Feb. 10, 1953 J. B. MOORE, JR 2,627,909

AIR DISTRIBUTING MEANS FOR POT TYPE BURNERS

Filed Oct. 13, 1948

FIG. 1.

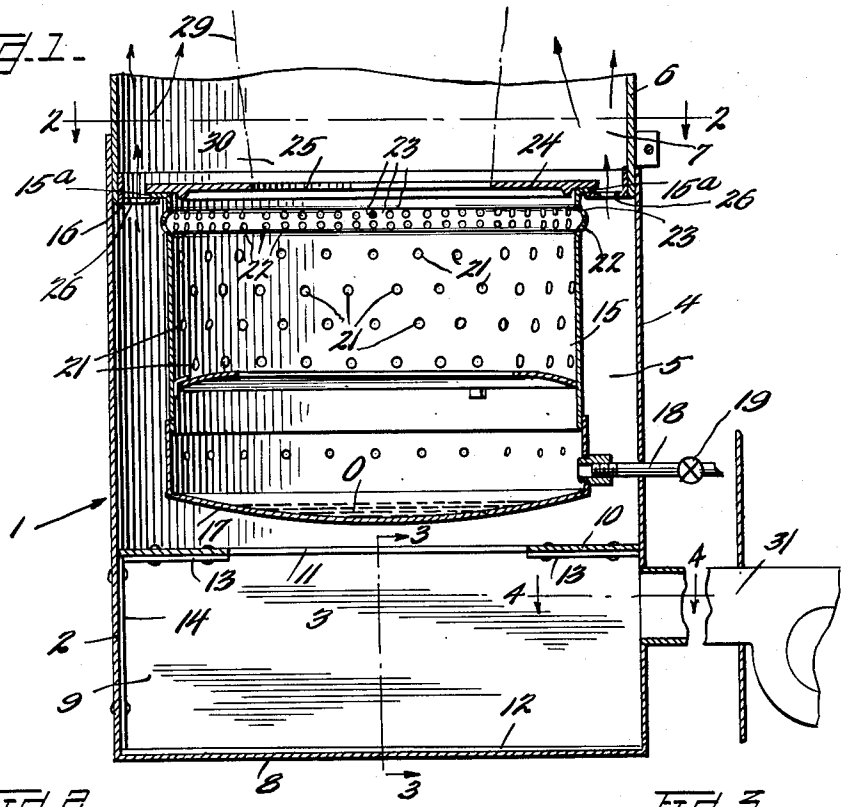


FIG. 2.

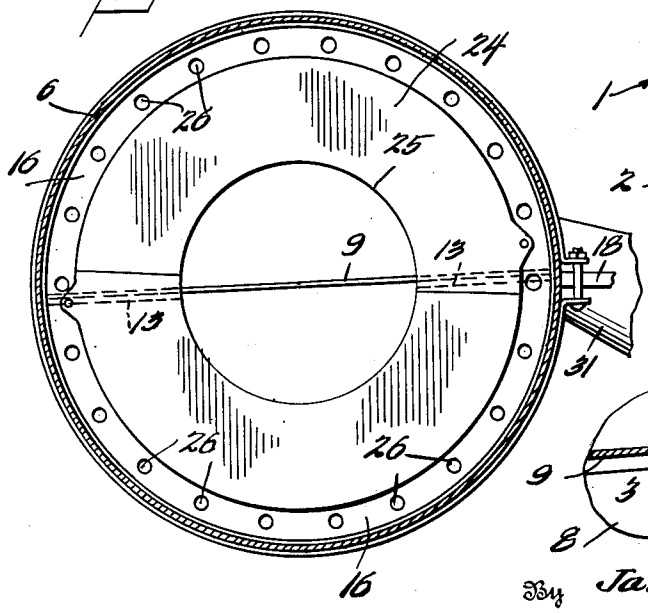


FIG. 3.

