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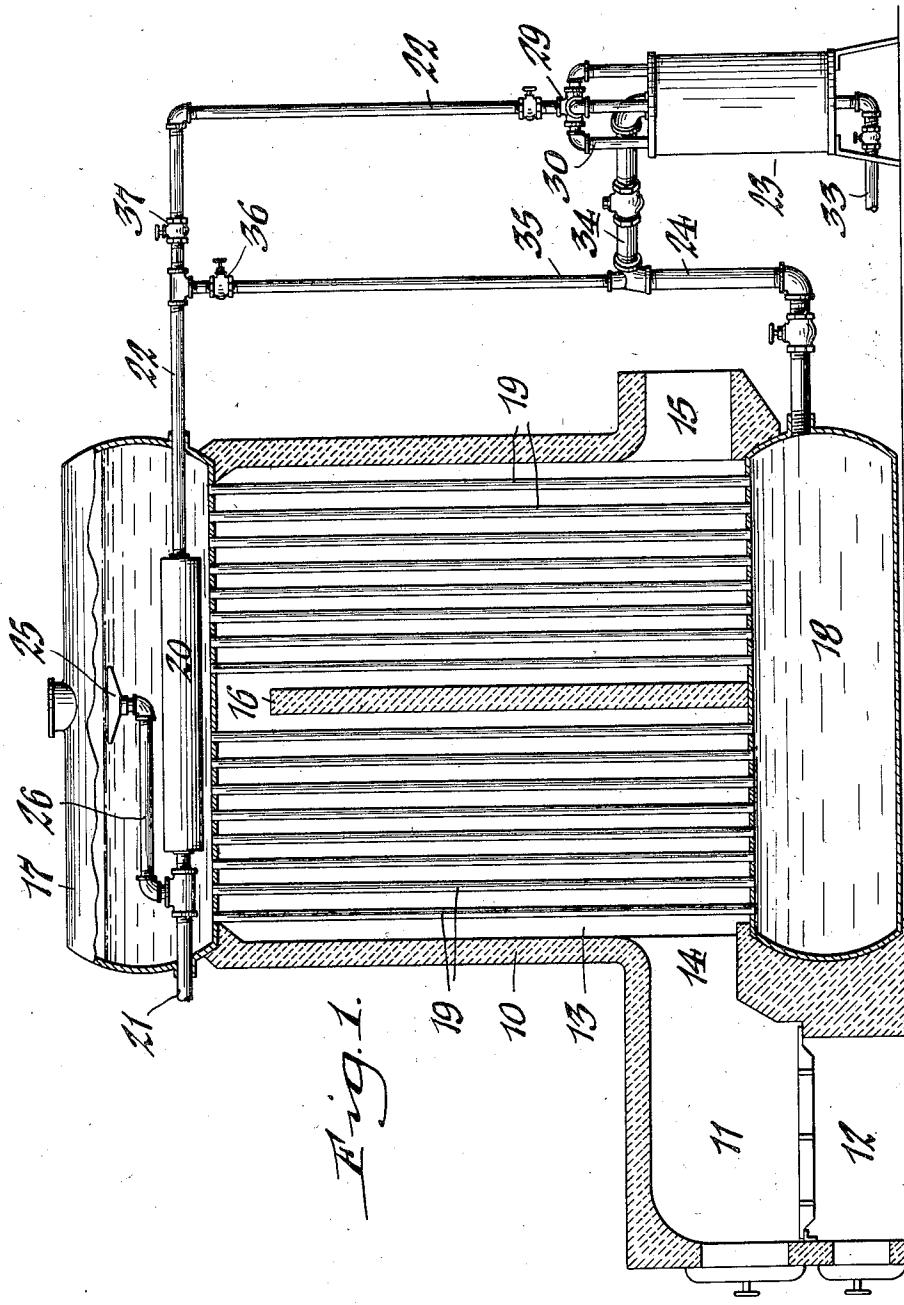
W. L. MARS

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CLEANING APPARATUS FOR BOILERS

