Sept. 17, 1935. W. W. WILLIAMS 2,014,918

HEATER

Filed Dec. 26, 1933 2 Sheets-Sheet 1

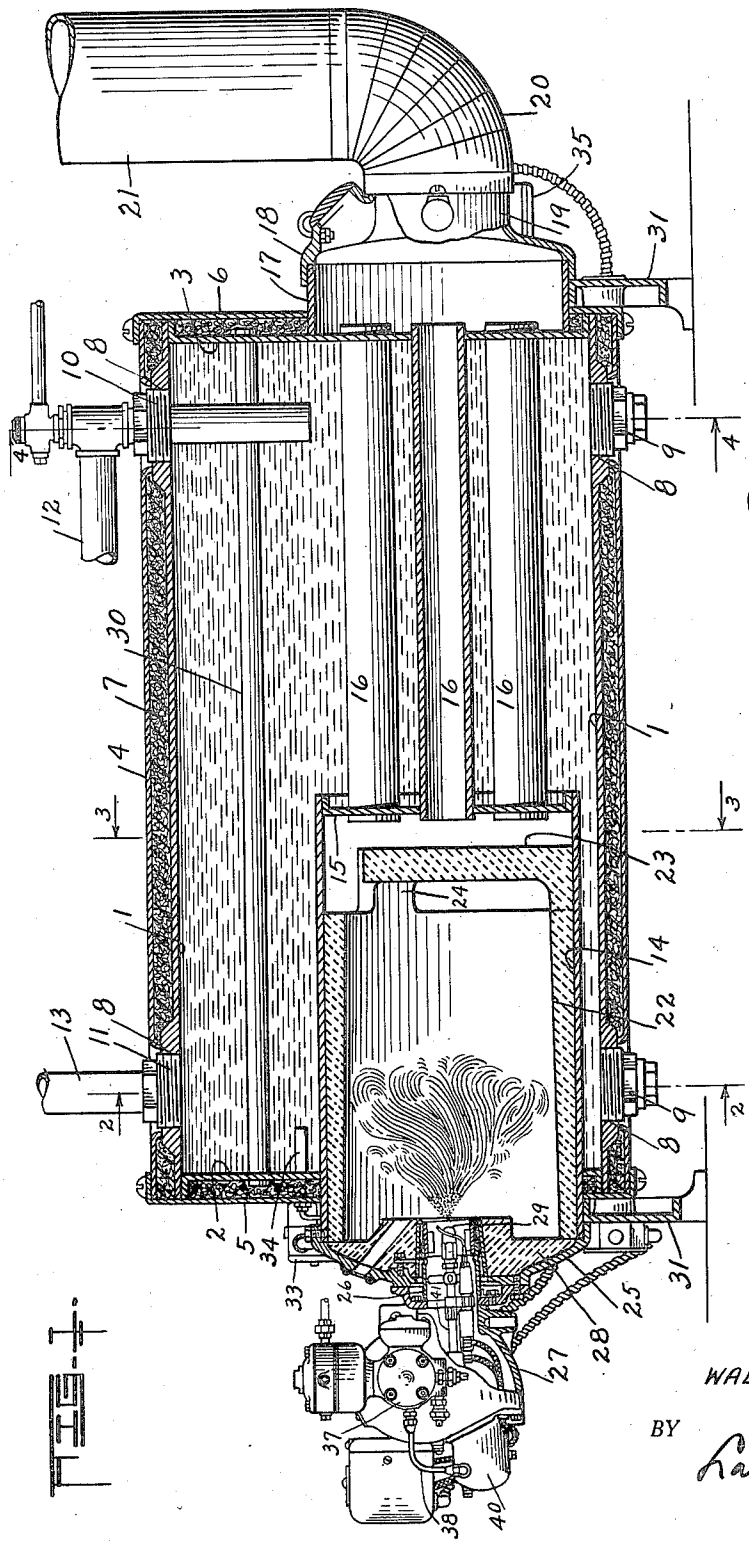


FIG. 1.

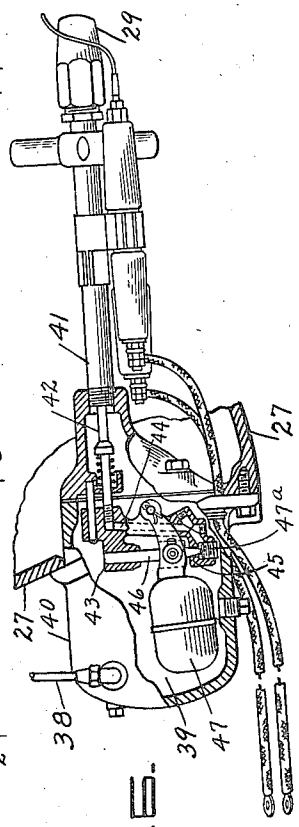


FIG. 6.

