Feb. 5, 1957 D. L. GETZ 2,780,279

OIL BURNER HAVING VARIABLE OIL AND AIR CONTROL

Filed July 9, 1954 4 Sheets-Sheet 1

FIG-1

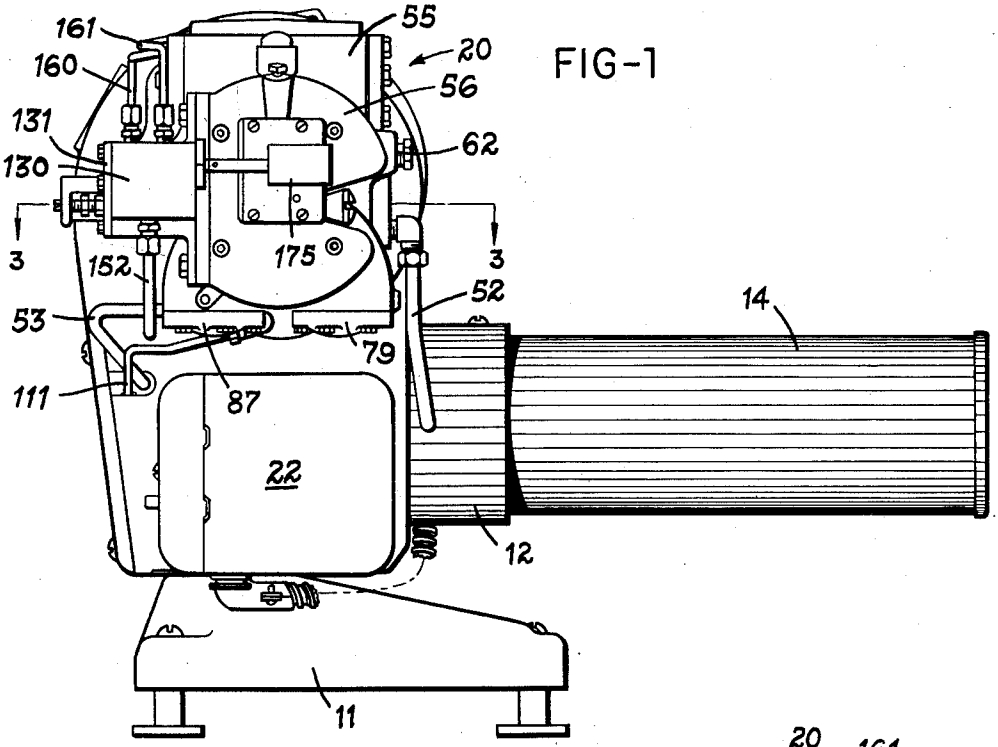
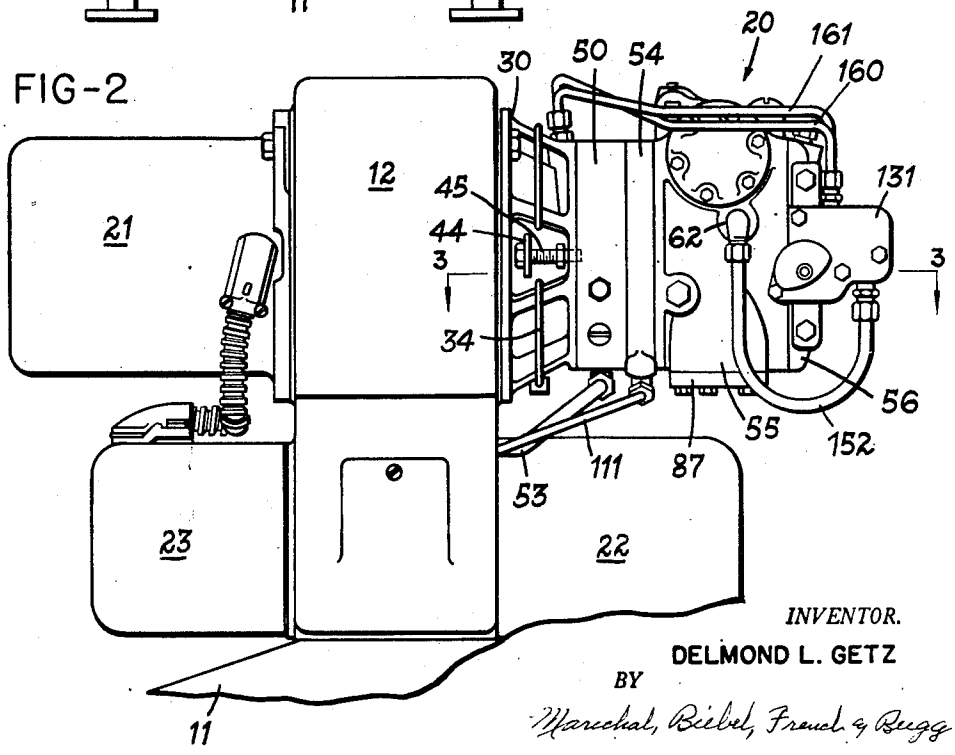


