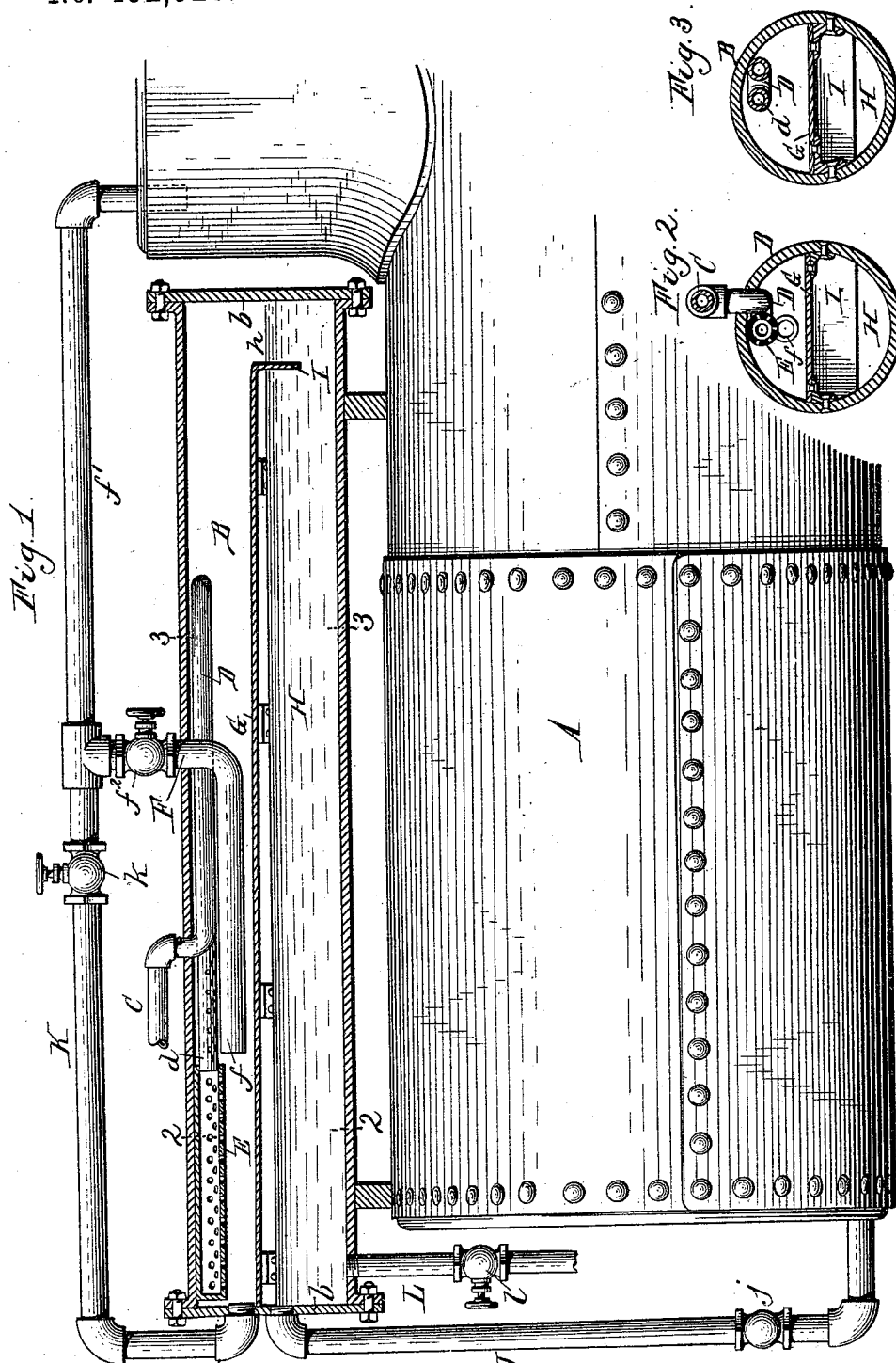


(No Model.)

F. C. PEREW.  
FEED WATER HEATER AND PURIFIER.

No. 492,928.

Patented Mar. 7, 1893.



