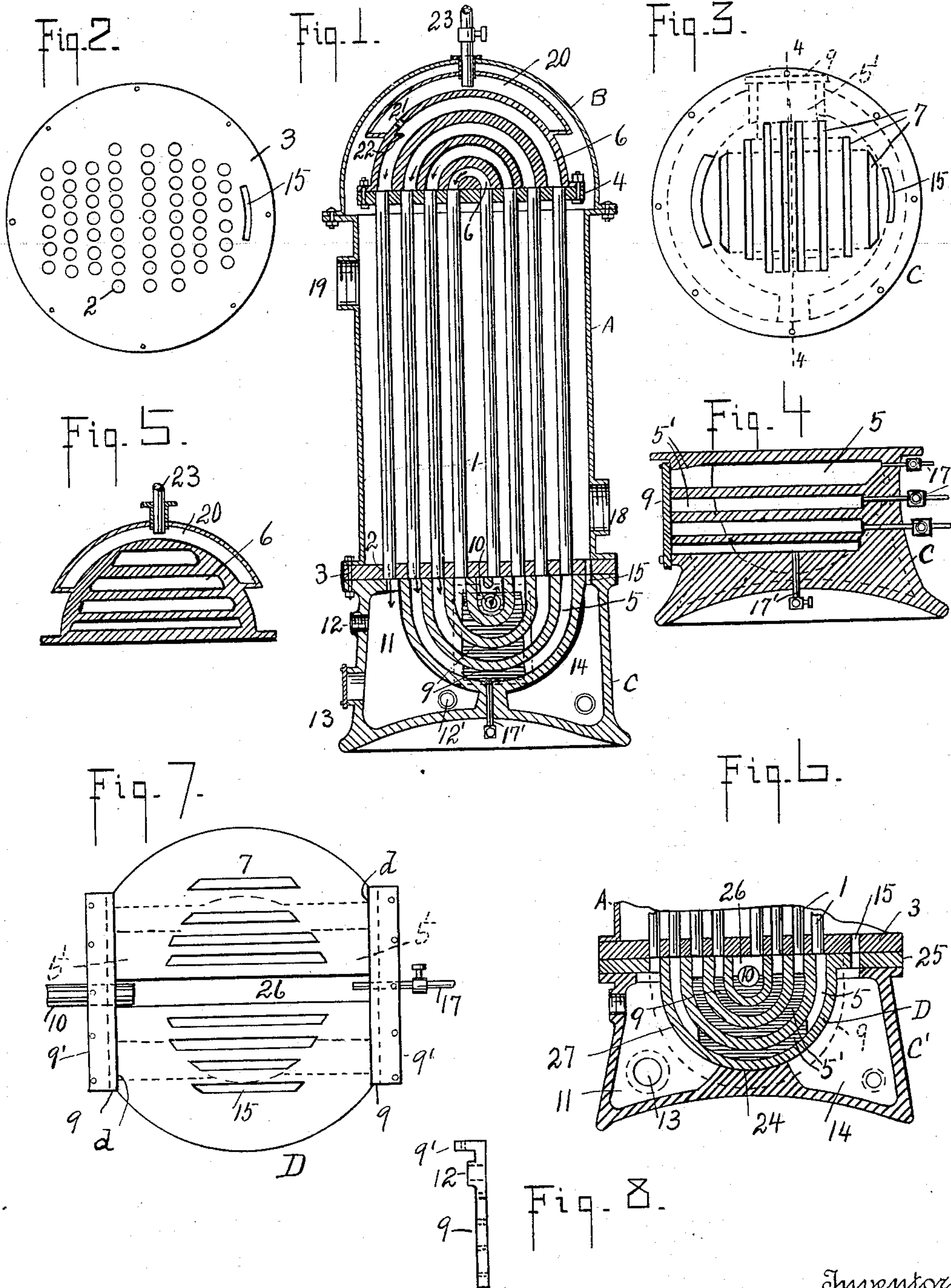


(No Model.)

C. J. JACKSON.
FEED WATER HEATER.

No. 604,249.

