

Self-Unloading Freight Steamer *Huron*

Unusual Type of Lake Freighter Fitted with Discharge Boom and Conveyors for Unloading Bulk Freight—Trial Data

One of the most interesting vessels built on the Great Lakes last year was the self-unloading bulk freight carrier *Huron*, constructed at the Great Lakes Engineering Works, Detroit, Mich., for the Wyandotte Transportation Company, Wyandotte, Mich. The vessel was launched February 7, 1914, and completed April 22, 1914. Its length over all is 439 feet 3 inches and on keel 416 feet. The molded beam is 56 feet and the molded depth 30 feet.

The general arrangement of the vessel is similar to practically all bulk freighters, the machinery being aft and the pilot house and "texas" forward on the forecastle deck, with the quarters for officers and crew in the deckhouse aft and in the forecastle and "texas" forward. There are in all 21 hatches and the net cargo capacity at 19 feet draft is 8,000 tons of stone and on about 16 feet draft 6,000 tons of coal. The water ballast capacity is 5,200 tons, and the machinery installed is designed to give the vessel a speed of 12 miles per hour.

The cargo space is arranged in two long hoppers running practically the full length of the hold, the slope of the hoppers being about 35 degrees. The water bottom is 3 feet 6 inches deep for a width of 31 feet. On each side of this the side tanks are carried up to the slope of the hopper. Along the centerline of each of the fore-and-aft hoppers are 32 gates, spaced generally $7\frac{1}{2}$ feet between centers. These gates are of the hinged type and each one is operated by a large hand wheel with shaft and chains, as shown in Figs. 8 and 9.

Directly under the center of each of the hoppers and just above the water bottom is a 42-inch pan conveyor

running the full length of the hold, and rising at the forward end to discharge into a cross chute, which delivers the cargo from both the fore-and-aft conveyors to a 72-inch pan conveyor on the centerline. This centerline conveyor carries the stone up above the spar deck and discharges onto a 48-inch belt conveyor, which delivers the stone over either side of the ship.

This belt conveyor has a length of 100 feet between centers and is carried on a truss, which is divided at the forward end and arranged so that it can be lifted to an angle of 20 degrees and swung outboard to an angle of 90 degrees with the ship on either side. The maximum reach of the discharge conveyor is 67 feet from the side

