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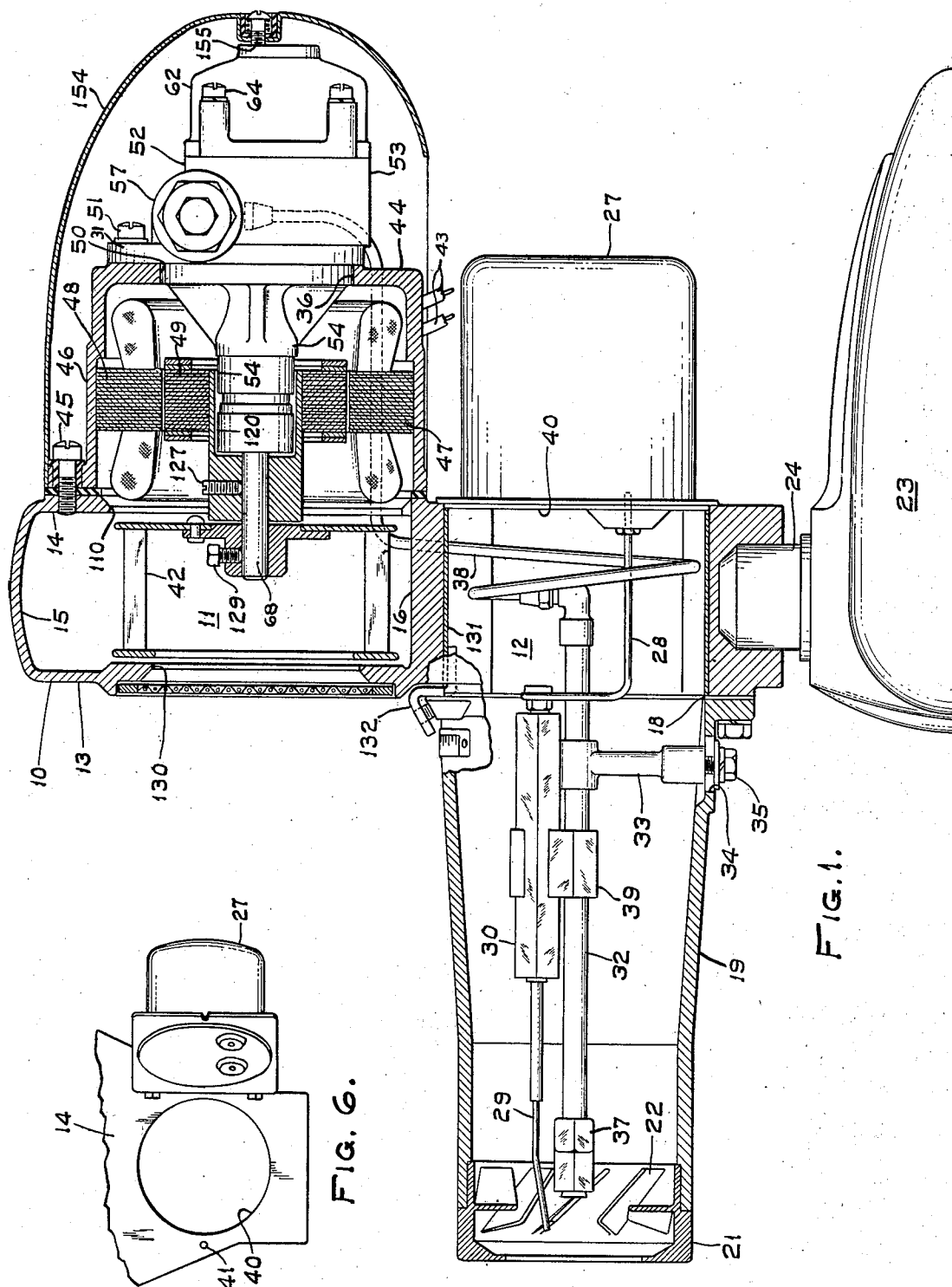
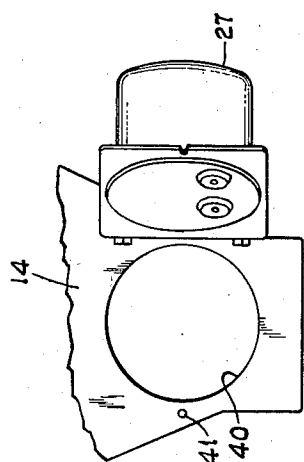
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OIL BURNING APPARATUS

