

Confidential!

NORWAY: COAST REPORT

PART II
THE COAST, PORTS, AND COAST DEFENSES

SECTION 1
KRISTIANIA FJORD

JUNE, 1917

OFFICE OF NAVAL INTELLIGENCE



FEBRUARY, 1918



WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

DECLASSIFIED
Authority E.O. 10501

NAVY DEPARTMENT,
OFFICE OF NAVAL INTELLIGENCE,
Washington, February 15, 1918.

This reprint of a confidential British Admiralty publication is intended for the use of officers generally, and in certain cases may be shown to persons in the Navy of the United States below the rank of commissioned officer who may require to be acquainted with its contents in the course of their duties. Nevertheless, this is to be considered a confidential book and due caution must be observed in communicating its contents to persons not commissioned officers of the Navy.

ROGER WELLES,
Captain, U. S. Navy, Director of Naval Intelligence.

Confidential.

**NORWAY:
COAST REPORT.**

**PART II.
THE COAST, PORTS, AND COAST DEFENCES.**

**SECTION 1.
KRISTIANIA FJORD.**

JUNE, 1917.

**The information contained in this book should be verified
and supplemented whenever an opportunity offers.**

DECLASSIFIED
Authority E.O. 10501

THE KRISTIANIA FJORD.

(See Chart 2 and Admiralty Charts, Nos. 2330, 3158, 3159, 1974, 1039, 3160.)

GENERAL REMARKS.

From its principal entrance between Little Faerder and Torbiørnskieer, Kristiania fjord extends nearly due N. for 55 miles to Kristiania, the capital of Norway. Varying in breadth from 13 miles at the entrance to two-thirds of a mile at Dröbak, the fjord is deep throughout in the main channel, and, on the whole, free from dangers. The shores are mountainous. The rounded islands and hills covered with fir and pine trees which characterise the scenery in the lower reaches, give place to steeper declivities northward of Dröbak, and bolder hills in the background.

Ice abounds during the winter months; the more important channels are kept open by ice-breakers.

Railway lines skirt both shores from the mouth of the fjord to Kristiania.

A number of towns are situated on the shores of the fjord and its numerous tributary fjords and inlets, which branch in all directions from the main channel.

All the small islands at the entrance to the fjord are connected by telephone.

The channel of approach to Kristiania is defended by the Dröbak fortifications, which are described in detail on pages 13 to 18.

COAST FROM THE NORWEGIAN-SWEDISH BOUNDARY TO KRISTIANIA.

The boundary between Norway and Sweden is shown on Chart 2. It follows up the middle of Sækken Channel, and strikes the coast opposite the entrance to Svinesund; it then continues up the center of that fjord and down the center of Idefjord to its head, when it bends somewhat southwards before turning northwards.

Of the various approaches to Svinesund from the sea, Lauersvælgen, the channel between Kirkeö and Lauer is that which is most used, but this channel is narrow and intricate. The eastern approach is through Sækken, the entrances to which lie between the island of Heia and the shoals off the Koster Islands. Both these channels have deep water, and the anchorages in the vicinity are fairly numerous.

FREDRIKSHALD.

(See Plate 1 and Admiralty Chart 3160.)

Ships of deep draft can approach Fredrikshald through Svinesund, but the navigation is difficult. There are two good harbors in which vessels can be moored, of which the outer harbor, which is inclosed by the islands of Bratö, Sauö, and Kuskier, can accommodate large vessels. The inner harbor, east of Sauö, is available for medium-sized ships.

THE COMMERCIAL PORT.

Quayage.

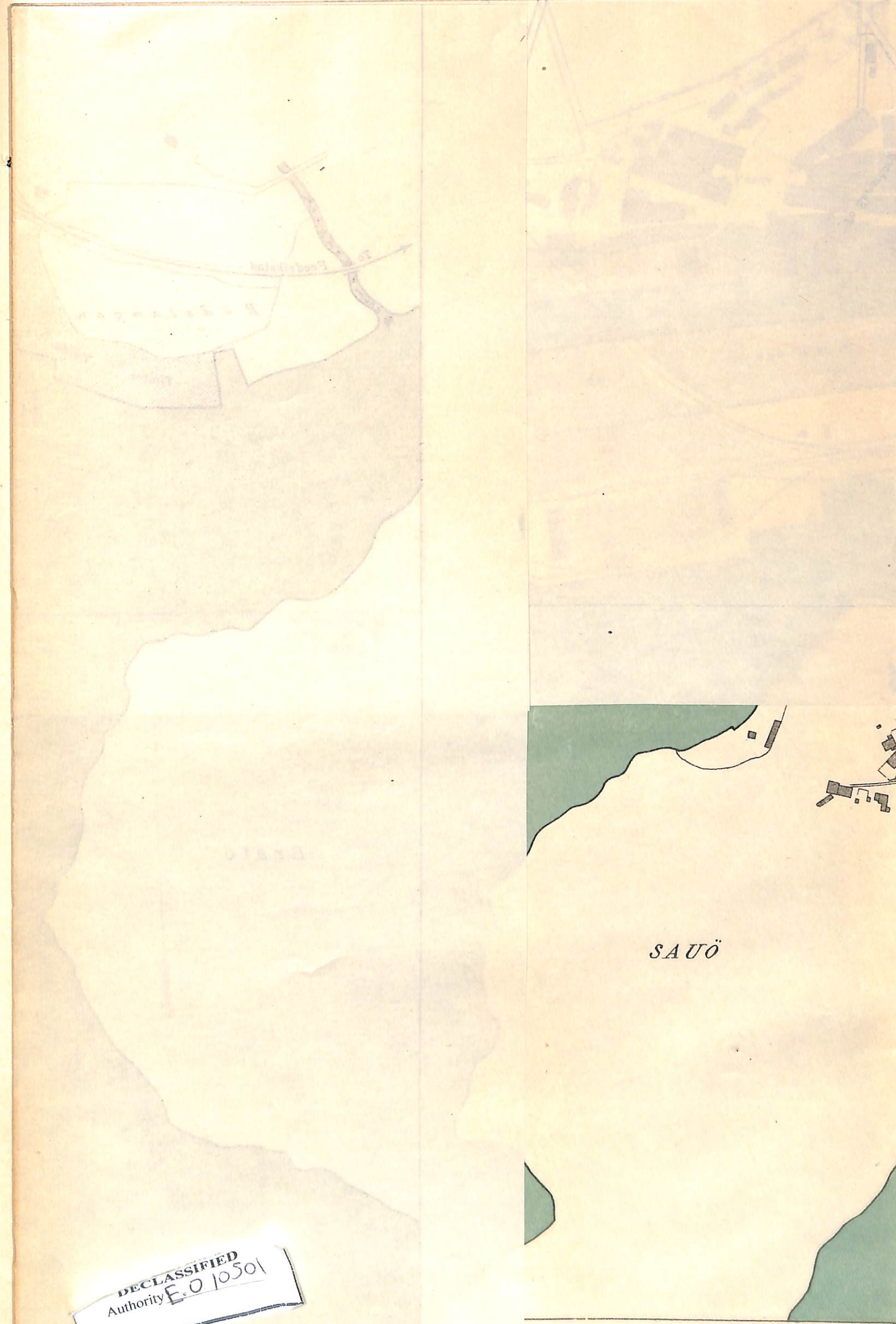
The quayage accommodation consists of Langebryggen (stone), 711 feet in length, with 10 to 20 feet depth alongside; Langebryggen (wood), 289 feet in length, with 14 to 18 feet depth alongside; Outer Railway Quay, 1,530 feet in length, with 10 to 16 feet depth alongside; Inner Railway Quay, 780 feet in length, with 15 to 17 feet alongside; and Mölbryggen (wood), 1,405 feet in length, with 15 to 18 feet depth alongside. Railway sidings are laid on to the quays in the Outer Harbor. All the quays are situated to the eastward of the entrance of the Tistedals Elv.

Lifting Appliances.

There is no information of any cranes or other lifting gear.

Repairing Facilities.

There is an iron factory at which small repairs to hull and machinery can be carried out.



DECLASSIFIED
Authority E.O. 10501

Patent Slips.

There are three patent slips owned by "Brevigs Mekaniske Verksted," whose works are situated in the Indre Havn. The largest is worked electrically and is 120 feet in length, with a cradle 160 feet long, capable of lifting a steamer of 400 tons. The two smaller are worked by steam, and the lengths of cradles respectively are 90 feet and 50 feet, the former able to lift a ship of 100 tons, and the latter of 80 tons.

Coal and Coaling Facilities.

The total import of coal into Fredrikshald in 1913 was 41,248 tons. About 2,000 tons are usually kept in stock, and coaling can be carried out either alongside a wharf with a depth of water of 17 to 18 feet alongside, or from lighters.

Trade and Shipping.

The principal industries are connected with dressed timber and granite, and there are numerous factories and sawmills above the town, which are operated by the rapid stream of the Tistedals Elv. A British Vice-Consul is resident in the town. The principal imports are coal and foodstuffs. About 400 vessels enter the port annually.

THE TOWN.

Fredrikshald, an ancient Norwegian frontier town, is one of the centers of the timber traffic of Eastern Norway and the adjoining parts of Sweden. The town is situated on both banks of the Tistedal river, and on the south bank on a hill is situated the disused fortress of Fredrikssten. The town had a population of about 12,000 inhabitants in 1914. In addition to the railway bridge close to the mouth of the river, two other bridges cross the river, affording communication between the two parts of the town. On the north shore and to the west of the town rises an isolated hill, called Rødsberget, and around the town the country is hilly. Extensions are going on to the north and east of the town on the north shore of the river. A system of canalisation has been undertaken in the more rapid portions of the lower river to ensure more convenient handling of the timber when floated down. The Customs House is situated at the eastern end of Langbryggen wharf, and south of the main square (Torv); other public buildings are the Raadhus (town hall), on the north side of the square, the post office at the eastern end of Kristian-August street, and the telegraph office on the west side of Wiels Platz, both the latter are in the northern town. There are several good hotels and electric light is used universally. The Power Station is on the north bank of the river and to the east of the town, and the gasworks are close to the Ebenezer Infirmary also in the eastern suburb.

COMMUNICATIONS.

By Steamer.

Steamers run to Strömstad once or twice daily, also to Kristiania daily, *via* Hankö; from Tistedalen on the river, 2 miles above Fredrikshald, a steamer communicates three times weekly with Skullerud, the journey being made up the river through a system of lakes and canals, called collectively the Fredrikshald Canal in which there are numerous locks.

By Railway. (See Map 1.)

Fredrikshald is on the main southern line from Kristiania and Sarpsborg to Møllerud on Lake Venern, whence it communicates with Gothenburg or Stockholm. The line crosses the frontier at Kornsjö (20 miles) into Sweden. There is a tunnel at Tistedalen, and several others between that place and the frontier, and the line which at first follows the river valley branches south-east from Tistedalen through thick woodland. The railway crosses the Tistedals Elv close to the mouth, and the station is on the south bank of the river.

By Road. (See Plate 6 facing page 26.)

Fredrikshald is great road center, and the majority are good though narrow. A main road runs S.E. to Enningdalen (10½ miles), where it bifurcates, one branch communicating with Strömstad (28 miles), and the other crossing the Swedish frontier at Kornsjö (20 miles). The most direct route to the frontier is by road due east to Holmegil (14½ miles), where it joins the Swedish system. At Hauglund (10½ miles) on this latter road a road branches north parallel with the frontier and with branches on either side of the lake district to Örje (26 miles), where it meets a road connecting the Glommen Valley with the frontier. A road parallel to this one runs due north from Fredrikshald to Mysen (33 miles) on the Glommen-Örje road. There is also communication by a network of roads with Sarpsborg and Fredrikstad, and a road crosses the narrow part of Svinesund at the village of that name, and continues to Strömstad.

By Telegraph and Telephone.

Telegraph and telephone lines cross the Svinesund into Sweden, and Fredrikshald is in direct communication by both with the main systems of both Norway and Sweden. There is apparently no communication northwards either by telegraph or telephone, except *via* Sarpsborg.

MILITARY DETAILS.

Fredrikshald being within the neutral zone, all formerly existing land and sea defences in the vicinity have been dismantled since 1905. In Brand Battery, situated immediately to the west of the Fortress of Fredrikssten, are mounted a few old guns for saluting purposes.

COAST FROM FREDRIKSHALD TO THE RIVER GLOMMEN.

The coast northwards as far as the mouth of the Glommen is considerably indented, and Single Fjord runs some way inland, but is of no special importance. There is a barrier of islands protecting the inner channel and affording various means of access to the open sea, and anchorages are fairly numerous.

FREDRIKSTAD.

(See Plate 2 and Admiralty Chart 3160.)

The immediate approaches to Fredrikstad are by way of the two entrances to the Glommen, the Östre Elven from the south and south-west, and the Vestre Elven from the west and north. These branches run respectively east and west of Kragerö. That portion of the river between Isegran and Graesvikfloen is shallow, but up to these points large vessels may ascend both branches. Of the several channels of approach between the islands by which Östre Elven is approached the Löbe Channel between Asmalö and Kirkeö is the deepest and widest.

THE COMMERCIAL PORT.

The port is of considerable importance owing to its situation at the mouth of the Glommen, on which the timber of the Österdal, the most richly wooded district in Norway, is floated down to the sea. At Fredrikstad the river is deep and broad, but the depth of water alongside the quays is not great, so that large vessels must load in the river in an average depth of 23 feet of water. The height and depth of water at Fredrikstad depends largely on the amount of flood in the River Glommen, which can fluctuate very considerably. The river is crossed in various places by steam ferries, connecting up different portions of the town.

Quayage.

There are ballast quays in both the Östre and Vestre Elven, of which the depth alongside the latter is 15½ feet. A new Customs quay has been erected with a depth alongside of 20 feet. A new quay has also been built at the factory De-no-Fa; it is dredged to 28 feet, and is 656 feet long. The height of the quays above normal water level is from 6 to 8 feet. It is proposed to bring the railway to the quays at the S. end of the town; there is already a branch running to the quays N.E. of the town.

At all the sawmills and other factories on the river between Fredrikstad and Sarpsborg there are small quays, but these are as a rule poorly equipped with cranes, &c.

Harbor Improvements.

At Vaterland, the southern suburb of Fredrikstad, new quays are under construction. They were to have been completed in 1916, and it was stated would have a depth alongside of 27 feet.

Lifting Appliances.

There are no floating or harbor cranes belonging to the port, and as nearly all the loading and discharging is done in the river, the quays hardly require them. There are a number of cranes of various sizes, however, at the shipbuilding yards (see under "Private Shipbuilding Yards"), of which the "Fredrikstad Mekaniske Verksted" owns one capable of lifting 150 tons.

Shipbuilding Capabilities.

These are discussed under "Private Shipbuilding Yards."

Repairing Facilities.

Repairs to hull and machinery can be undertaken by the various shipbuilding yards.

Docks.

There is a floating dock belonging to the "Fredrikstads Mekaniske Verksted."

Patent Slips.

There are in all six patent slips, three belonging to the "Fredrikstads Mekaniske Verksted," and three to the "Glommens Mekaniske Verksted."

Harbor Craft.

A considerable number of lighters are always at hand, and there are several tugs.

Coal and Coaling Facilities.

The import of coal in 1913 was 51,632 tons; about 10,000 tons is usually kept in stock. There is a coaling wharf with a depth alongside of 15 feet, but coaling is usually performed from lighters, of which there are several available of 50, 60, and 100 tons respectively.

Trade and Shipping.

