Sept. 13, 1932. H. H. DAUM 1,877,389

MEANS FOR REMOVING BOILER SCALE AND PREVENTING THE FORMATION THEREOF

Filed March 14, 1930

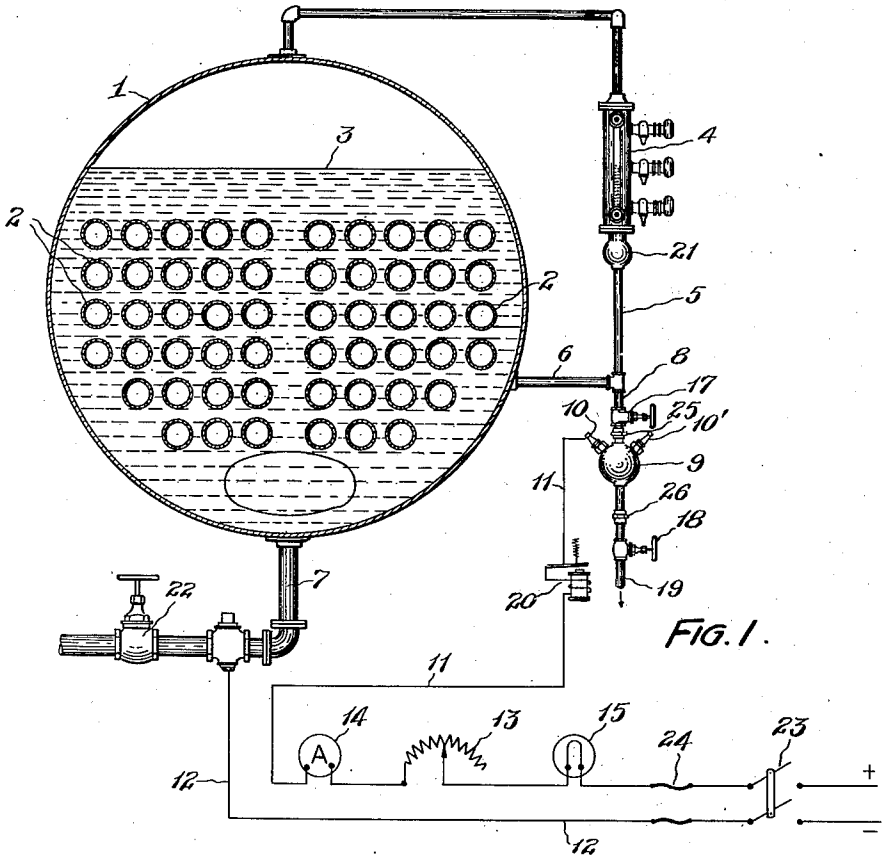

FIG. 1.

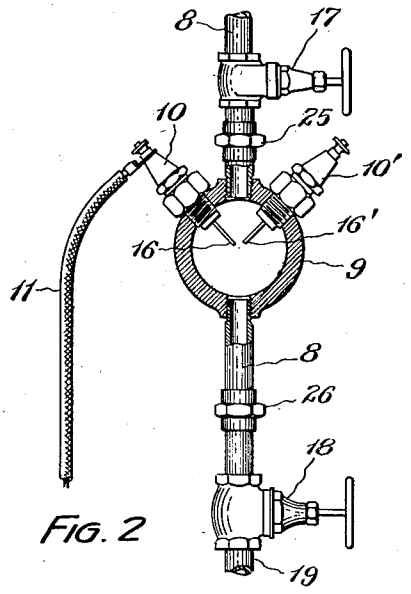

FIG. 2

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UNITED STATES PATENT OFFICE

HERMAN H. DAUM, OF HUDSON, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ELECTRO-MATIC SCALE ELIMINATOR, INC., OF CLEVELAND, OHIO, A CORPORATION OF OHIO

MEANS FOR REMOVING BOILER SCALE AND PREVENTING THE FORMATION THEREOF

Application filed March 14, 1930. Serial No. 435,891.

It is well known that boilers corrode because of the electrolytic action to which they are subjected and gradually become incrustated with scale and the internal surfaces become pitted due to the so-called normal current passing through the water. Also, impure water has a severe incrustating effect on boiler surfaces. My improved apparatus prevents this corroding and pitting and removes this incrustation and prevents the formation of further incrustation.

My invention particularly relates to means of this nature of an electrical character which may be economically manufactured, which may be conveniently and economically attached to boilers already installed, which may be quickly and conveniently detached and replaced, which is open to quick and convenient inspection, and the electric terminals forming part of which are self-cleaning. The cost of operating my improvements is slight compared with the cost of cleaning and protecting boiler shells and boiler tubes by any other method and/or apparatus with which I am acquainted. These improved means are also applicable to apparatus other than boilers whose surfaces are subject to scale formation, but as illustrative of my invention, I shall describe the same as applied to one type of steam boiler and I thus show the same in the accompanying drawing.

