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NORWAY PILOT

FROM FEJEFIORD TO THE NORTH CAPE THENCE
TO JACOB RIVER

1915

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PUBLISHED BY THE HYDROGRAPHIC OFFICE,
UNDER THE AUTHORITY OF THE
SECRETARY OF THE NAVY



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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PREFACE.

This publication comprises the sailing directions for the west and north coasts of Norway, extending from Fejefjord to North Cape and thence to Jacob River, the boundary between Norwegian and Russian Lapland.

The information contained herein is taken mainly from the British Admiralty sailing directions for these coasts. It has been brought up to date by hydrographic information received from various sources, principally notices to mariners, and is correct to H. O. Notice to Mariners No. 26, of 1915.

The bearings and courses are true, in degrees from 0° (north) to 360°.

Bearings limiting the sectors of lights are toward the light.

The directions of winds refer to the points from which they blow; of currents, the points from which they set. These directions are true.

Variations for the year, with the annual rate of change, may be obtained from H. O. Chart No. 2406, Variation of the Compass.

Distances are expressed in nautical miles, the mile being approximately 2,000 yards.

Soundings are referred to low water ordinary springs unless otherwise stated.

Heights are referred to mean high water, spring tides.

Details of lights, except buoy lights, should be taken from the latest light lists and charts, as no attempt has been made to cover these details in this volume.

The return coupons in the front of the book should be sent in at the expiration of the years shown on them.

In the interest of mariners, information regarding inaccuracies in this publication should be sent to the United States Hydrographic Office, Washington, D. C.

H. O. 136.

A summary of the Notices to Mariners affecting this publication, published during the year 1916, will be sent free of expense upon the receipt of this coupon at the United States Hydrographic Office, Washington, D. C.

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GLOSSARY.

PRONUNCIATION OF NORWEGIAN, SWEDISH, AND DANISH VOWELS, ETC.

A, a, is pronounced as *a* in the English word *class* or *palm*.

AA, aa, å, is pronounced as *a* in the English word *fall* or *warm*.

Æ, æ, ä, is pronounced as *a* in the English word *fate*.

E, e, ei, is pronounced as *e* in the English word *they*.

I, i, is pronounced as *ee* in the English word *bee*.

J, je, is pronounced as *ye* in the English word *yellow*.

O, o, is pronounced nearly as *oo* in the English word *loose*.

Ö, ö, is pronounced as *œu* in the French word *cœur*.

U, u, is pronounced as *u* in the English word *bull*.

Y, y, is pronounced nearly as *u* in the French word *pur*.

The letters Æ and Ö or Ø in Danish and Norwegian, and Å, Ä, and Ö, in Swedish, are placed at the end of the alphabet, a peculiarity which must be borne in mind when consulting Scandinavian dictionaries.

NOTE.—It will often be found that the spelling of names, places, and words varies slightly in different localities in Norway and Sweden, and the same thing occurs in official documents, and even in different charts of the same locality. In this work an attempt has been made to reconcile these differences in accordance with the most commonly used modern forms, and at the same time to agree with the Admiralty charts.

GLOSSARY OF A FEW NORWEGIAN WORDS WHICH MAY BE USEFUL IN QUESTIONING PILOTS.

Aa	.....	Rivulet, streamlet.
Aas	.....	Hill.
Agter, agterud	.....	Aft, astern.
Anker, ankre	.....	Anchor, to anchor.
Anker flig	.....	Anchor flukes.
Baad, båt	.....	Boat.
Baadsmand	.....	Boatswain.
Baake	.....	Beacon.
Bagbord; med roret!	.....	Port; the helm!
Bak sell	.....	Aback, all aback.
Bakke	.....	Hill.
Bæk	.....	Rivulet.
Berg, bierg, bjerg	.....	Mount, hill.

Bestik	Dead reckoning.
Bierge seil	Shorten sail.
Bo, boe, boen	A submerged rock.
Bod, sôbod	Warehouse.
Borg	Castle or mansion.
Boug	Bow.
Braat	A collection of rocks or shoals.
Bram seil	Topgallant sail.
Bram stang	Topgallant mast.
Brase bak	Brace aback.
Bugsere	To tow.
Bugt	Bight or bay.
By	Town.
Byge	Squall.
Dræg	Grapple.
Dyb, djup	Deep.
Dybgaaende	Draft of ship.
Ebb	Ebb tide.
Elv	River.
Fald	A fall, of a rock or hill.
Fartöi, fartyg	Vessel.
Favn, famn	Fathom.
Fæstning	Fort.
Fjord, fjord	Frith or arm of the sea.
Fjeld	Rocky bottom or rocky hill.
Flak	A flat or bank.
Flesa, flessa, flissa	(Splinter), rock above water.
Flig	Flukes.
Flod	Flood tide.
Flue, flua	A submerged rock with over 5 fathoms.
Fod	Foot, feet.
Fokke mast	Foremast.
Fokken	Foresail.
Fortöle	Moor with hawsers.
Friske i klydset	Freshen the cable.
Fuld og bi	Full and by.
Fyr; skib, skepp	Light; vessel.
Frytaarn	Lighthouse.
Gaard	House, farm.
Gab, gat	Gap, inlet, passage.
Gammel, gamle	Old.
Gangspil, spill	Capstan.
Giv op	Clew up.
Grund	Ground, shoal.
Gule	Yellow.
Haand-lod	Hand-lead.
Hage, huk	Strip or hook of lowland.
Hals	Neck of land, isthmus.
Hav, haf	Sea.
Havn, hamn	Harbor or haven.
Hei, heia, høi, høide	Hill or height, hummock.
Holm	Holm, islet.
Hoved, hufvud	Head.

Hus	House.
Hvid, hvide	White.
Ilae	Leeward.
Iland	Ashore.
Indre	Inner.
Istandsætte, raparere	Repair.
Jager	Flying jib.
Kabellaring	Messenger.
Kalv	Calf (a small rock or islet under a larger one).
Kap	Cape.
Kiede, kjetting	Chain.
Kil	Creek, cove.
Kirke	Church.
Kjendt-mand	An uncertified pilot.
Klippe	Rock.
Klyds	Hawsehole.
Klyver; bom	Jib; boom.
Knob	Knot.
Knude	Bluff, hummock.
Koffardi-skib	Merchant ship.
Kompas; stregerne	Compass; points of compass.
Kovende, or vende for vinden	Wear ship.
Krydse, krydsning	Beat, or turning to windward.
Lager val	Lee shore.
Led	Channel.
Lette anker	Weigh anchor.
Lette det ene	Unmoor.
Ligge bak	Lie to.
Lille, lldt, liden, lldet	Little.
Lods, lots	Pilot.
Iøb	Channel, passage.
Luv, luv op!	Luff.
Mærke	Mark.
Mærssell	Topsail.
Mellem	Between.
Mesanmast	Mizenmast.
Misvisning	Variation of compass.
Mølle	Mill.
Mund, munding	Mouth, outlet.
Nathuset	Binnacle.
Nes	Cape, promontory.
Nord, nordre	North, northern.
Nöst	Boathouse.
Ny	New.
Odde	Point.
Oplagshavn	A staple port or harbor.
Orlogsmand	Man-of-war.
Ö, öe	Island.
Ore	Ear (low point).
Öst, östre	East, eastern.
Paa grund	Aground.
Pakhus	Warehouse.

Pal.....	Pawl.
Pelling.....	Bearing.
Raa; sell.....	Yard; squaresail.
Rat.....	Wheel.
Ratline.....	Tiller ropes.
Rebe.....	Reef (sail).
Red.....	Roadstead.
Rende, rännan.....	Channel.
Rev.....	Reef (shoal).
Revle.....	Bar, stony shoal.
Ro.....	Row.
Röd.....	Red.
Ror.....	Rudder.
Rös, röse.....	Stone heap, rocky ground.
Sakning.....	Sternboard.
Sand.....	Sand.
Skandse.....	Redoubt, quarterdeck.
Skandsebeklädning.....	Bulwark.
Skib, skepp.....	Ship.
Skjer, skjær, skär.....	A rock above water.
Skjærpe.....	Brace up.
Skov.....	Wood or forest.
Slaggrund.....	The slope of the bottom, either from a shoal or the shore, which may be shallow water to be avoided or an anchorage to be used.
Slik.....	Ooze.
Slot.....	Palace, castle.
Smaa.....	Small.
Sö, indsö.....	Sea, lake.
Sömärke.....	Beacon, seamark.
Sort, sorte.....	Black.
Stad, stadt.....	City.
Stag; seil.....	Stay; sail.
Stage.....	Pole.
Stak.....	Heap, stack.
Sten, steen.....	Stone or rock.
Stjert.....	Tail or spit.
Stor, store, stort.....	Large.
Stor mast.....	Mainmast.
Stor seil.....	Mainsail.
Ström.....	Current, stream of tide.
Strömråse.....	Race (ripple).
Styre.....	To steer.
Stybord; med roret!.....	Starboard; the helm!
Styrmand.....	Mate.
Sund.....	Sound.
Syd, söndre.....	South, southern.
Syg, syghus.....	Ill, hospital.
Taarn.....	Tower.
Talje.....	Tackle.
Tare.....	Submerged rock, usually large and flat.
Til veirs.....	Aloft.
Tomme.....	Inch.

GLOSSARY.

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Tømmer.....	Timber.
Tømmer-mand.....	Carpenter.
Tønne.....	Buoy, cask.
Tørbøe.....	Rocks above water.
Toug, trosse.....	Line, rope, hawser.
Tværs.....	Abeam.
Uklar.....	Foul.
Væderqvarn.....	Windmill
Værft.....	Wharf, dockyard, shipyard.
Vager.....	Beacon, buoy, vane.
Val.....	Shore, coast.
Vand.....	Water, small lake.
Varde.....	Beacon (ashore).
Varp anker.....	Kedge.
Varpe.....	Warp.
Vende.....	Tack.
Vende for vinden, or Kovende.....	Wear ship.
Vest, vestre.....	West, western.
Vik, vig.....	Bay, cove, creek.
Vind.....	Wind.
Ydre, ytre, yttre.....	Outer.

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INFORMATION RELATING TO NAVIGATIONAL AIDS AND GENERAL NAVIGATION.

THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

The following publications are issued by the United States Hydrographic Office as guides to navigation: Charts, Chart Catalogues, Sailing Directions, Light Lists, Tide Tables, Notices to Mariners, Pilot Charts, and Hydrographic Bulletins. Of these, the Notices to Mariners and the Hydrographic Bulletins are free to mariners and others interested in shipping. The Pilot Charts are free to contributors of professional information, but are sold to the general public at 10 cents a copy. The other publications of the office are sold under the law at cost price.

The Charts, the Sailing Directions, and the Light Lists are all affected by continual changes and alterations, concerning which information from all parts of the world is published weekly in the Notices to Mariners.

The charts are always corrected for all available information up to the date of issue stamped upon them; and the Light Lists should be noted for the recent alterations and additions. The Sailing Directions, however, can not, from their nature, be so fully corrected, and in all cases where they differ from the charts, the charts must be taken as the guide.

Charts.—When issued from the Hydrographic Office, the charts have received all necessary corrections to date.

All small but important corrections that can be made by hand are given in the Notices to Mariners, and should at once be placed on the charts to which they refer.

Extensive corrections that can not be conveniently thus made are put upon the plates, and new copies are put on sale. Masters of vessels are urged to replace the old charts, which should be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which extensive corrections are made are noted on the chart on the right of the middle of the lower edge; those of the smaller corrections at the left lower corners.

The edition, and corresponding date, of the chart will be found in the right lower corner, outside the outer neat line.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (found in the lower right and upper left corners), in order that the edition of the chart referred to may be known.

The Light Lists are corrected before issue, and all changes are published in the weekly Notices to Mariners.

The navigating officer should make notations in the tabular form in the Light Lists and paste in at the appropriate places slips from the Notices to Mariners.

The Light Lists should always be consulted as to the details of a light, as the description in the sailing directions is not complete, and may be obsolete, in consequence of changes since publication.

The Sailing Directions or Pilots are kept corrected by addenda, and subsequent to date of last addenda they should be kept corrected by means of the Notices to Mariners. Sailing Directions issued to naval vessels carry with them an envelope containing slips of corrections up to date of issue.

Addenda are published from time to time, and contain a summary of all the information received up to date since the publication of the volume to which they refer, canceling all previous Notices to Mariners.

To enable the books to be more conveniently corrected, addenda and Notices to Mariners are printed on one side only, and two copies of the latter are issued to each naval vessel, one to be cut and the slips pasted in at the appropriate places, the other to be retained intact for reference.

To paste in the slips, as the Notices to Mariners are received, is one of the duties of the navigating officer demanding faithful attention.

It must, however, be understood that Sailing Directions will rarely be correct in all details, and that, as already stated, when differences exist the chart, which should be corrected from the most recent information, should be taken as the guide, for which purpose for ordinary navigation it is sufficient.

The Tide Tables, which are published annually by the United States Coast and Geodetic Survey, give the predicted times and heights of the high and the low waters for every day in the year at 70 of the principal ports of the world, and, through the medium of these by means of tidal differences and ratios, at a very large number of subordinate ports. The tables for the Atlantic and the Pacific coast ports of the United States are also published separately.

It should be remembered that these tables aim to give the times of high and low water, and not the times of turning of the current or of slack water, which may be quite different.

Notices to Mariners, containing fresh information pertaining to all parts of the world, are published weekly and mailed to all

United States ships in commission, branch hydrographic offices and agencies, and United States consulates. Copies are furnished free by the main office or by any of the branch offices on application.

With each Notice to naval vessels is sent also a separate sheet, giving the items relating to lights contained in the latest Notice, intended especially for use in correcting the Light Lists.

Pilot Charts of the North Atlantic, Central American Waters, and North Pacific and Indian Oceans are published each month, and of the South Atlantic and South Pacific Oceans each quarter. These charts give the average conditions of wind and weather, barometer, percentage of fog and gales, routes for steam and sailing vessels for the period of issue, ice and derelicts for the preceding period, ocean currents and magnetic variation for the current year, storm tracks for preceding years, and much other useful information. They are furnished free only in exchange for marine data or observations.

Hydrographic Bulletins, published weekly, are supplemental to the Pilot Charts, and contain the latest reports of obstructions and dangers along the coast and principal ocean routes, ice, derelicts, and wreckage, reports of the use of oil to calm the sea, and other information for mariners. They are to be had free upon application.

THE USE OF CHARTS.

Accuracy of chart.—The value of a chart must manifestly depend upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become.

To judge of a survey, its source and date, which are generally given in the title, are a good guide. Besides the changes that may have taken place since the date of the survey, in waters where sand or mud prevails, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail; until a chart founded on such a survey is tested it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbors and their approaches, no surveys yet made have been so thorough as to make it certain that all dangers have been found. The number of the soundings is another method of estimating the completeness of the survey, remembering, however, that the chart is not expected to show all the soundings that were obtained. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Large or irregular blank spaces among soundings mean that no soundings were obtained in these spots. When the surrounding soundings are deep it may fairly be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present,

such banks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch or pinnacle rock.

A wide berth should therefore be given to every rocky shore or patch, and instead of considering a coast to be clear, the contrary should be assumed.

Fathom curves a caution.—Except in charts of harbors that have been surveyed in detail, the 5-fathom curve on most charts may be considered as a danger line or caution against unnecessarily approaching the shore or bank within that line, on account of the possible existence of undiscovered inequalities of the bottom, which only an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for so detailed a survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The 10-fathom curve on rocky shores is another warning, especially for ships of heavy draft.

A useful danger curve will be obtained by tracing out with a colored pencil or ink the line of depth next greater than the draft of the ship using the chart. For vessels drawing less than 18 feet the edge of the sanding serves as a well-marked danger line.

Charts on which no fathom curves are marked must especially be regarded with caution, as indicating that soundings were too scanty and the bottom too uneven to enable the curves to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed around, as it is doubtful how closely the spot may have been examined and whether the least depth has been found.

The chart on largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it.

Caution in using small-scale charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on one of small scale the same amount of displacement means a large fraction of a mile.

Distortion of printed charts.—The paper on which charts are printed from engraved plates has to be damped. On drying distortion takes place from the inequalities of the paper, which greatly varies with different papers and the amount of the damping; but it

does not affect navigation. The larger the chart the greater the amount of this distortion. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted on the chart, especially if the lines to objects be long.

Mercator chart.—Observed bearings are not identical with those measured on the Mercator chart (excepting only the bearings north and south, and east and west on the equator), because the line of sight, except as affected by refraction, is a straight line and lies in the plane of the great circle, while the straight line on the chart (except the meridian line) represents not the arc of a great circle but the loxodromic curve, or rhumb line, which on the globe is a spiral approaching but never in theory reaching the pole, or, if the direction be east and west, a circle of latitude.

The difference is not appreciable with near objects, and in ordinary navigation may be neglected, but in high latitudes, when the objects are very distant, and especially when lying near east or west, the bearings must be corrected for the convergence of the meridians in order to be accurately placed on the Mercator chart, which represent the meridians as parallel.

On the polyconic chart, since a straight line represents (within the limits of 15 or 20 degrees of longitude) the arc of a great circle or the shortest distance between two points, bearings of the chart are identical with observed bearings.

The Mercator projection is unsuited to surveying, for which purpose the polyconic projection is used by the Hydrographic Office and the Coast and Geodetic Survey.

Notes on charts should always be read with care, as they may give important information that can not be graphically represented.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact positions. They should therefore be regarded as warnings, and not as infallible navigational marks, especially when in exposed places and in the wintertime; and a ship's position should always, when possible, be checked by bearings or angles of fixed objects on shore.

Gas buoys.—The lights shown by gas buoys can not be implicitly relied on; the light may be altogether extinguished, or, if periodic, the apparatus may get out of order.

Whistle and bell buoys are sounded only by the action of the sea; therefore, in calm weather, they are less effective or may not sound.

Lights.—All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of 15 feet for the observer's eye. The effect of a greater or less height of eye can be ascertained by means of the table of distances of visibility due to height, published in the Light Lists.

The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Refraction, too, may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light, the fact may be forgotten that aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be obtained from the standard compass when you lay down from aloft.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the ship is on the circle of visibility corresponding with the usual height of the eye, or unexpectedly nearer the light.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by its candlepower or order, as stated in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range corresponding to its height. Thus, a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the influence of the wind large areas of silence have been found in different directions and at different distances from the origin of sound, even in clear weather; therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly toward the land, and may not be observed by the lighthouse keepers until upon them; a ship may have been for many hours in it, and approaching the land in confidence, depending on the signal, which is not sounded. When sound travels against the wind, it may be thrown upward; a man aloft might then hear it though inaudible on deck.

The submarine bell system of fog signals is much more reliable than systems transmitting sound through the air, as sound traveling in water is not subject to the same disturbing influences; the fallibility of the lighthouse keeper is, however, about the same in all systems, so that caution should be observed even by vessels equipped with submarine bell receiving apparatus.

Submarine bells have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus may determine the approximate bearing of the signal.

These signals may be heard also on vessels not equipped with receiving apparatus by observers below the water line, but the bearing of the signal can not then be readily determined.

Vessels equipped with radio apparatus and submarine bell receivers may fix their distance from a light vessel having radio and submarine bell, utilizing the difference in velocity of sound waves of the radio and the bell. Sound travels 4,794 feet per second at 66° F. in water, and the travel of radio sound waves for practicable distances may be taken as instantaneous.

All vessels should observe the utmost caution in closing the land in fogs. The lead is the safest guide and should be faithfully used.

Tides.—A knowledge of the times of high and low water and of the amount of vertical rise and fall of the tide is of great importance in the case of vessels entering or leaving port, especially when the low water is less than or near their draft. Such knowledge is also useful at times to vessels running close along a coast, in enabling them to anticipate the effect of the tidal currents in setting them on or off shore. This is especially important in fog or thick weather.

The predicted times and heights of the high and low waters, or differences by which they may be readily obtained, are given in the Tide Tables for all the important ports of the world. The height at any intermediate time may be obtained by means of Tables 2A and 2B for most of the principal tidal stations of the United States, given in Table 1, and for the subordinate stations of Table 3 by using them as directed in the Tide Tables. The intermediate height may also be obtained by plotting the predicted times and heights of high and low water and connecting the points by a curve. Such knowledge is often useful in crossing a bar or shallow flats.

Planes of reference.¹—The plane of reference for soundings on Hydrographic Office charts made from United States Government surveys and on Coast and Geodetic Survey charts of the Atlantic coast of the United States is mean low water; on the Pacific coast of the United States as far as the Strait of Juan Fuca, it is the mean of the lower low waters; and from Puget Sound to Alaska, the plane employed on Hydrographic Office charts is low water ordinary springs.

On most of the British Admiralty charts the plane of reference is the low water of ordinary springs; on French charts, the low water of equinoctial springs.

In the case of many charts compiled from old or various sources the plane of reference may be in doubt. In such cases, or when-

¹ The distinction between "rise" and "range" of the tide should be understood. The former expression refers to the height attained above the datum plane for soundings, differing with the different planes of reference; the latter, to the difference of level between successive high and low waters.

ever not stated on the chart, the assumption that the reference plane is low water ordinary springs gives a larger margin of safety than mean low water.

Whichever plane of reference may be used for a chart, it must be remembered that there are times when the tide falls below it. Low water is lower than mean low water about half the time, and when a new or full moon occurs at perigee the low water is lower than the average low water of springs. At the equinoxes the spring range is also increased on the coasts of Europe, but in some other parts of the world, and especially in the Tropics, such periodic low tides may coincide more frequently with the solstices.

Wind or a high barometer may at times cause the water to fall below even a very low plane of reference.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can not be depended upon and additional caution is necessary.

Mean sea level.—The important fact should be remembered that the depths at half tide are practically the same for all tides, whether neaps or springs. Half tide therefore corresponds with mean sea level. This makes a very exact plane of reference, easily found, to which it would be well to refer all high and low waters.

The Tide Tables give in Table 3, for all the ports, the plane of reference to which tidal heights are referred and its distance below mean sea level.

If called on to take special soundings for the chart at a place where there is no tidal bench mark, mean sea level should be found and the plane for reductions established at the proper distance below it, as ascertained by the Tide Tables, or by observations, or in some cases, if the time be short, by estimation, the data used being made a part of the record.

Tidal streams.—In navigating coasts where the tidal range is considerable, especial caution is necessary. It should be remembered that there are indrafts to all bays and bights, although the general run of the stream may be parallel with the shore.

The turn of the tidal stream offshore is seldom coincident with the times of high and low water on the shore. In some channels the tidal stream may overrun the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

The effect of the tidal wave in causing currents may be illustrated by two simple cases:

(1) Where there is a small tidal basin connected with the sea by a large opening.

(2) Where there is a large tidal basin connected with the sea by a small opening.

In the first case the velocity of the current in the opening will have its maximum value when the height of the tide within is changing most rapidly; i. e., at a time about midway between high and low water. The water in the basin keeps at approximately the same level as the water outside. The flood stream corresponds with the rising and the ebb with the falling of the tide.

In the second case the velocity of the current in the opening will have its maximum value when it is high water or low water without, for then there is the greatest head of water for producing motion. The flood stream begins about three hours after low water and the ebb stream about three hours after high water, slack water thus occurring about midway between the tides.

Along most shores not much affected by bays, tidal rivers, etc., the current usually turns soon after high water and low water.

The swiftest current in straight portions of tidal rivers is usually in the middle of the stream, but in curved portions the most rapid current is toward the outer edge of the curve, and here the water will be deepest. The pilot rule for best water is to follow the ebb tide reaches.

Countercurrents and eddies may occur near the shores of straits, especially in bights and near points. A knowledge of them is useful in order that they may be taken advantage of or avoided.

A swift current often occurs in a narrow passage connecting two large bodies of water, owing to their considerable difference of level at the same instant. The several passages between Vineyard Sound and Buzzards Bay are cases in point. In the Woods Hole passage the maximum strength of the tidal streams is at about half tide.

Tide rips are made by a rapid current setting over an irregular bottom, as at the edges of banks where the change of depth is considerable.

Current arrows on charts show only the most usual or the mean direction of a tidal stream or current; it must not be assumed that the direction of a stream will not vary from that indicated by the arrow. The rate, also, of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

FIXING POSITION.

Sextant method.—The most accurate method available to the navigator of fixing a position relative to the shore is by plotting with a protractor sextant angles between three well-defined objects on shore which are shown on the chart; this method, based on the "three-point problem" of geometry, should be in general use.

For its successful employment it is necessary, first, that the objects be well chosen, and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice. Two observers are better for this method.

Near objects should be used either for bearings or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in displacing the position the longer the line to be drawn.

On the other hand, distant objects should be used for direction, because less affected by a small error or change of position.

The three-arm protractor or station pointer consists of a graduated brass circle with one fixed and two movable radial arms, the three beveled edges of the arms, if produced, intersecting at the exact center of the instrument. The edge of the fixed arm marks the zero of the graduation which enables the movable arms to be set at any angles with the fixed arm.

To plot a position, the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole.

The transparent xylonite protractor is an excellent substitute for the brass instrument, and in some cases preferable to it, as when, for instance, the objects angled on are so near the observer that they are more or less hidden by the circle of the instrument. The xylonite protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through three objects (in which case the sum of the observed angles equals the supplement of the angle at the middle object made by lines from the other two) it will be indeterminate, as it will plot all around the circle. Such an observation is called a "revolver." An approach to this condition must be avoided. Near objects are better than distant ones, and, in general, up to 90° the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation.

A single angle and a range of two objects give in general an excellent fix, easily obtained and plotted.

Advantages of sextant method.—In many narrow waters where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore.

In all cases where great accuracy of position is desired, such as the fixing of a rock or shoal, or of fresh soundings or new buildings as additions to the chart, the sextant should invariably be used. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. If a round of angles can be taken the observer's accuracy is also checked. In the case of ordinary soundings a third angle need be taken only occasionally; first, to check the general accuracy of the chart, as above stated; second, to make certain that the more important soundings, as at the end of a line, are correctly placed.

If communication can be had with the shore, positions may be fixed with great accuracy by occupying with theodolite or sextant two known points of the chart. The third angle of the triangle, that between the two points at the position sought, should be measured as a check.

The compass.—It is not intended that the use of the compass to fix the ship should be given up; in ordinary piloting the compass, with its companion, the pelorus, may be usefully employed for this purpose, although less accurate than the sextant.

If the accuracy of the chart is doubtful, the compass should be used in preference to the sextant.

In fixing by the compass, it should always be remembered that a position by two bearings only, like that by two angles only, is liable to error. An error may be made in taking a bearing, or in applying to it the deviation, or in laying it on the chart. A third or check bearing should, therefore, be taken of some other object, especially when near the shore or dangers. A common intersection for the three lines assures accuracy.

When the three lines do not intersect in a point, the following rule holds: If the line drawn to the middle object falls to the right of

the point of intersection of the lines to the two outside objects, the position of the observer was to the right of the line to the middle object; and if it falls to the left of the intersection his position was to the left of the line. Thus it will be seen that the assumption that the position is at the center of the triangle formed by the intersecting lines is incorrect.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called “bow and beam bearing,” the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy, and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam before the position is obtained.

By taking the bearings at two points and four points on the bow, a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current. Taking afterwards, the beam bearing gives, with slight additional trouble, the distance of the object when abeam; such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in cases of being suddenly shut in by fog.

When the first bearing is $26\frac{1}{2}^\circ$ from ahead, and the second 45° , the run between bearings will equal the distance at which the object will be passed abeam.

A table of multipliers of the distance run in the interval between any two bearings of an object, the product being its distance at the time of the second bearing, is given in the Light Lists and in Bowditch.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, caution is necessary, as should the chart be inaccurate, i. e., should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

The vertical danger angle may be conveniently used when passing elevated points of known heights, such as lighthouses, cliffs, etc. The computation of the distance corresponding to the height of the object and its angular elevation requires for small distances merely the solution of a plain right triangle; the natural cotangent of the angle multiplied by the height in feet gives the distance in feet. The convenient use of this method, however, requires tables such as those published by Capt. Lecky in his little book entitled

"The Danger Angle and Offshore Distance Tables." This book very usefully extends the vertical angle method to finding a ship's position at sea by observing the angular altitude of a peak of known height and its bearing. The tables give heights up to 18,000 feet and distances up to 110 miles.

When the angles are not too large they should be observed "on and off the limb" and the index error of the sextant thus eliminated, in preference to correcting for it the single altitude. It must be remembered that in high latitudes the bearing of a distant object needs correction for the convergence of the meridians before being laid down on a Mercator chart. The correction may be found by the following formula, using the approximate position. The sine of the correction equals the product of the sine of half the difference of longitude by the sine of the middle latitude. It is applied on the equatorial side of the observed bearing and its effect is always to increase the latitude of the observer.

Soundings taken at random are of little value in fixing or checking position and may at times be misleading. In thick weather, when near or closing the land, soundings should be taken continuously and at regular intervals, and, with the character of the bottom, systematically recorded. By laying the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship, and then moving the paper over the chart, keeping the line representing the track parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined. This plan was suggested by Lord Kelvin, whose admirable sounding machine renders the operation of sounding possible in quite deep water without slowing down the ship and consequent loss of time.

Pelorus.—All ships should be supplied with the means of taking accurate bearings both by night and by day. The standard compass is not always conveniently placed for the purpose; in such case a pelorus will be very useful, but the results are not as accurate as those obtained direct from the compass. The utility of such an instrument in ascertaining the change of bearing of an approaching ship should not be overlooked.

Position lines.—Among the various methods of fixing position at sea, the one which should be best understood and put to the most constant use is that employing position or Sumner lines. These lines give the most comprehensive information to the navigator with the least expenditure of labor and time. The knowledge gained is that the vessel must be somewhere on the line, provided the data used is accurate and the chronometer correct. As the information given by one line of position is not sufficient to determine the definite location of the vessel, it is necessary to cross this line by another

similarly obtained, and the vessel being somewhere on both must be at their intersection. However, a single line at times will furnish the mariner with invaluable information; for instance, if it is directed toward the coast, it marks the bearing of a definite point on the shore, or if parallel to the coast it clearly indicates the distance off, and so will often be found useful as a course. A sounding taken at the same time with the observation will in certain conditions prove of great value in giving an approximate position on the line.

The easiest and quickest way to establish a line of position is by employing the method of Marcq St. Hilaire, as modified by the use of tables of altitude. The principle of this method is one of altitude differences, in which the observed altitude is compared with the computed altitude for a dead reckoning, or other selected position, and the difference in minutes of latitude measured toward the body along the line of its azimuth, if the observed altitude is greater than the computed altitude, and vice versa. A line drawn at right angles to the line of azimuth through the point thus determined is the position line, somewhere upon which will be found the position of the vessel. The tables of altitude obviate the computation of the altitude and thereby greatly facilitate the establishment of the line.

A position line may also be found by computing two positions for longitude with two assumed latitudes, and drawing the line between them; or by drawing to the position obtained with one latitude a line at right angles to the bearing of the body as taken from the azimuth tables.

A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The position lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day and in combination with the sun gives an excellent fix.

The morning and evening twilight observations, besides their great accuracy, possess the additional advantage of greatly extending the ship's reliable reckoning beyond the limits of the ordinary day navigation, and correspondingly restricting the dead reckoning uncertainties of the night. An early morning fix in particular is often of great value. Though the same degree of accuracy as at twilight can not be expected, night observations are very valuable and should be assiduously practiced.

Piloting.—The navigator, in making his plan for entering a strange port, should give very careful previous study to the chart and sailing directions, and should select what appear to be the most suitable marks for use, also providing himself with substitutes to use in case those selected as most suitable should prove unreliable in not being recognized with absolute certainty. Channel buoys seen from a distance are difficult to identify, because their color is sometimes not easily distinguished and they may appear equally distant from the observer even though they be at widely varying distances. Ranges should be noted, if possible, and the lines drawn both for leading through the best water in channels and also for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down where no suitable ranges appear to offer. The courses to be steered in entering should also be laid down and distances marked thereon. If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circles should be plotted and regular courses planned, rather than to run haphazard by the indications of the angle alone, with the possible trouble from bad steering at critical points.

The ship's position should not be allowed to be in doubt at any time, even in entering ports considered safe and easy of access, and should be constantly checked, continuing to use for this purpose those marks concerning which there can be no doubt until others are unmistakably identified.

The ship should ordinarily steer exact courses and follow an exact line, as planned from the chart, changing course at precise points, and, where the distances are considerable, her position on the line should be checked at frequent intervals. This is desirable even where it may seem unnecessary for safety, because if running by the eye alone and the ship's exact position be immediately required, as in a sudden fog or squall, fixing at that particular moment may be attended with difficulty.

The habit of running exact courses with precise changes of course will be found most useful when it is desired to enter port or pass through inclosed waters during fog by means of the buoys; here safety demands that the buoys be made successively, to do which requires, if the fog be dense, very accurate courses and careful attention to the times, the speed of the ship, and the set of the current; failure to make a buoy as expected leaves, as a rule, no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

In passing between dangers where there are no suitable leading marks, as, for instance, between two islands or an island and the

main shore, with dangers extending from both, a mid-channel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely the direction midway between visible objects.

In piloting among coral reefs or banks, a time should be chosen when the sun will be astern, conning the vessel from aloft or from an elevated position forward. The line of demarcation between the deep water and the edges of the shoals, which generally show as green patches, is indicated with surprising clearness. This method is of frequent application in the numerous passages of the Florida Keys.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the helm to be put over and then steadying when on the desired heading, with the possibility of the attention being diverted and so of forgetting in the meantime, as may happen, that the ship is still swinging. The helmsman, knowing just what is desired and the amount of the change to be made, is thus enabled to act more intelligently and to avoid bad steering, which in narrow channels is a very positive source of danger.

Coast piloting involves the same principles and requires that the ship's position be continuously determined or checked as the landmarks are passed. On well-surveyed coasts there is a great advantage in keeping near the land, thus holding on to the marks and the soundings, and thereby knowing at all times the position, rather than keeping offshore and losing the marks, with the necessity of again making the land from vague positions, and perhaps the added inconvenience of fog or bad weather, involving a serious loss of time and fuel.

The route should be planned for normal conditions of weather, with suitable variations where necessary in case of fog or bad weather or making points at night, the courses and distances, in case of regular runs over the same route, being entered in a note-book for ready reference, as well as laid down on the chart. The danger circles for either the horizontal or the vertical danger angles should be plotted, wherever the method can be usefully employed, and the angles marked thereon; many a mile may thus be saved in rounding dangerous points with no sacrifice in safety. Ranges should also be marked in, where useful for position or for safety, and also to use in checking the deviation of the compass by comparing, in crossing, the compass bearing of the range with its magnetic bearing, as given by the chart.

Changes of course will in general be made with mark or object abeam, the position (a new "departure") being then, as a rule, best and most easily obtained. The pelorus should be at all times in readi-

ness for use, and the chart where it may be readily consulted by the officer of the watch. The sextant should also be kept conveniently at hand. www.libtool.com.cn

A continuous record of the progress of the ship should be kept by the officer of the watch, the time and patent-log reading of all changes of course and of all bearings, especially the two and four point bearings, with distance of object when abeam, being noted in a book kept in the pilot house for this especial purpose. The ship's reckoning is thus continuously cared for as a matter of routine and without the presence or particular order of the captain or navigating officer. The value of thus keeping the reckoning always fresh and exact will be especially appreciated in cases of sudden fog or when making points at night.

Where the coastwise trip must be made against a strong head wind, it is desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse current that prevail farther out. In some cases, with small ships, a passage can be made only in this way. The important saving of coal and of time, which is even more precious, thus effected by skillful coast piloting makes this subject one of prime importance to the navigator.

Change in the variation of the compass.¹—The gradual change in the variation must not be forgotten in laying down on the chart courses and bearings. The magnetic compasses placed on the charts for the purpose of facilitating the plotting become in time slightly in error, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of this change may be of importance. The date of the variation and the annual change, as given on the compass rose, facilitate corrections when the change has been considerable. The compasses are re-engraved once in 10 years; more frequent alterations on one spot in a copperplate would not be practicable.

The change in the variation is in some parts of the world so rapid as to need careful consideration, requiring a frequent change of the course. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles.

Local magnetic disturbance of the compass on board ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship. Observation shows that disturbance of the compass in a ship afloat is experienced in only a few places on the globe.

Magnetic laws do not permit of the supposition that the visible land causes such disturbance, because the effect of a magnetic force diminishes so rapidly with distance that it would require a local

¹ See H. O. Chart No. 2406, Variation of the Compass.

center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot; but the area of disturbance will be small unless there are many centers near together.

Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skillfully applied, may prevent much damage both to ships, especially of the smaller classes, and to boats by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:

1. On free waves, i. e., waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when no other oil is obtainable, or it may be mixed with other oils; all animal and vegetable oils, such as waste oil from the engines, have great effect.
4. In cold water, the oil, being thickened by the low temperature and not being able to spread freely, will have its effect much reduced, a rapid-spreading oil should be used.
5. A small quantity of oil suffices if applied in such a manner as to spread to windward.
6. It is useful in a ship or boat either when running or lying-to or in wearing.
7. When lowering and hoisting boats in a heavy sea the use of oil has been found greatly to facilitate the operation.
8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to permit leakage. The waste pipes forward are also very useful for this purpose.
9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan.

On a bar, with the ebb tide running, it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside, bearing in mind that her natural tendency is always to forge ahead. If she is aground the effect of oil will depend upon attending circumstances.

11. For a boat riding in bad weather to a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat and the bag readily hauled on board for refilling, if necessary.

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NORWAY PILOT.

CHAPTER I.

GENERAL REMARKS, FISHERIES, WINDS, CURRENT, TIDES, ICE—GENERAL NAVIGATION—PILOTS—LIGHTS, BEACONS, AND BUOYS—ANCHORAGES—COMMUNICATION—PASSAGES.

For general information see Scandinavia Pilot, Vol. I.

Fisheries.—The fisheries give employment to a large part of the population throughout the year. The most important are the cod, herring, and mackerel fisheries, which employ about 120,000 men. Whaling is now prohibited off the coasts of Finmarken and Tromsø.

The total value to Norway of the fish landed was about \$15,000,000 in 1911. About 105,600 men are employed on the seaboard.

Trawling regulations.—The undermentioned regulations, prohibiting trawling on the coasts of Norway, are in force:

1. It is prohibited to fish with trawl nets within the maritime jurisdiction of Norway.

2. So long as a fishing vessel with a trawl net is within the maritime jurisdiction of Norway the whole of the fishing gear on board shall be properly stowed away.

3. The regulations above do not apply to the use of shrimp trawls with floats. The largest dimensions for shrimp trawls are fixed by regulation.

4. Transgression of these regulations is punishable by fine, and the vessel, with her catch and gear, may be wholly or in part confiscated.

Regulations on drift-net fishing.—In order to prevent damage to nets and fishing gear during the Norwegian mackerel drift-net fishing season, the following rules by the Norwegian Government are in force:

1. At a distance of from 3 to 5 lengths of nets from the end of any chain of nets there shall be a buoy, with a spar at least 10 feet high, exhibiting a fixed white light visible all around the horizon, and a flag at least 3½ feet square, divided diagonally into a dark-colored portion and a light-colored portion.

Furthermore, for every 25 lengths of nets there shall be a buoy, with a spar at least 6½ feet high, carrying, on the first buoy from that mentioned above, two pennants; on the second buoy, three pennants, and so on.

2. On the approach of any vessel a flare will be shown by night, or a conspicuous object waved by day, on that side of the fishing vessel away from the nets.

3. In the event of there being any probability of the nets of two drift-net vessels becoming foul of one another, this is to be notified by four short blasts on the foghorn.

On hearing the above signal, all vessels concerned are to unite as far as possible in avoiding loss of nets.

4. The principal Norwegian mackerel fishing season and districts are as follows:

From about the middle of May to about the middle of July—off the coast opposite Arendal, Christiansand, and Farsund.

From about the middle of August to about the middle of September—in the North Sea.

Throughout the summer up to the middle of October small numbers of drift-net fishing vessels will be met with up the fiords.

Barents Sea fishing grounds.—Within the limits dealt with in this work are the following grounds:

1. This ground, known as "No. 3," is anywhere off the coast of Norway outside of the 3-mile limit. It is a winter fishing, from November to February, when large quantities of cod, codling, and haddock are taken.

This fishing is only workable from the 3-mile limit to about 5 miles off the land.

2. This ground, known as "No. 8," is situated inside the Varanger fiord, and is a very prolific ground for haddock from December to March.

The temperature of the sea on the Norwegian coast is almost invariably above freezing point at the surface. This is also the case in most of the fiords. The deep water shows degrees of heat all the year round, but in summer the water is warmer at the surface than at some depth below it; in winter the reverse is commonly the case. The annual fluctuations of temperature are greatest at the surface; they are but trifling in deep water. During the greater part of the year the surface of the sea has a higher temperature than the atmosphere; in one or two of the summer months only is it colder. Hence the waters of the ocean may be regarded as a vast reservoir of heat, whence the atmosphere supplies its losses nearly the whole year through.

Table showing surface temperature of the sea on the coast of Norway.

Stations.	Mean annual temperature.		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual variation.
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.
Reine (Lofoten Islands)....	42.9	39.0	¹ 36.7	37.4	37.8	41.0	46.2	51.1	² 53.8	49.3	43.9	40.1	38.8	17.1	
Andenes (Lofoten Islands)...	40.3	33.6	¹ 32.0	33.2	36.9	41.0	47.7	50.4	² 51.3	46.9	40.8	36.1	33.1	19.3	
Fruholm (north coast).....	40.8	37.4	¹ 36.1	36.3	37.6	38.7	42.1	46.2	² 47.1	45.7	43.3	40.6	38.1	11.0	

¹ Minimum.

² Maximum.

Gales may be expected in the proportion of 30 days in the year on the coast, but only for 4 days in the interior. There are more frequent gales in the winter solstice than during the equinoxes, and in summer they are uncommon; the heaviest gales occur in December and January. Gales from southwest are the most common; next in frequency to these are west and northwesterly gales. The wind is much more violent on the coast than in the interior.

Southwesterly gales are frequently accompanied by rain; they sometimes blow in violent gusts, and shift suddenly to northwest, and even to the eastward of north, increasing almost to a hurricane, and causing a very heavy cross sea; these are considered the most dangerous of all on the west and north coasts. If the wind continues fixed in the north, and its force moderates, the weather becomes fine; but should it be back round to the southwest, bad weather is sure to return. It has been observed that those gales which occur during spring tides are more violent, and last longer, than those which blow during the neaps, and that they acquire their greatest strength at the beginning of the flood. Gales from the west and northwest frequently bring snow or hail, especially in the north of Norway, and blow with violence. Northerly gales sometimes last for many days. These winds also cause a heavy cross sea off the coast.³

Table showing winds with which rain, snow, fog, or hail may be expected.

Stations.	Light winds.					Gales or strong winds.			
	Rain.	Snow.	Rain and snow.	Fog.	Hail.	Rain.	Snow.	Fog.	Hail.
Balstad (Lofoten Islands)....	SW.	NW.	NW.	SSW.	NW.	SW.	NW.	SW.	NW.
Andenes (Lofoten Islands)...	SW.	W.	W.	NE.	NNW.	SW.	NW.	NE.	NW.
Vardø.....	NW.	NE.	NE.	E.	.....	NW.	NW.	NE.	.....

³ Professors H. Mohn and Dr. F. C. Schübeler.

Storm signals.—The following system of storm signals is now adopted on the coasts of Norway. The signals are made on a mast with a yard, by means of cones, balls, flags, and lights, as follows:

Signal.	Signification.
One cone, point upward, by day, or three fixed white lights, placed in form of an equilateral triangle, apex uppermost, by night.	Storm from between north and west.
One cone, point downward, by day, or three fixed white lights in form of an equilateral triangle, apex downward, by night.	Storm from between south and west.
Two cones, vertical, points upward, by day, or one fixed white light placed over a triangle of three fixed white lights, apex uppermost, by night.	Storm from between north and east.
Two cones, vertical, points downward, by day, or one fixed white light placed below a triangle of three fixed white lights, apex downward, by night.	Storm from between south and east.
One ball by day or a fixed red light by night.....	An atmospheric disturbance in the neighborhood.

One red flag hoisted with any of the above day signals indicates that the direction of the wind is shifting with the sun, or from north to east, etc.

Two red flags indicate that the wind is shifting against the sun, or from north to west, etc.

These signals are shown either wholly or in part at Bodö.

Currents.—The great northeasterly surface drift of the Atlantic, carrying with it the high temperature of the Gulf stream, impinges on the western coast of Norway somewhere about latitude 62° north, and northward of this parallel, at a distance of 30 to 60 miles from the land, carries a vessel very perceptibly to the northward and eastward. From this point of impact it takes a northerly direction, and follows the coast round the North Cape, searching into the fiords of Finmarken and keeping their outer harbors open and unfrozen all through the winter, when those on the opposite side of the Atlantic in much lower latitudes are closed by ice, and at the same time effectually repelling the invasion of floating ice with which the Finmarken coast would otherwise be continually menaced. The portion which sweeps eastward from the North Cape, though greatly diminished in velocity and temperature, still retains sufficient warmth to ameliorate the climate and keep the principal harbors of Norwegian and Russian Lapland unfrozen and open to navigation the whole year through, at least as far eastward as Semiostrof (the Seven Islands), 155 miles eastward of Jacob elv.

Caution.—The necessity of strict attention to the force and direction of the current is strongly urged, especially in thick weather, on account of the great distance to which the rocks extend from the west coast of Norway, and the probability that a vessel will be set toward them.

Tides.—The tides upon the west coast of Norway northward of Jæderen and Skudesnes are produced by a tidal wave which travels

from southwest to northeast, making high water at Fuglenes (Hammerfest) somewhat later than at Skudesnes. The flood stream is probably strongest at 3 hours before high water and the ebb at 3 hours after high water. Springs rise 8 feet at Tromsö and 9 feet at Fuglenes (Hammerfest).

The flood stream generally sets northeastward and the ebb southwestward on the west coast of Norway, but frequent irregularities are occasioned by the bends of the coast, the numerous islands which obstruct the direct course of the streams, and the influence of strong winds. During southwesterly and westerly gales both streams set continuously to the northward, and with strong and continuous easterly winds to the southward. In the latter case, however, the tidal stream is less rapid, and when the flood should be making is almost imperceptible. The flood, or northeast going stream, is always stronger than the ebb, but the rate and duration of both are influenced by the winds.

Detailed information as to the nature of the tides will be found in the body of the work. The times of high water are given in local time.

Caution.—In the narrower channels between the islands the tidal streams often run with great velocity, and strict attention must be paid to their force and direction when navigating the Inner Lead, many vessels having been wrecked or stranded solely through neglect of this precaution.

Ice.—Drift ice is never met with on the western and northern coasts of Norway, notwithstanding the vicinity of the great ice fields, and the coasting stream vessels ply regularly round the North Cape as far as Vadsö, on the north side of Varangerfiord, all through the winter months. During severe winters the inner branches of the larger fiords are frozen over, but the outports are accessible throughout the year.

The distance to which the longer fiords of Lapland freeze, from the inner end outward, depends upon the severity of the winter and the quantity of fresh water discharged from the different sized rivers, but the outer, deeper, and principal parts of them are free from ice the whole year through.

Variation of the compass.—On the passage round the North Cape the variation of the compass ranges from 18° west near the Shetland Islands to 3° east at Vardö, the eastern extreme of Finmarken.

The annual change of the variation of the compass averages about 10' on the northern coasts, westerly variation decreasing, easterly variation increasing.

Caution.—When proceeding nearly due north from the British Islands the variation of the magnetic needle changes slowly, the

lines of equal magnetic variation running nearly north by east and south by west, but immediately on sailing to the eastward the variation begins rapidly, though very regularly, to decrease, a fact which must always be borne in mind when approaching the coast of Norway from the westward, and especially when bound round the North Cape. The change of variation, if not allowed for, will throw a vessel to the southward of the supposed position when proceeding either eastward or westward.

The principal ports and towns dealt with in this work are Kristiansund, Trondhjem, Namsos, Bodö, Narvik, Tromsö, Hammerfest, Vardö, and Vadsö.

Inner Lead—Caution.—On the coast of Nordland—that is, between the Vigten Islands and Vestfiord—vessels should either follow the inshore route the whole way or keep outside the islands altogether, because while the “highway,” as it may be called, of the Inner Lead is marked by numerous beacons and lights, the channels connecting it with the open sea are longer and more dangerous here than on any other part of the coast. They are consequently so little used that they are practically unknown to the coast pilots, and the fishermen who act as local pilots are not always to be implicitly relied upon. It might therefore be necessary when taking them to depend almost entirely upon the charts, and the difficulty of doing so is greatly increased by the fact that the outer islets and rocks are so low and so devoid of distinctive features that in many places a vessel's position can only be determined by bearings of distant mountains on the mainland or larger islands. Then, again, the risk of striking on some one of the hitherto undiscovered rocks which undoubtedly exist is naturally much greater in the outer part of the “skjærgaard” than in the channels which have been regularly frequented for many years. Therefore it may be laid down as a rule that, having once entered the Inner Lead on the coast of Nordland, there should be no thought of attempting to leave it except by the regular channels at either end.

Offlying banks.—From Trondhjem northward to Vestfiord and the Lofotenene, where the “skjærgaard,” or fringe of outlying rocks and reefs, extends from 20 to upward of 30 miles from the mainland, the absence of such banks and soundings as usually warn a mariner of his approach to land greatly increases the danger of navigation. The depth is generally from 100 to 200 fathoms, and in many instances shoals so rapidly that upward of 100 fathoms may be found within 100 yards of a rock. During heavy gales the sea will break on ground that has 18 or 20 fathoms of water on it, particularly if the depth happens to be great on that side from which the swell comes.

Around the Lofotens and thence northward to the North Cape a bank with depths of 40 to 100 fathoms fronts the islands for many

miles in places, known as the Havbro Bank, from whence great quantities of fish are obtained. In many places there are great fissures or breaks in this bank, with depths of 200 fathoms or more within a short distance of the rocks, rendering great caution necessary in thick weather.

Caution.—Instances having occurred of vessels being driven or obliged to stand in amongst the outer islets and rocks before a pilot could get on board, it may be well to call attention to the fact that the secret of successful navigation amongst unknown dangers, where the lead is of little use, is to keep the sun astern if possible, and con the vessel from the masthead. The necessity for great caution when approaching the coast during thick or foggy weather can not be too strongly insisted upon, on account of the absence of soundings, or their great depth in places, the distance to which the outer dangers extend offshore, and the general tendency of the current and stream to set toward the land. Mariners should always endeavor to make some conspicuous landfall, so that if necessary they may be able to stand in for one of the easier inlets or harbors without a pilot.

Pilots.—The Norwegian pilots have a high reputation. Their boats are decked over, and are admirably adapted for encountering heavy weather; but if unable to come out, they will almost always be found in smoother water, within the outer rocks.

Pilot vessels cruising off the coast of Norway at night exhibit a flare-up light at intervals of not more than 15 minutes, also a bright white light, visible all round the horizon, is shown.

Steam pilot vessels carry, in addition, a red light, visible all round the horizon, at a distance of 8 feet below the white light.

The pilots who have passed the Government examination wear a metal badge, bearing the word "lods" (pilot), surmounted by a crown; they are not allowed to take charge of a vessel beyond the limits of their particular districts, and no pilot is allowed to take the same vessel in and out of port.

The general coast pilots¹ are men who have been employed in the coasting trade; they are highly spoken of, and some of them are capable of conducting a man-of-war round the whole coast; in winter, however, they are not so easily obtained, many of them being then engaged in the fisheries. If bound to the northern parts of the country through the Inner Lead, one or more general coast pilots should be engaged at Trondhjem, Kristiansund, or other port southward of Namsos.

On approaching any part of the Norwegian coast, the signal for a pilot should always be made in good time, as there is frequently some delay in manning the pilot boats, the men having other occu-

¹ In Norwegian, *kjendt-mand*, a man acquainted with the coast, and capable of piloting a vessel, but not in Government employ.

pations. Northward of Leka, in latitude 65° north, there are long intervals between the pilot stations; but many of the islands are inhabited, and should there be no regular pilots on the spot, fishermen will generally be found who are well acquainted with the coast and are capable of taking charge of a vessel.

Steering words of command.—The following notice has been issued by the Norwegian Government:

From July 1, 1914, the words "Hoire" (right) and "Venstre" (left) shall be used as steering commands, and not "Styrbord" (starboard) and "Bakbord" (port).

"Hoire" shall mean that the vessel's rudder shall be turned to the right (starboard), and "Venstre" that the rudder shall be turned to the left (port).

In vessels under sail the expressions "Luf" (luff) and "Fold ar" (fall away) can still be used, but not "Op med roret" (up with the helm) or "Ned med roret" (down with the helm).

When foreign men-of-war visit Norwegian ports it is the custom for the harbor master and the head pilot to go on board with some pilots to offer their services in berthing the vessels, and usually without demanding any payment for such services.

A list of the pilot stations on particular portions of the coast is given near the beginning of each chapter.

NOTE.—The steering words of command "Styrbord" and "Bakbord" or "Hoire" and "Venstre," apply to the direction to which the ship's head is intended to turn, and not to the direction in which the tiller is to be put.

Lights.—The west coast of Norway, including the most frequented channels in the Inner Lead, is now well lighted. The lighthouses in the Inner Lead are generally small painted iron or wooden buildings, which are distinguished from neighboring houses, where necessary, by one or more red vertical stripes being painted on one of the sides, the lights being exhibited from balconies or one of the angles of the houses. In some cases, owing to ice or other causes, a difficulty may at times exist in the exhibition of certain lights.

Many lights of the seventh order, and also lantern lights, are not constantly watched, and so can not be implicitly relied on. This is not always stated with the description of these lights in the body of the work. (See Light List for latest details.)

The majority of the lights have colored sectors. The limits of these sectors are not described in this work, but they are inserted in many cases on the charts, and are given in all cases in the Light List.

When not otherwise specified the lights are generally shown all the year round, and north of the Arctic Circle they are kept burning all day in dark weather during the winter.

Beacons and buoys.—The following general system of beacons and buoyage is being adopted in marking the channels and shoals on and near the coasts of Norway:

1. Where the direction of the channel is nearest north-south or south-north:
 - On the east side of the fairway: Black poles, with pointed tops.
 - On the west side of the fairway: Red poles, with stubby tops.

2. Where the direction of the channel is nearest east-west or west-east:
 On the south side of the fairway: Black poles, with pointed tops.
 On the north side of the fairway: Red poles, with stubby tops.
3. A shoal with a channel on both sides is indicated thus:
- (a) By a stake with red and black horizontal stripes and a cross on the top, or
- (b) By red and black stakes on either side, in conformity with (1) and (2).
- NOTE.—By the direction of the channel is meant its main direction, and not the direction of any separate part.

Wrecks are marked by green poles.

In order to avoid needless repetition, all floating marks, except buoys, are simply described as "poles" throughout this work.

Caution.—Owing to the exposed position of many of the floating marks, which are sometimes broken adrift by floating ice, too much reliance should not be placed on their being in position during the winter months.

Cairns.—Numerous stone beacons and cairns, erected on the islets off the coast of Norway as leading marks for the various channels, are particularly useful, as it is often difficult to ascertain a vessel's exact position, especially in thick weather, owing to the great similarity of many of the smaller islands. Anchorage will frequently be found near these cairns.

Mooring rings.—In the centers of the black and white circles, resembling targets, which are painted on the rocks at intervals along the whole coast of Norway, rings or bollards will be found; they may be used either for mooring or warping. Anchorage is generally to be found opposite these rings, but in some places they are only intended for fishing vessels and small craft to make fast to when drifting to leeward in calm weather. A small tax is levied for the use of mooring rings in some of the principal harbors.

Anchorage.—As a general rule the harbors on the Norwegian coast are small; some of them appear to be mere notches, as it were, in the base of a lofty mountain, the entrances being invisible at a short distance. They generally, however, appear smaller than they are in reality, owing to the difficulty of judging heights and distances in Norway by the eye; this arises probably from the gigantic scale of the scenery and the general absence of any objects whose known dimension gives a scale of magnitude by which to form an estimate. These small coves, when measured, will often be found to include a considerable area, and many of them would afford shelter to one or two large vessels, though few are capable of accommodating a fleet. It is stated that the ground generally slopes more or less to the westward on the west coast of Norway; therefore, in unsettled weather, experienced coasters consider it safer to anchor on the west side of the harbors and run out hawsers to the shore eastward; a westerly gale would then only tend to drive a vessel farther

up the bank, and easterly gales are not so much to be dreaded. As a rule, it is advisable to secure with hawsers to the shore in all the smaller harbors.

Caution.—As the majority of anchorages on this coast are close to the shore, on account of the great depth in the fiords, a perfect understanding with the pilot is necessary as to the berth to be taken up. Being used to small craft, which always haul their sterns in to the shore rings, the pilots will often run large vessels into small corners, and secure them by the stern in the same way as the coasters. This is to be avoided, if possible, under all high land on account of the heavy squalls that strike down, even in fine weather.

Time signals.—In Norway masters of vessels may, in any port which has a telegraph station, obtain the errors of their chronometers at 9 a. m. standard mean time on Mondays and Thursdays by attending at the telegraph office when the signal is made from the observatory at Christiania.

Rescue vessels are kept cruising off the coast of Norway during certain periods of the year, and usually in the undermentioned localities included in the limits of this work:

Locality.	From—	To—
Stolmen to Fedie.....	January 1.....	April 30.
	October 1.....	December 31.
Aalesund to Kristiansund	January 1.....	April 30.
	October 1.....	December 31.
Titran to Nordøerne.....	January 1.....	June 1.
	September 15.....	December 31.
Lofoten to Vesteraalen.....	January 1.....	April 15.
	November 1.....	December 31.
Senjen.....	January 1.....	April 1.
Honningsvaag to Vardø.....	January 1.....	June 15.
	September 15.....	December 31.

These vessels are painted white, with a red Maltese cross within a blue ring on the bow, and have on the mainsail the letters "R. S." within a red ring.

Regulations for the use of radiotelegraphy by foreign vessels in Norwegian waters.—The undermentioned regulations for the use of radiotelegraphy by foreign vessels in Norwegian waters are now in force:

1. Radio telegraph or telephone stations on board foreign vessels must not be employed, except by special permission, within Norwegian territorial waters.

Requests for such permission must be sent to the Telegraph Department, which will communicate its decision after conference with the Marine Department.

2. Permission to use the stations on board foreign vessels when within Norwegian territorial boundaries may be restricted to certain fixed places, or to certain fixed periods of the 24 hours.

Correspondence by means of the radio apparatus shall be at once suspended whenever it shall be so desired by the Telegraph Department, the Marine Department, or by any one of the coast stations under their authority.

3. During the stay of a vessel in a Norwegian harbor within a distance of 5 kilometers (2.7 miles) from the nearest telegraph station, the station on board a foreign vessel must not be employed for telegraphing either with Norwegian or foreign coast stations.

Without special permission, the station, during a vessel's stay in a Norwegian harbor, must not be employed for communicating with other ship stations, except for the purpose of preventing accidents.

4. The regulations above mentioned do not, however, apply to stations on board vessels of war belonging to foreign powers which carry on mutual correspondence. Such stations are, however, bound to submit themselves to the regulations contained in the second clause of section 2.

5. Whenever the station on board a foreign vessel is employed during the stay in Norwegian territorial waters, this shall be done subject to the regulations contained in the International Telegraph Convention, with the rules pertaining thereto.

Norwegian fortified ports—Regulations respecting entry.—No foreign war vessel may enter any Norwegian fortified port or naval station without having previously obtained permission to do so. Such permission is, as a rule, granted by His Majesty the King, but under special conditions it may also be granted by local commanders, according to general instructions issued by the Defense Department. In making the application, the type and names of vessels, the date of their arrival, and duration of their visit should be stated.

Exceptions are made in the case of war vessels in distress, vessels carrying heads of States, and escorting vessels and ships on fishery inspection, hydrographic, or other scientific work.

Not more than three ships may visit the same port at the same time, and the visit must not exceed eight days.

Foreign war vessels may enter other Norwegian ports with previous notice, except in special cases to the contrary, but such war vessels must not number more than three of the same nationality, nor stay longer than 14 days, subject to diplomatic arrangement.

In every port or anchorage where there is a port authority foreign men-of-war are to anchor under the direction of the captain of the port, and remain in the assigned position. The same authority may give notice to shift berth or quit the port within six hours.

The personnel of foreign men-of-war are not allowed, without special permission, in the channels or in the vicinity of forts, batteries, or military establishments.

Landing parties for rifle or gun drill are not allowed, and torpedo drills are prohibited.

Officers and noncommissioned officers may land with regulation arms, but men must be without them.

Making or publishing plans or sketches or taking soundings (except for the safety of the ship) in Norwegian territorial waters is prohibited. [libtool.com.cn](http://www.libtool.com.cn)

Making or publishing plans, sketches, photographs, etc., of Norwegian fortifications or military establishments is prohibited.

Officers in command are to conform to the port and harbor regulations.

Submarine vessels.—Norwegian submarine vessels will, as a rule, when in Norwegian waters, be escorted by another vessel.

When a submarine vessel is maneuvering submerged, the escorting vessel will hoist a red flag. The only part of the submarine vessel then visible will be the two periscopes, the foremost of which is the lower.

Vessels approaching the escorting vessel, when the above-mentioned flag is displayed, must keep a good lookout and exercise great care in their navigation.

PASSAGES.

Steam vessels—Outward (northward) routes.—Steam vessels bound from the Thames or Dover Strait to the west coast of Norway, or the reverse, must bear in mind the constant stream of traffic across their course up or down the North Sea between the British coast and that of Holland and Germany. The number of sunken wrecks shown on the charts as lying in the fairway should alone urge upon seamen the need of the closest vigilance.

Apart from the tidal streams, the currents are uncertain, both in direction and strength, and, being sensibly affected by the winds, may at times set directly toward the shore; the safety of vessels, therefore, can in thick weather only be assured by timely use of the lead, and seamen should be prepared, on getting into shallow water, to anchor or stand off the land, as circumstances may require.

Between the Thames and Vestfiord, Lofoten Islands.—The course is direct to the coast of Norway, preserving a good offing until Vestfiord is entered. The Inner Lead, referred to on next page, may be taken for nearly the whole distance, entering if desirable at Karmsund, or by the Bergen Leads as for Bergen, thence northward by the Inner Lead to Vestfiord within the Lofoten Islands. None of the channels from seaward to the Inner Lead, between the Vigten Islands and Vestfiord, should be attempted.

Between the Thames and Tromsö.—As for the Lofotens, give all those islands a wide berth, making for Malangenfiord, which is the best entrance from seaward. Vessels of moderate draft can also proceed by Inner Lead through Vestfiord.

Between the Thames and Hammerfest and North Cape, etc.—The coast of Norway should be given a wide berth until ap-

proaching Sörö. Sörösund is the best approach to Hammerfest from the southward.

Thence through Rolfsösund, and on either side of Hjelmsö if bound to or beyond the North Cape. Or vessels may pass outside all the islands instead of entering Sörösund.

From North Cape to Vardö and Vadsö the land should be kept in sight, guarding against an indraft to the coast should thick or foggy weather set in.

Homeward routes.—The track for steam vessels is direct, as on the outward route.

The Inner Lead—Northward from Trondhjem, the Inner Lead, available for vessels of light draft only, is eastward of Storfosen and along the land to Foldenfiord.

Vessels of moderate draft take Kraakvaagfiord, the channel westward of Storfosen, and through Frøhavet, protected for a certain distance by the Frø and Halten Islands, from whence it is open sea as far as Foldenfiord, a distance of about 40 miles, passing on either side of Kya.

From Foldenfiord the Lead northward is marked by a pecked line, but a few remarks may be of value. The Lead is through Nærösund, westward of Risvær, eastward of Leka, past Melsten through Melstenfiord, and eastward of Helbergsö Lighthouse (here is Torghatten Mountain).

Thence eastward of Fletnen beacon and Knudstarren Shoal, into the inner end of the Storbrak entrance from seaward.

Northward of Torghatten the Lead is between Ulving and Havnö, Rösö, and Tjötö, westward of Alstenö, eastward of Dönnæsö, Lokten, and Tommen, and through Stifiord. Here is a fork, the eastern passage leading eastward of Rangsundö, on either side of Renö, and eastward of Röd Lövenö, the western leading westward of Rangsundö, Sundö, and Gjæsövær, and northward of Röd Lövenö, where the channels again connect.

Melösund.—Northward of Röd Lövenö, one route is through Melövær, a rather intricate part of the Lead, but it is apparently available for vessels of moderate draft; some steam vessels avoid it by passing eastward of Melö. Northward of Melövær, the Lead is southward of Sörstöt beacon and close westward of Kunna, from whence it seems advisable for other than vessels of light draft to put to sea and proceed up Vestfiord, giving all the dangers outlying the mainland a wide berth.

Vessels bound to Bodö can take the Inner Lead northward from Kunna, eastward of Fuglö, and between Fleina and Sandhornet Mountain, thence to Bodö; but northward of Bodö, as far as Lövövær, where it enters Vestfiord, the Lead is only suitable for vessels of light

draft. Others should get into Vestfiord by passing northward of Landegode.

Vestfiord to Tromsö.—Approaching the head of Vestfiord, vessels should keep within 2 miles of Tranö, thence through Tjelsund (which has a depth of only about $3\frac{1}{2}$ fathoms at low water over a bar near Sandtorv), Vaagsfiord, Solbergfiord, and Gisund (the latter has but 4 fathoms at low water in its southern entrance) into Malangenfiord; thence through the Ryström to Tromsö.

Tromsö to North Cape.—From Tromsö the Lead is northward through Grötsund, on either side of Arnö, through Sörösund, and north of Kvalö (here is Hammerfest and the north entrance to Altenfiord). Thence to the North Cape the Lead is through Rolfsösund, Bredsund, Maasösund, and Magerösund to Porsangerfiord. Here the Inner Lead ceases. Or, from Rolfsösund, vessels can pass northward of Hjelsö to sea, thence to the North Cape.

Sailing vessels—Outward (northward) route—Thames to North Cape, etc.—Sailing vessels from the east coast of England do well to pass in sight of the Shetland Islands, or even to the westward of them if the wind will permit, thus keeping a good distance from the coast of Norway. Vessels not having business on that coast should not approach the Lofoten Islands, as there are many offlying rocky shoals; the tides and currents run with great velocity and eccentricity, while the winds are often baffling. After passing at least 100 miles from the Lofoten Islands, the course may be changed to the eastward, in order to sight the North Cape, observing that the westerly variation of the compass decreases very rapidly while sailing to the eastward.

If bound eastward to Vardö, or Vadsö, keep the land in sight, guarding against an indraft, especially during thick or foggy weather. See Arctic Pilot, Vol. I.

Homeward route.—Sailing vessels should follow the direct route as far as the winds will admit.

CHAPTER II.

FEJEFIORD AND SOGNE SÖEN TO NORDFIORD.

Coast.—The coast line trends in a northerly direction from abreast Feje, and continues to be fronted by islands and rocky islets. Between Holmengraa and Stadt, a distance of about 80 miles, the continuity of the Inner Lead is so frequently interrupted by passages leading in direct from the open sea that it has been considered advisable to describe the various channels in their natural order and connect them by page references.

Landmarks.—The islands between Hellisö Lighthouse, off the southwest end of Feje, and Alden, in Bue fiord, present several prominent landmarks, which may be distinguished from a long distance in the offing. The Sulen Islands, on the north side of Sogne Söen, appear like a promontory, because the sounds between them are so narrow and crooked that they do not show at a distance. Polde-tind, a mountain on Indre Sulen, is very conspicuous; it rises gradually from a base extending about 3 miles north and south to a height of 1,993 feet.

The Utvær and other islands lying off Ytre Sulen are very low, and present no distinguishing features at any considerable distance, except the red lighthouse tower on one of the outer islets of the Utvær group. On Alden, about 18 miles northeastward from Utvær, is a conspicuous mountain stretching east and west, which may be seen from a distance of 40 miles; it is generally called "Norske Hesten," the Norwegian horse, but as it has a singular resemblance to a lion lying down, it is also called the "Lion." It has a hollow like a saddle in the center, and rises to the eastward and westward, the eastern extreme, 1,588 feet above the sea level, being the highest. Alden is at once seen to be an island.

The islands westward of Alden will appear from most positions like a projecting and connected point. Værö, the easternmost of this group, is very low, with two round knolls on it resembling haycocks, one larger than the other. The cluster known as Bueland is formed by a number of small low islands, and extends about 6 miles westward from Alden. Tviberg, an island lying $1\frac{1}{2}$ miles northeastward of Alden, is very remarkable; it resembles two hayricks, of which the westernmost is the larger and longer; when seen from the westward they appear as one. Alden and Tviberg are seldom obscured by fog.

About half a mile eastward of Tviberg is the large island **Atleö**, which rises to a height of 2,264 feet, but appears from the offing to form part of the mainland.

When nearing the land to the southward of Utvær, the openings of Fejefjord, Fensfjord, and Sogne Söen will be seen extending in different directions.

Tidal streams.—Between Holmengraa Lighthouse and the Stadt Peninsula the stream during the flood is said generally to run to the southward and that during the ebb to the northward; this can only apply to the coast, as in the offing the flood stream sets northward; the tidal streams are, however, greatly influenced by the winds. Strict attention, therefore, should be paid to the fixing of the ship's position by bearings when bound for any particular inlet, or if obliged by contrary winds to stand off and on.

Pilots are stationed at Hellisö, Bortnesö, Sandö, Utvær, Sulen, Gaasvær, Bueland, Kinn, Skorpö, Batalden, Hovden, Fröjö, and Bremanger. Bueland and the Utvær are the best places to stand in for between Hellisö and Alden in order to procure a pilot.

Soundings.—Between Hellisö and Kinn the soundings within a mile or two of the outer rocks are irregular, the depths varying from about 40 fathoms to upward of 200 fathoms, but from Kinn to abreast of Bremangerland, at the entrance to Nordfiord, the ground declines less abruptly, and the 100-fathom contour line trends generally from 5 to 10 miles from the outer dangers, although within this line there are irregular deeps where upward of 200 fathoms are found.

General directions.—Unless standing in to enter one or other of the fiords, it is advisable when navigating up or down this coast to keep outside the 100-fathom line of soundings. If compelled to seek shelter in bad weather, strangers should enter one of the larger fiords, and run into smooth water to pick up a pilot.

Fejefjord and Sogne Söen approach.—The entrance to the fiords lies between Holmengraa Islet on the south and the Utvær and Sulen Islands on the north, and is 8 miles wide. The water is deep. Several islets and shoals lie in this entrance and on either side of the approach, the most important of which will be mentioned. The easiest way into both fiords is by passing about 1 mile northward of Holmengraa Lighthouse.

Lights—Holmengraa Light.—A fixed and flashing light, with white and red sectors, is exhibited, at an elevation of 105 feet above high water, from a white wooden lighthouse, 41 feet high, with dwelling attached, and should be visible in clear weather, the white light 16 miles and the red light 12 miles. Shown from July 15 to June 1.

Utvær.—On the northern side of the approach, and situated upon one of the larger northwestern islets of the Utvær group, at 12½

miles northwestward of Holmengraa, a flashing white light is established. It is shown from an iron tower 115 feet in height, painted red, at an elevation of 154 feet above high water, and is visible in clear weather from a distance of 19 miles. Shown from July 15 to June 1.

Kværeknap.—Upon the south extreme of Ytre Sulen, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 95 feet above high water. The white, red, and green lights are visible from a distance of 7, 4, and 3 miles, respectively. Shown from July 15 to May 15.

Sogneoksen.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 77 feet, from an iron house erected on the center of Sogneoksen.

Dangers.—The following are the principal islets and dangers:

Holmengraa.—The islet of Holmengraa, 6 miles northward of Hellisö Lighthouse, at the entrance of Fejefjord and Sogne Söen, is easily recognized; it lies farther out, and is considerably higher than any in the vicinity. Rocks extend to the distance of about half a mile southward and westward of the lighthouse.

Storsvalerne and Smaasvalerne, in the fairway of the entrance to Sogne Söen, form two detached clusters, which may be passed either on the north or south sides.

Brejflu, a rock with a depth of 6 fathoms, lies nearly $2\frac{3}{8}$ miles north-northwest from Holmengraa Lighthouse. Half a mile north of Brejflu is Brejfluskallen, with 8 fathoms; the same distance south is Skallen, with 10 fathoms; and $1\frac{3}{8}$ miles south-southwest from Storsvalerne is Hammerskallen, with 8 fathoms. Between Smaasvalerne and Engelskjær, the southernmost of the shoals extending from the Utvær, the northern channel is only about 1 mile wide. Streta, with 6 feet of water, lies 400 yards north-northwest of Smaasvalerne. The sea breaks on this rock during heavy gales. The Utvær and its dangers cover a space of about 7 miles. They will be again referred to.

Holmetaaen, a rock with a depth of 6 feet, lies on the western extreme of a shoal extending 800 yards westward from Nordholmene, the northernmost islets of the Utvær group. Lillegrund, a patch with 4 fathoms, lies 1,200 yards southwest of Nordholmene, and is the outermost of the shoals between those islets and Svinö. The sea breaks generally on Holmetaaen, and frequently on Lillegrund.

Taarnskjær.—The Taarnskjær, or Tower Rocks, form a small cluster about halfway between Nordholmene and Gaasvær, and are useful marks.

Sogneboen is a dangerous rock lying 2 miles northeast of Nordholmene. Sogneboen is nearly always awash, but there are several

sunken rocks within 400 yards of it, on which the sea only breaks in rough weather.

The space eastward of Sogneboen and Taarnskjær, and between Ytre Sulen and Gaasvær, is studded with shoals and sunken rocks.

Halstejnbo has a depth of 6 feet, and lies a short mile north of the eastern Taarnskjær. In fine weather the sea only breaks occasionally on Halstejnbo, but its position is always indicated by breakers in bad weather.

Clearing marks.—Bearings of Nordholmene and of Taarnskjær will be sufficient guide to keep a vessel clear of all these dangers.

North Lead.—**Fejefjord**, the northern termination of the great inner channel leading to and from Bergen, is an open passage between Feje and Ronglevær, and is available for all classes of vessels. The entrance is northward of Holmengraa Lighthouse.

Pilots may be obtained from Feje and Hellisö.

Dangers.—**Mefjordboen**, a reef nearly awash, on which the sea usually breaks, is situated about 2 miles east of Holmengraa and about 1 mile southwestward of Grimeskjær, a round rock marked by a black stone beacon lying in the middle of the entrance to Fensfjord. A rock with $3\frac{1}{2}$ fathoms over it lies 600 yards east of Grimeskjær.

Kraakeflu, with 3 fathoms, lies 800 yards north of Mefjordboen. Shoals extend about 400 yards off the western rocks and islets of Ronglevær; **Vettejuvre**, the outermost islet, is marked by a black stone beacon. The east side of Feje Island is clear.

Directions.—If bound through Fejefjord and North Lead from the northward give the western Utvær Islets and Storsvalerne a berth of about 3 miles, and make due allowance for the set of the tide. By approaching Holmengraa Lighthouse on the bearing of 132° , Brejflu and other patches will be given a wide berth. When about 1 mile from Holmengraa, steer to pass about half a mile northeastward of it. Or vessels can pass within Brejflu and the other patches by passing about 1 mile westward of Storsvalerne, whence course may be shaped to pass between Brejflu and Kvanskjær. The latter, and the other islets on the north side of the entrance to Fensfjord, should be given a berth of a mile, and Mefjordboen about the same, leaving this danger to the eastward.

From a position 1 mile eastward of Holmengraa, the course through Fejefjord, allowing for tide, is 150° until abreast the south end of Feje, or when Hellisö Lighthouse bears 254° , when it may be altered to 170° . Continue steering on the latter course until the Hellisö Lighthouse bears 312° , and proceed through the North Leads, Hjeltefjord, or Herlöfjord, if bound to Bergen.

Anchorage.—**Grisholmsund**, half a mile northward of Feje, has anchorage in a depth of from 6 to 11 fathoms, and might be used

by a vessel of moderate draft, but it is exposed to a heavy swell in rough weather, and there is very little room.

Moldöosen, immediately on the north side of Feje, has anchorage for vessels of moderate draft in 10 to 12 fathoms over a good sandy bottom. A rock at a depth of 5 fathoms lies nearly in the middle of the entrance between Ringeskjær and Moldö; Paaskeflu, a rock awash on the south side of the entrance, is marked by an iron pole; and a rock with 6 feet lies about 200 yards northwest of the north point of Feje, also marked by an iron pole.

Rognsvaag, a small harbor on the north side of Feje, about half a mile southeastward of Moldöosen, has good anchorage for small vessels in depth of from 4 to 10 fathoms, but southerly winds are required for sailing vessels when leaving. There is a black stone beacon on the eastern entrance point.

Sildevaag, a narrow creek on the east side of Feje, has good anchorage for small craft in 4 to 6 fathoms, and one larger vessel might anchor just inside the entrance in 8 fathoms, over good holding ground. A black stone beacon with white stripe, and surmounted by an arm pointing southwest, marks Gjellevarnes, the eastern entrance point.

Ronglevær, the cluster of islets on the east side of Fejefjord, has two small harbors. The northernmost, between the southeast side of Rongleværö and Ramsholm, has a depth of 4 fathoms; and south of the small rock off the southwest point of Kaarö there are depths of 8 to 9 fathoms. The southern entrance to Ronglevær is the better of the two.

Beacons.—Jugarholmbo is marked by a pole; Bratholmflu, which has a depth of 12 feet and lies about 70 yards southward of Bratholm, is marked by an iron pole. The rocks on the south side of the entrance to the anchorage off Kaarö and southward of Lamholm, on the west side of the northern entrance to Ronglevær, are marked by iron poles.

Directions.—To enter Ronglevær from the southward vessels drawing less than 11 feet may steer direct for the lighthouse, keeping it between the bearings of 6° and 11° , and pass close to the east point of Bratholm, which is free from danger; but if of greater draft they should pass eastward of Bratholmflu.

Lights—Ronglevær.—An alternating red and white light, elevated 29 feet above high water, is exhibited from a small white wooden house on the southeast end of Bratholm, a small islet three-quarters of a mile southward of Rongleværö. The light is visible at the distance of 6 miles.

Hovden.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of

39 feet, from a small iron house, situated at Hovden, eastern side of Feje.

Senoksen.—A group occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at an elevation of 52 feet, from a small iron house, on a stone beacon, situated on the northwest end of Senoksen, eastern side of Fejefjord.

The above lights are shown from July 15 to May 15.

Fensfiord is a broad clear inlet extending nearly 25 miles in a southeasterly direction. On the north side of the fiord, 7 miles south-eastward of Sandö, is the entrance to Masfiord, which extends about 12 miles in a northeasterly direction. In Fensfiord the depth is great, but anchorage may be found in several bights known to the pilots. There are several channels between the islands to the northward and southward of the western part of Fensfiord which, though used by the smaller coasting steam vessels, are too narrow and intricate to be considered ship passages; the tidal streams also run through them with considerable velocity. The entrances to some of these passages are marked by stone beacons.

Dangers.—Rongleværstallen, with 5 fathoms of water, lies nearly a mile southeastward of Grimeskjær.

Hillersöflu, with 6 feet over it, lies nearly half a mile southward of the east point of Hillersö.

Bentseflua, with $4\frac{1}{2}$ fathoms, lies half a mile northwest of the northwest point of Stangen.

A patch of 2 fathoms exists half a mile southwestward of Gjejtö, north side of the fiord.

Directions.—A vessel might run into Fensfiord if necessary, passing northward of Holmengraa, Mefjordboen, Kraakeflu, and Grimeskjær, and southward of Hillersöflu, and proceed for either of the following anchorages:

Vikingvaag, a narrow creek about 1 mile northward of the southeastern extreme of Börtnesö, has anchorage for small vessels in depths of from 5 to 8 fathoms, bordered by shallow ground.

The point on the south side of the entrance has a stone beacon on it.

Napsvaag, a bay on the east side of Mjömenö, has good anchorage in depths of from 9 to 16 fathoms; a shoal on the north side of the entrance is marked by a pole.

Skjærgehavn.—Three miles northward of Napsvaag, on the northwestern extreme of Sandö, is Skjærgehavn, one of the stations for the coasting steamers, where vessels might anchor if necessary in a depth of 25 fathoms, southward of the shallow water extending about 100 yards from Spafoten, a rock awash marked by a black stone beacon and an iron pole. Small craft may anchor farther in where the depth is 6 fathoms.

Fensfiord to Sogne Söen.—Vessels may proceed from Fensfiord northward to Sogne Söen through the passage between Rautingkalven and the islands to the westward, amongst which there is anchorage for small craft; or they may take the passage farther eastward and proceed through Undelandsund, between Mjömenö and Sandö, and westward of Skjergehavn, Store Vatsö, and Hisö.

When taking the passage westward of Rautingkalven care must be taken to avoid Salöflu with 12 feet and Salöbo covered with 9 feet of water, which lie westward of Kversö and Salö; Salöbo is marked by a pole. Other dangers will be seen marked on the chart.

Lights—Rautingkalven.—On the southwest point of Rautingkalven an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, from a small white wooden house, at an elevation of 43 feet above high water.

Vikingnesset.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 43 feet, from a small iron house situated on the southeast point of Bortnesö, northern side of Fensfiord.

Hageskjær.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 19 feet, from a small iron house situated at Hageskjær, southern side of Fensfiord.

The above lights are shown from July 15 to May 15.

Beacons.—The southwest and northwest points of Rautingkalven are marked by black stone beacons.

Sogne Söen lies between the Sulen Islands and the islands northeastward of Holmengraa Lighthouse. About 16 miles above its entrance it is known as Sognefiord, and continues eastward for about 80 miles, with many branches. Sogne Söen is from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles in breadth, and its fairway is free from danger. The depth near the entrance is from 90 to 260 fathoms; in the fiord it is much greater.

Lights—Syllingsvaag (Gyllingsvaag).—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 41 feet above high water, at Syllingsvaag, on the west coast of Hisö. The white, red, and green lights are visible at the distance of 7, 4, and 3 miles, respectively.

Faalefoten.—An occulting light, unwatched, elevated 43 feet, showing white and red sectors, visible 6 and 4 miles, respectively, is exhibited from a small iron house.

The above lights are shown from July 15 to May 15.

Dangers.—The dangers in the approach to Sogne Söen southward of the Utvær have been described.

Utvær are a group of very low islands westward of the Sulen Islands, about 7 miles in extent north and south, lying on the north

side of the approach to Sogne Söen; there is nothing remarkable about them, except the lighthouse, which is described above.

Strömfiord separates the Utvær group from Sulen Islands. It is about 4 miles in length by 1 mile in breadth, and has rocks on both sides; those on the Sulen side are all within 400 yards of the islets and those on the west side would be indicated by breakers in anything like rough weather. Vessels seeking shelter might easily enter the fiord northward of Nordholmene, and thence proceed in mid-channel into smooth water, where a pilot would be obtainable.

Anchorage in Utvær and Sogne Söen.—In addition to the small-craft anchorages below mentioned, others may be found in many of the sounds between the islands on either side of Sogne Söen, but they are mostly too narrow for large vessels under ordinary circumstances.

Utvær.—On the north side of the approach to Sogne Söen, between two of the western Utvær Islets, there is a place where a couple of small vessels might lie, but it should only be resorted to by those acquainted with the locality. The northern entrance is between Skarö and Tussen, and there are passages both northward and southward of Bagholm.

Husö.—Eastward of Husö, on the west side of the south entrance to Strömfiord, there is also a small harbor, with a depth of 10 fathoms; the bottom, which consists of sand, affords good holding ground, but the swell sets in heavily.

Kolgravhavn is a good harbor for small vessels, with depths of 5 to 12 fathoms, on the east side of Strömfiord, within the islets eastward of Legö, but the entrance is difficult.

Noren.—On the north side of Sogne Söen, between the east side of Ytre Sulen and the small island Noren, there are two small harbors, with a depth of 5 to 7 fathoms; they are separated by a bar which extends from the projecting point to the west side of Noren to the opposite shore. The northern anchorage is the better of the two. Shoals extend 200 yards from the south end and east side of Noren; the latter is marked by an iron pillar; both are awash.

There is a stone beacon on the north point of Noren, painted black on the south and west sides and white on the north and east sides; and a rock, covered with 2 feet of water, lies off the south point of the islet to the northward, marked by an iron pole. The eastern entrance to the north harbor is between these two beacons.

Kværnösund, between Store and Lille Kværnö, on the south side of the entrance to Sogne Söen, is a safe but narrow anchorage for small vessels; it has a depth of 7 to 9 fathoms. Shoals extend for a short distance offshore on either side of the sound, and Kværnöbo, a rock with a depth of 6 feet, lies 1,400 yards westward of the beacon

on Store Kværnö. The sound must be kept well open when standing in.

Beacon.—On the northwest point of Store Kværnö, $5\frac{1}{2}$ miles eastward from Storsvalerne, stands a black stone beacon, which marks the south side of the entrance to Kværnösend.

Inner fiords.—**Sognefiord** is the continuation eastward of Sogne Söen, and is about 80 miles in length. The largest valleys in the Alps are not so long as this great inlet, the innermost recesses of which are over 100 miles from the open sea; at the same time it is hardly anywhere over 2 miles in breadth. The mountains on either side, except those nearest the sea, attain an elevation varying from 2,000 to over 5,000 feet; their summits are covered with snow all the year round, and their declivities are steep and precipitous, descending in many places almost perpendicularly to the water's edge. On the north side of the fiord, near the inner end, is the great Justedals Bræ, or snowfeld, which produces some of the largest known glaciers in Norway.

Sognefiord and its various branches abound in waterfalls and cascades, and the scenery generally is grand but somber. Seals are frequently seen here, wild fowl are plentiful, there are salmon in all the tributary streams wherever they can get up, and the surrounding districts afford good sport of various kinds.

The principal branches are the Fjærland, Nærö, Aurlands, Sogndals, Lyster, and Aardals Fiords.

In the Næröfiord the scenery is grand beyond description; the fiord is in many places barely 400 yards wide, and extends between precipitous and, in some places, almost perpendicular walls of rock, which rise on either side to a height of over 3,000 feet. This branch is not navigable in the spring, as the melting of the snow and ice on the mountains sometimes causes fragments of rock large enough to sink a passing vessel to fall into the fiord beneath.

Gudvangen lies at the inner end of Næröfiord.

The main chanel of Sognefiord is free from dangers, and the depth is very great, varying from about 500 to 660 fathoms. The water generally sets out through Sognefiord, and runs strongest along the northern shore.

Pilots for Sognefiord may be obtained at Skjærgehavn.

Communication.—Steamers run several times a week to and from Bergen. There is a telegraph at Lerdalsören.

Lights—**Rutletangen.**—An occulting white light is exhibited, at an elevation of 33 feet, from the northeast point of Fjærö, Rutletangen. It is visible 7 miles. Shown from July 15 to May 15.

Ajsnes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 61 feet, on the south extreme of the point.

Arnefiord.—An occulting light, unwatched, elevated 32 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on substructure.

Vegnes.—A group occulting light, unwatched, elevated 31 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on substructure.

Nordnes.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 18 feet, at Nordnes, north side of the entrance to Sogndals fiord. The sectors are visible 7, 4, and 3 miles, respectively.

Nærönes.—A group occulting light, unwatched, elevated 30 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house.

Frethejm.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 12 feet, from a small iron house at Frethejm, south extremity of Aurlands fiord. The sectors are visible 6, 4, and 3 miles.

The above lights are shown annually from July 15 to May 15.

Anchorage.—Considering its extent, Sognefiord has very few anchorages, but at the heads of nearly all the branches there are banks formed by the deposit from the different rivers that discharge into the fiord; these banks consist generally of soft mud, which affords excellent holding ground. The following are the anchorages most frequently used, but besides these there are numerous banks on which vessels might bring up close inshore, all of which are known to the fiord pilots.

Böfiord, about 5 miles within the entrance on the northern side, has anchorage at Lervik, in a depth of 8 fathoms, and is a place of call for local steam vessels. The western side of the fiord is foul, several islets and shoals lying close to the fairway. Vessels should keep well in to the eastern shore when making the fiord.

Kvamsö.—Within the small island Kvamsö, on the north side of Sognefiord, 40 miles from the entrance, is a small harbor with a depth of 5 to 10 fathoms. Immediately southward of the entrance the depth increases to 50 fathoms.

Vangsnes.—Off Vangsnes, $3\frac{1}{2}$ miles east-northeastward of Molsnes, the point eastward of Kvamsö, there is anchorage in 10 fathoms, with Vangsnes church bearing 155° , but the ground declines abruptly to the northward. Vangsenkjærene, rocky heads on a bank extending nearly 400 yards from the northwest side of Vangsnes, are marked by two iron poles.

Esefiord.—On the west side of the entrance to Fjærlandfiord, $3\frac{1}{2}$ miles northwestward from Vangsnes, is the entrance to Esefiord, which extends nearly 2 miles in a northwesterly direction with an

average width of 400 to 600 yards. Esefiord has good anchorage throughout in depths of from 7 to 9 fathoms. Balholmen, on the south side of the entrance to Esefiord, is a favorite holiday resort. Supplies of provisions are obtainable, and there is a good hotel.

Nærøfiord.—At Simlenes, on the west side of the entrance to Nærøfiord and Aurlandsfiord, vessels might bring up in 7 fathoms.

In the narrows between Stolnes and Bakke, about $2\frac{1}{2}$ miles from Gudvangen, the shoals nearest the fairway are marked by poles, two on each side of the channel.

Gudvangen.—Large steamers should anchor in from 20 to 24 fathoms a little outside the steamboat pier, and run out stern hawsers to the shore. Smaller vessels may anchor nearer the western shore in from 14 to 18 fathoms. A couple of large steamers, and perhaps one or two yachts, might possibly moor at Gudvangen at the same time, but they would have so little room that great care would be necessary to avoid fouling one another.

A shoal extends some distance from the mouth of the river.

There is a post road to Vossevangen and Hardanger.

Aurlandsfiord.—In Aurlandsfiord vessels may anchor at Underdal in a depth of from 9 to 12 fathoms, and off Aurland in 12 fathoms, opposite the trading establishment. A shoal extends about 100 yards from the mouth of the river at Aurland. Small vessels can lay alongside the steamboat pier.

Two shoals exist between Aurland and Frethejm. One, with a depth of 9 feet, lies 1 mile 9° and the other, with 12 feet, lies 1.2 miles 25° from Frethejm Light.

Lerdalsören, at the inner end of Lerdalsfiord, is a small town from which there is a post road to Christiania over the Fillefjeld. It has rather a somber appearance, being encompassed by high mountains, and is chiefly important as a center of communication with the finest branches of the Sognefiord. The population is about 800, and there are post and telegraph stations and two hotels here.

There is good anchorage northward of a white house with a pier and landing, in depths of 11 to 24 fathoms over soft mud, but the depth increases rapidly to the northward.

Aardalsfiord has several small patches of anchoring ground close inshore. Seven miles from the inner end of this fiord is the Vettis or Morka-fos, which has a perpendicular fall of nearly 900 feet.

Lysterfiord is considered the most beautiful of all the branches of the Sognefiord, and is a favorite yachting station. There is anchorage at Solvorn, at Marifjæren, near the outlet of Justedals River, and at several other places.

Storegrund, a rock with 2 fathoms over it, lies 600 yards south of Aangelsnes, the northern point of the entrance to Gaupne fiord;

Myregrund, at 3 fathoms, lies 800 yards northeastward from the same point.

Inner Leads.—The best of the channels between the islands northward of Sogne Söen are the Ytre Stensund (here described as the western Inner Lead) and that through Krakhellsund, Tollesund, Vilnesund, and Granesund, the eastern Inner Lead; the latter is the better for large vessels. Dalesund and Indre Stensund can only be taken by small craft thoroughly acquainted with the locality.

The western Inner Lead is through Ytre Stensund and Gaasværosen to Bue or Aspöfiord, thence eastward of Væro; thence between Alden and Tviberg (Aldefiord), or between Tviberg and Atleo, eastward of Molvær, and to Kinnsund.

From northward of Tviberg there is a passage southward of Hego and Skumsö, joining the eastern Inner Lead from Sogne Söen and Granesund.

Ytre Stensund, between Ytre Sulen and Ravnö or Dalé Island, is a passage suitable for vessels of moderate draft and size, in charge of a pilot. It has also several anchorages.

Lights—Bratholm.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited from a small iron house, at an elevation of 39 feet above high water, on Bratholm, lying upon the west side of the southern entrance to Ytre Stensund.

Fængskjær.—A group occulting red light is exhibited, at an elevation of 18 feet, on the northern of two small islets off the south point of Ravnö. It is visible 4 miles.

Olderkalven, on the west side of the northern entrance to Ytre Stensund, exhibited from a small white iron house on Smaaskjærtaren, at an elevation of 15 feet above high water, is an occulting light with white and red sectors. The white light is visible in clear weather at a distance of 6 miles, red light at 4 miles. These lights are shown from July 15 to May 15.

Beacons.—The southern entrance to Ytre Stensund is marked by Noren beacon, and the rock on the shoal extending from the east side of Noren is marked by an iron pillar.

On the east side of the north entrance there is a black stone beacon on Kraaka. Stilleboen, a sunken rock lying about 700 yards south of Kraaka, is marked by two iron poles. Laagöfaldet, about 1 mile northeastward of Kraaka; the eastern end of the Plitten rocks, at $1\frac{1}{2}$ miles northward of Kraaka; and the rocks extending eastward from the south end of Lyngö, are also all marked by iron poles. The shoal extending 400 yards eastward of Smaaskjærtaren Lighthouse is marked by a pole, and a rock, at a depth of 13 feet, lying near Larsraaholm, 1,140 yards southward of Smaaskjærtaren, is marked by a pole surmounted by a broom.

Directions.—When entering Ytre Stensund from the southward, pass about 600 yards eastward of Noren, and give the south point of Ravnö a berth of 200 yards, passing nearly in mid-channel between the rocks on either side of the passage.

Give the east side of Flatö a berth of nearly 400 yards and proceed eastward of Inderö, Smaaskjærtaren, and the other islets off Olderkalven, passing westward of Stilleboen and Kraaka.

Kraaka beacon, in line with Tangenesnipa, a hill near the north point of Ravnö (bearing 185°), leads between Plitten rocks and the shoals to the eastward, and when Laagöfaldet is abeam, a course may be shaped for Gaasværosen—that is, westward of Aspö—into Buefiord; or the entrance to Drevöosen, westward of Aspö.

At night.—The white sector of Sogneoksen Light bearing 180° leads into the southern entrance to Ytre Stensund. The southerly white sector of Bratholm Light leads up to that island, and, having passed the light, the northern white sector leads through the sound until nearly abreast of Tungenes, when course must be altered to the northeastward until the white sector of Olderkalven Light is entered. Having given the lighthouse a berth of 400 yards, enter the northern white sector, which leads through into Gaaværosen.

Gaasværosen, a broad passage between Gaasvæ and Aspö, connects Ytre Stensund with Buefiord. When passing through Gaasværosen vessels must give the rocks northward of Gaasvæ a wide berth.

Light—Lyngö.—A flashing light, with white, red, and green sectors, is exhibited, at an elevation of 41 feet, on the southeast point of Lyngö. The sectors are visible 9, 6, and 5 miles, respectively.

Anchorage.—There is shelter in the small harbor on the east side of Gaasvæ for small craft in from 4 to 5 fathoms, but the entrance is narrow and difficult and considerable swell sets in.

Small vessels find good shelter in Busköhavn, a narrow sound at the west side of Buskö, 5 miles eastward of Gaasvæ.

Drevöosen, Drevösund, and Færöosen.—Drevöosen, a narrow passage on the east side of Aspö, is also a continuation to the northward of Ytre Stensund Channel, or the western Inner Lead. Drevösund, the channel on the west side of Færo, is seldom used, as the southern entrance is foul. Færöosen, the channel between Færo and Buskö, is chiefly used by coasting craft.

Lights—Saltskaar.—On the southwest part of Saltskaar an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 38 feet above high water.

Drevösund.—On Skomageren, situated 200 yards westward of Drevöhatten, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 26 feet above high water.

Both the above lights are exhibited from small white iron houses, and the white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively.

Gjejta.—Near the center of Gjejta Island, situated about 4 miles northward of Skomageren, a fixed and flashing light, with white, red, and green sectors, is exhibited from a white wooden house, 33 feet high, at an elevation of 140 feet above high water. The white, red, and green lights are visible in clear weather at the distance of 16, 12, and 10 miles, respectively.

Sakrisskjær.—An occulting light, unwatched, elevated 25 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house.

All these lights are shown from July 15 to May 15.

Beacons.—On Lille Havneholm, a small islet off the southeast point of Aspö, is a black stone beacon, which marks the west side of the entrance to Drevöosen. Kvanskjærflu, which lies 150 yards northward of Kvanskjær, and Kjonholmflu, at a depth of $2\frac{1}{2}$ fathoms, lying 400 yards southeastward of Kjonholm, are each marked by a pole.

Stabben, a small low rock lying about 800 yards west-southward from the western Kviting Islet, and about halfway between Væro and Aralden, is marked by an iron pillar.

Directions.—From a position between Laagöfaldet and Plitten Rocks, the distance to the south entrance to Drevöosen is $2\frac{1}{2}$ miles. Keep rather eastward of mid-channel between the Havneholmene and Saltskaar, and pass either east or west of Skomageren; a shoal of 3 fathoms lies about 100 yards north of it. After passing Skomageren steer for the east end of Store Gjejtungen on a bearing of 6° . This leads between Kjonholmflu to the west and Kvanskjærflu and a rock with 13 feet of water lying about 400 yards north of Drevöhatten. When past Svartskjær, proceed between Gjejta and Bratholm, westward of Stabben, and eastward of the Skarholmene; or pass westward of Gjejtungen and as directed below.

At night.—Having passed Smaaskjætaren, steer to the northward in its sector of white light, and on entering the white sector of Saltskaar Light steer for the latter, bearing about 32° , and then direct for Skomageren Light immediately its color changes from red to green. Pass in mid-channel on either side of Skomageren and steer northward in its sector of white light until abreast the north end of Kjonholm; then alter course for Gjejta Light, keeping in its sector of fixed white until within about three-quarters of a mile of the island. Round the eastern end of Gjejta at the distance of a quarter of a mile and enter either of the small sectors of fixed white light, steering in one of them about 22° or 355° , with the light right astern, according to destination.

Anchorage.—Vessels taking the Stensund and Drevöosen passage may bring up to wait wind or tide between Flatö and Ringholm, in Ytre Stensund, in a depth of 12 to 13 fathoms; in the narrow sound

on the east side of Olderkalv in 8 to 16 fathoms; and off the east side of Aspö, about half a mile northward of the beacon on Lille Havneholm.

Indre Stensund, between Stensundöen and Indre Sulen, though sometimes taken by the coasting steamers, is very narrow and intricate.

Beacons.—On the south point of Indre Stensundö, the island in the middle of the south entrance to Indre Stensund, is a black stone beacon with a white cross; and on the eastern Laagöholm, at the west side of the north entrance, is a black stone beacon. There are many rocky shoals, some of which are marked by iron poles.

Lights—Indre Stensund.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 102 feet, from a small iron house erected near Lervaag on the west coast of Indre Sulen.

Dingenes.—A group occulting light, unwatched, elevated 40 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house; it shows groups of two eclipses.

The above lights are shown from July 15 to May 15.

The eastern Inner Lead from Sogne Söen is eastward of the Sulen Islands, through Krakhellesund or Tollesund, thence across Aafiord, westward of Sakrisö and Lutén, into and through Vilnesfiord, thence through Granesund and past Stavnes, across Stavfiord, between Trefodskjær and Boerne, eastward of Askroven and Od-dene, between Nekö and Færö to Stabben Lighthouse; thence eastward of the Nærö Islands (Næröfiord) into Frojsjöen. It is available for vessels of moderate draft.

Krakhellesund, between Indre Sulen and Losneö, is clear with the exception of a rocky patch lying nearly 200 yards southward of the projecting point on the west side of the south entrance. When taking this passage vessels should pass eastward of the Seglesten, which lie on the west side of the sound, 1 mile southward of the north point of Losneö.

Light—Seglesten.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 34 feet, on the rock near the northern end of the shoal.

It is shown from July 15 to May 15.

Tollesund, between Losneö and Skorpö, is free from danger: but vessels must give a good berth to the Thorsholmene and the south-east side of Losneö when entering from Sogne Söen.

Storakersund, on the east side of Skorpö, is a narrow channel leading from Sogne Söen to Aafiord.

Aafiord extends about 7 miles to the eastward from the north end of Skorpösund and forms part of the boundary between the dis-

tricts of Sogn and Söndfiord. There is good anchorage off Ulvik in a depth of 6 fathoms; off Öen Church in 7 fathoms; in Sörfiord, the northernmost head of the fiord, in from 7 to 10 fathoms; and in Hyllestad fiord, the southern head of Aafiord, in about 5 fathoms.

Sakrisö.—There is anchorage off the east side of Havnholm, at the southeast extreme of Sakrisö, north side of approach to Aafiord; and in a depth of from 4 to 8 fathoms in Skivenesvaag eastward of it.

Skifiord affords anchorage off Kjöstad in a depth of 4 fathoms, and off Myklebust near its head also in 4 fathoms.

Verpingsviken, on the southeast side of Luten, affords anchorage for small craft in 4 to 7 fathoms, sand, about 100 yards offshore.

Lutenvaag, on the west side of Luten, has depths of 2 to 7 fathoms, sand.

Hellershavn, in Lammetsund, affords anchorage for small craft in 6 to 8 fathoms, sand.

Vilnesfiord, a broad channel between the south side of Atleö and the mainland, is the continuation eastward of Bue or Aspöfiord, described below, and connects Krakhellesund and Tollesund with Granesund and Tvibergsund, and is here treated as a portion of the eastern Inner Lead. Its continuation eastward is Dalsfiord.

Dangers.—Mörpölsa is a rock lying 800 yards westward of Langö, the islet on the south side of the entrance to Vilnesfiord. It is marked by an iron pillar, and the sea breaks heavily on it when there is any swell. Foul ground exists between Langö and Mörpölsa.

Midfordskjær, three-quarters of a mile westward of Mörpölsa, and the same distance southeastward of Aralden, is marked by a black stone beacon.

Mögelasst (Mökallasst), a shoal patch lying 800 yards southward of Krokholm, at the eastern end of Vilnesfiord, is marked by an iron pillar.

Flatöflu is a patch with 2 feet of water over it, lying about 600 yards south of Flatö, an islet off the southeastern extreme of Atleö, south entrance to Granesund. There are two iron poles on Flatöflu.

Lights—Rauö.—On the southwest point of Rauö, on the north side of Vilnesfiord, is a white wooden building, from which is exhibited an occulting light, with white, red, and green sectors, visible 11, 8, and 6 miles, respectively. The light is elevated 56 feet.

Furenes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 33 feet, on the west point of Furenes, southern side of Vilnesfiord.

Prestö.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 36 feet, from the western side of Prestö, Granesund.

The above lights are shown from July 15 to May 15.

Fursætvaag, south side of Vilnesfiord, affords anchorage in depths of from 3 to 7 fathoms, and there is a good anchorage in 5 fathoms off Bredvaag, 3 miles to the eastward, but the entrance between Svinö and Haavaag is very narrow.

Granesund is about 4 miles in length by one-third of a mile in width in places, and separates Atleö Island from the mainland. The fairway is clear of known danger, excepting Flatöflu, above mentioned.

Bacons.—A rock at 300 yards southeast of Flatö, and the edge of the shoal ground extending eastward from the island, are marked by poles. A 9-foot patch in the northern entrance to Granesund at 300 yards from the western shore is also marked by a pole.

Anchorage.—There is anchorage in Granesund, on the east side of Prestö, in a depth of 9 fathoms; and northward of the islets, on the east side of Sauesund, southeast side of Atleö, in from 7 to 13 fathoms; the latter is the most commodious harbor. Also, at the west extreme of Rauö, westward of the north entrance to Granesund, in 9 fathoms.

Staveneshavn, between the two northernmost islets off Stavenes, has anchorage for small craft in 4 to 5 fathoms, sand, good holding ground.

Hegöhavn, west-southwest of Stavenes, between Hegö and Skumsö, is small, but has depths of 12 to 15 fathoms, the bottom partly stones.

Smelvær.—The bight westward of Rundholm, east side of the Smelvær, affords good anchorage in depths of from 6 to 14 fathoms, sand. A sunken rock lies in the approach about 150 yards north-eastward of Rundholm.

Tansö Road and Haven.—The harbor between Helgö, Tansö, and the south side of Askroven and within Skarveskjær affords good shelter in depths of from 4 to 16 fathoms, sand, and has both a north and south entrance. West of the north point of Tansö the depth increases to 16 fathoms; and in the narrow sound between Tansö and the south extreme of Askroven there is a depth of $2\frac{1}{2}$ fathoms, with anchorage at its east end for small craft.

Shoals extend 200 yards northward from the north point of Helgö, and the same distance south from the point at Espesæt, on the opposite side of the channel. The northeast side of Helgö is foul a short distance offshore, and a shoal with a depth of 3 feet extends nearly 200 yards from the northwest side of Tansö, its outer edge being marked by an iron pole.

Vallestadvaagene, on the northeast side of Askroven, is open to the northward, and affords anchorage in depths of from 4 to 6 fathoms.

Valvik Haven, on the west side of Askroven, has depths of 2 to 6 fathoms, with good anchorage for small craft.

Oddene.—The next anchorage northward of Askroven is on the southeast side of the Oddene, where small vessels find temporary anchorage in from 4 to 5 fathoms.

Nekö.—There is a small harbor between Nordre and Söndre Nekö, northward of Rekstenfiord, with depths of 6 to 9 fathoms; the eastern entrance is very narrow, with depths of 4 fathoms; a rock at the entrance is marked by an iron pole. Vessels must keep close in to the north side of Söndre Nekö when entering from the eastward.

Beacons near the fairway.—Trefodskjær, $1\frac{1}{2}$ miles south of Askroven Lighthouse, is marked by a black stone beacon, near which is the light, and the rocks extending eastward from Boerne, at half a mile westward of the above, by a pole; the fairway lies between.

