of the Illinois river down to and including Peoria, Ill.

NINTH DISTRICT—All the waters of Lake Erie, Ontario, and Champlain, with the River St. Lawrence, and their tributaries.

CODE OF SIGNALS.

1 Whistle or Bell.....	Go ahead.
1 Whistle or Bell.....	Stop.
2 Whistles or Bells.....	Back.
3 Whistles or Bells.....	Check.
1 Long Whistle or 4 Bells.....	Strong.
1 Long Whistle or 4 Bells	All right.
2 Whistles or 2 Bells, when the engine is working ahead. will always be a signal to Stop and Back Strong.	

DEFINITION OF GEOGRAPHICAL, OR NAUTICAL, AND STATUTE MILES.

A nautical mile, or a sea mile, is the length of one minute of longitude of the earth at the equator, at the level of the sea, or the ~~part~~ part of the earth's equatorial circumference. By the United States standard, and as used by the Coast Survey, its length is 1,152,664 common statute or land miles; 1855.11 metres; 2028.69 yards; or 6086.07 feet; consequently, 1 degree of longitude at the equator=69.160 land miles; and a land mile=0.86755 of a nautical mile. By British standard the sea mile is about 4 inches longer than by United States. Sometimes one minute of mean *latitude* is taken as a nautical mile. A minute of latitude at the equator is about 6,046 feet; and at the poles about 6,107; the mean of which is 6,076½ feet.

LENGTH OF A DEGREE OF LONGITUDE.

IN DIFFERENT LATITUDES, AND AT THE LEVEL OF THE SEA.

These lengths are in common land or statute miles, of 5,280 feet. Since the figure of the earth has never been *precisely* ascertained, these are but close approximations.

Degree of Latitude.	Miles.										
0	69.16	14	67.13	28	61.11	42	51.47	56	39.76	70	28.73
2	69.12	16	66.50	30	59.94	44	49.83	58	39.74	72	21.43
4	68.99	18	65.80	32	58.70	46	48.12	60	34.67	74	19.12
6	68.78	20	65.02	34	57.30	48	46.36	62	32.55	76	16.78
8	68.49	22	64.15	36	56.01	50	44.54	64	30.40	78	14.42
10	68.12	24	63.21	38	54.56	52	42.67	66	28.21	80	12.05
12	67.66	26	62.20	40	53.05	54	40.74	68	25.98	82	9.66

LIFE-SAVING SERVICE.

INSTRUCTIONS TO MARINERS IN CASE OF SHIPWRECK, WITH GENERAL INFORMATION CONCERNING THE LIFE-SAVING STATIONS.

Life-saving stations are located upon the lake coast, as shown in the list of stations following.

Upon the lake coast the stations are manned from the opening until the close of navigation.

All life-saving stations are fully supplied with boats, wreck-gun, beach apparatus, restoratives, etc.

All services are performed by the life-saving crews without other compensation than their wages from the Government, though, in view of the meagerness of their pay, they are not prohibited from receiving such rewards for labor performed or risks incurred at wrecks as owners or masters of vessels or other persons may see fit to voluntarily bestow upon them, but *they are strictly forbidden to solicit such rewards.*

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.

The station crews patrol the beach from two to four miles each side of their stations four times between sunset and sunrise, and if the weather is foggy the patrol is continued through the day.

Each patrolman carries Coston signals. Upon discovering a vessel standing into danger he ignites one of them, 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. In the day-time, a red flag will be shown from the station for the same purpose.

If the vessel is not discovered by the patrol immediately after striking, rockets or flare-up lights should be burned; or if the weather be foggy, guns should be fired to attract attention, as the patrolman may be some distance away on the other end of his beat.

Masters are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, especially on any of the sandy coasts where there is not much danger of vessels breaking up immediately, 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 four hundred yards off shore, and the surf when viewed from a vessel never appears as dangerous as it is. Many lives have been unnecessarily lost by the crews of stranded vessels being thus deceived and attempting to land in the ships' boat.

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.

INSTRUCTIONS.

Rescue with the Life-Boat or Surf-Boat.

The patrolman, after discovering your vessel ashore and burning Coston signal, hastens to his station for assistance. If the use of a boat

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Latitude.	Miles.
0	26.73
2	21.43
4	19.12
6	16.78
8	14.42
0	12.05
2	9.66

is practicable, either the large life-boat is launched from its ways in the station and proceeds to the wreck by water, or the lighter surf-boat 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 life-boat or surf-boat, 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 tail-block with a whip or endless line rove through it. This tail-block 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 halliards 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 tail-block 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 instructions being complied with, the result will be as shown in Figure 1 on page 267.

As soon as your signal is seen, a three-inch hawser will be bent on to the whip and hauled off to your ship by the life-saving crew.

If circumstances will admit, 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 tail block, 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 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 ship a breeches-buoy sus-



FIGURE 1.

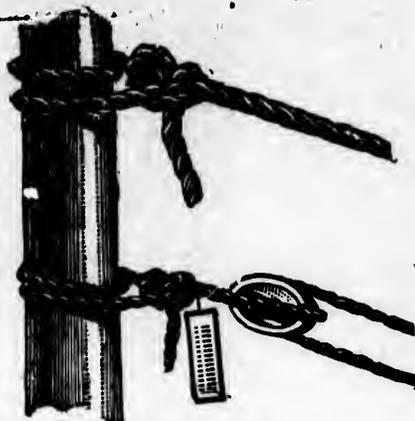


FIGURE 2.

pended from a traveler block, or a life-car from rings, running on the hawser.

Figure 3 on the following page, 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 into it 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 on to 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.

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 shore.

