

(No Model.)

2 Sheets—Sheet 1.

N. CLUTE.
FEED WATER HEATER.

No. 455,389.

Patented July 7, 1891.

Fig. 2

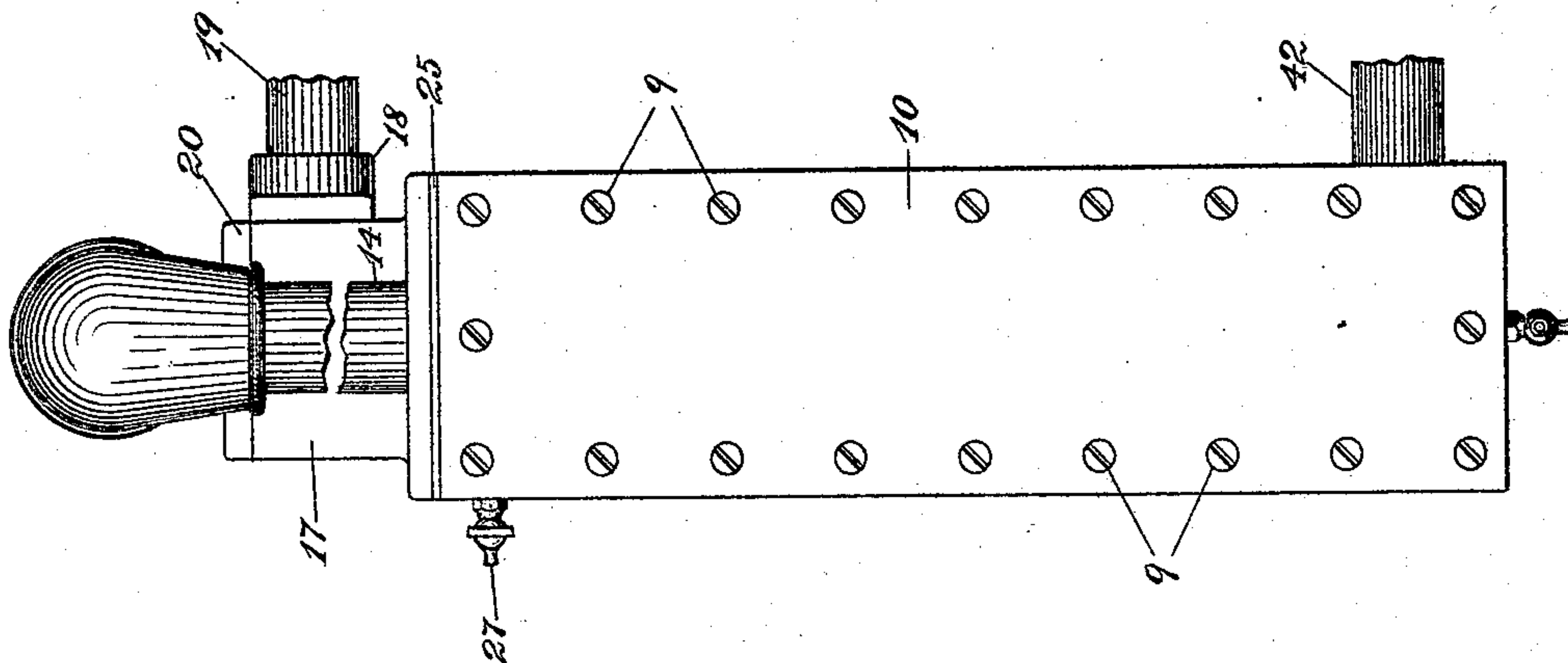
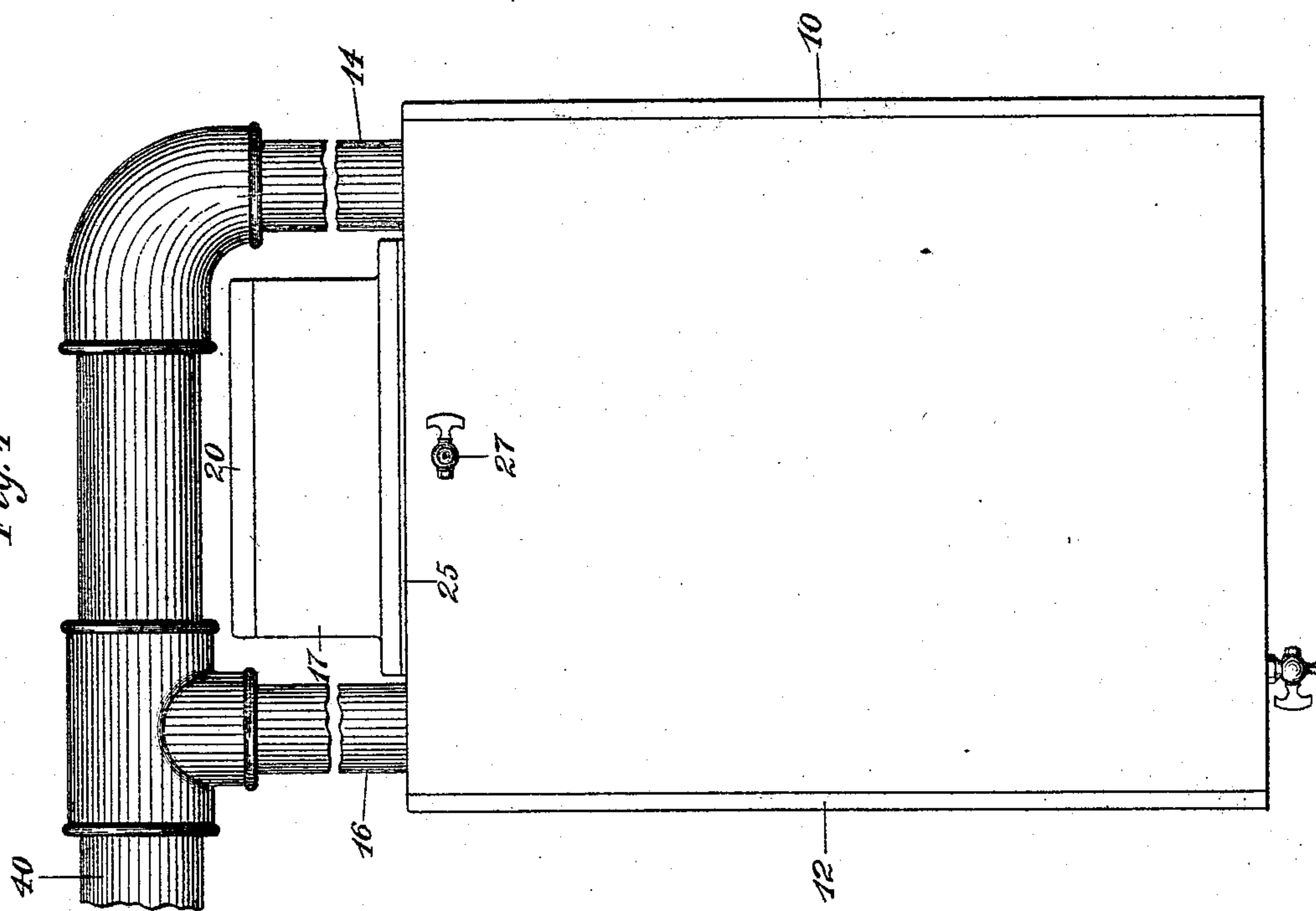


