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COMBINED DOMESTIC WATER HEATER

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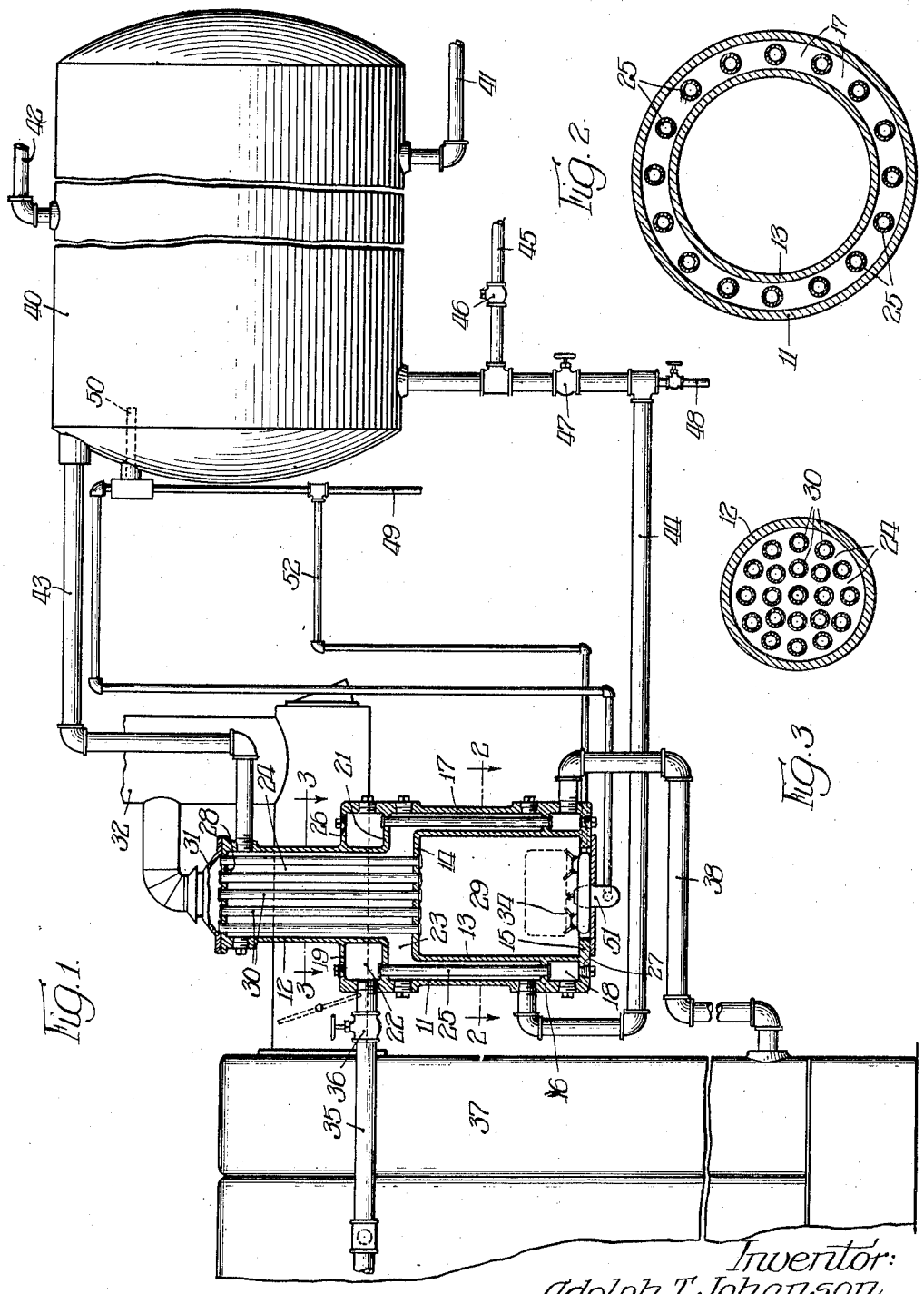

Fig. 1.

