Feb. 16, 1943. R. S. PRUITT 2,311,469

LIQUID FUEL BURNER

Filed Oct. 17, 1938 2 Sheets-Sheet 1

Fig. 1.

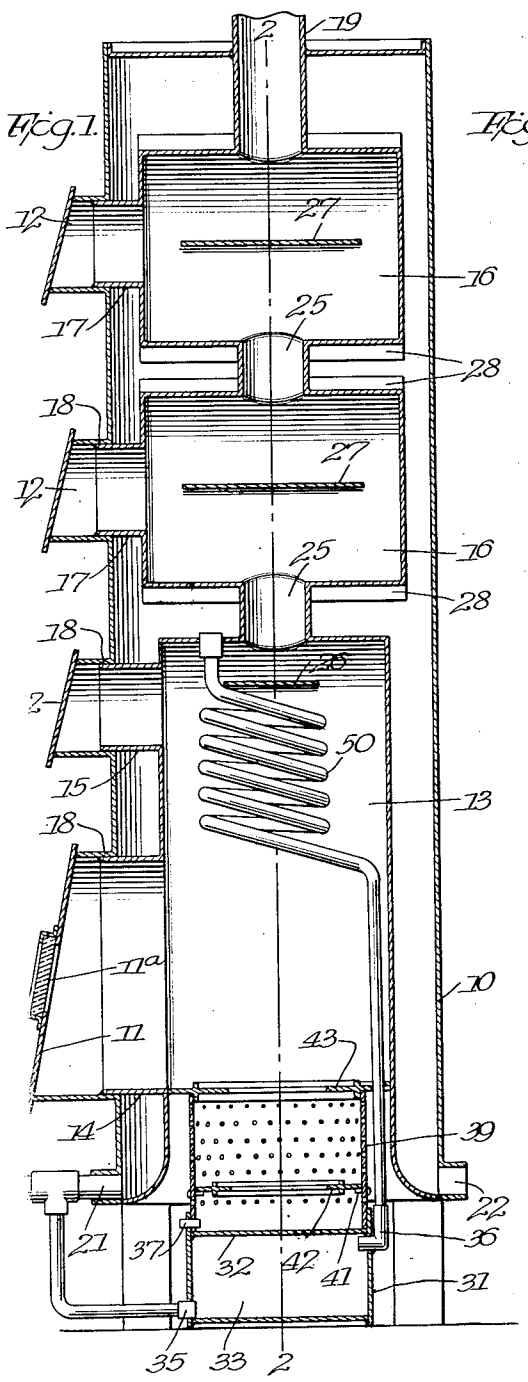
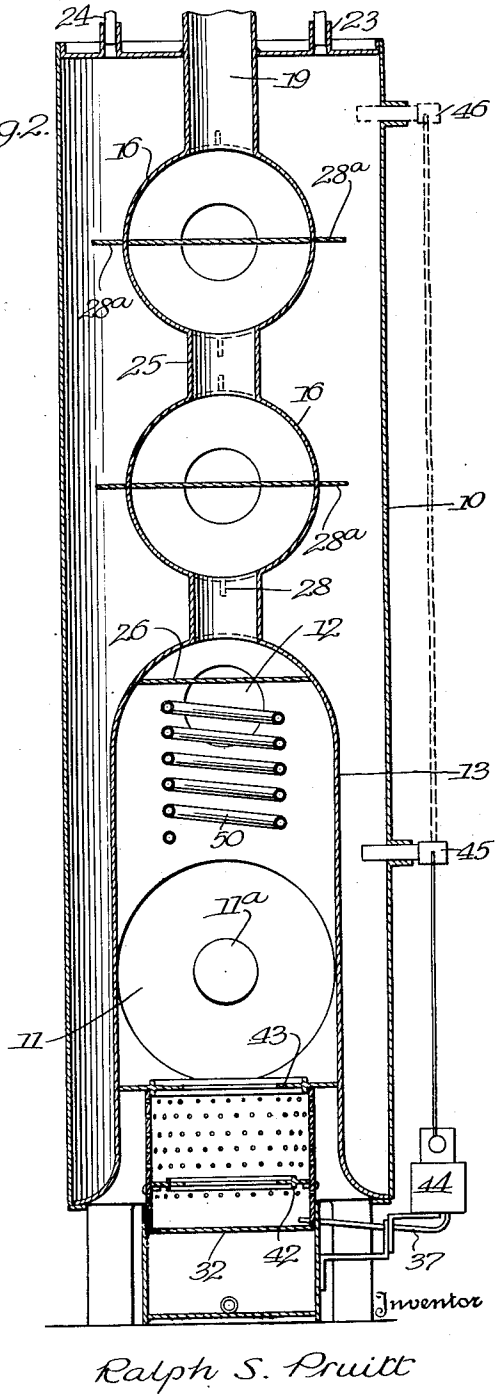