Lejeskjærene, 500 yards southeastward of Askroven Lighthouse, has a black stone beacon upon it; a patch, at a depth of $2\frac{1}{2}$ fathoms, lies between the rock and the lighthouse.

Yksöflu, 1,800 yards eastward of Askroven Lighthouse, is marked by a black iron pole with a spherical topmark.

Oddene, on the east extreme of this group, is a black stone beacon with a white belt and stripe.

Færö Southwest Point is marked by a black stone beacon with topmark; upon Færöbo, extending from the west side of the island, there is an iron pillar.

Mortingboe, 400 yards southward of Stabben Lighthouse, is marked by a black stone beacon, and its western edge by a pole.

Stabbeflu, with 9 feet of water over it, lying 300 yards westward of Stabben Lighthouse, is marked by an iron beacon; in the passage between it and the lighthouse there is a $3\frac{1}{2}$ -fathom rocky patch.

Svartskjær and several other dangers eastward of the fairway at this part are marked by iron poles.

Lights—In the eastern Inner Lead, from Granesund to Fröjsjöen, the following lights as aids to the night navigation of these narrow waters are established; they are described as met with by a vessel proceeding northward.

Stavenes.—Upon the northernmost islet lying off Stavenes and on the north side of the harbor an occulting light, with white and red sectors, elevated 24 feet above high water, is exhibited from a small white iron house.

Trefodskjær.—On the southwest extreme of Trefodskjær, a group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 31 feet.

Askroven.—On Klubben, the east point of Askroven, an occulting light, with white, red, and green sectors, is exhibited, from a small white wooden house, at an elevation of 38 feet above high water.

Neköosen.—On the small islet close to the east point of Nordre Nekö, an occulting light, with white, red, and green sectors, is exhibited, from a small white iron house, at an elevation of 30 feet above high water.

Stabben.—From a yellow dwelling with tower, 33 feet high, on Stabben Rock, in the Inner Lead, a mile northward of Neköosen, a fixed light, with white, red, and green sectors, and a flashing white sector, visible 12, 11, and 10 miles, respectively, is exhibited at an elevation of 53 feet.

Florö.—From a white iron house on piles on Rotaflua, situated in the approach to Florö, $1\frac{1}{2}$ miles east of Stabben Lighthouse, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 14 feet above high water.

Aarebraatnes.—At Aarebraatnes, on the east side of the southern entrance to Nærö fiord, an occulting light, with white, red, and green sectors, is exhibited, from a small red iron house, at an elevation of 28 feet above high water.

Drageskjærflu.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 19 feet, from a small iron house on Drageskjærflu, a rock about $1\frac{1}{2}$ miles northward of Aarebraatnes.

Seljestokken.—At Seljestokken, on Klenevaagnes, about $2\frac{1}{2}$ miles northward of Aarebraatnes, a group occulting light, with white, red, and green sectors, is exhibited, from a small red house, at an elevation of 19 feet above high water.

Sondre Botten.—At about $3\frac{1}{2}$ miles northward of Seljestokken Lighthouse, where the eastern Inner Lead enters Fröjsjöen from the southward, is Sondre Botten, where, from a small white iron house, at an elevation of 14 feet above high water, an occulting light, with white and red sectors, is exhibited.

In all the above (except Stabben Light) the white, red, and green lights are visible in clear weather at the distance of 6, 4, and 3 miles, respectively.

Stavenes Light is shown from July 15 and the remaining lights from July 20; they are all kept lighted until May 15.

Florö.—On the north side of Brandsö is the small trading town of Florö, which has a population of about 500.

There is anchorage in depths of from 11 to 20 fathoms between Floröskjærene and Nettet. Small craft find anchorage in the bight to the southward in about 5 fathoms. Floröskjærene, on the western side of the havn, is marked by a pole.

The shoal, extending 300 yards northeastward from Florö Lighthouse, on the north side of the entrance to Florö, is marked by a pole: a rock lying a short distance off the southwest point of Roten, is marked by an iron pole.

From a position near Stabben Lighthouse, Florö Lighthouse, on the bearing 85° or 98°, or in the sectors of white light from the latter at night, will lead in the fairway to Florö southward or northward of Græsskjær, respectively. When entering the harbor at night care must be taken to avoid the islet off the west end of the town.

Telegraph.—Florö is a telegraph station.

Furusund, a narrow channel between the two islets next westward of the southwest end of Brandsö, is only used by small coasters bound to or from Florö. There is anchorage for small craft in 6 fathoms on the west side of the sound and on either side of the island at the south end of the sound. Two shoals on the east side of the sound are marked by beacons. On Langoxen, a small islet on the east side of the north entrance to Furusund, is a black stone beacon.

Næröfjord is the Inner Lead from Stabben Lighthouse and Florö to Fröjsjöen. A wider and deeper channel from Stabben Lighthouse is westward of the Nærö group and of Hovden by Hellefjord, thence into Fröjsjöen as from Næröfjord.

Dangers—Beacons.—A small rocky shoal, over which the depth is 15 feet, lies in the southern entrance to Næröfjord, about 600 yards southeastward from the south extreme of Söndre Nærö. A patch with 4 fathoms over it lies close southeastward of this shoal.

Husholmskjær, about 200 yards from the southeast coast of Söndre Nærö, has upon it a black stone beacon with white belt.

A rock, with 6 feet over it, lies 700 yards north of Aarebraatnes Light.

A patch, with 15 feet, lying near the fairway, 500 yards eastward of Nordre Nærö, is marked on its eastern side by a pole.

Jekneskjærflu, a rock about 1,400 yards north of Aarebraatnes Light, is marked by a beacon.

Ureöskallen, with 10 feet, lying about 400 yards off Ureö, and Drageskjærgrund, situated on either side of the fairway at about 1½ miles northward of Aarebraatnes, are marked by poles.

Smaaskjær, lying off Seljestok, has upon it a black stone beacon with a white top.

Hollænderne, extending nearly 1 mile northward from Gaasö, is marked by a pole. Rognene is distinguished by a black stone beacon with a white cross and Langvingen by a black stone beacon with white belt.

Nærö Havn, near the northeast point of Söndre Nærö, affords anchorage for small craft in a depth of 9 fathoms.

Kvalvik, on the east side of Næröfjord, affords anchorage in a depth of 5 to 7 fathoms, sand. The shore is foul for some distance here, and also off Uren to the southward.

Anchorage in Hovden and Fröjsjöen, see below.

Directions—Eastern Inner Lead from Sogne Söen is through Krakhellesund or Tollesund, thence across Aafiord and westward of Sakrisö and Luten, between Midtfiordskjær and Mörpölsa, and northward until about midway between the north points of Aralden and Lammetu. Then haul to the eastward through Vilnesfiord and pass at least 200 yards southward of Mögelasset iron pillar and about half a mile southward of Flatö. The vessel will be past Flatöflu when the east side of Flatö bears 346° , and course may then be altered for Granesund; the west extreme of Prestö in line with the west side of Granesund, bearing 335° , clears the shoals extending eastward from Flatö, after passing which proceed in mid-channel. A $4\frac{1}{2}$ -fathom patch lies in the southern entrance at 250 yards west of Haneskjær.

For route westward of Atleö, see below.

Avoiding the 9-foot patch which lies almost in the center of the fairway in the northern entrance to Granesund, shape course to pass about 400 yards off Stavenes, and having passed that light steer for the lighthouse on the east point of Askroven, bearing 8° , until past the Højholmene; and pass between Askroven and Lejeskjær, marked by a black stone beacon, keeping close in to Askroven to avoid the $2\frac{1}{2}$ -fathom patch off Lejeskjær. Give the east side of Oddene (marked by a black stone beacon with white belt and stripe) a fair berth, and proceed between Færö and Nekö; thence westward of Mortingboe, marked by a beacon; and between Stabbefflu, marked by an iron beacon, and Aanö to Hellefiord.

Thence the smoothest passage to Frörsjöen is through Næröfiord, avoiding the 15-foot patch 800 yards southward of Husholmskjær beacon and the 15-foot patch about 1,200 yards northward of Aarebraatnes Lighthouse, near the fairway; thence westward of the 10-foot rocky shoal off Ureö, marked by a pole, and eastward of Drageskjærgrund Light, and Hollænderne pole, and of Rognene and Langvingen Islands (both with beacons); thence into Frörsjöen. Directions continued below.

Or vessels can proceed by Hellefiord, which is a wider channel, as below.

Hellefiord is the western continuation of the Inner Lead from Stabben Lighthouse northward, and to sea. The Inner Lead southward may be entered by Hellefiord when coming from northward or westward.

From Stabben Lighthouse to its northern entrance the fiord is about 7 miles in length by about three-quarters of a mile in width in its narrowest part; it lies between Vevlungen, Batalden, and Aralden on the west and the Nærö group and Hovden on the east. The fairway is apparently clear of danger with the exception of Risholmflu

on the west side, marked by an iron pole, and two shoals at 4 and $4\frac{1}{2}$ fathoms lying 1.2 and 1.6 miles, respectively, southeastward of Risholmflu. Islets and dangers extend northward of Batalden, and Aralden is foul to a short distance; the dangers will be readily seen on the chart.

Batalden is about $1\frac{1}{2}$ miles in extent, and its summit is 1,606 feet in height. Aralden is about 1 mile northward of it.

Shoals extend about 8 miles seaward of these islands, many of which are awash, whilst others break in moderate and bad weather. Senningerne are nearly the outer dangers; they are moderately high, and are situated about 6 miles west of Batalden.

Bearings of these, of Ytterøerne Lighthouse to the southward and of Kvanhovden Lighthouse, are sufficient guide for the avoidance of all dangers.

Lights—Voldskjær.—A flashing light every three seconds, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 27 feet, from a rock 400 yards south of the southeast point of Batalden. It is shown from July 20 to May 15.

Kvanhovden.—A fixed and flashing light, with white, red, and green sectors, visible 16, 12, and 10 miles, respectively, is exhibited from a white wooden house, 33 feet above the ground, at an elevation of 130 feet above high water, on the northwest point of Hovden. Shown from July 20 to May 15.

Anchorage.—On the west and south sides of Hovden, in Hellefiord, are the following anchorages:

Ytre Hovdevaag, on the west side of the isthmus connecting the northern and southern portions of the island, affords anchorage for large vessels in a depth of 11 fathoms, a little northward of Lille Skjær; small craft can proceed farther up the bight and anchor in from 4 to 6 fathoms.

Dombovaagen has anchorage for small craft in from 3 to 4 fathoms; at Kjejtang, the bight southward of it, in 4 fathoms; and in Barekstegaardene, also in a depth of 4 fathoms.

Flötningvaag, on the east side of Hovden, has small-craft anchorage in 5 fathoms. Indre Hovdevaag, within the isthmus before mentioned, is a good haven; in the middle there is anchorage for large vessels in depths of 11 to 20 fathoms, and for small craft farther in under the land in 6 to 9 fathoms. In the northern approach to Indre Hovdevaag lies Melkevigflu, a rock awash, marked by an iron pole with topmark; also three shoals, 1,000 to 1,400 yards southwest of the above, with from 6 to 10 feet, each marked by a pole.

On the west side of Hellefiord there is anchorage between the southeast extreme of Batalden and the Sauö Islets. It may be entered from either northward or southward, but the former is very narrow, with shoals on either side. The anchorage is only 200 yards

wide, with a depth of 12 fathoms, and only available with local knowledge.

Directions, continued from above. Proceeding to sea by Hellefiord from Stabben Lighthouse, or to Frörsjöen, steer for the west side of Hovden, eastward of Risholmflu beacon (iron pole), and also eastward of Hillesö, Batalden, and Aralden, in about mid-channel. When about 1 mile northward of Aralden, steer to bring the Skaar-kind Bierg, 998 feet in height, on Hovden (or at night Kvanhovden fixed white light) to bear 96° astern, which bearing kept on will lead clear of all danger to sea. (Hellefiord may be entered by reversing these directions.)

If proceeding into Frörsjöen by the Inner Lead northward, round Hovden at about half a mile distant; thence steer to pass about half a mile southward of Fiskholm Lighthouse, and up the fiord toward the Skatestrom.

Bue or Aspö Fiord, the entrance to which is about 3 miles in breadth between Aspö on the south and Bueland, Værö, and Alden on the north, is available for vessels wishing to enter the Inner Leads from seaward, or for those seeking shelter in bad weather, see anchorages below. No great difficulty would be experienced in the latter case in reaching shelter under the Væröerne by entering southward and eastward of them, and from thence, if desirable, proceeding southward of Rauö Light into Vilnesfiord and the Inner Lead, where there are several convenient anchorages.

Vilnesfiord and its continuation eastward, Dalsfiord, is the northern arm of Buefiord; Aafiord is the southern arm. The dangers which extend about 4 miles off the land, between Utvær to the southward, and Buefiord, also those from Bueland northward, and which extend considerably farther off, are easily avoided, as will be readily seen by referring to the chart. Aspö and the other principal islands on the south side of the entrance have been described with the Inner Lead.

Bueland group of islands lie on the north side of the entrance to Buefiord; the highest is over 200 feet in height. Shallow patches extend 1 mile or more seaward of them. Eastward of these is Melvær, with Olsund between and Melvær sund to the eastward, between Melvær and Værö.

Lights—Hovden.—An occulting light, with white and red sectors, is exhibited, at an elevation of 39 feet, on Hovden, Bueland. The white light is visible at a distance of 6 miles, red at 4 miles.

Gyrines.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 70 feet, on the western side of the north entrance to Olsund. The white, red, and green sectors are visible 7, 4, and 3 miles, respectively. Shown from July 15 to May 15.

Værö is generally low, with two round hills on it resembling hay-cocks, the highest 545 feet high; islets and dangers extend $1\frac{1}{2}$ miles southward of it, known as the Sorværet Islets.

Alden, northeastward of Værö, is about $1\frac{1}{2}$ miles in extent and 1,585 feet in height. Værösund is the navigable channel westward of it, and Aldefjord that eastward of it.

Værösund and Aldefjord have dangers in and near the fairways, but these may be avoided by a careful use of the chart.

Tviberg and Atleö.—Tviberg is the island immediately eastward of Alden, on either side of which is the western Inner Lead. Atleö, the large island next eastward, attains a height of 2,264 feet (Atleö Varde). The aspect of these islands has been described. Eastward of Atleö is Granesund, of the eastern Inner Lead.

Anchorage—Buefjord and western Inner Leads.—There are several anchorages in Buefjord and in the western Inner Lead northward, available with local knowledge. Bronkjavaag, in the Bueland group, between Bronkja and Bratholmene, has depths of 8 to 10 fathoms. Langö sund, between Langö and Gyriö, has depths of 7 to 10 fathoms. Under Barsholmene, east side of Melvær, there is anchorage for small craft in 3 fathoms. Soknevaag, south side of Værö, has depths of 8 fathoms. Klevevaag, in Værö Sund, has depths of 2 to 4 fathoms.

Aldevaag, south side of Alden, has depths of 2 to 5 fathoms; it is only about 200 yards in extent, with an entrance 150 yards wide, but it is a good anchorage for small craft. When entering keep close to the point on the east side of the entrance, and bring up eastward of the rock on the west side of the harbor.

Kalvaag, on the southwest side of Tviberg, affords anchorage for small craft in a depth of from 5 to 8 fathoms, but it is open to the southward.

Nervik, on the west side of Atleö, affords anchorage in from 5 to 8 fathoms, sand, near the head of the bight, distant about 150 yards from the shore.

Hindö Havn is in the Inner Lead, between and northward of Tviberg and Atleö. It is situated between Hindö, Koö, Smaleö, and Havnholm, and has depths of 7 to 8 fathoms, decreasing to 3 or 4 fathoms in the western part, where it is only suitable for small craft. Smaleöbö is marked by an iron pole.

Molvær, in the islands of that name, affords anchorage in 3 to 7 fathoms, good holding ground, between Ingvaldsö and Kringla Islands.

Beacons.—Passing northward between Tviberg and Atleö, western Inner Lead, the following beacons will be noticed:

On Havnholm, at the entrance to Hindöhavn, is a black stone beacon with two white vertical stripes. A pole marks Havnholmflu, the shoal 100 yards eastward of Havnholm.

Hindöflu, 250 yards eastward of Havnholm, is marked by a pole on its southwest side and an iron pole on its northeast side.

Svetangebo, with less than 6 feet water over it, lying 200 yards south of the east end of Svetange, is marked by an iron pole; Frit-hjofbo, at a depth of 15 feet, 200 yards eastward of the above, is marked by a pole. The fairway lies between these beacons.

Maasnesholmfu, extending about 200 yards westward from Maasnesholm, is marked by a pole; several dangers lie between this island and the northwest extreme of Atleö.

In the fairway southward of Hegö, at 200 yards southward of the southwest end of Skumsö, there is a sunken rock at a depth of 16 feet marked by a pole.

Lights—Hindösund.—On Havnholm, situated on the western side of the western Inner Lead, an occulting light, with red and green sectors, is exhibited, at the height of 17 feet above high water, from a white iron house on piles.

Hegö.—On the south point of Hegö, lying on the northern side of the Lead, an occulting light, with white, red, and green sectors, is exhibited, from a small white iron house, at an elevation of 31 feet above high water. The white, red, and green lights are visible in clear weather at the distance of 7, 4, and 3 miles, respectively.

This light also shows fixed white, visible 11 miles on the bearing of 84°.

The above lights are shown from July 15 to May 15.

Directions—Buefjord and Inner Lead.—Entering Buefjord from seaward, if wishing to proceed northward by the Inner Lead—the Eastern Lead through Vilnesfjord and by Granesund, described above, is to be preferred.

But to proceed by the route westward of Atleö, the channel between Værö and the Gjejtungen group of islets should be taken, thence southward of Alden. When entering the lead between Tviberg and Atleö, give the east side of the Senholmene a berth of about 600 yards, and pass 400 yards westward of Blegeskjær. Keep in mid-channel between the beacons on the shoals eastward of Havnholm; give the west end of Maasnesholm a berth of 300 yards, and proceed southward of Hegö and eastward of Skumsö and Melsholm to Stavenes. Here it joins the Inner Lead.

At night approach Gjejta from seaward with its light, fixed white, bearing 65°, and after rounding that island to the southward (when Rauö Light will be seen bearing 48°) at the distance of about 500 yards, enter its narrow strip of fixed white light bearing from 202° to 205°, and proceed in that sector with the light astern, keeping on its western extreme after Rauö Light bears 144° in order to clear the Atleö shore. Pass 100 yards eastward of Hindösund Light (here great care is necessary), then haul sharply northwestward and keep

in its red sector until Hegö Light changes color from red to white, when steer to pass 200 yards southward of that light, and haul northward for Stavenes when the light upon it shows white bearing about 32° .

Western Inner Lead.—From Buefjord the channel is between Varö and the Gjejtungen Islands (as for the Inner Lead), thence through Aldefjord, between Alden and Tviberg, avoiding the charted patches (keeping in Gjejta fixed white sector of light at night), and for Molvær. The recommended channel is between Mølvær and Kvanskjær; thence steer for Kinn Varde, the eastern mountain on Kinn, until the western extreme of that island bears 343° , when steer for it on that bearing, which will lead nearly in mid-channel between Store and Lille Lejesten, two small rocks about $1\frac{1}{2}$ miles southward of Kinn; and when Reksten Kletten, the hill on the east end of Reksten, bears 67° , proceed according to the directions for Kinn Sund.

Smelværberne, Aanoldflu, Jagtelidfaldet, Smelden, Knappen, and many other dangers lie near this track, and will be seen on the chart, but it would be useless to attempt any written description; neither is it advisable or prudent to attempt these channels without a pilot.

When northward of Kinn Sund the passage thence to Frojsjöen or to sea is westward of Lille Batalden and its shoals, and westward of Batalden and Aralden, reversing the directions for Kinn Sund from the northward.

Kinn Sund, between Kinn and Reksten, is the continuation northward of the western Inner Lead, between Buefjord and Frojsjöen. It is about 1 mile in length, but narrow toward its center.

On the west side of the south entrance to Kinn Sund shoals extend nearly 300 yards offshore, and a rock with 3 fathoms lies nearly 400 yards south of Rognsö, the islet eastward of the lighthouse. The northern entrance is clear of danger, with the exception of a shoal extending about 100 yards from the northeast side of Kinn and a little foul ground off the north shore of the small islet on the east side of the entrance.

Light.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 31 feet, from a small house on the east coast of Kinn. The sectors are visible 7, 4, and 5 miles, respectively. Shown from July 20 to May 15.

Anchorage.—Kinn Sund affords good anchorage both for vessels of moderate draft and for small craft. The best anchorage for the former is southward of Synderholm, in depths of 4 to 10 fathoms.

Small craft may anchor in the bight northward of the lighthouse in 8 fathoms.

Rognaldsvaagen, between Rognsö and Reksten, has depths of 2 to 4 fathoms. There are mooring rings on the shore at most of the anchorages.

Ytre Storhaugvaag, 600 yards northward of Rognsö, is a good harbor for ~~small craft~~, with depths of 4 to 5 fathoms.

Indre Storhaugvaag is also a good harbor, with a depth of 3 fathoms.

Directions.—There are several passages leading to Kinn Sund from seaward. From the southwestward, Reksten Kletten, the hill on the east end of Reksten, in line with the south point of Sandö, the islet southeastward of Kinn, bearing 74° , will lead in between Jongsgrund and Jongsgrundfaldene, and south of Rekstengrunden, which has a least depth of 5 fathoms, and Bataldböe, a rock nearly awash, lying 830 yards south of the southwest point of Kinn.

Give Sandö a berth of 400 yards, and when Kinn Sund is well open, or the lighthouse bears 335° , proceed in mid-channel for the anchorage. A rock, with 4 fathoms on it, lies 133° 1,200 yards from the lighthouse; therefore vessels must haul up for the entrance in time. Vessels may anchor either southward of Synderholm or about 400 yards north of the lighthouse.

Northern entrance.—A description of the landmarks, islands, etc., are given below:

To make Kinn Sund from the northwestward, bring the highest part of Batalden to bear 126° when distant 10 or 12 miles, and steer for it until the east side of Kinn or Kinn Lighthouse bears 166° , when it should be steered for, avoiding Brandsöflu, a rocky patch of 5 fathoms, and Araldflu, with 4 fathoms, nearly on the line of course. This will lead between the Senningerne, Stevnskjærflu, Stevnskjærbö, and other shallow patches westward of Batalden, and that island, and also in the fairway between other dangers, up to the entrance to the sound.

When past Kvitingerne, an islet $2\frac{1}{2}$ miles northward of Kinn, edge over toward Nærö to avoid Skallefluerne, extending out to the distance of 1,200 yards from the west extreme of Skorpen, and on passing Nærö edge to the eastward until Kinn Sund is open, and proceed in mid-channel through the north entrance. The passage between the northeast point of Kinn and the small islet to the eastward is very narrow, but has a depth of 20 fathoms close up to the shore on either side.

If the vessel is southward of the Senningerne, bring the south point of Batalden to bear 85° , and steer for it until the bearing of Kinn Lighthouse is 166° , as before, when steer for the lighthouse.

There is also a good passage between Tyskerfaldene and Haaboerne and northward of Ytterö Lighthouse. The largest islet of the Ytterö group, in line with the north point of Kinn, or the latter point in line with the northeastern steep edge of Reksten Kletten, bearing about 92° , will lead in from seaward. Keep nearly in mid-channel between the Sverslingerne and Ytterö and also between Kvitingerne

and Sandöerne and haul to the southward for Kinn Sund Lighthouse, giving Skallefluerne a good berth, as before.

Reksten and Skorpe fiords connect Kinn Sund, the western Inner Lead, with the Inner Lead eastward of the Nekö group. The directions for entering Reksten and Skorpe fiords are the same as for the southern and northern entrances to Kinn Sund, respectively. The south sides of Reksten and Skorpen are almost free from danger, but the islets and rocks on the south sides of both channels should be given a good berth, as there are numerous shoal patches between them. The most direct passage from Skorpe fiord to Stabben Lighthouse is between Aanö and the Grindholmene. When taking the channel between the latter islets and Nekö, vessels must pass southward of Trättebo, which lies 400 yards southeastward of Tratteskjær, and is marked by an iron pole.

Light—Æsosund.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 28 feet, from a small iron house on piles situated on Æsokluppen, off the southwest extreme of Skorpen. Shown from July 20 to May 15.

Anchorage.—**Rekstenvaag**, south side of Reksten Island and north side of Rekstenfiord, affords anchorage in 3 fathoms, sand, but it is open to southwest winds.

Langevaag has depths of 3 to 4 fathoms, and there are mooring rings on the shore.

Næröhavn, at the island of Nærö, $1\frac{1}{2}$ miles westward of Skorpen and northwest of Kinn Sund, affords anchorage in depths of 10 to 12 fathoms. A bight at its inner part will accommodate small craft in 3 fathoms.

Æsudent, at the west end of Skorpen, has depths of 3 to 5 fathoms.

Skorpevaagen, on the southwest side of Skorpen, has a depth of 3 fathoms.

Östre Skorpevaag, east side of Skorpen, is a narrow inlet with depths of 4 to 5 fathoms.

Buefiord to Fröjsjöen—Offlying dangers—General remarks.—From Buefiord, the islands northward for about 28 miles to Fröjsjöen, the next large fiord available for all classes of vessels from seaward, are fronted by islets, interspersed thickly with rocks awash or nearly so, and by many banks of 10 to 15 fathoms, dangerous in bad weather, at which time also the sea is boisterous within the 100-fathom contour line. These dangers are known generally as the Rygstenhav and the Askrohav, and extend as far westward as longitude $4^{\circ} 27'$ east.

The principal shallow outermost dangers are the Haastengrund; the Garboskjærene, which usually break; Gunnarskjær, above water;

Röringsgrund; Röringerne and Knappen, above water; and Jonsgrundfaldene, with 3 fathoms; the latter is one of those in the approach to Reksten fiord. Westward of Ytterö Lighthouse and Batalden Island, south side of entrance to Fröjsjöen, the dangers extend from 5 to 8 miles, the Senningerne being about 6 miles from Batalden.

Dangers extend from 3 to 8 miles southwestward and westward of Fröjen, the island north side of entrance to Fröjsjöen, the westernmost of which is Grundskallen, with a depth of 12 fathoms. Those bordering the actual entrance are fairly guarded by islets and rocks on which the sea breaks, as will be seen by the chart.

Bearings of Ytterö Lighthouse, Batalden, and Fröjen, described further on, are sufficient for the avoidance of all dangers, but it is recommended that vessels passing up and down the coast and not seeking an entrance into the fiords should give all the dangers a wide berth.

Landmarks.—The group of large islands lying 20 miles northward of Buefiord stand out conspicuously from the mainland, which is generally lofty, irregular, and indented. Amongst these islands Kinn is especially prominent, having two mountains on it which are separated by a deep ravine with steep sides. The eastern mountain, 1,042 feet high, is the higher and larger. In the middle of the western mountain there is a deep cleft, the sides of which approach the perpendicular and are of nearly equal height, so that it looks as if a piece had been cut out of the summit. These mountains run in an oblique direction to each other, so that one or other of the clefts will be visible from seaward except when due west of the island. The outer or western cleft is most conspicuous between the bearings of 0° and 90° , and the ravine between the mountains when bearing about 120° . There is no other island of this form on the whole coast, and it may be seen in clear weather from a distance of 30 or 40 miles. On the north end of Kinn is a white church with a red roof, which is visible at a distance of 8 miles.

Blaakollen, on Skorpen, $2\frac{1}{2}$ miles northeastward of Kinn, rises to a height of 1,297 feet.

Batalden, 1,606 feet high, lies northward of Skorpen, and is also a conspicuous mark.

Hovden, within Batalden, has a peak near its northwest extreme 998 feet in height. Here is the entrance to Fröjsjöen.

The large triangular island Bremanger, forming the north side of Fröjsjöen, is very high, and appears from most positions to form part of the mainland. On the eastern extreme of Bremanger is Hornelen Bierg, 2,985 feet in height. Rydlandshorn, near its southwest extreme, is 1,215 feet in height.

Fröjen, situated seaward of Bremanger, attains a height of 1,194 feet in Fanneskar.

Light—Ytterøerne.—Between Buefiord and Fröjsjöen, on the outer islet of the group, about 2 miles northwestward of Kinn, is exhibited from a circular lighthouse, 102 feet in height, painted red with one white band, at an elevation of 183 feet above high water, a fixed and group flashing white light. It is visible in clear weather from a distance of 20 miles. Shown from July 15 to June 1.

Tides.—The general nature of the tides between Alden and Stadt has already been described, but in the various channels between the islands the force and direction of the streams vary considerably.

Pilots.—Kinn is the best place to stand in for between Alden and Bremanger when the services of a pilot are required, but fishermen will generally be found on most of the outer islands.

Fröjsjöen is a channel about 15 miles in length, and nowhere less than 1 mile in width, with very deep water throughout. Vessels seeking shelter would find no difficulty in entering Fröjsjöen by running in for Skaarkind Bierg on Hovden, when bearing 95° (as for entering the Inner Lead southward through Hellefiord), or at night, Kvanhovden fixed white light; thence northward of Hovden. Fiskholm Lighthouse, bearing northward of 53° , leads southward of all dangers southwestward of Fröjen. The Inner Lead northward is through Fröjsjöen and its continuation, the Skate Ström.

Islands and dangers.—The islands and dangers in the approach to Fröjsjöen have been previously described.

Fiskholm (Smörhavn).—Upon Fiskholm, on the northern side of Fröjsjöen, at about $4\frac{1}{4}$ miles northeastward from Kvanhovden Lighthouse, a fixed and flashing light, with white and red sectors, is exhibited from a white wooden dwelling 33 feet in height, at an elevation of 92 feet above high water. The white light is visible in clear weather at a distance of 11 miles, red light at 8 miles. Shown from July 20 to May 15. See sketch on chart.

Hornelen.—At Hornelen, the southeast point of Bremanger, an occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at a height of 33 feet, from a small iron house. Exhibited from July 20 to May 15.

Anchorage—Directions.—All classes of vessels can enter Fröjsjöen without difficulty during daylight. At night the lights at Kvanhovden, Fiskholm, and Sondre Botten afford sufficient guide for the entry of vessels carefully navigated; vessels waiting for daylight should keep well seaward of Ytterø Light, a few miles southward of the entrance, off which also a pilot is obtainable from Kinn. The anchorages on the south side of the entrance have been described with Hellefiord; that on the northeast side of Hovden is

available for large vessels. Within those, on the south side of Fröjsjöen, are the following:

Gulenfiord.—About 7 miles within Hovden Island are three fiords with a common entrance (Gulenfiord) about half a mile in width; these are named Nordgulen, Midtgulen, and Sörgulen.

In Nordgulen, in the bight at the head eastward of Sande, there is anchorage in a depth of 9 fathoms; a sunken rock, with less than 6 feet of water over it, lies in the approach southward of Sande Point. In the bight eastward of Tanøerne anchorage may be found in 4 to 6 fathoms. A rock with 9 feet over it lies 400 yards west of Tanøerne.

In Midtgulen, in the bight northward of Kjælkenes, there is anchorage in 5 to 10 fathoms; a shoal projecting from the western point is marked by a pole. Off Mulehavn there is anchorage for small craft in 5 fathoms.

Sörgulen apparently affords anchorage at its head; in the center of the fiord, eastward of Sagebö, there is a rock at a depth of 9 feet.

Hænøen lies 5 miles eastward of Gulenfiord; between its eastern end and the mainland there is anchorage in a depth of 11 to 12 fathoms; a sunken rock in the entrance is marked by an iron pole.

Marö, in the approach to the Skateström, has a small cove on its northeast side, with depths of 11 to 15 fathoms. **Maröflu**, lying 200 yards south of the southeast point of Marö, is marked by an iron pole.

On the north side of Fröjsjöen are the following anchorages:

Kallevaag, a small bay on the southeast side of Fröjen, has good anchorage for large vessels in a depth of about 9 fathoms, and for small craft nearer the shore in 4 to 5 fathoms. On the west side of the bay is a rock marked by an iron pole. The best anchorage is 300 yards northeastward of this beacon and the same distance from the northern shore. Small craft may pass southward of the beacon and bring up westward of the islet in 5 fathoms.

Light.—On the northeast side of Kallevaag an occulting light, with white, red, and green sectors, is exhibited, elevated 24 feet above high water. The white, red, and green lights are visible at 6, 4, and 3 miles, respectively.

Beacons.—Langeskjær, 1,100 yards southeast of Kallevaag, is marked by a stone beacon; a rock about 250 yards east of the beacon, and another rock the same distance north of it, are each marked by a pole. A rock 500 yards northeast of Langeskjær beacon is marked by a pole, and another rock lying about the same distance northward from the beacon by an iron pole. A number of other dangers, many of which are marked by iron poles, lie farther northward in the southern approach to Oldersund, for which the small scale chart is an insufficient guide.

Directions.—To enter, steer for Fröjen Church, bearing 355° (or in the white sector of Kallevaag Light at night) until Fiskholm Lighthouse bears 101° , which bearing astern will lead between the rocks on either side of the passage to the anchorage eastward of the beacon. The light shows fixed white on this bearing.

Smörhavn is a small but good harbor formed by two of the southernmost islands off the southwest part of Bremanger; it is very narrow, but has a depth of 6 to 8 fathoms.

Beacons.—The eastern entrance is marked by a black stone beacon with a white belt, situated at the northeast extreme of Rota, the southernmost of the two islands above mentioned. Shoals extend 200 yards eastward of the northeast point of Rota, the extreme of which is marked by an iron pole. Shoals also extend the same distance southward from the southwest point of Vareholm, the outer edge marked by an iron pole.

Directions.—In approaching the western entrance care must be taken to avoid Guleskjærflu, covered with 4 feet of water and marked with an iron pole, which lies 900 yards northwest of Fiskholm; Storfluen, rocky heads of 4 and 6 fathoms, lying two-thirds of a mile westward of Fiskholm Lighthouse, and two shoals at $2\frac{1}{2}$ and 5 fathoms lying 200 and 400 yards, respectively, eastward of Guleskjærflu. The west sides of Fiskholm and Rota are bold-to, but the west entrance to Smörhavn, though free from danger, is very narrow. After passing a short 200 yards westward of Fiskholm, steer along the west side of Rota, and proceed in mid-channel through the entrance to the harbor.

At night, having passed northward of the dangers westward of Batalden in the sector of fixed white light shown from Kvanhovden, the fixed white sector of Fiskholm Light may be steered for when bearing 48° , which leads southward of the dangers southwestward of Fröjen, until near Fiskholm, when proceed as before; but it is not advisable for strangers to attempt it at night.

Eastern entrance.—By the eastern entrance, give the beacon on the Rota Shoals a berth of 100 yards and proceed in mid-channel to the anchorage in 6 fathoms 200 yards westward of the north point of Rota.

Rydlandsholm, about 3 miles eastward of Fiskholm Lighthouse; within this islet there is anchorage in a depth of 5 to 6 fathoms.

Berdlepollen, also on the north side, affords anchorage in about 9 fathoms, but there is only a depth of 9 feet in the entrance.

Light.—At Minnet, on the west coast of Fröjen, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 70 feet above high water.

Bremanger Poll, on the west side of Bremanger, northward of Fröjen, is about 5 miles in length, and open to the westward; Ryd-

landspoll, an inlet 1 mile in length, on its south side, about 2 miles within Oldersund, affords anchorage in a depth of about 8 fathoms, off Nödset.

Lights—Næsje.—On the north point of Fröjen an occulting light, with white and red sectors, is exhibited, at an elevation of 52 feet above high water.

Vedelskytten.—An occulting light, with white and red sectors, is exhibited from the northwest point of Vedelskytten, an island eastward of Fröjen, at an elevation of 42 feet above high water.

Haugsnæs.—A group occulting light, with white, red, and green sectors, is exhibited on Haugsnæs, Bremanger Poll.

The above are exhibited from small white wooden houses; the white lights are visible in clear weather at a distance of 7 miles, red lights at 4 miles, green lights at 3 miles. Shown from July 20 to May 15.

Oldersund, lying between Fröjen and Bremanger, has moderate depths where anchorage could be taken over the greater part of its northern end; in the more confined and sheltered space eastward of Olderöer the depth is 7 to 8 fathoms. The southern entrance is very narrow and intricate.

Beacons.—The foul ground extending about 600 yards eastward from Næsje is marked by an iron pole. Matsæk, a small rock north-east of Slænes, is marked by a black stone beacon.

The western ends of Telleboer and Svarteskjær, the extreme of the rocky shoal extending northward from Vedelskytten, and Olderstenen are marked by iron poles.

The channel between Olderöer and Vedelskytten is marked on either side by iron poles, as is the narrow channel leading into Oldersund from Fröjsjöen, and the shoal west of Varö is similarly marked.

Directions.—Bremanger Poll may be approached with Næsje Lighthouse bearing 98° (white light at night) and at a distance of about 1 mile from it, or when Oddebjerg bears 8° , steer 71° , enter Oldersund with Vedelskytten Lighthouse bearing 155° (white light at night), and pass eastward of Matsæk beacon.

Inner Lead—Skateström.—The narrow passage between the foot of Hornelen Mountain and Rugsundö is known as the Skateström from the rapidity of the tidal stream through it. This passage is the Inner Lead northward from Fröjsjöen to Faafiord, Nordfiord, and Vaagsfiord, etc. Approaching Skateström from seaward, through Fröjsjöen, see above.

Dangers—Directions.—Hornelflu, marked by an iron pole, lies on the north side of the eastern entrance to Skateström, and has a depth of 3 feet; Midtflu, with 2 feet, also marked by an iron pole, lies 700 yards northwestward of Hornelflu; Skaten, marked by a black light beacon with white belt, lies 200 yards from Bremanger

opposite Klubben; it has only 1 foot of water over it. Shoals extend to the distance of nearly 200 yards from Bremanger at Klubben and from Honskaar, two small farms about a mile southeastward of the west point of Rugsundö. A shoal is forming around a wreck in the bay eastward of Honskaar.

The shoal extending off Klubben is marked by an iron pole.

When passing through the Skateström vessels should keep mid-channel and pass southward of Hornelflu and Midtflu and northward of Skaten, proceeding either eastward or westward of Risö to Vaagsfiord or Nordfiord. Directions continued on below.

Lights—Kalveholm.—An occulting light, with white and red sectors, is exhibited, at an elevation of 21 feet, from a small iron house on Kalveholm, situated off the southwest side of Rugsundö.

Skaten.—A group occulting light, with white, red, and green sectors, is exhibited, at a height of 18 feet, from the beacon on Skaten.

Risö.—An occulting light, with white and red sectors, is exhibited, at an elevation of 26 feet, from a small iron house on the southwest point of Risö Island westward of Rugsundö.

Gangsö.—A group occulting light, with white, red, and green sectors, is exhibited, at a height of 16 feet, from the northeast point of Gangsöen.

Almindingflu.—An occulting light, elevated 14 feet, showing white, red, and green sectors, visible 8, 4, and 3 miles, respectively, is exhibited from a small iron house.

The above lights are shown from July 20 to May 15, and the white, red, and green sectors are visible 6, 4, and 3 miles, respectively.

Anchorage.—Small craft may anchor between Tiueholm and Rugsundö, between the south side of Rugsundö and the islets at Nygaard and Havnen, northward of Honskaar, and off the south shore half a mile westward of Klubben in 7 to 10 fathoms. Between the west point of Rugsundö and Risö there is a roadstead with a depth of 6 to 11 fathoms.

Rugsund, between the east side of Rugsundö and the mainland, is a narrow passage which can only be used by very small vessels.

From Risö Lighthouse the Inner Lead is across Nordfiord to Moldö Lighthouse.

Beacons.—Vemmelsflu, a mile north of Risö Lighthouse, and Kariskjær, off Blaalines, 800 yards southward of Moldö, are marked by iron poles.

Ulvesund is that portion of the Inner Lead connecting Vaags and Nordfiord with Silde Gabet. It is about 5 miles in length by about a third of a mile in breadth.

Moldösund, westward of Moldö, and the southern entrance to Ulvesund, though very narrow, is the best channel. It is 55 yards broad,

and has been dredged to a depth of $20\frac{1}{2}$ feet; the wider entrance, that eastward of Moldö, has depths of $2\frac{1}{2}$ fathoms only.

Lights—Sætenes.—An occulting light, with white, red, and green sectors, is exhibited from a small white iron house on pillars, on the southeast point of Vaagsö, at the southern entrance to Ulvesund. The white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively.

Moldö.—On the west side of Moldö, abreast of Sætenes, is exhibited from an iron framework, at an elevation of 10 feet above high water, an occulting red light, visible at the distance of 4 miles.

These lights are shown from July 20 to May 15.

Ulven.—Upon Ulven, a rock in Ulvesund, 2 miles north of Moldö, an occulting light, with white, red, and green sectors, is exhibited from a white iron house on the top of a black stone beacon with white belt. It is elevated 16 feet, and the sectors are visible 6, 4, and 3 miles, respectively.

Ulvesund.—On the east side of the northern entrance to Ulvesund a light, with fixed and group occulting white and red sectors, is exhibited, at an elevation of 52 feet, from a white wooden building. The white light is visible 12 miles, red light 11 miles.

Moldö offers no facilities for repairs; its exports are fish, cod-liver oil, etc. Population about 1,800. There is a telegraph station at Sætenes.

Beacons.—The edge of the shoal ground on the west side of Moldösund is marked by an iron pillar and that on the east side by two poles.

Gjeleskjær and Trolleböflu in Ulvesund are marked, respectively, by an iron pillar and by a black and white stone beacon; Ulven by a black stone light beacon with a white belt; and Kapelnesflu by a pole.

Smörskjær, a rock lying 1,800 yards northeastward from Ulvesund Lighthouse, is marked by an iron pillar.

Anchorage.—There is good anchorage for small craft on the north side of Skavö, southeast side of approach to Moldösund, in depths of from 5 to 10 fathoms.

Westward of the north point of Moldö there is anchorage in from 4 to 10 fathoms, rocky bottom. Northward of Brandhaves, 1,000 yards southward of Ulven, there is anchorage in from 4 to 8 fathoms; and in Kapel bugt, 1,200 yards northward of Ulven, in 8 to 16 fathoms. Southwestward of Vaagsö, in Skare bugt, there is anchorage in 8 to 10 fathoms.

There is also anchorage for small craft on the southeast and north sides of Silden.

Inner Lead—Directions (continued from above).—After passing either eastward or westward of Risö, proceed between Husevaagö

and the mainland for the entrance to Moldösund. A rock, with $4\frac{1}{2}$ fathoms, lies 600 yards south of Blaalines; otherwise the channel is clear. When passing through Moldösund vessels must keep midway between Moldö and Sætenes Lights. Trolleböflu, Læstholm, and Ulven may be passed on either side at a distance of not less than 100 yards; northward of Ulven the land on either side must not be approached nearer than 200 yards.

After passing Ulvesund Lighthouse vessels may either proceed past Skongsnes (directions given in next chapter reversed) and eastward or westward of the shoals off Kraaka, or they may pass southward of Smörskjær and eastward of Silden to the passage between Kraaka and Dragefeldet. Here the Inner Lead is broken and vessels have to proceed to sea westward of the peninsula of Stadt.

When rounding Stadt the coasting steam vessels frequently pass eastward of Utryggen, Ysteboen, and Bukketyvene, and westward of Skjærbo, in order to shorten the distance, but strangers should give all these dangers a wide berth. The summit of Hornelen, just visible eastward of Skolmen, bearing 164° , leads eastward of Utryggen and Ysteboen. There is a sector of fixed white light from Skongsnes, from 169° to 172° , for the use of those locally acquainted, for clearing the dangers southward of the Buholmene. Inner Lead continued in next chapter.

The Inner Fiords between Aafjord and Nordfjord belong to the Søndfjord district; the scenery in most of them is very fine, and good sport may be obtained in their immediate vicinity.

Dalsfjord extends about 17 miles eastward from Vilnesfjord, through very beautiful scenery, but is principally interesting on account of its historical associations. Toward the inner end of the fjord, on the north side, is Lökelandfos, a double fall 300 feet high.

Vaardalsflu, a rock lying 1,200 yards northeastward of Kysnes, the point on the south side of the entrance to Dalsfjord, has a depth of 1 foot, and is marked by an iron pole.

Anchorage may be found at various places in Dalsfjord and its branches.

Bredvaag, on the south side, affords anchorage in 6 fathoms, sand.

There is anchorage off Hellevik, eastward of Bredvaag, in 11 fathoms, and off Skoren, 1 mile east of Hellevik.

Flekkefjord, south side of Dalsfjord, affords anchorage in 7 to 11 fathoms, sand, within Langenes, on the east side of Aangholm; and on the east side of Hauglandsholm in 5 to 8 fathoms. The bight at Lendingen is a good haven, with 7 to 11 fathoms; off Fossen there is anchorage in 6 fathoms, and in Flekkehavn in 4 fathoms.

Dalsö, the large island eastward of Flekkefjord and westward of the town of Dale, affords anchorage at Storevik in $3\frac{1}{2}$ fathoms;

between Dalsö and Öholm in 4 fathoms; and in the bight on its southwest side in a depth of 6 fathoms, sand.

North side of Dalsfiord—Fosvik.—Between Fosvikholm and the land, north side of Dalsfiord, there is anchorage in 5 fathoms.

Lökeland, eastward of Fosvik, affords anchorage in a depth of 7 to 10 fathoms.

Standnes has anchorage in a depth of 10 fathoms, sand.

Kapstadviken affords anchorage in 5 fathoms, sand.

Stangfiord extends 5 miles inland on the south side of Stavenes, and has several good anchorages. Stavenes anchorage is mentioned with Inner Lead anchorages.

Folevaag, south side of the fiord, affords anchorage in depths of 8 to 11 fathoms; and at Eidsfiord, within, there is anchorage on its west side in 5 to 6 fathoms.

Stavanger, at the head of the fiord, has depths of 8 to 13 fathoms off it.

Stavfiord is separated from Brufiord by the beautiful island, Svanö. At the east end of Stavfiord, at its junction with Vefringfiord, between Svanö and Flokenes, there is a line of shoal patches and sunken rocks; Brugalten, in about the center of the passage, is marked by an iron pole with a black spherical topmark. The best passage through is northwestward of Svartskjær, a small rocky islet westward of Flokenes, but a rocky patch covered by only 9 feet water lies midway between the islet and Brugalten pole.

Anchorage.—There is anchorage at Vaagene, on the south side of the fiord, in 8 fathoms. Flokenesvaagen, west side of Flokenes, is a good anchorage, with depths of 5 to 8 fathoms. Svanö anchorages are described below.

Svanö is about 3 miles in length by 2 miles in breadth and from 800 to 1,000 feet in height. From Östnes, its east extreme, foul ground extends nearly a mile into Stavfiord, with sunken rocks as above stated.

Anchorage.—Svanö possesses several anchorages. Östnesvaagen, on the northern side of its southeast extreme, is the best anchorage in the island; and has a depth of 7 to 10 fathoms off the west end of Skogö. Kvalstadhavn, on the south side of Svanö, is also a good anchorage, with depths of 6 to 16 fathoms on the east side of Öen. On its west and northwest sides are Sjaavaag and Drivninghavn, with depths of 4 to 5 fathoms, suitable for small craft. On the north side, in Erstad bugt, there is anchorage in 4 fathoms.

Brufiord lies between Svanö and Storö; its continuation eastward is Vefringfiord, below mentioned.

Anchorage.—Stavik bugt, southward of Stavang, north side of the fiord, affords anchorage for small craft in from 3 to 4 fathoms.

Vejesund, northwest side of Storö, affords anchorage for small craft in from 3 to 4 fathoms.

Vefringfiord, and its continuation eastward, known as Fördefiord, extends about 18 miles inland from Flokenes to Förde. In Fördefiord the scenery is very fine, but of a wilder character than in Dalsfiord. Within Aalesund the land attains the height of about 3,000 feet.

Light—Flokenes.—On a rock, known as Lammeskjær, off the western extreme of the point, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown, at an elevation of 29 feet.

Anchorage.—Östre Flokenesvaag, south side of the fiord, affords good anchorage in depths of from 7 to 16 fathoms. At Gillesvik, farther eastward, there is anchorage in 7 fathoms within the holm. The bight eastward of Vefring affords small-craft anchorage in 12 fathoms. In Fördefiord there is anchorage in Holmesæt, between the holm and the land, in 5 to 8 fathoms; and eastward of Krokene there is anchorage in 7 to 10 fathoms.

Northward of Brufiord are several unimportant fiords, extending from 10 to 13 miles inland, known as Vasreset and Solemsfiord, Höjdalsfiord, Ekefiord, and Nordalsfiord.

Vasreset and Solemsfiord is the continuation of Rekstenfiord; Ekefiord is the continuation eastward of Solemsfiord.

In the former fiord there is a rock with 2½ fathoms over it about 800 yards eastward of Gjejtholmen.

Anchorage.—Krokene, in Solemsfiord, has anchorage in a depth of 3 fathoms. There is anchorage between Kjöina and the land, in 5 fathoms. Helgö, in the approach to Ekefiord, affords anchorage in 6 fathoms. The head of Ekefiord, off Hovland, has also a depth of 6 fathoms. Höjdalsfiord is entered from Vasreset by Alversund, which is narrow but deep.

CHAPTER III.

FAA, VAAGS, AND NORD FIORDS TO ROMSDALS ISLANDS.

General remarks—Aspect of coast.—About 12 miles northeastward of Bremanger, entrance to Nordfiord, is the peninsula of Stadt or Stadtlandet, one of the most remarkable promontories on the coast of Norway; it projects about 14 miles in a north-northwest direction from the mainland, and the large openings on either side are very conspicuous from the offing.

In hazy weather, when only small portions of the coast can be seen, it must be remembered that on the points Furestaven and Staalet of the peninsula are small peaks resembling detached rocks. Reviehorn, 1,409 feet in height, on the east side of Stadt, also appears from some positions to be detached; it is circular at the base, and has a conical summit.

From a position 10 or 12 miles westward of Stadt the opening on the south side of the promontory is very conspicuous. Vaagsö will appear about the same height as Bremanger; Husevaagö is much lower, and has several small peaks on it; the small opening of Faafiord will be clearly visible; and Fröjen will be seen a little westward of Bremanger. Veststejn and Klövning, two small islets off the northwest part of Bremanger, stand out distinctly from the land behind them, and may be seen from a distance of 10 or 12 miles; Veststejn rises gradually to a single small peak, but Klövning is divided into two nearly equal parts by a deep cleft, and is an excellent mark for the rocks off the entrances to Faafiord and Vaagsfiord.

If the vessel is farther northward, Hornelen, on the east end of Bremanger, will be very conspicuous, although there are other lofty mountains in its vicinity; it is 2,985 feet high, with two jagged summits, and falls nearly perpendicularly to the eastward. Skolmen (2,059 feet), 6 miles northward of Hornelen, is not so lofty; it rises gradually on three sides, terminates in a single peak, and falls abruptly to the eastward.

Pilots are stationed in the bay on the west side of Vaagsö; on Kraakenes, the northwestern extreme of the same island; in Siidegabet, and at Ervik on the west side of Stadt; but they can not come out to a vessel in the offing in bad weather if the wind is from seaward.

Nordfiord is about 60 miles in length from its entrance to Olden in Indvikfiord at its head, and is deep throughout. This upper portion of Nordfiord rivals the Hardanger and Sognefiords in beauty and grandeur. The district affords excellent sport, and the Nordfiord horses are considered the best bred in Norway.

Eastward of Amindingflu two rocks with 6 feet of water over them, each marked by an iron pole, the fiord is from 150 to 300 fathoms deep, and is practically free from known dangers.

The entrance to the fiord is divided into two channels by the islets Husevaagö, Gangsöen, Risö, and Rugsundö. The northern channel is known as Vaagsfiord, the southern as Faafiord. The Inner Lead from Fröjsjöen, through the Skateström, crosses Nordfiord between Risö and Moldösund.

Six miles above Amindingflu the fiord is known as Davikfiord, and 8 miles farther are the branches Eidsfiord and Isefiord, the latter, which is 5 miles long, opening into Aalfoten, Hundvikfiord, Hyenfiord, Gloppefiord, Utfiord, and Indvikfiord.

Anchorage.—In Nordfiord anchorage may be obtained close inshore, off Maurstad, in the bight eastward of Flaätöen. Also in 6 to 8 fathoms between that island and the mainland.

In Davikfiord there is anchorage in 14 fathoms off Daviken. A rock in the bay west of the anchorage is marked by a black beacon with a white belt. The best anchorage in Eidsfiord is off Eid at the head of the fiord in 10 to 20 fathoms. Shoal water extends 600 yards offshore at the latter.

South of Aalfoten anchorage may be obtained in 6 fathoms, and though neither Hundvikfiord nor Hyenfiord are suitable for anchoring in, there the several spots along the south and east coasts of Gloppefiord where vessels may anchor in from 5 to 20 fathoms.

A rock in Utfiord, close to the north shore, is marked by a perch.

There is anchorage off Utviken, in Indvikfiord, in 15 fathoms, south of Indviken in 8 fathoms, off Visnes, Löen, and Olden, all at the head of the fiord.

Lights—Hovdenes.—On Hovdenes the north point of Husevaagö, at the entrance to Nordfiord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 88 feet above high water. The white light is visible in clear weather at a distance of 7 miles, red and green lights at 4 miles. Shown from July 20 to May 15.

Anden.—On the reef extending from the point at the junction of Ut and Gloppe fiords, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited.

Vaagsfiord—Silde Gabet—Outer dangers in the approaches.—The following are the principal outer dangers between Bremanger and Stadt; for others see the charts.

Skorpeboe, with a depth of 6 fathoms, the outermost of the shoal rocky patches off the northern part of Bremanger, lies $6\frac{1}{2}$ miles northward of the northwest extreme of Bremanger.

Vetrungerne, a rock lying $3\frac{1}{2}$ miles east of Skorpeboe, is always visible; Faldet, with a depth of 2 fathoms, lies 1 mile north of Vetrungerne.

Tøjtemulen awash, Brunebo with 3 feet of water, and others lie within those mentioned.

Veststejn lies in the southwestern approach, and Klövning and Skaarningerne in the northwest approach.

Clearing marks.—Fanneskar, on Fröjen, bearing 152° , leads westward of all the shoals off Bremanger; the north extreme of Bremanger open southward of Veststejn, bearing about 75° , leads southward; and Hornelen in line with Hovdenes, the northern extreme of Husevaagö, 126° , leads northward of the outer dangers.

Dangers off Vaagsö.—The dangers off the northwestern part of Vaagsö extend nearly 4 miles to the westward and northward; they consist of numerous shoal patches and rocks above and below water. The outermost of these dangers are as follows, on all of which the sea breaks frequently in bad weather:

Alsboen, with a depth of 6 feet, lies 3 miles southwest of Kraakenes.

Steinen lies $2\frac{1}{2}$ miles westward of the north extreme of Kraakenes, and is always visible.

Havfruskalle is a $2\frac{1}{2}$ -fathom patch lying $3\frac{3}{4}$ miles west-northwestward of Kraakenes.

Clearing marks.—The west extreme of Bremanger bearing 180° or eastward of that bearing, leads seaward of all these dangers. Hornelen, seen southward of the southwestern extreme of Vaagsö 126° , leads southward of them; and Kraakenes bearing southward of 115° leads northward of them.

Törsflu is a 9-fathom patch situated 2 miles northwest of Kraakenes. Breakers sometimes rise suddenly on Törsflu when the sea is heavy, and it is better to avoid passing over it even in fine weather.

Dangers off Stadtlandet.—The west and north coasts of Stadtlandet may be approached anywhere to within a distance of 3 miles. The principal dangers off the west shore (north side of Silde Gabet) are:

Utryggen, a rock, awash, lying $1\frac{1}{2}$ miles west-southwestward from the southwestern extreme of Stadt, is always marked by breakers; a bank with depths of $2\frac{1}{2}$ to 6 fathoms extends 1,600 yards northeastward from Utryggen. Ramseflu and Oddeskaller, with 8 and 9 fathoms, respectively, lie southwestward and westward of Utryggen.

Havfluerne are a group of four rocks lying from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles north-northwestward of Utryggen; the middle rock, at a depth of 5 fathoms, lies $2\frac{1}{2}$ miles northwestward of Furennes.

Skjærboen, on which the sea nearly always breaks, lies 1,400 yards northwest of Furestaven.

Ystebøen is a 4-fathom patch, on which the sea breaks in bad weather, lying nearly 2 miles northwestward of Furestaven.

Bukketyvene are several rocks above water; the outer and largest rock lies 1 mile westward of the northwestern point of Stadt. Vossa is a 6-fathom patch halfway between Bukketyvene and the Buholmene.

Clearing mark.—Kraakenes bearing southward of 188° leads seaward of all these dangers. At night the fixed white sectors of light from Skongsnes lead in between the dangers, to Silde Gabet, but are only available with local knowledge.

Directions.—The clearing marks for each group of shoals have been given above; vessels not about to enter the fiords should preserve a wide offing.

In any case, vessels are recommended not to attempt to pass between Vossa or Bukketyvene and Stadtlandet, as, from the nature of the bottom, shoals which have not yet been found may exist in the passage.

Anchorage.—Between Bremanger and Stadt there are no very good harbors for large vessels, but in case of necessity vessels might run through Faafjord or Vaagsfjord to the Inner Lead, where there is anchorage eastward of Risö, and also westward of Klubben. There are anchorages also in Silde Gabet, eastward of Silden, and off Vaagsö in Ulvesund.

Faafjord, the southern entrance to Nordfjord, is a narrow inlet between Bremanger and Husevaagö; it is seldom used except by fishing vessels, and the only anchorages are those near Risö, just referred to, at the west end of Skateström. The best entrance to Faafjord is between Klövning and Skaarningerne; strangers ought not to venture amongst the shoals between Klövning and Veststejn.

Directions.—When entering Faafjord from seaward, keep Hornele about midway between the entrance points of Vaags fjord (126°) until the east side of Klövning bears 166° , when course may be altered to pass between that islet and Skaarningerne. The east side and southeast point of Klövning must be given a berth of 400 yards, but the west sides of Skaarningerene may be approached to within 200 yards. Give the west end of Husevaagö a berth of at least half a mile, and when past Ribben, a rock lying 800 yards from Bremanger at Faahaug and marked by an iron pole, keep on the south side of the fjord until near Björnö, which may be passed on either side within 100 yards; a shoal spit extends 500 yards eastward from the east point of Björnö, and the channel is then clear to the Skateström. If making for Nordfjord, pass westward of Risö.

If Hornelen can not be distinguished, steer for Klövning on the bearing of 138° until within 3 miles of it; then steer about 110° until well past Haavefluerne, with 11 fathoms, and proceed as directed above.

Vaagsfiord is the northern entrance to Nordfiord and to the Inner Lead from seaward.

Its entrance is between Svarteskjær (a rock above water lying 700 yards eastward from the middle rock of Skaarningerne) and the Baadsundskjærene, which extend nearly 800 yards from the southwest extreme of Vaagsö and are also visible. Hornelen kept between Hovdenes and Baadsundshalsen, the points of the fiord, will lead from seaward to Baadsundskjærene, which must be given a berth of 200 or 400 yards. Vessels may also stand in as directed for Faa-fiord, and proceed southward of Skaarningerne and Svarteskjær to Hovdenes, from which a shoal spit extends 200 yards to the westward; the eastern part of Vaagsfiord is free from dangers.

Vaagsvaag, on the south side of Vaagsö, is a good harbor for vessels of moderate size; it has a depth of 4 fathoms. Vaagsvaagflu, on the east side of the harbor, is marked by a pole. Vessels must keep nearly in mid-channel when entering, as there are shoals on both sides of the harbor. For other anchorages see Inner Lead, Chapter II.

Torskangerpollen.—At the south end of Torskangerpollen, a bay on the west side of Vaagsö, vessels might anchor in case of necessity in a depth of from 10 to 20 fathoms. Hendanes, the point on the west side of the entrance, bearing 98° , will lead in from seaward; give the point a berth of from 200 to 400 yards passing between the point and Oppedalboen, the rock eastward of it; thence for the anchorage.

Silde Gabet is a bay about 4 miles wide by about 6 miles in depth between Vaagsö and the peninsula of Stadt, with deep water over the great portion of it. The islands of Silden, Barmöen, and Seljeö lie in it. On its southwest side is Ulvesund, the Inner Lead, described in preceding chapter. The best anchorages in Slide Gabet are those in Ulvesund and on the east sides of Silden and Seljeö, but the approaches are rendered somewhat intricate by a number of shallow patches, the most important of which are here mentioned.

Dangers.—The outer dangers, westward of Vaagsö and southwest and west of Stadt, have been mentioned above.

Kraakenes.—The northeast side of Kraakenes is foul to the distance of nearly three-quarters of a mile; Kobbene, a small islet, lies about 600 yards offshore three-quarters of a mile eastward of the point. Brejflu, a patch of 8 fathoms, lies about halfway between Kraakenes and Skongsnes.

Melsfluer, a rocky patch with from 4 to 10 fathoms, lies with its outer edge, upon which is the least depth, $1\frac{1}{2}$ miles northwestward of Skongsnes Lighthouse.

The northeastern extreme of Silden, in line with Skongsnes Lighthouse bearing 106° , will lead southward of Melsfluer and northward of the shoals between Kraakenes and Skongsnes.

Kraaka.—This rock lies $1\frac{3}{4}$ miles north-northwestward of Skongsnes Lighthouse; it shows well above water, but is surrounded by sunken rocks, on some of which the sea breaks. Vessels should pass 1 mile to the northeastward or 600 or 800 yards to the southwestward of Kraaka. Ysteflu, with 9 fathoms, lies 1,600 yards westward of Kraaka.

The southwest side of Silden, in line with Skongsnes bearing 132° , leads northeastward of Ysteflu and of Melsfluer and southwestward of the shoals off Kraaka.

Tömmerviksflu (Timberviksflu), on the eastern edge of the foul ground extending from 400 to 800 yards off the east side of Vaagsö between Skongsnes and Halsör, is marked by a pole.

Halsörskjær, on the west side of the channel in the northern approach to Ulvesund, is marked by an iron pole.

Halsörflu, which lies abreast of the above and nearly $1\frac{1}{4}$ miles north of Ulvesund Lighthouse, on the east side of the channel, is marked by a black pole buoy.

Halsörbo, which uncovers at low water and is marked by an iron pole, lies out of the fairway 250 yards eastward of Halsörflu.

Arteflu, a rocky patch with a least depth of 4 fathoms, lies half a mile northwestward of the northwest part of Silden; Videflu and other patches, with from 6 to 8 fathoms, lie between Arteflu and Kraaka.

Dragefaldet, a rocky patch on which the sea generally breaks, lies nearly $2\frac{1}{2}$ miles southeast of Furenes. Eidshorn, a mountain about $3\frac{1}{2}$ miles southeastward of Selje Church, open northward or southward of the highest part of Seljeö, will lead northward or southward of Dragefaldet.

Skjæggane, with 6 fathoms, lies 1,400 yards southeastward of Dragefaldet.

Liberfluer, with 1 fathom least water, lies about 1,200 yards from the southwest side of Stadt, eastward of Dragefaldet.

Rocky patches extend half a mile northward from Kjholm, off the west end of Seljeö. Svarteskjær lies off the northwest side of Bar-möen, 1,200 yards southwest of Laagsnes; and Ganvaskjær lies out at an equal distance north-northwest from the same point. There are many other islets, rocks, and patches, for which see the chart.

Lights—Kraakenes.—A light, with fixed, flashing, and group occulting white, red, and green sectors, visible 16, 15, and 13 miles, respectively, is exhibited, at an elevation of 102 feet, from a white lighthouse situated on the northwest point of Vaagsö.

Hendanes.—A fixed, occulting, and group occulting light, elevated 159 feet, and visible 15 miles, is exhibited from a white wooden building, 39 feet high, on Hendanes; it shows white and red sectors.

Skongsnes.—On the northeast point of Vaagsö, from a white wooden dwelling, 33 feet in height, and at an elevation of 53 feet above high water, a light, with fixed and flashing white and red sectors, visible 12 and 9 miles, respectively, is exhibited.

For signal.—See Light List.

Selje.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 19 feet, from a small iron house situated at Selje, on the eastern end of Silde Gabet.

The above lights are shown from July 20 to May 15.

Pilots are stationed at Kraakenes, south side of entrance to Silde Gabet.

Directions.—The southwest side of Silden in line with Skongsnes bearing 132° will lead into Silde Gabet between Melsfluer and Kraaka. Give Skongsnes (which is foul to the distance of 400 yards) a berth of 600 or 800 yards and steer for Ulvesund Lighthouse on a bearing of 166° between the beacon on Halsörskjær and the pole on Halsörflu, and when Ulvesund is well open proceed through it, giving the land on either side a berth of 200 yards. The anchor may be let go in Skare Bugt, on the west side of the sound, when Ulvesund Lighthouse bears about 93° ; anchorage will also be found northward of Kapelnes, nearly a mile southwestward of Vaagsö Church.

There is also a good entrance to Silde Gabet between Kraaka and Utryggen; the highest part of Seljeö bearing 104° will lead about half way between those rocks, and when Ulvesund Lighthouse bears 166° vessels may either steer for it on that bearing, as before, or proceed northward or southward of Dragefaldet on the clearing marks before given with that shoal, and of Skjæggane for the anchorage at Seljeö.

At night.—When standing in for Silde Gabet at night, from northward or southward, a good offing must be kept until the vessel is within one of the fixed white sectors of Skongsnes Light; that between 108° and 104° leads northward of Brejflu, and the sector between 139° and 131° leads between Ysteflu and Kraaka. When within half a mile of Skongsnes Light, haul to the eastward to clear the shoals off Skongsnes, then steer for the white sector of Ulvesund Light, between the bearings of 164° and 168° ; thence into Ulvesund.

It is not advisable for strangers to attempt this unless necessity compels.

Silden.—Søndre Sildenhavn, at the southeast point of Silden, is a good anchorage for small craft. Nordre Sildenhavn has depths of 2 to 5 fathoms; a rock in the middle of the entrance is marked by an iron pole. The east coast of Silden must be given a berth of 400 to 600 yards.

Seljeö.—There is anchorage in a small cove on the east side of Seljeö in 5 fathoms, and farther out in depths of 18 to 23 fathoms, over a clean sandy bottom; off Selje Church the depth is 10 to 12 fathoms. Small craft may also anchor in the cove westward of the parsonage; a rock on the south side of the entrance is marked by an iron pillar. After passing Dragøfaldet and Skjæggane, vessels should steer for the south point of Seljeö, which may be passed at a distance of 100 yards, and bring up as most convenient. There are shoals on either side of the northern entrance, and a 1½-fathom patch lies nearly in mid-channel between Stadt and Ersholm, the islet eastward of Seljeö.

Coast—Stadt to Bredsund—Aspect.—From Stadt to Trondhem the outer coastline trends east-northeastward, but it is, more than any other part of the coast, intersected by ramifications of inlets and broken into numerous straggling peninsulas, promontories, and islands. The islands between Stadt and Bredsund, a distance of 25 miles, are lofty and steep toward the sea; the land behind them is also very high. The opening of Bredsund, between Harejdö and Godö, is very conspicuous from the offing; Svinöen, Rundö Lighthouse, and Sukkertoppen on Hesö, a sugar-loaf hill 1,050 feet high, which appears from the westward like a detached cone, are excellent landmarks; Rundö Island is high, with the exception of Kvalnes, its northeast extreme.

Pilots are stationed at Sandrö, Skorpen, and Rundö.

Tides and currents.—Northward of Stadt the main stream during the flood sets northeastward and that during the ebb southwestward, but between the islands the streams vary in direction and velocity. During strong westerly and southerly winds both streams set northeastward, and with continuous easterly winds southwestward; the northeast-going stream is always the strongest.

It is high water, full and change, at Rundö at Xh. 34m.; springs rise from 5 to 6 feet.

The normal current (irrespective of tide) as a rule sets northeastward, and is known at times to exceed the rate of 1 knot an hour.

At a distance of 30 to 60 miles from the land the current perceptibly carries a vessel to the northeastward, a fact which must be borne in mind when bound for any particular inlet.

Offlying islets and dangers.—**Svinö** is a small but conspicuous islet lying about 7 miles northward of Stadt Peninsula and $5\frac{1}{2}$ miles westward of Skorpen; it is distinguished by a red lighthouse, forming a good landmark, and there is no similar islet in the vicinity. Kalven is a small rock about 400 yards northward of Svinö.

Grundskallen, a rocky patch with 7 fathoms, lies $1\frac{3}{4}$ miles north-east of Svinöen.

Light—Svinö.—A group flashing white light, showing two flashes in quick succession every 15 seconds, is exhibited, at an elevation of 151 feet, from a red iron tower situated on the southeast point of Svinö, and is visible from a distance of 10 miles. Shown from July 20 to May 15.

Jukleboen, situated $4\frac{1}{2}$ miles northeastward of Svinö, is the outer shallow rock on a range of shoals extending 3 miles west-northwestward from the west side of Nerlandsö; it has a least depth of 14 fathoms, and in bad weather is generally indicated by breakers.

Hornboen, with 14 fathoms, lies about half a mile southward of Jukleboen. Patches of 12 and 14 fathoms lie 2 miles seaward of Jukleboen.

Between Svinö and Skorpen are Fauskene, about half a mile in extent, covered with a least depth of 2 fathoms; Fauskeflu, with $5\frac{1}{2}$ fathoms; Aarbenden, with 5 fathoms; Remmeflu, with 7 fathoms, all on the north side of approach to Flaavær Lighthouse.

Jejtmaren, situated nearly 2 miles southwestward of Rundö Lighthouse, has a depth of 15 feet, and breaks occasionally in fine weather, but seldom during calms or with offshore winds.

A vessel will be northward of Jukleboen and Jejtmaren when Rundö Lighthouse is in line with the summit of Godö bearing 71° .

Heste Reefs extend 1 mile northwestward and northward and $1\frac{1}{2}$ miles northeastward from Rundö Lighthouse; Baren and Store and Lille Vaaren are the principal rocks upon these reefs, and are always visible.

Golla.—The southernmost of the three rocks known as Golla, with depths of from $4\frac{1}{4}$ to 6 fathoms, lies $1\frac{1}{2}$ miles northeastward of the northern Heste Reef.

Valleboen is a group of rocky heads, with a least depth of 14 fathoms, about three-quarters of a mile in extent; the shallowest spot is situated $4\frac{1}{2}$ miles northeastward of Rundö Lighthouse. In bad weather the position of Valleboen is generally indicated by breakers; the ground is irregular for some distance seaward of it.

Haafu, with 5 fathoms water, lies $2\frac{1}{4}$ miles northward of Græsholmen.

Sukkertoppen, on Hesö, open fully its own width southward of Godö bearing 91° , leads in southward of Valleboen and Haafu and

northward of Golla to Bredsund; and the southwestern extreme of Godö bearing 110° leads between the 10-fathom patch northward of Valleboen and the shoals westward of Vikerö.

Directions.—Vessels proceeding up the coast should pass westward of Svinö, thence by keeping it in line with the outer extreme of Stadt Peninsula bearing 210° , all dangers will be avoided. If bound into Bredsund, vessels may pass northward or southward of Valleboen on the marks given above, but the route northward is recommended.

At night the lights on Kvalnes, Græsholmen, and Erknö afford sufficient guide for keeping a vessel seaward of all dangers.

Vanelv Gabet, between the northeast side of Stadtlandet and Kvamsö, is a good open passage leading to Vanelvsfiord and Haugsfjord.

Vanelvsfiord extends about 10 miles to the southward from Vanelv Gabet; it is visited by the coasting steam vessels, but is of little importance to strangers.

Haugsfjord has several commodious anchorages, whence vessels may either put to sea with ease or continue through Arramsund to the Inner Lead.

Directions—Dangers.—The whole of the northeast side of Stadtlandet is foul to a distance of from 400 to 600 yards offshore; shoals and sunken rocks extend about 1 mile westward and southwestward from Ristö; and between Frekö and the southwest side of Kvamsö is a mass of shoals. By giving Stadtlandet a berth of half a mile until eastward of Revjeholmerne all danger will be avoided; thence steer southward of Frekö and of Haugsholm for the Inner Lead.

Lights—Haugsholm.—On the western point of Frekö stands a white stone dwelling, from which a light, with fixed, flashing, and group occulting white, red, and green sectors, is exhibited, at an elevation of 68 feet above high water. The white light is visible 13 miles, red light 12 miles, green 10 miles.

Vanelvs fiord.—An occulting light, unwatched, elevated 31 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house.

Terneskjær.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 15 feet, from a small iron house on iron framework situated on the islet northward of Haugsholm.

The above lights are shown from July 20 to May 15.

Anchorages.—Storesund, between Haugsholm, Frekö, and Storholm, the islets off Kvamsö, has good anchorage in depths of 9 to 16 fathoms, sand; the best position is between the north points of Frekö and Haugsholm; farther to the northward the bottom is stony.

Freköflu, a rock off Frekö Lighthouse, is marked by a black stone beacon with white band; and Terneskjærflu, with 7 feet, which lies 400 yards north of Terneskjær Light, by a pole.

Small vessels may anchor off the north side of Frekö in a depth of $5\frac{1}{2}$ to 8 fathoms, or between the east side of Storholm and Grønneskjærboerne, marked by a beacon and an iron pole, in 4 fathoms, but the anchorage is only 200 yards in breadth.

Haugsholmhavn, off the east side of Haugsholm, affords anchorage for large vessels in 12 to 15 fathoms; for small craft there is good anchorage in Lille Haugsholmhavn, southward of the rock marked by an iron pole. Off the southeast side of Kvamsö there is anchorage in 6 to 14 fathoms, but the banks are rather steep to the eastward.

Voksöhavn, on the east side of Voksö, affords anchorage in depths of from 4 to 8 fathoms. Blegegrund, with $3\frac{1}{4}$ fathoms over it, marked by a pole, lies 600 yards south of the south point of Voksö, and a rock covered with 2 fathoms of water lies in the approach 600 yards northwest of the north point of Langholm.

In Vanelvsfiord there is anchorage on the west side in Borgundsvaag, between Borgundsholm, Lilleholm, and the land, in 5 fathoms.

In the bight within Sande Rocks there is anchorage in 3 to 6 fathoms. In the bight eastward of Sandviksnes there is good anchorage for small craft in 3 to 6 fathoms.

Syltefiord is the eastern head of Vanelvsfiord.

Aaramsund is a narrow channel between the islands southward of Sandö and the mainland. Nystöllu, a rock lying nearly 600 yards from the mainland northward of Nystöl, is marked by an iron pole. Blegegrund, marked by a pole, has been previously mentioned; there is a black stone beacon on Bleka, which lies 400 yards from the north point of the mainland between Haugsfjord and Rövdefjord. Stabbene, 700 yards from Bleka, is marked by a small iron house; a shoal extends fully 200 yards west-northwestward from Stabbene. Rörene, 450 yards north Stabbene, is also marked by an iron pole.

Light buoy.—A shoal with 3 fathoms over it lies nearly in the center of the fairway 400 yards westward of Stabbene Light. It is marked by a conical light buoy, painted black and red in horizontal bands and exhibiting a flashing white light. During the summer this is replaced by a stake.

After passing westward of Nystöllu and Bleka vessels may either proceed southward of Stabbene to the Inner Lead, or they may bring up in the harbor eastward of Voksö, previously described.

According to local information, the channel between Stabbene and Langholm is both deeper and wider than the channel south of Stabbene, which is generally used.

Lights—Aaramholm.—On Aaramholm, at the south side of Aaramsund, an occulting light, with white, red, and green sectors,

visible 6, 4, and 3 miles, respectively, is exhibited from a small white wooden house, elevated 19 feet above high water. Shown from July 20 to May 15.

Stabbene.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 10 feet, from a small iron house on the rock.

Inner Lead (continued from preceding chapter).—Vessels having rounded Stadt Peninsula, can enter the Inner Lead through Vanelvgabet, Haugsfjord, and Aaramsund, descriptions of which have just been given.

From Aaramsund vessels may proceed by what may be called the western Inner Lead through Sandsfjord westward and northward of the large islands Gurskeö and Harejdö to Bredsund; this is the most direct route, but the channels northward of Gurskeö are very intricate.

Or they may take the channel southward and eastward of those islands, the eastern Inner Lead, through the Rövde, Vartdals, and Sulen fiords, which is very much wider and safer, and barely 5 miles longer.

Sandsfjord, the direct continuation of the Inner Lead from Aaramsund, is a clear open channel between Sandö and Gurskeö. It is available for vessels of any draft; thence by the Inner Leads as mentioned above and described in the following pages. Dangers in the approaches, see below.

Telegraph.—A cable is laid across the southern part of this fjord, between Sandö and Gurskeö; vessels must not anchor near it.

Anchorage.—There is anchorage for one to two vessels of moderate size in Sandshavn, on the east side of Sandö, in 5 to 10 fathoms, over sand; the inner harbor has a depth of 5 fathoms, but is only available for small vessels. The anchorages are bordered by shoals, which are marked by four poles and two beacons with cages. Kleveböen, a sunken rock covered with less than 6 feet of water, lies nearly 500 yards east of the northeast point of Sandö, and Kleveflu at 4 fathoms lies 200 yards south of Kleveböen; vessels should give the east side of this island northward of Sandshavn a berth of at least 600 yards.

Lights—Langedrognset.—On Langedrognset, the northeast extreme of Sandö, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small white wooden house, at an elevation of 34 feet above high water. Shown from July 20 to May 15.

Hidsneset.—On Hidsneset, the northwest point of Gurskeö, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 51 feet above high water.

The white, red, and green lights are visible at the distance of 7, 4, and 3 miles, respectively. Shown from July 20 to May 15.

Directions.—If wishing to enter Sandsfiord from seaward, steer in with Langedrogneseet Lighthouse bearing 124° (Svinö right astern) between Dybeflu and Flesene, or within the white sector of light at night (avoiding Lille Hoven, a rocky patch of 14 fathoms, which breaks in a heavy sea); give the north side of Sandö a berth of at least half a mile, and haul to the southward when Sandsfiord is well open (a vessel will be clear of Kleveböen when within the white sector of Hidsneset Light); thence by Rövdefiord through Inner Lead.

Flaavær (western Inner Lead) are situated in the channel from seaward northward of Sandö, between Gurskeö and Nerlandsö. This channel is intricate in places and encumbered with shoals, and is connected with the western Inner Lead to Bredsund by Heröfiord and Röresund, available with local knowledge.

Light.—On the west point of Varholm, the western islet of Flaavær is exhibited, at an elevation of 55 feet above high water, a light, with fixed and flashing white and red sectors, visible 12 and 9 miles, respectively. Shown from July 20 to May 15.

Dangers.—The following are the principal dangers to be avoided when approaching Sandsfiord and Flaavær from seaward:

Skjæggene, a dangerous ledge westward of Sandö, on which the sea breaks in bad weather, is the outermost of the shoals in the southwestern approach; the northeastern rock lies about $1\frac{1}{4}$ miles north of the west end of Ristö. The northwest point of Rundö well open of Mulenes, bearing about 42° , leads westward of Skjæggene.

Jyngrundene, with 15 fathoms, and Grundskallen, with 12 fathoms, rocky patches which break in a heavy sea, lie, respectively, $1\frac{1}{2}$ miles west-northwest and 2 miles west-southwest from Skjæggene.

The shoals on the north side of approach, northward of Svinö and of Aarbenden, a patch of 6 fathoms, have been mentioned with the offlying dangers. Svinö Lighthouse bearing 294° leads southward of all these, and of Nabben, Store Godöflu, and others within and northward of them, but directly toward the Klovholmene.

Lille Godöflu, lying $1\frac{1}{4}$ miles south-southeastward of the south point of Skorpen, has a depth of 6 feet.

Flesene.—Southward of Nabben and southwestward of Godöflu are the Flesene, above water, with rocks and reefs extending 2 miles eastward of them. Hidsboen, at the eastern extreme, is marked by an iron pillar; there are many other rocks and shoals shown, for which see the chart.

Store Erkneskjær, $1\frac{3}{4}$ miles westward of Flaavær Lighthouse, is above water, but shoals extend about 400 yards to the southward and 600 yards westward from it.

Penningflu, which lies halfway between Store Erkneskjær and Flaavær Lighthouse, is marked by two iron poles.

Nordre Stabben, with a depth of 10 feet and marked by a pole, lies half a mile northeastward from Store Erkneskjær.

The east end of Store Sandö and Lille Kuholm, on the north and east sides of Flaavær, are marked by black stone beacons, and there are iron poles on the east and northwest extremes of Kufu, a shoal extending northeastward and westward from the Kuholmene. A shoal in the eastern entrance of Flaavær Havn is marked by two iron poles, and Rugflu, on the north side of the passage, by one iron pole.

Directions.—When northward of Stadt, and standing in for Flaavær by daylight, vessels should keep the west extreme of Rundö open of Nerlandsö bearing about 42° to pass westward of Skjæggene and the other dangers off Sandö; thence shape course to pass half a mile northward of Flesene, steering for Flaavær Lighthouse bearing 71° , which will lead between Store and Lille Godöflu and southward of Erkneskjær and Penningflu; when clear of the latter shoal, course may be altered to pass westward and northward of all the Flaavær Islets to Heröfiord; the passage southward of Flaavær is narrower and more intricate.

From Sandsfiord vessels may proceed southward of Hidsboen (marked by an iron pillar), Langflu (marked by an iron pole), and Flaavær, and northward of Kvaleboen (marked by a pole) to Heröfiord. The rocks above water off the mainland, southward of Flaavær must be given a berth of 400 yards; Kvaleböen, with a depth of 4 feet, lies 350 yards from the southeastern rocks of Flaavær. Tronden, a rock above water half a mile eastward of Flaavær, may be passed on either side at a distance of 300 yards; Trondeflu, on its northern side, is marked by an iron pole.

At night.—When standing in for Flaavær at night vessels must approach in the fixed white sector of Flaavær Light; Penningflu will have been passed when Hidneset Light changes from red to white, bearing 190° ; but only those with local knowledge should attempt the entry at night.

Flaavær Havn has good anchorage for small craft in a depth of 6 to 8 fathoms, sand. Vessels drawing more than 12 feet must enter by the eastern channel.

Entering Flaavær Havn from the westward, pass a good 100 yards northward of the lighthouse, and proceed in mid-channel between Varholm and the islet to the northward. The best entrance from the eastward is northward of all the beacons except that on Rugflu, but there is also a passage between Kufu and the shoal to the westward.

Röresund and Ulfstenfiord.—From Flaavær and Heröfiord the western Inner Lead continues through Röresund to Ulfstenfiord,

whence vessels may proceed eastward of Vatöen, Ægholmen, and Flörauden, to Bredsund. Torvikleden, which leads between Böland and the islands to the eastward, is the best passage through Ulfstenfiord; the channels leading eastward of Hatleö are extremely narrow and intricate. There is a boat passage between Bergsö and Böland. The channels are only available with local knowledge.

Lights (In western Inner Lead from Flaavær to Bredsund)—**Röresund**.—On the south side of Böland, northward of Blankholm, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house on iron pillars, at an elevation of 15 feet above high water.

Teigesund.—On the north side of Dimmenes, the northwest point of Dimö, at the western entrance to Teigesund, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 22 feet above high water.

Boholm.—On the northwest side of Boholm, off Osnes, Harejdö, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 56 feet above high water.

Torvikholmen.—On a rock close to the southwest side of Torvikholm, an occulting light, with white and red sectors, is exhibited from a white iron house near a wooden dwelling, at an elevation of 22 feet above high water.

Vatöen.—On Havneholm, close to the east side of Vatöen, a group occulting light, with white, red, and green sectors, is exhibited, from a small white iron house, at an elevation of 19 feet above high water.

Flö.—At Indre Flö, on the northwest coast of Harejdö, an occulting light, with white and red sectors, is exhibited, from a small white iron tower, at an elevation of 29 feet above high water.

The lights in the white, red, and green sectors of the above are visible in clear weather from a distance of 6, 4, and 3 miles, respectively. Shown from July 20 to May 15.

Dangers.—Between Flaavær and Bredsund are the following dangers:

Grönhaugflu, at the south end of Bergsö, marked by an iron pole.

Myglebostflu, on the west side of the entrance to the passage between Bergsö and Böland, by an iron pole.

Heröhunden, at nearly 400 yards west of Herö, by an iron pillar.

Kirkeflu, 800 yards west of Blankholm, by a black stone beacon; Rörestölflu, on the Böland coast, by an iron pole.

A patch of 2½ fathoms, marked by a pole, lies 200 yards off Röre farm in Röresund.

Blankholm has foul ground extending 350 yards east-northeastward from its east extreme, marked at its edge by an iron pole; the

shoal ground at Rörenes, on the Böland shore opposite, is marked by a pole.

Brandholm in Torvikleden is marked by a black stone beacon. A detached sunken rock about 450 yards southward of the beacon is marked by an iron pole.

Skarvikflu, south of Torvikholm, Torvikflu, Taska, Boen, and Skindbuksen, are marked by iron poles.

Paulflu, in Kalvösund, is marked by a pole.

Barene, 1,400 yards southeast of Indre Flö, is marked by a stone beacon.

There are numerous other dangers marked by poles, for which see chart.

Directions.—When proceeding eastward from Heröfiord, pass about midway between Heröhunden and the shoals to the northwestward, and proceed in mid-channel through Röresund, avoiding the 24-fathom patch, marked by a pole, off Roren farm; give the rocks off the southeast side of Böland a fair berth, continue in mid-channel between the Torvikholmene and the rocks off the point to the southwestward, proceed westward and northward of the Byholmene, and eastward of Kufu and Vatöen.

After passing about 300 yards eastward of the islands northward of Vatöen, bring Erknö Lighthouse in line with the east side of Flörauden bearing 22° ; this mark will lead westward of the shoal patches lying about 1,400 yards from the foot of Rophætta, and eastward of the sunken rocks extending 800 yards from Ægholmen; when about halfway between Ægholmen and Flörauden, course may be altered to pass 400 or 600 yards southward of the latter islet to Bredsund. Here the Lead joins the Eastern Lead from Sulenfiord.

The Kalvö Sund passage leads eastward of Paulflu, northward of Kalvö, and eastward of Store Hatleö and the Byholmene, but, as already observed, it is narrow and intricate.

There is also a passage through Teigesund, southeastward of Kjeholm and Roparen, thence westward of Böholm, and on either side of Tyveholmkraakene to the eastward of Vatöen, as before.

At night.—See Lights, above.

Anchorage.—There is anchorage for small vessels in Fröstadvaag, a creek on the south side of Böland, and also in the cove north of Herö Church. On the south side of Store Hatleö there is a small harbor with a depth of 7 to 8 fathoms. From off the south end of Vatöen, large vessels might pass half a mile eastward and northward of Kjörflaskene, and the same distance southwestward of Midtfiordskjær, to the anchorage southeast of Rundö.

Lights—Rundö.—On Kvalnes, the northwest extreme of Rundö Island, is a red circular iron tower, 87 feet in height, with two white bands, from which is exhibited, at an elevation of 121 feet above high

water, a light, with fixed and flashing white, red, and green sectors, visible 17, 16, and 14 miles, respectively. Shown from July 20 to May 15. See sketch on chart.

Langenes.—On Langenes, the northeast point of Rundö, from a small white wooden house, is exhibited, at an elevation of 40 feet above high water, a group occulting light, with white and red sectors, visible 6 and 4 miles, respectively. Shown from July 20 to May 15.

Gogsör.—At Gogsör, on the north side of Rundö, from a small white iron tower, and at an elevation of 15 feet above high water, an occulting light, with white, red, and green sectors, is exhibited for the use of the fishermen. The white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively. Shown from July 20 to May 15.

A fixed red light, visible 3 miles, is exhibited, at a height of 15 feet, from a post situated on the head of the south mole of the small harbor on the east coast of Rundö.

Sæviksten.—At Sæviksten, on the southern side of Rundö Sund, from a small white iron house, at an elevation of 83 feet above high water, an occulting light, with white, red, and green sectors, is exhibited. The white, red, and green lights are visible at 7, 4, and 3 miles, respectively. Shown from July 20 to May 15.

Rundö Sund anchorage.—Rundö Sund, a very narrow passage between Remö and the rocks off the south side of Rundö, should not be used by large vessels. There is, however, good anchorage within it for all classes of vessels in a depth of from 8 to 12 fathoms, sand, at about 800 yards southeast of the southeast point of Rundö. It may be reached in large vessels by entering northward of Rundö and passing west of Treholmene, the dangers off which are generally indicated by breakers. The southeast side of Rundö is foul to the distance of about 800 yards.

Bolla, a round smooth rock off the north point of Remö, in Rundö Sund, is above water, and is marked by a beacon; a $2\frac{1}{2}$ -fathom patch lies 200 yards southwestward of Bolla, and is marked by a pole; sunken rocks extend 600 yards south of the southwest point of Rundö. An iron pole marks the eastern side of these dangers. Foul ground extends 800 yards northeastward of Bolla. Its northeastern and eastern extremities are marked by iron poles.

Rophätta or Harejdö seen through Rundö Sund, and open northward of Nerlandsö, will lead in from seaward between Jukleboen and Jejtmaren; pass about half a mile northward of Nerlandsö, and not less than 800 yards southward of the southwest point of Rundö; thence steer direct for Bolla; it is better to pass northward of the $2\frac{1}{2}$ -fathom patch off the north point of Remö, as Bolla Rock is steep and the channel is straighter and broader than that to the south-

ward. When well past Bolla, vessels may either anchor between Rundö and Remö, or proceed southward of Græsholmen to Bredsund.

Tide.—It is high water, full and change, at Rundö at Xh. 34m.; springs rise from 5 to 6 feet.

Holmefjord.—After passing Goldnes, the north point of Nerlandsö, vessels might proceed southward of Remö, giving the rocks off the northeast point of Nerlandsö a berth of 400 yards to Holmefjord, where there is good anchorage southward of Teigenes in depths of 7 to 10 fathoms over sand and clay. The east extreme of the shoal of Teigenes is marked by an iron pillar and the south edge by an iron pole; the outer part of the shoal on the south side of the anchorage is marked by a pole. Troldholmskjærene, 500 yards northeast of Teigenes, is marked by a black stone beacon with white band. The only practicable entrance to Holmefjord is between Troldholmskjærene and the shoal off Teigenes.

Lights—Grönholmen.—An occulting light, with white and red sectors, is exhibited from a small white wooden house on Grönholmen, nearly midway between Remö and Nerlandsö, at an elevation of 39 feet above high water.

Forsnevaag.—An occulting light, with white, red, and green sectors, is exhibited from a white iron house, at an elevation of 16 feet, on the island fronting Forsnevaag, on the south side of Holmefjord.

Kvalsvik.—Near Kvalsvik, on the northeastern side of Nerlandsö, a fixed red light is exhibited.

The above white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively. They are fishing lights, and are shown from July 20 to May 15.

Eastern Inner Lead—Rövde and Vartdals fiords, which separate Gurskeö and Harejdö from the mainland, are deep, clear channels from 1 to $1\frac{1}{2}$ miles broad.

Their southern entrance from seaward is by Sandsfjord, and their connection with the Inner Lead southward is by Aaramsund.

The northern entrance from seaward is by Bredsund, and the Inner Lead northward is past Aalesund and over Lepsö-rev.

Lights—Sövdeholm.—On the south extreme of Sövdeholm, an islet off the southwest point of Gurskeö, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 31 feet.

Oksö.—On the southeast side of Oksö, at the junction of Rövde, Vartdals, and Volden fiords, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 87 feet above high water.

Rödöholm.—A group occulting light, elevated 69 feet, showing groups of two eclipses, is exhibited from a small iron house on the north point of Rödöholm; it shows white, red, and green sectors.

In the above lights the white light is visible at a distance of 7 miles, red light at 4 miles, green 3 miles. Shown from July 20 to May 15.

Shoals—Beacons.—Steggaren, a sunken rock, about 1 mile within the entrance of Rövdefjord, off the northern shore, is marked by an iron pole. Katskjær, 1 mile southeastward of Steggaren, is marked by a black stone beacon with white belt; Lilleflu, lying 400 yards northwest of it, by a pole.

Kroppen, a rock above water, lies 1,400 yards southward of Katskjær.

A shallow spit projects 200 yards off the point on the east side of the entrance to Sövdefjord.

Bekorskjær, situated 2 miles eastward of Sövdefjord, lies 250 yards northward of the small islet of Rövdeskjær, and another sunken rock the same distance eastward from it, both marked by iron poles; an unmarked patch of 13 feet lies 350 yards west of Bekorskjær.

A $3\frac{1}{2}$ -fathom patch lies 500 yards northward of Birkenes, the point on the east side of the entrance to Volden fiord; there is a patch of 11 feet, marked by a pole, about 600 yards westward of Birkenes, and a patch of $2\frac{1}{2}$ fathoms lies 400 yards southward of the same point. With these exceptions, the land may everywhere be approached to within 200 yards.

Anchorage.—There is anchorage in a depth of 9 fathoms in Larsnes, a small bay on the southwest side of Gurskeö, 2 miles east of Aaramsund; the entrance is between Kiipeholm and Katskjær (beacon) to the northward. On the south side of Rövdefjord there is anchorage a short distance eastward of Rövdeskjær at Knardal or Lille Rövde in depths of 5 to 10 fathoms; at Velsviken, at the east end of the fiord, there is anchorage in 9 fathoms at less than 100 yards offshore.

At the head of Sövdefjord, a branch of Rövdefjord, there is anchorage in 7 fathoms at 200 yards offshore.

In Voldenfiord, southeastern head of Rövdefjord, there is anchorage off Volden in a depth of 11 fathoms; Vignesflu, close to the northern point, is marked by an iron pole, and there is a red mooring buoy at about 200 yards from the shore. Voldenfiord has two heads, namely, Dals fiord and Östefjord.

Birkeviken, 1 mile southward of Birkenes, at the junction of Rövde and Vartdals fiords, affords anchorage in a depth of 10 fathoms; the shoal extending southward from Liholm is marked by an iron pole.

On the north side of Rödö, northeastward of Birkenes, entrance to Örsten fiord, there is anchorage in depth of 4 fathoms, and between

the two islets in 3 fathoms. There is anchorage also at Örsten, at the head of the fiord, and other places.

Baadvigen, on the west side of Oksö, abreast Birkenes, affords anchorage for small craft in 7 fathoms; the rocky ground extending about 400 yards northwestward from the southwest point of Oksö is marked by two iron poles. A rock covered by 3 feet of water only lies 100 yards south of AUSA Islet, and a rock with 9 feet over it lies nearly midway between Oksö and Ekö.

Eksund, northward of Oksö and of Ekö, affords anchorage for vessels of moderate draft in a depth of 9 fathoms. Ekö fiord is an intricate channel from Eksund leading between Gurskeö and Harejdö, with anchorage at various places, but it is too confusing to attempt any description.

In Vartdalsfiord there is anchorage at Flaavig in 5 fathoms.

Sulenfiord, which connects Vartdalsfiord with Bredsund, is free from dangers, with the exception of Övreflu, a rock marked by a stone beacon, with a shoal extending 200 yards northeastward from it, marked by an iron pole, which lies 1 mile northwestward of Hjöringnes, the east point of Harejdö; and a rock awash which lies 400 yards northwestward of Övreflu, and is marked by an iron pole. A shoal extends 400 yards from Eltrenes, the west extreme of Sulö, which point forms the east side of the north entrance to Sulen fiord. Here the Lead joins the Western Lead, at the entrance to Bredsund.

Liavaag, three-quarters of a mile westward of Hjöringnes, has anchorage in a depth of 10 to 15 fathoms. In Sulenfiord there is anchorage off Harejde Church.

Light—Hjöringnes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 62 feet, from a small iron house situated on Hjöringnes. Shown from July 20 to May 15.

Inner Lead continued below.

Bredsund is the largest and most accessible entrance to the Inner Lead between Stadlandet and the Halten Islands; therefore vessels bound to Molde, Kristiansund, or Trondhjem frequently put in here in order to obtain a pilot, and proceed either inside or outside and seaward of the Romsdals Islands if of heavy draft.

Dangers.—The dangers in the offing, on the south side of approach to Bredsund, Valleboen, etc., have already been mentioned. The rocks immediately bordering the north side are Klovgrunden, with 13 fathoms, and Statsgrundskallen, with 12 fathoms, only dangerous in bad weather, and the Olsflu, with $5\frac{1}{2}$ fathoms, about $2\frac{1}{2}$ miles northwestward of Godö.

The following lie within the sound, in the channel to Aalesund and Inner Lead:

Hogsten Reef extends nearly 400 yards from the southeastern extreme of Godö, and shows clearly under water.

Dybeflu, with a depth of 7 fathoms, lies 600 yards southeast of Hogsten Lighthouse.

Skarveflu, a 3-fathom patch about 800 yards from Snegelv Islet, on the west side of Hesö, is marked by a pole.

Erknöflu, with 4 fathoms, lies 1,200 yards from the northwest point of Hesö; Nordtaren is a 4-fathom patch lying 400 yards southwestward of Erknöflu, upon which the sea breaks occasionally when the wind is on-shore.

Kariflu, off the northeast side of Godö, is marked by a pole.

Lights.—The following lights are exhibited in Bredsund and its approaches:

Græsholmen.—On Græsholmen, south side of approach to Bredsund, from a white wooden dwelling with tower, 42 feet high, a light, with fixed and flashing white and red sectors, is exhibited, at an elevation of 76 feet above high water. The white light is visible in clear weather at a distance of 11 miles, red light at 9 miles.

Alnes.—Alnes, on the northwest point of Godö, is a light, with fixed and flashing white and red sectors. It is exhibited from a white wooden dwelling with tower, 35 feet high, is elevated 81 feet above high water, and should be visible in clear weather—white light at a distance of 11 miles, red light at 8 miles.

Lights northward of Alnes, see below.

Hogsten.—From Hogsten Lighthouse, a white stone circular tower on the molehead at the southeast point of Godö, is exhibited, at an elevation of 39 feet above high water, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively.

Red fixed lights, visible at a distance of about 4 miles, are exhibited on the moles at Gjelviken and Djup (Gjuv), westward of Hogsten, for the use of the fishermen. Shown from July 20 to May 15.

Havsten.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 172 feet, from a small iron house situated on the north point of the island.

Valderhaug Light, alternating white and red, on the southeast extreme of Valderö, is exhibited, from a white iron house on piles, at an elevation of 16 feet above high water, and is visible at the distance of about 6 miles.

Oksebaasen Light, on the west extreme of that island, shown from a small white wooden house, at an elevation of 33 feet above high water, is an occulting light, with white, red, and green sectors.

These lights unless otherwise noted are exhibited from July 20 to May 15.

Pilots may be obtained from Godö, Giskö, Vikerö, Valderhaug, and Aalesund.

Tides.—It is high water, full and change, at Valderhaug at Xh. 15m. The stream during the flood usually sets northward and during the ebb southward, with considerable strength.

Directions.—There is no difficulty in entering Bredsund should a vessel be seeking shelter in bad weather, and a pilot will be picked up abreast Godö.

The south side of Godö bearing 110° will lead in from sea, between Söndre Grundskallen with 10 fathoms and Klovgrunden with 13 fathoms, nearly 2 miles apart. When Græsholmen Lighthouse bears about 188° , steer to pass about half a mile southward of Godö; give Hogsten Lighthouse a berth of 800 or 1,000 yards, pass 400 or 600 yards westward of Erknoflu, and pass northward of the shoals westward of Aalesund, if bound to that port; thence to the harbor.

Vessels from the southward can enter by passing northward of Heste Reefs, or between Golla and Valleboen, on a bearing of Græsholmen Lighthouse, thence passing about a mile northward of it. There is also a passage close eastward of Valleboen.

At night these three passages are marked by fixed white sectors of light shown from Græsholmen, by either of which a vessel may come in, until about 1 mile from the lighthouse, when course should be altered for Hogsten Light, showing white. A vessel will be northward of all dangers off Harejdö with Græsholmen Light (fixed white) in sight bearing southward of 270° .

Valderhaug Light just in sight, bearing 51° , leads southward of the foul ground off Hogsten Light (near or over Dybeflu with 7 fathoms). From abreast Hogsten, keep in the white sector of Havsten Light until Aalesund Light comes in sight, showing red, and bearing 93° , when it may be steered for if bound there, or course may be shaped northward for Valderhaug. It is advisable, however, to secure a pilot when abreast Hogsten.

Valderhaug Strand.—If bound for the anchorage at Valderhaug Strand, give the south point of Valderö a berth of 400 yards and bring up about 300 yards from the shore, in a depth of from 8 to 10 fathoms, as soon as Valderhaug Lighthouse bears westward of 324° .

The depth is only 2 fathoms within 100 yards and 6 to 7 fathoms at about 200 yards from the southeast side of Valderö; at a distance of 400 yards from the shore there are depths of 10 to 16 fathoms, and beyond that the depth increases rapidly to the eastward and southward, but more gradually in the direction of the west point of Kverve: eastward of the lighthouse, the same depths will be found about 100 yards nearer the land. The bottom, which consists of sand and clay, affords good holding ground, but hawsers are usually laid out to the rings on shore.

If large vessels are to remain here any time they should be moored with an anchor laid well to the westward, as southwesterly gales send in a heavy sea, and violent squalls sweep down from the high land when the wind is fresh from the westward.

Aalesund is a town in the Inner Lead, standing on the western part of Nörvö at about 1½ miles southward of Valderö. It is very picturesquely situated, and the views of the distant Langfjeld Range from the high land above the town are exceedingly grand. Although of recent date, Aalesund, being the center for the cod fisheries of the western banks, has a considerable steamer traffic, and carries on a considerable trade with the Mediterranean, the principal exports being dried cod fish. Population in 1911, 13,858.

Supplies of provisions and water may be obtained, and between 2,000 and 3,000 tons of coal are kept in stock, with good facilities for coaling. There is frequent and regular steamship communication both northward and southward. Tugs are available, and some repairs effected by two workshops.

Storm signals are displayed from a mast on the mole.

Patent slips.—

Length.		Breadth of entrance.	Depth at M. H. W. S.		Lifting power.
On blocks.	Over all.		On sills.	On blocks.	
198 (cradle).....			{ Forward.....	8	700
			{ Aft.....	20	
150 (cradle).....			{ Forward.....	7½	350
			{ Aft.....	4	150
80 (cradle).....			{ Forward.....	4	150
			{ Aft.....	12	

The harbor is about 300 yards in length, with a depth of 4 fathoms in the entrance and 6 to 7 fathoms within. It is well sheltered and secure in all weathers; vessels of 290 feet in length and 22 feet draft can enter, but the entrance is extremely narrow. Vessels have to moor head and stern. Northwesterly winds send in a swell to the northeastern part of the harbor. See also Aspevaag, below.

The depth alongside the quay is from 16 to 18 feet at low water. The mooring buoy outside the harbor is only intended for small craft calling off the port.

Rocks.—About three-quarters of a mile westward of Aalesund, and nearly 400 yards from the northeast point of Hesö, there are two rocky patches, Nordre and Søndre Stenvaagflu, with depths of 2 fathoms, marked by poles. The reef extending about 200 yards from the same point is marked by an iron pole.

Olsskjær, a rock about half a mile northward of the entrance to Aalesund Harbor, is marked by a black beacon with two white belts. A spit, with 2 fathoms, extends nearly 200 yards east-southeastward

from Olsskjær, and a patch of $1\frac{1}{2}$ fathoms lies 300 yards northeastward of Olsskjær, marked by a pole.

A patch, with 3 feet water, lies 250 yards eastward of Fladholm, about 1 mile eastward of Aalesund, marked by two poles.

Light.—On the head of the pier, west side of the entrance to Aalesund Harbor, is exhibited from a small white iron house near a stone tower, at an elevation of 27 feet above high water, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively. Shown from July 20 to May 15.

Directions.—As for Bredsund.

Aspevaag.—A narrow channel, with 12 feet at low water, separates the west end of Nörvö from Hesö, affording access to Aspevaag from the northward through Stenvaag, available for small craft. The main entrance is southward of Hesö, through Hesse fiord, and is open to the eastward. Aspevaag is about $1\frac{1}{2}$ miles in length by half a mile in breadth, with depths of 9 to 18 fathoms, and affords anchorage all along the south front of the town of Aalesund, off which there are three mooring buoys in depths of 5 to 16 fathoms.

There is also good anchorage off Stenvaag in the western part, in from 3 to 10 fathoms, with hawsers to the shore. Southwest winds blow down from Sukkertoppen with violence at times. The northern entrance is only 100 yards wide. Aspene shoal, marked by an iron pole with white topmark and two poles, lies in the middle of Aspevaag; Kværnesflu is marked by two iron poles, and several other shoals by poles.

Light—Stenvaagen.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited from a small iron house situated at Stenvaagen, on the southwestern extreme of Aspevaag. Shown from July 20 to May 15.

Borgund and Aase fiords are the continuations eastward of Bredsund and Hesse fiords; they are apparently of no great importance to navigation.

Coast—Bredsund to Vikeröfiord.—Between Bredsund and Lepsö, east side of Vikeröfiord, are Giskösund, Gjösund, and Vikeröfiord, leading to Valderö, Aalesund, and the Inner Lead, but it is advisable to employ a pilot, as the rocks are numerous. Certain sectors of fixed white light from Alnes, Synes, and Erknö Lights lead through fairways available with local knowledge.

Outlying dangers.—The outer and principal shoals off the entrances to the above channels are here mentioned, but they are too numerous for full details, and they will be best understood by referring to the chart. A vessel will be well to the westward of these dangers as long as Kvalnes Lighthouse on Rundö bears southward of 188° , or Nerlands hornet is open seaward of that lighthouse.

Kalsboen is a rocky patch with a depth of about 1 fathom, usually indicated by breakers on the north side of the entrance to Giskösund, with Langeskjær in line with Erknö Lighthouse bearing 76° , the latter distant $3\frac{1}{2}$ miles.

