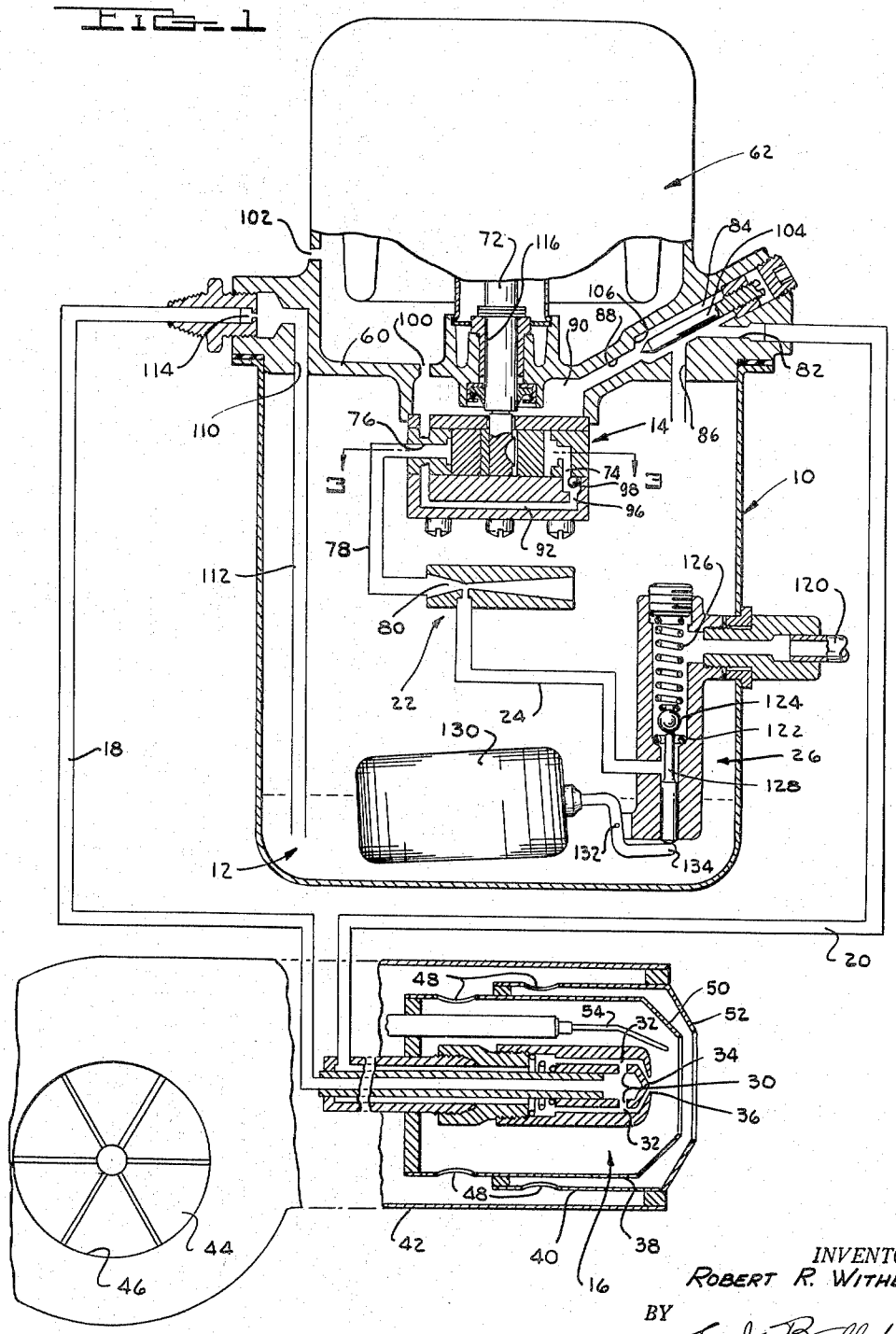
Nov. 22, 1955 R. R. WITHERELL 2,724,433

OIL BURNERS OF THE LOW PRESSURE TYPE

Filed June 28, 1951 4 Sheets-Sheet 1

FIG. 1



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OIL BURNERS OF THE LOW PRESSURE TYPE