FIG-2



INVENTOR.
DELMOND L. GETZ
BY
Marechal, Bicbel, French & Bugg
ATTORNEYS

Feb. 5, 1957 D. L. GETZ 2,780,279

OIL BURNER HAVING VARIABLE OIL AND AIR CONTROL

Filed July 9, 1954 4 Sheets-Sheet 2

FIG-3

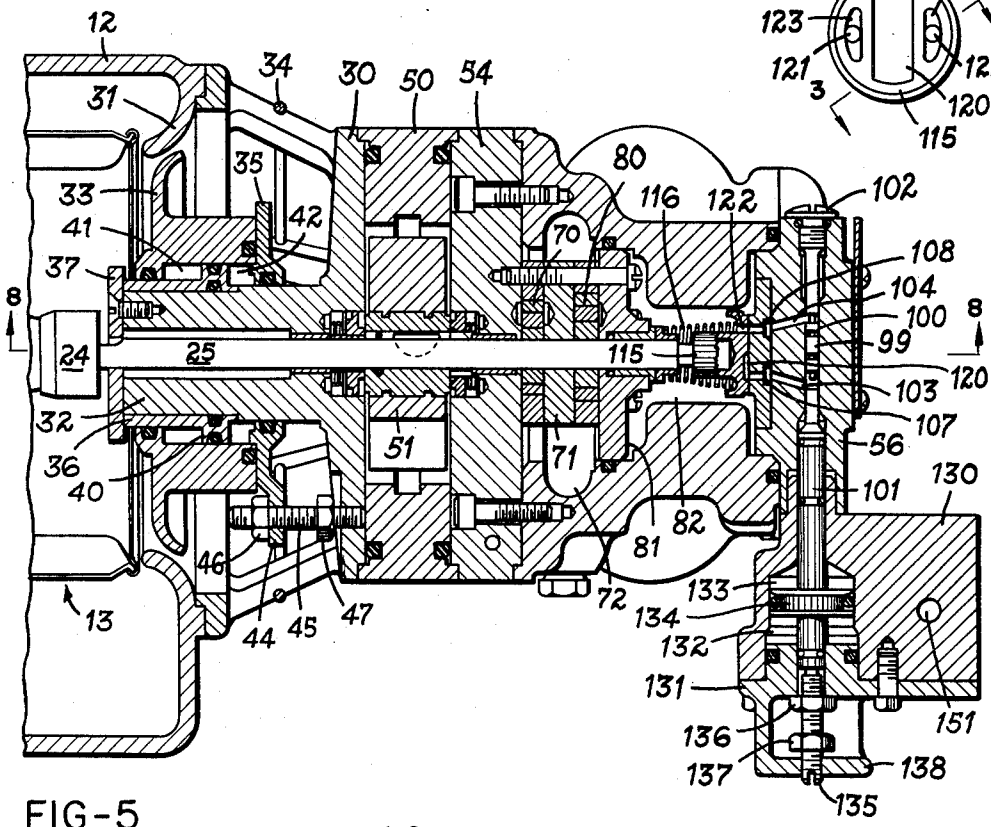


FIG-4

FIG-5

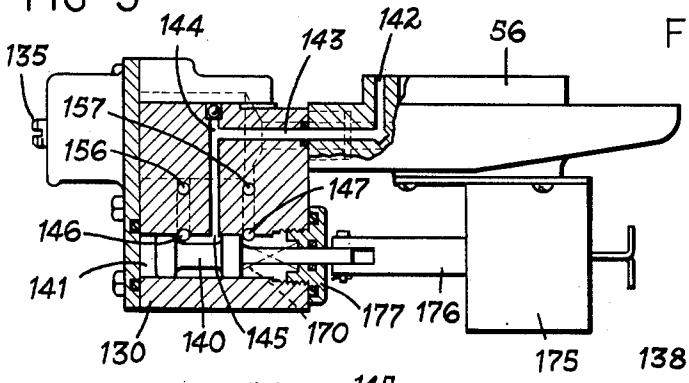


FIG-6

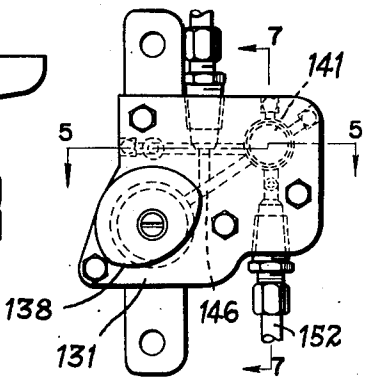
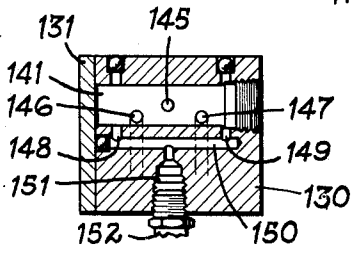