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FIG. 2.

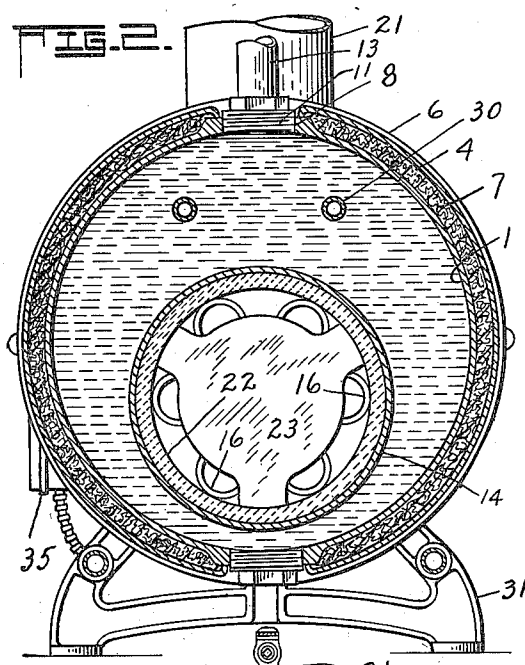


FIG. 3.

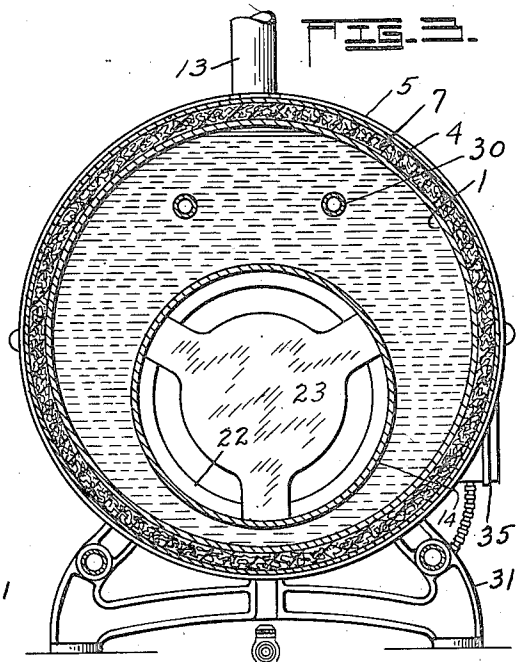


FIG. 4.

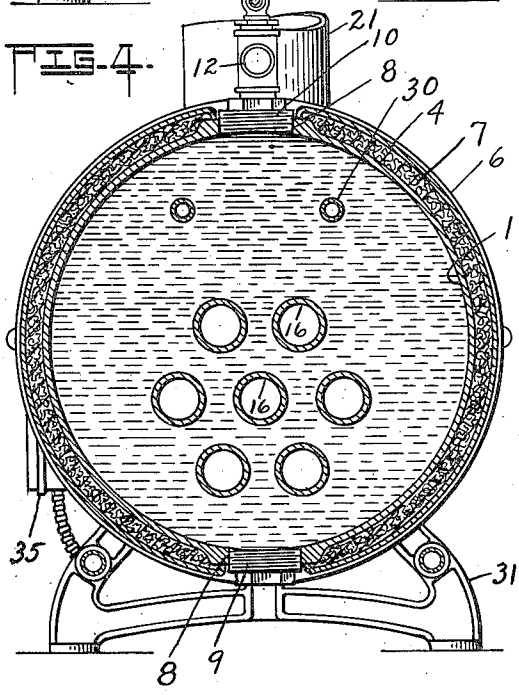
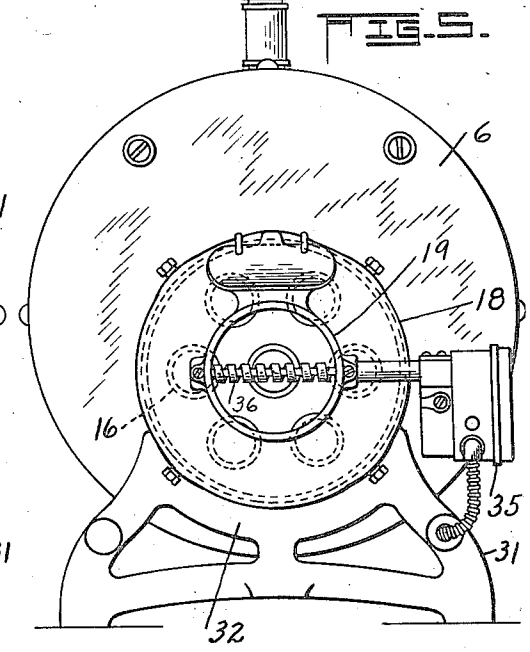


FIG. 5.



