March 4, 1947. D. P. LITZENBERG 2,416,932

OIL BURNER

Filed Aug. 13, 1943 2 Sheets-Sheet 1

Fig. 1.

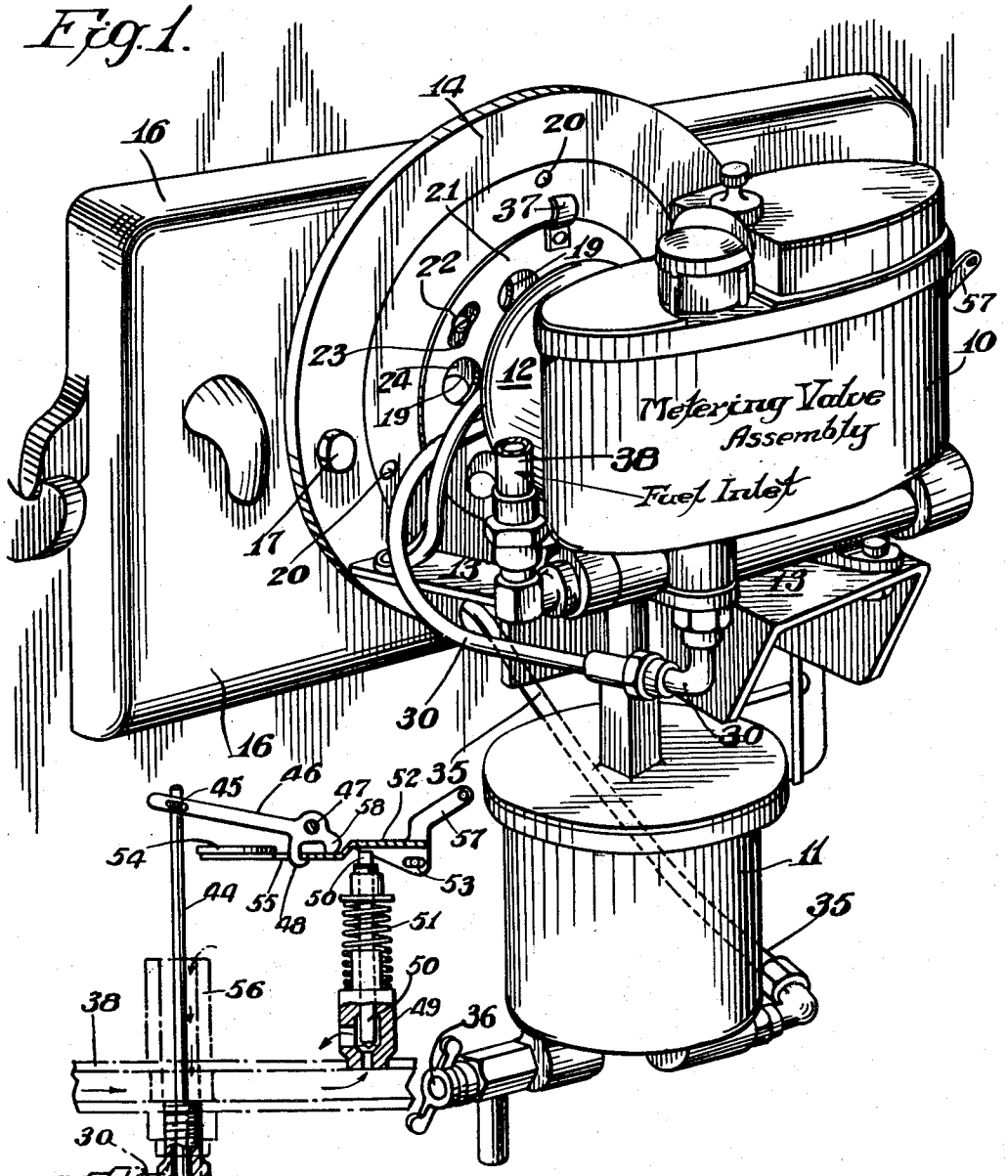


Fig. 5.

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Filed Aug. 13, 1943 2 Sheets-Sheet 2

Fig. 2.