Fig. 1



Witnesses:

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Henry L. Rickard.

Inventor:

N. Clute.

By his Attorney

J. H. Richards

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4

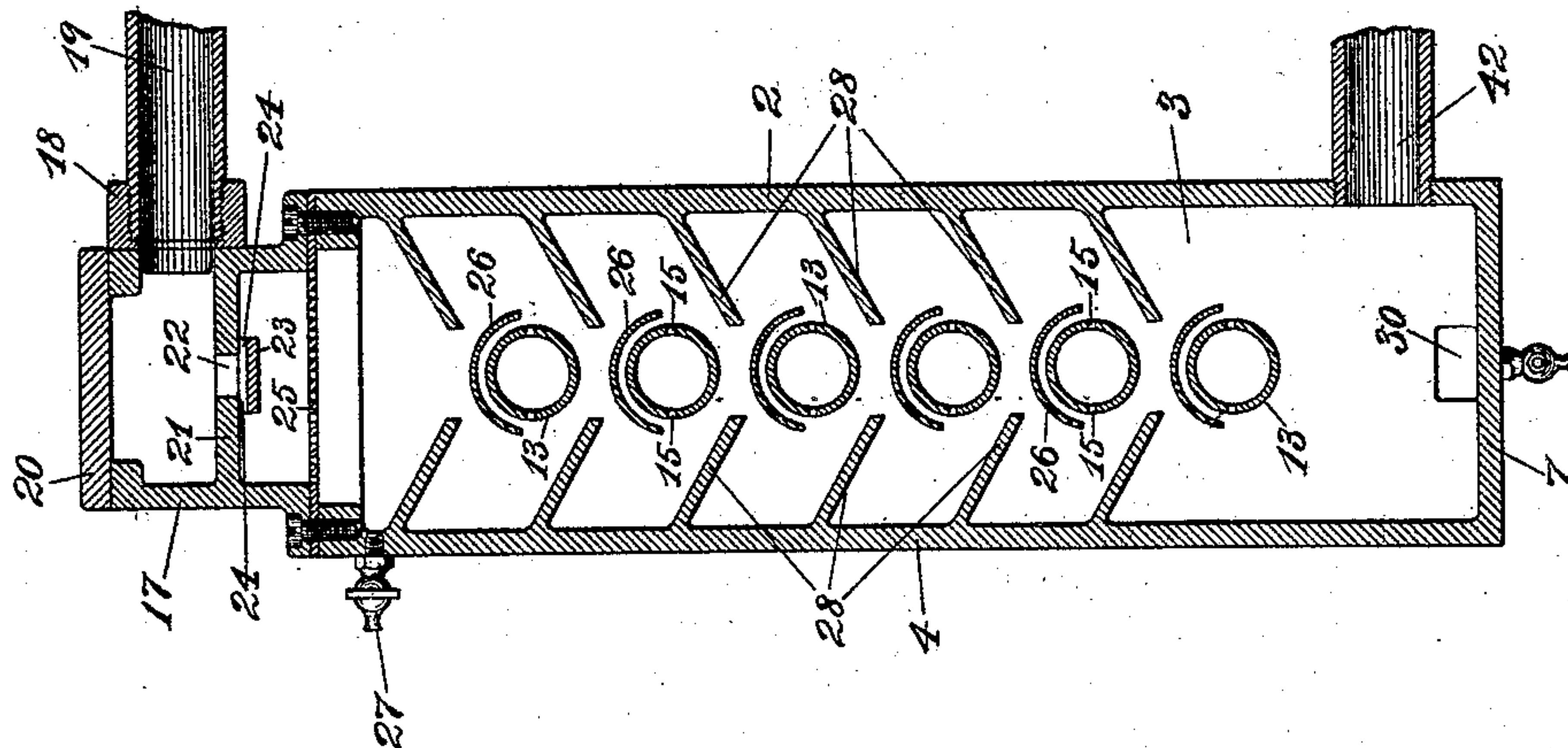
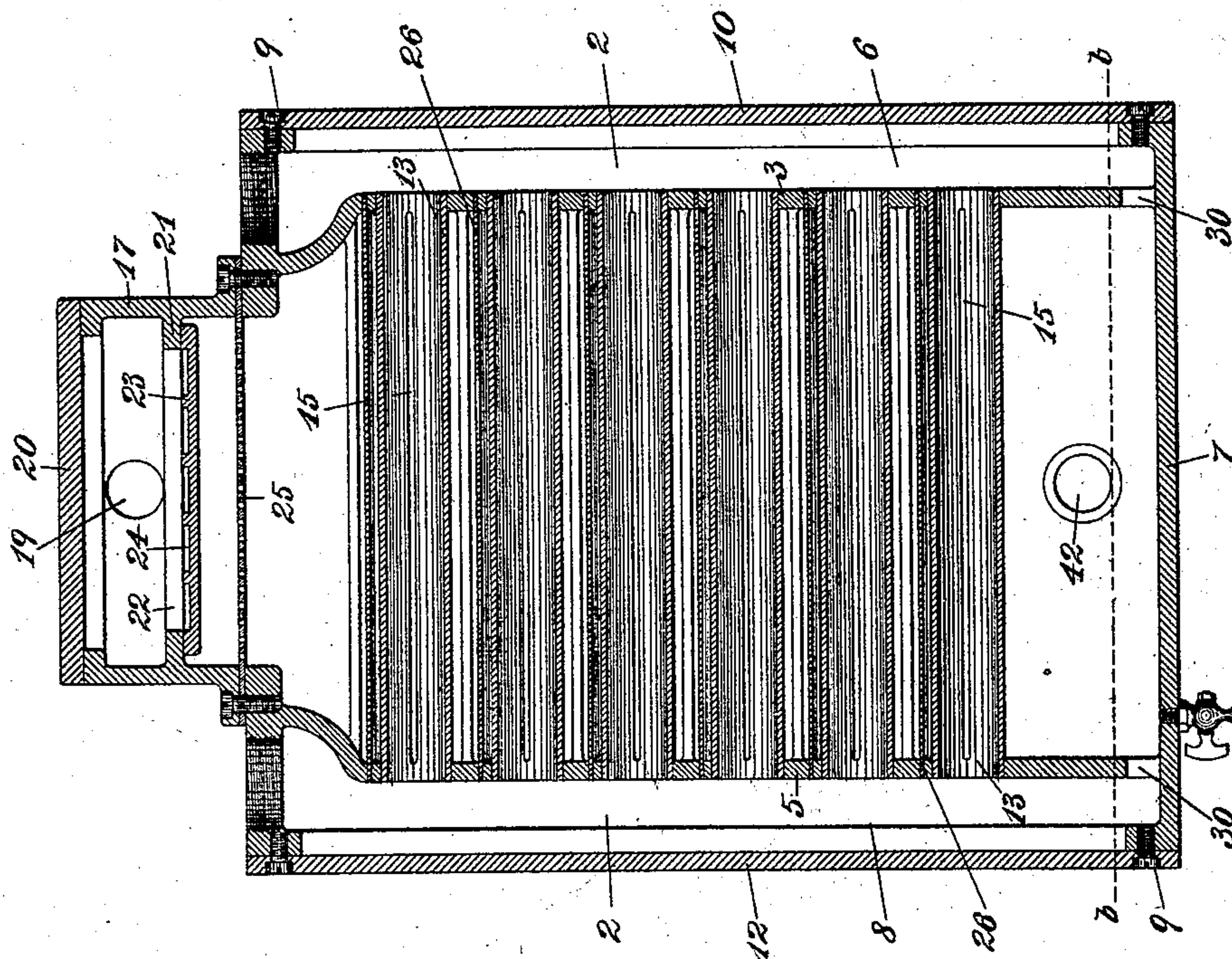


