July 9, 1940. R. W. DOEG 2,207,002

FUEL OIL PUMP

Filed June 20, 1938 2 Sheets-Sheet 1

Fig. 1.

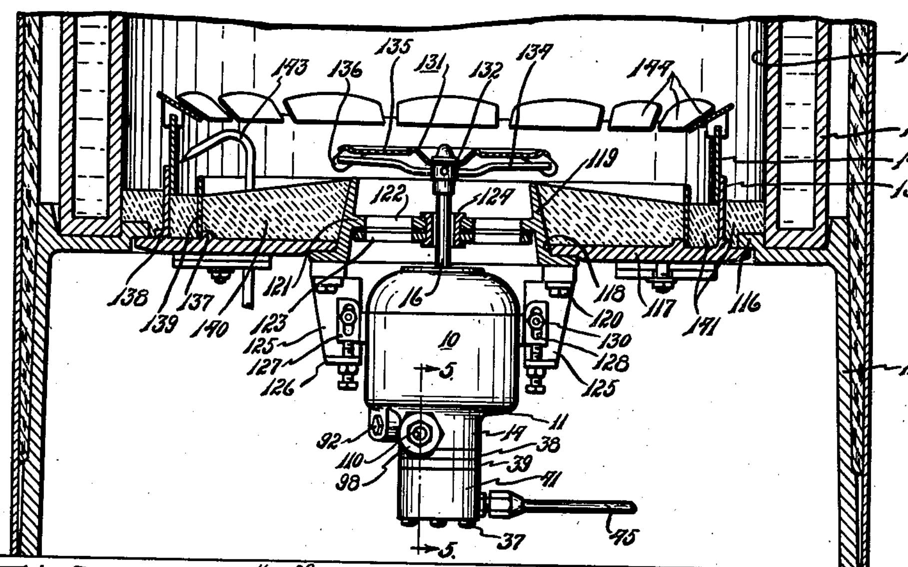


Fig. 3.

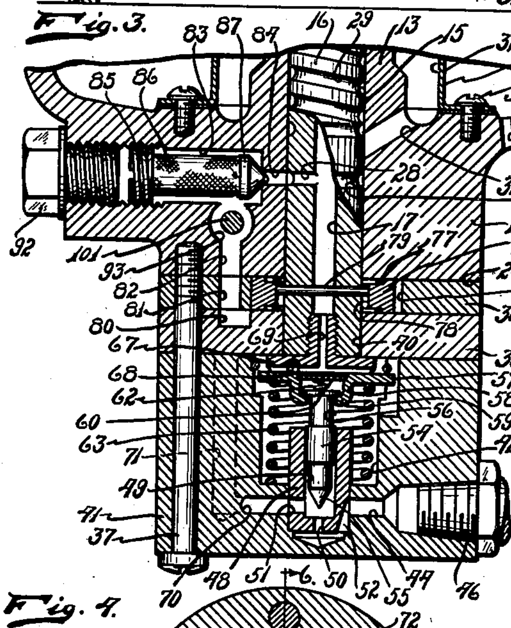


Fig. 5.

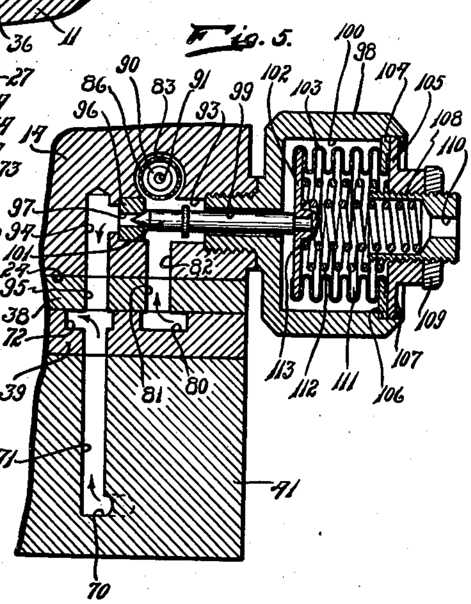
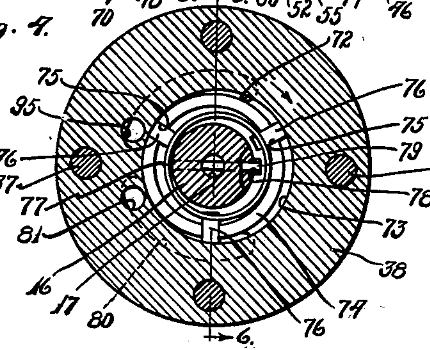


Fig. 4.



