

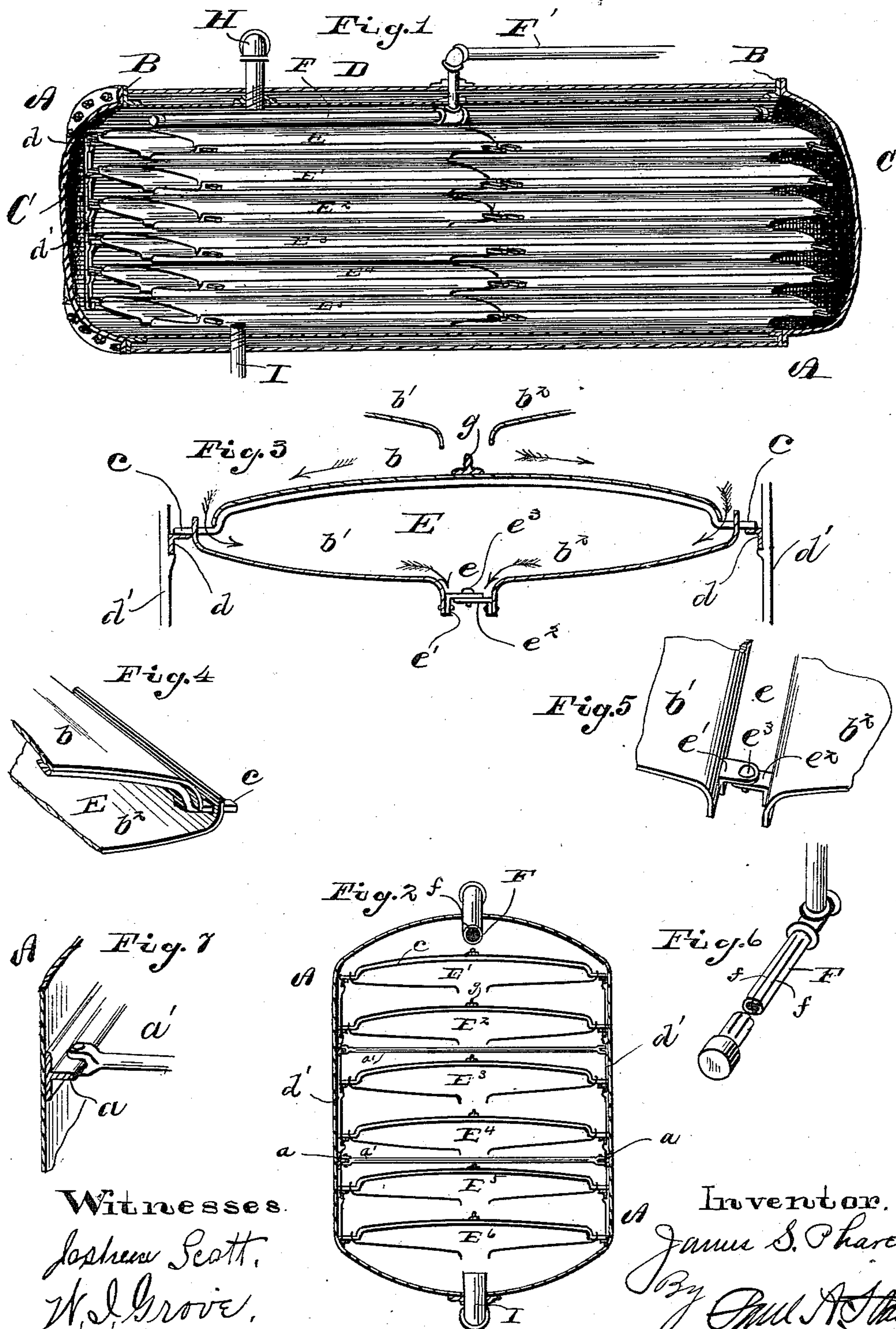
(No Model.)

J. S. PHARES.

FEED WATER HEATER AND PURIFIER.

No. 379,540.

Patented Mar. 13, 1888.



Witnesses.

Joshua Scott,
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UNITED STATES PATENT OFFICE.

JAMES S. PHARES, OF SPRINGFIELD, OHIO, ASSIGNOR OF ONE-HALF TO
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FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 379,540, dated March 13, 1888.

Application filed November 15, 1887. Serial No. 255,275. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. PHARES, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Feed-Water Heaters and Purifiers, of which the following is a specification.