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3 Sheets-Sheet 1



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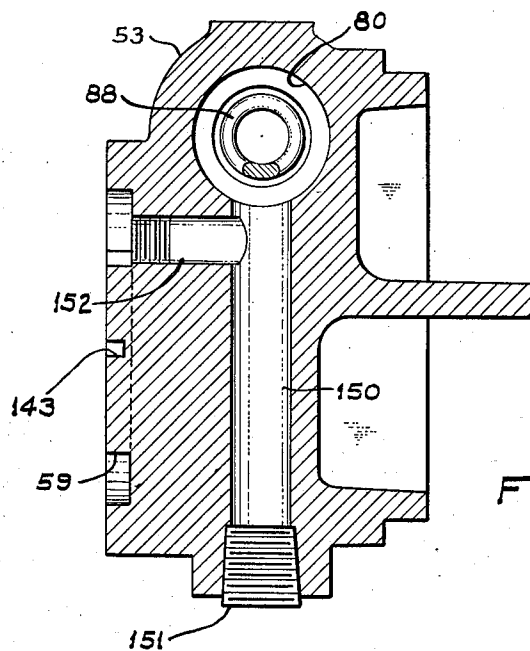


FIG. 4.

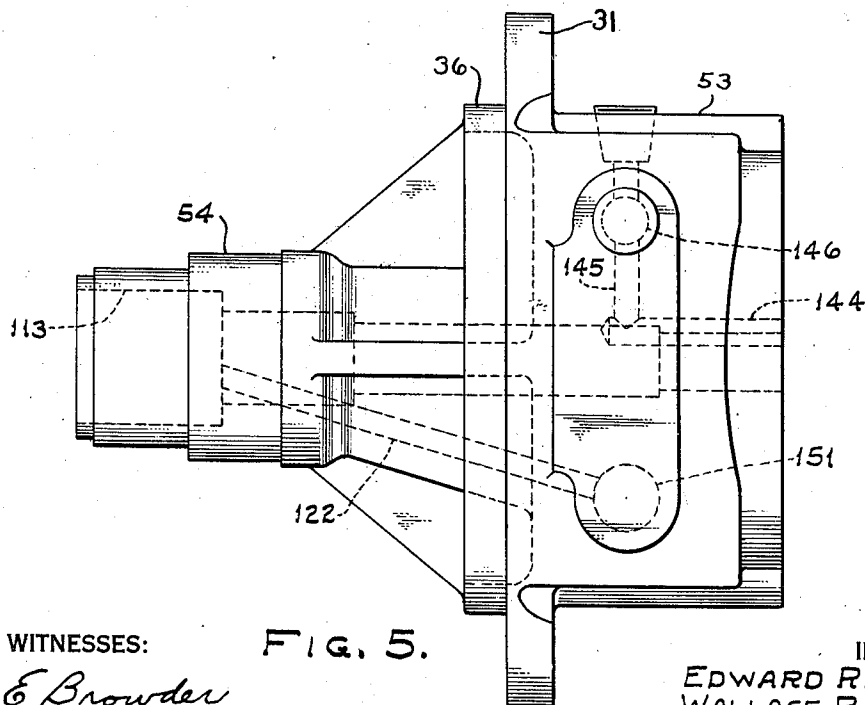


FIG. 5.

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OIL BURNING APPARATUS

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8 Claims. (Cl. 103—4)

This invention relates to oil-burning apparatus and more particularly to oil-burning apparatus of the pressure-atomization type.

An object of this invention is to provide improved oil-burning apparatus of this type.

Another object is to provide oil-burning apparatus of this type having an improved arrangement of fuel-supply unit, motor, and fan.

A still further object is to provide an oil burner of this type having an improved fuel supply unit.

A still further object is to provide an oil burner of this type that is economical to manufacture and pleasing to the eye.

These and other objects are effected by this invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a longitudinal section of the oil-burning apparatus;

Fig. 2 is a longitudinal fragmentary section of the fuel supply unit and motor;

Fig. 3 is a fragmentary transverse section taken approximately on the line III—III of Fig. 2;

Fig. 4 is a section taken on line IV—IV of Fig. 3;

Fig. 5 is a top plan view of the fuel supply unit casing; and,

Fig. 6 is a fragmentary view showing the transformer mounting.