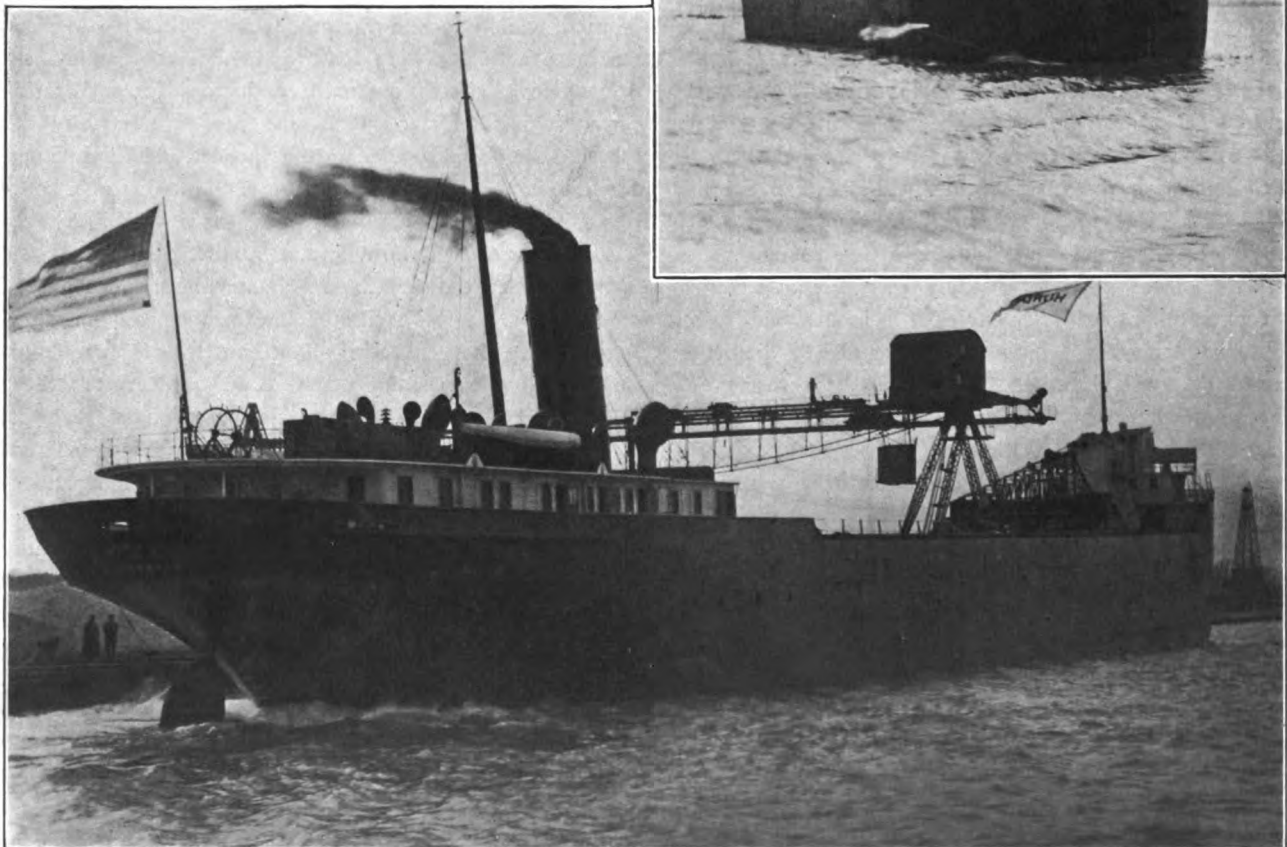


Fig. 1.—S. S. *Huron* at the Michigan Alkali Company's Dock

Fig. 2.—Bow View of the Vessel

of the ship and 52½ feet above the waterline, but, by the use of a short steel chute at the upper end of the boom, the stone can be thrown several feet farther from the ship than the actual reach of the belt.

CONVEYING MACHINERY

The conveyors are driven by two 150-horsepower reciprocating steam engines located on the spar deck in the forecabin. Ordinarily, one of these engines drives the two horizontal conveyors, while the other one drives the central inclined conveyor and the belt conveyor in the discharge boom. This same engine also drives the drum which raises and lowers the boom. The two engines are

per minute. The usual arrangement of cylinders has been followed in this engine, and the sequence from forward to aft is high-pressure, low-pressure, second intermediate-pressure and first intermediate-pressure. The crank sequence is high-pressure, first intermediate, low-pressure and second intermediate-pressure. The question of balance of moving parts has been given very careful attention, with results which have proved highly satisfactory in service.

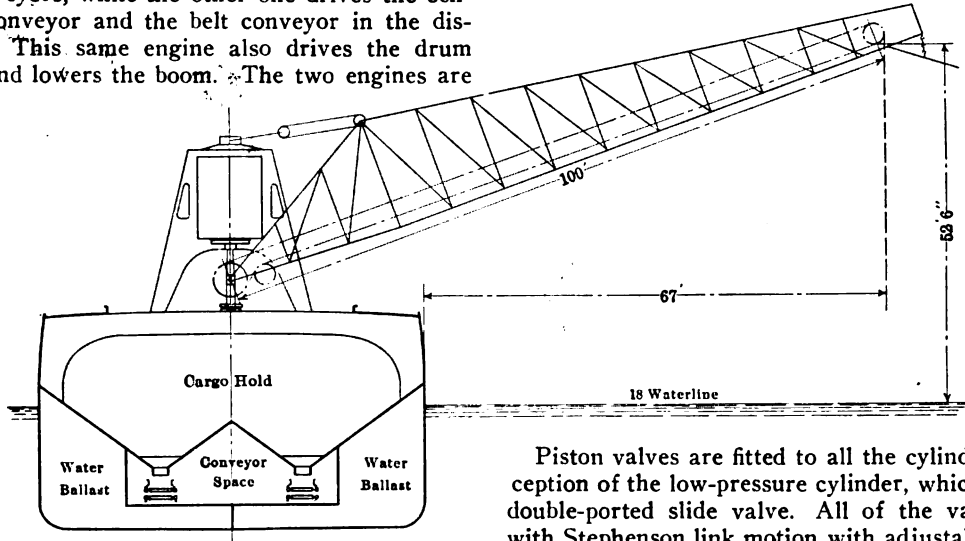


Fig. 3.—Cross-Section Showing Unloading Boom in Outboard Position

arranged with a connecting belt and clutches, so that in case of necessity either engine can be used to drive any part of the machinery.

