

(No Model.)

H. F. HAYDEN.

PURIFIER AND FEEDER FOR BOILERS.

No. 334,774.

Patented Jan. 26, 1886.

Fig. 1.

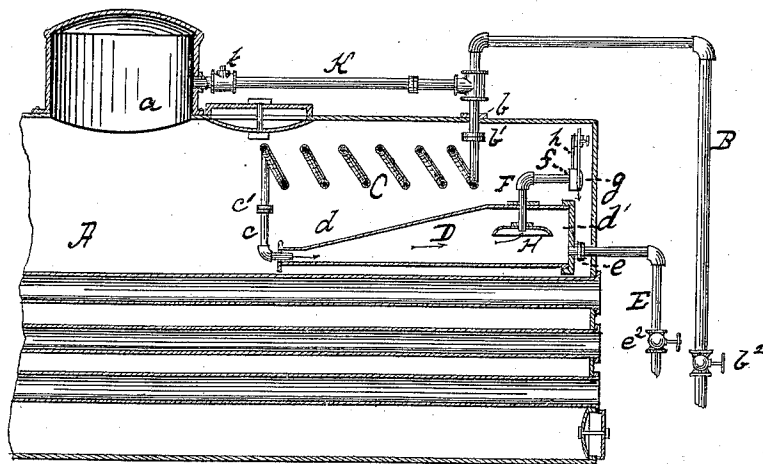
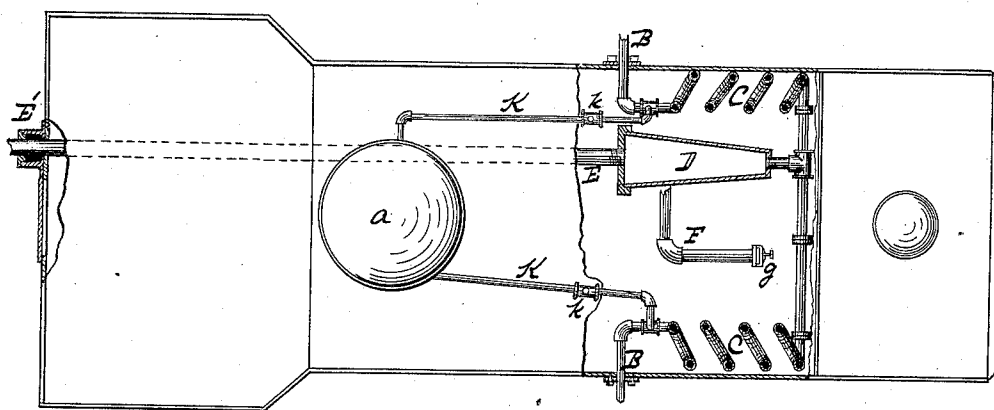


Fig. 2.



Witnesses.

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PURIFIER AND FEEDER FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 334,774, dated January 26, 1886.

Application filed November 7, 1885. Serial No. 182,145. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. HAYDEN, a citizen of the United States, residing at Washington city, in the District of Columbia, have
5 invented certain new and useful Improvements in Purifiers and Feeders for Boilers; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

10 Figure 1 is a vertical section of a stationary boiler and devices embodying my invention. Fig. 2 is a horizontal section of a locomotive-boiler, with the devices applied thereto, the
15 heating-coil and feed-water pipes being in duplicate.

Like letters refer to like parts wherever they occur.

My present invention relates to that class of
20 feed-water heaters and purifiers which embrace a sediment-chamber located in the boiler, a supply-pipe leading to and a blow-off pipe leading from the sediment-chamber, and suitable valves arranged in said pipes. Such
25 devices, as previously constructed, have in general depended on heating the water in the sediment-chamber to cause the separation of the sediment, and the use of perforated pipes to discharge the water from the sediment-chamber into the boiler, intending to trap and
30 retain the sediment in the sediment-chamber, from which it could be discharged at intervals by opening the valve of the blow-off pipe and permitting the steam from the boiler-space to enter the sediment-chamber through the perforations of the boiler-pipes. Sometimes the
35 sediment-chamber itself has been perforated, and discharge-pipes or rose-nozzles dispensed with. All such devices become inoperative,
40 sooner or later, from the following causes, and have to be removed from the boiler.

