Aug. 11, 1931. P. H. FERRIER, JR 1,818,057

WATER HEATER

Filed Aug. 15, 1928

Fig. 1.

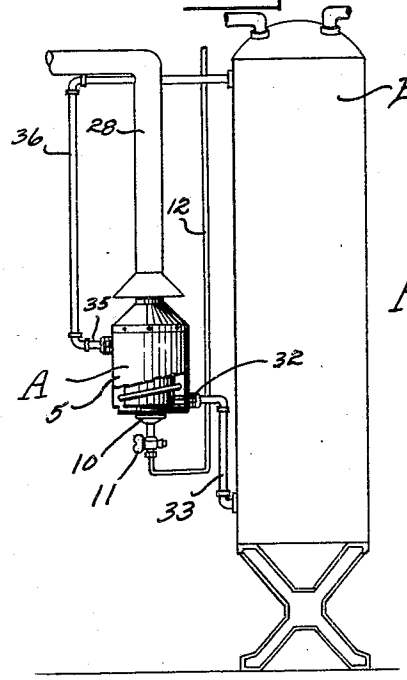


Fig. 2.

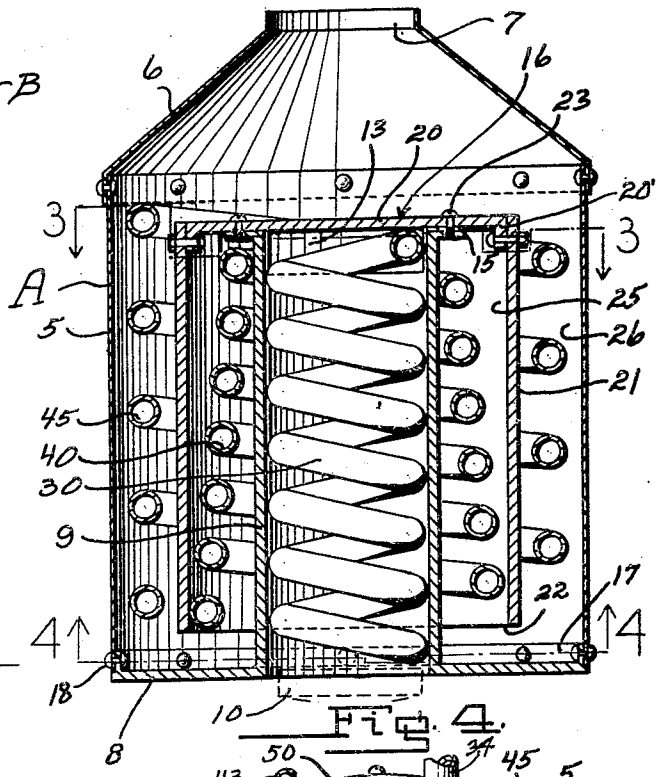


Fig. 3.

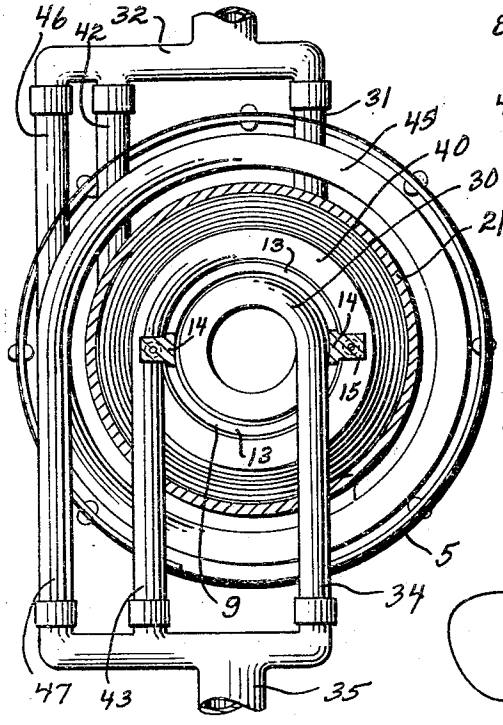
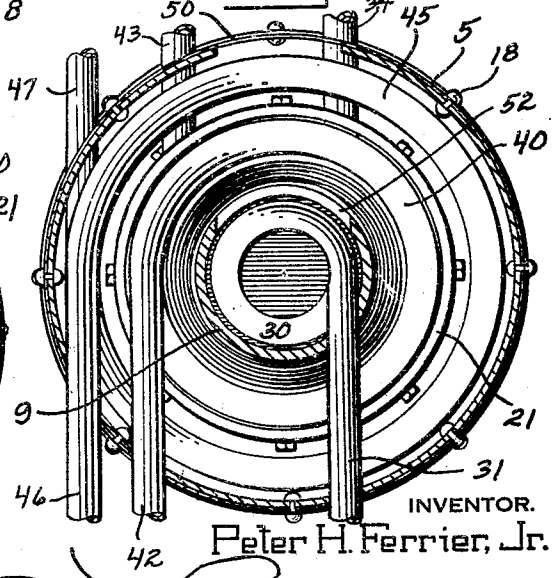


