

Feb. 13, 1940.

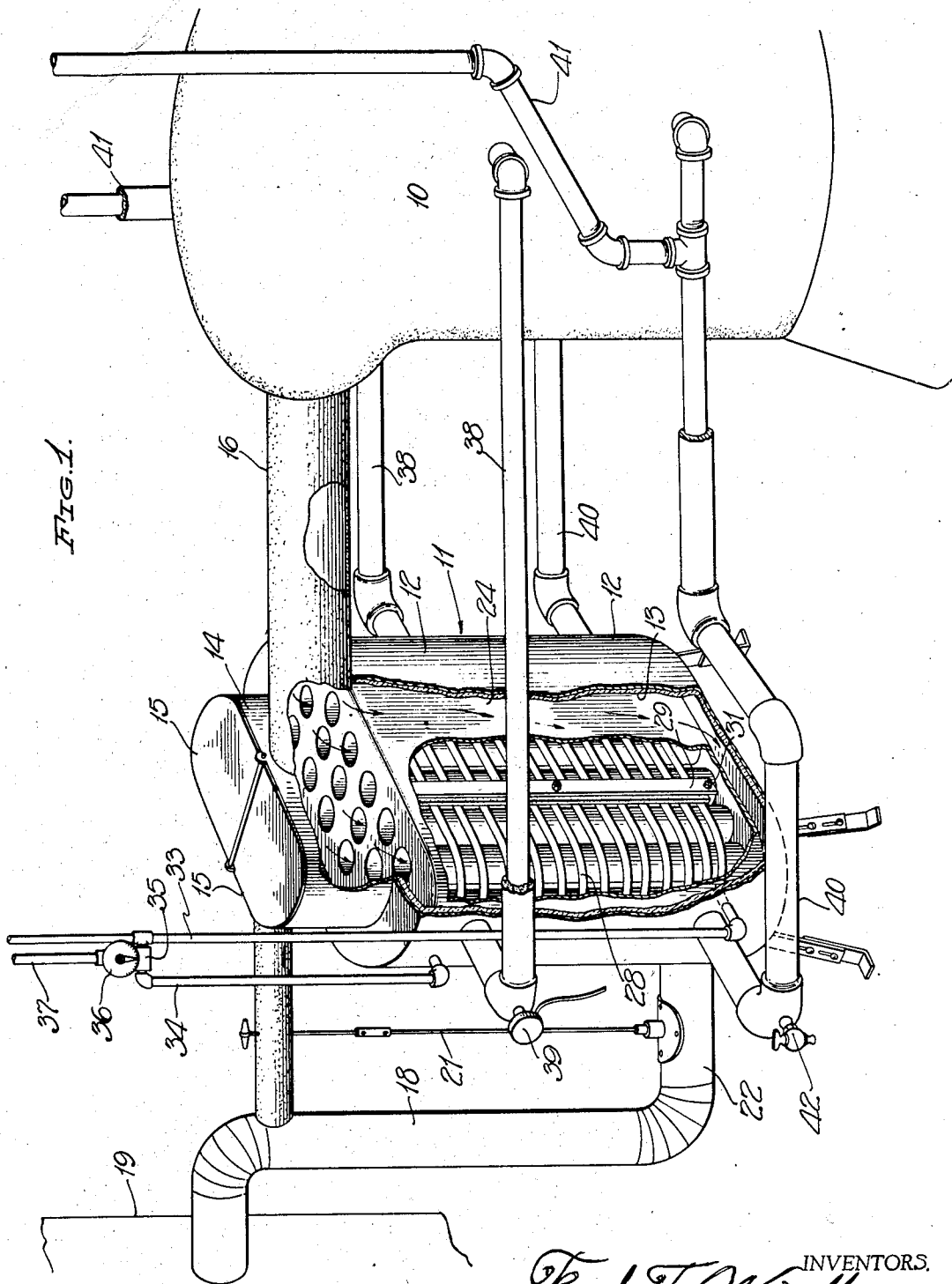
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2,189,749

WATER HEATER

Filed July 31, 1937

2 Sheets-Sheet 1



WITNESS:
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FIG. 2.

