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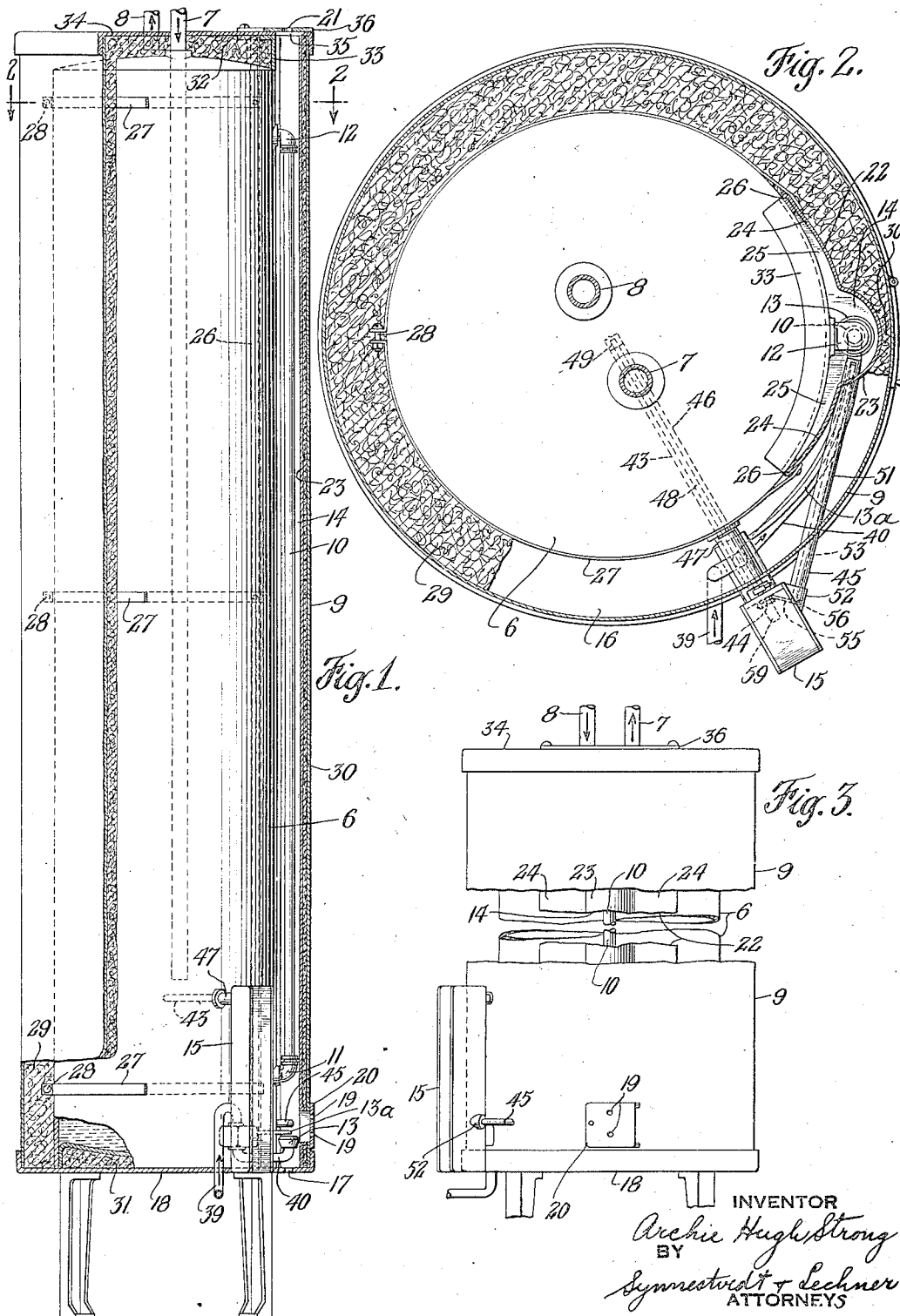
A. H. STRONG

2,056,989

WATER HEATER

Filed Dec. 5, 1934

2 Sheets-Sheet 1



INVENTOR

Archie Hugh Strong

BY

Symmes & Lechner
ATTORNEYS

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Fig. 4.