Fig. 4.



INVENTOR.

Peter H. Ferrier, Jr.

BY Lancaster and Allwine

ATTORNEYS.

Patented Aug. 11, 1931

1,818,057

UNITED STATES PATENT OFFICE

PETER H. FERRIER, JR., OF BROOKFIELD, ILLINOIS

WATER HEATER

Application filed August 15, 1928. Serial No. 299,724.

The present invention relates to improvements in water heaters primarily intended for domestic use for heating water in boilers.

The primary object of the invention is to provide a water heater for rapidly heating the water with a minimum amount of fuel consumption.

A further object of the invention is to provide a water heater of improved construction embodying a plurality of independent heating coils connected with common inlet and outlet terminals to provide independent water circulation passageways thru the heater.

A still further object of the invention is to provide a water heater embodying independent water heating coils with means for successively directing the heating gases thru the coils in such manner as to obtain the full heating efficiency of the gases prior to escape from the heater.

A still further and important object of the invention is to provide a water heater embodying novel features of construction for providing independent heating chambers for the independent heating coils, and which heater is of such construction as to permit of the heater being mounted beside a boiler and connected by circulation pipes to the boiler.

Other objects and advantages of the invention will be apparent during the course of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification and in which drawings:

Figure 1 is a view showing the improved water heater connected by circulation pipes to a common type of hot water boiler, a portion of the heater being broken away.

Figure 2 is an enlarged central vertical section thru the heater.

Figure 3 is a horizontal section on line 3—3 of Figure 2 and looking in the direction of the arrows.

Figure 4 is a horizontal section on line 4—4 of Figure 2 and looking upwardly in the direction of the arrows.

Referring to the drawing in detail, and wherein similar reference characters designate corresponding parts thruout the several views, the letter A may designate the improved heater and B a conventional type of hot water boiler with which the heater is shown connected.

The heater A includes a tubular casing 5 provided at its upper end with a conical-shaped cap 6 provided with an outlet opening 7. The casing 5 and cap 6 are preferably formed of sheet metal and the cap may be riveted or otherwise secured at its lower edge to the upper edge of the casing. Connected to the lower edge of the tubular casing 5 is a disc-shaped base plate 8 provided with an upstanding tubular portion 9 which is arranged concentrically of the tubular casing 5 and is of a height slightly less than the tubular casing. The tubular portion 9 at its lower end opens thru the base plate 8 and a suitable burner 10 is arranged at the lower end of the tubular casing so that the heat from the burner will pass upwardly thru the portion 9. The burner 10 may be an ordinary gas burner and be controlled by the valve 11 connected in the gas supply pipe 12. The upper end of the tubular portion 9 is cut away as at 13 to provide passageways for allowing escape of the heat passing upwardly thru the tubular portion. The upper end of the portion 9 is provided with diametrically arranged extensions 14 having offset ends 15 which provide brackets for supporting a hood 16. The base plate 8 is preferably provided with an upturned peripheral flange 17 whereby the base plate may be secured to the lower edge of the casing 5 as by rivets or the like 18. The member including the base plate 8 and tubular thru portion 9 is preferably of cast iron of considerably greater thickness than the tubular casing 5 for readily withstanding the heat from the burner 10.