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July 9, 1940. R. W. DOEG 2,207,002

FUEL OIL PUMP

Filed June 20, 1938 2 Sheets-Sheet 2

Fig. 2.

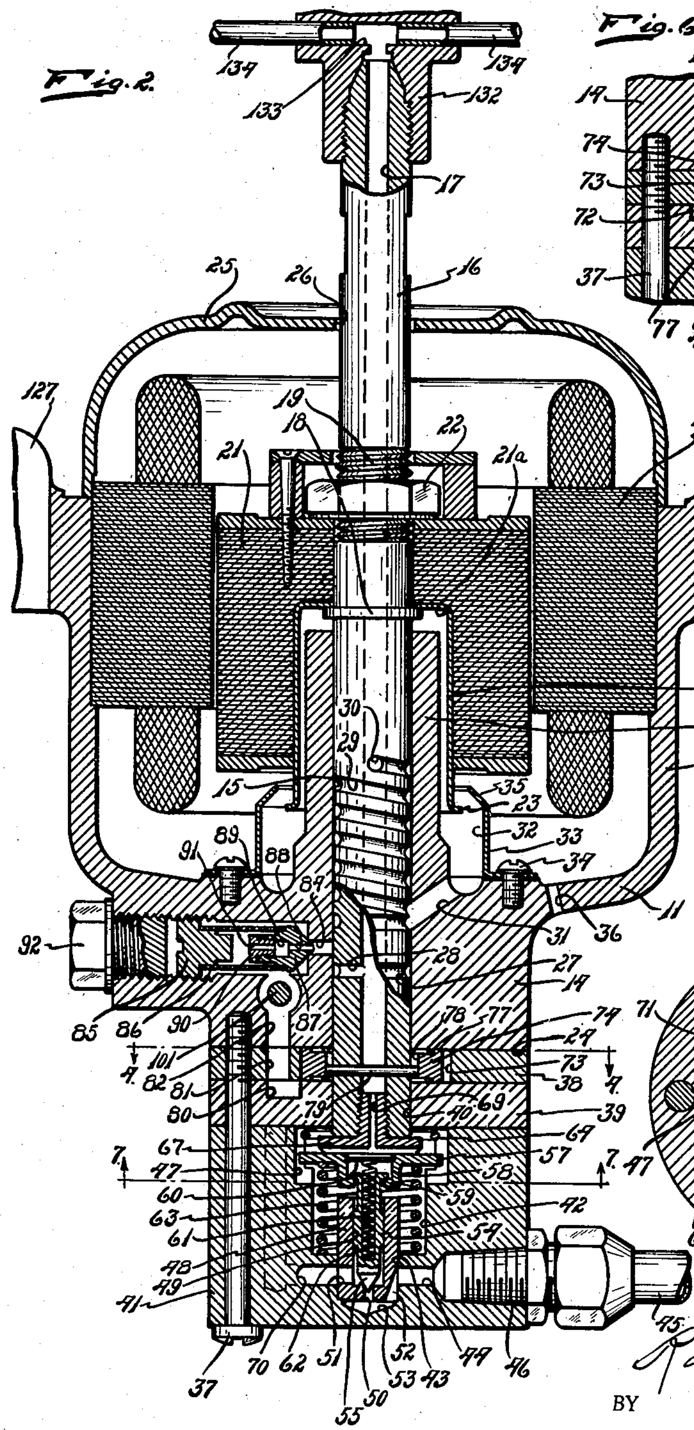


Fig. 6.

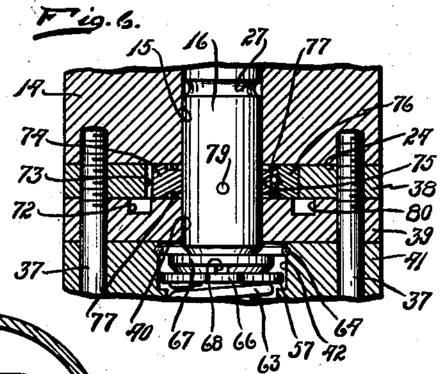
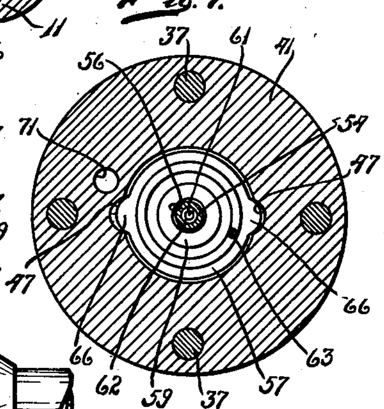


Fig. 7.



