

(No Model.)

W. L. SHEPARD.
FEED WATER HEATER.

No. 573,111.

Patented Dec. 15, 1896.

Fig. 1.

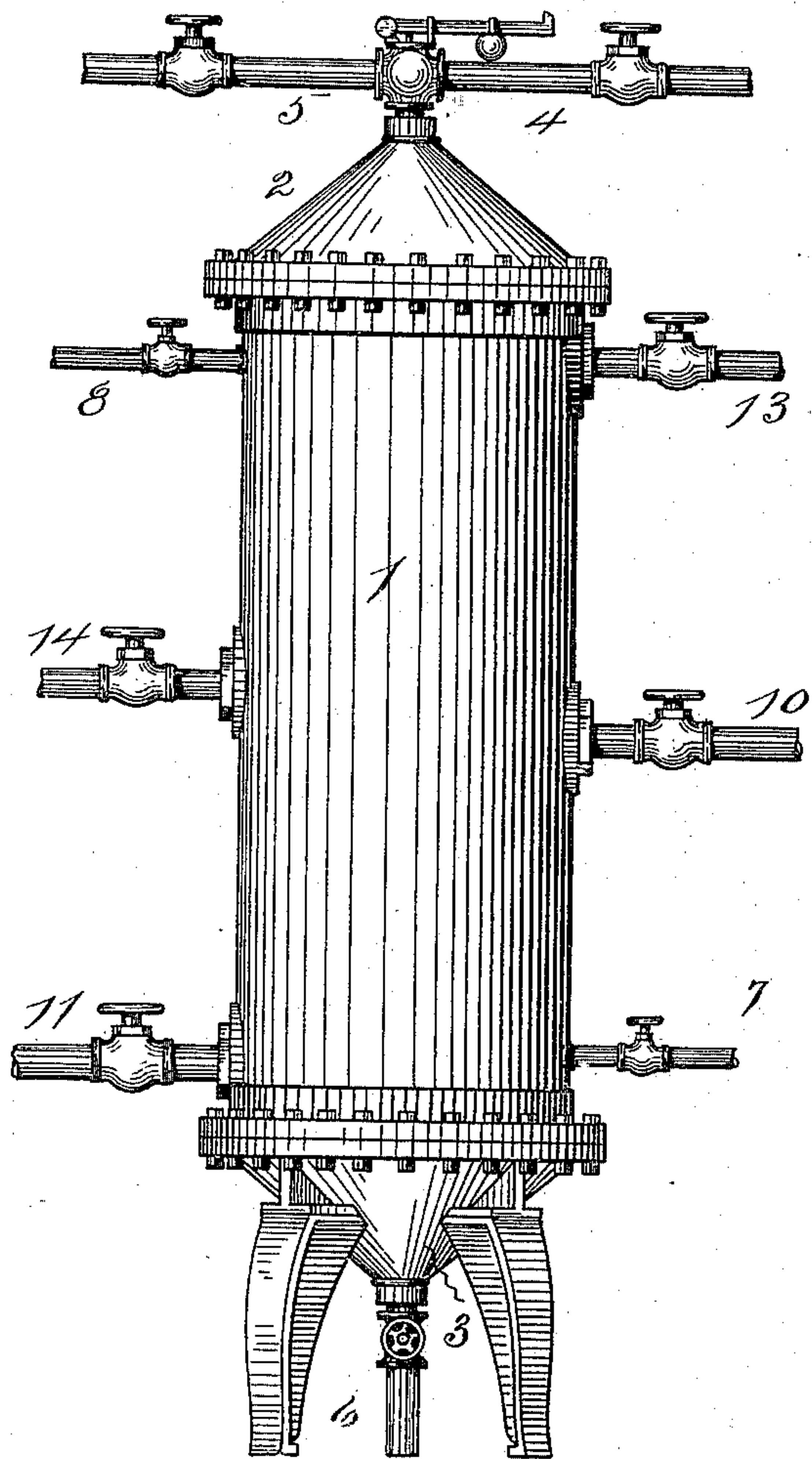
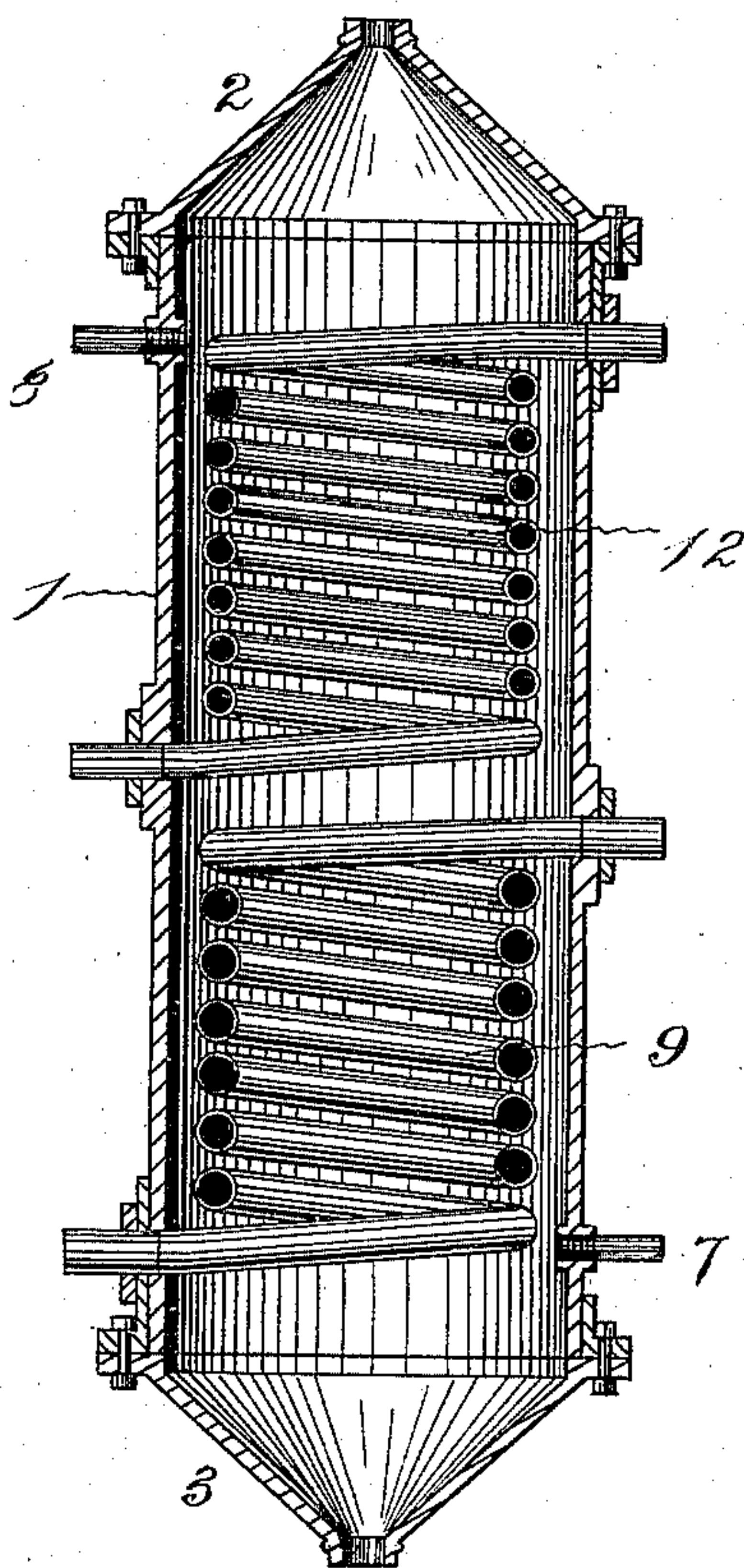


