Dec. 4, 1945. R. W. DE LANCEY 2,390,059

LIQUID FUEL BURNER

Filed Jan. 1, 1943 2 Sheets-Sheet 1

Fig. 1.

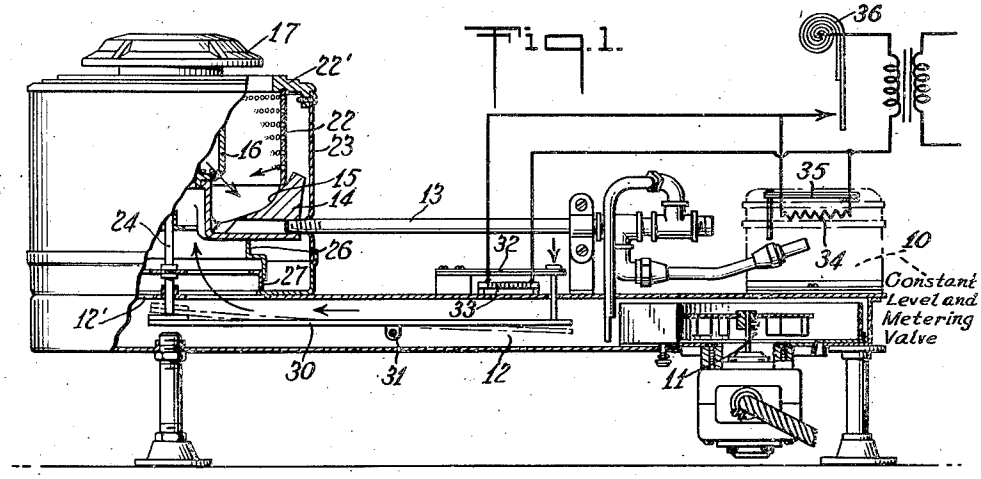


Fig. 2.

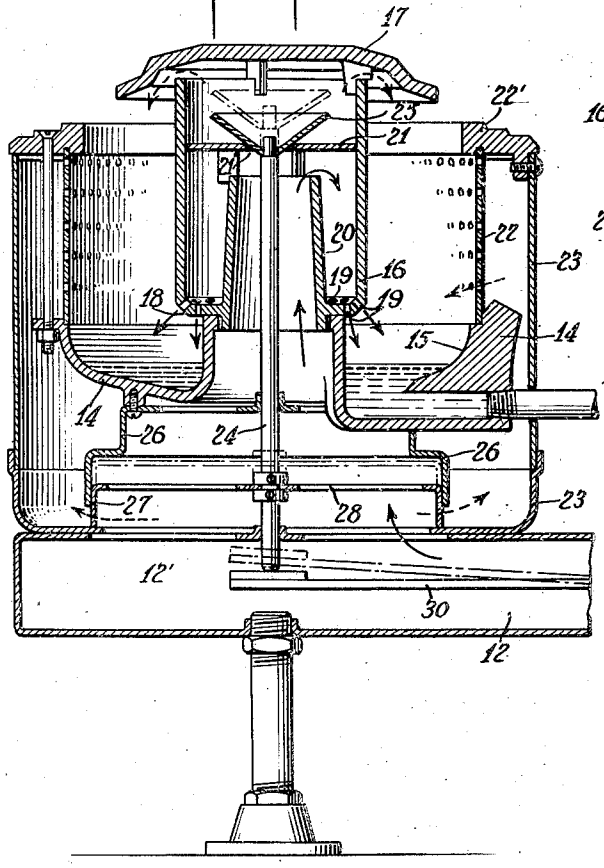
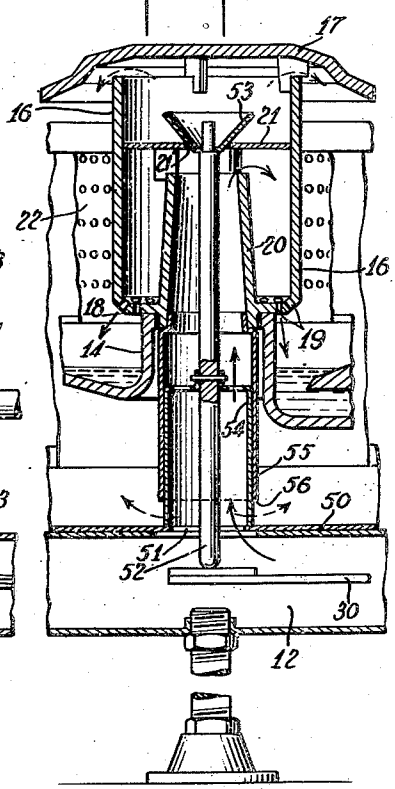