Referring now to the hood 16, and which is also preferably formed from cast iron, the same includes a disc-shaped cover plate 20 having a downturned flange 20′ to which is bolted the upper end of a tubular sleeve 21, and which sleeve is of less length than the height of the tubular portion 9 for disposing the lower edge 22 of the sleeve in spaced re-

lation above the base plate 8. The flat cover plate 20 rests upon the brackets 15 and is secured thereto as by cap screws 23 for retaining the sleeve portion 21 concentric to the tubular portion 9 and spaced substantially midway between the casing 5 and the tubular portion 9. The tubular casing 5, sleeve 21, and tubular portion 9 are arranged concentric to a common axis forming the axis of the tubular portion 9 so that the hood 16 provides an annular down draft heating chamber 25 encircling the tubular portion 9 and an up draft heating chamber 26 which is also of annular formation and is formed by the sleeve 21 and the tubular casing 5. The path of travel of the gases from the burner 10 will be upwardly thru the central heating chamber formed by the tubular portion 9, thru the openings 13 at the upper end of the tubular portion and downwardly thru the heating chamber 25 about the lower edge 22 thereof which is spaced above the base plate 8 and then upwardly thru the outer heating chamber 26 into the cap 6 and thru the opening 7 into the vent pipe 28. It will be seen that the solid cover plate 20 acts as a closure for the upper end of the central tubular portion 9 and also acts as a support for the depending sleeve 21 for retaining the sleeve concentrically of the heater and with its bottom edge 22 spaced above the base plate 8 to allow ready passage of the gases from the annular chamber 25 into the annular chamber 26.

Arranged within the central tubular portion 9 is a spirally formed heating coil 30 which extends from the top to the bottom of the tubular portion with the convolutions all of a like diameter and arranged in spaced relation one above the other. The lower end of the coil 30 extends thru the tubular portion 9 beneath the lower edge of the sleeve 21 and thru the outer tubular casing 5 as at 31 for connection with one arm of a common inlet terminal 32 connected with a circulation pipe 33 which is connected with the lower end of the boiler B. The upper terminal 34 of the coil 30 extends exteriorly of the casing 5 for connection with one arm of a common outlet teminal 35 connected by means of a circulation pipe 36 to the upper end of the boiler B. The inner heating coil 30 may be the primary heating coil since the coil 30 is located directly above the burner 10 and will therefore be subjected to the greatest amount of heat.

Arranged in the down draft or intermediate annular heating chamber 25 is a spirally formed intermediate heating coil 40 the convolutions of which taper and rise spirally and conically from the lowermost to the uppermost convolution as clearly shown in Figure 2. The lowermost convolution is of a diameter substantially equal to the internal diameter of the sleeve 21, while the uppermost convolution as will be observed is of a diameter substantially equal to the external diameter of the central tubular portion 9. This conical formation of the intermediate heating coil 40 has been provided for causing the down draft heating gases in the chamber 25 to be retarded in movement and caused to have greater heating effect upon the coil. The lower end of the coil 40 preferably terminates substantially flush with the lower end of the sleeve 21 so as to allow free passage of the heating gases into the outer heating chamber 26. The intermediate heating coil 40 is entirely independent of the inner or primary heating coil 30 and at its lower end is connected by a conductor 42 to one arm of the common inlet terminal 32. The upper end of the coil 40 is connected by a conductor 43 to one arm of the common outlet terminal 35.

Arranged in the annular outer heating chamber 26 is an outer heating coil 45 the convolutions of which are spaced a greater distance apart than the convolutions of the coils 40, and this outer coil 45 is connected at its lower end by a conductor 46 to the common inlet terminal 32, while the upper end of the coil is connected by a conductor 47 to the common outlet terminal 35. Thus it will be seen that water may pass thru any one of the coils 30, 40 and 45 between the terminals 32 and 35 independently of the passage of water thru the other coils.