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Patented July 9, 1940 **2,207,002**

UNITED STATES PATENT OFFICE

2,207,002

FUEL OIL PUMP

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Application June 20, 1938, Serial No. 214,835

20 Claims. (Cl. 103—11)

The present invention pertains to oil burning apparatus, and, particularly, to new and improved means for controlling the flow and supply of oil.

One of the objects of the present invention is to provide motor-driven oil burning apparatus with an oil flow controlling means actuated by the rotor of the motor.

Another object of my invention is to utilize, in a motor-driven oil burning apparatus, the attraction effect upon the rotor of the magnetic field of the stator for actuating an oil flow control valve.

Another object is to provide a motor-driven oil burning apparatus with an oil flow control valve means which is actuated to closed position by axial movement of the motor rotor in one direction, upon deenergization of the motor stator, and which is allowed to actuate to open position, by axial movement in the opposite direction of the rotor, upon energization of the stator due to the magnetic attraction of the stator field upon the rotor.

Another object is to provide an improved oil burning apparatus wherein oil will flow at a constant fixed pressure and volume.

Another object is to automatically supply the correct oil ratio by by-passing any excess oil to the suction side of the supply pump.

Another object is the elimination of nozzle stoppage, due to oil carbonization during the shut-down period, by draining the oil upon cessation of operation, to a chamber removed from high temperatures.

Another object is to provide a structure wherein all the parts are combined into a compact unitary structure, effecting a balanced and harmonious functioning of parts, while at the same time providing a unit that is easily and quickly adapted to various types of heating systems.

Another object is to provide for flexibility and ease of adjustment for adapting the unit to the peculiarities of various types of heating systems.

Another object is to provide an oil burning apparatus that is economical to manufacture, and highly efficient in operation.

The invention itself, however, both as to its organization, and its method of operation together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a fragmentary cross sectional view of a heating system illustrating the present invention applied thereto;

Fig. 2 is a vertical cross section of the oil burning apparatus shown in Fig. 1.

Fig. 3 is a fragmentary cross sectional view similar to Fig. 2 illustrating one phase of operation;

Fig. 4 is a cross sectional view taken substantially on lines 4—4 of Fig. 2;

Fig. 5 is a cross sectional view taken substantially on line 5—5 of Fig. 1;

Fig. 6 is a fragmentary cross sectional view taken substantially on line 6—6 of Fig. 4; and

Fig. 7 is a cross sectional view taken substantially on line 7—7 of Fig. 2.

Referring to the accompanying drawings in which like numerals refer to like parts throughout the several views, I have shown the invention adapted to an oil burning apparatus of the wall flame type wherein oil is discharged from a rotating head across the combustion chamber for combustion at a peripheral region adjacent the combustion chamber wall. It is to be understood, however, that the invention is equally as adaptable to other types of motor-driven burners, such as for example, rotary burners of the suspension flame type, and to pressure atomization burners.

Referring to Fig. 2, an annular casing 10 having a closed end 11 and an open end is provided to house the motor stator 12. The closed end 11 is formed with an axial portion 13 extending into the casing 10 and an axial stub 14 extending in the opposite direction. The portion 13 and stub 14 are formed with a continuous axial bore 15 to provide a journal for the motor shaft 16, which has a longitudinal passageway 17 extending from end to end.

The shaft 16 is provided with a peripheral shoulder 18 intermediate its ends and a threaded portion 19 spaced above the shoulder 18, as viewed in Fig. 2. Seating on the shoulder 18 is an inverted cup shaped element 20.

The motor rotor 21 is carried by the shaft 16 intermediate the shoulder 18 and the screw threads 19, and is recessed at one end at 21*a* to fit over the cup shaped element 20. The rotor 21 is rigidly secured to the shaft 16 by means of a nut 22 which when threaded downwardly on the screw threads 19 securely clamps the rotor and closed end of the element 20 against the shoulder 18. It is to be noted that the open end of the element 20 terminates in a narrow flange 23 well below the lower end face of the rotor 21.

The shaft 16 is journalled in the bore 15 for axial as well as rotational movement, the lower end of the shaft projecting below the end face 24 of the stub 14, and the element 20 surrounding the axial journal element 13 in circumferentially spaced relation.

The open upper end of the casing 10 is closed by a dome-shaped cover 25 having an opening 26 therein through which the upper end of the shaft 16 projects.

The shaft 16 is formed with a circumferential groove 27 having a passage 28 leading to the shaft passageway 17, and with a spiral groove 29, the upper termination of which communicates through passage 30 with the shaft passageway 17, the grooves 27 and 29 being within the bore 15.

A passageway 31 is provided through the axial portion 13 to place the bore 15 into communication with a chamber 32 provided within the casing 10 by an annular shell 33 secured to the closed end 11 by screws 34, the shell terminating in an inturned flange 35 somewhat above the flange 23 of the cup shaped element 20 in spaced relation.