Fig. 2.

Fig. 3.

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COMBINED DOMESTIC WATER HEATER

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2 Claims. (Cl. 122—32)

The present invention has reference to certain features of betterment and merit in heaters for water for domestic purposes, and it concerns more particularly heaters of this type which are of combined or conjoint construction designed to employ as a heating medium hot-water from a hot-water or steam boiler supplemented by heat from a gas, oil or similar auxiliary or secondary burner.

A leading aim or important object of this invention is to provide a domestic water-heater of this form which is relatively simple in construction, which is comparatively economical to manufacture, and which possesses marked efficiency in operation.

To the attainment of the above stated and other purposes of the invention, a present preferred embodiment of the same has been developed and illustrated in detail in the accompanying drawing which forms a part of this specification and to which reference should be had in connection with the following detailed description, and for simplicity like reference numerals have been employed throughout the views of such drawing to designate the same parts of the apparatus.

In this drawing:—

Figure 1 is a vertical, central section through the heater showing it coupled with the boiler and hot-water storage-tank;

Figure 2 is a horizontal section on line 2—2 of Figure 1; and

Figure 3 is another horizontal section on line 3—3 of Figure 1.

By reference to the drawing, it will be noted that the novel and improved water-heater in the present instance comprises a hollow, metal casting involving an outer, cylindrical shell or casing 11 having a reduced-diameter, upper section 12, the casting including an inner, cylindrical shell 13 spaced inwardly away from, and concentric with, the part 11, a top wall 14 for such inner casing, and a bottom wall or floor 15 for the two casings 11 and 13.

A short distance above the bottom wall, the inner and outer casings are joined together by a partition or division wall 16 separating the annular space between the two casings into upper and lower compartments 17 and 18, respectively.

Such outer casing or round wall 11 has a top 19 connecting it with the upper section 12, the latter extending downwardly below such top with its lower margin joined to the outer casing by a horizontal wall 21, whereby to provide a ring-shaped chamber 22 above it, it being apparent from the drawing that the wall 14 is some distance below the wall 21 forming a round chamber 23 in direct communication with the chamber 17 below it and with chamber 24 inside of the upper, smaller casing 12.

Walls 16 and 21 are apertured at a number of places in alignment with one another and these holes accommodate a series of open-ended, upright tubes 25 expanded therein in fluid-tight manner, these tubes being of copper or other appropriate metal and directly connecting together the two chambers 18 and 22, the two walls 15 and 19 having plugged holes 26 and 27, respectively, in registration with such tubes and providing means for the original introduction of the tubes, and their replacement, if required.

Casing 12 has a top wall 28 and this and wall 14 have a series of registering apertures in which are fitted and expanded a series of vertical copper or other metal tubes 30 which connect the chamber 29 inside of the inner casing 13 with the interior of a flue-gas conduit 31 adapted to be joined to the boiler-stack 32.

Floor-plate 15 has a central opening covered by a closure-plate 33 carrying a main gas-burner 34 of any appropriate construction.

Chamber 22, by means of a pipe 35 fitted with a control-valve 36, is connected to the interior of a boiler 37 below the surface of the water-level therein, and chamber 18 is joined by a pipe 38 to the interior of the lower part of the boiler, whereby the hot water from the upper part of such boiler automatically circulates through pipe 35, chamber 22, pipes 25, chamber 18 and pipe 38 back to the boiler.

A domestic hot-water storage-tank 40 has a cold-water supply-pipe 41 connected to the interior of its lower portion and its upper part has a discharge pipe 42 to deliver the hot water to the building hot-water supply system.

The upper portion of the heater-chamber 24, by means of a pipe 43, is joined to the interior of the upper part of the hot-water storage-tank 40, and the lower portion of the latter, by means of a pipe 44, is connected to the lower part of chamber 17 of the heater, pipe 44 being joined to the building return-pipe 45 equipped with the usual check-valve 46.

