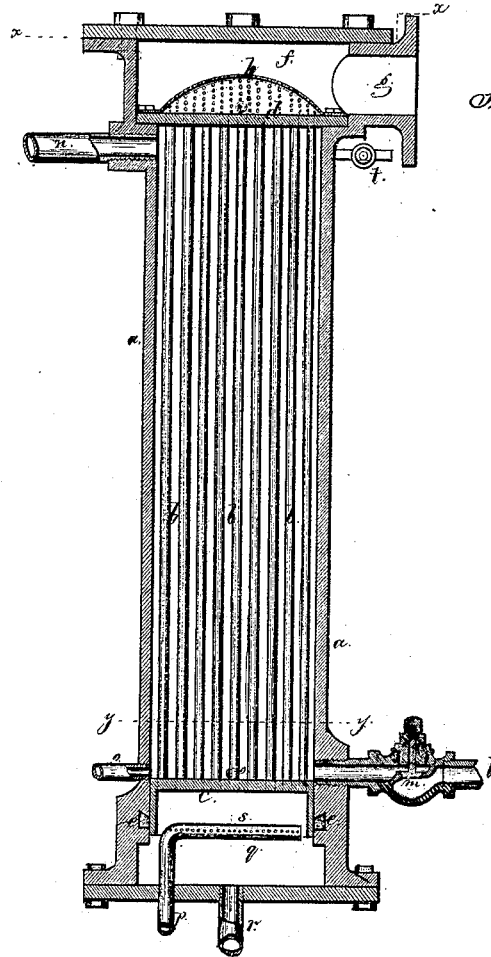


*Dilworth & Hodgins,*

*Steam Condenser.*

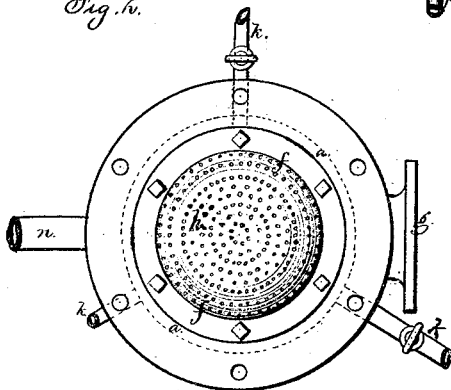
*No. 111,916.*

*Patented Feb. 21, 1871.*



*Fig. 1.*

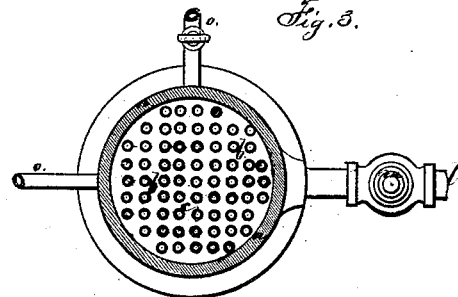
*Fig. 2.*



*Witnesses*

*Chas. H. Smith  
Geo. S. Halpern*

*Fig. 3.*



*Joseph Dilworth  
John L. Hodgins*

*L. W. Ferrell  
att'y*

# United States Patent Office.

JOSEPH DILWORTH AND JOHN COBOURG HODGINS, OF TORONTO,  
CANADA.

Letters Patent No. 111,916, dated February 21, 1871.

## IMPROVEMENT IN CONDENSERS AND FEED-WATER HEATERS FOR STEAM-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 we, JOSEPH DILWORTH and JOHN COBOURG HODGINS, of Toronto, in the county of York and province of Ontario, Canada, have invented an Improved Condenser and Feed-water Heater for Steam-Engines, and the following is declared to be a correct description thereof.

The escape steam from an engine passes into a chamber above a series of vertical tubes that passes through a cylinder containing the feed-water, and the water of condensation and vapors are taken away from the lower ends of these tubes.

The feed-water passes into the chamber near the bottom through a check-valve, and to the boiler by a pipe near the top.

Our invention, as distinguished from feed-water heaters heretofore constructed, relates to a perforated convex protecting plate above the condensing tubes, to prevent the tubes becoming obstructed by foreign substances.

We also arrange the said apparatus so as to effect the transfer of the steam heat to the feed-water, and the removal of sediment is accomplished by means of blow-cocks.

In the drawing—

Figure 1 is a vertical section of the apparatus, and

Figures 2 and 3 are sectional plans at the lines *x x* and *y y*, respectively.

The cylinder *a* is made of a suitable size and shape for receiving the ranges of vertical tubes *b b*, that pass through the heads *c d* and are secured therein.

The tubes should be of a small diameter and numerous; we prefer and use copper tubes.

The head *c* is sufficiently small to pass freely into the cylinder *a*, and the packing *e* makes a tight joint around this head when in place.

This packing *e* is made of an India-rubber ring, introduced into a V-shaped or dovetail groove around the interior of the cylinder *a*, and the head *d* is bolted upon the upper end of the cylinder *a* and within the chamber *f*, formed by an enlargement of the cylinder *a*.

The steam is admitted by a pipe, *g*, into the chamber *f*, and above the convex perforated plate *h*, that serves to retain any foreign substance and prevent its passing into the tubes *b* and obstructing them.

Around the edges of this chamber *f* cocks or valves

*k* are provided, to allow for blowing off any sediment or accumulation above the perforated plate *h*.

The feed-water is pumped or forced through the pipe *l* and check-valve *m* at the lower part of the cylinder *a*, but above the head *c*, and the heated water passes by the pipe *n* to the boiler.

Cocks or valves are provided at *o*, around the lower part of the feed-water space in the cylinder *a*, so as to allow of blowing off any sediment from the feed-water.

A pipe, *p*, and rose or sprinkler, *s*, are employed for introducing a spray of cold water into the chamber *g*, below the head *c*, so as to condense the remaining portion of any steam that may pass down through the tubes *b*, and a pipe, *r*, leads to an air-pump by preference, or to a tank from which the feed-water is taken to the pump.

By this construction the parts are easily kept free from sediment or foreign matter, leakage from expansion or contraction is prevented, the parts are not expensive to make or to keep in repair, a great saving of fuel is effected by the transfer of the steam heat to the feed-water, and, in consequence of the cool feed-water entering at the lower part of the chamber containing the vertical range of tubes, and going off to the boiler from the top of that range, the condensation of the steam is very perfect as it descends in the tubes *b*, and the feed-water is highly heated before going into the boiler.

The size of this apparatus must be in proportion to the engine and boiler. We have found that about five feet of condensing surface should be provided to each horse-power of the engine.

Air may be blown out of the apparatus by the cock *t*.

We claim as our invention—

1. The perforated plate *h* in the chamber, *f*, above the upper ends of the vertical tubes *b* of the feed-water heating apparatus, for the purposes set forth.

2. The blow-cocks or valves applied to and combined with the chamber *f* and perforated plate *h*, for the purposes set forth.

Signed by us this 14th day of November, A. D. 1870.

JOSEPH DILWORTH.  
JOHN C. HODGINS.

Witnesses:

J. B. BALDWIN,  
A. CHRISTIE.