Fig. 3.



INVENTOR
RALPH W. DELANCEY
BY
Jacob Liberman
ATTORNEY

Dec. 4, 1945. R. W. DE LANCEY 2,390,059

LIQUID FUEL BURNER

Filed Jan. 1, 1943 2 Sheets-Sheet 2

Fig. 4.

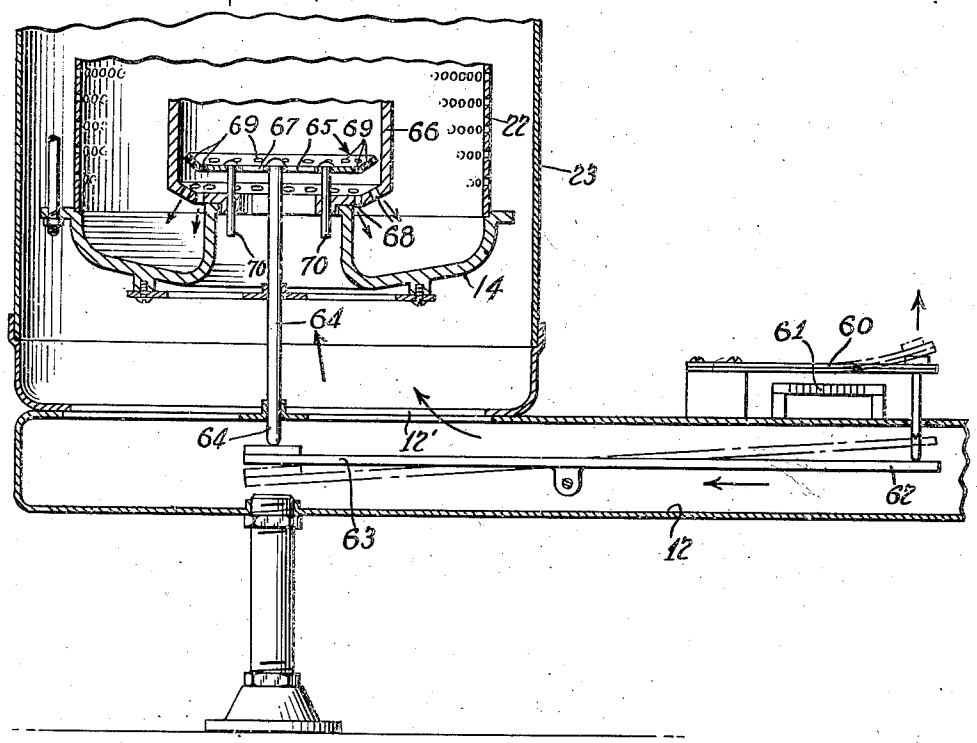
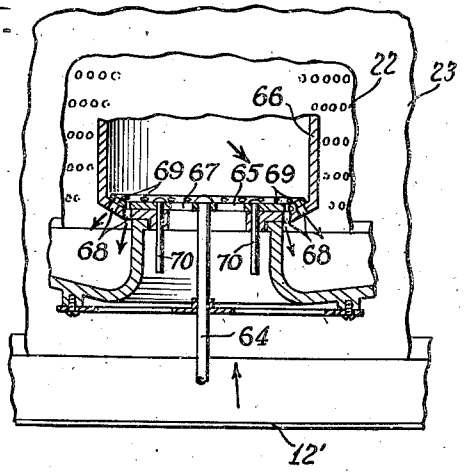


Fig. 5.