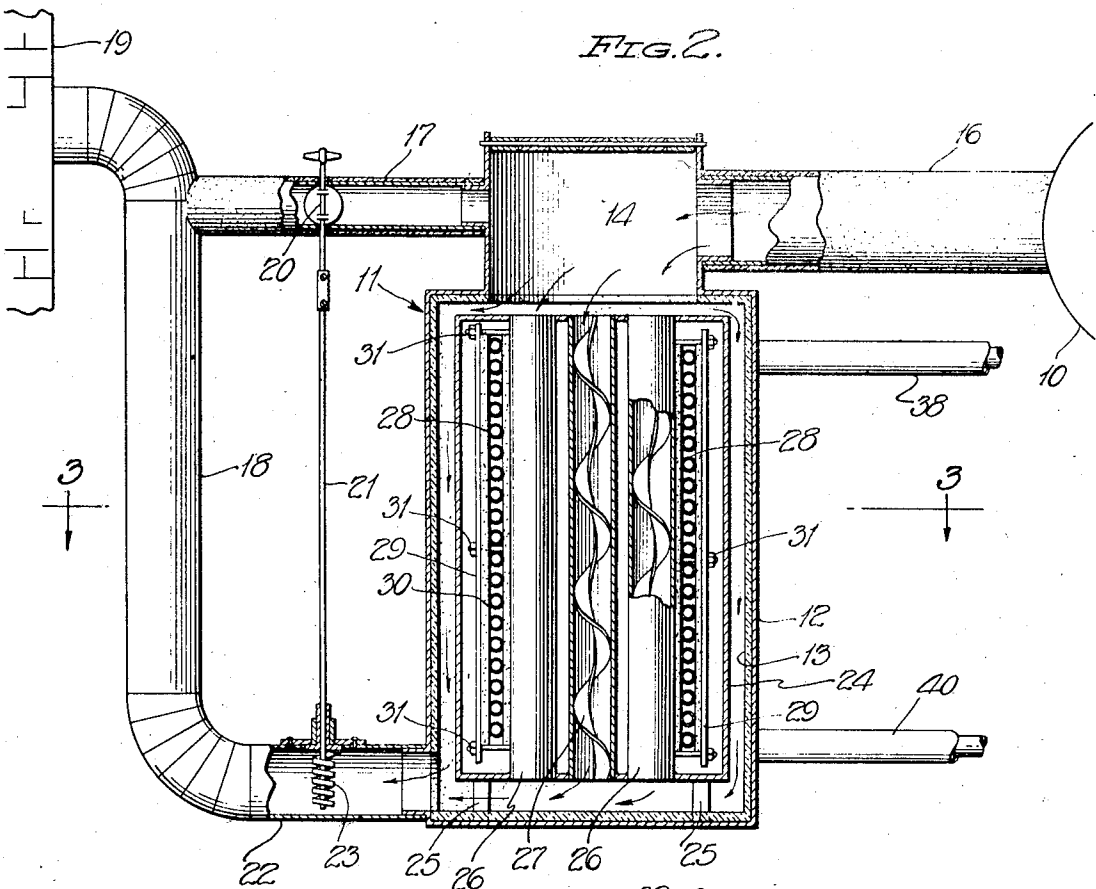
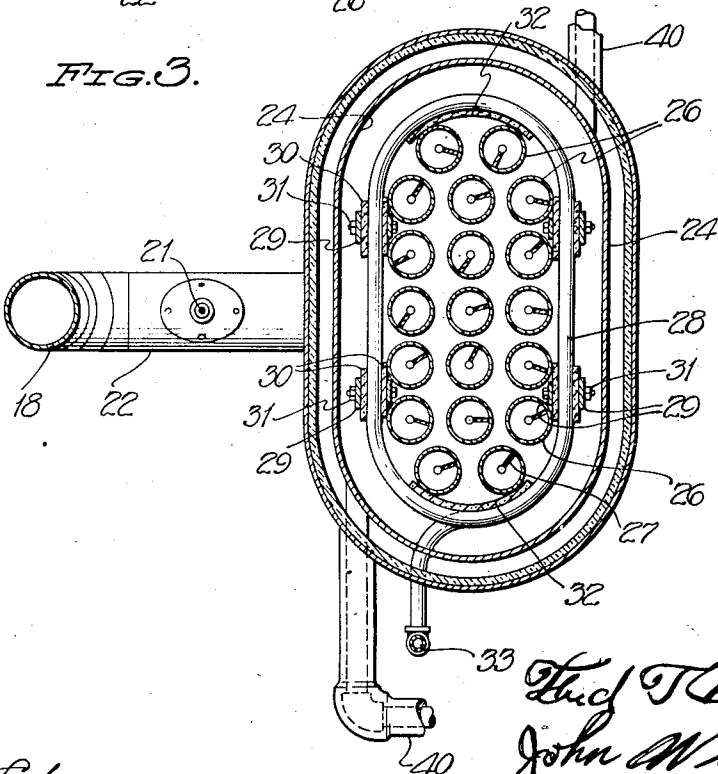