My invention relates to improvements in feed-water heaters and purifiers, and it particularly relates to that class of heaters and purifiers known as "live-steam heaters," in which heat for raising the temperature of the water and removing incrustating substances therefrom is obtained from the live steam direct from the boiler.

The object of my invention is to provide a novel construction of shelves or pans, over which the water is adapted to flow in a thin and uniform sheet, whereby a large amount of surface is presented to the passing water and on which the incrustating substances will be deposited.

My invention consists in the various constructions and combinations of parts herein after described, and set forth in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 is a perspective view, partly in section, showing the interior arrangement of my improved heater. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a transverse sectional view of one of the shelves or pans in detail. Fig. 4 is a detailed view in perspective of one of the shelves or pans, showing the manner of supporting same. Fig. 5 is a detailed view showing the manner of connecting the section of bottom pans. Fig. 6 is a detailed view in perspective of the supply-pipe by which the feed-water is supplied to the heater. Fig. 7 is a perspective view in detail of a portion of the shell of the heater, showing the manner of staying same.

Like parts are indicated by similar letters of reference throughout the several views.

In the accompanying drawings, A A represent the outer casing of the heater, which is constructed, preferably, of boiler-iron, riveted up in the usual manner, and provided at either end with suitable flanges, B B, to which the heads C C are secured. The outer surface of

the casing A may be provided with a jacket of wood or other non-conducting material, if so desired. The top and bottom of the casing are formed curved, as shown in Fig. 2, while the sides are preferably left straight, and in order to get the requisite strength I provide on either side longitudinal strips of T-iron, running the entire length thereof and connected together at suitable intervals by stay-rods a' . Extending longitudinally through the heater, and arranged in a series one above another, is a set of shelves or pans, E E' E², &c. The pans or shelves E are each formed of an upper portion, b , consisting, preferably, of a single sheet of thin or resilient metal, secured at either end to and supported by end pieces, $c c$, preferably of malleable iron, the lower portion of the shelves being formed in two parts or distributors, $b' b^2$, also supported from the end strips, c , and connected together in the manner hereinafter more fully set forth.

The end pieces, $c c$, are projected beyond the edge of the shelf or pan, and are adapted to rest on the longitudinal ways or guides $d d$, on which they are also adapted to slide. These ways or guides are constructed of angle-iron, secured at suitable intervals to vertical supporting-pieces d' , riveted or otherwise secured to the sides of the casing A A. The upper and lower portions, $b b' b^2$, of each of the shelves or pans E E', &c., are curved, as shown in Fig. 3, the upper portion, b , having the convex side upward, and the lower portions, $b' b^2$, having their convex sides downward. The edges of the upper portion, b , are preferably drawn in slightly and rounded on the arc of a circle having a radius much shorter than that which forms the main portion. The outer edges of the lower portion or distributors, b' and b^2 , are each turned upward in a similar manner and projected beyond the edges of the upper portion, b , as shown. The lower portions, $b' b^2$, are each provided in their upturned edges with suitable openings, through which the projecting ends of the end pieces, $c c$, are adapted to project, as shown in Fig. 4. The inner edges of each lower portion or distributor, b' and b^2 , are curved downwardly and are separated from each other, so as to form an opening or channel, $e e$, extending longitudi-

nally under the center of the upper portion, b . The lower portions, b' and b^2 , are provided at intervals with small angle-iron cleats e' and e^2 , riveted or otherwise secured to the downwardly-curved inner edges of the lower portions, b' and b^2 , the said cleats being adapted to overlap, as shown in Figs. 3 and 5, and provided with suitable openings therein to receive a connecting-pin, e^3 .

The water to be heated is admitted to the series of shelves or pans through a feed-pipe, F , extending longitudinally above the upper shelf, E , near the top of the casing $A A$, and connected through the casing to the supply-pipe F' . This pipe F is provided at the top with a series of longitudinal openings or slots, f , through which the water fed thereto passes in thin sheets, and, running down on the outside of the pipe, falls upon the upper portion, b , of the first pan, E , and in the center thereof. The water here divides and flows each way in a uniform sheet along the upper side of the plate b , and, passing over the downwardly-curved edges thereof, drops onto the concave surfaces of the lower portions or distributors, b' and b^2 , and, flowing in a uniform sheet on the same, is carried back to the center of the pan E and discharged through the opening or channel e onto the next succeeding pan, E' , of the series. In order to divide the water equally on each side of the respective shelves, I provide a divider, g , consisting, preferably, of a T-shaped strip extending longitudinally along the upper side of the top portion, so that in the event of the heater not setting perfectly level the water will not be unequally divided. It will be seen that the water thus passes from the center to the outer edges of the upper portion of each pan, thence from the outer edges to the center on the lower portion or distributor of each pan, and continues this course throughout the series. The steam from the boiler enters through the pipe H and fills the casing, and raises the temperature therein until it equals that in the boiler. The water passing over the various shelves is therefore subjected to the same conditions as in the boiler proper, and the incrustating substances are deposited on the said shelves. The water from the heater is carried off through an exit-pipe, which is preferably projected into the heater from the bottom and extends for a short distance therein, so that the water remains at a uniform depth at the bottom of the heater, thus forming a settling-reservoir, in which any mud or free solids contained in the water are deposited.