Fig. 2.



Witnesses

Scott H. Smith.

E. J. Hyde.

Inventor

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UNITED STATES PATENT OFFICE.

WILBUR L. SHEPARD, OF ELMWOOD, CONNECTICUT.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 573,111, dated December 15, 1896.

Application filed July 2, 1895. Serial No. 554,705. (No model.)

To all whom it may concern:

Be it known that I, WILBUR L. SHEPARD, a citizen of the United States, residing at Elmwood, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

The invention relates to the class of feed-water heaters that are constructed to utilize both live and exhaust steam for heating and purifying the water that is to be fed to a boiler.

The object of the invention is to provide a simple, convenient, and efficient apparatus which can be easily connected with the piping of any boiler and engine plant, so that the water for the boiler will be heated to a high temperature and purified before entering the boiler without absorbing an excessive amount of heat from the boiler or necessitating the consumption of an extra quantity of fuel in order to maintain the boiler-pressure at the desired degree.

To this end the invention resides in details of the construction of an apparatus arranged to more efficiently utilize the waste exhaust-steam from the engine of the plant for raising the feed-water from normal atmospheric temperature to about 212° , and then utilize live steam from the boiler for raising the water already heated by the exhaust-steam to a much higher temperature, so that the impurities will be precipitated and the water will enter the boiler at practically the temperature of the water in the boiler without causing an excessive loss of heat from the live steam employed to raise the water to this higher temperature or reducing the temperature of the boiler-water, as more particularly hereinafter pointed out.