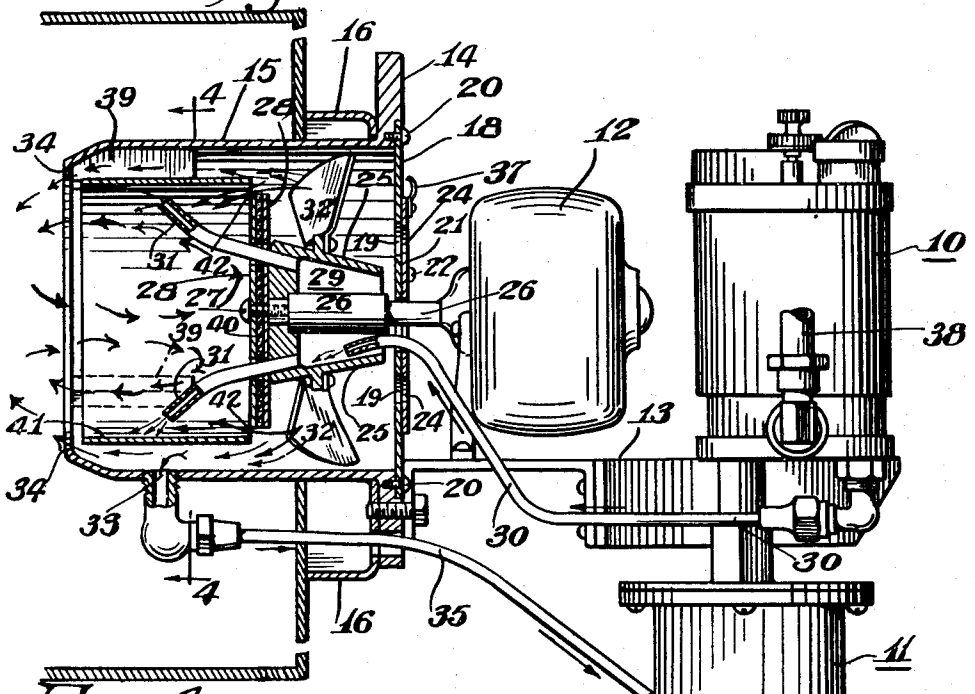


Fig. 4.

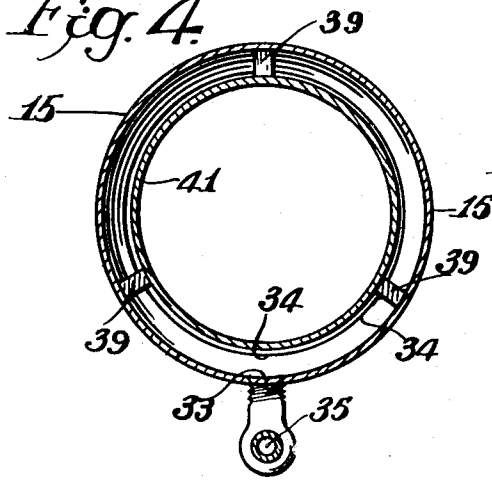
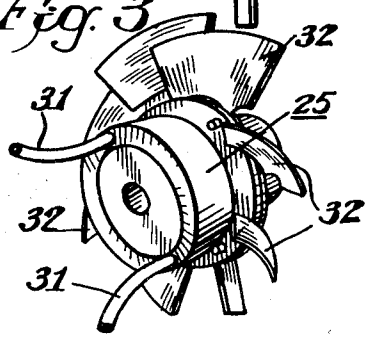


Fig. 3



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UNITED STATES PATENT OFFICE

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OIL BURNER

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Application August 13, 1943, Serial No. 498,566

3 Claims. (Cl. 158—77)

1

The present invention relates to oil burners and it relates more particularly to a certain new and useful oil burner for more efficiently burning fuel oil in a furnace or the like.

An object of the present invention is to provide a simple, economical and efficient burner for fuel oil. Another object of the present invention is to supply an oil burner which will burn the fuel oil with a more effective flame. Still another object of the present invention is to provide an oil burner which will more efficiently vaporize the fuel oil preliminary to combustion thereof.

Other objects and advantages of the present invention are apparent in the following detailed description, appended claims and accompanying drawings.

For the purpose of illustrating the invention, there is shown in the accompanying drawings one form thereof which is at present preferred, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangements and organizations of the instrumentalities as herein shown and described.

Referring to the accompanying drawings in which like reference characters indicate like parts throughout:

Figure 1 represents a perspective view of one embodiment of the present invention as it appears when installed in a furnace.

Figure 2 represents a view partly in elevation and partly in vertical cross-section of the embodiment of Figure 1.

Figure 3 represents a perspective view of the inner rotating element of the embodiment of Figures 1 and 2.

Figure 4 represents a cross-sectional view generally along the line 4—4 of Figure 2.

Figure 5 represents a schematic cross-sectional view of the shut-off mechanism.