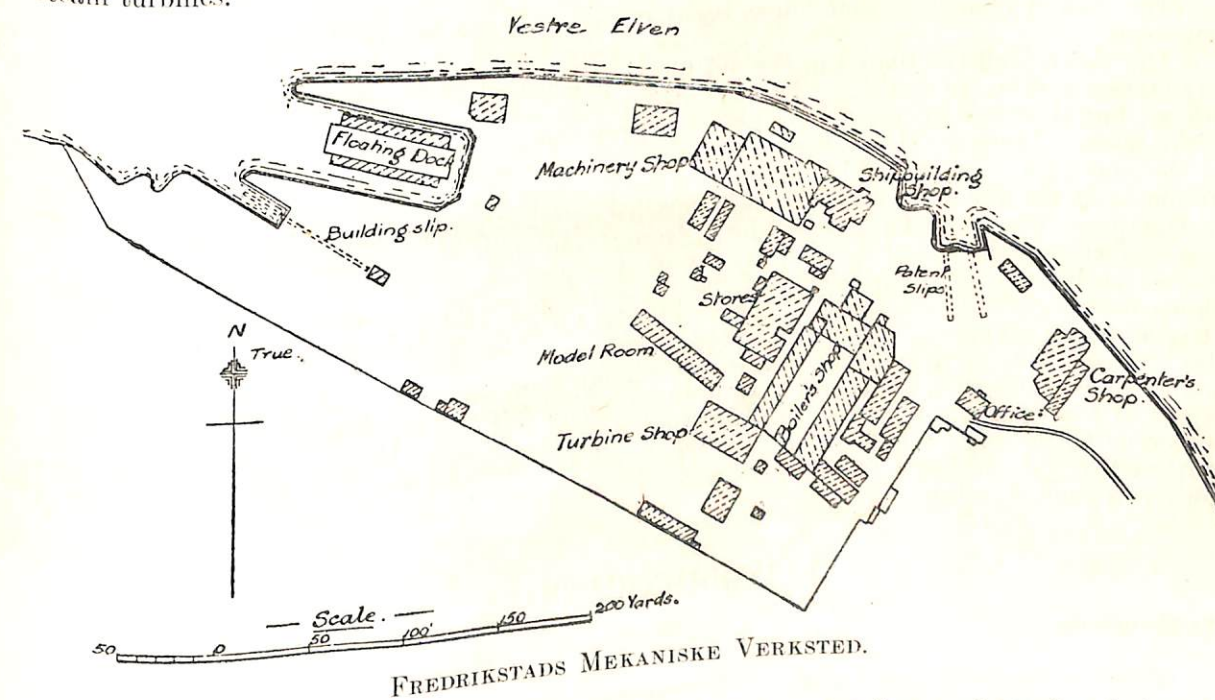
Shipbuilding and the dressing and preparation of timber are the principal industries, and in addition to timber, bricks and granite are exported. The chief imports are coal and general merchandise. A British Vice-Consul is resident. There is very considerable trade, and during 1913, 28 British vessels of a tonnage of 30,113 tons cleared the port.

PRIVATE SHIPBUILDING YARDS.

Fredrikstads Mekaniske Verksted. (See plan below.)

This shipbuilding yard, which is situated on the south bank of the Vestre Elven, and opposite to the Town, is of considerable importance, and sometimes carries out building for the Norwegian Government. The torpedo boats "Kvik" and "Dristig," and later the "Kjack" and "Hvas" were constructed at this yard. Of late years, this firm has been specialising in a vessel now known as the "Fredrikstad Type," and at present they are able to build steamers up to 4,500 tons dead weight. Up to 1915 the total number of ships turned out had been 77, of which the largest had a gross tonnage of 2,000 tons, but in 1915 considerable activity was reported, and one of the old slips was being lengthened. In March 1916 it was reported that the yard had received orders for 34 ships, the largest of which was to be of 4,500 tons dead weight, and the management is now (1916) contemplating making extensive alterations and additions, as it is hoped later to be able to construct ships up to 7,000 tons. These extensions, which are being carried out to the west of the present yard, are expected to be completed about the end of 1918. It is further proposed to build a new floating dock for the use of the works, and which it is hoped to complete by the end of 1917; this dock will be capable of dealing with the largest Norwegian man-of-war, or a vessel between 10,000 and 12,000 tons. These works are connected with the shipbuilding yard at Fevig, which constructs the hulls and sends the new vessels in tow to Fredrikstad for fitting out (see Section 2); the firm is also amalgamated with Messrs. Jensen and Dahl, shipbuilders, Kristiania.

The number of employés varies in accordance with the amount of work in hand from 1,000 to 1,500. Engines up to 1,200 H.P., and boilers of large size are built; the firm also constructs large water turbines, and it is believed that it will shortly begin to construct its own steam turbines.



Building Slips.

There are four building slips, which are 60 feet, 210 feet, 240 feet, and 300 feet in length respectively; one of these is believed to have been lengthened recently.

Floating Dock.

There is a floating dock, 212 feet in length, and capable of taking a vessel 285 feet long. The lifting power is 1,850 tons. A new floating dock is proposed. See above.

DECLASSIFIED
Authority E.O. 12501

Lifting Appliances.

The works are well equipped with cranes, one of which is capable of lifting 150 tons. There are also various smaller cranes lifting between 10 and 25 tons, and the building slips are also well fitted out with cranes and gantries. In the workshops there are a few travelling cranes.

Patent Slips.

The company operates three patent slips, the lengths of cradles being respectively 88 feet, 78 feet, and 59 feet. They are worked electrically.

Glommen's Mekaniske Verksted.

These works are situated opposite to the Nygaardsbryggen on the western shore of the Vestre Elven. The yard is only capable of building very small craft, such as tugs, lighters, &c., and only the smaller class of repairs can be executed. The number of employées in 1916 was about 300 workmen.

There is one crane to lift between 15 and 20 tons, and one or two smaller portable cranes are also installed.

The works own three patent slips, which are worked by electricity, and the lengths of the cradles are 90 feet, 70 feet, and 41 feet respectively.

Other Works.

The "Fredrikstads Armatur Fabrik" build small steamers, and execute small repairs. There are three building slips, 60 feet, 70 feet, and 100 feet in length respectively. Engines and boilers are also constructed. The number of employées in 1906 was 70 men. The exact position of this yard is not known.

The "Nobbetorp Mekaniske Verksted" is a small yard, situated on the left bank of the Glommen above Fredrikstad.

THE TOWN.

The town of Fredrikstad is situated at the southern point of Glemminge, an island formed by two arms of the River Glommen. The old town, together with the Fortress of Kongssten and its environments, is situated to the S.E. of the main town, and on the opposite side of the river. Opposite the town on the south shore of the Vestre Elven are numerous shipbuilding yards, factories, &c. The large soap and whale oil factory of De No Fa lies to the south of the old town and on the eastern shore of the Östre Elven; it has its own wharves. The population of the town in 1914 was 15,662 inhabitants, but it is probably increasing, as the town is extending towards the northeast.

The busiest quarter is that known as the Forstad, the southern and eastern part of the new town.

The Town Hall is situated in the old town, and near it is the garrison church. The railway station is situated in the northeast quarter of the town, and is well provided with suitable sidings, but there are at present no railway facilities for the wharves, except on the N.E. side of the town. There are three customs stations, one at Fredrikssten and the other on the quay on the north shore of Vestre Elven; east of the latter is the fish market. The third customs station is at the Customs wharf opposite Fredrikssten. There is a fire station on the wharf at Dampskibsbryggen. Of hotels, the Britannia Hotel in Keyersgade, the Schultz Hotel in Nygaden, and the Victoria Hotel are the most important. The town Power Station is situated in Torbjörns-gade in the center of the town, and other public buildings include a gymnasium, several churches, a riding school, and "Forlystelseshus Valhalla," a popular place of entertainment, situated in a square west of Torsgade. These are shown on the plan, as are also the post and telegraph offices, fire station, and municipal offices, &c. St. Joseph's Hospital is in Ridehusgade. The principal industries of the town consist in the manufacture and export of timber; large timber yards are situated on the banks of the river, and there are also numerous factories, of which De No Fa whale oil and soap factory is of special importance; southeast of the old town is a large vinegar factory, and in the western quarter of the new town is a motor factory.

COMMUNICATIONS.**By Steamer.**

There is frequent communication by steamer with London, Hull, Dutch, and German ports, and other Norwegian ports. Daily communication also with Kristiania and Sarpsborg.

By Railway. (See Map. 1.)

There is railway communication with Kristiania, *viâ* Moss; the line crosses the western arm of the River Glommen over the Kjölberg Bridge at Onsö (4 miles). The railway also runs along the west bank of the main stream to Sarpsborg (6½ miles).



FORSTAD

Newspaper Office

Power Station

Post Office

Newspaper Office

Harbour Office

Museum

Bank

Telegraph Office

Church

Hospital

Municipal Offices

Recreation Ground

Glommens Mekaniske Works

Ferry

ISEGRAN (Mine Store)

Mine Store

Powder Mag'ne

School

5

6

7

8

9

BRANDSTADEN

ST. GÅRDEN

ST. HAVEN

ST. JERNE

ST. LARS

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. KATHARIN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

ST. LAUREN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

ST. LAUREN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

ST. LAUREN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

ST. LAUREN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

ST. LAUREN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

ST. LAUREN

ST. MARTIN

ST. NIKOLA

ST. OLAV

ST. PETER

ST. SØREN

ST. TORV

ST. VIG

ST. VILHELM

ST. YVES

ST. ZACHAR

ST. ANDR

ST. BARN

ST. ERIK

ST. HANS

ST. JACOB

ST. JOHN

ST. KATHARIN

By Road. (See Plate 6.)

There is a network of roads radiating from Fredrikstad. Main roads lead to Moss (19 miles), *viâ* the bridge at Onsö, up both banks of the Glommen to Sarpsborg, and eastward to Fredrikshald (20½ miles).

By Telegraph and Telephone.

There is telegraphic and telephonic communication, *viâ* Sarpsborg with Strömstad (Sweden) and Fredrikshald, also with Moss and Kristiania. There is also a direct telephone service, independent of Sarpsborg, *viâ* the road, to Moss. A cable, maintaining telegraphic and telephonic communication, leaves the peninsula south of Fredrikstad in the neighborhood of Homleskjaer for the islands of Hvaler, whence the telephone cable continues from Gravningsundet to the Swedish coast just north of Dynekilen.

By River.

Above Fredrikstad, the Glommen is navigable to vessels drawing 15 feet to 17 feet for about 6 miles up to Sandesund, where there is a quay for the river steamers. The strength of the current, which is considerable especially in the spring, makes navigation difficult.

MILITARY DETAILS.

At the time of the 1905 crisis, the Swedish plan of attack is stated to have been to effect a landing on the S. E. shore of Kragerö, then cross the channel at Hutholm and seize the railway north of Fredrikstad.

COAST DEFENSES.

The defenses of Fredrikstad consist of Q. F. batteries which, supported by coast defence gunboats, protect the mine fields laid in Östre and Vestre Elven. The batteries were constructed about 1904, the cost (9,500L.) being defrayed by the sale of the old fortress of Fredriksten, which was disclased in 1903. A telephone connects Alshus and Hutholm, and there is telephonic communication with the islands (see "Communications").

No searchlights have been reported to be in these positions, which are known respectively as the Östre Elven Position (Battery No. I) and the Vestre Elven Position (Battery No. II).

Battery No. I on Chart 2.

This battery is situated near Alshus, and is plainly visible from the channel. The emplacements are hewn out of the rock, and the whole work is enclosed by a wire fence. A magazine and small barrack building are at a short distance on the north side.

In 1907 the armament consisted of:—

2—65 mm. (10-pdr.) or 57 mm. (6-pdr.) Q. F. guns.

Battery No. II on Chart 2.

This battery is situated near Hutholm. The guns can not be seen from the channel, the ground being high and rocky. An observer in 1907 saw what he thought to be a portion of the work, but whether this was on Hutholm (islet) or Kragerö is not clear.

The armament consists of:—

2—65 mm. (10-pdr.) or 57 mm. (6-pdr.) Q. F. guns.

SUBMARINE DEFENSES.

The coast defense batteries are used to defend the mine fields, of which that in the Östre Elven is situated near Battery No. I. The firing station is at the point just south of Kalleröd Lighthouse.

The Vestre Elven mine field is close to Battery No. II, and the firing station is situated at the battery.

Mine Store.

The old forts of Isegran and Cicignon have been turned over to the Mining Department, and in the former a mine store and mining establishment were set up in 1902. A small steam mine-laying vessel was seen here in 1907. The personnel employed at the mining station in peace time is stated to consist of 3 officers and 150 mining ratings.

Barracks and Military Establishments.

There are artillery barracks and stables for artillery horses near the cemetery to the north of Kongssten Fortress; inside Fredriksten Fortress itself there are artillery barracks on the north face, engineer barracks on the east face, and large infantry barracks situated in the central square. On the south side of the fortress is the arsenal, and to the east of it the Military Hospital.

SARPSBORG.

(See Plate 3 and Admiralty Chart 3160.)

The eastern entrance to Fredrikstad is available to Sandesund, the port of Sarpsborg, and affords up to 21 feet of water. Dredging operations are proceeding to enable vessels to go up drawing 22 to 24 feet of water during the winter.

The Commercial Port.

There is a very considerable extent of quayage, most of which has railway facilities. Vessels, if boomed out from the quayside, can at most of the loading places at Sandesund be safely loaded to a draft of from 1 to 6 feet in excess of the available depths quoted below.

The height between the surface of the water and the quays is normally 6 to 8 feet, but depends upon the flood in the river.

The following table gives particulars of the various quays:—

Name.	Length in Feet.	Depth alongside in Feet.	Cranes.	Remarks.
<i>Public Quays.</i>				
Tolboddyggen.....	82	10	.....	Under construction; 90 feet completed in May, 1915. Depth alongside to be increased to 16 feet.
Dampskibsbryggen.....	285	15 to 18	.....
New Quay.....	125	8	.....
Övre Alvim Brygge I.....	700	17 to 20	.....
Övre Alvim Brygge II.....	640	6 to 13	.....	In communication with railway.
Nedre Alvim Brygge.....	489	14	.....	Do.
Sandesund Brygge.....	393	10	.....
<i>Private Quays.</i>				
Mellös Brygge.....	1,378	15 to 18	4 electric, 2 steam.	Two of the electric cranes are used for discharging bales of pulp from storehouses.
New Quay.....	?	18	.....	Under construction.
New Pier (wood).....	450	18	.....	For discharge of pulp from Russia.
Hafslund Brygge.....	262	10	} 1 electric..	Crane discharges about 50 tons per hour.
New Quay.....	656	18 to 20		
New Quay.....	1,100	20 to 23	.....	Dredging in progress to 20 to 23 feet, and one new electric crane to be provided.
Greäker Cellulosefabrik.....	623	18	.....	Vessels must be boomed out.
Brödr Andersen's Brygge.....	290	15 to 20	.....
Yven Paperfabrik.....	.....	14	.....

The new quay at Mellös Brygge has been completed to a width of about 328 feet, and dredging is in progress, so that there may be 18 feet alongside.

The new quay at Hafslund Brygge has been completed, and at high water vessels drawing 20 to 23 feet can go alongside; about 300 feet of this quay has an available depth of 12 to 14 feet. Progress is being made on the reconstruction of the older part of the quay.

The harbor authorities possess no cranes, but at the "Kellner" Company's wharves there are two cranes capable of lifting 2 to 3 tons (fitted with grabs), also two "Coles" traveling cranes, one of 10 tons and the other of 5 tons, as well as other traveling electric cranes for loading vessels. The "Usines" Company have two cranes, one of 10 tons and the other of 15 tons. An additional electric crane is to be provided on the new quay at Hafslund Brygge. (See "Table of Quays.")

There are apparently no facilities for coaling ships at Sandesund. The port imports a large quantity of coal, the import in 1913 being 133,229 tons. A silo, said to hold about 4,000 tons, has been erected to deal with coal.

The Town.

The principal industries of Sarpsborg and Sandesund consist of saw, cellulose, and paper mills; carbide, electric power, and engineering works, and its principal export is timber.

In 1914 the population consisted of about 11,500 inhabitants, and the town is gradually increasing in size. It is situated on the right bank of the Glommen about 1½ miles above Sandesund. To the north of the town the river forms the lake of Glengshölen, and to the S. E. is the great waterfall, called the Sarpsfos, over which is the suspension bridge, which carries the railway. The falls are utilised for a number of saw mills, and celluloid and other factories, most of which are at Hafslund on the opposite bank. A little to the south of the bridge there is an electric power station, which serves factories all down the river as far as

Fredrikstad. A tramway runs from the fall past Borregaard to Sandesund. On the east bank of the river there is a salmon ladder, and a flume for the passage of sawn timber. At Sundlökken opposite Sandesund there are important zinc factories.

the cradles being 134 feet and 79 feet long; the larger will take a vessel up to 1,200 tons, and the smaller up to 210 tons. Both are operated by steam.

The salvage steamer "Troll," belonging to the "Norsk Bjergnings Kompagni," is stationed at Moss.

About 1,000 tons of coal are kept in stock. The import of coal in 1913 was 38,029 tons. Coaling is performed either from lighters or alongside.

The Town.

