HOT WATER HEATER

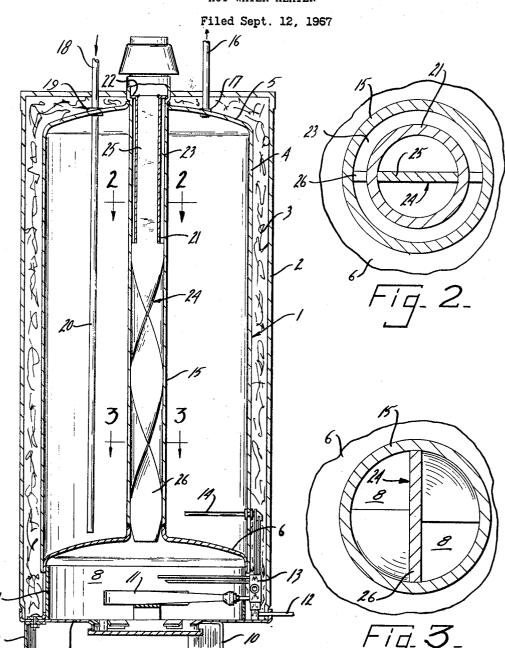


Fig. 1.

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1

3,492,972 HOT WATER HEATER

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8 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a hot water heater and more particularly to a gas-fired water heater having a flue extending centrally of the tank. The upper portion of the flue within the tank is insulated to reduce the heat transfer 15 from the combustion gases passing within the flue to the water in the upper portion of the tank and thereby prevent overheating of the water in this location.

The conventional gas-fired water heater includes a central flue which extends upwardly through the tank and the gases of combustion pass upwardly within the flue so that heat will be transferred from the combustion gases to the water within the tank.

In a hot water heater, the heated water tends to stratify in the tank with the highest temperature water being located at the top. When the high temperature water is drawn from the top of the tank, cold water is simultaneously supplied to the bottom and as the cold water 30 enters, the temperature in the lower portion of the tank falls way below the thermostat setting with the result that the thermostat will actuate the gas burner to heat the water within the tank. When the temperature of the water has regained he thermostat setting, the burner is 35shut off.

It has been found that when a series of intermittent, relatively short draws of hot water are made, each draw may cause a sufficient volume of cold water to enter the tank to actuate the burner, and the heated water at the 40 top of the tank will be further heated by the gases of combustion passing within the flue so that in some cases the water at the top of the tank may be heated 30 to 40° F. above the thermostat setting. When this overheated water is drawn from the tank, there is a danger of burning and 45 scalding the user. In addition, the conventional hot water heater includes a pressure and temperature relief valve and the overheated water in the top of the tank may exceed he setting of the relief valve thereby causing a discharge of heated water from the upper end of the tank to relieve the excess temperature. This relief of the high temperature water not only is a waste of heated water, but can be a nuisance factor if the relief valve is not piped to a drain.

The present invention is directed to an improved gasfired water heater which eliminates the problem of overheating of the water in the upper portion of the tank. According to the invention, the upper portion of the flue within the tank is insulated, thereby reducing the heat transfer from the combustion gases passing within the flue to the water in the upper portion of the tank. In the preferred form of the invention, a tubular sleeve is disposed within the upper end of the flue and spaced inwardly of the flue to provide an annular space or gap therebetween. A baffle is located within the sleeve and 65 projects downwardly beyond the sleeve to the lower end of the flue. The upper end of the baffle, within the sleeve, is generally straight without surface deviations, while the lower end of the baffle, located within the flue beneath the sleeve, is spiral in shape. As the flue gases pass upwardly within the flue, the spiral lower portion of the baffle serves

2

to provide a turbulent flow for the flue gas to thereby increase the rate of heat transfer from the flue gases to the water in the lower end of the tank. The upper straight portion of the baffle, however, minimizes turbulence of the combustion gases and therefore tends to reduce heat transfer between the combustion gases and the water in the upper end of the tank. Thus, the configuration of the baffle acts in conjunction with the dead air space around the upper end of the flue to provide an insulating effect which reduces heat transfer to the water in the upper end of the tank and thereby prevents overheating.