In the embodiment illustrated in the drawings, I have shown the novel oil burner construction of the present invention as used with a conventional metering valve 10 for controlling the supply of fuel oil to the burner. The metering valve 10 is provided with automatic thermostatic control means as well as manual control means all well known in the art and, therefore, not described herein. The embodiment shown in the drawings is also provided with automatic shut-off means which will be described in detail hereinbelow.

2

The metering valve and a conventional motor 12 are mounted upon a support 13 which is bolted to the outside of the outer flange 14 of a barrel or sleeve 15, mounted upon a fire door 16; the sleeve 15 extending inside of the door 16 and being supported thereupon by bolts 17 passing through the flange 14. An inwardly-extending flange 34 is formed on the inner end of the sleeve 15.

A plate 18 having openings 19 therein is fastened to the outer end of the sleeve 15 by bolts 20, screw-threadedly connected to the flange 14.

A disc 21 is rotatably mounted upon the outside of the plate 18; pins 22 set in the plate 18 and extending through slots 23 in the disc 21, permitting limited rotation of the disc 21 relative to the plate 18.

The disc 21 has openings 24 therethrough, which can be brought into and out of registration with the openings 19 in the plate 18 by rotation of the disc 21; the openings 24 and 19 being in full registration when the pins 22 are at one end of the slots 23 and being fully out of registration when the pins 22 are at the other end of the slots 23.

A cup-like member 25 is mounted upon the inner end of the shaft 26 of the motor 12; the shaft 26 passing through central openings in the plate 18 and disc 21. A bolt 27 passes through a pair of discs 28 separated by a gasket 40 and through the member 25 and is screw-threadedly connected to the innermost end of the shaft 26 to hold the assembly on said shaft.

An inner cylindrical vaporizing chamber or barrel 41 which is smaller in axial dimension as well as in diameter than the outer barrel 15, has its innermost open end somewhat spaced and recessed from the innermost flanged open end of the outer sleeve 15; the barrels 15 and 41 being spaced apart by a plurality of circumferentially spaced axially extending inner ribs 39 formed on the outer barrel or sleeve 15.

An annular frusto-conical chamber 29 is formed in the member 25; the chamber 29 being open at its end adjacent the plate 18.

A feed-line 30 extends from the metering valve 10 through the disc 21 and the plate 18 and is adapted to deliver fuel oil to the chamber 29 in the member 25.

A plurality of nozzles 31 extend from the chamber 29, through the discs 28, to the interior of the inner barrel 41; the nozzles 31 being set at an angle as shown in Figure 2, so that fuel oil draining from the chamber 29 therethrough will be delivered against the inner wall of the inner barrel

41. The discs 28 are adjacent the end of the barrel 41 and have a somewhat smaller diameter than said barrel so that a small peripheral clearance 42 is provided whereby a limited amount of peripheral air can enter said barrel. Instead of the clearance 42, a peripheral opening may be formed adjacent the rear end of said barrel in other ways known in the art.

A plurality of fan blades 32 are mounted upon the outside of the member 25 and are adapted to blow air inwardly through the space intermediate the outer sleeve 15 and the inner barrel 41 when the shaft 26 and the member 25 are rotated by the motor 12. During such rotation, a relatively slight amount of peripheral air is blown into the barrel 41 through the clearance 42.

The amount of air which so enters the barrel 41 is governed by the position and diameter of the discs 28 relative to the barrel 41 and these elements are so dimensioned that the air entering the barrel 41 will be just sufficient to support combustion of the small amount of oil which is delivered by the nozzles or spinners 31 into the barrel 41 on a "low" setting of the metering valve 10, but will be insufficient to burn anything but a very small part of the oil which is delivered into the barrel 41 on a "high" setting of the metering valve 10.

The greater part of the air-flow created by the rotating fan blades 32 passes through the annular space intermediate the sleeve 15 and the inner barrel 41 and emerges from the sleeve 15 in an annular swirling stream inside the furnace and away from the spaced, recessed inner end of the barrel 41. Thus, on a "high" setting of the metering valve 10, virtually all combustion of the oil takes place inside the furnace and away from both the sleeve 15 and the cylinder 41; little, if any, combustion taking place inside the barrel 41 due to the fact that the small amount of air entering said barrel is insufficient to cause combustion of any appreciable proportion of the relatively large amount of oil delivered by the nozzles or spinners 31 at a "high" setting of the valve 10.