Filed June 28, 1951 4 Sheets-Sheet 2

FIG. 2

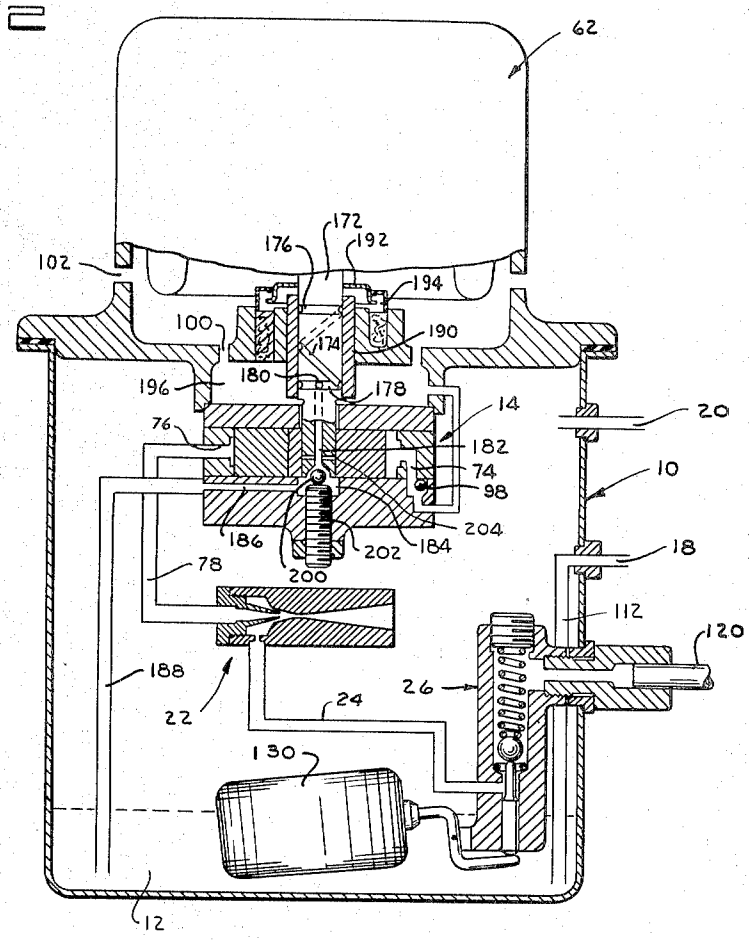
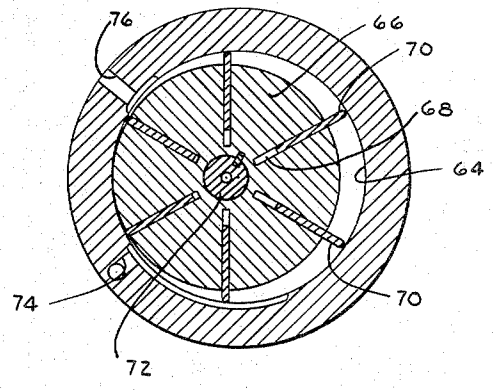


FIG. 3



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OIL BURNERS OF THE LOW PRESSURE TYPE

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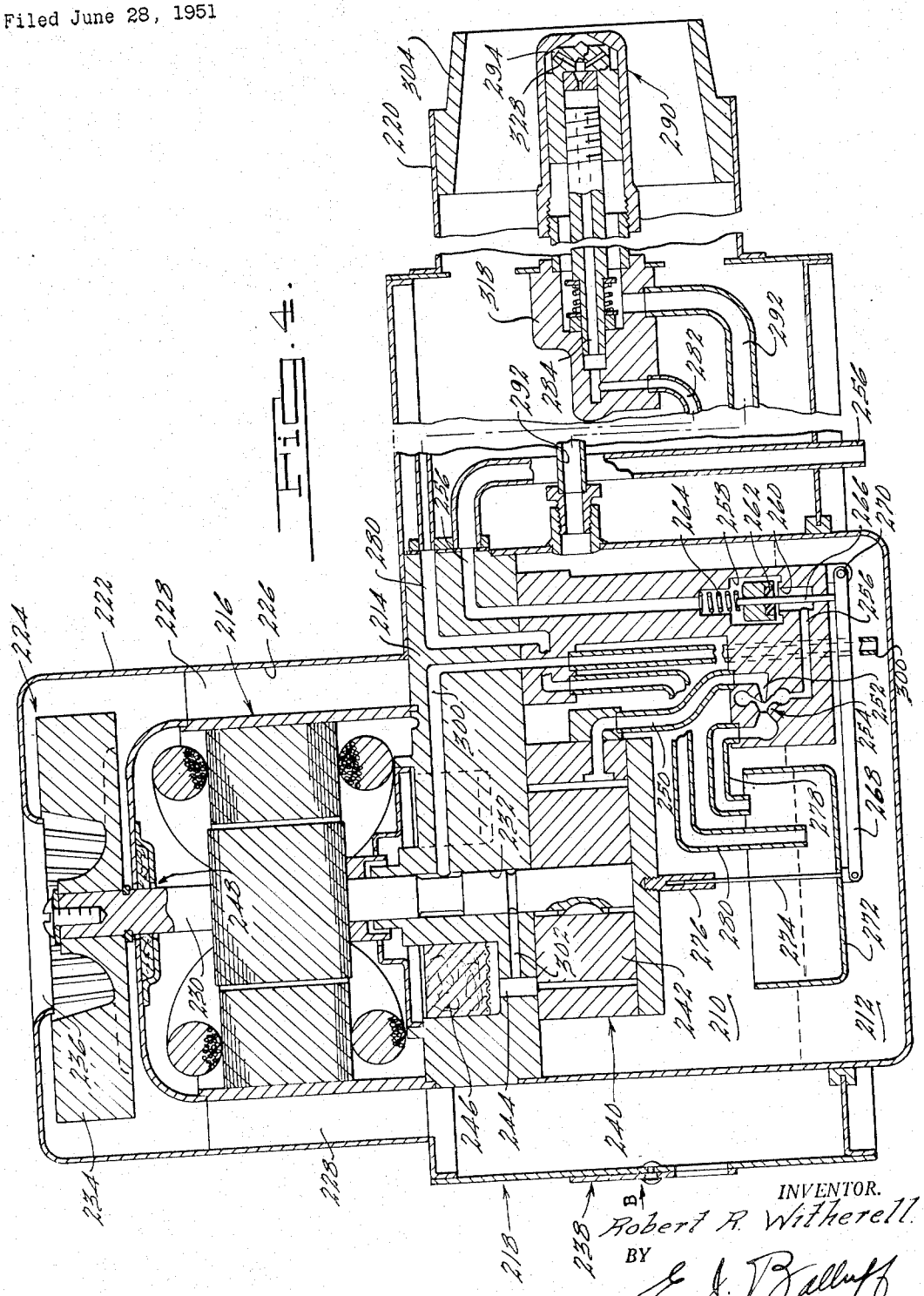
Fig. 4.



