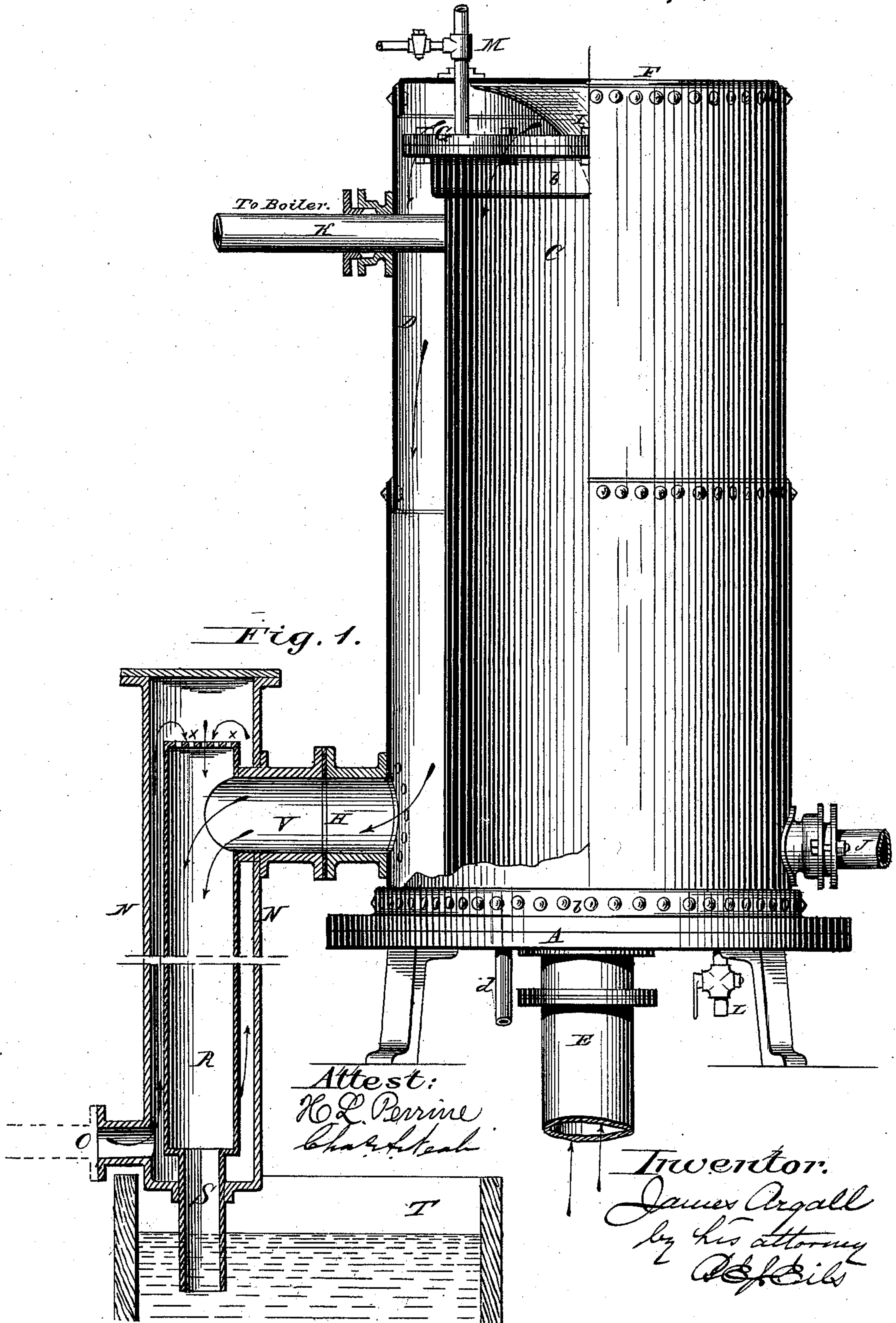


J. ARGALL.  
Feed-Water Heater.

No. 217,041.