Fig. 2.



Inventor

Ralph S. Pruitt

By Emery, Booth, Thurber & Miller

Attorneys

Feb. 16, 1943. R. S. PRUITT 2,311,469

LIQUID FUEL BURNER

Filed Oct. 17, 1938 2 Sheets-Sheet 2

Fig. 3.

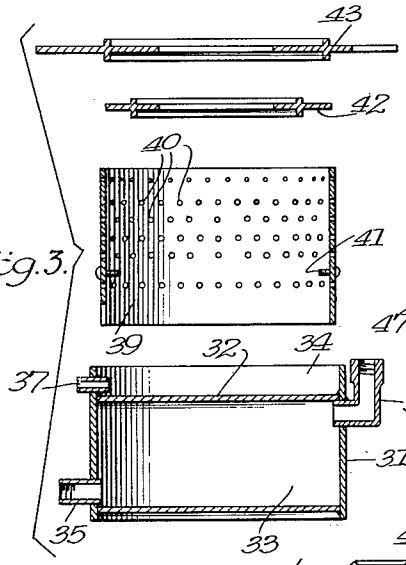


Fig. 4.

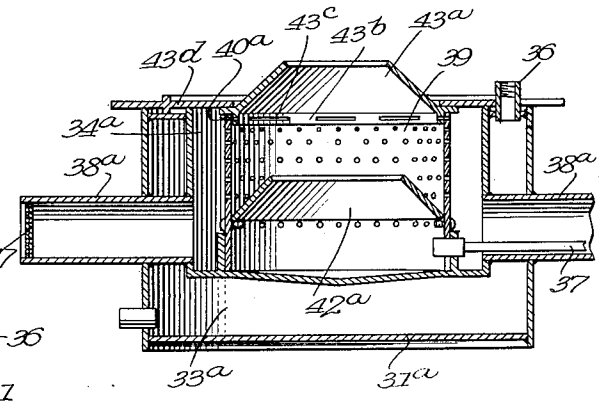


Fig. 5.

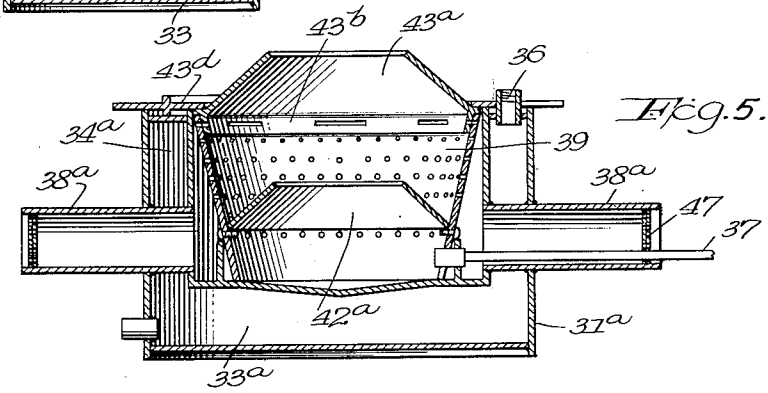
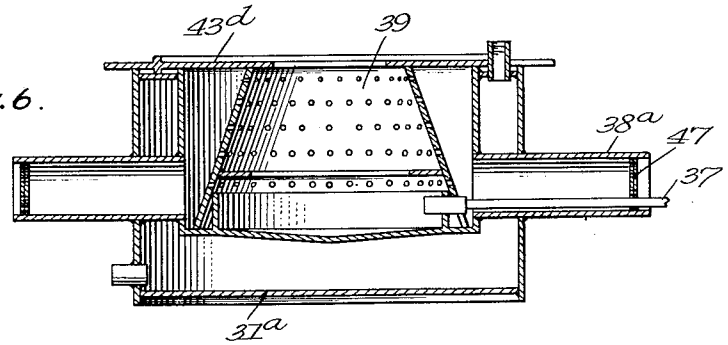


