

### Oil Engine Vessel "FORDONIAN"

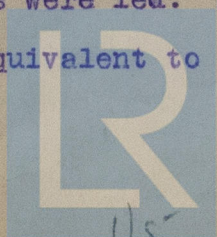
This vessel of 2368 tons gross was recently built at Glasgow under Special Survey for the Class 100A1, "For Canadian Service". She is fitted with a Diesel Oil Engine for her propelling power and with a two furnace donkey boiler placed on deck for working the auxiliary machinery, including steering gear, electric light etc., this boiler being intended to be worked continuously at sea. On completion she left the Clyde for passage to Canada but put back a few days later with machinery out of order.

Mr. J.H. Heck, the Senior Engineer Surveyor at Glasgow, was instructed to join the Greenock Surveyors and to report fully on the case for the information of the Committee.

From the reports made jointly by Mr. Heck, Mr. Tierney, and Mr. Austin it appears that the difficulties which led to the vessel's return arose mainly in connexion with the pumping arrangements of the vessel and with the air compressing apparatus connected with the main propelling machinery.

#### PUMPING ARRANGEMENTS

The vessel was fitted with two bilge pumps worked by the engine and one general service steam donkey pump. These were connected with the suction pipes leading to all parts of the vessel and were of the same size and description as would be fitted in a steamer of the same size and power. She was also fitted with a steam water ballast pump and this was fitted with special bilge suction in the engine room to take the place of the large injection which is fitted in steam vessels. The double bottom under the engines has a flat top extending to the sides of the vessel as is customary in Lake Vessels, but at the after end of the engine space the bottom was formed into a well into which the ordinary bilge suctions were led. Her pumping arrangements were therefore in all respects equivalent to those usually fitted in steam vessels.



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AIR COMPRESSING APPARATUS.

Diesel Engines require the oil fuel to be blown into the cylinders by highly compressed air. In the case of the "FORDONIAN" the main air compressor was worked by the main engines, and there was an auxiliary compressor, of about half the capacity of the main, worked by a steam engine taking its steam from the donkey boiler. The compressors deliver the air into four large steel storage bottles from which the supply is given to the fuel valves of the main engines and also to the starting valves. The main compressor is sufficiently large to supply all the air required by the main engines for fuel injection. The additional air necessary for manœuvring is supplied by the auxiliary compressor. The centre of the main compressor is necessarily at the centre line of the crank shaft and the arrangement was such that the air supply to the compressor was taken in from the engine room at about the level of the shaft.

Besides the air compressing apparatus which is required with all Diesel Engines, the engines of the "FORDONIAN", being of the 2 stroke cycle type, require air pumps for supplying the scavenging air which sweeps out the burnt gases from the cylinders and supplies the fresh air for the combustion of the next charge of oil. In this case there were two scavenge pumps and they took part of their air supply from the lower part of the engine room, near the level of the tank top.

DONKEY BOILER

The vessel is fitted with a large donkey boiler placed on deck. This boiler is 10 feet diameter by 10 feet long and has two furnaces. It is arranged to burn oil fuel and has a working pressure of 100 lbs per square inch. It is intended to be used continuously at sea for supplying the steam steering engine, the electric light apparatus and also for working the general service and water ballast donkeys and the auxiliary air compressor when required.

The donkey boiler was arranged to be supplied with feed water by means of a special donkey feed pump and also by an injector.



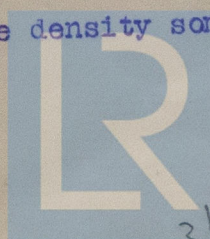
As the vessel is intended to trade upon the Great Lakes where the water is fresh these had suction to the sea, but for the voyage across the Atlantic it was arranged that one compartment of the double bottom should be filled with fresh water and the donkey feed pump had a special suction fitted to this compartment. The general service donkey was arranged also to draw from the sea and to feed the boiler in case of necessity.