FIG. 3.



WITNESS:

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WATER HEATER

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5 Claims. (Cl. 122—32)

This invention relates to improvements in domestic water heaters and more particularly to a tankless, non-storage type water heater for household use in connection with either oil or gas fired burners or boilers.

One of the principal features of the invention resides in combining of a domestic water heater and a boiler booster in a single unit as a tankless domestic hot water supply heater, and a water tank container as a heat transfer unit.

Another feature of the invention is the provision of a domestic water heater which embodies the utilizing of the waste heated gases of combustion and the heat from the water of a domestic boiler for heating purposes without affecting any material temperature change in the boiler water.

Another feature of the invention is the provision of a domestic water heater embodying a down-draft principle of heat control wherein a by-pass from the top of the system to a flue is normally open and which is automatically closed only when the heat in the lowest part of the down draft system reaches a predetermined temperature thus assuring positive circulation of heated gases through the system and the carrying off of the gases of combustion from the furnace or boiler.

Another feature of the invention is to provide a tankless domestic water heater operatively associated with the heat from an oil or gas burner of a domestic furnace which may function for use in the summer season as well as when the furnace is being used for house heating purposes in the winter season, without requiring alterations in the water heater system.

Another feature of the invention consists of a water heating system in which water is heated primarily by the heat of the waste gases of combustion of a domestic boiler and which includes automatic means for releasing any excessive accumulation of gases in the system which might otherwise cause an explosion.

A still further object of the invention is the provision of an efficient economical water heater which may be operatively connected with domestic boilers now in use without radical changes in construction or arrangement of parts.

With these and other objects in view, the invention resides in the certain novel construction, combination and arrangement of parts, the essential features of which are hereinafter fully described, are particularly pointed out in the appended claims and are illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of our improved water heating system operatively connected with a domestic boiler and with parts broken away in section.

Figure 2 is a vertical sectional elevational view.

Figure 3 is a horizontal sectional view on the line 3—3 of Figure 2.

Referring to the drawings by reference characters, the numeral 10 designates a conventional domestic furnace or boiler used for home heating and with which my combined water heater and boiler booster unit 11 is operatively connected.

The water heater and boiler booster unit 11 includes an outer steel casing or shell 12 which is of substantially oval shape in plan, the inner side of which is lined with suitable insulating material 13. The shell 12 is supported upon adjustable legs although any other pedestal support may be provided. The top of the outer casing 12 opens into a gas accumulator dome 14, the top of which is normally closed by a pair of oppositely disposed hinged safety blow-off doors 15—15. The dome 14 is connected at one side by a horizontally disposed insulated pipe 16 with the flue outlet at the top of the furnace or boiler 10 whereby heated gases of combustion from the furnace will enter the top of the outer shell 12 through the dome 14. A relatively smaller diameter horizontally disposed insulated by-pass pipe 17 has one of its ends connected to the dome 14 opposite the pipe 16, while the other end of the by-pass pipe connects with a flue pipe 18, the latter being connected adjacent the bottom of the shell 12 and rising upwardly and leading to a chimney 19. The by-pass pipe 17 has a butterfly damper 20 mounted therein from which an actuating rod 21 depends. The lower end of the actuating rod extends into a horizontally disposed branch 22 of the flue pipe 18 and is operatively connected to a temperature responsive device in the nature of a spiral thermo coil 23. The butterfly damper is normally open but is adapted to automatically close under the action of the thermocoil 23 when the temperature in the lower end of the flue pipe 18 reaches a predetermined temperature.