The conveying machinery is all controlled by levers on the spar deck, just aft of the forecabin, so that the operator has a full view of the discharge boom and therefore has complete control of its movements.

PROPELLING MACHINERY

The main engine of the *Huron*, as stated before, is located aft. It is a vertical quadruple expansion engine with cylinders 19½ inches, 28¾ inches, 41 inches and 60 inches diameter with a common stroke of 42 inches. The designed indicated horsepower at 85 revolutions per minute and 35 pounds mean effective pressure is 1,770, while the maximum horsepower will run well over 2,000 with an increase in the revolutions to approximately 93

Piston valves are fitted to all the cylinders with the exception of the low-pressure cylinder, which is fitted with a double-ported slide valve. All of the valves are driven with Stephenson link motion with adjustable cutoff on the reverse arms. The high-pressure valve is 13 inches diameter; the first intermediate, 16 inches diameter, and the second intermediate, 21 inches diameter. All of these piston valves have a travel of 5½ inches. The low-pressure double-ported slide valve has ports 49 inches wide, while the travel is 7 inches.

All of the pistons are of cast-iron box section, the high-pressure having a removable solid follower ring with water grooves. The first and second intermediate pistons have removable follower plates and adjustable bull rings to allow for wear, while the low-pressure piston has packing rings with spring adjustment. In order to facilitate the balancing of the engine, the high-pressure and second intermediate pistons are heavy castings.

The piston rods are of open-hearth steel 4⅞ inches diameter in body, secured to the pistons with a taper fit and a 3¾-inch nut and to the crossheads with a taper key. The crossheads are of cast steel fitted with removable brass shoes on both ahead and astern faces; the crosshead pins are machine steel 5¾ inches diameter and 7¾ inches

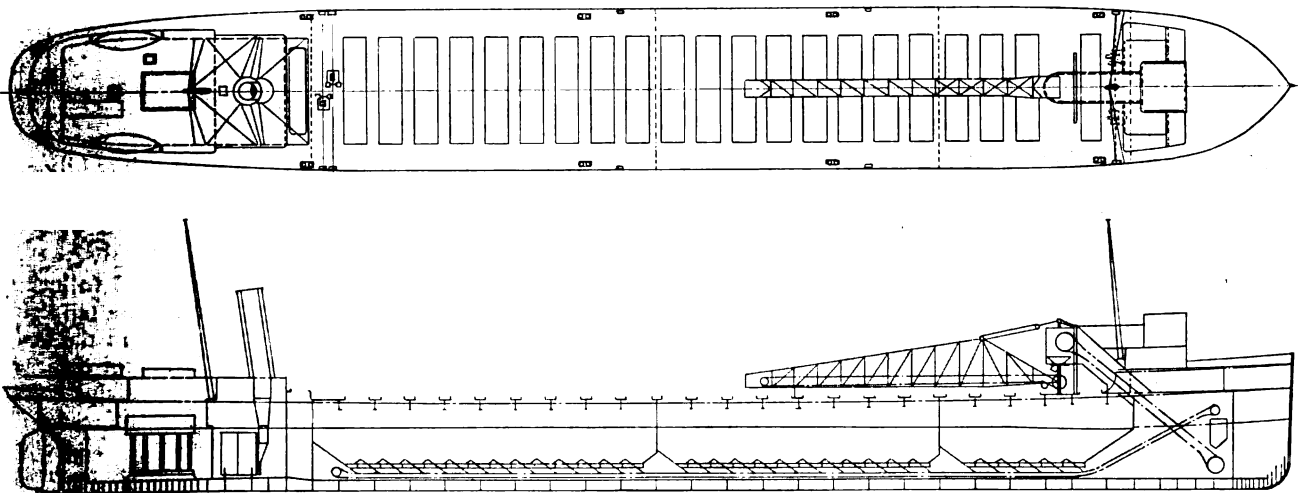


Fig. 4.—Deck Plan and Profile, Showing Arrangement of Conveyors on the *Huron*

long taper fitted to the crossheads for each piston rod.

