Sept. 12, 1944. J. L. BREESE 2,357,997

OIL BURNING PILOT

Filed May 28, 1941

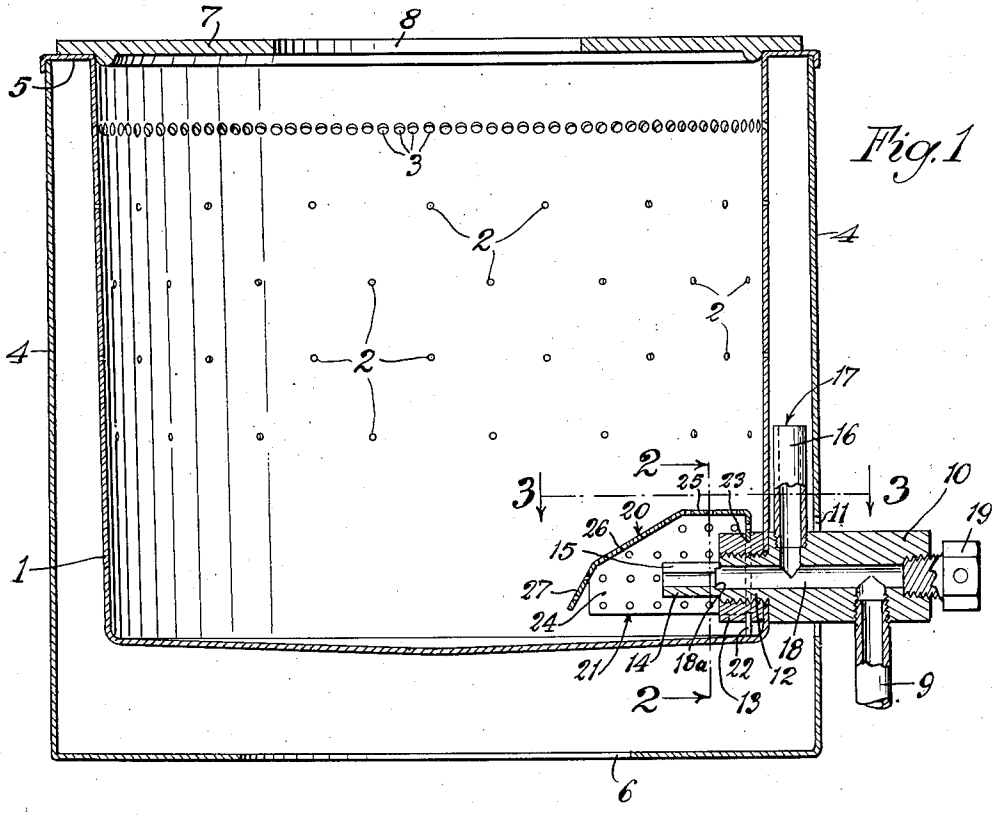


Fig. 1

Fig. 2

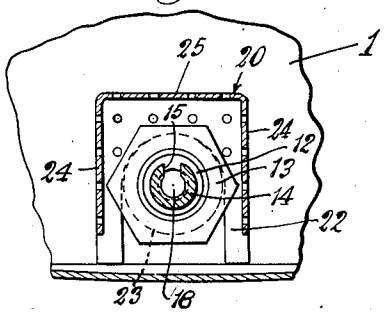


Fig. 3

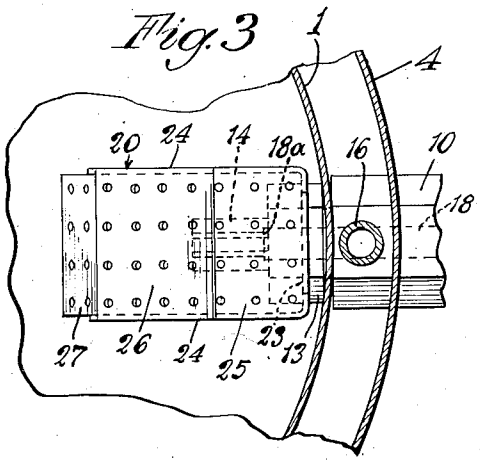
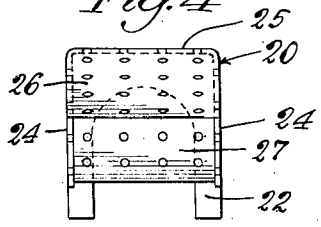


Fig. 4



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OIL-BURNING PILOT

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Application May 28, 1941, Serial No. 395,588

5 Claims. (Cl. 158—91)

My invention relates to an improvement in pilot lights for liquid hydrocarbon burners, and has for one purpose the provision of a pilot light which shall employ the same liquid fuel supply as the burner as a whole.