With the structure of the invention, the water in the upper end of the tank will not be overheated, even when short intermittent draws are made. By reducing the tendency for overheating, the potential danger of burning or scalding is eliminated and the unnecessary relief of high temperature water through the pressure and temperature

relief valve is also avoided.

Other objects and advantages will appear in the course 20 of the following description:

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

FIG. 1 is a vertical section of a typical gas-fired water 25 heater incorporating the invention;

FIG. 2 is a transverse section taken along line 2-2 of FIG. 1; and

FIG. 3 is a transverse section taken along line 3—3 of FIG. 1.

The drawings illustrate a conventional gas-fired water heater including a tank 1 which is located within an outer casing 2 and a layer of heat insulating material 3 is located within the space between the tank ${\bf 1}$ and the outer casing 2. The tank 1 includes a generally cylindrical shell 4 with the upper end of the shell being enclosed by an upper head 5 and the lower end of the shell being enclosed by generally convex lower head 6. Extending downwardly from lower head 6 in a generally cylindrical skirt 7 which defines a burner compartment 8 and the lower end of the burner compartment is closed off by a base plate 9 supported on legs 10.

The water contained within the tank 1 is heated by a conventional gas-fired burner 11 which is located within burner compartment 8. Gas is supplied to the burner 11 through a gas pipe 12 and the flow of gas within the line 9 is controlled by a solenoid operated gas valve 13. A thermostat 14 is located in the lower portion of the tank 1 and is responsive to the temperature of water therein. The thermostat 14 is operably connected to valve 13 and serves to modulate the flow of gas to the burner 11 in response to the demand for heat, or to turn the flow of gas on or off in response to the demand for heat, depending on the type of heater used.

The gases of combustion are conducted upwardly through a flue 15 which is located centrally of the tank 1 and is secured within openings in the upper head 5 and the lower head 6.

Heated water in the upper end of the tank is discharged through an outlet pipe 16 which is threaded within a stud 17 welded within an opening in the upper head 5. To supply cold water to the tank, an inlet pipe 18 is threaded within a stud 19 in upper head 5, and a dip tube 20 communicates with the inlet pipe 18 and extends downwardly to a distance slightly above the lower head 6.

The heated water in tank 1 will tend to stratify, with the water in the upper end of the tank being at the highest temperature. When heated water is drawn through the outlet pipe 16, a corresponding volume of cold water will be introduced to the tank through the dip tube 20, and when the temperature in the lower end of the tank falls below the setting of the thermostat 14, the gas valve 13 will

open to admit gas to the burner 11. When the burner is operating, the gases of combustion pass upwardly within the flue 15 and tend to heat the water within the tank. It has been found that when short, intermittent draws of water are made, the water in the upper end of the tank will tend to overheat due to heat transfer from the flue gases when the burner operates during the draw periods. To prevent this overheating, a sleeve 21 is disposed within the upper portion of the flue 15 and the upper end of the sleeve 21 is provided with a flange 22 which is secured to the upper end of the flue. The sleeve 21 is spaced inwardly of the flue 15 to provide an annular space 23 between the members. As the space 23 is closed at its upper end due to the connection between the sleeve and the flue, there will be no appreciable gas flow within the space and the space will serve 15 as a heat insulating barrier between the flue gases and the water in the upper end of the tank 1.

The sleeve 21 can be formed of any desired material which will withstand the temperatures involved, such as asbestos, ceramic materials, metal or the like.