Housed within the outer casing or shell 12 in spaced relation thereto is an inner casing or shell 24 constructed of sheet iron or the like, the same being supported upon legs 25 which rest upon the bottom of the outer shell 12. The space between the inner and outer sheets constitutes a flue passage for the waste hot gases of combustion from the domestic boiler 10 in their passage from

the flue pipe 16, dome 14 to the lower end of the flue pipe 18.

Extending the full height of the inner shell or casing 24 and opening through the top and bottom thereof are spaced copper flue tubes 26 the same being spaced well inwardly of the inner walls of the inner casing or shell 24. Extending the full length of the tubes 26 are spiral fins 27 which partition the tubes to provide spiral passages therethrough. Encircling the group of flue tubes 26 and closely spaced relatively to the outermost tubes 26 of the group is a single spiral copper water coil 28, the convolutions of which are closely spaced. The convolutions of the water coil 28 are held rigidly spaced by vertical metal clamping plates 29 spaced from the coil by strips of insulation 30 interposed between the plates and the coil. Bolts 31 secure the clamping plates 29 together. Due to the arrangement of the flue tubes, the coil 29 is substantially oval in plan to correspond to the cross sectional contour of the inner and outer casings. It is desired to maintain the coil in spaced relation to the group of flue tubes 28 and strips of insulation 32 may be interposed therebetween wherever necessary. The lower end of the water coil 28 extends through the inner and outer casings and connects with a cold water supply pipe 33, whereas the upper end of the coil extends through the inner and outer casings and connects with a hot water supply pipe 34. The hot water supply pipe 34 and the cold water supply pipe 33 are connected by a connecting pipe 35 in which an automatic cold water adjusting valve 36 is arranged. A hot water pipe 37 leads from the outlet side of the mixing valve to the various faucets of a home. The valve 36 is of the conventional type, the operation of which is thermal controlled by the temperature of the water passing through the pipe 34, whereby if the temperature is excessive, the valve will open to admit cold water from the pipe 33 to mix with the hot water and moderate the temperature of the heated water before the same passes to the pipe 37.

The waterback of the boiler or furnace 10 is connected by insulated pipes 38 to the upper portion of the inner shell 24, the said pipes 38 constituting hot water inlet pipes for supplying hot water to the inner casing where said water surrounds the flue tubes 26 and copper coil 28. However, the supply of hot water from the boiler 10 to the unit 11 is held in check until the temperature thereof reaches a predetermined high by an aquastat 39 arranged in each pipe 38. Outlet pipes 40 suitably insulated lead from the bottom of the shell 24 to the boiler 10 while risers 41 lead from the pipes 40 to the radiators of a domestic heating system. A drain pet cock 42 is arranged in an outlet pipe 40 to facilitate draining of the boiler water when desired.

In operation, assume that the boiler 10 is charged with boiler water as is the inner shell or casing 24 and pipes 38 and 40, while the butterfly damper valve 20 is open and the oil burner or other heat generator is in operation. It follows, that the waste heated gases of combustion from the fire box of the boiler 10 passes through the flue pipe 16 into the gas accumulating dome 14. The by-pass flue pipe 17 being smaller in diameter than the flue pipe 16, a proportional amount of heated gases pass downwardly through the flue tubes 26, and through the space between the inner and outer shells or casings 12 and 24, thence out through the flue 18 to the chimney 19. When the heat in the down draft passages

reaches a predetermined temperature set by the thermal coil 23, the said coil operates to turn the rod 21 to close the butterfly damper 20, thus diverting the entire flow of hot gases through the gas passages in the unit 11. The aquastat 39 is set for opening at a predetermined temperature so as to open when the boiler water in the boiler 10 reaches a predetermined temperature. Heat from the gases passing through the gas passages of the unit 11 is transferred to the water in the inner casing or shell 24 thus boosting the temperature of the boiler water, while the heat of boiler water in the inner casing acts upon the copper coil 28 to heat the water as it passes therethrough from the cold water supply pipe 33 to the hot water supply pipe 34. As previously stated, should the temperature of the hot water heated by the unit 11, be in excess of a predetermined degree, the automatic mixing valve 36 will operate to moderate the same by admitting cold water from the cold water supply pipe 33 into the hot water supply line.

Should the hot gases of combustion back up in the unit 11, the same will accumulate in the dome 14 and the pressure therein will be relieved by the blowing open of the doors 15, thus avoiding danger of explosion.