Referring to the accompanying drawings, Figure 1 is a side elevation of a feed-water heater embodying the invention. Fig. 2 is a central sectional view of the shell of this heater.

The shell 1 of the heater shown in the views is made cylindrical, of suitable sheet metal, with a conical cap 2 at the upper end and a conical bottom 3 at the lower end. Through the top of the cap 2 there is usually an opening connecting with a valve that opens to a safety blow-off 4 and a scum blow-off 5, while

through the bottom 3, to which the legs are connected, there is an opening to a properly-cocked mud blow-off 6.

An opening is made through the shell near the bottom for the entrance of the water-feed inlet 7, or the pipe that conducts the water to be heated from the source of supply to the heater, and near the top of the shell an opening is made for the water-feed outlet 8, or the pipe that conducts the hot water from the heater to the boiler.

In the lower part of the shell is located a coil of pipe 9. The upper end of this coil projects through the shell and is adapted to be connected with a pipe 10 from the engine or other source of exhaust-steam, and the lower end, which projects through the shell near the bottom, is adapted to be connected with a drip or escape pipe 11, so that the waste or exhaust steam will, when the cocks are properly set, flow through this coil in order that it may be utilized to raise the water in the lower part of the shell from its normal temperature to about 212° . In the upper part of the shell is located a coil of pipe 12, of smaller diameter. The upper end of this coil 12 projects through the shell near the top and is adapted to be connected with a pipe 13, leading from the steam-dome of the boiler into which the heated water is to be fed, and the lower end of this coil, which projects through the shell above the coil 9, is adapted to be connected with a pipe 14, that preferably leads to the boiler near or below the water-line.

A heater constructed according to this invention can be readily connected with the exhaust-steam pipes of an engine and with live-steam pipes from the boiler in such manner that the exhaust or waste steam, the temperature of which it is not necessary to maintain, can be first utilized to raise the water from normal atmospheric temperature to about 212° , and then the live steam is utilized to raise the water to a still higher temperature. By means of this arrangement the water in its cold condition is raised to its first heat by the exhaust-steam, which is waste and can be utilized for this without any additional expenditure of fuel or draft on the boiler. Water heated by exhaust-steam only of course does not deposit or precipitate its mineral

impurities and does not become heated enough to enter the boiler without lowering the temperature of the boiler-water, and thus necessitating the use of additional fuel to maintain the boiler-pressure. Water heated by the exhaust-steam from normal to 212° rises in the shell and then is in condition to be further heated by the live steam without requiring the live steam to part with the heat necessary to raise it from normal temperature to 212°. This enables the live steam to maintain its own temperature at a higher degree without loss or exhaustion of heat, which of course enables the live steam to heat the feed-water to a higher degree without drawing an excessive amount of heat from the boiler. This also insures such a heat that the feed-water will pass into the boiler at about the temperature of the boiler-water, so as not to pull down the boiler-pressure to any extent. The location of the coils in the heater is such that all the heat possible is obtained from the steam. The hot water as it rises is compelled to make contact with the increasingly-heated exhaust-steam coils and then with the more highly-heated live-steam coils, for of course the exhaust-steam and the live-steam coils will be hotter near the top, that is, at their inlet ends than their outlet ends. Any water of condensation from the live-steam coil can be readily led back to the boiler at the water-line or below, for the coil being at the top of the heater can be connected with a pipe that will provide a natural flow.

35 In practice the use of this invention has demonstrated that a higher heating and an increasing purification of the feed-water can be accomplished with a smaller amount of

fuel, therefore at less cost, than with the prior exhaust-steam heaters or prior live-steam heaters.

The shape of the shell provides a construction that is simple and cheap to manufacture and put together, that is strong, durable, and efficient, and one that can be very readily kept clean; and the arrangement, shape, and location of the coils of pipes, which are simply formed, heats the water to a high degree and does not materially interfere with the circulation.

I claim as my invention—

A feed-water heater consisting of a cylindrical shell with conical ends, supported vertically by legs projecting from one of the conical ends and having an opening through the apex of each cone, a valve at the apex of the top cone controlling both a safety blow-off and a scum blow-off, a valve at the apex of the bottom cone controlling a mud blow-off, a water-inlet pipe passing into the shell near the bottom and a water-outlet pipe passing out of the shell near the top, a cylindrical coil of pipe of one diameter located within and below the middle of the shell with its lower end extending out of the shell near the bottom and its upper end extending out of the shell below the middle, and a cylindrical coil of pipe of much smaller diameter located within and above the middle of the shell with its upper end extending out of the shell near the top and its lower end extending out of the shell above the middle, substantially as specified.

WILBUR L. SHEPARD.

Witnesses:

GEO. V. BRECKLEY,
H. R. WILLIAMS.