In addition to sleeve 21, a baffle 24 is mounted within the flue 15. The upper end 25 of the baffle is secured to the upper end of the sleeve 21 so that the sleeve and baffle can be inserted and withdrawn from the flue 15 as an intgral unit. As shown in FIG. 1, the upper end 25 of the baffle, within sleeve 21, is generally straight, without any surface deviations, while the lower end 26 of the baffle, which is located beneath the sleeve 21, has a generally spiral configuration. As the gases of combustion pass upwardly within the flue 15, the spiral portion 26 of the baffle will tend to provide a relatively turbulent gas flow which will increase the rate of heat transfer between the combustion gases and the water in the lower end of the tank. However, the upper, straight portion 25 of the baffle 3524 will minimize the turbulence of the gas and thereby tend to reduce the heat transfer from the combustion gases to the sleeve 21, as well as to the water in the upper portion of the tank. Thus, the baffle 24 cooperates with the sleeve 21 to increase the rate of heat transfer to the water in the 40 lower portion of the tank while reducing the rate of heat transfer to the water in the upper portion of the tank.

With the structure of the invention, the water in the upper end of the tank will not be overheated even when short intermittent draws are made. By reducing the tendency for overheating, the potential danger of scalding and burning of the user is decreased. Moreover, as the water in the upper end of the tank will not be overheated, the unnecessary relief of high temperature water through the pressure and temperature relief valve is avoided.

While the present invention shows the use of a sleeve 21 in the upper end of the flue 15 to provide a heat insulating barrier therebetween, it is contemplated that other insulating means can be applied to the upper end of the flue. For example, a high temperature insulating material which will not decompose or deteriorate when subjected to the high temperatures of the water or the flue gases can be applied as a coating to either the inner or outer surface of the upper end of the flue, or to both surfaces.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In a hot water heater, a tank to contain heated water and including an upper head having a cold water inlet and having a hot water outlet in the upper head, gas heating means located beneath the tank for heating the water within the tank, a flue extending upwardly from said gas heating means to the upper head and arranged to conduct the gases of combustion, the lower end portion of the flue

being in direct heat transfer relation to the water in the lower end portion of the tank, a tubular sleeve disposed within the flue in radially spaced relation to the upper end portion of the flue and extending downwardly a substantial distance from the upper head to provide an annular space between the sleeve and the flue, the upper end of the sleeve being connected to the flue to close off the upper portion of said annular space and the bottom end of said annular space being open, said annular space serving as a dead gas space and acting as a heat insulating barrier to reduce the rate of heat transfer from the combustion gases to the water in the upper end portion of the tank.

2. The hot water heater of claim 1, wherein the flue extends generally centrally of the tank, and projects through an opening in the upper head.

3. The hot water heater of claim 1, and including means located within the lower portion of the flue to increase the turbulence of the combustion gases therein and thereby increase the rate of heat transfer from the combustion gases to the water located in the lower end portion of the tank.

4. The hot water heater of claim 1, wherein said last named means is a spirally arranged baffle disposed within said flue.

5. A hot water heater, comprising a tank to contain heated water and having a cold water inlet and having a hot water outlet in the upper end, a gas fired burner located beneath the tank for heating the water in the tank, a flue extending upwardly from the burner to the top of the tank, heat insulating means associated with the upper portion of the flue for reducing heat transfer from the combustion gases to the water in the upper end portion of the tank, and baffle means disposed within the flue, the upper portion of said baffle means located radially inwardly of said heat insulating means being generally straight and the lower portion of said baffle means located beneath said heat insulating means being provided with surface deviations to increase the turbulence of flow of the combustion gases within said lower portion of the flue means and thereby increase the rate of heat transfer from the combustion gases to the water in the lower portion of the tank.

6. The hot water heater of claim 5, wherein said heat insulating means comprises a separate tubular sleeve spaced radially from said flue to provide an annular space therebetween.

7. The hot water heater of claim 6, and including means for securing said sleeve to the flue, said means extending circumferentially within said anular space to close said space and prevent free longitudinal flow of the combustion gases within said space.

8. The hot water heater of claim 6, wherein the upper end of said baffle means is attached to the sleeve whereby said sleeve and said baffle means can be inserted and withdrawn from said flue as a unit.

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122—164