The connecting rods are of open-hearth steel 8 feet 6 inches in length, center to center, with brass top end boxes adjustable for wear by means of a block and fore-and-aft taper wedge. The crank-pin boxes are of cast steel Babbitt-lined and are secured to the T ends of the connecting

cast with the crank slabs. The diameter of the crank shaft and of the crank pins is 12 inches and the length of the crank pins 11 inches. The shaft is supported in five journals, three of which are 18 inches long, and two 14 inches long, all lined with Babbitt and having semi-steel caps secured with binder bolts $3\frac{1}{4}$ inches diameter.

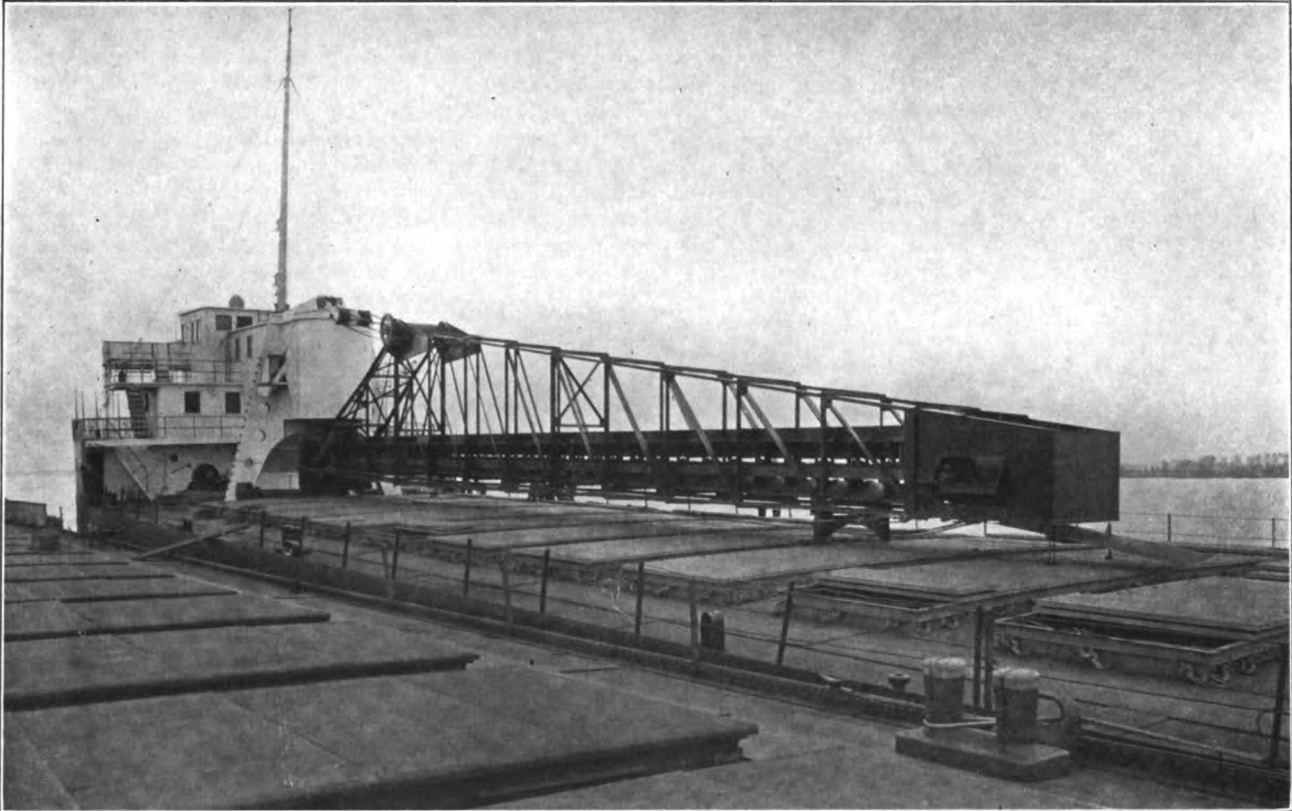
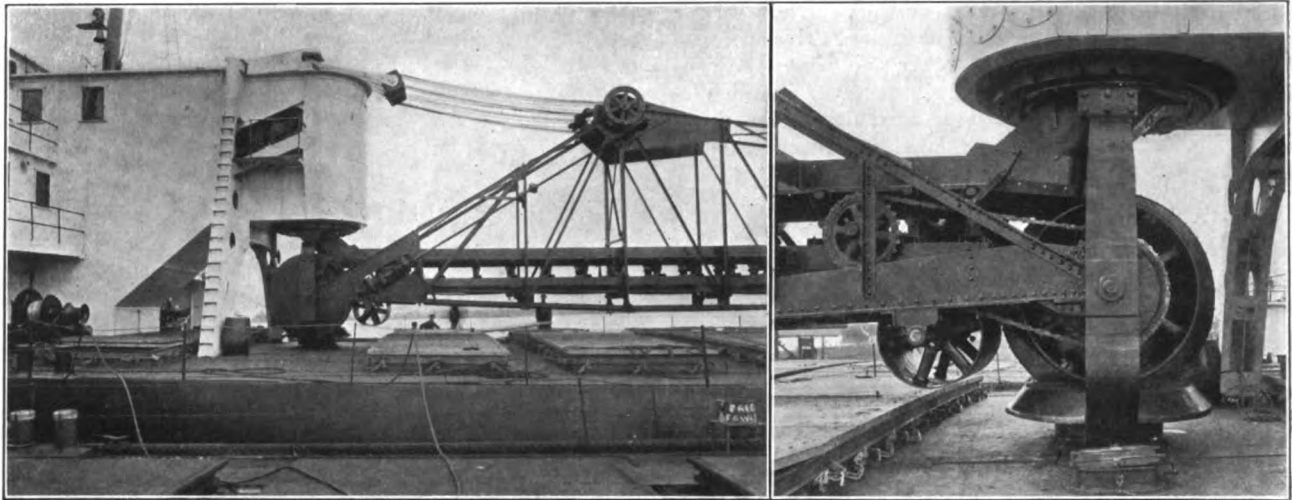


