

(No Model.)

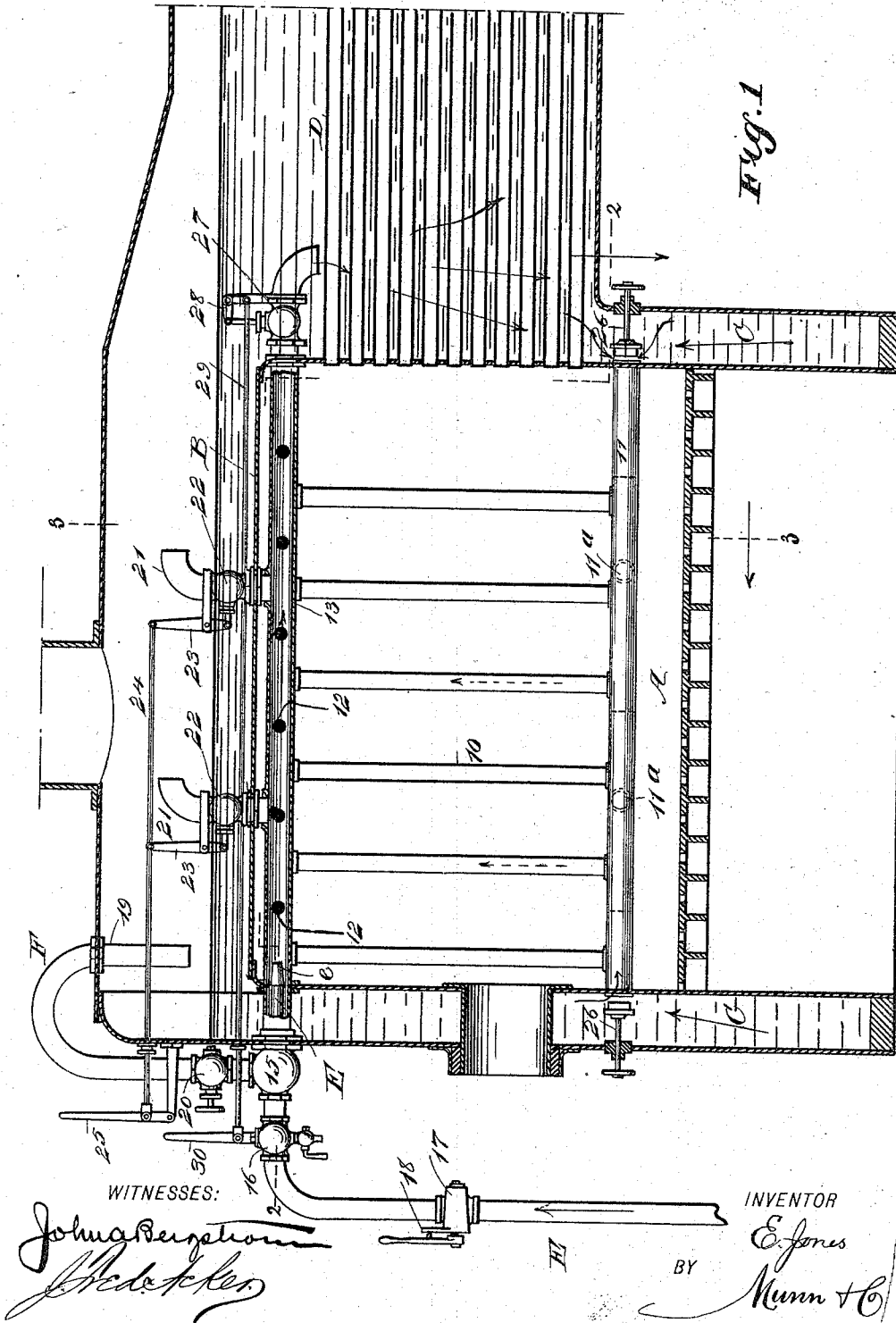
2 Sheets—Sheet 1.

E. JONES.

FEED WATER HEATER AND CIRCULATOR FOR BOILERS.

No. 530,420.

Patented Dec. 4, 1894.