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 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 bright 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 will have to return to his sta-



FIGURE 3.

tion, perhaps three or four miles distant, and the life-saving crew draw the apparatus or surf boat 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 a 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 ship will be a good mark for men experienced in the use of the wreck gun, and the first shot seldom fails.

RECAPITULATION.

Remain by the wreck until assistance arrives from the shore unless your vessel shows signs of immediately breaking up.

If not discovered immediately by the patrol, burn rockets, flare-up, or other lights, or, if the weather be foggy, fire guns.

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.

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.

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LIST OF LIFE-SAVING DISTRICTS, AND STATIONS ON THE LAKES.

NINTH DISTRICT.

EMBRACING LAKES ONTARIO AND ERIE.

NAME OF STATION.	KEEPER.	POSTOFFICE ADDRESS.
Big Sandy	William Fish	Ellisburg, New York.
Salmon Creek	Edwin E. Chapman	Texas, New York.
Oswego	Joseph O. Doyle	Oswego, New York.
Charlotte	Thomas Williams	Charlotte, New York.
Buffalo	Andrew Jansen	Buffalo, New York.
Erie	George F. Babcock	Erie, Penn.
Falport	Charles C. Goodwin	Painesville, Ohio.
Cleveland	Lucien M. Clemens	Cleveland, Ohio.
Point Marblehead	William M. Devan	Point Marblehead, Ohio.
Louisville		Louisville, Kentucky.

TENTH DISTRICT.

LAKES HURON AND SUPERIOR.

NAME OF STATION.	KEEPER.	POSTOFFICE ADDRESS.
Sand Beach	George W. Plough	Sand Beach, Mich.
Point aux Barques	Henry D. Ferris	Huron City, Mich.
Grindstone City	Henry Gill, Jr.	Grindstone City, Mich.
Ottawa Point	Frank J. Ocha	East Tawas, Mich.
Sturgeon Point	James E. Henderson	Harrisville, Mich.
Thunder Bay Island	John D. Persons	Alpena, Mich.
Middle Island	Donald McKenzie	Alpena, Mich.
Hammond Bay	Joseph Valentine	Hammond's Bay, via Cheboygan, Mich.
Bols Blanc	George S. Cleary	Bois Blanc, Mich.
Vermillion Point	Samuel F. Bernier	Deer Park, Luce Co., Mich.
Crisp's	Robert M. Small	Deer Park, Luce Co., Mich.
Two Heart River	Thomas H. McCormick	Deer Park, Luce Co., Mich.
Muskallonge Lake	John H. Frahm	Deer Park, Luce Co., Mich.
Marquette	Henry Cleary	Marquette, Mich.
Ship-Canal	George A. Smith	Hancock, Mich.

ELEVENTH DISTRICT.

LAKE MICHIGAN.

NAME OF STATION.	KEEPER.	POSTOFFICE ADDRESS.
Beaver Island	Owen Gallagher	St. James, Beaver Harbor, Mich.
North Manitou Island	Peter Olsen	Leland, Mich.
Point Betsy	Harrison Miller	South Frankfort, Mich.
Frankfort	George Morency	Frankfort, Mich.
Manistee	John Hanson	Manistee, Mich.
Grande Pointe au Sable	George Wilson	Alcorno, Mich.
Ludington	Charles Tufts	Ludington, Mich.
Pent Water	Martin Ewald	Pent Water, Mich.
White River	Charles Lysaght	Montague, Mich.
Muskegon	Henry J. Woods	Muskegon, Mich.
Grand Haven	John Lysaght	Grand Haven, Mich.
Holland	Charles M. Eaton	Holland, Mich.
South Haven	John E. McKenzie	South Haven, Mich.
Saint Joseph	William L. Stevens	St. Joseph, Mich.
Michigan City	Henry Finch	Michigan City, Ind.
Chicago	Telesford St. Peter	I. C. Pier No. 1, Chicago, Ill.
South Chicago	Edmond Dionne	South Chicago, Ill.
Evanston	Lawrence O. Lawson	Evanston, Ill.
Kenosha	Benjamin G. Cameron	Kenosha, Wis.
Racine	George Breckenfeld	Box 683, Racine, Wis.
Milwaukee	Nells A. Peterson	Milwaukee, Wis.
Sheboygan	Wm. Nequette	Sheboygan, Wis.
Two Rivers	Oliver Pilon	Two Rivers, Wis.
Sturgeon Bay Canal	Joseph Dionne	Sturgeon Bay, Wis.

DIRECTIONS FOR RESTORING THE APPARENTLY DROWNED.

RULE I. *Arouse the patient.*—Unless in danger of freezing, do not move the patient, but expose the face to a current of fresh air, wipe dry the mouth and nostrils, rip the clothing, so as to expose the chest and waist, and give two or three quick, smarting slaps on the stomach and chest with the open hand. If, however, there is reason to believe that considerable time has elapsed since the patient became insensible, do not lose further time by practicing Rule I, but proceed immediately to Rule II. After loosening clothing, etc., if the patient does not revive, then proceed thus:

RULE II. *To draw off water, etc., from the stomach and chest.*—If the jaws are clenched, separate them, and keep the mouth open by placing between the teeth a cork or small bit of wood; turn the patient on the face, a large bundle of tightly-rolled clothing being placed beneath the stomach, and press heavily on it for half a minute, or so long as fluids flow freely from the mouth.