Fig. 6.



Inventor

Ralph S. Pruitt.

By Emery Booth Stevens & Davis

Attorneys

Patented Feb. 16, 1943 2,311,469

UNITED STATES PATENT OFFICE

2,311,469

LIQUID FUEL BURNER

Ralph S. Pruitt, Anderson, S. C.

Application October 17, 1938, Serial No. 235,484

2 Claims. (Cl. 158—91)

The present invention relates to liquid fuel burning heaters, boilers and the like, particularly those adapted for domestic use, and the invention aims generally to improve existing heaters of that type.

More specifically the invention relates to that type of hot water or steam boilers, domestic hot water heaters and analogous devices designed for the heating of or the supply of domestic hot water to dwellings or buildings.

One of the primary objects of the invention is the provision of a boiler of the above type adapted for the burning of liquid fuel, as for example, oil, which will be cheap in the cost of construction and extremely efficient in operation.

Other objects and advantages of the invention will be apparent to those skilled in the art, in view of the following detailed description of one suitable embodiment which is illustrated in the accompanying drawings, in which

Fig. 1 is a vertical sectional view of my improved boiler;

Fig. 2 is a vertical transverse section of the boiler as taken on the line 2—2 of Fig. 1;

Fig. 3 is a disassembled view of the component parts of the burner shown in Figs. 1 and 2;

Figs. 4, 5 and 6 are sectional views of different modified forms of liquid fuel burner.

In the illustrated embodiment of the invention there is provided an outer casing or shell 10 which may be circular or rectangular in cross-section, as desired, and which is provided with a main access door 11 which may have a glass observation window 11a and one or more observation and cleaning doors 12. The casing 10 advantageously is of wrought iron construction welded at the joints to provide a watertight structure. Within the casing 10 is a primary combustion chamber 13 having outlets 14 and 15 communicating respectively with the door 11 and one of the doors 12, and one or more secondary combustion chambers 16 each having an outlet 17 communicating with one of the doors 12. The lower edge of the primary combustion chamber 13 may be permanently secured, as by welding, to the casing 10 at a point above the bottom of the casing 10, providing a hot water or steam storage chamber above said point between the casing 10 and the combustion chambers 13—16. Similarly the outlets 14 and 15 may extend within the frames of doors 1 and 12 a substantial distance and be welded thereto as at 18 to prevent leakage of water or steam at these points. The upper secondary combustion chamber 16 has a combustion outlet flue 19 extending through and above the tip of casing 10, and preferably welded thereto.

The lower portion of the water or steam storage chamber may be provided with a water inlet 21, and a hot water return connection 22, while the upper portion of casing 10 may be provided with a hot water or steam outlet 23 and a safety valve or pressure gauge connection 24.

The primary and secondary combustion chambers 13 and 16 are constructed to obtain a very large area or surface in contact with the combustion gases and water in storage chamber to obtain a maximum efficiency of the boiler. Conveniently, the upper portion of the primary combustion chamber 13 may be dome-shaped (see Fig. 2) and connected to a cylindrical secondary combustion chamber 16 by means of vertically disposed intermediate combustion chambers 25. Similarly when two or more secondary combustion chambers 16 are employed they may be similarly connected in spaced relation by means of intermediate combustion chambers 25. As the primary and secondary combustion chambers are preferably of less depth than the casing 10 (see Fig. 1), all surfaces of all combustion chambers 12, 16 and 25 are in contact with the water or steam in the storage space. The combustion chambers 13 and 16 may, if desired, be provided with baffles 26 and 27, respectively, of less width than the combustion chambers, to compel the combustion gases to follow a tortuous path to the flue 19, and to bring the gases in contact with all surfaces of the combustion chambers.