The town of Moss, which is a busy trading center, had a population in 1914 of about 9,000 inhabitants. It is the capital of the Amt of Smaalene and the residence of the Amt mand. The railway station is on the south side of the town. A bridge crosses to Jaelöen, where there are several villas, this being a favorite summer resort for the population of Kristiania. There are two or three good hotels, and a British vice-consul resides in the town.

Communications.

Steamers communicate with Kristiania several times daily, the voyage taking three to four hours. There is also a service four times a day to Horten on the opposite side of the fjord.

There is direct communication by railway with Kristiania (37 miles) and south-east to Fredrikstad (21 miles). (See Map 1.)

Three main roads leave Moss, one northwards along the coast to Soon (8 miles), Dröbak (16½ miles), and Kristiania; one N. E. to Vaaler (9 miles), where it distributes various branches inland; and the third southward along the railway to Fredrikstad. There are various offshoots from each of these main roads. (See Plate 6.)

Moss is situated on the main trunk telegraph and telephone lines between Kristiania, Sarpsborg, Fredrikshald, and the Swedish frontier. There is an independent telephone line running from Moss to Frederikstad, avoiding Sarpsborg.

Military Details.

Land defense works have been constructed near Moss, in connection with the defense of the E. shore of Kristiania Fjord. A battery on the "Onerod property," on Jaelöen, was reported in 1902, as well as the construction of another on Björnaas. It is also believed that two works exist just in rear of Moss, as shown on Plate 6.

All these works are merely prepared positions, without armament in peace time.

Soon.

To the north-east of the entrance to Mosse Sund is situated the small town of Soon, which is a fashionable bathing resort. There is good anchorage in the bay in from 8 to 14 fathoms; the principal export is timber.

This port is considered as suitable for carrying out a landing for the purpose of attacking the Dröbak defenses on the land side. It is believed that two works forming part of the interior line of land defense works (see page 17) have been constructed on each side of the entrance to the bay. They are probably without any armament in peace time, and are of the same general description as other works in this line. (See Plate 6.)

In August 1916 it was authoritatively reported that Messrs. Fred Olsen were about to construct three oil tanks at Soon for use of their motor ships.

COAST FROM SOON TO DRÖBAK.

North of Soon the Kristiania Fjord narrows down to a width of a little over a mile, which is caused by the long peninsula, known as Hurum landet, which bounds it on the western side. This width continues for about 6 miles northwards as far as Dröbak, where the fjord is somewhat obstructed by islands and gradually widens as it approaches Kristiania. These islands, of which the fortified areas on Kaholm and Haaöen are described later under 'Coast Defenses' taken by large vessels is on the east side; the western channel is impeded by a submerged breakwater, though there is an opening for vessels on the eastern side.

Dröbak.

Dröbak is situated on the eastern mainland and at the northern extremity of the narrow part of the fjord. There is a quay 60 feet long with 15 feet alongside, and also the steamer quay which is 200 feet in length and from 14 to 18 feet alongside. Dröbak, with a population in 1914 of about 2,000 inhabitants, carries on considerable trade in timber and ice. In winter when the upper part of the fjord is blocked by ice, navigation frequently remains open up to Dröbak, where goods for Kristiania are discharged.

Communications. (See Plate 6.)

There is ample means of communication by road with the neighborhood and with Kristiania, but no railway nearer than Aas (6 miles). There is frequent communication by

steamer with Kristiania, Moss, Svelvik on the western side of the fjord, and steamers call on their way from Kristiania to Bergen. There is communication by telegraph and telephone to join the main systems at Aas; there is also direct telephonic communication with Kristiania, and a telephone cable crosses to Fort Oscarsborg, on South Kaholm Island.

THE DEFENSES AT DRÖBAK.

(See Chart 2.)

NAVAL DETAILS.

In 1897, a site was purchased at Husvik for a naval laying-up harbor; moorings were laid down and stores for ammunition built at a cost of 1,000*l.* A few existing buildings were likewise converted to naval use. Nine years later it was decided to reduce the number of laying-up harbors, and Husvik was closed, the ammunition store being removed to the dockyard at Karljohansvaern.

The coast defense war vessels attached to the Dröbak defenses have now their headquarters at Karljohansvaern, but it is understood that in war time coast defense vessels are used to supplement the land defenses.

A Norwegian naval officer has stated that the depth of water in the channel off Dröbak is greater than shown on the chart.

MILITARY DETAILS.

Northward of Dröbak, Kristiania Fjord divides into two branches, which flow east and west of Haaö. The regular channel to Kristiania is eastward of Kaholm, the Askholms, and Storgrund. The approach to the channel west of Haaö, which is known as Vest Fjord, is blocked by a submerged breakwater between Foergested and Kaholm. A gap is left marked by two poles between Smaaskier and S. Kaholm, but passage through it is dangerous, owing to the strong and irregular currents.

The submerged breakwater, or fairage, mentioned above, was examined in 1909. The depth over it is 7 feet at L. W. O. S. In the middle of the opening (200 feet wide), nearly midway between S. Kaholm and N. Smaaskier, there is a depth of 5 fathoms at L. W. O. S.

The question of modernizing the fortress of Oscarsborg was under consideration in 1913.

COAST DEFENSES.

It was proposed in 1900 to construct extensive barracks at Husvik at a cost of 17,000*l.* This was never carried out, it being subsequently decided that the existing barracks on S. Kaholm, together with certain private dwelling houses in and about Husvik, would suffice to meet requirements.

It was proposed in 1899 to erect a power and light station to supply the torpedo battery, but this has never been done. The power is now supplied from Husvik.

A plan was adopted in 1900 for laying wire entanglement and fencing around all Norwegian coast batteries. The former is laid in belts 17 feet wide and surrounds each separate work; the latter is laid round the entire site, and is chiefly intended to keep off the public. 9,500*l.* was voted for this purpose at all defended localities.

In 1907, two old gunboats, painted grey, were lying alongside Bergholmen and Haaö. It should be ascertained, if possible, what vessels would be stationed at Dröbak in war time to assist in the defense of the forts.

It is believed that the main telephone exchange is in Oscarsborg. Mention occurred in the 1907 estimates of a captive balloon brought to Oscarsborg from Fredriksten. There is at least one steamboat belonging to the defenses; it is manned by men of the Coast Artillery. It is believed that no recent alterations have taken place in the principal armaments of the Dröbak defenses.

SEA DEFENSES ON THE DRÖBAK SIDE.

Veisvingen Battery (No. V on Chart 2).

This earth battery is scraped out of the slope of the hill. The face of the work stretching from S.E. to N.W., is about 80 yards in length. Traverses separate the guns, approximately 15 yards apart. In the rear of each traverse is a position for a range-finder (? or machine gun). The guns are all fitted with loading derricks.

At the east end of the work a magazine has been built behind a thick parapet, tipped with stone, and from 25 feet to 30 feet in thickness. The entrance is to the north. Three orographs

DECLASSIFIED
Authority E.O. 10501

have been provided, but there is no wire entanglement round the battery, though a barbed wire fence prevents intrusion of undesirables. A road leads direct through the wood to Vindfangerbugten to the north of the defenses.

It has been observed that the fold of the ground below the work renders the channel dead water for a distance of 1,500 yards from the east shore; owing to the dark background, the fort is difficult to distinguish from seaward.

The armament was verified in 1909, when it consisted of—

- | | |
|---------------------------------|--------------------------|
| 1—27 cm. (10.6-inch) M.L. gun | } taken from Oscarsborg. |
| 3—22.6 cm. (8.6-inch) M.L. guns | |

It has been stated that there are also machine guns and light Q.F. guns, but none have ever been seen.

Kopaas Battery (No. VI on Chart 2).

The three guns are mounted on the rock in the open, at the height of 120 feet, 90 feet, and 50 feet, respectively, above the sea level. The rock has been scraped away near the two lower guns to permit of increased depression, thus to command the channel close in. The guns are in line from the S.E. corner of S. Kaholm.

In 1900 the guns were painted the color of the ground, but were still distinguishable from the channel.

The magazines are under the gun positions.

The 1899 Estimates stated that one orograph had been provided, but that, "owing to the position of the guns," it was necessary to purchase two more (cost 55*l.* each). This was done. In 1900, 450*l.* was allowed for "arrangements for protecting the range-finders," understood to be the orographs mentioned above.

The armament was verified in 1909, at which date it consisted of—

- 3—15 cm. (5.9-inch) L/47 Q.F. Armstrong guns, with shields.

Battery No. VII on Chart 2.

This small Q.F. battery (open in rear) is situated 30 feet above the sea at the Point, almost in line with the guns of Kopaas Battery. It is close to a small white house, and stands nearly between this battery and Kopaas Battery is a small iron-faced parapet, possibly intended for two small Q.F. guns, but no armament was seen there either in 1907 or 1909.

The guns in this battery are mounted on traveling platforms running on rails and, when not in position, are entirely concealed behind a cement wall. The armament, which was verified in 1909, consisted at that date of—

- 2—57 mm. (6-pdr.) Q. F. guns, with light removable shields.

WORKS ON S. KAHOLM (FORT OSCARSBORG).

The works on S. Kaholm are known collectively as Fort Oscarsborg. They consist of two earth batteries, two masonry casemates (disused), an old stone work, and an old masonry citadel (*réduit*). As they have not been visited for some years, the following description of the works can not be considered quite reliable.

The barrage which closes Vestfiord (mentioned on page 13) projects from the S.E. corner of S. Kaholm.

A new "laboratory" building (cost 550*l.*) was added in 1900, the former one being very exposed. The use of the so-called laboratories, common to all Norwegian defenses, has not been ascertained, but it is probably for examining shell.

There is a small coal and firewood store and a fire-engine house, and the old gunpowder tower has been converted into a clothing store.

The boat harbor is situated at the north end of the island, where there is also a conspicuous building, the use of which is not apparent. The gap between North and South Kaholm is spanned by a bridge. There is a floating crane belonging to Oscarsborg. It is under- stood that the barracks can only accommodate 90 men, a portion of the garrison of Oscarsborg being accommodated at Husvik; a permanent garrison now mans the guns, and serves continuously for six months.

"Hoved" (Main) Battery (No. VIII on Chart 2 and Plate 4.)

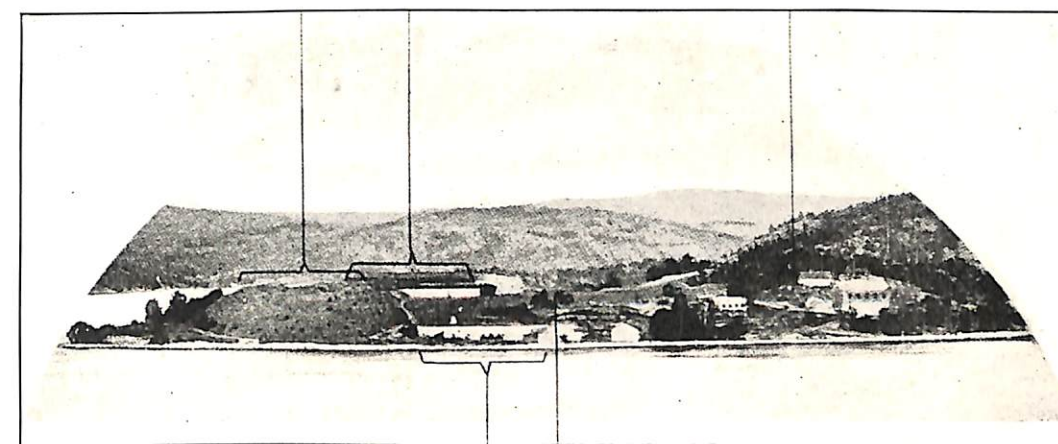
This battery has been described as built "upon the glacis of the old *réduit*." It faces S and S. E. The guns are mounted "*en barbette*" at a height of 45 feet above the water. The thickness of the parapet is 35 feet, and of the traverses 30 feet. An interspace of 66 feet separates the guns.

A well protected position for the battery commander is built at the extreme east end of the work.

DEFENCES OF DROBAK (KRISTIANIA FIORD).

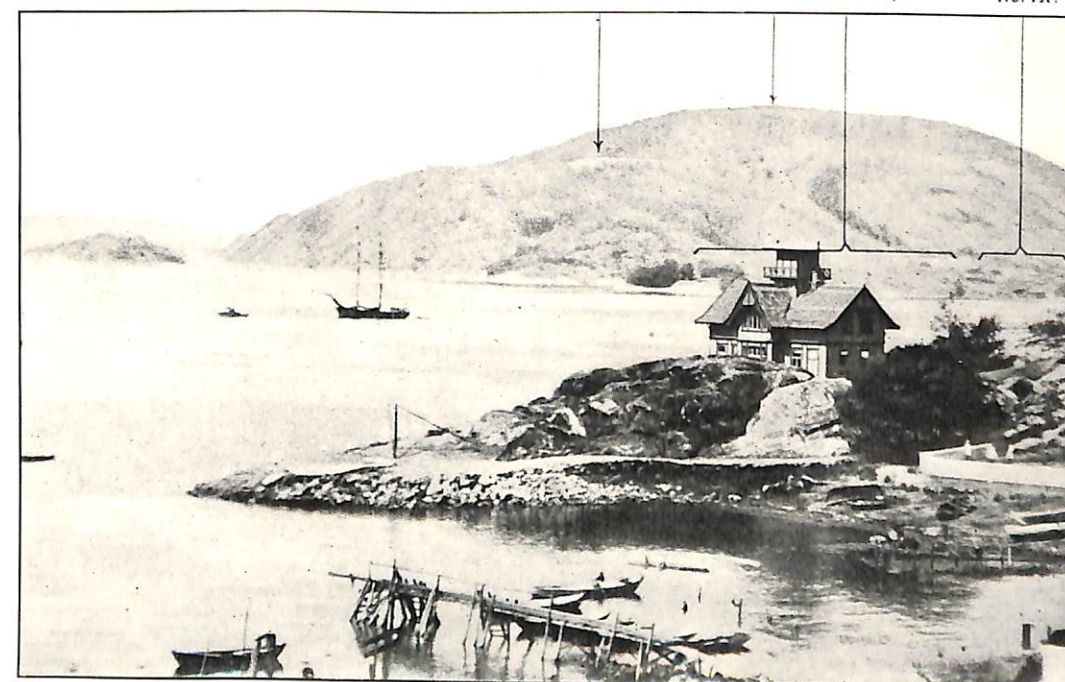
FORT OSCARSBORG.

No. VIII. Old Redoubt. No. X.



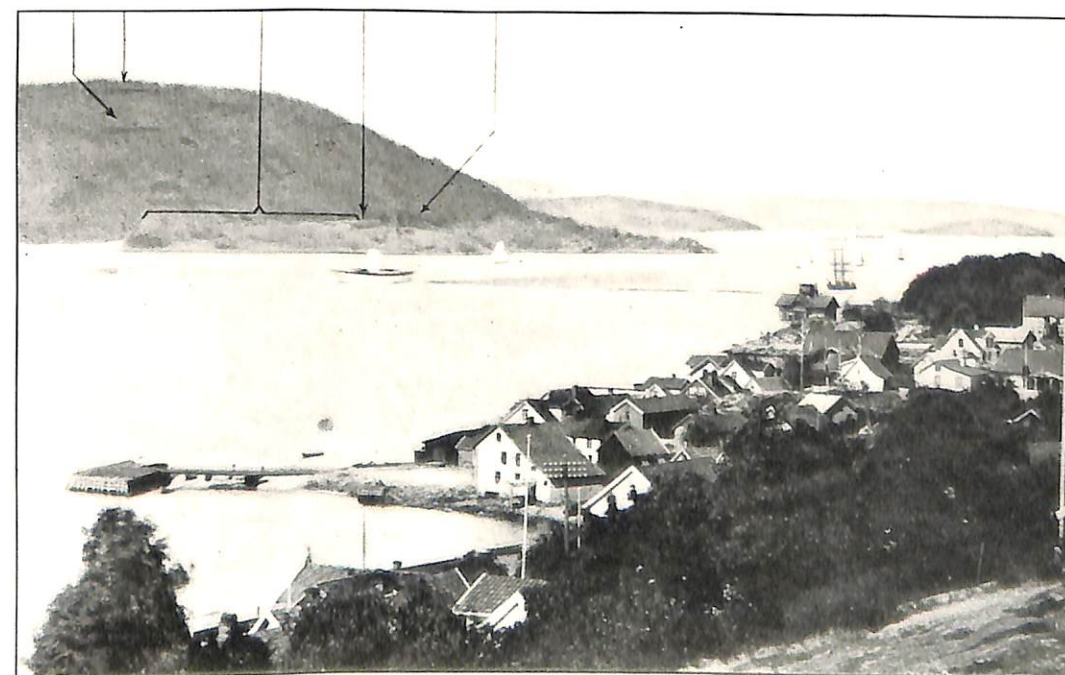
Casemate No. IX
View from Eastward.