Patented May 17, 1898.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES J. JACKSON, OF ERIE, PENNSYLVANIA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 604,249, dated May 17, 1898.

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To all whom it may concern:

Be it known that I, CHARLES J. JACKSON, a citizen of the United States, and a resident of Erie, county of Erie, and State of Pennsylvania, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

The object of this invention is to improve the construction of feed-water heaters; and the invention resides mainly in the construction and arrangement of the circulating system, in the construction of the top and bottom parts of the heater, in the scum-chamber, and in other features hereinafter described and claimed.

In the accompanying drawings, Figure 1 shows a central vertical section of the heater. Fig. 2 is a plan of the bottom tube-plate. Fig. 3 is a plan of the base. Fig. 4 shows a section of the base on line 4 4 of Fig. 3. Fig. 5 shows a section of the upper tube-connecting cap at right angles to the section of Fig. 1. Fig. 6 is a partial section showing a modification. Fig. 7 is a plan of the channeled body, and Fig. 8 is an edge view of a cover-plate.

In the drawings cylinder A and dome B form the steam-chamber, entirely surrounding the circulating system through which the water to be heated passes except in the base C. Said circulating system consists of straight tubes 1, the open ends of which at top and bottom are secured in holes 2 in tube-plates 3 4, the holes being preferably arranged in straight rows across the plates, so as to register with the ends of the curved passages 5 6 in the base and top of the heater. Plate 3 is bolted to the base and plate 4 to the tube-cap. Passages 5 6 are preferably cast in the base and in the cap in concentric curves of increasing radius and are of considerable width, as shown by the long slots 7, which are the ends of said passages. At one side or at both sides in the base these passages extend transversely to the side of the base C, as indicated at 5', and are there normally closed by plate 9, removably secured to the base. It is preferred to cover all these openings by a single plate 9; but this is not always essential. By removal of this plate the bottoms of the curved passages can be readily reached for cleaning without disconnecting the tube-plate from the base. In the side opposite plate 9, Fig. 4,

holes will be tapped to each of the curved passages for tubes 17, through which the passages, with their sets of tubes, can be separately drained or blown out. This outlet for the outer passage may be through the bottom, as at 17'.

The inlet-pipe for water is connected to the central passage at 10, with which a central row of tubes 1 are in communication. This row at the top is connected by the central curved passage 6 to the adjoining row of tubes, thence down and through the next curved passage 5 to the succeeding row of tubes 1, and so on through all the rows of tubes in series, as indicated by arrows in Fig. 1, the heated water from the last row passing into hot-water settling-chamber 11 in one side of the base and having an opening 12 for an outlet-pipe and a covered hand-hole 13 to permit removal of sediment, and a blow-off pipe 12'. In the opposite side of the base is a chamber 14 for water of condensation and oil which are admitted thereto through passage 15 from the steam-space in cylinder A, surrounding tubes 1, and dome B over the tube-cap. The two hot-water chambers 11 14 surround the part containing the curved passages 5, except at the small area, where the latter extend to the side of the base at plate 9, as above described, and thus greatly economizes heat. The inlet for cold water being at the central passage is far removed from the hot-water chamber and does not reduce the temperature thereof. The settling-chamber is at the end of the circulating system, and the water reaches it only after being thoroughly heated and after the scum and oil have been removed.

18 19 are steam inlet and outlet.

The upper tube-plate 4 may be like plate 3, except that opening 15 will be omitted.

Above the outer curved passage is a scum-chamber 20 as wide as or wider than said passage and connected therewith by suitable opening or openings 21, with a lip 22 as long as the opening and just below it to assist in diverting scum into the chamber, from which it is blown off through pipe 23 or otherwise. The combined area or capacity of the tubes in each row is greater than the area of outlet 12; but the lip 22 between opening 21 and the water-outlet is proportioned to reduce the area of the last passage 6 to about equal the

said outlet. This lip also serves to keep the water back in the tubes, allowing the maximum amount of light impurities to rise into the scum-chamber as well as to check the water and keep it the longest possible time in the outer and hottest rows of tubes.