Fauskene are four rocks on a bank about half a mile in diameter; the shoalest head has a depth of 5 fathoms and lies with Erknö Lighthouse bearing 99° , distant nearly $5\frac{1}{2}$ miles; its position is marked by breakers when there is any swell.

Grundskallen, an 8-fathom patch, on which the sea breaks during heavy gales, lies with Erknö Lighthouse bearing 123° , distant $6\frac{1}{2}$ miles.

Skarvholm and Storholm are islets about 40 feet in height situated about $5\frac{1}{2}$ miles north of Erknö Light; they form a mark for avoiding the shoals in that direction, being outside all the very shallow heads. From these islets northward and across the entrance to Harhams fiord there is a confused mass of shoals.

Lights—Erknö.—From a white wooden dwelling, with tower 34 feet high, near the center of Erknö, is exhibited, at an elevation of 161 feet above high water, a flashing white light every six seconds, with a fixed red sector. The white light is visible in clear weather at a distance of 14 miles, red light at 9 miles.

Synes.—From the southwest extreme of Vikerö is exhibited from a white wooden dwelling, at an elevation of 67 feet above high water, a light, with fixed and flashing white and red sectors. The white light is visible at a distance of 11 miles, red light at 8 miles.

Fishing Lights.—On Alnes mole, at the northwest end of Godö, and on Giskeö-degaarden molehead, on the north side of Giskö, fixed red lights are shown.

Blindeim.—At Blindeim, northwest coast of Vikerö, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at a height of 30 feet, from a small iron house.

The above lights are shown annually from July 20 to May 15.

Giskösund, between Godö and Giskö, is the channel through which vessels leaving the anchorage of Valderhaug Strand, southeast of Valderö, generally put to sea. The island of Giskö, which lies between Godö and Valderö, was formerly the seat of one of the most powerful families in Norway, and the remains of the old family chapel are still visible.

On the north side of the western entrance to Giskö Sund, within the outer dangers previously mentioned, are the Raudenerne, marked by a black stone beacon situated 2 miles northwestward of Alnes Lighthouse. Brejflu, Björneboen, and Lejafald are rocks on which the sea nearly always breaks, and lie westward and southward at

about and within half a mile from Rauden. Southeastward of Rauden, at the distance of half a mile, is Kraaka, marked by an iron pillar. Vestre Ellebaren, Lejasten, and Nordre Lejasten, the outer dangers on the reef extending about $1\frac{1}{2}$ miles westward of Giskö, are marked by iron poles; the northern and western edges of the reef itself are marked by poles.

Skjongsflu, a rock with 15 feet of water, lies three-quarters of a mile eastward of the north point of Havsten, and is marked by a pole.

The rocks north and west of Skjongholm, and north of Hustruhavn, between Giskö and Valderö, are marked by iron poles.

Shoal ground extending 600 yards northward from the northeast point of Giskö is marked by a pole.

Directions.—It is not advisable to enter Giskösund without the assistance of a pilot. The directions for entering, however, are as follows: Steer in with Synes Lighthouse bearing 81° , observing that the whole of Erknö, open southward of Langeskjær, bearing 65° , leads southward of Kalsboen. When Rauden beacon bears 144° , steer to pass northeastward of it and of Kraaka beacon; thence to pass about half a mile northward of Alnes, observing that the north point of Havsten bearing eastward of 104° leads southward of Giskö Reef; thence northward of Havsten to Aalesund or Valderhaug anchorages.

The south extremes of Valderö and Giskö in line bearing 94° lead in southward of Brejflu, to abreast Alnes, when proceed as before.

At night, by keeping within the limits of the fixed white sector of light from Synes, between the bearings of 86° and 75° , a vessel will pass southward of Kalsboen, and in the fairway, until within the sector of fixed white light from Alnes, between the bearings of 154° and 150° ; by keeping in this sector, being careful in passing Grimene, lying just outside the eastern limit, 1,400 yards northeastward of Rauden beacon, a vessel will pass eastward of Rauden and Kraaka; when within half a mile of Alnes alter course to the eastward, in the sector of occulting white light shown from Havsten.

This fixed sector of white light from Alnes leads directly in from seaward from the northward, in the fairway between the shoals, as will be seen on the chart.

Anchorages.—On the southeast side of Giskö is a roadstead with a depth of 11 to 20 fathoms, over sand, at a distance of 600 or 800 yards from the shore. Small craft will also find anchorage at several places on the west side of Valderö.

Gjösund is a narrow passage between Valderö and Vikerö, connecting the Inner Lead with the channel between Vikerö and Giskö; it has a depth of 12 to 15 feet, and affords anchorage to small craft.

There are entrances north and south of Erknö to the channels between Giskö, Vikerö, and Valderö, but they should on no account be attempted without a pilot on account of the numerous offlying rocks for which no definite marks can be given.

Vikeröfjord is a somewhat intricate channel from seaward, between the rocks outlying Vikerö and Lepsö into the Inner Lead.

Landmarks—Directions.—To enter Vikeröfjord from seaward it is necessary to make the Storholmene, an isolated cluster of islets about 40 feet high lying $5\frac{1}{2}$ miles northward from Erknö; on the inner islet is a conspicuous knoll known as Manden (the Man) from its imaginary resemblance to a human figure, and it is impossible to mistake the group when once seen; Mellingskær, a rock lying $2\frac{1}{4}$ miles southward from the Storholmene, is also a useful mark.

Vessels having approached the Storholmene from the westward, should pass about half a mile southward of them, and 400 yards northward or southward of Knappen, which lies nearly $3\frac{1}{2}$ miles southeastward of Storholm. The Rosholmene, lying about a mile northward of the northwest point of Vikerö, should be given a berth of three-quarters of a mile, but Fladskjær, the islet lying midway between Vikerö and Lepsö, may be passed at a distance of 200 yards, leaving it on the port hand.

Rosholmboerne, nearly awash, lies 850 yards north of Rosholm; Russen, at 3 fathoms, lies 200 yards west of Rosholmboerne; Fladskjærfald, marked by a pole, lies 200 yards east of Fladskjær.

The leading marks used by the fishermen would be useless to strangers, and therefore are not given.

Light.—From a red iron tower on Rosholm off the northwest end of Vikerö is exhibited, at an elevation of 44 feet above high water, a flashing white light every four seconds, visible 9 miles. It is obscured over the north coast of Vikerö. Shown annually from July 20 to May 15.

Anchorage.—If necessary, vessels might bring up anywhere along the whole of the east side of Vikerö, the depth being considerable and the bottom loose sand, but the 3-fathom contour, which is steep-to, extends 400 to 600 yards from the shore, making a vessel liable to drag into deep water in westerly winds; the best position is in 6 to 8 fathoms, with Roald Church in line with the northern side of Blindheimfjeld.

Inner Lead northward to Molde and Kristiansund (continued from above).—From Bredsund, between Hogsten Lighthouse on Godö and Hesö, the Inner Lead is between Aalesund and Valderö, thence eastward of Valderö, Vikerö, and Lepsö, over Lepsö-rev to Haröfjord.

Vessels drawing too much water to cross Lepsö-rev, the channel over the ridge connecting Lepsö Island with the mainland (which

has a depth of about $3\frac{1}{2}$ fathoms at low water in the fairway, with a rise of 6 feet), must go round Lepsö through Vikeröfiord and Harhamsfiord to avoid it. In the narrow passage between Kjøholm and the sunken rocks off the east side of Valderö, marked by an iron pole, there are patches of from 2 to 4 fathoms for which no marks can be given, and vessels of any draft should use the passage eastward and northward of Kjøholm in the perfectly clear channel. Northward of Oksebaasen the depths vary from 37 to 98 fathoms, but decrease rapidly toward Lepsö-rev from about a mile northward of Hanen. With the exception of Hanen, a cluster of rocks half a mile northward of Gjösundholm, and the shoals between Lepsö and the mainland, this part of the Inner Lead is almost free from dangers, but as the tidal streams are strong and the wind baffling and uncertain off the high land, it is advisable to employ a pilot.

Beacons.—There is an iron pillar on the highest of the Hanen Rocks, and Haneflu, 200 yards to the northwestward, is marked by an iron pole.

Lepsö-rev connects the islets off the south side of Lepsö to the mainland; it is composed of shingle, sand, and shells, with several rocky heads; the navigable channel is about 400 yards broad, with a least depth at low water of about $3\frac{1}{2}$ fathoms. Søndre Lepsö-rev, the ledge extending 500 yards from Gamlejmshaug, the point south of the lighthouse, has a depth of 2 fathoms at that distance; east-northeastward of the lighthouse there is a depth of 3 fathoms at 600 yards offshore. The edge of the reef on the northwest side of Lepsö-rev Channel is marked by Søndre Kværna Light structure and two red buoys; on the south side is Lepsö-rev octagonal stone lighthouse and a black stone beacon on the reef off Gamlejmshaug, but these latter are considerably within the edges of the shallow water.

Lights—Lepsö-rev.—From a white stone octagonal tower, 38 feet in height, on the head of the mole at Gamlejmshaug, a fixed light with white and red sectors is exhibited, at an elevation of 35 feet above high water. The white light should be visible in clear weather at a distance of 11 miles, red light at 8 miles.

Søndre Kværna.—On the northwest side of Lepsö-rev, from a small white iron house on iron pillars, an occulting light, with white and red sectors, is exhibited, at an elevation of 16 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles.

Rodholmen.—From a white wooden house, 38 feet high, on Rodholmen is exhibited, at an elevation of 45 feet above high water, a light with fixed and flashing white and red sectors, visible 12 and 9 miles, respectively.

These three lights are exhibited from July 20 to May 15.

Tidal streams.—It is high water, full and change, at Lepsö-rev at XIh. 0m.; rise about 6 feet. The stream during the flood usually sets northward and during the ebb southward with considerable strength.

Directions.—Vessels should round Kjeholm, the small islet eastward of Valderhaug, to the eastward, passing about midway between it and the lighthouse point on Oksebaasen. The west side of Gjösundholm (at 400 yards off which there is a 3-fathom patch) and Haneflu should be given a berth of at least 600 yards, and course may then be altered to pass about 4 cables westward of Gamlejmshaug, and rather nearer to Sondre Kværna Light structure and the buoys on Lepsö-rev than to Lepsö Lighthouse; thence to Haröfiord or Mifiord, passing on either side of Rodholmen.

Haugflua, with 3 fathoms over it, lies 1,000 yards west-northwestward of the beacon on Haugnes, the point $2\frac{1}{2}$ miles northeastward of Lepsö-rev.

Rogneholmen Reef, southeastward of Flæmsö, is marked by two iron poles, one of which is surmounted by two black cages; Grundrevet, its southeast edge, distant 600 yards from Rogneholm, is also marked by an iron pole.

At night, Rodholmen Light bearing 55° , the dividing line between the fixed white sector and the flashing white sector, leads in the fairway over Lepsö-rev until well past Lepsö-rev Light, when edge northward into the fixed white light of Rodholmen. Vessels should not get on the northwestern edge of the sector of white light shown from Lepsö-rev Light when abreast Rogneholmen, as the depth close outside it is only 2 fathoms; the middle of the white sector (light bearing 228°) should be kept. This bearing leads southeastward of both Haugflua and Grundrevet.

Anchorage.—In addition to the roadsteads eastward of Valderhaug and Vikerö, temporary anchorage may be found opposite the mooring rings on the north side of Oksebaasen, in a depth of 8 fathoms.

Haröfiord is a spacious channel to the eastward of Flæmsö, Fjerftoft, and Harö, and, after passing Rödholmen, there are no known dangers in the fairway.

In addition to those already described, the following are the principal dangers nearest the fairway:

Maleflu, 400 yards from the east point of Harö, is marked by a pole; Huseflu and Harnesflu, about 1,000 yards off the coast of Harö, are marked by iron poles; Husevikflu, about a mile northeast of Maleflu, and the nearest danger to the fairway to Lyngværfiord, has 6 feet of water over it, and is marked by a pole.

On the east side of the fiord the coast of Mien is foul in places to a distance of three-quarters of a mile. The outlying dangers are

Guldfluen, with 2 feet of water, marked by an iron pole, and Stenflu, nearly awash, and similarly marked, 1,400 yards northeastward of Guldfluen.

The southern entrance to Lyngværfiord, between Lyngvær and Sandö, is nearly 1 mile broad, and the islets and visible rocks on either side may be approached to within about 400 yards; attention must, however, be paid to the set of the tides, their velocity and direction varying considerably between the islands. From Ærstenen Light and Sandö the course lies eastward of Storskjær, Klövningen, and Gallerskjærene, and westward of Fladflæsa, Krabben, and Björnsund, to sea. See Lyngværfiord, Chapter III.

Besides the anchorages off Flæmsö, Harö, and Sandö, there are several small harbors amongst the islets on the north side of Grunde fiord, between Otteröen and Gorsen, but the approaches are so narrow and intricate that they could only be taken by very small vessels.

Telegraph cable.—There is a cable lying across from Risnæs to Ostnæs in the southwestern entrance to the fiord, about $1\frac{1}{2}$ miles northeastward of Lepsö; vessels must avoid anchoring in its vicinity.

Inner fiords.—The inner fiords of the Söndmöre district, between Nordfiord and Romsdal, extend for the most part between mountains ranging from 3,000 to 4,500 feet in height, and the scenery on many of them is of a most imposing character.

The Rövde and Vartdals Fiords, from which several minor branches extend 5 to 15 miles inland, also Sulenfiord, a deep clear channel between Harejdö and Sulö, have already been described.

Storfiord, with its continuations, extends eastward and southward from Sulenfiord to Hellesylt, a distance of over 70 miles. It is thus described by Mr. W. Mattieu Williams. "It is a magnificent excursion up Storfiord, the scenery gradually increasing in grandeur, until it reaches its climax at the mouth of the Gejrangerfiord. The first part of the trip, the eastward course through Storfiord, is the least interesting, the characteristic features developing themselves fully on turning southward into Slyngsfiord. This, and its continuation, Sunelvsfiord, as well as its side branches, Nordalsfiord and Gejrangerfiord, are sea-paved gullies, lying between rock walls of steep incline, or nearly perpendicular, which rise from 1,000 to 3,000 or 4,000 feet above the deep salt water. The hills hereabouts are rich in ironstone. At Örskog is a mine communicating with the fiord by a very steep tramway. The herring fishery is evidently the staple industry. In the course of the day we passed a number of farm buildings, some of them 2,000 or 3,000 feet above the deep fiord, with a mountain wilderness behind them and the fearful precipice in front. An incomprehensible track, a winding staircase of giddy ledges somewhere

on the face of the precipice, leads to a little boathouse on the fiord, an invariable adjunct to these farms. This in many cases is the only available means of communication between these strange Robinson Crusoe settlements and the outer world. The boats that are so carefully protected by the boathouses are built above, as there is no beach or footing below, and are let down by means of ropes. The launch of a boat down a 2,000 or 3,000 foot precipice without any but the most primitive appliances is not effected without some risk. The risk of climbing, boat launching, and those which demand the tethering of the children are not the only special dangers to which these farmers are exposed. In 1735 the wave raised by the fall of a mass of rock washed away a church and swept many miles along the fiord, destroying all the boathouses it encountered. Minor masses and avalanches frequently fall. The avalanches occur on the less precipitous rock faces, and are not mere accumulation of ice and snow but are chiefly made up of trees and fragments of rock, the denudation being due to the incline.

From morning till night we were winding through an ever-changing series of lakes that may be compared with that of Lucerne, but surpass it in all its own especial elements of grandeur.

In Gejrangerfiord we have the culmination of the wild grandeur of all the fiords of this region. Its only rival in Norway, and perhaps in the world, is the Nærofiord, which it resembles. Its unmeasured depths are walled by precipices which make a sheer perpendicular plunge of 3,000 to 4,000 feet down to its dark surface. Some eagle-nest Crusoe farms are even here, and gauzy waterfalls pitch from the unseen wilderness above over the sharp upper edge of the crag and proceed downward with a curiously deliberate and leisurely motion, waving gracefully in the air or gently grazing the face of the rock.

The "Seven Sisters" of the Gejrangerfiord are beautiful examples of this class of waterfall.

Anchorage.—Off Örskog, north side of Storfiord, there is anchorage in a depth of 14 to 18 fathoms.

There is anchorage off Merok in Gejrangerfiord in about 19 fathoms, at a distance from the mouths of the brook which form a waterfall a little above, according to draft.

Jöring (Hiörung) Fiord, the westernmost branch of Storfiord, penetrates about 18 miles inland in a southerly direction; the entrance is 5 miles eastward of Sulenfiord. This branch is also specially noted for the magnificent character of the scenery, the Jakta, Slogen, and Otaala Mountains rising abruptly from the fiord to a height of about 5,000 feet.

Sæbo.—To make the anchorage at Sæbo, in Jöringfiord, keep within 400 yards of the north shore of the approach, and gradually edge in to depths of 20 to 30 fathoms; the bottom on the northern shore is somewhat sloping, but the southern shore is very steep-to.

Eastward of Bredsund and Aalesund there are several small, unimportant inlets, studded with numerous islands of various sizes.

Ellingsö and Gryte Fiords extend about 12 miles inland to the eastward of Valderö, and are separated by the long narrow island Ellingsö. Bratholmstabben, in Ellingsöfiord, and Midtfordflu, in Grytefiord, are marked by iron poles. The wind blows in severe gusts from the mountains at times in these fiords.

Telegraph cables are laid across the western entrances to Ellingsö and Gryte fiords.

CHAPTER IV.

ROMSDALS ISLANDS TO KRISTIANSUND AND SMÖLEN.

Romsdals Islands form a somewhat straggling group, stretching along the coast in a northeasterly direction between Bredsund and Hustad Viken; they are fronted by dangerous clusters of rocks and shoals, which extend 5 or 6 miles seaward, making it necessary to maintain a considerable offing until the landmarks are distinctly recognized. Northward of the entrances already described the principal passages leading in from seaward are Harhamsfiord, Nogvidfiord, and Kraak sund. Within the islands are the Harö and Lyngvær fiords, which form the continuation of the Inner Lead northward from Lepsö-rev.

Aspect.—When approaching Romsdals Islands from the westward or northwestward, the three lofty islands Lepsö, Harhamsö, and Flæmsö will appear to be separated by channels of nearly the same width as the islands themselves. Blökallen, on Mien, about 7 miles eastward of Flæmsö, is 1,750 feet high, and jagged. About 5 miles south-southeastward of Blökallen is Skjæringen, 3,603 feet high, on the mainland; it has a depression in the top like a saddle, is visible at a distance of nearly 40 miles, and presents much the same appearance when viewed from different positions. Maaslifjeld, the highest of a cluster of pointed peaks nearly 7 miles farther inland, attain an elevation of 3,994 feet.

The red lighthouse on Ona Kalv is a capital mark, and, in conjunction with the lofty Storholmene, northward of Vikerö, is invaluable for rounding the extensive dangers between them.

Northeastward of Otteröen is Jendemsfjeld (2,079 feet), which, though not more lofty than the rest of the coast, is conspicuous from its perfectly round form. Skalten, 2,220 feet in height, $5\frac{1}{2}$ miles northward of Jendemsfjeld, has singularly pointed summits like inverted icicles; the mountains in this vicinity are nearly all round and level. Gulefjeld, or Budfjeld, near Bud, on the coast, is only 472 feet high, but rises from a level plain, and is conspicuous from its detached position; it has an almost flat summit, and presents much the same appearance from different points of view.

Pilots.—The pilot stations in the Romsdals Islands, northward of Vikerö, are Harhamsö, Ulle, Harö, Sandö, and Ona.

Tidal streams.—It is high water, full and change, off the outer Romsdals Islands at Xh. 45m. ; springs rise about 6 feet; higher tides are caused by westerly gales.

From Bredsund to Smölen, and also as far north as Halten Islands, the main stream of flood sets about northeast, though its regular course is often varied by the curves of the coast and the direction of the various channels. Outside the islands the stream during the flood sets northeast, or more northerly, and during the ebb southwest. During strong westerly winds the ebb is overcome by the northeastward set of the current, while if it blows steadily from the east the set is to the westward, its velocity being, however, considerably diminished by the flood tide.

The set on account of the northeasterly current is stronger and more generally to the northeast than in any other direction, especially at a distance of 30 to 60 miles from the land; great care is therefore necessary, when bound for any particular inlet, to avoid being carried northward of it, especially at a late season of the year, during long nights or dark weather, or with the wind from about south to west.

Harhams and Nogvid fiords approach.—Harhamsfiord, between Lepsö and Harhamsö, and Nogvidfiord, between Flæmsö and Fjertoft, are good entrances to the Inner Lead and Molde from seaward, but the Nogvid is preferable, and could be taken without a pilot. The Harhamene, owing to the more numerous shoals in its approach, and the possible difficulty of identifying the landmarks, should not be attempted without one.

There is only a boat passage through Ullesund, between Ulleholm and Harhamsö, the principal rocks in which are marked by iron poles for the guidance of fishermen.

Lights—Hellevik.—At Hellevik, on the north side of Lepsö, is exhibited from a white dwelling 21 feet high, at an elevation of 49 feet above high water, a light with fixed and flashing white and red sectors, visible 8 miles.

This light, for guidance of the fishermen, is shown from July 20 to May 15.

Ulla.—At Kværnholm, off the northwest end of Harmsö, from a white wooden house, with tower, 24 feet, is exhibited, at an elevation of 77 feet above high water, a light, with fixed and flashing white, red, and green sectors, visible 12, 9, and 7 miles, respectively.

Ullehammer.—At the fishing station of Ulle a fixed light, with white and red sectors, is exhibited from a yellow wooden dwelling, at an elevation of 46 feet above high water. The white light is visible at a distance of 7 miles, red light at 5 miles.

Fjertoft.—An occulting fishing light, with white, red, and green sectors, is exhibited from a small white iron house on the west ex-

treme of Fjertoft, at an elevation of 54 feet above high water. The white light is visible at the distance of 7 miles, red light at 4 miles, green light at 3 miles.

Ökenöflässa fishing light, occulting, with sectors of white, red, and green, is exhibited, at an elevation of 36 feet above high water, from a small white wooden house on the islet of that name, about 2 miles westward of Harö. The sectors are visible 7, 4, and 3 miles, respectively. The above lights are shown annually from July 20 to May 15.

Dangers.—Skreja and Skalmen are two dangerous rocks to the westward of Harhamsö. Skreja lies nearly $5\frac{1}{2}$ miles west of Ulla Lighthouse. Skalmen, above water, lies $3\frac{3}{4}$ miles west of the same lighthouse. Veteskallen, with 3 fathoms water, lies nearly midway between these two shoals, but about a quarter of a mile northward of a line joining them. Skalmenskallene, at 4 fathoms, lies 500 yards north of Skalmen.

The south point of Fjertoft, in line with or just open northward of the north point of Flämsö bearing 97° , will lead northward of these shoals; and Roppehorn (Rophætta) on Harejdland, open west of the Storholmene, or Erknö in line with the steep southwest side of Godö, about 178° , will lead westward. Hellevik Light shows flashing white over these dangers, and is obscured over another group southward of them; there is a narrow channel between in which the light shows fixed white. Patches with from 8 to 14 fathoms will be observed on the chart seaward of those mentioned.

Flemsbo, a rock awash, lies in the approach to Nogvidfiord, $1\frac{1}{2}$ miles north of Ulla Lighthouse, on Kværnholm.

Most of the dangers westward of Fjertoft, north side of Nogvidfiord and westward of Harö, are indicated by breakers when there is any swell, but their neighborhood should be avoided on account of the stream during the flood setting toward the reefs. The outermost of the shoals off Harö are Havflu, a 5-fathom patch lying 7 miles northward of the north extreme of Harö, Storeskallen, with 3 fathoms over it, lying $6\frac{1}{2}$ miles west of the west point of the same island, and Hellandskallen, with 5 fathoms, half a mile southwestward.

An extensive shoal, on which there are several rocks with but little water over them, lies about 1,200 yards within or southeastward of Havflu; it is known as Haröfaldene. Bearings of Ona Light (see below) should keep a vessel outside all the dangers here; but vessels should keep outside the range of the minor lights already mentioned.

Harhamsfiord—Directions.—On account of the numerous shoals in Harhamsfiord approach, it is advisable to employ a pilot; see Pilots, above. The following directions may, however, prove useful. The principal dangers are mentioned above.

From the southward, pass about 3 miles westward of the Storholmene, which forms a capital landmark, and steer about 31° until the whole of Fjertoft is just open north of Flæmsö, bearing 97° , which being steered for will lead northward of Skreja and Skalmen. When Harhams Klövning (the rock $1\frac{1}{2}$ miles west of Stavenes, the western point of Harhamsö) is in line with Goalde on Lepsö, bearing 141° , steer for it, which will lead between Blokalgrund with 12 fathoms and Björlökgrund with 10 fathoms, until Ulla Lighthouse bears 93° . Then edge to the eastward, steering for Harhamnes, the point westward of Harham, until Harhams Klövning is abeam, when course should be altered for Hellevik Lighthouse. These courses clear the foul ground eastward of Harhams Klövning and the 5 and 2 fathom patches off Stavenes. When Harhamnes is abeam the fairway is clear of danger.

Nogvidfjord—Directions.—The principal dangers in the approach to Nogvidfjord have been mentioned above. It is possible, having identified the entrance, to take it without a pilot, though it is not recommended to those without a considerable amount of experience. The three conspicuous peaks of Lepsö, Harhamsö, and Flæmsö, the two peaks on Harö, the three lower peaks of Fjertoft, Store and Lille Haröbur peaks on the southern part of Harö, as well as the Storholmene in the offing when approaching from the southward, should afford ready means for fixing the position of the vessel.

From the southward, the Storholmene should be given a berth of about 3 miles, thence steering about 31° until the whole of Fjertoft is open of Flæmsö and its offlying islets. Vessels of moderate draft may proceed in on that line (avoiding Nordre Haaskallen, a patch of 8 fathoms, by opening the mark still more when near it) until having passed between Flemsbo, awash, and Gasseflu, a $6\frac{1}{2}$ -fathom patch 1,200 yards southward of it; thence the dangers northward of Lilleskjær and Flæmsö should be rounded at a prudent distance. Within, the fairway is clear.

Vessels of heavy draft should continue the northeasterly course from the Stormholmene, until Skarafjeld, a hill on the mainland, comes in line with the north side of Flæmsö, bearing 125° , which being steered for will lead nearly in midway between Flemsbo, awash, and the Sværslingerne Islets; the above mark, however, passes very close to Brejflu, a patch of 6 fathoms, before nearing which, when Ulla Lighthouse bears 191° , a vessel should edge to the southward. When the Sværslingerne Islets are abeam, steer in mid-channel through the fiord.

Lilleskjær, in line with Haugnes beacon, bearing 144° , leads north-eastward of Flemsbo, and of Grundeflu, the 3-fathom patch north-east of it.

Sværlingerne Islets in line with any part of Fjertoft will also lead in until Ulla Lighthouse bears 191° , when course should be altered to give a berth to Brejflu and to pass half a mile south of the islets, thence in mid-channel as before. Course may then be shaped for Mifjord if bound to Molde.

Anchorage.—At the east end of Harhamsfiord there is anchorage in the bight between Lepsö and the islets to the eastward; and off Östnes, the southeast point of Harhamsö, is a convenient roadstead, with a depth of 6 to 14 fathoms over a sandy bottom. Vessels may anchor on the southeast side of Flæmsö in 6 to 8 fathoms; but they will have only 4 fathoms under the stern when swung toward the shore.

Anchorage may also be found along the whole of the east side of Harö in from 5 to 12 fathoms; care must, however, be taken to avoid Huseflu and Harnesflu, two rocks off the northeastern part of Harö; they are both marked by iron poles. Husevikflu, a 6-foot patch marked by a pole, lies about one mile off Harö.

Haavær Sund, a narrow channel between Sæterö and Haaværet, should not be attempted without the aid of a pilot. The outer rocks on either side of the entrance from seaward are Horsfaldene and Remboen, on both of which the sea breaks. The northern fall of Otteröen in line with the summit of Haavær, 114° , leads in until abreast of Kvalö Light. It is not advisable to offer any further directions.

Lights.—**Kvalöklub**, 2 miles northeastward of Harö, is a flashing light, with white, red, and green sectors. It is exhibited from a small iron house, at an elevation of 46 feet above high water. The white, red, and green lights are visible at the distance of 9, 6, and 5 miles, respectively.

Ona Kalv.—On Ona Kalv, about 3 miles southward of the entrance to Kraaksund, and west side of Lyngværfiord, is exhibited, from a red iron tower 48 feet high, at an elevation of 131 feet above high water, a fixed white light with a red flash of three seconds' duration every half minute, visible in clear weather from a distance of about 17 miles.

Husö.—An occulting (fishing) light is exhibited from a small white wooden house on northwest end, at an elevation of 80 feet above high water, showing sectors of white, red, and green light, visible, respectively, at the distance of 7, 4, and 3 miles, and useful to small craft with local knowledge.

The above lights are shown from July 20 to May 15.

Shoals near Ona.—Shoals extend about $2\frac{3}{4}$ miles directly off Ona, and about $6\frac{1}{2}$ miles northeastward, terminating in Klakken. In bad weather the rocks, even with a depth of 12 to 15 fathoms, break at times. The channels between these dangers are only available with local knowledge.

Fravskjær, lying 2 miles northwestward of Ona Lighthouse, is unmarked. Kippen, the northernmost rock above water of the Romsdals Islands, shows well above water, and is free from danger on the north side, but about a mile to the northeastward is Klakken, a patch with 6 fathoms.

Beacon.—About 1 mile southward of Kippen is a cluster of rocks known as Gallerskjærene, on one of which stands a black stone beacon. The rocks, extending $1\frac{1}{2}$ miles westward from Kippen and half a mile eastward of Gallerskjær, are nearly always marked by breakers.

Tidal streams.—In the channels around and near Ona the stream during the flood sets in and southward, and during the ebb out and northward, turning at high and low water.

Kraaksund is a good entrance between Ona and Gallerskjærene, but should not be attempted without a pilot. When a vessel is about 4 miles northward of Ona, its lighthouse, and the islets Røsholm and Oterö, will be distinguished, as well as several rocks to the northward and westward of them which lie on the southwest side of the channel. On the northeast side of the entrance will be seen Kippen, with two small rocks close to it, and the islets of Salstenen, Klövningen, and Aamunden.

Beacons.—Kraaka, a rock on the southwest side of the fairway, is marked by a black stone beacon, and Klövningen is distinguished by a deep cleft. Salstenen has a black mast with a cross.

Leading mark.—The leading mark for the entrance to Kraaksund is Lyngvær, in line with Hegdals Skaaret, the first cleft or dell in the high land on Otteröen. Vessels may pass from 200 to 400 yards northward of Kraaka.

Lyngværfiord.—Eastward of Ona Lighthouse and Gallerskjærene is Hustad Viken and Salstens Leden, the names given to the outer and northern parts of the entrance to Lyngværfiord, which lies between the northernmost Romsdals Islands and the islets off Gorsen; it is the best entrance to Molde and the Inner Lead from the northward. The shoals previously mentioned form the western side of approach, and those below mentioned, northward of Bud, the eastern side.

Haröfiord connects Lyngværfiord with the Inner Lead southward. Pilots may be obtained from Björnsund and Gorsen Islands.

Lights—Björnsund—Moöen.—From a white wooden dwelling 29 feet high, on the eastern part of Moöen, is exhibited, at an elevation of 85 feet above high water, a light, with fixed and flashing and group flashing white, red, and green sectors. The white light is visible in clear weather at a distance of 15 miles, red light at 12 miles, green light 10 miles. See sketch on chart.

Hammeroskjær—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 21 feet, from a small iron house on stone wall situated on the south side of Hammeroskjær at a distance of 800 yards southward of Björnsund Light.

Teinskjær.—A group occulting light, with red and green sectors, is exhibited, at a height of 32 feet, on Teinskjær. The sectors are visible 4 and 3 miles, respectively.

Fladflesa.—On Fladflesa, $1\frac{1}{2}$ miles northward of Lyngvær, a light, with fixed and flashing white, red, and green sectors, is exhibited from a white building, with tower, 44 feet high, at an elevation of 53 feet above high water. The white, red, and green lights are visible in clear weather at the distance of 12, 9, and 7 miles, respectively.

The above lights are shown from July 20 to May 15.

Shoals on east side of approach.—A range of rocks and shoals extends 2 to 3 miles from the mainland northward of Bud, the point on the east side of the entrance to Lyngværfiord. The dangers nearest the fairway are, Funnen, a $4\frac{1}{2}$ -fathom patch lying nearly $1\frac{1}{2}$ miles northward of the western Oddene off Bud (on which is a black stone beacon); Terningen, which breaks heavily even in calm weather, $2\frac{1}{2}$ miles north of the same island; and Kolbejnsflu, a 3 fathom patch, $1\frac{1}{2}$ miles northward of Terningen. Within or eastward of these are Hegerskjærene, the Lyroddene, marked by a beacon, and many other islets and rocks; several uncharted rocks are reported to exist, and great caution should be exercised when navigating in this vicinity. The northern danger in the approach to Lyngværfiord is the Kroppen, a patch of 3 fathoms; it lies $4\frac{1}{2}$ miles west of Fuglen beacon, south side of Fugle Channel.

Sandö.—There is anchorage in a depth of 6 fathoms on the south-east side of Sandö, southward of Ærstenen, on the edge of Sandö Reef.

Pilots are stationed in Sandö red.

Lights—Ærstenen.—On Sandholmen, a small sand islet nearly half a mile southward of Sandö, northwest side of Lyngværfiord, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house, at an elevation of 23 feet above high water.

Klepskjær.—An occulting light (unwatched), elevated 21 feet, is exhibited from a small iron house on Klepskjær; it shows white, red, and green sectors, visible 7, 4, and 3 miles, respectively.

The above are shown from July 20 to May 15.

Directions.—When bound into Lyngværfiord from the westward, vessels must not approach the visible rocks of Gallerskjærene nearer than 2 miles until Gulebjerg is in line with Skalten, bearing 113° . This mark will lead northward of all the dangers on the west side

of the entrance, and when about halfway between Gallerskjærene and Hegerskjærene, or with Björnsund Lighthouse about 161° , steer to pass about midway between Klövningen and the black stone beacon on Krabben; thence eastward of the iron pole on Faldene, the north-east reef of Sandö, and of Ærstenen Lighthouse into Harö Fjord. See Inner Lead from southward, above.

The bearings of Ona Lighthouse, Sandö Church, and the several islets will be sufficient guide for the avoidance of charted dangers, and pilots will always be found at Sandö. The dangers southward of Björnsund Lighthouse, in the entrance, are either visible or lie close to the islets, with the exception of a line of rocks extending about half a mile east and west, situated 800 yards northward of Orholm.

At night, Björnsund Light, showing fixed white, will keep a vessel clear of the dangers on either side of the entrance to Lyngværfiord (and of Karl med Hammeren and Turiskallen, with 14 and 15 fathoms, respectively, lying in the approach covered by a sector of fixed red), whence a vessel might proceed into Buddybet as below directed, but a stranger should not attempt Lyngværfiord.

Buddybet.—**Bud** is situated on the point of the mainland forming the east point of entrance to Lyngværfiord. Buddybet is the channel about 1 mile in width between the Oddene, close off Bud, and Björnsund Islets, leading to Harösund Havn, to which there is no great difficulty in entering with the plan, though a pilot should be taken.

Buddybet.—On the west extreme of Indre Harö, from a small iron house, is exhibited, at an elevation of 55 feet above high water, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively. Shown from July 20 to May 15.

Directions — Anchorages.—To enter Buddybet, steer in with Björnsund Lighthouse bearing about 161° until about $1\frac{1}{2}$ miles from it; then steer for the lighthouse on the southwest extreme of Indre Harö, bearing 122° . From the northwestward, Indre Harö Lighthouse in line with the large black stone beacon on the outer Oddene bearing 133° leads directly to the mouth of Buddybet.

In fine weather vessels may bring up southward of the trading station at Bud, but the anchorage is exposed to the westward. Supplies of provisions may be obtained here, and good water may be procured from a stream near the parsonage.

Harösund Havn is a small but good and safe harbor, with depths of 4 to 5 fathoms.

Kraakaflu, in the southern entrance, has an iron pole on it. This entrance is narrow and apparently shallow.

The northern entrance, through Harösund, is between Harö Lighthouse and Auspholm, on the west extreme of which is a black stone

beacon surmounted with a white ball. Give the beacon a berth of about 200 yards to avoid a patch with 10 feet over it lying about 200 yards northeastward of the lighthouse; thence keep along the northern side of the fairway into the anchorage. A rock on the southeastern side of the channel is marked by an iron pole.

At night vessels must approach in either of the fixed white sectors of Björnsund Light, which lead between the dangers on either side and clear of the fairway shoals. When about $1\frac{1}{2}$ miles from Björnsund Light, a vessel enters the white sector of Indre Harö Light, when it should be steered for. A stranger could not proceed beyond this.

Björnsund Havn, eastward of Björnsund Lighthouse, affords only indifferent anchorage, and the entrance is difficult; it should not, therefore, be attempted by strangers.

Molde approach.—Mifjord, and Moldefjord, its continuation eastward, is the channel leading to Molde. Vessels from the southward, of about 20 feet draft, may come by the Inner Lead by Lepsörev. From the southwestward, outside all the dangers, Nogvidfjord affords fairly easy access for all classes of vessels.

From the northward, Hustad Viken, thence through Buddybet between Björnsund and Bud, and through Julsund (the channel eastward of Gorsen and Otteröen) is generally used. From Hustad Viken vessels may also proceed through Lyngværffjord and Haröfjord; Grunde Fiord is also available.

Lights—Aarneskubben.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house situated on the southwest point of Otteröen.

Hjertö.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited at an elevation of 28 feet on west extreme of Hjertö.

Molde.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 27 feet, at Ræknes, near the west end of the town.

Dangers.—The fairways of Mi and Molde fiords are clear of dangers, and but few rocks exist off the shore for any distance. The Storholmene lie off the southwest point of Drönen, north side of the entrance to Mifjord. A shoal extends 200 yards from the shore eastward of Ræka, on the south side of the fiord. Haaskjærflu, a small 3-foot patch, lies 350 yards westward from Haaskjær, the western most of the islets and rocks extending from Tauterö; the eastern extreme of Kroppungflu, a shoal with $2\frac{1}{2}$ fathoms, lies 600 yards west of the western extreme of Tauterö. Maaseskjær is a rock off the eastern extreme of Tauterö; a shoal spit extends 250 yards eastward from Maaseskjær. Stabbeflu, a small shoal of 14 feet surrounded by very deep water, lies 1,200 yards south of the southwest point of

Tauterö, and is marked by a pole; Tomla, a shoal covered with less than 6 feet of water and marked by an iron pole, lies 1,000 yards farther off in the same direction.

Southward of Molde are many islets and rocks above water; Mekgrund, a 9-foot patch 1,600 yards northward of Hjertö Lighthouse, is marked by a pole.

Telegraph cables.—A cable is laid across the eastern end of Mifiord from Klevset to Sortemyr. Also across the narrows of Misund and the center of Vestre fiord.

Directions for Molde.—Having come from the southward over Lepsö-rev, or entered from seaward by Harhamsfiord, vessels should pass southward of Rödholmen at a distance of half a mile, and proceed through Mifiord and Moldefiord for the roadstead off the town. From Nogvidfiord the fairway is between Rödholmen and Storholm. Storholm, Ræka, and the islets westward of Tauterö should not be approached within half a mile; it is advisable to keep rather on the north side of the channel when entering the roadstead, in order to avoid Mekgrund and the rocks off Hjertö.

Grundefiord and Kjærringsundet.—If bound to Molde through Kjærringsundet, keep Sandö open westward of Orten until the Midtfordskjærene are in line bearing 81° , which will lead in the fairway. When Ona Lighthouse opens eastward of Orten, bearing 327° , shape course to pass about 400 yards southward of Kværnholm, in order to avoid Bleja, marked by an iron pole; and proceed southward of Snellen and through Kjærringsundet, which is free from dangers, to Julsundet.

There is a small cove at the inner end of Rakvaag with a depth of 7 fathoms; and temporary anchorage may be found eastward of Restadtangen in 6 fathoms, both on the south side of Grundefiord.

From the northward.—**Rosfiord and Julsundet**, the northern entrance to Molde through Buddybet, Rosfiord, and Julsundet, is narrow but not intricate; it is advisable to pick up a pilot before standing in between Björnsund and Bud.

With the exception of Kua, in Julsundet (a rock marked by a black stone beacon which lies nearly 1,200 yards east of Kjærringholm), the dangers on Rosfiord and Julsundet lie close to the shore, but a shoal with $1\frac{1}{2}$ fathoms over it is reported to lie 360 yards southeastward from Lauholm in Julsundet.

Lights—Hoksnes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 16 feet, from a small iron house situated on Hoksnes, eastern side of Gorsen. Shown from July 20 to May 15.

Julholm.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 27 feet, on Julholm, near the

southern entrance to Julsundet. The sectors are visible 7, 4, and 3 miles, respectively.

Directions.—Having entered Buddybet according to the directions given above, and intending to proceed without a pilot, give Harö, Sesholm, and Stensnes a fair berth, and proceed through Rosfiord and Julsundet to Moldefiord.

Anchorage.—If southward of Harösund Havn, vessels taking the Julsundet entrance might bring up for wind or tide at any of the following places; the depths given are all within 200 yards of the shore.

At Ejkrem, on the east side of Gorsen, 3 miles southward of Harösund Havn, there is a depth of from 16 to 27 fathoms. A rock on the south side of the entrance to the bight is marked by an iron pole.

On the north side of the entrance to Frænenfiord there are depths of 3 to 14 fathoms; and north-northeastward of Vaagö Church, on the south side of the fiord, there is a cove with a depth of 8 fathoms.

On the south side of Akeröbugt there is anchorage in 6 fathoms, with the church bearing 201° ; and southward of Akeröholm, with the church bearing 252° , there is a depth of 7 fathoms.

Molde is built upon a promontory on the north side of Moldefiord; though of little commercial importance, it is perhaps the most beautifully situated town in Norway, commanding a magnificent view of the extensive snowy ranges of the Dovre and Langfjelds.

There is sufficient water for coasting vessels alongside the steamer quay at Reknespynt.

Pilots are stationed at Molde.

Supplies.—Provisions and water are obtainable. A small supply of coal may be had, about 500 tons being usually in stock. In 1911, 8 steam vessels (3,400 tons) entered the port. There are but small means for repairing vessels. There are two hotels here.

Telegraph.—There is a telegraph station at Molde.

Anchorage.—There is a very fair roadstead between Molde and the islands to the southward, exposed to winds from southeast to southwest, which winds bring some sea, but the holding ground, of clay, is excellent. The anchor may be let go in about 8 fathoms and the stern hauled in by a hawser to the harbor poles, of which there are about 19 sets. Small craft may also berth alongside the wharf, or can lie at single anchor in from 9 to 10 fathoms. Large vessels usually anchor in about 15 fathoms. It is recommended to anchor close to the town and well to the eastward, to avoid hard ground and incommoding steamers going alongside the pier. The maximum depth between the town and the island to the southward is 19 fathoms, about midway.

Lökkeskallen and Moldegrund are two 7-fathom patches fronting Molde at about 600 yards from the shore.

Tides.—Springs rise about 9 feet.

Inner fiords—Fanefjord—Light.—On the north shore of Fanefjord, and at its western end about 3 miles eastward of Molde, an occulting light, with white and red sectors, is exhibited from a small white iron tower on standard, at an elevation of 21 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles. Shown from July 20 to May 15.

The inner end of the Fanefjord is 15 miles eastward of Molde. Fanestranden, the northern shore of Fanefjord, is noted for its luxuriant vegetation and great beauty.

Romsdalsfjord, with its various branches, penetrates a considerable distance inland eastward of Molde. The whole of the Romsdals district is celebrated for its magnificent scenery, and affords excellent sport. The river Rauma, in which there is good salmon fishing, falls into Romsdalsfjord, a short distance eastward of Veblungsnes, in Isefjord.

The principal branch, from Moldefjord, is Isefjord, which extends about 16 miles southward and eastward from Sækken, and near the inner end, on the south side of Isefjord, is Veblungsnes, a village of 40 or 50 houses.

Nes is situated opposite Veblungsnes, northward of the mouth of the river Rauma. It affords anchorage in a depth of from 18 to 20 fathoms at 400 yards off the town.

Langfjord extends about 16 miles eastward from Sækken; near its head are two smaller fiords, the southernmost being Erisfjord, at the head of which the British yacht *Osborne* anchored in 22 fathoms 300 yards from the beach. There is a depth of 6 fathoms within 12 yards of the shore. The fishing here is excellent.

Lights—Herjeskjær.—On Herjeskjær, a rock situated on the southern side of the entrance to Langfjord, an occulting light, with white, red, and green sectors, is exhibited from a small iron house.

Erisfjord.—An occulting light, with white, red, and green sectors, is exhibited on the eastern shore of the fjord southward of Grytnes.

Amongst the minor branches, Tresfjord, the entrance to which is about 6 miles southward of Molde, is considered the finest; there are various small anchorages in all these fiords.

The depths in Romsdalsfjord vary very considerably, the greatest yet obtained being 233 fathoms in the main branch of the fjord southward of Sækken.

Pilots for the Inner fiords may be obtained at Molde.

ROMSDALS ISLANDS TO TRONDHJEM LEAD.

Kristiansund approaches—General remarks.—From Bud to the south side of the entrance to Trondhjem Lead or Channel, a distance of 30 miles, the coast is fronted by clusters of small islets and

rocks extending between 7 and 8 miles offshore. Between these groups there are passages leading in from seaward to Kristiansund, viz, Fugle Leden, Ravne Gabet, the Treflis Leden, and Griphölen, all of which have very deep water, but the latter is the best entrance both for Kristiansund and Trondhjem. Vessels of moderate draft can also approach by the Inner Lead from Bredsund, over Lepsö-rev, or can come by the Inner Lead from still farther to the southward. The approach from the northward is by Romsöfiord, Fröfiord, and Frö Havet.

Other passages from seaward should not be attempted without a pilot, and it is advisable in all cases to employ one.

Bud to Kristiansund—Inshore channel.—This reach of coast is much exposed to the ocean swell, being sheltered only for a comparatively short distance by outlying islets and rocks and with shallow banks beyond them. There is, however, an inshore lead or channel between the islands outside Bud and Hustadland, named Stople Leden, thence southward of Svartoksen and Kvitholmen, available with local knowledge.

The channel from Lyngværfiord, through Hustad Viken, seaward of this, leading within Fugle Leden, is described later.

Tidal streams.—In calm weather the stream during the flood sets about northeast and that on the ebb west. With strong, long-continued winds, the set is with the wind.

Lights—Hustad Viken—Bekkerholmen.—From a small white house on an islet situated near the coast $3\frac{1}{2}$ miles northeastward of Bud, at an elevation of 56 feet above high water, is exhibited an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, and a fixed red sector, visible 10 miles.

Askvaag.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 37 feet, on the northern extreme of Haugsnes.

Nordneset.—On Nordneset, about 2 miles northwestward of Sjursvarden, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small white iron house, at an elevation of 52 feet above high water.

The above lights are shown from July 20 to May 15.

Fugle Leden is the southern channel from seaward leading to Kristiansund and Trondhjem, and is that generally used by vessels bound to the former place. Its entrance between Fuglen, a rock marked by a beacon, and Föllingen, the southernmost islet of the group separating it from Ravne Gabet, is nearly 3 miles wide, with depths of 36 to 87 fathoms.

Landmarks.—Kvitholm, an islet lying on the south side of Fugle Leden, about $2\frac{1}{2}$ miles from Stemshesten, is very conspicuous, being lofty, pointed, and perfectly white. On the northwest side stands

the lighthouse, which is the most important landmark to strangers on this part of the coast. The church at Hustad, 6 miles eastward of Bud, is also a conspicuous object.

Lights—Kvitholm.—On the southern side of Fugle Leden, from a circular white stone tower 62 feet in height on the northwest side of Kvitholm, is exhibited, at an elevation of 98 feet above high water, a light, with fixed, flashing, and group flashing white, red, and green sectors, visible 16 miles.

Smorholmen.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 43 feet, from a small iron house situated on the northeastern extreme of Smorholmen. Shown from July 20 to May 15.

Lille Sandö.—At Lille Sandö, about $4\frac{1}{2}$ miles northeastward of Kvitholm, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small white wooden house, at an elevation of 38 feet above high water.

Hestskjær.—From a square white stone dwelling with tower 70 feet in height erected on Hestskjær, is exhibited, at an elevation of 75 feet above high water, a fixed and flashing light, with white and red sectors, visible 14 miles.

The light shows fixed white through the navigable channels, and either flashing white or fixed red over dangerous ground.

NOTE.—As the channels indicated by the fixed white light are very narrow, mariners should bear in mind the character of the sector on each side of the channel they are navigating. See the limits on the chart.

The above lights are shown from July 20 to May 15.

Røksund.—An occulting flashing light, with white, red, and green sectors, at an elevation of 24 feet above high water, is exhibited on the eastern end of Langbaken, about 1 mile southward of Hestskjær. The white, red, and green lights are visible at a distance of 6, 4, and 3 miles, respectively. Shown from January 8 to April 30.

Sveggesund.—On the northeast point of Engelen, at the western side of the entrance to Sveggesund, $3\frac{1}{4}$ miles northeastward of Hestskjær, an occulting light, with white and red sectors, is exhibited from a small iron house on piles, at an elevation of 39 feet above high water. The white light is visible 7 miles, red light 4 miles. Shown from July 20 to May 15.

Stavenes.—At Stavenes, on the west side of the western approach to Kristiansund and the northeast extreme of Bremsneset, from a white wooden house, 23 feet in height, is exhibited, at an elevation of 62 feet above high water, a fixed and flashing light, with white and red sectors. The white light is visible in clear weather at a distance of 13 miles, red light at 12 miles.

Baltsernes.—On Baltsernes, the west extreme of Inlandet, south side of Sørsund, and $1\frac{1}{2}$ miles southeastward of Stavenes, from a

small white wooden house, is exhibited, at an elevation of 85 feet above high water, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively.

Omsund.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is shown, at an elevation of 13 feet, on the northern shore of the sound.

Pilots.—Smörholm, an islet lying $1\frac{1}{4}$ miles southeastward of Kvit-holm, is the only pilot station between Björnsund and Kristiansund.

Fuglen—Beacon.—A black stone beacon is erected on Fuglen.

Whistle buoy.—A red whistle buoy is moored at 900 yards westward of Midtflua (see below).

Dangers in Fugle Leden.—Kroppen is a shoal of 3 fathoms about 600 yards in extent on which the sea breaks in bad weather; the center lies $4\frac{1}{4}$ miles west of Fuglen beacon. It is the outer danger on the south side of the western approach to Fugle Leden. Farstad Midtklak, a patch of $6\frac{1}{2}$ fathoms, lies about 400 yards north-northeastward of it, and Utgrund of 14 fathoms at about half a mile northwest of it; these probably break in heavy weather. For others see the chart.

Fuglekrakken, with 2 fathoms over it, lies 600 yards northeast of Fuglen beacon.

Foul ground exists nearly a mile southeastward of Fuglen, terminating in Helbogen, nearly awash.

Stabbeflu, at 1 fathom, lies 400 yards south of Helbogen.

Midtflua, with 3 fathoms over it, lies 400 yards southward of Stabbeflu, and is marked by a pole.

Föllingen, the islet on the north side of the channel, lies 3 miles northeastward of Fuglen beacon. It is the highest of the rocks in the neighborhood of the beacon; Föllingsflu, a patch of 3 fathoms, lies three-quarters of a mile southwestward of it.

Bjogna, a sunken rock on which the sea breaks continually, and at times with considerable noise, lies 1 mile northwestward of Tromskjær, on the south side of the channel; it is steep to all round, is marked by a pole, and may be passed within a distance of 400 yards.

Tromskjær, the westernmost of the islets or rocks above water off the entrance to Lövä Fiord, may be approached to a distance of 400 yards.

Bararmene are two rocks awash, which constantly break, lying on a patch about 600 yards in extent; the center of the shoal lies $1\frac{1}{2}$ miles northeastward of Tromskjær.

Halluren, a patch of 2 fathoms, marked by a pole, lies distant nearly $1\frac{1}{2}$ miles east-northeastward of Bararmene, also on the southern side of the channel; but there is a clear passage southward of it.

Myrgrund is a patch of $2\frac{1}{2}$ fathoms on the northern side of Fugle Leden, nearly 1 mile northward of Bararmene. Søndre Myrgrund, a patch of 3 fathoms, lies about 600 yards southwest of it.

Rocks, at a depth of from 5 to $5\frac{1}{2}$ fathoms, extend about 200 yards southward of Søndre Myrgrund, and lie partly within the white fixed sector of Hestskjær light. They are marked on their south side by a pole with topmark.

Lille Sortna, the easternmost rock above water on the Myrholm Bank, north side of Fugle Leden, lies about 2 miles west of Hestskjær Lighthouse. Foul rocky ground extends 600 yards in an easterly direction from Lille Sortna. Its extremity is marked by a pole.

Braken, appearing as a black rock about 7 feet high at low water, on which the sea always breaks, with deep water close around, lies on the north side of the channel $1\frac{1}{4}$ miles eastward of Lille Sortna and three-quarters of a mile west of Hestskjær.

Tidal streams.—In the Fugle Leden and other channels to the Inner Lead, the stream during the flood sets to the eastward and that on the ebb to the westward, but with long, persistent northeast or southwest winds the stream is with the wind.

Directions—Fugle Leden to Kristiansund.—Coming from the southward, and having given Ona Lighthouse a berth of at least 5 miles, course may be altered for a position about 7 miles northward of Fuglen, marked by a black stone beacon, observing that Ona Lighthouse bearing southward of 217° will keep a vessel seaward of all the dangers near Hustad Viken.

A vessel will then be in the fairway to Fugle Leden, and may steer for Kvitholm Lighthouse in line with Fuglen beacon, bearing 117° . When within about 2 miles of the beacon, steer to pass about 1 mile northward of the island, between it and Föllingen; then with Fuglen beacon astern, bearing 266° , a vessel will pass northward of Bjogna, which always breaks.

When passing about 200 yards northward of Bjogna, Hestskjær Lighthouse should bear about 70° ; the latter being steered for very carefully on this bearing will lead between Bararmene, which break, and Halluren, with 2 fathoms (marked by a pole), on the one side, and the 3-fathom patch southward of Myrgrund (marked by a pole with topmark) and of Lille Sortna on the other. (Nordneset open southward of Kvitholm Lighthouse leads southward of Lille Sortna Reef.) Thence pass within half a mile of Hestskjær Lighthouse.

Braken is always visible, showing as a black rock several feet high at low water, and easily avoided; the shore should be kept about half a mile distance to Kristiansund. There is a patch of 5 fathoms at 270 yards northward of Hestskjær Lighthouse, with deep water beyond it.

When the western channel to Kristiansund is open, alter course to round Stavenes Lighthouse in mid-channel, avoiding the shoal situated about 300 yards northward of it. Bremsnesflu, a patch of $2\frac{1}{2}$ fathoms half a mile westward of Baltsernes, on the south side of the entrance to Sörsund, is marked by a pole. Thence in mid-channel through Sörsund into the harbor.

Vessels may also enter Kristiansund by Markussund, the southern entrance, through Bolgsvæt. Having passed Baltsernes at a distance of about 400 yards, round the black stone beacon with white cross on Linflu, and Linflua, the 10-foot patch lying 400 yards east of Linflu (marked by a pole), at a prudent distance, taking sufficient sweep to point the vessel straight for the entrance, which is free from danger on both sides; thence into the harbor.

Bolgfaldet, on the south side of the track through Bolgsvæt, is marked by two iron pillars, and Vikholmflu, to the eastward, by an iron pole.

Inner Lead—From Lyngværflord and Salstensleden to Kristiansund.—Coming from the southward by the Inner Lead, through Lyngværflord and Hustad Viken, bearings of the Gallerskjærerne, Björnsund Lighthouse and the islets on the south side of Hustad Viken will keep a vessel in the fairway.

Björnsund Lighthouse bearing southward of 200° until Sjurvarden Summit is open a little eastward of Nordneset Lighthouse, bearing 194° will lead northward of the dangers off Bud; steer in with the latter mark on until Hestskjær Lighthouse bears 70° , when steer for it on that bearing. This course leads southward of Midtflua and northward of Bjogna. Freikollen in line with the south extreme of Store Tromskjær, bearing about 87° , also leads southward of Midtflua, and over the middle of Store Tromskjær leads northward of Æggefluerne, a patch of 3 fathoms lying 1,400 yards northwest of Kvitholm. From Bjogna continue on the above-mentioned bearing of Hestskjær Lighthouse, and proceed as from Fugle Leden. See above.

NOTE.—Many sunken rocks at a depth of from 5 to 8 fathoms exist in the passage southward of Fuglen, and mariners are warned against using this channel when there is a heavy sea.

At night.—Fugle Leden is not sufficiently lighted for night navigation from seaward, except for vessels of light draft. Those from the Inner Lead and Hustad Viken use the narrow sector of fixed white light shown from Hestskjær Lighthouse, thence passing within 600 or 800 yards of Hestskjær Lighthouse and on to Stavenes Light. To enter Kristiansund, steer in within the limits of the sector of Baltsernes occulting white light, between the bearings of 124° and 132° , thence into Sörsund for Kristiansund.

Ravnegabet, or Griphölen, described in the following pages, are the proper channels from seaward at night, in charge of a pilot.

Ravnegabet, the channel between the Orskjærene Islets and Shoals and the Ravnene group, is a deep, clear channel about 2 miles in breadth; it is a better and clearer channel than Fugle Leden to Kristiansund from the westward; and Hestskjær Light renders the channel navigable at night.

Beacons.—On Bratskjæring, near the eastern end of the Orskjærene group, there is a square wooden beacon; on Søndre Ravnene, the southwesternmost of the Ravnene group, two stone beacons; and on Lille Skjelbreia, $3\frac{1}{4}$ miles to the northeastward, there is a wooden beacon painted black.

Directions.—If approaching the entrance to Ravnegabet from the westward, the two groups of islets mentioned will appear to be in the same cluster; but after passing the outer visible rocks of the Orskjærene group at a distance of 2 or 3 miles, the opening will be distinctly seen. Søndre and Östre Ravnene and Store Skjelbreia, nearly $2\frac{1}{4}$ miles farther eastward, are the highest in this group.

Freikollen, southward of Kristiansund, in line with Søndre Ravnene, bearing 114° will lead in northeastward of Grundkampen, a patch of 8 fathoms; Sortna and Lille Sortna in line, bearing 136° , lead in southwestward of it. Pass about 600 yards southward of Ravnene, thence from a half to 1 mile offshore to abreast Stavenes, and into Kristiansund as from Fugle Leden.

At night.—Steer in with Hestskjær Light between the bearings of 130° and 125° showing fixed white until Stavenes (fixed red) light disappears bearing 90° , or Grip (occulting red) light bears 37° , when course should be altered to pass three-quarters of a mile off Sveggesund Light, and when Stavenes Light reappears and changes to fixed white, alter to pass half a mile off it; thence into Kristiansund in the sector of fixed white light shown at Baltsernes between 124° and 132° .

Kraaka Leden is a narrow passage between Treflis and Ravnegabet westward of Kraaka and eastward of Muen, a rock awash at high water, and always visible. It should be only used by those locally acquainted and in handy vessels.

Hestskjær Light between the bearings of 164° and 169° showing fixed white leads through into Ravne Fiord, between Kraaka and Muen. A patch of 6 fathoms lies in this sector (in the fairway), 600 yards west of Kraaka.

Treflis Channel Beacons.—Treflis Channel is 1,200 yards wide in its narrowest part, straight and deep; and being situated nearly abreast Kristiansund, is commonly used by vessels visiting the port from seaward.

On its southwest side are the Skjelbreia Rocks, mostly above water, and on one of which is a black wooden beacon. Within it are the Gamle Jakob Shoals, Skjæringerne, a patch of 3 fathoms, Midtfordsfald, which breaks, and some deep-water patches.

On its northeast side are the Treflisa Rocks above water, marked by a black stone beacon; and Sydskjellingen, above water, within them. Northward of Treflisa are several shallow patches, the outer one, Ufstarren, with a depth of 5 fathoms, being distant nearly 3 miles.

Fausken, with 4 feet of water, marked by a pole, lies $2\frac{1}{2}$ miles east of Sydskjellingen.

Directions.—There is no difficulty in entering the Treflis Channel if Stavenes Lighthouse or the beacons on Skjelbreia Rocks and Treflisa are recognized. Having given a good berth to the Ravnene and other islets to the southwestward, Stavenes Lighthouse should be steered for bearing 127° , which leads through the fairway, between the beacons on Lille Skjelbreia and Treflisa, and direct to the entrance to Kristiansund, observing that Baltsernes open of Stavenes leads eastward of Gamle Jakob. Give Stavenes a prudent berth on entering, as from Fugle Leden.

Kvernberget, 633 feet high, eastward of Kristiansund, in line with Treflisa beacon, bearing 114° , also leads in from seaward between the outlying dangers.

This channel is not recommended at night even with local knowledge, as there are better ones.

Griphölen—Entrance for Trondhjem.—Griphölen, about 7 miles from Kristiansund, is $2\frac{1}{2}$ miles in breadth, and very deep; it is the principal southern entrance to Trondhjem Lead, and is available for all classes of vessels both by night and day during clear weather. The Grip and Indgrip Islands, two clusters of rocky islets and mostly barren, surrounded by sunken rocks, form the southwestern side of Griphölen; on the northeast side are the scattered islets and rocks extending nearly 8 miles southwestward from Smölen.

On the northern islet of the Grip group is the lighthouse, the best mark for identifying the channel.

Aspect of coast.—Approaching Griphölen from seaward, its locality may be easily recognized by the mountains; of these Stemshesten, 3 miles eastward of Hustad, and Tustern are the most conspicuous, being visible in tolerably clear weather at a distance of 40 to 50 miles. The land between them stretches east and west, and from a distance appears low and indistinct like the inner shore of a gulf, of which the mountains seem to form the extreme points. Stemshesten, 1,791 feet high, and Sjursvarden, 2,235 feet, southwestward of it, another top of the same ridge, form good marks; when seen from the northward the ridge has the appearance of a clump

with three circular summits, and from that point of view stands out like a large detached promontory.

Rensfjeld (not shown on the chart), about 12 miles southward of Kristiansund, is lofty and steep, having on the summit a hump like the crown of a hat. Mangilbjerg, about 7 miles eastward of Kristiansund, though not so lofty as the other mountains, is very remarkable, the eastern side sloping precipitously to the sea and the top having three jagged peaks which can be distinguished at a great distance. Freikollen, 1,998 feet in height, is a remarkable mountain 4 miles south of Kristiansund.

Gripö, the principal of the Grip Islands, is an object that can not be mistaken; it is a low island surrounded by islets and rocks, and though only about 600 yards in diameter, is very populous, and has a church with a small spire. The red lighthouse stands on an islet about 1 mile northward of it and is the best mark for identifying the channel, as before stated. Smölen, with the numerous islets and rocks surrounding it, is very low in proportion to the other islands and the mainland.

Lights—Grip.—From a red iron lighthouse, on a grey stone column, the whole 144 feet in height, erected on Brathaarskallen, at the northeast extreme of the Grip Islands, is exhibited, at an elevation of 154 feet above high water, a group occulting light, with white and red sectors; in clear weather the white light is visible from a distance of about 19 miles, red light at 16 miles.

Lyngvær.—On Nordö, a small islet on the west side of Smölen, and situated about 5 miles eastward of Grip Lighthouse, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 29 feet above high water. The white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively. Useful with Grip Light for fixing position of vessels entering.

On Omsundholmen and Porkholmen, about 1,000 to 1,600 yards, respectively, eastward of Nordö, small lights are shown for the use of the fishermen.

Yttre Langholm.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 40 feet, from a small iron house, situated on Yttre Langholm, south side of Yttre Fiord.

Hammersund.—On Skjæringskjær, in Hammersund, from a small white iron house on pillars, is exhibited, at an elevation of 21 feet above high water, an occulting light, with white and red sectors. The white light is visible at a distance of 7 miles, red light at 5 miles.

Stavenes and Baltsernes have been described.

Rödsandnes.—At Rödsandnes, on the west side of Bremsnesfiord, $2\frac{3}{4}$ miles southward of Stavenes, an occulting light, with white, red,

and green sectors, is exhibited, from a small white iron tower, at an elevation of 18 feet above high water.

Kvitnes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 55 feet, from a small iron house on the extremity of Kvitnes, on the southeast side of the northeastern entrance to Kristiansund.

Kvalvaagholmene.—An occulting light (unwatched), elevated 21 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on the eastern extremity of a group of islands.

Sognskjær.—An occulting light (unwatched), elevated 21 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house.

Melöen.—An occulting light (unwatched), elevated 43 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on the northwest end of Melöen.

Omfarskjær.—An occulting light (unwatched), elevated 28 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on iron base, erected on Omfarskjær.

Sorholm.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 14 feet, from a small iron house situated on Sorholm, northern side of Sorsund.

The above lights are exhibited from July 20 to May 15, with the exception of Lyngvær, which is shown from August 1.

Pilots may be obtained from Grip and Bratvær, northward of Smölen, but there is no difficulty in entering the channel without one when once Grip Lighthouse is in sight.

Offlying dangers.—**Griptarrene**, a dangerous rocky bank in the approach to Griphölen, is about 4 miles in extent; within this space there are several sunken rocks on which the depth varies from 6 to 15 fathoms, and one place where the depth is but 2 fathoms. **Östklakken**, the westernmost shallow head, has 7 fathoms, and lies about 15 miles westward of the west point of Smölen. **Stenen**, the southern head, has 6 fathoms. **Vestkleppen**, the 2-fathom patch, lies near the center of the bank with Grip Lighthouse bearing 118° distant 7¼ miles. **Nordkleppen**, patches of 11 to 15 fathoms, lie northward and eastward of Vestkleppen, distant about 1½ miles.

The sea breaks on these shoals when there is any swell, so that they may be possibly seen and heard at some distance, but it will be better to give them a wide berth.

Clearing marks.—Grip Lighthouse bearing southward of 134° leads northward of these dangers and bearing eastward of 102° leads southward of them; Stemshesten bearing southward of 183° will lead westward. At night Grip Light shows red over these dangers. Coast continued below.

Dangers in Griphölen.—The islets and sunken rocks extend nearly $1\frac{1}{2}$ miles seaward of Gripö; the north end of the dangers is guarded by the lighthouse.

Hilbaaren is the easternmost rock on the southwest side of Griphölen; it lies 4 miles southeast of the lighthouse, is awash, and marked by an iron pole. Foul ground extends about 800 yards northward and 400 yards northeastward of the pole.

Gaaseskjær is a rock above water on the northeastern side, distant about 3 miles northeastward of Grip Light. The sunken rocks off Gaaseskjær nearest the fairway extend $1\frac{1}{4}$ miles to the northwest and three-quarters of a mile southward from that rock.

Gjeslingerne, above water, mark the north side of the channel about $2\frac{1}{2}$ miles within Gaaseskjær.

Gotarren is a patch of $4\frac{1}{2}$ fathoms in the center of the fairway midway between Gjeslingerne and Hilbaaren; it probably breaks during heavy on-shore gales.

Solværsoen, lying $1\frac{1}{2}$ miles southeastward of the west end of Solværö, is above water, and marked by a black stone beacon. Boefluen, a patch of 2 fathoms, lies 600 yards west of the beacon; and Grundflua, a patch marked by a pole, lies about three-quarters of a mile east of the beacon. Elvikflu, with 19 feet, lies half a mile farther eastward. Solværsoen beacon is the turning point into Edöfjord for Trondhjem Channel.

Breiflua lies $2\frac{1}{4}$ miles eastward of Solværsoen beacon, has a depth of 9 feet, and is marked by a pole. Dangers extend about $2\frac{1}{4}$ miles from the west point of Edö toward Breiflua, forming the north side of the channel of Edöfjord.

Rocks off Tustern.—On the south side of Yttrefjord, the channel within Griphölen, rocks and islets extend about $1\frac{1}{4}$ miles to the northward from Golma and the western part of Tustern; the outer visible rocks may be passed at a distance of about 600 yards. Hestskjær fixed white light in sight, or Hammersund (Skjæringskjær) Light in sight, bearing eastward of 79° , leads northward of all dangers off Tustern. Hammersund white light in sight, bearing southward of 239° , also leads northward of the shoals off Vedö, eastward of it.

Directions—Griphölen.—The appearance of the coast and islands has been described. Having sighted Gripö, and the lighthouse on the northern islet of the group, the latter may be steered for when bearing between 72° and 102° , which leads in between the Griptarrene

Shoals and those southwestward of Grip. When about 4 miles from the lighthouse, edge to the northward of the latter bearing, so that it may bear southward of 94° before the vessel gets within 2 miles of the same, and then steer to pass about 1 mile northward of the lighthouse. Thence to avoid Gotarren, the patch of $4\frac{1}{2}$ fathoms in the fairway, keep within half a mile of Gjeelingerne if bound up Trondhjem Channel, thence southward of Solværsboen Beacon and up the fairway of Edöfiord. (Continued below.)

If bound to Kristiansund pass midway between Gotarren and Hilbaaren marked by an iron pole, with the black stone beacon on Gjæva, the westernmost islet off Tustern, bearing 145° . When Stavenes Lighthouse bears 209° it may be steered for; thence into Kristiansund through Sörsund as from the westward.

To enter Kristiansund by the northern and eastern entrance, steer for Kvitnes Lighthouse when it bears 167° . Give the Haaskjær Rocks off the west point of entrance a good berth, and when the sound is well open, proceed through it for the harbor. The western part of the sound is extremely narrow and has a depth of 3 fathoms only; strangers should not attempt it, but take the western entrance to Kristiansund through Sörsund.

At night.—From the southwestward the lights of Kvitholm. Hestskjær, and Grip afford ready means for plotting the track of the vessel toward Griphölen. Grip Light should be approached between the bearings of 72° and 102° (occulting white), which leads in between the Griptarrene Shoals and those southwestward of Grip. A good line of approach is with the light bearing about 88° .

When Hestskjær Light changes from flashing to fixed white, bearing about 165° , steer about 72° across the red sector of Grip Light. When Grip Light changes to white, steer to pass about half a mile northeastward of the light, thence across another red sector into another white one. By keeping toward either edge of this white sector a vessel will avoid Gotarren.

When Hestskjær Light again shows fixed white the vessel will be in the fairway between Hilbaaren beacon and the shoals westward of Tustern, and may shape course for Kristiansund, keeping in the above white sector of Hestskjær Light until abreast the west entrance to Kristiansund, whence course may be altered to pass eastward of Stavenes Light in the fixed white sector of light shown at Baltsernes, the west extreme of Inlandet; thence into the harbor.

Those locally acquainted, and in vessels of light draft, could enter the northern and eastern channel, with the aid of Kvitnes Light.

Bound to Trondhjem.—Keep on in the inner white sector of Grip Light, astern, which will lead southward of Solværsboen, until within about 1 mile of Hammersund Light, when steer eastward up Edö-

fiord, observing that Hammersund Light in sight leads clear of all dangers off Tustern.

From the northward.—Observe that Grip Light showing white leads westward of all dangers off Smölen; the light shows red over those dangers, and also over Griptarrene, the dangers westward of the approach from the northward. The light should be steered for showing white until within 1 mile of it, when proceed as if from the southwestward.

Caution.—When approaching Griphölen it is of great consequence in a sailing vessel to avoid being carried northward of the Grip Islets by the current, or tidal stream, not only on account of Griptarrene Shoal, but because it is more difficult to obtain a pilot northward of Gripö, owing to the scanty population of the islands. The great distance a pilot boat would have to proceed in order to reach a vessel outside the reefs, and the heavy swell which generally prevails, must also be taken into consideration. There is no anchorage between the Grip Islands and Bratvær.

Anchorage near Griphölen—Gripö.—In fine weather vessels of moderate size might anchor to wait wind or tide between Gripö and Grönningen, the islet southeast of it, in a depth of 12 to 18 fathoms, over a sandy bottom. Mooring rings will be found on the rocks; and there is no difficulty in leaving. There is also a small anchorage westward of a rock lying about 1,200 yards northeastward of Gripö.

Kvalhaue.—Northwestward of Kvalhaue, the eastern islet of the Solvær group, there is good anchorage in about 11 fathoms; it should be approached southward of Hauskjær and eastward of Kvalhaue. In the sound westward of Kvalhaue there is anchorage for small craft in $3\frac{1}{2}$ fathoms.

For anchorages in Trondhjem Lead eastward of Solværö see below.

Kristiansund is built on three islands, Kirkelandet, Indlandet, and Nordland, and forms almost a circle round its beautiful landlocked harbor; communication between the islands is maintained by steam launches. The town stands on such irregular ground that scarcely any two houses are on the same level, and the streets are singularly steep and crooked. The houses are built of wood, painted in various colors, and the appearance of the town and harbor with its numerous wharves and warehouses, varied by groups of shipping, is extremely picturesque. When approaching from seaward no houses can be seen until the vessel is close to the entrance.

Population.—The population of Kristiansund in 1911 was 13,201.

Trade.—The principal exports of Kristiansund are dried codfish, cod oils, roe, fish manures, salted herrings, and butter. The chief imports are colonial products, salt, and coal.

Supplies of provisions and other ship's stores are obtainable. Water is supplied by a tank vessel.

Coal.—About 3,500 tons of coal is usually kept in stock, 14,000 tons being imported annually. Coaling is not interrupted by bad weather. There is a coal wharf 160 feet in length, with a depth of 20 feet at a distance of 50 feet from it, and there is about 15½ feet alongside the railway quay.

Tugs are obtainable.

Slips.—

Name of dock.	Length.		Breadth of entrance.	Depth at M. H. W. S.		Lifting power.	Remarks.
	On blocks.	Over all.		On sill.	On blocks.		
Dale Brug Patent Slip ..	200 (cradle)			{Forward	10	1,600	Suitable for small vessels.
4 other patent slips	60 to 150 (cradle).			{Aft.....	25		

Repairs.—There are four building slips for small vessels, and two machinery shops.

Telegraph.—Kristiansund is connected with the telegraph system of Norway.

Communication.—The steam traffic between England and this place is maintained by the Wilson Line from Hull and the Norwegian Line to Newcastle. Mail and other steamers run frequently between the several ports along the coast.

Kristiansund Harbor is easy of access both by day and night by vessels in charge of a pilot, and is landlocked; it is about three-quarters of a mile in length, with a maximum breadth of 600 yards, but scarcely adapted for very long vessels; there is ample depth of water, however, for all vessels from sea to the harbor.

The southern and best entrance, the one generally used, is through Sörsund, and is not more than 100 yards wide between the shoals which lie close to the shore of either side. Markussund, the south-eastern entrance, is about the same width, with depths of 15 to 20 fathoms. Nord Sund, the northern entrance, is still narrower, and has a depth of 2½ fathoms only in a portion of it.

The depths in the harbor vary from 10 to 20 fathoms, with good holding ground, being deepest in the middle. About 100 yards from the piers the depth is 9 to 10 fathoms. Most vessels anchor on both sides of the harbor, with their sterns fast to mooring posts on the shore, but the eastern side is exposed to westerly winds.

Mooring buoys.—The principal anchorage is known as Grunden, and is apparently in the center of the harbor; a large mooring buoy

is situated in it. There are mooring buoys in the Vaag, in Sörsund, Markussund.

Storm signals are displayed night and day from a mast on Bjernehaugen.

Tides.—It is high water, full and change, at Kristiansund at Xh. 44m.; springs rise 7 feet.

Pilots.—There are no established pilots stationed at Kristiansund, but harbor pilots can be obtained at the harbor office.

Compasses can be adjusted by the director of the naval school.

Directions.—See the channels leading to Kristiansund from the southward, Fugle Leden; Ravnegabet; Treflis Channel; Griphölen; and the northern entrance, all of which have been described.

Inner fiords.—In the vicinity of Kristiansund the country is intersected by the numerous Nordmøre fiords, which, between the large islands Averö, Frejö (Fredö), Tustern, Stabben, and Ertvaagö, penetrate upward of 30 miles inland in various directions. A brief description of the principal channels only will be given here, as the services of a pilot are generally necessary.

Lövöfiord, westward of Averö, taken as a whole, is clear of dangers within the islands in its approach. There are several channels in from the Inner Lead, but the tidal streams run at the rate of 4 knots (at half flood and half ebb), and with the wind from seaward there is considerable sea. Kornstadfiord is the continuation southeastward of Lövöfiord, thence it turns eastward under the name of Kvernesfiord and joins Bremsnesfiord; they are comparatively free from danger. Eide is on the mainland, at the junction of Kornstad and Kvernes Fiords; Kornstad is situated on the northeast side of the fiord of that name.

Lights—Kraakholmen.—At the eastern end of Kvernes Fiord and southward of Bremsnes Fiord an occulting light, with white and red sectors, is exhibited on the small islet of Kraakholmen, off the west extreme of Bergsö, from a small white iron tower, elevated 23 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles. Shown from July 20 to May 15.

Bremsnesfiord, with its continuations Bergsö, Tingvold, and Sundals Fiords, extends about 35 miles to Sundalen. Near Bremsnes Church is the Bremsneshule, probably the largest cave in Norway; it is 40 feet wide, nearly 280 feet high, and penetrates Bremshatten for a distance of 280 feet. Sundalsaa, which takes its rise in the Dovrefjeld some miles southward of Snehætten, flows into the head of Sundals Fiord.

Farther to the northeastward is the entrance to Halsfiord, which is separated from Tingvoldfiord by a peninsula 25 miles in length and from 2 to 4 miles in breadth. Besides Stangvik and Surendals Fiords,

Halsfiord has several minor branches, and in its general form somewhat resembles a bird's claw.

The main channel of the Nordmöre fiords extends eastward and southward of Tustern, Stabben, and Ertvaagö, in an easterly direction, for a distance of 30 miles from the east side of Nordlandet, to Vinieören at the head of the Viniefiord; its average breadth is about $1\frac{1}{4}$ miles. The entrance from the Inner Lead is through Talgsöen, thence through Aarsundfiord and Viniefiord.

Although these fiords are less frequented by yachts than those of many other districts, they possess great attractions, and are well worth a visit,

Pilots for the inner fiords may be obtained at Kristiansund.

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CHAPTER V.

KRISTIANSUND AND SMÖLEN TO HALTEN ISLANDS AND BRANDS FIORD, INCLUDING TRONDHJEM LEAD.

Trondhjem Lead¹—**General remarks.**—In the last chapter the various entrances to Trondhjem Lead are described, of which Grip-hölen is the best.

Trondhjem Lead is the channel leading southward of Smölen, Hitteren, and Leksen Islands, and through part of Trondhjem fiord to the city of Trondhjem, and is available throughout for all classes of vessels. Its general direction is easterly for 70 miles from Grip-hölen, at which distance, at Agdenes, it bends abruptly to the southward for a distance of 10 miles to Rödberg, turning eastward again at Stadsbygden, a small village 10 miles westward of Trondhjem. The channel is reduced to a breadth of about half a mile by a number of small islets toward the east end of Hitteren, so that it is not very easy for large sailing vessels to work through.

With the exception of the dangers westward of Skarsö and Grisvaagö, which are easily avoided by checking the position by bearings of Tyrhaug Light, Kvitholm, and Friskjær beacon, the Lead may be said to be free from danger at a short distance from either shore. Some of the islets are distinguished by beacons, and the principal dangers are marked by iron poles or pillars. There are also many lights for navigating at night by those locally acquainted.

Tidal streams.—The tidal stream in Trondhjem Lead sets eastward during the flood and in the opposite direction during the ebb, but with a continuance of on-shore or offshore gales the stream runs with the wind. The velocity varies from about 1 to 2½ knots, being strongest in the narrows eastward of Terningen and off Agdenes, entrance to Trondhjem Fiord.

No tidal observations have been obtained in this neighborhood, but by interpolation of the tides observed at Kristiansund and Trondhjem it is high water, full and change, near Værøerne Lighthouse at about Xh. 30m., and near Rödberg Lighthouse at XIh. 15m.; springs rise about 9 feet throughout.

Weather.—The weather during the winter, spring, and autumn is often stormy, principally southwest gales seaward, but southeast or

¹ Trondhjem Lead is reckoned to begin at Tyrhaug and Ramsö Fiord.

east under the land. During the summer the prevailing wind is from north to northeast. Southwest winds bring thick weather. The clearest weather is during the spring; fogs prevail in the summer.

Lights.—The following lights are exhibited in Trondhjem Lead from July 20 to May 15.

Tyrhaug.—On a small rock off the east point of Edö, on the north side of the channel, a fixed and flashing light, with white and red sectors, is exhibited, at an elevation of 58 feet above high water, from a white dwelling with tower 46 feet in height. The white light is visible in clear weather at a distance of 13 miles, red light at 11 miles.

Remmingskjær.—On Remmingskjær, a rock situated $3\frac{1}{2}$ miles northeast of Tyrhaug Lighthouse, an occulting light, with white, red, and green sectors, is exhibited from a white iron house on an iron frame, at an elevation of 27 feet above high water. The white, red, and green lights are visible 7, 4, and 3 miles, respectively.

Klaksbroren.—A flashing light every five seconds, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 21 feet, on Klaksbroren, a rock situated $3\frac{1}{2}$ miles eastward of Remmingskjær.

Værøerne.—On an islet off the west extreme of Værö an occulting light, with white, red, and green sectors, is exhibited from a small white wooden house, at an elevation of 18 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles, green light at 3 miles.

Mageröen.—At Mageröen, on the east side of the harbor, an occulting light, with white, red, and green sectors, is exhibited from a small white wooden house, at an elevation of 15 feet above high water, which can be seen by vessels passing through Trondhjem Lead. The white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively.

Terningen.—On the east side of Terningen Islet, and on the north side of the channel, 16 miles eastward of Værö, a fixed light, with white and red sectors, is exhibited from a white wooden dwelling, at an elevation of 97 feet above high water. The white light is visible at a distance of 11 miles, red light at 8 miles.

Aunöen, on Lille Tranholm, $2\frac{1}{2}$ miles eastward of Terningen, is an alternating red and white light. The light, elevated 14 feet above high water and visible at the distance of 6 miles, is not constantly watched.

Böröholm.—Off the east end of Hitteren, on the north side of Trondhjem Lead and west side of Borösund, is exhibited from a white building with tower, 40 feet high, at an elevation of 48 feet above high water, a fixed and flashing light, with white and red

sectors. The white light is visible at a distance of 11 miles, red light at 8 miles.

Böröholm Light, though visible from part of the Trondhjem Lead, is chiefly intended for the guidance of vessels entering from the northward through Kraakvaag fiord.

Søndre Leksen, $2\frac{1}{2}$ miles southeastward of Böröholm. At Neset, from a small white wooden house, is exhibited, at an elevation of 16 feet above high water, an occulting light, visible 6 miles. Not constantly watched.

Kongsvold.—On Ringholm, 2 miles southeastward of Søndre Leksen Light, on the south side of Trondhjem Lead, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 27 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles.

Tyvholmen.—On Tyvholm, off the southeast end of Storfosen, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower at an elevation of 51 feet above high water. The white, red, and green lights are visible at a distance of 6, 4, and 3 miles, respectively.

Beian, north side of Trondhjem Lead, is an occulting white light, visible 6 miles, exhibited from a small white wooden house, at an elevation of 33 feet above high water.

Agdenes, on the south side of the channel, and at the turning point into Trondhjem fiord, is a fixed and flashing light, with white, red, and green sectors, and is exhibited from a white wooden dwelling, 24 feet high, at an elevation of 118 feet above high water. The sectors are visible 11, 8, and 6 miles, respectively.

Flesagalten.—On Galten in Skjörnfjord an occulting light, with white, red, and green sectors, is exhibited.

Steilestenene.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 15 feet, on Steilestenene, an islet $3\frac{1}{2}$ miles northeastward of Galten.

Harbaknes.—A group occulting light, with white, red, and green sectors, is exhibited at Harbaknes at the head of Skjorn fiord.

Hysnes.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 24 feet at Hysnes, 2 miles south of Agdenes.

Rödberg.—From a small white iron house on pillars on the east molehead at Rödberg, on the north side of channel, about midway between Agdenes and Trondhjem, an occulting white light is exhibited, at an elevation of 18 feet above high water, visible in clear weather at a distance of 7 miles.

Frosetskjær.—An occulting white light is exhibited. at an elevation of 17 feet, from a small iron house on stone beacon situated at

Frosetskjær, on the side of the southern entrance to Trondhjem Fiord; it is visible at a distance of 7 miles.

Munkholm Light, off Trondhjem, occulting white; see below.

Dangers—Beacons.—Trondhjem Lead is singularly free from sunken dangers, and the few that exist are well marked. Those westward of Edö have been described with Griphölen, the best entrance from seaward. The following are the principal dangers bordering the fairway:

Meklakken and Nordklakken, lying $1\frac{1}{2}$ miles east-southeast of Tyrhaug lighthouse, are marked by poles.

Grundflu, a sunken rock lying $2\frac{1}{4}$ miles northeast of Tyrhaug Lighthouse, is marked by an iron pole. Nordflua, a sunken rock lying 1,600 yards south of Remmingskjær Lighthouse, is marked by an iron pole.

Friskjær.—A black stone beacon is erected on Friskjær, the northernmost of the Grisvaagö rocks, south side of channel.

Friskjæroaren, 400 yards west of the beacon, is marked by an iron pole.

Ramsögalten, $2\frac{1}{2}$ miles northwestward of Friskjær and nearly $2\frac{1}{4}$ miles northeast of Remmingskjær Lighthouse, is marked by a black beacon.

Austklakken, a sunken rock at a depth of $5\frac{1}{2}$ fathoms, lies in the fairway at $1\frac{1}{4}$ miles east of Ramsögalten and about 2 miles southwest of Værö Lighthouse.

Skibnesgalten, on the west extreme of a shoal extending three-quarters of a mile off the west side of Dromnes, south side of channel, is marked by a black stone beacon with white belt; Skibnestarren, eastward of it, is marked by an iron pole; and there is a pole on Skibnesflu, about three-quarters of a mile westward of it. Storflutarren, half a mile eastward of Skibnesgalten, is marked by an iron pole.

Klovaholmflu, $1\frac{1}{4}$ miles eastward of Værö, north side of channel, is marked by an iron pole.

Tenskjær, $6\frac{1}{2}$ miles eastward of Værö, is distinguished by a black stone beacon.

Olsvikstenene and Havnskjær, situated, respectively, $3\frac{1}{2}$ and $1\frac{1}{4}$ miles westward of Terningen, are marked by iron poles; a rock, $1\frac{1}{4}$ miles westward of Olsvikstenene, is also marked by an iron pole.

Tranholm, a small islet $2\frac{1}{2}$ miles eastward of Terningen, marks the north side of the channel between Aunö and Ysthalm, and will be recognized by its black stone beacon and the white light structure on piles within it.

Kværnskjærgrunden, at the south extreme of the Veddö Islands, is marked by an iron pole.

Storaflu and Storatarren lie between Veddö and Söndre Leksen; the former is marked by two poles and the latter by an iron pole.

Smellingsflu, about 3 miles eastward of Nordre Leksen, is marked by a black wooden beacon. Vaaggrund, with a least depth of 9 feet, lying in the approach to Granvigen, at about 1,600 yards northwestward of the beacon, is marked by two poles.

Heggalten, on the south side of the channel and about 3 miles west of Agdenes, is marked by two iron poles.

Agdenesskjerringa, northward of Agdenes, is marked by a black beacon with white belt; Agdenesflu, eastward of it, by a black iron beacon.

Vestvikskjærene, 2 miles northeastward of Agdenes, has a black and white stone beacon on its west extreme and a black iron beacon on its east extreme.

Vesterflu, northwestward of it, is marked by an iron pole.

Frösetskjær, south side of Trondhjem Fiord, is marked by a black stone beacon with a white belt, on which is the lighthouse.

Munkholm, see Trondhjem Bay, below.

Directions—Trondhjem Lead.—Having entered by Griphölen, or coming by the Inner Lead past Kristiansund, from abreast Hammersund Lighthouse on Skjæringskjæret off Tustern, the distance is about 82 miles to Trondhjem, and the channel is available for all classes of vessels. By keeping near the center of the channel all dangers will be avoided. The principal dangers bordering the fairway are marked as above mentioned, and will be readily seen on the charts.

From Hammersund Lighthouse to Tyrhaug Lighthouse through Edöfiord the distance is about $9\frac{1}{2}$ miles; from the eastern end of Tustern a vessel should incline toward the north side of the channel, toward Edö, passing within half a mile of Tyrhaug Lighthouse. Thence northward of Klaksbroren and Friskjær beacon to abreast Værö, 8 miles above Tyrhaug. From Værö to Terningen Lighthouse, a distance of about 16 miles, is Trondhjem Channel, which is wide and free from danger. Between Terningen and Lille Tranholm Lighthouse, about $2\frac{1}{2}$ miles above, the channel for a short distance is little more than half a mile wide, but is deep and clear.

Thence from Tranholm to Agdenes, the turning point into Trondhjem fiord, the distance is about 18 miles. The dangers southward of Veddö, from 3 to 4 miles eastward of Tranholm, should be given a good berth, passing in mid-channel southward of Leksen Islands and of the beacon in Smellingsflu, up to Agdenes, the shoals off which are marked by poles; here is Trondhjem fiord, trending nearly south at right angles to Trondhjem Channel, whence the distance to Trondhjem is about 23 miles.

Give Rödberg Lighthouse a good berth when rounding it, passing northward of Frösetskjær and into Trondhjem Bay, southward of Munkholm, ~~avoiding the~~ shoal which extends 300 yards southeastward of it. Foul ground extends about three-quarters of a mile northward of Munkholm, marked by iron poles.

There is anchorage in Trondhjem Bay about 600 yards offshore, in depths of from 20 to 30 fathoms.

At night.—When dark, vessels should employ a pilot. The following directions may, however, prove useful to small steam vessels or sailing vessels with a fair wind. Most of the lights are on the northern shore, and are so arranged that by keeping just within the limits of the light when eastward or westward of them—that is, near the line of obscuration—the dangers on that shore are avoided and the southern shore given a wide berth.

Having entered by Griphölen as previously directed, or from Kristiansund, and being abreast Hammersund Light, course should be shaped to pass just eastward of Tyrhaug Light, keeping Hammersund Light in sight, which clears the dangers on the southern shore until nearing that light. Pass within half a mile of Tyrhaug Light, and steer direct for Værö Light, about 45° , showing white, preserving that bearing of it (the light shows red over Ramsögalten). Pass three-quarters of a mile southward of Værö, steering up the fairway, observing that Værö Light kept in sight leads southward of Klova-holmflu. Thence with Terningen Light just in sight, a vessel will pass southward of all dangers off the north shore westward of it. When past Tranholm, the northern limit of Terningen Light will keep a vessel southward of the dangers off Veddö; the northern limit of Söndre Leksen Light will keep a vessel southward of Storaflu; and when eastward of that light its northern limit will keep a vessel southward of the Fiskholmene. Beian Light in sight will just clear Smellingsflu and Hovdetaen Point, the west extreme of Örländ Bay.

Agdenes Light should be rounded at the distance of about half a mile, and the middle of Trondhjem fiord kept to abreast Rödberg Light. From about half a mile off the light steer to pass midway between the Flakholmene and the north shore, keeping Rödberg Light in sight, and when Munkholm Light bears about 113° , steer about half a point southward of it into Trondhjem Bay.

Anchorage—Trondhjem approach.—Solvær, in Griphölen, has already been mentioned. With the exception perhaps of Arneö Bank and the roadstead at Havn, none of the anchorages between Griphölen and Örländ bugt in Skjoren Fiord could accommodate more than one vessel, and strangers ought not to use them without the assistance of a pilot. Örländ has space for a number of vessels, and Rödberg in Trondhjem fiord will accommodate about six.

Arneö Bank.—About 5 miles eastward of Solvær, between Kutmansflu and Kjonrogsflu and southward of Langtarren, there is a bank about 1 mile in extent on which vessels may anchor in a depth of 6 to 9 fathoms, over a good sandy bottom. This may be considered a very fair roadstead except during strong southerly winds, which send in a heavy sea. On the southern part of the bank there is a patch of 4 fathoms named Mansholmflu. The peaks of Hoö and Mansholm in line, bearing 353° , lead about 300 yards westward of the patch, and nearly over Langtarren, with 1 fathom of water, 600 yards within it. Ytre Mansholmflu, 800 yards northeast of Langtarren, has also 1 fathom over it. Solværö Peak in line with the north extreme of the Fiordprakkerne group, bearing 261° , leads northward of Mansholmsflu and south of Langtarren. At the intersection of these lines there is a depth of about 6 fathoms.

Arneö.—On the north side of Arneö, about $1\frac{1}{2}$ miles northwestward of Arneö Bank, there is a good and secure harbor, about 600 yards in breadth, with a depth of from 6 to 7 fathoms over a clear bottom; there is apparently a depth of only 3 to 4 fathoms in the entrance. This is better than the anchorage at Solvær for outward-bound vessels meeting with contrary winds, especially if it is blowing fresh; but it is not a desirable place for sailing vessels bound through Trondhjem Lead, owing to the difficulty of leaving it with southerly winds.

Edö.—Temporary anchorage will be found on the south side of Edö at a distance of half a mile to 1 mile from the shore, in a depth of 15 to 20 fathoms, over sand; the best position, however, is 400 to 600 yards offshore, with the church bearing about 324° , in 7 to 9 fathoms, over clay. This roadstead may be left easily with easterly or westerly winds.

Tyrhaug.—Between Tyrhaug Lighthouse and Tyrhaug Town, at the northeast end of Edö, there is a good harbor, with a depth of 5 to 6 fathoms over fine white sand, but the berth to be taken up must depend upon the size of the vessel.

Katholmflua, situated at a distance of half a mile northward of Tyrhaug Light, is marked by a buoy on its southeastern side. About midway between the buoy and Edö there is anchorage for large vessels.

Ringholmen.—Eastward of Kristiansund the first anchorage on the south side of the entrance to Trondhjem Lead is Ringholmen, in Hammersund, 2 miles eastward of the black stone beacon with white cross on Lindvaagsvortna. The entrance is somewhat narrow and intricate, but the harbor is good though small, and has a depth of 7 fathoms.

Stangdragö.—Vessels of light draft may pass through Hammer-sund to the roadstead at Stangdragö, nearly three-quarters of a mile south westward of Skjæringskjæret Lighthouse, but the channel is narrow. Larger vessels might enter from the northward, close eastward of Ringholm. The anchorage has a depth of 8 to 9 fathoms, with apparently $4\frac{1}{2}$ fathoms in the northern entrance.

Storö.—In the small sound between Storö and Solskjærö, about 6 miles eastward of Ringholm, there is anchorage in depths of 8 to 10 fathoms, over a soft bottom.

Værö.—On the west side of Östre Værö, about 9 miles eastward of Tyrhaug Lighthouse, north side of the channel, there is a good small harbor with 8 to 10 fathoms, sandy bottom. Smaaskjær, Tareskjær, Klovaholmflu, and Grönholmflu are marked by iron poles.

Skibesö.—In Vorpbugten, on the northeast side of Skarsö, south side of channel, there is good anchorage in depths of from 3 to 14 fathoms. The winds which occasion any swell tend to drive a vessel up the bank, and when the wind is off the land hawsers may be laid out to the shore mooring rings. The pole on Skibesflu may be passed within 400 yards.

Taftö.—About 5 miles eastward of Dromnes is Taftö, on the east side of which vessels might bring up in 7 to 8 fathoms; but as the anchorage is indifferent it is seldom used.

Markusö.—On the north side of the Lead there is a good small harbor between Markusö and Hitteren, which vessels can enter and leave at all times; it is available for vessels of moderate draft. The best spot for anchoring is in the middle of the sound, where the depth is 15 fathoms, bottom sand and shells over the whole sound. Small vessels lie best just eastward of Markusö, with their head to the eastward and a hawser to the shore, in depths of 8 to 11 fathoms. Markusö is free from danger on its north side.

Magerö.—On the east side of Magerö, south side of the Lead, is a harbor which might accommodate two vessels of moderate size. There are depths of 11 fathoms, sand and clay, and several mooring rings. This is a telegraph station.

Aafærkammen touching the east side of Magerö, bearing 175° , leads through the fairway, between the shoals on either side in the entrance.

Havn.—Close eastward of Havn farm, about 2 miles westward of Terningen, is a roadstead where vessels may lie at single anchor in fine weather, at a distance of 400 to 600 yards from the shore; it is not recommended for sailing vessels during southerly winds, as there is considerable swell and some difficulty in getting away with these winds. The bank consists of clay, is of considerable extent, and has depths of 7 to 9 fathoms.

Havnskjær, which lies about 400 yards off the point on the west side of the anchorage, is marked by an iron pole.

Dybsund and Aunöhav.—Dybsund, between Jossenö and Aunö, has a depth of 7 to 10 fathoms, but can only be left by sailing vessels with northerly winds. There is also anchorage for small craft between Aunö and Tranholm and on the north side of Aunö.

A sunken rock in Aunö Havn, and a rock north of Grönholm, are marked by iron poles. Tranholmen is marked by a black stone beacon. Lille Tranholm Light in sight at night leads in.

Veddö Havn, on the west side of Veddö, is frequently used by coasters; the depths are from 3 to 10 fathoms. The dangers on either side of the south entrance are marked by iron poles; the shoals in the sound within Veddö and in Börösund are also marked.

Stora Havn, between Stora and Veddö, is only suitable for small craft; it has a depth of 12 to 13 fathoms, but the holding ground is rocky and untrustworthy, and there is also a considerable swell with southwesterly and southerly winds. The dangers in the northern entrance are marked by poles. The south entrance is free from danger.

Hevnskjelö.—On the northeast side of Hevnskjelö, 1 mile south of Tranholm, there is good anchorage in a depth of 10 to 12 fathoms, open to the eastward. There is room here for one vessel of moderate size.

Söndre Leksen.—In the bay westward of Storholm, on the south side of Söndre Leksen, there is anchorage for vessels of moderate draft and for small craft.

The latter lie best within Havneholm, on its north side, which is free from rocks; here are depths of 3 to 4 fathoms, good holding ground.

Vessels of moderate draft may anchor on either side of the holm, but will lie best to the eastward, on which side there are mooring rings. The farm on the Ness must not be shut in with the south point of Havneholm; with those points in line the depth is 5 to 6 fathoms, over sand.

A rock awash lies 135 yards southward of Lilleholm, situated southward of Storholm.

The tidal streams are rather strong and irregular here.

Nordre Leksen and Fiskholmene.—If unable to stem the tide, inward-bound vessels might bring up off the south end of Nordre Leksen in a depth of 8 to 10 fathoms, sandy bottom; or among the Fiskholmene to the eastward of Nordre Leksen in 6 fathoms; but these anchorages should only be used in fine weather.

Kongsvolden.—At Kongsvolden, on the south side of the channel, abreast Söndre Leksen, there is a good harbor, with room for one vessel of moderate size.

Stavö.—On the southwest side of Stavö, 3 miles eastward of Nofdre Leksen, there is good anchorage in a depth of 14 to 16 fathoms opposite the outer mooring ring, and in 8 to 10 fathoms opposite the inner ring, with good holding ground.

Garten.—Temporary anchorage might also be taken during a calm off the bight in the south side of Garten, in depths of 10 to 12 fathoms, over white sand.

Beian (Fladnes).—Beian Havn lies just westward of Fladnes, and is only available for small craft. There is a stone pier 250 feet in length, for the use of small craft and boats, on the west side of Fjeldhammeren. The shoal on the east side of entrance is marked by an iron pole.

About 1 mile eastward of Beian Lighthouse one vessel of moderate size might anchor at a distance of 200 to 400 yards from the shore. This anchorage may be left with any wind, but the water is deep, the bottom irregular, and the bank very steep. The remainder of the bay between Beian and the west point of Örlund bugt is rocky and uneven, the soundings varying from 7 fathoms close to the rocks to 20 and 30 fathoms at a few yards off, and then no bottom at 30 fathoms.

Örlund Peninsula, of which Fladnes with Beian Lighthouse on it forms the southwestern extreme, is remarkably flat. In some parts of the boggy ground anchors and chain cables have been found in a good state of preservation, and the skeleton of a whale was discovered in the valley of Terning about 50 feet above the sea level, showing that the plain must at some time have been covered by the sea. There are numerous barrows or tumuli on Örlund, and eastward of Örlund bugt is the manor house of Österaat, which is mentioned in history at a very early period, and was for centuries a nobleman's seat; it is now the only one of all the old manor houses of Norway that has preserved the character of an ancient chateau. On Borgklint, a hill about $1\frac{1}{2}$ miles northeast of Österaat, there are some prehistoric intrenchments of a remarkable character.

Örlund bugt, on the south side of Örlund, is an anchorage of considerable extent; the bottom is mud, except near the rock in its eastern part, with good holding ground outside a depth of 9 fathoms; between that depth and 5 fathoms it is generally hard clay, and inside of that stony, with patches of sand and rock. The water shoals from 7 fathoms to 5 and 3 fathoms rather abruptly in all parts. The foul ground, 6 fathoms and possibly less, in the eastern part of the bay, charted half a mile westward of the beacon on Skjeghaugflua, the rock off Österaat Point, should be avoided. Skjeghaugflu rarely breaks at high water. A patch of 7 feet lies about 800 yards northwestward of it.

The best anchorage is in a depth of from 10 to 16 fathoms, with the wooden pier bearing about 282° . Strong southeast and southerly

winds cause a considerable sea. There are no streams of good water in this bay.

In approaching from the westward, Skjeghaug should be kept open of Hovdetaan, to avoid the shoals in the bay westward of the latter.

Österaat bugt, eastward of Österaat Point, affords anchorage for two or three vessels, but in deep water and close to the shore. The holding ground is good, but the bank is very steep. Jægtvikflu, the shoal ground extending southward from Österaat Point, is marked by an iron pole.

Anchorage.—In Skjörnfjord there is anchorage between the Eids-holmene $2\frac{1}{2}$ miles eastward of Österaat bugt, in a depth of 7 to 8 fathoms, over sand and clay; and at Skjörn, $1\frac{1}{2}$ miles farther eastward, there are depths of 9 to 10 fathoms, but foul ground extends about one-third of a mile off its southwestern side.

At the eastern end of the fjord, known as Nordre Fiord, there is a tolerably well-sheltered harbor with a depth of 14 to 16 fathoms, but it would be difficult for a sailing vessel to get out again.

Fevaag, on the south side of Skjörnfjord, $2\frac{1}{2}$ miles northeastward of Brettingsnes, is a fair roadstead, with depths of 12 to 14 fathoms, tolerably well sheltered.

Flesa Islets lie about three-quarters of a mile northward of Fevaag anchorage; the southern and eastern extremes of the reef off them are marked by iron poles. The Galten Rocks lie north of them, and Sioflu, marked by an iron pole, half a mile westward of them. For other shallow patches in Skjörnfjord see the chart.

Trondhjemfjord.—Between Agdenes and Rödberg the anchorages are poor and only suitable for small craft, with the exception perhaps of Selven. Eastward of Rödberg, and at Trondhjem, there is anchorage for large vessels.

Tidal streams.—These are strong between Agdenes and Rödberg, attaining a velocity of 3 knots at times, being greatest at half tide. There is a choppy sea with the wind against tide.

Agdenes.—Near the sunken rocks northward of Agdenes a sailing vessel might bring up in a depth of 7 to 9 fathoms to avoid drifting during a calm.

Selven.—At Selven, in Trondhjemfjord, $1\frac{1}{2}$ miles southward of Agdenes, there is a snug cove for one vessel of moderate size, with a depth of 7 to 15 fathoms. There is a warping buoy in the entrance. The bottom is somewhat hard, and small craft should range enough cable to allow the anchor to reach the bottom without check.

Aaramen.—Three miles southward of Selven, abreast Aaramen farm, there is a bank at a short distance from the shore where an anchor might be dropped during a calm in 9 to 10 fathoms, over sand and clay, but it would be necessary to run out a hawser to the shore.

Esviknes.—Anchorage might also be taken northward of Esviknes, within Esvikgrund (on which is a rock awash), east side of the channel. The southwest point of Esvikgrund is marked by a pole.

Lensvik Bugt, about 4 miles southward of Aaramen, affords anchorage in a depth of from 12 to 16 fathoms, sand. There is room for one large vessel to anchor in 20 fathoms, with the church in line with the center of a clump of wooden huts, bearing 279° ; that position would be just within the edge of soundings, and with 80 fathoms of cable the vessel would tail into 5 fathoms or less.

Rödberg.—Eastward of Rödberg Point, the southeast side of which should be given a wide berth, there is a good roadstead capable of containing about six large vessels. There is anchorage in a depth of 5 to 7 fathoms with Stadsbygden Church bearing 324° , and in 15 fathoms, clay, with the church in line with cleft on the top of the hill bearing 338° , and the two eastern points in line bearing 79° .

Trondhjem Bugt affords anchorage with good holding ground for a large number of vessels of all classes, and there is deep water in the channel leading to it for the whole distance from the sea (about 82 miles).

The bay is nearly 2 miles wide in an east and west direction, open to the northwest and northward, from which direction are the prevailing winds, the opposite side of the fiord being about 7 miles distant. These winds raise a considerable sea at times, but the anchorage is safe during the summer months; vessels of moderate draft can enter the harbors, there being depths ranging from about 14 to 19 feet in them at low water springs; see below.

Anchorage.—The anchorage in the western part of the bay is with the lights at the entrance to the river in line to the eastward and Munkholm Light bearing between 0° and 45° in from 22 to 44 fathoms, clay. An anchorage is shown on the chart in about 15 fathoms 300 yards northeastward of the mole, sand and clay.

There is anchorage on the eastern side of the bay in about 20 fathoms, good holding ground, sand and mud, southeastward of Munkholm. An anchorage in 8 fathoms is shown on the chart 500 yards southward of Munkholm.

Munkholm lies in the middle of Trondhjem Bay, about 1 mile northward of the city, and is connected with the river entrance by a ridge on which there are depths of 8 to 21 fathoms, with from 30 to 50 fathoms on either side of it. The islet is about 150 yards in diameter, and with its fort and lighthouse forms a prominent mark for the anchorage.