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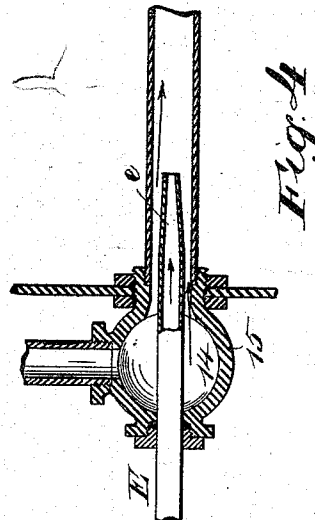
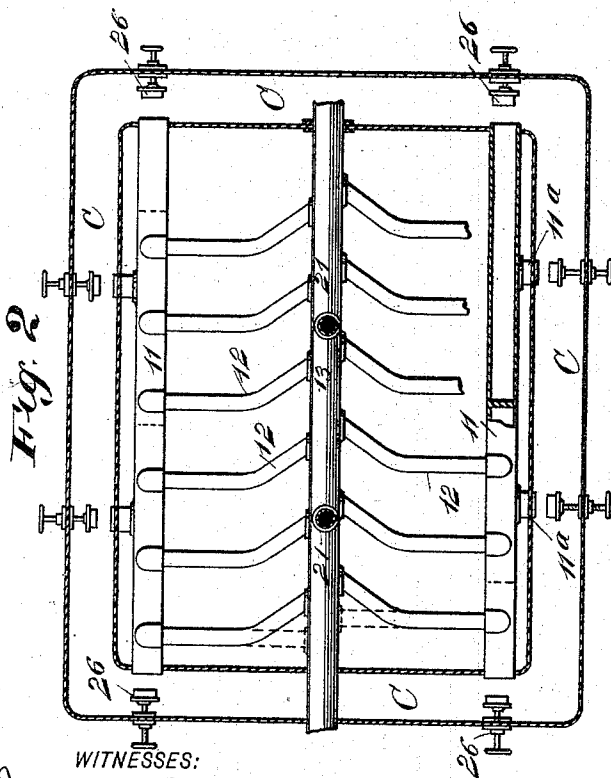
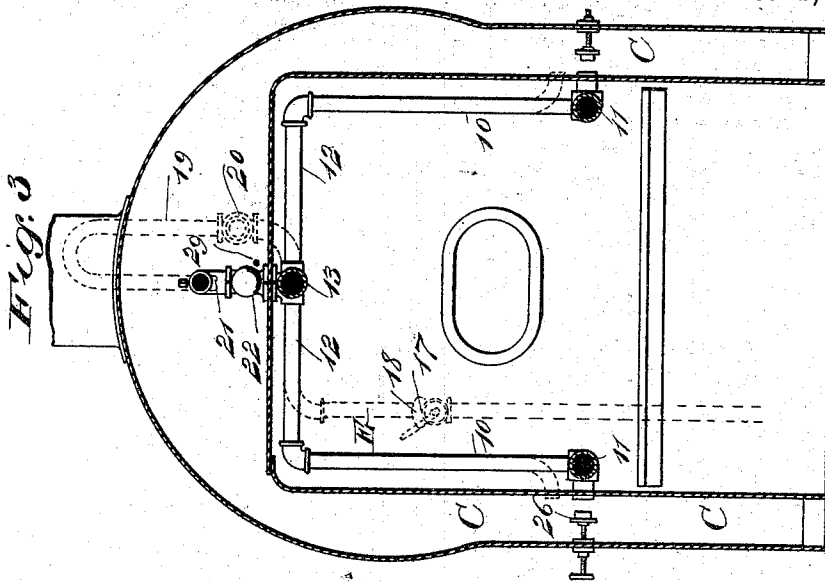
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WITNESSES:

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FEED-WATER HEATER AND CIRCULATOR FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 530,420, dated December 4, 1894.

Application filed March 24, 1894. Serial No. 504,945. (No model.)

To all whom it may concern:

Be it known that I, EDWARD JONES, of New York city, in the county and State of New York, have invented a new and Improved
5 Feed-Water Heater and Circulator for Boilers, of which the following is a full, clear, and exact description.

My invention relates to a feed water heater and circulator for boilers, and it has for its
10 object to provide a means whereby the circulation of the water in the boiler of a marine, stationary or of a locomotive engine will be thorough and constant, and whereby also the feed water will be heated before it reaches
15 the tubular section of the boiler, thus providing for a rapid generation of steam.

A further object of the invention is to so construct the feed mechanism that the amount of feed water to be forced into the boiler will
20 be thoroughly under control, and to provide a means whereby in the event the pressure in the water tubes should become too strong said pressure may be expeditiously and conveniently relieved, as well as to provide a
25 means whereby if in feeding the water to the boiler the water should by any possibility reach too high a level, the supply of water will be automatically reduced in quantity until a proper level is obtained.