Filed July 17, 1933

2 Sheets-Sheet 1



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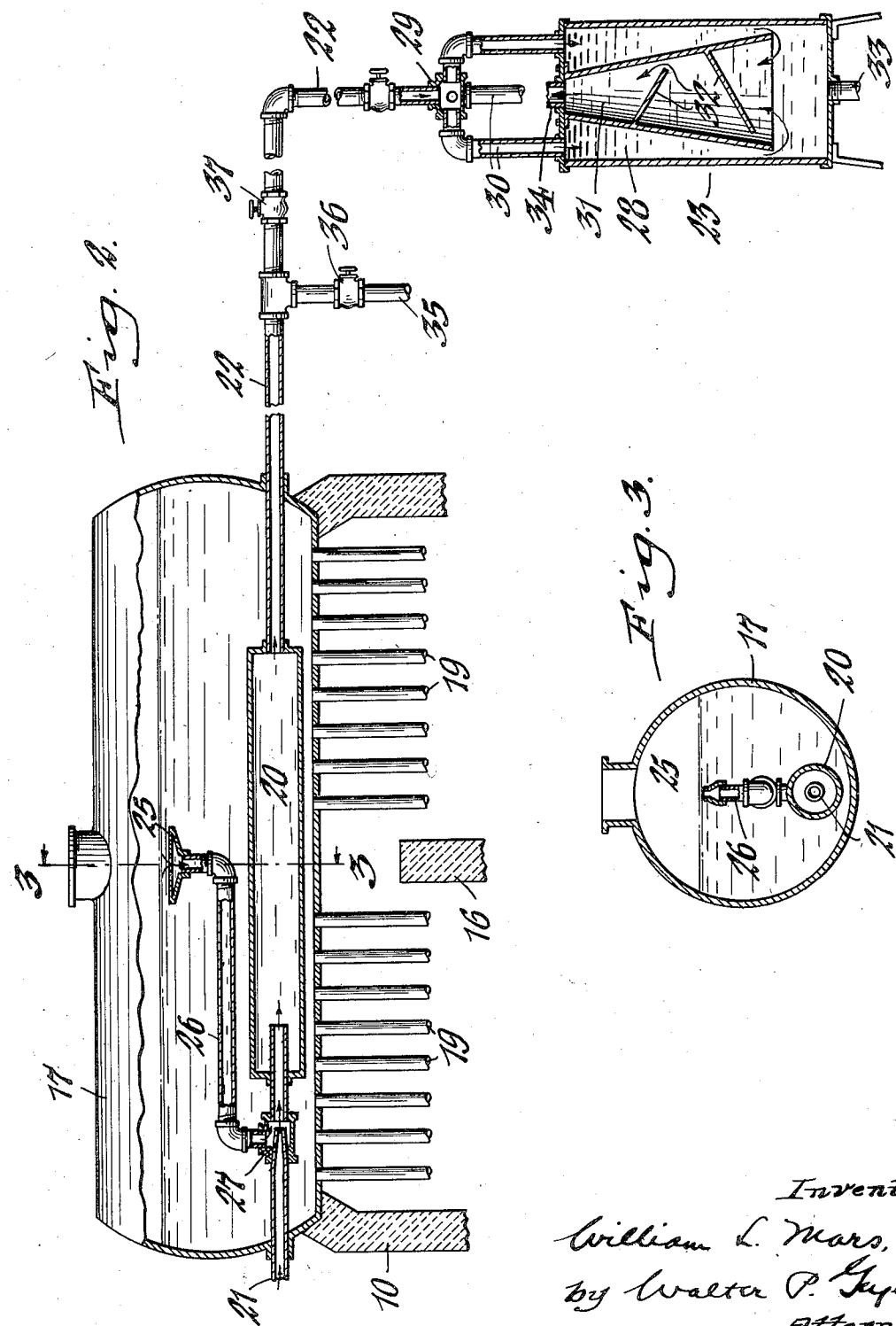
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## UNITED STATES PATENT OFFICE

2,011,819

## CLEANING APPARATUS FOR BOILERS

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1 Claim. (Cl. 122—398)

This invention relates generally to steam boilers but more particularly to an apparatus therefor for removing those elements from the circulating water which produce sediment and scale 5 within the boiler.

It has for one of its objects to provide an efficient apparatus of this character which will effectually and thoroughly remove sediment and foreign matter from the water during its circulation through the boiler, and thereby increase the circulation of the water in the boiler and obtain the maximum heat transfer and steam generation with a minimum consumption of fuel.

Another object of the invention is the provision of a cleaning apparatus for boilers which is simple and inexpensive in construction, which is positive, reliable and automatic in operation, and which is not liable to get out of order.

Other features of the invention reside in the construction and arrangement of parts herein-after described and particularly pointed out in the appended claim.

In the accompanying drawings:—

Figure 1 is a vertical sectional view of a boiler showing my improved apparatus applied thereto. Figure 2 is an enlarged longitudinal section of the apparatus showing its connection to the upper drum or header of the boiler. Figure 3 is a cross section taken on line 3—3, Figure 2.

Similar characters of reference indicate corresponding parts throughout the several views.

By way of example, I have shown my invention in connection with a water tube boiler, wherein 10 indicates the body thereof, 11 the combustion chamber, 12 the ash pit, and 13 the tube chamber communicating with the combustion chamber through the flue 14 and with the stack (not shown) through the flue 15, said chamber containing a bridge or baffle wall 16 for effecting the 20 proper circulation of the hot gases through the tube chamber. Disposed at the opposite ends of the chamber 13 are the customary upper and lower tube-drums or domes 17 and 18, respectively, which are connected to each other by the 25 water tubes 19.