It is well understood that in purifying feed-water by heat, when a temperature which will cause the separation of the impurities is first
45 attained, the sediment will fall in mass; but almost immediately the lighter particles will rise to the surface and float, only to be again, after a shorter or longer period, deposited as at first. As a result of this action, the float-sediment is carried to the spray pipes or nozzles, adheres thereto, and in a short time clogs
50 them up, so as to interfere, first, with the feed of

water to the boiler, and, secondly, with the access of steam to the sediment-chamber, the scale becomes baked on by the heat, and the devices as at present constructed become use- 55 less.

The object of my present invention is to overcome these difficulties and objections to the present devices, and to this end the feed-water is passed in volume through a heating-coil or heater, which raises it to the desired temperature before it enters the closed sediment-chamber, is delivered from the heater in volume directly to the closed sediment-chamber, and thence, under pressure and in volume, to the boiler. 65

In carrying out my invention, I first provide means for heating the water while in mass or an undivided condition to the desired point before it enters the sediment-chamber, such means preferably located within the boiler; secondly, I provide an independent means for insuring a full and sustained supply of steam to the sediment-chamber independent 75 of the pipe or ports by which the feed-water is delivered from the sediment-chamber, (in other words, the steam-space of the boiler communicates with the sediment-chamber otherwise than through the ports which discharge the feed-water from the sediment-chamber,) whereby the sediment is always bathed in either water or steam; thirdly, I discharge the feed-water from the sediment-chamber into the boiler under pressure through a pipe or 85 large orifice having an automatic spring-valve; fourthly, I so arrange the receiving end of the delivery-pipe which delivers the water into the boiler that the draft shall be from the body of water in the sediment-chamber below the surface float-matter and above the sediment; fifthly, I so shape the sediment or separation chamber that the float-matter shall rise and the sediment sink at once on entering said chamber, and drift thence to the blow-off 95 end of the chamber.

There are also minor features, which will hereinafter more fully appear.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same. 100

In the drawings, A indicates an ordinary tubular boiler to which the devices have been applied.

B indicates the feed-water-supply pipe, having the lock-nut *b* where it passes through the shell of the boiler, and a union-coupling, *b'*, which connects it with the heater C. The heater C is preferably a coil of sufficient length to insure the heating of the feed-water to the point where the impurities will deposit, and said heater may be arranged in any desired position within the boiler, preferably parallel with the sediment or separation chamber, as shown in the drawings.

D indicates the sediment or separation chamber, which may be of wrought-iron, if desired, but is usually a casting, which expands gradually from the receiving end *d* to the delivery end *d'*. Its contracted end *d* is tapped for the reception of a pipe, *c*, which is connected with the heater C by a union-coupling, *c'*, or in other suitable manner. The blow-off pipe E connects with the sediment or separation chamber D at its lowest point in or near the end *d'*, and said blow-off pipe E, as well as the feed-water-supply pipe B, is provided with suitable valves, *b²* and *c²*.

e indicates a union-coupling by which the connection between the sediment or separation chamber and the blow-off pipe may be effected.

In the case of a locomotive-boiler, the feed-water pipes B and heater C may be in duplicate, as shown in Fig. 2, and the blow-off pipe E may extend to the back sheet of the boiler, through the same into the cab. Where the pipe passes through the back sheet a stuffing-box, *E'*, is provided, so that the blow-off pipe shall not be injured by expansion or contraction.

F indicates the delivery-pipe, which conducts the feed-water from the separation or sediment chamber D into the boiler A. Its discharge end is provided with a valve-seat, *f*, screwed thereon, and with a valve, *g*, secured by a spring-steel valve-stem to a post, *h*, projecting from the valve-seat *f*. The spring of the valve should be sufficiently strong to require some force in the feed-water to open the valve, thus insuring the closure of the valve when the feed-water is cut off. The receiving or sediment chamber end of the delivery-pipe F dips into the sediment-chamber D more or less, preferably about one-quarter the diameter of the chamber, so as to draw the feed-water from below the surface, and may terminate in or be provided with a bell or inverted-cup shield, H, which will prevent the float-matter which drifts along near the top of the sediment-chamber D from being drawn into the delivery-pipe.