The annexed drawing and the following description set forth in detail certain means embodying my invention, such disclosed means constituting, however, but one of the various forms in which the principle of the invention may be embodied.

In said annexed drawing:

Figure 1 is a vertical transverse section through a steam boiler, to which my improved means have been applied, these means being shown in elevation, the Figure also showing electric connections to a main line, the current controls, ammeter, etc.; and

Figure 2 is a view similar to the showing in Figure 1, but partially in section, of part of my improved means, upon an enlarged scale.

Referring to the annexed drawing in which the same parts are indicated by the same respective numbers in the several views, a boiler 1 provided with the usual flue-tubes 2 is shown partially filled with water 3 for the creation of steam therein, this boiler being provided with a water column 4 in the line 5. The line 5 is also provided with a sediment chamber 21 below the water column 4. A blow-down line 8 communicates with the line 5 from the water column 4, and the lines 5 and 8 are connected by a pipe 6 with the interior of the shell 1 at any desired suitable point of rapid water circulation. A blow-down line 7 from the boiler 1 is connected to the interior of the shell 1 at about the point of the least rapid circulation of water and is provided with the usual valve 22.

I have incorporated with the aforegoing elements electric conductors and other parts of a complete electric circuit which will permit an electric current to flow from and back to a main line through the water 3 in the shell 1 and an anode element 10 which I also provide, exteriorly of the shell 1. This anode element 10 is located in line with the water column line 5, the shell 1 and the flue-tubes 2 constituting the cathode, and the current necessarily passing through the water in order to pass from the anode 10 to the cathode. In thus supplying such elements, I have formed the blow-down line 8 with an enlarged chambered member 9 below the sediment chamber 21, this chambered member 9 being adapted to receive the anode plug 10 which is insulated from the wall of the chamber 9 and whose terminal 16 extends into the chamber 9. The chambered member 9 is designed to stand a pressure of eight hundred pounds or more per square inch. The blow-down line 8 is continued downwardly into a discharge portion 19, and this lower portion 19 is provided with a value 18. I provide a gate valve 17 between the enlarged chambered portion 9 and the connection of the pipe 6 to the blow-down line 8. I have shown two of the plugs 10, intersecting the chamber 9, but one of them is so mounted only for the purpose of convenient storage for a replacement plug.

To the plug 10 is connected the conductor 11 which is connected to the positive pole of the main line and passes through the main switch 23, fuse 24, pilot lamp 15, variable resistance 13, and ammeter 14. The use of these last-mentioned elements is well known and probably, preferably, in actual installation certain of such well known elements would be contained in a standard control box. Another conductor 12 leads to the negative pole of the main line and is connected to the blow-down line 7 of the boiler 1. I incorporate in the positive conductor 11 adjacent the boiler shell 1 a vibrator element 20.

My invention is designed to clean the inner surface of the boiler shell 1 and the surfaces of the flue-tubes 2, as well as to prevent the formation of further incrustations thereon. I preferably use a direct current, but an alternating current can be used with a suitable motor generator set. The amount of current suitable varies because of different conditions, such as the amount of steam pressure, size of boiler, amount of incrustation, etc. This current amount, of course, can be regulated through the variable resistance 13, and the actual amount flowing can be seen in the ammeter 14 and, whether or not any current is flowing, is determined by the pilot lamp 15. The amount of current can vary from 400 milli-amperes to 1800 milli-amperes.

The course of the current in my apparatus is through the positive conductor 11 including the vibrator 20, through the plug anode 10, into the water contained within the chamber 9 and thence through the pipes 8 and 6 into the water 3 contained within the shell 1, the valve 17 being open and the valve 18 closed. Passing through the water 3, the current generates gases which fasten upon the inner surface of the shell 1 and the surfaces of the flue-tubes 2 under the incrusted scale and which gradually loosen and throw down the scale. The current passes out from the boiler shell cathode 1 to the negative conductor 12 through the blow-down line 7. The gases generated by this current also prevent the deposit of additional sediment upon the boiler shell and tubes and the formation of additional scale or the adhering of the same to the boiler surfaces. Thus these surfaces after once being cleaned are maintained clean or, if the invention is applied to a new boiler, the latter is protected from scale incrustation. The beneficial action of the current is increased by the action of the vibrator 20 in the conductor 11.

The valve 18 is opened when the boiler is periodically blown off through the water column line 5, sediment chamber 21, and blow-down line 8. The anode plug terminal 16 is automatically cleaned by the water blown off through the line 8. The anode plug 10 can be readily inspected by removal from the chamber member 9 and, of course, can be quickly replaced by a new plug, if necessary, an additional plug 10′ being conveniently carried for this purpose in the wall of the member 9, as plainly shown in Figure 2. The anode chamber 9 can be cut off from the boiler when desired by closing the valve 17, and also by means of unions 25 and 26 the anode chambered member 9 can be detached from the water column line 5 when the boiler is under pressure.