Another purpose is the provision of an improved pilot light which permits a very low turndown.

Another purpose is the provision of a pilot light which produces a minimum of smoking or carbon deposit.

Another purpose is the provision of an improved pilot light in which a pilot chamber is provided within and in communication with a pot type burner and associated with the normal liquid fuel supply means.

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

I illustrate my invention more or less diagrammatically in the accompanying drawing wherein:

Fig. 1 is a vertical axial section;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is an end view of the pilot housing.

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

Referring to the drawing, 1 generally indicates a burner pot having a plurality of primary air inlets 2 located at various levels in the wall of the pot. I may employ any satisfactory means for admitting secondary air, but I illustrate herein a plurality of closely spaced secondary inlets 3 located adjacent the top of the pot. Any suitable means may be employed for supplying air through the apertures 2 and 3. I illustrate for example an outer housing or drum 4, which may be connected to the pot 1 as by a top flange 5 of the pot. 6 is an air inlet aperture at the bottom of the drum 4. 7 is any suitable fire ring having a central aperture 8. As herein shown, it may simply be superposed upon the top of the pot.

9 is a liquid fuel inlet pipe from any source of liquid fuel not herein shown. Any suitable valve means not herein shown may be employed for varying or controlling the flow of fuel along the pipe 9. It will be understood also that any appropriate means for controlling the level of the fuel may also be employed.

10 generally indicates a nozzle fitting extending inwardly through an aperture 11 in the wall of the drum 4 and abutting against the outer face of the pot 1. 12 is a screw threaded portion projecting inwardly into the interior of the pot. 13 is a nut whereby the fitting 10 may be secured in relation to the pot. Extending beyond the screw threaded portion 12 and the nut 13 is the nozzle proper 14, placed somewhat above the bottom of the pot, and which may have its upper portion longitudinally slotted or cut away as at 15.

16 is an air tube, preferably located in the space between the pot 1 and the drum 4 and extending upwardly in close proximity to the outer wall of the pot 1. Its top is open, as at 17, whereby air may pass into the fuel passage 18 of the fitting 10. 19 is any suitable cleanout plug at the outer end of the fitting 10. 18a is a dam to back up the fuel in the passage 18.

20 generally indicates a pilot housing or box. In the form of Figs. 1 to 4 it is illustrated as having a clearance between its lower edge 21 and the bottom of the pot. It may be mounted in any suitable fashion, as by the provision of a rear wall 22 having an edge portion extending into the slot 23, in the nut 13. Particularly in the form of Figs. 1 to 4, the box 20 is provided with generally vertical foraminous side walls 24 and a top wall having a horizontal portion 25, an inclined portion 26, and a terminal and even more inclined portion 27. The nozzle proper 14 is thus housed within a foraminous housing or box, and fuel drops from the end of the nozzle upon the bottom of the pot in an area located within the box 20.

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

The use and operation of my invention are as follows:

In the employment of pot type burners a liquid hydrocarbon may be supplied to the bottom of the pot, as in the forms herein shown. The liquid fuel is vaporized on the bottom of the pot in response to the heat of combustion taking place in the upper portion of the pot or above the pot. As the vaporized hydrocarbon rises, it mixes with the primary air flowing in through the apertures 2, to produce an initial mixture of air and vaporized hydrocarbon which is converted to the final combustible mixture by the secondary air flowing in through the apertures 3.