FIG-7



INVENTOR.
DELMOND L. GETZ
BY
Marechal, Biebel, French & Bugg
ATTORNEYS

Feb. 5, 1957 D. L. GETZ 2,780,279

OIL BURNER HAVING VARIABLE OIL AND AIR CONTROL

Filed July 9, 1954 4 Sheets-Sheet 3

FIG-8

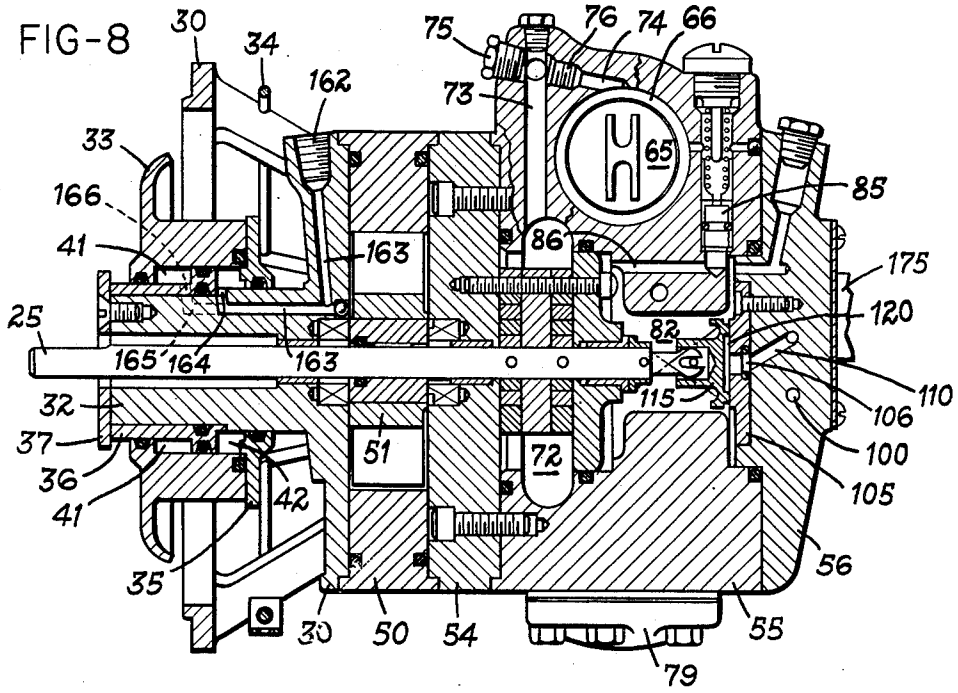
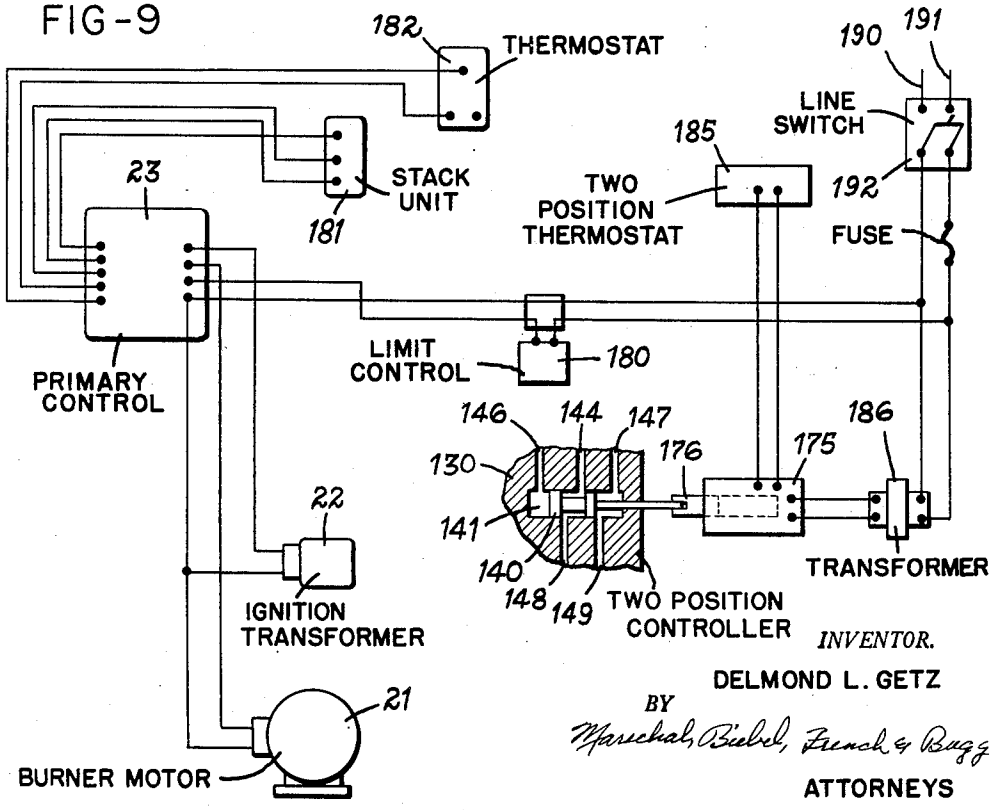


FIG-9



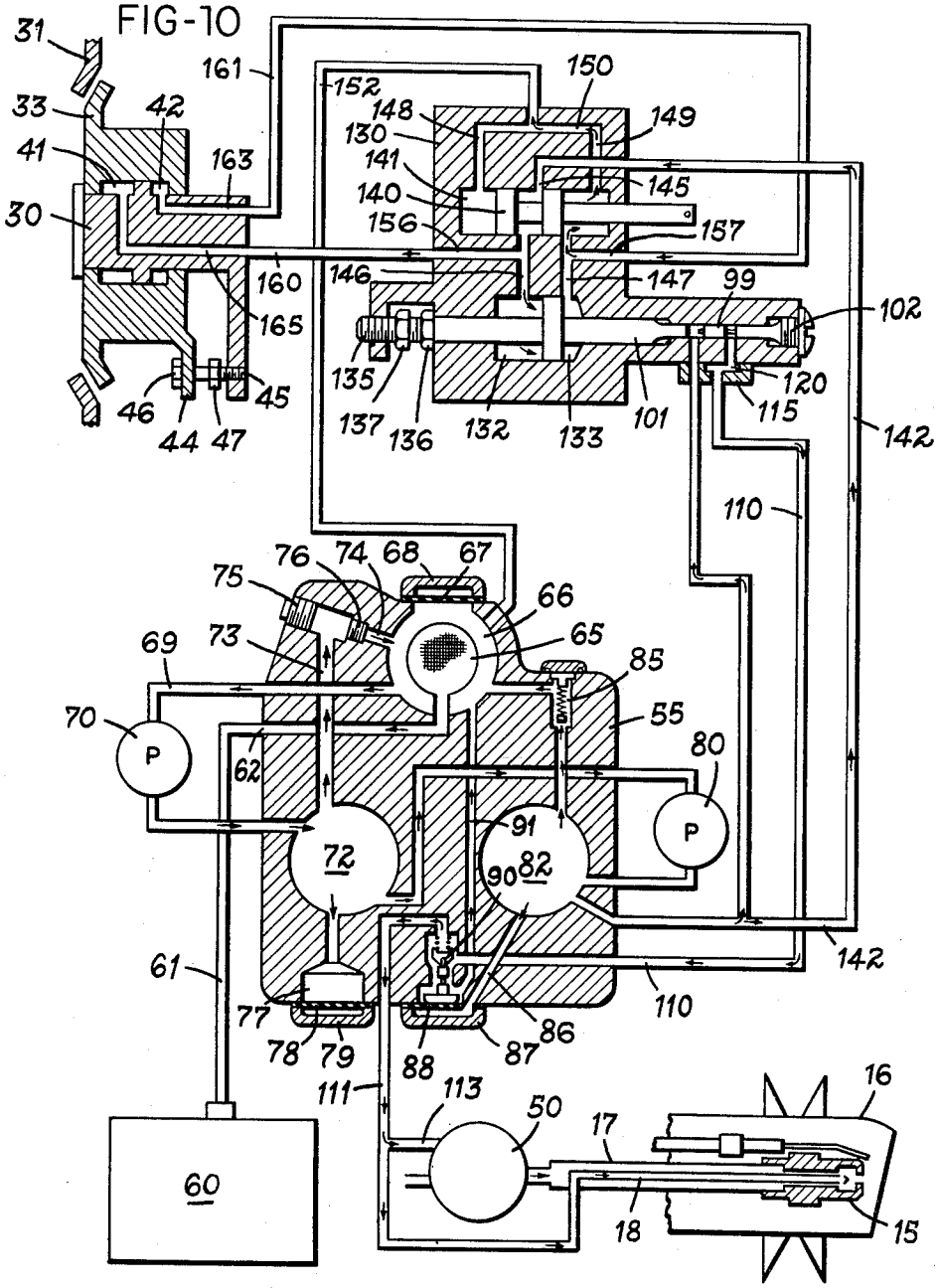
INVENTOR.
DELMOND L. GETZ
BY
Marschal, Bisbel, French & Bugg
ATTORNEYS