RULE III. *To produce breathing.*—Clear the mouth and throat of mucus, by introducing into the throat the corner of a handkerchief wrapped closely around the forefinger; turn the patient on the back, the roll of clothing being so placed beneath it as to raise the pit of the stomach above the level of any other part of the body. If there be another person present, let him, with a piece of dry cloth, hold the tip of the tongue out of one corner of the mouth (this prevents the tongue from falling back and choking the entrance to the windpipe), and with the other hand grasp both wrists and keep the arms forcibly stretched back above the head, thereby increasing the prominence of the ribs, which tends to enlarge the chest. The two last-named positions are not, however, absolutely essential to success. Kneel beside or astride the patient's hips, and with the balls of the thumbs resting on either side of the pit of the stomach, let the fingers fall into the grooves between the short ribs, so as to afford the best grasp of the waist. Now, using your knees as a pivot, throw all your weight forward on your hands, and at the same time squeeze the waist between them, as if you wished to force everything in the chest upward out of the mouth; deepen the pressure while you can count slowly one, two, three; then suddenly let go with a final push, which springs you back to your first kneeling position. Remain erect on your knees while you can count one, two, three; then repeat the same motions as before at a rate gradually increased from four or five to fifteen times in a minute, and continue thus this bellows movement with the same regularity that is observable in the natural motions of breathing which you are imitating. If natural breathing be not restored, after a trial of the bellows movement for the space of three or four minutes, then turn the patient a second time on the stomach, as directed in Rule II, rolling the body in an opposite direction from that in which it was first turned, for the purpose of freeing the air passages from any remaining water. Continue the artificial respiration from one to four hours, or until the patient breathes, according to Rule III; and for a while, after the appearance of returning life, carefully aid the first short gasps until deepened into full breaths. Continue the drying and rubbing, which should have been unceasingly practised from the beginning by the

assistants, taking care not to interfere with the means employed to produce breathing. Thus the limbs of the patient should be rubbed, always in an upward direction towards the body, with firm-grasping pressure and energy, using the bare hands, dry flannels or handkerchiefs, and continuing the friction under the blankets or over the dry clothing. The warmth of the body can also be promoted by the application of hot flannels to the stomach and arm pits, bottles or bladders of hot water, heated bricks, &c., to the limbs and soles of the feet.

RULE IV. AFTER TREATMENT.—*Externally:* As soon as breathing is established, let the patient be stripped of all wet clothing, wrapped in blankets only, put to bed comfortably warm, but with a free circulation of fresh air, and left to perfect rest. *Internally:* Give whisky or brandy and hot water in doses of a teaspoonful to a tablespoonful, according to the weight of the patient, or other stimulant at hand, every ten or fifteen minutes for the first hour, and as often thereafter as may seem expedient. *Later manifestations:* After reaction is fully established, there is great danger of congestion of the lungs, and if perfect rest is not maintained for at least forty-eight hours, it sometimes occurs that the patient is seized with great difficulty of breathing, and death is liable to follow unless immediate relief is afforded. In such cases apply a large mustard plaster over the breast. If the patient gasps for breath before the mustard takes effect, assist the breathing by carefully repeating the artificial respiration.

NOTE.—An eminent authority, Dr. Labordette, the Supervising Surgeon of the Hospital of Lisieux, in France, appears to have established that the clinching of the jaws and the semi-contraction of the fingers, which have hitherto been considered signs of death, are, in fact, evidences of remaining vitality. After numerous experiments with apparently drowned persons, and also with animals, he concludes that these are only signs accompanying the first stage of suffocation by drowning, the jaws and hands becoming relaxed when death ensues.* This being so, the mere clinching of the jaws and semi-contraction of the hands must not be considered as reasons for the discontinuance of efforts to save life, but should serve as a stimulant to vigorous and prolonged efforts to quicken vitality. Persons engaged in the tasks of resuscitation are, therefore, earnestly desired to take hope and encouragement for the life of the sufferer, from the signs above referred to, and to continue their endeavors accordingly. In a number of cases Dr. Labordette restored to life persons whose jaws were so firmly clenched that, to aid respiration, their teeth had to be forced apart with iron instruments.

TREATMENT OF FROST-BITES.

AS RECOMMENDED BY THE SURGEON-GENERAL OF THE MARINE-HOSPITAL SERVICE.

1. Do not bring the patient to the fire, nor bathe the parts in warm water.
2. If snow be on the ground, or accessible, take a woolen cloth in the hand, place a handful of snow upon it, and gently rub the frozen part until the natural color is restored. In case snow is not at hand, bathe the part gently with a woolen cloth in the coldest *fresh* water obtainable—ice water if practicable.

*The muscular rigidity of death (*rigor mortis*) occurs later, after the temporary relaxation here referred to.

3. In case the frost-bite is old, and the skin has turned black or begun to scale off, do not attempt to restore its vitality by friction, but apply carron oil on a little cotton; after which wrap the part loosely in flannel.

4. In all cases, as soon as the vitality has been restored, apply the carron oil, prepared according to Service formula. As it contains opium, do not administer morphia or other opiate.

5. In the case of a person apparently dead from exposure to cold, friction should be applied to the body and the lower extremities, and artificial respiration practiced as in cases of the apparently drowned. As soon as the circulation appears to be restored, administer spirit and water at intervals of 15 or 20 minutes, until the flesh feels natural. Even if no signs of life appear, friction should be kept up for a long period, as instances are on record of recovery after several hours of suspended animation.

Carron oil—(Service formula):
 Olive-oil or linseed-oil (raw).
 Lime-water, of each 12 parts.
 Tincture of opium, 1 part.
 Mix.

MEASURING DISTANCES BY SOUND.

Sound travels at the rate of 1090 feet in a second of time when the temperature is at the freezing point, and about 1125 feet when the temperature is 60 degrees above zero (scale of Fahrenheit), which may be used for all ordinary purposes.

This circumstance affords an aid to the mariner navigating in a fog, if by sounding the steam-whistle he can get an echo from the shore. The usual method is to observe carefully the time in seconds between the sound of the whistle and the echo, and multiplying it by the distance that sound travels in a second.

EXAMPLE.