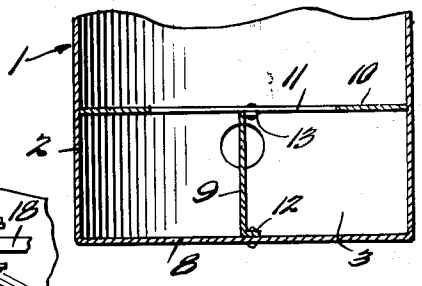
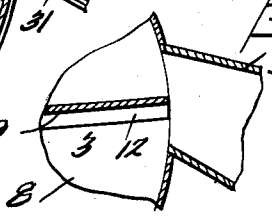


FIG. 4.



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AIR DISTRIBUTING MEANS FOR POT TYPE BURNERS

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2 Claims. (Cl. 158—91)

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The present invention related to an improvement in burners and more specifically is directed to an improvement in pot type burners adapted to burn hydrocarbon fuels.

One object of the present invention is to provide an improved means for supplying tertiary air to the combustion chamber of the burner.

Another object of the present invention is to provide means for inhibiting whirling of the hydrocarbon flame in the combustion chamber.

Another object of the present invention is to provide the air chamber of the burner with a splitter baffle member which divides the air and substantially inhibits it from whirling or circulating in the air chamber and this, in turn prevents whirling of the hydrocarbon flame, prevention of whirling of the flame being important in that type of burner wherein an oil pool is maintained on the bottom of the burner pot.

Another object of the present invention is to prevent whirling of the burner flame in the burner employing a pool of oil of the character herein described on the bottom of the burner pot, and in this manner make certain that enough heat is reflected to continue the boiling of the vapors from the surface of the oil pool.

With the above and other objects in view, the invention consists in general of certain novel details of construction, combination of parts, and the method of burning fuel oil hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the accompanying drawings—

Figure 1 is a vertical cross-section of the hydrocarbon fuel burner;

Figure 2 is a transverse cross-section taken on line 2—2 of Figure 1; and

Figure 3 is a vertical section taken on line 3—3 of Figure 1; and

Figure 4 is a transverse cross-section taken on line 4—4 of Figure 1.

Referring to the drawing, a housing 1 is provided which is divided into 3 sections, namely: an air chamber member 2 having an air chamber 3; a pot chamber section 4 having a pot chamber disposed therein, said pot chamber section having a chamber 5; and a combustion chamber member 6 having a combustion chamber 7; the latter being in operable connection with suitable flue connections which are not shown.

The air chamber member 2 is provided with a bottom 8, a vertically diametrically extending splitter baffle 9, and a top baffle plate 10 having a central aperture 11. The baffle 9 is provided with flanges 12, 13 and 14 which secure the baffle 9 to the bottom 8, baffle plate 10, and housing 1, as clearly shown in Figure 1. As shown in Figure 3 the vertical baffle plate 9 divides the air chamber 3 into two compartments of substantially equal volume. Other equivalent means may be used for holding the baffle plate 9 in position.

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In the pot chamber section 5 there is disposed a pot 15 which is mounted on the flange 16 extending inwardly from the combustion chamber member 6, said pot 15 having a concave bottom member 17 on which there is maintained a constant pool O of liquid fuel such as a hydrocarbon oil. The oil is introduced into the bottom of the pot 15 by means of a liquid fuel line 18 provided with a valve 19.

The wall 20 of the pot 15 has a series of apertures 21 therein for the introduction of primary air. For the introduction of secondary air, there are provided two rows of secondary air inlets 22 and 23 spaced circumferentially around the uppermost portion of the pot 15. These secondary inlets are about $\frac{7}{64}$ of an inch in diameter and are spaced about ¼ inch center to center. The pot 15 is provided with tabs 15a to thereby provide for the suspension of the pot on the interior flange 16. Carried by the pot 15 and partially closing the same is a flame ring 24 having a central aperture 25.

