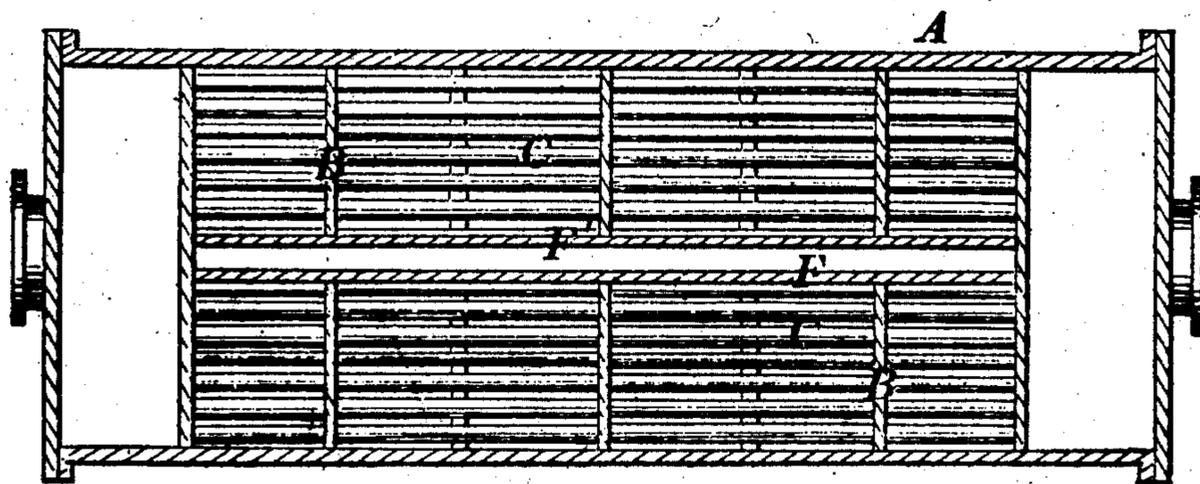


W. A. LIGHTHALL.  
REFRIGERATOR FOR STEAM ENGINES.

No. 35,162.

PATENTED MAY 6, 1862.



*TAKEN FROM PATENT OFFICE REPORT  
1862 VOL. II  
ONLY DRAWING ACCESSIBLE (1911)*

# UNITED STATES PATENT OFFICE.

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

## IMPROVEMENT IN REFRIGERATORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 35,162, dated May 6, 1862.

*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 certain new and useful Improvements in Refrigerators for Cooling the Injection-Water of Condensing Steam-Engines to be Reused; 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 plan view; Fig. 2, a horizontal section of Fig. 1 with the cover removed; Fig. 3, a vertical and longitudinal section taken through the line *x x*, Fig. 4; Fig. 4, a cross-section taken through the line *b b*, Fig. 3; and Fig. 5, a longitudinal section taken through the line *c c*, Figs. 1 and 4.

My invention relates to an improvement on the refrigerator patented to me by Letters Patent of the United States bearing date of February 26, 1861, (to which Letters Patent reference is hereby made;) and it consists in returning the injection-water from one section of the refrigerator to the other through a case or division, by which means the injection-water is subjected to the action of the cooling or refrigerating water in an opposite flow or direction. In other words, the cooling-water passes through the tubes of the refrigerator in one direction, while the heated injection-water (after passing through the bed-plate, air-pump, and hot well to the refrigerator) passes around and among the tubes in a contrary direction, the intent and purpose being that the coolest water (of the cooling-water) shall be applied to cooling down the injection-water to its lowest temperature as it leaves the apparatus.

The case or shell A of the refrigerator is made and the tubes C arranged as set forth in the Letters Patent before named, and the division-plates B are located and arranged as therein set forth. The cooling-water is taken

into the case to pass through the tubes C, through the nozzle D, and passes off through the nozzle E.

F F are two diaphragm-plates, which divide the apparatus into two sections, and which are separated from each other a sufficient distance to form a passage-way between them of sufficient area to pass through it the injection-water that enters the apparatus through the nozzle G. These plates are provided with apertures *e e'*, into the first of which the injection-water from the first section enters and passes through the length of the passage-way and enters and passes through the second to enter the second section, in order that it shall travel and pass over the tubes in a contrary direction to the current of the cooling-water entering through the nozzle D and passing off through the nozzle E. The injection-water that enters the apparatus through the nozzle G is taken off through the nozzle H to the condenser to be reused, for the purpose of condensing the steam exhausted into the condenser from the cylinder of the engine.

The advantage of exposing the current of injection-water to the contrary current of cooling-water is that the current of injection-water is subjected to a constantly-decreasing temperature as it passes and travels toward the end of the apparatus, from whence it passes off to the condenser, so that it is reduced more nearly to the temperature of the cooling-water than if the currents of each run in the same direction.

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

The combination of the diaphragm-plates F F' with the tubes C and division-plates B, arranged and to be operated as and for the purpose set forth.

WM. A. LIGTHALL.

Witnesses:

FRANCIS S. LOW,  
D. H. GOULD.