Aug. 14, 1945. M. D. HUSTON 2,382,419

POT TYPE LIQUID FUEL BURNER AND AIR SUPPLY MEANS THEREFOR

Filed June 26, 1942

Fig. 1

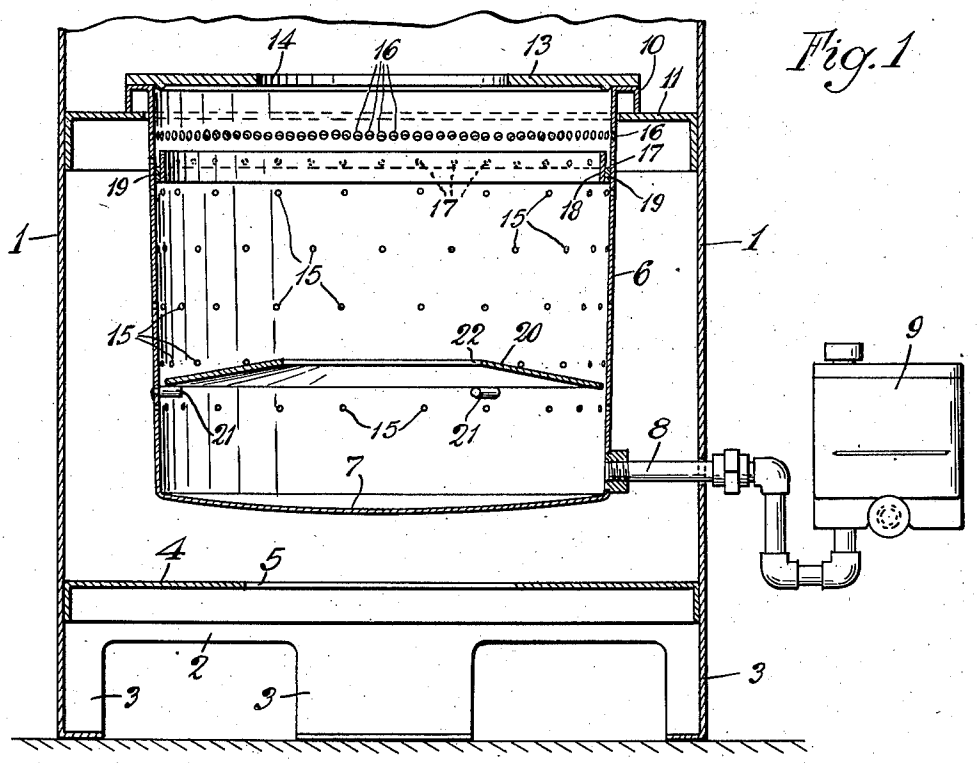


Fig. 2

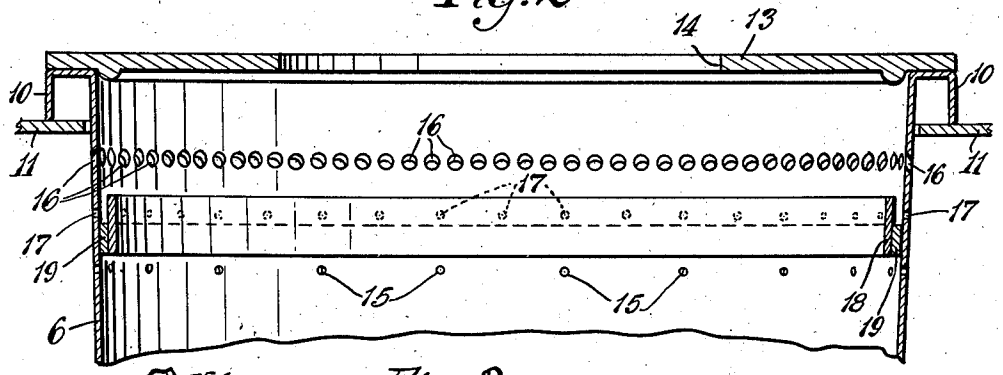


Fig. 4

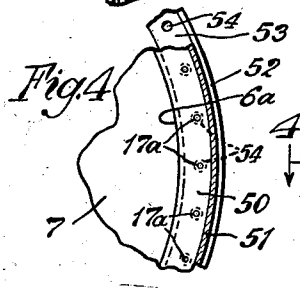
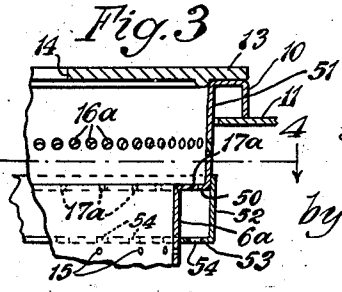


Fig. 3



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POT TYPE LIQUID FUEL BURNER AND AIR SUPPLY MEANS THEREFOR

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7 Claims. (Cl. 158—91)

The invention relates to an improvement in burners and particularly to pot type burners.

One purpose is to provide improved flame propagating means whereby quieter operation and flame stabilization are obtained.

Another purpose is to provide improved means for delivering secondary air whereby quieter operation is obtained.

Other purposes will appear from time to time in the course of the specification.

The invention is illustrated more or less diagrammatically in the accompanying drawing wherein:

Fig. 1 is a vertical axial section through a heater illustrating the invention;

Fig. 2 is a similar partial section on an enlarged scale;

Fig. 3 is a partial vertical section through a variant form of the device; and

Fig. 4 is a section on the line 4—4 of Fig. 3.

Like parts are indicated by like symbols throughout the specification and drawing.

Referring to the drawing, 1 generally indicates any suitable outer housing, which may for example be in the form of a cylindrical drum. It may be supported by any suitable means, for example the bottom ring 2, having a plurality of feet 3, which space the structure upwardly from the floor or surface upon which it is supported and permit air to flow therebeneath. 4 is a bottom partition having a central aperture 5 for admission of air to the space within the drum 1.

