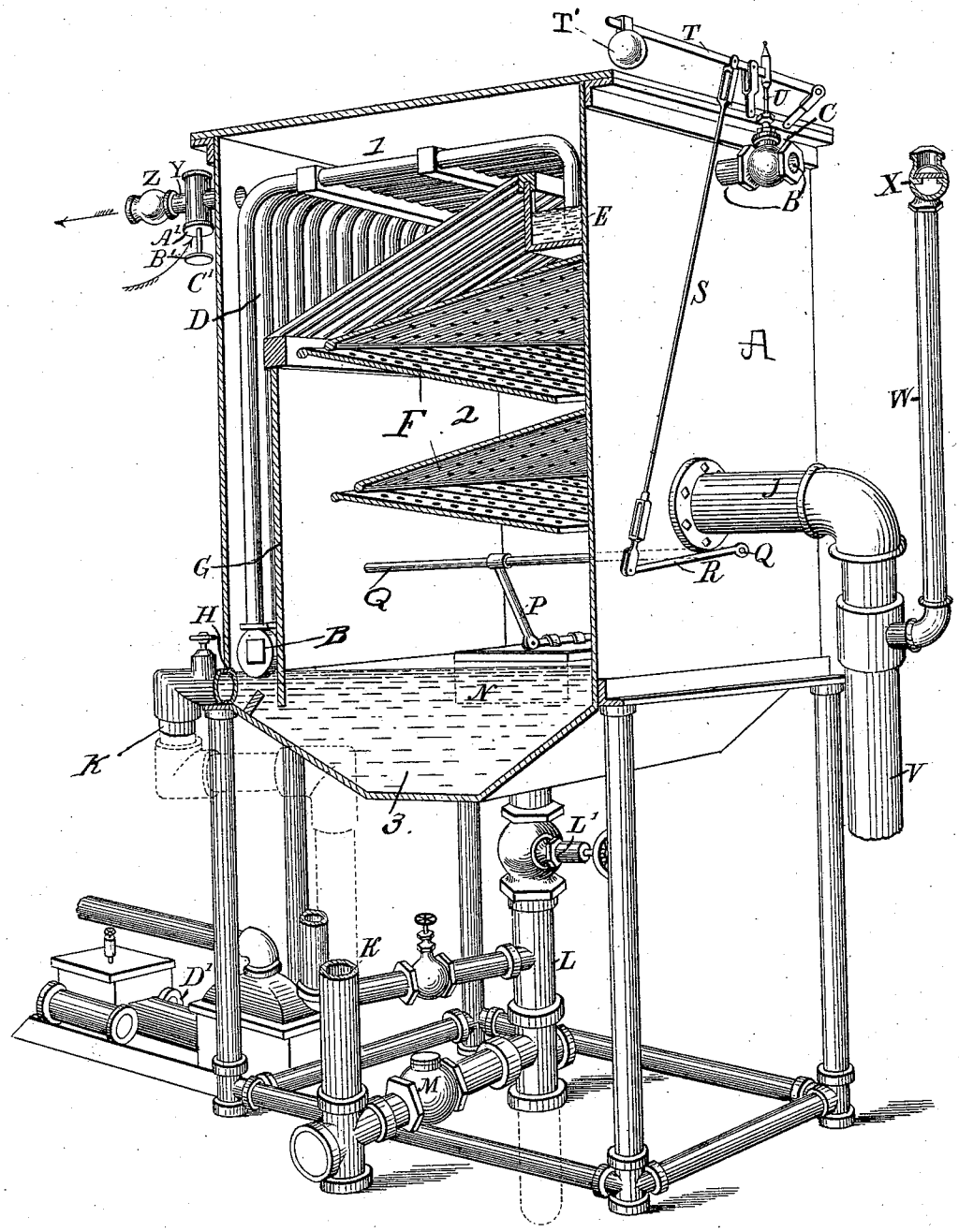
(No Model.)

W. WEBSTER.

FEED WATER HEATER AND PURIFIER.

No. 456,072. Patented July 14, 1891.



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UNITED STATES PATENT OFFICE.

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FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 456,072, dated July 14, 1891.

Application filed January 7, 1891. Serial No. 377,060. (No model.)

To all whom it may concern:

Be it known that I, WARREN WEBSTER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Feed-Water Heaters and Purifiers, which improvement is fully set forth in the following specification and accompanying drawing.

My invention relates to improvements in feed-water heaters and purifiers; and it consists, first, of means for automatically operating the valve of the water-supply pipe thereof, consisting of a gravity-regulating apparatus, as hereinafter described.

It further consists of means, as hereinafter described, for automatically regulating the fluctuating pressure in the vacuum-chamber of the apparatus caused by the condensation of the steam by the inflowing water.

It also consists of the combination of parts hereinafter described.

In the drawing, which represents a perspective view, having one side removed, of a feed-water heater and purifier embodying my improvement, A designates a tank having a water-inlet pipe B, with a valve C therein. A series of pipes D within the tank connect with the pipe B and discharge into a trough E, which is secured to the inner wall of the said tank. Below the level of one of the side walls of the tank over which flows the water is a series of inclined perforated plates F, over and through which the water passes in its descent from the trough, so that it is sprayed as it falls.

G designates a wall or partition extending across the tank and having its lower end below the level of the outlet-opening H, so as to hold back any impurities or scum floating upon the surface of the water in the lowest part of the tank.