No. XII No. XIII. No. VIII. No. IX.



View from S.E.

No. XII No. XIII. No. VIII Old Redoubt. No. IX



View from S.S.E.

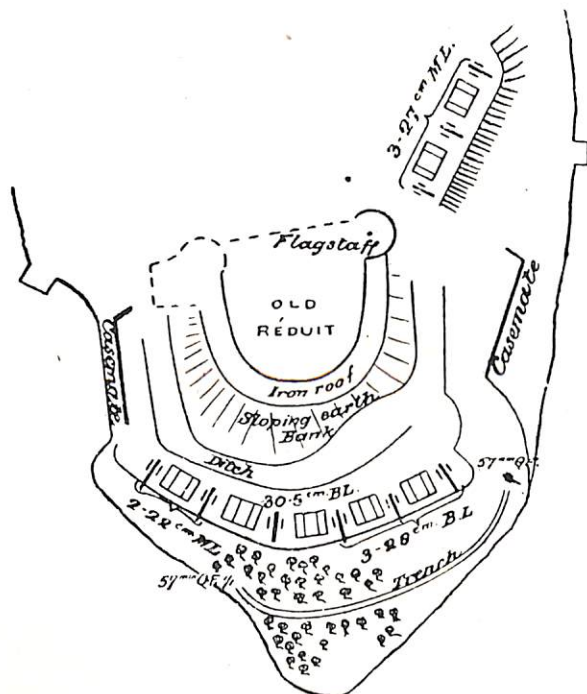
<—Dröbak.

<—Dröbak.

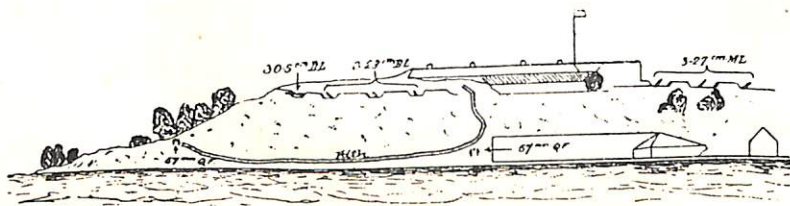
In 1900 it was reported that a depression range-finder had been mounted on each traverse between the B.L. guns. In the same year's Estimates, 1,000*l.* was allowed for providing "arrangements for protecting the range-finders in 'Hoved' and 'East' batteries." These range-finders are probably orographs.

Telescopic sights were purchased for the B.L. guns in 1906.

In 1909, an observer reported a deep ditch between the heavy gun positions and the masonry fort in rear. The latter is the old *rédut*, and the ditch is the moat belonging to it.



A trench or covered way, 4 feet wide and 12 feet deep, runs round the southern face of the island, below the main parapet, about 20 yards from the shore, and terminates at each end in a small battery mounting one 57 mm. gun. The battery at the western end was entered



VIEW FROM EASTWARD.

in 1909. It is entirely walled-in and cemented in front. The gun is mounted on a travelling platform on rails, and when not in position is entirely concealed; it fires out of a port at the western end of the battery, and commands the channel south of the island. In the trench close by is an ammunition hoist leading down to the magazines, which are apparently beneath the trench.

The battery at the east end was not entered, but as it is not covered in like the other one, the gun is visible, and commands the channel E. and N.E. of the island.

The armament was seen and identified in 1909, when (from east to west) it consisted of:—

- 3—28 cm. (11-inch) B.L. L/40, Krupp guns.
- 1—30.5 cm. (12-inch) B.L. L/25, Krupp gun.
- 2—22 cm. (8.6-inch) M.L. guns.
- 2—57 mm. (6 pdr.) Q.F. guns.

The 30.5 cm. gun is much shorter than the 28 cm. guns, but its shield is almost similar, *i. e.* large and spherical, and about 1½ inches thick; the M.L. guns have light shields only. The B.L. guns have a loading derrick.

East Battery (No. IX on Chart 2 and Plate 4).

This work practically adjoins No. VIII. The guns are mounted behind a grass-covered parapet, and are separated by traverses.

The arc of fire of one of the three guns permits it to command the channel as far south as the submerged breakwater; the other two guns do not fire much S. of E.

The guns are mounted at a slightly lower elevation than the ones in No. VIII. See under battery No. VIII., for protection provided for the R.F. 's.

This battery was visited in 1909, when the armament consisted of:—
3—27 cm. (10.6-inch) M.L. guns, without shields, with davits fitted at the muzzle. The guns were then painted dark grey.

Battery No. X on Chart 2, and Plate 4.

In 1910, a battery was observed at the position shown and armed with six light Q.F. guns and provided with an elevated iron position-finder supported on iron trestles.

WORK ON NORTH KAHOLM.

Battery No. XI on Chart 2.

The position of this battery is correctly shown on the chart. The guns are 30 feet above the water, and well concealed by trees. The armament consists of:—

2—57 mm. (6-pdr.) Q.F. guns, on elastic non-recoil mountings.

A telegraph cable crosses the channel from North Kaholm, North of Battery XI., to a point 600 yards East of Battery XIII. on Haaö.

WORKS ON HAAÖ.

The 1900 Estimates included a small vote for two cables (to replace old ones) between S. Kaholm and Haaö, for the purpose of controlling the Dröbak defences from a position on the latter.

In the same year the fire-commander stations at both positions were connected by telephone.

A telephone cable on posts runs along the east shore of Haaö island from a point abreast the north end of N. Kaholm (whence the cable appears to come) to a house near the position marked Tronstadodden on Chart 2.

The four magazines are situated at the water's edge, near Tronstadtbugten, with a jetty close by. No road appears to lead to them. Magazines have also been built at batteries Nos. XII. and XIII. In 1916, searchlights were reported to be stationed on the island.

A large building can be seen from the channel among the trees in the rear of No. XIII., but its use is not apparent.

A road zigzags up the east side of the island to Battery No. XIII., and close by is a rack railway for conveying up ammunition. It leads up to what appears to be bomb-proof casemates, on the sky-line.

It is reported that there is barrack accommodation for 2,000 men on Haaö.

Battery No. XII on Chart 2 and Plate 4.

This work is situated about 350 feet above the water.

The howitzers are mounted in deep emplacements, and can probably *not* be used for direct fire.

The shields show up prominently from S.

The armament consists of—

4—28 cm. (11-inch) B.L.L/14 Whitworth howitzers, with shields.

7,000*l.* was expended between 1890–95 upon constructing this work, and 25,000*l.* upon armament and ammunition.

“Top Battery” (No. XIII on Chart 2 and Plate 4).

This earth battery, easily distinguishable from south, is situated above No. XII., at a height of 656 feet above sea level. It commands a large portion of the ground behind Dröbak. The guns are converted 16.7 cm. M.L.'s, and in 1899 a sum of 2,700*l.* was voted for purchasing new mountings to replace the old wooden ones.

The armament consists of—

10—12 cm. (4.7-inch) (converted 16.7 M.L.) B.L. L/36 guns.

450*l.* was voted in 1899 for laying belts of wire entanglement 17 feet wide round this battery.

Money was voted for one orograph in 1900; till then none had been provided.

Battery near Noeset Point (No. XIV on Chart 2).

This battery is intended to protect the minefields. The work was seen in 1909, and it was found that the ground is cut away below the embrasures to enable the guns to be depressed.

The armament consisted at that date of:—

4—57 mm. (6-pdr.) Q.F. guns.

SUBMARINE DEFENSES.

Minefields. (See Chart 2.)

In 1897, since when there has been no information, the minefields were stated to consist of seven lines of observation and E.C. mines, extending from the church at Dröbak to Husvik Point.

An observation station stands in close proximity to the two 57 mm. guns belonging to Battery No. VII. It is built of stone or cement, with wide sight embrasures.

There is said to be another observation station on Kaholm.

A firing station is supposed to exist inside the tunnel in rear of the citadel on S. Kaholm. Minelaying practice took place in July 1913 in the neighbourhood of Dröbak.

A minefield was officially stated to be laid off the Oscarsborg defenses during the war.

Torpedo Battery.

The torpedo battery is situated on the south end of North Kaholm.

It is considered that it can be distinguished from the channel, although it has not been identified with absolute certainty. What appears to be it is visible on a S.E. bearing. A sum of 890*l.* was voted in 1910 for improving the torpedo battery here.

It has three tubes for Whitehead torpedoes, and was erected about 1898 at a cost of 14,000*l.* On the high ground between the torpedo battery and the bridge connecting North and South Kaholm is an iron shelter, supposed to be the firing station.

Torpedo tubes are also believed to exist on the Island of Storskjaer, opposite Dröbak.

Mining Establishment.

All the faces of the rock which are climbable on the south and east extremity of the island of Bergholm, are covered with barbed wire entanglement. In the indentation midway along the south shore there were in 1911 three gunboats fitted with cranes, the funnels being marked with one, two, and three bands respectively. There is a considerable supply of coal stored on the west side of the indentation.

In 1911, at the west side of the island, two mining launches were seen hauled up and reels of cable were laying on the shore. There is a long low mine store at the west extremity of the island at the entrance of which could be seen spherical and cylindrical mines which had the appearance of having been recently removed from the water. There are two small fixed cranes and a travelling crane on the wharf.

Boom Defense.

If booms exist for the defense of this locality it is probable that they are stowed in sections somewhere near, probably on the islands of Kaholm or Bergholm, though no signs of any large baulks of timber could be seen in the vicinity in July 1913. An Englishman who knows this part of the fiord well states that he has never seen anything in this connection.

It is understood that two booms do exist, but that they are probably stowed away in peace time, and are intended to be laid in war time in the positions marked on Chart 2.

Cable Store.

A cable store is known to exist on Bergholm. In 1908 the sum of 100*l.* was voted for various alterations to it.

SEARCHLIGHTS.

Three searchlights only have been mentioned in the Estimates. They were all seen in 1907, on the Dröbak side. One was mounted at the Point opposite S. Kaholm, just below No. VII.; a rail track leads from it N. of the Point. A second is situated at the Point about one mile N. of Dröbak town; a rail track connects with a door in the rock. The third is at the point just S.W. of the church, mounted in a pit.

In 1900 it was reported that the existing installation (which is understood to be situated near the church at Husvik), could work all three searchlights.

The position of all three searchlights was verified in 1909; none were seen at this date on South Kaholm.

LAND DEFENSES ON THE DRÖBAK SIDE.

(See Chart 2 and Plate 6.)

The following works are intended to secure the sea defenses from attack from the land side.

Infantry Parapet.

From the east of Veisvingen Battery (No. V. on Chart 2), an infantry parapet follows the contour of the hill to the Seierstein Redoubt, and continues beyond the redoubt for a

43730A—18—3

DECLASSIFIED
Authority E.O. 10501

distance of 400 yards, terminating there in a semi-oval redoubt containing two bomb-proof shelters. It has been stated that it is to be continued in a N.E. direction, as far as batteries Kringrud and Haer.

Seierstein Redoubt.

This work, completed in 1902, is intended for field or machine guns only. Both the infantry parapet (mentioned above) and this redoubt are well built, and revetted with stone.

A barbed wire entanglement is laid round the north and east faces of the Seierstein Redoubt, and along the front of the infantry parapet.

Kringrud Battery.

First mention of this work occurred in the 1902 Estimates, when it was spoken of as recently completed.

This battery is situated about 12 feet below the summit of the hill S. of Kringrud farm. The command is good and extends over the entire valley, from W. to S.E. The road leading to it is much overgrown.

It contains platforms for six guns, but none are apparently mounted in peace time. They fire over a parapet 4½ feet high, built of rock and cemented in front.

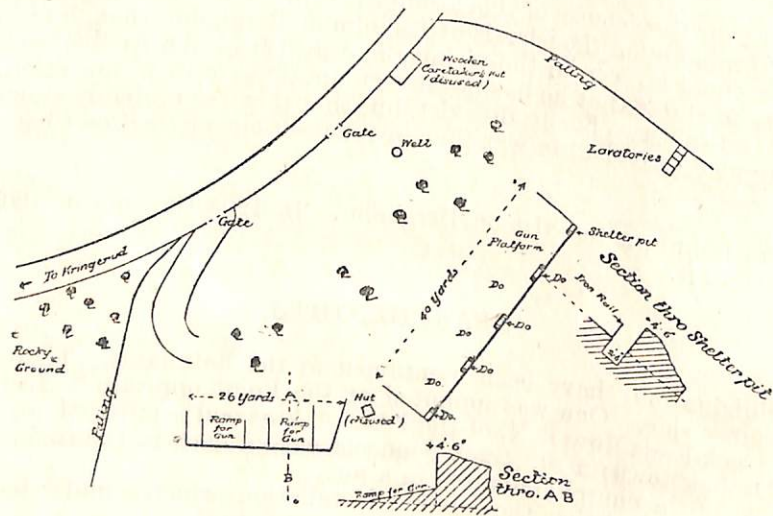
The work is surrounded by a barbed wire fence, and is in telephonic communication with Dröbak and Oscarsborg.

Battery Haer.

This work, situated near the village of the same name, was completed about 1902. It is understood to have a good command. In 1900 it was intended to lay wire entanglement round it, and prior to its completion the following armament was reported as intended to be mounted:—

4—15 cm. (5.9-inch) Q.F. L/47 Armstrong guns.
8 smaller guns.

Battery Haer is situated on the N. crest of the same hill as Kringrud. The field of fire is extensive from S.W. to E., but the road west of it and immediately below it is dead ground. It consists of two separate works a few yards apart, one containing platforms for four guns, and the other emplacements for two. No armament is mounted in peace time. The following sketch shows the general arrangement of the battery, and the sections of the parapets.



Both Batteries Haer and Kringrud are connected by telephone with the main exchange at Oscarsborg.

COAST FROM DRÖBAK TO KRISTIANIA.

The east side of the upper fjord is bounded by the Nesod Peninsula, which is, generally speaking, hilly, but well supplied with roads. There are several islands off the coast, the most important being the Steilene group, on two of which are important petroleum stores. There are four tanks on the island nearest the mainland, and two on one of the others. The approaches to Kristiania Harbour are narrow in places, but the channels are well marked, and there is little difficulty in taking them in clear weather.

KRISTIANIA.

(See Plate 5 and Admiralty Chart 1974.)

The actual entrances to Kristiania Harbor are known as the Skibsløb, or ship channel, between Hægholm and Lindö and the Vestre Løb, or west channel, between Kobbernaglen and Dynen lighthouses. The Skibsløb is generally used by merchant ships, but the Vestre Løb which is more roomy and less winding is the more usual approach channel for men-of-war and other large ships.

The port is situated about 55 miles from the entrance to Kristiania Fjord and the harbor is bounded by the mainland on the north and north-east, by the Ladegaard Peninsula on the west, and by numerous islands on the south-east and south. Of the three bights on the north side, known respectively as Biörviken, Piperviken and Frognerkilen, the last named is not much used by shipping, whereas Piperviken is the usual anchorage for men-of-war.

Bundefjord, which extends for some miles southward of Kristiania, and on the eastern side of the Nesod Peninsula is not much used except by small ships, though it is deep and mostly clear of dangers.

THE COMMERCIAL HARBOR.

(See Plate 5.)

Quayage.

The following table gives the most important quays, working from E. to W.:—

Name.	Length in Feet.	Cranes.	Remarks.
Coaling wharf.....	721		North of Kongshavn.
Grönlibryggen.....	1,968	One 3-ton electric.....	Depth alongside, 27½ feet. Rail-way sidings.
Bispebryggen.....	606		
Tolbodbryggen (customs).....	462		Customs quay and offices.
Langbryggen.....	744	One 6-ton, two 3-ton, electric, also floating cranes.	
Revierbryggen.....	577	One 3-ton electric.....	Grain elevator.
Fæstningsbryggen.....	728	One 20-ton fixed hand crane.....	
Utstikker I.....	308		Mail steamers, Xnia—Bergen.
" II.....	1,289	One fixed 20-ton at end, one 6-ton, two 5-ton, three 3-ton, all electric.	Wilson Liners' Berth.
" III.....	918		Grain elevator.
Fish harbor.....	754		
Vippetangbryggen.....	1,246	One 6-ton, one 3-ton, electric.....	Depth of water alongside: N. end 29 feet, S. end 19 feet.
Akershusbryggen.....	1,689		
Filipstadbryggen.....		One 3-ton fixed crane.....	Under construction.