INVENTOR
RALPH W. DELANCEY
BY
Jacob Sussman
ATTORNEY

Patented Dec. 4, 1945 2,390,059

UNITED STATES PATENT OFFICE

2,390,059

LIQUID FUEL BURNER

Ralph W. De Lancey, Meriden, Conn., assignor to The Miller Company, Meriden, Conn., a corporation of Connecticut

Application January 1, 1943, Serial No. 470,960

13 Claims. (Cl. 158—91)

The present invention relates to liquid fuel burners, and is more particularly directed toward pot type burners adapted to be supplied with fuel at a high rate for high fire and at a low rate for pilot operation and employing a blower to supply air for combustion.

According to the more usual designs of vaporizing pot type burners of the type referred to the blast of air blown into the vaporizing pot and combustion chamber is determined by the air pressure employed and the size and distribution of the air passages through which the air must travel to get to the various parts of the burner, these air controlling passages being of unvarying dimension so that the proportioning of the air stream is the same whenever the blower is in operation. As it is necessary to provide ample air for complete combustion at high fire, and the burner operates a great deal of the time at low fire, a very great excess of air is passing through the burner at that time.

The present invention contemplates improvements in oil burners of the type referred to according to which a larger proportion of the air is directed down into the vaporizer during low fire and pilot operation than during high fire. This makes it possible to provide a greater proportional supply of oxygen to the inner part of the vaporizer during low fire or pilot operation than during high fire, and to supply a greater portion of air to the remainder of the combustion space in the burner during high fire operation when such added air is required for the combustion of the fuel.

The present invention also contemplates that the redistribution of the air flow will be accomplished by means automatically set into operation at the same time as the metering valve which controls the rate of flow of fuel. Preferably the means for redistributing the air flow is operated by a thermostat having a normal or cold position corresponding with the position of the parts for low fire or pilot operation, and another or heated position corresponding with the position to be assumed during high fire operation, this thermostat being preferably actuated by a heater in parallel with the heater employed in the thermostatically operated metering valve. The operation of these thermostatically operated devices is coordinated by designing them to have the proper time constants.

The accompanying drawings show, for purposes of illustrating the present invention three of the many embodiments in which the invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a side elevational view of a liquid fuel burner with controls and blower, parts being in section;

Figure 2 is an enlarged sectional view of the burner;

Figure 3 is a view similar to Figure 2 showing a modified form of construction; and

Figures 4 and 5 illustrate a further modification.

In the drawings the combined constant level and thermostatically operated metering valve of conventional design is diagrammatically indicated at 10, and the blower for supplying air at 11. The air is blown through a conduit 12 of the burner proper, while the oil flows from the metering valve through pipe 13 to the vaporizer 14 of the burner. This vaporizer is annular and has a sloping lower wall 15 to form a pool of oil of varying depth. The inner part of the vaporizer supports a central air distributor 16 which in turn carries a flame spreader 17. The central air distributor has a portion which extends outwardly, as indicated at 18, to be above the inner part of the vaporizer, and this portion is provided with holes 19 for directing air downward into the inner part of the vaporizer. The central air distributor is also provided with a central chimney-like portion 20 which supports a fixed baffle 21 spaced above the same and adapted to direct air down toward the openings 19. This baffle has a central opening 21' through which air escapes to pass out under the flame spreader.

A perforated sleeve 22 extends upwardly from the outside of the vaporizer. The vaporizer and sleeve are supported from an upper ring 22' and are received in a cylindrical housing 23 which rests on top of the conduit 12 and carries the ring 22'.