Feb. 5, 1957 D. L. GETZ 2,780,279

OIL BURNER HAVING VARIABLE OIL AND AIR CONTROL

Filed July 9, 1954 4 Sheets-Sheet 4

FIG-10



INVENTOR.

DELMOND L. GETZ

BY

Marechal, Bibel, French & Bugg

ATTORNEYS

United States Patent Office 2,780,279 Patented Feb. 5, 1957

2,780,279

OIL BURNER HAVING VARIABLE OIL AND AIR CONTROL

Delmond L. Getz, Springfield, Ohio, assignor, by mesne assignments, to Kelsey-Hayes Wheel Company, Detroit, Mich., a corporation of Delaware

Application July 9, 1954, Serial No. 442,336

10 Claims. (Cl. 158—28)

This invention relates to oil burners for heating purposes and the like.

The invention has special relation to an oil burner embodying a control system for changing the output of the burner while in operation, by changing the rate of supply of liquid fuel to the combustion zone of the burner and simultaneously effecting corresponding change in the rate of supply of combustion air to the combustion zone. Thus for example, the invention is applicable to oil burner installations where it is desired to obtain operation of the burner at low output when the primary control is approaching the point of being satisfied, but to obtain a high output for times of high demand such as when the unit is just starting up or in the event of a change in the demand conditions, such as a sudden drop in the outdoor temperature in the case of a home heating system.

In the above example, an oil burner including the control system of the invention operates at high output under conditions of sudden or high demand until such demand is substantially satisfied, and it then automatically shifts to a low output for any remaining demand of the primary control. The control system of the invention is accordingly well adapted for controlling the operation of an oil burner in conjunction with an outdoor primary control arranged to cause operation of the burner at low output capacity in mild weather but to shift automatically to a high output capacity whenever the outdoor temperature drops below a predetermined range. The invention is similarly applicable to year-round air conditioning systems wherein the high output capacity is used only during winter for heating purposes while the low output capacity is used in summer for heating an absorption type refrigerating system for air cooling.

It is a primary object of the present invention to provide a control system for an oil burner as outlined above which will establish high and low output capacities for the burner and will shift the burner automatically between such output capacities in accordance with predetermined demand conditions.

A particular object of the invention is to provide such a control system as outlined above in which the liquid fuel for supply to the combustion zone is maintained under high pressure and in which shifting of the output capacity of the burner is effected by application of the hydraulic pressure of this liquid fuel to control members for metering the flow of liquid fuel and secondary air to the combustion zone of the burner.

Another object is to provide a control system as outlined above wherein the shiftable control members which meter the flow of liquid fuel and secondary air to the combustion zone are readily adjustable to vary their high and low output capacity positions as required for particular conditions of use of the oil burner.

It is also an object of the invention to provide an oil burner having a control system as outlined above which is especially adapted for use under conditions requiring extra high suction of the liquid fuel and which includes a pair of fuel pumps having a purging chamber connected

therebetween to establish an air-free supply of liquid fuel under pressure for the combustion zone and also for operation of the controls for the rates of supply of the liquid fuel and secondary air to the combustion zone of the burner.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a side elevational view showing an oil burner constructed in accordance with the present invention;

Fig. 2 is a rear view of the burner of Fig. 1, with part of its supporting structure broken away;

Fig. 3 is an enlarged sectional view taken generally on the line 3—3 of Fig. 2 and also of Fig. 4;

Fig. 4 is a detail view of the working face of the rotary valve shown in Fig. 3;

Fig. 5 is a view of a portion of the control mechanism for the rates of supply of liquid fuel and secondary air to the combustion zone of the burner, the view being partly in plan and partly in section on the line 5—5 of Fig. 6;

Fig. 6 is a detail elevational view of the mechanism in Fig. 5, looking from left to right in Fig. 5;

Fig. 7 is a section on the line 7—7 of Fig. 6 with the control valve removed;

Fig. 8 is a fragmentary sectional view taken on the line 8—8 of Fig. 3;

Fig. 9 is a wiring diagram; and

Fig. 10 is a schematic diagram illustrating the operation of the oil burner of Figs. 1–8.

Referring to the drawings, which illustrate a preferred embodiment of the invention, Figs. 1 and 2 show the general construction of an oil burner of the low pressure type adapted for conversion use in domestic installations. This burner is shown as including a pedestal type base 11 supporting an upper housing 12 forming a blower chamber in which is mounted the blower wheel 13 for supplying secondary air to the combustion zone at the outer end of the blast tube 14. The nozzle 15 is mounted as shown diagrammatically in Fig. 10 within the air cone 16 in the outer end of the blast tube on the forward end of the primary air tube 17, which encloses the oil tube 18.

