June 27, 1933. W. D. BRIDGE 1,915,484

BOILER CIRCULATOR AND CLEANER

Filed Feb. 21, 1931 2 Sheets-Sheet 1

Fig. 1.

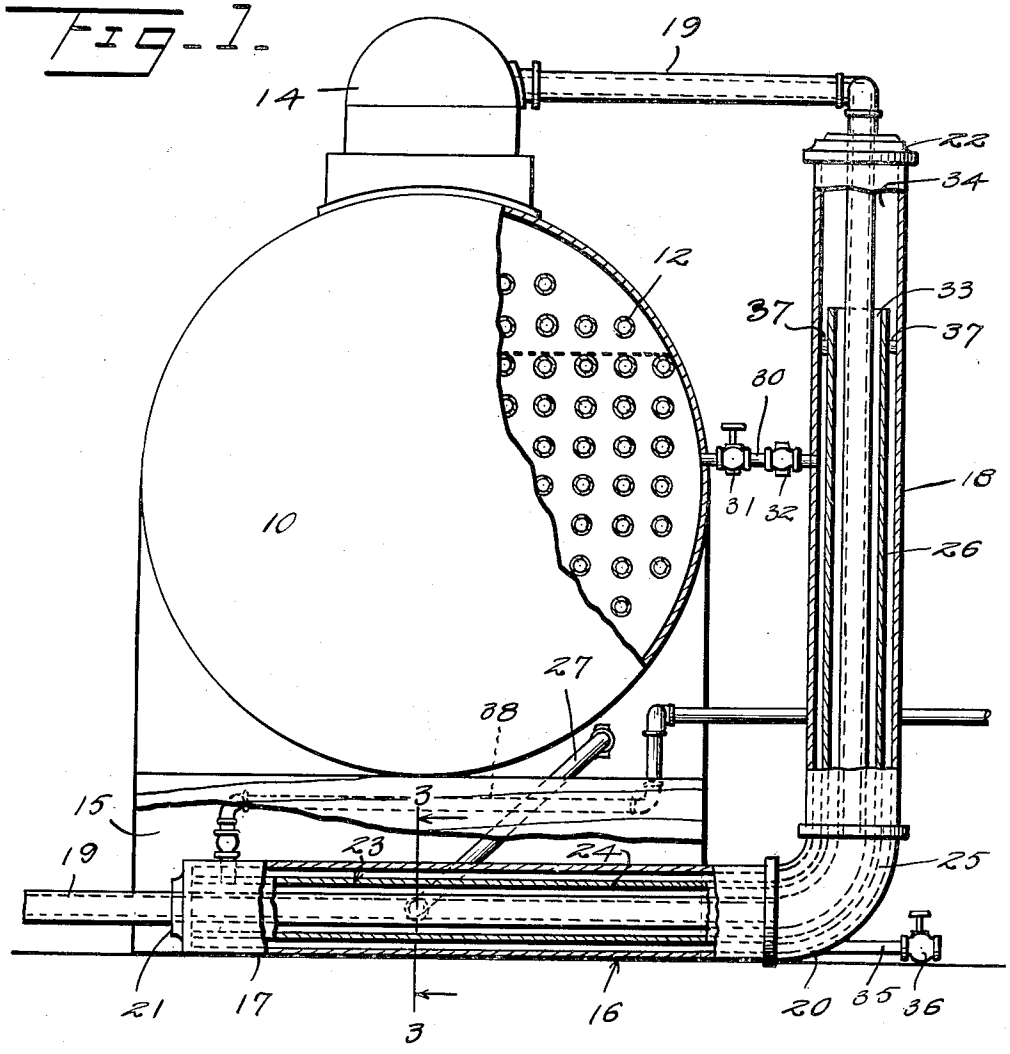
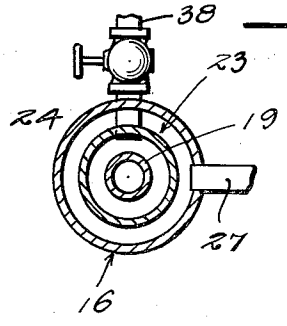


Fig. 3.



