W. A. Lighthall,

Steam-Boiler Condenser.

No. 46,117. Patented Jan. 31, 1865.

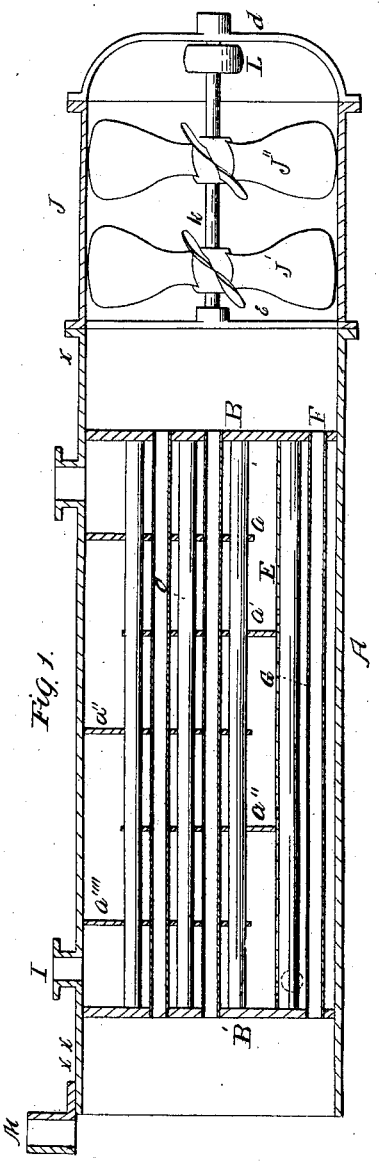

Fig. 1.

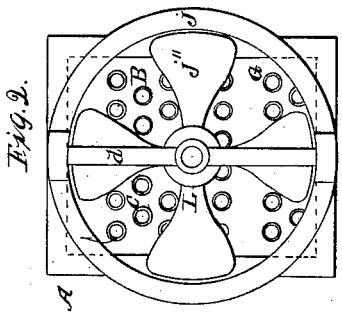

Fig. 2.

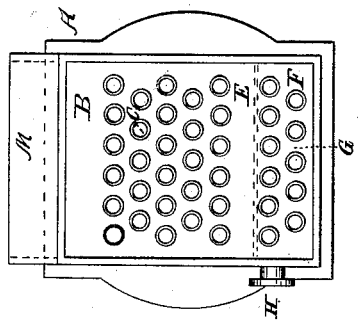

Fig. 3.

Witnesses:
Francis S. Low.
Sidney Low.

Inventor:
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UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN TUBULAR CONDENSERS.

Specification forming part of Letters Patent No. **46,117**, dated January 31, 1865.

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 Improvement in Condensers for Steam-Engines or Refrigerators for Cooling Liquids; 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 longitudinal vertical section; Fig. 2, an end view of end *x*, Fig. 1; and Fig. 3, an end view of end *x x*, Fig. 1.

My improvements are designed to condense steam or vapor exhausted from a steam-engine, and to cool or refrigerate liquids by the use of a draft of air (in and with which water is intermingled) passing through a series of tubes, (or their equivalents,) the steam or vapor to be condensed, or the liquid to be cooled, passing across and among the series of tubes on their exterior surface, and made to travel an extended distance by the use of a series of division-plates, whereby the steam or vapor to be condensed or the liquid to be cooled has to travel a greater distance than that traveled (through the tubes) by the cooling air and spray, the air being made to pass through the tubes by the action of an exhausting-fan of spiral or "propeller" form, or by a series of such fans, as may be required.

A is the body or case of the apparatus.

B B′ are the tube-sheets, in and to which the tubes C are secured. These tubes are secured in the heads by any desired means; but in case the apparatus is designed to condense the steam exhausted from a steam-engine they should be so secured as to allow one end, at least, of them to move in the head to allow for the alternate expansion and contraction incident to such use of them.

D is the nozzle through which the steam or vapor to be condensed, or the water or other liquid to be cooled, is passed into the apparatus, passing then first across and among the tubes in the space embraced between the head-sheet B and the division-plate *a*, and then through the space between the plates *a* and *a′*, and so on to the end of the apparatus, the steam or vapor condensed passing through the drip-plate E into the lower section, F, of the body to be cooled by the action of the series of cooling-tubes G, and to be taken off through the nozzle H; or the liquid to be cooled passing through the same course to be carried off through the nozzle I, in the latter case the nozzle H being shut off by a stop-valve or other desired means.

T is an open cylinder, secured to the end *x* of the case A, in which is placed and operated the set of exhausting spiral or propeller fans J′ J″, these fans being secured upon the shaft K and revolved by the pulley L by any desired means. The shaft is secured and revolves at one end in the cross bar or brace *d* and at the other end in the bar or brace *e*. These fans are made of the form usually given to the "propeller-wheels" used for propelling vessels, and of about the same pitch—say forty degrees—and are to be driven at such rate of speed that the movement of the air moved by them shall be at least thirty (30) miles per hour, the efficiency of the apparatus being increased with every increase of speed given to the fans. The air drawn into and through the tubes by the revolutions of the fans may, if desired, be blown into the furnace of the boiler or boilers of the apparatus, if any there be, to increase the intensity of the fire in the same.

M is a reservoir, supplied with water by any desired means, which is furnished at its bottom with the finest possible gauze-wire for the purpose of sprinkling the water contained in it in a spray in front of the front end of the tubes C, the water thus passing through the wire-gauze being drawn into the tubes by the draft of the air through them, and producing thereby a greatly decreased temperature, in accordance with a well known and practiced principle, one example of the practiced being the porous vessels containing liquids that are exposed to the wind, as used in the East Indies.

By this improvement the condenser or refrigerator can be used in sections of country and in positions where a proper and constant supply of water to pass through the tubes to produce the condensation or refrigeration could not be obtained. It is, therefore, peculiarly applicable to locomotive-engines, to engines to be used on common roads, and to engines to be used in sections of country where rain falls only at particular seasons, and where the supply of water in the intermediate time is therefore limited.

It is also applicable to the distillation of liquors and to the cooling of malt and other fermented liquors in positions where water cannot be procured in sufficient quantity for cooling purposes, (as named in the last paragraph,) or where such supply of water would be too expensive to be used with advantage or profit.

When the apparatus is used on shipboard, the supply of air to pass through the tubes could be taken from the lower portion of the vessel, so that a perfect ventilation would be produced by its operation. In such cases, also, if desired, the air passed through the tubes could be taken off through proper tubes to different parts of the vessel to keep such parts cool and ventilated.

I am aware that air has been used before to produce condensation or cooling; but it has always been used by pressure and not by exhaustion, the pressure in passing through or around and among the tubes tending to produce an increased degree of temperature by a well known law, while the same movement of the air produced by exhaustion, combined with spray, tends to produce a lessened degree of temperature.

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

1. The combination of the exhausting-fans J′ J″, or their equivalent, with the tubes C and division-plates *a a′ a″ a‴ a⁗*, as and for the purposes set forth.

2. The combination of the exhausting-fans J′ J″, or their equivalent, with the tubes C and reservoir M, as and for the purposes set forth.

WM. A. LIGHTHALL.

Witnesses:
FRANCIS S. LOW,
SIDNEY LOW.