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# UNITED STATES PATENT OFFICE.

FRANK C. PEREW, OF BUFFALO, NEW YORK.

## FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 492,928, dated March 7, 1893.

Application filed October 29, 1892. Serial No. 450,317. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK C. PEREW, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Feed-Water Heaters and Purifiers, of which the following is a specification.

This invention relates to that class of feed water heaters and purifiers in which the feed water, preliminary to its delivery into the boiler, is heated to a sufficiently high temperature to liberate the calcareous matter and other solid impurities which it contains, and in which the separated impurities are caused to settle in a chamber provided for that purpose, the purified water passing on to the boiler, while the impurities deposited in the settling chamber are blown off from time to time.

The first object of the invention is to increase the efficiency of the heating apparatus so that the feed water is heated not only to a sufficient degree to set free the lime and other solid impurities, but heated as nearly as possible to the temperature of the water in the boiler.

My invention has the further objects to improve the construction of the settling apparatus so as to prevent agitation of the water after the sediment is precipitated, and finally to provide an improved blow-off for thoroughly cleaning the apparatus.

In the accompanying drawings:—Figure 1 is a longitudinal sectional elevation of my improved apparatus applied to a boiler. Figs. 2 and 3 are cross sections thereof in lines 2—2 and 3—3, Fig. 1, respectively.

Like letters of reference refer to like parts in the several figures.

A represents the boiler which may be of any ordinary construction.

B is a heating chamber, preferably arranged lengthwise above the boiler, and consisting of a tight drum or cylinder having its ends closed by heads *b b*.

C is the feed water supply pipe of the apparatus which is connected with a pump or other available source, and D is a heating coil arranged lengthwise within the heating chamber B and receiving the water from the sup-

ply pipe C, which latter enters the top of the chamber. This heating coil consists of two or more pipes extending back and forth in the upper portion of the heater.

E is a distributor or perforated spray-pipe arranged within the upper front portion of the heating chamber and receiving the partially heated feed water from the return or discharge branch *d* of the heating coil. The feed water issues from this perforated pipe into the surrounding heating chamber, in the form of fine jets. The portion of the heating coil adjacent to the spray pipe is also preferably perforated, as shown.

F is a steam pipe entering the top of the heating chamber B, preferably near its middle, and having a horizontal rearwardly extending delivery portion *f* which is arranged below the heating coil and terminates with its open end at or near the front end of the spray pipe E. This steam delivery pipe is connected with the steam space of the boiler, by a branch pipe *f'*, and is provided with a valve or stop cock *f''* for controlling the passage of steam through the pipe. The steam delivered at the end of the steam pipe F commingles with the finely divided feed water as it issues from the spray pipe E, thereby heating it to a very high temperature. It also heats the coil D at the same time.

G is an imperforate longitudinal partition or diaphragm arranged about diametrically within the heating chamber and dividing the same into an upper compartment in which the heating coil and spray pipe are located, and a lower settling chamber or compartment H. This diaphragm extends from the rear end of the chamber to within a short distance of its front end so as to leave a passage *h* between the latter and the front end of the diaphragm through which the heated feed water passes from the heating compartment to the settling chamber. The diaphragm slopes from the rear end of the heating chamber toward its front end, as shown, to cause the water issuing from the spray pipe to flow toward the inlet-end of the settling chamber.

I is a transverse wall depending from the lower end of the inclined diaphragm and extending downward to within a short distance

of the bottom of the settling chamber. This wall, while allowing the water to pass under it, retards its flow upon reaching the foot of the inclined diaphragm and thus prevents the inflowing water from agitating the water in the settling chamber and raising the precipitated sediment.

J is the feed water delivery pipe which leads from the rear end of the settling chamber to the bottom of the boiler. This pipe preferably opens into the upper portion of the settling chamber, at about the level of the water in the same, where the feed water is purest. A check valve *j* is arranged in the delivery pipe J for preventing the water from flowing from the boiler back into the settling chamber.