Fig. 3



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UNITED STATES PATENT OFFICE.

NICHOLAS CLUTE, OF SCHENECTADY, NEW YORK.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 455,389, dated July 7, 1891.

Application filed March 6, 1891. Serial No. 383,953. (No model.)

To all whom it may concern:

Be it known that I, NICHOLAS CLUTE, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to heaters for utilizing the exhaust-steam in the heating of feed-water for boilers.

In the drawings accompanying and forming a part of this specification, Figure 1 is a front elevation of a feed-water heater embodying my present invention. Fig. 2 is a side elevation of the heater. Fig. 3 is a longitudinal vertical section showing the internal construction of the heater. Fig. 4 is a transverse vertical section in line *a a*, Fig. 1.

Similar characters designate like parts in all the figures.

My improved heater has a heating-chamber which is also the steam-condensing chamber, steam passages and pipes leading to and through said chamber, water supplying and discharging pipes, and means for effecting the commingling of the steam and water to condense the steam and thereby heat the water. The heating-chamber is preferably of a rectangular form, substantially as shown in the drawings, and may properly consist of the side walls 2 and 4, the end walls 3 and 5, the bottom plate 7, and a covering at the upper end thereof. Said side walls 2 and 4 are extended on each end thereof beyond the aforesaid end walls 3 and 5 to form the steam-chambers 6 and 8, respectively, which are closed by the covers or plates 10 and 12, secured in place by suitable screws, as 9. Steam is brought to said steam-chambers through suitable pipes, as 14 and 16, which lead from the exhaust-pipe 40 of a steam-engine, said pipes 14 and 16 being connected to the heater in any well-known and suitable manner. The steam is conducted through and into the heating-chamber by a series of steam-pipes 13, supported in the aforesaid end walls 3 and 5, after the manner of supporting the boiler-tubes in the tube-sheets of steam-boilers.

For properly distributing the steam to the

different parts of the chamber the steam-pipes 13 are formed with narrow slots 15 on either side thereof, which slots or openings extend throughout nearly the whole length of said tubes and pipes. A row of holes may, however, be substituted for said slotted openings.

For properly supplying the feed-water to the heater the top of the heater is provided with the box or water-chamber 17, into which the water is led through a supply-pipe 19, connected in any suitable manner, as by means of the flanged connection 18, to one side of said box. A cover 20 is removably secured to the top of the water-box by suitable screws or bolts, whereby access may be had to the interior of said box. At a little distance above the lower side of the box there is a floor or horizontal partition 21, having in the middle portion thereof an opening 22 extending nearly or quite the whole length of the box. Under said opening 22 is placed a water-distributing plate 23, between which plate and floor narrow passages 24 and 24 are formed for delivering the water in thin streams or "sheets" in opposite directions. The distributing-plate 23 acts to throw the feed-water to the sides of the perforated plate in substantially equal quantities, so as to more uniformly supply the water to the whole cross-sectional area of the heating-chamber.

Under the water-box and covering the heating-chamber I use the perforated plate 25 for delivering the water into the chamber in the form of numerous small streams. This plate is or may be held in place by being clamped between the water-box and the top of the heater-casing, as shown.

Over each of the steam-pipes 13 there is a shield or guard-plate 26, whose edges come down close to the plane of the steam-pipe openings or slots 15, as shown in Fig. 4. Inclined water-shedding plates 28 are arranged on either side of the vertical row of steam-pipes, and set to deliver the descending streams or sheets of water onto the aforesaid shields or guard-plates, from whence the water runs off onto the projecting streams of steam, whereby the water is blown outward and falls onto the next lower water-shed, the

steam and water being thoroughly commingled in the operation. The water entering at the top of the heater passes down over the successive sheds and shields, and is successively sprayed and commingled with the successive currents of steam until it attains its maximum temperature, when of course it is no longer heated by each succeeding stream of steam, and consequently the lowermost pipes may become ineffective for the further heating of the water. In this case the lower portion of the heating-chamber naturally becomes filled with steam, and the heating is done chiefly or wholly in the upper portion of said chamber. When the heater is working in this manner, the resistance to the outflow of steam naturally increases in the lowermost of the pipes, while the condensation at the upper part of the chamber produces a suction, naturally increasing the outflow of steam through the uppermost pipes. In practice these operations are of course self-regulating, and the heating of the water is extended downward from the top of the chamber in accordance with the supply of water relatively to the supply of steam. By this means the heater is adapted for heating a variable supply and works smoothly without the violent agitations common to the old forms of spray-heaters, which, as a rule, are well adapted only for heating a regular supply and to work under substantially uniform conditions. The heated water is discharged through a suitable outlet-pipe, as 42, set at the normal water-line *b b* of the heater.