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2,014,918

HEATER

Walter W. Williams, Bloomington, Ill.

Application December 26, 1933, Serial No. 704,058

1 Claim. (Cl. 122—50)

This invention relates to water heaters, and more particularly to the construction of a water heater in which the water is heated by the flame from a fluid fuel burner.

It is an object of this invention to provide a device of this character which may be employed for the heating of water for domestic or other purposes, as well as the heating of water for a hot water heating system or the heating of water to produce steam either for commercial purposes or for use in connection with a steam heating system. It is a further object of this invention to provide a combustion chamber therein with means for efficiently conducting the gases of combustion therefrom through a series of flues in which both the combustion chamber and flues are entirely surrounded by the water to be heated. It is another object of this invention to provide a small, compact heater of this character which is of particular advantage for producing hot water for domestic purposes and which is of simple construction, readily assembled, and readily installed in a home, and which is adapted to be readily connected to the chimney or stack of the dwelling or furnace within the dwelling.

With these and other objects in view, reference is made to the accompanying sheets of drawings which illustrate a preferred form of this invention, with the understanding that minor changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a view in central vertical section of a preferred form of this device with some parts shown in elevation.

Figure 2 is a view in transverse section taken on the line 2—2, Figure 1, looking in the direction of the arrows.

Figure 3 is a similar view taken on the line 3—3, Figure 1, looking in the direction of the arrows.

Figure 4 is a similar view taken on the line 4—4, looking in the direction of the arrows.

Figure 5 is a view in rear elevation of Figure 1 in which the stove pipe connection to the stack has been omitted.

Figure 6 is a detail view, partly in section and partly in side elevation, of the burner assembly and air pressure fuel delivery thereto of the fluid fuel burner illustrated in Figure 1.

The drawings illustrate an embodiment of this invention as applied to a hot water heater for domestic purposes, which includes a horizontal, cylindrical, metallic casing 1 provided with end enclosures 2 and 3 surrounded by a cylindrical jacket 4 spaced apart therefrom and provided with end closures 5 and 6 with the intervening space filled with heat insulating material 7. The casings 1 and 4 are provided with a plurality of registering apertures 8 which are shown in Figure 1 as being normally closed by plugs 9 at the bottom and connected at the top to a cold water inlet 10 and a hot water outlet 11, in which the cold water inlet 10 is connected by pipe 12 to a source of water supply and the hot water outlet 11 is connected by pipe 13 for delivering the hot water where needed for domestic purposes.

A cylindrical, metallic combustion chamber casing 14 is mounted in the end closures 2 and 5 with its axis parallel to the axis of the casing 1 and arranged with its lower side adjacent to but spaced apart from the bottom of the horizontal casing 1 with one end extending beyond the outer surface of the closure 5 and the other end terminated adjacent the vertical center line of the casing 1 and provided with a metallic closure plate 15, which plate is provided with a central opening and a plurality of spaced-apart similar openings, the centers of which are arranged on a circle concentric with the central opening. The opposite closure plate 3 of the casing 1 is provided with a similar number of similarly arranged similar openings in line with the opening in the plate 15. Metallic pipes or flues 16 are passed through the corresponding openings in the closures 15 and 3 and are secured thereto as by welding so that the interior of the combustion chamber casing 14 communicates through said pipes 16 to the exterior of the closure plate 3. A cylindrical casing 17, similar in diameter to the casing 14 and similarly surrounding the ends of the pipes 16, passing through the end closure 3, is mounted thereon and passes through the end closure 6, and to the outer end of this casing a cap 18 is attached which is provided with a concentric outstanding flange 19 for attachment to an elbow 20 of the stove pipe 21 leading to the chimney.

The combustion chamber casing 14 is provided with a cylindrical lining of refractory material 22 to form a combustion chamber therein extending from the outer end of the casing but spaced apart from the closure 15 thereof and supports a cylindrical baffle or target 23 concentric with the combustion chamber but of less diameter than the inner diameter of the combustion chamber in the space between the end of the combustion chamber and closure 15 by preferably three extensions 24 from the end walls of the lining 22 joined to the periphery of the baffle or target 23

so that the baffle or target is spaced apart from both the end of the combustion chamber and the closure 15.