	H.	M.	S.
The whistle is sounded at.....	10	5	19
The echo is heard by the observer at....	10	5	31
	—	—	—
			19

Then $1125 \times 19 = 21,375$ feet, which is approximately four miles. But it must be observed that the shore, or whatever the sound was projected against, is only one-half that distance from the observer, because the sound had to travel there and return. In this connection it may be well to remark that the echo does not always come from the nearest shore, but sometimes from a neighboring hill-side, back from the shore or from a dense fog bank, when there is no land near in that direction.

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TO DETERMINE THE DISTANCE OF AN OBJECT ON SHORE, WHEN RUNNING ALONG THE LAND.

Take the bearing of the object, and note the time, keeping the same course; see how many points it differs from the course; when its difference is doubled, the ship will be as far from the object as she has run in the interval.

EXAMPLE.—Steering N. by W. along the shore making 10 miles an hour; at noon Sand Beach light-house bore N. W. by N. The difference between the course and bearing 2 points, proceeding on the same course until it bears N. W. by W., which is 4 points from the course, or double the difference of two points, time half-past twelve; the distance run in the half-hour, 5 miles, equals the distance from the light-house when it bears N. W. by W.

ANOTHER METHOD.—When an object on shore is nearly abeam, note the interval until the object changes its bearings two and a half points. Twice the distance run in this time is the distance of the object.

EXAMPLE.—Steering N. by W. along the shore, Sand Beach light-house bears W., 1 point forward of the beam, proceeding on the same course until it bore W. S. W. $\frac{1}{4}$ S., $1\frac{1}{4}$ points abaft the beam; time running, one-quarter of an hour; distance run, $2\frac{1}{4}$ miles; twice this distance, 5 miles, is the distance of the light when the second bearing was taken.

THE BAROMETER.

1. Wind is air set in motion. The barometer is almost always affected before the wind actually begins to blow or the rain to fall. The length of time which passes between the first appearance of a change of weather and the actual setting-in is not always the same.

2. When the barometer is steady there is no great likelihood of a storm being near us, while, when it is unsteady, there is danger of the wind freshening to a gale. This unsteadiness may be due to mere local causes, so that it is at times very hard to say whether it shows that a serious storm or only a slight squall is coming on.

3. A sudden rise of the barometer is very nearly as dangerous as a sudden fall, because it shows that the level is unsteady. In an ordinary gale the wind often blows hardest when the barometer is just beginning to rise, directly after having been very low.

4. When the barometer at any place rises very high and continues so for some days, it is because there is too much air at the place, and the wind will be very light. A gale can only set in when the wind flows away, and it will not at first be severe at that place.

5. When the barometer is very low and continues so, there may be calm and even dry weather for a short time, what is called a "pet day" or a "weather-breeder;" but there is great danger of a serious storm, because the air will try to force its way into the districts where the bar-

ometer is low and increase the pressure there. The storm will probably be the worst where the barometer has been lowest.

6. The barometer rises for northerly winds (including from north-west, by the north to the eastward) for dry or less wet weather, for less wind, or for more than one of these changes.

7. The barometer falls for southerly winds (including from southeast by the south to the westward) for wet weather, for stronger wind, or for more than one of these changes.

8. Besides these rules for the barometer, there is one about the way in which the wind changes, which is very important. It is well known to every seaman, and is contained in the following couplet:

" When the wind veers against the sun,
Trust it not for back it will run."

9. The wind almost always shifts *with the sun*, that is, from left to right in front of you. A change in this direction is called *veering*.

10. If the wind shifts the opposite way, that is against the sun, the change is called *backing*, and it seldom occurs unless when the weather is unsettled.

THE THERMOMETER.

As the barometer shows weight or pressure of the air, so the thermometer shows heat and cold, or temperature.

The result of numerous observations shows, that in the northern hemisphere:

The thermometer rises with E., S. E., and S. winds; with a S. W. wind it ceases to rise and begins to fall; it falls with W., S. W., and S. winds; and with a N. E. wind it ceases to fall and begins to rise.

The above remarks must be considered as relating to the hemisphere generally, there are local exceptions to this rule, on the lakes we sometimes have a high thermometer with northwest winds. By examining carefully the following article on the instrumental and other local indications of approaching storms on the lakes, it will be observed that as the barometer falls rapidly the thermometer rises, the only exception seems to be with northeast gales, which are sometimes preceded by a high barometer with falling temperature. Northwest gales in the fall are generally preceded by light southeast winds, veering to the south, heavy clouds banked in the west, with lightning, and rain, barometer falling rapidly, and thermometer rising.

The thermometer should always be read in conjunction with the barometer.

INSTRUMENTAL AND OTHER LOCAL INDICATIONS OF APPROACHING STORMS.

(COMPILED FROM REPORTS MADE TO THE CHIEF SIGNAL OFFICER BY OBSERVERS OF THE SIGNAL SERVICE, U. S. A.)

ALPENA.—Cirrus, cirro-cumulus or cirro-stratus clouds in upper, and a dull haze in lower atmosphere. Lower winds from westerly direction, falling barometer and rising temperature.

BUFFALO.—Rising barometer, with comparatively clear sky, mild temperature and light to fresh winds from west to southwest.

Light cirrus or cirro-stratus clouds move from the west, apparently very high in the atmosphere; humidity and wind decrease, and occasionally a calm ensues.

This is followed by light winds from northeast, east, or southeast. Barometer begins to fall, and temperature to rise slowly; humidity increases steadily; cumulus clouds appear, moving slowly from west to southwest, and are soon followed by cumulo-stratus; wind increases in velocity, and shortly before precipitation occurs a dense white vapor resembling haze, and moving with the surface current, gradually covers the whole sky.