6 illustrates a burner pot having a more or less concave bottom 7. 8 is any suitable liquid fuel inlet line, the flow of fuel along which may be varied or controlled by any suitable means not herein shown and not of itself forming part of the present invention. Illustrated for example is a conventional float chamber 9. It will be understood that, either automatically or manually, the flow of fuel along the line 8 is controlled, and thereby the combustion within the pot 6. The pot 6 is provided with an upper flange 10, which may rest upon a supporting ring 11 extending inwardly from the wall of the drum 1. It will be understood that the space above the ring 11 and above the top of the pot 6 provides a combustion chamber.

A flame ring 13 may be employed, the central aperture 14 of which connects the interior of the pot 6 with the interior of the combustion chamber. The walls of the pot 6 are provided with a plurality of primary air inlet apertures 15. It will be understood that liquid fuel passing out upon the floor 7 from the line 8 will be vaporized by the heat of combustion occurring above the fuel in or above the pot. The vaporized hydrocarbon rises in the pot and mixes with air flowing in through the primary air inlet apertures to form a preliminary or primary mixture. This primary mixture then receives a supply of secondary air through an upper row of secondary air inlets 16, which are herein shown as adjacent the top of the pot. A lower row of somewhat smaller and less closely spaced secondary air inlet apertures 17 is employed.

The secondary air inlet apertures 17 is a baffle ring or sleeve 18, which is spaced inwardly somewhat from the wall of the pot by any suitable spacer 19. It will be realized, of course, that, whereas separate layers of sheet metal are shown, a single integral member may, if desired, be employed, which may vary in size and shape. What is essential is that the members 18 or 19, or their equivalent, provide a space the bottom of which is closed and the interior of which is in communication with the lower secondary air inlets 17. The result is an upward delivery of secondary air at relatively low velocity toward the bases or bottoms of the jets of secondary air which pass inwardly through the secondary air inlets 16.