A vertical shaft 24 extends from the conduit 12 up through the inside of the vaporizer and the central air distributor and is guided for vertical movement for any suitable means. The upper end of this shaft 24 has a conical damper or shutter member 25 adapted to cooperate with the opening 21' in the baffle 21. The vaporizer supports an annular diaphragm or baffle 26 which reaches down toward the bottom of the housing 23, and, as discussed in my application Serial No. 470,961, filed concurrently herewith, may be designed to reduce the pressure of the air supplied to the perforated sleeve to an amount substantially below the pressure of the air supplied to

the central air distributor. The shaft 24 carries a shutter member 27 movable inside the diaphragm 26 from a position where it restricts or closes off space between the diaphragm 26 and the housing 23.

When the parts are in the position shown in full lines in the drawings all the air which blows in through the conduit 12 passes through the central opening 12' in the conduit, through the perforated top wall 28 of the shutter 27, through the central air distributor and out under the baffle 21 and down through openings 19 into the vaporizer, except that which is allowed to escape about the shutter member 27. When the shaft 24 is moved up to the dotted line position air can escape out under the diaphragm 26, and pass up outside the perforated sleeve 22, and then blow in across the vaporizer, also some of the air coming up through the central air distributor can escape out under the flame spreader. When the parts are in the latter mentioned position air is provided for combustion of the fuel fed for high fire.

In order to automatically effect the movement of the shaft 24 at the proper time it is under the control of a suitable mechanism such as a lever 30 pivoted at 31 and movable from the full line to the dotted line position by a bimetallic thermostat 32 which is under the control of a heater 33.

As shown in Figure 1 of the drawings the heater 33 is in parallel with the heater 34 for the bimetallic operating member 35 of the metering valve. This circuit is usually under the control of a room thermostat, such as indicated at 36, but of course may be under the control of a manual switch. The metering valve will usually supply the proper amount of fuel for pilot operation and both thermostats 32 and 35 will be cool and all the air will be directed down through the openings 19. On demand for heat the thermostat 35 will open the metering valve and in proper timed relation depending upon the heating characteristics for the two thermostats the thermostat 32 will flex downwardly and change the air passages so that the air is directed in the proper manner for burning the large amount of fuel.

In the arrangement shown in Figure 1 one can omit the lower shutter 27 so that at all times air blows in through the perforated sleeve, if desired.

In the construction shown in Figure 3 the vaporizer 14, central air distributor 16, flame spreader 17 and the outer parts of the housing (not shown) are the same as in Figure 2. Instead of providing the bottom of the housing with a large opening, as indicated in Figure 2 here the bottom 50 of the housing has a smaller opening 51 through which all the air from the conduit 12 passes to the burner structure. A vertical rod 52 similar to the rod 24 extends up through the center of the burner, its lower end resting on the thermostatic lever 30 as previously described. The shaft or rod 52 carries an upper cone 53 and a cylinder 54 which is adapted to engage with the housing bottom when the thermostat is cold. The cylinder 54 is received within a sleeve 55 which extends down from inside the vaporizer preferably of small enough diameter so that it can be withdrawn upwardly through the opening in the vaporizer when the central air distributor is removed. The lower edge 56 of the cylinder 55 is spaced above the bottom 50 of the housing so that when the shutter forming cylinder 54 is raised air can pass out under the vaporizer.

In the construction shown in Figures 4 and 5 the thermostat 60 and heater 61 are connected into a control circuit, the same as shown in Figure 1, but here the thermostat is designed to operate in the other direction, that is to say to flex upwardly on being heated. This will permit the adjacent end of lever 62 to rise and the remote end 63 to lower. The lever supports a vertical shaft 64 suitably guided for vertical movement and carrying a shutter member 65 inside the central air distributor 66 and provided with a large central opening 67. The central air distributor has a series of openings 68 larger than the openings 19 contemplated in the construction of Figure 2 and the shutter 65 has small openings 69 corresponding in size with the openings 19. These openings 68 and 69 are kept in registry by guides such as indicated at 70. When the shutter 65 is in the lower position as shown in Figure 5 less air which passes up into the central air distributor is directed down into the vaporizer than when the shutter 65 is up as shown in Figure 4.