Another object of the invention is to provide a means whereby in the event any of the tubes in the fire box should leak, the tubes may be closed from the exterior of the boiler, and the leak readily and expeditiously
35 repaired.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

45 Figure 1 is a longitudinal vertical section through a fire box and portion of a boiler, illustrating the application of the improvements thereto. Fig. 2 is a horizontal section taken below the crown sheet. Fig. 3 is a vertical section taken at a point near the center of the fire box; and Fig. 4 is a detail sectional view, illustrating the manner in which

the supply pipe is made to enter the feed pipe, and its connection likewise with the water regulating device of the boiler.

55 In carrying out the invention, within the fire box A, and below the crown sheet B, a series of vertical water-heating tubes 10 is arranged along each side of the fire box, which tubes connect at their lower ends, each row
60 with a circulating pipe 11 of much greater diameter, and the circulating pipes enter the front and rear portion of the water legs C of the boiler, and likewise communicate with the
65 sides of the water legs through the medium of branch pipes 11^a. The circulating pipes may be in one length, or they may be and preferably are made in independent sections as illustrated. Each vertical water-heating pipe
70 is made to meet a horizontal top or arch water-heating-pipe 12, and the said upper horizontal arched water-heating tubes or pipes are made to connect with a feed pipe 13, located over the central portion of the fire box
75 beneath the crown sheet, and extending from front to rear of said box, the rear end of the feed pipe being carried over the fire tubes D of the boiler in a manner to deliver the water directly therein, as shown in Fig. 1, while the
80 forward end is carried through to the front exterior portion of the fire box, as shown in both Figs. 1 and 4. The upper water-heating tubes 12, are made to connect with the feed pipe in staggered order, those upon one side
85 connecting with the pipe intermediate of those upon the opposite side; and the said upper tubes are of decided angularity being inclined from a point at or near their centers in a rearwardly direction, the inclination being continued to their junction with the feed pipe,
90 whereby the feed water will be prevented from entering said pipes and is compelled to discharge upon the fire tubes D.

The feed pipe 13 at its outer end is preferably connected with a chamber 14, contained
95 within a casing 15 of any approved shape, the casing shown in the drawings being somewhat cylindrical; and the inner nozzle end e of a water supply pipe E, connected with a source of water supply, a tank for example, is
100 made to enter the said chamber 14, and pass through the same a desired distance within the feed pipe 13, the water supply pipe being of much smaller diameter than the feed pipe.

The water feed pipe at a point which may be near the chamber 14, is provided with a check valve 16, and below said valve the pipe is provided with a lazy cock 17, or the equivalent thereof, and the said lazy cock is provided with a gage 18, whereby it may be set to supply a predetermined amount of water.

It will be understood that the water supply pipe will extend preferably across the outer face of the fire box and down one side thereof, as shown in dotted lines, Fig. 3.

The water-regulating device heretofore referred to, consists usually of a goose neck 19, or a pipe otherwise curved, one end of which pipe is connected with the chamber 14 in the tubular casing 15, the other end of the pipe being made to extend downward through the top of the boiler preferably at its center, into the steam space; and the inner end of the pipe of the water regulating device is intended to be always above the water line. This pipe F is provided with a valve 20, whereby communication may be immediately shut off between its inner end and the feed pipe.

One or more release tubes 21, are passed down through the crown sheet and made to communicate with the interior of the feed pipe; and above the crown sheet each of said tubes is provided with a valve 22, whereby they may be opened or closed, and the said valves may be operated in any approved manner, but usually through the medium of levers 23 connected with the valves, and a rod 24 connected with said levers and extending outward beyond the front of the fire box, the outer end of the rod having connection with a hand lever 25, or the equivalent thereof. When occasion may demand, the ends of the circulating pipes may be closed by stoppers 26, and likewise the outer ends of the branches 11^a connecting with the sections. The stoppers are operated from the exterior of the boiler, as shown in Fig. 1; and the inner end of the feed pipe may likewise be closed when desired through the medium of a valve 27, operated for example by a lever 28, connected with a rod 29, which leads out through and beyond the front of the flue sheet of the boiler in the fire box thereof, being connected with a hand lever 30, located at the front exterior of the fire box.

In the operation of feeding and generating steam, the stoppers 26 are kept open, and likewise the valve 27 at the inner or delivery end of the feed pipe. The lazy cock 18 is set to permit a predetermined volume of water to pass in and enter the feed pipe 13, from whence the water will empty upon the fire tubes D, enter the water legs, pass from thence to the circulating pipes, up the vertical pipes 10 and then through the angular pipes 12 to the feed pipe, whereby a constant circulation will be obtained in an upward direction through the tubes and pipes in the fire box, and the feed water will be rendered very hot. The steam generated in the water

tubes of the said fire box finds an exit through the inner end of the feed pipe, with the hot water, or in the event that the water in the tubes should not generate steam, the hottest water will find an exit at that point.

