J. E. COUGHLIN.

Heater and Condenser.

No. 163,917. Patented June 1, 1875.

Fig. 1.

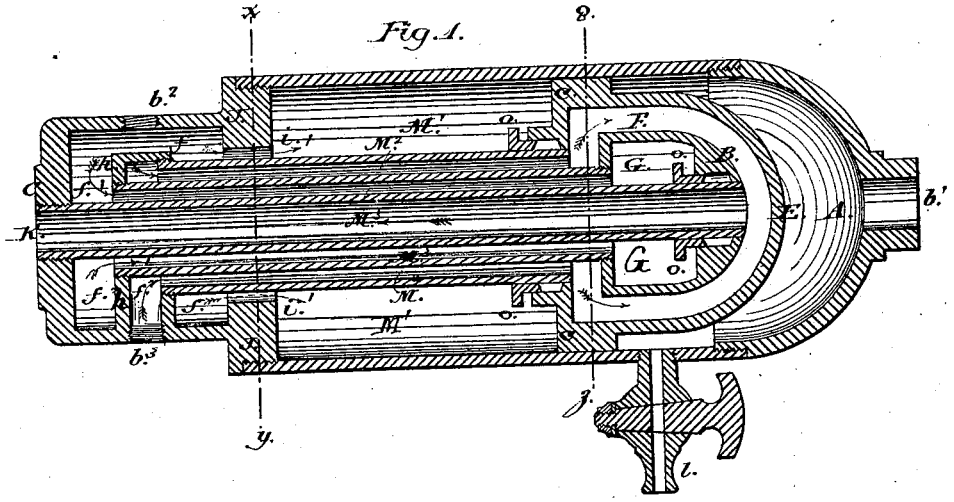



Fig. 2.

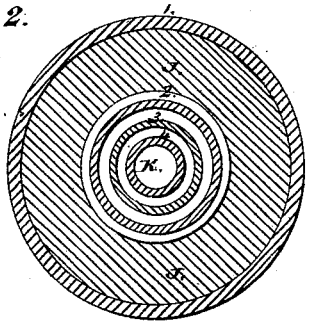



Fig. 3.

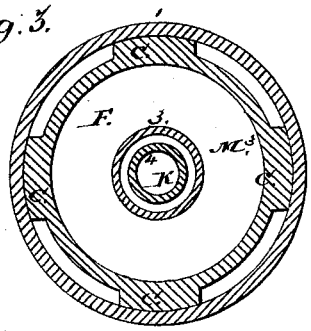
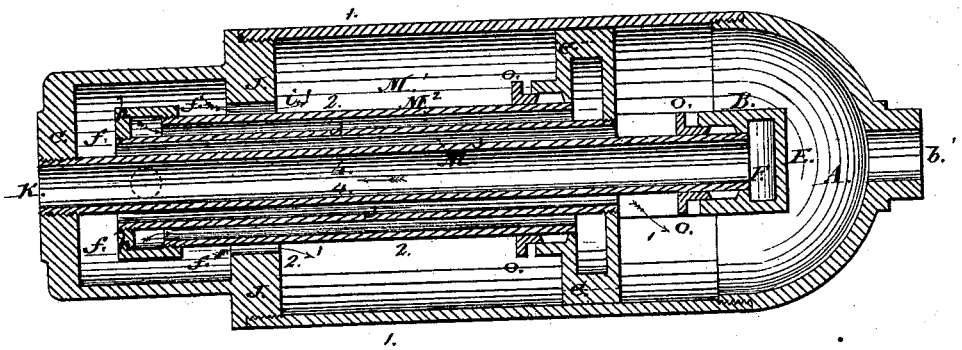



Fig. 4.

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## IMPROVEMENT IN HEATERS AND CONDENSERS.

Specification forming part of Letters Patent No. **163,917**, dated June 1, 1875; application filed May 6, 1874.

