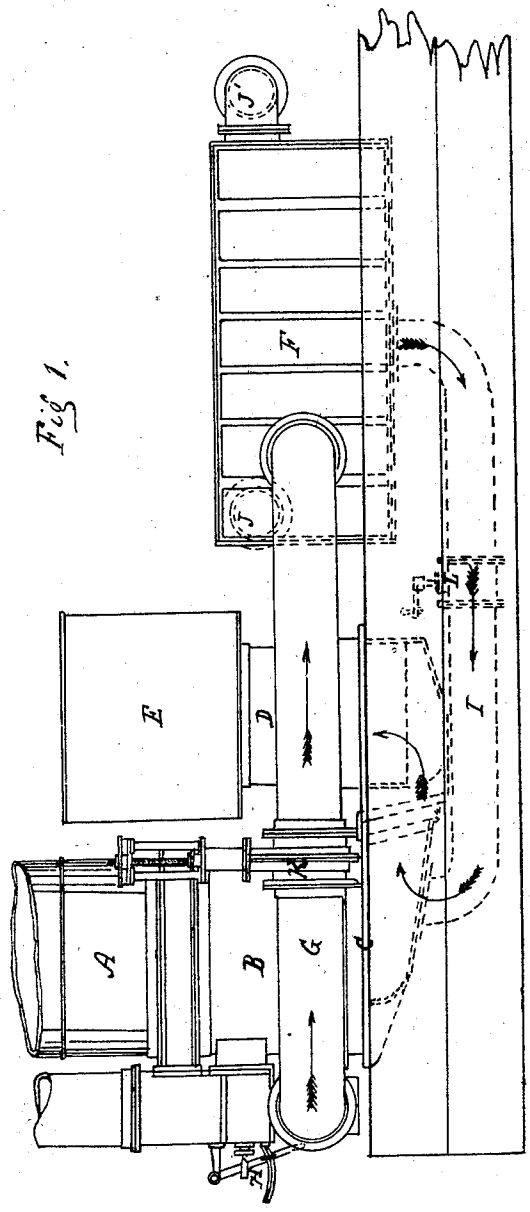
2 Sheets. Sheet 1.

W. A. Lighthall.

Condensing Engine.

No. 72054 Patented Dec. 10, 1867.

Fig 1.



Witnesses.

Francis S Lowe

E K Van Buren

Wm A Lighthall

2 Sheets. Sheet 2.

W. A. Lighthall.

Condensing-Engine.

No. 72054 Patented Dec. 10, 1867.

Fig. 2.

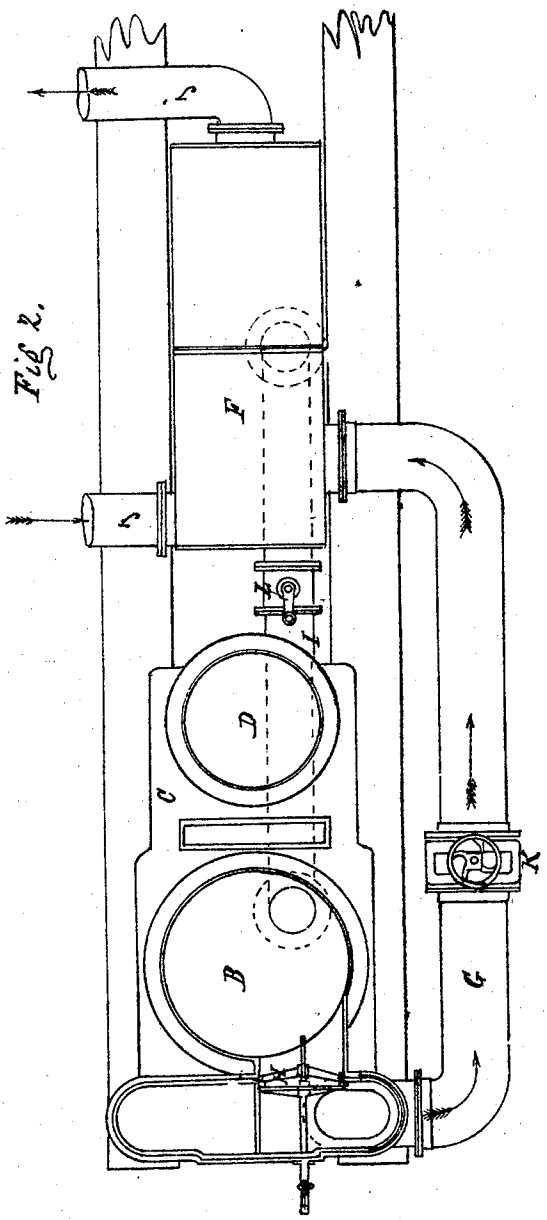
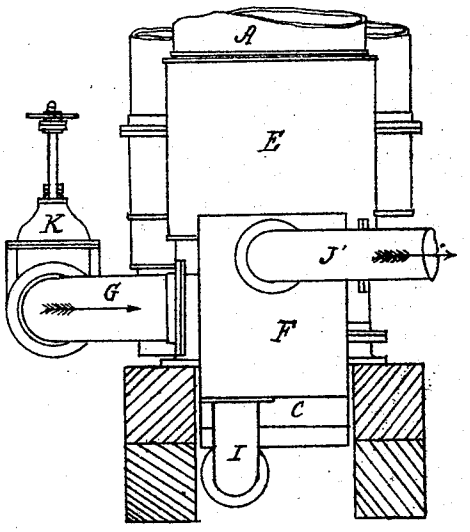