Referring to the accompanying drawings in which like numerals refer to like parts throughout the several views, the oil-burning apparatus shown includes a casing 10 having a fan chamber 11 and a plenum chamber 12 provided by a front wall 13 and a rear wall 14 which are spaced by a continuous connecting wall 15. The fan chamber 11 and the plenum chamber 12 are separated by a common wall 16. Air is delivered from the fan chamber to the plenum chamber through an opening in the wall 16. The casing 10 is provided with an air outlet 18 in its front wall 13 through which air is discharged from the plenum chamber 12. A blast tube 19 is secured to the front wall 13 of the plenum chamber coaxial with the air outlet 18. This blast tube is provided at its discharge end with an air diffuser 21 having inclined vanes 22. When installed, the discharge end of the blast tube extends into the fire box of a furnace.

The oil burner is supported on a base 23 connected to the continuous wall 15 of the casing 10 by a standard 24.

Secured to the rear wall 14 of the casing 10 and in line with the blast tube 19 is an ignition transformer 27 having an electrical connection with a

pair of conductors 28. The conductors 28 make connection with a pair of ignition electrodes 29 which extend longitudinally with respect to the axis of the blast tube. The ignition electrodes 29 are provided with insulators 30. An oil-supply conduit 32 is positioned longitudinally in the blast tube 19 by means of a standard 33 which extends through an elongated slot 34 in the bottom of the blast tube 19 and is held in position by a nut 35. The oil supply conduit has an oil atomizing nozzle 37 at one end and has its other end connected to a flexible oil tube 38 which is connected to the outlet of a fuel-supply unit. The ignition electrodes 29 are supported and held in proper position relative to each other and to the nozzle 37 by means of a clamp 39 which engages the insulators 30 and the fuel-supply conduit 32. The assembly including the ignition electrodes 29 and the atomizing nozzle 37 may be shifted longitudinally within the nozzle so as to properly adjust the assembly with respect to the end of the blast tube 19 by loosening the nut 35 and sliding the standard in the elongated slot 34.

The transformer 27 is hinged to the rear wall 14 of the casing coaxial with an opening 40, Fig. 6, therein, which is also coaxial with the blast tube 19. When the transformer is properly assembled for operation, it is held in position by hinges and a bolt 41 on which a wing nut is threaded. This arrangement permits the assembly, including the electrodes 29 and the nozzle 37 to be inserted into or removed from the blast tube 19 through the opening 40.

Secured to the rear wall of the casing 10 is a sub-assembly 44. This sub-assembly includes a motor 47, a fuel supply unit 52, and a fan 42. The elements of the sub-assembly are mounted on a single shaft 68 which is journaled in spaced bearings in the fuel supply unit 52.

The motor 47 includes a stator 48 and a rotor 49. The stator is pressed into a casing 46 which is attached to the casing 10 by bolts 45. The stator 48 is connected to a suitable source of power by means of conductors 43.

The fan 42 is fastened to the shaft 68 with a set screw 129. It will be noted that an opening 110 is provided in the rear wall of the casing 10 which is larger than the fan 42. This permits the sub-assembly 44 to be assembled separately and installed as a unit on the casing 10 by inserting the fan 42 through the opening 110 and bolting the motor housing 46 to the casing 10 with the bolts 45. This also permits easy removal of the complete sub-assembly from the casing 10 for repairs.

The sub-assembly 44 is above the blast tube 19 and extends from the casing 10 in the opposite direction from the direction of extent of the blast tube and in the same vertical plane with the blast tube. This arrangement of the sub-assembly and the blast tube 19 assists in symmetrically distributing the mass of the completed burner about the casing 10 and also permits the sub-assembly 44 to be removed from the casing 10 for repairs without disturbing the installation of the discharge end of the blast tube 19 in the furnace. This arrangement also gives the completed burner a streamlined appearance which is pleasing to the eye.