In the event the water in the boiler should reach too high a point, as for example, so high as to cover the inner end of the water-regulating device, the valve 20 being open, and said valve is preferably left in that state, the hot water will enter the tube F of the water regulating device, and in passing down that device into the chamber 14 and from thence into the feed pipe 13, will check the volume of cold water entering the feed pipe and thus prevent the water line from being raised to a higher level, and affording ample time for the water level to be lowered through the generation of steam, which will be very rapid.

In the event too great a pressure of steam or hot water should exist in the heating pipes within the fire box when for example the feed water is stopped, or is regulated to a minimum quantity, said pressure may be quickly and conveniently relieved by operating the hand lever 25, and blowing off into the steam space through the release tubes 21. Furthermore, in the event that a leak should occur in any of the pipes or tubes in the fire box, by closing the valve 27, or partially closing the valve 26 in the section in which the leak occurs, the flow of water through said pipes will be cut off and the leak may be immediately detected and quickly repaired, or all the plug valves may be closed, if desired.

By closing either the front or rear valve in the feed pipe the circulation may be diminished should it be too strong, and by closing the rear valve 27 in the feed pipe, the feed water will be compelled to reverse its action and enter the boiler through the water legs. The water supply pipe may be made to feed hot water which may be heated by the waste heat from the boiler in any approved manner, or from other source. The plug valves may be dispensed with when desired, but they may be employed with advantage.

The front pipes of the upper set in the fire box are preferably made straight as shown in dotted lines in Fig. 2, to overcome any vacuum that may arise, and to provide the feed pipe at its receiving end with sufficient water to prevent burning or overheating.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a boiler, the combination, with the fire box, of a feed pipe extending through from front to rear, circulating pipes located in the bottom portion of the fire box, in communication with the water legs thereof, side heating tubes extending upward from the circulating tubes, and upper tubes connecting the side tubes with the feed pipe, the upper tubes being angular, inclining from the front in direction of the rear from a given point in their

length, and a water-supply pipe connected with the feed pipe, as and for the purpose set forth.

2. In a boiler, the combination, with a fire box, circulating pipes located in the same at the lower portion thereof and communicating with the water legs, and a feed pipe extending through the fire box at one end over the fire tubes and at the other end to the front exterior of the box, of side heating tubes connected with the circulating pipes, upper sets of tubes connecting the upper ends of the side tubes with the feed pipe, the arrangement of the upper tubes being staggered and their inner ends having an inclination in direction of the rear, and a water supply pipe connecting with the feed pipe at its outer end, said water supply pipe being provided with a check and regulating valve, substantially as shown and described.

3. In a boiler, the combination, with a fire box, circulating pipes located in the same at the lower portion thereof and communicating with the water legs, and a feed pipe extending through the fire box at one end over the fire tubes and at the other end to the front exterior of the box, of side heating tubes connected with the circulating pipes, upper sets of tubes connecting the upper ends of the side tubes with the feed pipe, the arrangement of the upper tubes being staggered and their inner ends having an inclination in direction of the rear, a water supply pipe connected with the outer end of the feed pipe and extending into the latter, and a water

regulating device consisting of a pipe communicating with the feed pipe around the inserted portion of the water supply pipe, the upper portion of the said regulating pipe being carried through the top of the boiler within the steam space to a predetermined extent, as and for the purpose set forth.

4. In a boiler, the combination; with the fire box, circulating pipes located in the sides of the fire box at the lower portion thereof and communicating with the water legs of the boiler, a feed pipe located in the upper portion of the fire box and extending through the rear thereof over the fire tubes, and at its forward end extending through to the front of the boiler, and valved release tubes connected with the feed pipe and extending through the crown sheet of the fire box into the steam space of the boiler, of side water heating tubes connected with the circulating pipes and extending upwardly therefrom, an upper set of angular tubes connecting the upper ends of the side tubes with the feed pipe, the upper tubes entering the feed pipe alternately at opposite sides, a water supply tube or pipe connected with the outer end of the feed pipe, provided with a regulating and a check valve, and a means, substantially as shown and described, for manipulating the valves in the release tubes from the exterior of the boiler, as and for the purpose set forth.

EDWARD JONES.

Witnesses:

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C. SEDGWICK.