Wind-storms are preceded by unusually rapid barometric depression, increase in temperature and humidity, stratus or cumulo-stratus clouds, with southwest winds. Water at the foot of lake Erie rises in advance of the storm.

DETROIT.—Falling barometer from twelve to twenty-four hours in advance of the storm, with wind from southeast to northeast.

DULUTH.—Northeast storms, preceded by hazy atmosphere and fog over the lake, the former turning to stratus and the latter to nimbus cloud as storm approaches. Falling barometer, increasing humidity and falling temperature.

Northwest storms by low and falling barometer, rising temperature, high and increasing humidity, with cumulus and cumulo-stratus clouds. This class of storms most frequent in winter and spring.

Northern storms by falling barometer, falling temperature, increasing humidity, and cumulus clouds; most frequent in winter, and accompanied by snow.

Southern storms by falling barometer, rising temperature, increasing humidity, with hazy atmosphere.

Eastern storms by high and rising barometer, rising temperature, increasing humidity, with stratus clouds.

Western storms by falling barometer, high or rising temperature, and humidity, with heavy banks of stratus clouds in western sky. Occur at all seasons of year.

Fogs are usually followed by rain within twenty-four hours.

ERIE.—Storms from north, northwest, and west are preceded by falling barometer, brisk to high southerly winds, rising temperature, and increasing humidity. Storms from the southwest to southeast are preceded by slowly falling barometer, rising temperature. With steady south wind at any season of the year, rain is probable within twelve hours.

MARQUETTE.—Falling barometer for twenty-four or forty-eight hours, rising temperature, southerly winds, with cirro-stratus clouds moving from a westerly or southwesterly direction.

OSWEGO.—Wind storms are preceded by rapid fall of barometer, with wind veering from southeast to southwest, west, and northwest. Rain storms by oscillating barometer, with downward tendency, hazy atmosphere gradually changing to cirro-stratus or cirro-cumulus clouds moving from westward.

Northeast storms by high barometer and low temperature. Local storms by sudden fall of barometer, rising temperature, low humidity, cumulo-stratus clouds in west or southwest.

ROCHESTER.—Falling barometer, rising temperature, east to southeast wind, low humidity, and clouds moving from the southwest. A northeast wind backing to northwest or west, or veering to southwest in winter, indicates snow.

SAINT PAUL.—Falling barometer, rising temperature, low humidity, southeast wind, with cirrus and cirro-stratus clouds.

TOLEDO.—Barometer falling rapidly, rising temperature, low humidity, easterly winds, cirrus clouds in western horizon moving eastward, followed by stratus until sky is obscured.

LACROSSE, WIS.—Barometer falls steadily for twenty-four hours, with rising temperature, increased humidity, and cirro-stratus clouds before rain. Wind storms same as above, with addition of cirrus of great elevation moving in opposite direction to surface wind, and apparently highly electrified. Winter storms are preceded by gentle south to southwest winds, veering to north or northeast.

PORT HURON.—Thick, heavy haze or clouds in northwest, with southeast wind, indicates rain. Low and falling barometer, with wind from the west, northwest or east-northeast, indicates wind.

PROVERBS RELATING TO CLOUDS.

STORM-PRESAGING CLOUDS.

(Extracts from Signal Service Notes.)

From Aristotle's time the value of cloud signs in storm and rain prognostications has been recognized, but their interpretation has only recently become possible, since the movement of storm centers over wide areas has been systematically traced. The irregular motions of the high clouds, perhaps more than their forms (presenting the appearance of having been divided and torn up by up-rushing currents), indicate dangerous cyclones. If the equatorial air current in which cyclones are borne along is undisturbed by a cyclonic vortex, the clouds floating in its higher strata would sail on it at a uniform rate. But if we suppose that a storm is moving in the great current, the ascending air in the storm's center is ceaselessly invading the cloud stratum above. It is this uprushing air which divides the clouds. But as the interchange between the surface and upper air in the cyclone center tends to retard the

swift upper current which transports the cirriform clouds, the motion of these clouds, both over the storm center and far out in front of it, must often be retarded.

ANVIL CLOUDS.—Anvil-shaped clouds are very likely to be followed by a gale of wind.

APPEARANCES.—Soft-looking, delicate clouds foretell fine weather with moderate, or light breezes. Hard edged, oily appearing clouds, wind. A dark, gloomy, blue sky indicates wind; a bright, blue sky, clear fine weather. Generally the softer the clouds the less wind. Small inky clouds foretell rain.

ASSEMBLAGE OF CLOUDS.—If an assemblage of small clouds spread out or become thicker and darker, expect rain.

AGAINST THE WIND.—If you see a cloud rise against the wind, when that cloud comes up to you, the wind will blow the same way that the cloud came, and the same rule holds good of a clear place when all the sky is equally thick except one clear edge.

BULL'S EYE.—A small, fast growing, black cloud in violent motion, seen in the tropics, is called the Bull's Eye, and precedes the most violent hurricanes.

BLACK SCUDS.—Small black scuds (clouds), drifting from southwest, is a sign of rain.

BLUE SKY.—Enough blue sky in the northwest to make a Scotchman a jacket is a sign of approaching clear weather.

CROSS-WIND CLOUDS.—If you see clouds going cross wind, there is a storm in the air.

CLOUDS—WIND.—Clouds flying against the wind indicate unsettled weather.

DARK SKY.—If the sky becomes darker without much rain, and divides into two layers of clouds, expect sudden gusts of wind. Dark clouds in the west at sunrise indicate rain on that day.

EVENING AND MORNING.—

Evening red and morning gray
Will set the traveler on his way;
But evening gray and morning red
Will bring down rain upon his head.

FAIR.—

If the sky beyond the clouds is blue,
Be glad, there is a picnic for you.

FINE WEATHER.—If clouds at the same height drive up with the wind and gradually become thinner and descend, expect fine weather.

