

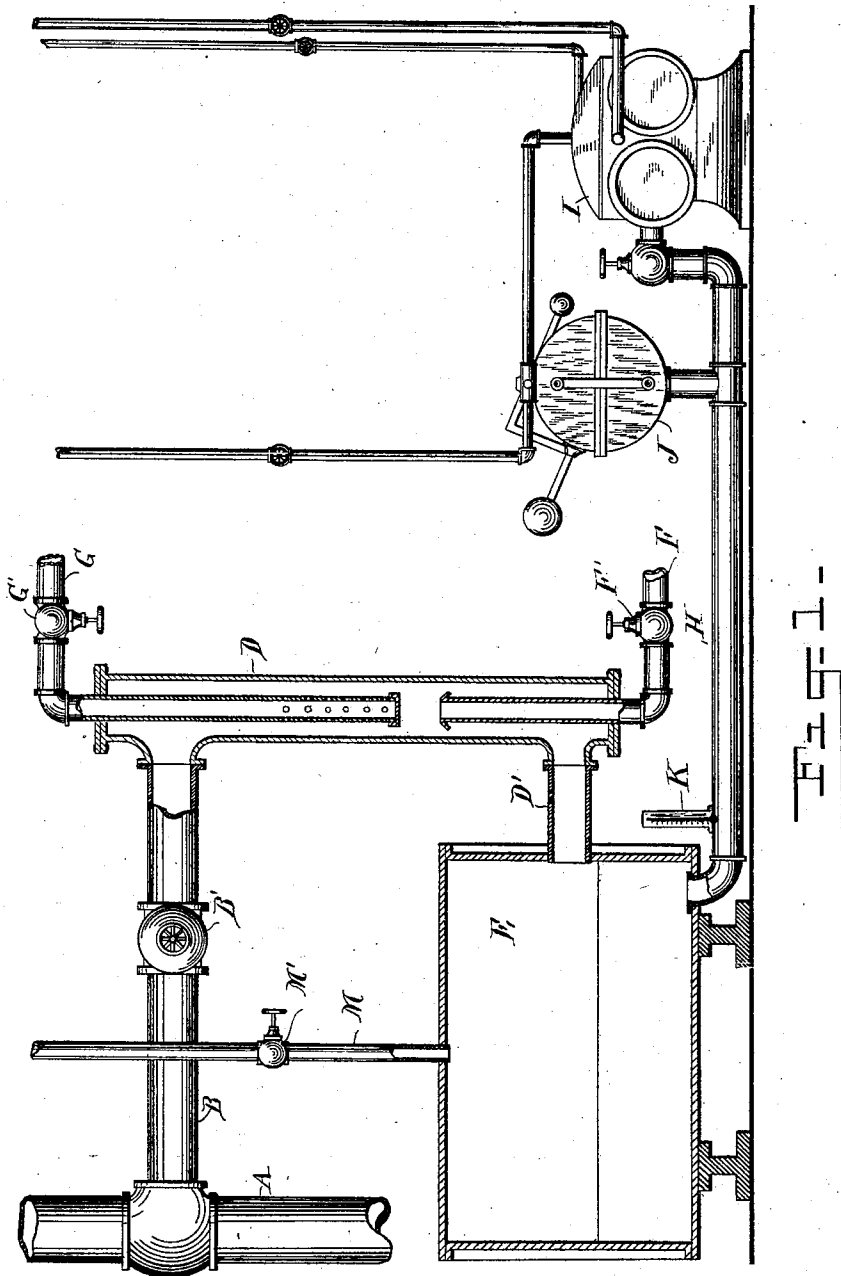
No. 720,200.

PATENTED FEB. 10, 1903.

