(No Model.)

J. W. HYATT.

STEAM BOILER FILTER.

No. 356,131. Patented Jan. 18, 1887.

Fig. 2.

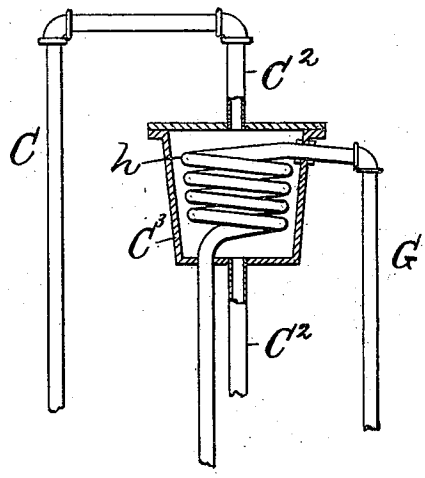

Fig. 1.

Attest:
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JOHN W. HYATT, OF NEWARK, NEW JERSEY.

STEAM-BOILER FILTER.

SPECIFICATION forming part of Letters Patent No. 356,131, dated January 18, 1887.

Application filed May 27, 1886. Serial No. 203,366. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. HYATT, a citizen of the United States, residing in Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Steam-Boiler Filters, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to automatically filter the water contained in a steam-boiler by inducing a current from the upper part of the fluid in such boiler to a filter and from the filter to the lower part of such boiler.

My invention consists in automatically inducing such current by connecting two pipes, respectively, with the upper and lower parts of the water-space in the boiler, and arranging such pipes to form an ascending and descending water-circuit, in which a filter is interposed, and in which a current is induced by circulating the feed-water through a conduit in contact with the descending pipe of such water-circuit. The feed-water for the boiler being colder than the contents of the water-circuit pipes, operates to chill the descending part of the circuit, and thereby induces a current through the same and through the filter. The heat thus abstracted from the water in the closed circuit is fully restored to the boiler by the increased temperature imparted to the feed-water, and no such loss results from the induction of the current in this manner as would arise if an extraneous body of fluid were used to cool the closed circuit and the abstracted heat were not returned to the boiler.

My construction will be understood by refefence to the annexed drawings, showing, in Figure 1, a transverse section of a boiler provided with my improvements, the descending part of the water-circuit being provided with a water-jacket, through which the feed-water supply for the boiler is pumped to induce the desired circulation. Fig. 2 represents only the upper part of the closed circuit, with a vessel interposed in the upper part of the descending circuit-pipe, and a coil inserted in such vessel and connected with the feed-water-supply pipe.

A is the boiler; B, the water-level therein; C C′ C^2, the pipes constituting the closed circuit, C representing the ascending part of the circuit, C′ the descending part of the same, and C^2 a horizontal section, in which the filter D is interposed. The section C is preferably connected with the upper portion of the water-space within the boiler and the section C^2 with the lower part of such water-space.

F is a force-pump for supplying the boiler with water, G the supply-pipe leading the cold water from the same to the water-jacket E, and G′ the pipe leading the heated water from the jacket to the steam-boiler. The vertical height of the pipe C may vary from six to twenty feet, according to the internal resistance of the filter employed, and all the pipes of the circuit would be carefully protected from radiation.

With this construction it is obvious that the water in the pipe C will contain more or less of the steam-globules which abound in the water near its surface B, and that the ascending part of the circuit must contain altogether the hottest fluid, owing to its immediate connection with the upper part of the water-space.

The descending part of the circuit to which the cooling-jacket E is applied will necessarily contain solid water, by reason of the condensation of all the steam-globules which it may have contained, and such water will evidently vary in gravity from that in the ascending column C in precise proportion to its reduction in temperature. Thus, in a boiler at ninety pounds pressure, the temperature would be 320°; and if the temperature of the feed-water were 60° the temperature of the descending column might be reduced over 100°. The proportionate reduction of volume arising from such a reduction in temperature would be over five per cent., as a cubic foot of water at 330° Fahrenheit (and corresponding pressure) weighs about fifty-six and one-fourth pounds, while its weight at 230° is fifty-nine and one-third pounds. Beside the difference arising from temperature, the specific gravity of the descending column, as compared with the ascending column, is greatly affected by the condensation of the steam-bubbles, so that in practice the difference in weight between two columns ten feet in height would amount to over one pound upon each square inch affected by the descending column.

The class of filters which I employ, and which I have frequently made the subject of

United States Letters Patent, require less than this pressure to permit the passage of the water-current, and the force generated by the cooling of such circuit is therefore sufficient to propel the entire contents of the water gradually through the filter, and to deposit therein the contained impurities.

I have found that in removing the impurities from the water by filtering the contents of the boiler, a much slower rate of filtration is effective than if the entire body of feed-water were passed through the filter. It would therefore be necessary only to induce a current through a closed circuit sufficient to transport the entire contents of the boiler three or four times daily through the filter to entirely prevent any deposit in the boiler.

As the feed-water usually evaporated from a boiler when in active operation is many times greater than this volume, it is evident that the removal of the impurities is effected with much less expenditure of energy by this method than by filtering the feed-water on its passage to the boiler. From these conditions it results that the circulation of the feed-water in the jacket E is much more rapid than the passage of the fluid through the closed circuit or column C′, and that the abstraction of heat necessary to generate the desired currents may be more perfectly and effectively performed than if the movement of the fluid in the circuit were more rapid. The filter employed for such purpose should be of a kind that is readily cleansed, to remove the accumulated impurities, and its internal resistance be thus kept at the normal point, and I therefore preferably use filters constructed as described in my Patents Nos. 273,542 and 293,742; but any desired construction may be used, as the nature of the filter forms no part of my present invention.

The construction in which the feed-water conduit passes inside a chamber contained in the descending water-circuit is shown in Fig. 2, a coil-heater pot, C^3, being interposed in the water-circuit in the upper part of the pipe C^2 and the feed-water being pumped through the coil *h*, which is connected at opposite ends with the pipe G. The cooling of the upper part of the pipe C^2 secures a difference in its temperature and its gravity throughout its entire length as effectually as if the cooling device were applied to its entire extent.

I am aware that it is not new to move the water from the water-space of a steam-boiler through a circuit containing a filter; but, while a steam-pump and other means have been employed to generate the necessary current in such a circuit, I am not aware that the cooling influence of the feed-water has ever been used to produce such current. By the use of my invention the use of any mechanical agency to force the water through the filter is entirely obviated, and the cleansing of the water in the boiler is effectually secured and the formation of scale prevented without the consumption of power or the loss of any material amount of heat from the contents of the boiler.

What I claim as my invention is—

The combination, with a steam-boiler, of an ascending and descending water-circuit connected with the water-space within the boiler, a filter interposed in said circuit, a conduit for the boiler feed-water in contact with the descending water-circuit, and a feeding device, as a pump or injector, arranged and operated to circulate the water-supply for the boiler through the said conduit, to simultaneously cool the descending part of the circuit and to heat the feed-water, substantially as shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN W. HYATT.

Witnesses:
HENRY J. MILLER,
CHAS. C. MCBRIDE.