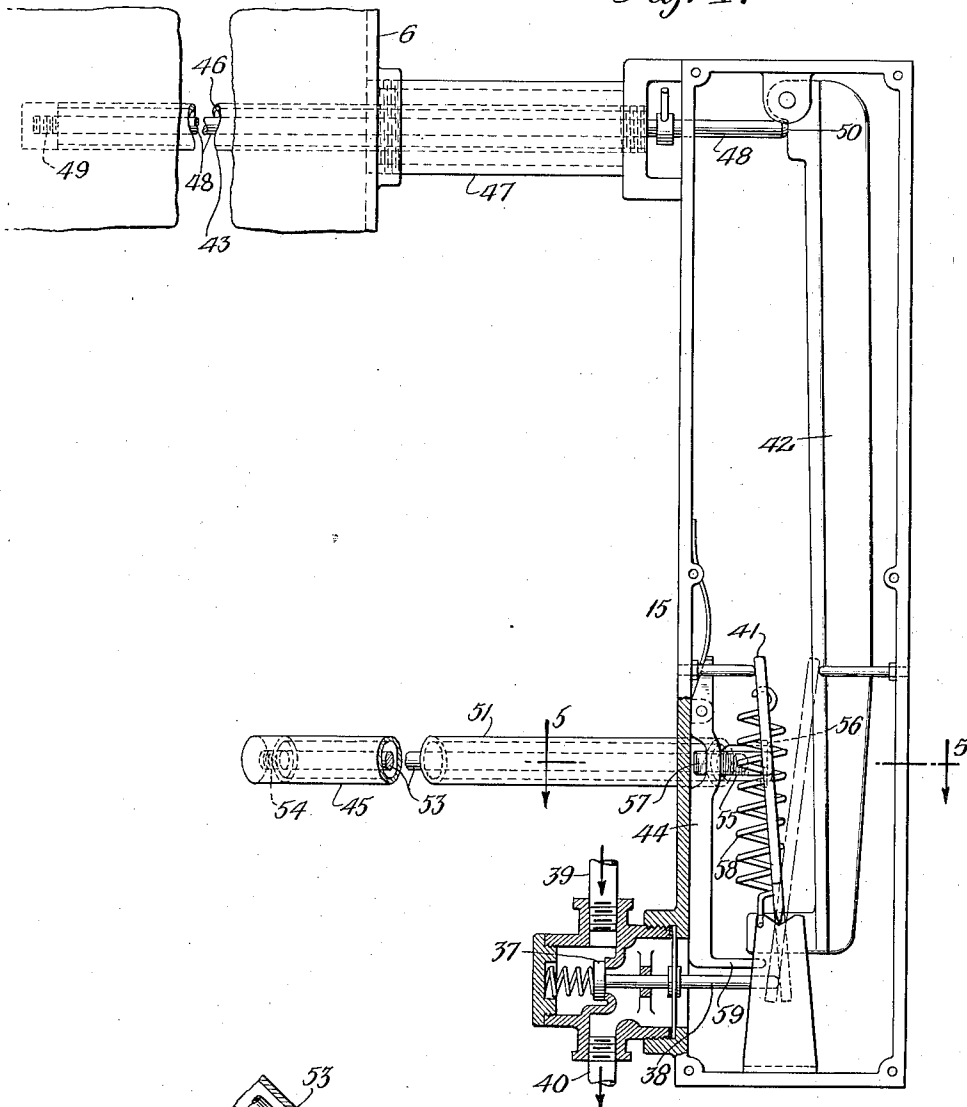
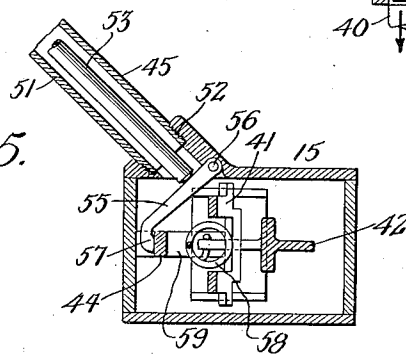


Fig. 5.



INVENTOR
Archie Hugh Strong
 BY
Symmes & Lechner
 ATTORNEYS

UNITED STATES PATENT OFFICE

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WATER HEATER

Archie Hugh Strong, Conshohocken, Pa.

Application December 5, 1934, Serial No. 756,017

2 Claims. (Cl. 122—19)

This invention relates to improvements in water heaters, particularly adapted for domestic use.

The primary object of my invention is to provide a very simple, compact, inexpensive and effective water heater.

More particularly, in a heater of the character described I aim to reduce the number of parts; to reduce the size of certain parts; and to provide an improved arrangement and disposition of automatic control mechanism for the heater.

Another object of my invention is the provision of water heating apparatus which may be readily applied to existing water tanks with very little expense and without increasing the outside diameter thereof.

How the foregoing, together with such other objects and advantages as may hereinafter appear or are incident to my invention are realized, is illustrated in preferred form in the accompanying drawings, wherein—

Figure 1 is a side elevational view of a water heater embodying my invention, the casing being partly in section to illustrate certain interior constructions;

Figure 2 is an enlarged plan section taken substantially on the line 2—2 of Figure 1 with a portion of the insulating material omitted;

Figure 3 is a front elevational view with a portion of the heater broken out to condense the figure;

Figure 4 is an enlarged elevational view, partly in section of an automatic control mechanism employed in the heater; and

Figure 5 is a plan section taken on the line 5—5 of Figure 4.