If desired, the pilot ring 20 may be employed, located in a lower portion of the pot and supported for example upon supporting studs or rivets 21 and provided with the secondary passage 22. It will be observed that the ring 20 is located above the lowest of the primary air inlets 15, and provides a small or pilot burner when the rate of combustion is reduced, by substantially diminishing the rate of flow of fuel inwardly along the line 8. When the burner is employed at the pilot stage, the flame propagating baffle sleeve is not performing any function, as combustion takes place only in the lower portion of the pot. However, at high fire the liquid fuel is supplied at such a rate that all of the primary air inlet apertures 15 are necessary to complete the primary mixture, and combustion takes place at or above the ring 18. The jets of air flowing inwardly from the secondary air inlet apertures 17 provide the necessary secondary air for complete combustion, and the flame rises upwardly through the aperture 14 and into the combustion chamber above the pot 6, and within the lower portion of the drum 1.

At the high stage, in pot type burners of the type herein shown, under some circumstances there is a tendency to noisy combustion. The

flame dances or flashes back and forth to and from the wall of the pot, along the axis of delivery of the jets from the inlets 16. I find that I obtain efficient flame propagation, under all conditions, by adding a small amount of additional secondary air, which preferably is delivered at low velocity upwardly toward the bases of the air jets. The result is quiet operation and a stabilized flame regardless of the velocity of the secondary air.

Referring to Figs. 3 and 4, I illustrate a variant form of the device in which the pot 6a is provided, adjacent its top, with an outwardly extending shoulder 50 and an upwardly extending portion 51 of somewhat greater diameter than the pot 6a. The secondary air inlets 16a are provided in the pot portion 51. Air inlets 17a are located in the generally horizontal or outwardly extending portion 50. Thus, instead of employing the directing sleeve 18, I direct the air upwardly by varying the formation of the pot. I may also employ under some circumstances an exterior expansion chamber, which may for example be formed by an angle member 52, having a bottom wall 53 provided with a plurality of air inlet apertures 54.

It will be realized that, whereas a practical and operative device has been described and illustrated, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of the invention. It is therefore wished that the description and drawing be taken as in a broad sense illustrative or diagrammatic, rather than as a limitation to the precise showing.

For example, whereas the secondary air is shown as admitted through a plurality of air inlets 16 located below the top of the pot, other means may be employed for admitting the secondary air through the wall of the pot or over the top of the pot. What is essential is that whatever means are employed, additional secondary air is delivered at relatively low velocity upwardly along a path or paths intersecting the secondary air jets.

The invention is illustrated as applied to a pot type burner in which the axis of the pot is vertical and liquid fuel is delivered to the bottom of the pot. It is equally applicable, however, to pot type burners in which the axis of the burner is horizontal or at an angle to the vertical. It may be applied, for example, to such structures as are shown in the co-pending James L. Breese and Bruce Hayter application Serial No. 442,414, filed in the United States Patent Office on May 11, 1942, which is assigned to the same assignee and which has matured into Patent No. 2,348,721, dated May 16, 1944. It may also be employed with gaseous fuel, such as natural gas.

An important advantage in the present invention is the provision of substantially noiseless combustion. This is particularly important in pot type burners which are frequently employed in relatively light structures used as space heaters and therefore present in the space or room to be heated. In a pot type burner such as shown in the present drawing, jets of inflowing air, such as flow from the apertures 16, mix with the vaporized hydrocarbon in the combustion chamber and form pencils or jets of flame. It is important to keep the base of each such flame solidly against the wall of the pot. As soon as the base of the flame moves away from the pot wall, it vibrates back and forth and sets up a series of sound waves. This is a major cause of noisy burners. In the present instance, I add a small amount of secondary air at the base of the jets of air and flame flowing from the secondary air inlets. This air is preferably delivered at an angle to the flow of the air through the aperture. The air velocity is far below the flame velocity and therefore the base of the flame never leaves the side wall of the burner. I have therefore provided a very simple method and apparatus for silencing burners which are particularly adaptable to pot type burners burning liquid hydrocarbon fuels.

