Sept. 26, 1944. F. L. JENNINGS 2,358,809

DUAL OIL BURNER APPARATUS

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FIG. 1.

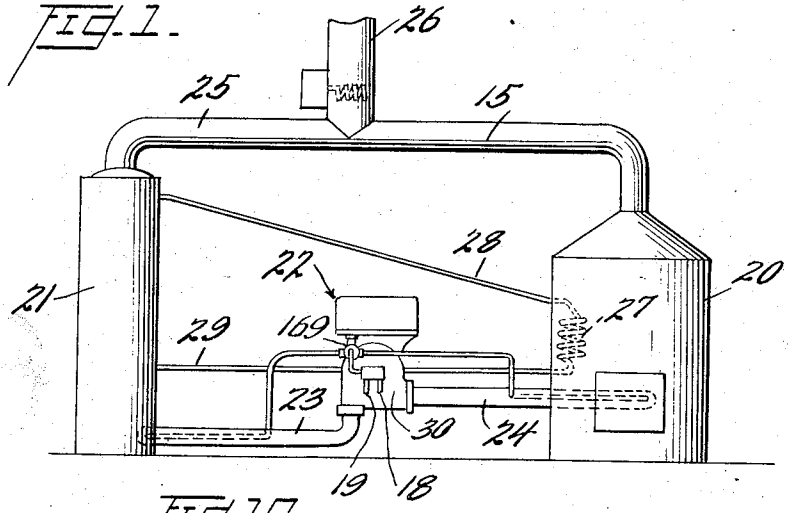

FIG. 10.

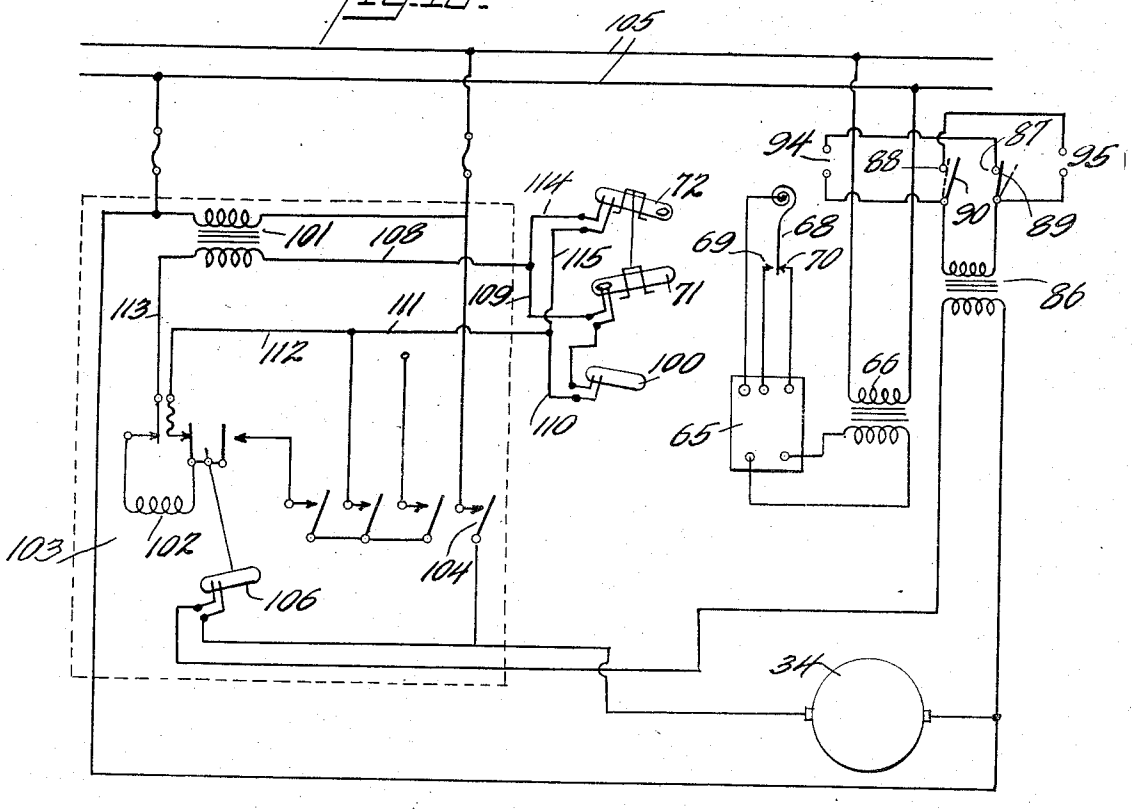

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FIG. 2.