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OIL BURNERS OF THE LOW PRESSURE TYPE

Filed June 28, 1951 4 Sheets-Sheet 4

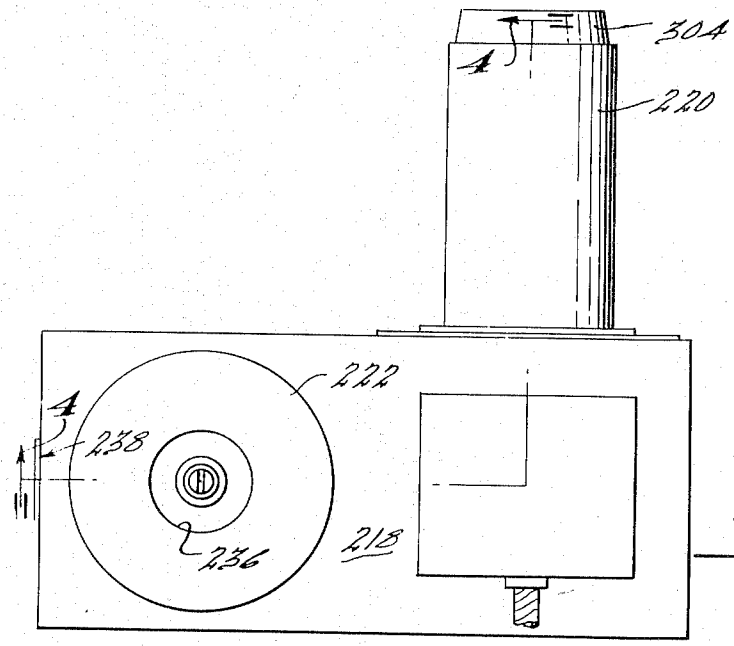

FIG. 5.

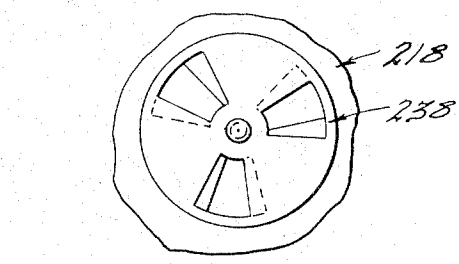

FIG. 6.

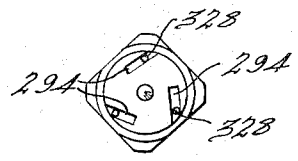

FIG. 9.

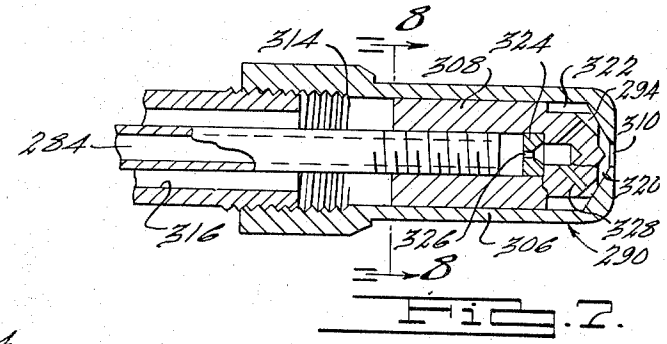

FIG. 7.

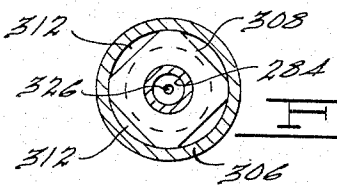

FIG. 8.

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United States Patent Office 2,724,433 Patented Nov. 22, 1955

2,724,433

OIL BURNERS OF THE LOW PRESSURE TYPE

Robert R. Witherell, Bloomington, Ill., assignor, by mesne assignments, to Henney Motor Company, Inc., New York, N. Y., a corporation of New York

Application June 28, 1951, Serial No. 234,084

19 Claims. (Cl. 158—36.3)

This invention relates to fuel and air pumping arrangements for liquid fuel burning systems and has particular reference to oil burners of the low pressure type in which oil and air are supplied under relatively low pressures to a mixing nozzle which mixes the oil and air supplied thereto and discharges such mixture of oil and air in the form of a spray of finely divided oil particles.

This invention has particular reference to a liquid fuel burning system of this type which is much simpler in construction and much less expensive to manufacture than oil burners of this type as now manufactured and sold. As a matter of fact, the low pressure fuel burning system herein disclosed is of such a simple nature and construction that it will be possible to manufacture and sell low pressure oil burners embodying this invention at a price which will be competitive with high pressure burners.

A principal object of the invention, therefore, is to provide a liquid fuel burning system of the low pressure type which is simple in construction, efficient in operation, and which may be manufactured and sold at a materially lower price than that at which burners of this type are now marketed.

Another object of the invention is to provide a liquid fuel burner of the low pressure type which is adapted efficiently to burn fuel at relatively low rates and which burner is simple in construction, thereby making it possible to use this burner in connection with low cost heating systems having a heat output of the order of 70,000 B. t. u. per hour.

Other and further objects of the invention will be apparent from the following description and claims and may be understood by reference to the accompanying drawings, of which there are four sheets, which by way of illustration show preferred embodiments of the invention and what I now consider to be the best mode in which I have contemplated applying the principles of my invention. Other embodiments of the invention may be used without departing from the scope of the present invention as set forth in the appended claims.

In the drawings:

Fig. 1 is a schematic view of a fuel burning system embodying the invention;

Fig. 2 is a fragmentary view illustrating a modified form of the invention;

Fig. 3 is a sectional view of the air pump taken along the line 3—3 of Fig. 1;

Fig. 4 is a schematic fragmentary view illustrating a modified form of the invention, taken generally along the line 4—4 of Fig. 5;

Fig. 5 is a plan view of the apparatus illustrated in Fig. 4;

Fig. 6 is a fragmentary side elevational view, looking in the direction of the arrow B in Fig. 4;

Fig. 7 is an enlarged sectional view of the nozzle illustrated in Fig. 4;

Fig. 8 is a cross sectional view taken along the line 8—8 of Fig. 7; and

Fig. 9 is a face view of an inner part of the nozzle illustrating the converging oil and air passages thereof.