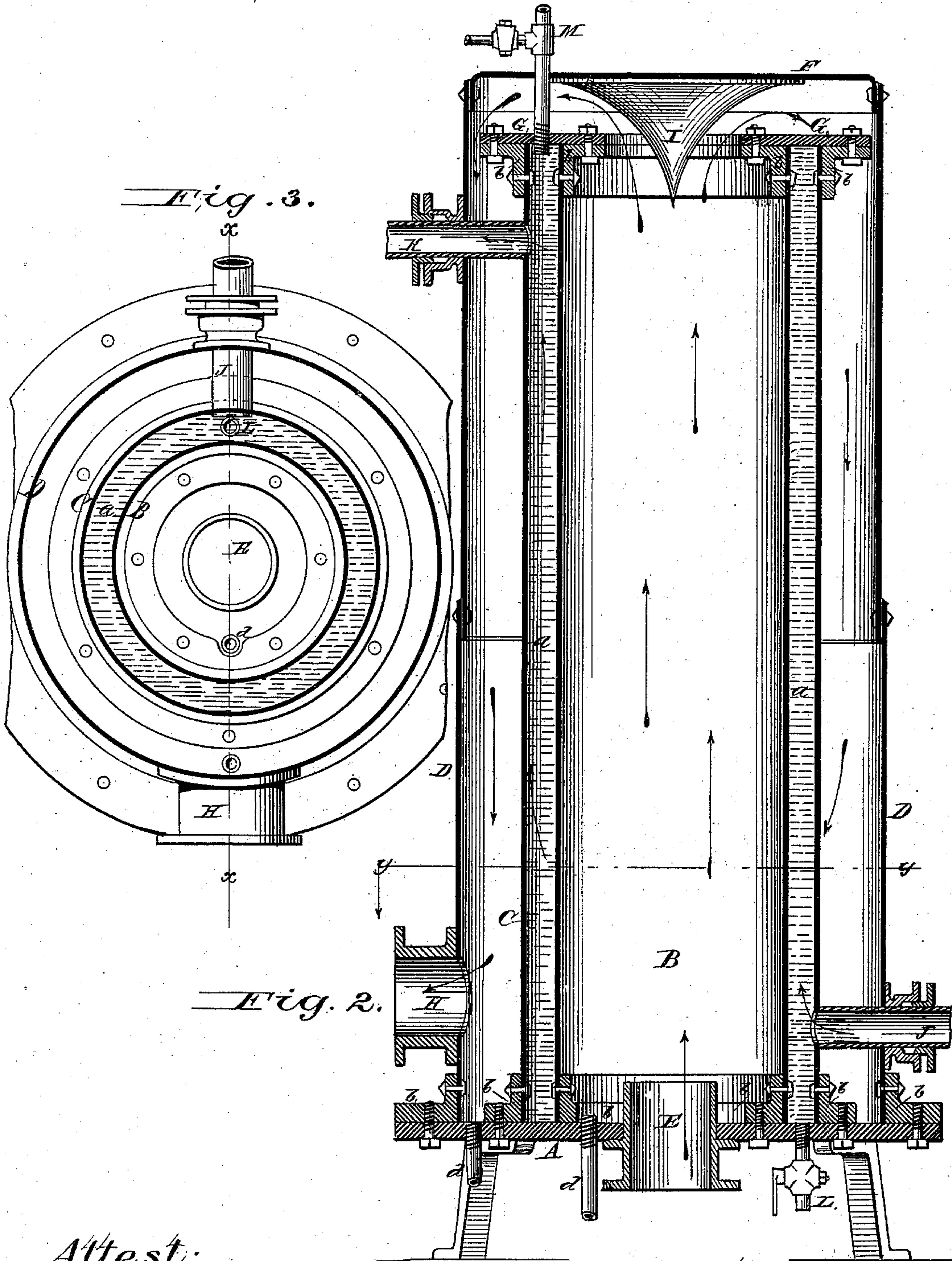
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# UNITED STATES PATENT OFFICE.

JAMES ARGALL, OF MINERAL POINT, WISCONSIN.

## IMPROVEMENT IN FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **217,041**, dated July 1, 1879; application filed December 20, 1878.

*To all whom it may concern:*

Be it known that I, JAMES ARGALL, of Mineral Point, in the county of Iowa and State of Wisconsin, have invented certain new and useful Improvements in Feed-Water Heaters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to apparatus for heating the feed-water for steam-boilers by means of the exhaust-steam of the engine.

My improvements consist, first, in constructing the feed-water heater of a nest of three cylinders, forming an annular water-chamber surrounded on both sides by steam-chambers, all three cylinders being at one end closed by a single head common to all, so that by the removal of such head ready access may be had to the interior of the heater for cleaning or repairing purposes; second, in providing the other or upper head of the outer cylinder of such a heater with a cone projecting down into the innermost cylinder for distributing the steam; third, in combining the heater and the tank or reservoir from which the heater is directly supplied with a means for condensing what little steam may pass from the heater by the cold water supplying the said tank or reservoir.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a side elevation of my improved feed-water heater, with a section of a pipe or device for condensing the steam after it leaves the heater. Fig. 2 is a central vertical section of the heater; and Fig. 3 is a horizontal section of the same on the line *y y*, Fig. 2.