It was fortified in the year 1658, and has been used as a place of confinement for State prisoners. Here are the remains of one of the oldest monasteries in the north of Europe.

Shoals.—The detached shoal, Holmgrundene, with depths of less than 3 fathoms, lies in a north-northeasterly direction about three-quarters of a mile from Munkholm, its extremity, Tua Rock, being marked by a perch. A tongue of shoal water with Taren, a rock, marked by a pole on its northwest point, extends 800 yards in a northerly direction from Munkholm Light. Three rocks lie on this tongue, the outer one, dry at half ebb, being 400 yards distant; the middle one is always uncovered, and the inner one is awash at high water. A shoal with less than 3 fathoms extends about 300 yards southeastward of Munkholm. There are no other dangers in the bay. A sand bank which dries at low water extends 500 yards from the shoal between the river entrance and Ladehammeren.

Trondhjem Harbor consists of Elvehavnen (the river harbor), Indre Bassin (east and west harbors), both of which connect with each other and with the Elvehavnen and Ytre Bassin (the outer harbor); the area is about 120 acres and the wharfage about 4,000 yards.

Elvehavnen is about 100 yards wide, and has depths in it of from 19 to 23 feet. Both sides of the harbor abreast the town are occupied by warehouses, fronted by quays, alongside which vessels lie. The quays on the western side from the railway bridge to the entrance have 15 to 19 feet alongside, and are used by coasting vessels, and on the west side they are continuous to the entrance. There are several bridges, the railway bridge being nearest to and 600 yards from the entrance. About 500 yards above it is Bakke Bridge. Both bridges are opened by signal to admit vessels above them. The breadth of channels through the bridges are 50 and 35 feet, respectively.

The customhouse or toldbod is situated at the junction of Elvehavnen and Indre Bassin.

Ytre Bassin (outer harbor), which is about 800 yards long by 200 yards broad, has depths at low water of from 16 to 19 feet in it. The harbor is formed by a mole fronting the reclaimed land on the western side of the river entrance; it has two entrances, one on the east from the river, the other on the west from the bay. On the southern side are quays with warehouses and railway, with depths of 15 to 16 feet alongside the quays, but in the eastern part of the harbor there is a berth for a vessel of 24 feet draft. There are bottom moorings at regular intervals; vessels moor head to the westward.

Indre Bassin is situated to the southward of Ytre Bassin; it is a narrow harbor, about 1,400 yards long east and west. The eastern entrance is through Bratörlop from the river, the western entrance through Ravnölöp, where there is a swing bridge; besides this there are three other swing bridges across the harbor. The harbor itself is chiefly used by small craft, but on the north side there are two

quays with 16 feet alongside for larger vessels, where coal can be obtained.

Il Bassin, which is just westward of Indre Bassin in the bight of Trondhjem Bay, is formed by a mole about 600 yards long, running parallel to the shore. The entrance is from the westward. There is about 15 feet alongside the quays, and a number of mooring posts. The timber business is carried on here.

At Ilsvik, in the southwestern corner of the bay, are several piers and jetties, with from 16 to 21 feet alongside them, where iron ore is shipped from the smelting station at Il. There are mooring buoys off these jetties.

Ice.—Although there may be a considerable quantity of ice in April and May, Trondhjem Harbor is usually free from ice. Good ice-breakers are kept in readiness.

Light—Munkholm.—An occulting white light is exhibited from a small white iron house, on the roof of the round tower, at an elevation of 88 feet above high water, and is visible in all directions from a distance of 7 miles in clear weather, except in the sector of 15° between the bearings of 60° and 75° , where it is obscured. Shown from July 20 to May 15.

Harbor lights.—From a small white tower with red band on a scaffolding, just off the end of the piles forming the east side of entrance to the river, is exhibited an occulting white light; and from a lamp-post erected in a small square stand on the head of the steamer quay, on the west side of entrance, abreast, is exhibited a fixed red light.

On the east head of the mole forming the outer harbor an alternating white and red light is exhibited from a small white iron house, at an elevation of 34 feet above high water, visible at the distance of 6 miles. It is obscured through a small arc over the mole and outer harbor.

On the west end of the mole at the eastern side of the west entrance to the outer harbor, from a white tower with red bands, is exhibited an occulting light, with white and red sectors, and from a small white iron house on the west side of this entrance, a white and green alternating light is shown, at an elevation of 34 feet above high water, and is visible from a distance of 6 miles.

A green and red light is exhibited on each end of the swinging part of each of the bridges, showing green when open, red when closed.

A white light, visible in the fairway, is exhibited on each end of the fixed part of the bridges. Vessels entering pass to the westward of these lights, those leaving to the eastward.

Fog signals.—During thick or foggy weather a fog bell is rung at the east end of the mole, struck once every half minute; also at the

western side of west entrance to outer harbor, struck twice in quick succession every 15 seconds.

Tides.—It is high water, full and change, in Trondhjem Bay at XIh. 12m.; springs rise $8\frac{1}{2}$ feet, but with strong on-shore winds it may be as much as 10 or 12 feet. There is no tidal stream in the bay, but in the river the water runs out pretty strongly with the ebb, especially in time of floods, when the snow melts on the mountains, during the months of May and June. The flood stream in the river is seldom noticeable. The stream in Trondhjem Lead and fiord varies from 1 to $2\frac{1}{2}$ knots, depending on the breadth of the channel and the wind in the offing.

Pilots for Trondhjem are taken at the entrance channels from seaward, but they are not accustomed to handle heavy ships, and therefore require to be closely watched. They are useful to point out the dangers. Vessels bound through the Inner Lead northward from Trondhjem should take a "general coast pilot." See Chapter I.

Pilots must be taken for entering any of the harbors, the signal being three long blasts with the steam whistle. They can also be telegraphed for to the harbor bailiff and secured in advance. They are obtainable at Ilsvik or, in bad weather, at the river entrance.

Tugs can be obtained.

Directions.—See Chapter III for the directions for Griphölen; and to Trondhjem, above. Approaching Trondhjem, the best channel is that westward and southward of Munkholm, but if proceeding northward and eastward of that island, the iron pole, marking Holmgrundene, should be given a wide berth.

The city of Trondhjem, or Nidaros, as it was termed until the fifteenth century, owes its origin to King Olaf Trygvesson, A. D. 996, although more properly Saint Olaf must be considered the actual founder. It was formerly the royal residence and seat of government, and remained the capital of Norway until 1380. According to an article of the constitution of 1814, the coronation of the Norwegian sovereigns must be solemnized in Trondhjem Cathedral. As capital of the Stift, or Province, Trondhjem, is the residence of the stiftamtmand, or civil governor, and the bishop; and as third in point of population, the coronation city of the Norwegian kings, the seat of the Royal Scientific Society and the Bank of Norway, and also as the scene of many striking historical episodes, it is one of the most important places in the country.

The city is beautifully situated at the head of a bay on the south side of Trondhjem Fiord. Nid Elven, by making a wide sweep to the southward before it flows into the fiord, converts the site of the town into a triangular peninsula, the western extreme of which is connected with the mainland by a narrow isthmus, while on the east side

the river is crossed by two bridges, before mentioned. The streets are wide and regular, with large square water cisterns at the intersections, and though most of the houses are of wood and without architectural pretensions, yet with their red roofs, and windows filled with flowering plants, they have a pleasant air of cleanliness and comfort. Destructive fires have hitherto been of frequent occurrence.

Besides the cathedral (Domkirke), which has a conspicuous spire, and the Church of Our Lady (Frue Kirke), which are of special interest, the principal buildings are the Bakland and Hospital Churches.

Stiftsgaarden, in Munkegaden, is a large wooden house which was fitted up as a residence for the king, and is occupied by the governor. Among the principal institutions may be mentioned a hospital, infirmary for lepers, lunatic asylum, asylums for the deaf and dumb, and several important private charities. There are several schools, a museum and public library, an exchange, two private banks, a theater, and various clubs and artistic societies.

Population.—At the census in December, 1911, the population was 45,335.

Arsenal and dockyard.—Close to the cathedral, on the south side of the town, are the remains of the old Kongsgaard, or Royal Palace, which, with the adjoining grounds, has been turned into an arsenal and dockyard. There is a nautical school, where it would appear that instruments can be tested; also an office where seamen can be engaged.

Trade.—Trondhjem is steadily progressing in wealth and commercial importance, trade being facilitated by railway communication with Christiania and the Gulf of Bothnia. The principal industrial establishments are a dockyard, a foundry connected with a boiler and engine factory, mechanical workshops, a building yard for iron vessels employing 300 hands, steam sawmill, distillery, tannery, ribbon factory, rope walks, tobacco works, etc.

The imports are coal, groceries, cotton goods, and machinery. The principal exports are sulphur pyrites, dried and salted fish (chiefly herrings), timber, wood pulp, tar, etc.

Supplies.—All kinds of supplies of provisions and stores may be obtained at Trondhjem. Water must be brought on board in ship's own boats.

Coal.—From about 9,000 to 10,000 tons are usually kept in stock; about 70,000 tons are imported annually. Vessels up to 15 feet draft can coal alongside the wharves in the inner harbors, and up to 18 feet in the outer harbor; others from lighters brought alongside. There is a heavy swell at times in the bay, rendering it dangerous to lighters alongside.

A United States consular agent is resident here.

Docks and patent slip.—

Name of dock.	Length.		Breadth of entrance.	Depth at M. H. W. S.		Lifting power.
	On blocks.	Over all.		On sill.	On blocks.	
Dry Dock No. 1.....		280	43	10½		
Dry Dock No. 2.....		310	44	11½		
Patent slip.....	112 (cradle).....			Forward.....	5½	400
				Aft.....	10	
Patent slip.....	130 (cradle).....			Forward.....	7	400
				Aft.....	11	
Patent slip.....	140 (cradle).....			Forward.....	8	500
				Aft.....	12	

Harbor regulations.—These are published in a small pamphlet, entitled “Havne Reglement for Trondhjem,” which should be obtained on the spot.

Repairs.—There are three machine shops affording facilities for repairs to hull and machinery for such vessels as can be accommodated in the dry docks; also a crane that will lift 65 tons. There are also repairing facilities at Hommelvik, situated 13 miles from Trondhjem.

Time signal.—From a signal staff on the pier between Elvehavn and outer harbor a ball, painted black and a white cross, is hoisted 15 minutes before the signal, and is suddenly dropped at 0h. 0m. 0s., mid-European time, corresponding to 23h. 0m. 0s. Greenwich mean time, or 23h. 41m. 28.3s. local mean time. The signal is made every day between June 1 and August 31, and on Wednesdays and Saturdays from September 1 to May 31. See Chapter I.

At the telegraph office the time is telegraphed from Christiania at 9 a. m., Standard mean time, on Mondays and Thursdays, when chronometers can be compared at the office.

Storm signals are shown from a flagstaff on the head of the jetty in the inner harbor. For signals see Chapter I. The night signal, however, for a disturbance in the vicinity is 8 electric lights placed in form of an hour glass.

Hospital.—There is a hospital, but no home for sailors.

Communication.—There is regular steamship communication with Hamburg, Hull, and Copenhagen, and railway communication with Christiania to the southward and the Swedish frontier to the eastward. Telegraphic communication with all parts of the world.

Climate.—In summer the climate of Trondhjem is very uncertain, the transitions from heat to cold being sudden and unexpected. In winter the temperature is less variable, and the sky is generally clear. At Ytterö, an island 25 miles northeastward of Trondhjem, the mean annual temperature, at an elevation of 250 feet above the

sea level, is 41° F.; the highest temperature registered up to 1872 was 82° F., and the lowest was 0° F., the mean daily temperature being below freezing point 123 days in the year. Trondhjem Bay never freezes.

South Trondhjem Province is rich in historical reminiscences and archeological remains; and the remarkable series of well-defined terraces, or natural levels, which extend for a considerable distance along the course of the Nid Elven are of special geological interest. Though the oak has all but ceased to grow, and few kinds of fruit come to any degree of perfection, the aspect of the country is cheerful, habitable, and flourishing. Some of the valleys are highly cultivated and extremely fertile. The rapidity of vegetable growth is sometimes extraordinary; on more than one occasion two crops of barley have been reaped in the same year, while it is not uncommon for barley to be reaped six weeks after it is sown.

The scenery of Trondhjem Fiord is varied and picturesque. The hills, though not densely wooded, are by no means bare, the birch in particular flourishing wherever the mountain slopes are sheltered from direct sea winds; and the shores of the fiord are dotted with picturesque villas and country houses, belonging to the wealthy families of the town.

Eastward of Trondhjem.—Trondhjem Fiord, with its continuations, extends about 45 miles northeastward from Trondhjem. This fiord affords in reality by far the readiest communication with the sea for all the northern parts of Sweden, as well as Norway, being only 26 miles from the Swedish frontier and 180 miles from Sundsvall, on the Gulf of Bothnia; it is never frozen, and is consequently navigable all the year round. The southern or eastern shore of the fiord is very irregular and forms several large bays and peninsulas; the northern or western shore trends generally in a northeasterly direction, with but few indentations.

Toward the inner part of the fiord the country is less rugged than in the immediate neighborhood of the city; the soil is superior, and cultivation is no longer confined to the hollows, but spreads in all directions. Luxuriant crops are produced, and the successful cultivation of the hop in this district is well worthy of notice. The scenery is very beautiful, Værdal especially, with its fine river and numerous farms, being one of the most flourishing valleys in Norway.

Pilots for the inner part of Trondhjem Fiord may be obtained at Trondhjem.

Strindfiord is situated immediately eastward of Trondhjem Bugt, and from its inner part Stördalsfiord extends eastward 6 miles, and Aasfiord northeastward about 9 miles; in these fiords there are several anchorages and but few outlying dangers. Saksvikskjær, a small rock lying half a mile off the southern shore, 5 miles eastward of

Trondhjem, is marked by an iron pole. Storegrund, a rocky shoal of 4 fathoms nearly half a mile in extent, lies in the middle of the approach to Strindfiord, $3\frac{1}{4}$ miles north-northeastward of Munkholm Lighthouse.

Ytteröen, about $7\frac{1}{2}$ miles in length and about $1\frac{1}{2}$ miles in breadth, lies in the middle of the continuation northeastward of Trondhjemfiord, with its western end distant 24 miles above Munkholm; it appears to be well populated. There is anchorage on the southern side of the island, near Sandaakeren, and in Övrebugt in 12 fathoms; Vansvikskjær, extending 800 yards from the shore, at a part of the coast nearly midway between these places, is marked by an iron pillar.

Levanger, a trading town with a population of about 1,000, is situated on the south side of Værdalsfiord, 4 miles southeastward of the east point of Ytteröen. The harbor of Levanger is the most sheltered of all the inlets on the southeastern shore of Trondhjemfiord; it is consequently much resorted to by fishing vessels, and forms a sort of commercial outpost for the trade of Trondhjem. There is roomy anchorage in the bay in depths of from 6 to 13 fathoms.

As soon as the snow renders the transport of heavy goods practicable on sledges, the Swedes come across the fjeld to Levanger in considerable numbers, principally from Jämtland; and two large fairs are held every year, one in December, the other in March. Several of the mercantile houses of Trondhjem have branch establishments here.

Værdalsören.—About 5 miles eastward of Levanger, at the mouth of Værdalselven, is the village of Værdalsören, whence a road leads $2\frac{1}{2}$ miles eastward to Stiklestad, celebrated as the spot where Saint Olaf was killed in battle, A. D. 1030.

Lights—Hommelvik.—An occulting light, with white and red sectors, visible 6 and 4 miles, respectively, is exhibited, at an elevation of 13 feet, from a small iron house on iron support situated on Nygaard Point, Stiordals Fiord.

Tautra.—An occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at an elevation of 58 feet, from a small iron house situated on the northwestern point of Tautra, Trondhjemfiord.

Faanes.—A group occulting light, showing two eclipses, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is shown, at an elevation of 29 feet, on the northwest extreme of Faanes.

Finsvik.—An occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at an elevation of 57 feet, from a small iron house situated on Lekshammeren, southern side of Trondhjemfiord.

Saltvik Havn.—An occulting light, with white and red sectors, visible 6 and 4 miles, respectively, is exhibited, at an elevation of 19 feet, from a small iron house situated at Saltvik, western side of Norvik sundet.

Levanger.—An occulting light, with white, red, and green sectors, is exhibited on the west side of the entrance to Levanger Havn.

The above lights are shown from July 20 to May 15.

Dangers—Beacons.—Breivikflu, 600 yards off the southern shore, $2\frac{1}{2}$ miles eastward of Tautra, is marked by an iron pole. Orsandgrund, with a depth of 3 fathoms, 1 mile northeast of Breivikflu, lies the same distance offshore.

Aasholmenflu, 600 yards northward of Aasholmen and 5 miles northeast of Orsandgrund, is marked by an iron pillar.

Nordgrundene are unmarked patches, with from 3 to 6 fathoms, lying from three-quarters of a mile to $2\frac{1}{4}$ miles westward of Aasholmen.

Hestöflu, lying $1\frac{1}{2}$ miles west from the south end of Hestöen, is marked by an iron pole.

Fiordgrundskjær, 2 miles east of the east point of Ytteröen, is marked by an iron pillar; Fiordgrundtaren and Skallen are sunken rocks, marked by iron poles, situated, respectively, one-third and two-thirds of a mile eastward of Fiordgrundskjær.

Directions.—With a careful use of the chart the eastward continuation of Trondhjem fiord can be navigated with safety, and no special directions are necessary. Anchorage can be obtained on the east side of Tautra, Faaneshavn, Felstadbugt, Levanger (as already stated), Rindan bugt (westward of Værdalsören), and other places on the southern coast. The shores of the channel northwestward of Ytteröen are clear of danger and steep-to, except at the southwest point of the island, where a reef projects to the distance of about 400 yards.

Beitstadfiord, the inner branch of Trondhjemfiord, is about 15 miles in length, east and west, and from 3 to $4\frac{1}{2}$ miles in breadth; it is almost an inland lake, the only entrance being through the narrow channel Skarnsund, on the west side of Inderö Peninsula.

Stenkjær, at the eastern extreme of Beitstadfiord, has about 1,900 inhabitants, who are for the most part employed in the timber trade. The town is built at the mouth of By Elven, which forms the outlet of the Snaasen Vand. Snaasen Vand is a beautiful lake, 64 feet above the level of the sea; it is about 20 miles in length, with a maximum breadth of 2 miles; the western extreme is about 5 miles northward of Stenkjær.

Lights—Vennesodden.—On the western side of Skarnsund, at its northern end, an occulting light, with white and red sectors, visi-

ble 6 and 4 miles, respectively, is exhibited from a small white iron house, at an elevation of 22 feet above high water.

Kirknestangen.—A flashing white light (unwatched) is exhibited from an iron post.

Bogetangen.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 19 feet, from a small iron house on substructure situated on the south extreme of Bogetangen, Stenkjær Fiord.

Stenkjær.—A group occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited at Stenkjær.

Beitstadsund.—On the eastern side of the south entrance to Beitstadsund, from a small iron house, at an elevation of 24 feet above high water, an occulting light, with white and red sectors, is exhibited.

The above lights are shown from July 20 to May 15.

Directions.—Skarnsund, 600 yards in width at its narrowest part, and with bold shores nearly throughout, presents no difficulty; Brura Rock, on the southern side of Venneshavn, is marked by an iron pole.

Beitstadsund extends northward and eastward about 6 miles to Hjellebotnen, and is apparently clear throughout, with anchorage almost anywhere in a not excessive depth of water; it is very narrow and suitable only for small vessels.

Værrasund extends 11 miles in a southwesterly direction from the western end of Beitstadfiord, with a general breadth of about half a mile, but contracts to a very narrow passage at 3 miles from its head, widening again to the westward; there would be considerable difficulty in obtaining anchorage in this arm.

SMÖLEN TO BRANDSFIORD.

Offlying islands—General remarks.—The three large islands, Smölen, Hitteren, and Fröjen, front the coast eastward of Kristiansund, and form the north side of the Inner Lead to Trondhjem from the southward, previously described.

Smölen is very low by comparison with the other islands and the mainland; Hitteren and Fröjen are rocky and high, but not mountainous. Hitteren is nearly 25 miles in length east and west, and from 7 to 9 miles in breadth; Smölen and Fröjen are much smaller. Between Smölen and the west points of Fröjen are the entrances to Ramsö and Fröi fiords.

Small islets, surrounded by rocks above and below water, extend about 12 miles northwestward of Fröjen, and from the northeast point of that island a scattered range of islets and rocks, terminating in the Halten cluster, stretches northeastward nearly 30 miles; these are known as the Frøerne. Between this range of islets and the

mainland, which trends in an almost parallel direction from Orland Peninsula to Brandsfiord, is the open space named Frö Havet (the Frö Sea).

Aspect.—When standing in toward the opening between Smölen and Fröjen from the northwestward, Kopperen, northward of Örland, Fonna, Stabben, and Tustern Mountains on the south side of Trondhjem Lead, will be visible in clear weather at a great distance. If the vessel is northward of Smölen, the mountains on Stabben and Tustern will be visible separately; but if westward of Smölen they will be shut in together, Tustern overtopping the group. If the mountains appear detached, and there is low land with outlying islets ahead, it must be Smölen; the high land on Hitteren will then be seen to the eastward, but Kopperen will be hidden by the hills of Fröjen.

Smölen is, as before observed, a comparatively low wooded island, with only a few elevated spots, none of which exceed 328 feet in height. It is encircled by a multitude of smaller islands, rocks, and shoals, especially on its northern and western sides, and the channels between are only available for small craft and boats with local knowledge. The island and some of the islets are fairly well inhabited, and there are several important villages on its north and west sides.

Lights.—The following lights are visible from the seaward approach to Ramsö and Fröi Fiords; they are shown from August 1 to May 15.

Skarholm.—A group occulting light, with white, red, and green sectors, is exhibited on Skarholm, on the south side of Odde Hölen.

Skalmen.—An alternating white and red flashing light is exhibited, at an elevation of 79 feet, from a white wooden house with tower 50 feet in height situated on the north side of Skalmen.

From the same tower, at an elevation of 70 feet, is exhibited a flashing white light, covering the Reiman Islands and Shoals to the northward.

Both the above lights are visible from a distance of 14 miles.

Bratvær.—On Torskholm, $1\frac{1}{2}$ miles northeast of Bratvær, situated on the northwest side of Smölen, an occulting light, with white and red sectors, is exhibited from a white iron house, 26 feet high, at an elevation of 43 feet above high water.

Olaskjær Light, situated in the inner channel eastward of Bratvær, 1 mile south of the preceding light, is group occulting, with white, red, and green sectors.

Veiholmen.—On Sengsholm, off the north side of Smölen, from a white wooden house, at an elevation of 22 feet above high water, an occulting light, with red and green sectors, is exhibited.

Haugjegla.—A flashing light, with white, red, and green sectors, is exhibited, at an elevation of 28 feet, from the northern part of Haugjegla.

Indvelen.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 19 feet, from a small iron house on iron frame, situated on Søndre Lejskjær.

Hauö.—A group occulting light, with red and green sectors, is exhibited, at an elevation of 16 feet, on the east side of Hauö, at the northwest point of entrance of Ramso fiord.

Vestre Suholm.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 28 feet, from a small iron house situated on Vestre Suholm.

Sæbuodden.—On the eastern side of the northern entrance to Ramsöfiord an occulting light, with white, red, and green sectors, is exhibited from a small white iron house on the west side of Sæbuö, at an elevation of 40 feet above high water.

Hernes-Strommen.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 36 feet, from a small iron house situated on Risöen, eastern side of Ramsö Fiord.

Hundholmen.—On Hundholm, about $3\frac{1}{4}$ miles northeastward of Sæbuodden, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 48 feet above high water.

In the above, the white, red, and green lights are visible at a distance of about 6, 4, and 3 miles, respectively.

Sletringen.—On Sletringen, off the west extreme of Fröjen and on the northern side of the entrance to Fröi Fiord, a group flashing white light, showing 4 flashes in quick succession every 10 seconds, is exhibited from a white tower 60 feet in height, at an elevation of 66 feet above high water, and is visible in clear weather from a distance of 13 miles in all directions, with exceptions noted in Light List.

From the same tower, at the elevation of 47 feet, a fixed red light is exhibited, visible at a distance of 12 miles over the outer shoals off Kyrhölen to the northward.

Titran.—On Sandholmen, about 1 mile eastward of Sletringen, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 23 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles.

Haavig.—At Haavig, $1\frac{1}{4}$ miles eastward of Sandholmen, an occulting light, with white, red, and green sectors, is exhibited, elevated 29 feet above high water. The white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively.

Ramsöfiord approach—Dangers.—The outermost danger off the north side of Smölen, west side of Ramsöfiord approach, is a reef which breaks; it is about 3 miles in length in a northeast and south-

west direction. Storböen, a rock at a depth of 9 feet on the north extreme, lies $3\frac{1}{2}$ miles north-northwestward from Veiholmen Lighthouse. Flaksböen, also covered with 9 feet water, is the rock on its southwest extreme.

Flesa, a rock above water, lies $1\frac{1}{2}$ miles within Storböen and Flaksböen, and with Skalmen, a lofty, narrow, isolated rock, lying northwestward from Bratvær Church, and Tonningen Bjerg, on Hitteren, form useful objects for cross bearings.

Reefs which break extend about 4 miles westward and northwestward of the Bratvær Islets.

Tonningen Bjerg, 758 feet in height, on Hitteren, bearing southward of 106° , leads northward of all these dangers; and Griphölen Light showing white, group occulting, bearing southward of 184° , leads westward of them. Kvitholm, a white islet on the west side of Ramsöfiord, bearing southward of 157° , leads eastward of these dangers, and of Gjesingboerne, a reef with rocks above water, on the west side of the approach to Ramsöfiord.

On the east side of approach to Ramsöfiord scattered islets and dangers extend about 10 miles northward of the whole length of Fröjen. The Kya and Baahaue Rocks, above water, lie nearest to the fiord, at about 5 miles north of the west extreme of Fröjen. About 2 miles westward of the Baahaue is Sönstflu, a patch of $4\frac{1}{2}$ fathoms, which breaks, bordering the channel. About 2 miles northward of it are patches of 11 and 14 fathoms, which break in bad weather.

Tonningen Bjerg bearing 151° open westward of Sletringen, the western islet of Fröjen, marked by its high white lighthouse, leads westward of all these. A narrow sector of red light from Sletringen covers the western edge of these shoals.

Pilots may be obtained from Bratvær and the Veiholmene, north side of Smölen, and from Titran, west end of Fröjen.

Tides.—It is high water, full and change, at Titran at Xh. 58m.; springs rise 6 to 7 feet.

Ramsöfiord, the westernmost of the northern entrances to Trondhjem Lead from seaward, lies between Smölen and Hitteren; it is about 7 miles in length in a north and south direction and from 1 to 2 miles in breadth between the numerous islets on either side of the fairway.

Dangers.—The principal dangers bordering the fairway in Ramsöfiord are: Mefiordboen, marked by an iron pillar, a rock near the extreme of a reef extending 1 mile eastward from Kvitholm, on the west side of the fiord; the same reef also extends about 1,200 yards northward of Kvitholm.

The west extreme of the reefs northward of Sæbuö, on the east side of the fiord, lies about $1\frac{1}{4}$ miles north of that island.

Östre Reiflu is a patch of $3\frac{1}{4}$ fathoms in the fairway, $1\frac{1}{2}$ miles northeastward of Mefjordboen. A patch of 5 fathoms lies $1\frac{1}{4}$ miles southeastward of Östre Reiflu.

Southward of Mefjordboen rocks extend into the channel eastward of the Vetholmene nearly 1 mile. Horkalboen, at about that distance southeast, is marked by an iron pillar.

Ramsöboen, near the fairway, about 1 mile westward of Ramsö, is marked by an iron pillar; and Ramsögallen, situated nearly 3 miles south-southeastward of it, on the north side of Trondhjem Lead, is marked by a black beacon. Fosflua, a patch of 3 fathoms, lies nearly midway, about 1,000 yards westward of the line joining them. A patch of 7 fathoms lies about one-third of a mile southwest of Ramsöboen, and a patch of 8 fathoms the same distance in the opposite direction. A patch of 3 fathoms lies at about 800 yards, and Breiflu, a patch of 9 feet at 1,200 yards southeastward of Dyrö, on the western side of the southern approach.

Directions.—The clearing marks for avoiding the dangers in the approach to Ramsöfiord are given on the preceding page. A pilot may be obtained from Veiholmen, on the west side of approach, if one has not been previously taken.

To enter the fiord, the west end of Sæbuö, or any visible rocks on the east side of the fiord, may be steered for when bearing eastward of 156° ; pass in mid-channel between the rocks above water southwest of Sæbuö and Mefjordboen pillar beacon; thence between Östre Reiflu, with $3\frac{1}{4}$ fathoms, and Nautskjærene southwest islet; thence on either side of the pillar on Ramsöboen and of Ramsögalten beacon, avoiding Fosflu and Austklakken, into the Trondhjem Lead.

Anchorage.—There are small temporary anchorages in the Bratvær Islets and the Veiholmene, west side of approach to Ramsöfiord, but only available with local knowledge.

Ramsöfiord has no good harbor; but small craft might put into Steinsösund on the west side of entrance. At Hammelvik, eastward of Sæbuö, and at the Ramsö Islets there is anchorage for small vessels, but the entrances are too intricate to be attempted without a pilot.

Fröi Fiord and Kraakvaagfiord.—Fröi Fiord, between Hitteren and Fröjen, is about 15 miles in length, and varies in breadth between the rocks on either side of the fairway from 600 yards to nearly 2 miles. The dangers on either side will be best understood by consulting the chart.

In the outer or western part of the fiord there is room for working, but it is very difficult to turn through the narrows in the eastern part of the channel on account of the strong tidal stream, which generally follows the wind. In clear weather, Kopperen Bjerg, on the main-

land, 1,562 feet in height, will be in sight the whole way through the fiord; it resembles a haystack in shape, and appears quite blue.

Directions.—The clearing marks mentioned above for approaching Ramsöfiord must be attended to until within the west end of Fröjen, when a pilot should be obtained from Titran.

The following remarks are deduced from the chart:

Having rounded the west end of Fröjen at the distance of about $1\frac{1}{2}$ miles, the northern islet of the Hilboan group, westward of Lyngvær, may be steered for when bearing about 90° , until within about 1 mile, when steer to pass about 600 to 800 yards northward of it; then with the black stone beacon on Edö bearing 83° a vessel will pass northward of the sunken rocks between Hilboan and the Lyngvær Rocks; when abreast the latter steer to pass about 400 yards northward of Edö. Eastward of this the channel is narrow, being only about 400 yards wide, requiring local knowledge to navigate it. There are iron poles on Vaholmflua, Kjærringvaagtaren, Ljusbotn, and Ramsböen on the south side of the channel, and on the north side a black stone beacon on Kjolholmskjær, abreast Edö, an iron pole on Kjolholmflua, and an iron pillar on Storflua.

Lights—Edö.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 35 feet, from a small iron house on piles situated on the north point of Edö, southern side of Froi Fiord.

Flesa.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 25 feet, from a small iron house on pillars situated on Flesa Islet, eastern entrance to Froi Fiord.

Meholm.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 30 feet, from a small iron house on stone beacon situated on Söndre Indtian, north of the eastern entrance to Froi Fiord.

Vestre Knarlagsund.—On Lille Mysingen, off the west side of Ulvö, an occulting light, with white, red, and green sectors, is exhibited, from a small white iron house, at an elevation of 32 feet above high water.

Dolmsund.—On Flesa Islet, at the eastern entrance to Dolmsund, 4 miles westward of the preceding light, an occulting light, with white and red sectors, is exhibited, at the height of 16 feet above high water.

Östre Knarlagsund.—On Svellungen, at the eastern end of Knarlagsund, and on the western side of the entrance to Kraakvaagfiord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 27 feet above high water.

The white, red, and green lights of the above are visible at the distance of 6, 4, and 3 miles, respectively. Shown from August 1 to May 15. www.libtool.com.cn

Kraakvaagfiord.—If entering Trondhjem Lead from Fröi fiord, give Ulvöen and Herö, on the west side of Kraakvaagfiord, a berth of about $1\frac{1}{2}$ miles, steering for Flessa Islet black stone beacon, when past the bearing of 174° , passing westward of Ugstenskjer and Ugstenen. Round Kraakvaagö at the distance of about 1 mile, if bound to Trondhjem, and shape course to pass southward of Smellingsflu beacon for Agdenes, when proceed as previously directed.

If bound to the westward, pass eastward of Sliskjærtaren and Sliskjer, marked, respectively, by an iron pole and by a black stone beacon with an iron pillar to the westward of it; and eastward of Storararren and Storafu, respectively marked by an iron pole and by two spar poles, into Trondhjem Lead, thence westward in mid-channel, reversing the directions already given.

At night.—The channel from Frö Havet and from Tarve Fiord, the Inner Lead from northward, is rendered available at night for those with local knowledge by the light on Böröholm, below mentioned. The vessel must be kept in the middle of the fixed white sector showing between 183° and 191° , the eastern limit of which passes close westward of Ugstenskjer, Sliskjertaren, and Sliskjer, and the western limit close eastward of Flessa. When within a mile of the light, steer to pass about half a mile eastward of it, and by keeping the light astern, bearing 308° until Söndre Leksen Light is sighted, the vessel will pass in mid-channel into Trondhjem Lead.

Light—Böröholm.—From the tower of a white wooden building, 40 feet high, on Böröholm, off the east end of Hitteren, is exhibited, at an elevation of 48 feet above high water, a light, with fixed and flashing white and red sectors, visible 11 and 8 miles, respectively. Shown from July 20 to May 15.

Anchorage.—Returning to the western entrance to Fröi Fiord described above, the anchorages between Titran and Trondhjem Lead will be found in the following order:

Within the Titran Islands there is anchorage close northeastward of Sandholm on which there is a lighthouse in a depth of 7 to 9 fathoms; when off the entrance to the harbor, which is eastward of Sandholm, the houses can be seen.

Two miles eastward of Sandholm there is a narrow anchorage at Fladö, with a depth of 13 to 16 fathoms; and farther to the eastward, on the southwest side of Ilsö, there is anchorage in 15 to 20 fathoms.

Small vessels might pass through Dolmsund, the narrow passage between Dolmö and Hitteren, in which they would find anchorage at Hopsö, opposite Dolm Church, and also at Heggaas, at the southeast

end of Dolmøen, abreast a beacon; but the tidal streams run through the sound with considerable velocity. The anchorage at Heggaas is the best, and has depths of from 5 to 14 fathoms.

In case of a shift of wind vessels would find anchorage in Knarlagsund, between Fjeldværø and Ulvøen; the holding ground is good and the depth is from 5 to 10 fathoms throughout nearly the whole sound; it may be entered either from the eastward or westward.

Between the southeast end of Hitteren and the south point of Börø there is anchorage in 8 to 12 fathoms, but there is a swell with northeasterly winds, and it is not so easy of access as Knarlagsund or Leksen.

On the southeast side of Storfosen there is good temporary anchorage.

At Fosenvaag, on the south side of Storfosen, there is good anchorage for small craft. Guldkisttarren, a sunken rock with a depth of 7 feet, lies in the approach, 600 yards west of the south point of Storfosen.

Cable.—A telephone cable lies across Dolmsund from Vikström to Vettaen. Vessels are cautioned against fouling it.

Frøjen to Halten Islands—Offlying dangers.—From the westward of Frøjen to the Halten Islands Lighthouse, a distance of 45 miles, are an infinite number of small and generally low islands, interspersed with rocks and shoals, known as the Froøerne. The outer rocks of this dangerous group extend in places nearly 40 miles from the mainland and upward of 5 miles from the nearest visible rocks, but the breakers will always be seen over the shallow heads and over many of those which have a considerable depth.

The whole should be given a wide berth, as nothing would be gained by coasting them, and the beacons and islets are probably not easily identified.

Pilots.—Pilots are obtainable from Halten Lighthouse. Fishermen occasionally resort to the outer islets of the Froøerne, and might be useful in case of need.

Lights off the north side of Frøjen:

Kya.—On Kya Islet, situated $6\frac{3}{4}$ miles northward of Sletringen, an occulting light, with white, red, and green sectors, is exhibited from a white iron house, at an elevation of 35 feet above high water. Shown from October 1 to April 15.

Søndre Kya.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 26 feet, from a small iron house on piles situated on Søndre Kya.

Homlingsvær.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 23 feet, from a small iron house on substructure situated on Likötaen, at a distance of 3 miles eastward of Søndre Kya Light.

Haakstein.—An occulting light, with white and red sectors, is exhibited, at an elevation of 54 feet, from a small iron house situated on islet in Indrehölen.

Kalholmen.—At Kalholmen, westward of Sulen, an occulting light, with white, red, and green sectors, is exhibited from a white iron house, at an elevation of 35 feet above high water.

Maltsækken.—At Maltsækken, northern side of Sulen, about a mile eastward of Kalholmen, an occulting white and red light is exhibited, at an elevation of 16 feet above high water.

Sulen.—A group flashing white light, every 15 seconds, showing 3 flashes in each group, and visible from a distance of 18 miles, is exhibited, at an elevation of 144 feet, from a white stone tower, 42 feet in height, situated on Store Sulen.

Two red fixed leading lights are exhibited from the northeast point of Store Sulen for leading into Sulen Harbor.

Sulsleikua.—An occulting light, with red and green sectors, visible 4 and 3 miles, respectively, is exhibited, at an elevation of 36 feet, from a small iron house on islet about 4 miles southeast of Sulen Light.

Mausund.—On the south point of Mauö, nearly 5 miles eastward of Sulen, an occulting light, with white, red, and green sectors, is exhibited from a white iron house, at an elevation of 96 feet above high water.

With the exception of Sulen the above lights are visible—white at a distance of about 7 miles, red and green at 4 miles. Shown from August 1 to May 15.

Islets and dangers—Beacons.—On Mauö, northward of the lighthouse, there is a black stone beacon.

Skogsö, nearly 5 miles eastward of Sulen, is higher than the neighboring islands, and is tolerably distinguishable.

Kya, near the southwest end of the reefs, is very low, but there are some fishermen's huts and a lighthouse on it. Tarbuskjær, northward of the Sulen group, is marked by a black stone beacon with a white diagonal stripe and white wooden topmark.

Staalskjæret, 2 miles northeastward of Tarbuskjær beacon, is marked by a black beacon.

Troldskjær is a rock above water about 11 miles northeastward of Staalskjæret pole and cross beacon. Vestflu, a patch of 7 fathoms, lies about 5 miles westward of Troldskjær, and is the outer danger; there is a depth of 65 fathoms half a mile seaward.

The outer and northernmost, as its name implies, is Utgrundsflu, a patch of 15 fathoms: northeastward of a line joining it to Halten Lighthouse are Ombakfald, Vestbrekka, and Ostbrekka, all of which break; the two latter only cover at high water. Halten Lighthouse bearing westward of 236° leads southeastward or within them.

Lights—Halten.—On the Halten Islands, the northern cluster of the Froöerne, at the west side of entrance to Frö Havet, stands a white stone tower with two black bands, 97 feet high, from which is exhibited, at an elevation of 128 feet above high water, a flashing white light, showing a flash every four seconds, which should be visible in clear weather from a distance of 17 or 18 miles in all directions.

Skanken.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 26 feet, from a small iron structure situated on Skanken, one of the Halten group.

Gimsan.—A flashing light every four seconds, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 38 feet, from a small iron house situated on the western of the Gimsan Islands.

Sauöen.—On the western side of Frö Havet, from a small white iron tower on the southeast extreme of Sauöen, an occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at an elevation of 29 feet above high water.

A group occulting light (showing two eclipses in each group), with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 21 feet, from a small iron house situated on the southwest point of the island.

Blejka.—A flashing light every five seconds, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 45 feet, from a small iron house on iron framework situated on the southwest point of Blejka, 2½ miles northwest of Sauöen.

Finvær.—A fixed, flashing, and group occulting light, with white and red sectors, visible 14 miles, is exhibited, at an elevation of 75 feet, from a white house on Finvær, 5 miles northwestward of Sauöen.

Dolsöen.—At Dolsöen, off the northeast end of Fröjen, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 36 feet above high water.

The above lights are shown from August 1 to May 15.

Anchorage among the Froöerne.—There are several anchorages available for small craft in charge of a local pilot; not otherwise. No directions can be given for them, and they are probably only used by fishermen in very small craft.

There is good anchorage in Sausund, westward of Sauö, north side of Frö Havet, 13 miles southwestward of Halten Islands, in a depth of 8 to 9 fathoms.

The harbor at Nordbuen, in the Lyngö group, 3 miles northeastward of Sausund, is also entered from Frö Havet.

The small harbor at the Halten Islands has a depth of 8 to 10 fathoms, sandy bottom. There are several fishermen's huts on these islets.

Frø Havet is about 30 miles in length in a northeast and southwest direction, and about 10 miles in breadth. It is the channel leading into Trondhjem Lead for vessels coming from the northward, and is available for all classes, being deep throughout. From the Halten Island Lighthouse, situated on the west side of the entrance, the distance to Trondhjem is about 75 miles.

Dangers.—The western side of the fairway is formed by the Halten Islands, Gimsan, Sauöen, Risöen, and others, and there are no known dangers on the channel side of a line joining them. Uttian, eastward of Fröjen, is foul to the distance of nearly 2 miles, but this is about 5 miles from the fairway track.

On the eastern side of the fairway, abreast Halten Lighthouse, dangers extend about 5 miles northwestward of the Almeningen Islets, Ranen, a patch of $3\frac{1}{2}$ fathoms, being situated at that distance; there is a patch of 13 fathoms 1 mile seaward of Ranen and 12 miles distant from Halten Lighthouse. Northeastward of Ranen, distant about 3 miles, is Borkklakken, a patch of $4\frac{1}{2}$ fathoms; these break with any swell.

Rodö Light in sight at night leads northward of it, and in the daytime Flessa Islet seen between Vaagsöen and Stokköen leads westward of them all. Southward of Ranen shoals extend about 3 miles westward of the Almeningen group and 1 mile off the Hosenöerne.

Flatholm, the westernmost island of the Malstenen group, has no dangers on the channel side of it, but shoals extend 5 miles northeastward in the direction of the Hosenöerne. Husöen, 10 miles southwestward of Flatholm, is foul to the distance of about three-quarters of a mile in places. Taarnet, an islet about 5 miles southwestward of Husöen, is foul to the distance of about half a mile. Ugstenskjør and Ugstenen, in Kraakvaagfiord, northward of Lyngo, both above water, have been referred to above.

Lights—Melstenen.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 46 feet, from a small iron house on pillars situated on Store Fladholm, Melstenen.

Tarven.—On Hegrestenen, the western Husöen, a fixed white light, with two flashing sectors, is exhibited from a white wooden house 29 feet high, at an elevation of 68 feet above high water. The light is visible in clear weather at a distance of 12 miles.

Klövholm.—A flashing light (unwatched) every five seconds, elevated 41 feet, showing white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited from a small iron house off the western side of Været.

Shown from August 1 to May 15.

Pilots.—Halten is a pilot station.

Directions.—To enter Frø Havet from seaward vessels should stand in well to the northward of Halten Lighthouse, distant at least about 5 miles, until it bears westward of 236° , when shape course to pass 4 or 5 miles eastward of it.

From the northward, along the land, it should be approached bearing southward of 183° to pass westward of Borklakken and other outlying dangers (Rödö Light in sight at night leads clear of them). When within 10 miles of Halten Lighthouse, shape course to pass 4 to 5 miles eastward of it, and when abreast it the course through Frø Havet is 208° ; the numerous islets bordering the fairway afford ready means for plotting the track of the vessel, so that allowance may be made for any set of the tidal stream.

From abreast Husöen, in the Tarven group, course should be shaped for the beacon on Flessa Rock, passing between it and Ugstenen Islet, and proceed as previously directed.

If obliged to work through Frø Havet without a pilot from Halten, a vessel should keep on the western side, both for safety and because it affords the best chance of obtaining assistance.

At night.—Coming from the northward Rödö Light should be kept in sight until Halten Light is sighted, when course may be shaped to pass about 4 miles eastward of Halten. When southward of the Gimsan Islets, and about 8 miles from Halten Light, steer to pass about 3 miles off Tarven Light, on the west side of Husöen; when abreast the light at about this distance, steer directly to Beröholm Light, in its fixed white sector, and proceed on for Trondhjem.

If bound to the westward, reverse the directions previously given.

Night navigation should not be attempted without a pilot.

Anchorage.—Besides the anchorages of Sausund, Nordbuen, and the Halten Islands mentioned above on the west and south sides of Frøhavet, there are some small harbors among the Tarven Islands on the east side.

On the northeast side of Gyltingen, the southernmost of the Tarven Islands, there is also a harbor for small craft.

Inner Lead—Northward from Trondhjem Lead.—That part of the Inner Lead between Beian at the entrance to Skjörnfjord and Bessakersund, and thence to Foldenfjord, is not only extremely intricate, but the scale of the published charts is so small that any description could not be fully understood if written; therefore all vessels should employ a "general coast pilot" before leaving Trondhjem, as the Government-passed pilots are not allowed to take vessels beyond Namsenfjord.

As it is impossible to give directions, the lighting is not described, but the principal shoals bordering the fairways are marked in accordance with the Norwegian system of buoyage.

See Light List and chart.

The channels from seaward leading to anchorages in the Inner Lead will be described in their proper order.

Anchorage.—Valdersund, the channel between Valsö and the mainland, affords anchorage for small or moderate sized vessels in depths of from 12 to 30 fathoms. A passage has been dredged through the sund, in which there is a depth of 13 feet at low water, marked by three black poles on the north side, and three white poles on the south side. Valdersund may be entered from Fröhavet by passing between the reefs extending from Giesin and Aarvær, the islet on the edge of the reefs extending southwest from Asen, if in charge of a pilot. Svineflu, a rock on the north side of the entrance, which is northward of Valsö, is marked by an iron pole, and a rock on the south side is marked by an iron pillar. In Stoksund, some 14 miles northeastward of Valdersund, there is anchorages at several places.

Krogö Havn, eastward of Marflessa Lighthouse, affords good anchorage in a depth of 5 to 6 fathoms, sandy bottom. Vessels may bring up either off the houses on the east side of Sydkrogö, opposite the mooring rings on the point, or farther southward. Between Lyngholm and the houses there is a small patch of 10 feet; otherwise the ground is even.

In Anstensund, northward of Almeningen Island, there is a safe anchorage for small craft in a depth of 7 to 8 fathoms, over sand; the sound is only 120 yards wide.

A vessel might also bring up for a time at Utro, northward of Roan Church. There are other anchorages well known to the pilots.

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CHAPTER VI.

HALTEN ISLANDS AND BRANDSFJORD TO LEKA.

General remarks.—Trondhjem may be said to form a connecting link between northern and southern Norway, which differ very considerably in many of their characteristics; its position, too, is geographically peculiar. The Scandinavian Peninsula is here only 250 miles broad, from Sundsvall, on the Gulf of Bothnia, to the North Sea at the entrance to Trondhjem Lead, and continues of nearly uniform breadth to Lulea, near the head of the Gulf of Bothnia, which is also about 250 miles from Bodö, on the west coast. The mountains of northern Norway, commonly known as the Kjölen Range, extend, though not in an unbroken chain, from the neighborhood of Alten, in latitude 70° (beyond which they rapidly decline), in a southerly direction to the parallel of Trondhjem, where they attain a height of nearly 6,000 feet at Sylfjeld, on the Swedish frontier. Here the expansion of the peninsula becomes apparent, and the mountainous surfaces, spreading in proportion, form those great tablelands of which the Dovre fjeld is a striking example, still, however, preserving a general parallelism to the western coast, which is everywhere nearly in contact with considerable hills. That part of the peninsula north of Trondhjem which belongs to Norway is both narrow and mountainous; it contains, therefore, a small population, and includes only 4 provinces, Nordre Trondhjem, Nordland, Tromsö, and Finmarken, while southern Norway contains 14. It is besides nearly destitute of longitudinal valleys; its rivers run comparatively short courses, and their banks offer but few level spots fit for cultivation, and still less accommodation for roads. The interstices of the hills which run from the main chain to the sea are occupied by fiords and gulfs; and in numberless cases these hills, being wholly separated from the mainland, form groups of precipitous, often almost inaccessible, islands. When to this is added the near approach to a sub-Arctic climate, where winter occupies about three-fourths of the year, it will be understood that in leaving Trondhjem we enter upon a country secluded by all its physical circumstances from the rest of the world, and possessing many corresponding peculiarities.

Halten—Light.—On the Halten Islands, the northern cluster of the Frö group, at the west side of entrance to Frö Havet, stands a white stone tower with two black bands, 97 feet high, from which is exhibited, at an elevation of 128 feet above high water, a flashing white light, which should be visible in clear weather from a distance of 17 or 18 miles in all directions.

Dangers.—Foul ground extends for about 3 miles northwestward of Halten Light, the outer danger being Ombakfald, with a depth of 2 fathoms.

Coast.—Between the Almeningen Islands, nearly abreast Brandsfjord, and the Vigten Islands, a distance of nearly 40 miles, there are comparatively few outlying dangers; the entrances to the harbors from seaward are consequently shorter than those to the northward, and vessels may with greater safety approach the coast in order to identify the landmarks or obtain a pilot. This part of the coast being, however, fully exposed to southwesterly gales, is much feared by the coasters. The Vigten Islands possess hardly any harbors of refuge, and in addition to being surrounded by outlying rocks and reefs they are rendered still more dangerous by an on-shore set into the bays northward and southward of the group. See below.

These islands form the commencement of that vast fringe of islands, rocks, and shoals which stretches along the coast as far as the entrance to Vestfjord, and sometimes extends fully 30 miles from the mainland; this fringe is termed in Norway the "skjærgaard."

Southward of the Vigtens are the extensive fiords Folden and Namsen, which are annually visited by numerous vessels in connection with the herring fishery and timber trade. These fiords are deep and, with few exceptions, free from dangers; they have also several good harbors.

Pilots are stationed at Oksbaasheia, Villa, Björövær, Namsos, Gjeslingen, Nærösund, Vigten, and Leka.

Tidal streams.—The stream during the flood sets to the northeast during fine weather, and during the ebb to the southwest; but in general the northeast-going stream (increased by the prevailing current) is the stronger, especially at the distance of 20 or 30 miles from the land. In continued stormy weather, with the wind from about south or west, the stream runs strongly and constantly to the northeast, and with northerly or easterly gales to the southwest, but not so strongly as in the former case. Within the islands the flood stream always sets to the northeast and the ebb to the southwest; but here also the northeast-going stream is the stronger.

Tides.—It is high water, full and change, at Villa at XIh. 20m.; extraordinary springs rise 8 feet.

Aspect of coast.—When approaching the coast 6 or 8 miles northward of the Halten Islands, land will be seen, in clear weather, as far

southward as Tönnelsfjeld, 1,220 feet in height, on the south side of Valsfjord, and from thence northward to Oksbaasheia, a distance of about 40 miles. About 2 miles eastward of Tönnelsfjeld are Lille and Store Kopperen; Store Kopperen, 1,562 feet in height, looks like a haystack, and may be seen from a distance of 30 or 40 miles in clear weather. On the island of Vaagsöen, about 15 miles northward of Kopperen, is Linesfjeld, 751 feet in height, and Stemmen, and in the steep cleft between these hills is a small hummock named Stemmen Kalve. Almeningen, which has a smoothly rounded peak in the middle, presents the same appearance when seen from the westward or northward, and is visible at a distance of 12 to 15 miles. Close to the northward of it is a group of low islands named Været, upon which there are three knolls. The hill within Vik is high and stands out distinctly from the land to the northward; Skjærvöen, an island off it, is much lower, and from the westward looks like a sugar loaf. Brandsfjord looks like a cutting between the hills on either side.

If farther to the northward, between Skjærvöen and Oksbaasheia, Hepsöen, Ramsöen, 499 feet in height, and the two Rödo Islands, with their lighthouses, may be distinguished; they are all tolerably high, but Ramsöen is the largest and most conspicuous, and is visible about 16 miles in clear weather.

Ranen and Borklakken Shoals, the dangers on the east side of approach to Frøhavet, have been described in the preceding chapter.

Kaura Leden, abreast Brandsfjord, is the channel northward of Borklakken Shoal and Kaura, the northernmost of the Været Islets; it is the first passage northward of the Halten Islands by which a vessel may enter the Inner Lead, or seek an anchorage.

Fishermen from Almeningen, who are capable of piloting a vessel, will generally be found near Ranen and Borklakken Shoals.

The black stone beacon on Kaura bearing 134° will lead in between Borklakken and Tarefaldet, a patch of $3\frac{1}{2}$ fathoms about 5 miles east-northeastward of it; pass eastward of Kaura at a distance of about 400 yards and proceed either for Krogö Harbor within Sydkrogö, or Bessaker sund. The services of a pilot are necessary.

Lights.—**Marflessa**, on Kraaka Rock, is occulting, with white, red, and green sectors.

Almeningsveret.—On Farmandsö an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 91 feet above high water.

Terningen.—On Storskaget, at the southwest side of entrance to Brandsfjord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 24 feet above high water.

In the preceding, the white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively, and the lights are exhibited from August 1 to May 15.

Bessaker Sund.—On Bessakerholm an occulting light, with white and red sectors, is exhibited from a small white wooden house, at an elevation of 88 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles.

Directions.—To enter Bessaker Sund, pass eastward of Kaura, as previously directed, thence southward of the two iron pole beacons on Vetmoboen; when the sound is open proceed through it in mid-channel.

The anchor may be let go either opposite the mooring rings on the largest of the small islets eastward of Börö, in a depth of 7 to 8 fathoms, over sand, or between these islets and Börö, in 10 to 11 fathoms. On the south side of the sound, opposite the houses at Bessaker, there is a depth of 7 to 8 fathoms, over sand, and more shelter from northerly winds. Farther in to the eastward, between Lóa Holm and the houses at Vik, there is a spacious and secure harbor with a depth of 12 fathoms, over sand.

From Bessaker Sund small vessels may proceed either northward or southward through the Inner Lead, if in charge of a pilot.

Klepholm Leden, northward of Klepholm and Flatö, also leads to Bessaker Sund, but the passage, though deep, is very narrow.

Kya is a small isolated holm about 8 miles northwestward of Rödö Lighthouse, and nearly 5 miles seaward of the dangers outlying the coast; it is surmounted by a black stone beacon with a white cross; in clear weather can be seen at a distance of 12 miles, and forms a capital landmark. A patch of 6 fathoms lies about 600 yards northwestward of Kya.

Aspect of coast from Kya.—Having approached Kya in clear weather, land will be visible extending from Store Kopperen to Heilhornet, a mountain 20 miles eastward of the inner Vigdens. From this position the Almeningen Islands, Skjærvö, and other islets may be distinguished. Vik Skjelen is high, projecting, and smoothly rounded. Hepsö, Ramsö, and the Rödö groups stand out distinctly from the mainland; Ramsö, 499 feet in height, is the highest, and has a small rounded peak on the north side of the summit. At the inner end of Vingefjord, on the south side of Helvikkeipen, is the remarkable mountain Halsfjeld, 1,654 feet in height, in which there is a deep cleft, and on the south side of the cleft a large round knoll. Helvikkeipen may be known by the opening on either side.

Oksbaasheia is the nearest land east of Kya; it is 748 feet high, stands out distinctly, and the outline of the southern slope is very irregular; on the southern part of Oksbaasheia, at the north side of

the entrance to Svesfiord, are two prominent knolls named Sæterklumperne. Halmö is somewhat higher than Villa, and may be known by its steep slope toward the sea. Villa Island is something in shape like a haycock or sugar loaf, and has a black stone beacon with white belt on it. About 7 miles eastward of Villa is Bolvigsula, a hill 1,750 feet in height, which has a beacon on its northernmost peak; these appear more distinctly separate from each other when seen from the northward. Björö is not easily distinguished from the mainland at a distance, but the lighthouse will possibly be made out. The lighthouse on Nordö, of the Vigten Group, may be seen, and on a nearer approach a few of the islets. See remarks on the Vigten Islands, next chapter.

Approaching the coast in clear weather, Heilhornet will be the first part of the mainland that is seen; it is a steep isolated mountain rising to a pyramidal peak 3,600 feet above the level of the sea, and is twice the height of the surrounding country; in clear weather this important landmark can be seen at a distance of 50 or 60 miles. The first noticeable objects southward of Heilhornet are Tviberg and Apeltua, in Foldenfiord, which stand well out from the land behind them; Apeltua is especially conspicuous; it resembles a broad sugar loaf or tower, and is separated from Hundhammer by a deep valley.

Southward of Apeltua, the hills on Gjöen or Jöen, and Hammes huk on Otterö (1,408 feet), show distinctly against the mainland in the background. On the northern part of Otterö there are also two remarkable sugar-loaf hills close together, named Aglensvik (1,391 feet); and when nearer the land a similar but smaller hill will be seen to the northward of them. Near Hammes huk, but on the opposite side of Namsenfiord, is the Vardfjeld, which is separated from the high land to the southward by a deep ravine. It is difficult to distinguish Björö from the mainland beyond the distance of 10 or 12 miles; Kvernö, Villa, and Halmö are steep, and show out more distinctly.

Entrances abreast Rödö.—The next entrance to the Inner Lead northward of Klepholm Leden is abreast the Rödö Islands, between Bremsflesa and Sönflesa, rocks above water and 3 miles apart, 4 miles and 2½ miles, respectively, from the islands.

Dangers.—Sunken rocks extend about 1 mile northeastward of Bremsflesa, at the extreme of which is a patch with a depth of 7 fathoms forming the southwest side of the entrance; Jupafaldene, with 1½ fathoms, lies close within the 7-fathom patch. Torssevelen, a 3¼-fathom patch, lies 1½ miles eastward of Bremsflesa. Estengrund, a patch of 14 fathoms, lies 1½ miles within the 7-fathom patch, on the south side of the fairway in the direction of Rödö Lighthouse. The foul ground extending about half a mile northward from the channel between the Rödö Islands is marked by a pole.

Bargrunden, a patch of 6 fathoms, lies about three-quarters of a mile southwestward of Sönflesa, and forms the north side of the entrance channel; within it, $1\frac{1}{2}$ miles eastward, on the north side of the fairway, is Mefaldbogen, a patch of 9 feet. These rocks break in bad weather.

The Buholmene group of islets and rocks, of which Sönflesa, just mentioned, is the southwesternmost islet, is about 3 miles in extent, and separates the entrance to the Rödö groups from the westward from that leading from the northward.

Foul ground, with rocks awash in places, extends about three-quarters of a mile westward of the peninsula separating Svesfiord from Bolefiord, of which Oksbaasheia is the summit, between which and toward Buholmene is the northern channel.

Sunken dangers and islets extend about 3 miles seaward of the north extreme of Oksbaasheia, and of the land northeastward of it.

The outermost is Grundene, a reef 3 miles in length, parallel to the coast, with many rocks above water.

Beacons.—In the northern approach are the following beacons:

On one of the Grundene Rocks, nearly $2\frac{1}{2}$ miles north of the islet off the north end of the Oksbaasheia, is a black beacon.

On Storkolla, nearly 1 mile west of the same islet, is a black stone beacon with a white belt. Several other dangers on the sides of the passage are marked by iron and spar poles.

Lights—Rödö.—From a white wooden dwelling, 24 feet high, on the summit of Nordre Rödö, is exhibited, at an elevation of 282 feet above high water, a light with fixed and flashing white and red sectors, visible in clear weather from a distance of 19 (red 14) miles.

On Söndre Rödö two alternating red and white lights, 453 yards apart, are exhibited, at elevations of 42 feet and 170 feet above high water, which can be seen at a distance of 7 miles. The lights are visible from 176° to 216° , and in line bearing 196° lead in mid-channel between Buholmene and Nasvagskaren (marked by iron and spar poles); they show with greatest intensity on that line.

Troldsteinodden.—A group occulting light (unwatched), elevated 61 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited on Troldsteinodden, southwest end of Kvalö; it shows groups of two eclipses.

These lights are exhibited from August 1 to May 15.

Pilots.—See above.

Directions—Anchorages.—The approach to the entrance to the Inner Lead from westward of Rödö Lighthouse, is easily recognized by Kya Islet, which lies about 5 miles seaward of all the dangers. The islet, with the Bremflesa and Sönflesa Rocks above water on either side of the western entrance, and Rödö Lighthouse within, afford ready means of checking the position of the ship. Rödö Lighthouse

being steered for bearing 103° from a position southwestward of Kya, will lead in between Jupafaldene and the Bargrund as far as the island, passing close to the foul ground on the south side of the channel nearly 1 mile westward of the lighthouse, and marked by a pole, before reaching which haul somewhat to the northward.

Pass northward of Rödö at the distance of about a quarter of a mile, and haul round eastward of it in mid-channel; thence southward for the anchorage at Vingsand, where there are depths of 6 to 7 fathoms, sand; or pass eastward into Svesfjord.

About $1\frac{1}{2}$ miles southward of Vingsand there is anchorage in the bight on the northeast side of Ramsö; and between that island and the mainland to the northward there are depths of 10 to 12 fathoms, sand.

From Ramsö vessels may pass between the island and the mainland to the Inner Lead southward, in charge of a pilot. There is a channel southward, leading westward of Rödö Islands, between them and the Hestskjær, thence westward of the foul ground extending southwest of Søndre Rödö, marked by poles. A beacon also stands on this foul ground.

At night.—Rödö Light, showing fixed white (bearing 103°), will lead in, as in the daytime; when within Mefaldbogen, edge northward into the flashing light, and thence into the red light, rounding Rödö at the distance of about 600 yards, thence southward to Vingsand. It is not recommended to enter at night without a pilot; and no directions are offered for navigating within Rödö.

Neither is it advisable to offer directions for the northern channel, as a pilot should be employed.

Foldenfiord approach.—Foldenfiord, leading to Namsen and Rödö-sundfiords, lies between the shoals extending southwestward from the Vigten Islands on the north and the coast and islands northeastward of the Rödö Islands on the south. About 30 miles above Villa Island Foldenfiord is reduced to a width of about 400 yards over a distance of about 2 miles, above which it is known as Indre Foldenfiord.

Dangers.—Kya Island lies in the approach from the southward, and is a capital landmark, as before stated. The nearest rocks above water outlying the Vigten Islands are the Nylandskjærene, at about 15 miles northeastward of Kya. Between there are several rocky patches with from 9 to 13 fathoms water, over which the sea breaks in heavy weather. They are named Sveskallen, Østvikklakken, Skillogen, and Klakken, and have very deep water around them; their positions will be best understood by referring to the chart. Abel-tuen, 528 feet in height, a hill immediately north of the entrance to Foldenfiord, open southward of the Nylandskjærene, bearing 79° ,

leads southward of Klakken and all the Vigten Island dangers, as also does Björö Light in sight at night, showing red.

Within Grundene on the south shore there are no dangers beyond about half a mile seaward of the rocks above water.

The center of the fiord northeastward of Rekö has a mass of shoals extending eastward to the Abelvær, a distance of about 8 miles; on their southern edge, forming the north side of the fairway, are the Syd Hunden and Flottra Rocks, above water, guarding the channel.

Lights and beacons.—In Foldenfiord and approaches are the following lights and beacons. The lights are exhibited from August 1 to May 15.

Ellingraasa.—From a white dwelling 35 feet in height near the west point of Björö is exhibited, at an elevation of 74 feet above high water, a light with fixed and flashing white and red sectors. The white light is visible in clear weather at a distance of 14 miles, red light at 13 miles. See sketch on chart.

Jensholmen.—An occulting light, with white, red, and green sectors, is shown on Jensholmen, northern side of Björö.

Rekö.—From a small white wooden house on Rekö is exhibited, at an elevation of 56 feet above high water, an occulting light, with white and red sectors.

On Rekö there is also a black stone beacon with white belt.

Vordsund.—On Lejholm, $2\frac{1}{2}$ miles eastward of Rekö, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 26 feet above high water.

Namsenfiord.—**Sörnamsen Light**, on Finsneset, west side of the fiord, is an alternating white and red light, elevated 19 feet above high water. It is visible 7 to 9 miles, strongest to seaward.

Bromsnes.—On Bromsneset, east side of Namsenfiord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 28 feet above high water.

The white, red, and green lights of the above (except Ellingraasa and Sörnamsen) are visible at the distance of 6, 4, and 3 miles, respectively.

Bangsund.—An occulting light, with white, red, and green sectors, is shown from the north point of Brandö entrance to Lyngenfiord.

Nordöerne (Nördö).—On Surençen, north side of approach to Foldenfiord, from a white wooden house, 33 feet in height, is exhibited, at an elevation of 118 feet above high water, a fixed white light, giving a bright flash every four minutes, and visible from a distance of 17 miles in clear weather between the bearings seaward of 326° and 190° .

On Guldkisten, about 1,600 yards northwestward of the lighthouse, is a black stone beacon.

Veirskaflet.—On the northern islet, about two-thirds of a mile from the above, an occulting light, with white, red, and green sectors, is exhibited, elevated 38 feet above high water. The white light is visible at a distance of 7 miles, red and green lights at 4 miles.

Raaholm.—A group occulting light (unwatched), showing groups of two eclipses, elevated 44 feet, is exhibited from a small iron house on the north end of Raaholm; it shows white, red, and green sectors, visible 7, 4, and 3 miles, respectively. This light may be extinguished without notice.

Gjæslingerne.—On Haraldsökraaka a flashing light is exhibited, at an elevation of 81 feet, from a tower 79 feet high. It is visible 14 miles. From the same tower an auxiliary fixed light, with red and green sectors, is shown.

Tronflesa.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 46 feet, from a small iron house on stone beacon situated on southern end of Tronflesa, about 3 miles westward of Gjæslingerne Light.

Kvitingen.—A group occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 22 feet, from a small iron house situated near the southwestern end of Kvitingen, 2½ miles northwest of Gjæslingerne Light.

Sörgjeslingerne.—On Nordre Skarveskjær, 1½ miles west of Gjæslingerne Lighthouse, an occulting light, with white, red, and green sectors, is exhibited, at 26 feet above high water. White, red, and green lights are visible at 6, 4, and 3 miles, respectively.

On Kvernholm, 2 miles westward of Gjæslingerne Lighthouse, is a black stone beacon surmounted by a cross.

Grinna.—On Grinna, 3½ miles northeastward of Haraldsökraaka, situated on the northern side of Nærösund approach, a light, with fixed and flashing white, red, and green sectors, is exhibited from a red iron tower, 62 feet high, standing on a stone base, and elevated 75 feet above high water. The white, red, and green lights are visible at the distance of 14, 14, and 13 miles, respectively.

Abelvær, south extreme of Kalvö, is an occulting light, with white and red sectors, elevated 33 feet above high water, visible at the distance of 6 (red 4) miles.

On Synstholmen, half a mile westward of the lighthouse, is a black stone beacon; there is a similar beacon in Abelvær Inlet.

Oterholmsund.—On Storö, 2 miles northwestward of Abelvær Lighthouse, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 34 feet above high water. The white, red, and green lights are visible at a distance of 7, 4, and 3 miles, respectively.

On **Præstøgalten**, about 600 yards southwestward of **Præstö**, at the southwest approach to **Nærösund**, is a black stone beacon.

Kvalholm.—An occulting light, with white, red, and green sectors, is shown on the northwest point of **Kvalholm**, south side of **Foldenfiord**.

Galtnesskjær.—An occulting light (unwatched), elevated 13 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on **Galtnesskjær**.

Kjeö.—A group occulting light, with white, red, and green sectors, is shown on **Kjeö**, 4 miles northeast of **Kvalholm**.

Anchorage.—**Ellingraasa** or **Ellingsund** lies between **Björö** and **Ellingen** Islands, and is approached from seaward between **Lilletarren** and **Leira Shoals**, about three-quarters of a mile apart, with depths of 6 and 10 fathoms, respectively, and which only break in heavy weather.

There are two black stone beacons on **Ellingen**, and a lighthouse on **Björö**.

It is advisable to employ a pilot if wishing to enter **Ellingsund**; but to enter without one, steer in with **Björö Lighthouse** between the bearings of 96° and 86° (fixed white light at night), thence round **Ellingen** at the distance of 400 or 600 yards.

A vessel should keep on the north side of the sound when proceeding to or from the anchorage.

Halmöraasa.—If there is so much northing in the wind that a sailing vessel from the southward can not fetch the anchorage in **Ellingsund**, she may bear up for **Halmöraasa**, eastward of **Villa** and **Halmö**.

Entering **Halmöraasa**, keep in mid-channel eastward of **Svartoksen**, the northernmost small black holm off **Villa**, on which there is a white beacon with a black belt; pass eastward of **Skaar**, thence close to west point of **Kvernö**, and steer for the northeast point of **Dragö**.

Having passed westward of the rocks off **Glasö**, keep close in to **Dragö**, and proceed for the anchorage eastward of the houses. There are depths of 6 fathoms close to the east side of **Dragö**, and 8 to 10 fathoms in the middle of the sound, over sand and clay.

The northern anchorage in **Halmöraasa** is in the bay on the west side of **Kvernö**, in 6 to 7 fathoms, but it is not a safe place with the wind at northwest.

About 200 yards westward of **Halmö Church** there are depths of 12 to 14 fathoms, over sand and clay; and there is also anchorage off the east point of **Aspö**.

Reköraasa—**Pilots**.—**Reköraasa**, between **Havnerö**, on which is a pilot station, and **Rekö**, leads from the northward to the anchorages on the east side of **Björö**, and is the next inlet northward of **Ellingraasa**.

To enter Reköraasa it is only necessary to keep in mid-channel; thence steer for the houses on Björö, passing between Björö and the pole off the north extreme of Lindö Reef.

From the fairway of Foldenfiord, the fixed white sector of Rekö Light leads to the entrance to Reköraasa; bring up about 600 yards southward of the warehouse, in a depth of 5 to 6 fathoms, over sand and clay.

From this anchorage a vessel may put to sea through the passage southeastward of Björö, but the channel is narrowed by numerous rocks, which only a pilot will know how to avoid.

Namsenfiord lies on the south side of Foldenfiord about 3 miles within Rekö Lighthouse, and from its entrance the distance is 20 miles to the town of Namsos, above which is the Namsen Elv; the fiord has an average breadth of about 1 mile with deep water throughout.

Directions.—Coming from the southward, Kya Island, situated about 5 miles seaward of all dangers, is a capital landmark. From abreast it, course should be shaped to pass about 1 mile northward of Villa, the Björö group, Rekö, and the black and white stone beacon on Svenskjær eastward of it. When the fiord is well open steer through the entrance in mid-channel; thence continue to Namsos guided by the chart.

Coming from the northward, Nördö main lighthouse should be given a berth of 6 to 7 miles to avoid the Hilleröen and other dangers extending about 5 miles southwestward from it; when southward of the Klakken (9-fathom patch), steer for the entrance to Namsenfiord, and proceed as above.

At night it is not advisable to enter Namsenfiord without a pilot, though it is possible, but a difficulty would arise in seeking anchorage. The lights on Björö, Nördö, Rekö, and on Finsneset and Bromsneset in Namsanfiord, offer every facility for fixing the position of the vessel. The western limit of Finsneset Light leads just eastward of the dangers on the west side of the entrance.

Anchorage.—A vessel might bring up to wait wind or tide at Sandmö, on the south side of Namsenfiord, 3 miles within the entrance; but the first good anchorage is in the sound between the Ledang holmene, about 3 miles southward of Sandmö, in a depth of 10 to 12 fathoms, sand and clay.

There is temporary anchorage at Statland; and in Hjertviksund, anchorage may be found at Saltnes and opposite the warehouses at Morken.

Small craft may bring up off the north side of Hoddö and in the cove on the east side of Hoddö, and there is temporary anchorage at Sund, westward of Skjæröpö, and also off the northwest side of Gaa-sungen. Hövik is a good small harbor with a depth of 8 fathoms over

sand and clay, but the north side of the cove is bordered by shallow water.

Near the mouth of Namsen Elv, which enters Namsenfjord a little eastward of Namsos, there is anchorage between Kvaholm and the mainland; also in Præstvik, Storvik, and the bight to the eastward; also in Andfindvik on the west side of Namsos, but the inner part is shallow. There are several mooring posts on the edge of the shoal northward of the town; also three buoys. The Namsen is too rapid to be navigable, but timber is floated down.

Namsos, a trading town with a population of about 2,500, has a building yard at which are constructed vessels up to 200 tons burden; the harbor is chiefly frequented by vessels loading with timber and plank from the steam sawmills. Fish is also an article of export.

Supplies.—Water and provisions may be obtained at Namsos, but there are no facilities for repairs other than for small wooden vessels. There is a hospital here.

Coal.—From 300 to 400 tons are usually kept in stock here. Coal is brought alongside in lighters.

Communication.—There is a weekly mail steamer, and communication by electric telegraph with other places, but no railway.

Lyngenfjord extends about 8 miles in a southwesterly direction from Namsenfjord. Aasneset, a village at the head of the fjord, is less than 15 miles from the northern extreme of Trondhjemfjord, with which it is connected by road. There are glass works at Aasneset.

Vessels may pass between Skjærpö and the rock on the western edge of the extensive shoal which lies at the entrance to Lyngenfjord to the anchorages in Bangssund, Altvik, and Fiævik.

Rödsund and Gylte fiords.—Rödsundfjord, between Otterö and Jöen, is connected with Namsenfjord by Lövfjord, Surviksund, and Lokkaren; and with Gyltefjord by Seierstadfjord. From Gyltefjord, between Jöen and the mainland, vessels may also pass through Nord-sund, eastward of Elvenö, to Lokkaren and Namsenfjord. Nearly all these channels are narrow and tortuous, and a strong stream runs through them, generally to the northward; they are, however, for the most part free from dangers.

Lights—Jeviken.—On the western side of the northern end of Rödsund an occulting light, with white and red sectors, is exhibited, at an elevation of 33 feet above high water.

Lövöen.—On the summit of Lövä, in Lövfjord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 92 feet above high water.

Lokkaren.—On Otterö, and toward the southern end of Lokkeran, an occulting light, white, red, and green sectors, is exhibited, at an elevation of 18 feet above high water.

The white, red, and green lights of the above are visible at the distance of 6, 4, and 3 miles, respectively. Shown from August 1 to May 15.

Stokgrund, in Foldenfiord, about a mile northwestward of Otterö and of the fairway to Namsenfiord and Rödsund, breaks constantly; it is marked by an iron pole.

Vessels may pass on either side of Stokgrund, and proceed into Rödsund as soon as the entrance is well open.

Anchorage may be found in Saltbuviken, on the east side of Otterö, and in the bay at Strömmen, on the west side of Elvenö; a spit extends 200 yards off the point on the south side of the entrance to Strömmen Bay.

Survik, a small cove at the south end of Surviksund, is a good harbor for small craft; the depth is 5 to 8 fathoms, over sand and clay, and there are mooring rings northward of the houses.

On the east side of Lokkaren there is temporary anchorage at Halsos and Katmark.

To enter **Gyltefiord** vessels may either pass through Brakstadsund, between Jöen and the islets to the northward, or between Taarnfald, which generally breaks, and Flottra, and steer eastward till the entrance to the fiord is well open. Shoals extend about 400 yards from the points of Brakstadsund; otherwise the channel is clear.

There is a good anchorage in the cove at Brakstad, on the south side of Brakstadsund, in a depth of 4 to 6 fathoms, sand and clay.

Small craft may bring up in the bights between Tingstad and Botne, on the east side of Gyltefiord; and on the east side of Nord-sund, about a mile within the north entrance, there is good anchorage in the cove at Brisselien, in 8 to 10 fathoms, over sand and clay.

Foldenfiord.—The whole of the open space eastward of Villa and Klakken, and southward of the islets off the Vigtens, is known as Foldenfiord by the fishermen and pilots, but the entrance to Foldenfiord proper is between Jöen and the Abelvær group. Indre Foldenfiord extends about 15 miles in an east-northeast direction from Kvistenfiord; it then bends to the southward and runs about southeastward for nearly 13 miles; the channel is very narrow throughout. Southward of Heilhornet, Indre Foldenfiord is only separated from the southern branch of Bindalsfiord by a neck of land about 1 mile in breadth.

The only dangers in Foldenfiord eastward of Stokgrund and Taarnfald (mentioned in connection with Namsen and Gylte Fiords) are Mefaldstaren, marked by one iron and one spar pole, $1\frac{1}{2}$ miles eastward of Falderaa; Lille Taren and Store Taren, about 600 and 800 yards southeastward of Oksningen; and Kjeotaren, 600 yards from the west side of Kjeholm, at the entrance to Kvistenfiord.

Klumptaren, in Kvistenfiord, is marked by an iron pole. Southward of Kvistenfiord is Opløifiord, in the entrance to which is Galtnesskjær, marked by an iron pole.

Anchorage.—Amongst the Gjæslingerne, a group on the north side of Foldenfiord, there are two places where a large vessel might anchor; and small craft or vessels of moderate size might bring up in most of the sounds between the islets and rocks forming the cluster, in a depth of 3 to 4 fathoms, but the services of a pilot are necessary.

There is a small harbor at Abelvær, on the north side of Foldenfiord, but a pilot is necessary to point out the entrances, which are very narrow and difficult to make out.

Langvaagen is also a small harbor, with a depth of 4 fathoms over sand and clay, between Hatholm and Purkholm; the entrance is eastward of Hatholm and southward of Fladholm and Purkholm.

On the south side of Foldenfiord, at Smednes, 5 miles eastward of the entrance to Gyltefiord, there is anchorage in a depth of 4 to 5 fathoms, over clay and sand, off the houses on the southeast side of the point.

On the south side of Kvistenfiord, the head of Foldenfiord, there is anchorage eastward of the houses on the northeast point of Buö. When entering Kvistenfiord, vessels should pass about 200 yards westward of Kjeholm to avoid Kjeotaren and the rocks off Oksningen.

Directions.—The directions for Namsenfiord should be followed from the sea to a position abreast Svenskjær beacon; thence proceed eastward on either side of Stokgrund beacon, southward of Flottra, and to the desired anchorage.

Inner Lead.—The Inner Lead from Trondhjem Lead northward as far as Foldenfiord is, as stated in preceding chapter, extremely intricate, and the scale of the published charts so small that a written description could not be fully understood; all vessels must employ a pilot.

The Lead northward from Foldenfiord will now be followed:

Nærösund, the Lead northward from Foldenfiord between Nærö and Indre Vitgen, is by no means a difficult passage, as the dangers off the south entrance are easily avoided; but as the Vigten Islands obstruct the direct course of the tidal streams, the water is forced through the narrow straits eastward of Indre Vigten with a velocity hardly to be stemmed by sailing vessels during the strength of the tide, even with a commanding breeze.

Lights.—The lights on the Gjæslingerne and on Grinna, on the northwestern side of the southern approach, and the lights on Abelvær and Storö, on the southern side of Nærösund, are mentioned with Foldenfiord.

Nærösund Light, exhibited from a white house with low tower, at an elevation of 49 feet above high water, is a light, with white

and red fixed sectors, and white flashing sector, visible 11 and 8 miles, respectively.

Strömö.—On the northwest side of Strömö, about 2 miles north-eastward of the preceding light, is exhibited from a small white wooden house, at an elevation of 98 feet above high water, a white and red alternating light, visible at a distance of 12 miles.

Borvik.—On Lille Lyngö, upon the southeast side of Nærösund, abreast Strömö, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house on piles, at an elevation of 15 feet above high water.

Stangholmgalten.—On a sunken rock at the entrance of Nord Salten, from a white iron house on piles, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 14 feet above high water.

Gjerdingen.—An occulting light, visible 13 miles between the bearings of 144° to 150° , is exhibited, at an elevation of 93 feet, from a small iron house on Gjerdingen.

On Lamholm, nearly 1,000 yards 327° from the above, are exhibited a fixed white light, visible 11 miles, and an occulting light, with white, red, and green sectors. The fixed light in line with Gjerdingen Light 147° leads eastward of the shoals north of Lovö.

Risvær.—On Risvær, $2\frac{1}{2}$ miles northeastward of the last-mentioned light structure, from a small white wooden house, is exhibited, at an elevation of 41 feet above high water, an occulting light, with white, red, and green sectors.

Ivarsholmen.—At Ivarsholm, off the east side of Risvær, an occulting light, with white, red, and green sectors, is exhibited, at 13 feet above high water.

Store Kvitholmen.—On Store Kvitholm an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 101 feet above high water.

The above lights (except Strömö) are visible in the white, red, and green sectors from a distance of 6, 4, and 3 miles, respectively; they are all shown from August 1 to May 15.

Gutvik.—On Sæla Skerry, $6\frac{1}{2}$ miles northeastward of Kvitholm, is exhibited, at an elevation of 23 feet above high water, an occulting light, with white and red sectors, visible 6 and 4 miles. Shown from August 1 to April 30.

Dangers.—The dangers in Foldenfiord approach have been mentioned. The following form the south side of entrance to Nærösund:

Lökkefaldet, with 1 fathom least water, on which the sea breaks in bad weather, is the northwesternmost of these dangers, and lies $2\frac{3}{4}$ miles south of Gjæslingerne or Haraldsökraaka Lighthouse: there is a depth of but 3 fathoms at 400 yards north of the shallow head.

Bondfaldet, a patch of $2\frac{1}{2}$ fathoms, lies about 1,600 yards southwest of Lökkefaldet.

From Lökkefaldet northeastward the dangers all lie southeastward of a line joining it to the beacon on Præstögalten, for which see the chart. The northwest side of the channel is guarded by the Gjøslingerne Light and by the lighthouse on Grinna.

Kultarene, a patch of $3\frac{1}{2}$ fathoms, lies on the north side of the fairway, about $1\frac{1}{2}$ miles northeastward of Grinna Lighthouse. Beyond this the channel is reduced to about half a mile in width, with rocks above and below water on either side. Præstögalten, about 600 yards southwestward of Præstö, is marked by a black stone beacon, as before stated.

Directions—Inner Lead.—Approaching the entrance to Nærösund from the southward, having passed on either side of Kya Island, proceed as directed for Namsenfiord, until abreast Björö, when course should be shaped direct for Gjøslingerne or Haraldsökraaka Lighthouse, which, kept between the bearings of 17° and 61° , will lead clear of the dangers on either side. When about 1 mile from the lighthouse, shape course to pass southeastward of Grinna Lighthouse, between it and the iron poles on Spygrundsfaldet and Stabben, with Præstögalten beacon bearing 49° . From abreast Stabben, edge to the northward to avoid the dangers extending southwestward of Præstö, thence in mid-channel through Nærösund for Strömö Lighthouse.

When past Marö, vessels may proceed either westward or eastward of Strömö (vessels drawing over 20 feet should pass eastward), continuing between Kraakö and the mainland; Svinö may be passed on either side; the channel then leads eastward of Gjerdingen to Risvær.

Haverskjæret, which lies nearly in mid-channel between Strömö and Ottersöen, is marked by a black stone beacon, and may be passed on either side. Gjerdinggalten, off the southeast side of Gjerdingen, is also marked by a black stone beacon.

Maröskjær, a shoal in the fairway off the northern side of Marö, is marked by an iron pole, and a rocky patch, a cable northward of Haverskjæret, is marked on its western side by a black buoy.

At night.—Nærösund should only be navigated at night with the assistance of a pilot. From abreast Björö Light, Gjøslingerne Light should be steered for between the bearings of 17° and 61° , or Grinna Light between 38° and 59° , both showing fixed white, which leads between the dangers on either side; when within about 1 mile of the former light steer 62° .

Pass Grinna Light at the distance of about half a mile (Gjøslingerne Light showing white clears the shoals about Grinna), and haul gradually to the northward across its green sector, steering for

Nærösund Light in the middle of its white sector from 39° to 44° , which covers the fairway. Strömö Light is visible between the bearings of 42° and 46° , and kept in sight also leads up the fairway between Præstögalten and Langtarene Shoals. It is not advisable to offer any further remarks, as they could not be followed.

Anchorage.—Small craft may anchor in Markedssund on the north side of Nærö, in 3 to 7 fathoms, sand and clay; and there is anchorage for larger vessels farther to the northeast in depths of 10 to 15 fathoms.

Vessels of moderate size may bring up in Rörvik, northward of Marö, in 6 to 8 fathoms; or in Smedvik, on the north side of Marö, in 4 to 5 fathoms, sand and clay. There are mooring rings at both these places, and an iron pole on Smedvikboen in Rörvik may be used as a warping post. A small supply of coal may be obtainable.

The cove on the southwest side of Ottersö is a good harbor for small vessels; it has a depth of 4 to 5 fathoms over sand and clay, and there is a passage on either side of the small holm in the entrance, but close to the south point of this holm is a sunken rock.

Vessels may bring up to wait wind or tide opposite the houses on the northeast side of Kraakö, but if northward bound it is better to anchor northward of Lyngö.

There are also temporary anchorages along the southeast side of Svinö, on the east side of Gjerdingen, northward of Gjerdinggulten black stone beacon, and between Maanes and the islets to the northward.

Risvær.—In Risværsund good temporary anchorage may be found, either off the houses or southward of Lerö, in 7 to 8 fathoms, sand and clay. In the middle of the sound there are depths of 16 fathoms. The entrance from the southward is between Blikö and Oterholm.

Southwestward of Oterholm is Oteren, marked by a blank stone beacon with white belt. Oterholm Flakket, with 5 feet of water lying 400 yards west of Oteren, is marked by a pole. Patches of 18 and 20 feet extend 200 yards east and west from Oterholm Flakket. Blikögrunden is marked by a pole. Garntyven Rock, off Risö, has an iron pillar. Risværgalten and Hornbo are marked by iron poles.

Lekafiord.—From Risvær the Inner Lead continues between Edö and Langö and eastward of Store Kvitholm to Lekafiord; a rock, with a depth of 19 feet over it, lies off the east end of Store Kvitholm, and another rock with 26 feet off the northeast end of Lille Kvitholm. Madsögalten is marked by a black stone beacon, Söndre Madsöflu by an iron beacon with ball, and Nordre Madsöflu by an iron pole.

Fröviksund.—At the north end of Fröviksund, between Leka and Frövikö, there is a good harbor, which may be entered either from

the southward or northward. Entering from the southward keep on the west side of the sound, proceed in mid-channel between Leka and Frövikö, and bring up anywhere between the north point of the latter island and Klungholm, in a depth of 7 to 8 fathoms, over sand and clay. Vessels from the northward may pass either eastward or westward of Klungholm, but care must be taken to avoid a rock lying close to the north point of that islet.

Southward-bound vessels may anchor in the bight east of Leka Church, about 1 mile northward of Klungholm, in a depth of 6 to 8 fathoms, sand and clay; and there is anchorage for small craft in the cove on the north side of Havneholm.

The southern anchorage on the east side of Leka fiord is in Fjölvik, which may be entered either from Dolmsund or from the northward. Vessels may also bring up in Rosvik, about 4 miles northeastward of Fjölvik, passing northward of the two small holms in the entrance.

Sör Gutvik, a creek three-quarters of a mile northward of Rosvik, affords secure anchorage, but can not be left with westerly winds. There are depths of 10 to 11 fathoms, over sand and clay, in the inner bight, and of 6 to 7 fathoms farther out. The best entrance is southward of the small holm Sæla, as a shoal with only 7 or 8 feet on it at low water lies in mid-channel between that islet and the point to the northward.

Vigten Islands.—When approaching the Vigten Islands from seaward there will be little difficulty in recognizing them; they rise to a height of 500 to 600 feet above the level of the sea, and are visible from a distance of 15 to 20 miles, standing out distinctly from the mainland. On the southwest side of the Vigten, on either side of Nordö Light, there is a passage leading between the reefs to the harbors amongst the outer islands, of which the southern one is the widest and best; on the north side of the group there is also an entrance from seaward, but only necessity would justify a stranger in attempting any of these channels without a pilot.

Outlying dangers.—Hilleröen, with a depth of 9 feet, is the westernmost shallow patch outlying the Vigten Islands; it always breaks, and is situated $4\frac{1}{2}$ miles southwestward of Nordö Light and $1\frac{1}{2}$ miles southwestward of Fiskflessa, a rock above water.

From Hilleröen the danger line trends about north-northeastward, with Skjærgrund, a patch of $6\frac{1}{2}$ fathoms, distant 5 miles; Sistadfad, a patch of 1 fathom (with Frufflessa above water 1 mile within it) at 9 miles; Bolletrevlen with 8 fathoms, distant about 15 miles; and Revelhausene, with $3\frac{1}{2}$ fathoms, about $1\frac{1}{2}$ miles beyond, northward of which about 1 mile is Aarsgrund, a patch of 7 fathoms. These and many others will be seen breaking, and in bad weather the break is nearly continuous for the whole distance. Between Hilleröen and Nylands skjær to the southeastward no dangers practically lie outside

the line joining them, except Klakken, a patch of 9 fathoms, mentioned with Foldenfiord approach.

When passing the Vigten Island dangers it is advisable to give them a wide berth, as nothing will be gained by approaching nearer than is necessary to ascertain the position of the vessel by cross bearings; the northern side has only been partially examined. There is a depth of 50 fathoms or more within a short distance of the breaking rocks.

Directions.—If northward of Hilleröen, and intending to visit the harbors within Nordö, a vessel may stand in for Nordö Lighthouse bearing 90° , which leads in northward of Freflessa and the other rocks above water near it. Guldkisten beacon bearing 79° is the line in, until within half a mile of it, thence passing northward of the beacon, but it is not advisable to attempt this. If the weather permits, fishermen will always come off from Nordö and point out the passage to Kjösövaag or the sound northward of Karstenö; in both these anchorages there are depths of 5 to 6 fathoms over sand, but if possible it will be better to run on to Austafiord in Langsund.

If southward of Hilleröen and the dangers southeast of it, steer for Nordö Lighthouse bearing about 39° , passing westward of Notknausen, with $2\frac{3}{4}$ fathoms, the southeasternmost danger; when Vestbraken Rock bears 135° , steer for the Soröerne Islets until Nordö Lighthouse bears 17° , when steer for it. The remarks above on the pilots apply also to this paragraph. As already observed, it is much safer to avoid the Vigtens altogether.

Anchorages north of the Vigten Islands.—Northward of Aarsgrund, which has a depth of 7 fathoms, breaking with a heavy sea (mentioned above), is a channel leading in northward of the Vigtens. Væremsnubben, a conspicuous round-topped mountain, 1,335 feet high, in line with Maaholm, bearing about 105° , or the lights on Maaholm in line on the same bearing, lead in northward of Aarsgrund and Djupboen, and southward of Baugrunden. Fishermen may be expected to come off from Frelsö, which is inhabited; but if no assistance can be obtained the above marks will lead clear up to Maaholm. The south side of this islet must be passed within a distance of 200 yards, as Maaholmtaren (marked by a pole) and Storflaget, at 6 feet, lie 500 yards southward of it.

The western anchorage in this passage is between the north and south Fjerholmene and Vahclm, in 8 to 12 fathoms, sand and clay, but it is much exposed to the sea; the entrance is westward of Nordre Fjerholm, three-quarters of a mile southeastward from Maahclm.

From Maahclm small vessels may steer for the south point of Kvalö, and bring up between that island and the islets to the southward in 6 to 8 fathoms, sand and clay. To enter this harbor a vessel

must pass northward of Ternholm and eastward of the islet to the northward of it.

Proceeding eastward to the Inner Lead, vessels must pass southward of Kvalö and northward of Mefjordsboen.

Lights—Lille Bremö.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 29 feet, from the north side of Lille Bremö.

Maaholmen—Leading lights—Front light.—An occulting white light, visible from a distance of 10 miles on leading line, 106° , 3 miles elsewhere, is exhibited, at an elevation of 37 feet, from Vestre Maaholmen.

Rear light.—An occulting light, with white, red, and green sectors, visible 14, 4, and 4 miles, respectively, is exhibited, at an elevation of 75 feet, from a white wooden house and tower situated on Östre Maaholmen, at a distance of 1,100 yards 106° from the front light.

Directions.—As the rock Oksrevltaren breaks in heavy weather it is necessary to keep the eastern leading light on Maaholmen open to the southward of the western light when entering Maaholmen from the westward.

Ternholmen.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 33 feet, from a small iron house situated on Ternholmen, south of Kvalö.

The above lights are shown from August 1 to May 15.

Langsund, the narrow strait between the Ytre and Mellem Vigtenene, is 12 miles in length, and navigable throughout. Near its center, off Austafjord, a trading station on Ytre Vigten, there is good anchorage in a depth of 8 to 10 fathoms, sand and clay.

CHAPTER VII.

LEKA TO DÖNNÆSÖ.

Nordland.—The province of Nordland, which extends in a north-easterly direction for about 260 miles from Bindalsfiord, near Leka, to Andenes, the northern extreme of Vesteraalen, comprises an area of 14,251 square miles, and next to Finmarken is the largest province in Norway; it is subdivided into the districts of Norde and Søndre Helgeland, Salten, Lofoten, and Vesteraalen, and contains 56 parishes, with a total population in 1910 of 164,687. Nordland is one of the most interesting parts of Norway, but owing to its distant situation, great extent, and imperfect means of communication, it still contains large tracts of country concerning the natural characteristics of which there is much to be learned. The coast and the outlying islets and reefs, known as “skjærgaard,” are remarkable for their fishing stations (*fiske-vær*), sea-fowl colonies, winding fiords, and stern rugged scenery, which maintains for more than 100 miles a character of surprising interest and variety; while in the inner districts beautiful valleys clothed with luxuriant vegetation, mountain plateaux only visited by wandering Lapps with their herds of reindeer, vast glaciers, magnificent waterfalls, subterranean rivers, stalactite caves, and many other rare phenomena, render the province of Nordland a peculiarly interesting and attractive field for scientific investigation. There is a marked difference between the characteristics of the outer and inner parts of the principal fiords of Nordland, and in summer the damp chilly air and rugged scenery of the coast present a strong contrast to the mild climate and rounded verdant slopes of the districts farther inland.

The people of Nordland are a bold and powerful race, with fine, well-knit frames, an expressive and sonorous language, and great independence of character.

General remarks.—The district of Helgeland lies between the parallels of Leka and Kunna. Between Leka and Dönnæsö the skjærgaard or outlying islets and reefs extend generally to a distance of 20 to 30 miles from the mainland. With the exception of the large islands of Leka, Vega, Alsten, and Dönnæsö, the whole of this space is thickly covered with innumerable small islets surrounded by rocks

both above and below water; the passages leading in from seaward are consequently fewer, longer, and more dangerous than any of those farther south. Between the Vigten and Vega there is only one entrance which might be attempted without a pilot, namely, the Sklinden Channel, but as even here the distance from the outer rocks to any secure anchorage is about 30 miles, vessels must enter in good time in order to reach a place of safety before nightfall. The various entrances northward of Sklinden are so narrow and difficult that necessity alone would justify strangers in attempting them; and as the outer islets and rocks are nearly without exception low and void of any distinctive features, a vessel's position can only be determined by bearings of distant objects. The mountains on the larger islands and the mainland possess, however, such striking characteristics, and attain such an elevation, that in tolerably clear weather they may be recognized at a distance of 40, 50, and even 60 miles, so that there is no great difficulty in selecting conspicuous landmarks by which to fix the position before approaching the outer and most dangerous part of these outlying dangers.

The rocks break more readily with westerly and northwesterly winds than with those from other directions, partly because these winds raise the heaviest sea, and also because the reefs are generally steep to the westward and northwestward.

In describing the entrances from seaward such harbors only will be mentioned as from their position and security are most likely to be useful; the anchorages farther in will be found under the heading of the Inner Lead.

The heights of the principal mountains have been partly determined by measurements and partly by estimation.

Pilots.—Between Leka and Fleinvær there is apparently no regular pilot service for the channels from seaward. In the Inner Lead pilots will be found at Mosiöen in Vefsenfiord and at Sandnessiö. During the summer fishermen will generally be found on Sklinden, Storbrak, Bremsten, Sjöla, Skjærvær, or other outlying islets, or they may be expected to come off on a signal being made; but in stormy weather they can not venture out in their small open boats.

Tides.—During the flood the stream sets northeastward and the ebb southwestward, but the northeast-going stream is the stronger. When the wind blows steadily in any one direction the tidal stream follows the wind. It is high water, full and change, at XIIh.; springs rise from 6 to 7 feet.

Landmarks.—When approaching the land about 10 miles northward of the Vigten Islands there will be little difficulty in distinguishing Sklindenvær, an isolated group of islets the largest of which is about 200 feet high. The whole range of the Vigten will be seen to the southward, and in clear weather Galtenfjeld (not on

charts), on the mainland, will be visible over them. Væremsnubben (1,335 feet), within the Vigten, presents much the same appearance as when seen from the southward. Leka (1,385 feet) is about the same height as Væremsnubben, and a pointed knoll rises from the middle of the island, which is a useful object by which to determine positions. On the north side of the conspicuous horn-shaped mountain Heilhornet are three smaller peaks, which can not be seen from the southward.

Gutvikfjeld, 1,949 feet in height, on the south side of the entrance to Bindalsfiord, is long and rounded. Trælnesshatten (1,854 feet), within Torgfiord, has a nearly flat summit, and is somewhat higher than the neighboring mountains. Farther northward is Andalshatten, a conspicuous cone-shaped mountain 3,156 feet high. The Höiholmstinderne are four sharp peaks about the same height as Andalshatten; the two central peaks are the smallest and nearest together. When seen from the southward the mountains on Vega (Gulsvaagfjeld and Vegtind) appear to form one block, but being isolated and 2,000 feet high they are easily distinguished. Westward of Vega is the small island Sjöla; it is about half as high as Vegtind, and will be known by its precipitous wall-like sides.

Aspect of coast from off Sjöla.—If approaching the land on the parallel of Vega, the small islet Sjöla, which is inhabited by fishermen, will be seen on the outer edge of the reefs; when near it the whole of the coast from Leka to Dönnæsö, and even as far northward as Lovunen, will then be in sight if the weather is clear. Dönnæs fjeld will then be visible at the distance of about 35 miles; it is of nearly the same height as the mountains on Vega (about 2,000 feet), and has an irregular summit; on the west side of Dönnæs fjeld is a detached conical peak named Dönmanden. The steep, lofty, and sharp peaks on Alstenö, known as Des Syv Söstre (Seven Sisters), or Alstadhoug Peaks, form a conspicuous and well-known landmark, but they appear more distinct from each other when seen from the northward. A little northward of Sjöla and Vega the remarkable mountain Finknæet rises abruptly from the mainland; it is narrow, and somewhat flat on the top, with precipitous sides. Finknæet (about 4,000 feet) is higher than Heilhornet, but lies farther inland eastward of the entrance to Vistenfiord; both mountains may be recognized at a distance of 60 to 65 miles in clear weather.

From a position near Sjöla, Gulsvaagfjeld and Vegtind stand well out in the foreground; they are separated from each other by a broad valley, which is closed when seen from the northward or southward. The trigonometrical beacon on Vegtind is not on the highest point of the mountain, but stands on a round knoll jutting out from the east side of it. Mosakslen, a ridge southward of Andalshatten, though much lower (highest part, at north end, 1,713 feet), stands out dis-

tinctly; and immediately to the southward is the small sugar-loaf hill Ramtinden (1,053 feet), which serves as a mark for the Storbrak entrance. Trælnesshatten appears to be separated from the high land south of Ramtinden by a valley named Rodalskaret, and the most conspicuous object to the southward is Heilhornet. From this point of view Leka appears detached from the mainland and rises gradually in the center, with a steep declivity toward the sea. (See Views II and III on chart.)

Sklindenvær.—This group of islets lies about 9 miles northward of the Vigten, and the largest, as before stated, is about 200 feet in height. There are passages on both sides of this group, but that to the northward is the most spacious, and leads direct to Sklinden Harbor, where temporary anchorage might be found if thick weather or approaching darkness should render it undesirable to proceed. It must be borne in mind that the distance from Sklinden Harbor to any safe anchorage farther in is about 25 miles.

Lights—Sklinden.—On Heimö, the largest of the group, a light, with fixed, flashing, and group-flashing white, red, and green sectors, visible 18, 14, and 12 miles, respectively, is exhibited, at an elevation of 147 feet, from a red iron tower 47 feet high.

Haarholmslua.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 11 feet, from a small iron house on framework support situated on Haarholmslua, Sklinden Harbor.

Baardsjær.—A group occulting light (two eclipses in each group), with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 28 feet, from a small iron house on piles situated on eastern side of Baardskjær.

The above lights are shown from August 1 to May 15.

Dangers off Sklinden.—Several rocky patches, which break in anything like a rough sea, exist from 5 to 8 miles westward of Sklinden. The northernmost of these patches, Horsgrundskoltene, has a depth of $3\frac{3}{4}$ fathoms; Trælnesshatten, kept open northward of all the visible rocks off Sklinden bearing 74° , leads northward of it. Horsgrund, with only 9 feet of water, lies 800 yards to the southward, and Grundmetaren, at $3\frac{3}{4}$ fathoms, lies nearly 2 miles southwestward. Galttaren, the southernmost patch, lies $3\frac{1}{2}$ miles southwest of Horsgrundskoltene and has a least depth of 6 fathoms. The whole of the land about Trælnesshatten open southward of the rocks off Sklinden, bearing 64° , leads southward of Galttaren.

Sklinden Finsva, a shoal with 6 feet of water on it, lies 5 miles southwestward of Sklinden, on the northwestern extreme of the extensive reefs off Rödö and Kvalö, of the Vigten group. Sklinden in line with the northernmost of the Höiholmstinderne, bearing 54° , will lead between this shoal and Galttaren.

Sklinden Harbor, between Sklinden and Tusholm, has a depth of 10 to 18 fathoms over sand; the ground is very irregular, and a heavy sea sets in during bad weather, especially with northerly and northwesterly gales. It should therefore only be used in cases of necessity.

To enter Sklinden Harbor from the northward give the rocks above water off Sklindenvær a berth of 1 mile; when past the eastern rock steer for the northeast point of Sklinden, proceeding for the anchorage when the sound between Sklinden and Tusholm is well open. Care must be taken to pass a good 200 yards from the northeast point of Sklinden, as a shoal extends from it.

Entering from the southward, by Sklinden Channel, between Sklinden Finsva and Galttaren, a vessel will be safe as long as Sklinden is kept between Trælshatten and the northern peak of Höiholmstinderne. Breigrund, a 9-foot patch three-quarters of a mile southwestward of Sklinden, breaks constantly; and the visible rocks off Sklinden may be approached to within half a mile.

A vessel may either heave to off the east side of Sklinden or stand off and on, and a pilot or fisherman will be almost certain to come off.

Sklinden Channel to Inner Lead.—From Sklinden vessels may proceed northward or southward of Leka, according to circumstances; in either case it is better to steer for the south end of that island until near Mefjordsbo, which lies $6\frac{1}{2}$ miles southeast of the northeast end of Sklinden, and, if covered, always breaks. A pilot should be employed.

If intending to proceed southward of Leka, steer for the lights on Gjerdingen on a bearing of 147° ; this will lead the vessel westward of Brunflesen, the westernmost of the range of islets extending 6 miles from the southwest part of Leka, and after passing Vevlan alter course to pass half a mile south of Skjærboen and thence to Leka fiord.

If bound to Risvær, or through Nærösund, the same directions may be followed until past Vevlan, when course may be altered for Risvær, or the lights may be kept in line until Humul Raasa is open.

Channel North of Leka.—To enter the Inner Lead northward of Leka. Having steered in from seaward through Sklinden Channel, with Sklinden Island between Trælshatten and the northern peak of Höiholmstinderne, keep the southwest end of Sklinden bearing northward of 316° until Mefjordsbo is seen breaking, when shape course to pass southward of it; thence to the eastward, passing southward of Einarfaldene and northward of the lighthouse on Steinsflesene, thence between Steinstaren and Lilletaren to Melsten, thence as for Langösund.

Lights—Steinsflesene.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at

an elevation of 34 feet, from a small iron house on framework support situated on northern extreme of Steinsflesa. Shown from August 1 to April 30.

Dangers.—**Steinstaren**, a shoal 1 mile in length, has a pinnacle with only 3 feet water over it near its center, situated $1\frac{1}{2}$ miles west of Melsten Lighthouse. Lilletaren, about a mile southward of Melsten, is covered with $4\frac{1}{2}$ fathoms of water.

Langösund, between Kvalö and Langö, has good anchorage throughout up to the small holm off the north point of Langö, and might accommodate two vessels of moderate size if moored. There is a depth of 9 fathoms at the south end of the sound, whence it decreases gradually northward to 6 fathoms; the bottom consists of sand and clay. The tidal streams run rather strong through Langösund, the flood setting northward and the ebb southward.

To enter.—After passing eastward or westward of Melstenen, steer to pass southward of the lighthouse on Helgelandsflesa, and pass between that rock and Uertaren, the north point of the shoal eastward of Melstenen, marked by an iron pole. Then steer between the north point of Gimling, which is high and easily distinguished, and Store Gjeitung, and haul to the northward, west of the iron pillar on Gjeitungboen and the iron pole on Vasvikboen off Kvalö, and bring up anywhere between Langö and Kvalö.

Vessels may also enter between Store Gjeitung and Lille Gjeitung, keeping on the south side of the passage; or between Lille Gjeitung and the islets off the south point of Langö, where there is a small harbor with 3 to 4 fathoms, over sand and clay.

Storbrak entrance—Höibrak (Högbrak).—The Storbrak entrance and the Mudvær entrance, about 3 miles apart and separated by large masses of shoals, lie about 10 miles eastward of Höibrak, a solitary islet situated about 11 miles north of the Sklinden group and visible at a distance of 4 or 5 miles; these channels are only available in fine weather with local knowledge, and strangers should give the neighborhood a wide berth.

Shoals.—About 2 miles southward of Höibrak are two rocks above water named Slifisa; the whole space between these rocks and Höibrak is foul. Ufstaran Shoal, with 7 fathoms, lies on the extreme of this reef, 1 mile westward of Höibrak. Leirboen, a rock awash, lies 2 miles eastward of Slifisa.