Because of the manner of delivery of the major portion of the air-flow, a central vortex is created which causes some of the hot combustion mixture (including burned and partially burned gases and heated air) to be returned to the barrel 41; this returning combustion mixture entering generally along the center of the barrel 41 and flaring outwardly to leave the barrel again along the periphery thereof, so that, aided by the small peripheral air-flow entering through the clearance 42, it tends to pre-heat the oil delivered by the nozzles 31 and to sweep the heated oil out of the barrel 41 for combustion in a zone removed from the barrel 41 and the sleeve 15.

When the burner is operating on a "low" setting of the valve 10, the air delivered through the clearance 42 may be sufficient to cause combustion within the barrel 41 of most of the relatively small amount of oil delivered by the nozzles 31, so that the barrel is kept at a sufficiently high temperature for properly vaporizing the oil at such "low" setting.

Thus, by means of the novel construction of the present invention, the barrel 41 is, at all times, kept at a sufficiently high temperature for proper oil vaporization; the heating of the barrel 41 being done by the influx of hot combustion gases at a "high" setting of the metering valve 10 and being done by the internal combustion of the small amount of fuel oil at a "low" setting of the metering valve 10.

A drain 33 is provided on the under side of the outer sleeve 15 so that, should combustion of the fuel oil cease during operation of the burner, the unburned fuel oil will be retained by the flange 34 on the barrel 15 and will accumulate in the bottom of the barrel 15 and will pass through the drain 33 and conduit 35 (which passes through registering openings in the bottom of the door 16 and the flange 14) to a chamber 11 which is mounted below the metering valve 10. A buoyant float 43 is disposed within the chamber 11 and is provided with an upwardly-extending stem 44 which extends into the casing of the metering valve 10. The upper end of the stem 44 is hingedly connected as at 45 to one arm of a lever 46 which is pivotally mounted upon a pin 47. The lever 46 is provided with a hook 48 disposed generally below the pin 47.

A fuel inlet line 38 is connected to a valve assembly 49 disposed inside of the casing of the metering valve assembly 10; the valve assembly 49 including a needle valve 50 which is normally tensioned to its uppermost open position by a coil spring 51.

A member 52 which is positioned directly above the upper end of the needle valve 50 is pivoted as at 53 and is provided with a weight 54 at its free end. The member 52 is provided with a slot 55 into which the hook 48 of the lever 46 is adapted to extend to engage the member 52 and to retain it in a generally horizontal position away from the needle valve 50.

When the burner is operating normally so that the fuel oil is being burned, the float 43 will be in its lowermost position within the chamber 11, as shown in Figure 5, so that the hook 48 of the lever 46 will hold the member 52 away from the needle valve 50 and will permit fuel oil to flow from the inlet line 38 through the valve assembly 49 into a sleeve 56 and from there into the feed line 30. When, however, unburned fuel oil accumulates within the chamber 11, the float 43 rises to unlatch the hook 48 from within the slot 55 and to permit the weighted member 52 to drop down upon the upper end of the needle valve 50 and thus to close the valve assembly 49. In this way, further flow of fuel oil to the feed line is prevented.

A re-set arm 57 extends outwardly from the casing of the metering valve assembly 10 and permits the member 52 to be lifted for re-setting after the fuel oil has been drained from the chamber 11 by means of the drain-valve 36.

A camming projection 58 is formed on the lever 46 and causes the hook 48 to re-engage within the slot 55 when the member 52 is lifted by the re-set arm 57.

Thus, the valve assembly 49 is again opened to permit delivery of oil to the feed line 30.

A handle 37 is provided for the disc 21 to permit rotation thereof in order to regulate the degree of registration of the openings 19 and 24 to control the degree of draft and the supply of air to the burner.

In operation, fuel oil enters through the inlet line 38 and passes through the open valve assembly 49 and the sleeve 56 to the feed line 30 from which it is delivered at a predetermined rate to the chamber 29; the member 25 and the nozzles 31 being rotated by the motor 12 through the shaft 26.

The oil passes from the chamber 29 through the rotating nozzles 31 and is sprayed against the inner wall of the barrel 41 with a swirling movement.

Rotation of the fan blades 32 sucks in air through the registering openings 19 and 24 and blows the air inwardly through the space intermediate the sleeve 15 and the barrel 41 and also through the peripheral clearance 42 as described hereinabove.

The annular swirling blast of air emerging from the open end of the sleeve 15 produces the vortex described hereinabove and causes hot combustion gases to be returned to the barrel 41 to heat the barrel and to aid in sweeping the oil sprayed from the nozzles 31 into the remote combustion zone.

As described hereinabove, at "low" settings of the metering valve 10, combustion takes place within the barrel 41.