One great advantage of this heater is that the tubes are free to expand and contract. The tube-cap, bolted to the upper tube-plate, practically makes loops of the tubes, at the same time leaving them all accessible for cleaning or removal. While curved channels cast in the base and in the cap for connecting the rows of tubes have advantages and are preferred, they are not always necessarily thus formed.

It is sometimes desirable, especially in large heaters, to cast or otherwise form the tube-connecting channels in a body separate from the base-casing, but constituting a part of the base. This is illustrated in Fig. 6, where C' is the base-casing and D the body, the bottom of which rests tightly against the curved surface 24 of the base-casing, and the top flange 25 of which rests on the top of the base-casing. The tube-plate 3 (with tubes 1) rests on said body, with the rows of tubes communicating with the channels, as in Fig. 1. In Fig. 6 the central channel is an open groove or depression 26, extending the whole width of said body, the body extending into curved openings 27 in the base-casing at both sides. The channels 5 are extended transversely to the sides of the body in both directions at 5', Figs. 6 and 7, the openings being covered by plates 9, which are preferably formed with top flanges 9', the upper sides of which when in position are in the same plane as the top of the body. The body and the flanges of said plates have bolt-holes corresponding to holes in the base in the tube-plate and in the flange of cylinder A, so that the parts can be securely bolted together. The plates 9 are also bolted to the flat sides *d* of body D. Through one of the plates 9 extends the water-inlet tube 10, and through the other plate extend the blow-off pipes 17 to the several curved channels.

I claim—

1. The combination, in a water-heater, of several rows of tubes terminating at top and bottom in tube-plates, a base on which the bottom tube-plate rests containing passages connecting the bottoms of the tubes of one central row to the bottoms of the tubes of an adjoining row, a cap on the tops of the tubes also having passages and connecting the tops of the tubes in the second row with those of a third row, and so on for other rows until the outer rows are reached, water inlet and outlet passages, one communicating with a central row of the tubes and the other with an outer row, and an inclosing steam-chamber.

2. The combination, in a water-heater, of groups of tubes connected in series, the connection at the bottom being by curved pas-

sages cast in the base and extending transversely to openings at one side, a removable plate normally covering said openings, and a steam-chamber inclosing the tubes.

3. The combination, in a water-heater, of groups of tubes the groups being connected in series by detachable curved passages at top and bottom, the passages at the bottom having normally-closed clearing-openings and a removable cover therefor.

4. The combination, in a water-heater, of groups of tubes the groups being connected in series by passages at top and bottom, the passages at the bottom having blowing-out connections whereby the passages and connected rows of tubes can be drained or blown out separately.

5. The combination, in a water-heater having a water inlet and outlet and a steam-chamber, of rows of tubes connected in series by suitable passages, a scum-chamber over the connecting-passage of the last row of tubes, and one or more openings from said passage to the scum-chamber.

6. The combination, in a water-heater having a water inlet and outlet and a steam-chamber, of tubes suitably connected at the bottom, a tube-plate in which the tubes terminate at the top, a cap having curved passages for connecting the tubes at the top, and a scum-chamber connected with the outer passage.

7. The combination, in a water-heater, of tubes terminating at the top in a tube-plate, a cap having curved passages for connecting the tubes, a scum-chamber over the last passage, there being one or more openings from said last passage to the scum-chamber, a lip or lips below the openings for diverting scum into the scum-chamber, and a steam-chamber.

8. The combination, in a water-heater having water inlet and outlet, and a steam-chamber, of rows of tubes connected in series by passages, the rows of tubes and the passages being of greater capacity than the outlet of the heater, the passage to the last row of tubes at its outer end being contracted between the water-outlet and the opening into the scum-chamber so as to make it about equal in capacity to the water-outlet, as specified, whereby scum is more perfectly diverted to the scum-chamber, and said scum-chamber.

9. The combination, in a water-heater having a water inlet and outlet and a steam-chamber, of rows of tubes connected in series by suitable passages, a scum-chamber over the connecting-passage of the last row of tubes, and one or more openings from said passage to the scum-chamber, and a blow-out pipe connected to the scum-chamber.

Signed this 8th day of December, 1896.

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Witnesses:

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