A vessel will be westward of the Höibrak Reefs as long as Væremsnubben can be seen southward of Slifisa bearing about 153° . The north side of Höibrak should not be approached within 1 mile.

The outer shoals between Sklinden and Höibrak are Vegtaren and Brunan, each with a depth of 6 fathoms, and Søndre Vegtaren, with $3\frac{1}{2}$ fathoms; Revfald, a rock with 9 feet on it, lies $4\frac{1}{2}$ miles northeast-

ward of Sklinden. A vessel will be seaward of these shoals and the Höibrak Reefs as long as Sklinden bears eastward of 170° .

Mikal, with a depth of 14 fathoms, lies between Höibrak and Stenene (5 miles from the latter), and seldom breaks. A vessel will be northward of Mikal when Sjöla bears 59° .

About 3 miles eastward of Mikal is the edge of the main reef, which extends southward about 26 miles to the Horten and Været Islands, with the Mudvær and Storbrak entrances between, off which are several detached shoals; the least charted depth is $1\frac{1}{2}$ fathoms, on Vestbrot. These, as well as patches with deeper water, break with a heavy sea.

Ryggefald, on the south side of Storbrak entrance, nearly always breaks. Skjæribaaen, 3 miles southward of it, is uncovered at low water, and always breaks. Skudfald (Skutfallet), about 2 miles westward of Storbrak, generally breaks.

Storbrak, on the south side of entrance, has a few fishermen's huts on it.

Directions.—Should it be necessary to seek anchorage from a position westward of Höibrak, or between that island and Stenene, and circumstances prevent a vessel from taking the Sklinden Channel, she may stand in either southward of Slifisa or northward of Höibrak. Care must be taken not to approach the reef connecting these islets within 1 mile, and the highest part of Leka must be kept bearing eastward of 158° until the leading marks are distinguished.

Ramtinden, a hill on the mainland, open northward of the fishing huts on Storbrak bearing 74° , will lead clear of all the outer dangers up to Fiskebo, a rock above water lying $1\frac{1}{2}$ miles westward of Storbrak; Ryggefald and Skudfald, on the main reef, generally break. When about 1 mile from Fiskebo steer about 54° , passing about 1 mile or more northward of Storbrak.

Fishermen who act as pilots may always be obtained from Storbrak in summer, but in winter the island is deserted.

From abreast the huts on Storbrak steer to pass about a mile northward of Ertenbrak and the islets to the eastward, on which there are some fishing huts, and about $1\frac{1}{2}$ miles southward of the Kversteinen, where fishermen live both in summer and winter. Pass about midway between the rocks extending about 3 miles southward from Vega and the islands on the opposite side of the channel.

Anchorage.—From abreast Varholm a vessel may proceed for the south point of Ylving and bring up between that point and the islets to the westward in a depth of 6 to 7 fathoms, sand; but as this harbor is exposed to the southward, it is better to continue between Ylvingen and the Velfjord Holms to Havnsund, between Havnö and Esö. Esöflua, awash, about 800 yards southwest of the south point

of Esö, is marked by an iron pole; Esötaren, with 3½ fathoms, lies 200 yards south of it.

In the southern part of Havnsund there is a depth of 5 to 7 fathoms over clay and sand, and at the north end of the sound, opposite the houses on Havnö, from 3 to 4 fathoms.

Mudvær entrance.—About 3 miles northward of Storbrak entrance there is a channel leading to Mudvær, a fishing station southwestward of Vega, where temporary anchorage might be found; but as the channel, though over 100 fathoms deep, is so narrow and difficult that the slightest deviation from her course would run a vessel on shore, it should never be attempted without a pilot.

Bremsten Islets.—Nine miles westward of Vegen, at the fishing station of Bremsten, is a small harbor where vessels of less than 18 feet draft might find shelter with northwesterly or northerly winds. The west side of Stenene and the northwest side of Sjöla may be approached to within half a mile, and a pilot will generally come off from Bremsten.

The entrance is southward of Sjöla and of Svinglebo, which constantly breaks, and northward of Leibrak, which is above water. From half a mile northward of Leibrak steer for the north point of Bremsten, and pass between it and the rocks to the northward; having rounded the point and a rock lying close to the east side of it, keep close in to the south end of Bremsten, where there is a depth of 3 fathoms, to avoid a rock on the opposite side of the channel, and bring up off the houses in 6 to 7 fathoms, sand.

Lights—Gjeteröen.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 71 feet, from a small iron house situated in the center of the largest Stenene Islet.

Bremsten.—On Sorholmnaikken, west side of Bremsten Havn, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 59 feet above high water.

Nordholmen.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 43 feet, from a small iron house on beacon situated on the north end of islet northward of Bremsten.

Mudvær.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 31 feet, from a small iron house on substructure situated on islet southwestward of Leikö.

Skjærvær.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 40 feet, from a small iron house situated on islet north of Skjærvær.

The above lights are shown from August 1 to April 30.

Outlying islets and dangers.—From Bremsten for about 24 miles northeastward the space is covered so thickly with islets and rocks that it is impossible to find a passage through them, and the only places where shelter might be found in an emergency are the small harbors at Skjærvær and Nordvær, on the outer extreme of these reefs, 8 miles northwestward of Vega. The space westward and southward of Dönnæsö is equally foul, but there is an entrance southward of Ytterholm which might be taken in case of need, though scarcely without a pilot.

Skjærvær and Nordvær.—As these fishing stations are inhabited, a pilot may be expected to come off should the weather permit; but as the entrances to the harbors are not very difficult, the following directions will probably be sufficient guide if attended to.

The highest part of Vega, bearing 142° , will lead in from seaward to a position 1 mile from and between Skjærvær and Nordvær. The entrance to Skjærvær Harbor is close eastward of the northern Kraaksundholm, so that when entering a vessel must pass westward of Tenholm; this must especially be borne in mind in bad weather, when the sea breaking over the small holms on the west side of the anchorage increases the difficulty of distinguishing the narrow entrance. The anchorage is between the Kleppan and Skjærvær, and has a depth of 6 to 8 fathoms, sandy bottom.

To enter Nordvær, bring the highest part of Aakvigfjeld, on Dönnæsö, in line with Skarvö, the western islet of Nordvær (54°); this mark will lead eastward of Spildre and the rocks southwest of Skarvö and westward of Skarvöbo, on all of which the sea breaks continually. When the sound west of Vikelsö is open, proceed through it, and bring up opposite the highest part of Vikelsö in a depth of 6 to 8 fathoms, fine sandy bottom. In bad weather this harbor, though very narrow, is preferable to that at Skjærvær, as the entrance is more easily distinguished.

Entrance westward of Dönnæsö.—The outer islet westward of Dönnæsö is, as its name implies, Ytterholm. Within it is Indreholm and the Gaasvær; these with numerous sunken rocks form the north side of the entrance to the Inner Lead westward of Dönnæsö.

North-northwestward of Ytterholm, about $3\frac{1}{2}$ miles, are the Meløeskjærene, above water, and about $1\frac{1}{2}$ miles beyond are the Meløeskolten, shallow heads which nearly always break. Nord Sweet with 5 fathoms and Lille Sweet with 15 fathoms are $5\frac{1}{2}$ miles and 7 miles northwestward of Ytterholm; Skal Sweet with 13 fathoms, Bak Sweet with 15 fathoms, and Ka Sweet with 13 fathoms lie, respectively, $5\frac{1}{2}$, $6\frac{1}{2}$, and 4 miles westward, west-southwestward, and south-southwestward; these with others within them break during heavy on-shore gales.

Ytterholm bearing 114° leads southwestward of these dangers.

Lights—Ytterholm.—A group flashing light is exhibited, at an elevation of 155 feet, from a white iron tower on the summit of Ytterholm. It is visible 18 miles.

A light, with fixed and flashing white, red, and green sectors, visible 12, 9, and 7 miles, respectively, is exhibited from the same tower.

To enter.—Having approached the entrance with the southward extreme of the Dönnæsö Mountains bearing about 80° , a vessel will pass about $2\frac{1}{4}$ miles southward of Ytterholm and half a mile southward of Langfaldet, a patch of 6 feet in the fairway. From abreast Ytterholm Steinen will probably be visible and in line with the mountain peak; thence the channel may be taken either northward or southward of the Steinene group.

Vessels taking the passage southward of the Steinene group will find anchorage eastward of Indre Öksningen, in 6 to 10 fathoms, and in Aakvig bugt, on the southwest side of Dönnæsö; also in the narrow sound eastward of Præstøer; but as none of the outer passages on this part of the coast can be safely navigated without a perfect knowledge of the locality, any attempt to describe such dangerous labyrinths would be misleading rather than useful.

Lights.—For the use of local craft using the above channels and anchorages, occulting lights, with white, red, and green sectors, visible at the distance of 6, 4, and 3 miles, respectively, are exhibited at—

Ytre Flesan, latitude $65^{\circ} 58'$ north, longitude $11^{\circ} 54'$ east.
 Skaalvær, latitude $65^{\circ} 51'$ north, longitude $12^{\circ} 12'$ east.
 Traetholm, latitude $65^{\circ} 56'$ north, longitude $12^{\circ} 12'$ east.
 Gjeltholm, latitude $65^{\circ} 59'$ north, longitude $12^{\circ} 15'$ east.
 Ytre Öksningen, latitude $66^{\circ} 1'$ north, longitude $12^{\circ} 14'$ east.
 Hestö sund, latitude $66^{\circ} 0'$ north, longitude $12^{\circ} 16'$ east.
 Aakvig, latitude $66^{\circ} 2'$ north, longitude $12^{\circ} 20'$ east.

These lights are shown from August 1 to April 30.

Inner Lead—Lekafiord to Dönnæsö—Directions.—The Inner Lead from Lekafiord to Dönnæsö presents no great difficulties, and the principal dangers are marked, but it should not be attempted without a pilot. From abreast Torgfiord there are three routes northward: Brönnösund, the eastern one, is narrow and the tidal streams are strong, requiring very careful navigation, even when in charge of a pilot. Toftö sund, the middle route, is a deep, clear passage westward of Torget, and though less direct is easier than Brönnösund.

Large vessels are recommended to take the western route, proceeding eastward of Lille Fleina beacon, Blaabakflu iron pole, and Tvertaren (a patch of $3\frac{1}{2}$ fathoms, unmarked, situated 1,200 yards

north of Lille Fleina beacon), and westward of Store Fleina, Gaasboen iron pole beacon, and of Uttorgflesa black beacon with white belt, rejoining the other Leads eastward of Ylvingen. Flestaren, a patch of $2\frac{1}{2}$ fathoms, marked by a pole, lies about 600 yards south-westward of Uttorgflesa beacon, and Knutstaren, with 6 feet only, marked by a pole, lies 1 mile westward of the beacon and near the fairway.

The track is between the two last-mentioned dangers, which are about three-quarters of a mile apart; Fleina Light in line with Hellö Light bearing 139° leads between them.

From abreast Ylvingen the route is northward between Rösö and Tjötta and westward of Alsten to Dönnæsö. Directions continued in following chapter.

Sövik Bay, in Alsten, and Sandnessiö appear to be the best anchorages for large vessels.

Lights and beacons.—The following lights and beacons are established to assist the pilots in the navigation of the Inner Lead between Lekafiord and Dönnæsö. These lights are exhibited from August 1 to April 30; the white sectors of light usually denote the clear channel, but with certain restrictions. Except where otherwise stated, in the white, red, and green sectors the lights are visible at the distance of 6, 4, and 3 miles, respectively. The names of some of the beacons mentioned here are not shown on the charts, but they may afford some guide to those taking the Lead. They are not sufficient, however, for navigating these channels without a pilot.

Lekenesbugt.—An occulting light, with white, red, and green sectors, is exhibited on Bryggenes.

Kjeldværö.—A group occulting light, with white, red, and green sectors, is shown on the northernmost of the islets north of Leka.

Melstenen.—On Melstenen Islet, from a small white iron house, is exhibited, at an elevation of 46 feet above high water, an occulting light, with white and red sectors.

Helgelandsflesa.—A group occulting light showing groups of two eclipses, elevated 30 feet, and showing white, red, and green sectors, is exhibited from a small iron house on a substructure erected on Helgelandsflesa.

Gimlingen.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 41 feet, from a small iron house situated on the west point of Gimlingen.

Vennesund.—On the east side of Kvalö, about 5 miles eastward of Melstenen, an occulting light, with white, red, and green sectors, is exhibited 10 feet above high water.

Gauggalven Light, Bindalsfiord is occulting, with white, red, and green sectors, and is elevated 67 feet above high water.

Liaholm.—On Liaholm, off the west end of Oksningöen, Bindalsfjord, an occulting light is exhibited at the height of 16 feet above high water, showing white and red sectors.

Tosbotn.—A white flashing light (unwatched) is exhibited from an iron post.

Gjeilskjær.—On Gjeilskjær, eastward of the Inner Lead, about 8 miles northeastward of Melsteneu, an occulting light, with white, red, and green sectors, is exhibited from a small white wooden house, at an elevation of 17 feet above high water.

Jutvikskjær Light, occulting, with white and red sectors, is exhibited from a small wooden house on iron piles, at an elevation of 11 feet above high water, situated about $1\frac{1}{2}$ miles northeast of Gjeilskjær.

Helbergöen.—On the north end of Helbergö, about $10\frac{1}{2}$ miles northeastward of Melsteneu, is exhibited, from a small white wooden house, at an elevation of 61 feet above high water, an occulting light, with white, red, and green sectors.

Klubholmen.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 49 feet, from a small iron house situated on north coast of an islet on eastern side of Kvitingan.

Hellö.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 108 feet, from a small iron house situated on the southern part of Hellö.

Fleina.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 39 feet, from a small iron house on substructure situated near the center of Fleina Islet.

Uttorgflesa.—A light, with fixed, group occulting, and flashing white, red, and green sectors, visible 13, 10, and 8 miles, respectively, is exhibited, at an elevation of 56 feet, from a white wooden house with low tower situated on the northern end of Uttorgflesa.

Sömnes.—On Jarholmen, north side of entrance to Sömnes Havn, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 26 feet above high water.

Brönnösund.—On Stokholmen, south entrance to Brönnösund, an occulting light, with white, red, and green sectors, is exhibited from a small iron house, at an elevation of 34 feet above high water.

Hestö.—A white flashing light (unwatched), elevated 16 feet, and visible 4 miles, is shown from an iron pillar off Hestö, south entrance to Brönnösund.

Naboskjær is a small fixed light, with red and green sectors, visible 2 miles and 1 mile, respectively.

Aaboskjærснаget, northwest of Brönnö, is a group occulting green light.

Rodskjær Light, on the east side of northern entrance to Brönösund, is an occulting red light shown from a small white iron tower on piles, at 13 feet above high water.

Rodskjærsnaget is a group occulting red light.

Hesto-odden Light, exhibited from a small white iron house on piles on the west side of entrance, is an occulting light, with red and green sectors, elevated 15 feet above high water.

Værholm is a group occulting light, with white and green sectors.

Præstöern.—On Præstöern, off the north entrance to Brönösund, a light, with fixed and flashing white and red sectors, is exhibited from a white wooden house with tower 38 feet in height, at an elevation of 47 feet above high water. The white light is visible at a distance of 11 miles, red light at 8 miles.

Halholmen.—An occulting white light is exhibited, at an elevation of 26 feet, from a small iron house situated near the center of Halholm, Vega Fiord.

Klabben.—An occulting light (unwatched), elevated 24 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Klabben.

Ylvingen.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 44 feet, from a small iron house on substructure situated on the eastern side of Ylvingen.

Rörö.—On Leikua, off the southeast side of Vega, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower, at an elevation of 32 feet above high water.

Borgskjær.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 23 feet, from a stone beacon situated on a rock to the eastward of Vega.

Sjelva.—On Sjelva a fixed and flashing light, with white, red, and green sectors, is exhibited from a white wooden tower, 41 feet high, at an elevation of 47 feet above high water. The white light is visible in clear weather at a distance of 12 miles, red light at 9 miles, green light 7 miles.

Snertholmen Light, at the northern entrance of Vevelstadsund, is occulting, with white and red sectors, and is exhibited from a small white iron tower, at an elevation of 24 feet above high water.

Tjötta.—On the south point of Langholm, off the south end of Tjötta, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 14 feet above high water.

Rosögalt.—On the north extreme of Rosögalt an occulting light, with white and red sectors, is exhibited from a small white iron house on piles, at an elevation of 21 feet above high water.

Söröholm Light, on the south islet, about $3\frac{1}{2}$ miles northward of Rosögalt, is occulting, with white, red, and green sectors, and is exhibited from a small white iron tower, at an elevation of 23 feet above high water.

Sovik.—An occulting light, with white, red, and green sectors, is exhibited on Hyllneset, west side of Sovik bugt in Alstenö.

Herösund.—On Kirkeflua, situated off the northern end of the Andöerne on the west side of Alstfiord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower on piles, at an elevation of 14 feet above high water.

Lövösund.—An occulting light, with white, red, and green sectors, is exhibited on the north point of Lövä.

Sandnessiöen western light, on the northern side of Alsten, exhibited from a small white iron tower on pillars, is occulting, with white and green sectors.

Sandnessiöen eastern light is group occulting, with white, red, and green sectors, and is exhibited from a small iron house on the eastern side of the islet.

Beacons.—In and near the direct channel between Leka fiord and Dönnæsö the following islets and shoals are marked by beacons.

Several shoals are also marked by poles, for which see chart.

Melgrund, north of Leka, by a black stone beacon with white belt.

Helgelandsflesa by a black stone beacon.

Tyven, northwest of Kvalö, by a black stone beacon.

Grönstabben, west side of Melsten Fiord, by a black stone beacon with white belt.

Gloven is marked by a black iron beacon over a wooden building.

Helbergöen, southward of the light building, has a black stone beacon on it.

In Torgværet, the channel for large vessels northward from Helbergöen Light, are the following:

Sandötaren is marked by a black iron beacon over a wooden building.

Lille Fleina by a black stone beacon.

Lille Gaasö by a black stone beacon with triangle.

Uttorgflesen, by a lighthouse. Here the Lead joins the Storbrak entrance from seaward, and is wide and deep as far northward as Havnö and Esö.

Grönöskjær is marked by a black iron beacon; **Oterholm** by a black stone beacon.

Kvitholmskjær by a black beacon.

Rognan by a black wooden beacon.

Northward of Tjötta Lighthouse, **Juledagene**, west of Tjötta, is marked by a black beacon with white belt.

Alstahaugholmen by a black wooden beacon.

The rock northward of Söröholm Lighthouse is marked by a black stone beacon.

Valögalten is marked by a black beacon.

Vikholmen by a black stone beacon.

Bakskjær by a wooden beacon.

Anchorage.—Between Lekafiord and Brönnösund there are several anchorages on both sides of the Lead.

Langösund is the first anchorage northward of Leka, and from thence small vessels may pass westward of the rocks off the north side of Kvalö to Lyngvær fiord.

Sandvær, westward of Helbergöen Lighthouse, has good anchorage for small craft between Fæö and Lyngö, in 7 to 10 fathoms, sand and clay. Entering from the southward from Melstenfiord, steer for the central and highest knoll on Sandværö until the sound is open, and proceed in mid-channel between the cairns on the south points of the islands forming the harbor, taking care at the same time to give the south point of Fæö a good berth, as a shoal extends off it to the southward and eastward. The sound is navigable throughout, with a least depth of $3\frac{1}{2}$ fathoms, but the northern entrance is extremely narrow.

Biskoptarren, a sunken rock with 1 fathom, lies southward of the entrance 1,100 yards southwest of the south end of Helbergö; it is marked by a pole. Helbergtarene, patches with depths ranging from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, lie in the fairway eastward of Helbergö.

Havnö.—Among the islets southwestward of Torget there is anchorage for small craft at Havnö, in 2 to 3 fathoms, sandy bottom. When entering keep close to the point on which the cairn stands.

Möihavn, between Torget and Brakholm, has a depth of 8 to 10 fathoms over clay and sand.

Torghatten Cave.—There is a remarkable natural tunnel or cave in Torget, 520 feet in length, in a northeast and southwest direction, 70 feet in breadth and 64 feet in height at the northeast end; it is 200 feet in height near its center and 239 feet at its southwest end. The floor of this cave is 457 feet above the sea at its northeast end, and the summit of the island is 266 feet above the middle of the roof.

Brönnösund, the eastern channel of the Inner Lead, between Brönnö and Torget, as before stated, can not be safely navigated without thorough local knowledge, for although dangers are marked, yet the channels between them are so narrow and the tidal streams so strong that slight mistakes have on several occasions led to disaster, even with pilots on board.

On the east side of the holms, in the middle of the sound, there is anchorage in a depth of 3 to 6 fathoms, over hard sand, but owing to the narrowness of the channel, the strength of the tidal streams, and the shoals off the west side of Brönnö, getting under way in a sailing

vessel is attended with difficulty. There is also anchorage near Buholm in 4 to 5 fathoms, but the above remarks also apply. Seamen are cautioned that no vessel is allowed to lie in the fairway, which, on the west side of Buholm is only 30 yards wide. A small supply of coal may be obtained.

Lights in Brönnösund. See above.

Telegraph.—There is a telegraph station on Brönnö.

Toftsund; the middle channel of the Inner Lead, on the west side of Torget, is deep, and, though less direct, is easier than Brönnösund.

There is anchorage on the west side of Toftsund, between the two southernmost Steinöerne, in 5 to 8 fathoms, over fine sand; the entrances are between Lilværbratten (which will be known by its height and conical top) and Kirstiö and between the latter islet and the southern Steinö.

Between the Præstö Islands there is anchorage in a depth of 8 to 10 fathoms, clay and sand.

Tilrem.—Northward of Toftsund there is anchorage at Tilrem Markedsplads, on the west side of Mosakslen, in a depth of 6 to 7 fathoms over sand and clay. An annual fair is held at Tilrem. Vessels might bring up for a time in the narrow sound between the Strömsöerne, $2\frac{1}{2}$ miles northward of Tilrem.

Nordtaren, a rock on the western side of the northern approach to Tilrem, is marked by a red bell buoy on its northern side, and two rocks, 400 and 600 yards southward of Nordtaren are marked by perches.

Ylvingen—Rörö.—The harbors on the southwest side of Ylvingen and between Havnö and Esö have already been described. Anchorage may also be found at Rörö, on the east side of Vega.

In Smaavær, northward of Ylvingen, there is a small harbor with depths of 3 to 4 fathoms, sand.

Alstahaugvaag affords anchorage in a depth of 10 to 11 fathoms within the entrance, in 8 to 9 fathoms opposite the warehouse belonging to the parsonage, and in 6 to 7 fathoms farther in, over sand and clay; the inner part of the bay is shallow. Southwesterly gales send rather a heavy sea into this harbor.

Sövik.—In Sövik bugt in Alstenö, westward of the Seven Sisters, there is very good anchorage for several large vessels, the depth decreasing gradually from 20 to 7 fathoms, over sand and mud.

At Sandnessiö or Stamnes, on the north side of Alstenö, there is a small harbor with a depth of 6 to 8 fathoms opposite the jetty, over sand and clay. The shoal off Stamnes must be avoided when entering from the westward.

Trade—Telegraph.—Sandnessiö is a place with considerable trade, and the coasting tonnage cleared during the year is said to

amount to about three times that of Mosiöen, of which it is the outport. There is a telegraph and a pilot station here.

Coal.—Vessels of 20 feet draft can coal alongside the wharf. About 250 tons are usually in stock.

At Björns Markedsplads, a large village on the southeast side of Dönnæsö, where the principal Nordland fairs are held, there is a good harbor for vessels of moderate size, with a depth of 7 to 10 fathoms, over sand and clay. A shoal extends about 200 yards north-eastward from the point on the south side of the entrance. There is also anchorage in 8 to 12 fathoms in the sound eastward of Björnsö, which is more easily left than the inner harbor. About 200 yards distant from the eastern Björnsholm, in this sound, there lies a shoal nearly dry at low water.

Anchorage on west side of Dönnæsö, see following chapter. Also Inner Lead anchorages.

Inner fiords.—Between Leka and Dönnæsö are Bindalsfiord with its branches, Ur, Remen, Sæl, and Toso fiords, Velfiord, Vistenfiord, Vefsenfiord, and Leirfiord.

Telegraph.—A cable is laid across Bindalsfiord from Skauviknes to Hjelmset. Vessels must not anchor in its vicinity.

Lights—Velfiord—Nævernes.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 26 feet, from a small iron house situated at the southern extreme of Velfiord.

Vefsenfiord.—On Aakvikskjær, northern side of Vefsenfiord, an occulting light, with white, red, and green sectors, is exhibited from a small iron house, at an elevation of 14 feet above high water.

At Alterneset, on the western side of the southeast arm of Vefsenfiord, $3\frac{1}{2}$ miles northward of Mosiöen, an occulting white light is exhibited, elevated 21 feet above high water.

Mosiöen.—There are two red fixed leading lights at Mosiöen as a guide to the entrance to the dredged channel.

Leirfiord.—On Furneset, southern side of Leirfiord, an occulting light, with white and red sectors, is exhibited from a small iron house, at an elevation of 19 feet above high water.

The above lights are visible—white, red, and green sectors, at a distance of 6 or 7, 4, and 3 miles, respectively. They are shown from August 1 to April 30.

Vefsenfiord—Shoals.—Hansholmgrunden, a shoal with rocky bottom in its northern part and firm clay to the southward, with a least depth of 6 feet near its southern extreme, where the breadth of the shoal is about 500 yards, stretches about $1\frac{1}{2}$ miles southwest from Hansholm. It is marked by a pole at its southwestern end, and a rock with 6 feet over it lying about 1,000 yards southwest of Hansholm is also marked by a pole.

Fiordgrund, a shoal, with a depth of 16 feet, lies in the southwest entrance of Vefsensund, about half a mile east-southeastward of Aavikskjær Lighthouse.

Mosiöen lies at the head of Vefsenfiord and at the entrance to Vefsen Elven. It is stated that vessels of any size can lie alongside the wharf at Halsöen. The exports are silver ore and guano; the imports, manufactured goods. The principal exports and imports to and from these places are chiefly shipped via Bergen and Trondhjem.

An English company owns the large Vefsen estate, which has been turned into a sporting property; upon it accommodation has been provided for the reception of visitors. Some 10 miles of good roads have been made to the lakes and rivers in the Svenningdal valley.

Supplies—Pilots—Telegraph.—There is a telegraph station at Mosiöen, and mail steamers call three times a week. Pilots are stationed here. Provisions are obtainable, but there are no facilities for repairs.

CHAPTER VIII.

DÖNNÆSÖ TO FLEINA.

General remarks.—The “skjærgaard” (the outlying islets and reefs) extend from 20 to 30 miles seaward between Dönnæsö and the Trænen, and then gradually draw in toward the coast in the direction of Kunna, where the outer dangers are only 10 miles offshore. There are several islands of considerable size on this part of the coast, but Dönnæsö is far the largest.

Most of the entrances from seaward are long and difficult to a stranger, and many of the outer islets are low and not easily identified, so that in places a vessel's position can only be determined by the bearings of mountains on the mainland or the larger islands in clear weather. The group of islands known as Trænen, which lies 24 miles from the mainland on the Arctic Circle, is therefore invaluable either as a landmark or point of departure, as its precipitous peaks are visible in clear weather at least 40 miles, and can not be mistaken for any others. At night the light on Sörholm, the southern islet of the group, is visible about 17 miles. Trænen has two good harbors, one or other of which may be made available with any wind; the entrances are somewhat narrow, but the leading marks are so clearly defined that unless the weather is singularly unfavorable the chart and directions will be sufficient guide.

Fondalen, or, as it is sometimes named, Svartisen, a range of glacier-bearing mountains between Ranen and Salten fiords, is one of the most remarkable features of this part of Norway, and as there is no other snowfeld so near the sea on any other part of the coast, it can not be mistaken. Blaamanden, one of the glaciers of the Sulitjelma group, eastward of Bodö, lies so far inland that it is hardly visible from an offing of 10 to 15 miles beyond the outer rocks, or 30 to 35 miles from the mainland, while the great snowfeld of Fondalen, reaching as it does almost to the coast, may be seen distinctly at a great distance; in the spring and during cold summers it is snow white, but in warm summers, when the surface snow disappears, it has a clear bluish-green color. The positions of these mountains are not shown on the charts.

Fondalen is said to extend through 50 miles of latitude, with a breadth of from 15 to 30 miles, and is perhaps the largest snowfeld in Norway. On the seaward side of Fondalen a glacier of the first order descends to the Nordfiord, a small branch of the Melfiord, and three others descend to the Holandsfiord, which is the innermost part of the Skarsfiord. On the landward side is a glacier named Hatvisvage Jækna. The eastern boundary of this snowfeld touches Stormvand and Eitervand; and, farther south, a considerable glacier descends to the Svartisvand, which it partially fills.

Of the numerous fiords which penetrates this part of the coast, the Ranen and Sionen fiords, eastward of Dönnæsö and Tommenö, are the principal; the former extends about 30 miles inland, and several rivers fall into it. Mö, a flourishing little place at the inner end of Ranenfiord, is the center for the Swedish trade in Nordland, and one of the proposed starting points for a line of railway between Norway, Sweden, and Finland. The inhabitants of Ranen are noted for their skill in boatbuilding, which is carried on to a considerable extent. Timber is also exported from Ranen.

Pilots.—Fishermen who act as pilots may be obtained at Fleinvær, Aasvær, and the Trænen.

Tides.—Between Dönnæsö and the Trænen the flood sets north-eastward and the ebb southwestward, as between Leka and Dönnæsö; northward of the Trænen the tidal stream is uncertain, depending in a great measure upon the prevailing winds. It is high water, full and change, at the Trænen at XIh. 45m.; springs rise 7 feet.

Aspect—Landmarks.—The landmarks on this part of the coast are far more distinct and conspicuous than any to be found farther north. The high peaks on the mainland and larger islands, which often rise to a height of several thousand feet above the sea level, may be seen in clear weather at a distance of 40 or 50 miles, and sometimes even farther; their rugged Alplike forms are easily recognized, and do not materially alter their appearance when viewed from different positions; in tolerably clear weather a vessel's position can therefore be determined with ease and certainty.

Trænö (Sanna), the principal island of the Trænen group, is by far the most important landmark on this part of the coast; it is divided into four peaks, which rise to the height of about 1,000 feet, and, as already observed, may be seen at a distance of 40 miles. Trænstaven, the northernmost and highest of these peaks, is 1,086 feet high, is entirely separated from the others, and forms a nearly perfect cone; the two middle peaks (Miaatinderne) are close together; the southern peak, Gumpen (Gompen), has a precipitous face toward the south, but slopes gradually on the opposite side toward the Miaatinderne, which it joints at about half their height, and is therefore less isolated than Trænstaven. The small but steep

hills of Dörvær will be seen to the northeastward of the Trænen; the southernmost is the highest.

In the vicinity of the Trænen the coast is visible in clear weather as far southward as Vega, while Kunna, a headland on the mainland, will be just in sight to the northward. Röd Lövenö is a conspicuous island, something in shape like a crouching lion. Hestmandö, to the southward, is over 1,600 feet high, with a sharp summit, and stands out distinctly from the jagged peaks on the mainland. Lovunden, which is about 2,000 feet high, and appears isolated, is easily recognized by its steep, nearly perpendicular, fall to the westward and its gradual slope toward the mainland; it appears rounder when viewed from the south and west, but when seen from any other position has about the same appearance as that shown in the view on the chart. Southeastward of Lovunden are the Tomtinderne, three high peaks on Tommenö. Lurö, an island about 1,600 feet high, with rounder and less abrupt declivities than those in its vicinity, lies between Tommenö and Hestmandö; and eastward of Lurö is the Oxtinden, a lofty blunt cone of rock on the mainland. The Syv Söstre, or Seven Sisters, on Alstenö, Aakvigfjeld on Dönnæsö, and Höiholmtinderne will be visible southward of Lovunden; and in clear weather the snowfjeld of Fondalen will be plainly seen.

Northward of Tommenö the mountains present very different characteristics to those farther southward, their outlines being more sharply defined, jagged, and torn, while they are also generally patched with snow during the whole summer. Of the landmarks just mentioned, Trænen, Dörvær, Hestmandö, and Lovunden are the most important, as with the help of these it is easy to make one of the Trænen Harbors.

When approaching the coast northward of the Trænen, the southernmost of the Lofoten Islands will be visible in clear weather; Sandhornet, a mountain on the northern side of the entrance to Bejernfiord, which rises to the height of about 3,000 feet, with a precipitous face to the westward, and the islands Fleina and Fuglö, will also be easily recognized. Fleina is low, Fuglö is high and steep and in cold summers has patches of snow on it. About 8 miles southwestward of Fuglö is the conspicuous headland of Kunna, which is only connected with the mainland by a strip of flat alluvium, and has, therefore, the appearance of an island. Southward of Kunna the outlines of the land become gradually more indistinct till terminated by the peak of Hestmandö, which is just visible. The great snowfjeld of Fondalen will be unmistakable, its appearance differing in a marked manner from that of the dark and riven peaks in the foreground, amongst which Melötind and Bolgen are conspicuous. During the winter, when all the mountains are covered with snow,

Fondalen is still distinguishable, because when seen from the offing it appears to run parallel with the horizon with hardly any depressions or peaks; the highest part only will show some dark patches of bare rock amongst the snow.

ENTRANCES FROM SEAWARD TO THE INNER LEAD.

Floholm fishing station, which is inhabited during the summer, is the outermost group westward of Dönnæsö; it lies about 20 miles southwestward of Trænen, and is composed of several small islets surrounded by rocks and shoals. On Floholm is a black stone beacon.

Valflesa is the outermost rock above water of the Floholmene, and being situated near the edge of the reef is a sufficient warning of approach to it. **Lundböen**, a breaking patch, lies 3 miles southwestward of Valflesa, and there are no charted dangers seaward of it.

Lights.—On **Skarholmen**, about 7 miles southeastward of Floholm, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 57 feet above high water. The white, red, and green lights are visible 6, 4, and 3 miles, respectively. Shown from October 15 to March 31.

Skibaasvær.—An occulting light (unwatched), elevated 26 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Östre Djupsö. Shown from August 1 to April 30, annually.

Gjesnakken.—On Gjesnakken, at the southwest side of Aasvær, an occulting light, with white and red sectors, is exhibited, at an elevation of 64 feet. Shown from October 1 to March 31.

Lassan.—An occulting light, with white, red, and green sectors, is shown on Lassan, an islet 3 miles eastward of Gjesnakken.

Aasvær Fiord.—Aasvær Fiord, the channel northward of Aasvær to the Inner Lead and Salsovik from seaward is the first that is available without a pilot from Sklinden Channel, situated about 60 miles to the southward. The best route from Aasvær is westward of Tommenö, through Stifjord, westward of Aller and Stensland, and eastward of Renö and Rod Lovenö. For this and other routes see the tracks on the chart.

Dangers.—The outer danger on the southern side of approach is Moholmssve, a patch of 12 fathoms about 5 miles northeastward of Floholm; on the north side is Övskallen, a patch of 6 fathoms, the southern extreme of the Trænen dangers. These rocks are about 10 miles apart.

The southernmost of the Tomtinderne Peaks, on Tommenö, in line with Aasvær Lighthouse, bearing about 90°, leads northward of Moholmssve; and a vessel will be southward of Övskallen as long as the northern Tomtinderne Peak is well open southward of Lovunden bearing 108°.

Islets and rocks extend about $5\frac{1}{2}$ miles westward of Aasvær Light-house and about 4 $\frac{1}{2}$ miles westward of Lovunden. Similar dangers extend about 3 miles southward of Lovunden, and of Buö within it, reducing the channel to a breadth of about 2 miles abreast Andersbakken; there is but little difficulty in avoiding them.

Lights—Aasvær.—On Andersbakken, the northeastern islet of Aasvær, stands a white stone dwelling, with tower 42 feet high, from which a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 80 feet above high water. In the white, red, and green sectors, the light is visible at a distance of 11, 8, and 6 miles, respectively.

Rensösund.—On Kylholm, about 5 miles southeastward of Andersbakken, and at the northern entrance of Rensösund, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 23 feet above high water.

At Buurö (Buö), on the west side of Dönnæsö, about 5 miles south-southwestward of Kylholm, an occulting light, with white, red, and green sectors, is exhibited from a white iron house on piles, at an elevation of 29 feet above high water.

Engelsholmen.—On Engelsholm, Nordovaag, at the north end of Dönnæsö, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 47 feet above high water.

Lille Mangvarden Light, on Faugholm, on the southeast side of Buö, is an occulting light, with white and red sectors, exhibited from a small white iron house, at an elevation of 36 feet above high water.

In these lights (except Aasvær) the white, red, and green sectors are visible at a distance of 6, 4, and 3 miles, respectively. Shown from August 1 to April 30.

Beacons.—The beacons that can be identified on the chart are alone given here. Ravnöen and Kvalhausen, in the Aasvær group, are marked by black wooden beacons; Synstholmbo, on the north side of the channel, is marked by a black beacon; Stabben, on south side, by an iron pole; Vestre Garsgrunden, by a pole; Östre Garsgrunden, by a black iron beacon; Udöbo (Utöbo), by an iron beacon; and Lomöegalten, by an iron pole. Hjertöbo, westward of Tommenö, is marked by an iron pole on its south end and by an iron pillar on its north end. Mangvardkua, north side of channel, southward of the Risvær, is marked by a black stone beacon. Within these the channel is broad and clear. See the chart.

Pilots.—Fishermen will come off from Aasvær in almost any weather.

Directions.—Aasvær fiord is not difficult with daylight and clear weather, when the approach can be identified; the Tomtinderne

Peaks on Tommenö are especially useful. The southernmost of the Tomtinderne bearing 97° will lead in northward of Aasvær and its dangers, and Andersbakken Lighthouse bearing eastward of 127° will lead clear of the dangers extending southwestward of Lovunden.

Vessels may either pass close northward of Andersbakken and bring up in 30 fathoms on a bank of soundings close eastward of the lighthouse (whence there are passages leading to the inner harbors of Aasvær), or, after passing half a mile southward of Synstholm beacon, they may steer for the north point of Dönnæsö, passing between Udö and Udöbo pillar, and bring up in Nordövaagen in a depth of 6 to 10 fathoms, over clay and sand, westward of Engelsholm Lighthouse. Udöbo can be passed on either side, but there is a $4\frac{1}{2}$ -fathom patch 200 yards north of the beacon.

At night.—Entering Aasvær fiord at night, the position of the vessel must be ascertained by bearings of Sörholm flashing light on the Trænen, until within the range of Aasvær Light, which will be visible when bearing southward of 88° , showing white. It should be approached in the white sector between that bearing and 133° , which leads in clear of the dangers on either side. After passing within half a mile northward of Andersbakken vessels may either bring up as directed above or proceed, crossing the green sector and entering the white one between the bearings of 277° and 281° , which sector (astern) leads southward of Synstholmbö and northward of Udöbo; thence westward of Tommenö to the Inner Lead. No directions can be offered for this latter portion, which is but imperfectly lighted; neither should it be attempted without a pilot.

Anchorage.—In addition to the anchorage eastward of Andersbakken Lighthouse (mentioned above) are the following:

There are secure anchorages amongst the islets of Aasvær, but the entrances can not be described with sufficient accuracy to enable strangers to take them without a pilot. The other available anchorages within 5 miles of the north point of Dönnæsö are: Risvær on the north side of the channel westward of Tommenö, Hofsvaag (Hovsvaag) in Lökten (Löкта) on the east side of Dönnæsö, and Gleinsvaag (Glensviken) abreast it.

The harbors on the west side of Dönnæsö are Aakvig (Aaker-vaag); Sörövaag, in a depth of 7 to 8 fathoms; Nordövaag trading station, in 12 to 16 fathoms; and Torsvigbugten, the cove westward of Dönnæs Church, in 8 to 10 fathoms; in all of these the bottom is of sand and clay.

Trænen.—The Trænen, with the Selvær and Dorvær groups, with their outlying dangers, occupy a space about 18 miles in length in a direction parallel to the coast by about 7 miles in breadth. Rocks above water fringe the edges of the reefs surrounding the islands, rendering it practically safe to approach the visible dangers, with

the exception perhaps of the southern extreme, where Övskallen, a patch of 6 fathoms, lies 1½ miles southward of Sörholm Lighthouse. The aspect of the group has been already described.

Lights.—On Sörholm, the southern islet of the Træn group, from a grey stone dwelling with red tower, 90 feet in height, is exhibited, at an elevation of 120 feet above high water, a flashing white light, visible in clear weather all round from a distance of 17 miles.

On Lamholmen, 4½ miles northeast of Sörholm, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower, at an elevation of 48 feet above high water.

Dörvær.—At the northwest side of Orka (Orkja), on the eastern side of the Træn group, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 32 feet above high water.

Søndre Selvær Light, nearly 2 miles north of Dörvær, is also occulting, with white, red, and green sectors, elevated 40 feet above high water.

Nordre Selvær Light, nearly a mile farther north, is a similar light, shown at an elevation of 28 feet.

In the above (with the exception of Sörholm), the white, red, and green lights are visible at the distance of about 6, 4, and 3 miles, respectively. They are all shown from August 1 to April 30.

Harbors.—It will depend upon the direction of the wind which of the following entrances to the harbors situated on the east side of Træn will be the most convenient. The anchorage on the east side of Træn is known as the outer harbor and that eastward of the island on which the church stands as the inner harbor. Vessels should not attempt to make these harbors from the westward during strong southerly winds, as heavy squalls then sweep down from Trænstaven in different directions.

Western approach—Dangers.—On the south side of the approach from the westward is Gauven (Gauva), a patch of 2 fathoms, which nearly always breaks; it lies on the northwest end of the main reef.

Also, Solken with 7 fathoms, Katten with 7 fathoms, and Nordre Mjaagrund with 2½ fathoms; these break in heavy weather.

Tverbö and Stavfjeldbö are shallow patches on the north side of the entrance well within the above; their positions will be seen on the chart; they always break.

Aalvorsbö, which breaks, lies a short distance northwestward of the west extreme of Træn.

Directions—Western entrance.—Coming from the southwestward, give Sörholm a berth of about 1 mile; Froa (Floan) and Böval (Bövar den) Islets may be approached to within half a mile. Thence keep Sörholm open westward of the Froa Islets, which leads westward of Gauven patch, and when the southernmost and highest peak

of Dörvær is just open northward of Trænstaven, the northern peak of Træn bearing 72° , steer for it. This mark will lead between Gauven and Solken to Aalvorsbö, which will be seen breaking right ahead; pass northward of this shoal, and continue between Træn (Sanna) and Stavfjeldbö, which always breaks. The north side of Træn is free from danger, with the exception of a small rock close to the northeast side of Trænstaven.

After passing the north point of Træn, haul to the southward for the anchorage. Vessels may bring up in the outer harbor either with Trænstaven bearing 278° or off the houses at the foot of Trænstaven, in 6 to 7 fathoms, over clay and sand; farther eastward, near Husö, the island on which the church stands, there are depths of 10 to 12 fathoms. Fresh running water can be obtained, both in summer and winter, close to the houses under Trænstaven.

From the northward, Trænstaven bearing 97° leads in between Katten and Nordre Mjaagrund; and when the breakers on Stavfjeldbö are visible, proceed as directed above.

Southwest entrance.—There is a fair channel leading both to the outer and inner Trænen Harbor along the south side of Træn. To make the outer harbor, pass close to the south point and east side of Trænö, passing westward of the island and the shoal which lies a little southward of the east point of that island.

When proceeding for the inner harbor, after passing the south point of Træn, continue north of Heeö. Pass close southward of Hikilen, proceed in mid-channel through the sound eastward of Ytre Haksholm, and bring up in the inner harbor, off the houses southward of the church, in a depth of 7 to 8 fathoms, over clay and sand. Hikilen is a lofty, abrupt, and narrow peak on an islet northward of Surenö, the eastern holm on the south side of the channel, and close eastward of Hikilen is the small islet of Ytre Haksholm.

Southern entrance.—This entrance is much wider than those from the westward.

Approaching from the southward, keep the northern peaks of Tommenö open southward of the south point of Lovunden bearing 108° , until Baadskjær (Baalskjær), the easternmost round black rock eastward of Sörholm, is in line with Trænstaven, bearing 6° , which leads eastward of Övskallen. Then steer to pass 400 to 600 yards eastward of Baadskjær; with Orka Peak, touching Skarvö, bearing 40° , a vessel will pass northward of two 4-fathom patches and between Surenö, on which is a black stone beacon, and Surenöbo, a 6-foot patch, and when Hikilen (see above) is made out, course may be altered to pass eastward of Surenö and Ytre Haksholm to the inner harbor eastward of the church. See Lamholmen Light, above.

If the wind is strong from the northwestward, or it is considered inadvisable to attempt the inner harbor, vessels may either heave-to

to leeward of Dörvær, or, if the weather is fine, they may bring up eastward of the eastern islets of Trænen, which may be approached to about 400 yards, and a pilot will almost always come off on a signal being made. Dörvær bearing 30° will lead eastward of Surenöbo.

Dörvær Havn.—Under the circumstances just mentioned anchorage might also be found amongst the Dörvær. To enter the harbor, keep the highest peak of Dörvær bearing 30° until sufficiently near to distinguish the southernmost round islet of the group; pass close to the west side of the islet, then steer up the sound, and bring up far enough in to be sheltered from wind and sea, in 5 to 6 fathoms. The sound is very narrow, especially at the entrance, and in one place a depth of only $2\frac{1}{2}$ fathoms has been reported. There is a black stone beacon on the south point of Dörværo, the southeast islet of the group.

Trænfjord, eastward of the Trænen and the Dörvær, has the Lovunden group of islets, the highest of which is 2,030 feet, on its south side, and Lurö, Hestmandö and Næsö on its east side, with channels to the Inner Lead between them, only available with local knowledge. Several patches exist toward the center of the fjord, which will be seen on the chart; these lie out of the tracks usually taken.

Lights.—The following lights are exhibited in the southeastern part of Trænfjord and its vicinity from August 1 to April 30:

Kvalholm.—An occulting light, with white and red sectors, is shown from a small white iron house on the eastern Kvalholm, at an elevation of 32 feet above high water.

Otervær Light, 3 miles southwestward of Kvalholm, is a similar light, shown at an elevation of 37 feet.

Æggelöse (Eggelöse) Light, off the northwest end of Onö, is occulting, with white, red, and green sectors, and is exhibited from a small white iron house, at an elevation of 100 feet above high water.

Lurö Light, on Leiskjær, lying about 1 mile off its western coast, is occulting, with white, red, and green sectors, and is shown from a small white iron house, elevated 22 feet above high water.

Sorvær Light, occulting, with white, red, and green sectors, is exhibited from a small white iron house on the north end of the island, at an elevation of 68 feet above high water.

The sectors of white, red, and green lights in the above are visible, respectively, at a distance of from 6 to 7, 4, and 3 to 4 miles.

Kvalholm, about 3 miles northeastward of Lovunden, is the outer anchorage in Trænfjord, and will afford shelter if a northwesterly gale renders it impossible to make the Træn anchorages; it may be entered either from the eastward or westward. After passing

Övskallen, the southern danger of the Træn group, according to the foregoing directions, steer about 57° until the southernmost of the Tomtinderne Peaks is visible northward of Lovunden, bearing 125° . The vessel will then be past Felting, a 9-fathom patch on the north-western extreme of the foul ground off Lovunden, and course may be altered for Kvalholm.

To enter by the eastern channel, pass northward of Kvalholm, and after giving its east point a berth of 400 yards to clear the shoal which extends off it, a vessel may proceed in mid-channel westward through the sound, where there is anchorage off the middle of Kvalholm in a depth of 14 to 15 fathoms, over clay and sand. South-eastward of the eastern entrance is Lyngöskjær, marked by a black beacon; Bagskjær, about 2 miles to the southward, is marked by a black stone beacon.

From abreast Alsholm, the north extreme of Lurö in line with the south side of Kvalholm bearing 77° , will lead up to the western entrance to the sound; thence in mid-channel.

Varö and Rösö.—If wishing to proceed farther in from Kvalholm pass half a mile northward of a cluster of small white holmene named Kvitingen, on the western of which is a black beacon with a white belt, and steer about 99° until Eggelöse, a round islet covered with heather westward of Onö and Lurö, can be seen ahead. From Eggelöse, which may be passed on either side, vessels may steer for the south point of Varö, and bring up between that island and Rösö, in a depth of 7 to 10 fathoms, over clay and sand. When entering the harbor, keep close in to the south point of Varö in order to avoid a rock, which dries at half ebb, on the south side of the entrance.

The small harbor on the southwest side of Rösö has a depth of 12 fathoms, and is secure in any weather. There are passages between and westward of the two holms off the entrance, but they are very narrow. There is also anchorage between the southeast point of Rösö and the islet to the eastward, in 7 to 8 fathoms.

Vessels may also proceed southward of Onö into the Inner Lead.

The other harbors on this part of the coast are described under the heading of the Inner Lead.

Myköerne (Myken) group.—The outlying islets and rocks, the Myköerne, Valvær, Tænholmene, Kraakene, etc., northeastward of Trænen, should be given a wide berth, as there is no object in approaching them; vessels of light draft might, however, if necessary, bring up to wait wind or tide between the islands known as Ydre Myköerne. This is the only anchorage to be found amongst the outlying islets between Trænen and Fleina, and it is easy of access. A sailing vessel must enter the sound from the northward or southward, with a fair or leading wind. The southeast side of

each entrance is marked by a black stone beacon. In the principal sound, between Skjærö, the island on which the houses stand, and that to the northward, there are depths of 4 to 6 fathoms, over rocky ground with patches of sand; there is also anchorage in the smaller sound to the southeastward.

The Valvær Islets are uninhabited, and there is no anchorage either here or in the groups to the eastward and northeastward, viz, Skjærvær, Tænholmene, and Rævskind.

Between the Tænholm group and Skjærvær there is a passage leading in from seaward to the channels northward of the Meløvær group, as will be seen on the chart.

Lights—Ydre Myköerne Light, on the summit of Juteöen (Jutö), is an occulting light, with white, red, and green sectors, elevated 114 feet above high water.

Næsöväer.—A group occulting light, with white, red, and green sectors, is exhibited from a small iron house situated on the northern extremity of Næsöväer.

Valvær.—On the southwest part of Valvær a group occulting light, with white, red, and green sectors, is exhibited, giving two eclipses in quick succession, elevated 155 feet.

In the above, the white, red, and green sectors are visible from a distance of 7, 4, and 3 miles, respectively.

INNER LEAD—DÖNNÆSÖ TO MELÖVÆR AND FLEINA.

Lights.—The following lights, exhibited from August 1 to April 30, have been established in this portion of the Inner Lead for the night navigation of vessels in charge of pilots. Except where otherwise stated, the lights in the white, red, and green sectors are visible about 6, 4, and 3 miles, respectively, and are shown from small white houses or towers.

Ranen fiord.—Occulting lights, with white and red sectors, are established on Bardalsö and Stromholm, and an occulting light, with white, red, and green sectors, is shown on Moskjær, off Mo, at the eastern extreme of the fiord.

Langneset (Hornnes) Light, on the east side of Lökten, at an elevation of 34 feet above high water, is occulting, with white and red sectors.

Hofsvaag Light, on Tarholm, west side of Lökten, is a similar light.

Hannesholm (Handnesholm) Light, on the southwest point of Hannesö (Handneso), is an occulting light, with white, red, and green sectors, elevated 21 feet above high water.

Saura Light, on the south side of Hanneso, about 2 miles from its west extreme, is occulting, with white, red, and green sectors.

Sauraholmen Light, about 1,400 yards southward of the preceding, 8 feet above high water, is an occulting white light.

Kleivholmen Light, on the eastern side of the Inner Lead, is an occulting light, with white and red sectors, at an elevation of 27 feet above high water.

Bonetskjær Light (8 miles northward of Kleivholmen), off the eastern side of Östre Kvar, is occulting, with white and red sectors, elevated 20 feet above high water.

Andklakken Light, about 1 mile southward of Hestmandö, is an occulting light, with white, red, and green sectors, at an elevation of 41 feet above high water.

Rangsundö.—On the east extreme of Rangsundö an occulting light, with white and red sectors, is exhibited, at an elevation of 33 feet above high water.

Selsovik.—A group occulting light, with white, red, and green sectors, is exhibited on the east side of Selsoviksund.

Kjobmandskjær Light, on the north side of Rangsundö, in the approach to Selsövik, is an occulting light, with white and red sectors.

Ornstolen Light, Selsövik, is also occulting, with white and red sectors.

Ivaröen.—An occulting light, with white, red, and green sectors, is shown on Ivaröen, southern side of the entrance to Verang fiord.

Sandværken Light, off the south end of Röd Lövenö, 14 feet above high water, is occulting, with white and red sectors.

Kilen.—A group occulting light, with white, red, and green sectors, is shown on the eastern side of the entrance to Kilen Harbor, Tjongs fiord.

Angersholmen Light, off the west end of Omnæsö (Aamnö), is an occulting light, with white and red sectors, elevated 23 feet above high water.

Melövær.—On Æggelösa (Eglöisa), westward of Melö, at 36 feet above high water, is an occulting light, with white and red sectors.

Melösund.—At the east end of Melö, an occulting light, with white and red sectors, is exhibited, at an elevation of 84 feet above high water.

Melönes Light is situated about a mile northeastward of Melösund Light, and is group occulting, with white, red, and green sectors.

Glomnes.—An occulting light, with white, red, and green sectors, is shown on Glomnes, northern side of Glom Fiord.

Sörstöt Light is occulting, with white, red, and green sectors.

Stötsund.—On Seiskjær, northern approach to Stötsund, is exhibited, from a white wooden dwelling with low tower 41 feet in height, at an elevation of 49 feet above high water, a light, with fixed and

flashing white, red, and green sectors, visible 12, 9, and 7 miles, respectively. www.libtool.com.cn

Finneset Light is occulting, with white, red, and green sectors.

Femris.—On the northwest point of Femris, $6\frac{1}{2}$ miles northeastward of Finneset, a group occulting light, with white, red, and green sectors, is shown, at an elevation of 82 feet.

Fuglö.—On the southeast point of Fuglö an occulting light, with white and red sectors, is exhibited, at an elevation of 43 feet above high water.

Hustadsund.—On the south end of Veö an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 134 feet above high water.

Beacons.—The following are the beacons situated in or near the eastern or principal channel between Dönnæsö and Fleina:

Ranskjær, east of Lökten, black stone beacon.

Kjerringskjær, 2 miles northward of Tommenö, black stone beacon.

Bonetskjær, off Östre Kvarholm, black beacon and lighthouse.

Sandværken, Angersholm, and Melövær, by light beacons.

Rorbö and the Vestre Flæsene, or Fuglesangserne, by black beacons.

In the western channels are:

Hjertöbo, the southwestern shoal off Tommenö, $1\frac{1}{4}$ miles from the north end of Dönnæsö, visible at low water; the northwestern part is marked by an iron pole and the southeastern extreme by an iron pillar.

Udöbo, nearly 1 mile northward of Nordövaagen, is marked by an iron pillar.

Hangskjær, southward of Rusvær (Risvær), by a black beacon.

Mangvardkua, a small islet southward of Mangvarderne, is marked by a conical black stone beacon. See sketch on chart.

In Lurö Lead.—Landrag, Korsholm, Flatskjær, and Knottan are marked by beacons.

Madskjær, about $\frac{1}{2}$ mile north of Lurö, is marked by a beacon. A rock, with least depth of 6 feet, is located in mid-channel between Madskjær and the outer Kvar Island about 656 yards northward of Madskjær beacon.

Andklakkene.—Katlorten is marked by a black stone beacon.

In Selsövik south entrance, Kvitingen and Klofittingen are marked by black stone beacons, and Skaala by a black and white beacon; and in the north entrance, Seingsholmen is marked by a black stone beacon and white belt; other marks here are not mentioned, as they could not be identified.

In the south approach to Melövær, Kua or Melöværkua is marked by a black stone beacon; in the northern approach Svartoksen is

marked by a black stone beacon; between are shoals marked by poles. See sketches of beacons on chart.

In Glommenfiord, Hatboen is marked by a black stone beacon.

Northward to Stöt.—Sörstöt is marked by a black stone beacon and lighthouse.

In Stötsund, Bonetskjæret is marked by a white and red stone beacon; other dangers by iron poles.

Westward of Stöt.—Kraaka is marked by a black stone beacon and Gaasholmen by a black stone beacon with a white belt.

Northward of Kunna.—Vestre Fuglesangerne is marked by a black stone beacon. Rocky ground extends three-quarters of a mile from the northern and northeastern coast of Kunna, narrowing the fairway between it and Melögrund in which a depth of 6 fathoms is charted.

Ertenskjær is marked by a black stone beacon with white stripe; Rosöskjær, eastward of Fuglö and Stabben, by black stone beacons.

In the Fleinvær.—Tværöen, Langhölmen, and Skakholmen are marked by black stone beacons.

Directions (continued from preceding chapter)—**The Eastern Lead.**—From Björnsodden, the east point of Dönnæsö, the best route northward is eastward of Lökten and Tommenö, through Stifiord, southward of Rang sundö, eastward of Renö and Röd Lovenö, westward of Omnæsö, where it is joined by the Western Lead, described later. This eastern and in-shore channel is spacious and the fairway is free from known dangers as far as Omnæsö, whence the best route is through Glommenfiord, thence between Melö and Sjerpa (Skjærpa) and through Stotsundet westward of Kunna.

Melöværsund is considered one of the most dangerous places in the Lead, as the tides are strong and variable, but it is sometimes used by steam vessels of 20 feet draft.

Coasting steam vessels usually take the intricate channels leading westward of Lökten, Tommenö, and Lurö, to Hestmandö, as there are trading stations all along the route; from Hestmandö there are several passages leading to Melövær.

The Western Lead.—To proceed by the Western Lead, after passing on either side of Svenskjær (off Björnsodden in Dönnæsö), and between Dönnæsö and Lökten, keep Björnsodden well open of Lökten until past the poles marking Hjertöbo, and steer direct for the beacon on Mangvardkua. Pass westward of Mangvardkua, eastward of Kvitholmbo pole, and westward of Lille Mangvarden (on which is a light), the western islet of Mangvarden.

After passing Mangvarden, keep the east side of the round, heather-covered islet Æggelöse (on which is a light) in line with the west side of Kvitværko. Kvitværko and Æggelöse (Eggelöse) may be passed on either side, whence the more eastern of the western

tracks (not the better of the two) leads close eastward of Sörvær and westward of a shoal off Korsholm beacon; Eggelöse must then be kept open westward of Korsholm until Sörvær is passed, when course may be altered for Andklakkene, three round hillocks southeastward of Hestmandö. The channel between Sörvær and Maavær is to be preferred, passing between Sörvær and the pillar on Kibö, on either side of Belsöbö pillar, thence for the Andklakkene as before.

There are passages eastward and westward of Andklakkene, and also between them. To pass to the westward, which is the safest course, give the west sides of Dragskjær, marked by a pole, and Blikö a fair berth, taking care to avoid the rocks southward of Bukö, and continue in mid-channel between Klubholm and the island to the eastward. The entrance to the eastern passage is between Andholm and Dragskjær pole, both of which must be given a berth of at least 200 yards; proceed eastward of Blikö and Andklakkene, giving the eastern Andklak hillock a fair berth in order to avoid a rock lying close in-shore, and continue between Kjöbmandskjær (above water) with a cairn and the north point of western Andklakke, keeping in mid-channel to avoid the shoals on either side of the passage. The channel between the Andklakke Islets is seldom used except as an entrance to the anchorage, being foul and narrow.

A vessel should steer from Andklakkene toward Björnö, whence the houses in Selsövik and the sound westward of Selsö will be visible. (From southward of Björnö the eastern and best lead is southward of Rang Sundö, described above.) There is also a good channel westward of Sundö and Gjerövær, thence northward of Röd Lövenö, where all the Leads connect.

To proceed through Selsösund give Klofittingen black-stone beacon a good berth to avoid the shoal which extends north-north-west from it, and proceed through Selsösund, passing on either side of the high islet Örnstolen, on which is a light; from thence there is a passage northward between Gjerö and Gjerövær and to Röd Lövenö, but it can not be recommended, as it is narrow, difficult, and for strangers almost impracticable.

After passing Örnstolen it is better to proceed between Rang Sundö and the island to the northward; here is Kjöbmandskjær Light.

There are shoals on both sides of the eastern entrance to Hundsröven, otherwise the sound is deep, and has a good small harbor with a depth of 4 to 6 fathoms, over sand. Caution is necessary when hauling to the eastward from Örnstolen in a sailing vessel, as, if the wind is fresh from the southeastward, it will be dead foul between Rang Sundö and Gjerö, with heavy squalls off the land.

There are no dangers in the channel eastward of Gjerö, and a vessel might bring up to wait wind or tide between the northernmost islets

off the northwest side of Renö. Sorskallen, off the south end of Sandværken, is marked by an iron pole, and the western slope of the hill on Bolgen open eastward of Svinö leads eastward of it; it is better to keep more on the east side of the channel, but Sætvigodden must not be approached within 400 yards.

At Röd Lövenö the Leads connect; thence northward the Lead is between Svinö and Omnæsö to Melövær (continued below).

Anchorage.—Between Björns Markedsplads, in Dönnæsö and Melövær, are the following anchorages:

Gleinsvaag (Gleinsviken), on the east side of Dönnæsö, $3\frac{1}{2}$ miles northward of Björnsodden, is a small but secure harbor, with depths of 4 to 6 fathoms over good holding ground, and there are mooring rings on both sides. Keep in mid-channel when entering, as there is foul ground off the points on either side.

Glein is a telegraph station.

Hofsvaag (Hovsvaag).—There is good anchorage in the bights northward and southward of Troneset, the projecting point at Hof, on the west side of Lökten. On the north side of the point there is a depth of 6 to 8 fathoms and on the south side of 10 to 14 fathoms, shoaling to 8 and 6 fathoms farther in; the bottom consists of sand and clay. See light on Tarholm.

Hjertö (Hjartö).—There is anchorage for small craft among the islets off the southwest side of Tommenö, in 2 to 3 fathoms, over sand. After passing 800 or 1,000 yards southward of Hjertöbo, marked by an iron pillar, steer for the highest part of Hjertö till close in, and bring up in the sound to the eastward. There is also an entrance between the islets and rocks northward of Hjertö, but it is intricate and dangerous.

Nordövaag is the northernmost harbor of Dönnæsö; it has a depth of 5 to 10 fathoms, over clay and sand.

Rusvær (Risvær), about 5 miles northward of Dönnæsö, has a small but good harbor on the west side of Bukö, with a depth of 3 to 4 fathoms. To enter it give the southwest side of Hangskjær, marked by a black iron beacon, a good berth, pass westward of Veiskjær, and proceed for the anchorage; the northern entrance is blocked by a shoal. There is also temporary anchorage close northward of Rusvær, but care must be taken to avoid the shoals to the northward.

Relö.—There is good anchorage between the east side of Relö and the Havnskjærene, in 3 to 5 fathoms, over clay and sand. Vessels must pass northward of the Havnskjærene, giving the northeastern point of the eastern rock a fair berth. Finmarksholm, on west side of the entrance, is marked by a black wooden beacon.

Kvitvær.—On the west side of Kvitvær is a small snug harbor, with a depth of 8 to 9 fathoms over sand. Entering from the southward, pass eastward of Bestefarskjær, marked by an iron pillar, and

westward of a small shoal on the east side of the entrance to the anchorage. If coming from the northward, pass westward of Svart-skjærbo pillar, proceed in mid-channel for the harbor, and bring up westward of the warehouses.

Sörvær has anchorage in three different sounds between the islets on the east side of the group, in 3 to 5 fathoms; these anchorages though very narrow are often used, being close to the fairway, and secure in all weathers.*

Kværö.—Vessels taking the eastern channels will find temporary anchorage on the east side of Vestre Kværö at the north end of Stifjord; it may be entered either from the southward or northward.

Andklakkene.—Entering the passage between the Andklakkene from the southward, pass westward of the south point of Blikö and keep the east point of the western Andklakke touching the west point of the middle islet, which will lead between the rocks southward of Bukö and westward of Blikö; when these are passed proceed for the anchorage, and bring up either abreast of the houses in a depth of 6 to 8 fathoms or southward of the middle Andklakke in 10 to 12 fathoms, over clay and sand. The northern part of the sound is only 8 or 9 feet deep at low water, therefore vessels of greater draft coming from the northward must pass eastward or westward of the group and either enter from the southward or between Andklakkene and Blikö. The Andklakke Islets and Kjöbmandskjær will be visible from Selsösund and Rangundö. See Andklakken Light.

Selsösund has good anchorage in 12 to 14 fathoms, over sand, and in the small bight near the houses there are depths of 5 to 7 fathoms.

Röd Lövenö.—In summer, or during a calm, small vessels may bring up between the islets off the south side of Röd Lövenö. See Sandværken Light.

Rödörosö, on the northeast side of Röd Lövenö, is a very good small harbor; it has a depth of 6 to 8 fathoms, sandy bottom, and may be entered either from the southward or northward. The entrances are very narrow, but not difficult, and there are rings for mooring and warping.

Svinvær.—In the sound northward of Svinö there is anchorage off the houses, and also farther to the westward, in a depth of 3 to 4 fathoms, over sand. The southern entrance is clear, but the northern entrance is so foul that it can only be used by those thoroughly acquainted with the locality. There is a sunken rock in the middle of the passage between the two anchorages.

Aamnöhavn.—In the narrow sound between the west point of Omnæsö and Havnö, the island to the westward, there is anchorage in depths of 5 to 7 fathoms, over sand. This harbor, though often used, is by no means good; it may be entered either from the northward or southward.

Mefjordholmene.—Vessels will find temporary anchorage between the Mefjordholmene, northward of Aamnö Havn.

Skarsfiord, and **Hölandfiord**, its continuation eastward, are entered southward of Omnæsö. There is anchorage at its head in from 35 to 40 fathoms. It is visited occasionally by the large tourist steamers from England, etc.

Melövær to Fleina—**Melövær**, a cluster of islets and rocks about 2 miles in width and 3 miles in length off the western end of Melö, is considered one of the most dangerous places in the Inner Lead; the tides are very strong, and run in different directions through the numerous narrow sounds between the islets; the wind also is frequently variable and baffling under the high land of Melö. The general depth in Melövärsund is from 4 to 5 fathoms. Steam vessels of 20 feet draft sometimes use this channel.

To avoid passing through Melövärsund, steam vessels should take Glommenfiord, and proceed through Melösund, the passage between the east point of Melö and Sjerpa, previously mentioned, and in the following directions:

Directions—Anchorages.—After passing westward of Omnæsö (see Angersholmen Light), the black stone beacon on Melöværkua will be sighted, and course may be altered for Glommenfiord and the passage between Melö and Sjerpa; with the exception of Ruvne (Halvpundholm), marked by a black beacon, Halvpundsteinen, marked by a pole, and Hatböen, marked by a black beacon, off the southwest point of Melö, this channel is perfectly clear. Northward of Melö temporary anchorage may be found between the eastern islets of Gaasvær. Glomskallen, a rock at a depth of 2 fathoms, lies half a mile north of the north point of Melö.

If intending to pass through Melövärsund, which is not available without a pilot, the course is direct for Melöværkua beacon, passing about 400 yards eastward of it. Thence the channel is close over to the islets on the east side up to Melövær Light, and beyond in mid-channel between Olstokvær and Nordre Melövær beacon. The general depth in Melövær is 4 to 5 fathoms, as previously stated, and if the wind is light or the tide adverse, sailing vessels may bring up as soon as Melöværkua beacon is passed.

At night Melövær Light between the bearings of 18° and 19° showing white, leads eastward of Melöværkua.

The best passage for sailing vessels whose draft does not exceed 12 feet is that to the westward of Melövær, where there is room for beating to windward, but no directions are given, as the services of a pilot are necessary.

Although the fairway between Röd Lövenö and Melövær is so spacious and free from dangers, it is not advisable for southward-

bound sailing vessels to leave Melövær when it is blowing from the southward or southeastward. It is peculiar to the reach between Omnæsö and Kunna that off-shore winds, or those from northeast to southeast, do not blow so hard there as farther to the southward, and for that reason it is known as the calm quarter. And it sometimes happens that if Melövær is left with a light easterly wind, a southeasterly or southerly gale, with rain, is encountered in the vicinity of Röd Lövenö.

Northward of Melövær.—After leaving Nordre Melövær beacon pass eastward of Sandværbo, marked by an iron pillar, lying 800 yards eastward of Sandvær. The Bremholmene, three bare rocky islets lying $1\frac{1}{4}$ miles northward of Melövær, should be passed on their eastern side at a distance of 200 or 400 yards. Shoals extend about three-quarters of a mile westward from Gaasvær, but they are visible at low water; Melövær Light in sight, showing red, leads westward of them.

Vessels may proceed to the northward either by the Stötsundet between Stöt Huusöe and Kunna, which is the best for large steam vessels, or through Stapfiord, west of Stötvær; the latter is the best for sailing vessels.

Stötsundet.—The channel between Stöt Huusöe and Kunna is seldom used by sailing vessels, owing to the probability of being becalmed under Kunna, but it is the best for steam vessels, and, with the exception of the rocks extending 400 or 600 yards from the northeast side of Stöt Huusöe, is free from danger. From Kunna vessels may pass on either side of Nordre Bredgrund (a 4-fathom patch lying 1,600 or 1,800 yards west of Stötkuv) to Stableleden, or they may proceed northward through the channel eastward of Rorbö beacon, or that eastward of Fuglesang beacon and Fuglö. Nordre Bredgrund and Rorbö are covered by the red sectors of light from Stöt and Finneset.

From Kunna smoother water will naturally be found eastward of Fuglesang beacon than in the channel westward of Rævskind group, and less wind. If the wind is north-northwesterly outside the islands it will be about west under Fuglö, and on closing Femris it will fall nearly calm, with occasional puffs. The tidal streams are very strong in this channel, the flood setting northward and the ebb southward, and with westerly or northwesterly winds there is a strong indraft. The only directions that seem necessary are that vessels should keep nearest the mainland when passing between Fleina and Veö, continuing between Sandhornet and Arnö, thence past Saltenfiord to Svartoxen off the entrance to Bodö.

Anchorage.—The anchorage between Femris and Rusö has a depth of 3 to 4 fathoms, and may be entered either from the eastward or

westward. There is a black stone beacon with white stripe on Ertenskjær, off the west entrance. In Hustadsund, between Veö and Sandhornet, there is temporary summer anchorage in 3 to 5 fathoms, over sand.

Stableleden, which leads westward of Stötvær, Fleinvær, and Blixvær, and eastward of Tænholm and Givær, is the best passage for sailing vessels in fine weather, but between Tænholm and Givær is fully exposed to seaward. It is best to pass between Kraaka, marked by a black stone beacon, and the islets westward of Sörstot, in order to avoid Sondre Bredgrund, with 5 fathoms, which lies nearly three-quarters of a mile westward of Kraaka. The highest part of Röd Lövenö, kept westward of Bolgen, will lead between the shoals off Stötvær and Tænholm, and westward of Ydstbö and Meebö, to the channels northward of Fleinvær; but if bound to Bödö, vessels may pass about 2 miles westward of the Rævskind group and Fuglevær, and proceed through the channel between Fleinvær and Arnö.

CHAPTER IX.

FLEINA TO TRANÖ, VESTFIORD, AND LOFOTENE.

General remarks.—The district of Salten comprises that part of Nordland which lies between Kunna and Ofotenfiord; it is intersected by several deep fiords, which penetrate far inland, and is perhaps the most desolate part of Norway; even firewood is scarce in many places, the pasture lands are few and small, the cattle diminutive, and cultivation is virtually limited to Saltdalen and a low tract between the Salten and Folden fiords, where barley and potatoes are grown. The population is scanty, and depends chiefly on the fisheries for subsistence.

The Lofoten Islands, which constitute the district of Lofoten, are separated from the coast of Salten by the great open space or channel named Vestfiord, which is about 100 miles in length and from 40 to 50 miles in breadth at its southern extremity, narrowing gradually thence in a northeasterly direction to a mere strait. The Lofotene are a rocky chain of island mountains, with such sharply defined summits that they have been aptly compared to a row of shark's teeth; the eastern peaks average 2,000 feet in height, Vaagekallen on Östre Vaagö attaining an elevation of 3,300 feet. The passages between the islands are extremely narrow and tortuous, and the tidal streams rush through them with violence, forming strong whirls and eddies, a fact to which the Malström owes its fictitious celebrity; these channels or tideways are termed ströms.

The mountains, where not too precipitous, are covered in summer with a vigorous growth of grass, which supports a few diminutive cattle and sheep. The resident population of this group is about 4,000, but during the fishing season (January, February, and March) the islands are visited by 4,000 or 5,000 boats, each with a crew of four or five men, who come from the neighboring province, provided with provisions and tackle for the season.

The coast of Salten consists of numerous straggling peninsulas, trending generally in a northeasterly direction, and is fronted by numerous islets and sunken dangers, known as the "skjærgaard," extending from 10 to 15 miles seaward between Fleina and Foldersfiord, and gradually decreases in breadth from thence to the north-

ward, disappearing almost entirely toward the inner end of Vestfiord. In this "skjærgaard" the islands Landegode and Engeloën are important landmarks, on account of their size and configuration.

The principal fiords on this part of the coast are Saltenfiord, southward of Bodö; Foldenfiord, northward of Landegode; Sagfiord, eastward of Engeloën; and Tysfiord and Ofotenfiord, at the northeast end of Vestfiord; Ofotenfiord, which extends 45 miles inland on the south side of the boundary between the provinces of Nordland and Tromsö, is in fact a continuation of Vestfiord. All these inlets are distinguished in places by imposing mountain scenery, and some of their tributary rivers are of considerable size. There is a beautiful and well-wooded valley at the inner end of Sagfiord, and Lapp settlements may be seen in Tysfiord. Rösvik in Sör Foldenfiord, and Victoria Havn in Beisfiord, near the inner end of Ofotenfiord, are stations from which several interesting excursions may be made.

Tidal streams—Whirlpools.—In the neighborhood and northward of the Lofotene the tidal streams run with greater velocity than on any other part of the coast of Norway, and in places where rapid streams are compressed within narrow channels whirlpools are formed which are sometimes sufficiently strong to turn a vessel round and to necessitate very careful steerage. These whirlpools are cavities in the form of an inverted bell, wide and rounded at the mouth and narrower toward the bottom; they are largest when first formed, and are carried along with the stream, diminishing gradually until they disappear; before the extinction of one two or three more will appear, following each other like so many pits in the sea, the suction or spiral motion communicated to the water does not seem to extend very far beyond the cavities. Fishermen affirm that if they are aware of their approach to a whirlpool and have time to throw an oar or any other bulky body into it, they will get over safely; the reason is that when the continuity of the surface is broken and the whirling motion of the sea interrupted by something thrown into it the water must rush suddenly in on all sides and fill up the cavity. For the same reason, in strong breezes, when the waves break, though there may be a whirling round, there can be no cavity. In the Saltström boats and men have been drawn down by these vortices, and much loss of life has resulted.

Between the Trænen and Vestfiord the stream is irregular, and dependent on the winds, but has a general tendency to set northward past the west side of Röst. In the whole of Vestfiord the motions of the tidal streams are materially influenced by the winds. Sometimes, when there is little or no current in mid-channel, there is a regular ebb and flood along the land on either side, the streams invariably setting in contrary directions on the opposite sides of the

fiord. The flood sets in to the northeastward and the ebb runs out to the southwestward, either along the mainland or the southeast coast of Lofoten, but when or on which coast the streams will make is uncertain.

FLEINA TO HELLIGVÆR.

Before describing Vestfiord and the Lofotene, it will be convenient to complete the description of the coast as far northward as Helligvær, which lies about 15 miles northward of Fleina and Sandhornet, and may be considered the northern termination of the great "skjærgaard" between Frø Havet and Vestfiord.

Between Fleina and Helligvær are the fishing stations Fleinvær, Blixvær, and Givær, and within these islands are the entrances to Bodö and Saltenfiord. Fuglö, Sandhornet, and the lofty island Landegode, in the summit of which there is a hollow running about north and south, are excellent landmarks for this part of the coast.

Fleinvær.—Skibshavn, in the southern part of Fleinvær, a cluster of low islands northward of Fleina, is the next outlying harbor of any importance northward of Trænen; the anchorage, surrounded by small holms and rocks, has a depth of 6 to 8 fathoms over loose sand, and two mooring rings for hawsers to the shore. There is also a good harbor for small craft, with the same depth and bottom, in the northern part of Fleinvær.

Pilots.—Skibshavn may be entered or left with any wind, as there are four entrances, but they are difficult, and can not be taken without the assistance of a pilot, which service, however, most of the inhabitants of the group are able to render.

Lights.—A white, red, and green occulting light is shown, at an elevation of 49 feet, from Sandholm, the northeast extreme of the group.

A similar light, with an elevation of 64 feet, is shown from Altersholm.

Both the above lights are shown from August 1 to April 30. For sectors see Light List.

A fixed light, with white and red sectors, is exhibited at the northeastern entrance to Skibshavn. It is privately owned.

Beacons.—Tværöen in the southern entrance, Langholmen in the northern and Skakholmen in the northeastern entrance, are each marked by a black stone beacon.

Dangers.—The only dangers to be avoided when approaching Fleinvær from seaward are Ydstbö with 12 fathoms and Meebö, a shallow patch, situated, respectively, 4 miles and $3\frac{1}{4}$ miles westward from Nupen, the southernmost islet of the Fleinvær group; their position is, however, generally indicated by the great number of sea birds about them. Ydstbö is only dangerous in bad weather. The

highest part of Röd Lövenö kept well westward of Bolgen, bearing about 191° , leads westward; Blixvær, large island open northward of Ydre Skarven, the northwestern rock of Fleinvær bearing 56° , leads northeastward of Ydstbö and Meebö; Sandhornet, in line with the summit of Fleina, bearing 95° , leads southward.

Arnö Havn, about 3 miles eastward of Fleinvær, is a good and safe but small harbor, with mooring rings, and a depth of 4 to 6 fathoms over loose sand. Lamagrund, a 7-fathom patch off the southern entrance, marked by a pole, may be avoided by keeping close to the shore on either side of the bay when entering. In passing through either of the northern entrances it is necessary to keep very close to the land to the eastward. In the northern anchorage there are mooring rings in a small rock.

The position of Arnö Havn may be identified by a black conical beacon.

Blixvær (Brixvær).—The islands between Fleina and Landegode are termed collectively Blixvær, but include the small clusters Kjærvær, Terra, and Stensvær (Steinsvær); the three latter groups are uninhabited, and afford no anchorage, but on the southeast side of the large island Blixvær there are several harbors suitable for vessels of any class. The western harbor Hjelmoyssund, between the south side of Blixvær and the islet to the southward, has a depth of 10 to 12 fathoms over a good sandy bottom. It has no mooring rings.

The northeastern harbor is useful for sailing vessels taking the Inner Lead and meeting with foul winds. The best position is just southward of the warehouses, in a depth of 4 to 6 fathoms, over sand, with a hawser to the shore ring in the rock. The entrances to Blixvær will be best understood by reference to the chart.

In the Stensvær the south and east entrances to the anchorage are each marked by a black stone beacon.

Givær and the Tæn Islets.—About 5 miles northwestward of Blixvær is the group Givær, and 3 miles farther west, on the outer edge of the "skjærgaard," are the Tæn Islets. There is a very small and indifferent harbor in Givær, but as the group is inhabited, a pilot might be obtained there.

Dangers.—Indre Mesyen (Kjærvær Mesjöen) Shoals, with from $3\frac{1}{2}$ to 12 fathoms, lie about halfway between Givær and Blixvær.

Ydre Mesyn (Mesjöen), at 2 feet, and Trimin (Treingin), which uncovers, lie midway between Givær and the Tæn Islets.

Sörboen Shoals extend $1\frac{1}{2}$ miles southward from the western Tæn Islets. The highest part of Landegode, open southward of Givær Islets, leads southward of these dangers.

Light—Tænholmen.—On the largest Tæn Islet, from a tower on a white wooden building, 46 feet high, at an elevation of 89 feet above

high water, a flashing white light is exhibited, visible in clear weather at a distance of 15 miles. Shown from August 15 to April 30.

Helligvær, about 6 miles northward of Blixvær, is much resorted to by vessels engaged in the Lofoten fishery; there is a sound right through the group, with good anchorage in almost every part of it, but the northern harbor, abreast Vaag, is considered the best in winter.

Pilots are stationed at Helligvær.

Lights.—The following lights are exhibited from the 1st of August to the 30th of April; they serve to mark the entrances to Helligvær, and are also useful to vessels entering or leaving Vestfjord.

Grytöen.—On Grytö, on the west side of the south entrance to Helligvær, a fixed white light, visible at a distance of 14 miles in clear weather, is exhibited, at an elevation of 104 feet above high water, from a white wooden dwelling with tower 36 feet high.

Grimsholm.—On the east side of the south entrance to Helligvær an occulting light, with white and red sectors, visible 6 and 4 miles, respectively, is exhibited from a white iron house, 21 feet in height, at an elevation of 53 feet above high water.

Undersholm.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 67 feet, on Undersholmen, an islet off the eastern extreme of Vaagö (Vokkö).

Danger.—**Kjengböen**, which lies about $3\frac{1}{2}$ miles north of Undersholm Lighthouse, has a depth of 1 foot, and is nearly always marked by breakers.

Directions.—The southern entrance to Helligvær, which is about a quarter of a mile southeastward of Grytö Lighthouse, is rather difficult to make out, but the white light dwelling will possibly be identified at a sufficient distance.

Entering from the northward, steer for the highest hilltop on Vaagö, keeping Undersholm Lighthouse between the bearings of 176° and 143° , until past the western rock of Lyngvær; continue along the east side of Vaagö, and bring up either in the sound, in a depth of from 7 to 10 fathoms over an uneven clay bottom, or between the holms to the eastward in 13 to 15 fathoms. There is also an entrance to the northern harbor from the eastward, but it is extremely narrow and can not be taken without a pilot.

In the middle of the sound, between the north and south anchorages, is Sörværgalten, which covers at high water, and is marked by an iron pillar.

Lyngvær.—The small harbor in the south part of Lyngvær, about a mile southeastward of Vaagö, is only used by coasters and fishing vessels.

Bodö (Nordland's By), on the mainland, is the seat of the administration and the chief town in Nordland; it is finely situated on the south side of a bay about 8 miles eastward of Blixvær, near the southwestern extremity of the peninsula on the north side of Saltenfiord (Saltfiord). The productive herring fisheries in the neighborhood have materially tended to further the prosperity of the town, and it had in 1910 a population of about 4,700. When the Lofoten fishery is at its height the harbor is crowded. Southwesterly gales send in considerable sea. In the western part of the bay there are depths of 6 to 9 fathoms over clay, but the inner end is shallow.

Nyholm Sund, the northern entrance, eastward of Lille Hjertö, on which is a light, has the same depth and bottom, and is more sheltered, but it is necessary to moor with hawsers made fast to the shore rings, as the sound is narrow and the tidal streams are strong. The southwestern entrance is deep but intricate. Temporary anchorage may be found in Skibsholm Sund, on the northwest side of Hjerto, but southwest and northeast winds send in a heavy swell.

Lights—Svartoxen.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 35 feet, from a small iron house on stone beacon situated on Svartox, a rock in the entrance to Bodö Sund, 3 miles southwestward of the town.

Hernesskagen.—On Kvannöen, off Hernesskagen, about 2½ miles southwest of Bodö, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small white iron tower on a stone base, at an elevation of 39 feet above high water.

Rösöskjær.—A group occulting light, with white and green sectors, is shown, at an elevation of 16 feet, off the east end of Rösöskjær, an islet 1½ miles east of Svartoxen.

Bodö.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 19 feet, at a distance of 33 feet from the west end of the mole.

Lille Hjertö (Hjartö)—Northern Light.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 15 feet, from a small iron house on iron frame situated on the northeast point of Lille Hjertö.

Southern Light.—A group occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at an elevation of 33 feet, from a small iron house situated on the southwest point of Lille Hjertö.

The lights are shown from August 1 to April 30.

Beacons and dangers.—In the approaches to Bodö are the following beacons and dangers:

Store Svartoxen, a round black rock, about $1\frac{1}{2}$ miles westward from Herneskagen, the southwestern extreme of the peninsula north of Salten fiord, is the westernmost rock off the entrance to Bodö, and is distinguished by a lighthouse.

Lille Svartoxen, a mile to the northeastward, is marked by a black and white stone beacon.

Kirkgrunden, with 9 feet of water, lies about 600 yards southwest of Svartoxen, and is marked by a pole, and Fiskgrund, a shoal with 2 fathoms on it, marked by a pole, lies about the same distance south of Store Svartoxen.

Breigrunden, a rock, with 2 fathoms, marked by a pole, lies 800 yards southward of Herneskagen Light.

Kvitörskallen, northeastward of Rösöskjær, is marked by an iron beacon on a wooden building; and there are iron poles on various shoals. The coast between Herneskagen and Bodö is foul for about 200 yards distance offshore.

Löbholm (Löpsholm), a small islet lying 3 miles north-northeastward from Lille Hjertö Lighthouse, is marked by a black stone beacon; Lopsholmtaren, a shoal extending nearly 400 yards from the south and west sides of Löbholm, is marked by a pole.

Toftbo, a sunken rock, on the east side of the north entrance to Bodö, lies 600 yards from the mainland, and is marked by a black stone beacon.

Remsögrund, covered with 6 feet of water, lying about 1,400 yards eastward of Remsö and $2\frac{1}{4}$ miles northward of Löbholm, is marked by a pole.

Fladskjær, between Stensvær and Landegode, is marked by a black stone beacon, Fladskjærboen by a pole, Mökkelbo (Nökelbö) by an iron pole, and Fænesodden by a black stone beacon and lighthouse.

Kjekboen (Kjeipböen), about $1\frac{3}{4}$ miles northeastward of the north point of Landegode, is a reef nearly a mile in length east and west, marked by an iron pole; its position is also generally indicated by breakers.

Directions.—Vessels bound to Bodö from the southward should endeavor to make the Trænen, and from a position about 10 miles northwest of Trænstaven, allowing for tide, steer 53° for about 45 miles, giving all visible rocks to the eastward a berth of 3 or 4 miles; they will then make the Tæn Islets westward of Givær, and may close Fleinvær for a pilot, taking care to avoid the outlying shoals. The best channel to run for, if there is no pilot on board, is that between Fleinvær and Fleina, which is free from known danger close up to the visible rocks on either side. Sandhornet in line with the summit of Fleina, bearing 95° , will lead in southward of Ystbo

and Meebo, and when Nupen, the southernmost islet of Fleinvær bears 36° , shape course in mid-channel.

From about 1 mile northward of Arnö steer direct for Hjertö, until within 1 mile of Svartoxen beacon; pass westward and northward of that rock, taking care to avoid Kirkgrund marked by a pole, and proceed for Bodö Harbor. Svartbarren (Lille Svartoxen), with a black and white beacon, may be passed on either side, and the south side of Nyholm is free from danger. It is not recommended, however, to enter without local knowledge.

When standing in from seaward between Fleinvær and Blixvær, the northern islets of Fleinvær must be given a berth of 2 miles in order to avoid Rödgrundene, with depths of 3 to 4 fathoms, and the southern part of Kjærvær should not be approached nearer than 1 mile.

Northern approach to Bodö.—If bound to Bodö from Vestfiord the north extreme of Landegode should be approached between the bearings of 154° and 115° , which leads between Oiensveboen, with 5 fathoms of water, and Kjengböen, covered with 1 foot of water; pass within half a mile of Æggelöse Lighthouse, and proceed west of Bringholm, marked by a black beacon, passing eastward of Remsögrund (marked by a pole) and on either side of Löbholm, and westward of Toftbo, marked by a black stone beacon.

Caution is necessary when navigating the space between Bodö and Landegode in sailing vessels, especially in winter, on account of the violent squalls to which it is exposed. Easterly winds are the most dangerous, as they blow with fierce and frequent gusts off the land; northwesterly winds are also very unsteady, with heavy squalls off the high peaks of Landegode.

Pilots.—Government pilots are stationed at Bodö.

Supplies—Coal.—Provisions may be obtained, and there is a spring of good water at the inner end of the bay. About 4,000 tons of coal are kept in stock. Most of the steamers passing up and down the coast coal here. For other than vessels of light draft, coaling is performed by lighters. The depth alongside the coal wharf at low water springs is about 12 feet. There are no facilities for repairs, but on the north side of the harbor is a place where small craft are beached.

Trade.—Coal and coke, salt, spirits, malt, sugar, and iron are the principal imports. Exports, sulphur pyrites, copper, herrings, stockfish, and codfish oil.

Telegraph—Communication.—Bodö is in connection with the telegraphic system of Norway. There is no railway. Mail and other coasting steamers call here.

Storm signals.—The entire system of storm signals (see Chapter I) is shown at Bodö.

Hospital.—There is a small hospital at Bodö.

Lights—Landegode.—On **Æggelösa**, near the north point of Landegode, from a red iron tower 95 feet in height, and at an elevation of 131 feet above high water, a group flashing white light is exhibited, visible in clear weather from a distance of 17 miles.

On **Björnö**, off the northeast side of Landegode, is exhibited from a white wooden dwelling, at an elevation of 150 feet above high water, a light, with fixed and flashing white, red, and green sectors, visible 12, 9, and 7 miles, respectively.

Fænes odde.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 39 feet, from a small iron house on piles situated on the southwest point of Landegode.

Vestre Grasö.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 46 feet, from a small iron house situated on Vestre Grasö, Vaag Islands.

The above lights are shown from August 15 to April 30.

Anchorage.—Landegode has three harbors which might be useful to vessels entering Bodö from the northward, but it is difficult to make them without a pilot, and the entrances are very narrow. Kjelbotten, on the northeast side of the island, has a depth of 4 to 5 fathoms over sand, and vessels may bring up in the entrance to the harbor in 16 fathoms. Kvi, nearly 2 miles southward of Kjelbotten, has the same depth and bottom. Sköllerösund, northward of Fænes, is a small but snug harbor with a depth of 4 to 5 fathoms, sandy bottom.

Saltenfiord.—About 10 miles eastward of Fleina is the entrance to Saltenfiord, which, with its continuations, the Skjærstad and Saltdals fiords, penetrates about 40 miles inland. Strong winds and tidal streams are experienced in the outer part of Saltenfiord, and southwesterly gales send in a heavy sea. It generally happens, especially in winter, that when a stiff breeze is blowing right out of Saltenfiord it is calm, or the wind is southerly, beyond Fleinvær. Salten and Skjærstad fiords are connected by the Saltström (Saltstraumen), a narrow sound between Strömö (Straumö) and Knaplundö. Godöstraumen, between the east end of Knaplundö and the mainland, is navigable for boats, but only at certain times. Skjærstadfiord has several small branches, amongst which Valnesfiord is noted for its rich deposits of iron ore. Saltdalen, a fertile valley, consisting of a series of terraces, well dotted with farms, is watered by the Salt-dalselv, a river which discharges into Saltdalsfiord at Saltæs, and is navigable for boats as far as Storiord farm.

Lights—Saltstrømmen.—On the western extremity of Knaplundö, at the northern end of Saltström, an occulting light, with

white and red sectors, is exhibited, at an elevation of 23 feet above high water.

Mefallskjær.—A group occulting light, with white, red, and green sectors, is shown on Mefallskjær, $4\frac{1}{2}$ miles northeastward of Saltstrømmen Light.

Lights are also shown at Alnes, Oines, and Tangeodden, but these are not shown on the chart.

Saltström or Saltens Malström is one of the most remarkable natural phenomena in Norway. Skjærstadfiord is a huge landlocked basin, which is partly filled and emptied by the tides twice a day; the body of water consequently forced through the comparatively narrow sound between Strömö and Knaplundö in so short a time is enormous. At full and change, and when the snow begins to melt in spring, there is sometimes a difference of more than 4 feet between the surface levels of the outer and inner fiords toward high and low water, and the violence of the stream is then so great that the houses near it tremble, and whales have been driven back when trying to force a passage through. Even in fine weather the noise of the stream may be heard at a considerable distance, and it is only navigable during the short intervals of slack water, when vessels may pass between the west side of Knaplundö and the low holm which lies nearly in the middle of the sound.

Beiernfiord.—At the west end of Strömö is the entrance to Beiernfiord, which extends about 16 miles inland to the fine river and valley of Beierdal, and separates the island of Sandhorn from the mainland. The scenery on the inner part of this fiord is magnificent. In winter a canal is cut through the ice to admit the local steam vessels from Bodö.

VESTFIORD AND LOFOTEN ISLANDS.

General remarks.—The principal outlying islands on the southeast side of Vestfiord are the Helligvær and Landegode; the Fjerkvittingerne, Husö, with its outlying dangers, Smaavær, Engelvær, Engelö, and Lundö will now be described.

On the northwest side of Vestfiord are Röst, Værö, Moskenæsö, Flagstadö, Vestvaagö, Östvaagö, and Hindö. Vessels bound to Tromsö from the southward may either pass westward of Röst and the Lofotene to the entrances north of Andenes, or they may proceed through Vestfiord to Tjel Sund. Having once entered Vestfiord it would be imprudent to attempt putting to sea again through any of the channels between the Lofoten Islands, and it is unadvisable for sailing vessels to attempt either of the channels between Röst and Lofoten Point, except in fine weather or cases of emergency.

Trade.—In order to avoid delay in discharging in the Lofoten Islands, vessels should first go to Solvær and take the customs'

officers on board there before proceeding to their destination, or else give timely warning to the officers to proceed to the port of discharge.

Coal.—About 2,000 tons are usually in stock at Brettesnes. Depth alongside coal wharf, 12 feet at low water. Vessels of heavier draft are coaled from lighters.

Supplies of provisions are obtainable, and repairs on a small scale can be effected at Brettesnes. There is a hospital at Gravdol in Vest Lofoten.

Communication with the mainland from Brettesnes, etc., by telegraph, and with other ports by the coasting steam vessels.

Harbors.—Örsvaag is apparently the best harbor in Lofoten for vessels of moderate draft; Henningsvær and Svolvær are the great fishing stations. Brettesnes is, however, the principal port of trade.

Fishing seasons.—The cod-fishing season in the Lofotene is from mid-February to mid-April, and the herring season from about August to November. Near Hammerfest the cod season begins in April and May, and ultimately at Vadsö, where it terminates about August.

Pilots.—It must be borne in mind that the Lofoten pilots never use the words “styrbord” (starboard) and “bagbord” (port), like those on other parts of the coast, but say instead “Hold ikke mer ud!” “ikke ind!” (keep no farther out! no farther in!), both of which expressions refer to the *mainland*, not to the coast of Lofoten.

There is a pilot station in the Helligvær and in Engelvær, groups of islets off the mainland on the southeast side of Vestfiord. Also in the Henningsvær, and at Skraaven, in Lofoten, northwest side of Vestfiord. Vessels bound through the Inner Lead can not do better than run for Skraaven when in want of a pilot.

Licensed Government pilots are stationed at Lödingen, south entrance of Tjelsund, and one can always be secured by a telegraphic message being sent in advance stating probable date of arrival. Unlicensed and incompetent men with but a slight knowledge of the locality are reported to offer themselves sometimes southwestward of this place; these should not be employed, for, not only is risk run, but full compulsory pilotage and distance money is charged by the Norwegian authorities, in addition to the fee that may have been already paid.

Vestfiord—Landmarks—General directions.—Vestfiord lies between the Lofoten Islands and the mainland northward of Fleina. The Inner Lead northward to the North Cape is through Vestfiord. The fiord between Fleinvær and the Röst group, the southwestern of the Lofoten Islands, is about 40 miles wide, which is reduced to about 12 miles abreast Skraaven Island, about 70 miles above Röst, whence the distance to the head of the fiord, the commencement of the Inner Lead, abreast Ofotenfiord, is about 35 miles.

The Værö group and Mosken are good landmarks, also Skraaven, which is 600 feet in height, and in form that of a right-angled triangle. When approaching Vestfiord from the southwestward in clear weather, Trænen and Röst will probably be sighted before the mountains on the mainland are visible, but frequently a sea mist envelopes these islands, while the great snowfeld of Fondalen and some of the high mountains on the mainland to the southward may be seen distinctly. Northward of Fondalen, Kunna head will appear quite isolated, with a rounded summit. Sandhornet will be conspicuous farther to the northward, and between that and the mountain on Landegode only two blocks of high land show above the horizon. Röst, Værö, Mosken, and Helseggen or Lofotodden, the southern point of Moskenæsö, are easily recognized.

Between Lofotodden and Skraaven the coast of Lofoten falls back about 5 miles, and if the weather is sufficiently clear the openings of all the ströms or channels will be visible from a distance of 10 or 12 miles. Vaagekallen, about 3,300 feet in height, on the southwest part of Öst Vaagö, rises above the other islands, in the form of a sugar loaf, and the broad opening of Gimsö ström will be seen to the westward. Urbjerg, on Vest Vaagö, Lille Molla, and some parts of Vaagekallen also are so precipitous that the snow can not lie on them; in winter, therefore, they stand out dark and distinct against the snow-covered mountains behind them.

It is better to keep on the Lofoten side of Vestfiord when westward and southward of Skraaven, not only on account of the dangerous "skjærgaard" off the mainland, but because many of the islands on that side are uninhabited, and it is difficult to find anchorage, while the Lofoten coast offers good and secure harbors. Eastward of Skraaven, however, the dangers are all on the north side of the fiord, and it is necessary to keep nearest to Tranö Light on the mainland side.

When entering Vestfiord in thick weather the lead becomes of considerable importance. Toward Lofotodden on the west side the strength of the tidal streams may render sounding difficult, but between that point and the entrance to Gimsö ström, where the depths increase suddenly from 40 and 50 to 60 and over 70 fathoms, a vessel will generally be about 4 miles from the land, provided she does not shoal the water to less than 50 fathoms.

Eastward of Skraaven the lead is of no use, depths of nearly 200 fathoms being found within half a mile of some of the rocks off Hindö, and between 200 and 300 fathoms within the same distance of the mainland.

At night.—A vessel should shape course up Vestfiord for Henningsvær or Skraaven Lights; the light on Röst, the southwest ex-

treme of the Lofoten group, or that of Fladö, off the mainland, being useful guides.

The outlying islands and dangers northward of Helligvær, south-east side of Vestfiord, will first be described, with the Inner Lead.

Vestfiord, southeast side—Outlying islands and dangers.—Fjerkvitingerne lies between the distance of $2\frac{1}{2}$ and 6 miles from the settlement of Kjærringö, on the mainland, the largest islands of which are Kalsö and Helö.

Beacon.—Oiholm, the southwesternmost of the group, situated 5 miles northeastward of Landegode, is distinguished by a white stone beacon; Oiholmbo, a patch of 2 fathoms, marked by an iron pole, lies 1 mile southeast of Oiholm. Oiensveboen, a patch of 5 fathoms, is the westernmost danger off the Fjerkvitingerne; it lies 6 miles northwest of Oiholm beacon, and is generally marked by a heavy swell over it.

Husöbaran is the cluster of rocks and reefs extending about 5 miles seaward of the Husö group. Brænsundskjær, Kuven, and Maaloskopjærholm are the principal high rocks, and serve as marks for avoiding the outlying dangers. Utgrundflæsa, which breaks, lies about $1\frac{1}{2}$ miles westward of Kuven, with Utgrund, a patch of 12 fathoms, at $1\frac{1}{4}$ miles beyond.

Beacon.—Maaloskopjærholm, westward of the Smaavær, is distinguished by a black stone beacon with cross.

Engelvær, or the Engel group of islands, lie about 5 miles offshore, abreast Skotsfiord. There is a narrow channel through the group and two small harbors for small craft, mentioned with the Inner Lead, below.

Beacons.—Store Jensö, the southeastern islet of Engelvær, and Brokskjær, $1\frac{1}{2}$ miles eastward of Store Jensö, are each distinguished by a black stone beacon.

Bredsund is the channel separating Engelvær from the Lövvær. Store Floholmen, the southernmost of these, on the east side of Bredsund, is marked by a black stone beacon with white stripe. See Oksholmen Light.

Valsvær is the group of islets lying between Lövvær and Engelö, at the northern termination of the Inner Lead from Bodö to Vestfiord. Northeastward of Engelö the southern shore of Vestfiord is apparently free from danger beyond the distance of about half a mile.

Engelö is about 9 miles in length east and west by about 5 miles in greatest width, and attains a height of 2,113 feet in its southern portion. It is separated from the mainland by Flagsund, leading to Sagfiord from the Inner Lead. Stegen (Steigen) is a settlement on its west side, and there is a hill 1,122 feet in height at about 1 mile northward of it.

Lundö, eastward of Engelö, is also high, and is separated from that island by Skagstadsund, and from the mainland eastward of it by Nordoxsund.

Lights—Fladö (Flatö).—On the southwest point of Fladö, in Lövvær, a fixed and flashing light, with a red sector, is exhibited, at an elevation of 154 feet, from a stone dwelling with tower.

The fixed white light is visible 12 miles, flashing light 18 miles, and the red sector 8 miles.

Brunvær.—On Akteröen, in the Brunvær, close northward of Engelö, is exhibited from a small white wooden house, at an elevation of 115 feet above high water, an occulting light, with white and red sectors, visible 6 and 4 miles, respectively.

Skagstadsund.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 19 feet, from a small iron house on superstructure situated on Engelö, western side of Skagstadsund.

Oxnes (Oksnes).—On the north point of Lundö, from a small white iron house, at an elevation of 83 feet above high water, an occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited.

The above lights are shown from August 15 to April 30.

Anchorage.—Brunvær affords anchorage for small craft in a depth of 5 fathoms, sand. Entering from the southward, pass northward of all visible rocks (white light in sight at night) and southward of the largest islet of the group, thence in mid-channel through the sound to the eastward, and bring up on the south side of it. About a quarter of a mile southeast of the northern islet of Brunvær is a rock dry at low water marked by a pole, and a 1½-fathom patch lies half a mile eastward of the same islet.

INNER LEAD.

General remarks.—From Landegode northward to Engelö, a distance of about 35 miles, the Inner Lead is so difficult and the rocks and outlying dangers forming the southeast side of Vestfjord lie in such thick clusters, that it is almost impossible to find the various channels without a thorough knowledge of the locality, and many of the passages are so shallow that low water springs leave a depth of barely 10 feet. None of the anchorages in this Lead are suitable for large vessels, and, with the exception of the small harbors at Helligvær, Bodö is almost the only place on the east side of Vestfjord that could be run for with safety in bad weather.

A short account of the Saltværslead, the western route, and the Inner Lead proper, nearer the shore, is given here, but neither are available without a pilot. Vessels of other than light draft should take to the open sea when northward of Landegode.

Saltværslead, the passage leading westward of Fjerkviting and Engelvær and eastward of Husöbaran, is sometimes used by northward-bound coasters of light draft; few of those who take this passage are fully acquainted with the dangers that lie there.

Anchorage.—The first anchorage in the Saltværslead is at the south end of the Fjerkvitingerne. The northwestern entrance is between Lörvene and Bredgrund and northward of Aröbo, which always breaks; the sound leading thence to the anchorage is difficult to make out, and a shoal lies in the fairway.

The southwestern entrance is somewhat easier; after passing on either side of Husöbo and between the south side of Husö and two small rocks (the southernmost of the group), vessels may either bring up in a depth of from 10 to 16 fathoms, over sand and stones, southward of the high grass-covered islet at the northeast end of the sound, or proceed eastward of it to the anchorage on the north side of Kviting, where there are depths of 4 fathoms over a good sandy bottom. Entering the latter anchorage from the eastward, vessels must give the northeast point of Kviting a fair berth, or if the wind is foul they may bring up off the point and warp in.

Kalsö Havn, 3 miles northeastward of Kviting, is small but secure, and has a depth of 6 fathoms over sand and clay. The western entrance, southward of the Kvitholmene, is not difficult, but it is necessary to keep on the north side of the sound. There is also an entrance from the northward.

Husö.—At Husö, northwestward of the Bræntinderne, there is a small harbor with a depth of 10 to 12 fathoms, over sand. Entering from the southward, vessels may pass on either side of the Moöbo, which breaks constantly and is marked by an iron pole, and proceed westward of Söndre Moö and Husö. The entrances westward of Nordre Moö and Andholm are not difficult, but the passage south of Kviting is foul and shallow.

Engelvær has two very small harbors, one at each end of the group, and there are depths of 2 to 3 fathoms over sand at both places; that at the north end is furnished with mooring rings. These harbors are often used by small coasters, and there is a passage right through the group, but it is very narrow and difficult.

Inner Lead—Landegode to Vedö.—From Landegode the Inner Lead proper continues eastward of the Fjerkvitingerne to Vedö, and is only available for small craft with local knowledge. Other vessels should proceed to sea from abreast Landegode, as before stated, and proceed up Vestfiord. In the Inner Lead the channel eastward and abreast the Fjerkvitingerne is deep and clear; Helöskjær may be passed on either side, and besides the anchorages in Fjerkviting, mentioned above, there is a small harbor at the trading station of Kjærringö, 3 miles eastward of Kviting.

From Helöskjær a small craft should steer for Kjöbo black stone beacon, and pass westward of it; Svartoxen will then be the nearest rock to the northwestward, and after passing eastward of that and westward of the three islets to the northeastward, course may be altered to pass close to the west side of Vedö and eastward of a large high islet northward of Svartoxen. There is also a passage westward of Floesskallen and Flöbo, but it is intricate.

Lights—Kjærringö.—On the northeast extreme of Kjærringö an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 18 feet above high water.

Olapersö.—On the east end of Olapersö, situated immediately westward of Vedö, an occulting light, with white, red, and green sectors, is exhibited, elevated 16 feet above high water.

In the above the white lights are visible at a distance of 6 miles, red lights at 4 miles, green lights at 3 miles. Shown from August 15 to April 30.

