(No Model.)

W. EVANS.

CIRCULATING WATER GRATE AND FEED WATER HEATER.

No. 459,274. Patented Sept. 8, 1891.

Fig. 1

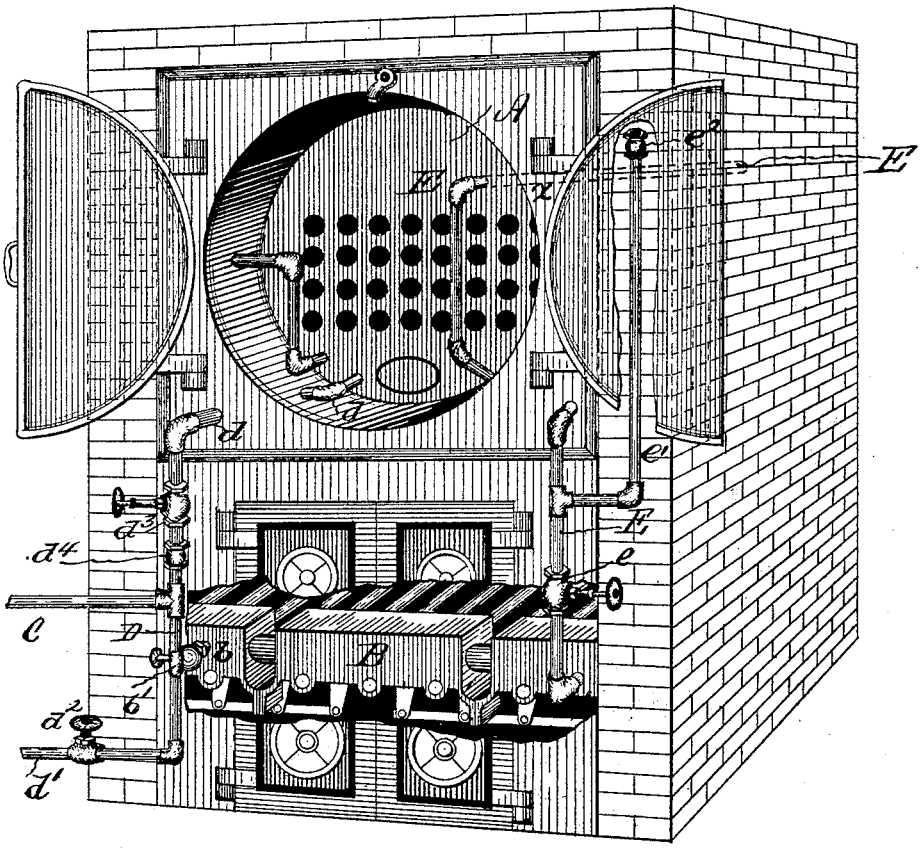


Fig. 2

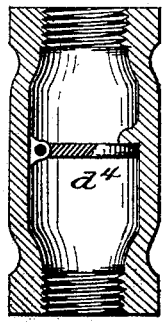
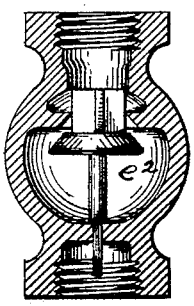


Fig. 3



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CIRCULATING WATER-GRATE AND FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 459,274, dated September 8, 1891.

Application filed March 20, 1889. Serial No. 304,077. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM EVANS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Circulating Water-Grates and Feed-Water Heaters, of which the following is a specification.

My invention has relation to water-circulating grates for the fire-boxes of locomotive or stationary steam-boilers having valves in the pipe connections for the boiler and grate and in the blow-off pipe to admit of the feed-water being fed through the grate into the boiler, of an automatic circulation of water from the boiler through the grate and back to the boiler when the feed-water is shut off, of entirely shutting off the grate from the boiler, and of blowing off either the grate or the boiler to separately cleanse the same; and it has for its object the provision of check-valves in the pipe connections between the grate and boiler, whereby the accumulation of air or the formation of air-traps in said pipes and grate and the consequent accidental burning out of the water-bars by reason of the absence of water therein, due to the formation of such air-traps in the grate-bar or its pipe connections, is avoided, and the feeding of air into the boiler along with or in advance of the feed-water is obviated, and, further, the feeding of water through the grate to the boiler and the automatic circulation from and to the boiler through the grate is effected in a more efficient manner.

My invention accordingly consists of the combinations, constructions, and arrangements of parts, as hereinafter described in the specification, and pointed out in the claims.

Reference is had to the accompanying drawings, wherein—

Figure 1 represents a perspective view, partly broken away, of a stationary boiler with circulating-grate of the form having shaking-bars and a system of pipe connections between the boiler, grate, and feed and blow-off pipes embodying my improvements. Fig. 2 is a sectional view of the preferable form of check-valve in the pipe leading from the feed-water pipe to the bottom of the boiler, and Fig. 3 is a like view of check-valve for a branch from the pipe leading from the outlet end of the grate to the inlet-pipe for the boiler.

A represents the steam-boiler; B, the water-circulating grate, which may be of any suitable form or make, but which I prefer to construct with shaking-bars and with hollow sectional bearing bars or ends, a type of which is fully shown, described, and claimed in pending applications filed October 29, 1888, Serial No. 289,476, and December 26, 1888, Serial No. 294,710.