K indicates a steam pipe provided with a suitable check-valve, *k*, and which connects the feed-water-supply pipe B with the steam-space of the boiler, so as to admit live steam freely to the heater-coil C and the sediment or separation chamber D. Where the heating-coil C is omitted, the pipe K may deliver directly into the sediment-chamber D, preferably

ably at a point near where the feed-water enters.

The construction of the devices being of the character or embodying the principle hereinbefore set forth they will operate as follows: The feed-water being admitted through supply-pipe B will enter the heating-coil C, and in its passage therethrough will be raised to such a temperature as will on its escape from the coil cause the separation of the impurities, vegetable and mineral. The feed-water thus heated enters the contracted end of separation or sediment chamber D, whereupon the heavier sediment falls to the bottom of chamber D and drifts toward the blow-off pipe, while the lighter float-matter rises to the surface or against the top of the sediment-chamber, and also drifts toward the blow-off end of the chamber D. The float-matter will thus be carried above the shield or inverted cup H, while the middle strata or body of the feed-water, which is pure, enters the dip end of delivery-pipe F, and, forcing open the valve *g*, falls into the boiler. As soon as the feed-water entering by pipe B is cut off and the valve *c²* of blow-off-pipe E opened, the check-valve *k* of pipe K opens and live steam from the steam-space of the boiler rushes into heating-coil C, forces the water therefrom (and sediment, if any has deposited in the coil) into the sediment-chamber D, and thence into the blow-off pipe E. As soon as all the water, sediment, &c., has been forced from chamber D, and steam appears coming from the blow-off pipe, the valve *e²* thereof is closed and live steam will fill and remain in the coil C and sediment-chamber D until such time as the supply of feed-water is again turned on.

Having thus described the nature, operation, and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In feed-water devices for boilers, the combination, with a sediment or separation chamber arranged within the boiler and provided with a feed-water-supply pipe and a blow-off, of a water-heater interposed between the supply-pipe and the sediment or separation chamber and directly connected with both, so as to maintain a pressure in the sediment-chamber, substantially as and for the purposes specified.

2. In feed-water devices for boilers, the combination, with a sediment-chamber arranged within the boiler and having a supply-pipe and a blow-off, of an independent steam-supply which connects the sediment-chamber with the steam-space of the boiler, substantially as and for the purposes specified.

3. In feed-water devices for steam-boilers, the combination, with a sediment or separation chamber arranged within the boiler and provided with a feed-water supply and a blow-off, of a delivery-pipe whose receiving end dips in the sediment-chamber, so as to draw the feed-water from below the surface-level of

the sediment-chamber, substantially as and for the purposes specified.

4. In feed-water devices for steam-boilers, the combination, with a sediment or separation chamber having a water-supply and a blow-off, of a delivery-pipe whose receiving end dips in the sediment-chamber and is provided with a shield or inverted cup to arrest the float-matter, substantially as and for the purposes specified.

5. A tapering sediment or separation chamber for feed-water purifiers, having the supply-port at the contracted end and the blow-off and delivery ports at or near the opposite end of said chamber, substantially as and for the purposes specified.

6. In feed-water devices for steam-boilers, the combination, with the tapering sediment-chamber having the supply-port at its contracted end and the blow-off port at its opposite end, of the dip-pipe delivery arranged adjacent to the blow-off port of the sediment-chamber, substantially as and for the purposes specified.

7. In feed-water devices for boilers, the combination, with a sediment-chamber having a blow-off, of a heating-coil interposed be-

tween the sediment-chamber and the water-supply, and a valved steam-pipe which connects the heating-coil with the steam-space of the boiler, substantially as and for the purposes specified.

8. In feed-water devices for boilers, the combination, with a sediment-chamber having a water-supply and a blow-off, of a delivery-pipe provided with an automatic spring-valve arranged to cause the delivery of the feed-water under pressure, substantially as and for the purposes specified.

9. In feed-water devices for boilers, the combination of a supply-pipe, B, a heater, C, and sediment-chamber D, arranged within the boiler, a steam-pipe, K, having a check-valve, $\frac{1}{2}$, and which connects the steam-space of the boiler with the heater C, a valved delivery-pipe, F, and a blow-off pipe, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 26th day of October, 1885.

HENRY FRANKLIN HAYDEN.

Witnesses:

LA MOTT W. RHODES,
WILLIAM PLATT.