As shown in Fig. 1, an oil burner embodying the invention comprises a reservoir 10 for containing a body of oil 12 and air under pressure, motor driven air pump means 14 discharging into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, an oil and air mixing nozzle indicated generally at 16 having restricted converging oil and air passageways so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of an oil fog, a fluid connection 18 between such body of oil and the oil passageway of the nozzle and operable for supplying oil to the nozzle in response to the pressure to which the oil in said reservoir is subjected by the air discharged by said air pump means, a fluid connection 20 between said reservoir and the air passageway of the nozzle 16 for supplying air under pressure thereto, and means comprising an oil injector 22 actuated by the air discharged into said reservoir by the air pump means 14 for supplying oil to the reservoir through the oil supply line 24 and under the control of a float valve indicated generally at 26.

The nozzle 16 may be of the construction shown in Williams Patent No. 1,934,755, issued November 14, 1933, for "Burner Assembly," and as diagrammatically illustrated in Fig. 1, includes oil passageways 30 supplied with oil through the line 18 and arranged to discharge jets of oil into the air passages 32 which are supplied with air through the air line 20 at substantially the same pressure as that at which oil is supplied to the nozzle through the line 18. The oil and air passages 30 and 32 thus converge so as to mix the oil and air, which mixture then flows into the tip chamber 34 and then is discharged over the knife edge orifice 36 thereof in the form of a spray of finely divided oil particles into a stream of secondary air.

The nozzle 16 is arranged in an air cone 38 which in turn is arranged in an outer air cone 40, which in turn is arranged in and at the outer end of an air supply pipe 42 supplied with secondary air by a centrifugal fan 44 having an air inlet 46. The back ends of the air cones 38 and 40 are provided with a series of openings 48 so that air may flow into such cones from the tube 42, and the forward ends of the air cones are frusto-conical, as indicated at 50 and 52, so as to direct the streams of secondary air which flow through the air cones 38 and 40 into the spray of finely divided oil particles discharged by the nozzle 16 so as to form with such spray a combustible mixture which may be ignited by an electric ignition system including a pair of spaced electrodes 54.

The reservoir 10 may comprise a suitable container having secured to the upper end thereof a frame or casting 60 which closes the top of the reservoir 10 and forms a support for the pump 14 and for an electric motor indicated generally at 62. The pump 14 may be of the rotary sliding vane type and include a cylinder 64 having a rotor 66 rotatable therein and provided with a series of radial slots 68 in each of which a vane 70 is arranged. The rotor 66 is fixed for rotation on the end of the shaft 72 of the motor, and upon rotation of the rotor 66 air will be drawn into the pump cylinder 64 through the inlet 74 and compressed and discharged through the pump outlet 76.

A pipe or conduit 78 is connected to the discharge 76 and is arranged to direct a jet of air into the throat 80 of the oil injector 22 for actuating the same. The line 24 for supplying oil from a storage tank to the reservoir 10 opens into the throat 80 of the injector so that during operation of the pump 14 the jet of air supplied to the injector 22 will cause a flow of oil through the line 24 into the injector

22 and from which it is discharged along with the air from the pump into the reservoir 10.

The air line 20 for supplying air under pressure to the nozzle may be connected to one end of a duct 82 formed in the casting 60, and the duct 82 communicates through a passage 84 with a passage or pipe 86 which opens into the upper part of the reservoir so that air under pressure may flow from the reservoir through the line 20 to the air supply passage of the nozzle. The air passages of the nozzle are restricted so that primary air at the proper pressure and in adequate amounts will be supplied to the nozzle for mixture with the oil supplied thereto so as to form a primary mixture of oil and air. The passages 86 and 84 form part of a by-pass between the inlet and discharge sides of the pump and which further includes the passage 88, the chamber 90, and the passage 92 which leads to the inlet 74 of the pump.

The air supply passage 92 leading to the inlet 74 is provided with a valve chamber 96 for a check valve 98 so that when the pump 14 is not operating, air from the reservoir 10 may not escape through the pump and through the inlet thereof to atmosphere. The other end of the passage 92 communicates with the chamber 90 which is provided with a series of air inlet openings 100 communicating with the interior of the casing of the motor 62, and which casing in turn is provided with a series of air inlets 102 so that air for the pump 14 is supplied through the openings 102, 100, the chamber 90, and the passage 92.

An adjustable air metering valve 104 cooperable with a valve seat 106 formed between the passages 84 and 88 may be provided to control the by-passing of air from the outlet side of the pump to the inlet side thereof. This control also will regulate the air pressure in the reservoir 10. Air is always free to flow through the line 20 and the air passages of the nozzle and to escape from the nozzle 16 so that at the end of the cycle of burner operation the air under pressure in reservoir will be dissipated through the nozzle 16 so as to purge the same of oil.

The oil line 18 which supplies oil to the nozzle 16 may be connected to a duct 110 formed in the casting 60, and this duct is connected by pipe 112 to the body of oil in the bottom of the reservoir 10 whereby the air pressure in the reservoir 10 will cause oil to flow through the pipe 112, the duct 110 and the line 18 to the nozzle 16. A calibrated orifice 114 may be arranged in the connection between the line 18 and the duct 110 so as to meter the flow of oil to the nozzle, and this forms a metering means for metering the flow of oil to the nozzle. Other forms of metering means may be employed for this purpose, or the oil passages in the nozzle may be so restricted as to perform this metering function. In any event, the flow of oil to the nozzle 16 is so regulated that the primary mixture of oil and air discharged by the nozzle will mix with the secondary air stream so as to form a combustible mixture. In some cases it may not be necessary to employ a fan for supplying a secondary air stream.