*To all whom it may concern:*

Be it known that I, JOSEPH E. COUGHLIN, of the city of San Francisco, and State of California, have invented a new and useful Improved Heater and Condenser for Steam-Engines; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, making a part of this specification, in which—

Figure 1 is a longitudinal sectional view of a heater and condenser embodying the improvements in my invention. Fig. 2 is a transverse sectional view of the same, taken through line *x y* in Fig. 1. Fig. 3 is a transverse sectional view taken through line Q Z, Fig. 1; and Fig. 4 is a longitudinal sectional view of the invention, taken at right angles to Fig. 1.

The object of my invention is to produce a heater and condenser for steam-engines, by which the exhaust steam can be utilized to heat the water while passing from the feed-pipe to the boiler to the boiling-point, and by said operation be itself condensed to water.

To effect these objects I first construct four tubes or pipes about eight feet long, the largest tube or pipe being about four inches in diameter, and the smallest about one inch in diameter, and telescope the lesser within the larger pipes, as shown in Fig. 2. The dimensions of the tubes should, of course, be varied according to the size of the engine in connection with which they are to be used. I next cut a thread around one end of the pipes or tubes on their outsides, for screwing them to their positions, as hereinafter explained, with the exception of the largest tube or steam-jacket, on which I cut the thread upon the inside and at both ends. I next construct a cast-iron cap, A, oval in shape, with a screw around the inner end of the same, for screwing it to the steam-jacket or outside tube, and causing it to form part of the same. I also provide the cap A with an exhaust-discharge, $b^1$. I next construct a cast-iron partially oval-shaped water-chamber, B, with lugs or rests *c c*, which bear against the steam-jacket or outside tube No. 1. E is the outer wall of the chamber B, and F the water-passage therein. G G is a steam-passage around the circumference of the interior tube No. 4. *o o* are glands for holding rubber or other packing around the tubes, to cause the joints to be water or steam tight. C is a cast-iron cap screwed to the opposite end of the steam-jacket No. 1, and provided with the opening $b^2$, for the entrance of the exhaust steam, and the opening $b^3$, for the entrance of the water from the feed-pipe. *f f f* are enlarged chambers, through which the steam and water pass in their course through the heater and condenser. *h h* and J J are partition-walls, and *i i* are steam-passages. Spaces $M^1$, $M^2$, and $M^3$ are formed by telescoping the tubes 1, 2, 3, and 4.

The water enters the heater at $b^3$, fills the space $M^2$ between tubes 2 and 3, passes to the opposite end, into the enlarged chamber F, returns through tube No. 4, and discharges at K. The exhaust steam enters at $b^2$, makes its way through the passages *i i* and $M^1$ to the chamber G at the opposite end of the heater, thence around the outside of the water-chamber B, to the cap A, and discharges at $b^1$, or, if condensed to water, is drawn off at the cock *l*. Arrows 1 show the course of the steam. The plain arrows show the course of the water.

There are numerous advantages in this construction, among which are the following, viz: It can be applied to engines at a small cost; it is simple in construction; the pipes are of thin metal, and the exhaust steam is utilized to heat the water in its passage from the feed-pipe to the boiler; and, finally, it saves a large per cent. of both fuel and water, as the exhaust steam is again condensed in heating the water, and may be again used.

Having thus described my invention of improvements, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. A heater and condenser for steam-engines, consisting of a series of pipes or tubes, telescoped one within another, so as to form alternate steam and water passages, and having a cap at each end, one of which is provided with a steam-induction, a water-induction opening, and a water-discharge orifice,

and the other with a discharge and a condensed-steam discharge-orifice, all combined substantially as and for the purposes set forth.

2. The combination, in a heater and condenser, of the telescoped tubes 1, 2, 3, and 4, cap A, having the discharges $b^1$ and $l$, cap C, having steam-induction opening $b^2$, water-induction opening $b^3$, and water-discharge K, water-chamber B, having water-passage F, and enlarged steam-chamber G, all constructed and operating substantially as and for the purposes set forth.

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