The fuel supply unit 52 includes a casing 53 which has a hub 54 extending therefrom which projects through an opening 50 in the motor casing and extends thereinto. This fuel supply unit is detachably connected to the motor casing 46 by bolts 51 which extend through holes in a flange 31 on the casing 53 and engage screw threaded holes in the motor casing 46. The shaft 68 is journaled in the casing 53 and is supported by the spaced bearings 111 and 112. The bearing 111 is carried by the hub 54 and is positioned inside the motor casing 46. The fan 42 and the rotor 49 of the motor are overhung on the shaft 68. The shaft 68 is of sufficient strength to take all of the radial thrust due to the overhung weight of the fan and the rotor without whipping or bending. The rotor 49 is recessed over the hub 54 as indicated at 126 and is fastened to the shaft 68 with a set screw 127. This arrangement of the rotor permits the use of a shorter, less flexible, shaft than otherwise and the hub of the rotor adds rigidity to the assembly and assists in resisting bending and whipping of the shaft. This arrangement of the rotor also centralizes most of the overhung weight near the bearing 111. Herebefore, in burners having a horizontally disposed motor, two separate shafts and two separate sets of bearings have been used, that is, a motor shaft and a set of bearings to support it, and a pump shaft and a set of bearings to support it. Such an arrangement usually required a flexible coupling to connect the motor shaft and the pump shaft. The present invention eliminates the necessity of having two sets of bearings by supporting the entire weight of the motor, the fuel supply unit, and the fan on the bearings of the fuel supply unit, which arrangement also eliminates the necessity of using a flexible coupling between the motor and the fuel supply unit.

The opening 50 in the motor casing 46 is larger in diameter than the rotor 49 to permit the rotor to be withdrawn through the opening. This permits the fuel supply unit 52 and the rotor 49 to be removed as a unit for servicing merely by loosening the set screw 129 so that the fan 42 may be removed from the shaft 68, removing the screws 51, and disconnecting the fuel line 38, without disturbing the mounting of the motor casing 46 and without disturbing the electrical connections of the stator 48. The casing 53 of the fuel supply unit has a shoulder 36 thereon that is substantially as long as the walls of the motor casing 46 are thick. This shoulder 36 serves to center the rotor 49 in the stator 48 when the fuel supply unit is installed on the motor casing 46.

Oil pumping means indicated generally by the reference numeral 56 and an oil pressure regulating valve indicated generally by the reference numeral 57 are mounted on the casing 53. A filter 58 for filtering the oil before it enters the

oil pumping means 56 is attached to a shoulder 59 on the casing 53 by means of a resilient ring 61. A complementing cap 62 which provides a chamber 63 is attached to the casing 53 by bolts 64. This cap encloses the oil pumping means 56 and the filter 58, and it may be readily removed for servicing the oil pump or to clean the filter.

The oil pumping means includes a pair of intermeshing helical gears 66 and 67. The gear 66 is mounted on and is driven by the shaft 68. The gear 67 idles on a stub shaft 69. The gears 66 and 67 are enclosed in a close-fitting housing which includes a plate 70 and a cover 73. The plate 70 has apertures 71 and 72 formed therein in such manner that the clearance between the walls of the apertures and the ends of the gear teeth is very small. The plate 70 and the cover 73 are attached to the casing 53 by bolts 74 which enter threaded apertures 76 in the casing 53.

The oil pressure regulating valve 57 includes a bore 80 which is provided with an oil inlet 81, a burner connection 82, and a by-pass outlet 83. Fitted within the bore 80 is a sleeve 84, and slidable in this sleeve is a piston 86. One end of the piston 86 confines one end of a compression spring 88. This spring is provided at its other end with a pressure plate 89. The pressure on the spring 88 may be adjusted by means of a screw 93 which is threaded through a closure member 92 and has one end bearing against the pressure plate 89. A cap 94 completely encloses the screw to prevent accidental turning of the same and also to prevent any accidental leakage of oil from the valve.

The piston 86 is provided with a central passageway 96 extending through the same, and one of its ends forms a bypass port 97 into which fits one end 98 of a needle valve 99.

One end of the bore 80 is fitted with a screw-threaded ferrule 101 which is provided with a port 102 for receiving the other end 103 of the needle valve 99. This ferrule has a nut 104 screwed into one end, thereby providing a chamber 105 for the operation of the valve 99.

The valve 99 has a sliding fit through the nut 104 and is provided with a collar 106 against which one end of a spiral spring 107 bears, while the other end of said spring rests against an end wall of said chamber. The ferrule is provided with openings 108 for establishing communication with the bore 80.