The heads $C C$ of the heater are each removable, and when so removed the pans $E E'$, &c., may be readily removed by sliding from their place on the ways or guides d . By the construction of the pans above set forth the upper and lower portions may be readily separated by removing the pin e^3 and sliding the lower portions from the end pieces, $c c$, and when so separated may be readily cleaned and the incrustating substances thereon removed.

It is obvious that any number of the pans or shelves may be used in a series, and the pans may be of any length desired to secure the required capacity. When larger-sized heaters of considerable length are used, I preferably use a double series of pans, as shown in Fig. 1—that is, each pan or shelf is made in two sections, the ends of which are adapted to come together, the object of this construction being to render them more convenient for cleaning.

It is obvious that the constructions herein shown may be used in other forms of heaters than a live-steam heater, and that the constructions may be modified without departing from the spirit of my invention. The same constructions would answer equally well as an exhaust-steam heater, suitable means being provided for passing the exhaust-steam of the engine through the casing $A A$.

Having thus described my invention, I claim—

1. In a feed-water heater and purifier, a longitudinal shelf or pan of substantially uniform width throughout its length and formed with an upper convex portion, over which the water is adapted to flow uniformly from the center to the outer edges, and a lower concave portion, over which the water is adapted to flow uniformly from the outer edges to the center, substantially as set forth.

2. The combination, with the outer casing having a curved top and bottom and straight sides, of the series of longitudinal shelves or pans of substantially uniform width, each provided with a convex upper portion adapted to convey water each way thereon in a uniform sheet from the center to the outer edges, and a lower concave surface adapted to convey water from the outer edges to a central longitudinal opening therein and discharge the same onto the next succeeding pan of the series, substantially as set forth.

3. In a heater, a pan consisting of an upper curved portion riveted or otherwise secured to the end pieces, having projecting ends adapted to rest on suitable guides or ways, and a lower curved portion having openings adapted to extend over said projecting end pieces, and means for connecting the inner edges of said lower portion together, so as to form a central opening or channel between the same, substantially as set forth.

4. The pan or shelf for the heater, consisting of an upper convex portion, end pieces to which same is secured, the lower concave portion connected to said end pieces and provided with upturned outer edges extending beyond the outer edges of said upper portion, and with downwardly-turned inner edges connected together, so as to form a central opening or channel between same, and means for readily disconnecting the same, substantially as set forth.

5. The combination, with the outer casing, of the vertical supporting-strips having angle-iron ways secured thereto, and the pans or shelves having end pieces, to which a convex

upper plate is attached, the said pans being provided with lower concave plates provided with openings adapted to pass over said end strips, having downwardly-turned inner edges
5 connected together by angle-iron cleats and a removable pin, so as to form a central opening or channel therein, substantially as and for the purpose set forth.

6. The combination, with the outer casing, of
10 the series of longitudinal shelves or pans, each consisting of an upper and lower portion of substantially uniform width, adapted, respectively, to carry the water in a uniform sheet from the center to the outer edges, and from
15 the outer edges back to the center, and having a pipe provided at the top with openings therein adapted to distribute the water uni-

formly throughout its length to the upper pan of the series, substantially as set forth.

7. The combination, in a heater, of a series 20 of pans or shelves of substantially uniform width, each having an upper convex surface adapted to carry the water from the center to the outer edges, and a lower concave portion adapted to carry the water from the outer edges 25 to the center, and the longitudinal divider on the top surface for dividing the water which is discharged thereon, substantially as set forth.

In testimony whereof I have hereunto set my hand this 9th day of November, A. D. 1887. 30
JAMES S. PHARES.

Witnesses:

CHASE STEWART,
PAUL A. STALEY.