GUSTS.—If there be a cloudy sky and dark clouds driving fast under higher clouds, expect violent gusts of wind.

HEAVY SKY.—If the sky after fine weather becomes heavy with small clouds, expect rain.

HUES.—Clouds being soft, undefined, and feathery, will be fair. Generally, any deep, unusual hue of clouds indicates rain and wind, while the more quiet and moderate tints indicate fair weather.

LOW CLOUDS.—Clouds floating low enough to cast shadows on the ground are usually followed by rain.

MACKEREL CLOUDS.—

Mackerel scales and mares' tails
 Make lofty ships carry low sails.

RED SKY.—When it is evening, ye say it will be fair weather, for the sky is red; and in the morning it will be foul weather to-day, for the sky is red and lowering. (Matthew xvi: 2, 3.)

When the clouds are gathered towards the sun at setting, with a rosy hue, they foretell rain.

If there be red clouds in the west at sunset, it will be fair; if the clouds have a tint of purple it will be fine, or if red bordered with black in the southeast.

STORM.—Behold there ariseth a little cloud out of the sea like a man's hand.

Prepare thy chariot and get thee down, that the rain stops thee not. And it came to pass in the meanwhile that the heavens were black with clouds and wind, and there was great rain. (Kings xviii: 44, 45.)

WIND.—If the wind blow between north and east or east, with clouds for some days, and if clouds be then seen driving from the south high up, rain will follow plentifully, sometimes forty-eight hours after; if after the rain the wind goes to the south or southwest, better weather will follow.

YELLOW SKY.—A light yellow sky at sunset presages wind.

A pale yellow sky at sunset presages rain.

PROVERBS RELATING TO THE MOON.

DRY WEATHER.—When the horns of the moon are sharp it indicates dry weather.

New moon far in the south indicates dry weather for a month.

EAST WIND.—If the moon changes with the wind east, the weather during that moon will be foul.

FAIR WEATHER.—Phases of the moon occurring in the evening, expect fair weather.

FINE WEATHER.—If the full moon rises clear, expect fine weather.

GALE MOON.—If the moon is seen between the soud and broken clouds during a gale, it is expected to souff away the bad weather.

HALO.—The larger the halo (ring) about the moon the nearer the rain clouds, and the sooner the rain may be expected.

A lunar halo indicates rain, and the number of stars inlosed, the number of rainy days. The moon with a circle brings water in her beak.

MOON, WIND-CLOUDS, ETC.—

When first the moon appears if then she shrouds
 Her silver crescent, tipped with sable clouds,
 Conclude she bodes a tempest on the main,
 And brews for fields impetuous floods of rain.
 Or if her face with fiery flushings glow,
 Expect the rattling wind aloft to blow.

But four nights old (for that is the best sign),
 With sharpened horns, if glorious then she shine,
 Next day not only that, but all the moon
 Till her revolving race be wholly run
 Are void of tempests both by land and sea.

MOON HALO.—A large ring around the moon and low clouds indicate rain in twenty-four hours; a small ring and high clouds, rain in several days.

MOON, POINTS OF.—If the new moon appears with the points of the crescent turned up, the month will be dry. If the points are turned down, it will be wet.

NEW MOON.—New moon on its back indicates wind; standing on its point, rain in the summer and snow in winter. (Dr. John Manual.)

OLD MOON.—

In the old moon

A cloudy morning means a fair afternoon.

The old moon seen in the new moon's arms is a sign of fair weather.

RED, DIM, OR PALE MOON.—A dim or pale moon indicates rain, a red moon indicates wind.

If the full moon rises red, expect wind. When the moon rises red and appears large, with clouds, expect rain in twelve hours.

PROVERBS RELATING TO RAIN.

CLEARNESS.—Unusual clearness in the atmosphere, objects being seen very distinctly, indicates rain.

EVENING AND MORNING.—

Evening red and morning gray,

Are sure signs of a fine day.

Evening gray and morning red,

Put on your hat or you'll wet your head.

HOURS OF COMMENCING.—If rain commences before daylight, it will hold up before 8 A. M.; if it begins about noon, it will continue through the afternoon; if it commences after 9 P. M., it will rain the next day; if it clears off in the night, it will rain the next day; if the wind is from northwest or southwest, the storm will be short; if from the northeast, it will be a hard one; if from the northwest, a cold one, and from the southwest a warm one.

If rain ceases after 12 M., it will rain next day.

If rain ceases before 12 M., it will be clear next day.

MORNING RAIN.—

If it rain before seven,

It will clear before eleven.

If rain begins at early morning light,

'Twill end ere day at noon is bright.

NOTICE.—

Rain long foretold, long last;

Short notice, soon past.

WIND AND RAIN.—Marry the rain to the wind and you have a calm.
WIND.—

With the rain before the wind,
Your topsail halyards you must mind.

PROVERBS RELATING TO THE RAINBOW.

CLEAR.—The rainbow has but a bad character; she ever commands the rain to cease.

COLOR.—If the green be large and bright in the rainbow, it is a sign of rain. If red be the strongest color, there will be rain and wind together. After a long drought the rainbow is a sign of rain. After much rain it indicates fair weather. If it breaks up all at once, there will follow severe and settled weather. If the bow be in the morning, rain will follow; if at noon, slight and heavy rain; if at night, fair weather. The appearance of two or three rainbows indicates fair weather for the present, but settled and heavy rains in a few days.

EVENING RAINBOW.—

If there is a rainbow at eve,
It will rain and leave.

EAST AND WEST RAINBOW.—Rainbow in the east indicates that the following day will be clear.

A rainbow in the west is usually followed by more rain the same day.

FAIR WEATHER.—

The boding shepherd heaves a sigh,
For see, a rainbow spans the sky.