The cleaning apparatus for effecting the removal of those elements in the water, such as alkali, magnesium and lime which cause the formation of scale on the boiler tubes, as well as 30 other foreign matter, is so designed and operatively associated with the boiler as to effect the cleansing and purification of the water during its circulation through the boiler. In its preferred construction shown in the drawings, the 35 cleaning apparatus is constructed as follows:—

Disposed within the upper drum 17 and adjacent the bottom thereof, so as to be completely immersed in the water contained within the drum, is a chamber for receiving and conducting water from the pump line and top of the boiler to the cleaner and which may be in the form of a horizontally-disposed tank or cylinder 20 having an inlet at one end connected to the feed water inlet pipe 21 of the boiler and an outlet at its opposite end to which a pipe 22 is connected for conducting the water to a cleaner or sediment collector indicated generally by the numeral 23, the latter in turn being connected to the lower drum 18 by a pipe 24, whereby a continuous circulation of water is effected through the receiving chamber, the cleaner and the boiler. This chamber, being positioned within the upper drum, functions to quickly heat the water fed thereto and thereby separates the scale-forming elements from the water, these elements being converted 20 into a collective mass or body and removed from the water as it is circulated through the cleaner or sediment collector 23 on its return flow to the lower drum 18.

The receiving chamber 20, in addition to being connected to the feed water line of the boiler, also communicates with the water in the upper drum 17 through the medium of a substantially funnel-shaped receiver or skimming device 25 which is disposed over the chamber with its mouth at or slightly below the normal level of the water in the drum, whereby this device skims off or removes any foreign matter which collects on the surface of the water in said drum. This skimming device is connected by a pipe 26 with the inlet end of the chamber 20, and as seen in Figure 2, the discharge end of this pipe is arranged in inductive relation to the discharge end of the feed water inlet pipe 21, whereby, as the water is forced through said pipe 21 by pump pressure, a vacuum is set up which acts to draw the water and the foreign matter collected on the surface thereof from the drum 17 into the chamber. As shown in Figure 2, the pipe 21 terminates in a contracted or nozzle-end 27 which extends beyond the discharge end of the pipe 26 to produce the induced effect desired.

The cleaner or sediment collecting device 23, which is located below the upper drum 17 and interposed between the chamber 20 and the lower drum 18, preferably consists of a cylindrical tank or casing 28 into which the water from the pipe 22 flows by gravity. The lower or discharge end of said pipe terminates in a distributing head 29 having pipes 30 which are connected at different 55

radial points to the upper end of the tank. Located centrally within the latter and spaced from the surrounding wall thereof with its upper contracted end arranged inwardly of the discharge ends of the radial pipes 30 is a tubular member or cone-shaped collecting drum 31 having baffles 32 disposed in the interior thereof in the manner shown in Figure 2. In circulating through the cleaner to effect the removal of the foreign matter therefrom, the water passes downwardly through the tank 28, and then upwardly through the drum 31 where the foreign matter is intercepted by the baffles 32 therein and eventually settles to the bottom of the tank where it may be withdrawn from time to time through a drain or valved blow off pipe 33. Connected to the upper end of the cleaning tank and in communication with the corresponding end of the drum 31 is a discharge pipe 34 which leads to the pipe 24 connected to the lower boiler-drum 18.

It will be noted that the circulation of the water in the boiler and the cleaner 23 is upward, whereby all lighter-than-water foreign matter is raised to the surface of the normal water level of the boiler for removal through the skimming device 25, the chamber 20 and the cleaner, with the result that the scale-forming elements in the water are withdrawn and prevented from continuously circulating through the boiler and impairing its efficiency.

Should it be desired to effect the removal of the cleaner for any reason without interfering with the operation of the boiler, I provide a bypass or branch pipe 35 which connects the pipe

22 with the lower drum 18. In this pipe is arranged a valve 36 and in the pipe 22 beyond the connection thereof with said branch pipe 35 is a valve 37, whereby the flow of water to the boiler-drum 18 or cleaner 23 is controlled.

I claim as my invention:—

In an apparatus of the character described, the combination of upper and lower water circulating pipes connected to the corresponding circulating elements of a boiler, respectively, the connection between the upper circulating pipe and upper circulating element of the boiler consisting of a skimming device disposed in the upper circulating element of the boiler in proximity to the water level therein for removing foreign matter therefrom, forcing means associated with said skimmer and one end of said upper water circulating pipe and arranged to create circulation from said upper boiler circulating element through said skimmer into said upper water circulating pipe, thereby inducing an upward circulation through the boiler, and a cleaner interposed between said pipes and including a tank to which the other end of said upper water circulating pipe is connected and a collecting drum of substantially conical shape for the foreign matter disposed in said tank, said drum opening at its flared bottom into said tank and connected at its upper end to the lower circulating pipe, whereby the water is circulated downwardly through the tank and upwardly through the collecting drum, the latter having baffles extending into the interior thereof for intercepting the foreign matter.

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