In addition, pipe 44 may have a shut-off valve 47 and a valved blow-off pipe 48 for flushing out the heater.

Gas-burner 34 is supplied with fuel through a gas-supply pipe 49 fitted with a thermostat 50 in the upper part of the hot water in the supply-

tank **40**, whereby the flow of gas to the burner is automatically controlled by the temperature of the water in the tank to maintain a predetermined, substantially uniform temperature therein, the pilot-flame of the burner **51** receiving its fuel-supply through another pipe connection **52**, by means of which the pilot-burner receives a constant supply of gas, whereas the main-burner **34** is supplied with fuel intermittently as occasion demands.

From what precedes, it will be clear that the water entering the compound or duplex heater through pipe **44** is heated in compartment **17** by the hot boiler water flowing downwardly through the several tubes **25**, the contents of the tubes as they become cooled by such heat transfer returning to the boiler.

So long as such continuous flow of boiler water heats the domestic water to the needed degree, the gas or other fuel burner **34** remains inactive, although its pilot flame is constantly burning.

The domestic water thus heated flows up through chamber **24** and passes out through pipe **43** to the storage-tank and from thence to the hot-water supply system of the building.

In case the temperature of the water thus heated from the boiler is inadequate for the domestic service, the thermostat **50** feeds fuel to the main burner **34** and this is at once ignited by the flame at the pilot-burner **51**, whereupon the heat developed in the combustion-chamber **29** by the burning of the gas at the main burner is applied to the water in chamber **17** supplementing that applied by the boiler-water.

Additionally, the hot gases of combustion flowing upwardly from the chamber **29** to the stack through the tubes **30** further heat the water in chamber **24** surrounding such tubes.

As soon as the desired temperature of the water is attained, the thermostat automatically terminates the flow of gas to the burner and such auxiliary or supplemental heating is stopped until it is again required.

One of the outstanding and important features of this construction resides in the fact that the primary heater supplied by heat from the boiler constitutes a confining jacket for the burner of the secondary or gas heater, whereby a substantial economic advantage is gained in that loss of heat is reduced to a minimum and the heaters function conjointly to maximum advantage.

It will be observed, that, when the gas-burner is not in operation, the water is economically heated by the boiler water in the tubes **25** which are completely surrounded by the domestic water undergoing the heating action, and, when the gas-burner is in operation, its heat is imposed on the entire inner surface of the water in chamber **17**, such chamber and its contents constituting a heat-insulating jacket for the combustion-chamber **29**.

Those acquainted with this art will readily understand that the invention as herein set forth is not necessarily limited and restricted to the precise and exact details of construction illustrated and described and that these may be modified or changed in more or less degree without departure from the heart and essence of the invention as defined by the appended claims and without the loss or sacrifice of any of the material benefits and advantages accruing from the employment of the invention, the scope of which is set forth in the following claims which should be construed as broadly as permitted by the state of the prior art.

I claim:

1. In a duplex domestic water-heater, the combination of a primary-heater having a first conduit-means for the circulation of hot-water from the boiler therethrough and a second conduit-means for the circulation of the domestic water to be heated therethrough and in heat-exchange relation with said hot-water from the boiler in said first conduit-means, and a secondary- heater including (*a*) a combustion-chamber in heat-exchange relation with the domestic water in said primary-heater, (*b*) a fuel-burner in said combustion-chamber, (*c*) a heating-chamber connected to said primary-heater and through which chamber the domestic water from said primary-heater flows, and (*d*) tubes through said heating-chamber and surrounded by the domestic-water therein and through which tubes the products of combustion from said burner are discharged from said combustion-chamber, said second conduit-means forming a domestic-water jacket around said combustion-chamber, and said first conduit-means being composed of a group of tubes extended downwardly through said jacket and surrounded by the domestic-water in the jacket.

2. The water-heater set forth in claim 1 in which said heating-chamber is at a higher level than said second conduit-means.

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