

(No Model.)

W. L. SHEPARD.
FEED WATER HEATER.

No. 573,111.

Patented Dec. 15, 1896.

Fig. 1.

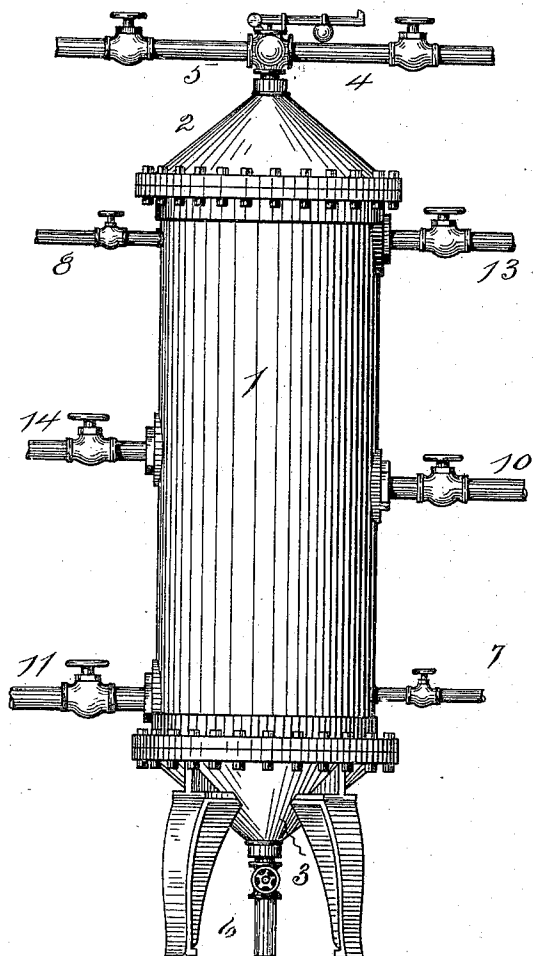
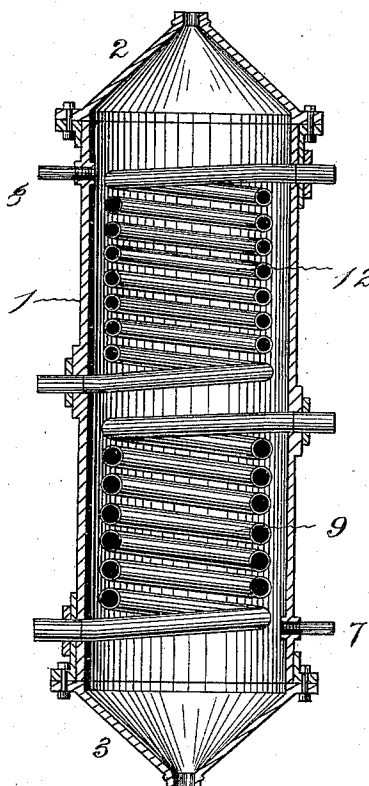


Fig. 2.



Witnesses

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E. J. Hyde.

Inventor

Wilbur L. Shepard, by
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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 tem-
 perature of the boiler-water, and thus neces-
 sitating the use of additional fuel to maintain
 5 the boiler-pressure. Water heated by the
 exhaust-steam from normal to 212° rises in
 the shell and then is in condition to be fur-
 ther heated by the live steam without requir-
 ing the live steam to part with the heat nec-
 10 essary to raise it from normal temperature to
 212°. This enables the live steam to main-
 tain its own temperature at a higher degree
 without loss or exhaustion of heat, which of
 course enables the live steam to heat the feed-
 15 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
 20 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
 25 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
 30 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 40
 heaters.

The shape of the shell provides a construc-
 tion that is simple and cheap to manufacture
 and put together, that is strong, durable, and
 efficient, and one that can be very readily 45
 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 circu-
 lation. 50

I claim as my invention—

A feed-water heater consisting of a cylin-
 drical shell with conical ends, supported ver-
 tically by legs projecting from one of the con-
 ical ends and having an opening through the 55
 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 60
 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 be-
 low the middle of the shell with its lower end
 extending out of the shell near the bottom 65
 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 up-
 per end extending out of the shell near the 70
 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.