At the north end of Oslo Harbor lies the Eastern Railway station terminus fronted by various quays, floating pontoons, and sheds. The quays from the Eastern Railway station as far as the Vippetangbryggen are built of stone, rising about 6 feet above normal water level, and are well lit by electricity. They are connected by a goods railway, with sidings, running from the Eastern Railway station, round the base of the obsolete fortress of Akershus, to Piperviken Harbor and the Western Railway terminus. A driving road runs alongside the railway track and close to the water's edge; this road is called the "Strandveien." At the north end of Piperviken Harbor, flanked on the east by a wooden quay and on the west by a stone quay, are the landing stairs used by launches from men-of-war, yachts, &c. Stone quays extend westwards past the Western Railway terminus to the Akers Engineering Works (see page 21). The Filipstad Bay quays, at present under construction, are further west. A wooden pier in Hjortnæs Bay is the starting point of a ferry to the Bygdö Peninsula. The total length of quayage at Kristiania is about 28,000 feet with a depth of water alongside varying from 10 to 30 feet; there is practically no rise and fall of tide. There are ample mooring facilities to rings on the quay walls and the harbors are well buoyed.

Harbor Improvements.

In 1915 the harbor authorities of Kristiania invited a general international competition for designs for the extension of the port with the object of further development with the plant already existing. It was proposed to establish a free port. Competitive drafts were to be lodged with the harbor board by November 1915; it is not known what result there has been. The filling up of Filipstad Bay for affording additional quayage has been going on for some time and the shore front is being pushed out between the railway and the water from

DECLASSIFIED
Authority E.O. 10501

The municipal gasworks are situated at the intersection of Hausmanns Gade and Storgaden; new gasworks are being built at the inner end of Bestumkilen, on the western bank of the river.

A corn silo of 10,000 tons has been built at the inner end of Utstikker III. quay, the discharging taking place on the east side of the latter. The conveyance of the corn to the silo is effected through an underground duct. To the north of the city is St. Hans Haugen (St. John's Hill), which is a public promenade, and on the summit of which is a reservoir of the city waterworks.

On the west side of the city there is a long narrow lake from which runs a stream called the Frogner Elv into Frognerkilen Bay; on the east side of this lake is the sports ground, where there is an oval cycle track and flat grass center 720 feet long. There is also an oval sports ground, 490 feet long, on the S.W. side of St. Hans Haugen.

The electric power station for the trams is situated at the west end of Valkyriegaden in the N.W. of the town, and the central tram station is at the south end of Sporveisgaden, S.S.W. of St. Hans Haugen; the central fire station is situated S.W. of the Slots Park, at the intersection of Bygdø Allé and Drammensveien.

The population of Kristiania in 1913 numbered about 255,857 inhabitants.

COMMUNICATIONS.

By Sea.

The following is a brief statement taken from the press of some of the principal lines of steamers which called at Kristiania (exclusively of regular sailings between Norway and the adjacent countries):—The Forende Company's New York line was started in 1881, and calls once or twice a week, and the Boston Line, started in 1901-02, calls every fortnight. The Philadelphia and Boston route, started in 1905-06, calls only once a fortnight. Finally the same company has a line, started in 1907, and calling once every three months, to La Plata. The Johnson Line to Brazil and Argentina calls every three weeks. In 1913 the Ostasiatiska Kompani began to call at Kristiania every three weeks for India, China and Japan. The Norway Mexico Gulf Line was started in 1907, and keeps up connection every three weeks with the United States, Cuba and Mexico. The Ostasiatiska Kompani also started a line every six weeks to the Pacific coast. Messrs. Fred Olsen began a line in 1911 to Buenos Ayres, which in 1913 ran monthly. The Norwegian American Line began its sailings every three weeks in 1913 to Halifax and New York. In the same year Messrs. Thor Thoresen started a line to East Africa and Madagascar, which is intended to run every two months. The India Line, to run monthly, started in 1914, and Messrs. Lorentzen & Co.'s line to Brazil. To the foregoing may possibly be added sailings of a new South American Line in 1914 from West Norway. Up to 1907 the Forende Line to the United States was, it is stated, the sole regular transatlantic steamer connection to Kristiania.

There is also a very considerable coastal service, which is of considerable importance owing to the absence of railway communications along a large portion of the coast.

By Railway. (See Map 1.)

Kristiania, being the metropolis, is the center from which all railways to various parts of Norway radiate. There are two stations, the Eastern Railway station (Hoved Banegaard), situated at the head of Björviken Harbor, from which communication with all lines starts, except communication with the Western Railway to Drammen, Telemarken, Hougund, and Krödren which starts from the Western Railway station (Vest-Banegaard), situated at the head of Piperiken. The two stations are connected by a line which runs along the main quays and round the fortress of Akershus. There are locomotive and carriage shops in the vicinity of both stations, and large warehouses. Starting from the south, railway communication is as follows, from Kristiania:—

- (a) Kristiania—Ski (15 miles)—Moss (37 miles)—Sarpsborg (65 miles)—Fredrikshald (85 miles)—Kornsjø (frontier station 105 miles)—Goteborg (221 miles), or Stockholm; with alternative route Ski—Mysen (25 miles)—Sarpsborg.
- (b) Kristiania—Lilleström (13 miles)—Sörumsand (23 miles)—Skulerud (58 miles).
- (c) Kristiania—Sörumsand (23 miles)—Kongsvinger (62 miles)—Magnor (frontier station 82 miles)—Stockholm (357 miles).
- (d) Kristiania—Kongsvinger (62 miles)—Elverum (120 miles)—Trondhjem (371 miles).
- (e) Kristiania—Hamar (78 miles)—Elverum (98 miles)—Trondhjem (348 miles).
- (f) Kristiania—Lilleström (13 miles)—Hamar (78 miles)—Dombås (213 miles).
- (g) Kristiania—Roa (36 miles)—Fagernes (130 miles).
- (h) Kristiania—Roa (36 miles)—Hönefoss (56 miles)—Bergen (305 miles).
- (i) Kristiania—Hougund (43 miles)—Hönefoss (77 miles).
- (k) Kristiania—Drammen (33 miles)—Hougund (43 miles).
- (l) Kristiania—Drammen (33 miles)—Tönsberg (71 miles)—Larvik (98 miles)—Eidanger (119 miles); thence, to Forsgrund (121 miles) and Skien (126 miles), or to Brevik (125 miles).

The question of electrifying the Government railways has been under serious consideration, and as a commencement it has been decided to at once start on the work of electrifying



Bakkehaug

Søndergade
Nørregade

Bjlsen
Park

Church

Nørre
Brylind

Four
Asens
Plads

Diakonisse
støtten

Diakonisse
støtten

School

Waterworks

Kirke
gården

Cemetery

Church

the Kristiania—Drammen Line. Detailed plans are nearly finished, and the field work is to commence at once. Current will be supplied by a power station to be at once erected at Hakavik, which will develop 17,200 H.P. The Kristiania-Drammen railway is a double line of narrow gauge, which is being gradually reconstructed to normal gauge (4 feet 8½ inches), and is to be completed by 1920. It is believed that the tunnels on the railway lines leading into Sweden have all been mined by the authorities.

By Road. (See Inset Plate 5.)

Kristiania is the center of a network of roads, the principal of which are as follows:—

1. Westwards to Drammen, *via* Sandviken. This road, as far as Sandviken, is level and fairly good and wide, but extremely dusty in dry weather. It skirts the fjord and railway at various points, the surrounding country being comparatively flat near the road, and dotted with pine woods and houses. Small streams pass under the road at various points, for instance at Sandviken, Lysaker, Bestum, and Sköien, the Lysaker stream forms a possible line of defense against a force marching on Kristiania from the west, though there is an alternative parallel road more to the north.
2. From Baerum Iron Works, north-west of Haslum and south-west of Bogstad Vand, whence the Lysaker stream issues, a road enters Kristiania at Majorstuen, the terminus of the city electric tram lines. This is also a good level road.
3. The above-mentioned main roads are connected by a fairly good and shaded cross road, running more or less N. and S. on the Kristiania side of the Lysaker stream.
4. Another cross road, narrow and poor, runs northward from near Sköien Railway Station.
5. A moderate, but narrow, road runs northward from Vestre Aker Church to the W. of Gaustad Asylum, and on to Sognsvand Lake, at the S. end of which it is connected by a stony lane with 6.
6. A fair road from Vestre Aker Church to the E. of Gaustad Asylum to Sognsvand Lake, after which the road becomes little better than a cart track.
7. The main road leading N. from Kristiania is an excellent one, about 5 miles in length, on the west bank of the Akers Elv to Maridalsvand, at the north end of which are the Skars Powder Mills.
- 8 and 9. Two fairly good roads lead N.E. to Grorud on either bank of the Loelv.
10. This road is the main approach from the south, and is an excellent road, skirting the east shore of the Bundefjord. It is called the Liabro Chaussée, and enters Kristiania at the suburb of Oslo.
11. This road converges with 10, and has a winding descent from Ekeberg hill; the road is good and wide, but steep near Oslo.
12. An indifferent road crosses the flat summit of Ekeberg hill, and descends at Oslo by steep and sharp turns. *N.B.*—Norwegian roads generally are well constructed for light traffic only, and become dusty and friable in dry weather with heavy traffic, and are hardly yet suitable for much heavy motor traffic.

By Telegraph and Telephone.

The positions of the general post and telegraph office, and of the central telephone exchange are marked on Plate 5. Kristiania is the center of the systems, and especially by telephone communication is almost universal to every village throughout the Kingdom. There is direct communication with Swedish towns and with Copenhagen. The principal telephone exchanges in the district round Kristiania are those at Baekkelaget, Grorud, Sköien, Slemdal, Stabaek, and Sandviken.

By Electric Tram.

The tramway system of Kristiania is excellent. It is worked on the overhead system, and connects all the principal outskirts of the town with the Stor-Torv. In 1913, an underground electric railway was being built from the center of the city, near the National Theater to Majorstuen; the work was found to be of great difficulty, and it is not known how far progress has been made.

The terminus of the city tram service to the N.W. is Majorstuen, whence an electric tramway runs N.N.W. to Holmenkollen; in 1913 work had been commenced on the extension of this tramway to the top of Tryvandshöien.

To the N.W. an electric tramway runs from Majorstuen to Smestad, where the road to Holmenkollen branches northwards from the road to Bogstad.

A tramway has also been projected from the suburb of Oslo southwards over Ekeberg Hill to Nordstrand, to the east of and almost parallel with the railway to Moss. The electricity for the tramways is derived from the Municipal (Coal) Electric Works, but it is believed that the supply will soon be obtained by water power by the municipality. The Holmenkollen Tramway Company, like most other industrial establishments outside the town boundary, derive their power from the Kykkelsrud Falls on the River Glommen by means of overhead cables. A concession was granted in 1913 to construct and work a private electric tram line from Kristiania to Ljan on the outskirts of the capital.

By W/T.

There is a W/T station at Ovresaeter, about 4 miles north of the city. The station was opened for work in 1916. The station is reported to be situated in a very lonely spot, and is unguarded. The station is on the Marconi principle, but it is also fitted into a short range Telefunken installation.

NAVAL DETAILS.

The headquarters of the First Naval District and the naval station is at Horten and Karljohansvaern, for description of which see page 30.

There is no actual building called the Admiralty, but the Admiralty offices are situated in the building assigned to the Ministry of Defense, which is to the E. of Akershus Fortress, and just south of the Norges bank.

The King is Commander-in-Chief of the Army and Navy.

The Defense Department, which was established by Act of Storthing of 1899, comprehends the War and Navy Departments (Armeeg-og-Marinestyrelsen). At its head is a Minister of State (Statsråd).

At the head of the Navy Department is a Vice-Admiral (styled "Commanding Admiral"), who has general direction of all the business of the department, but has under his special supervision the training of the fleet, manœuvres, discipline, and the appointment of officers in command. To assist him he has a personal staff of one kommandörkaptein and one kaptein.

The general business connected with naval administration is performed by the first and second sections (1ste og 2den Afdelingen) of the Navy Department, each under a Kommandör.

The General Staff (Admiralstaben), under a Rear-Admiral, consists of one kommandörkaptein, one kaptein, and two lieutenants.

The Commissariat, Ordnance, Torpedo, Works, and Hydrographic Department of the Navy have their head offices, stores, workshops, &c., in the Royal Dockyard at Horten (see page 31).

MILITARY DETAILS.

It has been extremely difficult recently to obtain information with respect to the defenses of Kristiania, but it is understood that very little improvement has taken place during the past two years. An officer of the Coast Artillery, stationed at Dröbak stated in 1916 that for all practical purposes there has been no change in the defenses for the past two years.

Between 1892 and 1895, 55,000*l.* was expended on improving the defenses of Dröbak, one of the chief additions being the howitzer battery on Haaö.

In 1897 the Army Department had in hand the sum of 73,500*l.* from the sale of the Akershus site at Kristiania, and of this 24,000*l.* went to purchase the Sejerstein and Husvik for ammunition for guns already mounted, magazines, lighting installation at Husvik, submarine defense material, and the laying-up harbor at Husvik. In addition 2,500*l.* was voted for completing an unnamed battery (probably Kopaas battery), and other smaller sums were required for a Q.F. gun magazine, and purchasing night sights, &c.

Probably all the defenses, with the exception of Kopaas battery and a portion of the land defense works, had been completed by 1897, since when no large sums have been voted except for maintenance.

In the spring of 1914 the Storthing voted a sum of 177,778*l.* for defensive works in Kristiania Fjord; this sum included a vote made in 1912 for fortifications in the Horten district, a sum which at the time was not expended. A press report in 1915 states that a grant of 541,666*l.* was made towards the defense of this area; this sum probably included the 1914 vote, but at the same time appears to show the desire of the Norwegians to improve their defenses. Nothing is, however, known of any changes.

There are no defenses in the immediate vicinity of Kristiania. The coast defenses lie some miles down the fjord at Dröbak (see page 13), Tönsberg Fjord (see page 36), and Avelvik (see page 29), and are described under those headings. Submarine defenses are also combined with the coast defenses.

LAND DEFENSES.

(See Plate 6.)

The land defenses on the E. shore of Kristiania Fjord were intended, according to their original plan, first to prevent inroads from Sweden, and secondly to prevent landings on the coast between Soon and Fredrikshald. Two separate lines of works called the *Interior* and *Exterior Lines*, were accordingly commenced in 1900.

This *Line* which stretches from Fredriksten (Fredrikshald) through Örje and Urskog to Kongsvinger, was originally intended to consist of permanent works mounting guns of medium calibre at the four places named. They had, however, not progressed very far when

COAST FROM DRAMMENS FJORD TO HORTEN.

(Admiralty Charts 1974 and 2330.)

To the westward of the entrance to Drammens Fjord is Sandesogns Fjord which runs inland about 5 miles in a N. W. direction. There is no port of any importance in this bay, but the railway from Drammen to the south strikes the coast at its head, and follows it close to the water's edge as far south as Mulevik.

Holmestrand. (Admiralty Chart 3159.)

Holmestrand is a small town with about 2,300 inhabitants, and is situated just north of Horten at the foot of a steep cliff.

There are two harbors, of which the outer is available for ships of any draught. The depth of water in the inner harbor is 20 feet, and there is no rise and fall of tide. The railway quay is 120 feet long, and there is a steamer quay 216 feet in length; other quays have a total length of 700 feet, and the depth of water alongside is from 19 to 21 feet. The Custom House Quay (Toldboddyggen) is being reconstructed with stone, and when finished it will be about 120 feet long, with up to 24 feet alongside. There is a brisk trade in timber.

Communications.

Holmestrand has communication by rail (see Map 1) with Kristiania (53 miles), *viá* Drammen (20 miles), and southwards with Skien (73 miles), *viá* Larvik (45 miles); there is also a railway to Eidsfoss (17 miles) at the south end of Lake Ekern, where there are railway carriage works. and to Vittingfoss (19 miles); the junction for these two lines is at Hoff (12 miles). There is road communication to Drammen along the coast, and southwards to Horten, about 6 miles; also a good road leads westward, *viá* Hillestad to the Lagan Valley and Kongsberg. The town is situated on the main coastal telegraph and telephone route.