The casing 10 is also provided with a drain passage 36 through its end wall 11 outside the stub 14.

Secured by means of screws 37 to the end face 24 of the stub 14, are, first an annular plate 38, second, a plate 39 having a central aperture 40, and, last, a valve housing 41, these parts having endwise engagement in the order named, as shown in Figure 2.

The valve housing 41 in the end which abuts the plate 33 is formed with a chamber 42 which is formed with a further chamber 43 of reduced diameter. Also, extending inwardly from one side of the member 41 is an oil inlet recess 44 extending across and intersecting the chamber 43 to which an oil feed conduit 45 is connected by a nipple 46. The wall of the chamber 42 at its upper end is formed with diametrically opposite parallel grooves 47 for a purpose to be later described.

Arranged within the small diameter chamber 43 with a tight fit is a sleeve member 48 projecting upwardly into chamber 42 and having a bore 49 terminating in a valve port or restricted opening 50 at the bottom of the member 48, the member having an oil passage 51 communicating with the oil inlet recess 44 and opening into the bore 49. It is to be noted that the sleeve member 48 closes off the inlet recess or passage 44, and that one side of the member 48 is formed with a groove 52 registering with the inlet end of passage 44 to place this portion of the passage 44 into communication with the bottom 53 of the chamber 43 which lies below the end of the sleeve member 48.

Arranged within the bore 49 of the sleeve member 48 is a slidable valve member 54 having a lower end of reduced diameter which terminates in a conical end 55 in axial alignment with the port 50 to close the same as shown in Figure 2.

The upper end of the valve member 54 projects above the sleeve member 48 and is formed with circumferential groove 56 of substantial width.

Arranged within the chamber 42 is a plate member 57 having an axial cylindrical portion 58 which terminates in a radial inwardly extending flange 59 extending into the circumferential groove 56. A stop 60 is provided across the top of the cylindrical portion and interposed between this stop and the bottom of a recess 61 in the valve member 54 is a compression spring 62 which normally urges the plate member axially away from the valve member 54 into engagement with the upper side wall of the groove 56.

Also surrounding the sleeve member 48 and extending between the bottom of the chamber 42 and the plate member 57 is a compression spring 63, normally urging the plate member 57 upwardly whereby it holds the valve member 54 away from the port 50 in open valve position as shown in Figure 3, a snap ring 64 being provided to engage with the wall of the chamber 42 above the plate member 57 to serve as a stop for the plate member 57.

The wall of chamber 42 is provided with the previously described opposite parallel axial grooves 47 to loosely receive ears 66 formed on the plate member 57 which prevent rotation of the member 57.

The lower end of the shaft 16, as shown in Figures 2 and 3, projects through the annular member 38 and through member 39 into the chamber 42, it having bearing engagement with the opening 40 in the member 39.

The lower end of the shaft 16 is provided with a hardened end thrust member 67 threaded into the passage 17 and having bearing engagement with the plate member 57, as shown in Figures 2 and 3, the thrust member having a groove or slot 68 across its bearing face, and an axial passage 69 of small diameter opening into this slot and into the shaft passage 17, for a purpose to be later described.

The outlet side 70 of the inlet recess or passage 44 opens into an upwardly extending passage 71 terminating in an elongated suction port 72 in the upper face of the plate member 38, as shown in Figure 5, and in dotted outline in Figure 4.

Arranged within the bore 73 of the annular member 38 is a fuel pump which comprises an eccentric roller 74 provided with radial slots 75 within which suitable blades 76 are positioned to move radially outwardly by centrifugal force into engagement with the bore 73. The blades 76 are also assisted to engage the bore 73 by rings 77 which engage the rear of each blade 76 so that each blade, as it retracts into its slot 75 tends to cause the rings to assist the other blades to move radially outwardly.

The roller 74 surrounds the shaft 16 with sliding engagement and is provided with axial slots 78 into which the ends of a drive pin 79, extending through the shaft 16, project, whereby the shaft may move axially with respect to the roller 74 and yet drive the same.

The suction port 72 communicates, as shown in Figure 4, with the interior of the member 38. The oil is forced by the blades 74 through a discharge port 80 formed in the upper face of the annular plate 39, as shown in Figures 4 and 5, and through a passage 81 in the pump member 38 into a vertical passage 82 in the stub which communicates with a chamber 83 extending radially inwardly from one side of the stub 14. The chamber 83 opens into the bore 15 through a port 84 of reduced diameter and has a filtering and metering device therein.