The hub 54 of the casing 53 is counterbored as indicated at 113 to provide space for a shaft seal, indicated generally by the reference numeral 114, to prevent oil that leaks down the shaft 68 from escaping from the end of the same.

The seal 114 includes a ring 115, which is fastened to the shaft 68 with a pin 116 and rings 117 and 118 which are connected in a fluid-tight manner by an expansible bellows 119. The ring 118 is held tightly against the end of the hub 54 by a nut 120 which is screw-threaded on the end of the hub. The ring 117 is held tightly in contact with the ring 115 by a compression spring 121 inside the bellows. This spring has one end abutting against the nut 120 and its other end abutting against the ring 117. The contacting surfaces of the rings 115 and 117 are finished smooth to prevent oil from leaking between the same.

The bearings 111 and 112 are lubricated by oil that flows down the shaft 68 from the oil pumping means 56. Oil in excess of that required to lubricate the bearings collects in the space around the ring 115 and it is drained away

through a passage 122 which joins the passage 150.

Oil is supplied to the fuel supply unit 52 from an oil storage tank through a pipe 140 which connects to a passage 141 in the casing 53. The oil flows through a longitudinal substantially horizontal passage 142 into the chamber 63 and through the filter 58. When the oil level gets up to approximately midway the chamber 63, the oil flows through a passage 143 in the casing 53 and into the space between the meshing helical teeth on the gears 66 and 67. The gears rotate in the direction of the arrows, Fig. 5, and the oil is forced by the rotating gears into a substantially longitudinal horizontal passage 144, a substantially transverse horizontal passage 145, a substantially vertical passage 146, and into the bore 80 of the oil pressure regulating valve 57. When the oil pressure in the bore 80 attains a pressure approximately equal to 80 pounds to the square inch, which is sufficient pressure to overcome the compression of the spring 88, the action of such pressure raises the piston 86 and thereupon the spring 107 will raise the needle valve 99 so that the end 103 which is in the burner port 102 will be raised, thereby permitting the oil to flow through the openings 108, the port 102, burner connection 82, oil line 38, and to the burner nozzle 37.

The other end 98 of the valve 99 will remain in the by-pass port 97 until the pressure rises to approximately 100 pounds to the square inch. At this time, the collar 106 has come in contact with the nut 104 and is prevented from rising further while the piston 86 continues to move, thereby withdrawing the end 98 of the valve 99 and permitting oil to flow through the passageway 96 and out through the by-pass outlet 83 which connects to a vertical passage 150 in the casing 53.

The oil burner disclosed herein may be installed in either a two-pipe system or a single-pipe system. Accordingly, if the burner is installed in a single-pipe system a plug 151 is placed in the lower end of the passage 150 and the bypassed oil passes through a passage 152, which opens into the passage 150 near the top of the same, and returns to the chamber 63. If the burner is installed in a two-pipe system, the plug 151 is removed from the lower end of the passage 150 and placed in the passage 152, and a pipe is connected to the passage 150 to conduct the bypassed oil back to the storage tank.

The casing 10 has an opening 130 in the front wall 13, which is coaxial with the opening 110 in the rear wall 14, through which combustion supporting air is drawn into the fan chamber by the fan 42. This air is forced down into the plenum chamber 12 and through the blast tube 19. In order to regulate the amount of air delivered to the blast tube, an air regulator 131 is provided in the plenum chamber 12. A handle 132 is provided for adjusting the regulator.

The sub-assembly 44 is enclosed by a streamlined cover 154 which is held in position by a screw 155 which engages a threaded aperture in the cap 62.

It should be noted that all of the passageways in the casing 53 are straight and they may be drilled from the outside of the casing. This facilitates manufacturing in that it is not necessary to mold any of the passageways. The casing 53 may be cast as a solid element and all the necessary passageways drilled therein later.

From the above description, taken in connec-

tion with the drawings, it will be seen that this invention provides an oil burner of the pressure-atomization type having an improved fuel supply unit, and an improved arrangement of fuel supply unit, motor and fan.

While we have shown our invention in but one form it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and we desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What we claim is:

1. In an oil burner, a motor casing enclosing a stator and a rotor of an electric motor, a pump casing attached to said motor casing, bearings carried by said pump casing, one of said bearings being located within said motor casing, a horizontally disposed shaft carried by said bearings, and a pump element disposed in said pump casing and driven by said shaft said rotor being attached to said shaft so as to rotate therewith, said rotor having a recess therein into which the bearing located inside the motor casing extends so that the weight of the rotor acts on said shaft closely adjacent said bearing.