The shaft 72 is connected to the rotor of the motor so that the motor 62 will drive the air pump 14, and such shaft is journalled in bearing 116 supported in the frame or casting 60. The bearing 116 may form part of a so-called oilless bearing.

The injector 22 will discharge a mixture of oil and air into the reservoir 10, and some particles of the oil so discharged will remain in suspension and be carried through the pipe 86, the passage 84, and the passage 88 into the chamber 90 and thence downwardly through the shaft opening in the pump and also through the passage 92 into the pump for lubricating the pump.

The oil line 24 is connected to the float valve 26, which in turn is connected to another oil supply line 120 which is connected with a suitable oil storage reservoir. The float valve 26 includes an annular seat 122, a ball valve 124 adapted to seat on the seat 122 so as to close the valve, a spring 126 which biases the ball valve 124

to its seat, and a pin 128 which is adapted to project through the valve seat and engage the ball valve member 124 for unseating the same. A float 130 is pivoted at 132 and has an arm 134 engageable with the pin 128 for raising the same when the level of oil in the reservoir falls below a predetermined minimum, thereby to open the valve 26 and permit the application of suction at the throat of the venturi of the injector 22 to the oil line 24 so as to cause oil to flow through the line 120, the valve 26 and the passage 24 into the injector 22, from whence it is discharged into the reservoir 10. When the level of oil 12 in the reservoir reaches a predetermined elevation, the float will rise and permit the spring 126 to seat the ball valve member 124 and to shut off the supply of oil to the reservoir. The float valve 26 together with the injector 22 thus forms a means for maintaining a predetermined amount of oil in the reservoir 10.

In the modification shown in Fig. 2 the arrangement is the same except that a different form of injector is shown and also except for a different arrangement for lubricating the air pump 14, and hence similar reference characters are used in Fig. 2 to indicate the parts corresponding with those shown in Fig. 1.

In the case of Fig. 2, the pump shaft 172 is provided with a spiral groove 174 which extends between annular grooves 176 and 178. A cross duct 180 connects annular groove 178 with axial duct 182 which at its lower end opens into a chamber 184 that communicates with a duct 186. A pipe 188 depending into the oil 12 in the reservoir 10 is adapted to supply oil from the body 12 to the duct 186 and thence upwardly through the passage 182 and the cross duct 180 to the annular groove 178. Upon rotation of the motor shaft 172 the spiral groove 174 cooperating with the bearing 190 will cause oil to flow upwardly along the shaft for lubricating the bearing and thence into the groove 176, from which it escapes into the oil slinger 192 which discharges the oil into a chamber 194, the lower part of which contains packing material and which permits the flow of oil into the pump inlet chamber 196. The pump inlet 74 communicates with the pump inlet chamber 196 which, like Fig. 1, is supplied with air through openings 100 and 102 in the motor casing.

A hardened steel ball 200 positioned by a screw 202 in the chamber 184 is engageable with a socket in the end of the motor shaft 172 so as to form a thrust bearing for the shaft 172, the walls of the socket being relieved so as to permit flow of oil from the chamber 184 upwardly through the axial duct 182 in the shaft 172. The shaft 172 may also be provided with several cross ducts 204 for supplying lubricant to the interior of the pump 14. Some of the lubricant which is returned to the pump inlet chamber 196 from the chamber 194 will flow into the pump through the opening therein through which the shaft 172 extends for lubricating the pump, and other parts of the oil from the chamber 196 will flow into the pump through the inlet 74 thereof for lubricating and sealing the working parts of the pump.

The construction and operation of the embodiment shown in Fig. 2 otherwise will be the same as that shown in Fig. 1, it being understood that some means, such as previously mentioned, are employed for metering the supply of oil to the nozzle 16.

It is contemplated that suitable electrical controls will be provided for the burner so as to drive the motor 62 and the fan 44 simultaneously and so as to energize the ignition electrodes 54 at the beginning of the burner cycle of operation so as to ignite the combustible mixture formed by the spray discharged by the nozzle 16 and the secondary air stream.

In the modification illustrated in Figs. 4 to 9 inclusive the reservoir 210 for containing a body of oil 212 and air under pressure is closed at its top by a casting or block 214 which forms a bearing and support for a motor indicated generally at 216, such for example as a frac-

tional horsepower shaded pole motor. The reservoir **210** is partially enclosed by a casing **218** to the front of which an air tube **220** is secured. The casing **218** includes a cap **222** which encloses the motor **216** and forms a fan chamber **224** above the motor and an annular passage **226** which delivers air from the fan chamber downwardly over the outside of the motor **216** and into the casing **218**. A series of vanes **228** projecting outwardly from the motor spaces the same from the cap **222** and may also serve as air deflectors and a means for dissipating the heat of the motor into the air which flows downwardly through the annular passage **226**.

The shaft **230** of the motor is journalled in a bearing **232** formed in the block **214** and a fan wheel **234** is secured to the upper end of the shaft **230** and within the fan chamber **224**. The fan chamber is provided with an air inlet **236**. The casing **218** may be provided with a means, such as a rotary disc valve **238**, for regulating the amount of air delivered by the fan **234** to the air tube **220**. A rotary air pump indicated generally at **240** of construction like that disclosed in Fig. 3 is mounted in the reservoir **210** and on the under side of the block **214**, and the rotor **242** thereof is keyed to the lower end of the motor shaft **230** so as to be driven thereby simultaneously with the operation of the fan **234**.