The filtering and metering device comprises a plug 85 adjustably threaded into the chamber 83 and supporting one end of a cylindrical screen 86. The opposite end of the screen has a tapered member 87 secured thereto which is adapted to seat in and close the port 84. The tapered member 87 is drilled to provide a metering passage 88 opening from an enlarged bore 89 into the port 84. Also arranged within the enlarged bore 89 is a threaded plug 90 having a metering passage 91 therein. The chamber 83 is closed at its outer end by a suitable closure plug 92 threaded therein.

In order to provide for a control of the output of the pump and to avoid fluctuation in oil pressure, I have provided a pressure relief mechanism, including a chamber 93 intersecting the passage 82 and communicating with a passageway 94 leading back to the suction inlet 72 through a passage 95 in the member 38. Arranged in the chamber 93 between the passages 82 and 94 is a valve seat 96 having a port 97 therethrough.

Threaded into the chamber 83 is a cup shaped casing 98 having a passage 99 therethrough opening into an enlarged bore 100 of the casing, and slidably arranged within the passage 99 is a needle valve 101 arranged to close or open port 97.

The outer end of the valve stem 101 projects into the bore 100 of the casing 98 and carries a rigidly attached plate 102 to which one end of a bellows 103 is secured in sealed engagement to an annular plate 104. The plate 104 has attached thereto an annular threaded member 105 and the plate 104 and member 105 are seated in a slightly enlarged portion 106 of the bore 100 and sealed by some suitable means such as soft solder 107, as shown in Figure 5. Threaded into the member 105 is a threaded sleeve 108, which is locked against movement by means of a lock nut 109, and which has an opening 110 of reduced diameter therethrough, whereby the interior of the bellows 103 will be subjected to atmospheric pressure.

The bellows 103 with its plates 102 and 104 forms a chamber 111 which is open to the atmosphere through the opening 110. A compression spring 112 is disposed within this chamber 111 between the plates 102 and 104, and a second coil spring 113 is arranged between the plate 102 and the end of the sleeve 108, the pressure of which is adjustable by threading the sleeve 108 inwardly or outwardly.

While the present invention is applicable to various types of oil burners such as the pressure atomization type and the suspension rotary type, I have shown the same, for the purpose of illustration, associated with an oil burner of the rotary wall flame type.

To this end I have shown a boiler 114 mounted upon a suitable base 115, having a horizontal continuous flange 116 extending inwardly from the inner boiler wall 150. Suitably secured to this flange 116 is an annular hearth plate 117 having a central opening 118. A frusto-conical stack 119 is secured to the under side of the plate 117, by screws 120, to extend through the opening 118 into the combustion chamber formed by the inner boiler wall 117.

Extending across the stack 119 is an integral web 121 having airflow apertures 122 therein, which are controlled by an apertured shutter 123 rotatably mounted with reference to the web 121, as shown in Figure 1, a spool-like element 124 being mounted to support the shutter 123 from the web 121.

Supported by the screws 120 are a pair of depending brackets 125 having horizontal flanges 126. The motor casing 10 is provided with outwardly extending ears 127 having elongated openings 128 therein, the ears 127 seating upon vertical adjusting screws 130 extending through the flanges 126.

It will be noted that the shaft 16 extends upwardly through the spool-like element 124 to a point substantially above the top of the stack 119 and is provided with a fuel and air distributing head 131.

The fuel and air distributing head 131 comprises a head portion 132 threaded to the upper end of the shaft 16 and having a central chamber 133 for receiving oil from the shaft passageway 17, from which chamber 133 a plurality of radially extending oil distributing tubes 134 project, as shown in Figures 1 and 2. Secured to the top of the head portion 132 is a horizontal air deflecting plate 135 having fan blades 136 on its under side arranged between the tubes 134.

The principle of operation of a wall flame type oil burner is that the distributing head discharges, within the combustion chamber air drawn in by the fan blades and oil in a generally horizontal path to a zone of combustion near the combustion chamber wall. To this end, I have provided the hearth plate 117 with an inner annular flange 137 and an outer annular flange 138, a metal band 139 being telescoped with the flange or shoulder 137 to extend to approximately the horizontal plane of the top of the stack 119.

A suitable body 140 of refractory is carried on the hearth plate 117 between the stack 119 and band 139, the refractory being a short distance below the upper edge of the band, as shown in Figure 1. Refractory material 141 is also disposed between the band 139 and outer flange 138 below the upper edges thereof, and between the flange 138 and boiler wall.