Fig. 5.—Upper End of Casing of Central Conveyor and Inboard End of Discharge Boom, Showing Method of Pivoting Discharge Boom and Blocking and Tackles for Elevating Boom

Fig. 6.—Inboard End of Discharge Belt and Boom, Showing Large Forging on Which Boom is Pivoted

Fig. 7.—View of Deck, Showing Discharge Boom and Forward House

rods with annealed steel bolts $2\frac{1}{2}$ inches diameter in the body and $2\frac{3}{4}$ -inch thread. The body of the connecting rod is $4\frac{3}{4}$ inches diameter at the top and $5\frac{3}{4}$ inches at the bottom.

The crank shaft is of open-hearth steel of the built-up type with cast steel slabs securely shrunk and pinned to the shaft. Near the center a coupling is fitted with one-half forged on the after section and the other half formed in the cast-steel crank slab. The forward high-pressure and after first intermediate slabs have balance weights

The thrust shaft is also of open-hearth steel 12 inches diameter with the thrust collars forged on. The tail shaft is of the same material $12\frac{1}{2}$ inches diameter in the body and $13\frac{3}{4}$ inches in the bearing, which is 4 feet 6 inches long fitted with lignum vita and Babbitt strips. The thrust block of cast iron has cast iron shoes faced with Babbitt on both faces and adjustable for wear. There are five collars, making the unit thrust pressure about 47 pounds per square inch.