This oil burner is generally similar in construction to the oil burner disclosed in the copending application of Getz et al. Serial No. 200,232, filed December 11, 1950, and assigned to the same assignee as this application. It includes a pump assembly 20 for supplying oil and primary air to the nozzle and combustion zone, this pump assembly being mounted at one side of blower housing 12 for operation by a drive motor 21 mounted at the opposite side of housing 12. The ignition transformer 22 and primary electrical control unit 23 are similarly mounted at opposite sides of the housing 12 below the pump assembly and drive motor. A flexible coupling 24 connects the motor drive shaft with the drive shaft 25 for the pump assembly.

The blower 13 is provided with an adjustable air inlet mechanism best seen in Figs. 2 and 3. The air inlet casting 30 is mounted on the blower housing 12 in overlying relation with the curved portion 31 of housing 12 which forms the air inlet to the blower wheel and axially overlies the wheel as shown. The casting 30 includes an inner tubular portion 32 which forms the support for the hub portion of a conical damper 33 mounted for movement along the part 32 to control the effective flow area through the inlet 31, and casting 30 is also provided with a protective wire 34.

Means are provided for establishing high and low limit positions of the damper 33 with respect to the air inlet 31. Referring to Figs. 3 and 8, a cap 35 is bolted on the rearward end of the hub portion of damper 33 and is slidable directly on the tubular portion 32 of the casting 30. A

sleeve 36 is secured on the inner end of this casting portion 32 and is held thereon by an end cap 37, the forward end of the damper 33 being slidable on this sleeve 36. A circumferential shoulder 40 on the sleeves 36 cooperates with the inner surface of the damper hub to form a pair of annular chambers 41 and 42 for hydraulic fluid, and the junctions between all these parts are sealed as by means of suitable O-rings or the like as shown.

The sleeve 36 thus cooperates with the damper 33 and the end cap 35 to form a double acting hydraulic cylinder containing the two pressure chambers 41 and 42, and provision is made as described hereinafter for selectively supplying hydraulic fluid to these chambers to cause the damper 33 to move back and forth along the support 32. The cap 35 includes a tab portion 44 which is slidable along a bolt 45 set in the casting 30 and carrying a pair of adjustable nuts 46 and 47. These nuts can be set as desired to cooperate with tab 44 in forming stops establishing the limits of movement of the damper 33, the nut 46 establishing the low limit position in which the damper is closest to the air inlet 31, and the nut 47 similarly establishing the high limit position of the damper furthest removed from the air inlet.

The outer end of the air inlet casting 30 carries the pump assembly 20, wherein the atomizing air pump housing 50 and rotor 51 are shown as of the construction disclosed in the copending application of Charles G. Brelsford Serial No. 219,716, filed April 6, 1951, and assigned to the same assignee as this application, the air pump being provided with a suction tube 52 leading from the blower housing and a discharge tube 53 leading to the primary air tube 17. A pump plate 54 is mounted on the air pump housing 50 and in its turn supports the main pump and valve housing 55, and on the outer end of the housing 55 is the port plate 56 which houses the unit for metering the flow of oil to the nozzle and also supports the control unit for effecting adjustment of the rates of flow of oil and secondary air to the combustion zone.

The flow of liquid fuel through the pump assembly may be more readily followed by reference to the diagram in Fig. 10. The main fuel reservoir is indicated diagrammatically at 60, and it is connected by a line 61 to an inlet port 62 in the valve housing 55, there being duplicate ports 62 at both the front and back of the housing to suit the convenience of the user. The port 62 is connected internally of the housing 55 with a screen 65 in a suction chamber 66 provided in the upper part of the housing 55 and having an anti-hum diaphragm 67 and an air cushion chamber formed by the cap 68. From the suction chamber 66, the liquid fuel is drawn through suitable passages in the pump plate 54, as indicated at 69, to the first stage liquid fuel pump 70. This pump is shown in Figs. 3 and 8 as of substantially the same construction illustrated in the above Getz et al. application, and it is mounted on the drive shaft 25 between the pump plate 54 and a port plate 71.

The pump 70 discharges into a purging chamber 72 formed within the housing 55 and having a venting passage 73 for air therefrom. If this oil burner is utilized with a a single line supply system from the reservoir 60, the passage 73 connects directly at 74 with the suction chamber 66, and the outer end of the passage 74 is plugged at 75. If the burner is utilized with a two-line supply system, the return line to the reservoir is connected in the place of the plug 74, and instead a plug is inserted in the tapped portion 76 of the passage 74. Thus in either case, air drawn in by pump 70 and discharged into purging chamber 72 is purged from the liquid fuel before the latter passes further on in the system. The purging chamber 72 also has a lower end extension 77 in the housing 55 which is provided with an anti-hum diaphragm 78 and an air cushion chamber formed by the cap 79.

The second stage liquid fuel pump 80 is also mounted on the shaft 25 between the port plate 71 and the pump end plate 81 and is shown as of the same construction as pump 70. This pump 80 draws air-free liquid fuel from the lower end of the purging chamber 72 and discharges into the pressure chamber 82 within the valve housing 55. The pressure chamber 82 is connected by an adjustable pressure relief valve 85 with the suction chamber 66 to return excess oil to the suction side of the first stage pump 70 whenever the pressure within chamber 82 exceeds the value determined by the initial setting of this relief valve. The pressure chamber 82 is also connected as indicated at 86 with a fluid pressure chamber in cap 87 and a diaphragm 88 to operate the main shut-off valve 90 controlling the oil flow to the nozzle as shown in more detail in the above noted Getz et al. application. A vent passage 91 leads from the low pressure side of diaphragm 88 to the suction chamber 66.

The rate of flow of liquid oil from the pressure chamber 82 to the nozzle is controlled by a valving and metering mechanism shown in detail in Figs. 3, 4 and 8. The metering unit includes a floating piston 99 reciprocable in a bore 100 which extends through the port plate 56 and is closed at one end by an adjustable plunger 101 and at the other end by a screw plug 102 to limit the reciprocating movement of piston 99. As shown, the piston has small tip portions at each end to assure that there will always be a fluid receiving chamber at both ends of the piston within the bore 100.