Telescoped with the annular flange 138 and resting upon the refractory body 141 is a second annular band 142, preferably of sheet metal, which extends upwardly into the path of the oil and air discharged from the distributing head 131. This band 142 serves as an ignition and vaporizing wall, which after the oil is ignited by some such means as a gas pilot flame (not shown), or a spark electrode 143, becomes heated and vaporizes the intercepted oil. In order to facilitate combustion, the band 142 supports suitable deflectors 144 in spaced relation, which serve to direct the vaporized mixture outwardly toward the boiler wall when combustion occurs in an annular ring of flame, the band 139 serving to direct a portion of the air stream in an upward direction toward the vaporizing wall 142 for admixture with the vaporized oil.

In the operation of the oil burner, particularly with respect to the present invention, the motor rotor 21, when there is no demand for operation, that is, when the stator 12 is deenergized, has the position shown in Figure 2, the weight of the shaft 16 and rotor 21 being sufficient to overcome the resistance of the springs 62 and 63, with the result that the valve member 49 is forced to its lowermost position to close the oil port 50 and preclude the flow of oil beyond the port 50. Also, in this position, oil flow is further prevented because the groove 27 and oil passageway 28 of the shaft 16 are not in registration with the passageway 84, but are closed by the bore 15, this insuring a double oil cut off.

When there is a demand for operation, the rotor 12 is energized by well known controls (not shown), and upon energization a magnetic field is created which, in addition to causing the rotor 21 to rotate, attracts the rotor and centralizes it with respect to the field, that is, the rotor, and shaft are raised, with the obvious result that the shaft passageway 28 is brought into registration with the passageway 84, and, that the spring 73 causes the valve member 49 to raise and open the port 50. Consequently, rotation of the shaft 16 causes the pump mechanism, previously described, to withdraw oil from the source of supply through inlet 44, port 50, passages 71 and 72, and discharge the same through outlet 80, passages 81 and 82, chamber 83, restricted passages 91 and 88 to the passageway 84 where it flows through shaft passage 28 to the passageway 17 and thence to the distributing tubes 134.

The relief valve mechanism, port 97 and valve stem 101, as previously described, insures a constant oil pump output, that is, it insures that the oil being supplied to the distributing tubes 134 will flow under a predetermined pressure without fluctuation, so that the proper relation between air and oil supply can be definitely controlled.

Lubrication of the rotor shaft 16 is effected through the spiral groove 29. Should, however, lubricant, that is, the fuel oil, flow above the journal 13, it will be directed by the sleeve 20 into the chamber 32 and thence through passage 31 for recirculation.

If, for any reason, oil should discharge into the casing 10 it will drain through the passage 36 in the casing 10.

Immediately upon deenergization of the stator 12, such as when the heat demand is satisfied, the rotor 21 and shaft 16 drop from the position shown in Figure 3 to the position shown in Figure 2 by reason of their combined weight, to interrupt the oil flow by closure of the port 50 and the groove 28. When this occurs, the oil in the shaft passage 17 and tubes 134 will at once, by reason of gravity, drain through passage 20 and groove 29 into the chamber 32 and avoid any possibility of oil carbonization in the discharge tubes 134. Upon initiation of shaft operation, the spiral groove 29 pumps the drained oil back to the axial passage 17. During the operation of the burner, as the oil is drawn through the passage 44 past the unseated valve 55 it will have a tendency to create a partial vacuum in the chamber 42 that tends to eventually disrupt the flow of oil to the pump. The passage 69 and groove 68 permit communication between the shaft passage 17 and chamber 42 whereby to allow oil to flow into the chamber 62 and seal the needle clearance in the sleeve 48 so that the pressure in the chamber 42 will never be less than atmospheric.

It is obvious from the foregoing that I have provided an oil burner mechanism that will insure a positive shut-off of oil supply upon the demand for operation being satisfied; that the ratio of oil and air supply can be positively controlled to insure the proper mixture; that a predetermined oil pressure can be maintained; that, during the shut down period, insurance is had against carbonization, and that I have provided a compactness of parts which is conducive to economical manufacture and assembly.

While I have described the preferred form of the invention, I do not wish to limit myself to the exact details as shown, but wish to avail myself of such variations and modifications as may come within the scope of the appended claims.

What I claim is:

1. In an oil burning apparatus, a shaft having an axial oil passage therein and an oil inlet passageway opening from the periphery of said shaft into said passage, a journal for said shaft having an oil supply port opening into the bore thereof, said shaft being axially movable within said bore, and an electric motor comprising a rotor fixed to said shaft, and a stator, said rotor in the deenergized condition of said stator being axially offset with respect to said stator and said oil inlet passageway being closed by said bore, said rotor upon energization of said stator being movable due to magnetic attraction into the magnetic field of said stator whereby to axially move said shaft to bring said inlet passageway and oil port into oil flow registration.