Inventor

W. D. Bridge

By Watson E. Coleman

Attorney

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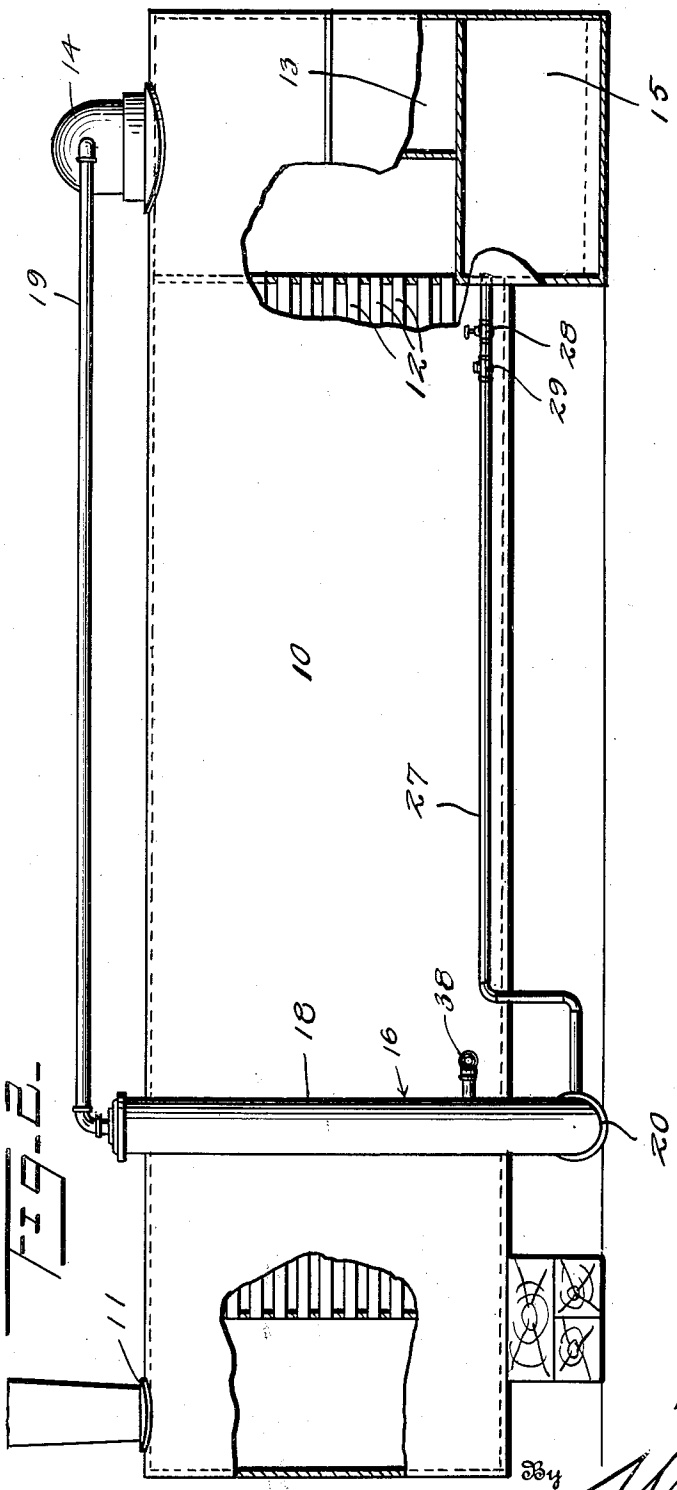


Fig. 2.

Inventor

W. D. Bridge

By Watson E. Coleman

Attorney

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UNITED STATES PATENT OFFICE

WILLIAM D. BRIDGE, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-THIRD TO ELBA O. BOGGS, OF WINFIELD, KANSAS, AND ONE-THIRD TO WADE S. BRYAN, OF SEMINOLE, OKLAHOMA

BOILER CIRCULATOR AND CLEANER

Application filed February 21, 1931. Serial No. 517,584.

The present invention relates to boilers and more particularly to devices or attachments for boilers whereby to facilitate circulation of the water within the boiler and coactively clean the interior of the boiler of any scale and coactively prevent accumulation of scale within the boiler.

An object of this invention is to provide a device of this kind which can be readily attached to any conventional steam boiler whether of the portable or stationary type, the device embodying features which will not absorb any power from the boiler for operation thereof.