HORTEN AND KARLJOHANSVAERN.

(See Chart 2 and Admiralty Chart 3159.)

Horten, situated on the W. shore of Kristiania Fjord, about 30 miles from the open sea, is a town of 10,000 inhabitants. It is of no commercial importance, and is only mentioned on account of its proximity to Karljohansvaern, where the chief naval station of Norway is situated.

Karljohansvaern, with its spacious harbor, which is enclosed by Horten Spit on the E. side and by the islands of Lövä, Mellemö, Östö, and Vealös on the N. side, is situated just N. of Horten. The naval establishment lies on the inner side of the Spit. The entrance to the harbor, which lies between the third and last of the above-named islands, does not admit the largest vessels. Inside, however, there is ample accommodation for all vessels. There is also an entrance for small craft between Möringen and Vealös; while very narrow, intricate, and shallow passages are to be found between the other above-mentioned islands.

A Special Committee reported in 1905 that 22,000*l.* would be required for dredging the harbor to the required depth, but no portion of this sum has yet been voted.

For several years past about 600*l.* has been the annual sum expended on dredging. It is believed that Vealögabet has been deepened to 7½ or 8 metres, so that the largest Norwegian war vessel may enter.

A canal has been cut at the root end of Horten Spit from the fjord to the harbor, for the purpose of causing a change of water in the latter. It is understood that torpedo boats *cannot* make use of this canal.

The total length of quays at Karljohansvaern is 1,460 feet; the depth alongside varies from 10 feet to 21 feet.

NAVAL DETAILS.

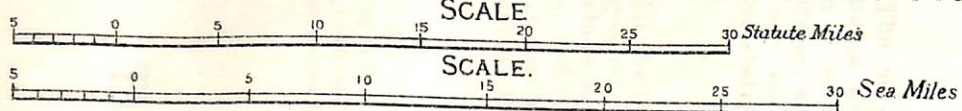
Karljohansvaern is the headquarters of the principal (1st) Naval District, and, besides being the chief Naval Station of Norway, is the only one where repairs to ships can be effected in a Government yard. The Stationschef, or officer commanding the station, is a Kommandör (post-captain), and has on his staff two other naval officers. In addition to his district duties he has the command of all the naval establishments, including the fortifications of Horten, and, in part, the dockyard. The laying-up harbor at Melsomvik and the 1st Signalling Company, likewise come under his orders.

The naval establishments include the Dockyard, the Naval Barracks, residences for officers and officials, the War College for officers, schools for petty officers, the Naval Hospital, and the Observatory.

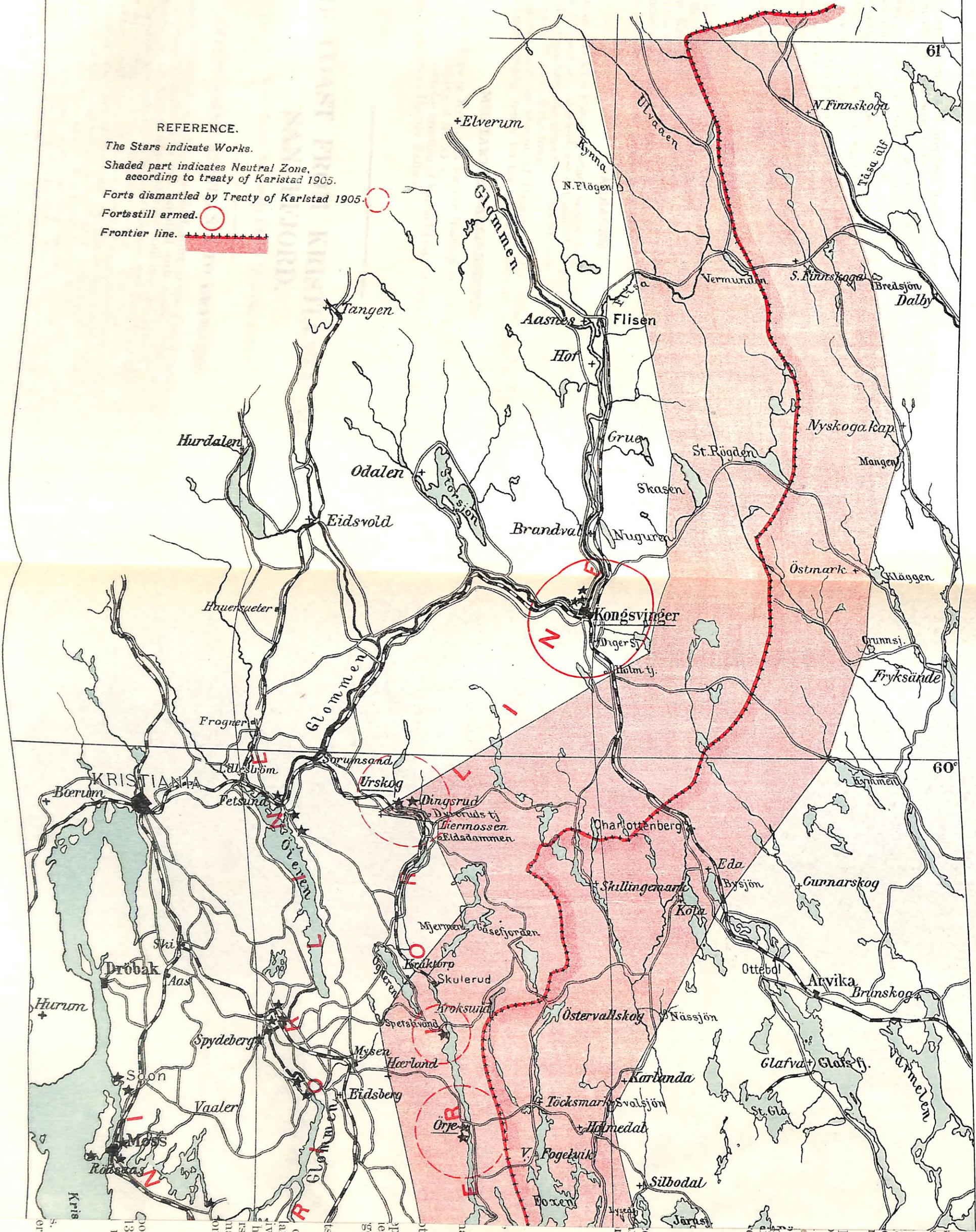
In its present unprotected state Karlsjohansvaern is practically valueless in war time. The advisability of providing new defenses, or removing the station to another location, is now under consideration. Until a decision is come to, little money is likely to be spent either in extending the old or in constructing new buildings, &c., at Horten.

DECLASSIFIED
Authority E.O. 10501

7° W. from Stockholm 6° 5°
LAND DEFENCES ON E. SIDE OF KRISTIANIA FIORD.

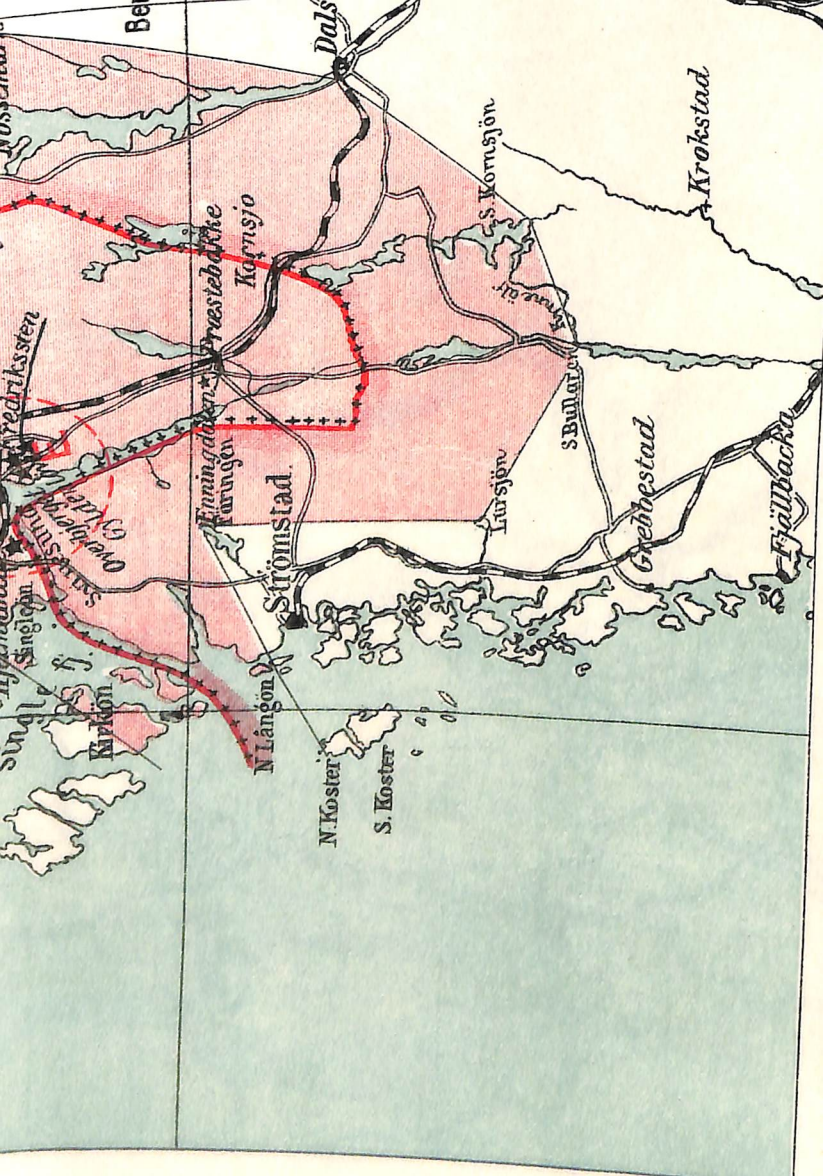


REFERENCE.
 The Stars indicate Works.
 Shaded part indicates Neutral Zone, according to treaty of Karlstad 1905.
 Forts dismantled by Treaty of Karlstad 1905.
 Forts still armed.
 Frontier line.



Authority E. O. 10501

only tent: 31
 and
 nance
 is a
 and
 er in
 ncial
 he
 the
 base
 to a
 pair-
 n for
 ready
 8897.
 und,
 st of
 tent:



The Special Committee which assembled in 1906 to consider the question has recently reported in favor of one of the two following plans, the choice being left to the Government:

- (1) To re-fortify Karljohansvaern at a cost of 540,000*l.*;
- (2) To abolish Karljohansvaern, and to establish a new naval station at Tromsund, north of Arendal, at a cost of 440,000*l.*, and to erect defenses there at a cost of 410,000*l.*

The Defense Law, passed in the Storting in 1912, provided for an expenditure of 38,889*l.* on the naval station in Kristiania Fjord, which presumably referred to Horten, but as already stated there has been considerable discussion as to the advisability of retaining this station for the use of the fleet. According to the opinion of experts, in 1914 the Naval Yard itself was considered to be well suited as the headquarters of the fleet, and as principal building and repairing base; it was as well equipped as could be expected in view of the money allotted for its upkeep, but it lacked suitable defenses. In the same year the sum of 122,222*l.* was allotted to a naval station in the Tönsberg district, so it may be assumed that in time to come the main base will be allocated elsewhere than at Horten; meanwhile money is to be spent to keep the Karljohansvaern yard in a suitable state for present requirements, and in April 1916, a proposal was laid before the Storting for a secret grant of 33,472*l.* for various extensions and modernising operations connected with the Karljohansvaern Naval Station, which points to the desire for at least a temporary retention of the site.

THE ROYAL DOCKYARD.

The dockyard is under the superintendence of the Vaerfts-director, formerly an officer in the navy, who holds the relative rank of kommandör. In regard to the working and financial management of the yard, he is directly under the Navy Department; in military matters he is subordinate to the Stationschef.

The four departments of the dockyard are:—

1. Engineering (Det Mekaniske Vaerksted).
2. Constructor's (Skibsbyggeriet).
3. Bookkeeping (Bogholderiet).
4. Rigger's (Ekvipagen og Takkelvaesenet).

The following departments of the Navy Department have their head offices, stores, and workshops, &c., in the dockyard:—

1. *Commissariat* (Hovedintendatur).
2. *Ordnance* (Artilleri). The director is a kaptein. The Laboratory and Ordnance workshop are under a kaptein. The Chief of Ordnance (Kanon Kontrollor) is a kaptein.
3. *Torpedo* (Minevaesen). Director—a kommandörkaptein; assistants—two kapteins and one engineer.

Since the mine defenses were transferrd to the Coast Artillery, this department has charge of the locomotive torpedoes only, including the batteries at Oscarsborg and Bergen, and mines carried on board ship. It also has charge of all electrical instalments, both afloat and ashore.

4. *Works* (Bygningsvaesen).
5. *Hydrographic* (Navigationsvaesen). In charge—a kommandörkaptein; assistants—a kaptein and 1st lieut.

The dockyard, the development of which has for some years remained stationary, is only capable of building, engining, and boiling torpedo boats, and executing repairs to larger vessels. The extent of the site, on the other hand, would permit of greatly increased activity. With the exception of building large ships, all work required by the navy is executed here, and the plant is presumably capable of meeting normal demands for alterations and repairs.

The destroyer "Garm" was built at this yard in 1913, and in the 1914-15 Estimates money was voted towards the fitting out of the Horten Dockyard for the construction of submarines, though so far as is known no steps have yet been made to lay any down.

The number of workmen employed in 1911 was 600.

Improvements.

In September 1914 work had commenced on a quay for submarines and torpedo boats, also an accumulator house and an experimental laboratory. 16,667*l.* was voted in the 1913-14 Estimates for new machines, and other improvements to the torpedo workshop, and new machines and tools for the dockyard shops were also to be supplied.

Lifting Appliances.

Three pairs of sheers, the largest being up to 30 tons, are mounted on the quays. A floating crane of 200 tons lifting capacity was provided in 1910, and on the same hull there is a smaller crane with a capacity of 25 tons.

DECLASSIFIED
Authority E.O. 10501

Docks.

The Government Dock is 305 feet long on bottom, 60 feet 4 inches wide at entrance H. W. O. S., and 20 feet 4 inches deep over sill, H. W. O. S. The longest Norwegian warship can be accommodated. Money was voted in the 1914-15 Estimates for altering the dock to afford more room for workmen, and consisted principally of an extension of the floor of the dock; it is believed that this has now been completed. The dock can be used by mercantile vessels under exceptional circumstances only.

Building Slips.

There are four building slips for torpedo boats or destroyers. It was reported in 1911 that a new slip was to be constructed for which a sum of 2,805*l.* had been appropriated.

Water Supply.

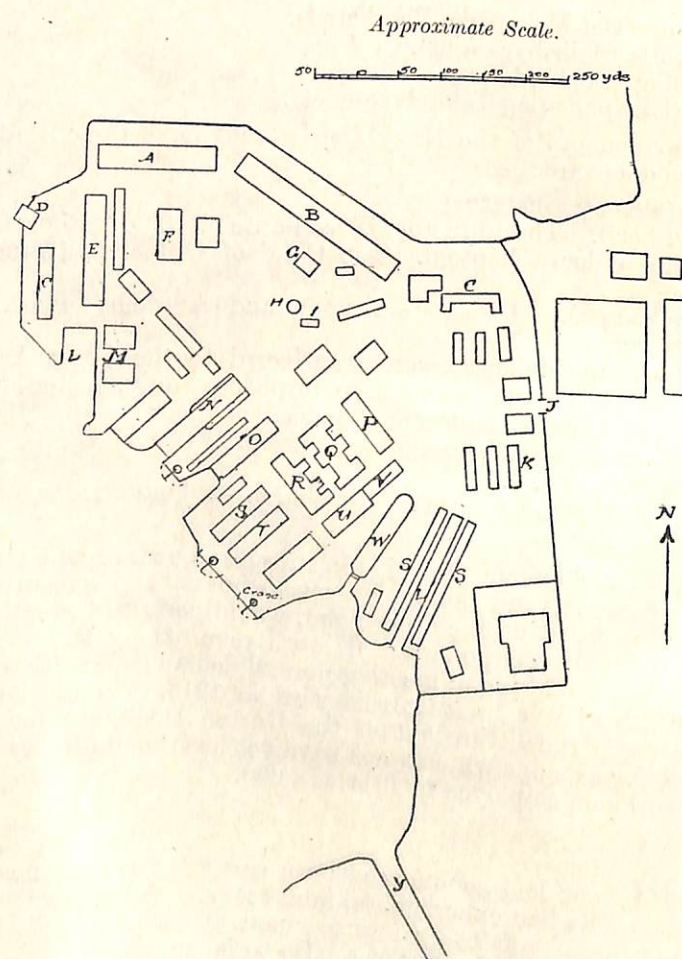
The water supply is from a reservoir on the hill to the west of and immediately opposite to the dockyard.