About the exterior end of the casing 14 and refractory lining 22 a cap 25 is secured, which cap is provided with a central opening through which the draft pipe 26 is extended from the casing 27 of a fluid fuel burner mechanism, which casing is secured to the said cap 25. The interior of the cap 25 is provided with a refractory lining 28 which also surrounds the draft pipe 26. The fluid fuel burner is preferably of the type disclosed in this applicant's prior copending application Serial Number 662,711, filed March 25, 1933, and is provided with a nozzle 29 adjacent the inner end of the draft pipe 26 for delivering fuel to be ignited and burned within the combustion chamber surrounded by the refractory walls 22.

It is preferable to impart rigidity to the end closures 2 and 3 above the combustion chamber and flues 16 by the application of tie-rods 30 passing through and secured to the respective end closures as shown in Figure 1. It is also preferable to support the horizontal casing upon legs 31 extending downward from an integral arcuate portion 32 of the same radius as that of the casings 14 and 17, which arcuate portion 32 engages and supports the underside of the casing 14 and the underside of the casing 17 exterior to the end closures 5 and 6.

As the fluid fuel burner illustrated is of the electrically operated and controlled type, a control 33 therefor is mounted on the exterior of the casing 5, having a bulb 34 passing through both adjacent end closures 2 and 5, which is adapted to be responsive to the temperature or pressure of the water or steam, as the case may be, within the casing 1. The flange 19 of the cap 18 preferably mounts a commercial stack safety 35 forming a part of the fluid fuel burner control having a thermostatic element 36 passing within the opening leading to the stack.

In the type of fluid fuel burner disclosed, fluid fuel is delivered from an electrically operated compression pump 37 through a pipe 38 to the interior of a chamber 39 formed within a casing 40 inserted through the bottom of the casing 27 mounted upon the cap 25, which casing 40 is secured to the casing 27, as shown in Figure 6, and which casing 40 supports an air delivery pipe 41 leading to the nozzle 29. A smaller fuel discharge pipe 42 is mounted concentric with and spaced apart from the interior of the pipe 41 and leads from the nozzle 29 to a bracket 43 supported within the chamber 39, which is provided with a duct 44 communicating with the fuel pipe 42 and with the lower portion of the chamber 39. The duct 44, in communicating with the chamber 39, forms a valve seat 45 upon the upper side of an extension of the bracket 43 for the reception of a vertically reciprocable needle valve stem 46 mounted to be reciprocated by the movement of a float 47 pivotally mounted upon the bracket 43. When fluid fuel and air under pressure are delivered through the pipe 38 to the chamber 39, the oil separates out and collects in the bottom of the chamber while the air passes through the air discharge pipe 41 to the nozzle 29. As the level of the fuel collecting in the bottom of the chamber 39 rises, the float 47 will open the valve 45 whereby the pressure of air within the chamber 39 above the fuel will force the same through the duct 44 and fuel discharge pipe 42 to the nozzle 29. It has been found during periods of non-use, the needle valve stem 46 will stick in the valve seat 45. This invention contemplates the providing in the walls of the bracket 43 surrounding the duct 44 below the valve seat 45 with a screw-threaded opening therethrough below the valve seat and concentric therewith and the insertion of a screw-threaded adjusting member 47a therein which may be so adjusted at the factory as to be contacted by the lower end if the needle valve 46 to support the tapered end thereof within the seat 45 to make just sufficient contact therewith to close the valve and then prevent the same from sticking.

From the above disclosure, it is seen that the combustion chamber is entirely surrounded on three sides by the water to be heated and particularly by the water at its lower temperatures. The target baffle 23 prevents the flame from the nozzle 29 from being drawn through the pipes or flues 16 by the draft of the chimney or stack, if possible from the nature of the fuel. In any event, the target baffle being concentric with and of substantially equal radius to the line of the centers of the outer pipes or flues 16 directs the heat from the combustion chamber first against the casing 14 thereabout and then into the space between the rear of the target baffle and pipe support closure 15 and from thence through the center and surrounding pipes or flues 16 to the stack or chimney. These pipes 16 are in continuation of the combustion chamber and are each surrounded by the water to be heated between the end closure 15 of the combustion chamber and the more distant end closure 3 of the casing and as the heat from the combustion chamber is diffused by the baffle target the temperature of the heated gas passing through each pipe is substantially the same to be transmitted to the surrounding water.

What I claim is:

A water heater including a casing to contain the water to be heated, a combustion chamber therein surrounded by the water to be heated, a source of heat for said combustion chamber, a plurality of flues leading the heated gases of combustion from the combustion chamber through the water to be heated and through the more distant casing closure, said combustion chamber including a metallic jacket having an end closure supporting the ends of the flues leading therefrom and a refractory lining terminated short of said end closure, and a circular refractory baffle supported by integral extensions from the lining between the end of the lining and said closure.

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