To increase the effective heating surface of the combustion chambers, the primary and secondary chambers 13 and 16 may be provided with outwardly extending fins 28. These fins may be formed integrally with the combustion chambers 13 and 16 when the latter are made of castings, but preferably the chambers 13 and 16 are made of wrought metal sections, and the fins are of separate metal strips welded between the sections and extending through and beyond the chambers. For example, fins 28a in the secondary combustion chambers may be formed as extensions of the baffles 27.

The boiler is advantageously heated by a liquid fuel burner, preferably of the pan or pot type.

According to the invention, the burner comprises a combined burner bowl and water jacket 31 formed of a cylindrical shell having a partition 32 intermediate its height, forming below said partition a closed water jacket 33 and above it an open topped burner bowl or pan 34. The water jacket 33 is provided with water inlet and outlet

connections 35 and 36, respectively, while the pan 34 is provided with an oil inlet 37 and one or more air inlets 38ª adapted to supply air under natural or forced draft to the burner bowl.

Removably supported upon the burner pan 34 is a burner shell 39 provided with spaced perforations 40 throughout a substantial portion of its area, and supporting means 41 between the lower and second row of perforations. A pilot burning or intermediate combustion ring 42 is removably supported on said supporting means 41, said ring 42 being preferably formed of an annular metal plate having circular reinforcing units above and below it to prevent distortion of the ring. A high fire baffle ring 43 similar to the baffle ring 42 is removably supported upon the upper edge of the shell 39, the outer dimension of said ring 43 being such as to tightly fit the interior walls of the combustion chamber 13. As will be apparent from Fig. 1, the ring 43, shell 39 and with it the ring 42, may be conveniently removed through the door 11 for ready cleaning.

Fuel oil may be supplied to the pan 34 through oil inlet pipe 37 controlled by regulating valve 44, of suitable design, which in turn is under control of a hot water thermostat 45 or a steam thermostat 46 connected to the control valve 44. The valve 44 is preferably of the well known type designed normally, when in "off" position to supply a small quantity of fuel to the oil line 37 sufficient to maintain a small pilot flame in the burner pan 34. When, however, the thermostats 45 or 46 call for heat, the valve 44 is opened to supply a larger amount of fuel to the pan 34 for high fire burning.

Air is supplied to the burner through inlets 38 around the burner shell and passes through perforations 40 into contact with the flame. Advantageously, during high fire burning, as controlled by thermostat 45 or 46, the air may be under an induced or forced draft, being directed into contact with the flame between rings 42 and 43. For pilot burning operation, however, air supplied through the perforations 40 below the ring 42 under natural draft only will be sufficient.

The water inlet 35 of the burner water jacket 33 is suitably connected to the water inlet supply 21, while the outlet 36 is connected to an economizer and circulating coil 50 emptying into the water storage chamber, preferably between the primary combustion chamber and secondary combustion chamber as shown in Fig. 1. Water in jacket 33 absorbs heat from the burner, which would otherwise be lost, and passes upwardly through coil 50, directly in the path of products of combustion. This preheated water enters the water storage chamber at a sufficiently low level so that it is at a temperature above the water in the storage chamber at that level, and promotes an efficient circulation of water in the storage chamber.

Alternatively, the burner unit may be constructed so that the water jacket surrounds the sides as well as the bottom of the burner as shown in Figs. 4, 5 and 6. In the modified forms of the invention shown in Figs. 4, 5 and 6, the combined water jacket and burner pan 31ª may be so constructed that the burner pan 34ª is deeply recessed in the water jacket 33ª, a distance equal, at least, to the height of the perforated shell, so that the water jacket 33ª surrounds the shell as well as underlies the burner pan. The pan 34ª may have upwardly extending means 34ᵇ for centering and supporting the shell 39 in the pan. Air inlets 38ª extend through the side walls of the water jacket to supply air to the central recess, and conveniently the oil supply pipe may extend through one of the air inlets, as shown in Fig. 4. The amount of air entering the burner through inlets 38ª may be varied by the adjustable shutters 47.