The inlet **244** to the air pump **240** communicates through a filter **246** with the interior of the motor, and air from the fan chamber **224** is supplied to the interior of the motor through the gap **248** around the shaft **230** in the top wall of the motor casing. A conduit **250** conducts air discharged by the air pump **240** to a jet **252** which discharges into the throat of the venturi of an injector indicated generally at **254**. An oil supply line **256** communicates at one end with the throat of the venturi of the injector **254** and leads to an oil supply reservoir. The line **256** includes a valve chamber **258** having valve seat **260** and a valve member **262** therein. A spring **264** biases the valve member **262** to seat on the seat **260** so as to shut off the flow of oil through the line **256** to the injector **254**.

The valve member **262** is carried by a reciprocal valve rod **266**, the lower end of which rests upon lever **268** pivoted at one end to a stationary pivot **270**. The other end of the lever **268** is pivoted to a cup or open float **272** which is adapted to float in the body of oil **212** in the reservoir **210**. A guide rod **274** carried by and projecting upwardly from the cup **272** is slidable in a guide **276**. A conduit **278** connected to the discharge side of the injector **254** empties into the cup **272**.

During operation of the air pump, with the parts arranged as shown in Fig. 4 the jet of air discharged from the jet **252** will draw oil through the line **256** and discharge the same with the air through the conduit **278** into the cup **272**. When the level of oil in the cup **272** reaches a predetermined value, the mass of the cup **272** and the oil therein will cause the cup **272** to sink in the oil **212** to a point until the rod **266** will have moved downwardly sufficient to permit the spring **264** to seat the valve member **262** and shut off the flow of oil through the line **256**. An oil conduit **280** at one end terminates inside the cup **272** and at its other end **282** is in communication with oil passage or tube **284** in the nozzle indicated generally at **290**.

The oil discharged from the conduit **278** will accumulate in the cup **272** while the air discharged from the conduit will accumulate in the reservoir **210**, and when sufficient pressure is attained therein such pressure will cause the flow of oil from the interior of the cup through the conduit **280** to the oil passage **284** of the nozzle. An air conduit **292** communicates at one end with the interior of the reservoir **210** above the oil level therein and at its other end with the interior of the nozzle **290** for supplying air to the air passages **294** thereof. The air passages **294** are restricted so that air will accumulate in the reservoir **210** to the desired pressure, say for example a pressure of the order of two to three pounds per square inch.

The embodiment illustrated in Fig. 4 may be provided with a means similar to that shown in Fig. 1 for regulating the pressure within the reservoir **210**. When a sufficient amount of oil has been withdrawn from the cup **272**, the same will rise due to the buoyancy thereof, which will unseat the valve member **262** thereby permitting the injector **254** to draw oil into the reservoir **210** and deliver the same into the cup **272**. An oil line **300**, the lower end of which terminates below the level of the body of oil **212**, leads to the bearing **232** for supplying oil to the same, and from this bearing oil is returned through the filter **246** and through the duct **302** to the interior of the air pump **240** which serves to lubricate the same.

The casing **218** and the air tube **220** house the nozzle **290** and the air and oil lines which supply air and oil to the same. The nozzle, like those illustrated in the previous modifications, is arranged to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles into a secondary stream of air which is supplied by the fan **234** through the air tube **220**. An air cone **304** may be arranged at the outer end of the air tube **220** so as to tend to converge the air stream into the conical spray of finely divided oil particles issuing from the nozzle **290**.

As shown in Figs. 7, 8 and 9, the nozzle **290** consists of an outer cap **306** and an inner member **308**, the outer cap having a knife edge orifice **310** therein. The member **308** is of such shape as to leave between it and the cap **306** a plurality of air passages **312** which are supplied with air from the space **314** in back of the member **308**, the space **314** communicating with an air pipe **316** which in turn is mounted in and communicates with the interior of a hollow member **318** to the interior of which the air line **292** is connected. The member **308** is seated inside the cap **306** and cooperates therewith to define an annular tip chamber **320** within the orifice **310**. The air passages **312** at their forward ends terminate in an annular chamber **322**, and the air slots or passage **294** extend between the chambers **322** and **320**.

The oil pipe **284** delivers oil into a cavity in the member **308** within which a metering plug **324** is arranged, the metering plug having a metering orifice **326** for metering the flow of oil from the ppie **284** into the oil passages **328**. The oil passages **328** extend between the cavity in the member **308** on the downstream side of the metering orifice **326** and the air passages **294**. Thus the air passages **294** and the oil passages **328** converge, and the oil passages discharge jets of oil into the air streams flowing through the air passages **294**. The oil and air are discharged from the passages **294** into the tip chamber **320** in a tangential manner so that the oil and air mixture will swirl therein and then break over the knife edge of the orifice **310** and be discharged in the form of a conical spray of finely divided oil particles into the secondary air stream issuing from the air cone **304** and mix therewith to form a combustible mixture.

The oil and air are supplied to the passages **294** and **328** at substantially the same pressure, which may be a pressure of the order of two to three pounds per square inch when the initial mixing of the oil and air takes place in the passages **294** and the tip chamber **320**.

The arrangement disclosed in Fig. 4 for feeding oil from the reservoir **210** to the nozzle **290** enables the burner to become operative without priming, after running out of oil, since the oil supplied to the nozzle is taken from the inside of the cup **272** which, when emptied, becomes buoyant and unseats the valve member **262** so that the air pump **240** will be operative to effect the flow of oil through the oil supply line **256** into the cup **272**.