An exhaust-steam inlet-pipe J leads into the tank at the lower portion thereof, and an overflow-pipe K leads from the tank, connecting with a drain-pipe L, which leads from the sediment-well of the said tank, and has a valve L′ therein, the said overflow-pipe being provided with a check-valve M. So far as described the said parts are well known, being shown and described in United States Letters Patent granted to me for improvements in apparatus for purifying feed-water, and bearing date October 9, 1888, Serial No. 390,927, and are not claimed herein, being no part *per se* of this invention.

To automatically regulate the valve C of the inlet-pipe, the following-described gravity-regulating mechanism is used. N designates a suitable open pan or other receptacle filled with water connected to an arm P of the shaft Q, which latter is journaled in the sides of the tank or other suitable bearings, so as to be oscillated by the rise or fall of the pan, due to the quantity of water in the lower part of the tank and in which the pan floats. One end of the shaft Q passes through the side of the tank, preferably above the water-level, and a rod S is connected to an arm R thereof. The said rod S is also attached to one limb of a pivoted lever T, which latter has secured to its other limb a rod U, fastened to the valve C of the water-supply pipe, whereby the oscillation of the shaft Q, caused by the rise or fall of the pan N, will, by means of the arm R and rod S, operate the said valve C, so as to control the supply of the water passing into the tank. A movable weight T′, to counterbalance the weight of the material of the pan, is placed on one end of the lever T. The action of the gravity-regulating apparatus thus described is positive at all times under fluctuating pressures.

The steam-inlet pipe J is connected with an exhaust-pipe V, leading from an engine or other supply of exhaust-steam, the latter pipe having a communicating pipe W, provided with a valve X, opening to the atmosphere.

To automatically control or regulate the fluctuating pressure in partial vacuum within the tank, which is due to the condensation of the steam by the inflowing water, an air-exhaust pipe Y leads from the air-vent of the same, and is provided with a valve Z, opening to the atmosphere. Between the valve Z and the said tank is an air-inlet valve A′, having a downwardly-projecting stem B′, with a head or disk C′, adapted to support weights thereon. The valve A′ is weighted, so as to regulate the pressure desired in the vacuum-chamber. The operation of the said valves Z and A′, in connection with the steam-inlet pipe J, is as follows: As the steam and water

enter the tank the air therein escapes through the valve Z, which opens outward. As the pump D′ is operated, drawing the purified water from the tank, the pressure of the air in the said tank is reduced, and when it is below the adjusted pressure the pressure of the air outside of the valve A′ will open the same, so that the atmospheric air will enter the tank through said valve until the pressure within the tank, in connection with the weights, counterbalances the atmospheric pressure, when the said valve will close and no longer admit the atmospheric air. The reduction or lowering of the pressure within the tank below the atmospheric pressure induces the flow of the exhaust-steam in the pipe V toward and into the pipe J, and thus into the tank, in preference to its passage through the pipe W and valve X, the latter remaining closed by reason of the atmospheric pressure thereon. When it is not desired to use the steam in the tank and the pressure within is equal to that of the atmosphere, the exhaust-steam will readily flow through the pipe W, escaping through the valve X.

It will be noticed that, owing to the vacuum-chamber and the induction therein of the current of exhaust-steam from the pipe J, there is no back-pressure of steam in said pipes.

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

1. A feed-water heater and purifier having a vacuum purifying-chamber, an air-exhaust pipe leading therefrom with an automatically opening and closing valve therein, and a steam-pipe leading into said chamber, said parts being combined substantially as described.

2. A feed-water heater and purifier having a vacuum-chamber, a steam-inlet pipe, an air-exhaust pipe with automatically-operating valve therein, a discharge-pipe, a gravitating pan, a shaft with arm pivotally connected with said pan, an inlet-pipe with valve, a lever connected with said valve and to a rod having a pivotal connection with an arm of said shaft, and a weight on said lever counterbalancing the weight of the material of the gravitating pan, said parts being combined substantially as described.

3. A tank having a vacuum with a water-inlet pipe, an air-exhaust pipe with automatically-operating valve therein, and a steam-inlet pipe with communicating pipe having a valve opening to the atmosphere, said parts being combined substantially as described.

4. A tank having a vacuum-chamber, an air-exhaust pipe with an automatically-operating valve therein, a steam-supply pipe with a communicating pipe open to the atmosphere, a water-inlet pipe with valve therein, a discharge-pipe, a gravitating pan in said tank, a lever connected with said inlet-pipe valve and having a counterbalance-weight thereon for the material of the gravitating pan, and mechanism connected with said lever and said pan for operating said valve, said parts being combined substantially as and for the purpose set forth.

5. A feed-water heater and purifier having an inlet water-pipe with a valve therein, an oscillating shaft with a projecting arm, a pan pivotally connected with said arm, a lever connected with said inlet-pipe valve, a weight on said lever balancing the material of said pan, and a rod connected with said lever and to an arm on said shaft, said parts being combined substantially as described.

6. A feed-water heater and purifier having a tank, a water-inlet pipe with a valve, a gravity-regulator in said tank, an oscillating shaft having an arm pivoted to said regulator, a pivoted lever having a rod pivoted to one end thereof and to an arm rigidly attached to said shaft, and a rod attached to the other end of the lever and to the valve in the supply-pipe, said parts being combined substantially as described.

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