I. WATTS.  
FEED WATER HEATER.  
APPLICATION FILED JUNE 16, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES:

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J. B. Clautice

INVENTOR

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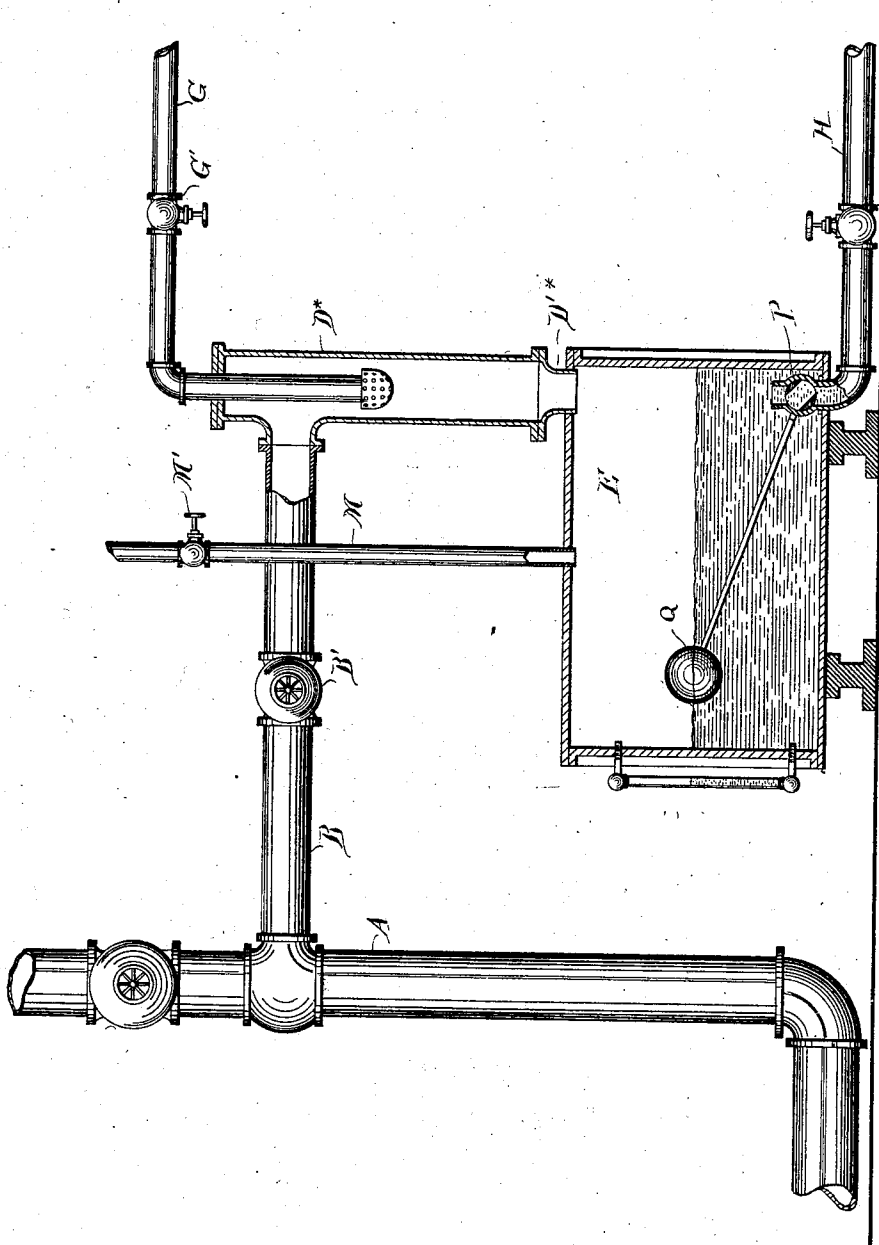


Fig. 2.

WITNESSES:

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# UNITED STATES PATENT OFFICE.

IRA WATTS, OF MOUNT VERNON, NEW YORK.

## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 720,200, dated February 10, 1903.

Application filed June 16, 1902. Serial No. 111,850. (No model.)