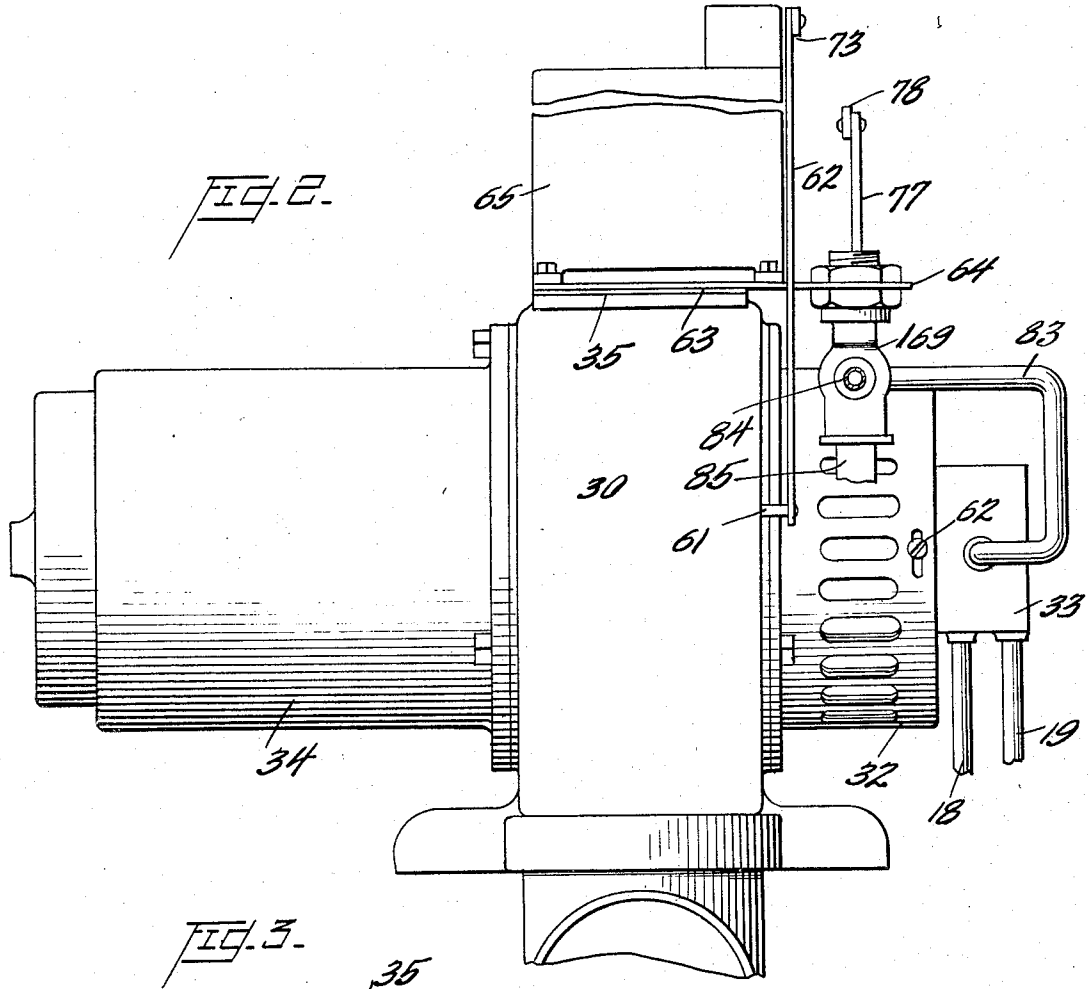
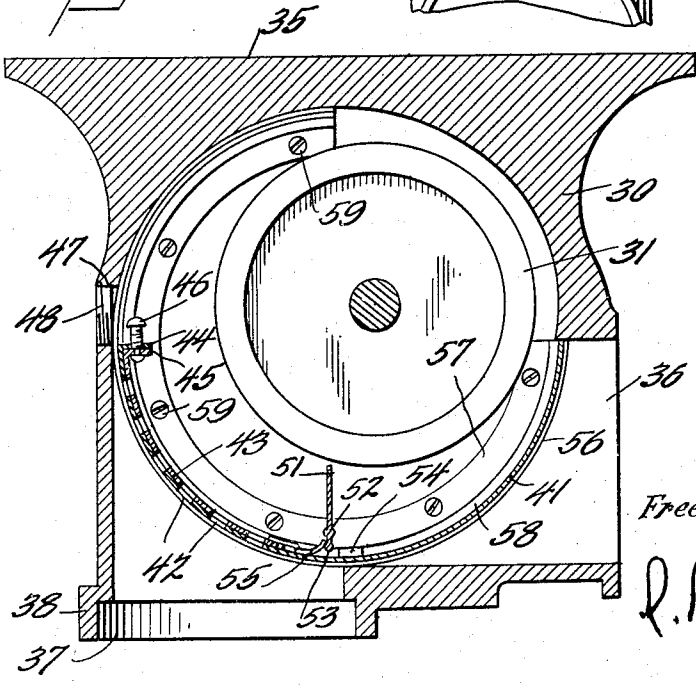