At high stages of combustion, when a full supply of fuel flows through the pipe 9 and the nozzle 14, the final mixture burns at or above the

level of the secondary inlets 3, and the heat of combustion causes the vaporization of the fuel progressively supplied to the bottom of the pot. The fire is controlled by controlling the volume of fuel delivered from the nozzle 14. When, by the use of any suitable valve control means, the supply of the liquid hydrocarbon is reduced to a minimum, the small volume then is vaporized and burned at or about the pilot piece or shell 20.

This primary mixture of vaporized hydrocarbon and air flowing in through the air tube 16 is burned within the pilot piece 20, the function of the holes in the pilot piece being to balance the pressure inside the combustion compartment thus formed. Final combustion begins in the pilot piece or housing and flame flows through the holes. The pilot piece picks up heat from the heat of combustion and radiates it back to the nozzle. The jets of flame which pass through the holes may pick up additional air outside of the pilot piece.

I find it advantageous to slot or cut away the nozzle tip, as shown at 15, and the mixture of air and hydrocarbon receives additional air as it flows along the terminal portion of the nozzle 14. As soon as high fire is desired and the flow of fuel is increased, the fuel then flows in increasing volume down upon the bottom of the pot, and the level of combustion rises as the fuel supply increases, until full combustion has taken place at or above the secondary apertures 3.

In effect I provide a rather definitely defined zone or area which is kept at a temperature considerably above the evaporation temperature of the oil, and the liquid oil flowing through the passage 18 reaches this area or zone at a temperature above vaporization. The hydrocarbon cracks but does not thereafter contact the liquid oil. As soon as the fuel is cracked, any solid particles are carried along with the air away from the liquid and are virtually in a gaseous state.

I find it desirable to make the nozzle of steel so that it will not readily transmit the heat back to the liquid hydrocarbon. I employ a nozzle which protrudes well into the combustion zone, and I make the side wall of the nozzle as thin as is possible with the necessary mechanical strength. By slotting or cutting away the top of the nozzle, as at 15, I obtain the result that the point of evaporation can be anywhere in the trough so provided without permitting the fuel to drop off as a liquid; also, without vaporizing the liquid too far back into the nozzle.

I find it advantageous also to provide a limiting means or shoulder, as shown for example at 18a, to act as a dam and to back up some of the oil in the bottom of the inlet nozzle or passage. In the event that any carbon accumulates in the back of the dam and is not swept through the nozzle by the air and fuel flowing therethrough, it has a wick action equivalent to the damming up of fuel in the bottom of the nozzle.

Basically, what I provide is a small smokeless oil burner operating at the tip of the main oil supply pipe. The oil is vaporized before leaving the end of the pipe, and the dry gas is mixed with air issuing from the same pipe at a velocity sufficient to stop burning back in the oil inlet. This gas and air mixture is then burned at a point near enough to the nozzle to provide the proper heat for vaporizing the oil before it leaves the nozzle. The air coming through the oil pipe or nozzle supplies the primary air only, and the heat applied to the end of the nozzle supplies the means for turning the oil, gas and air into a dry gas. This mixture then receives sufficient secondary air in the pot to maintain final and smokeless combustion.

The structure essentially includes two parts, first, the nozzle and mixing member which carries the fuel, and the primary air, to the pot and which receives sufficient heat completely to vaporize the liquid hydrocarbon before it escapes from the nozzle. In order to keep the gas thus formed from backfiring into the nozzle, air is delivered at a rate of flow above that of flame propagation. Secondly, in order to maintain the nozzle heated to a sufficient temperature for complete vaporization of the fuel, it is necessary, not only that the nozzle extend into the pot, but that means be employed to localize pilot combustion and to return heat to the nozzle tip.

In effect, after the combustible gas has been formed, I provide a supplemental combustion chamber which lies wholly within the pot itself, and I do not wish to be limited in my claims to any specific form of localizing and heat reflecting means except so far as the limitation is specifically written into the claims.

An important feature of my device is that the liquid hydrocarbon may be fed by gravity along the pipe, and a sufficient primary air supply is provided by natural draft alone, although under some circumstances I may wish to employ means for producing excess air pressure. In any event, the liquid hydrocarbon flows along the nozzle with the primary air supply, and the nozzle is heated sufficiently to vaporize completely the liquid hydrocarbon so that it does not escape from the nozzle in liquid condition. Any tendency to burn back into the nozzle is prevented by maintaining a rate of air flow or rate of flow of the ensuing mixture greater than the speed of flame propagation.