*To all whom it may concern:*

Be it known that I, IRA WATTS, a citizen of the United States, residing in Mount Vernon, in the county of Westchester, in the State of New York, have invented a certain new and useful Improvement in Feed-Water Heaters, of which the following is a specification.

My experiments have been directed mainly to the heating of water for feeding to steam-boilers, and I will describe the invention as thus applied; but it may be used for any purpose in which it is desired to heat water by steam.

The invention provides means for easily and completely regulating the temperature at which the water is delivered. It is easy to expose water to exhaust-steam, so as to heat it to about the same temperature as the steam. Under some conditions it is expedient to do this; but in ordinary cases it is preferable, in order to avoid difficulties in leading it about and pumping, to heat the water only to a lower temperature. I provide for obtaining, by simply adjusting a valve, any temperature from the full heat of the exhaust-steam, 212° Fahrenheit, down to any lower temperature desired. I prefer for general purposes that the valve be so adjusted as to deliver the water at a temperature of about 210° Fahrenheit.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a central vertical section of the parts involving the novelty and an elevation of other long-approved parts which I use in connection therewith. Fig. 2 is a corresponding section showing a modification.

Referring to Fig. 1 and to the letters of reference thereon, A is a pipe leading the exhaust-steam upward from a steam-engine. (Not represented.) B is a right-angle branch therefrom, and B' a valve which allows this branch to be tightly closed when required for repairs of the apparatus or the like; but in ordinary working this valve will be always set wide open. The pipe B opens into an upright vessel D, which extends downward and is provided with a branch D', which leads into a sufficiently capacious receptacle E. A

pipe F brings water which has been condensed from the steam which is used. It is controlled by a valve F'. Another pipe G, having a regulating-valve G', brings water from a pump or from an elevated tank or street-main or other source, (not represented,) which may be drawn from as required. Each of these pipes F and G is extended into the upright vessel D and may be equipped, as shown, to discharge the water into the interior thereof in freely-escaping streams.

M is a pipe which leads outward from a high point in the receiver E. It is controlled by an adjustable valve M'. This pipe M and valve M' by discharging more or less liberally under the very gentle pressure which obtains in the apparatus effect the control of the temperature, as will appear farther on.

When the apparatus is working, a current of exhaust-steam flows either in rapidly-succeeding jets or in a constant stream through the pipe A, and all that is necessary to change the temperature to which the water shall be heated in my apparatus is to turn the valve M', so as to increase or diminish its aperture. This pipe M may communicate with the atmosphere through the roof of the building (not shown) or may be otherwise arranged to offer only a very slight resistance. A pipe H leads from the bottom of the capacious receiver E to a pump I, which I will assume to be a "Duplex Worthington," adapted to take away the water at the uniform heat induced by my apparatus a little below that of steam at atmospheric pressure.

J is a pump-governor, of any ordinary or suitable style, regulating the working of the pump I according to the height of the water-level in the vessel E, so as with all variations in the reception of water through the pipes F and G to maintain the water-surface in the receiver E at a practically uniform level and afford a liberal supply for the intermittent demands of the pump. The pump-governor must be always adjusted so as to hold the water-line in the vessel E below the junction of the pipe D'.

There is under all ordinary conditions a small quantity of air present in steam. As under the conditions obtaining in my apparatus the relatively cold water received

through the pipes F and G condenses the steam in the vessel D, its place is supplied by fresh increments received through the pipe B. Some of the steam is condensed, but another portion remains, and all of the small quantity of air mingled therewith remains. As the operation proceeds air thus received accumulates in the receiver E in appreciable proportions. Although the pressure in this vessel is very gentle, it is sufficient to induce a movement of the mixture of air and steam upward through the pipe M.