This application is a continuation-in-part of my prior copending application Serial No. 195,371, filed November 13, 1950, now abandoned, for "Fuel and Air Pumping Arrangements for Oil Burners of the Low Pressure Type."

While I have illustrated and described preferred embodiments of my invention, it is understood that these are capable of modification and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A fuel and air pumping arrangement for supplying oil and air to the nozzle of a low pressure type oil burner comprising a reservoir for containing a body of oil and air under pressure, motor driven air pump means discharging into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, a fluid connection through which oil is supplied from said body of oil to said nozzle in response to the pressure to which the oil in said reservoir is subjected by the air discharged by said air pump means, a fluid connection through which air is supplied from the mass accumulated in said reservoir to said nozzle, and means actuated by the air as it is discharged into said reservoir by said air pump means for supplying oil to said reservoir.

2. A fuel and air pumping arrangement according to claim 1 including oil level responsive means arranged to control the operation of said means for supplying oil to said reservoir.

3. A fuel and air pumping arrangement according to claim 1 wherein said oil supplying means include an injector connected to said air pump means so as to be actuated by the air pumped thereby, and an oil supply line in communication with the throat of said injector.

4. A fuel and air pumping arrangement according to claim 1 wherein said oil supplying means include an injector connected to said air pump means so as to be actuated by the air pumped thereby, an oil supply line in communication with the throat of said injector, a valve in said oil supply line, and a float responsive device in the oil in said reservoir arranged so as to cause opening of said valve when the level of oil in said reservoir falls below a predetermined level so that the suction at the throat of said injector is effective to cause flow of oil through the oil supply line into said reservoir.

5. A fuel and air pumping arrangement for supplying oil and air to the nozzle of a low pressure oil burner comprising a reservoir for containing a body of oil and air under pressure, a motor driven rotary air pump discharging into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump for regulating the air pressure in said reservoir during operation of said pump, an oil and air mixing nozzle having restricted, converging oil and air passageways so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of an oil fog, a fluid connection between said body of oil and said oil passageway of said nozzle for supplying oil thereto, a fluid connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, an oil injector connected with the discharge side of said pump so that the air discharged by said pump functions as a jet for operating said injector, an oil supply line in communication with the throat of said injector so that during operation of said air pump said injector will function to draw oil into said reservoir, and means controlling the operation of said injector so as to maintain a predetermined amount of oil in said reservoir.

6. A fuel and air pumping arrangement for supplying oil and air to the nozzle of a low pressure oil burner

comprising a reservoir for containing a body of oil and air under pressure, air pump means discharging into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, and an oil and air mixing nozzle constructed and arranged so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, an oil line between said body of oil and said nozzle for supplying oil thereto, a fluid connection between said reservoir and said nozzle for supplying air under pressure thereto, means utilizing the air as it is discharged by said air pump means for supplying oil to said reservoir, and means for supplying a secondary stream of air for mixture with the spray of oil particles.

7. A fuel and air pumping arrangement for supplying oil and air to the nozzle of a low pressure oil burner comprising a reservoir for containing a body of oil and air under pressure, air pump means discharging into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, an oil and air mixing nozzle constructed so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said body of oil and said nozzle for supplying oil thereto, a fluid connection between said reservoir and said nozzle for supplying air under pressure thereto, and means actuated by the air as it is pumped by said air pump means for pumping oil into said reservoir.

8. A fuel and air pumping arrangement for an oil burner comprising a reservoir for containing a body of oil under pressure, pump means disposed in and discharging into such reservoir so as to subject the oil therein to pressure, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, and means disposed in said reservoir and actuated by the discharge of said pump means for pumping oil into said reservoir.

9. A fuel and air pumping arrangement for supplying oil and air to the nozzle of a low pressure oil burner comprising a reservoir for containing a body of oil under pressure, air pump means discharging into such reservoir so as to subject the oil therein to pressure, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, an oil and air mixing nozzle constructed so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said body of oil and said nozzle for supplying oil thereto in response to the pressure in said reservoir, a fluid connection between said air pump and said nozzle for supplying air under pressure thereto, and means actuated by the air as it is pumped by said air pump means for pumping oil into said reservoir.

10. A fuel and air pumping arrangement for supplying oil and air to the nozzle of a low pressure oil burner comprising a reservoir for containing a body of oil and air under pressure, an air pump mounted on said reservoir and having its discharge connected with said reservoir so as to subject the oil therein to pressure, means associated with said reservoir and pump for regulating the air pressure in said reservoir during operation of said pump, an oil and air mixing nozzle constructed so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said body of oil and said nozzle for supplying oil thereto in response to the pressure in said reservoir, a fluid connection between said air pump and said nozzle for sup-

plying air under pressure thereto, and means actuated by the air pumped by said air pump means for pumping oil into said reservoir.

11. An oil burner comprising a reservoir for containing oil and air under pressure, an air pump arranged to discharge into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump for regulating the air pressure in said reservoir during operation of said pump, an oil and air mixing nozzle having converging oil and air passageways arranged so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said reservoir and said oil passageway of said nozzle and operable for supplying oil thereto, a connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, and means including an injector connected to said air pump so as to be actuated by the air as it is pumped thereby for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a valve in said oil supply line, an open float in the oil in said reservoir connected to said valve for opening said valve when the level of oil in said float falls below a predetermined level, said open float being arranged to accumulate therein at least part of the oil discharged by said injector and said fluid connection terminating inside of said float so that oil is supplied from the accumulation thereof in said float through said fluid connection to said nozzle in response to the pressure to which the oil in said float is subjected by the air discharged by said air pump.