Vedö Havn.—The channel to Vedö Havn is northward of the southernmost and largest of the three islets southwestward of Vedö and southward of the two smaller holms, thence between Vedö and the high bare islet to the southeastward. There is anchorage in the bay abreast the houses in a depth of 4 to 6 fathoms, over sand. A sandbank near the entrance to the harbor shows as a light patch at low water; the least depth on it is 4 fathoms. When proceeding northward from Vedö Havn vessels keep close to the mainland, or pass westward of the high round holm in the middle of the sound, avoiding the shoals off the north point of Vedö.

Vedö to Valsvær.—From Vedö the Inner Lead continues westward of Sjaaholm beacon, and eastward of Bensö to Leiskjæret beacon. Northward of Leiskjæret the depth in the channel nowhere exceeds 5 or 6 fathoms, and is for the most part not above 3 or 4 fathoms; the bottom is therefore visible nearly the whole way to Valsvær. All this portion of the Lead is extremely intricate and narrow.

Beacons.—In Vedösund.—Olapersö, Sjaaholm (Skjaaholm), Stensöen, and Leiskjæret are distinguished by black stone beacons.

In Grotösund.—There are several beacons, but as a pilot is necessary, they are not described. Two of them are marked in feet for the use of the pilots.

The principal sunken dangers are marked by iron poles and pillars.

Lights—Stensholmen.—On Stensholm, $2\frac{1}{2}$ miles east of Husö, two leading lights, 236 yards apart, are exhibited from small white iron towers; these when in line bearing 184° lead through the channel northward to Grotösund.

The high light, at an elevation of 54 feet above high water, is occulting, with white, red, and green sectors.

The lower (northern) light, elevated 33 feet above high water, is white occulting.

At Leines, about 2 miles eastward of Stensholm, a fixed white (private) light, 42 feet above high water, is occasionally shown.

Silskjær.—An occulting light, with white, red, and green sectors, is shown on Silskjær in the approach to Grotösund.

Logskjær Light, on Lille Manhausen, is an occulting red light, 7 feet above high water.

Maltsækken Light, near Grotö, exhibited from a white iron house, at an elevation of 27 feet above high water, is occulting, with red and green sectors. This light with that on Logskjær form leading lights through the dredged channel.

In **Grotösund**, on Oksholmen, a fixed light, with white, red, and green sectors, is exhibited, elevated 13 feet above high water.

On Nordskot, 410 yards 138° from the above, a fixed red light is exhibited from a white wooden house, at an elevation of 52 feet above high water. These lights in line bearing 138°, both showing red, lead between Kiuklinggrund and Kiuklingen, in 17 feet water. For Fladö Light, westward of Engelö, see above.

Bogö.—On Trætskjær, eastern end of Flagsund, an occulting light, with white, red, and green sectors, is exhibited from a white iron house on a stone basement, at an elevation of 16 feet above high water.

A local fixed red light, 13 feet above high water, is occasionally shown at Bogösund.

In the above the white lights are visible at a distance of 6 miles, red at 4, and green at 3 miles. Shown from August 15 to April 30.

Directions.—There is a depth of 12 fathoms within 10 yards of the west side of Leiskjæret, and it is necessary to pass very close to that rock in order to avoid the reefs to the westward. When past Leiskjæret beacon, steer for the high round islets named Brettingen, in order to avoid the sunken rocks Brettingsboerne, marked by two iron poles and an iron pillar. Proceed eastward of Brettingen and steer to pass eastward of Sildskjær Lighthouse.

Thorough local knowledge is indispensable to the safe navigation of Bringebærsund and Grötösund, the channels westward and northward of Spanna, and no directions can be given that would be practically useful. Vessels drawing more than 12 feet can only pass through at high water; easterly and southeasterly winds blow straight through Grötösund with irregular puffs, and the tidal streams are very strong, the flood setting northward and the ebb southward.

Northward of Grötösund the passage becomes easier, but there are shoals on both sides which are invisible at high water.

The channel leading from abreast Frammonö, past Lövä, and through Valsvær requires perfect local knowledge, but Bredsund (Breisund), the passage leading between Engelvær and Floholm beacon to Vestfiord, is less difficult. From Frammonö vessels may proceed southward of Engelo through Flagsund to Sagfiord, which is also connected with Vestfiord by the channels east and west of Lundö.

Anchorage.—Leines Havn is the first anchorage northward of Vedö. To enter from the southward pass southward of Sjaaholm beacon, and steer for the south point of the nearest high island, continuing along its west side until past the north point, when the anchor may be let go in 4 to 8 fathoms, over sand and shells. There is also anchorage farther northward, off the houses.

Off the warehouse in Grötösund, where mooring rings have been placed, there are depths of 3 to 5 fathoms, over sand and stones.

Small craft may bring up in Valsvær, but the channel has barely 12 feet in it at low water springs; the bottom consists of sand.

Lights.—At Skutvik, nearly 3 miles southeast of the north point of Lundö, and on the east side of Okssundet, the northern entrance to Sagfiord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 91 feet above high water.

Klingenberg Light, off Karlsö, on the north side of Sagfiord, is an occulting light, with white and red sectors, at an elevation of 16 feet above high water.

The white, red, and green lights are visible from a distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 30.

Coast.—From Brunvær to Tranö, a distance of about 16 miles, the southeast coast of Vestfiord is apparently free from danger beyond the distance of about half a mile.

The following small anchorages lie between:

Dalsvær, 5 miles northeastward of Brunvær, has a small harbor with a depth of 3 fathoms, but it is very difficult to make out the entrance. Skaftholmen, in the approach, is marked by a black stone beacon with topmark. Both Dalsvær and Strömhavn, 3 miles to the northward, are exposed to violent squalls.

Björnvaag and Buvaag are two small and very indifferent harbors in the neighborhood of Fikke, about 4 miles southwestward of Tranö.

The small harbor at Buö, 2 miles southwestward of Tranö Light, is seldom used, being out of the regular track of vessels; and Engesholmshavn, at Tranö, is only used by small vessels bound to the northward.

Punnan (Pundan), a shoal eastward of Tranö, is marked by an iron pillar; Masboen, by a pole.

Lights—Tranö.—A group flashing white light is exhibited, at an elevation of 49 feet, on Stangholm. It is visible 12 miles between the bearings of 71° and 224° .

Stensos Light, on the east side of Tranö, exhibited from a small white iron tower on pillars and stone base, at an elevation of 26 feet above high water, is an occulting light, with white and red sectors.

Brandoskjær.—A group occulting light, with red and green sectors, visible 4 and 3 miles, respectively, is exhibited, at an elevation of 23 feet, from the western side of Transund.

Nordkilklub Light, about $4\frac{1}{2}$ miles east of the northeast extreme of Tranö Peninsula, is occulting, with white, red, and green sectors, and is exhibited from a small white iron house, at an elevation of 34 feet above high water.

The white, red, and green sectors are visible 6, 4, and 3 miles, respectively, and the lights are shown from August 15 to April 30.

Lofoten Islands.—**Röst** is the southwesternmost group of outlying islands on the west side of Vestfiord. Röstö is a flat and low island from $1\frac{1}{2}$ to 2 miles in diameter, surrounded by a great number of islets and rocks, none of which are visible beyond a distance of 8 or 10 miles. Southward of Röstö are the precipitous islands Vedö and Storö; Vedö is 780 feet high, and Storfjeld on Storö attains an elevation of 876 feet. Stavö, on the east side of Röstö, rises to a height of 485 feet. These three islands are excellent landmarks, and in clear weather may be seen from a distance of more than 30 miles.

When within 20 miles of the Röst group, the high sharp peaks of Ellevsnyk, Trenyk, and Hernyk will be visible southward of Storfjeld; the peculiar configuration of these islets renders them unmistakable, especially if seen when bearing about 103° , from whence they show clear of each other. From a position northward or northward of Röst, Værö, Mosken, and Moskenæsö or Lofoten will also be visible. When seen from a distance, Værö will appear like a low ridge with small sharp peaks and abrupt declivities to the north and south. The small island Mosken will show two peaks, and land will be visible to the northward as far as Fuglehuk, the northwest point of Moskenæsö.

Röst has several good harbors, but they can only be entered from the southward and eastward; the north and west sides of the group are inaccessible, consequently no shelter can be found from westerly or northwesterly gales.

Lights—Skomvær.—On Skomvær, near the southwest extreme of the Röst group, a group flashing light, visible in clear weather at a distance of 19 miles, is exhibited from a red iron tower 104 feet in height and at an elevation of 154 feet above high water. From the northeastward it is partially obscured by the high islands.

The following small lights are shown around Röst:

Værholmnaaken, southward of Röst, is occulting, with white, red, and green sectors.

Bratskjær, east of Röst, is a similar light.

Hellö, southeast of Röst, is a group occulting, with white, red, and green sectors.

Mærskjær, also southeast of Röst, is similar to Hellö Light.

Halklakken, westward of Röst, is occulting, with white, red, and green sectors.

In the above the white sectors are visible 7 miles, red 4 miles, and green 3 miles. They are shown from August 15 to April 30.

Beacons.—There are many stone beacons on islets and rocks around Röst, as well as poles on sunken dangers, but they could not be identified on the existing charts.

Pilots.—Although Röstö is inhabited, pilots can hardly be expected to come out even in fine weather, and still less in foul.

Radiotelegraph.—A radiotelegraph station, open to the public from 9 a. m. to 1 p. m. and from 4 p. m. to 7.30 p. m. on ordinary days, and from 8 a. m. to 10 a. m. on holidays, has been established on Röst, call letters L. F. R.

Dangers off Röst.—An uneven sand bank, sufficiently shallow in some places to break in heavy weather, extends several miles southward and southwestward from Röst; in consequence of this, and the great strength of the tidal streams, the southern islets of the group should not be approached in a sailing vessel nearer than about 5 miles, unless with a commanding northerly breeze, when, to prevent losing ground, a vessel might pass about a mile southward of the southernmost visible rocks and northward of Sörskallen patches. The westernmost of these, named Sörskallen (Nils Persaskallen), has a depth of $3\frac{3}{4}$ fathoms, and is situated $4\frac{1}{2}$ miles southwestward of Skomvær Lighthouse.

The west side of Röst should, in a sailing vessel, be given a berth of about 5 miles, to avoid the danger of being driven amongst the rocks by the tides if the wind should fail.

Flæsskallerne are the northernmost heads on the uneven stony ground which extends about 4 miles northward and northeastward from Röstö; as there are depths of 10 to 15 fathoms on these rocks they only break when the sea is very heavy, but it is better to pass northward of them on account of the rapidity of the tidal streams in their vicinity. The southeast point of Værö, entirely hidden by Maahorn, the southwest point, or the latter bearing 80° will lead northward of Flæsskallerne, and a vessel will be abreast of them when the eastern peak of Trenyk is visible between Storfjeld and Vedö, bearing 220° .

Rocks above and below water extend 2 miles southeastward from Stavö, on the east side of Röstö; their position is generally indicated by breakers. Mosken, or the south peak on Moskenæsö, kept open eastward of the northern hill on Værö bearing 24° will lead eastward of all the dangers off the east side of Röst.

Anchorage.—On the east side of Röstö there is good anchorage eastward of Röst Church, and also at Lyngvær, about 1 mile farther south. The channels to these harbors are long and difficult and can only be taken with the aid of a pilot. Stangholm, northeastward of Liltinskjær, in the south channel to the anchorage eastward of Röstö, is marked by a black stone beacon.

Guldholmhavn, on the east side of Vedö, is of much more importance, as it might be entered without a pilot, but only with a southerly wind in a sailing vessel. If there is a strong westerly or southwesterly wind at sea, it will be scanty and irregular near Vedö, with sudden squalls. When approaching Vedö from the southward, vessels must pass eastward of Fiskflæsa, which lies 3 miles south of Vedö; at high water only two black naked rocks are visible, but at low water several more will be seen to the southward. It is almost impossible to mistake Fiskflæsa, as it lies nearly 2 miles from the nearest islets, and is the only isolated rock in the whole of Röst. Odböen, a sunken rock, lies $1\frac{1}{2}$ miles south of Fiskflæsa; the whole of the space to the westward and northward of this rock and of Fiskflæsa is foul.

The highest part of Vedö kept between 345° and 327° will lead between the shoals on either side of the entrance to Guldholmhavn. On nearing the island, a small rounded hill will be seen under the highest part of Vedö, and a vessel must stand no farther to the westward than to have these two in line; several small rocks will also be seen off Röstholm, a high islet with a gradual slope to the southward and a steep fall to the north; these must be given a good berth. After passing between Röstholm and Leiskjær, which latter lies about 600 yards to the eastward, continue between the east side of Vedö and the Tennholmene, and bring up in a depth of 7 fathoms when a low holm lying in a small bight to the northward is sighted. Small craft may run farther in, and bring up off the holm in $1\frac{1}{2}$ to 2 fathoms. There is a passage from Vedö to the harbors farther north, but a pilot must be obtained from Röst before it can be used.

Værö is as dangerous of approach as the Röst group, rocks and shoals encompassing it on all sides. Some of the dangers are marked, but they could not be identified, if named, on the existing charts.

The rocks off Maahorn, the southwestern extreme of Værö, are especially dangerous, as they extend nearly 2 miles to the southward, and, with the exception of Kallen, which is only visible at low water,

are always covered. A vessel will be westward of the dangers westward of Værö as long as an opening can be seen between Vedö and Storö, bearing about 221° . Stavö, in line with the north side of Vedö, about 249° , will lead southward of the dangers extending southward of Værö.

The whole northwest side of Værö is unapproachable and uninhabited. From Brunskallen, which lies $3\frac{1}{2}$ miles westward of the southwestern part of Værö, the outer edge of the dangerous rocky ground surrounding that island and Mosken extends in a northeasterly direction to about 1 mile beyond Hogholm; at the latter position is a rock awash at low water at about 1 mile westward of Horgan (Herjeskallen), a $4\frac{1}{2}$ -fathom patch near the center of the Malström. Ytertuven, a hillock forming the southeastern extreme of Lofotodden, kept bearing eastward of 63° , will lead northwestward of these dangers, but as the east-going stream sets very strongly toward them, they should be given a wide berth.

Lights—Værö.—A fixed and flashing light, with white and red sectors, visible 12 miles, is exhibited, at an elevation of 47 feet, from a white stone dwelling, 42 feet high, on the east side of the entrance to Sörlandsvaagen, east side of Værö.

Sörlandsvaag Light, exhibited from a small white iron house, at 13 feet above high water, is occulting, with white, red, and green sectors, visible at the distance of 6, 4, and 3 miles, respectively.

These lights are shown from August 15 to April 30.

Anchorage.—Sörlandsvaagen, on the east side of Værö, has a depth of 2 to 4 fathoms, over sand, off the houses, and rather deeper water farther in. Kvitvarden, a round rocky hillock at the extreme end of the point on the east side of the entrance, is distinguished by its peculiar whiteness. Having once made out Kvitvarden, the entrance is not difficult, but it is too narrow for working either in or out, and all the rocks and points must be given a fair berth.

Beacons.—Seiklakken, at the entrance of Sörlandsvaagen, is marked by a black stone beacon with white belt; several rocks are marked by iron poles.

Radiotelegraph.—There is a radiotelegraph station on Værö, open to the public from 9 a. m. to 1 p. m. and 4 p. m. to 7.30 p. m., except on holidays, when it is open from 8 a. m. to 10 a. m.; call letters L. E. N.

Malström or Moskenström—Tidal streams.—It is high water, full and change, at Værö at 0h. 31m.; springs rise $9\frac{1}{2}$ feet, neaps $7\frac{1}{2}$ feet.

The eastern stream in the Moskenström makes approximately about one hour before low water, and the western or ebb stream about one hour before high water, subject to wind and weather, as stated below.

Westward of the Lofotene there is a continuous northerly current independent of the tidal stream, as stated below.

General remarks.—Though rumor has greatly exaggerated the importance of the Malström, or more properly Moskenström, which runs between Mosken and Lofotodden, it is still the most dangerous tideway in Lofoton, its violence being due, in great measure, to the irregularity of the ground, which rises rapidly from the westward toward the east end of the strait, while on the south side the streams are obstructed by the bank northward of Værö. The stream attains its greatest velocity, which may be estimated at about 6 knots an hour, during westerly gales in winter. Its direction depends very much on the wind and weather; with a westerly gale at sea it often runs continuously to the eastward during both flood and ebb, either slackening or perhaps remaining quiescent for a short time at high and low water, but soon acquiring fresh strength and resuming its easterly course. If the sea should be getting up, and the tide rising at the same time, the rush of water is considerable, and the channel quite unnavigable. In winter it often happens that a westerly gale at sea will send a heavy swell in toward the coast while there is clear weather over the land and a steady easterly wind blowing out of Vestfjord; at these times the surges swell to an extraordinary height, and rage and break with great violence over the whole space between Lofotodden and Högholm; as the strength of the tide increases the sea becomes heavier and the stream more irregular, forming extensive eddies or whirlpools (Malström). During such periods no vessel should enter the Moskenström; neither is it advisable to attempt the passage in a sailing vessel with light variable winds in summer; but with a steady breeze, after several days' fine weather, there is no danger at all in taking it. It is imprudent to try and force a passage either in or out if the stream is adverse.

The Moskenström naturally runs strongest between Lofotodden and Högholm, where the passage is narrowest, and its velocity is much greater on the north side of the channel than near the islets; in several places it sets right in toward Lofotodden in consequence of its meeting with the counterstream (termed by the fishermen "bagevie"), which runs along the shore with a velocity often equal to that of the main stream, but in a contrary direction.

At high water the ebb begins to run southwestward, out through the Moskenström, and past Værö and Röst, gradually turning through west toward northwest. At half ebb the stream through the Moskenström runs straight out to sea, bending to the northward when clear of the narrows; at Værö and Röst the stream has by this time assumed a more northerly direction, running directly to the northward past the south and west sides of these islands. At three-

quarters ebb the stream bends more to the eastward at Værö and Röst, and its strength gradually decreases. At this period the Moskenström stream has slacked, and remains quiescent for about half an hour; it then begins to run eastward into Vestfiord, and gradually acquires its full velocity. At low water, when the Moskenström has already assumed its easterly course, the water remains stationary at Röst for about half an hour. As the water rises the flood stream begins to set about northeast from Röst toward Værö, gradually increasing in strength, and veering through east to the southward of southeast. Toward high water it takes a southerly and southwesterly direction, gradually slacking until it is scarcely felt; then, after another interval of half an hour, the succeeding ebb begins to make as before.

The Moskenström therefore runs eastward with the flood and westward with the ebb, while the streams turn completely round Röst, with the sun, once in 12 hours, the flood varying its direction gradually from about northeast through east toward southwest, from which point the ebb turns through west toward north and northeast. This is the regular course of the tides in fine settled weather.

In winter, when the weather is very unsettled, with protracted and violent gales from the west and northwest, there is slack water at Röst during the time when the streams would otherwise run from about east through south to west, and the tide does not set perceptibly northwestward until the second hour of the ebb; it then acquires considerable velocity, veering to the northward, but gradually loses strength as its direction becomes eastward of north, until at half flood it slacks altogether.

It is stated that during the first and second quarters of the moon the eastern streams are twice as strong as those which run to the westward, and that during the third and fourth quarters these conditions are reversed and the west-going streams are the strongest.

Shoals.—**Horgan** (Herjeskallen), in a position $1\frac{1}{4}$ miles south of Ytertuven, lies near the middle of the Moskenström; it has a depth of $4\frac{3}{4}$ fathoms, and even in calm weather, when the sea does not break, the water over it bubbles and appears to boil, leaving a white scum on the surface, owing to the stream being interrupted in its course and forcibly deflected upward.

A patch, with $1\frac{1}{2}$ fathoms at low water, lies nearly midway and a little north of a line joining Horgan to the northernmost of the Högholmene.

To avoid these dangers, vessels should keep over toward the north or south sides of the channel; the north side is much preferable, but neither Lofotodden or the Högholmene should be approached nearer than half a mile.

Directions—Anchorage.—There is temporary anchorage for very small vessels in the cove at Helle, northward of Loftodden, but it is inadvisable to enter without a pilot. Off the entrance there are two rocks on which the sea always breaks; after passing southward of these, midchannel must be kept when entering the bight, as there are shoals on either side; when so far in that the houses are visible, course may be altered for the anchorage, where there are depths of 2 to 3 fathoms over sand. A shoal lies close northeastward of the small sound which has to be passed when entering the cove.

Between Værö and Röst.—When the Moskenström is impracticable, vessels entering or leaving Vestfjord must either pass northward or southward of Röst, as the whole of the space between the Högholmene and Værö is studded with rocks and shoals. The tidal streams in Rösthavet between Værö and Röst sometimes equal the Moskenström in velocity, but as the channel is broader and the depth greater, the streams run more evenly and do not raise such a heavy topping sea; this, however, only applies to the open channel, for over and near the rocks on either side it is just as bad.

Entering between Röst and Værö from the westward, Maahorn should be kept bearing southward of 80° until the eastern peak on Trenyk is visible between Storfjeld and Vedö (bearing 221°), when steer about 125° , which course will lead in about midchannel, guarding against the strong tidal stream. Stavö, in line with the north side of Vedö bearing about 249° , leads eastward of the dangers extending southeastward of Værö.

West coast of Lofoten.—The whole of the outer or western coast of Lofoten, from Helle on the west side of Lofotodden to Hasselfjord on the north side of Öst Vaagö, is inaccessible, and should be avoided; on the whole of this reach there are neither entrances nor places of refuge, with the exception of Flagstadpollen, Napström, Borgvær, and Gimsö Ström, the approaches to which are dangerous in the extreme.

From Lofotodden to Fuglehuk the coast presents an unbroken range of precipices, without any landing place. It is also fronted by a sandbank, with rocks and shoals, extending from 2 to 5 miles offshore; beyond this the depth increases rapidly.

From Fuglehuk, northward of Hasselö, the coast is also fronted by a sandbank extending to about 5 miles in places. (Continued in next chapter.)

The principal landmarks are Röst, Værö, the Moskene, Skivenmount, near Bunes, on the west side of Moskenæsö, Fuglehuk, and Napstind.

Current.—The current sets continuously to the northward on the west side of the Lofotene, independently of the tidal streams.

Pilots and anchorage.—Vessels making this part of the coast should not approach the west side of Moskenæsö nearer than to have Eggumsaksla, on the northwest part of Vest Vaagö, well visible outside or westward of Fuglehuk. If obliged to seek shelter, the only places where pilots can be expected are off Stokvig near Fuglehuk or off the entrance of Napström, where fishermen might possibly be found; the nearest shelter in such case would be either in the shallow bay of Flagstadpollen, where there is a ground swell in bad weather, or at Nap.

In the Borgvær group of islands, between Eggumsaksla and Hoiksla, there is an anchorage, with a depth of 4 fathoms, available for vessels in charge of a pilot. The harbor is only used in summer, but there is another place near the houses where vessels might be laid up in winter. Southerly winds are generally squally and irregular near Eggumsaksla.

Lights.—On the west and northwest coasts of Lofoten the following lights are exhibited from August 15 to April 30. Unless otherwise stated they are shown from small white houses, the white, red, and green lights being visible in clear weather at a distance of 6, 4, and 3 miles, respectively.

Leiholmen.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 21 feet, from a small iron house on stone beacon situated on the south point of Leiholm, western side of the northern approach to Sundström.

Jusholmen.—A group occulting light, with white, red, and green sectors, is exhibited from a small iron house situated on the north point of Jusholm, eastern side of northern entrance to Sundström.

Napholm.—An occulting light, with white, red, and green sectors, is shown on Napholm, western side of the northern entrance to Nepstrømmen.

Hæsholm.—On Storholm, about 3 miles west of Himmeltind, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 52 feet above high water.

Eggum Light, at an elevation of 19 feet above high water, is occulting, with white, red, and green sectors.

Borgvær.—On the northern end of Storborgen a group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 84 feet above high water.

In Borgvær Harbor, three-quarters of a mile eastward of the above light, an occulting light, with white, red, and green sectors, is shown, at an elevation of 34 feet above high water.

Sande.—At Sande, about $1\frac{1}{2}$ miles eastward of the Borgvær group, two fixed red leading lights are exhibited, elevated 75 and 39 feet, respectively, above high water, and visible in clear weather at a dis-

tance of 7 miles. These lights (400 yards apart) in line, bearing 147° lead through Sandleden.

Kvalnes.—An occulting light, with white, red, and green sectors, is shown, at an elevation of 26 feet, on the north extreme of Kvalnesaksla Peninsula from a white iron house on piles 33 feet high.

Hovsund.—An occulting light, with white, red, and green sectors, is shown on Bukholmen, off the north point of Gimsö, at an elevation of 26 feet.

Laukvig.—On Drangelodden, on the southern side of the western approach to Hasselfjord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 26 feet above high water.

Southeast coast of Lofoten.—With the exception of Nusfiord, Orsvaag, and Storvaag eastward of it, none of the harbors on the southeast coast of Lofoten are suitable for large vessels, but smaller craft might be moored in most of them. Raftsund is the least dangerous and most remarkable of the channels between the Lofoten Islands westward of Tjelsund, but the latter is the only passage leading northward from Vestfiord within the islands.

Telegraph.—Some of the ports of Lofoten, mentioned hereafter, are connected with the telegraphic system of Norway; at others telegraph stations are opened during the fishing season.

Sörvaag, between Moskenes and Glaapen Point, is the southern harbor on the southeast side of Lofoten.

Kraaka, a rock in the entrance, is marked by a white stone beacon with black belt. Other shoals are marked by poles.

Lights—Glaapen.—From a white wooden dwelling, 23 feet high, on the north side of Glaapen Point, is exhibited, at an elevation of 131 feet above high water, a fixed white light, visible from a distance of 17 miles in clear weather.

Aa Light, on Aakerberget, 1½ miles westward of Glaapen Light, elevated 40 feet above high water, is occulting, with white, red, and green sectors.

Moskenes Light, three-quarters of a mile north of Glaapen, elevated 18 feet, is also occulting, with white and red sectors. In this and Aa Light the white and red sectors are visible at the distance of 6 and 4 miles, respectively; the green sector of Aa Light is visible 3 miles.

The above lights are shown from August 15 to April 30.

Directions.—To enter Sörvaag vessels should pass between Glaapen and Kraaka, which lies northeastward from the lighthouse. It is necessary to keep close in to Glaapen, as there are three sunken rocks off the southeast side of Kraaka.

Off the houses on the north side of Glaapen there are depths of 4 to 6 fathoms, good sandy bottom; the harbor is very narrow, but secure

in all weathers, though a swell sets in when the wind blows out of Vestfjord, and it is then difficult to leave.

There is also anchorage in Moskenesvaag, but it should only be used in summer, and southerly winds send a heavy sea in to both these places. When taking this channel it is best to keep nearest to Kraaka, between which and Moskenesland there are two rocks which dry at low water.

Telegraph.—There is a telegraph station here.

There is also a radio telegraph station, open to the public from 9 a. m. to 1 p. m. and from 4 p. m. to 7.30 p. m., except on holidays, when it is open from 8 a. m. to 10 a. m.; call letters L. E. N.

Kirkfiord.—**Reine Havn** is situated just within the southern entrance to Kirkfiord, at about $2\frac{1}{2}$ miles northeastward of Sörvaag; it will be easily recognized by the rather lofty island Olenilsö (Olnilsö) in the middle of the entrance to Kirkfiord, and also by a large house to the westward. The entrance is between Langskjær, a long low rock off the south end of Olenilsö, and a tolerably high islet named Lamholm, which lies half a mile southward of the lighthouse. There is a depth of 14 feet at low water in the dredged channel to Reine.

Lights—Reine.—On the south point of Olenilsö, from a white wooden dwelling, a fixed light, with white, red, and green sectors, is exhibited, at an elevation of 35 feet above high water. Visible 8, 5, and 4 miles, respectively.

Havnö.—A group occulting light, with white and green sectors, visible 7 and 3 miles, respectively, is exhibited, at an elevation of 30 feet, from a small iron house situated on the east point of Topö, at the entrance to Kirkfiord.

Two leading lights are exhibited on the west side of the inner harbor. The front light is white occulting, elevated 24 feet. The rear light is also white occulting, elevated 56 feet. These lights in line bearing 268° lead into the inner harbor.

The above lights are shown from August 15 to April 30.

Telegraph.—There is a telegraph station here.

Beacons.—On Lamholm is a black stone beacon with white belt; Fiskeskjær is marked by a black stone beacon. The sunken rocks near the fairway are marked by iron poles.

Directions.—When passing northward of Lamholm care must be taken to avoid a rock, with $2\frac{3}{4}$ fathoms, which extends off the south end of Langskjær; then steer direct for Andö, which is high, passing eastward of Fiskeskjær beacon, which lies about 300 yards west of the lighthouse.

The best anchorage is westward of Fiskeskjær beacon, in a depth of 5 to 6 fathoms.

Festhælen.—Southeast of Festhælen, in Havnsund, is a small but good harbor with a depth of 4 fathoms, over sand; but the entrances are so narrow that only small vessels can enter if there is any sea on.

Sundström, the channel between Moskenæso and Flakstadö, is narrow and foul, and only partially navigable for very small vessels. There is a small, unimportant harbor at Sund, with a depth of 4 fathoms, but it can not be left by sailing craft if the wind is between southeast and southwest. Sundbo, a shoal in the middle of the harbor, is marked by an iron pillar. Nakmean, on the western side of approach, is also marked by an iron pillar.

Light—Sund.—On Lille Grimsholm, east side of approach to Sund, from a small iron house on a beacon, is exhibited, at an elevation of 40 feet above high water, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively.

Nusfiord.—There is a good anchorage on the west side of Nusfiord, 4 miles eastward of Sundström; and within the high islet north of the houses is a large and secure basin with a depth of 10 to 20 fathoms; it is difficult to leave, however, with southerly and south-easterly winds.

Light.—On Bonesodden, the west entrance point of Nusfiord, an occulting light, with white and red sectors, visible 6 and 4 miles, respectively, is exhibited from a small white iron tower, at an elevation of 36 feet above high water. Shown from August 15 to April 30.

Napström, between Flakstadö and Vest Vaagö, though broader than Sundström, is equally foul, especially on the east side. On Revlan, east side of southern approach, there is a depth of 8 feet. There is anchorage at Strömö and Nap, on the western shore.

Balstad.—Southward of the peninsula, between Napström and Buksnesfiord, is a cluster of islets and rocks, between which are the entrances to Balstad Havn. Svinö, the southernmost and largest of these islands, will be known by its height. A rock in the havn is marked by an iron pole.

Lights—Svinö.—On the east side of Svinö, from a white wooden dwelling 24 feet high, is exhibited, at an elevation of 192 feet above high water, a fixed and flashing light, with white, red, and green sectors, visible 12, 9, and 7 miles, respectively.

Balstad Havn Light, occulting, with white, red, and green sectors, is elevated 17 feet above high water.

These lights are shown from August 15 to April 30.

Beacons.—Leiskjær is marked by a black stone beacon, Tjestböen by an iron pole, and the shoals on both sides of the channel to Balstad Havn by iron poles.

Directions—Anchorages.—If wishing to enter Balstad Havn, pass nearly 1 mile eastward of Svinö, and proceed between Leiskjær

beacon and the iron pole on Tjestbo; continue along the north side of Gjermesö, pass eastward of a shoal opposite the houses of Balstad, and bring ~~light~~ ~~near~~ ~~a~~ ~~small~~ ~~rock~~ on the west side of the sund, in 4 fathoms.

When northward of Gjermesö a large warehouse will be seen in a bight to the southwestward, where there is also anchorage, but the water is not very deep. There is a still smaller anchorage on the south side of Gjermesö.

Brandholmsboen are several sunken rocks lying $1\frac{1}{2}$ miles south of Brandsholm, south side of Vest Vaagö, with Svinö bearing 270° about $2\frac{1}{2}$ miles; these rocks dry at low water, and when covered nearly always break.

Mortsund, on the east side of the entrance to Buksnesfiord, is a good but small harbor; the entrance is too narrow and difficult to be attempted by strangers.

Telegraph.—There is a telegraph station at Mortsund.

Lights.—On Gulholmen, south side of Mortsund, is exhibited, at an elevation of 47 feet above high water, an occulting light, with white and red sectors, visible 6 and 4 miles.

Finholmen.—A group occulting light (groups of two occultations), with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 50 feet, from a small iron house situated on Finholmen, eastern side of the eastern entrance to Mortsund.

Buksnes Light, at the inner end and on the western side of Buksnes fiord, is an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, exhibited at an elevation of 39 feet above high water.

These lights are shown from August 15 to April 30.

Beacons.—Flatskjær and Kvanholmen in Mortsund are marked by black stone beacons; Dynan by an iron beacon; the northern side of Brandsholmbo, in the eastern approach to Mortsund, by an iron pole.

Ure is a harbor for small craft, about 3 miles eastward of Mortsund, only available with local knowledge.

There is a telegraph station at Ure during the fishing season.

Lights.—On Björnerö, west side of approach to Ure, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited from a small white wooden house, at an elevation of 80 feet above high water.

Notskjær.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 37 feet, from a small iron house situated on north side of islet in Ure Harbor.

The above lights are shown from August 15 to April 30.

Kraakeskallen, a patch awash at low water, situated about 1,200 yards eastward of Björnerö Lighthouse, is marked by an iron pole.

Steine, 2 miles northeastward of Ure, is adapted for small craft in charge of a pilot. There is a telegraph station here.

Light.—At Steine an occulting light, with white and red sectors, is exhibited from a small white wooden house, at an elevation of 34 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles. Shown from August 15 to April 30.

Hagbaren and Hysungerne are marked by black stone beacons.

Stamsund is a harbor for small craft, about $1\frac{1}{2}$ miles eastward of Steine.

The principal dangers are marked by iron poles.

Telegraph.—There is a telegraph station here.

Buöhavn is a harbor for small craft, situated northward of Stamsund.

Lights.—On Törnholm, in the approach to Stamsund, a fixed light, with white, red, and green sectors, visible 8, 5, and 4 miles, respectively, is exhibited from a white dwelling, at an elevation of 51 feet above high water.

On **Hellen**, in Buöhavn, an occulting light, with white and red sectors, visible 6 and 4 miles, respectively, is exhibited from a small white wooden house, at an elevation of 41 feet above high water.

Off Valberg, on Skogholm, an occulting light, with white, red, and green sectors, visible at the distance of 6, 4, and 3 miles, respectively, is exhibited from a white iron house, at an elevation of 39 feet above high water.

The above lights are shown from August 15 to April 30.

Gimsö Ström, between Ost and Vest Vaagö, and eastward of Gimsö, is foul and intricate, and the tidal streams run with considerable strength; it is consequently a dangerous passage to attempt, even with a pilot, and northward-bound vessels would afterwards have to pass close to the west side of Langö, one of the most dangerous places on the coast.

Lights.—The following lights are shown, for the use of small craft passing through Gimsö Ström, from August 15 to April 30. The white, red, and green lights are visible at the distance of 6, 4, and 3 miles, respectively.

Søndre Lyngvær, on Storöklub, at an elevation of 21 feet above high water, is occulting, with white and red sectors.

Nordre Lyngvær, on Brandholmboen, at an elevation of 12 feet, exhibited from a white iron house on piles, is occulting, with white and red sectors.

Klokkerböen, within the northern entrance, at an elevation of 13 feet, is occulting, with white, red, and green sectors.

See also lights at Henningsvær, on eastern side of south approach. **Kristenskjærene**, $1\frac{1}{2}$ miles northward of Klokkerbøen, is group occulting, with white, red, and green sectors.

Anchorage—Skokkelvikøerne.—Amongst the Skokkelvikøerne, on the west side of the entrance to Gimsö Ström, there is a small harbor with a depth of 3 to 4 fathoms over sand, but it is only used by small fishing vessels.

At Lyngvær, in Gimsö Ström, about 4 miles northward of the entrance, there is good anchorage among the islets, and also off the houses farther northward, but a shoal projects from the jetty. Brudgomskjæret, in the southern entrance to Lyngvær, is marked by an iron pillar; other dangers by poles. Temporary anchorage may also be found at Sundklak and Barstrand, and there is a fair but shallow harbor for small craft at Sand, northward of Gimsö Church.

Sundklakström, which separates Gimsö from Vest Vaagö, is very shallow, the depth in some parts being only 3 feet.

Henningsvær, off the southwest point of Öst Vaagö, is the largest of the Lofoten fishing stations, but the harbor is small.

Lights—Henningsvær.—On the southwest end of Saltværingholm is exhibited from a white wooden dwelling with tower, 37 feet in height, at an elevation of 107 feet above high water, a fixed and flashing white light, and visible in clear weather the fixed light 12 and the flashing light 16 miles. The light bearing 19° will lead up to the western entrance to the harbor. See sketch on chart.

On **Hellandsoen**, about 200 yards north of the (above) main light, from a small white iron house, at an elevation of 51 feet above high water, an occulting light, with white, red, and green sectors, is exhibited.

Sauö Light, about three-quarters of a mile northeastward of Henningsvær, elevated 28 feet above high water, is occulting, with white and red sectors.

Festvaag Light, nearly $1\frac{1}{2}$ miles north of Henningsvær Light, is occulting, with white, red, and green sectors, elevated 32 feet.

The above lights are exhibited from August 15 to April 30. With the exception of the main light, the white, red, and green sectors are visible at the distance of 6, 4, and 3 miles, respectively.

Beacons.—Stampen and Brödrene are marked by black stone beacons; Hyseskjæret by a black stone beacon with white belt; other shoals by iron poles.

Telegraph station.—There is a telegraph station at Henningsvær.

Directions.—The western entrance to Henningsvær Harbor is not difficult. Vessels may pass either northward or southward of Vestvær, a cluster of islets and rocks westward of Henningsvær, and proceed for the anchorage, taking care to avoid Holländeren Shoal, which lies southward of a small black rock and nearly always breaks.

In fine summer weather the anchorage off the houses may be used, but, as there is a considerable swell there in bad weather, it is better to anchor farther to the eastward, in a depth of 4 to 6 fathoms, good sandy bottom.

In thick weather it is necessary to guard against mistaking the northwest point of Vestvær for the point on the south side of the entrance to Henningsvær Harbor, as, if the breakers on Barene were taken for those on Holländeren, a vessel would probably run right in amongst the rocks. If northward of Vestvær in thick or rough weather, it is advisable to pass southward of Hyseskjæret beacon and Brandskjær, then haul to the southward, and the anchor may be let go in a depth of 10 to 12 fathoms, over sand, southwest of Engö.

The eastern entrance to Henningsvær Harbor is marked by the Brödrene, mentioned above.

Outlying dangers.—Grundskallerne is a steep rocky ridge southward of Vaagekallen; the shoalest part, on which there is a depth of 8 fathoms, lies nearly 3 miles southeastward of Henningsvær Lighthouse. Skraaven bearing 64° will lead southward of Grundskallerne.

Bikjeboene is a sunken rock on the southern extreme of a shoal extending about a mile southwestward from the Moholmerne, which lie 4 miles eastward of Henningsvær.

The Skjolden Rocks lie about $1\frac{1}{4}$ miles northeastward of the Moholmerne, off the entrance to Örsvaag; they uncover at low water, but generally break if there is any swell. They are marked by iron poles. Andersbo, with $5\frac{1}{2}$ fathoms, lies three-quarters of a mile eastward of the Skjoldene.

Moholm beacon.—There is a black stone beacon on the eastern Moholm.

Hopen and Örsnes.—Hopen Havn, about 4 miles northeastward of Henningsvær, is the southern harbor on the southeast side of Öst Vaagö; there is a depth of 13 feet in the middle of the dredged channel. This havn is not much used, as the heavy squalls that strike down from Vaagekallen render it an unsafe anchorage, especially in winter. Örsnes Havn, a little eastward of Hopen, is very small, and the entrance is narrow. In both these harbors there are depths of 3 to 5 fathoms, good sandy bottom. The dangers are marked by poles.

There are two telegraph stations at Hopen.

Lights.—At Hopen two alternating red and white lights are exhibited from small white wooden houses, 330 yards apart, the front light elevated 39 feet above high water and the rear light 144 feet; they are visible from a distance of 6 miles in clear weather, and when in line bearing 304° lead midway in the dredged channel. Shown from August 15 to April 30.

Moholmerne.—A group flashing white light, elevated 122 feet, and visible 17 miles, is exhibited from an iron red tower 87 feet high on the Moholmerne.

Örsvaag, eastward of Örsnes, has a depth of 3 to 5 fathoms over sand, and is the best harbor in Lofoten for vessels of moderate draft. The best approach is between the Moholmerne and the Skjoldene and eastward of Sagö Lighthouse. Örsvaagbo, in the middle of the bay, is marked by a pole.

Telegraph.—There is a telegraph station at Örsvaag during the fishing season, and a permanent station at Kabelvaag.

Light.—From a white wooden dwelling, 25 feet in height, on the north side of Sagö, west side of entrance to Örsvaag, is exhibited, at an elevation of 92 feet above high water, a light, with fixed and flashing white and red sectors, visible 12 and 9 miles, respectively.

Directions.—When entering Örsvaag the northern part of Sagö must not be approached nearer than 50 yards; a narrow ledge of rock, with a depth of 7 feet on the shoalest part at low water, extends 300 yards northward from the lighthouse. The best anchorage is with the lighthouse bearing southward of 170°.

Storvaag and Kabelvaag are the next harbors eastward of Örsvaag. One vessel of moderate size might moor in Storvaag, but Kabelvaag, southward of Vaage Church, is narrow, and exposed to southerly winds and swell; a breakwater is, however, in course of construction. In both these harbors there are depths of 3 to 5 fathoms, over sand. Bjorgvinskjær and Storggrund, in Kabelvaag, are marked by iron poles, and Præsteflu, in Storvaag, by an iron pillar.

Tide.—It is high water, full and change, at Kabelvaag at 0h. 4m.; springs rise about 7 feet.

Light.—**Kabelvaag Light**, exhibited from a small white iron tower on Leiskjær, at an elevation of 26 feet above high water, is occulting, with white and red sectors, visible 6 and 4 miles, respectively. Shown from August 15 to April 30.

Svolvær, about 4 miles northeastward of Örsvaag, is one of the largest and safest harbors in Lofoten, and is, therefore, frequented by hundreds of vessels during the fishing season.

At Kjeo, an islet on the east side of the south entrance to Svolvær, there is a disused light dwelling. See sketch on chart.

Telegraph communication.—Svolvær is the center of local communication, and the mail steamers call here. There is also a telegraph station.

Lights.—At Svolvær leading lights are exhibited from two small white iron houses, 975 yards apart, the front light on Bekholmen is occulting, with red and green sectors, elevated 17 feet, the rear on

Storhaugen is red occulting, at 88 feet above high water; they are each visible in clear weather at the distance of 7 miles between 356° and 8° , and are in line when bearing 2° .

Vorsetoen.—A group occulting light, with white and red sectors, visible 6 and 4 miles, respectively, is exhibited, at an elevation of 34 feet, from the east side of Vorsetoen, an islet on the western side of the entrance to Svølvær.

Small occulting lights are also shown on Vabeinskjær, Kjeösten, Jomfruen, and Kummen, red on Vabeinskjær, green on Kjeösten and Kummen, and white on Jomfruen.

The above lights are shown from August 15 to April 30.

Beacon.—Vabeinskjær is also marked by a black stone beacon with white belt.

Directions.—Hvalbensleden, the southern entrance to Svølvær, is narrow, but not difficult with a suitable plan of the harbor. To enter from the southward give the dangers westward of Skraaven a good berth and steer direct for Svølværfjeld, which will be easily recognized, as it is the highest mountain on the coast eastward of Vaagekallen. When nearly abreast of Vaage Church, Rödhholm, a round, high, grass-covered islet, will be seen on the port bow, and immediately eastward of Rödhholm are some small low rocks. Give Rödhholm a berth of a quarter of a mile, and pass eastward of Vabeinskjær. Svinö will be known by the houses on it.

Vessels should keep on the east side of the sound at first, and then haul over to the westward to avoid Kjeösten; when past that, the anchor may be let go either in a depth of 10 fathoms on the west side of the harbor or in 4 fathoms near the houses on the east side; there is also an anchorage farther in. The outer harbor is exposed to heavy squalls off the mountain during northwesterly gales.

The eastern entrance is difficult and only available with a pilot.

At night the leading lights in line showing red and bearing 2° will lead clear of the dangers in the approach, and when past Vabeinskjær vessels may proceed westward of Kjeö for the anchorage.

Börvaagen, Helle, and Vatterfiord.—The harbors at Börvaagen, Helle, and Vatterfiord, northward and eastward of Svølvær, are only suitable for small craft.

Skraaven is an important fishing station frequented by numbers of vessels, but the entrances from the southward and westward are difficult, while the channels leading in from the northward and eastward can only be taken by vessels of 6 to 8 feet draft, and even these would have to wait for high water. The harbor has a depth of 4 fathoms near the land, and 8 to 10 fathoms farther out, over good holding ground.

Telegraph.—There is a telegraph station here during the fishing season.

Böen, the southernmost of the rocks off Skraaven, has a depth of 12 feet, and lies about 1 mile from the southwestern extreme of the island.

Lights.—On the western part of Sjaarholm, from a white wooden dwelling, is exhibited, at an elevation of 51 feet above high water, a light, with fixed and flashing white and red sectors. The white light is visible in clear weather at a distance of 11 miles, red light at 8 miles. See sketch on chart.

At Galgeholmen, on the north side of Skraaven, an occulting light, with white and red sectors, is exhibited, elevated 20 feet above high water.

Slaakö.—On Slaakö, southward of Lille Molla, and off the northeast side of Skraaven, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 176 feet above high water.

In this and the preceding light the white, red, and green sectors are visible at the distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 30.

Beacons.—Kraaka is marked by a black stone beacon, Vasvikholm by a black beacon with a white belt, Rödholm by a black stone beacon with cross, and Flesa by a black stone beacon. Several dangers are marked by poles.

Directions.—To enter Skraaven from the westward, keep Sjaarholm Lighthouse or Light bearing 67° until near Vasvikholm; continue past the north side of the latter islet and proceed southward and eastward of Sjaarholm for the harbor, the entrance to which is very narrow and should not be attempted by strangers.

Passages north of Skraaven—Molldören.—There are passages between Skraaven and Lille Molla, and also between the latter island and Store Molla, but they can only be used by those acquainted with the locality. Molldören, the sound between Lille and Store Molla, is both narrow and intricate.

Lights—Molldören.—On Vaatvikneset, east end of Lille Molla, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower, at an elevation of 39 feet above high water.

On the north point of Husholm, in Molldören, is exhibited an occulting red and white light, elevated 28 feet.

In these the white lights are visible at a distance of 6 miles, red at 4 miles, green 3 miles. Shown from August 15 to April 30.

There is a small but good harbor among the Gulbrandsholmene, on the south side of Lille Molla. The small harbors at Vikan, and Guldvik, in Molldören, are chiefly used by fishing craft.

Brettesnes Havn is situated on the north side of Molldören eastern entrance.

The depth in the harbor is from 5 to 8 fathoms, and vessels of 500 tons burthen frequent it. The coal wharf has a low-water depth of 12 feet alongside.

Communication.—The mail steamers call here, and also at Svolvær.

Telegraph.—There is a telegraph station here. •

Öihellesund, on the west side of store Molla, is deep, but there are so many dangers in its entrance that a pilot is necessary. At its northern end it is closed by a bank with 4 feet of water.

Raftsund.—Eastward of Store Molla is the entrance to Raftsund, a deep and comparatively clear but very narrow channel between Öst Vaagö and Hindö (Hinnö). The land rises precipitously on the west side of the sound, but the eastern shore, though steep, is of a different character, and is covered with birch woods and pasture. Between Svartsund and Hanö, the narrow part of the sound, spring tides attain a velocity of more than 6 knots, the stream turning from one to two hours after high and low water; the wind also is very unsteady and squally. There is deep water close to the holms northward of Raftsund, and the passage itself is not very difficult; it is 15 miles in length, and northward-bound vessels would have to put to sea again and proceed westward of Andö, after passing through Sortlandsund, as Risösund is very shallow. Anchorage may be found at Slotholm (Slaatholm), Digermulen, and Svartsund, and vessels may bring up almost anywhere close to the shore.

Cable.—A telegraph cable lies across the sound from Steinbaknes to Hansjælvik, and also from Brakö to Storneset. Vessels are cautioned against anchoring in their vicinity.

Light.—At Digermulen, on the eastern side of the southern end of Raftsund, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 77 feet. The white light is visible 10 miles to southward, 6 miles to northward. The red and green lights are visible 4 and 3 miles, respectively.

Vasnes.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 13 feet, from a small iron house situated on Vasnes, western side of the sund.

The above lights are shown from August 15 to April 30.

Hindö (Hinnö).—Hindö, between which and the mainland is the Inner Lead, has a circumference of about 140 miles, and is thus the largest island on the coast of Norway; it is intersected by numerous fiords, the inner parts of which are separated from each other by low and narrow isthmuses. In the western and southern parts of Hindö the mountains are generally high, steep, and wild, especially eastward of Gullsfjord, where they attain an elevation of 3,000 to 4,000 feet; but in the northern part, between Kvæfjord and Vaags-

fiord, the hills are rounder and lower, only one mountain, Hemmestadfjeld, rising to a height of about 3,000 feet.

Small harbors on south side of Hindö.—There is no anchorage for vessels of moderate draft off the south side of Hindö eastward of Raftsund, and the passages between the islands are foul and shallow. There are harbors in Risvær, Varvær, Svellingen, and Kjeö, but they are only used by the small coasters connected with the cod and herring fisheries in Ögsfiord and Kanstadfiord.

Lights.—The following lights, exhibited from small white structures, visible in their white, red, and green sectors at a distance of about 6 or 7, 4, and 3 miles, respectively, where not otherwise stated, are shown from August 15 to April 30:

Risvær, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 28 feet, on the southwest point of Seingsdraget.

Aarsteinen Light, on Lille Bustleivholm (a rock off the east coast), is an occulting light, with white, red, and green sectors, elevated 32 feet above high water.

Haakjærringholmen Light, northward of Selsö, off the entrance to Ögsfiord (Öksfiord), is an occulting light, with white and red sectors, at an elevation of 82 feet above high water.

Seingen Light, on Nordre Formandsö, elevated 29 feet above high water, is flashing, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively.

Smitskjær Light, about three-quarters of a mile northeast of Formandsö, is an occulting light, with white, red, and green sectors, elevated 39 feet above high water.

Skarvhausen Light, southward of the eastern end of Offersö, at an elevation of 52 feet above high water, is occulting, with white, red, and green sectors.

Kjeö Light, situated on Skipholm, and elevated 35 feet above high water, is occulting, with white, red, and green sectors.

Beacons.—In Smitskjær Lead, Vesthallen and Hyseskjær are marked by black stone beacons. Rundholmen, Raviskjærholmen, and Svartsbakskjær, in Risvær, are marked by black stone beacons. Svartskjær, Skiftingerne, Svellingerne, Akteröen, Storsandö, Mat-skjær, Lille Lysö, and Syd Eisteinen, in Svellings Lead, are marked by black stone beacons. In Offersö, Svartoxen, in the western channel, is marked by a black stone beacon. In Kjeoen, Tværskjær is marked by a black stone beacon with white belt, and Latmandsbo by a black stone beacon. Other dangers are marked by iron poles and pillars.

Dangers southward of Hindö—Head of Vestfiord.—The dangers off the southeastern coast of Lofoten, westward of Skraaven,

are all within $1\frac{1}{2}$ miles of the land; but those to the eastward, in the inner part of Vestfiord, extend from 2 to 5 miles off the south side of Hindö, reducing the channel to a breadth of $2\frac{1}{2}$ miles, but it is wider again within as far up as the entrance to Ofotenfiord.

Breiskallen, a 6-fathom rocky patch lying about $2\frac{1}{2}$ miles north of Eggelösa, the point northwestward of Tranö Lighthouse, between which is the fairway of Vestfiord, is the southernmost shoal of those extending about 5 miles southwestward from Offersö; Helligskallen, with 3 fathoms, and Mefjordboen, which dries, lie half a mile and a mile, respectively, to the northward of it; Baargrund, a patch of 9 fathoms, lies nearly $2\frac{1}{2}$ miles westward of it. At a short distance southward of these shoals the depths are from 200 to 300 fathoms, the eastern edge of the foul ground extending from Offersö, between Breiskallen and Hvaholm (Vadholm), is equally steep. Hvaholm is a grass-covered islet 2 miles southward of Offersö, and will be easily recognized.

Clearing mark.—The highest point of Lille Molla bearing 270° will lead southward of all the dangers off Hindö eastward of Skraaven.

Offersö.—There is a boat harbor here.

Kanstadfiord, with its branches, situated westward of the Löd-ingen Peninsula, extends northward to the distance of about 8 miles, and is about 1 mile in average breadth.

Hökfiord is an extension to the northwestward of Kanstadfiord.

Light.—At Svendsgam (Svensgam), on the eastern side of Hökfiord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 15 feet above high water. Shown from August 15 to April 30.

Tysfiord, situated on the southeastern side of the inner end of Vestfiord, lies 10 miles east-northeastward of Tranö, and penetrates thence about 30 miles in a southerly direction; several other fiords branch off on its eastern side.

Lights—Korsnes.—On Korsnes, at the western entrance to Tysfiord, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower, at an elevation of 26 feet above high water. Shown from August 15 to April 30.

Telegraph.—There is a telegraph station at Korsnes.

Ofotfiord is the continuation northeastward of Vestfiord from abreast the southern entrance to Tjelsund. It is about 45 miles in length by 2 to 4 miles in breadth, and its head is known as Römbaksfiorden. The fiord is available for all vessels. There are but few dangers and they are all marked.

Dangers.—Lilandsgrundboen, a shoal with less than 6 feet water over it, and from which a 3-fathom bank extends half a mile

westward, lies in the fairway of Ofotfiord, situated 2 miles south-westward of the lighthouse on Ungsmalö. It is marked by four poles. Voldflua (Vollflua), a similar shoal, marked by a pole, lies about midway between Lilandsgrund and Ungsmalö.

Skjomgrund, with $2\frac{3}{4}$ fathoms, off the entrance to Skjomen, is marked by a pole. A rock with 2 fathoms over it exists in Herjangsfiord about a mile west of Lindstrand.

Lights—Barö.—On the northwest side of Barö, on the southern side of approach to Ofotfiord and Tjelsund, a light, with fixed and flashing white, red, and green sectors, is exhibited, at an elevation of 98 feet above high water, from the gable of a white wooden dwelling, visible in clear weather at a distance of 15 miles.

The following lights are exhibited in Ofotfiord from August 15 to April 30. White, red, and green sectors are visible at a distance of 6 to 7, 4, and 3 miles, respectively.

Revelsö Light, in the entrance to Ædfiord (Efiord), is occulting, with white, red, and green sectors, elevated 20 feet above high water.

Havnesholmen Light is occulting, with white and red sectors, elevated 38 feet above high water.

Tjellebotn Light, 2 miles eastward of the preceding, is occulting, elevated 14 feet above high water, showing white and red sectors.

On Ungsmalö, west side of entrance to Bogen, north side of Ofotfiord, is exhibited an occulting light, with white, red, and green sectors, elevated 34 feet above high water.

Skogö.—A similar light to the above is exhibited on Skogö, 2 miles to the northeastward.

Fornes Light, on Skredneset, $3\frac{1}{4}$ miles eastward of Ungsmalö, at an elevation of 70 feet above high water, is occulting, with white and red sectors.

Framnes Light, at entrance of Beisfiord, is occulting, with white and red sectors, at an elevation of 41 feet above high water.

Telegraph.—There is a telegraph station at Liland.

Victoria Havn (Narvik bugt) is situated on the east side of the entrance to Beisfiord, south side of Ofotfiord. It is about $1\frac{1}{2}$ miles in extent, is well sheltered, never freezes, and affords anchorage all over it in depths of from 9 to 14 fathoms. The east side of the bay is formed by the precipitous snow-clad summit Fagernes, 4,165 feet in height, easily accessible. There is good trout and salmon fishing in the neighborhood.

Narvik, a town with a population of about 5,000 in 1911, is connected by railway to Lulea, on the Gulf of Bothnia. The principal industry is export of iron ore, immense quantities of which have been discovered in Lapland. Nearly 3,000,000 tons were exported in 1912.

There are 7 wharves at Narvik, with depths of 20 to 30 feet alongside.

CHAPTER X.

TJELSUND (VESTFIORD) TO TROMSÖ AND NORD KVALÖ.

Tromsö Province—General remarks.—Tromsö Province, which includes the subdistrict of Senjenö and Tromsö, extends from Ofotfiord, in the Inner Lead northward of Vestfiord, to Kvænangenfiord, and has an area of 10,134 square miles, with a population of 81,902 in 1910. The inhabitants consist of Norwegians, Quains, and Lapps, the western part of the province being chiefly peopled by Norwegians and the eastern hundreds by Lapps and Quains.

This province may be characterized generally as an Alpine region, both the mainland and the islands which protect it from the sea being nearly covered with jagged precipitous peaks separated by deep narrow ravines. The vegetation which clothes every valley, glen, and mountain slope is remarkable for so high a degree of latitude, and presents a striking contrast to the rugged outlines of the fjelds, imparting great beauty and variety to the scenery. The limit of the birch is from 1,000 to 1,200 feet above the sea on the coast, but rises to 1,800 feet in the interior, where the pine also flourishes at a considerable elevation. There are numerous snow fjelds and glaciers, but most of the latter disappear at some distance above the sea; avalanches and stone slips are of frequent occurrence, and several rivers have forced their way through the mountains, emerging on the opposite sides.

The mountainous peninsula between Ulfsfiord and Lyngenfiord, eastward of the town of Tromsö, is the northern extreme of a chain of lofty peaks, which extends from thence on the meridian of about 20° east longitude to the lake of Torneå Trask. From this range the ground declines on either side, but in a different manner; to the westward the descent is gradual, the country preserving its Alpine character both throughout the coast region, where the principal summits attain an elevation of 3,000 to 5,000 feet, and also on the larger islands, which generally vary in height from 2,000 to about 4,000 feet; the eastern declivity is much more abrupt, and the transition to the plateaux of Finmarken is distinctly perceptible. Jæggevarre, south of Lyngseide, the loftiest mountain in the province, is 6,500 feet high.

A striking characteristic of this Province is the vast number of fiords and sounds which divide the coast and islands into numerous

sections, bounded on the landward side by isthmuses which seldom exceed ~~a few hundred feet~~ in height; some of these fiords form good entrances from seaward and sheltered inshore passages, while others penetrate far into the mainland; and as most of the roads are mere reindeer paths used by the Lapps in their spring and autumn migrations, the sea is by far the most important means of communication.

Owing to the nature of the country and the fact that most of the inhabitants of northern Norway depend chiefly on the fisheries, the coast is more thickly populated than the interior; and agriculture, though carried on with tolerable success in some of the valleys (those of Bardo and Lyngen being the most northern corn lands in the world), is but a secondary business. The upland pastures are, however, of considerable importance, and the loftier tracts, which can not be used by the farmers, are grazed every summer by about 110,000 tame reindeer.

The mineral resources of Tromsö Province would appear to be inconsiderable; as yet, however, they are undeveloped.

Sport.—Most of the lakes and rivers in Tromsö Province abound in fish, the principal varieties being salmon, trout, char, grayling, and turbot. Good shooting is to be found almost everywhere. Ptarmigan are plentiful on the coast; capercaillie and black game are found in the larger valleys, and golden plover are common on the mountains. Hares are abundant. Wild reindeer are scarce; they are principally found in the mountains near the Rosta-elv. Otters and seals are occasionally killed. Bears have multiplied of late years, especially in Kvænangen, on Senjenö, in Sör Reisen, and Maals Elv; wolves also have increased. Lynx and glutton are local; hawk, falcon, and owl are common; eagles are less frequent. Sea fowl are plentiful on the coast; ducks and divers swarm in almost every lake and tarn, and geese are abundant near the frontier and in the northern fiords.

Inner Lead—Vestfiord to Tromsö and Grötsund.—Before returning to the outer coast it will be convenient to follow the Inner Lead from Vestfiord to Tromsö, in order to preserve the continuity of the various channels as far as possible. (Continued from preceding chapter.) See also general directions for Vestfiord, Chapter IX.

Tjelsund (Tjeldsund), between Hindö and the mainland, is the continuation of the Inner Lead from Vestfiord to the northern ports; it is in several places very narrow, and the channel is rendered intricate by sunken rocks and shoals; the tidal streams also are very strong, and the numerous whirls and eddies necessitate careful steering. As, however, the principal dangers are well marked, the aid of a pilot, though desirable, is not indispensable in daylight. Vessels of about 20 feet draft use this channel; these can only pass Sandtorv at near high water.

The direction of the fairway in Tjelsund is assumed to be from south to north; red stakes, therefore, should be left on the port hand and black stakes on the starboard hand.

Tidal streams.—In the southern part of Tjelsund the streams turn at high and low water, the flood setting northward and the ebb southward; but in Balstadström and at Sandtorv the streams turn about three hours later.

Telegraph.—Lödingen and Sandtorv in Tjelsund are telegraph stations.

Shoals.—Havneskallen, on which there is a depth of 3 fathoms at low water, lies about 600 yards northward of Hjertholm Lighthouse. A rock at a depth of $2\frac{1}{2}$ fathoms, lying 200 yards eastward of the lighthouse, is marked by a pole.

Lights—Lödingen.—From a small iron house on substructure on Hjertholm, east of Lödingen, on the west side of the entrance to Tjelsund, is exhibited, at an elevation of 72 feet above high water, an occulting light (unwatched), with white, red, and green sectors, visible 7, 4, and 3 miles, respectively.

Rotvær.—An occulting light, elevated 72 feet, and showing white, red, and green sectors, visible 14, 14, and 12 miles, respectively, is exhibited from a white wooden tower, 44 feet high, on Rotvær.

The above are shown from August 15 to April 30 annually.

The following lights, all occulting, are exhibited from small white buildings at various places in Tjelsund, the white, red, and green sectors being visible, respectively, at the distance of 6, 4, and 3 miles. Shown from August 15 to April 30.

Nordstrandskjær, near Digermulen, elevated 17 feet above high water.

Staksvoldsholmen, on north side of fairway, at an elevation of 73 feet above high water.

Steinsvikflu, 2 miles east of Staksvoldsholmen, at an elevation of 17 feet, has white, red, and green sectors.

Nordgrund, off Ramstad, on the south side of the fairway, is elevated 12 feet, and has white and red sectors.

Sandtorv, on Storböen, east of Sandtorv, with white, red, and green sectors, is elevated 10 feet.

Leikviksund Light, with white, red, and green sectors, is exhibited on Langkvitnes, at an elevation of 15 feet above high water.

Græsholm Light, on Stegelholm, with white and red sectors, is exhibited, at an elevation of 11 feet above high water.

Rolnesholm Light, with white, red, and green sectors, shown on Storholm, 4 miles northeast of Stegelholm, is elevated 54 feet.

Kobstein, on the western side of the channel opposite Storböen, is a group occulting green light, shown at an elevation of 10 feet.

Light buoys.—Three light buoys are moored in Tjelsund in the following positions:

On the south edge of Balstadskallen, northern side of the fairway, at a distance of 1,300 yards westward of Steinsvikflu Light.

On Steinstigrund, northern side of the fairway, at a distance of 750 yards northwest of Nordogrund Light.

On Leikvikholmgrund, 600 yards southwest of Leikviksund Light.

In summer these buoys are replaced by red stakes.

Beacons.—Falken, which lies about 600 yards southward of Strandsholm, is marked by a black stone beacon; Rippelskjæret, Holsflua, Remmafluen, and Hellvorn by black stone beacons; Söndre Storgrund by a red buoy.

Thence northward to Græsholm; Mid Stenslandsflu is marked by a black stone beacon; Svartskjær by a black beacon with white belt; Stegelholm by a black stone beacon and a lighthouse.

Tjelsund—Directions.—After passing Hvaholm (Vadholm), at the head of Vestfiord, Lödingsaxlen (Lödingsaksla), the mountain between Tjelsund and the broad opening of Kanstadfiord, will be easily recognized, and on approaching the small low islets of Rotvær the church at Lödingen will be visible. Having passed the east side of Rotvær (marked by an iron pole) at a distance of half a mile, the highest islet of that group in line with the highest of the Hammerö Peaks southwestward of Tranö, astern, will lead clear into Tjelsund.

Lödingen or Hjertholm Light shows as a flashing light over these islets and fixed white in the fairway eastward of them.

In the approach to Tjelsund the nearest dangers are Tverskjærene, marked by a beacon, western side of the entrance to Kanstadfiord, and Storböen, a patch of rocks extending from the shore $1\frac{1}{2}$ miles south of the southwest point of Barö, also marked by a pole. The southwest side of Tjelö, east side of approach, is also foul from 400 to 800 yards offshore.

In fine weather vessels might bring up on the bank that extends southward from Lödingen in a depth of 6 to 7 fathoms, good holding ground, with the parsonage house bearing between 331° and 353° .

Having passed Lödingen Light, the east side of Rotvær just open eastward of Hjertholm will lead eastward of Falken (marked by a beacon) and Munkskjær, whence it is advisable to keep as nearly as possible in mid-channel up to Balstadström. Lödingen Light in sight at night also leads eastward of these dangers; thence the white light at Staksvoldsholm leads up the fairway.

Dybfæst (Djupfest) Havn.—Small craft might bring up in Dybfæsthavn, a creek northwestward of Munkskjær, in a depth of 4 to 6 fathoms over sand and clap; the north side of Munkskjær must be given a fair berth. There is also indifferent anchorage at Staksvold and Kongsvig, in 10 to 12 fathoms; the bottom is very irregular, and

shoals rapidly toward Kongsvig. Vessels of moderate draft sometimes bring up here when waiting for high water to pass Sandtorv.

Balstadström.—In passing through the Balstadström it is advisable to keep rather to the southward of mid-channel, except at Stensvig, where it is necessary to edge to the northward to avoid Steinsvikflu, on which there is a black stone beacon and lighthouse.

(Ramsund, a narrow channel on the east side of Tjelö, connecting the Inner Lead with Ofotenfiord, is shallow and foul.)

Five rocks, with depths of $2\frac{1}{2}$, 3, $3\frac{1}{2}$, $3\frac{3}{4}$, and 5 fathoms over them, exist in the fairway between Steinstigrund and Holsflua. The leading mark usually employed, Nordogrund Light in line with Ravneflaagiet Cliff, leads over one of these rocks. By altering course to the southeastward after passing Holsflua eastern stake on this leading line a vessel may pass to the southward of these rocks in a depth of 5 fathoms.

Proceed in mid-channel between Nordogrund Lighthouse and the buoys on Steinstigrund and Störnesgrund; continue between Storboen and Kobstein Lighthouses, and when well past Skaanland Chapel, where shoals extend nearly 600 yards from the mainland, the channel is open and clear up to Leikvik, and the land on either side may be approached to a distance of 200 yards.

At Leikvik, or Leikvis, about 4 miles northward of Sandtorv, the channel is narrowed by several low, grass-covered islets. It is necessary to keep as nearly as possible in mid-channel between the Leikvikholmene and the mainland, where, though the bottom is generally visible, there are probably depths of 8 to 10 fathoms.

The eastern extreme of the southern Leikvikholmen in line with the summit of Kaarberget leads approximately in the middle of the fairway from Leikvik to Græsholm.

Having passed between 400 and 600 yards eastward of Voldstadfluen, marked by an iron pillar, vessels should steer so as to pass about 500 yards northwestward of Svartskjærene, marked by a black beacon with white belt; and after passing about 200 yards eastward of Græsholm, course may be altered either for Vaagsfiord or Astafiord.

Anchorage.—Lödingen or Roholmhavn, between Hjertö and Roholm to the northward, has a depth of 10 fathoms, shoaling to 5 fathoms within 100 yards of the shore, over sand. The anchorage is convenient and sheltered, and will hold a dozen or more coasters. Large vessels would run the risk of tailing on to Havneskallen, a $2\frac{1}{2}$ -fathom patch half a mile northeastward of Lödingen Light.

Telegraph.—Lödingen is a central point of steamer and telegraph communication.

Sandtorv.—There is anchorage at Sandtorv off the merchants' wharf southward of Kobstein Lighthouse, in a depth of from 10 to

15 fathoms, good holding ground, and small vessels may bring up off the point to the northward. Temporary anchorage may be found in Gaasvig in 10 fathoms, and also between Snipholm and Hindö.

Telegraph.—Sandtorv is a telegraph station.

Græsholm Havn is a small but secure harbor with a depth of 4 to 7 fathoms, over sand; there is barely a depth of 3 fathoms in the southern entrance at low water, but the eastern entrance is deeper. Stegelholm, on which there is a lighthouse and beacon, is the eastern islet of the group, and must be given a fair berth.

Vaagsfjord, the continuation northward of the Inner Lead to Tromsö, is a great landlocked basin between Hindö, Rollen (Rolla), Andorgö (Andorja), Dyrö, Senjenö, and Grytö; it is comparatively clear and spacious, but must be navigated by sailing vessels with caution on account of the extreme variability and violence of the winds, and, if possible, an anchorage should be found in time to avoid the danger of being under way during the long, dark, and stormy nights of autumn and winter. It generally happens in winter that when an easterly gale blows out through the fiords of the mainland a westerly wind is blowing in from the sea through the inlets between Hindö and Senjenö, so that it is impossible to make an anchorage on either side. Under these circumstances, northward-bound vessels should endeavor to make Tjötö, while those bound to the southward from Solbergfjord should keep over toward Senjenö and bring up for the night either off the northeast end of Lekangstö or on the east side of Stangesland, westward of Bolholm, where there is better anchorage.

Coasting vessels sometimes bring up during calms on the east side of Engenes, the northwestern extreme of Andorgö, but it is a very exposed position. The entrance to the Ström, $1\frac{1}{2}$ miles southeastward of Engenes, is so narrow, and the tides rush through with such velocity, that it is often quite unnavigable.

Strong northerly winds raise a confused, short, disagreeable sea when the northward or flood stream is making, and southerly winds produce the same effect during the ebb.

Directions.—When passing through Vaagsfjord with a fair and steady breeze there is nothing to fear, but when beating to windward care must be taken to avoid Langgrund (Einholmgrund), with 4 fathoms, by keeping the eastern extremes of Lille Rogeln open eastward of Rogeln; also the shoals between Rogeln and Topsund, as well as those off the southwestern part of Rollen; the rocks off Roldnes, and Bispefluen on the west side of the entrance to Solbergfjord, must also be given a good berth.

Telegraph.—There is a telegraph station at Havnigen, east side of Rollen, east side of Vaagsfjord; and also at Harstad, on the west side of the fiord.

Between Rogeln and Topsund.—The tracks shown on the chart on the west side of Vaagsfiord, between Rogeln and Topsund, are the channels used by coasters when bound to and from the various trading stations; but strangers would find it difficult to distinguish the numerous small islets and rocks, and, as there are several dangerous shoals between them, it is inadvisable to stand to the westward of a line joining Lille Rogeln and the west side of Tjötö without a pilot.

Harstad, a trading station southward of Trondenes, was some years since a place of considerable promise, but the failure of the herring fishery, on which it was mainly dependent, prevented its further development. A small supply of coal may possibly be obtained.

Lights.—On Tyvholm, off Harstad, an occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited from a small white wooden house, at an elevation of 32 feet above high water.

Stangnesodden.—A group occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 16 feet, from a small iron house situated on Stangnes, on Hindö, opposite Tyvholm.

These lights are shown from August 15 to April 30.

See Light in northern approach, on Senjehestneset, below.

Beacons.—On the west side of the fiord, northward of Rogeln, Breivikgalten and Maagö are each marked by black stone beacons. Several other dangers close inshore are marked by poles.

When entering Topsund from Vaagsfiord it is advisable to keep well over toward the south point of Tjötö, and to pass northward of the small island Tjeö (Kjeö), in order to avoid the shoals to the southward. There is a small anchorage on the southeast side of Tjeö.

Tjötö.—With the exception of Dyrösund, Tjötö is the only place of shelter between Tjelsund and Kloven, at the east end of Solbergfiord. The western entrance is clear, with the exception of three small rocks close in to the southwest side of Akerö; and when entering from the eastward it is only necessary to give the north points of the two islets between Tjötö and Akerö a fair berth. The harbor proper, northward of the houses on Tjötö, has a depth of 6 to 10 fathoms, over sand and clay. In fine weather small vessels may also bring up off the entrance to the sound, between the northeast point of Tjötö and the islet to the northward, in 5 to 7 fathoms, good holding ground; but they must not stand too far in, as the sound is nearly dry at low water.

Pilots.—Tjötö is a pilot station.

Light—Engenes.—On the northwest point of Andorgö, situated on the eastern side of Vaagsfiord, an occulting light, with white, red,

and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small white wooden house, at an elevation of 74 feet above high water. Shown from August 15 to April 14.

Astafiord, which separates Rollen and Andorgö from the mainland, is free from danger, with the exception of the shoal eastward of Storholm, which extends about a mile southwestward from Söndre Roldnes, and a shoal, marked by a pole, which lies a mile northeastward of Lavangnes. In fine weather vessels may bring up off Havnvigen, on the east side of Rollen, where there is a mooring buoy, but there is no secure harbor in the whole of the fiord.

Astafiord has four small branches into the mainland. Gravfiord (Grovfiord) is about 3 miles in length; the outer and inner parts are connected by a narrow sound, through which the tidal streams run with considerable strength.

Gratangen is a winding inlet about 8 miles in length; the shores are steep and inaccessible, except at the inner end.

Lavangen is about 5 miles in length; the shores of the outer part are precipitous, but become less bold toward the inner end, where alluvial banks of considerable extent have been deposited by the Spansdal Elven. These three inlets are free from danger, but a shoal extends nearly 400 yards offshore between Myrland and the entrance to Gratangen, and there are two rocks off Lavangnes, on the north side of the entrance to Lavangen.

Salangen extends about 3 miles eastward from Andorgö, and at the inner end is a cluster of islets and rocks, from which Sagfiord extends 2 miles to the southward. At its head is Salangs Elven, the stream from which is too rapid for rowing boats to enter against. All these fiords are inhabited, and, with the exception of Sagfiord and the inner part of Gratangen (which freezes to a distance of about 2 miles from the mouth of the Fiordbotten Elven), they are generally open all through the winter, but violent squalls strike down from the surrounding mountains.

Light.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is shown, at an elevation of 44 feet, on Revholmen, in the entrance to Sagfiord.

Bygden, between Rollen and Andorgö, connects Vaagsfiord and Astafiord. Coasting vessels bound from Tromsö to Lofoten in January and February, and leaving Tromsö with northwest or westerly winds (which blow from the southwest and south in Vaagsfiord), are frequently obliged to run into Bygden or Mjösund; and when a gale drives the land wind back their only place of refuge is in one or other of the branches of Astafiord.

From Nordre Roldnes, which must be given a good berth, shoals extend from 400 to 1,000 yards off the east side of Rollen as far southward as Ibbestad Church; the east side of the channel is clear,

with the exception of a few rocks above water off Löbstad. Vessels may pass either eastward of Tyveholm or westward of Fladholm, but there is a rock between these islets, marked by a pole.

Light.—On Aarneset, at Ibbestad, southern end of Bygden, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 36 feet above high water, from a white iron house on stone basement. Shown from August 25 to April 14.

An occasional light is shown from Dyrstadholmen.

Mjösund, a narrow channel between Andorgö and the mainland, leads from Vaagsfiord and Dyrö Sund to Astafiord, but being exposed to violent squalls it is very seldom used except by coasters bound to the trading stations Lavangnes and Havnvigen. There is a passage on each side of the holm in the middle of the sound.

Hellevikgrund is marked by an iron pole.

Light.—A group occulting light, with white, red, and green sectors, is shown, at an elevation of 54 feet, on Mjösundholm.

Dyrösund, between Dyrö and the mainland, has several fair anchorages, which are especially useful in winter to vessels meeting with bad weather in Vaagsfiord or Solbergfiord.

Light.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 21 feet, from a small iron house on framework support situated on Skjæret, eastern side of Dyrö Sund. Shown from August 15 to April 14.

Dangers.—There are shoals off the house at Myklebostad, on the east side of Dyrögummen, the mountain on the south part of Dyrö; and also off the point eastward of Dyrö church; these places, therefore, should be given a berth of 400 to 600 yards. On the east side of the sound, immediately northward of the house at Kastnes, a shoal with two rocks on it, marked by a black beacon, extends about 400 yards offshore. At Skjæret, eastward of Dyrö Church, a shoal extends off about 200 yards, marked by a pole, and there are several rocks off the point on the west side of Broderstadbotten, marked by two iron poles.

The sunken dangers are marked by poles.

Anchorages.—Northward-bound vessels generally anchor westward of the small islet off Dyrö Church, northward of the shallow ground extending about 200 yards offshore opposite the houses at Dybvig, or in the cove at the northeast extreme of Dyrö. The latter is also a good place of refuge for vessels beating to the westward through Solbergfiord and obliged to seek shelter; a rock, awash at low water, lies close to the point on the north side of the entrance, and there are several rocks in the inner part of the harbor. Vessels

may bring up southeastward of the T-iron that is driven into a low rock within the entrance, in a depth of 6 to 7 fathoms, shoaling to the northward.

For southward-bound vessels there is anchorage at Havn, eastward of Dyrögummen, in 12 fathoms, shoaling toward the inner part of the cove, and in Kastneshavn, on the opposite side of the sound, in 7 fathoms. A reef extends nearly 250 yards off the point on the east side of Havn, marked by a pole, and the north and west sides of the point west of Kastneshavn are foul to nearly 400 yards offshore. Fresh water may be obtained from a well at Havn.

During strong southerly or westerly winds a short heavy sea and baffling squalls alternating with calms will be encountered between Andorgö and Dyrö; on entering Dyrösund the wind steadies and the water becomes smooth.

Solbergfiord is a broad clear channel on the south side of Senjenö. A small sunken rock lies abreast the house at Belholm, and between that and Möen (Mobakken) a shoal extends from 400 to 600 yards off the mainland, and is marked by a pole. A shoal with a depth of 2 fathoms exists 2 miles eastward of Klöven Light, and a shoal at $2\frac{1}{2}$ fathoms 1 mile southeast of Klovennes. With these exceptions, there is nothing to fear between Bispefluen, marked by an iron pillar, and Klöven.

Tranöbotten is a broad but shallow inlet extending about 3 miles northward from Tranö. Reisenfiord is the continuation eastward of Solbergfiord, and receives the waters of two small rivers.

Lights—Dyrö.—On the northwest point of Dyrö an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 23 feet above high water.

Hyseskjæret Light, on the east side of the entrance to Tranöbotten, is an alternating red and white light, visible 6 miles; it is shown from a small white house, at an elevation of 19 feet above high water.

Klöven.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown on the north side of the fiord, 4 miles west of Klöven.

These lights are shown from August 15 to April 14.

Finsnes Light, south entrance to Gisund.—See below.

There are no harbors in Solbergfiord between Belholm and Klöven, but vessels would find shelter in Dyrösund when bound either way.

Klöven is a flourishing trading station at the east end of Solbergfiord; there is a very small but snug harbor on the south side of the point opposite the merchants' houses, with a depth of 6 to 8 fathoms, over clay and loose sand. In the outer part of the harbor the ground is uneven and rocky, and a rock which covers at high water lies close to the point on the north side of the entrance.

Gisund, a winding channel between Senjenö and the mainland, connects Solberg and Malangen fiords, and is the continuation of the Inner Lead northward; it is about 16 miles in length from Finsnes to Aglapsvik, and at Lökelle and Gibostad the navigable channel is only from 400 to 600 yards in breadth. The south entrance to Gisund has a depth of 4 fathoms at low water, with large loose stones in it. Vessels of about 20 feet draft use this channel.

Telegraph.—Gibostad is connected with the telegraph system of Norway.

Winds.—Strong easterly winds sweep round the point northeastward of Klöven, and blow irregularly from the eastward and northeastward in the southern part of Finfiord; toward Finsnes the wind steadies and falls light, while at the same time it is calm, or nearly so, in Gisund. Strong southerly and southwesterly winds are extremely irregular northward of Finsnes; and violent squalls strike down from Kistefjeld, which is over 3,000 feet high.

Tides and tidal streams.—In the narrows of Gisund the tidal streams are very strong. From low water the flood sets northward from Vaagsfiord, Dyrösund, and Solbergfiord, into Gisund, losing strength toward Leiknes, where it meets the flood stream, which sets southward through the narrows abreast Bukkeskind, from Malangenfiord. At high water the streams separate at Leiknes, one portion setting southward toward Vaagsfiord, the other northward to Malangenfiord, where it meets the west-going stream from the Ry Ström and runs out to sea. At Finsnes the streams turn at high and low water. The time of high water, full and change, is very approximately about 1h. 30m.

Dangers, buoys, and beacons.—Grundreisskjærgrund, at $2\frac{1}{2}$ fathoms, and marked by a pole, lies almost in the center of the southern entrance to Finfiord.

Ovre and Indre Stovikgrund, at 4 and $6\frac{1}{2}$ fathoms, lie 0.8 and 1.3 miles, respectively, north of Klöven.

Holmegrund, at 3 fathoms, lies a mile southwest of Finsnes.

A patch of $2\frac{1}{2}$ fathoms, marked by a pole, lies 800 yards southwest of Finsnes.

Finsnesskjær, a patch of 2 fathoms, lies in the center of the southern entrance. It is marked on its southern side by a black beacon and on its northwestern side by a black buoy exhibiting a flashing green light.

The northeastern extremity of the shoal extending from Lankelleholm, the islet on western side of the entrance, is marked by a red buoy exhibiting a flashing red light.

A patch of $2\frac{1}{2}$ fathoms lies immediately north of Finsnesskjær, and several shallow patches marked by poles lie between it and the mainland.

Bjørnhiskjærbæ is marked on its western side by the lighthouse, as is Bjørnhiskjær.

Several 2-fathom patches, marked by poles, lie near the fairway between Finsnes and Leiknes.

Græsmyrgrundene, a line of shoals marked by poles, extends from the eastern shore nearly across the fairway south of Leiknes.

Leiknes is marked by a black beacon, and the shoals southwest and north of it by light buoys, exhibiting a flashing white light.

Kobbeoren, 1 mile north of Leiknes, is marked by two poles.

A 3½-fathom patch lies in the center of the fairway between Gibostad and Bukkeskind. The shoals on each side of the fairway here are marked by poles, as are the shoals off Sandholm, Skallen, and Molnesgrund, near the northern entrance.

Lights.—**Finsnes Light**, at the south entrance to Gisund, exhibited from a small white iron house on piles, at an elevation of 54 feet above high water, is an occulting light, with white and red sectors.

Bjørnhiskjær Light, 1,420 yards north of the preceding, also occulting, with white and red sectors, is exhibited from a small white iron house on piles, at an elevation of 11 feet above high water.

This light in line with Finsnes Light, bearing 180°, leads between the Leiknes shore and the offlying shoals.

Bjørnhiskjærbæ.—A group occulting light, with white, red, and green sectors, is shown on the western edge of the shoal, at an elevation of 15 feet.

Bukkeskind leading lights on the east shore of Gisund, in line bearing about 48°, lead between the Leiknes shore and offlying dangers; they are exhibited from small white wooden houses at the respective elevations of 144 feet and 12 feet above high water. The high light is fixed white, visible at the distance of 10 miles; the low light, 617 yards southwestward of the above, is white and red occulting.

Röbergodden.—On the east side of the northern entrance to Gisund, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 114 feet above high water.

The above lights are shown from August 15 to April 14. The white, red, and green lights are visible, respectively, at the distance of 6 or 7, 4, and 3 miles.

Gisund—Directions.—It is evident from the foregoing remarks that caution must be observed in passing through Gisund. There would be no difficulty in obtaining a pilot before entering the sound, and it is inadvisable to proceed without one in winter; but in summer there would be little risk in doing so. The south entrance, the shallowest portion of the sound, has a low-water depth of 4 fathoms.

Entering Gisund from the southward, steer to pass half a mile east of Kloven Point, thence the same distance west of Finsnes to avoid the 14-foot patch marked by a pole off the point. Thence pass westward of the beacon on Finsnesskjær, and between the black and red light buoys marking the west side of the above shoal and the northeast extreme of the shoal off Lankhelleholm. Edge to the westward to clear the $2\frac{1}{4}$ -fathom patch north of the buoy on Finsnesskjær, and pass west of the light on Bjornhiskjærbae. Bring the lights on Bjornhiskjær and Finsnes in line astern, bearing 180° , which will carry a vessel past Leiknes in a least depth of $\frac{1}{2}$ fathoms.

After rounding the poles marking the dangers off Leiknes, bring the lights at Bukkeskind in line bearing 48° . This line will lead east of Kobbeören and the shoals off Giö.

When Gibostad telegraph station is abeam, course may be altered to pass midway between Gibostad and Bukkeskind, but a shoal of $3\frac{1}{2}$ fathoms lies nearly in mid-channel opposite the front Bukkeskind Light.

Pass midway between Sletnes and the pole marking the shoal north of Hestö, thence eastward of the shoal off Sandholm and Skallen. When well past Lenvik Church the entrance into Malagenfjord will be open, and the channel is then free from danger up to the Ryström. Aglapsbo, in the bay north of Aglapen, marked by a pole, will be avoided by keeping Bentsjordtinden in line with or open of the point on the east side of Aglapsvik bearing 79° . On the west side of Bentsjordtinden, an imposing mountain 3,932 feet high, is a deep ravine named Brokskar, from which southerly winds descend in heavy gusts.

Anchorage.—Vessels may bring up on either side of Gisund; between Lökhelle and Leiknes, in depths of from 10 to 13 fathoms; between the pole beacons on the north and west sides of Leiknes in about 13 fathoms; and between Gibostad and Sletnes in from 5 to 8 fathoms, over good holding ground, but here the tidal streams are strongest.

On the north side of Kaarvik there is anchorage in 6 fathoms, but to the southward a shoal with 3 fathoms on its northwest extreme, extends 800 yards from the shore south of the Sandbak Elven.

Small craft may bring up northeastward of Hannes, 1 mile northwestward of Sletnes, in 6 fathoms; the bights north and south of the point are shallow.

There is a depth of 11 fathoms about 400 yards from the shore southwestward of Lenvik Church, and of 10 fathoms westward of the church, shoaling rapidly toward the bight. Lenvik has a depth of 3 fathoms near the point on the north side, but farther southward there is only about 7 feet.

The **Ry Ström**, the continuation of the Inner Lead, is a remarkable strait and rapid between Kvalö and the small island Ryö; it is about $1\frac{1}{2}$ miles in length, and in the narrowest part is barely 550 yards in breadth. The numerous whirlpools during the maximum strength of the tidal streams render it at that time a somewhat hazardous passage even for steam vessels; it can only be taken by sailing vessels when the tide is slack or favorable. The stream changes its direction at high and low water, running eastward with the flood and westward with the ebb, and during spring, when accelerated by strong winds, it is said to attain a velocity of 6 to 7 knots. In June, 1876, during spring, the stream was tested and found to be a little over 3 knots.

A rock, with $4\frac{1}{2}$ fathoms on the shoalest part, lies 400 yards from the northwest side of Ryö; a shoal which dries at low water extends about 100 yards from Kvalö between Havn and Hamren, and the north side of Ryö is foul to about 50 yards offshore; the navigable channel, which carries a depth of from 20 to 40 fathoms, is thus narrowed at one particular point to about 400 yards.

As the wind generally falls light about the middle of the Ry Ström, sailing vessels should always have a boat ready for towing them out of the whirlpools;¹ and it is advisable to keep rather southward of mid-channel in the narrowest part of the strait. When steaming through the Ry Ström there should be good men at the wheel, and the helm should be given sharply to meet the whirlpools. When well past Ryö, a course about 40° for 5 miles will carry a vessel past the entrance of Balsfjord to the entrance to Tromsösund.

The passage southward of Ryö is only available for vessels under 7 feet draft, and with local knowledge.

Light.—On Kvalö, westward of Hamren, at the northeast end of the Ry Ström, is exhibited from a small iron house, at an elevation of 31 feet, a group occulting light, with white and red sectors, visible 7 and 4 miles, respectively. Shown from August 15 to April 14.

Anchorage.—If unable to pass through the Ry Ström, vessels may bring up to wait for the turn of the tide at Bentsjord, nearly $1\frac{1}{2}$ miles westward of Ryö, in depths of from 7 to 15 fathoms over soft clay. There is anchorage for small vessels at Strömsbugt, 2 miles northward of Bentsjord; in the bight on the south side of Ryö; and also at Havn, the bight in Kvalö abreast Ryö.

There is anchorage also at Hamren, about 800 yards north of the east end of Ryö, and also along the southeast side of Kvalö, between Larseng and Tisnes; but the whole of the space between the latter

¹ On entering the Ry Ström the yacht *Annie* was whirled round several times, but on sending the boat ahead no difficulty was experienced in towing her clear of the whirlpools.—Lieut. G. T. Temple, of the British Navy.

point and Grindö is shallow. Vessels may bring up to wait wind or tide off most of the houses on the mainland between Nordre Berg and Tromsösund; and also off the south point of Tromsö.

A shoal of $2\frac{1}{2}$ fathoms lies about 1,400 yards southwest of the south point of Tromsö, on the west side of the fairway.

The islet near Marisletten in line with the south point of the houses at Houköbund leads southward of the shoal; and the same islet in line with Grindö leads northward of it.

Balsfiord.—Between the Ry Ström and Tromsösund is the entrance to Balsfiord, a beautiful winding inlet which penetrates about 35 miles inland; it is for the most part free from dangers, and has several small anchorages. At the mouths of the Sagelv and Storelv or Nordkiosely, two small rivers which flow into Sör and Nord Kjosen at the inner end of Balsfiord, are alluvial banks of considerable extent, which dry at low water. About 4 miles southward of the entrance to Balsfiord is a small inlet named Ramfiord, which extends about 6 miles to the eastward and southward between wild and lofty mountains.

Tromsö Sund, between Thomsö and the mainland, is the continuation of the Inner Lead between Ry Ström and Grötsund.

Directions—Entrances.—It is not advisable for those unacquainted with the approaches to Tromsö to attempt to enter without a pilot. The principal approaches to Tromsö from the southward are the Inner Lead, through Vestfiord, and its continuation through Tjelsund, Vaagsfiord, and Gisund into Malangenfiord; Andfiord, through Topsund and Vaagsfiord; and Malangenfiord; the latter is the direct entrance from seaward from the southward.

The best entrance from the northward is by Fuglösund, eastward of Inderbofaldet, thence through Grötsund to Tromsö; Kvalsund is sometimes used. There are several other entrances, but they are all more or less intricate and dangerous.

Tromsö Havn is formed by a small bay fronted by the Steingrunden, a shoal about 200 yards in length north and south, on which a mole, 250 yards long, is built. Six hundred yards south of Tromsö is a mole 400 yards in length in a northwest and southeast direction.

Owing to the filling up of the harbor by deposit its anchorage for other than small craft is very limited, and vessels drawing over 10 feet ground in places at low water springs. Where the larger class of vessels lie there is only room for 7 or 8 vessels, moored head and stern, but there is water enough for small craft to the northward and westward. Ships of about 500 registered tons can be berthed at the wharf.

The deeper water is in and near the southern entrance, from 16 to 18 feet, apparently, at low water. The northern entrance has only about 9 feet. Springs rise about 8 feet.

Vessels of about 8 feet draft should use the southern entrance, which is available for vessels of about 12 feet draft; vessels of heavier draft must anchor southward of the entrance or northward of the harbor altogether.

A good anchorage for coaling is northward of the customhouse, situated on the north point of the harbor, being out of the strength of the tidal streams and nearer the coal stores.

Dangers—Beacons and buoys.—Steinen, a rock with less than 6 feet on it, off the northern entrance, is marked by a pole. The eastern extremity of the shoal ground fronting the harbor is marked by a buoy, the southeastern edge by a buoy showing a flashing white light.

The extremity of the southern mole marks the edge of the shoal ground off Tromsösundet, and the northeastern edge of this shoal is further marked by a buoy.

The western edge of the shoal off Hunger opposite Tromsösundet is also marked by a buoy.

These marks and buoys belong to the harbor authorities and may be found moved without notice having been given.

Lights.—On **Storsteinnes**, east side of Tromsösund, an occulting light, with white and red sectors, visible 7 and 4 miles, is shown, at a height of 22 feet.

Exhibited from August 15 to April 14.

Two fixed red lights (vertical) are occasionally shown on the end of the mole off Tromsösundet.

Skatoren.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 14 feet, from a small iron house on iron framework situated on the eastern extreme of Tromsö.

Outer anchorages.—In Tromsösund, which is protected from sea winds by the high land of Kvalö, there are depths of 10 to 12 fathoms at 400 or 600 yards southward of the Steingrund, over good holding ground consisting of firm sand; and there is also good anchorage northeastward of Toldbodnes (customhouse), as before stated. In the whole of Tromsösund, and in the southern portion of the harbor, the tidal streams are very strong; therefore it is generally necessary to moor.

The eastern shore of Tromsösund is foul to a short distance offshore, and the bight north of Storsteinnes is nearly dry at low water.

Pilots are obtainable at Tromsö.

Tides and tidal streams.—It is high water, full and change, at Tromsö at 1h. 14m., local time; springs rise 8 to 9 feet, neaps rise about 5 feet. The flood runs southward through Tromsösund from Kvalsund from three hours before until three hours after high water,

when the ebb sets northward until three hours after low water; if, therefore, southward-bound vessels get under way from Tromsö two hours after high water, the remainder of the ebb will carry them through the Ry Ström and Malangenfiord; Gisund will probably be reached by the time it is low water, and the flood will then be favorable as far as Leiknes, about the middle of Gisund.

Tromsö, the principal town north of the Arctic Circle, was founded in 1794, and since 1816 the population has increased from 300 to 7,633 in the year 1910. The town is pleasantly situated on the east side of the small but remarkably fertile island from which it takes its name; it is fronted by a row of warehouses, has several regular streets, with large private houses and good shops, and presents a singularly thriving and cheerful appearance, the luxuriant vegetation and numerous picturesque villas on the hill above the town, which barely exceeds a height of 400 feet, presenting an agreeable contrast to the wild mountain scenery in the background.

Tromsö is the residence of the Stift Amtmand (governor) and the bishop, and besides several churches and good schools, has a hospital, a savings bank, a branch of the Bank of Norway and of the Nordenfjeldske Credit Bank, and a museum.

Tromsdalstind, on the mainland eastward of Tromsö, is 4,064 feet high; and in Tromsdal is a well-known Lapp encampment.

Trade.—Since the crisis of 1867, Tromsö has more than regained its former commercial activity; its prosperity is mainly due to the brisk foreign trade created by the extensive fisheries of northern Norway and the sealing expeditions annually dispatched to Spitsbergen and Novaya Zemlya; and a lucrative trade is also carried on with Arkhangel. There are several establishments for the preparation of cod-liver oil and train oil, two tanneries, a rope walk, and a brewery.

Customs.—A specification of cargo with requisitions for supplies should be in readiness to hand to the customs official, who usually boards the vessel in Malangenfiord.

Supplies of provisions may be obtained at Tromsö, but water should be procured from the east side of Tromsösund, that supplied to the town from Præstevand, a lake with boggy shores, being indifferent.

There is a good hospital, but no home for sailors.

Coal.—From 3,000 to 5,000 tons of coal are usually kept in stock. Lighters are kept ready loaded. Vessels can coal alongside the wharf, where there is a depth of 14 feet at low water, with a rise of tide of 8 feet at springs.

Repairs to machinery of small craft can be effected; shipbuilding is almost confined to the repairs of vessels that frequent the port.

Patent slips.—

Name of dock.	Length.		Depth at H. W. O. S.			Lifting power.
	On blocks.	Over all.	Breadth of entrance.	On still.	On blocks.	
	Feet.	Feet.	Feet.	Feet.	Feet.	Tons.
Patent slip.....	200 (cradle).....		38	{ Forward.....	9½	500
8 smaller slips.....				{ Aft.....	17½	
						100 to 250

Communication by telegraph with all parts of the world. Mail steamers communicate three times a week with Norwegian ports.

Inner Lead.—Between Tromsö and Kvalö is a channel named Sandesund, which, though sufficiently deep in mid-channel, is seldom used. Near the east side of Grindö the depth is only 4 fathoms, but increases toward the west side of Tromsö; farther northward, in the narrowest part of the sound, there are shoals on both sides, with a depth of 8 fathoms between them.

Grötsund, a broad clear channel southward of Ringvadsö and Reenö, is the continuation northward of the Inner Lead to sea through Fuglösund Passage; and also of the Inner Lead northward to Hammerfest, through Kaagsund, Kvæningenfiord, and Sörösund. The wind is less variable in Grötsund than is usual in the Inner Leads on this part of the coast, and the tidal streams are but little felt, as the principal streams of flood and ebb are directed through Kvalsund and Tromsösund.

Lights.—On **Söndre Tönsnes**, northern approach to Tromsö, is exhibited from a small white wooden house, at an elevation of 14 feet above high water, an occulting light, with white, red, and green sectors. The white, red, and green lights are visible, respectively, at a distance of 6, 4, and 3 miles.

Hansnes.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 26 feet, from a small iron house situated on Hansnes, western side of the southern entrance to Kval Sund.

Vaagnes.—A group occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 20 feet, from a small iron house situated on Vaagnes, southern side of Grötsund.

On Grötnes, Reenö, on the northern side of the eastern entrance to Grötsund, an occulting white light is exhibited from a small white iron house, at an elevation of 110 feet above high water, visible at a distance of 7 miles in clear weather.

These lights are shown from August 15 to April 14.

Dangers—Beacons.—**Söndre Tönsnesodden**, near the lighthouse, has a black wooden beacon; **Nordre Tönsnesodden** has a black wooden

beacon with an arm. Tönsnesboen is a rocky shoal off Nordre Tönsnesodden, nearly three-quarters of a mile in extent; a low white rock on the southeastern part, which lies 800 yards from the north point beacon, is marked by a black stone beacon, and never covers; the northwest end, which lies nearly 1 mile from Kragnes on Söndre Kvalö, is dry at low water and is marked by an iron pole. A rock, with 6 feet water, lies half a mile southwestward of Tönsnesboen, marked by a pole. These dangers may be passed on either side, but the western channel should be taken, as the eastern is narrow and has only 4 fathoms in the middle, shoaling gradually toward the sides.

Anchorage.—Small vessels will find good anchorage, in 4 fathoms, over sand, off the south side of Ringvadsö, southwestward of Ringvadsholm, a small low islet 5 miles eastward of Tönsnes Lighthouse. There is also good anchorage farther eastward north and south of the islets between Nipö and Finkrogen, in from 4 to 9 fathoms; Finkrogbo, a sunken rock southeast of Nipö, is marked by an iron pillar; a rock westward of Nipö is 4 feet above high water.

A shoal, which does not cover, extends off Grötnes, the southeast point of Reenö, reported by the British ship *Racoon*, 1864, but is not shown on Norwegian charts.

Directions.—Proceeding northward from Tromsö there are no dangers near the fairway except Tönsnesbo, above mentioned, and marked by beacons. Northward of these the channel is wide and clear to Fuglösund, directions for which will be found in the next chapter. To proceed by Inner Lead to Hammerfest, viâ Kaagsund, see next chapter.

Coast.—Continued from preceding chapter.

Vesteraalen is the general name of the group of islands outlying the mainland northward of the Lofotene. Like that of the Lofotene, they are dangerous of approach, and should be avoided, Hasselfjord being practically the only place of refuge between Vest Vaagö and Andenes.

Vesteraalen includes the islands Langö, Hasselö (Hadselö), the northwestern part of Hindö, and Andö.

Aspect.—The mountains of Lofoten and Vesteraalen are steep and lofty, often covered with snow, and on the whole easily recognized; they may be seen at a distance of 40 to 50 miles.

When approaching Vesteraalen from the westward several prominent mountains will be visible in clear weather. Himmeltunderne, two conical peaks on the west side of Vest Vaagö, attain an elevation of about 3,000 feet, and rise higher than the other mountains of Lofoten. Mö Sadlen, on Hindö, about 3,500 feet high, is always covered with snow, and when bearing southeast the summit appears

nearly flat, with two almost perpendicular peaks, on which the snow can not lie, to the southward. In clear weather Mø Sadlen will be seen as soon as the Lofotene, although it is so much farther inland. On nearing the islands the sharp hills on the small island Gauk Værö, and those near Nykvaag, 10 miles to the northward, will appear to stand out from Langö. Haarkallen or Staven is a sharp isolated peak on the north side of Eidsfiord, and northward of Haarkallen is a nearly flat ridge with seven small rounded knolls named Boina or Börnene (the Children), not named on chart; with these exceptions, the mountains on Langö are too much alike to present any conspicuous landmarks when seen from a distance; the openings of the fiords will, however, be recognized without difficulty. Aasenaxlen is a high, bold headland 6 miles northward of Gauk Værö; Skaarvaagfjeld, between, is much lower. Northward of Malnestind land may be seen indistinctly as far as Langenes, and if the weather is very clear the mountains on Andö will possibly be visible.

From a position westward of Andö the high and strongly marked mountains on that island will be easily recognized as they rise abruptly from low marshy lands of considerable extent, and from a distance appear like detached rocky islands; in clear weather they are visible 40 or 50 miles. The mountains on the northern part of Andrö are separated from Okla and Bora and Bjornskinds fjelds by the Dverberg marshes, which can not be seen beyond 8 miles; sometimes, however, the peaks on Senjenö will be visible over them. Klotinden, 4 miles southwest of Langenes, is the highest peak on the north end of Langö; it assumes a sharply pointed appearance when brought to bear southward of east, and is then an excellent landmark. Myrtinden, between 2 and 3 miles southward of Klotinden, Hornet, with its peaks inclining toward the north, and the deeply indented summit of Skogsö, are also noticeable objects. Dyrötind and Tindstinden, southwestward of Skogsö, stand out distinctly like two sugar loaves, and the promontory between the Mökland and Malnes fiords has the appearance of a steep rocky island. Aasenaxlen and Skaarvaagfjeld will be merged and indistinct; the small peak of Gauk Værö will be just visible above the horizon at a distance of about 30 miles, and if the weather is sufficiently clear the snow-clad summits of Madmoderen, Vaagekallen, Kvalnesaxlen, and Himmeltinderne will be seen faintly to the southward.

Offlying banks — Andersboskallen — Sörskallen.— About 19 miles offshore (on the parallel of Aasenaxlen), and about 9 miles within the 100-fathom contour line of soundings, is Sörskallen, the southernmost head of a rocky bank about 3 miles in extent north and south, known as Andersboskallen. On Sörskallen there is a depth of 20 fathoms, with 52 fathoms around it.

Nordskallen, 2 miles northward of Sörskallen, has a least depth of 22 fathoms, with depths of 32 to 47 fathoms around it.

Stenene, at about 1 mile northward of Nordskallen, is about 1½ miles in extent east and west, with depths of 31 and 32 fathoms on its extremes. It would be by no means safe to pass over these banks with a heavy westerly swell, which would raise a high topping sea even if it did not break; rollers set in toward Andersboskallen from a long distance to the westward.

The large flocks of sea birds which assemble over the shoals of coal fish (a species of cod) on Andersboskallen, and which led to its discovery, are never seen anywhere else off this part of the coast, as they would be on equally shallow ground: it is, therefore, almost certain that this is the only outlying bank off Lofoten and Vesteraalen that can be considered in any way dangerous.

Torfindskallen, Klakken, and Gjeineggen are rocky heads lying nearly in line with each other northwest of Skogsö: Torfindskallen has a depth of 35 fathoms, Klakken about 40 fathoms, and Gjeineggen 39 fathoms; the latter is about 2 miles within the 100-fathom line and 14 miles from Skogsö.

Sortskallen is about 4 miles in extent north and south, with depths varying from 41 to 54 fathoms, and deeper water between the rocky heads; the depth of 41 fathoms is on its southern edge and about 4 miles within the 100-fathom contour line.

Current.—From northward of a position about 10 miles southwest of Andersboskallen a strong current runs to the northeastward and eastward, often attaining a velocity of 4 knots over the shoalest places, where the sea is, during gales, consequently very high; the velocity of the current increases steadily to the northward, but depends very much on the wind. The 100-fathom contour line is here so near the coast that the regular tides have some influence on the current over the bank, but the only perceptible effect is that it runs more slowly to the northward during the ebb. On the whole, there is scarcely any place off the coast of Norway where the current is so strong as between the Lofotens and Andö.

Hasselfjord (Hadsselfjord).—The harbors at the inner end of Hasselfjord might be of considerable importance to vessels embayed between Vest Vaagö and Langö. Bearings of Madmoderen and Ongstadnyken will be the best guides for avoiding the dangers off Gimsö and Hassel, on either side of the approach. From Hasselfjord vessels might either proceed northward through Sortlandsund and Gavlfjord or southward through Raftsund to Vestfjord, but it would be inadvisable to attempt Gimsöström under almost any circumstances.

Dangers off south side.—The northernmost dangers off Gimsö are Krogtindskallen and Tintorskallen, the former of which, with

a depth of $3\frac{1}{2}$ fathoms, lies 5 miles northwest of Laukvig Lighthouse. Tintorskallen, with $3\frac{3}{4}$ fathoms, lies half a mile southward of Krog-tindskallen. Himmeltindtorren, with 7 fathoms, lies $1\frac{1}{2}$ miles eastward of Krog-tindskallen and $\frac{1}{4}$ miles northwestward of the same lighthouse.

Off north side.—Harboerne and Sundsfaldet, extending $2\frac{1}{2}$ miles southwestward, and Hekkelen, lying $1\frac{3}{4}$ miles southward of Ulvöholm, are the southernmost dangers on the north side of the entrance to Hasselfjord. The Harboerne are two heads dry at low water, but generally break when covered; all these rocks should be given a wide berth.

Beacons.—Ersokskjær, north side of approach westward of Hassel, Indbjörskjær, Stabben, and Jæven are marked by black beacons; Troldskjæret by a black stone beacon with cross; and Ulvöholm by a black beacon with a white cross. Some of the sunken dangers are marked by iron poles and pillars.

Lights.—On Svinöen, off Melbö, north side of Hasselfjord entrance, is exhibited from a white wooden house, at an elevation of 35 feet above high water, an occulting light, with white and red sectors, visible 6 and 4 miles, respectively.