What is claimed is:

1. In a pot type burner, a burner pot having a closed end and an open end, and a circumferential wall, said wall having a plurality of primary air inlet apertures spaced circumferentially thereabout at various distances from the closed end of the wall, means for delivering a liquid fuel to the interior of the pot for vaporization, the wall of the pot adjacent the open end being provided with a plurality of secondary air inlet apertures arranged circumferentially about the pot, and means for delivering a flow of air directly across said apertures, closely along the inner face of the pot wall, including a ring slightly inwardly spaced from the inner face of the pot wall and adjacent but vertically out of line with the secondary air inlet apertures, the space between the pot wall and the edge of the ring away from the secondary air inlet apertures being closed, the pot wall having apertures in communication with the space between said ring and the pot wall, said ring being located on the side of the secondary air inlet apertures away from the open end of the pot, whereby the air delivered by said ring is directed toward the open end of the pot.

2. In a pot type burner, a burner pot having a closed end and an open end, and a circumferential wall, said wall having a plurality of primary air inlet apertures spaced circumferentially thereabout at various distances from the closed end of the pot, means for delivering a liquid fuel to the interior of the pot for vaporization, the wall of the pot adjacent the open end being provided with a plurality of secondary air inlet apertures arranged circumferentially about the pot, and means for delivering a flow of air directly across said apertures, closely along the inner face of the pot wall, and in the direction of the open end of the pot.

3. In a pot type burner, a burner pot having a closed end and an open end, and a circumferential wall, said wall having a plurality of primary air inlet apertures spaced circumferentially thereabout at various distances from the closed end of the pot, means for delivering a liquid fuel to the interior of the pot for vaporization, the wall of the pot adjacent the open end being provided with a plurality of secondary air inlet apertures arranged circumferentially about the pot, and means for delivering a flow of air directly across said apertures, closely along the inner face of the pot wall, and in the direction of the open end of the pot, and a centrally apertured flame ring partially closing the open end of the pot.

4. In a pot type burner, a burner pot having a closed end and an open end, and a circumferential wall, said wall having a plurality of primary air inlet apertures spaced circumferentially thereabout at various distances from the closed end of the pot, means for delivering a liquid fuel to the closed end of the pot for vaporization, the wall of the pot adjacent the open end being provided with a plurality of rows of secondary air inlet apertures arranged circumferentially about the pot, such

secondary air inlet apertures being more closely spaced, circumferentially, than the primary air inlets, and means for directing air upwardly to the bases of the jets inflowing through an upper row of said secondary air inlets, including an annular, generally cylindrical baffle mounted on the pot wall and defining, with the pot wall, a space in communication with a lower row of the secondary air inlet apertures in the pot wall.

5. In a pot type burner, a burner pot having a circumferential wall, an open end and a closed end wall opposite said open end, means for delivering fuel on to said closed end of the pot said circumferential wall having therein a plurality of circumferentially spaced primary air inlets located at various distances from the ends of the pot, and having a plurality of circumferentially spaced secondary air inlets located adjacent the open end of the pot, and means for delivering additional air upwardly toward the bases of the jets flowing into the pot through said secondary air inlets, said secondary air inlets being inclined toward the open end of the pot.

6. In a pot type burner, a burner pot having a circumferential wall, an open end and a closed end wall opposite said open end, means for delivering fuel on to said closed end of the pot said circumferential wall having therein a plurality of circumferentially spaced primary air inlets located at various distances from the ends of the pot, and having a plurality of circumferentially spaced secondary air inlets located adjacent the open end of the pot, and means for delivering additional air upwardly toward the open end of the pot and toward the bases of the jets flowing into the pot through said secondary air inlets.

7. In a pot type burner, a burner pot having a circumferential wall, an open end and a closed end wall opposite said open end, means for delivering fuel on to said closed end of the pot said circumferential wall having therein a plurality of circumferentially spaced primary air inlets located at various distances from the ends of the pot, and having a plurality of circumferentially spaced secondary air inlets located adjacent the open end of the pot, and means for delivering additional air upwardly toward the open end of the pot and toward the bases of the jets flowing into the pot through said secondary air inlets, including an annular baffle mounted on the inner wall of the pot.

MILTON D. HUSTON.