HIGH RAINBOW.—When rainbow does not touch water, clear weather will follow.

MORNING AND EVENING RAINBOWS.—

Rainbow in the morning, shepherds take warning;
Rainbow at night, shepherds' delight.

A morning rainbow indicates rain; an evening rainbow, fair weather.

WEST AND EAST SHOWER.—Rainbow in the morning shows that shower is west of us, and we will probably get it. Rainbow in the evening shows that shower is east of us and is passing off.

PROVERBS RELATING TO STARS AND METEORS.

COMETS BRING COLD WEATHER.

FALLING STARS.—If there be many falling stars during a clear evening in summer, expect thunder.

If there are no falling stars on a bright summer night, expect fine weather.

MANY STARS.—When the sky is full of stars, expect rain. Many stars in winter indicate frost. In summer, when many stars twinkle, clear weather is indicated.

MILKY WAY.—The edge of the Milky Way, which is the brightest, indicates the direction from which the approaching storm will come.

SHOOTING STARS.—If meteors shoot towards the north, expect a north wind next day. Many shooting stars on summer nights indicate hot weather.

TEMPEST.—When a star tows the moon and another chases her astern, tempestuous weather will follow. The phenomenon is probably styled a big star chasing the moon.

WIND AND RAIN.—If the stars appear large and clear, expect rain or wind.

PROVERBS RELATING TO THE SUN.

AURORA.—Aurora Borealis denotes cold.

CLOUDY SUNSET.—

The sun sets weeping in the lowly west,
Witnessing storms to come, woe and unrest.

—*Shakespeare.*

DARK CLOUDS.—If the sun sets in dark, heavy clouds, expect rain next day. If at sunrise there are many dark clouds seen in the west, and remain there, rain will fall on that day.

DOUBLE SETTING.—Sun setting double indicates much rain. Red sun indicates fair weather. Orange sun, usually foul weather. Mock suns in winter are usually followed by intense cold.

DULL COLOR.—When the sun appears a pale or dull color expect rain.

DRAWING WATER.—Rays of the sun appearing in a cloud forbode rain. If the sun draws water in the morning, it will rain before night.

GOLDEN SET.—

The weary sun hath made a golden set,
And by the bright track of his fiery car,
Gives tokens of a goodly day to-morrow.

Richard III.

HALO.—A solar halo indicates bad weather. A halo around the sun indicates the approach of a storm, within three days, from the side which is most brilliant. If there be a ring or halo around the sun in bad weather, expect fine weather soon. A bright circle around the sun denotes a storm, and cooler weather.

HAZINESS.—A blur or haziness about the sun indicates a storm.

PALE TWILIGHT.—Pale, yellow twilight, extending high up, indicates threatening weather.

PALE SET.—If the sun sets pale, it will rain to-morrow. A green sunset indicates rain.

PALE SUNRISE.—If the sun rises pale, a pale red, or even dark blue, there will be rain during the day.

RED CLOUDS.—If the clouds at sunrise be red, there will be rain the following day.

RED.—A red evening indicates fine weather; but if the red extends far upwards, especially in the morning, it indicates rain or wind.

RED SUN.—A red sun has water in its eye.

SEA-GREEN SKY.—When the sky during rain is tinged with sea-green the rain will increase; if with deep blue, the rain will be showery.

YELLOW SUNSET.—A bright yellow sunset indicates wind; a pale yellow, wet; a neutral gray is a favorable sign in the morning and an unfavorable one in the evening.

The sun reveals the secrets of the sky,
And who dares give the source of light the lie?

CANALS.

TABLE showing the smallest locks on the several lines of navigation; also the dimensions of the largest vessels which may pass through them:

NAME OF CANAL.	Dimensions of Lock in Feet.			Dimensions of Vessels in Feet.			Tonnage of Vessels.
	Length.	Breadth.	Depth of water on Sills.	Length.	Breadth.	Draught of water when loaded.	
Lachine	270	45	12	250	44	12	1,000
Beauharnois	200	45	9	180	44	9	700
Cornwall	200	55	9	180	54	9	750
Williamsburg	200	45	9	180	44	9	700
Welland	270	45	14	250	44	14	1,000
St. Ours Lock	200	45	7	180	44	7	600
Chambly	118	23½	7	110	23	6½	230
Rideau	134	33	5	120	21½	4½	250
St. Anne	200	45	9	180	44	9	700
Carillon	200	45	9	180	44	9	700
Grenville	200	45	9	180	44	9	700
Culbute	200	45	6	180	44	6	550
St. Peter's	200	49½	18	199	49	17½	1,000
River Trent	181	32½	4½				
<i>United States Canals.</i>							
Erie	110	18	7	102	17½	6½	220
Champlain	100	18	5	92	17½	4½	80

ST. CLAIR FLATS SHIP CANAL.

This canal was projected in 1866, with a view to obtaining a straight channel across St. Clair Flats, 13 feet deep, 300 feet wide, and provided on each side with a dike 7,300 feet long. The dikes consist of timber cribs resting upon piles driven into the original bottom of the shoal, and filled with materials dredged from the channel between them, each dike being protected on both sides by sheet-piling. The work was completed, according to this project in 1871.

The project was modified in 1873, so as to further improve the mid-channel to a depth of 18 feet, and width of 200 feet. This modification was completed in 1874. Improvements are now in progress by which the depth will be increased to 18 feet.

ST. MARY'S FALLS SHIP CANAL.

This canal, which overcomes the rapids in the St. Mary River, connecting the water of Lakes Huron and Superior, is situated in the State of Michigan, and was first projected in 1837. The canal was not, however, commenced until 4th June, 1853, and the first boat passed through the old canal on the 18th June, 1855. Cost of old Canal to 14th May, 1885, \$999,802.46. In 1870 the enlargement of the canal was commenced, and it was opened to navigation on 1st September, 1881, but not completed until 1882, up to which time the cost of enlargement had been \$2,150,000.