The bedplate and both the front and guide columns of



Fig. 8.—View on Tank Top under Hoppers Looking Forward, Showing After End of Starboard Conveyor

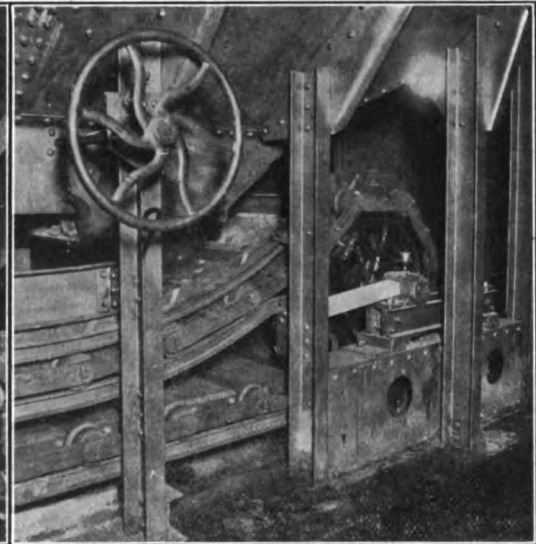


Fig. 9.—After End of Starboard Conveyor, Showing One of the Gates and Hand Wheel that Operates It

the engine are of cast iron of box section, all securely bolted at their various points of connection. Reversing of the engine is accomplished with a direct-acting steam cylinder 10 inches bore and 24 inches stroke, and provision is made for both reversing and turning the engine by hand.

The propeller is of the sectional type with four blades. Both the hub and blades are of cast iron with machine-steel stubs and brass ends. The diameter of the propeller is 14 feet 6 inches; the pitch, 13 feet 3 inches at the tip and 12 feet 1 inch at the hub, with a total developed area of 75 square feet.

BOILERS

Steam is supplied at a pressure of 215 pounds per square inch by two Scotch boilers, 14 feet 9 inches mean diameter

and 12 feet long over all. Each boiler has three corrugated furnaces, 44 inches inside diameter, leading to separate combustion chambers. The total heating surface in the two boilers is 5,192 square feet and the total grate surface 110 square feet, making a ratio of heating surface to grate area of 47 to 1. The heating surface in each boiler is divided as follows:

Tubes	2,211 square feet
Furnaces	140 square feet
Combustion chambers.....	245 square feet
Total	2,596 square feet

The draft area through the tubes is 13.28 square feet, making a ratio of grate surface to draft area of 4.14 to 1.