Should combustion fail for any reason, the unburned oil will drain through the conduit 35 to operate the shut-off mechanism described hereinabove.

The oil burner of the present invention gives a hotter and more effective flame and results in more complete combustion than ordinary conventional oil burners.

Thus, introduction of the greater part of the primary air between the inner barrel 41 and the outer sleeve 15 prevents premature combustion of the fuel oil at "high" settings of the metering valve 10; combustion taking place away from the barrel 41 and inside of the furnace since the small amount of air entering through the peripheral clearance 42 is insufficient to support any appreciable amount of combustion at such "high" valve settings.

On the other hand, the present construction permits combustion within the barrel 41 at "low" valve settings so that the barrel 41 will be heated and will always be sufficiently hot to ensure proper vaporization of the oil even at "low" valve settings.

The oil burner construction of the present invention can be quickly and easily installed in conventional furnaces. The assembly of outer sleeve and inner barrel together with their support 13 can be installed in a conventional coal-burning furnace by simply cutting a hole in the furnace door 16 of a size sufficient to take the outer sleeve 15 and by bolting the flange 14 to the door.

It is, of course, also possible to install the unit in any conventional oil-burning furnace in place of the conventional oil-burning jet.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is:

1. An oil burner comprising an elongated sleeve adapted to be mounted upon a furnace or the like and to extend within the combustion chamber thereof, said sleeve having adjustable air-inlets at its outer end, said sleeve being generally cylindrical but being inwardly tapered at its inner end, a cylindrical barrel disposed within said sleeve and maintained in co-axial spaced relationship therewith by a plurality of circumferentially arranged spacing ribs, the inner end of said barrel terminating somewhat short of the inner end of said sleeve, a power shaft extending into said sleeve from the outer end thereof, a hub mounted on said shaft and adapted to be rotated therewith, said hub being disposed outwardly of said barrel and having an annular chamber therein, a fuel line extending into said hub chamber and adapted to feed fuel thereto, a plurality of circumferentially arranged nozzles carried by said hub and extending from said chamber into said barrel, said nozzles being adapted to spray fuel oil against the inner wall of said barrel upon rotation of said hub, a plurality of fan blades mounted on said hub outwardly of said barrel, the diameter of said blades being greater than that of said barrel, and a circular plate mounted at the inner end of said shaft, said plate being disposed generally at the outer end of said barrel and being somewhat smaller in diameter than said barrel so as to provide a small annular clearance therewith, rotation of said blades being adapted to send a limited supply of air into said barrel through the aforesaid annular clearance while directing the greater part of the air inwardly through said sleeve externally of said barrel.

2. An oil burner comprising means forming a combustion chamber provided with an opening in an outer wall thereof, an elongated generally cylindrical sleeve within said combustion chamber and aligned with and extending from said opening, said sleeve being open at its inner end and having adjustable air intake ports at its outer end, a barrel mounted within said sleeve and appreciably spaced therefrom radially, said barrel having its open inner end terminating short of the inner end of said sleeve, means for atomizing fuel oil inside said barrel, means for introducing a relatively small peripheral stream of air into the rear end of said barrel, said peripheral stream of air being sufficient to support appreciable combustion of fuel oil within said barrel at low fire settings but being insufficient to support appreciable combustion of fuel oil within said barrel at high fire settings, and means disposed within said sleeve for drawing air through said ports and blowing it inwardly through the annular space intermediate the barrel and the sleeve and across the open end of said barrel, thereby to suck vaporized oil from said barrel into a combustible mixture with the air and to cause eddying of hot combustion gases into the barrel at high fire settings.

3. An oil burner comprising means forming a combustion chamber provided with an opening in an outer wall thereof, an elongated generally cylindrical sleeve within said combustion chamber and aligned with and extending from said opening, said sleeve being open at its inner end and having adjustable air intake ports at its outer end, a barrel mounted within said sleeve and appreciably spaced therefrom radially, said barrel having its open inner end terminating short of the inner end of said sleeve, means closing the major portion of the rear end of said barrel, means for introducing a swirling stream of fuel oil inside said barrel, and fan means disposed within said sleeve rearwardly of said barrel and adapted to draw air in through said ports and to blow a small amount of said air peripherally into the rear end of said barrel while blowing the greater part of said air through the annular space intermediate the barrel and the sleeve and across the open end of said barrel, thereby to suck vaporized oil from said barrel into a combustible mixture within the combustion chamber and away from the barrel and to cause eddying

of hot combustion gases into the barrel, thereby to aid vaporization of said fuel oil.

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