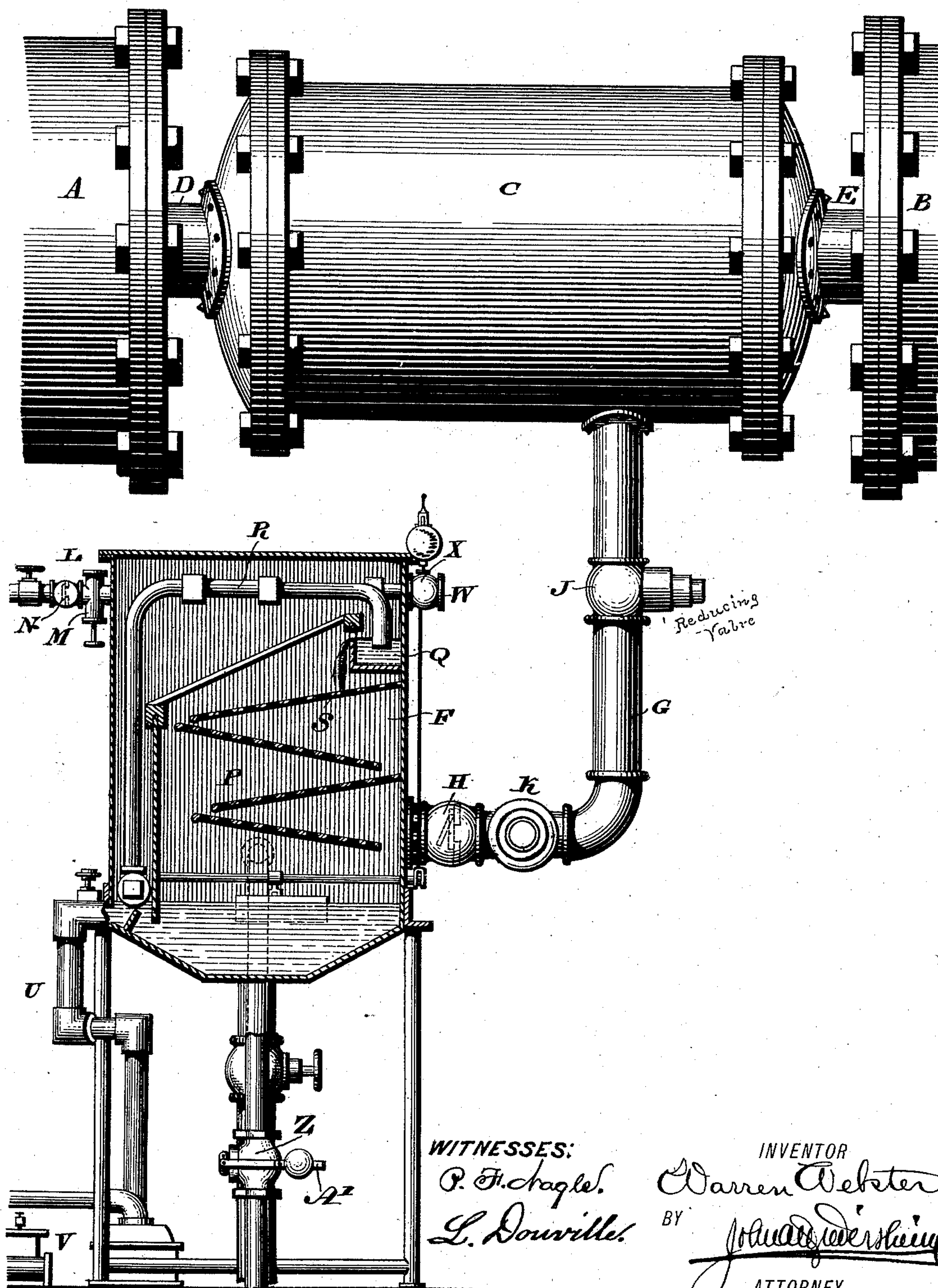


(No Model.)

W. WEBSTER.
FEED WATER HEATER.

No. 475,992.

Patented May 31, 1892.



WITNESSES:

P. F. Chagles.
L. Douville.

INVENTOR

Warren Webster
BY *John A. Sederberg*
ATTORNEY.

UNITED STATES PATENT OFFICE.

WARREN WEBSTER, OF PHILADELPHIA, PENNSYLVANIA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 475,992, dated May 31, 1892.

Application filed July 6, 1891. Serial No. 398,478. (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 has for its object the heating to a high temperature of the water admitted into the feed-water heater and purifier by steam taken from a steam-receiver, which latter is in communication with two cylinders of a compound engine. For this purpose it consists of a receiver in communication with the lowest-pressure cylinder and one having next to the lowest pressure of a compound engine and having a pipe communicating with the feed-water heater and purifier and provided with reducing and check valves, as hereinafter described.

It further consists of the combination and arrangement of parts, as hereinafter described.

In the figure in the drawing, which represents a partial side and partly sectional view of an apparatus embodying my invention, A and B designate the cylinders of a compound engine of any usual form, and C a steam-receiver connected with said cylinders A and B by the tubes or pipes D and E, respectively.