These two chambers in the bore 100 are connected by passages 103 and 104 with a counterbore in the inner surface of the port plate which has a valve insert 105 secured therein. The valve insert 105 has a central port 106 therethrough and also a pair of ports 107 and 108 which match the passages 103 and 104 as shown in Fig. 3. The port 106 matches a passage 110 in the port plate 56 which is controlled by the shut-off valve 90 as shown in the above Getz et al. application, and as indicated in Fig. 10. The valve 90 is in turn connected with a suitable port in pump plate 54 from which a line 111 leads to the oil tube 18 to the nozzle. Fig. 10 also shows a bleed line 113 for providing oil for lubrication purposes to the primary air pump 50—51.

The valve insert 105 cooperates with a rotary valve 115 mounted on the end of the drive shaft 25 and continuously biased by spring 116 into pressure tight running engagement with the valve insert 105. As shown particularly in Fig. 4, the valve 115 has a wide groove 120 in its end face, and it is also provided on either side of this groove with a pair of through ports 121 and 122. The area on the face of the valve surrounding each of these ports is also grooved as indicated at 123.

In operation, whenever one of the ports 121 and 122 matches one of the ports 107 and 108 in the valve insert, which happens each 90° of rotation of the valve 115, the other port 107 or 108 will match the groove 120 in the valve as shown in Fig. 3. Thus in the position of the parts shown in Fig. 3, the port 108 will be the pressure port through its direct connection by port 122 with the pressure chamber 82 to admit oil under pressure to one end of the piston 99 through the passage 104. At the same time, the port 107 will be connected through groove 120 with port 106 and will thus become the discharge port to transfer the oil at the opposite end of piston 99 to the discharge passage 110, with this transfer being under pressure from the oil entering bore 100 at the pressure end of piston 99.

It will thus be seen that the metering unit is operated by the pressure within chamber 82, and that its operation is alternately to fill and discharge the small chambers in the bore 100 at either end of piston 99, thus providing a metered flow of oil to the nozzle at a rate which depends upon the capacity of these chambers. Since in turn the capacity of the metering chambers depends upon the effective length of the stroke of piston 99 as governed by the adjustment of the plunger 101, it will be seen that the metered rate of oil supply may be changed by movement of this plunger, and means are provided for effecting such movement of the plunger simultaneously with similar movement of the secondary air damper 33

as desired to adjust the output capacity of the burner to prevailing conditions.

These adjusting means for the output capacity of the burner are operated hydraulically by the hydraulic pressure in the pressure chamber **82**. Referring first to Fig. 3, a housing **130** and cover **131** are mounted on the port plate **56** in line with the bore **100**. Within the housing **130** is a double acting hydraulic cylinder having pressure chambers **132** and **133** on either side of a piston portion **134** on plunger **101**. At the outer end of plunger **101** is a threaded stud **135** carrying a pair of nuts **136** and **137** cooperating with the cap **131** and a bracket portion **138** of the cap to form stops establishing the low and high rate positions of the plunger **101** respectively.

The application of hydraulic pressure to the cylinder chambers **132** and **133**, and also to the cylinder chambers **41** and **42** for the damper **33**, is controlled simultaneously by a spool type valve **140** in a bore **141** within the housing **130**. Referring particularly to Figs. 5–7, there is a direct connection from the pressure chamber **82** to the bore **141** provided by a passageway **142** in the port plate **56** which connects with passageways **143** and **144** in the housing **130**, the passage **144** terminating in a pressure port **145** located approximately centrally in the bore **141**. Bores **146** and **147** lead from the bore **141** to the respective cylinder chambers **132** and **133** to connect the pressure port **145** with one or the other of these chambers depending upon the position of valve **140**. The return lines from these cylinder chambers are provided by a pair of ports **148** and **149** in bore **141** connecting with a bore **150** in the valve housing **130**, and this return bore is connected through a port **151** and line **152** with one of the inlet ports **62** to the suction chamber **66** in the main valve and pump housing **55**.

The hydraulic pressure to move the damper **33** is also provided initially from the bore **131** and the passages **146** and **147**. Referring to Figs. 5–7, two vertical bores **156** and **157** connect with the bores **146** and **147** respectively, and each of these bores has a port at its outer end which is connected by one of the lines **160** and **161** with a corresponding port in the air inlet casting **30**, one of these ports **162** being shown in Fig. 8. This port **162** is connected by bores in the casing forming a passage **163** terminating in a port **164** opening through the damper support **32** and the sleeve **36** into the cylinder chamber **42**. A similar passage **165** (Fig. 8) leads to a port **166** similarly opening through the support **32** and sleeve **36** into the cylinder chamber **41**.

It will accordingly be seen that when the valve **140** is in the position shown in Figs. 5 and 10, there will be a direct application of hydraulic pressure from the pressure chamber **82** through the several passages and tubes as described to the respective cylinder chambers **41** and **132**. Simultaneously, the other cylinder chambers **42** and **133** will be connected to the suction chamber **66**. As a result, the damper **33** will be forced at its low limit position established by adjustment of the nut **46**, and similarly the plunger **101** will be forced to its low limit position established by adjustment of nut **163**.

Fig. 5 shows the valve **140** provided with a spring **170** biasing it to the position just described, which sets the oil burner for low output capacity operation. When valve **140** is shifted against spring **170** to the opposite end of bore **141**, the oil burner is set for high output capacity operation with the bore **147** being connected with pressure port **145** to receive oil therefrom for transmission to the cylinder chambers **42** and **133** while the other cylinder chambers **41** and **132** will be connected to the suction chamber **66** to effect shifting of the damper **33** and the plunger **101** at their respective high limit positions.

Operation of valve **140** may be effected by any suitable two-position controller, such for example as a solenoid **175** mounted on the end plate **56** as shown in Fig. 5 and having its armature **176** connected to the stem portion of valve **140** which projects outwardly from housing **130** through the sealing cap **177**. This solenoid may in turn be thermostatically controlled as described in connection with Fig. 9.