A flashing white (unwatched) light is exhibited from Melbö Molehead.

Laukvig.—An occulting white, red, and green light is exhibited at Laukvig on the southern side of approach to Hasselfjord, at about $10\frac{1}{2}$ miles southwestward of Svinöen.

Stronstad.—On Stronstad, about 3 miles south of Svinöen, an occulting light, with white, red, and green sectors, is exhibited at an elevation of 52 feet above high water. The white, red, and green lights are visible at a distance of 7, 4, and 3 miles, respectively.

The above lights are exhibited from August 15 to April 30.

Directions.—Entering Hasselfjord from the southward or westward keep Himmeltinderene open to the westward of Kvalnesaxlen until Ongstadnyken, on the south extreme of Hasselö, bears 82° or the south extreme of Hasselö is in line with Mö Sadlen: Madmoderen kept about 150° will lead in from the northward. A vessel will be eastward of Krog-tindskallen when the eastern extreme of the high island of Gimsö bears 183° , and should then edge to the southward in order to give Harböerne a good berth, proceeding in mid-channel between Öst Vaagö and Hasselö for the most convenient anchorage.

Anchorage.—The only secure harbors between Hasselfjord and Sortlandsund are Hanö, at the north end of Raftsund, and Riisö, at the east end of Börösund: but small vessels might bring up in summer on the east sides of Selö and Holdö, on the south side of Hasselfjord, and also at Melbö, on the north side of the fjord.

Hanö.—Entering Hanö Harbor from the westward, pass 400 or 600 yards northward of Hoholm, and steer about 116° until Stabben Rock, on which there is a black beacon, is recognized; having passed southward of Stabben and the rocks to the eastward, proceed through the sound south of Brotö, passing south of Hanöholm, and bring up off the high holm eastward of the houses at Hanö, in a depth of 5 to 6 fathoms; there is also anchorage farther in, but the inner part of the bight is bordered by a flat. Entering Hanö Harbor from Raftsund, give the point on the south side of the entrance a fair berth, as a shoal, marked by a pole, extends off it. Only a few small stones of the Kiuklingerne, eastward of Hanö, are visible at high water, but an iron pole marks the channel side of them.

Beacons.—At and near Hanö are the following beacons: Futhellen, entrance to Hanö, marked by an iron pillar; Brotöskjær, in Brotholmsund, by a white stone beacon; Skallen, Endstenen, Kiuklingerne, and a rock in Hanöhavn, by iron poles.

Light—Hanövekka.—In the entrance to Hanö from the northward, and to Raftsund, on Brotholmen, is exhibited from a small white wooden house, at an elevation of 61 feet above high water, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively. Shown from August 15 to April 30.

Börösund separates Hasselö from the southeast part of Langö, and is easily navigable. At its east end there is anchorage at Riisö, Stokmarknes, and Bitterstad.

Telegraph.—Stokmarknes is connected with the telegraph system of Norway.

Beacons.—Klubba, on the north side of channel, abreast Fladset, is marked by a black stone beacon. Sandoën is marked by a black wooden beacon with white belt and a black triangular topmark.

The principal sunken dangers are marked by iron poles or pillars.

Lights—Drogneset.—On the northwest point of Hasselö, at the western entrance to Börösund, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower on stone base, at an elevation of 87 feet above high water.

Stokmarknes Light, on the north point of Böröen, exhibited at an elevation of 292 feet above high water, from a small white iron house, is an occulting light, with white, red, and green sectors.

In the above the lights in the white, red, and green sectors are visible at a distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 30.

Directions.—If intending to proceed from Hasselfjord for the anchorage at Riisö at the east end of Börösund, keep nearly in mid-channel between Öst Vaagö and Hasselö until Hassel Church bears 14° : pass eastward of Indbjörskjær, a solitary rock off the southeast side of Hasselö, marked by a black stone beacon, and steer so as to

pass at least 600 yards eastward or westward of Jæva beacon; give the northeast side of Riiso a berth of 400 yards, and bring up off the northwest side of that island in a depth of 4 fathoms over a good sandy bottom; small vessels may anchor farther in. The harbor at Stokmarknes may be entered either from the eastward or westward.

Entering Börösund from the westward it is necessary to keep within three-quarters of a mile of the north side of Hasselö, passing southward of the black stone beacon on Klubba. Near the west end of Börösund there is a small harbor at Fladset, on the north side of Hasselö.

Sortlandsund, a beautiful channel between Hindö and the southeast side of Langö, connects Raftsund and Hasselfjord with Gavlfjord and Riisösund, thence to Andfjord. Vessels may bring up almost anywhere in Sortlandsund, but the best place is southward of Fiskholm; the cove at Kvitnes, southward of Fiskholm, is very small, and is difficult to leave in a sailing vessel with northerly winds.

Beacons.—Fiskholm, off Rödnes, is marked by a black stone beacon. Nord Vardholmgrund is marked by a black stone beacon surmounted with a cross; most of the principal sunken dangers are marked by iron poles or pillars.

A rock with $5\frac{1}{2}$ fathoms on the northern side of the fairway, about a mile southeastward of Bö, is unmarked.

Jerstavret, with $\frac{1}{2}$ fathoms, is situated on the northern side of the fairway abreast Fiskholm and Lysrivet, also with $\frac{1}{2}$ fathoms and on the northern side of the fairway, lies abreast Kjæringnæsö.

Light buoy.—A shoal extending southward of Sortland is marked by a light buoy exhibiting a flashing white light. It is replaced in summer by a black stake.

Lights—Kvitnes (Kartnes).—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 21 feet, on Kvitnes.

Stamnes.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 38 feet, on Stamnes.

Eidsfjord.—In thick and stormy weather it might happen that a vessel making for Hasselfjord may miss the entrance by keeping too far to the northward, and be compelled to stand in to the southward of Gauk Værö; in that case she might either run into Börösund, as already directed, or seek shelter at Lilleö or Steine, on the north side of approach to Eidsfjord, or at Guvaag, in Eidsfjord; but if the weather permits, it would be advisable to heave to off the northwest side of Hasselö for a pilot. If uncertain as to position, the peak on Gauk Værö, Mö Sadlen, the openings of Börösund, and the inlets on the north side of Eidsfjord may serve as landmarks.

The principal sunken dangers in Eidsfjord are marked by iron poles or pillars.

Lilleö (Litlö) has a flat summit, and is lower than Gauk Værö, which is steep and sharp. The approach to the anchorage is easy, a vessel having only to pass southward and eastward of all the visible rocks lying southwest of Lilleö at a prudent distance, and bring up off the entrance to the small bight east of the house. If there is no pilot on board it will be easier to make Lilleö than Steine.

Light.—A flashing white light, visible 19 miles, is exhibited, at an elevation of 182 feet, from a white iron tower on the south extreme of the island.

Steine.—The entrance to Steine, eastward of Lilleö, is west of the two islands named Jersö (Gjersö). It is necessary to pass west of Jersöene, and the anchor should be let go southward of the warehouses, the whole of the bight farther in being shoal.

Kvalbakken is marked by an iron pillar, and four other sunken dangers by iron poles. Venieodden, in the approach, is marked by a black stone beacon with triangle.

There is also anchorage at Venie, westward of Steine, but the entrance is difficult.

Light.—At the entrance of Steine, on the southwest of Langö, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower, elevated 18 feet above high water. In the white, red, and green sectors the light is visible at a distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 30.

Guvaag, between the two western inlets on the north side of Eidsfiord, affords good shelter to vessels of moderate size; there is a depth of 10 fathoms in the entrance and of 4 fathoms farther in. When entering Eidsfiord a vessel should keep nearly in mid-channel till eastward of the isolated rock Jörgefiordflæsen, marked by a black beacon with a white belt, when the entrance to Guvaag, between a high wooded islet and some houses to the eastward, will be seen ahead; the anchor may be let go either eastward of the islet or farther in.

West coast of Langö.—The west coast of Langö is everywhere fronted by rocks and shoals, and the few channels between them are narrow and dangerous. Northward of Malnes the island is intersected by long and narrow fiords, the entrances to which are obstructed by islets, rocks, and shoals; on some of the latter the depth is considerable, but as they are exposed to the full force of the open sea, it is dangerous to pass over them even in tolerably fine weather; therefore only the utmost necessity would justify strangers in resorting to this part of the coast for shelter. The best landmarks in clear weather are the mountains on Langenes, which stand out distinctly against Andö, and the peak on Gauk Værö, for as the mountains on the islands nearest the coast are generally high and conical, it is difficult to distinguish them from those to the eastward until quite near

the land. At Delpen, northeastward of the entrance to Prestfiord, there are three small sharp peaks of considerable height. The most notable peaks on Langö have been described.

Tides and current.—At some distance from the coast of Langö the current runs to the northward, as described above, but nearer the land and between the islands and rocks the flood stream sets northward and the ebb southward, the streams turning regularly, either before or after high and low water, at different places.

Skaarvaag.—Between Lilleö and Malnes the coast is almost inaccessible from seaward. There is a good small harbor in Skaarvaag, about 3 miles northward of Gauk Værö.

Pilot.—A pilot for this part of the coast will be found on Svinö, eastward of Gauk Værö.

Lights.—At Skaarvaag entrance an occulting light, with white, red, and green sectors, is exhibited from a small iron house, elevated 45 feet.

Stromsjoen leading lights, at Hella in Vikan fiord, are 164 yards apart and in line when bearing 126° . They are exhibited from small white wooden houses, the rear light, fixed white, at an elevation of 76 feet above high water, the front light, occulting white, elevated 42 feet.

Aasen (Aasan) fiord.—On Aasenö, at the entrance of Aasenfiord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 23 feet above high water.

These lights and others on the seaward side of Langö are shown from August 15 to April 30, and are visible in the white, red, and green sectors at a distance of 6, 4, and 3 miles, respectively.

Malnesfiord.—**Hovden.**—There is a harbor for fishing craft at Hovden, west side of entrance to Malnesfiord.

Lights.—**Nautneset Light**, near Hovden, is occulting, with white, red, and green sectors, and is exhibited from a small white iron house, at an elevation of 82 feet above high water.

Hovden Light, about a quarter of a mile northeastward of the above at the west side of entrance to Malnesfiord, is also an occulting light, with white and red sectors, elevated 25 feet above high water.

Frugga Islet.—A group occulting light (unwatched), elevated 48 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Frugga Islet.

At Sunderö, about 4 miles eastward of Hovden, is exhibited from a small white wooden house on Aflösclubben, at an elevation of 44 feet above high water, an occulting light, with white and red sectors.

Terö Islet.—An occulting light (unwatched), elevated 76 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Terö Islet.

Smines.—A group occulting light (unwatched), elevated 49 feet, showing red, white, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Smines.

Vaaje Light, near Voie, on the west side of Skogsö, is a group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively. It is exhibited, at an elevation of 62 feet, from a small iron house.

Gjeitholm.—An occulting light (unwatched), elevated 48 feet, and showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Gjeitholm.

Præst (Prest) Fiord.—About 4 miles northward of Malnes there is a channel leading in southward of Skogsö to Præstfiord, but it is foul and difficult; the entrance to Præstfiord, northeastward of Skogsö, is easier. By bearings of Langenes and the three conical peaks at Delpen it will be easy to make out Nordvoren, which lies 1 mile northward of Gaasö.

The Anværboen dangers extend three-quarters of a mile from Klotinden and are marked by a pole; Teisten, which nearly always breaks, lies about 1,600 yards westward of Krognæs.

Beacons.—Vorneskjær, eastward of Jæva Light, is marked by a black stone beacon. Other sunken dangers are marked by iron poles or pillars.

Lights.—**Nöksund (Nyksund) Light**, on the east side of the approach to Præstfiord at about 4 miles northward of Skogsö, is an occulting light, with white, red, and green sectors, exhibited from a small iron house, at an elevation of 188 feet above high water. In the white, red, and green sectors the light is visible at a distance of 6, 4, and 3 miles, respectively.

On Jæva (Gjæva), in Præstfiord, is exhibited from a small iron house, at an elevation of 24 feet above high water, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively.

The above lights are shown from August 15 to April 30.

Directions.—Entering Præstfiord from the northward, pass 600 or 800 yards eastward of Nordvoren, and steer so as to pass within 800 yards of the east side of Gaasö and the rocks to the southward, in order to avoid Anværboen, marked by a pole. When past the rocks south of Gaasö, edge to the eastward to avoid Teisten, and from off Krognæs steer for the northeast side of Skogsö. If the wind is westerly a vessel may bring up in smooth water off the east side of Skogsö, westward of Jæva Lighthouse, but with northerly winds it will probably be necessary to run on to Oxnes (Oksnes) Church, taking care to avoid a shoal lying 400 yards off the houses at Fjeldgrimstad and marked by a pole.

Bredstrand.—A pilot may be obtained at Oxnes to take the vessel to Bredstrand if the weather permits; but southward of Skogsö the channel is foul and the wind variable.

Vest Svartboria, at Bredstrand, is marked by a black stone beacon, and other dangers by iron poles or pillars.

Northwesterly winds fall calm at Bredstrand, and when the wind is southeasterly or southerly it will blow fresh from the northward at Bredstrand and Oxnes and fall quite calm northward of Malnes.

Langenes—Directions.—Sailing vessels bound to the southward and meeting with southwesterly winds off the coast of Andö will find it difficult to proceed on account of the strong northerly current; under these circumstances the small harbors north of Langenes Church, and farther to the westward at Sjö, might possibly be useful, but they should not be attempted without a pilot. A vessel should therefore stand off and on to the westward of the large grassy islet Anden, which, with the low rocks Flæsa and Brakan, will be easily recognized, until one has been obtained.

During northerly gales a swell is felt in the harbors at Langenes, but these anchorages are, nevertheless, preferable for a sailing vessel to those in Præstfiord, from which it is difficult to put to sea on account of the irregularity of the wind.

Light—Langenes.—On the summit of Lyngö, westward of Langenes, an occulting light, with white, red, and green sectors, is shown from a small iron house, at an elevation of 104 feet. Visible 6 miles. Shown from August 15 to April 30.

Telegraph.—There is telegraphic communication between Langenes and the mainland during the fishing season.

Gavlfjord, which separates the north end of Langö from Andö and Hindö, is connected with Hasselfjord by Sortlandsund, and is the only entrance between Langenes and Andenes, the whole of the west side of Andö being quite inaccessible. From the northward vessels of the larger class should pass seaward of Langö in preference to using Gavlfjord, which is difficult if the weather is thick or stormy, and it should not be attempted by strangers unless they have first obtained a pilot from Andenes or some place southward of Langenes.

If driven in between Langenes and Andö during a northwesterly gale, the safety of a vessel will depend on a sharp lookout and attention to the chart, and by following the directions given below, as under these circumstances probably no boat would be able to get off.

Lights.—**Bervaagen Lights**, on the west coast of Andö, east side of approach to Gavlfjord from the northward (and situated about 11½ miles northeastward of Langenes Light at the western side of entrance), are two leading lights exhibited from small white wooden houses 450 yards apart, which in line bearing 108°, lead between the rocks to Børhellen.

The rear light is fixed white, elevated 141 feet above high water. The front light is occulting white, elevated 44 feet above high water. These lights can be seen in clear weather at a distance of about 6 miles.

Mevær Lights, at the northeast end of Gisselö (Gislö), about $4\frac{1}{2}$ miles southeastward of Langenes, are occulting lights, with white and red sectors, exhibited from white iron houses, 550 yards apart, which are in line (showing red) when bearing 144° .

The front light is not visible over the entrance to Gavlfjord.

The above lights are shown from August 15 to April 30.

On Aakenes, about 3 miles eastward of the northeast point of Gisselö, two red lantern lights are exhibited when the steamer touching there is expected.

At Alsvaag, about $3\frac{1}{2}$ miles southward of the northeast point of Gisselö, two red lantern lights (private) are exhibited when the mail steamers are expected; these lights in line lead to the anchorage.

Dangers.—Flæsa (Flesan) and Brakan, on the west side of approach, have been referred to with Langenes; though very low, they will be easily recognized, as the sea breaks constantly over them. A reef extends $1\frac{1}{2}$ miles southwestward from Flæsa. A rocky ledge, on the outer part of which there are depths of 12 to 20 fathoms, extends 2 miles in a northeasterly direction from the northernmost islets off Gisselö, on the west side of Gavlfjord. On the opposite side of the channel is a sandbank, with depths from 10 to 20 fathoms, extending from half a mile to a mile off the west coast of Andö. The passage between the reef and bank is only three-quarters of a mile broad, and there is such a heavy swell across the whole of this space during northerly gales that it appears to be quite impassable.

Beacons.—Mevær, one of the northernmost islets off the north side of Gisselö, is marked by a black stone beacon with white belt. The principal sunken dangers are marked by iron poles or pillars.

Directions.—When approaching the entrance to Gavlfjord from the westward and northward there will be no difficulty in recognizing Langenes, which is high, and steep toward the sea; the lofty pointed summit of Björnskindfjeld on Andö is also a good landmark. Having passed northward of Brakan Rocks, or between them and Flæsa, a vessel may steer for the northwestern part of Orkleven (Orkleiva) until within about 2 miles of Andö. The projecting point at Aakenes, southwestward of Orkleven, kept bearing 172° leads between the reef extending northeastward from Gisselö and the bank fronting Andö until Langenes bears 284° ; a vessel will then be about halfway between the reef and bank, and should steer so as to pass at least half a mile westward of Aakenes. The rocks off this point are marked by an iron beacon and two iron poles. When southward of these rocks it is only necessary to pass the visible rocks that lie between Gisselö

and Bremnes at a prudent distance, and to avoid the Huroita (Hudröta) Shoals (marked by an iron pole and an iron pillar, extending nearly half a mile from the land north of Gaasfiord); thence proceed to Reensnesö, or some other anchorage.

Anchorage.—Alsvaag is the best harbor in Gavlfjord, but the entrance is not easy for strangers. A shoal, dry at low water, extends off the point on the south side of the harbor, and is marked by an iron pillar. Skibleiskjær (Skiblingskjær), in the approach, is marked by a black stone beacon; the principal sunken dangers are marked by iron poles or pillars.

If wishing to enter Alsvaag from the northward steer 183° from Aakenes until the Skibleiskjær beacon is on the starboard beam, a good 200 yards distant; thence proceed between the Grøsholmene and Indstö (Instö), keeping about 200 yards from the land on the north side of the entrance to the harbor, in order to avoid the shoal to the southward, and bring up off the merchants' houses in a depth of 5 to 8 fathoms, over sand and clay.

To make Alsvaag from the southward, give the Bremnesholmene a berth of at least 400 yards, and proceed on either side of Troldskjær (marked by an iron pole). Give the west sides of Lyngö and Masskjær a good berth, in order to avoid the shoal ground between them, and do not haul in for the harbor until within 200 yards of Indstö.

Indifferent anchorages may be found at Skjölhavn, on the west side of the entrance to Risösund; also southward of the shoal extending about 600 yards from the south side of Bremnesholm; and also on the east and south sides of Reensnesö.

Risösund, between Hindö and Andö, becomes more shallow every year, and eastward of the trading station at Risöhavn the depth at low water in 1893 (dredging then, however, being in progress) was only 3 or 4 feet.

Indicators to mark the depth of water (in Norwegian feet) are placed in various parts of Risösund.

Lights.—On the north side of Risösund two vertical fixed red lights are exhibited from small white wooden houses at the respective heights of 37 and 10 feet above high water.

At Korsholm an occulting red light is exhibited at 10 feet above high water.

These lights can be seen from a distance of about 4 miles. Shown from August 15 to April 30.

They are of little use to strangers.

Beacons.—Oggaardsneset, the northwest point of Hindö, east side of western entrance to Risösund, is marked by a black wooden beacon; Hammeröen and Korsholmen by black stone beacons. The

south side of the channel is marked by red poles and buoys, and the north side by black poles and buoys. In the eastern entrance, Aaseflesa is marked by a black stone beacon and Vekke, the rock southward of it, by an iron pole.

Andenes—Aspect.—Andenes, the northernmost point of Andö and Nordland, is a celebrated fishing station and important landfall. When approaching Andenes from the westward the mountains on Andö and Langö will be sighted long before those to the eastward are visible. Röiken, which forms the northern termination of the high land on Andö, rises to the height of 1,483 feet, and is steep toward the north and west.

From the foot of Röiken a low sandy flat extends about 3 miles to the northeastward, and from the western edge of this flat, about halfway between Röiken and Andenes Lighthouse, a rock named Andaxlen mærket or beacon, which at a distance of 8 or 10 miles has the appearance of a small round hummock, rises almost perpendicularly to the height of about 200 feet. On a southeastern bearing this rock appears detached, but on other bearings from seaward it can not well be distinguished. The church and houses on Andenes will not be seen from the deck beyond a distance of 4 or 5 miles, but the red lighthouse is an excellent landmark; see sketch on chart.

On Senjenö, which lies eastward of Andö, there are several remarkable mountains ranging from 2,000 to 3,000 feet in height, covered with snow, and also many prominent headlands; the steep projecting points Kjærringneset, Teistenes, Trællen, and Oxen (Oksen) are all good landmarks; but Kjölva Peak, which forms the northern extreme of the island, is especially prominent, and from a position northwestward of Andenes can hardly be mistaken.

Bank off Andö.—As already observed, the whole of the west coast of Andö is inaccessible, being skirted by a bank of white sand on which there are numerous rocks above and below water. Northward of Bervaagen this bank carries a depth of from 1 to 4 fathoms and extends from 2 to 3½ miles off the west coast of Andö, and nearly 5 miles northward from Andenes, the general direction of its western edge being northeasterly; on the east side of Andö it does not extend more than 1 mile from the shore.

Owing to the frequency of westerly and northwesterly gales on this part of the coast, vessels making Andenes from the southward should stand well to the northward before closing the land, so that in case of being obliged to enter Andfiord they will be able to pass 8 or 10 miles northward of Röiken and Andenes in order to clear the shoals on the northern extreme of the bank off Andö; there is no passage southward of these shoals, and although they have depths of 4 to 5 fathoms they break heavily.

Lights—Andenes.—From a circular red iron tower on Andenes, 131 feet in height, standing on the north extreme of the point, is exhibited, at that elevation above high water, a fixed and flashing white light, visible in clear weather from a distance of 17 miles.

Andenes Havn.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown from a tower at the end of the harbor mole.

Moholm.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown, at an elevation of 56 feet, on Moholm, $1\frac{1}{4}$ miles west of Andenes.

On **Böringerne**, nearly a mile eastward of Andenes Lighthouse, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house on piles, at an elevation of 19 feet above high water. The light in the white, red, and green sectors is visible at the distance of 6, 4, and 3 miles, respectively.

Haugnes.—A group occulting light, with white, red, and green sectors, is shown on Haugnes, $2\frac{1}{2}$ miles southeastward of Andenes.

These lights are shown from August 15 to April 14.

Pilots may be obtained at Andenes, but they will not be able to get off during gales from the northward and westward.

Andenes Havn.—There is no harbor on either side of Andö, but vessels in want of a pilot may bring up in the roadstead on the east side of Andenes, in depths of from 8 to 16 fathoms, over fine white sand. There is a small harbor here for fishing boats.

The snowy summit of Barstind, on Senjenö, kept just northward of Maanes will lead about 1 mile northward of all the shoals off Andenes, and when the lighthouse bears 206° , course may be altered to pass about $1\frac{1}{2}$ miles eastward of Flæsene, the northeastern rocks above water off Andenes. With northerly winds, sailing vessels should anchor well out from the bank off Andö in depths of from 12 to 14 or 16 fathoms, so that there may be no difficulty in getting under way; but if the wind is westerly they may bring up about $1\frac{1}{4}$ miles from the shore in 10 fathoms, with the lighthouse bearing about 302° and Haugnes about 183° .

Telegraph.—Andenes is a telegraph station.

Tides.—It is high water, full and change, at 0h. 45m.; springs rise about 8 to 9 feet, neaps 5 feet.

Andfiord, the large inlet between Andö and Senjenö, extends about 25 miles to the southward from the west side of Grytö, under the name of Kvæfiord, the inner part of which, Gullerfiord, penetrates so far into Hindö that it is only separated from Kanstadfiord and Vestfiord by a low isthmus 4 miles broad. On the east side of Andfiord there are several groups of low islands surrounded by rocks and shoals, and on the west side, about 2 miles southeastward of

Dverberg Church, lies Myreflæsene, a small cluster of rocks between which and Andö there are several shoals.

Andfiord is connected with Vaagsfiord and the Inner Lead by Topsund and by the channel between Melövær and Senjenö; it is, however, but little frequented, except by small coasters, as the larger class of vessels, when bound to Vesteraalen and Lofoten from the northward, almost always pass westward of Andö and Langö.

Topsund is exposed to heavy and baffling squalls, and it is difficult to find anchorage there without a pilot. The passage between Melövær and Senjenö is preferable to that through Topsund, but a pilot should be obtained from Andenes before taking it, as there are several shoals and low rocks that would be dangerous to strangers, especially in thick or hazy weather, and the harbors between Andenes and Tjötö are only suitable for small vessels.

Lights.—The following lights in Andfiord and at its northern approach, shown from August 25 to April 14, are exhibited from small white structures, the lights in the white, red, and green sectors being visible at the distance of 6 or 7, 4, and 3 miles, respectively:

Maanes.—On Maanes, Senjenö, east side of approach to Andfiord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 139 feet above high water.

Törsken.—On the north side of Törskenfiord, about 5 miles south-eastward of Maanes, an occulting light, with white and red sectors, is exhibited, at an elevation of 37 feet above high water.

Holmenvær.—On Hjemholm, east side of Andfiord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 75 feet above high water.

Steinavær.—On Styrmandsholm, Steinavær, eastern side of Andfiord, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 90 feet above high water.

Bornöklubben Light, Symsvoldsund, Bjerkö, is elevated 121 feet above high water, and is a similar light to the above.

Dverberg.—At Dverberg, east side of Andö, an occulting light, with white, red, and green sectors, is exhibited, elevated 20 feet above high water.

Directions—From sea to Inner Lead.—The middle of Andfiord should be kept until past Myreflæsene, dry at low water and marked by a black beacon, as sunken rocks extend about 2 miles to the westward of the high islet Örja, and there are numerous rocks to the northwestward of Steinavær.

If obliged to proceed through Andfiord from Myreboen without a pilot, a vessel should, if possible, stand toward Melövær and endeavor to pick up a fisherman. There are several harbors near Melövær, but with the exception of that in Symsvoldsund, where there is good

anchorage for vessels of moderate size, they are only suitable for small craft.

Failing to obtain a pilot at Melövær, course may be altered either for Symsvoldsund, Grytövær, or Topsund.

Between Melövær and Steinavær.—After passing the black beacon on Myreflæsene, vessels taking the passage between Melövær and Steinavær should keep as nearly as possible in mid-channel between those groups, and endeavor to make the small and very low rocks, named Flæsene, the southernmost of which should be given a berth of nearly half a mile, in order to avoid a patch of 2 fathoms, marked by an iron pole.

Kalten, on the south side of the channel, is marked by a black stone beacon.

Having passed Kalten beacon, the shoals extending nearly 1 mile from the southwest point of Senjenö will be cleared by keeping over toward the round black rock Trælskjær, which, though small, is isolated and conspicuous; the western islet of Lemmingvær should be given a berth of at least 1 mile, and course may then be altered to proceed as requisite through Vaagsfiord.

Light.—**Senjehestneset Light**, exhibited from a small white iron house on a point on the eastern side of the entrance to Vaagsfiord, is an occulting light (unwatched), with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, elevated 28 feet above high water.

Aahavn.—On Aaholmen, Aahavn, an occulting light is exhibited, with white, red, and green sectors, elevated 22 feet above high water.

Sandssund.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 21 feet, from a small iron house on stone beacon situated on Vest Dyna, in the channel between Grytö and Sandö.

In the above the white, red, and green lights are visible at a distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Topsund.—Entering Topsund from Andfiord, it is advisable to give the western islets of Grytövær a berth of nearly 2 miles, in order to clear the offlying rocks. Tjeö (Kjeö), a rather high islet at the south-east end of Topsund, kept nearly its own width open northward of Elsnæs will lead northeastward of Skjærvhausbo and the other shoals southwestward of Grytövær, which have but 3 to 4 fathoms water over them, yet seldom break. Hestebo, marked by an iron pole, lies 600 yards northward of Elsnæs, and dries at low water; the channel is northward of it. Heavy and baffling squalls may be expected off the mountains on Grytö, the height of which is estimated to be about 4,000 feet. As both shores of Topsund are inhabited, there will be no difficulty in obtaining a pilot capable of taking a vessel through

Vaagsfjord and Tjelsund. The eastern entrance to Topsund has already been described.

Light—Seenholmen (Senholmen).—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 36 feet, from a small iron house situated on an islet off western extreme of Grytö. Shown from August 15 to April 14.

Kvæfjord.—There is no harbor in any part of Kvæfjord, and the anchorages on the east side of Gapö and at the southeast end of Kvæö are so much exposed to southerly and easterly winds that they should only be resorted to when absolutely necessary. All the known dangers are marked by poles.

Light—Eldeflæsa (Ellaflesene).—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 24 feet, from a small iron house situated on an islet on eastern side of Kvæfjord. Shown from August 15 to April 14.

Andenes to Nord Kvalö—General remarks.—The coast from Andenes to Nord Kvalö, like that to the southward, is fronted by a range of large islands with abrupt declivities toward the sea; these, again, are fronted by a bank with islets and sunken rocks to a distance of 5 to 10 miles.

This part of the coast is of considerable importance, as it includes several entrances to Tromsö as well as to the extensive fiords which penetrate the mainland. It is also important to Archangel traders, as these vessels frequently approach the outer islands in order to get a correct departure, or are driven in by northwesterly gales. At Nord Kvalö is the northern termination of that range of islets and rocks known as the "skjærgaard," that forms one of the most distinctive features of the western coast of Norway.

Caution—Bank of soundings.—This coast is fronted by a bank with depths of less than 100 fathoms, with average depths of 40 to 50 fathoms, to a distance of 25 to 40 miles in places; in others, more especially off the entrance to the various fiords, the banks are separated by deep fissures, with depths of 200 fathoms and more, extending into the fiords, or to within a few miles of the outer dangers, rendering this coast, even with a most careful attention to the lead, most dangerous to approach in thick or foggy weather. These banks are known as the Havbro (Sea bridge) fishery ground for a considerable distance up and down the coast.

Havbrobakken, a patch of 16 fathoms, described as a long sand bank which never breaks, lies on the southern side of one of the deep fissures just mentioned, and has a depth of 150 to 200 fathoms at a short distance northward and eastward of it, while for many miles to the southwestward the depths are from 30 to 50 fathoms. The

marks for it are Trehorningen (the northern peak, apparently, of Mulen), on Rebbeneseö, in line with the northern slope of Syd Fuglö and the cairn on Sandvær in line with the southwest end of Skarsteensfjeld.

Fishing stations.—The principal fishing stations on this coast are: Bö, at the south end of Langö; Oxnes, on Skogsö; Andenes; the Torsken and Bergs fiords, on the west side of Senjenö; and Utvær, about 16 miles westward of Skarsteensfjeld.

Entrances to the Inner Lead.—Of the various entrances from seaward to Tromsö and the Inner Lead, Malangenfiord, Vengsö deep, and the entrance north of Syd Fuglö are the only channels that can be safely taken by strangers, even in fine weather, without a pilot; therefore, owing to the prevalence of fogs and northwesterly gales and the distance to which the “skjærgaard” extends from the outer islands, it is recommended that vessels from the southward bound to Kaafiord, Hammerfest, or round the North Cape should give this part of the coast a wide berth, and make the land to the eastward of Nord Kvalö.

Tides.—The tidal streams on this part of the coast are irregular, and depend very much upon local conditions; as a general rule, the flood sets northward and the ebb southward within the 100-fathom contour line, while in the various fiords and sounds between Senjenö and Nord Kvalö the flood sets in direct from seaward, following the direction of the channels, and the ebb runs out, the streams turning at high and low water. The time of high water, full and change, is about 1h.; springs rise 8 to 9 feet, neaps about 5 feet.

Landmarks.—Strangers will have some difficulty in recognizing this part of the coast from the offing. The highest visible mountains lie a considerable distance inland, and seldom exceed an elevation of 4,000 or 5,000 feet, while the islands occupying the foreground frequently rise to a height of 2,000 or 3,500 feet. When seen from a distance, therefore, the mountains on the larger islands appear to diminish those in the background, and, on a closer view, hide them altogether. At a distance, also, the islands themselves lose the height and peculiarity of outline which they really possess, and appear to form a continuous mass, which is capped by so many sharp peaks that considerable local knowledge is required to distinguish any one in particular with certainty.

The most noticeable points are Andenes, with its lighthouse, and the north extreme of Nord Kvalö, both of which lie so far from the inner coast that they stand out very distinctly against it; as a rule, however, the openings of the numerous fiords and sounds will prove the most useful guides.

When nearing the land to the northward and westward of Kjölva the opening of Öifiord will be visible eastward of the snowy peaks

of Mælen. Southeastward of Kjolva are the conspicuous conical mountains Astria and Skindkollen (about 2,400 feet in height), which are most important marks for the entrance to Malangenfiord; they are separated by a deep valley and are very steep toward the sea, with sharp summits. Vasbruna, near one of the heads of Malangenfiord, and Bentsjordtinden, near the Ry Ström, show well above the comparatively low land that bounds Malangenfiord. Hoja (Haaaja) is distinguished from all the neighboring islands and mountains by its height and precipitous descent toward the sea, and will be seen at the same time as the mountains on Sæsö and the northern part of Syd Kvalö. In clear weather the mountains on Andö will be visible to the southward, and land will be seen to the northward as far as Rebbenesö and Syd Fuglö.

If westward of the low islets and rocks, westward of Syd Kvalö, its Alplike mountains, amongst which Bremnestinderne, Skamtinden, Tromtinderne, and Blaamanden are the most remarkable, the sharp lofty peak of Vengsö and the rounded snowy summit of Snefjeld, on Ringvadsö, form a background to Hoja, Sæsö, and the lower islands Angstouren, Björnö, etc. The two highest peaks on Andö will still be above the horizon to the westward of Senjenö, while the irregular outline of Rebbenesö, the lower and flatter island Sandö, and the sharp pyramidal peak of Syd Fuglö will be visible to the northward of Skarsteensfjeld.

On an easterly bearing Syd Fuglö assumes the appearance of an almost perfect pyramid, but when seen from the northward or southward it shows several smaller peaks, of which the southernmost appears to be quite isolated.

When westward of Syd Fuglö the high, dark, and steep mountain Mulen, or Bredviks Mulen, on the northern part of Rebbenesö, stands boldly out; and southward of Rebbenesö, Snefjeld and the jagged peaks Skulgamtinderne on Ringvadsö, which are almost always covered with snow, are especially noticeable. If farther to the northward, Grötö and the mountains Alangen and Rosmaalen, on Nord Kvalö, will be easily recognized; and the small but high island Hat Öerne, with Sandö and Syd Fuglö, will be conspicuous to the north and west of Rebbenesö.

The northernmost mountains on Nord Kvalö, and of Vandö eastward of it, fall almost perpendicularly toward the sea, and are distinguished from those to the southward by their slightly undulating summits. The peaks of Alangen on Nord Kvalö, on the contrary, are high and sharp, and their hollows are almost always filled with snow; they are separated from the mountains to the northward by a deep valley, which, however, is only visible from a position westward of Grötö, whence the northern ridge of Vandö may be seen through a similar valley on the south side of Rosmaalen.

Between Nord Kvalö and Vandö is the smaller island Helgö, whose northern steep peak is named Hornet.

Senjenö.—Next to Hindö, Senjenö is the largest island on the coast of Norway, and when viewed from the sea its peaks, which strikingly resemble those of Arran, and like them are composed of granite, present a singularly wild and imposing appearance. A ridge from 2,000 to 3,000 feet high extends northeast and southwest along the whole island, dividing it into two sections of very different character, the north and west sides being rugged and precipitous, while the south and east sides are characterized by rounded slopes, which are covered with luxuriant birch woods, interspersed with cultivated fields and thriving hamlets. The west and north coasts of Senjenö are indented by numerous inlets, which are separated by lateral spurs of the main ridge; northward of Senjehesten these inlets will be found in the following order: Selfjord; Sifiord, with its branches Gjeska and Veimandsfiord; Torskenfiord; Gryllefiord; Bergsfiord, which is connected with the Ström by a channel 70 yards in breadth, through which the tides run with great violence; Stensfiord and Ersfiord; Mefiord; Öifiord; Baltestadfiord, west of Hekkingen; Stönneshotten; and, lastly, Lysbotten, on the west side of Gisund. Most of these inlets are either directly exposed to the open sea or are only partially sheltered by groups of small islets and rocks, which render the entrances dangerous. There is an anchorage south of Torsken Church that may be entered without much difficulty; but, as a rule, all the headlands between Andfiord and Malangenfiord should be given a berth of at least 5 or 6 miles.

Lights.—**Kjöbmandsoen Light**, on the north side of the entrance of Bergsfiord, exhibited from a small iron house, at an elevation of 85 feet above high water, is an occulting light, with white and red sectors.

Lille Teistholmen Light is white occulting, exhibited from a small white iron house on masonry base, at an elevation of 24 feet above high water. This light in line with Kjøbmandsoen Light bearing 188° leads in between various dangers to the northward.

Kvanholm.—A group occulting light (unwatched), elevated 15 feet, is exhibited from a small iron house on Kvanholm; it shows white, red, and green sectors.

Havn Light, on Hellandsnes, about 1½ miles south of the preceding, is an occulting light, with white, red, and green sectors, elevated 49 feet above high water.

Fladneset Light, on south side of Bergsfiord, about 3 miles east of Hellandsnes, is also occulting, with white, red, and green sectors, exhibited at an elevation of 44 feet above high water.

At Bövær, Bergsfiord, an occulting light, with white and red sectors, is exhibited, at an elevation of 32 feet above high water.

At Mefjord, and on the southern side of entrance, an occulting light, with white and red sectors, is exhibited, at an elevation of 122 feet above high water.

Öifjord.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 86 feet, from a small iron house situated on the north point of Husö, eastern side of Öifjord.

The above lights are shown from August 15 to April 14. They are visible in the white, red, and green sectors at a distance of 6 to 7, 4, and 3 miles, respectively.

Malangenfiord—Tromsö approach.—Between the small islands Hekkingen and Edö is the entrance to Malangenfiord, which first separates Senjenö and Syd Kvalö, and then, dividing into several branches, penetrates about 20 miles inward, its greatest length being about 33 miles. Malangenfiord is the best entrance to Tromsö for all vessels from the southwestward, the distance from the entrance being only 30 miles.

Dangers.—The most dangerous shoals off the entrance of Malangenfiord are the Kvalkjyvene, a cluster of sunken rocks on which the least water is 3 fathoms; the eastern rock lies with Hekkingen Light-house bearing 148° , distant $3\frac{1}{2}$ miles. These rocks are the northernmost dangers on the west side of the approach. A continuous line of shoals extends between 3 and 4 miles in a northwesterly direction from Hekkingen, from whence the dangers on the southern side take a more westerly direction, for which see the chart.

On the eastern side of the approach shoals extend about 1 mile north-northwestward from Edö. Two miles northward of Edö is Kvitholm, with sunken and other rocks around it. Farther northward are the Hundungerne and Skulbaren Islets, with Aarsboen, a patch of 6 fathoms, $1\frac{1}{2}$ miles westward of the latter.

Within the entrance shoals extend about 600 yards offshore between Thorsnes and Ytre Buvik and 1,300 yards between Indre Buvik and Sandvik; the south side of Syd Kvalö should nowhere be approached nearer than 600 yards, as in many places large boulders lie some distance from the shore.

Lights.—On Hekkingen, west side of entrance to Malangenfiord, a light, with fixed, flashing, and group occulting white and red sectors, is exhibited from a white wooden dwelling 33 feet in height, at an elevation of 75 feet above high water. The white light is visible in clear weather at a distance of 14 miles, red light at 12 miles.

Hekkingesund Light, exhibited from a small white iron house on Klubholmen, at an elevation of 52 feet above high water, is an occulting light, with white, red, and green sectors, visible at a distance of 6, 4, and 3 miles, respectively.

Shown from August 15 to April 14.

Beacons.—A stone beacon with a flat top stands on the highest part of Hekkingen, at an elevation of 265 feet. Kvalen, a rock southeastward of Edö, is marked by an iron pole, as is also the rock in Hekkingensund. Other sunken dangers are marked by iron poles.

Pilots are stationed at Hekkingen Lighthouse, on Hillesö, and on Sommerö.

Tides.—During spring and the greater part of the summer a stream always sets out of Malangenfiord, independently of the tidal streams, which are then only perceptible near the shore, where they turn at high and low water as usual; therefore, as sea winds generally fall light toward the coast, sailing vessels should have boats ready for towing in case it should be necessary. During the rest of the year the flood sets in from seaward, and the ebb runs out.

It is high water, full and change, at about 1h. 30m.; springs rise about 7 feet.

Directions.—Vessels bound into Malangenfiord from the southward should keep westward of 10° east longitude until northward of the sixty-eighth parallel in order to pass the west coast of Lofoten at a safe distance; they may then steer more to the northeastward, and endeavor to make Andenes, on which there is a light. When northward of Andö, Kjölva and the headlands on the west coast of Senjenö, with Senjehesten, will be easily recognized, and course may be shaped to pass 5 or 6 miles northward of Kjölva. When Austria and Skindkollen are open eastward of Mælen (the mountain south of Kjölva), there will be no difficulty in distinguishing Hekkingen and Edö, and course may be altered to pass northward of Kvalkjyvene; Kjölva should not, however, be brought to bear westward of 230° until the point at Lökvik, on the east side of Austria, is visible eastward of Hekkingen bearing about 154° ; this mark will lead eastward of Kvalkjyvene up to the entrance to Malangenfiord.

A vessel will be westward of the shoals off Hoja and Edö as long as Hekkingen beacon, or lighthouse, bears eastward of 174° .

Having passed Hekkingen and Edö at a prudent distance, it is only necessary to give the land on either side of Malangenfiord a berth of about 800 yards, and to avoid the shoals between Thorsnes and Sandvik, proceeding past Gisund for the Ry Ström and Tromsö as before directed.

Anchorage.—Having entered Malangenfiord, vessels might bring up either between Store Lyngö and Lille Sommerö, in Lökvik, in Indre Buvik, or off the shoal between Indre Buvik and Sandvik.

To make the anchorage between Store Lyngö and Lille Sommerö, pass 400 or 600 yards south of Edö, and the same distance south and east of the small rock Kvalen, marked by an iron pole, which lies 1,400 yards southeastward of the south extreme of Edö; then steer so as to pass about 300 yards westward of Store Lyngö, and bring up

halfway between that island and the southwest end of Lille Sommerö, in 15 fathoms, over clay. The anchorage is only 300 yards broad, and it is not advisable to attempt it without a pilot.

Small craft may pass southward of the islets east of Store Lyngö to the anchorage west of Varholm, which has a depth of 5 fathoms.

In Lökvik, about $2\frac{1}{2}$ miles southward of Hekkingen Lighthouse, and the same distance from the south point of Edö, anchorage may be found in depths of from 15 to 19 fathoms, over sand and clay; the bank is very steep to the eastward, but there is a ring for hawsers on the shore. The points north and south of Lökvik must be given a fair berth, and the cove south of the mooring ring is shallow to a distance of 300 yards from the shore.

About 400 yards from the shore at Indre Buvik the depths are 10 to 15 fathoms, over clay, and off the western edge of the shoal between Indre Buvik and Sandvik the depths are 6 to 11 fathoms, over sand and large stones. Caution is necessary in taking up the latter anchorage, as the bank is very steep.

Indre Malangen.—The inner part of Malangfiord, with its three principal branches, Mons Elv, Ouersfiord, and Nordfiord, is almost everywhere free from dangers to within 400 or 600 yards of the shore. Roksfjordström, which connects Roksvandene with Malangfiord, is only navigable for boats.

A shoal, marked by a pole, extends 900 yards off Spildernes in a southwesterly direction, and foul ground, also marked by poles, extends 600 yards northward and 1,200 yards southward from Spilderö. A rock off Molsnes is similarly marked. The inner parts of Mons Elv and Nordfiord are obstructed by alluvial banks of considerable extent, and the whole of the inner part of Malangfiord must be navigated with caution by sailing vessels on account of the sudden and baffling squalls to which it is exposed.

There is anchorage west of Tendskjærholm, on the west side of the entrance to Indre Malangen, in a depth of about 8 fathoms, over sand and clay; vessels may also bring up northward of Roksfjordnes, in about 9 fathoms. In Gjövik and eastward of Furö, Spildernes, and Spilderö, there is indifferent anchorage for small craft.

Mons Elv, the most important branch of Malangfiord, extends about 4 miles in a southerly direction on the west side of Molsnes, a thickly wooded point 4 miles southward of Spilderö. At the inner end of this branch is the mouth of the Mons Elv, which, with the Rösta, Divi, and Bardo Rivers and numerous tributary streams, forms the principal watercourse in Tromsö Province. The Mons Elv is navigable for boats up to Malangsfos, a distance of about 15 miles, and jægts (native boats) ascend it as far as Brandskognes, about 3 miles below Malangsfos, for timber, firewood, tar, birch bark, etc.

Above Malangsfos (a fall 30 to 40 feet high) the upper part of the river is practicable for boats as far as Rostavand, a distance of nearly 25 miles. The Mons Elv is not highly spoken of as a salmon river, and the attempts made to lower the Malangsfos by mining, to facilitate the passage of timber rafts and to allow the fish to run up have, so far as the latter object is concerned, been attended with indifferent success.

Tusö anchorage—Ersfiord Deep.—The first entrance from seaward, north of Malangenfiord, is the narrow and difficult channel between the rocks off Hillesö and Tusö; it should not be attempted by strangers. It leads to anchorage on the south side of Tusö, in a depth of 5 fathoms, between the rock off the houses and the point to the westward, where there is a mooring ring. The passage from Tusö to Malangenfiord eastward of Hillesö is narrow and intricate.

Ersfiord Deep, between Tusö and Hoja, is a much easier entrance than that between Hillesö and Tusö. Having passed about three-quarters of a mile westward and northward of Skulbaren, an isolated black rock lying about 4 miles westward of the south extreme of Hoja, the channel is open and clear to the eastward, and course may be altered to pass either west or east of Angstouren to Tusö, or between Hoja and Sæsö to Vengsöfiord. On the east side of Angstouren there is anchorage near the shore where the depth is 8 fathoms, but as the bottom is uneven and the tides are very strong it should only be resorted to in case of emergency. There is a good small harbor on the east side of Hoja; the rocks in the entrance, which dry at low water, may be passed on either side.

Lights—Sommerö.—On Saltholmen, off the northern side of Sommerö, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 39 feet above high water.

Skarveskjær.—A similar light is shown on Skarveskjær, west of Sommerö.

Varstrand (Vasstrand).—Near Varstrand, on the southwest side of Bræmnestind, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 24 feet above high water.

The white, red, and green sectors of the above the lights are visible at a distance of 6 or 7, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Vengsöfiord.—This passage to Kvalsund and Tromsö is of importance to vessels making the land about Utvær (Auvær), a group of islets about 9 miles westward of Vengsö, especially if hindered from entering Malangenfiord or Kvalsund; it is also one of the easiest entrances on this part of the coast.

In tolerably clear weather there will be no difficulty in distinguishing the landmarks already mentioned, and care must be taken not to approach too near the shoals off Utvær, which will be cleared by

keeping Angstouren in sight to the westward of Hoja. The summit of Vengsö bearing 81° will lead southward of Bringskjær and Dragene, which dry at low water and break when covered, and immediately on passing these rocks a vessel may edge to the northward a little, in order to give the shoals northward of the Rösholmene a good berth. The Ganholmene, two round islets about 3 miles westward of Ljösö, will then be easily recognized; the westernmost is almost black, and the other is whitish, and immediately to the northward is a cluster of small rocks.

When within $1\frac{1}{2}$ miles of the Ganholmene a vessel should steer so as to pass about 800 yards southward of them, proceeding in mid-channel through Vengsöfiord. The shoals eastward of the Ganholmene will be avoided by keeping rather over toward the point north of Tromtinderne, which may be passed within a distance of 1 mile, or by keeping the steep point on the west side of the entrance to Kalfjord bearing 95° .

From Vengsöfiord vessels may pass eastward of Vengsö and Musvær and westward of Vaagsö and Gaasvær to Kvalsund; the channel is free from dangers, and it is only necessary to give the land on both sides a good berth; there is also a passage east of Vaagsö.

Tides.—Eastward of Vengsö the tidal streams are very strong, the flood setting in from Vengsöfiord and the ebb running out.

Lights—Hoja (Haaja).—On Kjeholmen, northeast coast of Hoja, an occulting light, with white and red sectors, is exhibited, at an elevation of 91 feet above high water.

Rösholm.—On the summit of Rösholm an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 123 feet above high water.

The lights in the white, red, and green sectors of the above are visible at a distance of 6 or 7, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Anchorage.—The northeast extreme of Hoja bearing 129° leads between the rocks off that island and Björnö to the anchorages within Ersfiord Deep. On the south side of Rösholm there is just room for one small vessel, moored head and stern. In Ljösösund, between Ljösö and Vengsö, there is a snug harbor for small craft close to the house on Ljösö; there is also anchorage in the middle of the sound, in a depth of about 15 fathoms; the tides are very strong, and northerly winds send in a heavy swell.

Tromvig, on the east side of Tromtinderne, has a depth of 4 to 8 fathoms, and is a good harbor in any weather; the best position is off the northernmost house on the west side of the bay.

Vessels may bring up to wait wind or tide off Vengsvig, on the southeastside of Vengsö, in 4 fathoms, over sand. In Puskevig and the whole of the sound between Vengsö and Vaagsö there is a good

level sandy bottom, but a shoal extends about 200 yards off Vengsö toward the northern part of the sound, and, as already observed, the tides are very strong.

Kvalsund—Simabak Leden and Stor Leden.—Kvalsund, which separates Syd Kvalö and Ringvadsö, is sometimes used by vessels bound to Tromsö from the northward. The entrances from seaward, Simabak Leden and Stor Leden, are separated by a number of shoals, most of which break during westerly winds on account of their irregular formation and steep slope to the westward, while even in calm weather the ground swell causes the sea to break on several of the shoalest parts; they are, therefore, at all times more or less dangerous. The least water on them is $2\frac{1}{2}$ fathoms.

Vinstraafaldene, the outer shoal between the two entrances, has a depth of $2\frac{1}{2}$ fathoms, and breaks with very little sea. Faldene, on which there is a depth of 6 fathoms, is the northernmost shoal on the south side of Stor Leden, and is also one of the first to break. A vessel will be nearing the shoals off the entrance to Kvalsund when the principal cluster of Utvær is in line with Astria bearing 190° and the north extreme of Grötö is in line with Syd Fuglö 50° .

Lights—Lyngö.—A light, with fixed, flashing, and group flashing white, red, and green sectors, visible 15, 11, and 9 miles, respectively, is exhibited, at an elevation of 90 feet, from a white wooden house and tower, 42 feet in height, situated on Lille Lyngö.

Simabak leading lights—Front light.—An occulting white light, visible from a distance of 10 miles, is exhibited, at an elevation of 49 feet, from a small iron house on pillars situated on Kvitholmen.

Rear light.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 91 feet, from a small iron house situated on Lyngö; the white sector is visible from a distance of 7 miles, except on the leading line, where it is visible 10 miles; the red sector is visible 4 miles; and the green sector 3 miles.

The above lights in line bearing 123° lead through Simabak Leden.

Klokkerholmen.—An occulting light, with white, red, and green sectors, is exhibited, at an elevation of 34 feet, from a small iron house situated on Klokkernes, northern side of entrance to Kvalsund. The white sector is visible from a distance of 7 miles, except between Risö and Lyngö, where it is visible 10 miles; the red and green sectors are visible 4 and 3 miles, respectively.

Ytre Korvig (Kaarvik).—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 28 feet, from a small iron house situated on the eastern side of Kvalsund.

The above lights are shown from August 15 to April 14.

Pilots.—From June to September pilots might be obtained from Lyngö, which, though not inhabited, is frequented by fishermen during the summer; at other times Musvær, north of Vengsö, is the only place whence assistance can be expected.

Tides.—The tidal streams are very strong in all parts of Kvalsund, especially toward the south end of the sound and in the narrow passages east and west of Haakjærringholm, where springs at times attain a velocity of 6 or 7 knots. It is high water, full and change, at about 1h. 30m. The streams turn at high and low water, the flood setting in from seaward and the ebb running out.

Directions.—If intending to enter Kvalsund, Astria, at the entrance to Malangenfiord, should be kept open westward of the Utvær Islands and the north extreme of Grötö open northward of Syd Fuglö until Skarsteensfjeld and Kibergnes, on the north and south sides of the entrance to Kvalsund, are clearly distinguished; the small round island Lyngö, the flat-topped island Risö (Riisö), and a small stream named Snigelv, which runs down Skarsteensfjeld and looks like a fine white stripe on the side of the mountain, are also important landmarks. Snigelv, in line with Treingerne, the western rocks off Risö, bearing 109° , will lead northward of Vinstraafaldene; and the highest part of Lyngö in line with Valnes, the point immediately south of Gaasvær, or the lights on Lyngö in line bearing 123° will lead in the fairway of Simabak Leden, close northward of Vinstraafaldene. When within $1\frac{1}{2}$ miles of Lyngö course may be altered to pass 400 to 600 yards northward of the rocks off that island, and the channel is then clear up to Kvalsund, with the exception of Kutungerne, two islets surrounded by rocks which lie close south of the fairway.

If a vessel be unable to proceed through Kvalsund on account of the tide, she may bring up either at Ytre or Indre Korvig (Kaarvik), on the southwest side of Ringvadsö, or on the opposite side of the sound at Vaagen or Troniord. Foul ground extends about 400 yards northward from the rock off the entrance to Ytre Korvig, and the same distance westward from the point south of Indre Korvig. A patch of 3 fathoms lies half a mile west of the last-named point. A rock, with 9 feet of water, lies near the shore about 800 yards northward of the house at Troniord, and the northernmost rock on the south side of the anchorage at Troniord lies between 200 and 400 yards from the shore eastward of the house.

Small fishing craft sometimes anchor on the east side of Lyngö, but the harbor is small and shallow. There is also anchorage on the whole of the east side of Risö, but there is only a depth of 2 fathoms at several hundred yards from the shore; farther out, where the depth is greater, vessels would be exposed to northwesterly winds and

swell. In Engvig, on the west side of Rebbenesö, there are depths of $1\frac{1}{2}$ to 2 fathoms.

After passing Korvig it is necessary to keep over toward Ringvadsö, in order to avoid a rocky shoal lying nearly in mid-channel 1 mile eastward of Troniord house, and marked by a pole. Haakjærringholm, from which a shoal extends half a mile to the northward, marked by an iron pole, should be passed on its western side, keeping as nearly as possible in mid-channel. The shoals off Tönsnes are the only dangers between Haakjærringholm and Tromsö. The northwestern end of Tönsnesboen, dry at low water, is marked by an iron pole, the southeastern extreme by a black stone beacon.

Besides the places already mentioned, vessels might bring up in almost any part of Kvalsund, near the shore, to wait for a favorable tide.

The marks for entering Stor Leden, which is broader than the Simabak Leden, are Lille Lyngö, a small holm close south of Lyngö, open north of Kibergnes, bearing 108° . After passing Vinstraafaldene, Faldene, and Steingrund at 3 fathoms, there is nothing more to fear in fine weather, but if there is much sea on, it is advisable to edge to the southward when the breakers on Faldene bear about 252° until Snigelv is only a little open of the rocks off Lyngö, in order to give Magnheldboen and Melvikböen (with 3 fathoms over it) a good berth. When about 2 miles from Lyngö, course may be altered to pass northward of that island as directed on page 172.

Entrances north and south of Sandö.—These channels are difficult and should not be attempted without a pilot. Small vessels taking the southern entrance might find anchorage among the islets south of Sandö, on the east side of Risö, or at the south end of Rebbenesö; there is also an anchorage at Mjölvig (Melvik), on the east side of Sandö.

Entrance south of Syd Fuglö.—There is an entrance south of Syd Fuglö of about the same width as that north of that island, below described. Taraldboen, with a depth of 5 fathoms, and Helvedesgrund, with 4 fathoms, about 2 miles apart north and south, are the outer dangers. Sandterren, with 4 fathoms, lies in the fairway, with a deep channel on either side. This channel leads to the anchorages off Sandö before described; it also joins the channel northward of Syd Fuglö off Mulen. It is not advisable to take this channel without local knowledge.

North of Syd Fuglö—Grötösund, the entrance north of Syd Fuglö, is on the whole easy, but if the tide is falling a vessel will have a strong stream against her in Grötösund; the tides run strongest over a rocky ledge with depths of 4 to 6 fathoms which extends right across the sound from the north point of Andammen. From Grötö-

sund and Gersætsund vessels may proceed either through Skagösund and Kvalsund to Tromsö, eastward through Helgöfiord, or northward through Raasa.

Directions.—By bearings of the sharp sugar-loaf peak of Syd Fuglö, the small island Mægta, and the two peaks of Hat Öerne, there will be little difficulty in distinguishing the small rock Kolbenskjær, which lies $1\frac{1}{2}$ miles northward of Syd Fuglö, and has the shape and appearance of a black cask. Tænbo, on which there is a depth of 13 fathoms, lies nearly $1\frac{1}{2}$ miles west of Kolbenskjær, and the south extreme of Hatöboerne, a rocky ledge with from 2 to 5 fathoms, lies $1\frac{1}{2}$ miles north-northeastward of the same rock.

Kolbenskjær kept between the north and south points of Hat Öerne will lead between the shoals off Syd Fuglö and Tænbo; and the same rock in line with Mægta, bearing 134° , leads between Tænbo and Hatöboerne. The north side of Kolbenskjær should be given a fair berth, and vessels entering from the southward should edge to the northward when within a mile of it. When within 2 miles of Hat Öerne, course may be altered to pass between that island and Mulen to Grötösund. The rocks eastward of the low holms south of Hat Öerne and Sandholmbo (between the north points of Rebbenesö and Andammen) are dry at low water, and break when covered. If unable to stem the tide in Grötösund, a vessel might bring up for a time off the rocks west of Grötö; the anchorage off Grötö house has only a depth of 3 fathoms, over sand.

When proceeding through Grötösund it is necessary to keep about two-thirds over toward the south side of the sound, as large masses of fallen rock extend several cables from Grötö. These dangers are marked by an iron pole, but a shoal extends nearly half a mile from the northeast point of Andammen. When past the southeast point of Grötö, course may be altered for Bersætsund. Vargösund, between Rebbenesö and Hersö, is so narrow, and the tidal streams run through with such violence, that, though sufficiently deep, it can not be considered a navigable channel.

Bersætsund.—In passing through Bersætsund, an easy channel between Hersö and Nord Kvalö, it is only necessary to keep well out from the land on either side, and vessels should not haul into Skagösund until Hornet, on Helgö, is open south of Nord Kvalö, or until the north points of Ringsvalsö and the high steep island Daavö are in line, in order to clear the shoals extending nearly three-quarters of a mile southeastward from Hersö.

Skagösund.—In Skagösund, a winding passage southward of Hersö and Rebbenesö, the tidal streams run very strong, especially between Varvig and Gjövig; the flood sets northeastward and the ebb southwestward. The shoals off Storfjeld, Gjövig, and Skarsteen-

fjeld will be avoided by keeping nearest to Ringvadsö, in the northeastern part of the sound, and nearest to Rebbenesö when southward of Varvig.

If unable to stem the tide, vessels may bring up in almost any part of Skagösund near the shore. On the southeast side of Hersö there is a good harbor for small vessels, with a depth of 3 fathoms, increasing to the westward and southward. The best anchorages in Skagösund are Varvig, Botten, Finkirken, Jutevig, and Gjövig, but at all these places the depth decreases to about 3 fathoms near the shore, and farther out vessels are in the strength of the tide. Small craft may also bring up in the sound east of Teistholm, where there are depths of 3 fathoms. In Maasvig the depth is only from 8 to 12 feet.

Lights—Dyrsnes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 25 feet, from a small iron house situated on Dyrsnes, south side of the northern entrance to Skagösund.

Stromsnes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 11 feet, from a small iron house situated on Stromsnes, 5 miles southwest of Dyrsnes.

The above lights are shown from August 15 to April 14.

North of Grötö.—There is a narrow channel leading northward of Hat Öerne and Grötö from Syd Fuglö, but it can not be taken without a pilot.

There is also a straight but narrow passage between the rocks and shoals that extend 5 or 6 miles northward from Grötö and Nord Kvalö. The marks for this channel are Toftefiordnes on Rebbenesö in line with the northeast extreme of Grötö, which leads eastward of Blaamandsboen, the outer danger, and between Vest and Ost Jonsbo, but this channel ought not to be attempted by strangers. The flood stream sets in to the southward between the rocks off Grötö and Nord Kvalö, and the ebb runs out to the northward. Eastward of Maasnes, the west point of Nord Kvalö, there is a good harbor for vessels of 8 feet draft.

Nord Kvalö is about 9 miles in length north and south by about 3 miles in breadth. Lille Alangen Mountains on the southern end are about 2,000 feet in height; Rosmaalen on the north end are about 1,500 feet in height, and drop steeply toward the sea. Sunken dangers, on which the sea breaks heavily at times, extend about 5 miles northward and westward of it, for which see the chart.

CHAPTER XI.

NORD KVALÖ TO THE NORTH CAPE.

General remarks.—The coast between Nord Kvalö and the North Cape includes the entrances to Hammerfest and the Kaafiord copper works in Altenfiord, as well as the principal northern entrances to Tromsö, and is therefore of considerable importance. It has already been mentioned that eastward of Nord Kvalö there is no regular “skjærgaard” (offlying banks with islets and dangers, with passages within them), and from this point to the Russian frontier in Varrangerfiord the mainland is either exposed to the open sea or protected at intervals by large islands with bold foreshores; it is also deeply indented by large fiords, which generally run straight in from the sea, with but few branches or windings. Between the islands and the mainland there are several large sounds, so that the Inner Lead still continues, although with long and frequent breaks, as far as Porsangerfiord, eastward of the North Cape.

Nord Kvalö to Sörö.—About halfway between Nord Kvalö and the North Cape is the large island Sörö, in point of size the third island on the coast of Norway. The outer islands between Nord Kvalö and Sörö are Vandö (Vannö), Nord Fuglö, Arnö, and Loppen; within these are the three great inlets Ulfsfiord, Lyngenfiord, and Kvænangenfiord; and between Loppen and Sörö is Sörösund, the western approach to Hammerfest. The large peninsula formed by Kvænangenfiord, Stjærnsund, and Syd Langfiord (a branch of Altenfiord) separates the provinces of Tromsö and Finmarken, and is connected with the mainland by Alteidet, an isthmus 6 miles broad, over which there is a road for vehicles. This peninsula is a mass of wild mountains, attaining a height of 3,500 feet, and exposing flat snow-covered surfaces from which glaciers extend down on almost every side nearly to the level of the sea; it is named the Jökulsfjeld, and is indented by fiords in all directions.

These are probably the northernmost glaciers of the old continent, except perhaps the small ones on the neighboring island of Seiland. Only one or two summits near Altenfiord attain the snow line, and the hills being lower in the interior of Finmarken than on the coast at the same time that the snow line is higher, perpetual snow may be said to be entirely unknown there, as well as at the North Cape.

Tides and tidal streams.—At a distance of 5 to 10 miles from the outer islands the tidal streams follow the direction of the coast, the flood setting to the northward and eastward and the ebb to the southward and westward. Nearer the land the flood sets more directly toward it, and the ebb runs off to seaward, the direction of the stream varying with the trend of the coast. In the outer channels the streams are still more affected by local conditions, and the influence of the wind is very perceptible. Thus, when the wind remains fixed in one quarter, the tidal stream frequently follows it in Fuglösveet, Fuglösund, Lyngenfjord, and Sörösund, for several days.

In Langesund, between Ringvadsö and Reenö, where the stream is much stronger than in Grötsund, the streams turn one hour after high and low water, the flood setting northward and the ebb southward.

In Karlsösund the flood runs eastward and the ebb westward.

In Kaagsund, Lögsund, and Maursund the streams turn 3 hours after high and low water, the flood setting to the eastward and northward and the ebb in the contrary direction.

In the outer parts of the various inlets the tide runs in from seaward with the flood and out with the ebb.

It is high water, full and change, at about 1h. 30m.; springs rise about 6 feet.

Landmarks.—There is generally little difficulty in distinguishing the landmarks on this part of the coast, as there are several conspicuous mountains on the outer islands which stand out in bold relief against the broad openings of the fiords.

Vandnæringen, the name usually applied to the high land on the north end of the large island Vandö, is formed by the flat-topped precipitous mountains Bratnæring and Jeisnæring, about 1,400 feet in height, the summits of which slope gradually toward the north. Vandkisten and Vandtinden, the mountains on the southern part of Vandö, attain an elevation of between 3,000 and 4,000 feet. When approaching Vandö from the northwestward Syd Fuglö and some of the landmarks already described will also be visible; Nord Fuglö will project beyond Vandnæringen, to which, from this point of view, it has some resemblance.

When Fuglösveet is open Nord Fuglö will appear quite detached, and is then a very conspicuous landmark, rising to a height of about 2,500 feet, with a very steep fall to the south and west; about three-quarters of a mile from Fuglöskagen, the northwestern extreme of the island, lies a small islet named Kalven (The Calf).

On opening Kvænangenfjord, the jagged summits of Kvænangstinderne will be visible eastward of the high island Arnö, which is very steep to the north and west. Loppen will appear low and dark, with

an even slope to the northward; it is the lowest island on the coast, and has a flat summit. The mountains on Stjernö will be visible over or eastward of Sildmyling, on the north end of Silden, which will make like sugar loaves; and in clear weather the northwestern promontory of Sörö, which is named Soppen, will be visible at a distance of about 30 miles.

If farther to the eastward, Andotten, which is very steep toward the sea, will be seen on the north side of Bredvig Bunden, a large bay on the west side of Sörö. Lille Haaen, the southwest point of Sörö, is also a good mark; it is separated from the higher hill Store Haaen or Navern, 1,597 feet high, by a low neck of land.

Other useful objects will be seen on nearing the land, but as they serve as leading marks for the various entrances from seaward, they will be described hereafter.

Lights.—**Koja Light**, on Koja Island, is occulting, with white, red, and green sectors, and elevated 85 feet above high water.

Grimsholmen Light is an occulting white light, elevated 234 feet, and shown on the summit of Grimsholmen, northeast of Vandö.

Burösund Light, on the south point of Burö, is occulting, with white and red sectors. It is elevated 16 feet.

In the above the white, red, and green lights are visible at a distance of 6 or 7, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Dangers between Vandö, Nord Fuglö, and Sörö.—At a distance of 7 to 9 miles from Vandö and Nord Fuglö, a dangerous line of rocks and shoals, with deep water between, extends about 17 miles in an east and west direction.

The western shoals north of Vandö are: Nordstö, with 3 fathoms; Svebo, with 5½ fathoms; Öst Fuglo, at 10 fathoms; Grötögrund, with 3 fathoms; Tampeisa, with 6 fathoms; and eastward of these, Bredgrund, with 5 fathoms, and Kusggrund, with 8 fathoms, water.

Nordstö, the northernmost of these shoals, lies 6½ miles northward of the north extreme of Vandö.

Gaasægtarren, eastward of those just mentioned, is about 1½ miles in length in a north and south direction, with depths of 6 fathoms at the extreme, and 40 to 80 fathoms at a short distance. It breaks at times.

Östre Gaassene, between 2 and 3 miles eastward of Gaasægtarren, extend 1½ miles in a northwest and southeast direction; the rocks dry at low water, and the sea breaks all round them in many places. The western rock lies 8½ miles northwestward of the north extreme of Nord Fuglö.

Nordbo, on which there is only 1 fathom, is about 1 mile in extent, and breaks in three places; the center of this very dangerous shoal lies about 7 miles north of Nord Fuglö.

Kjærringgrund, a fishing ground southward of Nordbo, has depths of 18 to 22 fathoms, and does not break.

Kalvbo, a steep conical rock with 5 fathoms, lies barely half a mile northward of Fuglökalv, the north point of Nord Fuglö; it breaks with a moderate sea.

Inderbofaldet, about 2 miles in extent, is the outer danger on this part of the coast. The bottom is very irregular, rising in sharp rocky points to within 5 or 6 fathoms of the surface, with depths of 10 to 20 fathoms close-to. The 5 and 6 fathom patches break in quite moderate weather, and in bad weather it is probable that the sea breaks where there are depths of about 15 fathoms. Its center lies $12\frac{1}{2}$ miles north-northeastward of the north extreme of Nord Fuglö.

Ydre Gjesboen, about 5 miles north-northeast of Inderbofaldet, is the northernmost part of the Gjesbo fishing ground; it has a uniform depth of from 20 to 30 fathoms, and consists of coarse sand with small stones and coral. There is no reason to suppose that Ydre Gjesboen ever breaks.

About 3 miles northeastward of Ydre Gjesboen there is a ridge extending about 2 miles in an east-southeast and west-northwest direction, upon which the depths are from 16 to 23 fathoms, over a coral bottom; this ridge probably breaks in bad weather.

Shoals off Sörö.—There are several shoals with from 4 to 10 fathoms westward of Sörö, but they are all within 2 miles of the shore. Kveitegrund and Grundbak, farther to the westward, are fishing grounds with 34 and 39 fathoms least water. About half a mile off the southwest point of Sörö is Haagrund, with a depth of $5\frac{1}{2}$ fathoms. These shoals form the eastern side of Alten, described later.

Reenlibo, about 3 miles north-northeast of Soppen, has 16 fathoms water, and may be considered to break in bad weather. Sildbo, which lies about 1 mile northward of Reenlibo, is also considered dangerous by the fishermen, but as the least water found is 23 fathoms it probably never breaks; the same remark applies to Bröndseraas, with 21 to 25 fathoms, lying $12\frac{1}{2}$ miles northeastward of Soppen.

Making the land.—In clear weather, Syd Fuglö, Nord Kvalö, Vandö, and Nord Fuglö will be seen long before the outer dangers are approached, and there will be no difficulty in making the channel between Inderbofaldet and Sörö, which is on the whole the safest for strangers; it is therefore recommended that sailing vessels bound to Tromsö from the northward, or to any part of Finmarken from the southward, should endeavor to make the land to the eastward of Nord Kvalö in preference to attempting the devious channels between Malangenfiord and Nord Fuglö. With fine, clear weather vessels might pass on either side of Nordbo, but the narrow passages between

Östre Gaassene and the western rocks off Vandö should not be attempted at any time without a pilot, as the wind is very unsteady near the land and the streams are strong.

Pilots may be obtained from Loppen, and also from Hasvig, on the southwestern extreme of Sörö.

Entrance between Nord Kvalö and Vandö—Directions.—If intending to stand in for this entrance from the northwestward, and having attended to the remarks for making the land as given above, the whole of Nord Fuglö must be kept quite open northward of Vandö, to pass northward of the dangers off Nord Kvalö, until the eastern extreme of Helgö is nearly touching the islets off Vandö, bearing 164° , which latter mark will lead in mid-channel between the dangers off Nord Kvalö and of Vandö.

Flæsa, two rocks above water, which lie about 2 miles westward of Vandnæringen, may be passed on either side, but foul ground exists half a mile west of them and a $4\frac{1}{2}$ -fathom patch lies 1 mile to the northeast. When past Flæsa, vessels may either proceed westward of Helgö through Raasa to Skagösund or to Helgöfiord, or eastward of Helgö through Hammerfiord to Langesund, or southward of Vandö through Vandsund or Karlsösund.

Thorsvaag (Torsvaag), on the northwest side of Vandö, is an indifferent harbor for small vessels; east of the high islet Koja there are depths of $2\frac{1}{2}$ to 3 fathoms, and farther out in the sound of 7 fathoms; southerly winds send in rather a heavy sea.

Light.—A group occulting light, with white, red, and green sectors, is shown, at an elevation of 23 feet, on Skarvbaren, south side of the entrance to Thorsvaag.

Hammerfiord.—Vessels may bring up in the bay on the west side of Vandö, with the northern extreme of Helgö bearing 276° , in a depth of 8 to 12 fathoms, over sand; but the roadstead is exposed to northwesterly winds. There are no dangers in Hammerfiord.

Raasa.—With a southerly wind it is better to beat through Raasa than Hammerfiord, whether bound to the eastward or westward; the land on either side may be approached to within 400 yards, and anchorage may be found, if necessary, eastward of the rocks off Helgö house, on the southwest side of Helgö; the depth is 4 to 6 fathoms over fine sand, but near the eastern rock there is only $2\frac{1}{2}$ fathoms, shoaling toward the shore. If the wind is strong from the southeast vessels might bring up between the westernmost of these rocks and the west point of Helgö. There is also a good but very small harbor within the holms west of Rödgammen, the southeast point of Nord Kvalö; it has a depth of 3 fathoms over good holding ground, and may be entered either from the eastward or westward.

Shoal.—At about 400 yards southward of the holm southward of Rödgammen is a shoal nearly dry at low water, marked by an iron pole.

Helgö, Daav, and Grund fiords.—When passing through Helgöfiord vessels should give the whole of the north coast of Ringvadsö a good berth, as rocky patches lie several hundred yards offshore. Kjærringskjær, which lies $1\frac{1}{4}$ miles southwest of the southeast point of Helgö, is above water, and is marked by a black beacon.

Light.—An occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is shown on Sjaaholmskjær, off the southwest point of Helgö.

Shoals.—A shoal of small extent, with 3 fathoms water over it and 11 to 16 fathoms around, lies near the fairway of Helgöfiord, 800 yards east of the northeast point of Daavö.

Fuskenes, the north point of Reenö, is foul to the distance of about 400 yards; a patch of 4 fathoms lies about 1,600 yards northward of it, and another patch of 3 fathoms is situated 600 yards north of the above shoal. A shoal, covered by 9 feet of water, and marked by a pole, lies in the fairway nearly 2 miles northwest of Fuskenes.

Anchorage.—Besides the anchorages of Helgö house, south side of Helgö, there is another on the south side of Daavö, in a depth of 8 fathoms. The harbor at Langstrand, on the east side of Daavfiord, is very small, but deep enough for large vessels; the rocks east and southwest of the islet that forms the harbor are dry at low water.

Grundfiord has anchorage in a depth of 4 fathoms. From the east entrance point a shoal ledge, about three-quarters of a mile broad, with four rocks awash at low water, and depths of 1 to 3 fathoms between them, extends about $1\frac{1}{2}$ miles in a north-northwest direction. There is a mine here.

Langesund.—Between the shoals of Grundfiord and Fuskenes is the entrance to Langesund, a narrow channel between Ringvadsö and Reenö, which connects Helgöfiord and Grötsund, the eastern entrance to Tromsö; it is nearly free from dangers, and good anchorage will be found north and south of the projecting point, Skatör, in depths of 4 to 8 fathoms, over sand; there is also good holding ground near both shores of the sound, but as the tides are strong and the wind invariably fails, the channel eastward of Reenö is always preferable for sailing vessels.

Shoals.—A shoal with a least depth of 4 feet, general depths of 11 to 18 feet, and 14 to 27 fathoms around, lies about 1 mile southwest of Elvenes. It is marked by two poles.

A shoal with 5 fathoms, having deep water inshore of it, lies off the northeastern shore of Langesund, about 1 mile east of Skatör, and about 400 yards from the nearest point of Reenö.

A rock off Nipo, at the southern entrance to the sound, is marked by an iron pole.

Karlsösund and Vandsund.—Karlsösund, between Reenö and Karlsö, is free from dangers, except a 5-fathom patch lying half a mile west of the northwest end of Karlsö. The anchorages abreast Karlsö Church and at Gammel Gaarden are protected, respectively, from northerly and southerly winds; but it is advisable to anchor well offshore, as if the wind shifts to northwest or southeast it is generally necessary to leave.

Vandsund, between Karlsö and Vandö, is a broad, clear channel, but has no anchorage.

Tromsö approach from northward.—Fuglösveet and Fuglösund, the entrances west and east, respectively, of Nord Fuglö, are generally used by vessels bound to Tromsö from the northward. The wind nearly always fails in Fuglösund, even when a stiff breeze is blowing outside and inside, therefore it is not recommended for sailing vessels.

Directions.—Having passed between the dangers off Nord Kvalö and Vandö, a vessel can proceed through Fuglösveet, passing on either side of the Grimsholmene and Rundskjær. The Grimsholmene are rocky islets about 200 feet high, and when north of Vandö will show three detached peaks; the southern peak, kept just open north of the north extreme of Vandö, will lead southward of Tampeisa Shoal.

As a rule, the channels between Bredgrund and Inderbofaldet should only be taken by those acquainted with the marks for the various channels, but in fine, settled weather careful bearings of Nord Fuglö might be sufficient guide.

Fakkebo, with 3 fathoms, Næsbon with less than 6 feet, and Haavardsbo with 6 fathoms lie off the eastern extreme of Vandö, the latter being nearly 1 mile from the point; but southward of that point the channel is clear, and vessels bound to Tromsö may proceed either north or south of Karlsö to Langesund, or eastward of Reenö to Grötsund, according to circumstances.

A shoal is said to extend some distance from Grotnes, as mentioned in preceding chapter, where also the few dangers in the approach to Tromsö from the northward are also described.

Lights—Skörö.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown at an elevation of 42 feet, on the south extreme of Store Skörö.

Bankekjeilen.—An occulting light (unwatched), elevated 39 feet, showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited from a small iron house on Bankekjeilen.

Between Inderbofaldet and Sörö.—Coming from the southwestward and intending to stand in between Inderbofaldet and Sörö,

which, as already observed, is the best entrance for strangers, give Nord Kvalö and Vandö a berth of at least 10 miles, and keep Rosmaalen, the northern mountain on Nord Kvalö, bearing southward of 232° until Fuglen on Sörö bears 92° , or Eliassen on Stjernö bears about 120° ; the latter bearing will lead northeastward of Ydre Gjæsboen and of the 16-fathom ridge northeastward of it. Vandtinden, on Vandö, open southward of Nord Fuglö, bearing 224° , will lead well eastward of Inderbofaldet, and when within 10 miles of Nord Fuglö course may be altered for Fuglösveet or Fuglösund. Kalvbo, northward of Fuglö, will be cleared by giving the Kalv a berth of 1 mile.

Anchorage.—Buröhavn, between Vandö and Burö, has a depth of 5 fathoms; the southern entrance is clear, but that from the northward should not be attempted by strangers. Burö will be easily distinguished; it forms a single hill, about 500 feet high, and nearly round.

The sound between Store and Lille Skörö can only be entered from the southward. There is anchorage under Store Skörö, opposite the house nearest the entrance; but vessels would be more sheltered from the squalls off Vandö, and those from Lyngenfiord, by anchoring off the holm lying in a small bight on the northeast side of Lille Skörö, there is a depth of 4 fathoms over good holding ground at both places.

A patch of 2 fathoms, marked by a pole, and a rock with 6 feet over it lie about 1,000 yards east of the southeast point of Lille Skörö.

Nord Fuglö is so steep and inaccessible that there is only one place north of Haakjærringnes where boats can land, and that only when the sea is smooth.

Spennen, eastward of Skörö, is also steep, but not very high; vessels might bring up in summer, during northwesterly winds, between the rocks off the south side, where there is also a landing place.

Vandvaag, on the southeast side of Vandö, has a depth of 5 fathoms over sand, but is small and narrow, and exposed to heavy squalls in bad weather.

On the west side of Langfiord, an inlet on the south side of Arnö, is a bight named Akkerfiord, where vessels might anchor, either off the house or farther to the northward, in 4 to 5 fathoms, over sand; but they would be exposed to heavy squalls during all westerly winds.

Telegraph.—Akkerfiord is a telegraph station.

Ulfsviord forms the southern continuation of the channel leading eastward of Reenö from Fuglösveet and Fuglösund, and, with Sör Ulfsviord, extends upward of 20 miles in a south-southwest direction from Grötsund. It is free from dangers, and, besides the open roadsteads at Oldervig and Jægervand, has more sheltered anchorage at the trading station Gjövig, on the south side of the entrance to

Kjosén, where there are depths of 5 to 6 fathoms opposite the merchant's house and 4 fathoms in the small bight to the westward. There is also a boat harbor at Skevaag, between Ulfsfiord and Grötsund.

Sör Ulfsfiord is connected with Ulfsfiord by a narrow strait and rapid known as the Ström, which is hardly navigable for boats.

Kjosén is a narrow inlet extending 7 miles in an easterly direction from Gjövig to Lyngseide, between mountains averaging about 5,000 feet in height; the wind sweeps down from these mountains with such violence that the houses and farms in the neighborhood often sustain considerable damage. Kjosén and the inner part of Sör Ulfsfiord are generally frozen during some part of every winter.

Lyngstuen.—Ulfsfiord and Lyngfiord are separated by a remarkably wild mountainous peninsula, which rises in several places to upward of 4,000 feet, and terminates northward in the headland named Lyngstuen, from which a shoal extends about 400 yards. Lyngseide, the isthmus connecting this peninsula with the mainland, is 2 miles in breadth between Lyngen and Kjosén, and not more than 200 feet high; it is crossed by a good road for vehicles.

Lyngfiord, with its continuation, Storfiord, penetrates about 40 miles inland in a southerly and southwesterly direction from Lyngstuen, and is unfrozen the whole year through. It is approached from Fuglösund.

This fiord is politically interesting, as the inner part is only about 25 miles from the western boundary of the Russian Empire. It is also noted for its magnificent scenery. In November and January a fair is held at Skibotten, on the east side of the Storfiord, and there is a bridle road through the Skibotten Valley, as well as a winter track communicating with Sweden; the latter is principally used by Lapps, who bring the produce of their reindeer to the winter fairs, and by Quains, who trade chiefly in butter.

The Mortendals, Skibotten, and Kaafiord Rivers, which flow into Lyngfiord, though rich in trout, are of little importance as salmon streams.

Lyngsbo, about 2 miles westward of Vorterö, is nearly always awash, and is marked by a black beacon. Both Lyngsbo and Braadtet, marked by a pole, off the west side of Ulö, are dangerous in thick weather, but if the land can be seen they are easily avoided by keeping toward the western shore of the fiord. A shoal, marked by a pole, extends 1 mile northward from Spokenes, and continues in the direction of Rotsund; there are several rocks off the Aaröholmene, as well as in Karnes bugt; a rock, lying about a mile north of Nordtasholm Light is marked by an iron pole.

Anchorage may be found at Dybvig, Aaröholm, Karnes, Pollen, and Skibotten; the latter place is rather exposed to the northward.

Kaafiord extends 9 miles in an easterly direction from Nördnes; the inner part is shallow.

Lights—Spokenes. At Spokenes, on the eastern side of Lyngenfiord, an occulting white light is exhibited from a small white iron house, at an elevation of 15 feet above high water, visible at a distance of 6 miles.

Rotsund.—About $3\frac{1}{4}$ miles eastward of Spokenes Light, on the south side of the entrance to Rotsund, an occulting light, with white, red, and green sectors, is exhibited, elevated 21 feet above high water. In the white, red, and green sectors the light is visible at a distance of 6, 4, and 3 miles, respectively.

Nordtasholm.—A group occulting light, with white, red, and green sectors, is shown on Nordtasholm. Karnes bugt.

These lights are shown from August 15 to April 14.

Winds—Squalls.—Both Ulfsviord and Lyngenfiord must be navigated by sailing vessels with great caution, on account of the violence and irregularity of the winds. Lyngenfiord is considered especially dangerous, as the wind is deflected by the mountains and blows in contrary directions in different parts of the fiord. It frequently happens that when a gale is blowing in one of these fiords it is dead calm in the other, a fact to be borne in mind when rounding Lyngstuen. All winds from east through south to west-southwest blow out of Lyngenfiord, where there is often a stiff breeze while it is calm in Fuglösund. Northerly winds prevail in summer and southerly winds in winter; the latter are the most dangerous.

Inner Lead—Northward from Tromsö.—The Inner Lead from Tromsö through Grötsund to Fuglösund has been described in preceding chapter. Thence to Hammerfest the route is through Kaagsund, which, with Kvænangfiord and Sörösund, will now be described.

Kaagsund, between Arnö and Kaagen, is free from dangers, with the exception of a rock with 6 feet water, marked by a pole, lying nearly half a mile southward of the House on Haugnes, the point on the east side of the entrance to Langfiord. Skagegrund, which also has 6 feet, and is marked by an iron pole, lies within 600 yards of the north point of Vorterö. From Kaagsund the main route is eastward of Lögö, passing west of Skjærvöskjær (marked by a black wooden beacon) and Skjærvöbo (with 7 fathoms). There is a chanel westward of Lögö through Lögsund, but it is not recommended, as very sudden and violent squalls strike down from Arnö during westerly and southwesterly winds. Kaagsund is connected with Vorterösund and Maursund by Kjölmangen, a clear channel between Vorterö and Kaagen.

The anchorages between Grötsund and Kaagsund are Karlsösund; Nordre and Søndre Lenangen, both open to northerly winds; and

Langfiord. There is anchorage in Kaagsund, northward of Singlen, a house on the southeast side of Arnö, in a depth of 6 to 8 fathoms, over good holding ground; and in Lögsund, south of Havnnes, where there is good holding ground, in 8 to 12 fathoms.

Lights—Nordre Lenangen.—An occulting light, with white, red, and green sectors, is shown on the eastern shore of the inlet, 2 miles south of the entrance.

Kaagsund.—On Singlen, the southeast end of Arnö, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 31 feet above high water.

Skjærvö.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 50 feet, on the north point of Skjærvö.

Lögsund.—An occulting light, with white, red, and green sectors, is shown northward of Nygaard, western side of the sound.

In the above lights the white, red, and green sectors are visible at a distance of 7, 4, and 3 miles, respectively.

Shown from August 15 to April 14.

Maursund.—Vorterösund, between Vorterö and Ulö, and Rotsund, between Ulö and the mainland, lead into Maursund from the westward. The only dangers in these channels are the shoals off Spokenes and the west side of Ulö, at the south entrance to Rotsund and Lyngsbo, which are mentioned also with Lyngfiord. There are passages on both sides of the low island Store Hagsten, at the northeast end of Maursund, but a shoal stretches nearly halfway across the western channel from the east side of Lille Hagsten.

There is anchorage between the Follesöerne, in Vorterösund, in a depth of 5 to 7 fathoms, over good holding ground; and also on the east side of Havnnes, the south point of Ulö.

Light—Taskebynes.—An occulting light, with white, red, and green sectors, is exhibited at Lille Taskebyne, east point of Kaagen.

Kvænangfiord extends some 40 miles inland in a southeasterly direction from the open sea; the entrance is between Arnö and Brynild, a projecting point forming the western extreme of the peninsula between the districts of Tromsö and Finmarken. It is, with few exceptions, free from dangers, but is dotted with islands, some of which are of considerable size and height. Between Kvænangen and Reisen fiords are the Kvængstinderne, a fine group of jagged mountains eastward of Kaagen. On the east side of Kvænangfiord are the Older, Rein, Jökul, Lille Alten, and Bur fiords; Reisenfiord is the only branch of any importance.

At the head of the Jökulfiord is the only glacier in Norway which is actually washed by the sea, and which "calves" like those of Greenland.

The inner part of Kvænangenfiord is termed Kvænangsbotten; it is divided into two basins, and the water in the inner one is nearly fresh. At Kjækan, in Kvænangsbotten, there are copper works belonging to the Alten Mining Co.; an annual fair is also held there. The entrance to Kvænangsbotten is through the Nordström, a narrow sound which is impassable during springs on account of the great velocity of the stream.

Lights—Andsnes.—A group occulting light, with white and red sectors, is shown at Andsnes, eastern side of the entrance to the fiord.

Brynild (Brynild).—An occulting light, with white and red sectors, elevated 144 feet, is shown at Brynild, about $1\frac{1}{4}$ miles southwest of Andsnes.

The white and red lights are visible 7 and 4 miles, respectively.

Directions.—Should circumstances render it advisable to stand into Kvænangenfiord from sea, a vessel may either proceed for Tromsø through the channels described above or seek anchorage; but this entrance, being more circuitous from seaward, is less used than Fuglösveet and Fuglösund for vessels bound to Tromsø. After passing eastward of Inderbofaldet as directed above a vessel may either stand toward Loppen for a pilot, or steer direct for the entrance to Kvænangenfiord; but when working in it will be necessary to avoid the dangers described below.

Vessels bound through the Inner Lead northeastward from Kvænangenfiord should pass southward of Svartskjær, Kalven, and Loppen, and northward of Silden, into Sörösund.

Dangers.—Loppeboen, which lies about 2 miles west of the north point of Loppen, has a depth of 10 fathoms, but probably breaks in bad weather.

Svartskjær lies $1\frac{1}{2}$ miles from the mainland and $2\frac{1}{2}$ miles northward of Brynild Point; it is very low, and a reef extends about half a mile to the southwestward; the sea breaks heavily over it.

Arnöboen are two rocks lying 2 miles northeastward of the north extreme of Arnö; they break continually.

Skjærvöboen, with two heads, lies nearly 3 miles northeastward of Skjærvö, has a depth of 7 fathoms, and only breaks in very bad weather.

Jasonboen lies 1 mile north of the north point of Hukö. It has a depth of only 3 feet.

A patch of rocks lying midway between it and Hukö is marked by an iron pole.

A reef extends 1,200 yards off Mandskjærvig, on the northeast side of Kvæangstinderne. Svartskjær, lying halfway between Spilderer and Kjærringholm, off the entrance to Lille Alten and Bur Fiords, is marked by an iron pillar; and Vasnesgrund, north side of Lille

Altenfiord, is marked by an iron pole. A shoal extends half a mile off the point eastward of Nöglén Island, and is similarly marked.

A sunken rock in the Nordström, entrance to Kvænangsbotten, is also marked by an iron pole.

Anchorage.—The first anchorage southward of Lögsund and Singlen is in a bay on the east side of Skjærvö, which is exposed to heavy squalls during southwesterly winds. There are depths of 5 to 8 fathoms opposite the church and houses, but the inner part of the bay is foul. The shoal off the point on the south side of the entrance has a depth of 7 fathoms, and hardly ever breaks. There is also anchorage on the southeast side of Hukö and off the houses at Meiland.

Reisenfiord is a large irregular inlet extending about 13 miles in a southwesterly direction from Hukö. The Reisenelv, which falls into this fiord, is, next to the Maalselv, the largest river in Tromsö district; it is of some importance for communication, and is said to be a good salmon stream.

The Storskog, Navet, and Baddern Rivers, though of inconsiderable size, are reported to afford fair fishing; the Baddern falls into the bight of the same name east of the entrance to Kvænangsbotten.

Light—Stornes.—An occulting light, with white, red, and green sectors, is shown on Stornes, Reisen Fiord.

FINMARKEN.

General remarks.—The district of Finmarken extends from Brynild, on the northeast side of the entrance to Kvænangfiord and southward of the water space known as Alten, to Jacobs Ely, in Syd Varanger; it includes the subdistricts of Alten, Hammerfest, Tanen, Vardö, and Varanger, and has an area of 17,918 square miles. In 1910 the population of this district amounted to 38,065; of these about one-half were Norwegians, one-third Lapps, and the remainder Quains and "Blandingsfolk" (half castes). The fisheries supply the means of living to most of the inhabitants of Finmarken, who follow their arduous avocation at all seasons of the year when the weather admits of their putting out to sea.

In the western part of Finmarken the islands and coast preserve the Alpine character of the Tromsö district, but on a less extensive scale, only the highest mountains exceeding an elevation of 3,000 feet. There is scarcely any vegetation near the coast, and most of the mountains rise precipitously from the sea, the narrow strip of foreshore being barely sufficient for the site of an occasional Lapp hut, nearly the only buildings on these thinly inhabited shores. There are several important fishing and trading stations, however, and some large fowling cliffs termed loomerics. Öst Finmarken is distin-

guished by tablelands of inconsiderable elevation, which descend abruptly to the sea. The whole coast of Finmarken is deeply indented, the Alten, Porsanger, Laxe, Tana, and Varanger Fiords being the principal inlets.

There are very few roads in this district, and to travel in the interior during spring and autumn is almost impracticable, while in summer, during calm weather, the air literally swarms with mosquitoes; in winter all land journeys are performed with reindeer.

Most of the lakes and rivers abound in fish, and feathered game is also plentiful.

Islands.—Southward of Sörö are the three large islands Stjernö, Seiland, and Kvalö; between these are the various entrances to Altenfiord, and on the west side of Kvalö is the town of Hammerfest, the capital of Finmarken. The principal islands eastward of Sörö are Rolfsö, Hjelmsö, Maasö, and Mageröen, the northernmost island of Europe.

Alten.—The great open space between Loppen and Silden on the one side and Sörö on the other is termed Alten. It not only forms the western entrance to Hammerfest and Altenfiord, but is also resorted to by vessels seeking shelter and intending to put to sea again. When sure of the landmarks, a vessel may stand in between Inderbaldet and Sörö as directed for Fuglösund, and either steer for Loppen or Hasvig, in order to obtain a pilot, or proceed direct through Sörösund or Stjernesund.

There are no dangers in Alten except the shoals off the west end of Sörö.

Anchorage.—In and near Alten are the following anchorages, and about 12 miles within Silden is the harbor of Vasdalen, in Öxfjord, on the south side of Stjernesund.

Loppen Road and Frakfiord.—The roadstead southward of Loppen Church has a depth of 5 to 15 fathoms, shoaling quickly toward the shore, over a clean sandy bottom; as all westerly winds send in a heavy swell, vessels are often obliged to leave. The anchorage off the house at Stölen, on the west side of Frakfiord, is out of the way, and the wind is generally light and unsteady within the entrance to the fiord. Neither of these anchorages are recommended. When entering or leaving Loppen Road care must be taken to avoid Fluen, with 5 fathoms, extending nearly 600 yards off the north point of Marö. Between Marö and the mainland the depth is only about 2 fathoms.

Pilots are stationed at Loppen.

Silden Island separates Söndre Bergsfjord from Nordre Bergsfjord.

Light.—At Kalven, southward of Loppen, on its southeastern side, an occulting light, with white and red sectors, is exhibited from a

small white iron house, at an elevation of 34 feet above high water. The white light is visible in clear weather at a distance of 7 miles red light at 4 miles. Shown from August 15 to April 14.

Bergsfjordene.—Between the south point of Silden and Marö, to the southward, is a narrow passage leading from Söndre Bergsfjord to the anchorage in Nordre Bergsfjord, which, though out of the way, might be useful in case of being obliged to leave Loppen Road. There is said to be no passage between Marö and the mainland. There are depths of 6 fathoms northeastward of the round islet Klubholm, and 3 fathoms between two islets to the eastward, but the latter anchorage is very small and the northern entrance to it is only 2 fathoms deep.

It is preferable, however, to enter Nordre Bergsfjord from the northward, east of Silden, keeping in mid-channel, as the wind is very squally near the land. The principal glacier in Bergsfjord is said to be one of the most accessible on the coast, being only a quarter of an hour's walk from the shore.

Lights.—On Klubholm, eastward of Marö, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 19 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles. Shown from August 15 to April 14.

Nuvsvaag.—An occulting light (unwatched), elevated 53 feet, showing white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is shown from a small iron house in Nuvsvaag, Nuvsfjord.

Beacons.—Fluskjær, northward of Klubholm, is marked by a black stone beacon, and Fluskjærflu by an iron pillar.

Lørsnesbo, about 1 mile northward of Lørsnes, has a depth of 15 fathoms, and only breaks in very bad weather. Lørsnes is foul to about 400 yards offshore.

Sörö—West and north anchorages—Hasvig.—The harbor at Hasvig, on the east side of the isthmus between Lille and Store Haaen, at the southwest extreme of Sörö, is open to all winds out of Sörösund, and westerly gales send in a heavy sea. A rock, covered at high water, lies close to the east point of Lille Haaen; Haagrund, with $5\frac{1}{2}$ fathoms, half a mile westward of Lille Haaen, already mentioned, otherwise the approach is clear. There is a depth of 8 fathoms, over sand, in the outer part, and 3 to 5 fathoms farther in, south of the merchant's house. There is a mooring buoy here.

Lights—Stangenes.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited at Stangenes, 1 mile northwest of Hasvig.

Hasvig.—On the east point of Lille Haaen is exhibited from a small white wooden house, at an elevation of 82 feet above high water, an alternating red and white light, visible at a distance of about 6 miles.

Brandholm.—An occulting light, with white, red, and green sectors, is shown on Brandholm, $2\frac{1}{2}$ miles east of Hasvig Light.

Mælte Fiord.—An occulting light, with white and red sectors, is shown on the west side of the fiord.

Karken.—A group occulting light (unwatched), elevated 56 feet, showing white and red sectors, visible 7 and 4 miles, respectively, is exhibited from a small iron house.

These lights are all shown from August 15 to April 14.

Pilots are stationed at Hasvig.

Breivik Fiord.—In the inner part of Breivik Fiord, thme large bay on the west side of Sörö, there is anchorage east of Holmen, the islet lying close to the south shore, and also in the cove at Nesel. There is no passage south of the islet, and care must be taken to avoid a sunken rock lying close to the shore west of Nesel, marked by an iron pole, and a rock lying 400 yards north of the west point of Holmen.

Anchorage may also be obtained, in about 5 fathoms, at 200 yards northwestward of Pantseren Light. The best approach is from the north, as there are several shoals in the southern entrance.

Light—Pantseren.—An occulting light, with white, red, and green sectors, is shown on Pantseren, the island off Breivik.

Sörvær.—The harbor at Sörvær, south of Fuglen, is very small, and can not be entered without a pilot. Ytre Baren is marked by a black stone beacon, and several sunken dangers are marked by iron poles.

Light.—In Sörvær, upon Koja Islet, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, at an elevation of 150 feet above high water. The light in the white, red, and green sectors is visible at a distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Shoals.—A number of detached shoals, which probably break with onshore winds, lie in the near approach to Sörvær, of which the outermost are Horsböen, at 7 fathoms, lying $1\frac{1}{2}$ miles south-southwest of Koja Lighthouse, and Breigrund, at $6\frac{1}{2}$ fathoms, nearly 2 miles west of the light.

North coast of Sörö.—There are no outlying dangers off the north coast of Sörö, but it is a dangerous lee shore during northerly gales, and its bays are fully exposed to the open sea. In Dönnesfiord, and also between the Sandöerne in Sandöfiord, a large inlet southward of Bondö and westward of some small islets on the west side of Finfiord, which extends eastward of Kamö, there are harbors of refuge for small vessels; but they are exposed to violent squalls, and also to the heavy sea that runs in with westerly and northerly gales. They are only available with local knowledge.

Böle Fiord, 10 miles eastward of Sörvær, is open to the north, but otherwise sheltered. There is anchorage southward of Böle (where is a whale fishery station), in 9 fathoms.

Stangskjær, eastern side of the entrance, is marked by an iron pole.

Hammeren, in line with Sandviknes bearing 150° , leads west of Stangskjær.

Galten, in Dønnesfiord, 6 miles east of Böle Fiord, has anchorage in 4 to 6 fathoms east of Storgalten.

Fladegrund and **Galtegrund**, two patches of 26 and 28 feet, lie 200 and 600 yards, respectively, south of the island.

Light.—An occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is shown on the east side of the inlet, at an elevation of 33 feet.

Sandö.—There is anchorage for small vessels off the east coast of Sandö, as stated above, and also in Skarv Fiord, east of Skarvholm, in 4 fathoms.

Finfiord.—There is also anchorage in Finfiord, south of Finfiord Holm, in 4 fathoms.

Altenfiord—Western approaches.—The entrances to Altenfiord are Stjernesund, which separates Stjernö from the mainland; Rognsund, between Stjernö and Seiland; and Vargsund, which separates Seiland from the mainland and Kvalö.

The tidal streams are very strong in all these channels, but especially in Rognsund, which is not only shallower than the other two but also receives the greater part of the fresh water from the rivers in Altenfiord. At low water the flood stream begins to run in through Stjernesund and Rognsund, the two meeting between Stjernö and Korsnes, whence one branch runs southward into Altenfiord and the other northeastward through Vargsund. About 3 hours after low water the tide turns in Vargsund, and the streams from all three sounds then run into Altenfiord. At high water the stream turns in Altenfiord, Rognsund, and Stjernesund, and runs out to the northward and westward, but does not turn in Vargsund until three hours later, when it again runs to the northeastward for six hours.

Southward of Korsnes there is but little stream, and the freshets cause a continual northerly current there during the greater part of the summer; these freshets have also a perceptible influence on the tidal streams in Rognsund by accelerating the northern stream and retarding the southern.

Stjernesund—Directions to Altenfiord.—Stjernesund is free from known dangers close up to the land on either side, but when entering from Alten (from the northwestward) care must be taken to avoid Nusfiordbo, a bank with a least depth of 2 fathoms on the southern side of the fairway and on the east side of the entrance to Nusfiord;

foul ground extends from 400 to 800 yards off Stjernfoden, on the opposite side of the fairway. Klubbenestind, a remarkable sugar-loaf ~~mountain~~ on the south side of the entrance to Stjernesund, bearing 143° , or Klubbenes bearing 131° , will lead northward of Nusfiordbo. The wind is very unsteady in Stjernesund, calms and heavy squalls alternating in rapid succession.

When proceeding from Stjernesund to Altenfiord vessels should give the points north and south of Langfiord a fair berth; a rock marked by an iron pole lies about 400 yards northeast of the former point, and Korsnesgrund, a shoal about 1 mile southwest of the point on the east side of the entrance to Altenfiord, is also marked by an iron pole. There are several small rocks and islets about $1\frac{1}{2}$ miles northwestward of the headland between Kaafiord and Rafs Bunden; southward of these are several shoals, which are almost awash at low water, and are marked by iron poles. Öskarnes, on the north side of the entrance to Kaafiord, should be given a wide berth, as it is foul; the opposite shore may be approached with safety.

One of the glaciers in Nusfiord descends to within a short distance of the sea.

Anchorage.—Ulfiord, on the east side of Lörsnes, is shallow, and has no anchorage. The first harbor eastward of Nordre Berbgsfiord is on the south side of a projecting point on the east side of Nusfiord; it is only suitable for small vessels and is exposed to heavy squalls.

Öxfiord.—Eastward of Klubbenestind, south side of Stjernesund, is the entrance to Öxfiord, which penetrates 10 miles into the Jökulfjeld Peninsula. There is anchorage on both sides of this inlet about 2 miles from the entrance; that on the east side is in a small bay off the outlet of Vasdalen, a large ravine extending about 3 miles inland. At the upper end is a considerable lake, which is dammed up by an ancient moraine. The best berth for vessels of moderate draft is in a depth of from 6 to 10 fathoms, over sand, a little eastward of the Öxfiord trading station.

Öxfiord is of some importance as a place of refuge to vessels that may be driven into Altenfiord during bad weather, as it is often comparatively calm in Öxfiord, and the water is smooth when a hard gale is blowing outside, and even in Stjernesund. Sometimes, but rarely, southeasterly winds sweep through Vasdalen with great violence, and it is then necessary to shift berth to Tverfiord, the harbor on the opposite side; there is also anchorage about 4 miles farther in. There are no dangers in the harbor off Vasdalen, but when entering Öxfiord it is necessary to give Klubbenes and Ysnes a fair berth.

Supplies.—All ordinary supplies of provisions may be obtained in Öxfiord, as well as good water; the harbor is consequently much frequented by Russian traders, coasters, and fishing craft.

Lille and Store Lokkerfiords.—On the south side of Stjernsund there is anchorage eastward of Öxfjord in Lille and Store Lokkerfiords; the latter is the best harbor, but the inner part is shallow; the bottom consists of sand.

Simavig and Halvarvig, the harbors on the north side of Stjernsund, are open to southerly winds, which, however, do not blow home.

Rognsund, between Stjernö and Seiland, is the next entrance eastward of Stjernsund, leading to Altenfiord; it is a narrow channel subject to strong tidal streams, as the greater part of the water from Altenfiord passes through it. The sound is, however, only 11 miles in length, and is free from dangers with the exception of two rocks off Pollen, in Stjernö, which are marked by a pole, and some rocks (also marked by a pole), half a mile south of the northeast point of Stjernö, northward of Lille Kvalfiord, which will be avoided by keeping over toward Seiland. A rock at 6 feet lies nearly half a mile west of the south point of Seiland.

Junkerhavn, on the west side of Seiland, is a small but good harbor, with a depth of 4 fathoms. On the opposite side of the sound there is good anchorage in Store Kvalfiord, and also in the next bight to the northward; but there is a rock on each side of the entrance to the latter.

Light.—On Miaanes, western side of Rognsund, an occulting white light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 37 feet above high water, visible at a distance of 6 miles. Shown from August 15 to April 14.

Altenfiord—General remarks.—Altenfiord, the largest and best known of the Vest Finmarken fiords, penetrates about 16 miles inland southward of Stjernö and Seiland; its shores are irregular, forming several large bays and small inlets; but Langfiord, which extends 15 miles in a westerly direction to the east side of Alteidet, is the only branch of any extent; the whole of the fiord and district of Alten is well populated, chiefly by Quains.

Altenfiord is accessible to all classes of vessels.

On the north side of Kaafiord, which extends about 4 miles westward from the inner part of Altenfiord, are the well-known copper works belonging to the Alten Mining Co. The officers of the Alten Mining Co. are most kind and hospitable to travelers, and are sometimes able to supply vessels with coal.

On the south side of Rafs Bunden, a large bay eastward of the trading station Bosekop, is the mouth of the renowned salmon river, Alten. A large fair is held at Bosekop in November and March. The Alten Valley, which is the most extensive in Finmarken, has a comparatively mild climate and a productive soil. In summer the thermometer sometimes rises to 57° F. in the shade,

and in winter it rarely, if ever, falls below zero, when in many parts of the world in the same latitude mercury freezes. Vegetation is remarkable for so high a latitude; the birch, fir, alder, and mountain ash grow and thrive, while barley, potatoes, and other vegetables are successfully raised, this being the most northern point on the globe where agriculture is carried on. There are numerous cattle and good dairies.