F designates a feed-water heater and purifier, and G a pipe communicating with the receiver C and said heater. The said pipe is provided with a check-valve H for preventing the water which is in the heater from entering the receiver through the branch pipe, which might occur under certain conditions, and J and K are pressure-reducing valves of any ordinary construction for lessening the pressure of the steam from the receiver C before it enters the heater. The heater is provided with an air-outlet pipe L, having an automatically-operated air-inlet valve M of usual construction, and a check-valve N. The heater has a vacuum-chamber P, in which the steam enters from pipe G, a trough Q, which receives the inlet-water from the pipes R,

and the inclined perforated plates S, over and through which the water passes while falling from the trough Q, in which the supply-pipes R empty. A discharge-pipe U conveys the feed-water from the heater to a pump V.

It is usual in heating feed-water in connection with a compound engine to pass the exhaust-steam from the last cylinder through a coil-heater to a condenser, where, owing to the vacuum which is maintained therein, the exhaust-steam is withdrawn and reduced in pressure to such an extent that it is not practical to heat the feed-water, which is taken from a hot well at a temperature of about 100° to over 140°, when it is passed into the boiler.

By this device steam of less pressure than that carried in the steam-receiver is utilized, and the maximum amount of water is heated by the minimum amount of steam, the same being reduced by either or both of the valves J and K, as desired. The air in the heater escapes by the outlet-pipe L, the check-valve N preventing its return unless the vacuum is too great, when the automatically-operating inlet air-valve M, which can be weighted to any desired extent, will admit the necessary or required amount.

The water-inlet pipe W, which supplies the pipes R, is provided with an automatically-operating valve X, operated by the movement of a float and connected mechanism, the same being of usual form.

The manner of operation of the device is simple and from the foregoing description easily understood.

As the heater receives the steam from the receiver a constant supply may be readily furnished to the pipe G, and thus to the heater, and, owing to the reducing-valves, at any desired pressure.

My object is to take the water from the hot well or other usual source, or if there is a coil-heater between the last cylinder and the condenser to take the water from that at the maximum temperature which can be obtained, which would be, as previously stated, about 140°, and feed it into the water-inlet W of the drawing, whether upon the top or side, the manner in which it enters being immaterial. Then to heat it to a higher temperature by

steam from the steam-receiver after a portion of the energy of the steam has been utilized in one or more steam-cylinders from the time it left the steam-boilers under full pressure before it entered the steam-receiver, I take from the steam-receiver just the quantity of steam which is sufficient to heat the feed-water to 210° or 212°. To accomplish this I use the branch pipe G, with a pressure-reducing valve located therein, from the steam-receiver to the vacuum-heater, and by this I cut the pressure in the steam-pipe leading from the reducing-valve into the vacuum-heater to as near steam at 212° or atmospheric pressure as possible, since steam at atmospheric pressure contains a greater number of latent heat-units to accomplish the desired object, which is to heat the water more economically than if the full steam-pressure carried in the steam-receiver were carried in the vacuum-heater on account of the vacuum-heater, which may be made in any form of a tank, so long as there is no opening to the atmosphere, or, in other words, being practically sealed, excepting to the entrance of water and steam, a vacuum would form, but would vary, owing to the differences in the different volumes of water that would be allowed to enter. The pump, which is ordinarily connected to the heater, would not then operate satisfactorily on account of fluctuation of vacuum. To overcome this objection, I use the air-inlet or vacuum valve M, so as to communicate with the inside of the vacuum-heater, and by which I am able to allow a proper amount of air to enter by setting the valve to any degree of vacuum I desire.

An overflow-pipe Y, of larger diameter than the water-supply pipe W, leads from the heater, so as to prevent the water from accumulating therein beyond a given or indicated level. The overflow-pipe Y is provided with

a valve Z, having a lever A', which is weighted, so as to close the valve to prevent air from entering the heater in case of a partial vacuum at any time; but adapted to open the same when the pressure in the heater exceeds a desired amount.

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

1. A vacuum feed-water heater and purifier having a vacuum-chamber and an automatic air-inlet or vacuum valve, in combination with a steam-receiver adapted to be in communication with the cylinders having the lowest and next to the lowest pressure of a compound engine, and a connecting-pipe for said heater and receiver, having a steam-pressure-reducing valve therein, substantially as described.

2. A vacuum feed-water heater and purifier having an automatic air-inlet or vacuum valve, in combination with a receiver adapted to be connected with two of the cylinders of a compound engine, and a connecting-pipe for said heater and receiver, having a pressure-reducing valve therein, substantially as described.

3. A vacuum feed-water heater and purifier having an automatic air-inlet or vacuum valve, in combination with a steam-receiver adapted to be connected with two of the cylinders of a compound engine, a connecting-pipe for said receiver and heater, having a pressure-reducing valve therein, and an overflow-pipe leading from said heater, having a weighted automatic valve, substantially as described.

WARREN WEBSTER.

Witnesses:

JOHN A. WIEDERSHEIM,
A. P. JENNINGS.