Coal.

It is understood that a considerable quantity of coal, the property of the Government, is kept at Horten. Vessels of 21 feet draught can coal alongside the wharf. Coal is stored on board two hulks in the harbor, which are fitted with steam winches; also in sheds at the coaling point on the N. W. side of the yard, and at the N. E. end of the dockyard.

Various Shops, &c.

The situation of the various shops, &c., is shown on the plan below.

Royal Dockyard at Karljohansvaern.

Reference.

A.—Boat shed.
B.—Torpedo boat store.
C.—Coal.
D.—Torpedo testing station.
E.—Wood store.
F.—Torpedo store.
G.—Submarine safety tank.
H.—Signal station.

I.—Charts.
J.—Dockyard entrance.
K.—Joiners' shop.
L.—Camber.
M.—Boats.
N.—Building slip.
O.—Repairing slip.
P.—Offices.

Q.—Machine shop.
R.—Boiler shop.
S.—Stores.
T.—Rigging loft.
U.—Power station.
V.—Coppersmith's shop.
W.—Dock.
Y.—Canal.

Machinery and Tools.

The machine and erecting shops were recently supplied with modern electrically-driven machines. The erecting shop has two cranes of 12 and 6 tons capacity respectively. In addition to repairs the boilers and machinery for torpedo boats built in the yard are made here.

Power Station.

The power station contains two machines, but a third was to be installed which will admit of the yard being electrically lit.

This has probably now been completed.

Whitehead Torpedo Store.

The Whitehead torpedo store (210 feet by 45 feet by 20 feet) which is situated in the northern part of the dockyard, just south of Old Battery A., consists of a workshop, offices, and storeroom. The air compressor is in a small building close by. When visited in 1910 the building had been extended 40 feet; upwards of 180 torpedoes, mostly 45-cm., were seen, belonging chiefly to the torpedo boats stationed here. The total value of the stores is about 10,000*l.* (Estimates, 1904). There are rail tracks to the torpedo sheds and quay.

A new building was seen in 1910 at the north end of the yard immediately in rear of the torpedo store.

Torpedo Boat Sheds and Store.

Of the two torpedo boat sheds, one can accommodate 22, and the other 4, boats. All can be launched simultaneously. With the exception of coal, which is kept stored in bags, and provisions, the stores that are not actually in the boats are kept in lofts overhead. Provisions are kept ready for each boat in another storehouse. Boats that cannot be accommodated in the torpedo sheds, are hauled up during the winter in other parts of the yard, or remain in the water. In 1905, 1,400*l.* was spent in repairs to the slips, of which one was extended in 1909 to take two more boats.

Torpedo Testing Station.

A new testing station was erected in 1907 on the quay adjoining the store; torpedoes are fired into the harbor.

Mine Store.

As far as is known, there is no proper mine depôt in the dockyard. Only a small reserved stock is kept on the upper floor of one of the large storehouses.

Magazines.

There are four modern magazines on Mellemø and an explosive store on Östö.

Gun and Small Arms Store.

In the gun store are kept the light guns taken out of the ships during winter. The small arms store exists for the same purpose. Only small repairs to guns and mountings can be executed.

Tank.

A tank was erected in 1910 for exercising the crews of submarines in escaping from the conning tower in case of accident. It is situated in rear of the long torpedo boat store.

Drill Battery.

The hulk "Kong Sverre" is berthed alongside the yard; in addition to providing accommodation for conscripts the hulk is fitted up as a drill battery. There are 75, 65, and 57 mm. guns as well as smaller guns and loaders. The gymnasium, situated outside the yard, is also fitted up as a drill battery, and contains three guns fitted with swinging targets, and a fourth gun fitted with an aiming tube.

COMMUNICATIONS.**By Railway.**

Horten is situated at the terminus of a branch line, which joins the coast railway from Kristiania to Skien, at Skoppum (4½ miles). The railway station is at the south end of the town, and the railway follows the coast for 2 miles before branching inland.

By Road.

Two main roads leave Horten, one northwards along the coast to Nykirke, the other south along the coast through Borre to Tønsberg.

By Telegraph and Telephone.

The coastal telephone lines pass through Horten, and there is also telegraphic communication with Tønsberg and Holmestrand.

By W/T.

There is an instructional W/T station in the dockyard.

43730A-18-5

DECLASSIFIED
Authority E.O. 10501

MILITARY DETAILS.**COAST DEFENSES.**

The coast defenses of Karljohansvaern are antiquated and totally inadequate. A committee was appointed to draw up a scheme of defense in 1908, but the result of their report is unknown, though it is believed that nothing has yet been done to improve the present armaments, which are only M.L. guns.

The existing batteries are only armed with old M.L. guns. The batteries are briefly as follows:—

A on Chart 2.—Small earthwork at N.W. corner of Dockyard; armament, 7 small M.L. guns.

B on Chart 2.—A similar work inside the Dockyard.

C on Chart 2.—A 2-gun (9-inch M.L.R.) battery at N. end of Horten Spit (Möringen).

D on Chart 2.—A battery of 3 M.L. guns midway between Möringen and the canal.

E on Chart 2.—An earth battery of two 9-inch M.L. guns on the Spit near the mouth of the canal.

F on Chart 2.—Fort "Norwegian Lion" (Norskeløve) on Vealös Island, small M.L. guns.

There were no signs of works A and B at the time of a visit in April 1912, and it may be assumed that the works enumerated under this heading no longer exist, with the exception, perhaps, of a few guns retained for saluting purposes.

The question of including a vote in the estimates for fortifications at the naval station at Horten was under consideration in 1912; it was decided, however, that this matter should remain in abeyance for the present, as it was considered to be of greater importance for the moment to provide the material and personnel required by the fleet for upholding Norway's neutrality and for defending the west coast.

A committee appointed to consider the question of the defenses of this locality issued its report in May 1913, in which an expenditure of about 555,000*l.* on defensive works was recommended, to be allotted as follows:—355,000*l.* on works at Bastö, 37,000*l.* on Horten, and the remainder on Tönsberg.

There are altogether 21 S.B., M.L. guns used for saluting purposes. In 1916 it was reported that there were no defenses on Bastö Island.

LAND DEFENSES.

Land defense works have recently been constructed on the high ground west of Horten. A visitor in 1907 was informed that the armament included several large modern B.L. guns. The position is said to be of considerable extent, near Apenaes. One battery can be distinguished from Horten, surrounded by wire entanglement, but no guns are visible. There is no knowledge of any other work.

No vote for these defenses has appeared in the estimates. It is conjectured that the guns are those originally intended for the new-dismantled works on the east shore of the fjord, and if this is the case, no fresh vote would be required.

Quite distinct from the above are the works in connection with the land defenses on the west shore of Kristiania fjord, situated (it is stated) in Falkenstein Forest, a few miles from Horten. They were constructed about 1900 to 1902, and are probably merely prepared positions for light mobile guns, which are only mounted in war time.

SEAPLANE STATION.

There is a seaplane station situated on the north side of Horten Spit, east of the Dockyard. In May 1917, there were six seaplanes, but 20 more were proposed during the year. The housing sheds face the sea, and launching rails are laid down. There is a small factory attached to the station.

COAST OF TÖNSBERG FJORD.

The coast to the south of Horten is peculiarly free from natural obstruction as far south as the small town of Vallö, which stands on a promontory 6 miles further south. Vallö is only 3½ miles from Tönsberg, with which town it communicates by road, and it is of importance for the petroleum refineries which form the principal industry. To the south of Vallö there is a mass of islands as far south as the entrance to the Tönsberg fjord, of which Notterö and Tiömö are the largest. From Traelen, the bay west of Vallö, a canal has been dredged for vessels of 21 feet draught into the south-eastern basin of Tönsberg harbor, thus separating Notterö from the mainland. Vraengen, the sound between Tiömö and Notterö, connects the Sandö sund, which lies amongst the islands, with Tönsberg fjord, and has anchorage at several places, but it is very narrow and crooked, and there is a strong current. A ferry communicates between

the islands near the western entrance, and a telegraph cable crosses the strait from close to Tuten lighthouse in Notterö to Tiömö. There is telephonic communication between these islands and the mainland, and there is a commercial W/T station, situated in the southern part of Tiömö, on Thoraas hill.

TÖNSBERG.

(See Chart 2 and Admiralty Charts 3158, 3159.)

The port of Tönsberg is situated at the inner end of Tönsberg Fjord, which extends about 14 miles inland, and is separated from the Kristiana Fjord by the islands of Tiömö and Notterö. The southern part of the fjord is about 2 miles wide, studded with numerous islands, rocks and shoals, which render its navigation difficult, especially for large ships. Approaches to the Tönsberg Fjord may be made either through Töndegabet, the channel westward of Olsskier, or through Tiömö Kilm; the latter is the most usual route, the former being too narrow and dangerous for the easy access of large ships.

The northern lights of the basin which forms Tönsberg harbour are very shallow, and on the south side shoals extend 2 cables north and north-east from Danholm.

The south-eastern basin of the harbour is also shallow, but a channel, known as the Steens canal, has been dredged to 21 feet through which vessels may approach Tönsberg direct from the Kristiana Fjord, between Notterö and the mainland.

Small vessels of not more than 7 feet draught may pass through the Oslebak channel, on the east side of the Island of Veierland in the fjord, but this passage is very narrow and intricate. There are a considerable number of anchorages in the fjord, all of which are described in the Pilot. On the east side of the main islands, Sandö sund is a channel through the "Skärgård" for vessels drawing not more than 16 feet of water, and Rysse sund may also be used by vessels of moderate draught; there are also several approaches to these channels through the outer rocks, all of which are described in the Pilot.

THE COMMERCIAL PORT.

The port is available for ships of large size, though only those of moderate draught can approach the quays. Of late years it has been chiefly known as the headquarters of the Norwegian whaling and sealing fleet, which consists of about 50 vessels, one third being steamers.

Quayage.

The total length of quayage is about 2,000 feet with a depth alongside of from 16 feet to 20 feet.

Shipbuilding Capabilities.

The "Kaldnaes Patent Slip" Company owns a shipbuilding yard at Tönsberg. An auxiliary fuel oil steamer for the Norwegian Government has recently been launched by this firm, which had total orders in 1916 for five vessels, the largest of which was to be of 550 tons dead weight. In 1916, it was reported that the "Kaldnaes" Company had increased its capital for the purpose of building a large new dock, which is said to have some connection with the new fortification of the Kristiana Fjord.

A large new shipyard was reported in 1916 to have been established at Tönsberg in Jarlsö (? Gaasö) Island, where for many years there have existed smaller yards for sailing ships. It is stated that the new yard will be able to build steamers of upwards of 6,000 tons and that the company will commence with a capital of one million kroner. An arrangement has been made with the "Fredrikstad Mekaniske Verksted" to supply all the engines and boilers required by the new yard.

Repairing Facilities.

Small repairs to hull or machinery can be carried out by the firms of "Kaldnaes," and "Foyens Vaerft" on Husö; there is also a small repairing yard at Vallö for quite small vessels.

Patent Slips.

The "Kaldnaes Mekaniske Verksted" owns a patent slip which can take vessels up to 200 feet in length. In connection with this slip there is a side slip which can take three ships, each of a length not greater than 100 feet. The "Foyens Vaerft" Company owns a small slip for the use of whaling vessels and such craft, not more than 90 feet long.

Coal and Coaling Facilities.

In 1913, coal imports to the amount of 20,500 tons were brought to Tönsberg. About 1,000 tons is usually kept in stock. Vessels usually coal alongside the coaling wharf where there is a depth of water of 16 feet.

Trade and Shipping.

The principal exports are pit props, oil, and guano, and imports consist chiefly of coal, barley, hemp, and salt. In 1911, 276 vessels with an aggregate tonnage of 76,074 tons, entered the port in the foreign trade. According to the Norwegian Veritas Register for 1912, the port of Tönsberg owned 237,000 tons of steam tonnage and 15,000 tons of sailing vessels.

THE TOWN.

The town is beautifully situated at the inner end of the Tönsberg Fjord, facing S. W. It is the oldest town in Norway and was originally a town of very considerable importance in the Kingdom. In 1915 the population was about 11,000 inhabitants.

COMMUNICATIONS.**By Sea.**

There is daily communication with Kristiania and the coast ports by steamer.

By Railway. (See Map 1.)

Tönsberg is situated on the main coast line from Kristiania (71 miles) to Skien (55 miles). There is also a branch railway line *via* Hillestad (20 miles) to Eidsfoss (30 miles), at the south end of Lake Ekern with its railway carriage works.

By Road.

Two main roads actually leave the town, one to the eastward where it splits up into two branches, the southern running to Vallö and the northern following the coast line to Aasgaard from Larvik to Drammen. The other main road communicates in a N. W. direction with the main road running

By Telegraph and Telephone.

Tönsberg is a main center of the coastal telegraph and telephone system, communicating direct with Kristiania. There is communication by telegraph and telephone with the W/T station on Tiömö, and with several of the outlying islands at the entrance to the Kristiania Fjord. There is telephonic communication only to Eidsfoss.

MILITARY DETAILS.**COAST DEFENSES.**

(See Chart 2.)

Tönsberg Fjord was fortified a few years ago in order to provide a base for the Fleet less open to attack than Horten. The defenses were completed about 1898. A committee appointed to consider the question of the defenses of this locality recommended, in May 1913, a sum of 163,000*l.* to be appropriated for this purpose, but it is not known whether any further steps have been taken as no details have appeared, excepting that a grant was made in 1914 of 144,444*l.* towards the Tönsberg defenses. A permanent garrison now mans the guns of the forts and serves continuously for a period of six months. There are altogether 14 field guns in the Tönsberg defense area, the position of some of which are on Nötterö, but none are permanently mounted. A steamboat was purchased in 1901 for running trips to Tönsberg from Melsomvik and other establishments. A new range-finder was purchased in 1908.

HAA ISLAND SITE.

On the north-east shore of the island, opposite Tinvik, there are three buildings, the northernmost of which has the appearance of a mine store, the next that of a boathouse, and the third that of a magazine. Close to the mine store a number of sinkers are stored in the

open. On the wharf close to the magazine is a small crane. A telephone cable leaves the island just north of these buildings and is landed on the shore opposite immediately north of Tinvik.

On the north-west shore, near the northern extremity of the island, there are six buildings, the northernmost of which has the appearance of a magazine; the next one is a dynamite store, and the third has the appearance of a magazine. The fourth and fifth are two-storied and appear to be used as storehouses and coal stores. The southernmost building also appears to be a coal store. A water tank is secured close to the dynamite store and on the wharf is a small crane.

On the west side of the island, a short distance north of battery No. XVIII. and close to the water edge, are two small buildings; one is apparently an engine house and has a pipe running down to the water, the other is almost hidden behind a rock and is protected by wire entanglements.

Close to the water's edge and a short distance west of the southern extremity of the island is an entrance into the rock, also protected by wire entanglements.

All the gun positions are surrounded by wire entanglements, as also are the magazines at the north end of the island.

No. XVI on Chart 2.

The guns are mounted independently near the S. end of the island. Two 21-cm. guns are mounted on the summit of two peaks about 120 feet above the sea level.

Slightly northward of, and a little higher than, the westernmost of these two guns, is a third, judged to be a 15-cm.

On a third peak to the E., and about 80 feet above the sea level, is another (apparently) 15-cm. gun.

When the guns were seen in 1907 they were all housed in, so that the caliber of the two smaller guns may have been misjudged. Two 21-cm. guns, however, are known to be mounted here.

The heavy armament on Haa Island consists of—

- 2—21-cm. (8.2-inch) guns.
- 2—(?) 15-cm. (5.9-inch) guns.

Nos. XVII and XVIII on Chart 2.

On each side of the island, in the positions marked on the chart, two light Q. F. guns are mounted about 30 or 40 feet above the sea level for the protection of the minefields.

The light armament on Haa Island consists of:—

- 4—57 mm. (6-pdr.) Q. F. guns.

SUNDSAAS SITE.**No. XIX on Chart 2.**

This battery has been constructed on the high ground at Sundsaas, on the western shore of the fjord.