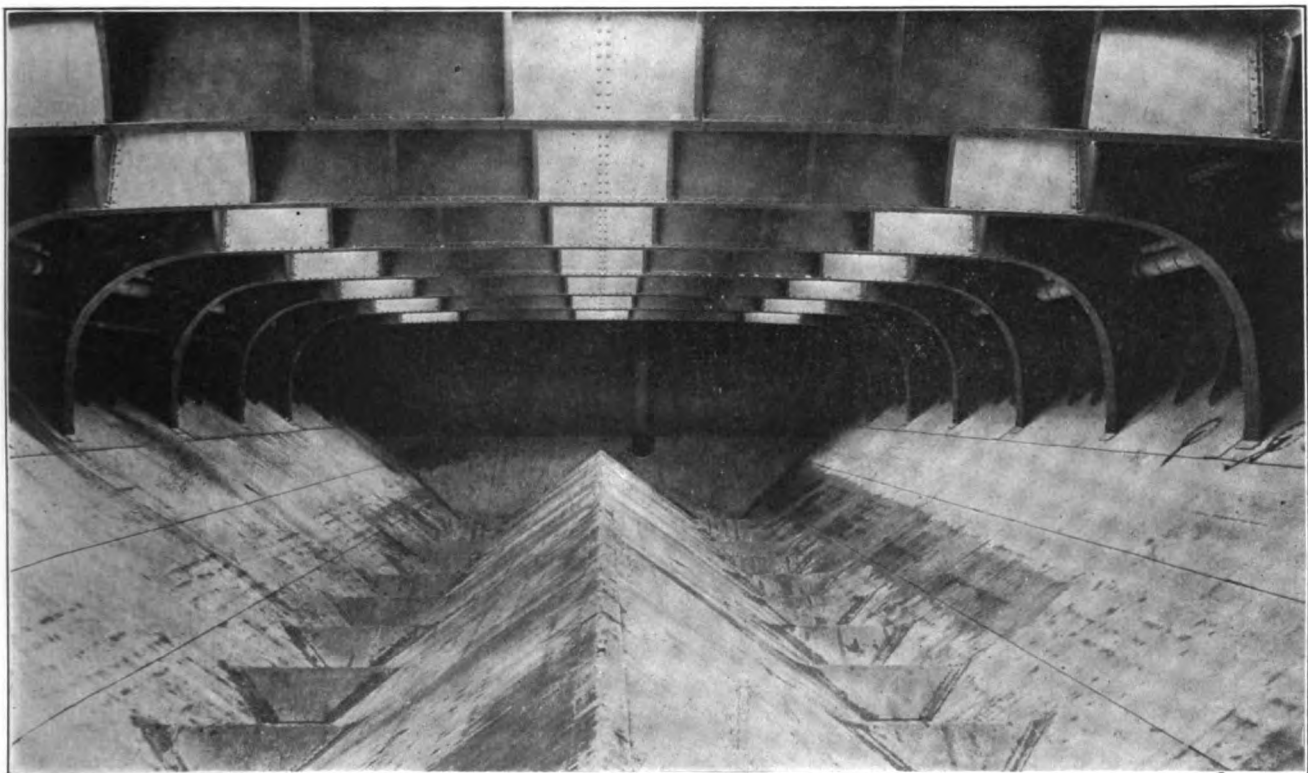


Fig. 10.—Inside of No. 3 Hold Looking Aft, Showing Fore-And-Aft Hoppers and Also Small Cross Hoppers

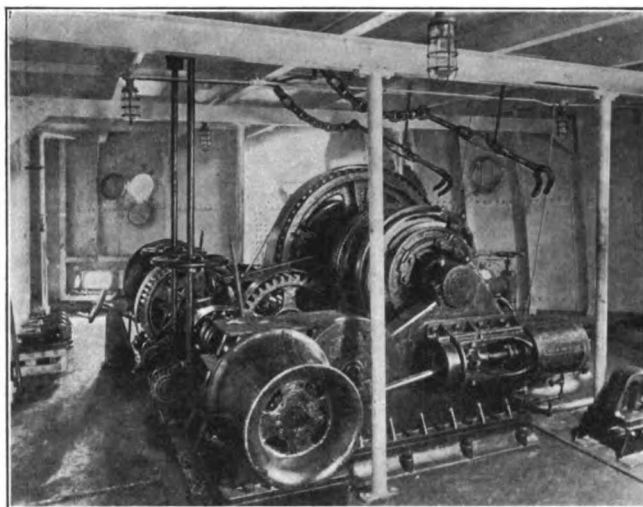


Fig. 11.—Windlass and Windlass Room

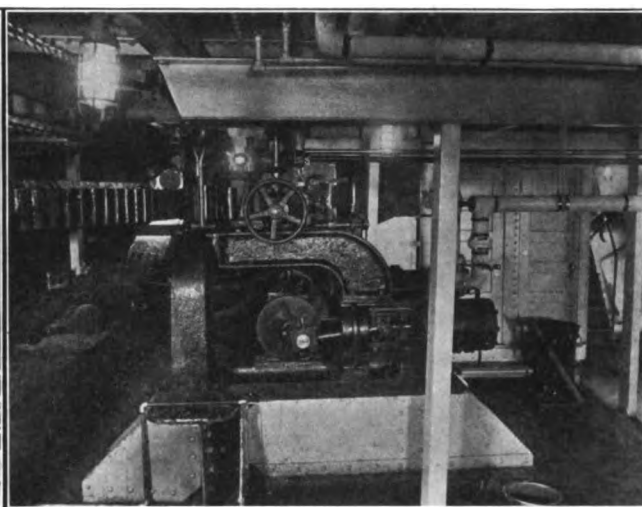


Fig. 12.—Steering Engine and Part of Quadrant

The boilers work under a system of positive heated draft, the air being conducted to the furnaces through a system of ducts.

The main steam stop valves are 6 inches diameter, and the main steam pipe 7 inches diameter. The auxiliary stop valves are each 5 inches diameter, supplying steam for all purposes, including also the unloading machinery forward.

The safety valves are 5 inches diameter, the feed valves 2 inches diameter, the main feed valves from the purifiers

are $4\frac{1}{2}$ inches, the main blow-off $2\frac{1}{2}$ inches and the surface blow-off $1\frac{1}{2}$ inches in diameter, respectively.