C represents the feed-water pipe, which in practice is provided with a valve or is connected to the pump or injector. (Not shown in the drawings.) Pipe C connects with a pipe D, one end d of which leads to the bottom of the boiler and the other end d' is provided with a valve d^2 and constitutes the blow-off end and valve for the boiler and grate, as hereinafter more particularly described.

In pipe B, between its union with pipe C and the boiler, is located a valve d^3, and between the blow-off cock d^2 and the feed-pipe C pipe D is provided with a branch pipe b, leading to the inlet end of grate B, and has a valve b'.

In pipe D between valve d^3 and the feed-pipe connection therewith is a check-valve d^4, which opens downwardly by the pressure from the boiler and is closed upwardly by the feed-water pressure in pipe D. Said check-valve may be of any suitable form; but I prefer the hinged or pivoted flat form of the same, as indicated more plainly in Fig. 2, in order to avoid contracting the water area or bore in its casing.

E represents a pipe having valve e leading from the outlet end of the grate B to the top of the boiler, into which it passes and is conducted along the interior of the boiler, as indicated by dotted lines x in Fig. 1, until it reaches a line of location corresponding to the bridge-wall in the fire-box or that part of the boiler which is the hottest part of the same, in order that the feed-water dropping or falling therefrom will not affect the gage-cocks of the boiler, and that such water when deposited in the boiler will at once be in the hottest part of the same. Another advantage of extending such pipe E into the boiler, as described, is that the water flowing or forced through pipe E is subject to and receives in-

crements of heat from within the boiler before escaping from pipe E, and an economy in the fuel needed to maintain the steam-supply is thereby effected.

Pipe E, or preferably, as indicated in Fig. 1, a branch e' therefrom, is extended above the water-line in the boiler and is provided at its top with a check-valve e^2, a form of which is more plainly shown in Fig. 3. This check-valve is closed by the pressure in pipes E E′ and drops by gravity. Normally when there is no water in the boiler or grate the check-valves d^4 e^2 drop by gravity or are opened, and normally valve d^3 in pipe D and the valves b' and e are always opened and the blow-off valve d^2 is closed. When water is fed to the boiler through the grate B, the check-valve d^4 closes to prevent air or water passing into the bottom of the boiler, such water by the closure of check-valve d^4 being conducted through the grate to pipe E and thence to the top of the boiler. As the feed-water finds its way through the pipe connections and grate-bars the air in the grate or its pipe connections escapes to the branch pipe e' and through the check-valve e^2 to the external air, and hence trapping of air in such fixtures is avoided and an easier circulation of water through the grate to the boiler is effected, and all accidental burning out of the water-pipes, due to absence of water therein by reason of air-traps, is obviated. When the feed-water is shut off from pipe D, the check-valve d^4 drops by the pressure from the boiler and an automatic circulation from the bottom of the boiler to and through the grate and back to the boiler takes place. Should any accident occur to the grate, causing leakage, or should any other impairment of the same take place necessitating repairs, by closing valves d^3 and e the grate is cut off from the boiler, and the feed-water being shut off and the blow-off valve d^2 opened, the water in the grate is drained off to admit of repairing the grate. To blow off the grate at any time independently of the boiler, the valve d^3 is closed and the valves e, b', and d^2 are opened, whereupon the boiler-pressure is then through pipe E and acts to blow off the grate through pipe b, valve b', and blow-off cock d^2. To blow off the boiler, the valves b' e are closed and the valves d^2 and d^3 are opened. The check-valve d^4 opens by the pressure from the boiler.

As it is obvious that the pipe connections for different forms of grates and boilers need to be variously located and the valves in said pipes correspondingly placed, I do not confine myself to the arrangement of pipes herein shown.

The feed-pipe C from the pump or injector may be used alone or in conjunction with a separate or the usual feed-water pipe, in which case the latter serves for feeding the boiler when the grate is cut off from the boiler or when the feed through the grate is closed and the automatic circulation from the boiler to the grate and back again to the boiler occurs.

What I claim is—

1. The combination, with a steam-boiler furnace, circulating-grate, pipe connections between the boiler and grate, a feed-pipe, and blow-off pipe, of valves in said pipes to admit of shutting off the grate from the boiler and of blowing off either the grate or boiler, and check-valves and air-escape, substantially as set forth.

2. The combination of a steam-boiler furnace, circulating-grate, pipe connections between the boiler and grate, a feed-pipe, valves in said pipes for controlling said feed, and check-valves in the pipes between the boiler and grate, substantially as set forth.

3. In combination with a steam-boiler furnace, water-bar grate, pipe connections and valves for feeding the water through the grate to the boiler, and check-valves in the pipes between the boiler and grate, substantially as set forth.

4. The combination of a boiler A, water-bar grate B, pipe D, having feed-water pipe C, valve d^3, check-valve d^4, and branch b, with valve b', outlet-pipe E, having valve e, check-valve e^2, and its terminal end extending into the boiler, substantially as set forth.

5. The combination of a boiler A, water-bar grate B, a system of feed-water and valved pipe connections, including pipe E, for said boiler and grate, and said pipe E, having branch e', with check-valve e^2, and its terminal end extending for some distance into the boiler, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM EVANS.

Witnesses:
J. R. MASSEY,
FRANK R. JORDAN.