Another object of this invention is to provide a device of this kind which is so constructed that the pressure of the boiler will cause circulation of the water through the device so as to provide a continuous circulation from the device to the boiler.

A further object of this invention is to provide in a device of this kind means for superheating the water passing through the device.

A still further object of this invention is to provide a device of this kind by means of which the pressure of the device is used for removing the accumulated scale or foreign particles which are trapped within the device.

The above and various other objects and advantages of this invention will in part be described in and in part be understood from the following detailed description of the present preferred embodiment, the same being illustrated in the accompanying drawings, wherein:—

Figure 1 is a detail front elevation partly broken away of a boiler having a device constructed according to the preferred embodiment of this invention mounted thereon, the device being shown in front elevation partly in section;

Figure 2 is a side elevation partly broken away of a boiler having a device of this kind mounted thereon, and

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Referring to the drawings, wherein like numerals of reference designate corresponding parts throughout the several views, the numeral 10 designates generally a boiler of conventional construction which may be of the portable or mobile type or of the stationary type and which is provided at one end with a fire box 13 and at the opposite end with a smoke stack opening 11.

The boiler 10 is provided in the present instance with a plurality of flues 12 which extend longitudinally of the boiler 10 and open at one end into the fire box 13 and at the opposite end into the forward end of the boiler construction from which point it passes outwardly through the stack opening 11. The boiler 10 is also provided at the desired location with a steam dome 14 which is disposed at the top of the boiler 10, and beneath the fire box 13 or at any other desired location, there is provided a sediment basin or shell 15 wherein the sediment caused through the heating of the water within the boiler is adapted to accumulate.

In boilers at present in use, and particularly those in use in the oil fields, the present water available in its impure form contains a considerable quantity of lime and other particles which accumulate within the shell of the boiler 10 and about the flues 12 so that after the boiler has been in operation for a short period of time, the interior of the boiler and the periphery of the flues 12 become coated with a relatively hard scale which impairs the efficiency of the boiler.

In order to provide a circulating medium for the water within the boiler 10, we have provided a casing or housing generally designated as 16, which is of substantially L-shaped construction having one portion 17 thereof disposed in substantially horizontal relation and the other portion or leg 18 of the casing or housing 16 is disposed in substantially vertical position and having the upper end thereof terminating at a point above the top of the boiler 10.

A steam pipe 19 is connected at one end to the dome 14 and extends axially through the casing or housing 16 and is connected at the opposite end to a suitable power member such as a pump or the like. The horizontal member 16 and the vertical member 18 of the housing 16 are connected by means of an L-connection 20. One end of the housing

member 17 is provided with a cap 21 of annular construction which is provided with a suitable opening so that the steam heating pipe 19 may be extended through the cap 21. The upper end of the housing member 18 is provided with a similar cap 22 which is adapted to close the upper end of the housing member 18 about the heating pipe 19.

Disposed within the housing 16 and in spaced relation to the heating pipe 19, there is positioned an inner casing generally designated as 23, which is of substantially L-shaped construction, and at one end the horizontal leg 24 engages the cap 21 so as to close one end of the inner casing member 24, and the opposite end of the inner casing member 24 is connected to an L 25. The horizontal leg 26 of the inner casing 23 is connected at one end to the L 25 and the opposite end of this vertical inner casing member 26 is free and terminates in spaced relation to the upper cap member 22 and substantially below the top of the boiler 10.

An intake water pipe line 27 is connected at one end to the boiler 10 and preferably to the mud rim or sediment basin 15, and at the opposite end the water line 27 is connected to the outer casing 16, the point of attachment being closely adjacent the lower cap member 21.

A manually operable valve 28 is interposed within the pipe line 27 and in like manner, a check valve 29 is interposed in the pipe line 27 intermediate the valve 28 and the casing 16, so that the water will flow in only one direction within the pipe line 27, this direction being from the boiler 10 toward the casing 16.

A return pipe line 30 is connected at one end to the casing 18 and at the opposite end to the boiler 10. The return pipe line 30 is connected to the casing 18 at a point below the open end of the vertically disposed inner casing member 26, and the point of attachment of the opposite end of the pipe line 30 to the boiler 10 is below the normal level of the water within the boiler.