2. In an oil burning apparatus, a shaft having an axial oil passage therein a circumferential oil inlet groove and a passageway opening into said passage and said groove, a journal for said shaft having its bore surrounding said groove and having an oil supply port opening into said bore, said shaft being axially movable within said bore, and an electric motor comprising a rotor fixed to said shaft and a stator said rotor normally being axially offset with respect to said stator and said groove normally being closed by said bore, said rotor being movable upon energization of said stator into the magnetic field of said stator due to magnetic attraction whereby to axially move said shaft to bring said oil inlet groove into oil flow registration with said oil supply port.

3. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable upon energization of said stator into the magnetic field of said stator due to magnetic attraction and axially movable upon deenergization of said stator at least partially out of said field, an oil supply passageway, valve means associated with said passageway for opening and closing the same, and connection means operable by the axial movement of said rotor for actuating said valve means.

4. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable into the magnetic field of said stator due to magnetic attraction upon energization of said stator and axially movable at least partially out of said field upon deenergization of said stator, a shaft rigidly fixed to said rotor, a member having an oil supply passageway therein, and valve means associated with said passageway for opening and closing the same, said shaft being in engagement with said valve means for actuating the same upon axial movement of said rotor.

5. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable into the magnetic field of said stator due to magnetic attraction upon energization of said stator and axially movable at least partially out of said field upon deenergization of said stator, a shaft rigidly fixed to said rotor, said shaft having an axial oil passage therein, a member having an oil supply passageway, for supplying oil to said shaft passage, valve means associated with said supply passageway for opening and closing the same, said shaft being in engagement with said valve means for actuating the same upon axial movement of said rotor to open said supply passageway upon energization of said stator and to close said supply passageway upon deenergization of said stator.

6. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable into the magnetic field of said stator due to magnetic attraction upon energization of said stator and axially movable at least partially out of said field upon deenergization of said stator, a shaft rigidly fixed to said rotor, a casing member having an oil supply passageway therein, and valve means associated with said passageway for open-

ing and closing the same, said valve means including spring means urging said valve means to open passageway position, said shaft cooperating with said valve means upon deenergization of said stator to move the same against the pressure of said spring to closed passageway position.

7. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable upon energization of said stator in a vertical direction into the magnetic field of said stator due to magnetic attraction and axially movable upon deenergization of said stator by gravity at least partially out of said field, a shaft securely fixed to said rotor and axially movable therewith, a valve casing member having an oil supply passageway therein, and valve means carried by said member for opening and closing said passageway, said shaft projecting into said member and having end bearing engagement with said valve means whereby upon deenergization of said stator to move said valve means to closed passageway position, and upon energization of said stator to permit said valve means to move to open passageway position.

8. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable upon energization of said stator in a vertical direction into the magnetic field of said stator due to magnetic attraction and axially movable upon deenergization of said stator by gravity at least partially out of said field, a shaft securely fixed to said rotor and axially movable therewith, a valve casing member having an oil supply passageway therein, and valve means carried by said member for opening and closing said passageway, said shaft projecting into said member and having end bearing engagement with said valve means whereby upon deenergization of said stator to move said valve means to closed passageway position, said valve means including spring means to move said valve means to open passageway position upon vertical axial movement of said shaft and rotor due to the magnetic attraction of said rotor during energization of said stator.

9. In an oil burning apparatus a casing member having a vertical bore therein, a shaft journalled in said bore and having an oil delivery passage therein, a second member having an oil supply passageway in communication with said delivery passage, valve means for opening and closing said passageway, said shaft having its lower end in engagement with said valve means and being axially movable from a predetermined upper position to a predetermined lower position and in its said lower position holding said valve means in closed passageway position, and an electric motor comprising a motor securely fixed to said shaft and a stator, said rotor in said lower position of said shaft being axially offset downwardly with respect to the magnetic field of said stator and being movable axially upwardly due to magnetic attraction upon energization of said stator whereby to raise said shaft and permit said valve means to move to open passageway position.

10. In an oil burning apparatus, an electric motor having a stator and a rotor axially movable into the magnetic field of said stator due to magnetic attraction upon energization of said stator and axially movable at least partially out of said field upon deenergization of said stator, a shaft rigidly fixed to said rotor, said shaft having an oil passageway therein provided with an inlet port in the periphery thereof, means forming a journal for said shaft and having an oil passage communicating with the bore thereof, said bore enclosing said inlet port and said shaft being axially movable in said bore to position said port into and out of registration with said oil passage, casing means associated with said journal means and having an oil supply passageway communicating with said oil passage, and valve means in said casing means for opening and closing said last named oil supply passageway, said shaft during the deenergized period of said stator holding said valve means in closed passageway position and in such position holding said oil passage out of registration with said port, said shaft being axially movable with said rotor upon energization of said stator to register said oil passage with said port and to permit said valve means to open said oil supply passageway.