By so arranging the coils in separate heating chambers and causing the heat to pass from first one chamber then into another, full heating efficiency of the heat will be obtained since the heat is caused to travel a tortuous path thru the heater from the burner to the outlet opening 7. The water in the central coil 30 will be heated to the highest degree, while the water in the coils 40 and 45 will be heated to a lesser degree. The heated water from the independent coils will however all pass to the common outlet terminal 35 and co-mingle before passage thru the circulation pipe 36 into the boiler B.

By so having the coils arranged concentrically as shown, such will permit of the heater being constructed much shorter in height than the usual type of water heater.

The lower portion of the casing 5, and also the lower portion of the tubular portion 9 may be provided with suitable vent openings as shown at 50 and 52 in Figure 4 for aiding in combustion of the gases and proper circulation of the heating gases thru the annular heating chambers. By so forming the portions 9, 20 and 21 of relatively thick cast metal, such will allow for the portions to retain sufficient heat to heat the water in the coils for a considerable period of time after the flow of gas has been cut off.

Thus it will be seen that a novel and im-

proved construction for water heaters of this character has been provided wherein a plurality of separate and independent heating coils are arranged in a novel manner in concentrically arranged annular heating chambers having such communication one with another as to cause the heating gases to successively act upon the independent coils before passing from the heater. It will also be apparent that a novel arrangement has been provided wherein the series of independent coils passing thru the heater are connected at their lower ends to a common inlet terminal and at their upper ends to a common outlet terminal, and which arrangement will tend to cause a large quantity of water to circulate thru the heater between the inlet and outlet terminals.

Changes in detail may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. A water heater comprising a vertically disposed casing having an outlet opening at its upper end, a base plate closing the lower end of the casing and having an axially disposed tubular extension projecting upwardly in the casing to form a central heating chamber, said extension having side openings at its upper end, a hood supported on the upper end of the tubular extension and having a depending sleeve forming annular heating chambers having communication between one another beneath the lower end of the sleeve, a heating coil arranged in each of said heating chambers for connection at their upper ends with a common outlet terminal and connected at their lower ends with a common inlet terminal, and a burner arranged beneath the coil provided in the central heating chamber.

2. A water heater comprising a sheet metal casing having an outlet opening at its upper end, a cast iron base plate closing the lower end of the casing and having an integrally formed axially disposed tubular extension projecting upwardly in the casing to form a central heating chamber, said extension having side openings at its upper end and having bracket portions above the openings, a cast iron hood including a flat cover plate secured over the upper end of the tubular extension to said brackets and an annular depending sleeve encircling the tubular extension to form annular heating chambers, said sleeve at its lower end terminating above said base plate, a heating coil arranged in each heating chamber, a common outlet terminal for the upper ends of the coils, a common inlet terminal for the lower ends of the coils, and a burner arranged beneath the heating coil in the central heating chamber.

3. In a water heater, a tubular casing, a tubular member supported axially in the casing being open at its lower end and having side openings at its upper end, a hood supported by the tubular member including a cover plate extending over the upper end of the tubular member above the side openings and a depending sleeve encircling the tubular member, said sleeve providing intermediate and outer heating chambers, a spirally formed heating coil arranged in the tubular member, a spirally formed heating coil arranged in the outer annular heating chamber, a heating coil of conical formation arranged in the intermediate annular heating chamber and tapering upwardly, said heating coils at their upper ends being connected to a common outlet terminal and at their lower ends to a common inlet terminal, and a burner arranged in the lower portion of the tubular member beneath the heating coil arranged therein.

4. In a water heater, a tubular casing, a tubular member arranged concentrically of the casing and having side openings at its upper end, a hood closing the upper end of the tubular member and provided with a depending sleeve encircling the tubular member to provide an annular down draft heating chamber about the tubular member and an annular up draft heating chamber between the sleeve and tubular casing, a base plate extending across the lower end of the tubular casing beneath the lower edge of the sleeve, a heating coil arranged in the tubular member and one in each of said annular heating chambers, a common outlet terminal for the upper ends of the coils, a common inlet terminal for the lower ends of the coils, and means for directing heat upwardly thru the tubular member.

PETER H. FERRIER, JR.