K is a blow-off branch or cleaner pipe which extends from the junction of the steam pipe F and its supply branch *f'* to the rear end of the heating chamber, B, and which opens into the heating chamber immediately above the head of its diaphragm. This cleaner pipe is provided adjacent to the branch pipe *f* with a valve or stop cock *k*.

L is a blow-off pipe connected with the bottom of the settling chamber H at or near its rear end as shown, and through which the accumulated sediment is discharged from the apparatus. This blow-off pipe has a valve or stop cock *l*.

In the normal operation of the apparatus, the valve of the steam delivery pipe F is open and the valves of the cleaner pipe K and the blow-off pipe L are closed. The impure feed water entering through the supply pipe C traverses the coil D whereby it is heated to a comparatively high temperature. It then passes into the spray pipe E, and as it issues from the perforations of the latter it encounters the steam delivered by the steam pipe F, whereby its temperature is increased to or nearly to that of the water in the boiler. The heated feed water descends from the spray pipe upon the head of the sloping diaphragm and, flowing over the latter, enters and passes through the settling chamber and thence through the delivery pipe J into the boiler. In passing through the settling chamber, the liberated solid impurities are precipitated, while the purified water passes onward to the boiler. As the agitation of the water entering the front end of the settling chamber is checked by the depending wall I of the diaphragm, the sediment has an opportunity to settle and after being deposited upon the bottom of the settling chamber is undisturbed by the comparatively quiet flow of the water through the chamber. By discharging the partially-heated feed water into the extreme rear end of the heating chamber and delivering the steam rearwardly against it in the opposite direction from which it flows over the diaphragm, the passage of the water is retard-

ed and it is kept under the influence of the steam for a correspondingly longer period, thus insuring the heating of the feed water to a very high temperature before it reaches the boiler. When it becomes necessary to blow-off the sediment deposited upon the diaphragm and the bottom of the settling chamber, the valve of the steam supply pipe F is closed and those of the cleaner pipe K and the blow-off pipe L are opened. The steam now passes from the branch pipe *f'* through the cleaner pipe K, and into the portion of the heating chamber above the diaphragm G, thence forwardly through said chamber and into the front portion of the settling chamber and thence rearwardly through the latter, whence it escapes through the blow-off pipe L. The steam upon entering the rear end of the heating chamber, sweeps over the diaphragm, carries along any impurities deposited upon it and forces them through the settling chamber together with any sediment lodging upon the bottom of the latter chamber and finally discharges the same and the remaining feed water through the blow-off pipe. By drawing off the feed water from the settling chamber at or near its surface, the water is obtained in its purest state; and by connecting the blow-off pipe with the extreme bottom of the chamber, the thorough removal of all the deposited sediment is insured.

I claim as my invention—

1. In a feed water heater and purifier, the combination with an imperforate heating drum or chamber having an imperforate longitudinal diaphragm which divides the same into an upper heating compartment and a lower settling chamber communicating with said heating compartment, of a feed water supply pipe entering said heating compartment and terminating near the rear portion thereof, a steam supply pipe also entering said chamber and extending rearwardly toward the mouth of the feed water supply pipe, whereby the flow of the feed water toward the settling chamber is retarded, and a delivery pipe connected with the settling chamber, substantially as set forth.

2. The combination with the imperforate heating drum or chamber having a water supply pipe, and a longitudinal partition extending rearwardly from the front end of the drum and dividing the same into an upper heating compartment and a lower settling chamber, of an independent cleaner pipe connected with the front portion of said heating compartment adjacent to the upper side of said partition, and a sediment blow-off pipe connected with the rear end of said settling chamber, substantially as set forth.

3. The combination with the imperforate heating chamber having a feed water inlet and a steam supply pipe provided with a

stop cock, of a longitudinal diaphragm dividing said chamber into an upper heating compartment and a lower settling chamber communicating with said heating compartment,  
5 a cleaner pipe leading from said steam supply pipe to the rear portion of said heating compartment and provided with a stop cock, and a blow-off pipe connected with the bot-

tom of the settling chamber, substantially as set forth.

Witness my hand this 26th day of October, 1892.

FRANK C. PEREW.

Witnesses:

JNO. J. BONNER,  
FRED. C. GEYER.