Fig. 9 shows a typical illustrative wiring diagram for use in practicing the present invention. The main burner motor **21**, ignition transformer **22** and primary control **23** are shown as provided with a limit control **180** and stack unit or combustion safety control **181** of the usual safety type arranged in the furnace or burner and in the stack to shut off the burner in the event of overheating or non-operation respectively. The switch **182** represents a conventional room thermostat operating through the primary control **23** to limit the operation of the burner should the room temperature increase to an uncomfortable limit in the event of malfunctioning.

The remainder of the wiring system in Fig. 9 includes a thermostat switch **185** having only two positions and connected to control the solenoid **175** or other controller for the valve **140**, the solenoid **175** being connected through a transformer **186** with the main power lines **190** and **191** and manual switch **192**. The thermostat switch **185** may be, for example, an outdoor thermostat switch which is adjusted to shift between its high and low positions when the outdoor temperature drops below a predetermined range. With such an arrangement, the thermostat switch **185** would be connected to energize the solenoid **175** when the outdoor temperature is below the predetermined range, thereby causing the valve **140** to shift to its high output capacity position as described above. For higher outdoor temperatures, however, the solenoid **175** would not be energized so that the valve **140** would be in its low output capacity position shown in Fig. 10.

The thermostat switch **185** may also be located within the house or other building being heated, in which case it is similarly adjusted to shift between its two positions at a predetermined temperature, which normally will be below the temperature which will cause the thermostat switch **182** to turn on the burner. With such arrangement, if the room temperature is only slightly below the adjusted setting of the thermostat switch **182**, the burner will operate at low output capacity, but if there is a substantial difference between the room temperature and the setting of thermostat switch **182**, then the thermostat switch **185** will shift to its high output capacity position until the room temperature approaches the desired range. Other similar variations in the wiring arrangements will be readily apparent in accordance with the principles of the invention as described above.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A control system including an oil burner and means for varying the output capacity of said oil burner comprising means including a pressure chamber for supplying liquid fuel to the burner, blower means including an air inlet for supplying secondary air to the burner, a damper controlling said inlet, means supporting said damper for shifting movement between high and low limit positions to change the effective flow passage through said inlet, double acting hydraulic means for reversibly effecting said shifting movement of said damper, means for metering the rate of supply of liquid fuel from said pressure chamber to the burner including a control member supported for shifting movement between respectively high and low rate limit positions correlated with said high and low limit positions of said damper, additional double acting hydraulic means for reversibly effecting said shifting movement of said control member, and selectively operable means for connecting both said hydraulic means with said pressure chamber to cause simultaneous shifting movement of said damper and said con-

trol member to either their said high limit positions or their said low limit positions respectively with resulting simultaneous change in the rates of supply of liquid fuel and secondary air to the burner.

2. A control system including an oil burner and means for varying the output capacity of said oil burner comprising means including a pressure chamber for supplying liquid fuel to the burner, means for supplying secondary air to the burner, a control member supported for shifting movement between high and low limit positions changing the rate of supply of secondary air by said air supplying means, double acting hydraulic means for reversibly effecting said shifting movement of said control member, means for metering the rate of flow of liquid fuel from said pressure chamber to the burner including a control member supported for movement between respectively high and low rate limit positions correlated with said high and low limit positions of said air control member, additional double acting hydraulic means, for reversibly effecting said movement of said fuel control member, and selectively operable means for connecting both said hydraulic means with said pressure chamber to cause simultaneous shifting movement of both of said control members to either their said high limit positions or their said low limit positions respectively and simultaneous variation in the rate of supply of both liquid fuel and secondary air to the burner.

3. A control system including an oil burner and means for varying the output capacity of said oil burner comprising means including a pressure chamber for supplying liquid fuel to the burner, means for supplying secondary air to the burner, a control member supported for shifting movement changing the rate of supply of secondary air by said air supplying means, double acting hydraulic means for reversibly effecting said shifting movement of said control member, means for metering the rate of flow of liquid fuel from said pressure chamber to the burner including a floating piston having oil receiving chambers at each end thereof, means for alternately connecting each said oil chamber to said pressure chamber and simultaneously connecting the other said oil chamber to the burner to meter the flow of liquid fuel to the burner through reciprocation of said piston by the hydraulic pressure in said pressure chamber, a stop member limiting the stroke of said piston and supported for movement between limit positions establishing respectively long and short strokes for said piston and correspondingly high and low rates of supply of liquid fuel to the burner correlated with said high and low limit positions of said air control member, additional double acting hydraulic means for reversibly effecting said movement of said stop member, and selectively operable means for connecting both said hydraulic means with said pressure chamber to cause simultaneous shifting movement of said control member and said stop member to either their said high limit positions or their low limit positions respectively and simultaneous variation in the rates of supply of both secondary air and liquid fuel to the burner.

4. A control system including an oil burner and means for varying the output capacity of said oil burner comprising means including a pressure chamber for supplying liquid fuel to the burner, blower means for supplying secondary air to the burner, a conical air inlet leading generally axially to said blower means, a damper for said inlet, a support mounting said damper for movement axially of said inlet to vary the effective flow passage therethrough, stop means establishing respectively high and low limit positions of said damper on said support, cooperating means on said damper and said support forming a double acting hydraulic cylinder for reversibly moving said damper on said support in response to the application of hydraulic pressure to one or the other end of said cylinder, said support having passageways therein communicating respectively with opposite ends of said cylinder, selectively operable means for connecting a selected one of said passageways with said pressure chamber to cause said reversible movement of said damper, and means responsive to operation of said selectively operable means for causing the rate of supply of liquid fuel from said pressure chamber to the burner to increase upon movement of said damper to said high limit position and to decrease upon movement of said damper in said lower limit position.