Fig. 3.



Witnesses
Francis S Lowe
E R Van Buren

Wm A Lighthall

United States Patent Office.

WILLIAM A. LIGHTHALL, OF NEW YORK, N. Y.

Letters Patent No. 72,054, *dated December* 10, 1867.

IMPROVEMENT IN CONDENSING-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, WILLIAM A. LIGHTHALL, of the city, county, and State of New York, have invented a certain new and useful Improvement in Condensing-Steam Engines for marine purposes; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, in which—

Figure 1 is a side elevation.

Figure 2 is a plan view.

Figure 3 is an end view.

The nature of my invention consists in so arranging the ordinary jet-condenser and air-pump of a condensing-steam engine with a surface-condenser (in which the condensation of the exhaust-steam from the engine is effected by contact with the tubes of the same, and through which tubes a proper supply of cooling-water is passed) as to enable the engine to be worked with either the jet or the surface-condenser, at will, and to allow the change from the one plan of condensation to be made to the other without the stoppage of the engine to which the apparatus is attached.

In the ordinary jet-condenser, the condensation of the steam is effected by the use of the water in which the vessel is floating. If this water is salt or impure, the feed-water follows the nature of the condensing-water, and feeds the boilers of the vessel with salt or impure water, the effects of which are too well understood by practical engineers to require comment.

With the surface-condenser the steam is exhausted into an apparatus composed of a series of tubes, through which tubes the cooling-water (the external water) passes, and around which the steam passes to be condensed. The water of condensation, not coming in contact with the water used for condensation, is returned back to the boiler fresh, so that the boiler is preserved from the injurious effects of the water fed to it by the use of the jet-condenser, and the engine is made more effective for the same amount of fuel used, for the reason that no deposition is made in the boiler to retard the action of the heat of the boiler. It may, (and does,) however, occur, that, by reason of a temporary defect in the surface-condenser named, the ordinary jet-condenser should be ready to be used in case of such an emergency, without the stoppage of the vessel, until the defect in the surface-condenser can be remedied so that the same can again be used. In such case, I make provision for shutting off the connection to the surface-condenser, and putting in action the jet-condenser until such defect can be remedied, the salt or impure water fed to the boiler in such case being ordinarily so slight in amount, and the duration of the use of the jet-condenser being so short, that no injurious effects to the boiler result; nor does the extra amount of fuel used amount to a quantity worthy of notice.

In addition to these benefits, my improvement is valuable for the reason that in case the surface-condenser should, from any reason, become so permanently disabled that the same cannot be used, then the jet-condenser can be applied so as to operate in connection with the engine in the usual way, using the ordinary "blow-off" to prevent the boiler from becoming sealed.

A is the cylinder, B the condenser, C the bed-plate, D the air-pump, and E the hot-well of an ordinary condensing-engine. F is the surface-condenser, located as shown, if possible, or in any other proper location, provided the one shown cannot be used. G is a pipe to the surface-condenser, through which the exhausted steam passes thereto, the steam being shut off from its natural course to the jet-condenser B by the closing of the valve H. I is the pipe through which the water of condensation, and the incondensable vapor, are taken into the condenser B, the former to be taken away by proper force-pumps to the boiler, and the latter to escape through the air-pump to the atmosphere. J J′ are pipes through which cooling-water is taken to and from the condenser F. K and L are valves, which require to be operated as described. The first shuts off the connection for the passage of steam to the condenser F, and the other the flow of condensed water to the condenser B, when the jet-condenser is in use, both to be opened when the valve H is closed.

What I claim as my invention, and desire to secure by Letters Patent, is—

The arrangement of the ordinary jet-condenser B, air-pump D, and hot-well E, with the surface-condenser F and the valves H, K, and L, as shown and described, so that the change from the use of the jet-condenser to that of the surface-condenser can be made at will, and *vice versa*.

WM. A. LIGHTHALL.

Witnesses:

FRANCIS S. GOSS,

E. R. VAN BUREN.