Two guns at the summit of Sundsaas were clearly seen against the sky-line from the northward in July 1913, and appeared to be of at least 15-cm. caliber.

An alternative earlier report of the possible armament has been stated as—

- 2—12-cm. (4.7-inch) Q. F. guns.
- 4—65-mm. (10-pdr.) Q. F. guns.

There is a magazine and some houses used as barracks on Sundsaas.

SUBMARINE DEFENSES.

There are two minefields, one on each side of Haa Island, for which the observation station is on Haa Island.

The firing station is on Haaoholm, and is surrounded with wire entanglement.

In July, 1913, a mining launch was observed weighing cylindrical mines, which had evidently been some time in the water, in the position marked on chart 2, "Probable Minefield" to the westward of Haa Island. Altogether three mining launches were seen, two of which were alongside the mine store on the N. E. shore of the island.

In 1914, the commandant of Tönsberg forts issued an announcement to the effect that mines had been laid at Vraengen, in the strait between Nötterö and Tiömö, the guard ships for which were stationed at Buerstad and Burstangen, and during the war a further announcement was made warning ships of the presence of a minefield at Vraengen.

There is also believed to be a minefield between Husö and the mainland to protect the approach to the Steens Canal.

SEARCHLIGHTS.

There are known to be searchlights on Haa Island, but their number and position is unknown.

BARRACKS.

Five buildings, erected about ten years ago, are situated on Haa Island for the accommodation of 20 officers, 50 N. C. O's, and 350 men.

GARRISON.

The war garrison of the Tönsberg defenses is believed to consist of the officers and men above-mentioned with the addition of a mining section.

Melsomvik. (See Chart 2 and Plate 7.)

Situated about 5 miles south of Tönsberg, and on the west side of the fjord, is the small bay known as Melsomvik, on which is situated the naval laying-up harbor of that name. The locality is thickly wooded. It is a calling place for the Tönsberg—Tömö steamers, otherwise communication is by railway from Tönsberg to Stokke, whence Melsomvik is about 1½ miles by road.

A certain amount of coal used to be stored here, in addition to that kept in hulks moored off the yard. A landslide occurred here, however, in November 1912, and at the time of a visit in July 1913 no coal could be seen. Further up the fjord on the west side opposite Kausen there was a large heap of coal, containing some 3,000 or 4,000 tons, which leads one to assume that the depôt has been shifted.

In the yard there are some boat sheds, a torpedo store, and various other stores, one of which has been converted into a small machine shop with some lathes, a planing machine, &c. There are two small cranes on the wharf.

The water supply is from a reservoir on the hill, west of the yard, which is connected up by telephone.

To the south of the yard there are five buildings which have the appearance of magazines or mine stores. They are all connected by rails with the wharf.

About a third of a mile to the south of the yard, and close to the water are two buildings, probably intended for mine stores.

Plate 7 gives a view of the laying-up harbor and of the two buildings, a third of a mile south of the yard; at the time the photos were taken (1912) the latter were under construction, but have since been completed.

This establishment is under a naval officer of Kaptein rank, with two officers of the commissariat branch under him.

It was once the intention to make Melsomvik the chief naval station of Norway in war time, but, owing to the narrowness of the approach up Tönsberg Fjord, this idea has probably been abandoned.

In 1914, a vote of 122,222 $\frac{1}{2}$ was made toward the establishment of a naval station in the Tönsberg district, and a further grant was made in 1915 for the requisitioning of land at Melsomvik, but there is nothing further to show that this base has been specially selected as a new naval station on a large scale, except that a further report in 1916 stated that it was proposed to build a harbor here for the accommodation of men-of-war, though at the time no progress had been made toward construction. It is believed that a coast defense gunboat is usually stationed at Melsomvik.

COAST FROM TÖNSBERG FJORD TO SANDEFJORD.

(See Chart 2 and Admiralty Chart 3158.)

To the westward of the entrance to Tönsberg Fjord, the coast line is conspicuous by two long peninsulas, down each of which run roads from Sandefjord at the head. Between the two peninsulas is Midtfjord, which extends nearly 5 miles inland, and contains a number of anchorages (see Pilot). The entrance to Sandefjord is one mile west of Midtfjord, and vessels may approach it either eastward or westward of Rauøer and south Eastgrund, both of which lie off the entrance 3 miles. The islands of Svenøer, to the westward of the Rauøer group, mark the west side of the entrance to Kristiania Fjord.

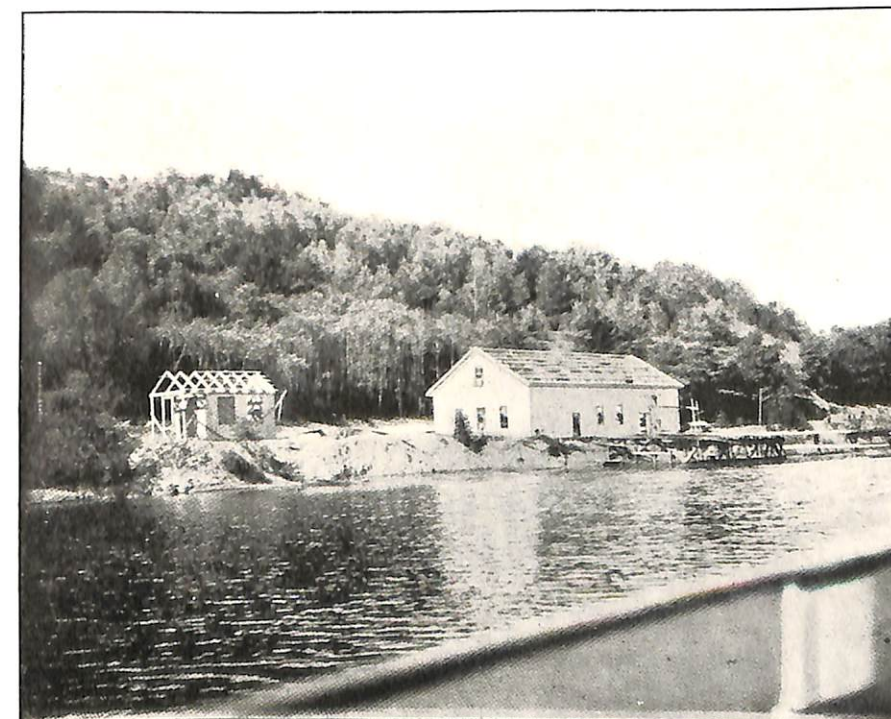
Sandefjord.

Sandefjord lies at the head of the fjord of the same name, and has a good harbor with a depth of 7 fathoms, shoaling to 4½ and 2½ fathoms. The town is a favorite watering place, and is much frequented by invalids on account of the medicinal effect of its mud and sulphur baths. It is also a busy shipping port, and according to the Norwegian register of 1913 the town owned about 88,000 tons of steamer tonnage, and 27,000 tons of sailing.

There is a navigation school in the town which had a population in 1913 of 5,800 inhabitants.

MELSOMVIK.
Naval Laying-up Harbour.

? Magazines or Mine Stores.



? Mine Stores.

DECLASSIFIED
Authority E.O. 10501

The Commercial Port.

The length of quayside in the harbor is about 1,000 feet with a depth of water alongside varying from 10 feet at the eastern end to 17 feet at the west quay. There is one crane to lift 4 tons.

Steel steamers up to 1,883 tons have been built by the "Framnes Mekaniske Verksted" at Sandefjord, which is a firm which builds a considerable number of vessels of the smaller type. There is a mechanical workshop where large repairs to machinery can be undertaken, and the works have two cranes, lifting respectively 30 and 15 tons.

The three floating docks operated by this company, having a lifting power of 5,500 tons, 1,600 tons, and 900 tons respectively, and the two smaller docks can be combined to take a vessel 330 feet long and of 4,000 tons displacement. Further details are given in the "Dock Book." There are three building slips for small steamers.

Coal for steaming purposes can be obtained, the quantity usually kept in stock being about 2,000 tons.

Communications.

In addition to steamer communication, which is fairly frequent to other coast towns, Sandefjord is situated on the main railway line from Kristiania (86 miles) to Skien (40 miles); the distance from Tönsberg by rail is 21 miles. Sandefjord is the center of a network of roads which communicate with various parts of the coast, and inland; it is within about 2 miles of the main road from Kristiania to Larvik, and is in communication with the main road running northwards from Larvik up the Lagen River valley.

The town is on the coastal telegraph and telephone system, but there is no communication by either directly inland.

Land Defenses.

It was reported in 1902 that the fortifications at Sandefjord had recently been completed at a cost of 900*l*. They consist, it is understood, of a work on Mokollen (near Sandefjord), and another on Braarudaasen (unidentifiable). There is no further information.

DECLASSIFIED
Authority E.O. 10501

INDEX.

[Defenses are printed in *italics*.]

Aas.....	12	Gaasö Island.....	35	<i>Kringrud Battery</i>	18
Aasgaardstrand.....	26	Gardermoen.....	27	Kristiania.....	19
Akers Elv.....	21	Gaustad Asylum.....	25	Kristiania Fjord.....	4
Akershus.....	23	Gleingsholen, Lake.....	10	Kroderen.....	24
Akers Mek. Verksted.....	9	Glommen, River.....	6	Krogstad Leret.....	11
Ahusus.....	34	Glommen s. Mek. Verksted.....	8	Kuskier.....	4
Apenaes.....	13	Graevikfloen.....	6	Kvaerners Brug.....	23
Askholm Islands.....	11	Gravningsundet.....	9	Kykkeisrud Falls.....	25
Askim.....	6	Grönsund.....	27	Ladegaard Peninsula.....	19
Asmalö.....	6	Grorud.....	25	Lagan, River.....	30
Baegna, River.....	28	Hano Island Battery.....	36	Langeles.....	27
Bækkelaget.....	25	Haagen.....	13	Larvik (Laurvik).....	30
Baerum Ironworks.....	34	Haeholm.....	37	Laner.....	4
Bastö Island.....	24	Haegholm.....	19	Lauersvaengen.....	4
Bergen.....	34	Hagerholm.....	18	Laurvik (Larvik).....	24
Bergsholmen.....	13	Hakavik.....	25	Liabro Chaussée.....	25
Björholm.....	23	Hamar.....	24	Lier.....	28
Björviken.....	19	Hankö.....	5	Lilleström.....	24, 27
Björnaas.....	12	Hanshaugen Hill.....	24	Lindö.....	19
Bjrgstad Vand.....	25	Haslum.....	25	Ljan.....	19
Borre.....	33	Hauersæter.....	27	Löbe Channel.....	25
Borregard.....	11	Heia.....	5	Lo Elv.....	6
Braarudaasen.....	27, 39	Hellestad.....	4	Lövö.....	25
Bragernes.....	28	Hillstad.....	30	Lysaker.....	30
Brafo.....	4	Hjortnaes Bay.....	19	Lysaker Elv.....	25
Brevigs Vaerft Kompagni.....	5	Hoff.....	30	Lysaker Fjord.....	27
Brevik.....	24	Holmegil.....	5	Magnor.....	24
Buurstad.....	37	Holmen Island.....	28	Meijorstuén.....	24
Bundeifjord.....	19	Holmenkollen.....	25	Maridal, Lake.....	25
Burstangen.....	37	Holmestrand.....	30	Mellemö.....	21
Bygdö Peninsula.....	19	Holsfjord.....	28	Mellerud.....	30
Cicaignon Fort.....	9	Hönefoss.....	9	Melsonvik.....	5
Danholm.....	35	Horten.....	24	Midtfjord.....	38
De-No-Ea.....	8	Hovgsund.....	30	Mokollen.....	38
Dombaa.....	24	Hoved Battery.....	14	Möringen.....	27, 39
Drammen.....	28	Hurum Landet.....	12, 27	Mosse.....	11
Drammens Mek. Verksted.....	28	Husö.....	35	Moss Mek. Verksted.....	11
Drammens Fjord.....	28	Husvik.....	13	Moss Vaerft Aktieselskab.....	11
Drams Elv.....	28	Hutholm.....	9	Mulevik.....	30
Dröbak.....	12	Hvaler.....	9	Myreds Mek. Verksted.....	23
Dynekilén.....	9	Hvals.....	27	Mysen.....	5
Dynen.....	19	Idefjord.....	4	Nesod Peninsula.....	18
Ekeberg Hill.....	25	Isegren Fort.....	9	Nittedals Elv.....	27
Eidanger.....	24	Isegren.....	6	Nobbetorpnek Verksted.....	8
Eidsfoss.....	30	Jaeloen.....	11	Noeset Point.....	16
Ekern, Lake.....	30	Jarlsö Island.....	35	Nordstrand.....	16
Elverum.....	24	Kabahn, North.....	16	Norsk Bjeernings Kompagni.....	12, 20
Enningstalen.....	5	Kabahn, South.....	14	Nykirke.....	33
Faerter, Little.....	4	Kaldnaes Patent Slip Company.....	35	Nylands Shipbuilding Yard.....	33
Fagernes.....	24	Kallerød.....	9	Öeren.....	27
Falkenstein Forest.....	34	Karlshansvaern.....	30	Olsen and Borge.....	23
Felsund.....	27	Karlstad, Treaty of.....	27	Olskier.....	35
Filipstad Bay.....	19	Kausen.....	38	Onsö.....	8
Foerrested.....	13	Killigen.....	23	Orje.....	5, 26
Foss m.....	27	Kirkøb.....	4	Oscarshavn.....	13
Foigner's Staal — Beton — SKibsbyggering.....	11	Kjølbjerg Bridge.....	8	Oscarshavn, Fort.....	13
Foyens Vaerft.....	35	Kjølkjaern, Lake.....	28	Oslebak Channel.....	23
Frammes Mek. Verksted.....	38	Kobbernagten.....	19	Oslö.....	35
Fredrikshald.....	4	Kongsberg.....	20	Osterdal.....	19
Fredrikstad.....	5	Kongshavn.....	28	Ostö.....	6
Fredrikstad's Armatur Fabrik.....	8	Kongsvinger, Fort.....	20	Ostre Elven.....	30
Fredrikstad's Mek. Verksted.....	7	Kongsvinger.....	8	Ovressæter.....	9
Frogner Elv.....	24, 27	Kopas Battery.....	24, 26	Piperviken.....	26
Frognerkilen.....	19	Koster Islands.....	5	Porsgrund.....	19
		Kraegerö.....	6	Rauger Islands.....	38
				Ringerike.....	28

INDEX.

Roa.....	24	Smaastangen.....	11	Töndegabet.....	35
Rödsberget.....	5	Sognsvand.....	21	Tönsberg.....	35
Rydsse-stund.....	35	Soon.....	12	Tönsberg Fjord.....	35
Saekken Channel.....	4	Sorumsund.....	24	Torbjörnskier.....	4
Sandefjord.....	38	Spydeberg.....	27	Torgauten.....	11
Sandesogns Fjord.....	30	Stabaek.....	25	Trælen.....	34
Sandesund.....	34	Stellene Islands.....	35	Trondhjem.....	24
Sandviken.....	10	Stokke.....	18	Tronsstadodden.....	16
Sarpsborg.....	27	Storgründ.....	13	Tuten.....	34
Sarpsbøss.....	4	Strömsud.....	28	Tyveholmen Island.....	22
Sautö.....	17	Strömstad.....	5	Urskog.....	26
Seterstein Koldubö.....	6	Sundlokkén.....	11	Vaalér.....	12
Single Fjord.....	20	Sundsaas.....	37	Vallö.....	34
Skarnsö.....	29	Sundvolden.....	28	Vatland.....	6
Skars Powder Mills.....	25	Svangstrand.....	28	Vealäs.....	30
Ski.....	19	Svelvik Ström.....	38	Vealögabet.....	30
Skieløb.....	24	Svenöer Islands.....	38	Vierland Island.....	35
Skien.....	23	Svinesund.....	4	Verle Bay.....	13
Skillebaek.....	23	Tanger.....	28	Vest Fjord.....	11
Sköten.....	33	Telemarken.....	24	Vestre Elven.....	9
Skoppum.....	28	Thomas Hill.....	34	Vindfangerbugten.....	19
Skouger.....	5	Thunes Mek. Verksted.....	23	Vittingfoss.....	14
Skulerud.....	25	Tinvik.....	36	Vraengen.....	34
Slendal.....	29	Tistedalen.....	5		
Slottet.....	12	Smaaleneues.....	4		
Smaaleneues.....	13	Smaaskier.....	4		

DECLASSIFIED
Authority E.O. 10501