I direct particular attention to the fact that my improvements are located entirely outside of the shell 1 and that, therefore, the inspection, repair and replacement of the same can be very easily effected. Also, the improvements can be easily applied to boilers already installed.

What I claim is:

1. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a water column line including a sediment chamber, a pipe connection to said line below said chamber, said pipe connection being formed with an enlarged chambered portion provided with an anode plug intersecting the wall thereof, but insulated from the latter, and having a terminal portion extending into the chamber of said enlarged portion, so as to be subject to the blow-down action therethrough.

2. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a water column line including a sediment chamber, a pipe connection to said line below said chamber, said pipe connection being formed with an enlarged chambered portion provided with an anode plug intersecting the wall thereof, but insulated from the latter, and having a terminal portion extending into the chamber of said enlarged portion so as to be subject to the blow-down action therethrough, and a conductor connected to said plug and provided with a vibrator element.

3. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a boiler having flue tubes, a water column line, and a blow-down line from the boiler, a pipe connection intersecting the boiler shell and communicating with the interior thereof, a blow-down line communicating with said water column line, an anode plug intersecting the wall of said water column blow-down line and insulated therefrom, said pipe connection communicating with said water column blow-down line, valves in said water column blow-down line above and below said anode plug, the latter being adapted for attachment to a positive conductor and said boiler blow-down line being adapted for attachment to a negative conductor.

4. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a boiler having flue tubes, a water column line having a sediment chamber, and a blow-down line from the boiler, a pipe connection intersecting the boiler shell and communicating with the interior thereof at a point of rapid water circulation, a blow-down line communicating with said water column line below said sediment chamber, an enlarged chambered portion formed in said water column blow-down line, an anode plug mounted in the wall of said enlarged portion and extending into the latter so as to be subject to the blow-down action therethrough, said plug being insulated from the wall of said enlarged portion, said pipe connection communicating with said water column blow-down line between said sediment chamber and said enlarged chambered portion, valves in said water column blow-down line above and below said enlarged chambered portion, said plug being adapted for attachment to a positive conductor and said boiler blow-down line being adapted for attachment to a negative conductor.

5. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a boiler having flue tubes, a water column line, and a blow-down line from the boiler, a pipe connection intersecting the boiler shell and communicating with the interior thereof, a blow-down line communicating with said water column line, an anode plug intersecting the wall of said water column blow-down line and insulated therefrom, said pipe connection communicating with said water column blow-down line, valves in said water column blow-down line above and below said anode plug, union members in said water column blow-down line intermediate said plug and said valves, respectively, whereby said plug and the portion of said water column blow-down line intermediate said unions can be temporarily removed, said anode plug being adapted for attachment to a positive conductor and said boiler blow-down line being adapted for attachment to a negative conductor.

6. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a water column line, a pipe connection to said line adapted for blow-down action and provided with an anode plug intersecting the wall of said connection, but insulated from said wall, said plug having a terminal portion extending into the chamber of said pipe connection so as to be subject to the blow-down action therethrough.

7. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a water column line, a pipe connection to said line formed with an enlarged chambered portion provided with an anode plug intersecting the wall thereof, but insulated from the latter, and having a terminal portion extending into the chamber of said enlarged portion so as to be subject to the blow-down action therethrough.

8. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a water colmn line, a pipe connection to said line formed with an enlarged chambered portion provided with an anode plug intersecting the wall thereof, but insulated from the latter, and having a terminal portion extending into the chamber of said enlarged portion so as to be subject to the blow-down action therethrough, and a conductor connected to said plug and provided with a vibrator element.

9. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a boiler having flue tubes, a water column line, and a blow-down line from the boiler, a pipe connection intersecting the boiler shell and communicating with the interior thereof, a blow-down line communicating with said water column line, and an anode plug intersecting the wall of said water column blow-down line and insulated therefrom, said pipe connection communicating with said water column blow-down line.

10. Means for removing boiler scale and preventing the formation thereof comprising, in combination with a boiler having flue tubes, a water column line having a sediment chamber, and a blow-down line from the boiler, a pipe connection intersecting the shell of the boiler and communicating with the interior thereof at a point of rapid water circulation, a blow-down line communicating with said water column line below said sediment chamber, an enlarged chambered portion formed in said water column blow-down line, and an anode plug mounted in the wall of said enlarged portion and extending into the latter so as to be subject to the blow-down action therethrough, said plug being insulated from the wall of said enlarged portion, said pipe connection communicating with said water column blow-down line between said sediment chamber and said enlarged chambered portion.

11. Means for removing boiler scale and preventing the formation thereof comprising a pipe connection to said boiler forming part of a blow-down line and an anode in said pipe connection, said anode being insulated from the wall of said connection and being positioned in said connection so as to be subject to the blow-down action therethrough.

Signed by me this 4th day of March, 1930.

HERMAN H. DAUM.