Referring to the drawings, my improved water heater comprises an upright water tank or storage vessel 6 having a cold water inlet pipe 7 and a hot water outlet pipe 8 connected therinto; a casing 9 in spaced surrounding relation to the tank 6; an upright water circulating tube or pipe 10 connected at its lower end into the lower portion of the water tank, as indicated at 11, and at its upper end into the upper portion of the tank, as indicated at 12; a burner 13, such as a gas burner, located below the pipe 10 and approximately in alignment therewith; a flue 14 through which the products of combustion pass; and an automatic control device 15 for controlling the supply of heating medium or gas to the burner.

The flue 14 is located in the annular space 16 between the water tank 6 and the casing 9 and preferably extends from the bottom to the top of the casing. The water pipe 10 and the burner

13 are located within the flue and combustion air is admitted into the lower portion of the flue by means of an opening or openings 17 in the bottom 18 of the casing. Additional air may be admitted through openings 19 in the door 20 which is provided to give access to the burner. The gases of combustion are exhausted from the flue through a top outlet opening 21.

The flue 14, as best illustrated in Figure 2, comprises a metallic member 22 having an approximately semi-circular central portion 23 and laterally extending portions 24. The central portion 23 is of such radius that adequate flue space is provided around the water tube 10 and the lateral extensions 24 are so formed that flue spaces 25 are provided between them and the wall of the water tank 6. The upright edge portions 26 of these extensions contact with the tank and the member 22 is held in place as by means of metal bands 27 adapted to be tightened by bolts 28. The inner wall of the flue is defined by the portion of the tank wall which lies between the upright edges of the member 22 and consequently the products of combustion in addition to sweeping over the water tube 10 to heat the water circulating in the tube also sweep over this exposed wall surface of the water tank so that heat is transmitted to the water in the tank.

It will be seen from the foregoing that the portion of the space between the tank 6 and the casing 9 which immediately surrounds the water tube 10 is thus subdivided into a flue. The remaining portion of this space is filled with suitable heat insulating material 29, it being noted that the flue is of such size with respect to the width of the annular space 16 that insulating material may be located between the flue and casing as indicated at 30. Insulating material is also provided between the bottom of the tank and casing as indicated at 31 and between the top of the tank and casing as indicated at 32.

At the top of the tank the inner wall of the flue is formed by a metallic member 33 suitably secured in place and spanning the distance between the top of the tank and the top 34 of the casing. An opening 35 of the same shape as the cross section of the flue is provided in the top 34 and a removable cover 36 is positioned over this opening. The outlet 21 above referred to is located in the cover 36.

In the particular water heater illustrated in the drawings, the water tank is approximately 60 inches high and has a capacity of approximately 30 gallons in which case I employ a water tube 10 of approximately $\frac{5}{8}$ of an inch in diameter, a

burner of approximately 1 inch in diameter and a flue measuring approximately $1\frac{1}{2}$ inches by $2\frac{3}{4}$ inches in cross section at the central portion. Thus I employ a long length of small diametered water pipe closely adjacent the water tank located in a long insulated stack or flue, through which the gases of combustion pass to sweep over considerable surface area of the water tank in addition to the entire outside surface of the water tube, and a small size burner having a low input such as 2500 to 2600 B. t. u. per hour or five cubic feet of 520 B. t. u. gas per hour. Thus, at 75¢ per 1000 cubic feet with an input of 2600 B. t. u. per hour and with the burner burning without interruption during an entire month, the consumption would be approximately 3600 cubic feet of gas at a cost of \$2.70 per month. The sizes and gas input given in this example are calculated to effectually meet the hot water demands for the service for which a tank of the given size is ordinarily employed.

The gas input, of course, may be varied to suit conditions and may, for example, be increased to 5000 or 6000 B. t. u. per hour or even higher without running into any undesirable condition, such as a higher carbon monoxide percentage in the air free products of combustion than is allowed under the requirements of the A. G. A. for this class of appliance.

While I have illustrated a single water tube, it is to be understood that, in some instances, I contemplate employing a plurality thereof in which case I prefer to connect the tubes into upper and lower headers which, in turn, would be connected into the tank.

It is desirable to provide some kind of automatic device for controlling the gas supply and the arrangement and disposition of the control device is now to be described is particularly suitable for my improved heater.

The control mechanism is generally constructed in accordance with my Patent No. 1,953,446, issued April 3, 1934, and comprises a valve member 37 having a stem 38 extending into the casing of the mechanism, the valve member being spring-urged to its closed position and being moved to its open position upon actuation of the valve stem. The valve has a gas inlet 39 and a gas outlet 40 which leads to the burner 13. A pilot 13a, receiving its gas directly from the main gas supply, is provided for igniting the burner.