A tertiary source of air supply is provided by apertures 26 positioned circumferentially of the flame 29, said apertures being preferably about ½ inch in diameter and spaced about 2¼ inches apart. The apertures 26 supply the air directly into the combustion chamber 7. Liquid fuel is introduced into the concave bottom 17 of the pot 15 and a layer of oil O accumulated on the bottom as diagrammatically shown in Figure 1. The depth of the oil layer may vary considerably as for example from ⅛ of an inch to ⅝ of an inch in vertical thickness at the central portion of the bottom member but preferably varies from $\frac{3}{16}$ of an inch to $\frac{4}{16}$ of an inch at the thickest portion of the oil layer O. In the usual pot burner the liquid fuel supplied to the bottom 17 of the pot 15 is vaporized directly by the heat of combustion in or above the pot. In contra-distinction thereto, in accordance with the present invention, a layer of oil O is maintained on the bottom 17 of the pot and boiled to constantly supply vapor or gas. It takes a short period of time for the burner to operate properly after being initially started but once vaporization of the oil from the body of the oil O is initiated, there is a constant vaporization from the oil body.

This is a more advantageous procedure than that afforded by introducing into the bottom 17 of the pot a steady small quantity of liquid fuel which is substantially directly vaporized by reflected heat, that is, no pool of oil is allowed to accumulate in the concave bottom 17 of the pot 15. The vaporized hydrocarbon emanating from the surface of the liquid fuel oil pool or reservoir O, mixes with the primary air issuing from apertures 21 to produce a mixture which is burned in the presence of secondary and tertiary air.

The tertiary air is supplied substantially along the exterior surface of the combustion chamber 7 and is not directly introduced into the base 30 of the flame 29 as has been proposed and is customary in the prior art. When the secondary air is introduced at the base 29 of the flame 20 or closely adjacent thereto, the flame or hydrocarbon-air mixture is cooled to a point where combustion is not efficiently effected.

The tertiary air is introduced closely adjacent the wall of the combustion chamber 7 so as to be heated by the radiant heat of the flame before coming in contact with the flame 29 itself. When the air streams are so-positioned, the tertiary air enters the flame at a distance substantially above the base 30 of the flame. For example, the tertiary air streams do enter the flame 29, at a distance from 6 to 12 inches, and preferably 8 to 10 inches above the base of the flame. This procedure has the additional advantage of allowing the fresh tertiary air to combine with the flame at the outer edges of the flame which are normally deprived of sufficient oxygen to be substantially completely combusted. Introducing the tertiary air in the manner set forth, the flame burns as a very bright white flame having a temperature between about 2300 and 2600° F. If the tertiary air were introduced at the base of the flame, said air would have a cooling effect on the flame or the mixture at the base of the flame because not enough hydrocarbons have been burned at the base of the flame to develop the heat necessary to maintain a high rate of combustion. By causing the tertiary air to combine with the flame at approximately 8 to 12 inches above the base of the flame, sufficient hydrocarbons are burned to increase the flame temperature and also sufficient radiant heat has been turned into the tertiary air streams to raise the temperature of the streams to substantially the temperature of the flame itself to thereby cause an accelerated combination of the air with the hydrocarbon fuel mixture. The burner of the present invention burns the oil with a flame of high intensity and to a height of four to five feet above the base of the combustion chamber.

It has been proposed to supply secondary air above a high fire ring and tangentially thereto by a pair of diametrically opposed and radially extending air conduits which surround the traveling mixture of vaporized hydrocarbon and primary air. In the present invention, the secondary air is supplied as set forth and the tertiary air is supplied to the combustion chamber 7 through a series of apertures 16 circumferentially of the flame 29, said air being preferably supplied at a pressure of between $\frac{1}{16}$ and ½ of an inch of water, depending upon the amount of oil burned per unit of time in the combustion chamber 7. The provision of a split vertically extending baffle 9 prevents whirling of the flame 29. If the flame 29 is permitted to whirl, the diameter of the flame becomes smaller and it does not reflect enough heat to continue the vaporization of oil from the surface of the oil layer or pool O. This results in the building up of the oil pool O to such a thickness that it will automatically trip the fuel oil supply valve thereby cutting off the liquid fuel supply and the burner will cease to operate. As previously pointed out the tertiary supply of air is positioned to inhibit whirling of the flame 29.