2. In an oil burner, a motor casing having a stator positioned therein, a pump casing having a pair of spaced bearings therein, one of said bearings being located in said motor casing, a shaft journaled in said bearings, a pump element disposed in said pump casing and rotatable with said shaft, a motor rotor mounted on said shaft and supported on said bearings, said rotor being positioned closely adjacent the bearing that is located in the motor casing, and means detachably fastening said pump casing to the motor casing and positioning the rotor in proper relation to the stator.

3. In an oil burner, a motor casing having a stator positioned therein, a pump casing having a hub extending into said motor casing, a shaft journaled in said hub, said hub having a recess therein, a shaft seal positioned in said recess, a pump element disposed in said pump casing and rotatable with said shaft, a bearing for said shaft positioned in said hub closely adjacent said shaft seal, a motor rotor mounted on said shaft and rotatable therewith, said rotor having a recess therein into which said shaft seal and a portion of said bearing adjacent the same project so that the rotor encompasses said shaft seal and said portion of the bearing, and means detachably fastening said pump casing to said motor casing and positioning the rotor in proper relation to the stator.

4. In an oil burner, a fan chamber, a sub-assembly including a fuel supply unit, a motor, and a fan disposed in said fan chamber; said sub-assembly being attached to and supported by said fan chamber and extending substantially horizontally therefrom, said fuel supply unit having a shaft extending therefrom and bearings for said shaft, said fan and the rotor of said motor being mounted on said shaft and thereby supported on the bearings of said fuel supply unit, there being an opening in the side wall of said fan chamber adjacent said sub-assembly large enough to permit withdrawal therethrough of said fan, upon removal of said sub-assembly, without disconnecting said fan from said shaft.

5. In an oil burner, a fan chamber, a sub-assembly including a fuel supply unit having a shaft extending therefrom, a motor, and a fan

disposed in said fan chamber, said sub-assembly being attached to and supported by said fan chamber and extending substantially horizontally therefrom, bearings for said shaft, said fan and the rotor of said motor being attached to said shaft and thereby supported on the bearings of said fuel supply unit, said rotor being recessed over a portion of said fuel supply unit, there being an opening in the side of said fan chamber adjacent said sub-assembly large enough to permit withdrawal therethrough of said fan, upon removal of said sub-assembly, without disconnecting said fan from said shaft.

6. In an oil burner, a fan chamber, a fan therein, a motor casing connected to said fan chamber, a stator and a rotor positioned in said motor casing, said motor casing having an opening therein large enough to permit said rotor to pass therethrough, a pump including a casing, a pump element therein, and a shaft that extends from the casing and projects into said motor casing, said rotor being carried on said shaft, means for detachably securing said pump casing to said motor casing so that the pump casing closes said opening in said motor casing, said rotor being removable from said motor casing through said opening, whereby said pump and rotor may be removed from said motor casing as a unit without removing said motor casing from the fan chamber.

7. In an oil burner, a fan chamber, a fan therein, a motor casing connected to said fan chamber, a stator and a rotor positioned in said motor casing, said motor casing having an open-

ing therein large enough to permit said rotor to pass therethrough, a fuel pump removably attached to said motor casing and having a shaft that extends through said opening and projects into said motor casing, said rotor and said fan being carried on said shaft, said rotor being removable from said motor casing through said opening, whereby said pump and rotor may be removed from said motor casing as a unit without removing said motor casing from the fan chamber, there being an opening in the side of said fan chamber adjacent said sub-assembly large enough to permit withdrawal therethrough of said fan, upon removal of said sub-assembly, without disconnecting said fan from said shaft.

8. In an oil burner, a fan chamber, a motor casing connected to said fan chamber, said casing having an opening therein, a stator positioned in said motor casing, a pump including a casing adapted to be attached to said motor casing, a pump element in said pump casing and a shaft extending from said pump casing and projecting into said motor casing, a rotor connected to said shaft, said rotor being insertable into said motor casing through said opening therein, means automatically lining up said shaft with said motor casing when said pump casing is placed in position thereagainst so that said rotor will be in proper position relative to said stator, and means detachably securing said pump casing to said motor casing.

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