The control device includes a snap arm 41, a compounding lever 42, a thermostatic device 43 operating on the lever 42, and a safety lever 44 adapted to be operated by the thermostatic device 45. The snap arm is spring-connected to the lever 42.

The thermostatic device 43 comprises a tube 46 extending into the water tank and secured in a support 47 carried by the tank, and a rod 48 located in the tube and secured thereto at 49. The rod 48 extends into the casing of the control mechanism and engages the lever 42 at 50.

The thermostatic device 45 comprises a tube 51 secured in the casing of the control mechanism at 52, and a rod 53 located in the tube and secured thereto at 54. The rod 53 extends into the casing of the control mechanism and engages the safety lever 44 through the medium of a lever 55 pivoted at 56 and having its free end 57 in engagement with the lever 44, it being noted that by providing this arrangement I am enabled to dispose the thermostatic device 45 at an angle with respect to the thermostatic device 43, as

viewed in Figure 2. Thus the thermostatic device 43 is disposed radially of the tank and is directed toward and located below the cold water inlet pipe 7 which is extended well downwardly into the tank as shown in Figure 1. The thermostatic device 45, however, is disposed tangentially of the tank and enters into the annular space between the tank and casing and terminates at a point closely adjacent the pilot 13a where it is subjected to the heat of the pilot flame.

The operation of the automatic control mechanism is as follows. When the water in the tank is cold, the tube 46 contracts, thus moving the rod 48 to the right, which, due to its contact with the lever 42 at 50, rocks the lever to the right. This moves the lower end of the spring 58 toward the right an amount such that the spring creates a pull on the upper end of the arm 41 in a direction to cause it to snap into the position shown in dot-and-dash lines. Such movement of the snap arm causes it to move the valve stem 38 to the left to open the valve 37 and supply gas to the burner 13 and, assuming that the pilot is lit, this causes ignition of the burner.

When the temperature of the water rises to a predetermined value, the tube 46 expands, and since the rod 48 is attached to the tube at its free end it moves in a direction away from the lever 42. However, the spring 58 is creating tension on the lever 42 in a direction tending to move it to the left, and therefore the lever follows the rod 48. When the lever moves in this direction a predetermined amount the arm 41 is snapped into its other position, namely, that shown in full lines, this being due to the shifting of the lower end of the spring to the left. Thus the lower end portion of the snap arm permits the valve 37 to snap into its closed position to cut off the supply of gas to the burner. When the water drops to a predetermined low temperature the valve is opened in the manner above described, and so on. The above operation is what may be termed the service control of the heater.

The device 45 is so positioned that its tube is subjected to heat from the pilot 13a, and therefore when the pilot is lit the tube expands and moves the rod 53 in a direction away from the levers 55 and 44, whereby the lever 44 assumes its position of non-interference with the snap arm. However, when the pilot is extinguished the tube 51 cools and contracts, thus moving the rod 53 in its other direction, whereby the lever 44 is swung to the right on its pivot and the projection 54 thereof engages the arm 41 to move it to its full-line position and thereby hold or lock it in the position in which the valve 37 closes to cut off the supply of gas to the burner 13.

It will be seen from the foregoing that I have provided a water heater which is very compact, inexpensive to manufacture, and neat in appearance, and one in which it is a simple and inexpensive matter to replace parts, particularly the water tube.

Although the gas consumption of the heater is small, the water is nevertheless very effectively heated, it being noted that only a small quantity of water is circulated through the water tube but with relatively rapid flow.

I have found that this rapid flow of a small quantity of water in an arrangement such as shown in which the tube is closely adjacent the tank and located within an insulated flue of small cross-section and considerable length is an important factor serving to increase the efficiency of

my water heater over other water heating appliances for domestic purposes.

I claim:

1. A water heater comprising a water tank, a
5 vertical water tube connected into the tank for
circulation and extending in close parallel rela-
tion to the tank wall, burner means below said
water tube, and means attached to the tank and
providing with the adjacent wall portion of the
10 tank a vertical flue in which said water tube is
located, said means being generally semi-circular
in cross-section, but having laterally extending
portions for exposing additional wall surface of
the tank to the heat of the products of combus-
15 tion in the flue.

2. A water heater comprising a water tank, a
water tube connected into the tank for circulation
and extending in close parallel relation to the
tank wall, burner means below said water tube,
and means providing a flue in which said water
5 tube is located, said means having a central por-
tion approximately semi-circular in cross-section
in spaced relation to the tube, and portions ex-
tending laterally from said central portion and
contacting with the tank wall at points spaced
10 from said central portion to expose an extended
area of tank wall surface to the products of com-
bustion in the flue.

ARCHIE HUGH STRONG.