11. In an oil burning apparatus, pump means for delivering oil for combustion, means forming an oil passage having an outlet communicating with said pump means and an inlet for communication with a source of fuel supply, valve means associated with said passage for opening and closing same and motor means for operating said pump means, said motor means having a stator and a rotor axially movable with respect to said stator, said stator and rotor being in alignment during the energized period of and out of alignment during the unenergized period of said stator, said rotor during said unenergized period holding said valve means in closed passage position and upon alignment with said stator due to magnetic attraction through energization of said stator opening said valve means to open passage position.

12. In an oil burning apparatus, pump means for delivering oil for combustion, means forming an oil passage in communication with said pump means, valve means for opening and closing said passage, an electric motor having a stator and a rotor axially movable with respect to said stator into and at least partially out of the magnetic field thereof upon energization and deenergization, respectively, thereof, said rotor having a connection for actuating said pump means and a connection with said valve means for causing opening of said passage upon energization of said stator and closing of said passage upon deenergization of said stator.

13. In an oil burning apparatus, an oil pump for delivering oil for combustion, an oil supply passageway connected to the inlet of said pump, an axially movable shaft for operating said pump, an electric motor having a rotor securely fixed to said shaft and a stator, said rotor being normally axially offset with respect to the magnetic field of said stator and being arranged upon energization of said stator to be drawn axially into said field by the magnetic attraction thereof, and means responsive to the axial movement of said shaft for controlling the flow of oil through said oil passageway.

14. In an oil burning apparatus, an oil pump, a discharge passageway for said pump for supplying oil for combustion, a shaft for operating said pump, and an electric motor having a fixed stator and a rotor, said rotor being fixed to said shaft and being normally axially offset with respect to the magnetic field of said stator and being arranged upon energization of said stator to be drawn axially into said field to axially move said shaft, said shaft having an oil passage registerable with said discharge passage for controlling

the flow of oil from said passageway in response to axial movement of said rotor and shaft.

15. In an oil burning apparatus, a casing means having a pressure pump for withdrawing oil from a source of supply, a motor for operating said pump, an oil discharge passage in said casing means leading from the discharge side of said pump, an intake passage for said pump, a port between said intake and discharge passages, and a pressure differential valve means associated with said port, said valve means being responsive to the pressure of oil in said discharge passage to by-pass oil to said intake passage upon rise in pressure above a predetermined value.

16. In an oil burning apparatus of the rotary type, casing means, a motor driven shaft journalled in said casing means, an oil distributing head secured to said shaft, a fuel pump operable by said shaft, an intake passage for said pump, a discharge passage means for said pump for feeding oil to said distributing head, and means for predetermining the pressure of the oil being fed to said head comprising a by-pass passage communicating with said intake passage and said discharge passage means and a differential pressure valve means responsive to the pressure of the oil in said discharge passage mean for by-passing oil to said intake passage when the pressure thereof exceeds a predetermined value whereby to maintain a supply of oil to said head under a constant predetermined pressure.

17. In an oil burning apparatus, a journal member having a vertical bore therein, a motor-driven shaft journalled in said bore and extending above the same, said shaft having an axial oil supply passage therein, means for supplying oil to said axial passage, and means for draining oil from at least the upper portion of said axial passage upon cessation of operation of said shaft.

18. In an oil burning apparatus, a journal member having a vertical bore therein, a motor-driven shaft journalled in said bore and extending above the same, said shaft having an axial oil supply passage therein, means for supplying oil to said axial passage, and means for draining oil from at least the upper portion of said axial passage upon cessation of operation of said shaft and for returning the drained oil to said shaft upon initiation of operation of said shaft.

19. In an oil burning apparatus, a journal member having a vertical bore therein, a motor-driven shaft journalled in said bore and extending above the same, said shaft having an axial oil supply passage therein, means for supplying oil to said axial passage, and means for draining oil from at least the upper portion of said axial passage upon cessation of operation of said shaft, said last named means including an oil receiving reservoir communicating with said bore and a passage in said shaft communicating with said reservoir and with said axial passage at an elevation above said reservoir.

20. In an oil burning apparatus, a journal member having a vertical bore therein, a motor driven shaft journaled in said bore and extending above the same, said shaft having an axial oil supply passage therein, means for supplying oil to said axial passage, and means for draining oil from at least the upper portion of said axial passage upon cessation of operation of said shaft and for returning the drained oil to said shaft upon initiation of operation of said shaft.

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