

spring a leak as a result of coming in contact with any one of the many locks through which she passes in her regular trading.

"There are two independent controls from the bridge to the engine room telegraph, and the main steam steering engine is operated by rods from the bridge. As with the sister (sic) ships D. A. GORDON and A. E. McKINSTRY, there are two masts with derricks on each, and the chart house and navigating bridge are situated right forward. The rudder is balanced and is of large area. In the trials, the vessel turned in almost her own length, and when the helm was put hard over, she almost came to a dead stop. The propeller is 11 ft. 9 in. in diameter by 9 ft. pitch.

"The main propelling engine is a four-cylinder two-stroke cycle single acting Carels type of Diesel oil engine. The cylinders are 18.1 in. diameter by 32.23 in. stroke, and the engine runs normally at about 100 revolutions per minute. In the main features of the structure, steam engine marine practice has been closely followed. The columns of the engine are of the box section, bolted rigidly together at the top, and are very thick, to withstand the tension stresses consequent upon the high pressures of the Diesel cycle. The cylinders have separate liners pressed in, and the liners have exhaust ports round the whole of their periphery, and communicate with an exhaust belt of large cross sectional area, running round the cylinder. The water spaces are large and ribs are cast on the inside of the cylinder to aid water circulation and to give the cylinder wall strength to resist the direct pull passing through it.

"On each cylinder there are six bolted doors, of about 9 in. diameter, permitting of ready inspection and cleaning of the water cooling space. At the bottom of the cylinder there is a lantern ring which serves to keep the joint between the cylinder and liner water tight, and further, to prevent the escape of cylinder gases into the engine room. Any leakage of gases goes into an annular chamber, which is connected to the scavenging pump suction, and is thus kept at a pressure below that of the atmosphere. The cylinder head is of cast steel and has large cooling water spaces, with seven valve openings; one fuel, four scavenging, one starting air, and one safety. The piston of the Carels engine is in two pieces. The top piece is carried by a shoulder on the piston rod, and the bottom piece, or shroud, is carried at its bottom by another shoulder on the piston rod. Water cooling is adopted for the piston, and the water is circulated by the action of the plungers.

"The arrangement of the engine into two units of two cylinders each permits of a two piece crank shaft in interchangeable halves, of the vertical spiral drive for the valve gear being taken from the centre of the engine, and also of the scavenging pumps being driven from the two centre crossheads by links, as with the air pump of steam engines. The dimensions of the double acting scavenging air pumps are 27 1/2 in. diameter with a 23 1/2 in. stroke, and give thus a ratio of free air compressed for scavenging to combustion air taken into the main cylinders of 1.65, which is higher than the usual practice.

"The pressure of the scavenging air is 3 lb. per sq. in. There are four valves in the cylinder head for the inlet of the scavenging air to cope with the large volume of low pressure air used in the engine. The scavenging pumps are controlled by two piston valves worked by slipping eccentrics driven from the aft part of the two piece interchangeable built up crank shaft, and the change of angular position permitted by the slipping of the eccentric on the crank shaft automatically reverses the scavenging pump piston valves. The scavenging air is led by cast iron pipes from the valves to a built up 3/16 in. lap riveted steel plate reservoir running along the cylinder top and supplying the four scavenging valves on each cylinder. The exhaust is led down by bent cast iron pipes from the cylinder belt to the main exhaust pipe running along the engine to the cast iron silencer. These bends have internal water injection and the silencer is also internally water cooled and is of the cascade design. The exhaust is led overboard under the counter. The funnel is for the exhaust gases from the donkey boiler (located in the boilerhouse at the forward end of the after deck cabin).

"Separate leads are provided from the water cooling pumps worked off the links driving the scavenging pumps, and cocks are provided on all these leads to regulate independently the amount of cooling water supplied to each part. The temperature of this cooling water may be felt, as there are open discharges into funnels leading to the bilges. As regards lubrication, for the main bearings solidified oil is used, for the crank pin bearings the ordinary drip feed suffices, and the bearing pressures for the main and crank pin bearings are