I claim:

1. In combination, a burner pot having a circumferential wall, a closed end and an open end, said circumferential wall having a plurality of primary air inlet apertures circumferentially spaced thereabout and located at various distances from the closed end of the pot, said wall being provided with secondary air inlet means adjacent the open end of the pot, a liquid fuel duct, extending into the pot, at a point between the closed end of the pot and the primary air inlet apertures nearest to the closed end of the pot, said liquid fuel duct being spaced away from the closed end of the pot, means for delivering a liquid fuel to the duct for delivery toward the pot, means for supplying air to the inflowing stream of fuel before it leaves the liquid fuel duct, and a foraminous pilot housing located over and extending beyond the delivery end of the liquid fuel duct.

2. In combination, a burner pot having a circumferential wall, a closed end and an open end, said circumferential wall having a plurality of primary air inlet apertures circumferentially spaced thereabout and located at various distances from the closed end of the pot, said wall being provided with secondary air inlet means adjacent the open end of the pot, a liquid fuel duct, extending into the pot, at a point between the closed end of the pot and the primary air inlet apertures nearest to the closed end of the pot, said liquid fuel duct being spaced away from the closed end of the pot, means for delivering a liquid fuel to the duct for delivery toward the pot, means for supplying air to the inflowing stream of fuel before it leaves the liquid fuel

duct, and a foraminous pilot housing located over and extending beyond the delivery end of the liquid fuel duct and between the closed end of the pot and the primary air inlet apertures nearest to the closed end of the pot.

3. In combination, a burner pot having a circumferential wall, a closed end and an open end, said circumferential wall having a plurality of primary air inlet apertures circumferentially spaced thereabout and located at various distances from the closed end of the pot, said wall being provided with secondary air inlet means adjacent the open end of the pot, a liquid fuel duct, extending into the pot, at a point between the closed end of the pot and the primary air inlet apertures nearest to the closed end of the pot, said liquid fuel duct being spaced away from the closed end of the pot, means for delivering a liquid fuel to the duct for delivery toward the pot, means for supplying air to the inflowing stream of fuel before it leaves the liquid fuel duct, and a foraminous pilot housing located over and extending beyond the delivery end of the liquid fuel duct, the direction of delivery of the fuel being generally parallel with the closed end of the pot.

4. In combination, a burner pot having a circumferential wall, a closed end and an open end, said circumferential wall having a plurality of primary air inlet apertures circumferentially spaced thereabout and located at various distances from the closed end of the pot, said wall being provided with secondary air inlet means adjacent the open end of the pot, a liquid fuel duct, extending into the pot, at a point between the closed end of the pot and the primary air inlet apertures nearest to the closed end of the pot, said liquid fuel duct being spaced away from the closed end of the pot, means for delivering a liquid fuel to the duct for delivery toward the pot, means for supplying air to the inflowing stream of fuel before it leaves the liquid fuel duct, and a foraminous pilot housing located over and extending beyond the delivery end of the liquid fuel duct, the duct terminating in an open topped nozzle extending a substantial distance inwardly from the pot wall.

5. In combination, a burner pot having a circumferential wall, a closed end and an open end, said circumferential wall having a plurality of primary air inlet apertures circumferentially spaced thereabout and located at various distances from the closed end of the pot, said wall being provided with secondary air inlet means adjacent the open end of the pot, a liquid fuel duct, extending into the pot, at a point between the closed end of the pot and the primary air inlet apertures nearest to the closed end of the pot, said liquid fuel duct being spaced away from the closed end of the pot, means for delivering a liquid fuel to the duct for delivery toward the pot, means for supplying air to the inflowing stream of fuel before it leaves the liquid fuel duct, and a foraminous pilot housing located over and extending beyond the delivery end of the liquid fuel duct, the duct terminating in a fuel nozzle extending a substantial distance into the interior of the pot, said foraminous pilot piece being mounted on and surrounding said nozzle.

JAMES L. BREESE.