In the form of invention shown in Fig. 4, the burner shell 39 may be cylindrical as in Figs. 1 and 2, while the baffle rings 42ª and 43ª may be upwardly tapering or frusto-conical as shown. The upper row of perforations of the shell may be elongated slots 40ª to provide additional air when required, the length of which can be adjusted by turning the ring 43ª so that the depending flange 43ᵇ thereof, which may also be slotted as at 43ᶜ, will open or close the slots 40ª. The ring 43ª may be held in place on the shell by means of a holding ring 43ᵈ which preferably is of sufficient diameter to fit the surrounding combustion chamber.

The perforated shell 39 need not be cylindrical as shown in Figs. 1, 2 and 3, but may be, and preferably is, in the form of an inverted frustum of a cone, as in Fig. 5, or it may be frusto-conical as in Fig. 6. The perforations 40 in the shell 39 may be either horizontal or perpendicular to the tapered shell.

My improved boiler and burner unit improves the combustion and efficiency of liquid fuel heaters and boilers, in that a maximum of the heat of the products of combustion is taken up by the water, resulting in a very low stack temperature. The construction of the primary and secondary combustion chambers, as well as the water jacket and burner with the economizer coil, contribute greatly to the efficiency of the boiler. In addition, the relatively low and uniform temperature obtained by the burner water jacket produces the proper ratio of hydroxilation-to-"cracking" combustion of the liquid fuel, thereby preventing too large a proportion of the combustion being of the cracking kind and resulting in a minimum of carbon formation and very high fuel burning efficiency.

The liquid fuel burner, and particularly the forms thereof shown in Figs. 4, 5 and 6, is readily adaptable to the conversion of present coal or gas fired boilers into efficient oil fired units. Likewise, existing warm air furnaces may be converted into efficient oil fired units if the burner jacket hot water is properly utilized.

The special shapes of the burner shells and rings as shown in Figs. 4, 5 and 6, provides a more thorough mixture of air and fuel and also reduces resistance to air flowing into and through the burner, thereby resulting with greater burning capacity and burning efficiency of the burner.

I claim:

1. A liquid fuel burner for furnaces and the like comprising a cylindrical casing, the bottom of said casing being provided with a burner pan, the bottom of said pan being provided with upwardly extending means, a perforated shell resting on the bottom of said pan and adapted to engage and be supported by said upwardly extending means below the lowermost perforations of said shell, the sides of said shell being spaced from the sides of said casing and forming therebetween an air supply chamber, means for feeding fuel in regulated amounts through said shell and upwardly extending means to the bottom of said burner, a pilot burning baffle ring supported interiorly of the shell substantially below the top thereof and above the lowermost perforations of

said shell so that said lowermost perforations will provide adequate supply of air below said ring to support combustion of a pilot flame burning on said ring, a high fire baffle ring mounted adjacent the upper end of said perforated shell, means connected with said casing for supplying air to the air chamber above the bottom of the burner pan in sufficient amounts to support combustion of the pilot or high fire flame.

2. A liquid fuel burner for furnaces and the like comprising a relatively deep water jacketed casing provided with a bottom forming a burner pan, a perforated shell supported within said casing and on the bottom of said pan with its sides spaced from the sides of said casing and forming therebetween an air supply chamber; means for feeding fuel through the side of said water jacketed casing and shell to the bottom of the burner pan, a pilot burning baffle ring supported interiorly of the shell substantially below the top thereof and above the lowermost perforations of said shell so that said lowermost perforations will provide an adequate supply of air below said ring to support combustion of a pilot flame burning on said ring, a high fire baffle ring mounted adjacent the upper end of said perforated shell, means connected with the side of said casing for supplying air to said air chamber in sufficient amounts to support combustion of the pilot or high fire flame.

RALPH S. PRUITT.