The steam-pipe shields serve to guide the water and also to protect the steam-pipe from being chilled by the water, thus preventing condensation of steam within the steam-pipe itself. This feature overcomes one of the obstacles encountered in many kinds of heaters and prevents the making of the objectionable "water-hammer" action by accumulation of the water in the pipes.

For the purpose of disposing of the condensed water sometimes coming down from the exhaust-pipes and forming to some extent in the steam-chambers at the sides of the heater, I extend said steam-chambers downward below the normal water-line *b b*, Fig. 3, and connect them by passage 30 with the lower end of the heating-chamber. The hot water collecting in the lower end of said chamber will stand above the passages and fill also the lower part of said steam-chambers up to the normal water-line *b b*, Fig. 3. Any accumulation of condensed water in the steam-chambers flows through said passages into the heater-chamber, and is thus disposed of. This arrangement prevents in a large degree the passage of any condensed water into the steam-distribution pipes 13 and also provides for the disposition of any which may form in said pipes—as, for instance, when the cooled heater is being put into use.

The water-shedding plates or "water-sheds" 28 may be cast integral with the walls of the heating-chamber, or the same may be made separate from the walls of the heater and be affixed thereto in any suitable manner, as by riveting or by means of bolts. (Not shown.)

The heater should be provided with a vent-valve 27, set preferably immediately below the plate 25, whereby when the heater is put into service the air may be allowed to escape.

One of the principal objects in my present invention is to furnish a heater in which the feed-water may be delivered at substantially the temperature of the steam, or nearly 212° Fahrenheit.

It will of course be understood that this feed-water heater may be connected and arranged intermediate to a steam-engine and the boiler-feeding pump, and to operate as a condenser for assisting the engine, after the manner of other kinds of water-heating condensers now in use.

Having thus described my invention, I claim—

1. In a feed-water heater, the combination, with the heating-chamber, of the steam-pipe having an opening at the side thereof for the steam, and the guard-plate set over the steam-pipe and having its edge above and contiguous to the plane of the steam-pipe opening, substantially as described.

2. In a feed-water heater, the combination, with the heating-chamber, of the steam-pipe therein, the guard-plate over the steam-pipe, and the oppositely-disposed water-shedding plates, substantially as described, terminating over the guard-plate, substantially as described.

3. In a feed-water heater, the combination, with the heating-chamber, of the steam-pipes and their guard-plates, the water-shedding plates set in oppositely-disposed pairs intermediate in height to the several steam-pipes, each pair of said plates being set to deliver the descending streams of water onto the next lower guard-plate.

4. In a feed-water heater, the combination, with the heating-chamber and means supplying steam thereto, of the water-box having the longitudinal opening in the floor thereof and the water-distributing plate set below said opening, whereby the water is distributed to the opposite sides of the heating-chamber, substantially as described.

5. In a feed-water heater, the combination, with the heating-chamber and means supplying steam thereto, of the water-box having a longitudinal opening in the floor thereof, a distributing-plate, substantially as described, fixed below said opening, and the perforated plate between the water-box and heating-chamber, whereby the water is delivered to the opposite sides of the chamber in substantially equal quantities in numerous small streams, substantially as described.

6. In a feed-water heater, the combination, with the heating-chamber and pipes, substantially as described, supplying steam thereto, and means supplying water to the chamber, 5 of the steam-chambers at the sides of the heating-chamber and extending to the lower part thereof, said steam-chambers being connected below the normal water-line with the heating-chambers, substantially as described.

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Witnesses:

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