While we have shown and described what we consider to be the preferred embodiment of our invention, we wish it to be understood that such changes and alterations as come within the scope of the appended claims may be resorted to if desired.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent of the United States, is:

1. A water heating system comprising in combination, a fired boiler, a water heating unit including spaced inner and outer casings, the space between said casings constituting a flue passage, vertical flue tubes extending the length of the inner casing, a water coil contained within said inner casing and surrounding said flue tubes, means connecting said boiler and said inner casing for circulating boiler water through said inner casing, a flue pipe connecting the top of said outer casing with the flue outlet of said fired boiler for conveying hot gases of combustion from said boiler to the top of said outer casing for down passage through said flue tubes and flue passage, a chimney flue leading from the bottom of said outer casing for carrying off the hot gases after their passage through the flue tubes and flue passage, a by-pass flue pipe connecting the top of said outer casing and said chimney flue, a damper in said by-pass flue pipe normally in an open position, and thermal actuating means responsive to the temperature of the downdraft gases passing through said chimney flue for moving said damper to closed position when the temperature of the hot gases entering said chimney flue reaches a predetermined degree.

2. A water heating system comprising in combination, a fired boiler, a water heating unit including spaced inner and outer casings, the space between said casings constituting a flue passage, vertical flue tubes extending the length of the inner casing, a water coil contained within said inner casing and surrounding said flue tubes, means connecting said boiler and said inner casing for circulating boiler water through said inner casing, a flue pipe connecting the top of said outer casing with the flue outlet of said fired boiler for conveying hot gases of combustion from said boiler to the top of said outer casing for down

passage through said flue tubes and flue passage, a chimney flue leading from the bottom of said outer casing for carrying off the hot gases after their passage through the flue tubes and flue passage, a by-pass flue pipe connecting the top of said outer casing and said chimney flue, a damper in said by-pass flue pipe normally in an open position, thermal actuating means responsive to the temperature of the downdraft gases passing through said chimney flues for moving said damper to closed position when the temperature of the hot gases entering said chimney flue reaches a predetermined degree, and automatic means for releasing excess pressure of the accumulation of hot gases in said flue passage and flue tubes to the exterior of said outer casing.

3. A hot water heater comprising spaced inner and outer casings, a dome at the top of said outer casing, hinged doors in the top of said dome, a flue pipe leading from said dome and adapted to be connected to the flue of a fired boiler, a chimney flue pipe leading from the bottom of the outer casing, a by-pass flue pipe connecting said dome and said chimney flue pipe, the by-pass flue pipe being of a cross sectional area less than that of said chimney flue pipe, a group of flue tubes extending through said inner casing, a water coil surrounding said group of flue tubes and adapted to be connected in a water supply pipe line, hot water inlet and outlet pipes leading from said inner casing and adapted to be connected with the boiler water chamber of a boiler, a normally open damper mounted in said by-pass flue pipe, and thermal means in said chimney flue pipe adjacent its connection with said outer casing operatively connected to said damper for closing said damper when the tem-

perature in said chimney flue pipe reaches a predetermined degree.

4. A water heater comprising an outer insulated casing, an inner metal casing disposed in spaced relation to said outer casing, a group of vertical flue tubes opening through opposite ends of said inner casing, a flue inlet in the top of said outer casing, a flue outlet at the bottom of said outer casing, a hot water heating coil pipe encircling said group of flue tubes and supported in spaced relation with respect to said flue tubes and inner casing, and hot water inlet and outlet pipes leading from said inner casing and adapted to be connected with the boiler water chamber of a furnace.

5. A water heating unit comprising spaced inner and outer casings, the space between said casings constituting a flue passage, a group of vertical flue tubes extending the length of and through the ends of the inner casing, hot water inlet means entering the top of said inner casing, hot water outlet means leading out from the lower portion of said inner casing, a water coil pipe contained within said inner casing in surrounding relation with respect to said flue tubes and closely spaced from the outermost of said group of vertical flue tubes, a flue pipe connecting the top of said outer casing with the flue outlet of a fired boiler for conveying hot gases of combustion from a boiler to the top of said outer casing for down passage through said flue tubes and flue passage, and a chimney flue pipe leading from the bottom of said outer casing for carrying off the hot gases after their passage through said flue tubes and flue passage.

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