It has been proved by trial that the temperature of the water taken from the vessel E through the pipe H will be lower or higher in proportion as the valve M' is opened or closed. Opening the valve M', so as to give a more liberal escape, lessens the back pressure in the vessel E, and thereby induces a freer and more rapid circulation of steam from the exhaust or steam pipe A through the branch B, which consequently results in raising the temperature of the water flowing into E and delivers through the pipe H water at 211° or 212° Fahrenheit, and when there is some back pressure on the engine, as when the exhaust-pipe A instead of discharging freely into the atmosphere discharges through a long circuitous series of pipes for warming a building, the temperature in the vessel B may be raised by opening the valve M' above 212°, even to 216° or 217°. If, on the contrary, the opening offered by the valve M' is contracted so as to limit the escape of the mixture of vapor and air, the proportion of air in the vessel E increases and the temperature of the water delivered through the pipe H is lowered to 208° or 207° Fahrenheit or still lower. The theory on which the success of this regulation depends is believed to be that although the temperature of the vapor in the vessel, and consequently of the associated air, is quite up to that due to the pressure, the efficiency of the mixture in warming the water exposed thereto is reduced by reason of the lessened contact of the steam with the water as the proportion of air is increased. The area of the water-surface exposed being the same, the water becomes less heated when the air is in a larger proportion and becomes more heated when by reason of a wider opening of the valve M' the mixture escapes more freely and its place is supplied by fresh steam from the pipe A, thus raising the proportion of steam in the mixture, and consequently increasing the efficiency of its heating effect on the water. After the heat, whatever it be, is attained by the water the effect is indicated in any ordinary way. K is a thermometer, not essential to the apparatus, but which may be convenient to refer to at intervals to know at what temperature the water is being worked.

Modifications may be made without departing from the principle or sacrificing the ad-

vantages of the invention. The form and proportions of the vessel E and of the upright condensing chamber or pipe D may be varied within wide limits; but it is essential to success that it be sufficiently capacious below the connection D' to prevent the pump from pounding. Of course it is well to have the connection with D of the branch B from the exhaust A sufficiently above the vessel E to avoid the chance of water flowing back through B into the exhaust-pipe A. My apparatus proportioned as shown operates successfully in every respect.

I have referred to the steam flowing upward through A as "exhaust-steam" and usually will be able to obtain for this apparatus the steam discharged at a little above atmospheric pressure from a high-pressure engine; but in case such is not available, or if for any reason I choose to reinforce a small supply thus obtained by fresh steam from the boiler, such live steam may be discharged into the pipe A or an equivalent pipe, and the apparatus will serve in all respects the same as I have described, and such mode of working is intended to be included by the claims.

In the form shown in Fig. 2 the same letters of reference are used when the parts are identical. The upright vessel D is over the receptacle E and communicates therewith through a pipe D' in the top. The provision shown in the other figure for admitting return water by a separate pipe is omitted. Such water may come in through a branch (not shown) communicating with the pipe G. The pump-governor is omitted.

There need not be any pump to take away the water for some purposes, as for a laundry.

The delivery of the water is controlled by a cock P, operated by a float Q in the vessel E. The water-level is maintained always far below the point of connection of the short pipe D'.

I claim as my invention—

1. In a water-heater having a connection B from an exhaust-pipe A into a chamber D in which latter the water to be heated is distributed from one or more pipes F, G, the combination therewith of a capacious receiver E with a provision H and connections for taking water from a low point therein and a pipe M for discharging air and vapor from a high point therein, and with a connection D' leading from the vessel D to the receiver E above the water-line in the latter, all arranged for joint operation substantially as herein specified.

2. In a water-heater having a connection B from an exhaust-pipe A into a chamber D in which latter the water to be heated is distributed from one or more pipes F, G, the combination therewith of a capacious receiver E with a provision H and connections for taking the water from a low point therein and a

pipe M for discharging air and vapor from a high point therein and with a connection D' leading from the vessel D to the receiver E above the water-line in the latter, and the  
5 valve M' for controlling the flow through the pipe M, all arranged for joint operation substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

IRA WATTS.

Witnesses:

GEORGE F. SCHOFIELD,  
M. F. BOYLE.