12. An oil burner comprising a reservoir for containing oil and air under pressure, a motor driven air pump in such reservoir arranged to discharge into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump for regulating the air pressure in said reservoir during operation of said pump, an oil and air mixing nozzle having converging oil and air passageways arranged so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said reservoir and said oil passageway of said nozzle and operable for supplying oil thereto, a connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, an injector actuated by the air discharged by said pump for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a valve in said oil supply line, an open float in the oil in said reservoir connected to said valve for opening said valve when the level of oil in said float falls below a predetermined level, said open float being arranged to accumulate therein at least part of the oil discharged by said injector and said fluid connection terminating inside of said float so that oil is supplied from the accumulation thereof in said float through said fluid connection to said nozzle in response to the pressure to which the oil in said float is subjected by the air discharged by said air pump.

13. An oil burner comprising a reservoir for containing oil and air under pressure, an air pump arranged to discharge into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump for regulating the air pressure in said reservoir during operation of said pump, an oil and air mixing nozzle having converging oil and air passageways arranged so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said reservoir and said oil passageway of said nozzle and operable for supplying oil thereto, a connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, and means including an injector connected to said air pump so as to be actuated by the air pumped thereby for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a normally closed valve in said oil supply line, an open float in the oil in said reservoir connected to said valve for opening said valve when the level of oil in said float falls below a predetermined level, said open float being arranged to accumulate therein at least part of the oil discharged by said injector and said fluid connection terminating inside of said float so that oil is supplied from the accumulation thereof in said float through said fluid connection to said nozzle in response to the pressure to which the oil in said float is subjected by the air discharged by said air pump, and means in said nozzle upstream relative to said converging passageways for metering the supply of oil to said converging passageways.

14. An oil burner comprising a reservoir adapted to contain a body of oil and air under pressure, means operable to accumulate a mass of air under relatively low pressure in said reservoir, an injector operated by said means for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a valve in said oil line for controlling the flow of oil therethrough, an open float arranged to accumulate oil discharged from said injector and to float in the body of oil in said reservoir, an oil and air mixing nozzle having restricted, converging oil and air passageways so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between the oil accumulated in said open float and said oil passageway of said nozzle for supplying oil thereto under the pressure of the air in said reservoir, a connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, said fluid connection having means associated therewith for metering the supply of oil therethrough to said nozzle.

15. An oil burner comprising a reservoir adapted to contain a body of oil and air under pressure, means operable to accumulate a mass of air under relatively low pressure in said reservoir, an injector operated by said means for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a valve in said oil line for controlling the flow of oil therethrough, an open float arranged to accumulate oil discharged from said injector and to float in the body of oil in said reservoir, an oil and air mixing nozzle having converging oil and air passageways so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between the oil accumulated in said open float and said oil passageway of said nozzle for supplying oil thereto under the pressure of the air in said reservoir, and a connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto.

16. An oil burner comprising a reservoir adapted to contain a body of oil and air under pressure, means operable to accumulate a mass of air under relatively low pressure in said reservoir, an injector operated by said means for supplying oil to said reservoir, an oil supply line in communication with the throat of said injector so as to cause oil to flow through said line into said reservoir, means for controlling the flow of oil through said line so as to maintain oil in said reservoir within minimum and maximum limits, an oil and air mixing nozzle having restricted, converging oil and air passageways so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between the oil accumulated in said reservoir and said oil passageway of said nozzle for supplying oil thereto under the pressure of the air in said reservoir, and a connection between

said reservoir and said air passageway of said nozzle for supplying air under pressure thereto.

17. An oil burner comprising a reservoir for containing oil and air under pressure, a motor driven air pump arranged to discharge into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump for regulating the air pressure in said reservoir during operation of said pump, an oil and air mixing nozzle having converging oil and air passageways arranged so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of a spray of finely divided oil particles, a fluid connection between said reservoir and said oil passageway of said nozzle and operable for supplying oil thereto, a connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, and means including an injector connected to said air pump so as to be actuated by the air pumped thereby for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a valve in said oil supply line, and a float in the oil in said reservoir connected to said valve for opening said valve when the level of oil in said reservoir falls below a predetermined level.

18. A fuel and air pumping arrangement for an oil burner comprising a reservoir for containing a body of oil and air under pressure, motor driven air pump means discharging into such reservoir so as to accumulate therein a mass of air under pressure above and in contact with the oil therein, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, an oil and air mixing nozzle having restricted, converging oil and air passageways so as to mix the oil and air supplied thereto and to discharge such mixture of oil and air in the form of an oil fog, a fluid connection between said reservoir and said oil passageway of said nozzle and operable for supplying oil thereto in response to the pressure to which the oil in said reservoir is subjected by the air discharged by said air pump means, a fluid connection between said reservoir and said air passageway of said nozzle for supplying air under pressure thereto, and means including an injector connected to said air pump means so as to be actuated by the air pumped thereby for supplying oil to said reservoir, an oil supply line opening into the throat of said injector, a valve in said oil supply line, and an open float in the oil in said reservoir connected to said valve for opening said valve when the level of oil in said float falls below a predetermined level, said open float being arranged to accumulate therein at least part of the oil discharged by said injector and said fluid connection terminating inside of said float.

19. A fuel and air pumping arrangement for an oil burner comprising a reservoir for containing a body of oil under pressure, air pump means disposed in and discharging into such reservoir so as to subject the oil therein to pressure, means associated with said reservoir and pump means for regulating the air pressure in said reservoir during operation of said pump means, and an injector having an oil supply line connected to its throat and connected to said air pump means so that the air as it is discharged thereby energizes said injector to pump oil during the operation of said air pump means, said injector being arranged to discharge the oil pumped thereby into said reservoir.

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