#### WATER ENTERING THE ENGINE ROOM.

The engines are fitted with the same water service to bearings etc., as are usual with steam engines, the water used finding its way into the engine room bilges. In addition the pistons of the main engines are water cooled and the water for this also runs into the bilges. The cylinder cooling water is discharged directly overboard.

#### TROUBLES EXPERIENCED.

On the first day of the voyage the main engine bilge pumps were found not to clear the bilges properly and the general service donkey was put to pumping the bilge. At the same time it was found that the donkey boiler feed pump would not draw from the double bottom. The boiler was then fed with sea water through the injector. The next day the vessel put into Moville where some modification of the donkey pipes was made with the view of supplying the boiler with fresh water, but no attempt appears to have been made to ascertain the cause of the donkey boiler feed pump being unworkable or of the bilge pumps not working properly. (On the return to the Clyde it was found that the donkey feed pump suction pipe was choked with waste and that some of the bilge valves were jammed up with waste also) Through the use of sea water in the boiler the density of the water was then reported to be five times that of the sea. Some of the water was blown out and the density somewhat reduced and the vessel resumed her voyage.



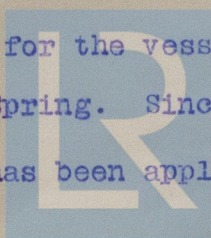


The next day the bilges had become full of water and as the vessel was rolling heavily the splash of the water entered both the main air compressor and the scavenge pumps. The engines were stopped and it was found that ~~that~~ the white metal had run out of the main bearing of the main compressor. The auxiliary compressor was then used. This had to be supplied with steam from the donkey boiler.

As the main engine bilge pumps and the donkey feed pump would not work, the boiler had to be fed from the sea by the injector, as it would not supply steam enough to work the general service pump for its own feed as well as to supply the ballast donkey which was working on the bilges and the auxiliary air compressor, the steering engine and the electric light. This necessitated stoppages for blowing down the boiler in order to freshen the water in it. After some efforts to continue the voyage it was determined to put back and the vessel arrived at Lamash on the 6th day after leaving. She was towed from Lamash to Greenock.

On her return one of the cylinder covers of the main engines was found to be cracked. This has been renewed. The defect was attributed to water getting into the cylinder through the scavenge pumps. The air inlets to the scavenge pumps and to the main air compressor have been carried considerably higher up in the engine room. It has been arranged that the double bottom under the engines shall, for the voyage out, be left open to the engine room to provide more space for the bilge water, and the ballast suctions to this space will now be available as bilge suctions. An extra bilge suction pipe has also been fitted so that now there are no less than six suctions in the engine room connected either to the main engine bilge pumps or to the two steam donkey pumps. The main compressor has been repaired by new bearings being fitted.

It has now been arranged for the vessel's departure for Canada to be deferred until the Spring. Since her return a Winter North Atlantic Load Line has been applied for and the



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Surveyors have made certain recommendations for temporary strengthenings to the hatches, etc.

Regarding the machinery they have recommended that an auxiliary condenser should be fitted capable of condensing all the steam from the auxiliary machinery as they consider it to be imprudent to attempt to carry sufficient fresh water in the double bottoms for supplying the boiler for such a long voyage, as the continued withdrawal of water from the tanks would produce such a large surface of free water as would materially reduce the metacentric height and the arrangement would also be objectionable from the violent motion to which the water would be subjected in bad weather. They also suggest that certain articles of spare gear for both main and auxiliary compressors should be supplied to lessen the liability to a complete breakdown, and they further recommend that a 24 hours trial should be made of the machinery, during four hours of which the main air compressor should be disconnected and the engines supplied with air from the steam driven auxiliary compressor only.

These recommendations are concurred in and it is submitted that they should be officially communicated to the representatives of the Owners.

#### CLASSIFICATION.

The classification of the vessel has been deferred on account of some articles of spare gear, as arranged for, not having been supplied. These have now been placed on board. It is, however, submitted that the classification should be further deferred pending the result of the proposed new trial of the machinery and the placing on board of the additional articles of spare gear and the auxiliary condenser as recommended.

*J.M.*

12.11.12.

*B.*

*E. G. G.*



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