A represents the bottom of the heater, upon which is fastened a nest of three cylinders, B, C, and D, one within the other, as shown. The inside cylinder, B, forms the upward passage for the exhaust-steam from the engine, which enters in the bottom A at E.

The outside cylinder, D, forms the surrounding jacket for the heater, and extends a suitable distance above the other two cylinders, and is closed at the top by a head, F.

The intermediate cylinder, C, is of the same height as the inside cylinder, B, and forms with the same the annular water-chamber *a*. These two cylinders B and C are connected at the top by an annular plate, G, which closes the top of the water-chamber.

The connections between the three cylinders and the bottom A, as well as between the two inner cylinders and the plate G, are made by means of flanged rings *b b*, to which the cylinders are riveted, and these rings are then bolted to the bottom and top plate respectively. Suitable packing should be introduced, so as to make the joints perfectly steam and water tight.

It will be observed that by the use of a single head for closing the lower end of all three cylinders I provide for a simple and comparatively inexpensive mode of construction, as well as for ready access to the interior of the heater.

To the under side of the top head, F, of the surrounding casing D is attached a cone, I, the apex of which points downward into the upper end of the cylinder B. As the exhaust-steam enters at the bottom of this cylinder it passes upward and is divided by the cone I, so as to spread evenly over the plate G and pass downward between the cylinder C and casing D, and then passes out at H.

It will thus be seen that the water-chamber *a* is completely enveloped by the exhaust-steam, thereby heating the water therein, which causes all sediment to be precipitated and deposited in the bottom of the heater, while the pure water alone passes into the boiler. The water is pumped into the heater through a pipe, J, near the bottom, and passes out to the boiler from near the top through a pipe, K.

*d d* are drip-tubes for drawing off the water condensed in the heater. The deposit in the heater may be blown off at any time through a blow-off cock, L, at the bottom by means of live steam from the boiler, admitted at the top through a pipe, M.

When it is desired to condense the exhaust-



steam which may pass from the heater, I combine the heater with a water-tank and a condenser, as shown in Fig. 1. The condenser shown consists of an upright pipe or cylinder, N, closed at both ends, and having a water-inlet, O, near the bottom. Within this pipe is a smaller pipe or cylinder, R, having an outlet, S, passing through the lower end of the cylinder N and down into a feed-water tank, T, so that the lower end of said pipe S shall be submerged in water. As the lower end of the pipe S dips into the water of the tank, it follows that all the exhaust-steam escaping from the heater into said pipe will be condensed and deposited in the tank, for, should any of the steam escape condensation while in the pipe by reason of the temporary stoppage or intermittent flow of water through the perforations *x*, said steam will be conveyed into the water in the tank, where condensation must ensue. The upper end of the pipe or cylinder R is closed and perforated, as shown at *x*. The steam-outlet H of the heater is, by a pipe, V, connected with the pipe R near the top.

The water being pumped in at O rises in the outer cylinder, N, and passes through the perforations *x* into the inner cylinder, R, where it comes in contact with the exhaust-steam escaping from the heater. The result is that not only is the exhaust-steam condensed, but the water is also heated to a certain degree before it gets into the tank T, and from this tank it is then pumped into the heater.

I am fully aware that the employment of the exhaust-steam to heat the feed-water before it enters the boiler is not new, and I do therefore not claim such, broadly, as my invention.

In my invention, owing to the double heating-surface and the great quantity of exhaust-steam enveloping the water-chamber, the water is kept boiling for a considerable time be-

fore it is forced into the boiler, thus precipitating the lime and other foreign substances to the bottom of the heater.

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

1. A feed-water heater having an annular steam-surrounded water-chamber, and constructed substantially as before set forth—namely, of a nest of three cylinders, all secured at one end to a single bottom plate, the two inner and shorter cylinders being at the other end joined to a ring closing the annular water-chamber between them, while the outer and longer cylinder is closed at the other end by a separate head.

2. A feed-water heater having an annular steam-surrounded water-chamber, and constructed substantially as before set forth—namely, of a nest of three cylinders, all secured at one end to a single bottom plate, the two inner and shorter cylinders being at the other end joined to a ring closing the annular water-chamber between them, while the outer and longer cylinder is closed at the other end by a separate head provided with a cone projecting into the open upper end of the innermost cylinder.

3. The combination, substantially as before set forth, of the feed-water tank, the feed-water heater, and the jet-condenser, which has the open end of its discharge-pipe dip into the water of the tank, by which construction any exhaust-steam escaping from the heater is fully condensed by the cold water flowing through said condenser to the tank.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JAMES ARGALL.

Witnesses:

JOHN P. TROUNCE,

ARCHIBALD MCARTHUR.