From the foregoing it will be apparent that it is possible during low fire or pilot operation to direct into the interior of the vaporizer a much larger proportion of the air supplied by the blower than during high fire. While automatic electrical operation is generally advantageous it is entirely possible to effect the change manually, especially where the fuel control is manual.

Since it is obvious that the invention may be embodied in other forms and constructions within the scope of the claims, I wish it to be understood that the particular forms shown are but a few of these forms, and various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. In a liquid fuel burner, in combination, a constant level valve having a metering valve for delivering liquid fuel at a high rate for high fire or at a low rate for pilot operation, a thermostat for operating the metering valve, a remote controlled heater for the thermostat, an annular vaporizer into which the fuel flows by gravity to form an annular pool, a concentric perforated sleeve above the periphery of the vaporizer, a central air distributor having openings for directing air downwardly into the vaporizer, means for supplying air under positive pressure to the outside of the sleeve and to the inside of the central air distributor, a shutter for controlling the air flowing from the central air distributor to the vaporizer, a second thermostat for operating the shutter, and a second heater energized concurrently with the first, the second thermostat acting to move the shutter to increase the flow of air to the vaporizer in timed relation with the shifting of the metering valve to pilot position.

2. In a liquid fuel burner, in combination, a constant level valve having a metering valve for delivering liquid fuel at a high rate for high fire or at a low rate for pilot operation, a thermostat for operating the metering valve, a remote controlled heater for the thermostat, an annular vaporizer into which the fuel flows by gravity to form an annular pool, a concentric perforated sleeve above the periphery of the vaporizer, a central air distributor carrying a flame spreader and having openings for directing air downwardly into the vaporizer and outwardly below the flame spreader, means for supplying air under positive pressure to the outside of the sleeve and to the inside of the central air distributor, a

shutter for preventing the air from flowing under the flame spreader so that all the air entering the central air distributor must pass downwardly into the vaporizer, a second thermostat for operating the shutter, and a second heater energized concurrently with the first, the second thermostat acting to move the shutter to the open position in timed relation with the shifting of the metering valve to high fire position.

3. A burner such as claimed in claim 2, having a second shutter for controlling the flow of air to the outside of the sleeve, the second shutter moving with the first and being open when the first shutter is open.

4. In a liquid fuel burner, in combination, a constant level valve having a metering valve for delivering liquid fuel at a high rate for high fire or at a low rate for pilot operation, a thermostat for operating the metering valve, a remote controlled heater for the thermostat, an annular vaporizer into which the fuel flows by gravity to form an annular pool, a concentric perforated sleeve above the periphery of the vaporizer, a central air distributor having openings for directing air downwardly into the vaporizer, means for supplying air under positive pressure to the outside of the sleeve and to the inside of the central air distributor, a shutter in the central air distributor and having openings smaller than the openings in the central air distributor for restricting the air flowing from the central air distributor to the vaporizer, a second thermostat for operating the shutter, and a second heater energized concurrently with the first, the second thermostat acting to move the shutter to a position to open the larger openings in timed relation with the shifting of the metering valve to pilot position so as to increase the flow of air to the vaporizer.

5. A liquid fuel burner comprising an annular vaporizer having a downwardly and inwardly sloping wall and adapted to form an annular pool of fuel, a central air distributor having holes to deliver air downwardly onto the inner part of the pool, an outer perforated sleeve to deliver air inwardly across the pool, an air chest about the sleeve and under the vaporizer, means for supplying the air chest with air under pressure for both the sleeve and the central air distributor, means for controlling the rate of flow of fuel for high fire and for low fire respectively, and means operating concurrently with the flow rate control means for increasing the proportion of air which is blown from the central air distributor down into the vaporizer when the burner is operating at low fire.

6. A pot type liquid fuel burner having an annular vaporizer, a central air distributor having downwardly opening holes above the inner part of the vaporizer and an upwardly extending air passage, a flame spreader carried at the top of the central air distributor and under which air escapes into the flame a substantial distance above the vaporizer, means for supplying air to the central air distributor from below, a shutter above the openings for closing the air passage leading to the flame spreader and normally biased to closed position, a thermostat for operating the shutter to open position, means to control the flow of fuel to the vaporizer for high fire and for pilot operation, and means for automatically holding the shutter in the open position when the fuel flow controlling means is adjusted for high fire.