5. In an oil burner having a main fuel reservoir and a nozzle and including means for supplying secondary air to said nozzle, the combination of a first liquid fuel pump adapted for connection with said main reservoir, means defining a purging chamber for receiving the output of said first pump, means for venting air from the top of said purging chamber, a second liquid fuel pump connected with the lower end of said purging chamber to draw air-free liquid fuel therefrom, means defining a pressure chamber for receiving the output of said second pump, metering means connected between said pressure chamber and said nozzle for conducting fuel from said pressure chamber to said nozzle at a metered rate, means forming a double acting hydraulic cylinder for reversibly adjusting said metering means to vary said metered rate of supply of liquid fuel, selectively operable means for connecting either end of said hydraulic cylinder with said pressure chamber and simultaneously connecting the other end of said cylinder with the suction side of one of said pumps, and means responsive to operation of said selectively operable means for causing the rate of supply of secondary air to said nozzle to increase upon increase in said liquid fuel supply return and to decrease upon decrease in said liquid fuel supply return.

6. In an oil burner having a main fuel reservoir and a nozzle and including means for supplying secondary air to said nozzle, the combination of a first liquid fuel pump adapted for connection with said reservoir, means defining a purging chamber for receiving the output of said first pump, means for venting air from the top of said purging chamber, a second liquid fuel pump connected with the lower end of said purging chamber to draw air-free liquid fuel therefrom, means defining a pressure chamber for receiving the output of said second pump, metering means connected between said pressure chamber and said nozzle for conducting fuel from said pressure chamber to said nozzle at a metered rate, means forming a double acting hydraulic cylinder for reversibly adjusting said metering means to vary said metered rate of supply of liquid fuel, means including a movable control member for changing the rate of supply of secondary air to said combustion zone, means for forming a second double acting hydraulic cylinder for reversibly moving said control member, and selectively operable means for connecting one end of both said hydraulic cylinders with said pressure chamber and simultaneously connecting the other ends of said cylinders with the suction side of one of said pumps to cause simultaneous increase or decrease respectively in the rates of supply of both liquid fuel and secondary air to said nozzle.

7. In an oil burner having a main fuel reservoir and a nozzle and also having blower means including an air inlet for supplying secondary air to said nozzle, the combination of a first liquid fuel pump adapted for connection with said main reservoir, means defining a purging chamber for receiving the output of said first pump, means for venting air from the top of said purging chamber, a second liquid fuel pump connected with the lower end of said purging chamber to draw air-free liquid fuel therefrom, means defining a pressure chamber for receiving the output of said second pump, a damper controlling said air inlet, means supporting said damper for shifting movement between high and low limit positions to change the effective flow passage through said inlet, means forming a double acting hydraulic cylinder for reversibly effecting said shifting movement of said damper, selectively operable means for connecting either end of said hydraulic cylinder with said pressure chamber and simultaneously connecting the other end of said cylinder with

the suction side of one of said pumps, and means connected between said pressure chamber and said nozzle and responsive to operation of said selectively operable means for causing the rate of supply of liquid fuel to said nozzle to increase or decrease upon movement of said damper to said high or low limit position respectively.

8. In an oil burner having a main fuel reservoir and a nozzle and including means for supplying secondary air to said nozzle, the combination of a first liquid fuel pump adapted for connection with said reservoir, a housing defining a purging chamber connected to receive the output of said first pump, means in said housing for venting air from the top of said purging chamber, a second liquid fuel pump mounted within said housing and connected with the lower end of said purging chamber to draw air-free liquid fuel therefrom, said housing also having therein a pressure chamber receiving the output of said second pump, metering means connected between said pressure chamber and said nozzle for conducting fuel from said pressure chamber to said nozzle at a metered rate, means forming a double acting hydraulic cylinder for reversibly adjusting said metering means to vary said metered rate of supply of liquid fuel, selectively operable means for connecting either end of said hydraulic cylinder with said pressure chamber and simultaneously connecting the other end of said cylinder with the suction side of one of said pumps, and means responsive to operation of said selectively operable means for causing the rate of supply of secondary air to said nozzle to increase upon increase in said liquid fuel supply return and to decrease upon decrease in said liquid fuel supply return.

9. In an oil burner having a main fuel reservoir and a nozzle and including means for supplying secondary air to said nozzle, the combination of a pump and valve housing having a suction chamber therein, means for connecting said suction chamber with said reservoir, a first liquid fuel pump in said housing connected with said suction chamber to draw liquid fuel therethrough from said reservoir, means in said housing forming a purging chamber receiving the output of said first pump, means in said housing for venting air from the top of said purging chamber, a second liquid fuel pump connected with the lower end of said purging chamber to draw air-free liquid fuel therefrom, said housing also

having therein a pressure chamber receiving the output of said second pump, metering means connected between said pressure chamber and said nozzle for conducting fuel from said pressure chamber to said nozzle at a metered rate, means forming a double acting hydraulic cylinder for reversibly adjusting said metering means to vary said metered rate of supply of liquid fuel, means including a movable control member for changing the rate of supply of secondary air to said nozzle, means forming a second double acting hydraulic cylinder for reversibly moving said control member, and selectively operable means for connecting one end of both said hydraulic cylinders with said pressure chamber and simultaneously connecting the other ends of said cylinders with said suction chamber to cause simultaneous increase or decrease respectively in the rates of supply of both liquid fuel and secondary air to said nozzle.

10. A control system including an oil burner and means for varying the output capacity of said oil burner comprising means including a pressure chamber for supplying liquid fuel to the burner, blower means including an air inlet for supplying secondary air to the burner, means for metering the rate of supply of liquid fuel from said pressure chamber to the burner including a control member supported for shifting movement between respectively high and low rate limit positions, double acting hydraulic means for reversibly effecting said shifting movement of said fuel control member, selectively operable means for connecting said hydraulic means with said pressure chamber to cause shifting movement of said fuel control member, and means responsive to operation of said selectively operable means for changing the effective flow area through said air inlet between high and low limit positions respectively in accordance with movement of said fuel control member to said high and low rate limit positions thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,397,987	Senninger	Apr. 9, 1946
2,484,920	Witherell	Oct. 18, 1949
2,490,529	Logan	Dec. 6, 1949
2,491,201	O'Donnell et al.	Dec. 13, 1949