An air conduit 31 as shown in Figure 3 supplies air to the chamber 3.

In accordance with the present invention there has been provided a pot type burner, an outer housing therefor, a burner pot disposed in the lower portion of the housing and provided with a bottom, said housing also having an air chamber below the burner pot and a combustion chamber member having a combustion chamber disposed above the pot. A high fire ring partially closes the top of the pot, said ring being provided with a central aperture. Primary air apertures are disposed at various levels in the wall of the pot. Means are provided for delivering liquid fuel adjacent to the bottom of the pot. Means are also provided for delivering secondary air to the mixture of primary air and vaporized fuel rising from the pot. A top plate partially closes the air chamber. The burner has means for supplying air substantially exteriorly of the burner flame. In one form of the invention, a pool of liquid fuel is provided on the pot bottom, as hereinbefore specifically set forth. A vertically extending baffle is disposed in the air chamber to divide the chamber into two portions to substantially inhibit the whirl of air introduced therein. The combustion chamber is provided with an outer wall having at its lower portion an inwardly extending circumferentially disposed interior flange, having therein circumferentially spaced apertures for supplying tertiary air to the burner flame.

There is herein disclosed a method comprising maintaining a layer of liquid fuel on the bottom of the burner pot, heating said fuel to the boiling point which, of course, will vary with the different kinds of fuel but in general may vary between 350° F. and 450° F. The boiling of the layer of liquid fuel on the concave bottom of the burner pot produces fuel vapors. However, during said boiling step the layer of the liquid fuel is maintained on the bottom of the pot. The air is introduced into the air chamber in a plurality of separate streams, preventing the air from whirling while in the chamber, and as it issues therefrom. There is formed a non-whirling mixture of fuel vapors and primary air, and secondary air is supplied to the non-whirling mixture of the vaporized fuel and primary air rising from the burner pot. The so-produced, non-whirling mixture is burned in the combustion chamber in the presence of a plurality of separately spaced air streams, supplied externally and circumferentially, of the burner flame.

I claim:

1. In a pot-type heater, an outer housing, a burner pot disposed in the lower portion of said housing and provided with a bottom, an air chamber member located below the burner pot, said member having a side wall and a bottom wall, a combustion chamber member having a combustion chamber disposed above said pot, a high fire ring partially closing the top of the pot, said ring being provided with a central aperture, primary air apertures disposed at various levels in the wall of the pot, means for delivering liquid fuel adjacent to the bottom of the pot, means including apertures below the high fire

ring for delivering secondary air to the mixture of primary air and vaporized fuel rising from the pot, a vertically disposed baffle extending substantially diametrically across said air chamber below said pot to divide the chamber below said pot into two portions to reduce the whirling of air introduced therein, means for introducing air into each portion of said divided chamber, a top plate partially closing said air chamber, said plate being apertured substantially centrally to provide for the passing of air to the air outlets, and means for supplying tertiary air in a plurality of streams adjacent the interior surface of the combustion chamber to the burning mixture of vaporized fuel and secondary air.

2. In a pot-type heater, an outer housing, a burner pot disposed in the lower portion of said housing and provided with a bottom, an air chamber member located below the burner pot, said member having a side wall and a bottom wall, a combustion chamber member having a combustion chamber disposed above said pot, a high fire ring partially closing the top of the pot, said ring being provided with a central aperture, primary air apertures disposed at various levels in the wall of the pot, means for delivering liquid fuel adjacent to the bottom of the pot, means including apertures below the high fire ring for delivering secondary air to the mixture of primary air and vaporized fuel rising from the pot, a vertically disposed baffle extending substantially diametrically across said air chamber below said pot to divide the chamber below said pot into two portions to reduce the whirling of air introduced therein, means for introducing air into each portion of said divided chamber, annular flange means extending inwardly from said air chamber side wall and partially closing said air chamber, said annular flange means being apertured substantially centrally to provide for the passing of air to the air outlets, and means for supplying tertiary air in a plurality of streams adjacent the interior surface of the combustion chamber to the burning mixture of vaporized fuel and secondary air.

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