The length of the canal is about 7,000 feet. The width varies; the least width is at the swing bridge, or movable dam, 108 feet, the depth of water from 15½ to 16 feet. The lock is 515 feet long between gates, 80 feet wide in chamber, and 60 feet wide at the gates, with 16 feet of water during mean low water; total lift varies from 16½ to 18 feet. The gates and capstans are operated by machinery; the power is produced by two turbine wheels, which also furnishes power to run the electric lights.

New Lock.—The new lock to be constructed upon the site of the old State locks is to have a length of 800 feet between gates, a width of 100 feet throughout, a depth of 21 feet on the miter-sills, and a lift of 18 feet. The canal is to be deepened to correspond.

GREATEST DEPTH OF WATER IN THE LAKES.

LAKE SUPERIOR.—The greatest depth as appears from the Lake Survey is 168 fathoms, at a point 53 miles N. N. E. ¼ E. from Manitou Island light, and 61 miles E. ½ S. from Passage Island light.

LAKE MICHIGAN.—The greatest depth is 145 fathoms, at a point 26½ miles S. W. by W. ¼ W. from Point Betsey light, and S. E. by E. ¼ E. 33½ miles from Sturgeon Bay Ship canal light.

LAKE HURON.—The greatest depth is 125 fathoms, at a point 26½ miles S. S. W. ¼ W. from Cove Island light, and 58 miles E. ¼ S. from Thunder Bay Island light.

LAKE ERIE.—The greatest depth is 35 fathoms, at a point 6½ miles S. E. ¼ E. from Long Point light, and N. by E. ¼ E. 24½ miles from the main light at Erie.

LAKE ONTARIO.—The greatest depth is 123 fathoms, at a point 28 miles N. E. by E. ¼ E. from the pierhead light at Charlotte, and N. N. W. ¼ W. 15½ miles from the main light at Big Sodus.

Feet.	Tonnage of Vessels.
2	1,000
3	700
4	750
5	700
6	1,000
7	600
8	800
9	250
10	700
11	700
12	700
13	550
14	1,000
15	220
16	80

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WATER TABLE.

Showing the mean level of Lake Michigan and Lake Huron during the months of May, June, July, August, September, October, and November, for sixteen years, from 1876 to 1891.

Date.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1876.....	1.9	1.0	1.2	1.3	1.3	1.7	1.8
1877.....	2.2	2.2	2.1	2.2	2.4	2.6	2.6
1878.....	2.5	2.8	2.3	2.3	2.6	2.5	2.8
1879.....	3.4	3.3	3.2	3.4	3.5	3.7	3.8
1880.....	3.4	2.9	2.7	2.8	2.9	3.2	3.3
1881.....	3.0	2.8	2.6	2.8	2.9	2.7	2.6
1882.....	2.6	2.4	2.2	2.2	2.3	2.5	2.7
1883.....	2.5	2.1	1.6	1.5	1.8	2.1	2.0
1884.....	1.9	1.8	1.7	1.9	2.2	2.0	2.4
1885.....	2.0	1.7	1.6	1.5	1.6	1.8	2.0
1886.....	1.3	1.2	1.4	1.5	1.7	1.8	2.1
1887.....	2.1	1.9	2.0	2.2	2.5	2.8	3.2
1888.....	2.85	2.55	2.53	3.48	3.78	3.07	3.25
1889.....	3.63	3.30	3.04	3.10	3.27	3.64	3.98
1890.....	3.76	3.33	3.14	3.14	3.41	3.62	3.83
1891.....	3.89	3.94	3.91	4.04	4.20	4.57	4.88

NOTE.—The above figures, from official records indicate the number of feet and tenths, that the level of the lake was below the plane of reference, which corresponds with the High Water of 1838. The highest water of which we have any authentic record was in the year 1838, and the lowest water occurred in 1819; the difference between the extreme fluctuations was $5\frac{1}{2}$ feet.

A new plane of reference has been adopted. It is the mean level of the sea, observed in New York Bay. In January, 1891, the mean level of Lake Michigan and Lake Huron was 580.02 feet, and Lake Superior 600.66 feet above this plane of reference.

The height of Lake Superior, as observed above the lock in the Sault River, is 20.64 feet above Lake Huron. The level below the lock is 3.07 feet above Lake Huron.

REGULATIONS FOR ISSUING CHARTS OF THE LAKE SURVEY.

1. Charts are no longer issued free of charge to vessels. 2. Charts can be purchased by any one, at the U. S. Engineer's office, 34 West Congress St., Detroit, for 20 cents per sheet. The general chart of Lake Superior is in three sheets, and that of Lake Michigan in two sheets and Lakes Huron, Erie and Ontario in one sheet.

AREA OF THE LAKES, AND THEIR HEIGHT ABOVE THE SEA.

LAKE SUPERIOR contains 31,200 square miles, and its mean level for nineteen years is 601.55 feet above the mean level of the sea.

LAKE MICHIGAN contains 22,450 square miles, and its mean level for 19 years, is 581.56 feet above the mean level of the sea.

LAKE HURON contains 23,800 square miles, and its mean level for 19 years is 581.56 feet above the mean level of the sea.

LAKE ERIE contains 9,960 square miles, and its mean level is 573 feet above the mean level of the sea.

LAKE ONTARIO contains 7,240 square miles, and its mean level is 246.65 feet above the mean level of the sea.

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2.0	2.4
1.8	2.0
1.8	2.1
2.8	3.2
3.07	3.25
3.64	3.98
3.62	3.82
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