A manually operable valve 31 is interposed in the pipe line 30 between the boiler 10 and the vertical casing 18 and a check valve 32 is also interposed in the pipe line 30 between the valve 31 and the vertical casing 18, so that the flow of water from the intake pipe line 27 through the inner casing 23 and back to the boiler 10 through the pipe line 30 can be manually regulated and this flow established in only one direction.

The space between the upper or open end 33 of the inner vertical casing 26 constitutes a steam trap 34 for the accumulation of any steam which may be formed by means of the heating member 19 passing through the casings 16 and 23 or any steam which is forced through the water pipe line 27 from the boiler 10. The pressure of this steam 34 cooperating with pressure in the supply pipe 38 will operate to force the water downwardly from the open end 33 of the inner casing 26 into the pipe line 30.

A drawoff or cleaning pipe line 35 is attached at one end to the elbow 20 and a valve 36 is connected to the drawoff 35 so that the pipe 35 may be manually closed or opened, as desired. The free end of the inner casing member 26 is held concentrically within the outer casing by means of a spacing member 37 which not only holds the free end of the inner casing member 26 concentrically within the outer casing 18, but also concentrically with and in spaced relation to the heating pipe member 19. A water feed line 38 is connected at one end to a source of water supply and is preferably connected to the injector for the boiler 10 and this opposite end of the pipe 38 is extended through the outer casing 17 adjacent the cap 21 and connected to the inner casing or boiler 24 so that the water from the feed line 38 will pass between the inner member 23 and the heater 19.

In the operation of this device, when a suitable head of steam is provided in the boiler 10, and when the pumps or other power members are placed in operation, the steam will circulate through the steam line 19 to the pumps or other power members. The outlet valve 28 may then be opened so as to permit the water from the lowermost point of the boiler to flow through the casing intake pipe line 27 and into the outer casing member 16. From this point, the water will circulate about the inner casing 24 and be forced upwardly through the vertical outer casing 18 and outwardly through the return pipe 30. The accumulation of steam in the steam trap 34 disposed above the free end of the riser 26 is adapted, with the additional pressure in the feed line 38 from a suitable pump or injector (not shown), to force water into the pipe 30 so as to partially agitate the water in the boiler 10. The space between the inner casing or boiler 23 and the outer casing or housing 16 provides a sediment well whereby sediment is received or deposited therein from the boiler 10 and from the space between the inner casing or boiler 23 and the heater pipe 19. This sediment can be readily removed by opening the valve 36 on the drawoff pipe 35, which is under pressure from the boiler when the valve 28 is opened. When it is desired to fill the boiler with water, the feed line 38 may be opened by means of a suitable valve disposed therein and the injector or other pump member set into operation so as to force the water through the space between the inner casing or boiler member 23 and the heater 19. This inner boiler member 23 constitutes a pre-heater for the water entering the boiler from a

suitable source of water supply so that no cold water will be forced into the boiler.

Furthermore, by pre-heating this water, a considerable amount of precipitate is removed therefrom, thus purifying the water and removing therefrom a considerable quantity of lime or other particles which become a precipitate upon heating the water to a predetermined degree. The space between the inner boiler member 23 and the heater 19 may be such as to dispose a relatively thin film of water about the heater 19 so that this water can be quickly heated to a relatively high degree before entering the boiler 10.

It is, of course, understood that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

I claim:—

1. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising an elongated outer casing, a heating element extending through the outer casing, an inner casing within the outer casing and positioned about and in spaced relation to said heating element, connecting means connecting one end of said inner casing to the water supply, said inner casing at a point remote from said connecting means having communication with said outer casing, and connecting means for connecting said outer casing with a boiler whereby to provide a superheating water circuit.

2. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising an elongated outer casing, a heating element extending through the outer casing and connected at one end to the boiler, an inner casing within the outer casing and disposed about and in spaced relation to said heating element, pipe means connecting one end of said inner casing to the water supply whereby to admit water from the supply into one end of said inner casing, said inner casing at a point remote from said water intake having communication with said outer casing, and return pipe means for connecting the outer casing with a boiler, said return pipe means being connected to said outer casing at a point remote from the intake of said inner casing.

3. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising an elongated L-shaped outer casing of circular cross sectional configuration, a heating element adapted to be connected at one end to a boiler and extending axially through said outer casing, an inner casing within said outer casing and disposed about and in spaced relation to said heating element, said inner casing having one end thereof closed, the opposite end of said inner casing being open and disposed in spaced relation to the adjacent end of said outer casing, an intake pipe adapted to be connected at one end to the boiler and at the opposite end adjacent the closed end of said outer casing, and a return pipe connected at one end to said outer casing adjacent the open end of said inner casing, the opposite end being adapted to be connected to the boiler.

4. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising a cylindrical outer casing having closed opposite end portions, a heating element extending axially through said outer casing, an inner casing mounted concentrically within said outer casing and in spaced relation to said heating element, said inner casing having one end thereof closed, the opposite end of said inner casing being open and disposed in spaced relation to the adjoining end of said outer casing whereby to permit communication from said inner casing to said outer casing, an intake pipe line connected at one end to the water supply and at the opposite end extending through said outer casing and into said inner casing whereby to admit water from said supply into said inner casing adjacent the closed end thereof, and a return pipe connected to said outer casing adjacent the open end of said inner casing and providing means for connecting at the opposite end to a boiler at a point below the normal water level within the boiler.

5. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising an elongated L-shaped outer casing having one leg thereof positioned in substantially horizontal position, the other leg being positioned in substantially vertical position and terminating at a point above the top of a boiler, a heating element extending concentrically through and beyond the outer casing, an inner L-shaped casing mounted within the outer casing and disposed concentrically thereof and in spaced relation to said heating element, said inner casing having one end thereof closed and the opposite end open and communicating with the outer casing, intake pipe means connecting the water supply with said inner casing adjacent the closed end thereof, and return pipe means for connecting the boiler with said outer casing, said return pipe means being connected to said outer casing at a point adjacent the open end of said inner casing and check valves mounted in said return pipe means whereby

to permit the flow of water in only one direction.

6. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising an elongated cylindrical outer casing having the opposite ends thereof closed, a heating element disposed concentrically within said outer casing, an inner casing mounted concentrically within said outer casing and positioned in spaced relation about said heating element, said inner casing having one end thereof closed, the opposite end of said inner casing being open and communicating with said outer casing, intake pipe means connecting the water supply with said inner casing adjacent the closed end thereof, return pipe means for connecting the boiler with said outer casing adjacent the open end of said inner casing, and drawoff means connected with said outer casing whereby to permit cleaning of sediment deposited within said outer casing.

7. A device of the character described adapted to be connected to a boiler and a source of water supply under pressure, comprising a cylindrical elongated outer casing, a steam pipe extending concentrically through said casing, cap means for holding said steam pipe concentrically within said outer casing and coactively closing the opposite ends of said outer casing, an inner casing disposed concentrically within said outer casing and in spaced relation to and about said steam pipe, said inner casing being connected at one end to one of said cap means, the opposite end of said inner casing terminating at a point spaced inwardly from the adjoining end of said outer casing, means for holding said open end of said inner casing concentrically within said outer casing, intake pipe means connected at one end to the water supply and at the opposite end to said inner casing adjacent the closed end thereof, a second intake pipe for connecting the casing to a boiler, return pipe means for connecting the said boiler with said outer casing adjacent the open end of said inner casing, manually operable valve members interposed in said intake pipe means and said return pipe means, check valves interposed in said second intake pipe means between said valve and said outer casing, check valve means interposed in said return pipe means intermediate said valve and said outer casing whereby to establish a circulation through said outer casing to said boiler in one direction, a drawoff pipe connected at one end to said outer casing, and a valve interposed in said drawoff pipe whereby to regulate the expulsion of sediment from said outer casing.

8. A device as described comprising an outer casing, an inner casing, a heating pipe extending longitudinally of each of said casings, means for securing said heating pipe to said outer casing, said inner casing terminating at a point inwardly of one end of the outer casing and opening at said terminated end into said outer casing, the opposite end of said inner casing being closed, pipe means connecting the inner casing adjacent its closed end to a source of water supply under pressure, intake pipe means adapted to connect the outer casing adjacent the closed end of the inner casing to a boiler below the water level of the boiler, and an outlet pipe adapted to connect said outer casing with said boiler below the water level of the boiler, said outlet pipe being disposed adjacent the open end of said inner casing.

In testimony whereof I hereunto affix my signature.

WILLIAM D. BRIDGE.