7. A pot type oil burner having a cylindrical outer shell with an opening in the bottom, a blowing air in through said opening, an upper ring carried by the shell, a perforated sleeve below and concentric with the ring and inside the shell, an annular vaporizing pot secured below the ring and having a central opening, a central air distributor above the central opening in the pot, a flame spreader carried by the central air distributor, the central air distributor having air passages for directing a portion of the air forced up into the central air distributor downwardly into the pot the flame spreader and central air distributor, when assembled, providing other air passages for directing another portion of said air out under the flame spreader, a shutter carried in the central air distributor for impeding air movement upwardly toward the flame spreader and delivering air toward the passages which direct it downwardly into the pot, fuel control means to provide fuel for high fire or for pilot operation, and means operable when the fuel control means is adjusted for high fire for automatically opening the shutter.

8. A burner such as claimed in claim 7, having a second normally closed shutter operable by the shutter opening means for regulating the air supply to the shell outside the perforated sleeve and the amount of air which passes through the sleeve.

9. A pot type oil burner having a cylindrical outer shell with an opening in the bottom, a blower for blowing air in through said opening, an upper ring carried by the shell, a perforated sleeve below the ring, an annular vaporizing pot secured below the ring and having a central opening, a central air distributor above the central opening in the pot, a flame spreader carried by the central air distributor, the central air distributor having air passages for directing some of the air forced up into the central air distributor downwardly into the pot, a shutter in the central air distributor having smaller openings than the openings in the central air distributor and opposed thereto, the shutter being movable toward and away from the the openings in the central air distributor so as to regulate the air passing through the same, fuel control means to provide fuel for high fire or for pilot operation, and means operable when the fuel control means is adjusted for high fire for automatically moving the shutter to the position for restricting air flow through the openings in the central air distributor.

10. An oil burner having an annular vaporizer provided with a sloping bottom to form an annular pool of varying depth, means to feed oil at a rate to form such a pool and means to reduce the rate so that as the oil is consumed the pool recedes inwardly, a blower, an air chest receiving air from the blower, an outer sleeve above the periphery of the vaporizer and having holes for directing air inwardly above the vaporizer, a central air distributor having holes for directing air downwardly into the deepest part of the vaporizer, said holes communicating with the air chest and being of such sizes as to deliver air in predetermined proportions for operating the burner at high fire, movable means to redistribute the air flow so that a greater portion of the air may be sent through the holes in the central air distributor, and thermostatically operated means acting concurrently with the fuel flow rate controlling means for actuating the movable means to redistribute the air when the rate is reduced.

11. The method of burning liquid fuel which comprises supplying an annular vaporizer having a sloping bottom with liquid fuel at a high rate to

form a pool therein for high fire operation and at a low rate for a pilot flame, blowing air in fixed proportions against the deeper and the outer peripheral portions of the pool for high fire, and concurrently with the change of rate of fuel flow to the low rate increasing the proportion of air blown toward the deeper part of the pool to increase the air supplied to the narrowing pool surface as the fuel is being consumed.

12. The improvement in annular pot type burners having a central air distributor carried on top of the inner periphery of the pot, the central air distributor having an outer cylindrical wall of larger diameter than the inner periphery of the pot and openings for delivering air downwardly into the pot, a flame spreader carried by and spaced from the top of the central air distributor, and a baffle supported inside the central air distributor above the openings and having an opening smaller than the interior opening in the central air distributor to impede air movement upwardly to the flame spreader and divert air toward the first mentioned openings which includes a movable member having a position for reducing the flow of air through the opening in the baffle.

13. The improvement of claim 12 further characterized by a thermostat for operating the member to the latter mentioned position, and a remote controlled electric heater for the thermostat.

RALPH W. DE LANCEY.