Lights—Korsnes.—On the eastern side of Altenfiord at Korsnes, fronting Stjern and Rogn Sunds, an occulting light, with white and red sectors, is exhibited from a small white iron house, at an elevation of 91 feet above high water.

Langnesholmen.—From a small white iron house on the north extreme of Langnesholm, entrance to Langfiord, at an elevation of 127 feet above high water, an occulting white light is exhibited.

Landgudnes.—An occulting light, with white, red, and green sectors, is shown at Landgudnes, eastern side of the fiord, near Dybvig.

Amtmandsnes.—A similar light to the above is shown at Amtmandsnes, south side of the entrance to Rafs Bunden.

In all the above lights the white sectors are visible 6 or 7 miles, red sectors 4 miles, and green 3 miles. They are shown from August 15 to April 14.

Beacons.—The beacons on the dangers have been mentioned with the directions from Stjernerund.

Anchorage.—**Voldstranden**, southward of Langnesholm, is the first anchorage within Altenfiord; it has a depth of 6 to 10 fathoms, over sand, but is exposed to northeasterly winds.

Aarö and Dybvig.—On the southeast side of Aarö there is a good but small harbor, with a depth of 5 fathoms; and about 3 miles southeastward of Aarö there is anchorage in 5 fathoms at Dybvig, but a shoal lies off the warehouse.

Talvig, a trading station 5 miles southward of Voldstranden, is a very fair harbor, even for large vessels; the depth varies from 4 to 15 fathoms, over sand and clay. The best berth is on the northeast side of the bight.

Oskarnes, on the northern side of Kaafiord, affords good anchorage during northerly winds.

Bosekop, on the east side of the entrance to Kaafiord, has a small harbor, with a depth of 5 fathoms, over good holding ground.

Pilots—Telegraph.—Bosekop is a pilot and telegraph station.

Kaafiord.—The inner part of Kaafiord is divided into two basins, the entrance to which is through a very narrow channel, with only 18 feet in it at high water. The inner basin is small and shallow, but the outer one is deep and large, and forms an excellent harbor.

Vessels bound to the copper works either anchor at the smelting house to discharge coal or load with ore or off the warehouse within the church. There are depths of 4 to 5 fathoms near the shore at low water, but the bottom is rather hard. Off the point under the church there are two rocks which cover at high water; the outer one lies about 50 yards from the shore.

There are depths of 25 fathoms on the north side of Kaafiord, outside the entrance to the Coppermine Basins, but too close to the shore for single anchor. On the south side of Kaafiord there are depths of 15 to 20 fathoms at a distance of 200 to 400 yards offshore, and within that the water shoals gradually to 10, 8, and 7 fathoms close up to the rocks. There is also anchorage on the south side of Oskarnes, where vessels will be well sheltered from northerly winds, as before stated.

The tidal streams run very strong through the entrance to the Coppermine Basins, which are only accessible with a favorable stream, or at three hours before and after high and low water, when the tide is slack.

Bafs Bunden has no regular anchorage, and the south side of the bay is occupied by alluvial banks, which are dry in places and extend about 1 mile from the islets at the mouth of the Alten Elv.

Vargsund.—Stjersund, Rognsund, and the southern end of Vargsund connect at the entrance to Altenfiord, from whence Vargsund runs northward between Seiland and the mainland, thence westward of Kvalö to Hammerfest and to the open sea. The passage eastward of Kvalö is Kvalsund, also leading to the sea.

Vargsund is free from dangers in its southern portion, and its least breadth is 1 mile. In the northern portion, toward Hammerfest, however, the channel is narrow and somewhat intricate. Here the narrows between Kvalö and the north end of Seiland are known as the Ström, from the rapid streams that run through.

Beacons—Dangers.—The beacons on the dangers southward of Korsnes, at the junction of the four channels, have been mentioned with directions from Stjersund.

Northeastward from Korsnes for a distance of 18 miles Vargsund is free from danger.

Komagskjæret, Sjaaholmskjæret at 3 miles northward of it, Boköskjæret in the Ström, and Rypklubskjæret, between the Ström and Hammerfest, are marked by black stone beacons. A rock three-quarters of a mile south of Rypklubskjæret Beacon is marked by an iron pole.

Lights.—At Fiskelvnes, south side of the western entrance to Kvalsund, an occulting light, with white and red sectors, is exhibited, at an elevation of 43 feet above high water.

Strømmen.—On Strömsneset, east side of the channel, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 105.

The white lights are visible at a distance of 6 miles, red lights at 4 miles, green at 3 miles. Shown from August 15 to April 14.

Anchorage.—In the southern part of Vargsund there is anchorage in a depth of 6 fathoms, good holding ground, off the trading station on the south side of Komagfiord, which extends 1 mile into the mainland, and on the south side of the small islet in Olderfiord, on the southeast side of Seiland, in 4 to 5 fathoms, over sand and clay. Temporary anchorage may also be found in several parts of the sound.

At Kvisnes, on Seiland, 2 miles southward of the Ström, there is a good small harbor with a depth of 5 to 7 fathoms, over sand. Stövelhavn, on the west side of the south entrance to the Ström, has a depth of 8 to 9 fathoms, and is a good temporary anchorage for vessels unable to stem the tide, but the bank is rather steep. There is also anchorage, in 3 to 5 fathoms, over sand, in Klokkerholmavn, south of the projecting point on the east side of the Ström; the east side of Klokkerholm must be given a good berth, and there is no passage between the islet and point.

Hammerfest western approach.—Sörösund is the direct lead from the westward to Hammerfest. Its western part is from 6 to 8 miles in breadth, but abreast the northwest part of Seiland it is reduced to less than 2 miles. The shores are everywhere free from shoals beyond the distance of 400 yards, except between Karken Islet and Öifiord, where a patch of 4 fathoms lies 600 yards offshore.

Tides.—The flood generally sets eastward and the ebb westward through Sörösund, but, as already observed, the stream sometimes follows the wind for several days together, and runs with considerable strength. The time of high water, full and change, is at about 1h. 10m.

Lights—Stangenes, Hasvig, Brandholm, Mælte fiord, and Karken have already been described.

Vatnholm.—From a small white wooden house on Vatnholm, north shore of Sörösund, at an elevation of 49 feet above high water, an occulting white light is exhibited, visible in clear weather at a distance of 7 miles.

Kaarhavn (Korhavn).—An occulting white light is exhibited, at an elevation of 22 feet, on the west side of the entrance to Gyfiord.

Grundvaagnes.—On Grundvaagnes, the western point of the north end of Seiland, an occulting white light is exhibited, at an elevation of 262 feet above high water, visible at a distance of 7 miles.

Melkö.—On Melkö, about 2 miles northward of Hammerfest, a white occulting light is exhibited, at an elevation of 38 feet above high water, visible at a distance of 7 miles.

Mylingen.—A flashing white light is exhibited, at an elevation of 133 feet, on the north point of Kvalö. It is visible 9 miles.

Fuglenes.—On the north entrance point of Hammerfest Havn a group occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited, at an elevation of 16 feet, from a white iron house.

On Hammerfest mole, a fixed red light, elevated 14 feet, is exhibited from an iron post, visible at a distance of 2 miles.

These lights are shown from August 15 to April 14.

Directions.—Having passed the dangers westward of Sörö described above and rounded Haagrund, with $5\frac{1}{2}$ fathoms, off Lille Haaen at a prudent distance, course may be shaped through Sörösund. About 15 miles eastward of Lille Haaen is Vatnholm, a small islet on which there is a light and a beacon with two arms, about 800 yards from Sörö; from here the high island Haajen will be seen to the northeastward, distant about 13 miles, and a smaller island, Hjelman, which looks very like a beehive, will be seen to the westward of Haajen. There are passages on both sides of Vatnholm, but the northern one is narrowed by a shoal, marked by a pole, extending off the point on the west side of the cove at Vatna. About 300 yards east of Vatnholm is a sunken rock with 3 feet over it at low water and 17 fathoms close to its south side. The Svartvigskjær Rocks, off Seiland, on the opposite side of the sound, are close inshore and show above water.

After passing about 600 or 800 yards south and east of Vatnholm, steer direct for Haajen, giving the north point of Seiland a fair berth, and proceed for the houses on Fuglenes, taking care to avoid Molvigbo, marked by an iron pillar. The south side of Hjelman, kept just in sight southward of Haajen, bearing 262° , is an excellent leading mark up to Hammerfest havn, which is not very easily distinguished. Give Fuglenes a fair berth, and bring up either eastward of the consul's house in from 10 to 18 fathoms or abreast of the warehouses round the harbor, where there is generally a row of small coasting vessels moored head and stern.

Anchorage in Sörösund.—Temporary anchorage may be found in almost all the small fiords on the south side of Sörö eastward of Hasvig, but the first fair harbor is the small cove at Vatna, northward of Vatnholm, where there is good anchorage for vessels of moderate size, especially during westerly winds, in a depth of 5 to 8 fathoms, over sand and clay. The east side of Vatnholm and the point on the west side of the harbor must be given a berth of 400 yards.

At Fella, $3\frac{1}{2}$ miles northeastward of Vatnholm, there is a good small harbor with a depth of 5 fathoms, over sand. A shoal, with 6 feet, extends about 400 yards southwestward from the point on the east side of the entrance, and is marked by a pole.

Korhavn, on the north side of the projecting point of Seiland southeastward of Fella, has a depth of 5 to 6 fathoms, and is free from dangers, but it is exposed to easterly winds. A rock about 200 yards northeastward of the lighthouse is marked by an iron pole.

Grundvaag, at the north end of Seiland, has a depth of 4 fathoms, over sand, but it is exposed to a swell during northerly winds.

Hammerfest Havn, which is bounded on the northwest side by a narrow projecting point named Fuglenes and on the southeast by the town, is sufficiently capacious to contain several large vessels. It is about 1,200 yards in length east and west by about 800 yards in breadth, and has depths varying from 5 fathoms near the shore to about 20 to 23 fathoms near its center.

The havn is well sheltered by the surrounding mountains from all winds except those from the southwestward, and even when those winds blow hard large vessels may ride in security near Fuglenes, which is the best anchorage in the havn, the depths varying regularly from 5 to 23 fathoms, according to the distance from the shore, over good holding ground consisting of sand and clay. The eastern part of the havn is not only more exposed but the shores are much steeper.

Near the extremity of Fuglenes are the barely recognizable remains of an earthwork battery covered with turf, and the lighthouse.

Close to the British consul's house is a granite pillar surmounted by a bronze globe marking the northern termination of a meridional arc, measured, under the direction of M. Struve, from Ismail on the Danube through $25^{\circ} 20'$ of latitude; position of pillar, latitude $70^{\circ} 40' 11''$ north, longitude $23^{\circ} 40' 20''$ east. This work was commenced in 1816 and completed in 1858.

Fuglenes was one of a chain of stations extending from the Equator to Spitsbergen, at which pendulum observations were made by Sir Edward Sabine in 1822-23.

The port is altogether so convenient, from its easy access and vicinity to the open sea, that it is of great importance to seamen; its anchorages afford protection from all winds, and good pilots and supplies may be obtained at a moderate rate; it is also in the direct route to the White Sea and Siberia.

The harbor of Hammerfest, though small, often berths a considerable number of moderate-sized vessels, and is perfectly secure, as no wind can affect its shipping. In fact, it may be said to be completely landlocked, so that when a gale of wind is blowing outside, the harbor remains unruffled and presents almost the appearance of an inland basin.

The anchorage is excellent, in depths of from 5 to 17 fathoms, and there is a row of buoys, for the use of which a small tax is levied, for securing stern hawsers to; the inner part of the bight is shallow.

There is water enough for small vessels alongside several of the private jetties; one has a depth of 16 feet at low water.

Regulation.—It is forbidden to use sirens or steam whistles, except for the purposes of navigation, in Hammerfest havn and its approaches between the hours of 9 p. m. and 6.30 a. m.

Tides.—It is high water, full and change, at Hammerfest at about 1h. 10m. local time; springs rise about 9 feet, neaps 7½ feet.

Approaches.—Sörösund, described above, is the shortest and, on the whole, the best entrance to Hammerfest from the westward, especially in bad weather, when it is undesirable to be off the north coast of Sörö; but in summer, with an easterly wind, a long tedious beat might be saved in a sailing vessel by stretching well off the land and standing in to the eastward of Sörö. The best entrance from the eastward is through Rolfsösund.

Dangers.—**Molvigbo**, a sunken rock, nearly dry at low water, and marked by an iron pole, lies about 200 yards offshore on the south side of the entrance to Hammerfest havn; the white house at **Molden**, at the head of Hammerfest havn, open northward of Hammerfestnes, the point north of the church, leads northward of the rock.

A rock, with a depth of 2½ fathoms over it, lies 450 yards north-eastward of **Molvigbo**.

It is not advisable to approach the shore nearer than 200 yards anywhere between Rypklubb and Hammerfestnes, as it is rocky and foul in several places.

Hammerfest had a population in 1907 of 2,362 inhabitants. It forms a semicircle round the south side of the havn, is fronted by a row of large warehouses, and is almost surrounded by barren hills, which not only conceal it from seaward but also to a certain extent deprive it of the limited amount of sunshine that it would otherwise enjoy. The church, with a spire at its eastern end, standing on the rising ground westward of the town, is conspicuous. Nature here seems almost torpid, fogs are frequent, the birch trees are mere bushes near the level of the sea, and very little can be grown in the gardens; the hills are nevertheless green during the summer, and from some points of view the town has a cheerful and even picturesque appearance. Hammerfest is the residence of the amtmand (superior magistrate or governor of the district), and has two churches, two good schools, and a savings bank.

Trade.—The chief trade of the port consists in purchasing and exporting the produce of the Finmarken fisheries, and sending expeditions to the great fishing banks for cod and to Spitsbergen for reindeer, walrus, seals, white bears, and eider down. The harbor is resorted to by British, Russian, Dutch, Swedish, Danish, German, and Spanish traders, but it is especially frequented by Russian

coasters, which come to fish or to buy fish, and bring hemp, flax, tow, sailcloth, linen, tar, nails, and ironmongery, and sometimes a considerable quantity of corn. Cod-liver and train oil is prepared here in large quantities, and the smell thus created sometimes pervades the whole town, and is not easily forgotten. White bear, silver fox, reindeer, and other skins, as well as eider down, walrus tusks, Lapp boots, snow shoes, etc., are sold at fair prices.

Supplies.—Supplies of provisions and water may be obtained at Hammerfest.

Coal.—The average quantity of coal in stock is about 5,000 tons of North Country and Scotch coal. One of the wharves has a depth of 16 feet alongside at low water.

Repairs.—Wooden vessels can be repaired, but only the smallest defects to machinery can be effected. A vessel can be strengthened for ice navigation. There is a slip for craft under 200 tons.

Hospitals.—There are two hospitals.

Pilots are always available at Hammerfest.

Communication.—There is steam communication thrice a week with the south of Norway. Telegraphic communication to all parts.

Coast—Sörö to North Cape—Aspect of islands.—From the conspicuous headland Soppen, at the northwest extreme of Sörö, the northern coast of that island continues generally high, and presents a broken appearance of bold steep headlands separated by deep inlets. About 8 miles from the northeast end of Sörö is the remarkable craggy islet Bondö, and 2 miles southeastward of Bondö are the islands of Store and Lille Kamö, which, as well as Kjödvigfjeld, will be known by their jagged and peaked summits. Eastward of Kjödvigfjeld, which is the northeast point of Sörö, and nearly in the middle of the broad opening between Sörö and Rolfsö, is the high rounded islet Skibsholm, and 2 miles southward of Skibsholm is the flat and low islet Rævsholm. These islets, though not visible at a great distance, are excellent marks for the approach to Hammerfest from the northward.

Rolfsö and Ingö, as well as Hjelmsö, are high and mountainous, therefore visible from a considerable distance. Hjelmsö is very steep toward the sea, and on the north end is a high rocky pinnacle named Hjelmsöstauren, which rises nearly perpendicularly from the sea and is easily distinguished when seen from the northeastward.

Off the western part of Mageröen are the Stappen Islands, which, though small, are high and precipitous; Stappestauren, the western part of Store Stappen, has the same remarkable formation as Hjelmsöstauren.

Beacon.—A conspicuous black stone beacon, built in ledges or steps, has been erected on the northern part of Kjödvigfjeld, the northeast point of Sörö.

Knivskjærodden and North Cape (Nord Kap).—The long, low, projecting point Knivskjærodden, the northernmost extremity of Mageröen, and consequently of Europe, is much less conspicuous, and therefore less celebrated, than the North Cape, which is flat on the top and very steep toward the sea. When a vessel is sufficiently near the coast for the North Cape to be seen over Knivskjærodden, Mageröen will be easily recognized as the land's end.

Lights—On Fruholm, a small islet at the northwest extreme of the Ingö group, stands a circular iron tower 62 feet high, painted red with a white band, from which is exhibited, at an elevation of 144 feet above high water, a fixed light, with white and red sectors, visible 18 and 16 miles, respectively.

Tufjord.—At Tufjord, on the northwest coast of Rolfsö, about 5½ miles southward of Fruholm, an occulting light, with white and red sectors, is exhibited from a small white iron tower, elevated 26 feet above high water. The white light is visible at a distance of 6 miles, red light at 4 miles.

These lights are shown from August 15 to April 14.

Pilots may be obtained from Fruholm, or from Kjödvig or Mee Fiords, at the east end of Sörö.

Tides and tidal streams.—Outside the islands the flood stream (combined with the current) runs nine hours to the northeast, and the ebb three and one-half hours to the southwest. Within the islands the tides are regular, but there is a tide and half tide; that is, the streams do not turn in mid-channel till three hours after high and low water by the shore, being gradually propelled from the sides toward the middle of the channel as the tides make. The tides are much stronger than might be expected, considering the depth of the water, and the line between the opposing streams is generally distinctly marked by rippings and whirls, which in calm weather will turn small vessels round. The direction and velocity of the tidal streams depend very much upon local conditions and the strength of the wind.

The time of high water, full and change, is between Ih. and IIh., local time; springs rise about 8 feet.

Hammerfest, northwest approach—**Entrance east of Sörö.**—The best marks for the entrance eastward of Sörö are the islands of Bondö and Kamö. Kjödvigfjeld, the northeast point of Sörö, on which there is a beacon, with the projecting headland Tarhalsen and the islets Skibsholm and Rævsholm. If these can be distinguished there is no difficulty in entering, but in thick weather the following shoals are dangerous:

Bondöskjær, which lies about 1½ miles west of the south point of Bondö, is steep to all round, but a shoal extends half a mile off the north end of Bondö.

Tubeon, a shoal which lies between 6 and 7 miles northwestward of Skibsholm, in the entrance between Sörö and Rölfso, is about 1 mile in diameter, and breaks in many places, the depths on it varying from 3 to 6 and 8 fathoms. Björnö open east or west of Skibsholm just clears it. Fruholm Light bearing eastward of 65° leads northward of it.

Faldet, a small shoal with 2 fathoms over it, lies right in the fairway, $2\frac{1}{2}$ miles northward of Tarhalsen, the north point of Sörö.

Shoals off Rævsholm.—There are several shoals round Rævsholm, southward of Skibsholm, namely, Vesterböen with 10 fathoms, Faldet with 3 fathoms, Östergrund with 12 fathoms, and Liltgrund with 6 fathoms; these will be avoided by giving Rævsholm a berth of 2 miles.

Directions.—Having identified the entrance, there is no difficulty in entering. A vessel may steer in from seaward with the east extreme of Sörö bearing about 133° , observing that Rævsholm bearing 105° or eastward of that bearing leads southward of Faldet. Thence in mid-channel between Sörö and the Rævsholm dangers and between Sörö and Kvalö to Hammerfest, giving Melköskagen, the islet off Melkö, a berth of half a mile to avoid the shoal, marked by an iron pillar, which extends off it. From thence the channel is clear up to Hammerfest havn, and it is only necessary to avoid Molvigbo, also marked by an iron pillar. From abreast the east extreme of Sörö, Haajen and Hjelman will be easily recognized, and Melkö will make like a low projecting point, with a lighthouse on it.

Skibsholm kept between the bearings of 99° and 116° will lead well between Faldet and Tubeon. Coming from the northward, Skibsholm bearing 145° or southward of that bearing will lead eastward of Tubeon. There are no dangers off the east coast of Sörö.

Small vessels may pass through Melkö sund, keeping close to the north side of Melkö; this passage is shallow and very narrow, and therefore not available by strangers. A sunken rock in Melkö sund is marked by an iron pillar.

Anchorage.—On the east side of Akkerfiord (which is the northeastern inlet on the southeast side of Sörö) there is a harbor with depths of 5 to 6 fathoms, over sand; and there is anchorage on the east side of Skibnesfiord, 4 miles to the southward, in 3 to 4 fathoms; but the depth increases rapidly toward the center of the fiord. The harbor at Forsel, situated on the northeast side of the north end of Kvalö, has depths of 4 to 5 fathoms, over sand, but is only suitable for small vessels, being narrow and exposed to northerly winds; it is necessary to keep close to Forselö, which has a beacon on it, to avoid a shoal off Stenbitskjær marked by an iron pole, and there is a rock off the point on the east side of the cove.

Kvalsund, leading eastward of Kvalö, separates that island from the mainland, and is principally used by boats and Russian fish traders. It is everywhere free from dangers, but the southern part is very narrow. The only anchorage in the sound is off the merchant's house at Kvalsund, on the west side of the entrance to Reppefiord; it has a depth of 4 to 6 fathoms, over sand, but is exposed to northerly winds. From Kvalsund vessels may proceed through Vargsund either to Hammerfest or Altenfiord.

From Reppefiord, which extends 8 miles southeastward from Kvalsund, there is an overland route across Reppefiordeide to Kistrand in Porsangerfiord; as there is no beaten track, and the way lies among hills and morasses, intersected by numerous unbridged streams, it is a long and tedious journey; the distance is about 20 miles.

Light.—A white and red occulting light, elevated 26 feet, is shown from Fægfiordholm, Reppefiord, from August 15 to April 14.

Ingöhavn, on the north side of Ingö, is very conveniently situated for vessels bound round the North Cape and obliged to seek shelter. The harbor is somewhat open to the northwest, and when the wind is in that quarter it is difficult to get to sea under sail. The entrance is between Fruholm Lighthouse and Stabben Rock, and after passing westward of Seiskjær, which constantly breaks, a projecting point will be seen to the southward; keep close to the outer extreme of this point to avoid the rocks to the eastward, and bring up in the middle of the harbor, right opposite the house at Ytterenga, in a depth of 8 to 10 fathoms, over sand.

Vessels not drawing more than 6 feet will find an excellent harbor farther in, off the house at Sandvig, to which there is also an entrance between Svartoxen and Kartöskjær. A beacon has been built to mark this entrance, but the only directions that can be given to strangers are to keep a sharp lookout and steer for light bottom, avoiding the dark patches.

Beacons.—Stabben, Seiskjær, and Gylteböen are marked by iron pillars.

Lights—Ingö.—On Aflösningen, Ingöhavn, an occulting light, with white, red, and green sectors, is exhibited from a small white iron tower on a stone base, at an elevation of 40 feet above high water.

On Finnes, at another anchorage in Ingö, situated about $1\frac{1}{2}$ miles southward of Fruholm Lighthouse, an occulting light, with white and red sectors, is exhibited, at an elevation of 42 feet.

These lights, visible in the white, red, and green sectors at a distance of 6, 4, and 3 miles, respectively, are shown from August 15 to April 14.

Radiotelegraph.—A radiotelegraph station is established at Ingö. The call letters are L. E. I. It is always open to the public from

May till September, and from 8 a. m. to 9 p. m. for the remainder of the year.

Pilots are obtainable at Ingö.

Communication.—Finnes is a telegraph station.

Tufjord, on the northwest side of Rolfsö, is difficult of approach, and can only be used by small vessels. Svartoksen, half a mile westward of the entrance, is marked by a beacon, and the principal dangers by poles.

Telegraph.—Tufjord is a telegraph station.

Hammerfest, northeast approaches—Rolfsösund—Directions.—The northeastern approach is between Ingö and Hjelmsö and through Rolfsösund, a broad clear channel between Rolfsö and Renö (Reenö); it is only necessary to give the islets and rocks extending nearly 3 miles off the southeast side of Ingö a good berth, and to avoid Gjetöskjær, off the west side of Hjelmsö. There is also a channel eastward of Hjelmsö, referred to below.

Anchorage may be found in Akkerfiord, Havösund, Rolfsöhavn, and Bustudhavn, in Bustadsund, south of Rolfsösund. There is also temporary anchorage, with a depth of 3 to 5 fathoms, over sand, on the south side of Lille Latö, to the northeastward of Bustadsund, but it is open to southerly winds.

Akkerfiord.—Anchorage may be had off Sandviken in 5½ fathoms or off Akkerfiord (where is a telegraph station) in 11 fathoms.

Mefordskjær, a rock awash, lying 1,200 yards northward of the latter anchorage, is marked by an iron pole, and a shoal extending off Akkerfiord is marked by 2 poles.

Light—Finkonviknes.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited on Finkonviknes, 1 mile north of Akkerfiord.

Havösund.—When entering Havösund from the westward vessels should keep toward the mainland, as the deepest water is on the south side of the sound and foul ground extends off the southwest side of Havö. The shallowest part of the sound, which has silted up of late years, is southward of Havö Church, where it is almost dry at low water, being only navigable by boats when the tide permits.

Storvikskjærene, in the western entrance, is marked by an iron pole.

Havösund is a telegraph station.

Light—Havösund Light, situated on Kirkeneset, on the northern side of the sound, is an alternating red and white light, exhibited from a small white wooden house, elevated 15 feet above high water, and visible at a distance of about 6 miles. Shown from August 15 to April 14.

Rolfsöhamn, on the southeast side of Rolfsö, is so exposed that it should only be resorted to in fine summer weather. The holding ground is good; the depth is greater on the north than on the south side of the harbor. The point on the south side of the entrance must be given a berth of 400 yards, as a shoal extends off it.

Light.—Rolfsöhamn Light, situated on the point northward of the entrance to Rolfsöhamn, is an occulting white light, visible at a distance of 7 miles; it is exhibited from a small white wooden house, elevated 55 feet above high water, and shown from August 15 to April 14.

Bustadsund, between Renö and the mainland, is free from dangers, but a shoal extends nearly 400 yards off the northeastern extreme of Renö. On the southeast side of the sound is Bustadhavn, a small landlocked harbor, which, however, is exposed to squalls from off the surrounding hills, and the entrance is extremely narrow; it is almost exclusively used by Russian fish traders intending to remain some time. Vessels should not anchor northward of mid-channel, as a rocky ledge extends from the northern shore; the depth varies from 8 to 15 fathoms, over sand.

Light.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown, at an elevation of 105 feet, on the southern side of Bustadsund.

Channels between Hjelmsö and Mageröen—Bredsund.—This channel, between Hjelmsö and Maasö, may be taken by vessels coming from the eastward, giving Stukebo and Store Stappen a berth of 1 mile, passing southward of Stappegrund, which has a depth of 11 fathoms, and Kirkegrund, with 4 fathoms over it, which lies $2\frac{1}{2}$ miles eastward of northeast point of Hjelmsö; thence northward of Maasökälv into Bredsund, observing that Stromsnes, the south extreme of Hjelmsö, bearing westward of 224° , will lead eastward of the dangers off that island. Bredsund proper, southward of Hjelmsö, has no dangers, neither has it any anchorage, but the following dangers lie in the approach.

Dangers—Beacons.—Kirkegrund has been mentioned above; Sortvignæring, the Northeast extreme of Hjelmsö, is foul to the distance of half a mile; Skjæringgrund, with 3 fathoms, lies three-quarters of a mile eastward of Kiholm, east side of Hjelmsö; Rundskjær, with 6 feet over it, lies 1,400 yards to the southward; Hertvikskjær, off the northwest point of Maasö, is marked by a black stone beacon; Vestvaagboen, near the southwest point of Maasö, is marked by an iron pole.

Stukebo, a patch of $2\frac{1}{2}$ fathoms, lies $1\frac{1}{2}$ miles northeast of the north extreme of Store Stappen.

Between Mageröen and Maasö.—After passing Store Stappen and Gjesværnæring, vessels can proceed between Mageröen and

Maasö to Maasösund, or to Magerösund. The western extreme of Mageröen and the east side of Maasö should be given a berth of half a mile; ~~care must be taken~~ to avoid Torveskallen, a rock with 6 feet of water on it, which frequently breaks, lying $1\frac{1}{2}$ miles east of Torvenes, in Maasö.

Lights—Maasö.—On Torvenes, an occulting light, with white, red, and green sectors, is exhibited, at an elevation of 35 feet.

A similar light is shown at an elevation of 45 feet from the south point of the island.

The sectors are visible 7, 4, and 3 miles, respectively.

Beacon.—Sjaavigbo, off Maasö, is marked by an iron pole.

Anchorages—Gjesvær Havn.—With the exception of Store Stappen, the numerous islets forming the trading and fishing station of Gjesvær, off the northwest extreme of Mageröen, are low and flat, therefore strangers should not stand in amongst them until the pilot comes off.

Entering Gjesværhavn from the northeastward, pass nearly half a mile north and west of Langskjær, which lies off the northwestern extreme of Mageröen, and continue between Bok Stappen and Lysö, giving the west side of the latter a berth of at least 1,200 yards. The rocks northeast of Refsholm and Bok Stappen will be avoided by keeping Gjesværnæring open south of Refsholm and north of the highest part of Store Lyngö. Give the east point of Sandholm, on which is a beacon, a berth of 400 yards and bring up east of Store Lyngö, in a depth of 6 to 8 fathoms; small vessels may anchor in the bight at Gjesvær in a depth of 3 to 4 fathoms, over sand.

Entering Gjesværhavn from the westward, pass at least 200 yards northward of Leikua and Molvikholm, on which are beacons, then steer for Sandholm, giving the north side of Store Lyngö a fair berth, and bring up as before. If intending to anchor in the bight at Gjesvær, steer for the entrance, marked by poles, and, having passed Gjesvær, anchor as convenient. This passage should not be attempted by strangers.

Lights—Lyngöen.—Gjesvær West Inlet Light is an occulting light, with white, red, and green sectors. It is exhibited from a small white wooden house, elevated 51 feet above high water, and is situated on the north point east of Store Lyngö.

Aflösningen.—Gjesvær North Inlet Light is an occulting light, with white and red sectors. It is elevated 62 feet above high water, and exhibited from a small white wooden house situated on Aflösning, on the east side of Gjesvær.

These lights are visible in the white, red, and green sectors at a distance of 6, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Bacons.—Leikua, in the western entrance, is marked by a black stone beacon with white belt, and the flat off Molvikholm by a black

stone beacon; Sandholmen, in the eastern entrance, by a similar beacon with a white stripe, and Hompskjær by a black beacon.

The principal sunken dangers are marked by iron poles.

Graakold bugt, on the west side of Mageröen, is an indifferent harbor, with a depth of 5 to 7 fathoms, over sand. There are two entrances, but that from the northward through Vandholmsund is very narrow and can only be used in calm weather on account of the ground swell; when taking it vessels should pass 100 yards east of Skarvskjær.

Vandfiord.—On the north side of Vandfiord, a large inlet 2 miles south of Graakoldfjeld, there is anchorage off a house named Værre, in a depth of 3 fathoms, shoaling toward the inner part of the bight, over sand.

Östvaag and Værre Slottet.—In Östvaag, on the southeast side of Maasö, there are depths of 3 to 4 fathoms, over sand; and in a bight on the mainland named Værre Slottet, 3 miles south of Östvaag, there is a depth of 3 fathoms, over sand; these harbors afford very little protection from easterly winds.

Lights.—For lights here and in Maasösund see above.

Maasösund, which connects Bredsund and Magerösund, is free from known dangers. Kjærringgrund, half a mile eastward of Holmen, on the south side of the sound, has a depth of 7 fathoms.

Magerösund, between Mageröen and the mainland, leading to Porsangerfiord, is narrow, but free from dangers.

The tidal streams turn three hours after high and low water in Magerösund, the flood setting eastward from half flood to half ebb and the ebb westward from half ebb to half flood.

In Magerösund are the following lights and anchorages:

Lights.—**Risvigsnes Light** is an occulting light (unwatched), showing white, red, and green sectors, visible 7, 4, and 3 miles, respectively; it is elevated 58 feet above high water, and is situated on Risvigsneset, on the southwest side and within the western entrance of Magerösund.

Lafjordnes.—A group occulting light is exhibited, at an elevation of 24 feet, on the east side of the entrance to Lafjord. It is visible 7 miles.

Søndre Honningsvaag Light is an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively. It is elevated 85 feet, and is shown on the eastern side of the entrance to Søndre Honningsvaag.

These lights are shown from August 15 to April 14.

Stikkelvaaghavn, on the southwest side of the western entrance of Magerösund, is a good small harbor, with a depth of 4 to 7 fathoms, over sand; the best berth is near the small holm in the inner part of the bight.

Lafiord.—On the east side of Lafiord there is also a good small harbor, especially for vessels proceeding westward; a little south of the *gamme*, or Lappe hut, there is a depth of 4 to 5 fathoms, over clay.

Lille Veinesbugt, on the west side of the entrance to Sarnes Pollen, a large bay on the south side of Mageröen, has good holding ground, but is open to easterly winds.

Sarnes Pollen.—East of the islet in the inner part of Sarnes Pollen there is good anchorage in a depth of 9 to 15 fathoms; the inner part of the creek is shallow.

Sarnes.—The small harbor on the north side of Sarnes, east of Sarnes Pollen, has a depth of 4 fathoms, and may be entered from the eastward or westward, but as a sand spit, marked by an iron pole, extends nearly 400 yards off the northwest point of the islet between Altesula and Mageröen, the eastern entrance is the better of the two.

Altesula.—Between Altesula and the islet off Sarnes there is anchorage in depths of from 6 to 10 fathoms, over sand, and although open to the eastward it is spacious, and may be easily left with any wind. The north side of Altesula should not be approached nearer than 2 cables, as a rocky ledge extends off it, marked by an iron pole.

Søndre Honningsvaag.—On the east side of Søndre Honningsvaag, the inlet east of Altesula, is a good small harbor, with a depth of 4 to 10 fathoms, over sand, which is especially convenient for vessels going westward. A black stone beacon and lighthouse marks the east side of the entrance, and the shoal extending southwest of the beacon is marked by an iron pole.

Telegraph.—There is a telegraph station here.

Nordre Honningsvaag.—The entrance to this harbor is very narrow, and the shoals on each side are marked by iron poles. Two masts in line erected on the west side of the harbor lead through the channel. A black stone beacon with topmark marks the north side of the eastern entrance.

Pilots.—Nordre Honningsvaag is a pilot station.

Kjelvig.—Vessels bound to the eastward would find indifferent anchorage in Kjelvig, a peculiar cauldron-shaped hollow in the high land on the eastern extreme of Mageröen, west side of approach to Porsangerfiord, but it is exposed to violent squalls, and a swell is felt during northeasterly winds. The depth varies from 6 to 15 fathoms on the south and north sides of the cove; the islet in the entrance may be passed on either side.

Light.—At Kjelvig, from a small white iron tower on Kjelen, elevated 29 feet above high water, an alternating red and white light is exhibited, visible at a distance of about 6 miles. Shown from August 15 to April 14.

The anchorages on the northeast side of Mageröen are described in the next chapter.

CHAPTER XII.

THE NORTH CAPE TO JACOB ELV.

General remarks.¹—From Mageröen to Jacob Elv, which separates the coasts of Finmarken and Russian Lapland, the mainland is entirely unprotected by islands; Magerösund is, therefore, the northern termination of the Inner Lead.

The great inlets Porsanger, Laxe, Tana, and Varanger fiords, which, with their minor branches, penetrate the northeastern part of Finmarken, also divide it into large peninsulas, which again are indented by smaller inlets extending from 1 to 10 miles inland. The peninsula between Laxe and Tana fiords is connected with the mainland by a low isthmus named Hopseid, which is barely half a mile broad between the inner extremes of the Eids and Hops fiords. Varanger Halvö, which is the largest peninsula in Norway, having a coastline of about 160 miles, lies eastward of Tanafiord and river, and is connected with the mainland by an isthmus named Eidet, or Varangerfjeld, which is about 9 miles in breadth between Seida and Nyborg and 500 feet high.

On the east and south coasts of Varanger Peninsula are the towns of Vardö and Vadsö.

Tides.—From the North Cape to Vardö the general direction of the flood stream is east-southeasterly, and the ebb runs in the reverse direction, the east-going stream, combined with the easterly current, being the stronger.

Variation.—The variation in 1913 changes its sign from west to east a few miles eastward of the North Cape (about longitude $26\frac{1}{2}^{\circ}$ east).

The North Cape—Aspect—Landmarks.—There is a great deal of similarity in the headlands on the northeast coast of Finmarken, all being dark, precipitous, and barren, with deeply furrowed sides and level summits, cut off at an altitude of about 1,000 feet; they are, therefore, not easily distinguished from a long distance, but the openings of the fiords are unmistakable.

The North Cape is the highest and most conspicuous headland on the north coast of Mageröen, and is therefore a more important land-

¹The Lappish as well as the Norwegian names of many places are given in the charts of this part of the coast, as these names are not infrequently used by the fishermen.

mark than Knivskjærodden, the extreme north of the island. It is a bold, black headland with a smooth, flat summit, and is composed of nearly vertical strata of mica slate, cut off at exactly the same level. The highest point of the plateau is 1,004 feet above the level of the sea, and the outermost edge is very little lower.

A remarkable pointed crag or spur named Hornet, which strikingly resembles the horn of a rhinoceros, projects from the eastern slope of the cape, and on a mound near the northern edge of the summit is an obelisk of hewn granite which, with its pedestal, is 8 feet high, and was erected in commemoration of the visit of King Oscar II in 1873.

When approaching the North Cape either from the westward or eastward, Mageröen will be easily recognized as the land's end. Skjærsvaagnæring, the headland east of the North Cape, is also high, dark, and table-topped, but has a peculiar hollow or recess, like an amphitheater, in the middle, and there is a small but high island, Store Skikka, $1\frac{1}{2}$ miles to the northwestward. From thence to the east point of Mageröen the coast is hilly and uneven.

Eastward of Mageröen the broad entrances to Porsanger and Laxe fiords are very conspicuous; they are separated by a projecting mass of high land named Spierta Niarga, which when seen from the sea appears to form an unbroken and almost horizontal ridge, terminating in the lofty precipitous cape Sværholtklubb. When seen from a distance Sværholtklubb appears detached, and, during the summer, quite white, as if covered with snow, the black rock being almost concealed by myriads of sea birds and their ordure.

Anchorage.—Most of the harbors between the North Cape and Vardö are small and exposed; therefore, though the absence of outlying dangers renders them easy of access, they should only be sought in case of emergency.

Hornvik.—Vessels might bring up for a few hours, in a depth of about 20 fathoms, in Hornvik, a small bight on the east side of the North Cape, but only in calm weather.

Skarsvaag,¹ a trading station on the east side of the projecting point Bornes, is the first harbor eastward of the North Cape, distant about 3 miles; it is chiefly frequented by Russian fish traders, and, being open to the northward, should only be resorted to in fine summer weather. The best anchorage is north of the point to the eastward of the merchant's house.

Directions.—Store Skikka may be passed on either side at a distance of 400 yards, and vessels may approach the west side of Lille Skikka to within 300 yards. Risfjord is clear of dangers up to the

¹ This is the best station from which to ascend the North Cape.

anchorage, but a sunken rock lies about 200 yards northeast of Bornes.

A narrow intricate passage east of Lille Skikka leads to an anchorage in 6 fathoms off Lille Skarsvaag.

Light.—Skarsvaag Light, exhibited from a small white iron house on Bornes, at an elevation of 60 feet above high water, is occulting, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Kamöfjord.—There is anchorage in Kamöfjord between the east side of Mageröen and Store Kamö, but it is small and out of the way. Foul ground extends a short distance off the south and east sides of Kamö, which island may be passed on either side. Two rocks in the approaches to the anchorage are marked by iron poles.

Lights.—On the west side of the anchorage an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, elevated 64 feet above high water.

Helnes.—A group flashing white light, is exhibited, at an elevation of 128 feet, on Helnes, the easternmost point of Mageröen. It is visible 17 miles.

The above lights are shown from August 15 to April 14.

Sværholtklubb, which separates Porsangerfjord from Laxefjord, is the most remarkable "fuglebjerg" or "loomery" in Norway, and perhaps in the world. The rocks fall almost perpendicularly, and forms a series of narrow ledges 2 or 3 feet apart, rising like a gigantic flight of stairs to the height of about 1,000 feet. On these ledges, which extend along the face of the cliff for more than a mile, are perched millions of sea birds in horizontal rows, their white breasts contrasting strongly with the black rock behind. On firing a gun or blowing a steam whistle a roar of wings is heard, mingled with harsh wailing screams, and a dense cloud rises from the face of the rock and literally darkens the sky; in spite of this, however, the numbers still remaining on the ledges appear to be undiminished. Of the species that breed here, the three-toed gull or kittiwake is the most numerous. The shag or green cormorant breeds in great numbers on the lower part of the cliff, while the common guillemot, razor-bill, and puffin are also abundant. Amongst the less numerous species may be named the common gull, the great black-backed gull, the herring gull, the lesser black-backed gull, and the back guillemot or dovekie.

Nord Kyn, the northernmost extreme of the mainland or continent of Europe, bears 96° , distant 36 miles from the North Cape, to which it has some resemblance. When seen from the northward, however, Nord Kyn shows a rounded and more gradual slope to the eastward, while the west side is steep and abrupt.

Eastward of Nord Kyn the coast is rugged, precipitous, and irregular, with several large projecting points and bays, but does not present any conspicuous landmarks. The land south of Sletnes, 10 miles eastward of Nord Kyn, is quite low, and therefore not easily seen; the nearest hills rise at some distance inland. At Omgangsklubb, on the northwest side of the entrance to Tanafiord, the land is higher, but still without any noticeable features. The entrance to Tanafiord is narrower and less conspicuous than the openings of Porsanger and Laxe fiords, although the land in its vicinity is higher.

Tanahorn, on the southeast side of the entrance to Tanafiord, is the best landmark on this part of the coast; it is a steep, dark, conical hill, about 1,000 feet high, and forms a striking contrast to the land around, more especially to that on the west side of the fiord, which is much lower, and generally has the appearance of being covered with snow. When within a distance of 20 miles, on a bearing of about 250° , Tanahorn will make like an island, but when seen from a greater distance it can not be distinguished from the high level mountains farther inland.

From Tanahorn the coast trends generally in a southeasterly direction for about 50 miles to Vardö, and presents the appearance of a nearly horizontal ridge 400 or 500 feet high; there are no landmarks, neither does the aspect of any particular tract serve as a guide. The only point that might be noted is Kyst Tavla, 1,178 feet high, on the south side of Syltefiord; it is conical, like Tanahorn, but has a rounder apex. The openings of Ris (Riis), Kongs, Baads, Sylte, and Pers fiords may be distinguished at a distance of about 10 miles; there are two large hills at the head of Risfiord, which will be visible when the inlet is quite open. Harbaken, or HAVINGBERG, a projecting headland between Sylte and Pers fiords, is also a noticeable point, and when bearing eastward of 160° toward the shore, may be recognized at a distance of 25 miles.

The general appearance of the country is barren; hardly a trace of soil or vegetation is visible on the tablelands, and fresh green grass is only found in the clefts of the hills facing the sea.

Offlying banks—Sleppen Bank.—About halfway between the North Cape and Nord Kyn, and 11 or 12 miles northward from Sværholtklubb, is the well-known fishing bank Sleppen. The shallowest spot found has a depth of 25 fathoms.

Shoals off Sletnes and Omgangsklubb.—It was formerly reported that dangerous shoals extended some distance off Sletnes, between Nord Kyn and Tanafiord, but surveying officers have found none except the Törboerne, which lie within 1 mile of the shore. Off the entrance to Köifiord, between Sletnes and Omgangsklubb, there are four rocks with from 10 to 16 fathoms, and Torskallen, a rock with 6 fathoms over it, lies about a mile northward of the fishing

station at Omgang. According to the soundings laid down on the chart, it is not advisable to stand into less than 60 or 70 fathoms in foggy weather, and as there is very often a heavy sea between Sletnes and Omgangsklubb, owing to the strength of the tides and the irregularity of the ground, it is prudent to give this part of the coast a berth of 4 or 5 miles.

Fiords—Anchorages.—The fiords and anchorages will be described in their natural order.

Porsangerfiord—General remarks.—This fiord penetrates 65 miles inland in a southwesterly direction from Sværholtklubb, its east point of entrance. It is visited by vessels trading to Repvaag and by small Russian coasters which visit the fishing stations on the northern coasts of Norway to load with fish.

The coasting steam vessels run regularly up the fiord as far as Kistrand, about 20 miles southward of Repvaag, and where there is a telegraph station. The outer part of the fiord is bounded by precipitous and barren tablelands, with almost uniformly level summits, and the scenery is somber and monotonous; farther in the shores are different in character, the dwarf birch reappears, and the slopes are covered with green pasture.

Iron and copper ores have been discovered in the inner part of Porsangerfiord, as well as limestone.

The outer part of Porsangerfiord is from 7 to 10 miles in breadth, and the only shoals that can be considered dangerous are those southward of Store Tamsö, referred to below.

Vestbotten, the southwestern extreme of the fiord, is so shallow that it is only navigable, even for boats, at high water, and is still filling up. The inner part of Porsangerfiord is generally frozen in winter as far out as Ösekarholm, and sometimes beyond.

Tides.—In Porsanger, as in most of the fiords of Finmarken, the tide sets in from seaward with the flood and out with the ebb, the time of high water, full and change, being at about 1h. 0m. Land winds are prevalent in summer and draw straight out of the fiord.

Lights—Repvaag.—On Havneset an occulting light, with white and red sectors, is exhibited, at an elevation of 150 feet above high water.

On Haarvignes, eastern shore of the fiord, an occulting light, with white and red sectors, is exhibited, at an elevation of 62 feet above high water.

Olderfiord.—On the northern side of entrance to Olderfiord an occulting light, with white and red sectors, is exhibited, at an elevation of 72 feet above high water.

Kistrand.—On the northwest side of Sandholm, and about 2 miles southward of Kistrand Church, an occulting light, with white and red sectors, is exhibited, at an elevation of 42 feet above high water.

Kulvig.—On the northeast extreme of Troldholm, in the approach to Kulvig, an occulting light, with white and red sectors, is exhibited, at an elevation of 29 feet above high water.

Sjaaholm.—On the southwest point of Sjaaholm, $2\frac{1}{2}$ miles eastward of the above light, an occulting light, with white, red, and green sectors, is shown, at an elevation of 69 feet.

Annika.—A similar light to the above is shown, at an elevation of 46 feet, on Annika, 3 miles southward of Sjaaholm.

The above lights are shown from small white iron towers, and are visible—white sectors at a distance of 6 miles, red at 4 miles, green 3 miles. Shown from August 15 to April 14.

Dangers.—Öst and Vest Lysbund Shoals lie in the fairway of Porsangerfiord. Ost Lysbund, with a least depth of 8 feet near its north end, is composed of rock and stones, and lies $3\frac{1}{2}$ miles southward of the south extreme of Store Tamsö. It is marked by a pole.

Vest Lysbund, with a least depth of 5 feet near its center, is a rocky shoal 2 miles southwest of Öst Lysbund. Its west side is marked by a pole.

Kjæsgrund, with a least depth of 6 feet near its center, lying $1\frac{1}{2}$ miles north of Paaskenes, extends 1 mile in a northeast and southwest direction, is half a mile in breadth, and has general depths of $2\frac{1}{2}$ to $6\frac{1}{2}$ fathoms, over sand and rock. A pole marks its western side, and eastward of the shoal there is a channel with a depth of 11 fathoms.

Rocky ground extends about $1\frac{1}{2}$ miles northwest of Nord Langö, northern approach to Olderfiord; a rock awash at low water, and marked by a pole, lies near its extreme. Foul ground extends 200 yards from the northern portion of Syd Langö. A rocky head, with a depth of 1 fathom, lies about 400 yards off the north extreme of Tredivenes; the point of the peninsula abreast is foul to the distance of about 200 yards.

The whole of the inner part of Porsangerfiord is shallow, navigation being further obstructed by a number of low islands and holms; the principal passages and harbors are shown on the chart. Westward of Sandholm is a rock off Russermark, marked by a pole. Two rocks between Ösekarholm and Troldholm are marked by poles. The passage between Reenö and Nord Tangö is foul and should not be used.

Anchorage.—**Repvaag**, a large trading station on the west side of Porsangerfiord, about 12 miles southward of Magerösund, is the only place of shelter in the outer part of the fiord, excepting those mentioned under Magerösund, in preceding chapter. The harbor, though narrow, is good and secure, but difficult to make during westerly winds, which are squally and baffling; it has a depth of 3 to 6 fathoms, over good holding ground consisting of clay and sand.

Foul ground extends a short distance off the eastern shore of the harbor, and on the west side, just within the entrance, is a small rock; vessels should ~~therefore keep as~~ nearly as possible in mid-channel when entering or leaving.

Good temporary anchorage may be found on the north side of Vedbotten, nearly a mile northward of Repvaag; the depth varies from 5 to 7 fathoms, according to the distance from the shore, over clay and sand.

Kistrand lies 20 miles southward of Repvaag and about 2 miles north-northwest of Sandholm^o Light, west side of the fiord. Coasting steamers trade here.

Telegraph.—Kistrand is in telegraphic communication with all parts.

Laxefjord extends 35 miles in a southerly direction from the east side of Sværholtklubb, and varies from 7 to 10 miles in breadth; the shores are irregular, and form a succession of bays and inlets, which extend from $1\frac{1}{2}$ to 6 miles inland from the main fiord. The fiord is quite clear nearly up to Lebesby, the principal place and anchorage in the fiord, and anchorage may be found either in the Eids or Store Torske Fiords; there is also temporary anchorage in Tømmervig, on the western shore.

In Laxefjord, as well as in the other fiords, the tidal stream sets in with the flood and out with the ebb.

Kjöllefjord, on the east side of the entrance to Laxefjord, is about 4 miles in length; the head of this inlet forms a fairly sheltered bay, where there is a fishing and trading station. Vessels may anchor on the south side of it in a depth of 4 to 5 fathoms, east of the nearest point to the inner end of the fiord; the point itself must be given a good berth, as a reef extends nearly 400 yards northward of it. The best anchorage, especially in winter, is in a bight west of the trading station on the north side of the bay, where there is deep water over sloping ground; a rock, with a depth of 6 feet, marked by an iron pole, lies about 200 yards from the southwestern shore of the high land west of the bight.

Finkirker Rocks are nearly isolated from the bold headland on the south side of the entrance to Kjöllefjord; they resemble a building with square towers.

Light.—On Galgenes, the point on the south side near the head of Kjöllefjord, is exhibited an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively; it is elevated 17 feet above high water, and shown from August 15 to April 14.

Sværholt is a small bay just within Sværholtklubb, the west point of the entrance to Laxefjord; it is inhabited, but no information has been obtained as to its anchorage.

Tömmervig, a small inlet 8 miles southward of Sværholt, should only be resorted to during westerly winds; the depths vary between 4 and 10 fathoms, over good holding ground, but the inner part of the bay is shallow.

Eidsfiord, the principal eastern branch of Laxefiord, extends about 6 miles in an easterly direction from the large bay south of Kjöllefiord, nearly dividing the peninsula separating Laxe and Tana fiords. Having passed on either side of a round rock 4 miles within the entrance, vessels may anchor according to their draft, the depth decreasing to 3 fathoms toward the creek leading to Hops Eidet.

Store Torskefiord is the northernmost of two small inlets about 10 miles southwest of the entrance to Eidsfiord. The best berth is just within the first point on the south side of the fiord; but there is also anchorage along the northern shore. The depth is from 4 to 8 fathoms.

Lebesby, about 7 miles southward of Store Torskefiord, is the principal place in Laxefiord; it is surrounded by pasture land, and the hills are wooded with birch. The harbor south of Lebesby Church is good and spacious; it has a depth of 5 to 8 fathoms, over good holding ground.

The entrance, either north or south of Sjaaholm, is easy. The best anchorage is off Sjaanes, in 7 fathoms.

Ytter Bondoskjær, 3 miles southwestward of Sjaaholm, is awash, and is marked by a pole. **Lillegrund**, at $3\frac{1}{2}$ fathoms, lies 800 yards east of the north point of Sjaaholm.

Telegraph.—Lebesby is a telegraph station.

Lights.—**Lebesby Light**, shown on Stamnes, 2 miles north of Lebesby, is an occulting light, with white and red sectors. It is exhibited, at an elevation of 98 feet above high water, from a small white wooden house. The white light is visible at a distance of 6 miles, red light at 4 miles.

Sjaaholm.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown, at an elevation of 64 feet, from a small iron house on the west extreme of Sjaaholm.

Bratholm.—An occulting light, with white and red sectors, is shown, at an elevation of 81 feet, on Bratholm, southern extreme of Laxefiord.

The above lights are shown from August 15 to April 14.

Coast—Anchorages.—**Skjötningberg** is a cove 2 miles south-eastward of Kjelsnæring, the headland north of Kjöllefiord. Vessels may bring up in a depth of about 4 fathoms either abreast of or a little within the trading establishment on the west side of the cove, but the anchorage is unsafe during northerly or westerly winds.

Light.—From a small white iron house at Skjötningberg, elevated 45 feet above high water, an occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is exhibited. Shown from August 15 to April 14.

Sandfiord, a bay on the west side of Nord Kyn, is inhabited, and might afford temporary anchorage during calm weather, but it is fully exposed to the northwest.

Steinfiord and Mehavn, on the west and east sides of the middle bay southeastward of Nord Kyn, are small but safe harbors; the first is used by eastward and the latter by westward bound sailing vessels; the inner part of Mehavn is shallow and dries at low water. When entering or leaving these harbors it is necessary to avoid Kinerod, two rocks, one of which is awash at low water, which lie $1\frac{1}{2}$ miles west-southwestward from Store Kamö; the northernmost of these rocks is marked by a pole.

Holmespira, in Mehavn, is marked by an iron pole. There are also 10 mooring buoys in the havn.

There is a telegraph station at Mehavn.

Steinfiord is a well-sheltered anchorage with depths varying from 23 to 3 fathoms. The best anchorage is in 14 fathoms, off Kuskielhavn.

Light.—Mehavn Light, on the northern entrance point to the harbor, is an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, exhibited from a small white iron house on substructure, elevated 37 feet above high water. Shown from August 15 to April 14.

Steinvaag, a fishing station on the west side of Sletnes, is inhabited, but has no anchorage.

Light—Sletnes.—A flashing white light is exhibited, at an elevation of 127 feet, from a red iron tower with two white bands, 117 feet high, situated on Sletnes.

It is visible 17 miles, and is shown from August 15 to April 14.

Gamvik lies on the east side of the low land south of Sletnes; there is a church and trading station, besides several houses, and the harbor is much frequented during the spring fisheries. Vessels must pass $1\frac{1}{2}$ miles eastward of Baren Shoal, on which there is a black stone beacon with white belt, surmounted by a triangle, and when the town bears 290° steer for it, and bring up southwestward of the beacon, in a depth of 5 fathoms. Coasters of light draft also anchor in the shallow bight farther in. The entrances are difficult and should not be attempted, nor should the coast be approached within a mile, without the assistance of a pilot, which may be obtained on the spot. There are two mooring buoys in the harbor, and several rocks there are marked by iron poles.

Shoals.—Köibo and Kamö Grund, each with 11 fathoms over them, lie $2\frac{1}{2}$ and $2\frac{1}{4}$ miles, respectively, north-northeastward of Flintodden Light structure; and Grundskallen, a shoal with 13 fathoms, lies $1\frac{1}{2}$ miles east of the same building.

Lights.—At Gamvik, on Flintodden, north side of the havn, is exhibited from a small white wooden house, at an elevation of 18 feet above high water, an occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively.

On Kaaveneset, south side of the havn, from a small white iron house, elevated 24 feet above high water, a group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited.

These lights are shown from August 15 to April 14.

Risfiord, 3 miles southward of Gamvik, is an inlet penetrating about 2 miles in a south-southwesterly direction. Skalangflua, lying in the entrance, is marked by an iron pole, and Lille Kobbeskjær, above water, and foul to a distance of 300 yards, lies nearly a mile northeastward of Skalangflua.

Light.—On Finnvikneset, on the western side of Risfiord, well within the entrance, an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, elevated 36 feet above high water. The white light is visible at a distance of 7 miles, red light at 4 miles, green 3 miles. Shown from August 15 to April 14.

Köifiord.—There is good anchorage in a depth of 6 to 8 fathoms over sand in a small cove on the east side of the inner part of Köifiord. Vessels may run in on either side of Köiö and the islets to the southward, but the western passage is the clearer of the two.

Shoals.—Eastward of Köifiord and north of Omgang are Torskallen, with 6 fathoms, at 1 mile offshore, and Bispeskallen, with 12 fathoms, distant $2\frac{1}{2}$ miles from it. Within half a mile of Omgang are three rocks awash, marked by iron piles.

Tanafjord proper penetrates about 26 miles inland, in a southwesterly direction, on the west side of the Varanger Peninsula. Its shores are abrupt mountain declivities, intersected, especially on the west side, by smaller inlets. The principal branches are Hops, Lang, and Vester Tana fiords, which extend in a westerly and southwesterly direction from the main fiord, at the inner end of which, on the east side, is the mouth of Tana Elv. This inlet is distinguished from the other fiords of Öst Finmarken by the comparatively great altitude of the mountains encompassing it. Stangenesfjeld, east of the entrance to the Tana Elv, attaining a height of 2,300 feet, while Algas Varre, opposite Guldhalm, on the Tana, and Digermulen, on the south side of the entrance to Langfiord, are not much lower.

A kind of sandstone quartz is here the prevailing formation; the rock consists of white, yellow, and red strata, and crumbles readily when exposed to the atmosphere; steep naked cliffs, deep chasms, and huge masses of fallen rock and débris are visible on every side.

In consequence of the considerable body of water which Tana Elv empties into the sea, a strong stream almost always runs out through the fiord, especially between the mouth of the river and Molvigskjær.

Skar and Hul fiords.—Between Omgangsklubb and Hopsfiord, a distance of 12 miles, the western shore of Tanafiord is steep, inaccessible, and uninhabited, except at Finnkongkjeilen, where anchorage may be obtained in 25 fathoms. Between 8 and 10 miles from the entrance there is anchorage in Skar and Hul fiords, which extend $1\frac{1}{2}$ miles in a northwesterly direction from the main branch. These harbors afford temporary anchorage in calm weather, but during strong southwesterly winds, when heavy baffling flaws render it almost impossible to beat in, they should not be attempted by sailing vessels. The anchorage for small craft in Skarfiord is at the head of the bay on the north side, in a depth of 8 fathoms, over sand.

In Hulfiord vessels may either anchor near the northern shore, west of a low grassy point just within the entrance, or at the inner end of the fiord; there are depths of 4 to 8 fathoms, over sand, at both places.

Light—Finnkongkjeilen.—An occulting white light is exhibited from a small white iron house at the head of the bight, at an elevation of 66 feet above high water, visible at a distance of 6 miles. Shown from August 15 to April 14.

Hopsfiord is an irregular inlet extending 10 miles in a westerly direction from Tanafiord to Hops Eidet. In this branch the tidal streams are irregular and sometimes very strong; they depend in a great measure on the winds prevailing at sea.

There are no harbors on the south side of Hopsfiord, but anchorage may be found on the north side of the entrance at Ydre and Indre Hop. Ydre Hop, the eastern harbor, is open to southeast winds, but is the easiest to get away from under sail; it has a depth of 12 fathoms, over clay. When entering Indre Hop vessels should keep close to the low point running out from the eastern shore, and bring up on the north side of it in about 20 fathoms, over sand. It is necessary to secure with hawsers to the shore during westerly winds, which are here very unsteady and violent.

At the inner end of Hopsfiord there is good anchorage east of Hops Eidet, a trading station on the isthmus of that name; the best berth is a little north of the houses, in a depth of 8 fathoms. A shoal lies about 200 yards from the northern shore of the fiord, $1\frac{1}{2}$ miles eastward of Hops Eidet.

Langfiord.—The outer part of Langfiord is 8 miles in length from Digermulen to Suologædje Islet, whence it extends 8 miles farther inland in a westerly direction. It is considered a very dangerous place during southerly winds on account of the heavy squalls which then sweep down from Digermulen and the high steep mountains to the westward. Near the middle of the fiord, 2 miles from the entrance, is a solitary rock or islet, from which a shoal extends some distance to the southward.

There are three small harbors on the north side of Langfiord, but none on the south side. The shore of the outer harbor, a small narrow creek named Guolsovuoppi, is inhabited. When entering or leaving vessels must keep the southern shore close aboard, in order to avoid a rock on the north side of the entrance, within which there is a depth of 4 fathoms, over sand. Nearly 2 miles southwestward of Guolsovuoppi is another small creek, with a depth of 4 fathoms, over clay; and 3 miles farther in there is good and safe anchorage, in depths of 4 to 12 fathoms, over clay, off the west end of Suologædje, which may be passed on either side.

Troldfiord.—The eastern shore of Tanafiord is steep and almost unbroken, Ydre and Indre Molvig being the only inhabited spots between Tanahorn and Stangenesfjeld. In case of necessity vessels might anchor on the north side of Troldfiord, a small inlet 5 miles east-southeastward of Digermulen, either just within the two rocks near the entrance or opposite the Lapp hut farther in. A rock off the south point of entrance of Troldfiord is marked by an iron pillar.

Stangenes.—The anchorage in Leer Pollen, on the south side of Stangenes, the southwestern extreme of Stangenesfjeld, is protected from all winds blowing into the fiord, but during the autumn a swell is thrown in from seaward, and southerly winds raise a heavy cross sea. Vessels should keep Stangenes aboard when proceeding to or from the anchorage, as the banks thrown up by the Tana are not far south of the point; these banks undergo annual alteration, and only carry a few feet of water; the northern and eastern edges of the northern part are marked by five poles. The shoal ground extending from Stangenes is also marked by a pole.

Molvigskjær, northward of Stangenes, is marked by a black wooden beacon with a white belt.

Light.—**Vagge Light**, on Stangenes, is an occulting light, with white and red sectors, exhibited from a small wooden house on stone base, at an elevation of 25 feet above high water. The white light is visible at a distance of 7 miles, red light at 4 miles. Shown from August 15 to April 14.

Tana Elv.—This well-known stream is the third river in Norway as regards length of course; its valley is richly wooded, but thinly inhabited. The Tana is formed by the junction of the Anariokka

and Karasiokka, and for a long distance constitutes the boundary between Norway and Russia, but at Polmak Church the frontier bends abruptly to the southeastward, while the river diverges to the northward and enters the fiord west of Stangenesfjeld. The lower part of the river, though broad and imposing in appearance, is occupied by extensive banks of mud and sand, which form shallow changeable channels, only navigable for the boats of the country.

Small craft might ascend the Tana, with the last of the flood, as far as Marienlund, $1\frac{1}{4}$ miles above the trading station on Guldholm, a small islet opposite the church, 2 miles from the mouth of the river. Generally, however, vessels bring up at Stangenes. At Seida, 15 miles above Marienlund, there is a Lapp settlement, whence the fjeld may be crossed to Nyborg in 4 or 5 hours.

Telegraph.—There is a telegraph station at Tana, abreast of Guldholm.

Vester Tana and Smal Fiords extend 9 and 6 miles inland, respectively, from the inner part of Tanafiord, of which they are in fact continuations. There is no harbor in either of them.

Lights—Smal fiord.—An occulting light, with white and red sectors, is shown, at an elevation of 41 feet, on the east side of the entrance to the fiord.

Bergholm.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is shown, at an elevation of 59 feet, on Bergholm (Baeklisuolö), in Vester Tana Fiord.

Coast.—Berlevaag, a fishing station 6 miles eastward of Tanahorn, is much frequented. The harbor is sheltered from south and west winds, but open to those from the north and east, which, however, do not send in much sea, as the reefs at the entrance form a natural breakwater; the depth is only 2 to 3 fathoms. The water is shallow to nearly half a mile offshore west and east of Berlevaag, and it is necessary to keep the northern shore when entering the harbor to avoid reefs on the south side.

Light.—At Berlevaag, on Tronderneset, is exhibited, from a small iron house, at an elevation of 36 feet above high water, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively. Shown from August 15 to April 14.

Beacons.—Svartoxen, a rock on the north side of the entrance, is marked by a black stone beacon surmounted by a barrel. The sunken dangers are marked by iron poles or pillars, and there is a mooring buoy in the haven.

Light.—At Kjolnes, about $2\frac{1}{2}$ miles eastward of Berlevaag, an occulting white light is exhibited from a small white iron house, at an elevation of 31 feet above high water, visible in clear weather at a distance of 7 miles. Shown from August 15 to April 14.

Risfiord and Kongsfiord.—There is anchorage in Risfiord in Sebelon Lugten in from 2 to 5 fathoms. The approach is between Grönö and Rundholm, both of which islands are foul to a short distance.

Hergevikgrund, with less than 6 feet of water, lies 1,000 yards westward of the latter island.

There is anchorage in Kongsfiord in a depth of 3 to 4 fathoms, over sand, on the south side of Veineshalen, the isthmus connecting the small peninsula between Ris and Kongs Fiords with the mainland.

At the entrance to Kongsfiord are Helö and Kongsö, noted for their pastures and sea-fowl colonies.

The easiest entrance is between Helö and Veinesodden, but Kua, with less than 6 feet over it, and marked by two iron poles, lies in the fairway 1 mile west of the southwest point of Helö.

At the inner end of Strömsfiord, which is connected with Kongsfiord by a very narrow passage, is Kongselv, which is said to afford good fishing.

Light.—**Veinesodden Light**, situated on the north side of the entrance to Kongsfiord, is an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, exhibited from a small iron house, at an elevation of 62 feet above high water. Shown from August 15 to April 14.

Baadsfiord (Baasfiord).—The most secure harbor between Tanahorn and Vardö is at the inner end of Baadsfiord, northward or southward of a large island. When entering the southern harbor vessels should give the south point of the peninsula a fair berth, taking care at the same time to avoid a small rock off the western shore, and bring up abreast of the houses, in a depth of 8 to 10 fathoms, over clay and sand; the fiord is free from danger. The northern harbor, which is buoyed, is easy of access, but in entering the north shore should be kept to.

Telegraph.—There is a telegraph station at the northern harbor.

Makur, $1\frac{1}{2}$ miles eastward of the entrance to Baadsfiord, is most exposed; a few fishermen frequent it during the spring.

Lights.—**At Makur** an occulting light, with white and red sectors, is exhibited from a white iron house, 21 feet high, at an elevation of 42 feet above high water.

Baadsfiord Light, on the north side of the entrance to the northern harbor, also occulting, with white and red sectors, is exhibited from a small iron house on stone base, at an elevation of 21 feet above high water.

In the above the white lights are visible at a distance of 6 miles, red lights at 4 miles. Shown from August 15 to April 14.

Lönfaldene, a cluster of rocks 1 mile east of Makur, extend nearly half a mile offshore, but the sea nearly always breaks on them.

Syltefiord.—The harbor southwestward of Veinesodden, at the inner end of Syltefiord, has a depth of 6 to 8 fathoms, over sand. The only danger in the fiord is Tavleskjær, marked by an iron pillar, lying about 1 mile east of Veinesodden, and visible at low water. Vessels may pass either side of Tavleskjær.

There are good pastures in the inner part of Syltefiord, and for some distance up the Orddoiokka there is said to be a fair growth of birch; but on the shores of the fiord almost every tree has been felled.

Light.—On Veinesodden an occulting light, with white and red sectors, visible 7 and 4 miles, respectively, is shown, at an elevation of 49 feet.

Havningberg, on the south side of Harbaken, is one of the best fishing stations in Finmarken, but as the harbor is fully exposed to the eastward it can only be regarded as a temporary anchorage for vessels proceeding westward. It has a depth of 3 to 5 fathoms, over sand, and as ledges extend offshore, care must be taken not to stand too far in.

There are three mooring buoys here.

A shoal extends about a quarter of a mile northward of Harbaken.

Light.—Havningberg Light is a group occulting white light (unwatched), visible about 7 miles; it is elevated 57 feet above high water, and exhibited from a small iron house on substructure situated on the northeast point of Harbaken. Shown from August 15 to April 14.

Telegraph.—Havningberg is a telegraph station.

Persfiord (Peersfiord), the first deep inlet north of Vardö, is inhabited, but has no anchorage. Although grass thrives here, there are no signs of trees or even bushes.

Vardö.—The islands of Vardö are situated off the eastern extreme of Finmarken, on the north side of the entrance to Varangerfiord. The western and largest island, which is separated from the mainland by Bussesund, is nearly divided by two bays, between which there is only a narrow isthmus. The western division of the island is long and narrow, extending nearly 3 miles in a north and south direction, while the eastern part, though higher and broader, hardly exceeds 1 mile in length. Reinö and Hornö, the eastern islands of the group, are kept as breeding places for the eider duck. Vegetation is almost confined to cloud berries and scurvy grass, which, however, grow luxuriantly, the latter covering many of the house roofs.

Lights.—Vardö Light is a flashing white light. It is visible 20 miles, and is exhibited, at an elevation of 194 feet, from a white wooden house, 30 feet high, situated on Hornö.

Fog signal.—A foghorn is established at the lighthouse. See Light List.

Skagodden Light, situated near the north end of Vardö, is an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively; it is shown from a small wooden tower, elevated 98 feet above high water.

Reinösund.—A group occulting light, with white, red, and green sectors, is exhibited, at an elevation of 21 feet, on the south point of Reinö.

In Vest Vaagen, the northern harbor, on the extreme of the western breakwater, an occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 29 feet.

On Guldringnes, east side of entrance to Öst Vaagen, the southern harbor, is exhibited, from a small white iron tower, elevated 24 feet above high water, an occulting light, with white and red sectors, visible 6 and 4 miles, respectively.

The above lights are shown from August 15 to April 14.

Dangers in the approaches—Beacons.—In the northern approach, Skagodden and Reinöskjær are marked by black stone beacons, that on Skagodden surmounted by a cross and that on Reinöskjær by a topmark; and the banks off Svinö and Tofteskiten are marked by iron poles. The shore southward of Tofteskiten, and Hasselneset, the north point of the eastern part of Vardö, are foul to the distance of 200 and 400 yards, respectively, the edge of the banks being marked by poles.

In the southern approach Hornöfluen is marked by an iron pole; it is about 600 yards in length east and west and barely 400 yards in breadth; the southern edge lies 600 yards from the south side of Hornö. The position of the shoal will be shown by a short breaking sea if there is any swell outside, and by tide ripples in fine weather.

The bank off Hasselneset is marked by a pole, as stated above, and the west side of Moloindlöbet by a red iron tower.

In the south harbor, on the west side, Steilnesboen is marked by an iron pole and Steilnesfluen by an iron pillar.

In Bussesund, Engelsvikfluen and Svartneskjær are marked by iron poles and Smelrorskjær by an iron pillar.

Harbors.—**Vest Vaagen**, or more properly speaking Nord Vaagen, is the principal and the best harbor; it is about 700 yards in length from the breakwaters to its head, with depths ranging from 10 fathoms in the entrance (about 60 yards wide, between the breakwaters) to 3 fathoms at about 300 yards within; southward to its head the harbor is shallow.

There are mooring and warping buoys both within and without the breakwaters.

Only small vessels can lie alongside the private jetties fronting the warehouses, but alongside the Government pier there is a depth of 20 feet at high water. The pier is connected by a tramway with the level ground outside the fort, and is altogether very convenient; it must not, however, be used without permission.

Pilots are stationed at Vardö.

Directions.—Vest Vaagen may be approached either from the northward between Svinö and Reinöskjær or from the eastward between Vardö and Hornöfluen, and as the dangers are all marked, there is no great difficulty in a steam vessel.

The only directions that seem necessary for the northern approach to Vest Vaagen are that vessels should pass at least 200 yards eastward of Svinö Bank and Tofteskiten beacons, and keep nearly in mid-channel when entering the bay, thence passing between the breakwaters to the harbor. If working in or out care must be taken to avoid Seigrund, at $2\frac{1}{2}$ fathoms, lying 500 yards east of Reinöskjær. The church, which stands on an eminence, is a conspicuous object from the northward.

Approaching Vest Vaagen from the eastward, keep within 600 yards of the east side of Vardö until past Hornöfluen, marked by an iron pole; then haul over toward the south side of Reinö, and run along it until the bay is open, in order to clear the shoal on the east side of the entrance.

Ost Vaagen, the bay on the south side of Vardö, is about 800 yards in length north and south, and decreases in breadth from about 400 yards at the entrance to less than 200 yards near the inner end. The depth is not above 1 fathom for nearly 400 yards from its head.

In the outer part of the bay there is anchorage near the western shore in 3 or 4 fathoms, over sand, but it is very much exposed to southeasterly winds, which throw in a heavy sea, and is not adapted to the larger class of sailing vessels. Entering Öst Vaagen, keep at least 800 yards southward of Steilnes, the point on the west side of the entrance, to avoid the dangers off it until the bay is well open; avoid the eastern shore, which runs off shallow to a considerable distance, and take care not to stand too far in, the inner portion being shallow, as above stated.

Bussesund, between Vardö and the mainland, has an average breadth of 1 mile, and affords good anchorage to vessels bound either way, though it is somewhat exposed to swell from the northward and southward. There are depths of 10 to 14 fathoms in the middle of the sound, but the usual anchorage southwest of Vardöhus has a depth of 5 to 6 fathoms, about 250 yards off the island shore, over sand and small stones. There is also a small harbor between the southwest side of Tyvholm and Indre Smelror.

The space between the north side of Tyvholm and the point north of Ytter Smelror is shallow and rocky; Engelsvikfluen, marked by two iron poles, a small rock abreast of the powder magazine on Vardö, will be avoided by keeping in mid-channel or by giving the west point of Vardö, southeastward of Tyvholm, a berth of at least 500 yards; it must be borne in mind that shallow water extends about 800 yards southward from the southwest end of Vardö.

Prohibited anchorage.—Vessels are forbidden to anchor within a distance of 200 yards of the submarine conduits which have been laid across Bussesund at a distance of about 700 yards to the southward of Tyvholm. The route of the conduits is marked by two boards, one on each shore of the channel, and the limits of the prohibited anchorage by two lines of buoys placed, respectively, about 200 yards northward and 200 yards southward from the conduits; the northern buoys have each a broom as topmark and the southern buoys have each a cross as topmark.

At night two red lights are shown to mark the conduit, one on each shore.

Tides.—It is high water, full and change, at Vardö at Vh. 41m.; springs rise $6\frac{1}{2}$ feet. The flood stream makes at 11h. and runs south-southeastward and slightly toward Vardö in Bussesund.

The ebb makes at $5\frac{1}{2}$ h. and runs in the opposite direction; there is but little slack. The maximum strength in Bussesund is $1\frac{1}{4}$ knots.

The town of Vardö is built on the isthmus and the shores of both harbors, and is commanded by Vardöhus, a small fort on the west side of the island, held only by a few artillerymen. The population in 1907 amounted to about 2,700.

Regulations respecting entry of vessels of war.—See Chapter I.

Trade.—The fisheries constitute the chief resources of Vardö, but the situation, security, and capacity of its northern harbor, as well as the facilities offered for discharging and taking in cargo and storing goods, make it a convenient depôt for Siberian and White Sea traders. Vessels bringing salt and coal usually clear for the White Sea in ballast.

The principal exports are whale oil, whalebone, stock fish, salted fish, and guano.

Supplies.—Good water and supplies of provisions may be obtained at Vardö, and small vessels may be beached for repairs, but there are no facilities for repairs beyond ordinary blacksmith's work; and there are neither docks nor slips.

There is a small infirmary.

Coal.—From 8,000 to 10,000 tons of coal are reported to be kept in stock. Vessels are coaled by lighters.

Communication.—Norwegian mail and trading steamers run between Hamburg and Vadsö, calling at Vardö weekly, for seven months in the year. These vessels appear to run to Vadsö all the year round. In March, April, and May mail steamers run between Christiania and Vardö.

Russian mail steamers trade between Vardö and Arkhangel from about June to September.

Telegraphic communication with all parts of the world.

Caution.—When sailing along the coast of Russian Lapland caution is necessary during thick and foggy weather, which is very prevalent from the middle of May to the beginning of July, on account of a decided indraft toward the shore. The flood stream runs eight hours to the southeast and the ebb four hours to the northwest; this rule is, however, only applicable when close inshore, for in the offing the flood sets in more directly from the northward, and is in fact the indraft against which it is necessary to guard.

Varangerfiord—General remarks.—At Kibergnes, $4\frac{1}{2}$ miles southward from Vardö, the coast trends to the westward, and forms the northern shore of the estuary of Varangerfiord. Domenfjeld, between Vardö and Kiberg, attains an elevation of 500 feet, and is the highest point for some miles round, the coast between Kiberg and Vadsö, a distance of about 30 miles, being generally low and flat, forming open shallow bays bounded by white sandhills. Being better protected against northerly gales than the east and north shores of the Varanger Peninsula, this coast is comparatively thickly populated, and vegetation, though still scanty, is more vigorous.

Weather.—The climate in Varangerfiord differs materially from that of the outer coast, consequently the wind often blows in contrary directions between Kibergnes and Vadsö. The sea wind generally reaches as far in as Lille Ekkerö, 20 miles westward of Kiberg, and there meets the so-termed Varanger wind, which often blows out of Varangerfiord from the southwest or south while there is a northwest wind, with foggy weather, at Vardö. In the entrance to Varangerfiord, between Vardö and Ribachi Peninsula, in Russian territory, easterly winds are remarkably prevalent during the summer, and are so constant that they might almost be named trade winds. They continue till the autumn, when shifting winds and unsettled weather form a transition to a hard and stormy winter, during which the prevailing winds are southwesterly.

Fogs.—From the middle of May to the beginning of July, when the ice breaks up in the White Sea, dense sea fogs often roll in as far as Vadsö, but seldom reach the inner part of Varangerfiord.

Tidal streams.—The tidal wave from the southwestward, having reached the North Cape, takes an east-southeast direction parallel to the land and past the north side of Ribachi Peninsula. At 10

miles off the coast a branch from the main stream of the flood turns to the southward at XIIh. full and change, at the rate of $1\frac{1}{2}$ knots, and fills Varangerfiord. It is said to be stronger in places near the shore. See Caution, above. At Vadsö it is high water, full and change, at VIIh. 30m. In Varangerfiord and along the contiguous Russian coast the streams at times create a short and heavy sea, which often rises without any wind, when distant gales drive fogs and swell in toward the coast.

Pilots are stationed at Store Ekkerö and at Vadsö.

North shore of Varangerfiord—Kiberg.—The harbor at Ytter Kiberg, westward of Kibergnes, the northeast extreme of Varangerfiord, is a fishing station much frequented by Russian coasters, and it is considered good by the inhabitants; but it is open to winds from east to south, which must throw in a heavy sea, and there are several rocks in the entrance. Heimtaket, a patch of $2\frac{1}{2}$ fathoms, lies $1\frac{1}{2}$ miles south of Ytter Kiberg Lighthouse.

Vessels may bring up on the east and west sides of the bight in about 2 fathoms, and also between the two middle rocks, but the space between the rocks and the houses is shallow. The western anchorage off Indre Kiberg has a depth of 3 to 8 fathoms, over sand.

Lights.—**Ytter Kiberg Light** is an occulting light, with white and green sectors, visible 6 and 3 miles, respectively. It is exhibited from a small white wooden house, elevated 49 feet above high water.

Storskjær.—A flashing light, with white, red, and green sectors, visible 9, 6, and 5 miles, respectively, is exhibited, at an elevation of 31 feet, on Storskjær, 3 miles southwest of Ytter Kiberg.

The above lights are exhibited from August 15 to April 14.

Beacons.—There are two black stone beacons off Ytter Kiberg. Other shoals are marked by iron poles.

Off Indre Kiberg, Svenskeskjær is marked by a black stone beacon and Svenskegalten by an iron pillar. Gjeitryggen and Skarvskiten, off Kramvik, are marked by iron poles.

Kiberg to Skalnes.—For a distance of nearly 3 miles westward of Kiberg low islets and rocks above and below water extend from 1 to $1\frac{1}{2}$ miles offshore; therefore it is prudent to give this part of the coast a berth of 2 miles.

Entering Varangerfiord in thick weather it is necessary to keep a good lookout for the promontory of Skalnes, or Gallonjarg, as its long, flat, projecting point might easily be mistaken for one of the Ekkeröen, which lie farther to the southwest, and in that case a sailing vessel intending to pass between Lille Ekkerö and the mainland with a scant wind might get embayed between Komagnes and Skalnes. There is no harbor or safe anchorage between Kiberg and Skalnes, and the various points and bays shelve off flat and stony for a considerable distance.

Store Ekkerö.—Sailing vessels meeting with contrary winds off Lille Ekkerö might bring up in a depth of 3 to 5 fathoms on the west side of Store Ekkerö, 7 miles southwestward of Skalnes; but a heavy sea runs in during southeasterly winds, and the holding ground is untrustworthy. The inner part of the bay is shallow.

Both Store and Lille Ekkerö are inhabited. The former consists of horizontal strata of sandstone, abruptly broken off to the eastward; immense numbers of sea fowl breed on it, and their eggs form a valuable addition to the resources of the inhabitants.

Light.—Lille Ekkerö Light is an occulting white light, exhibited from a small iron house situated on the southeast point of Lille Ekkerö, and elevated 41 feet above high water; it is visible at a distance of 7 miles. Shown from August 15 to April 14.

Beacon.—Store Ekkerö is distinguished by a black wooden beacon.

Pilots are stationed here.

Vadsö Havn lies 8 miles westward of Store Ekkerö, and is protected from easterly and southerly winds by Store Vadsö, the low island fronting the town, but it is exposed to westerly and southerly winds, which send in a heavy sea.

From the west end of the island a breakwater extends to the northward for a distance of about 400 yards.

Abreast the west end of the island there are depths of 20 to 28 feet at low water, affording anchorage for vessels of moderate draft; eastward of this the water quickly shoals to about 12 feet. The depths are from 7 to 12 feet at about 200 yards westward of the south extreme of the town. The bottom consists of loose sand, and the depth is continually diminishing, but dredging operations are in progress, according to reports received.

The east and west anchorages are separated by a bank dry in places at low water springs; there is a depth of about 10 feet at high water springs in a narrow channel over it.

The anchorage eastward of the town has a depth of 6 to 12 feet, and is exposed to east and southerly winds, which send in a heavy sea.

Loading and unloading have to be performed by lighters, and are attended with difficulty, as the tidal streams run through the sound with considerable strength, and shallows extend offshore for some distance.

Lights.—On the southwestern side of Store Vadsö is exhibited from a small white iron house, at an elevation of 87 feet above high water, an occulting light, with white and red sectors, visible 7 and 4 miles, respectively.

Vadsö Havn.—An occulting light, with white and red sectors, is shown, at an elevation of 20 feet, from the head of the breakwater.

The above lights are shown from August 15 to April 14.

Tides.—It is high water, full and change, at Vadsö at VIh. 30m. The spring rise is said to be 7 feet, but it may possibly amount to about 10 feet; northeasterly gales at times increase the spring rise to as much as 12 feet.

Pilots.—Vadsö is a pilot station.

Shoals.—The principal dangers in the approach to Vadsö Havn are Yttre Seigrund, at $2\frac{1}{2}$ fathoms, which lies $1\frac{3}{4}$ miles southeastward of the east extreme of Store Vadsö, and two patches of $4\frac{1}{2}$ fathoms, which lie midway between Seigrund and the above point.

Vadsö, situated on the northern shore of the harbor, had a population of 1,984 in 1897, mostly Finlanders. It is the residence of the prefect of Nordland, and a livelier place than Vardö, like which it is much frequented by Russian traders from the White Sea. The church is conspicuous from seaward.

Trade.—The fisheries form the chief resource of Vadsö. The principal exports are salt fish, dried fish, cod-liver oil, and manure, etc. The imports are coal, salt, and dry provisions. In 1911, 105 vessels of 43,270 aggregate tonnage visited the port.

The trade is mainly carried on by Norwegian vessels.

Supplies of provisions are obtainable, but there is neither dock accommodation nor facilities for repairs to vessels or engines.

There is a small hospital.

Coal.—A considerable quantity of coal is kept here by the Bergnski and Nordenfjeldski Steamship Cos.; 5,105 tons were imported in 1900. Coaling is from lighters.

Communication.—There is regular steamship communication weekly with the south of Norway and Hamburg via Vardö. Telegraphic communication with all parts.

Coast—Vadsö to Nyborg.—From Vadsö the northern shore of Varangerfiord continues a westerly direction to its head, in Mæskfiord, or for a distance of 25 miles, and gradually decreases in breadth from 6 miles at the entrance to about $2\frac{1}{2}$ miles between Næsseby (Neseby) and Kvalnes (Veines). This coast is higher and less flat and uniform than the coast to the eastward of Vadsö, the loftiest hills being Klubbenes and Storfjeld. Vegetation also becomes more vigorous toward the inner part of the fiord, and the coast is well populated; at Paddeby, 7 miles westward of Vadsö, a few scattered birch trees appear, and at Klubbenes, 5 miles farther in, the hills are clothed with verdure and a luxuriant growth of birch to the very summits. The prevailing formation is sandstone.

Lille Vadsö and Sandskjær—Beacons.—Between Vadsö and Paddeby a flat extends off some distance and should be given a good berth. Beyond are the islets Lille Vadsö and Sandskjær. The reef extending northward of Lille Vadsö and also Andersbyöret are marked by poles. Sandskjær is distinguished by a black stone beacon.

Jacobselv and Skitnelv.—Jacobselv, or Annejok, a stream said to abound in fish, enters the fiord at Finnes 2 miles west of Paddeby. The settlement of Jacobselv is situated on the west side of its mouth. At three-quarters of a mile farther west is the mouth of Skitnelv. Anchorage may be found off both these places in a depth of 3 to 4 fathoms, clay. A rock lies in the middle of the entrance to Jacobselv, but vessels of light draft might pass over it at high water, and there is a deep secure basin within.

Mortensnes.—The bay at Mortensnes, a trading station on the west side of Storfjeld, 7 miles westward of Finnes, affords anchorage to vessels of any draft, but it is exposed to a heavy sea during southerly winds; several rocks lie west of the point. Between Mortensnesskjær, the southeastern rock, and the point there are depths of 10 to 12 fathoms, but toward the northern shore of the bay and in the small cove near the houses the depth is but 3 fathoms; the bottom consists of clay.

Mortensnesskjær, the eastern part of the reef, westward of the point and anchorage, is marked by a black stone beacon; and a rock in the havn is marked by an iron pole.

Næsseby (Neseby).—The small bay east of Næsseby Church, 3 miles westward of Mortensnes, has a depth of 3 fathoms, over clay, but is open to the southward.

Light.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 20 feet on Lök Holm, west of Næsseby. It is shown from August 15 to April 14.

Mæskfiord is the northern and innermost branch of Varangerfiord, with which it is connected by a very narrow passage named the Mæskfiordström. It is a good summer anchorage. At the inner end of the fiord, on the north side, is the trading station of Nyborg or Raavijok, whence Varangerfjeld may be crossed to Seida.

For a distance of nearly 2 miles westward of Næsseby shallow water extends 600 to 800 yards off the shore, and as there are shoals on both sides of the Mæskfiordström, the services of a pilot are indispensable. Foul ground also extends from 400 to 800 yards off the south and west shores of Mæskfiord. About three-quarters of a mile eastward of Nyborg lies Aarnesgrund, a rocky shoal which covers at high water, and between that and the land to the northward is a good summer anchorage, with a depth of 3 to 4 fathoms, over soft mud. In winter the fiord is frozen as far out as the Mæskfiordström.

Beacons.—Angsneskjær, off the south point of entrance, the rock west of Angsneset, the shoal ground extending off the south shore of the fiord and the east end of Aarnesgrund, toward the head of the fiord, are marked by poles.

Karlbotn is the southern extension of Varangerfiord and extends 5 miles westward of Kvalnes. In the middle of its entrance is Skjaa-holm, a hilly island. Shoal water extends for three-quarters of a mile westward of Skjaa-holm, and there is a 3-fathom patch in the northern channel; elsewhere there are no dangers more than a quarter of a mile offshore.

Anchorage may be obtained anywhere within half a mile of the shore.

South shore of Varangerfiord—General remarks.—The whole of the southern shore of Varangerfiord is commonly termed Syd Varanger, although the western part actually belongs to the parish of Nasseby, which is included in the Tana district. The coast, which trends east-southeastward for about 50 miles from Karlbotn to Jacob Elv, is intersected by several deep inlets, and the cliffs, though neither lofty nor imposing in form, are yet steep, bold, and rocky, presenting a striking contrast to the flat-topped sloping terraces on the north side of the fiord; the absence of outlying islands and rocks is in fact the only feature common to both coasts. The general character of the country also differs materially from that of the Varanger Peninsula, and the forest growth is especially remarkable for so high a latitude; even near the coast, the bare rocky hills are relieved by birch, scrub, and heather, while within the fiords the trees rapidly increase in size and number, until at no great distance from the sea the hills are covered with birch, aspen, and alder, with luxuriant grasses and heather. About 15 miles farther inland the birch begins to disappear, and is gradually lost in the dense forests of fir, the area of which, in Syd Varanger alone, may be estimated at not less than 800 geographical square miles. The surface of the country is hilly and undulating, the thickly wooded slopes being interspersed by numerous lakes and tarns. The principal rivers are the Neiden, Pasvig (Kloster), and Jacob. Granite appears to be the prevailing rock on the coast.

During the last 50 years the population of Syd Varanger has greatly increased, owing to the improved means of communication and other conditions favorable to colonization.

In winter the fiords of Syd Varanger generally freeze to a distance of 3 to 7 miles from the inner ends.

Kvalnes.—Northwestward of Kvalnes, an important fishing station on the south side of Karlbotn, there is anchorage opposite the houses in a depth of 3 fathoms.

Veinesbotn, the inlet south of Kvalnes, has a small but very good harbor on the west side of the projecting point three-quarters of a mile west of Nyelv; the depth is 10 to 12 fathoms, over sand, and there is deep water close up to the shore. There is also anchorage in 5 fathoms at the head of the inlet.

Kvalnes to Bugö.—From Kvalnes to Bugö, a distance of 19 miles, the coast is desolate, barren, and generally more mountainous than that to the eastward; it is free from dangers, with the exception of a few scattered rocks lying within 400 to 600 yards of the shore, but affords no anchorage except on the west side of Latnæring.

Bugöhamn.—The first harbor in Syd Varanger eastward of Veinesbotn is between the mainland and Bugö, a low island lying 6 miles southward of Vadsö. It may be entered either from the northward or southeastward, but the northern entrance is narrowed by rocks off the west side of Bugö and is also rather shallow; the southeastern entrance is deep and clear. Vessels may bring up either opposite the houses or off the southwest point of Bugö, in 3 fathoms. The depth decreases to 15 or 16 feet toward the shore, and as a swell sets in during easterly winds the latter anchorage is indifferent.

In Bugöhamn three rocks are marked by three iron poles.

Light—Bugönes.—On the west side of the southeastern entrance to Bugöhamn an occulting light, with white, red, and green sectors, is exhibited from a small white iron house, elevated 80 feet above high water. In the white, red, and green sectors the light is visible at a distance of 7, 4, and 3 miles, respectively.

Bugöfjord.—Eastward of Bugö is the entrance to Bugöfjord, which extends 8 miles inland between Bugöfjeld and Brasfjeld. At the inner end of the fjord is a settlement.

Kjöfjord lies about 3 miles eastward of Bugöfjord, and close westward of Skogerö, which island attains a height of 1,541 feet. This fjord extends 17 miles in a southerly direction, and is connected with Bögfjord by Korsfjord; the inner part, into which the Neiden Elv and Munk Elv discharge, is named Neidenfjord and the head Munkfjord. The shores of this inlet are high, rocky, and barren for some distance inland, but assume a milder character toward Neidenfjord, where there are several settlements. The banks of the Neiden Elv and Munk Elv consist of huge sandhills. The Neiden has a course of 40 miles and has numerous rapids. There is a loomery (cliffs abounding in sea fowl) in the outer part of the fjord.

Kjöfjord is free from dangers with the exception of Halvarskjær, which lies close to the mainland $1\frac{1}{4}$ miles south of Brashavn, and a patch of $2\frac{1}{2}$ fathoms in the approach, situated half a mile northwest of Kjö. At about 5 miles within the entrance is a narrow strait named the Ström, which sailing vessels can only pass through with a commanding breeze if the tide is adverse. Immediately south of the Ström there is good anchorage in Stensnesvaag, on the west side of the fjord; and at Buholm, at the junction with Korsfjord, there is anchorage in a depth of 15 fathoms, over clay.

Off the mouth of the Neiden, about 3 miles from the head of the fjord, are extensive sandbanks, which dry at low water, and as banks

have also been thrown up by the Munk Elv, the inner part of the fiord will only admit vessels of very light draft.

Tides.—It is high water, full and change, at about Vth. 15m.; springs rise 11 feet. The streams turn soon after high and low water, and run with a maximum velocity of 3 knots in the Ström.

Brashavn, situated just within the west side of entrance to Kjölfjord, is a small landlocked harbor with a depth of 6 fathoms, over sand; the proper entrance is southward of the islet forming the harbor, as the boat passage on the north side is only 15 to 20 yards in breadth, with a depth of 3 feet at low water. When entering the harbor vessels should pass well to the westward of the 2½-fathom shoal lying half a mile northwest of the north point of Kjö, referred to above.

Brashavn has good holding ground, black mud, but the water is deep for any but very small craft; moderate-sized vessels would require to anchor in a depth exceeding 30 fathoms.

Korsfiord.—Eastward of Buholm there is anchorage in Korsfiord at Junkerelv, in a depth of 5 fathoms, over clay; vessels may also bring up in almost all the coves and bights on both sides of the fiord and wherever the land is not very high or steep. It is necessary to keep close in on the north side of the fiord after passing Tusindvig to avoid the shoal which blocks the passage between the islet in the fairway and the south shore.

There is but little stream in Korsfiord, as the flood streams from Bog and Kjö Fiords meet there.

Ellinghavn, westward of Tommørneset, at the southeast end of Korsfiord, has a depth of 5 fathoms, over sand.

Bögfiord.—Eastward of Skogerö is the entrance to Bögfiord, which, with its continuations, Klosterelv and Lang Fiords, is the largest and most important of the fiords of Syd Varanger. It extends 12 miles in a southerly direction to the mouth of the Pasvig (Kloster) Elv and 17 miles to the inner end of Langfiord. The hills are of inconsiderable altitude on both sides of the fiord. Vegetation consists chiefly of birch and luxuriant grasses. On Kirkenes, or, as it is also termed, Piselones, between the Klosterelv and Lang Fiords, is a church and parsonage, as well as a trading station, where the ordinary articles of ship chandlery may be obtained in moderate quantities.

In 1867 Bögfiord was frozen as far out as Kjelmesö, and even on the 25th of June the ice lay about 3 miles out from the head of the fiord.

Shoal.—Nordkapstöten, a rock with a depth of 7 feet, lies 800 yards offshore in the eastern approach to Bögfiord, at 2¼ miles eastward of Östre Dragene, off the northeast point of Kjelmes. It is

marked by a pole. The northwest of Kjelmesö open northward of Östre Dragene leads northward of Nordkapstöten.

Directions.—Entering Bögfiord, vessels may pass on either side of Kjelmesö (Dalmak), but the eastern passage is the more spacious.

Nordkapstöten, in the eastern approach, should be avoided as above directed, and Östre Dragene, the rocks off the northeast point of Kjelmesö, should be also given a good berth. The stream produced by the freshets from the Pasvig Elv almost always runs out through Bögfiord, and early in summer, when the river is full, it is almost impossible to navigate the fiord under sail without a strong breeze.

Lights—Bögfiord (Bokfiord).—A group flashing white light is exhibited, at an elevation of 91 feet, on the east entrance point to the fiord. It is visible 15 miles.

Fog signal.—A foghorn is established at the above lighthouse. See Light List.

Kjelmösund.—A group occulting light, with white, red, and green sectors, visible 6, 4, and 3 miles, respectively, is exhibited, at an elevation of 79 feet, on the southwestern extreme of Kjelmö.

Kjelmö.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is exhibited, at an elevation of 51 feet, on the southeast point of Kjelmö.

Renö.—A group occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown on the west side of Renö.

The above lights are shown from August 15 to April 14.

Anchorage in Bögfiord—Kjelmesö.—There are several small harbors on the west and south sides of Kjelmesö, that near the northwest end of the island being the best; it has a depth of 3 fathoms over fine sand, but is very narrow. Entering from Varangerfiord, keep rather over toward Skogerö until past Vestre Dragene, which extend about three-quarters of a mile in a north-northwest direction from the northwest point of Kjelmesö; proceed along the west side of the latter island, passing at least 200 yards west of a little sandy cove, and keep a good lookout for the entrance to the harbor, which can not be seen until the vessel is close to it. The point forming the harbor is steep-to. The coves on the southwest and south sides of Kjelmesö are only suitable for very small coasters.

Sölvfarbugt.—Within the southeastern point on the north side of Sölvfarbugt, the inlet on the west side of Bögfiord, is a good harbor protected from all winds, and vessels might safely lay up there; it is frozen in winter. The entrance, which opens directly the point is passed, is through a sound 300 yards in length and 100 yards in breadth in the narrowest part. The harbor extends 400 yards north-westward from the west end of the sound, and is 300 yards in breadth.

The least depth in the sound is 18 feet, but in the harbor there are 18 to 19 fathoms, decreasing regularly to 4 fathoms near the shore; the bottom consists of clay.

Kjelmeskjær, the eastern rock in the middle of the approach to Sölvfarbugt, is marked by a stone beacon.

Renö Road, on the south side of Renö, affords good anchorage to all classes of vessels. On the south side, and in the middle of the bay, there are depths of 30 to 33 fathoms, decreasing to the north, east, and southeast. The best anchorage is along the south side of Renö, in 15 to 20 fathoms, shoaling to 4 fathoms within about 50 yards of the island shore. The bank, which consists of clay, is steep to the westward. Vessels may also anchor at the south end of the narrow sound between Renö and the mainland.

When entering Renö Road from the westward care should be taken to avoid a steep bank of stones and clay which lies southward of mid-channel; it has a depth of 9 feet, is only about 14 yards in extent, and may be passed on either side; it lies about 1 mile east-southeastward of the southwest point of Renö. Another patch, covered by less than 6 feet of water, lies about a mile southeast of the above point. It is marked by a pole.

Tides.—It is high water, full and change, in Bögfiord at VIh. 20m.; springs rise 9 to 10 feet. The streams run in and out with a velocity of $1\frac{1}{2}$ to $2\frac{1}{2}$ knots.

Both the flood and ebb streams run to the eastward along the south side of Renö, but on the south side of the anchorage, between Hælen and Ropelv, the flood runs to the westward.

Klosterelvfiord.—Anchorage may be found at several places on both sides of Klosterelvfiord, and large vessels may anchor in a depth of 15 fathoms off the east end of Skögöen, a low island east of Kirkenes. Sabelskjær, a shoal lying between 400 and 600 yards from the eastern shore of the fiord between Hælen and Skögholm, is marked by an iron pole, with topmark.

The entrance to the inner part of Klosterelvfiord is eastward of Skögö, the narrow sound on the west side of that island being partially dry at low water. A shoal lies right in the fairway southward of the east point of Skögholm, and local knowledge is required to distinguish the clearing marks; vessels bound to Pasvig Elv without a pilot should bring up a little northward of the point in a depth of about 15 fathoms and send a boat to Elvenes for assistance.

Elvenes.—In the cove at Elvenes, on the east side of the entrance to the Pasvig Elv, there is good anchorage for yachts or coasters in depths of 5 to 7 fathoms; the best berth is right opposite the house of the bailiff of Syd Varanger; but the anchor should not be dropped too far in, as the east and south shore of the cove dry out a short dis-

tance at low water. The stream from the river is thrown to the westward of the anchorage by the point.

Pasvig Elv.—The Pasvig rises in Lake Enare. A noticeable feature of the Pasvig is that it forms a chain of narrow lakes, which are connected by reaches of river that seldom exceed 1 mile in length, and generally consist of rapids. It is said that there are about 12 lakes and 29 fosses or falls on this river; the whole length of the Pasvig is navigable by boats poling, but no vessel can ascend above Elvenes. The mouth of the river has a depth of 9 feet.

The country bordering on the Pasvig is well suited to settlers; there are extensive pine forests, interspersed with patches of birch, of sufficient size for building purposes, and the river offers an easy means of transport for timber; the soil is in places rich and fertile, and naturally produces good pasturage, while the river abounds in fish and its banks in game.

Langfiord, the western branch of Klosterelvfiord, extends 3 miles in a southwesterly direction and then bends abruptly south-southeastward for 5 miles; these portions are connected by a narrow channel, through which the tidal stream runs with considerable velocity; its passage is attended with danger, even for boats, as it is obstructed by large boulders.

Coast—**Holmengraafjeld.**—Eastward of Bögfiord the coast around Holmengraafjeld is foul to the distance of about 600 yards.

In Holmengraa Fiord southeastward of it there is boat anchorage within the islet on the north side, in $2\frac{1}{2}$ fathoms. The depths in the fiord are from 20 to 40 fathoms.

Jarfiord is a narrow inlet extending 11 miles in a southerly direction eastward of Holmengraafjeld; the inner part is inhabited. Anchorage may be found at Hindö, southward or eastward of the island, in depths of 8 to 10 fathoms, mud, with less water farther in; there is no passage east of the island (named Zelery by the Russians). Vessels under 10 feet draft could winter in the head of this bay, as the ice remains quiet.

There is also anchorage at the head of the fiord in a depth of 10 fathoms, mud, sand, and rock. Rocks extend about three-quarters of a mile offshore on the east side of the entrance, but they are easily avoided by keeping over toward the west side. The tidal streams run with a velocity of $1\frac{1}{2}$ knots. The inhabitants here are engaged in raising cattle, and so possibly can supply fresh meat. There is fresh water in the brook at the southeast head of the bay, and a tolerable amount of firewood is obtainable.

Light.—An occulting light, with white, red, and green sectors, visible 7, 4, and 3 miles, respectively, is shown, at an elevation of 44 feet, on Lille Jarfiordnes, eastern side of the entrance to the fiord.

Pasvig, a fishing and trading station $3\frac{1}{2}$ miles eastward of Jarfiord, is the eastern harbor of any importance on Norwegian territory.

The point on the northeast side of the entrance is distinguished by a large black stone beacon with white belt, which, however, is masked from the eastward; but vessels approaching from that direction will recognize Skibsholm, nearly 1 mile eastward of the entrance and about half a mile offshore, marked by a black stone beacon, and should steer so as to pass about half a mile northward of it.

There is no passage southwestward of the rocks on the south side of the entrance to the harbor, but the channel between these and the north point, though very narrow, will admit vessels of any draft. Large vessels should anchor on the southwest side of the bay in 20 to 24 fathoms. Small vessels may run in toward a low point and bring up in the bight between that and the steep shore to the southward. There are depths of 15 fathoms right opposite a slope of broken rocks and stones, and of 7 to 8 fathoms farther in toward the sands, about 150 yards from which is a ballast heap with only 11 feet over it.

A bar or reef, with 7 fathoms, stretches across the entrance to Pasvig, and forms a natural breakwater, so that although the harbor is open to the westward very little sea runs in.

Smaaströmfjord is a fishing station 2 miles eastward of Pasvig. The entrance, which is narrowed by low rocks, should not be attempted without a pilot until some local knowledge has been acquired. In the outer part of the fiord the depths vary from 4 to 7 fathoms.

Kobholmfiord, between Smaaströmfjord and Jacob Elv, is uninhabited, has no good harbor, and is not suitable for anchorage, the depths being very irregular and the wind baffling and squally off the surrounding hills. Small vessels may bring up in a depth of about 6 fathoms close to the north shore of the bay on the west side of the fiord, but it is advisable to secure with a hawser to the shore, as the bank is very steep to the southward. There is also anchorage off the mouth of the stream at the inner end of the fiord, in 8 to 10 fathoms, and for large vessels in 25 to 30 fathoms, sand. Fresh water is obtainable from the brook here.

Vessels are recommended to pass westward of the small islets in the middle of Kobholmfiord, avoiding the sunken rock in the fairway abreast the southern islet. Rocks and sunken dangers extend northward 700 yards off the east point of the entrance, and there is also a detached sunken rock 600 yards westward of the same point.

Jacob Elv enters Varangerfiord at half a mile eastward of Kobholmfiord. There are a few Norwegian houses on the left bank of the river, and some Russian families live on the opposite side, where there

are several fishing huts and salting houses. Russian fishing vessels lie in the mouth of the river during summer.

A stone chapel stands on the west side of the entrance to the river, not far from the three hundred and sixty-third cairn, the northernmost of the cairns that define the boundary between Norway, Russia, Finland, and Sweden, and thus marks the northeastern limit of the Kingdom of Norway.

Depths.—The Jacob Elv is but a small stream, flowing from lakes and marshes 40 miles inland, passing between hills with considerable declivity and frequent rapids, so that it is not navigable even for small boats more than $3\frac{1}{2}$ miles from its mouth. The width of the entrance is about 23 yards, with a depth inside of about 4 feet; but outside there are sandbanks which dry at low water and on which the sea breaks with any swell. Small craft under 5 feet draft can enter at half tide when there is sufficient water over the bar and banks in the approach. Rocks, which uncover at low water, extend a distance of 700 yards off the point west of the entrance.

Tides.—It is high water, full and change, at Jacob Elv at VIh. 30m.; springs rise 10 feet.

For the coast eastward of Jacob Elv see the Arctic Pilot, Vol. I.

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