AUXILIARIES

All of the pumps in this vessel are independent of the main engine with the exception of the air, bilge and water-service pumps. The attached air pump is of the double-acting type driven from the low-pressure crosshead with a beam and connections. It is 24 inches diameter with a

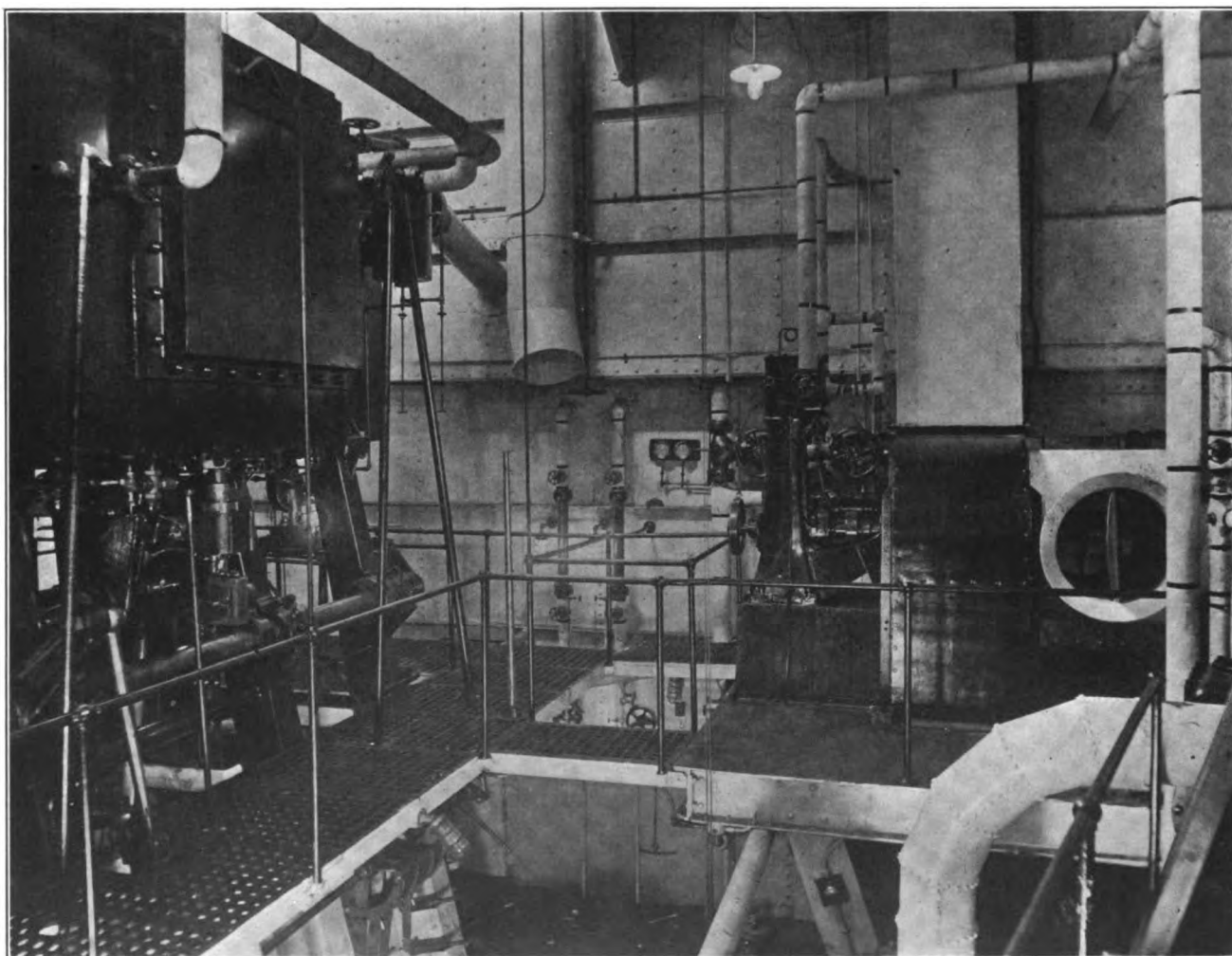


Fig. 13.—Starboard Side of Engine Room, Looking Forward at the Level of the Upper Grating