FIG. 3.



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DUAL OIL BURNER APPARATUS

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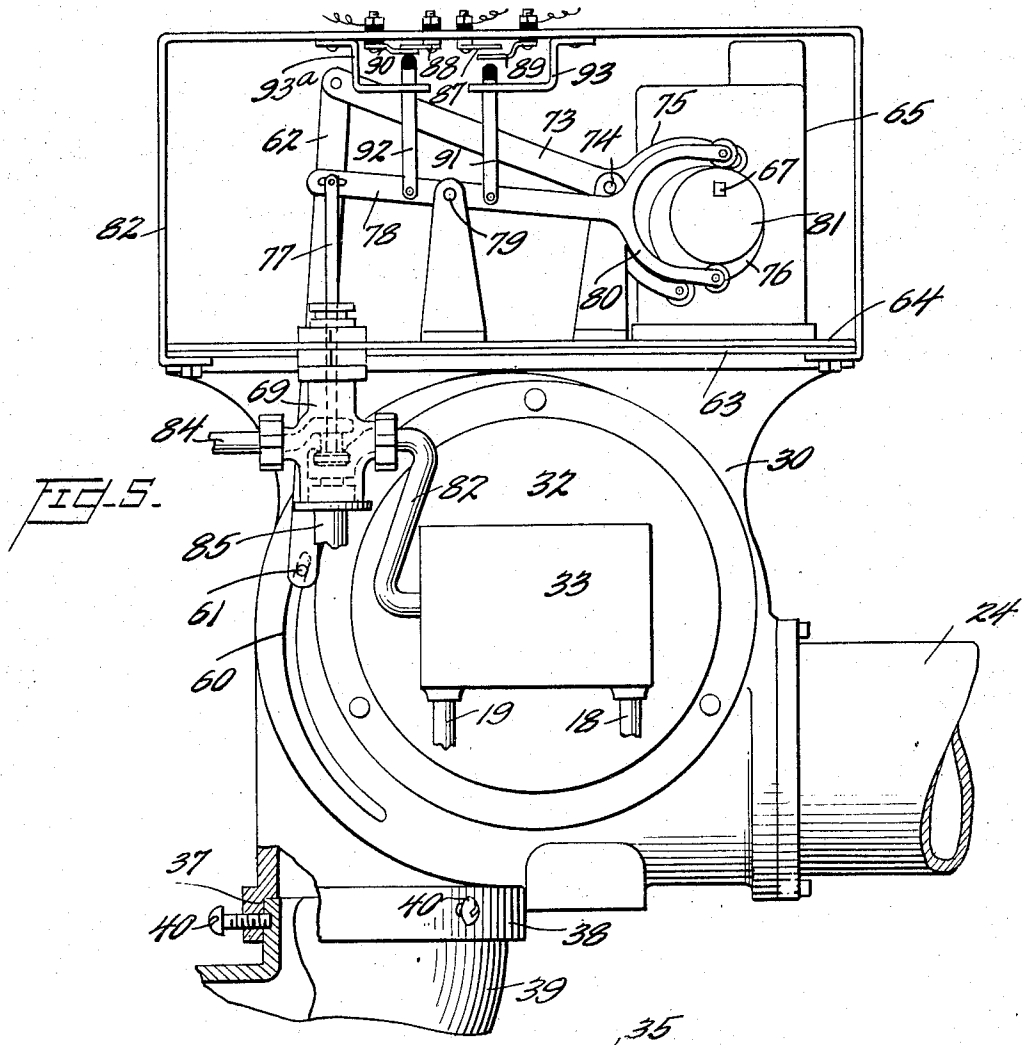

FIG. 5.

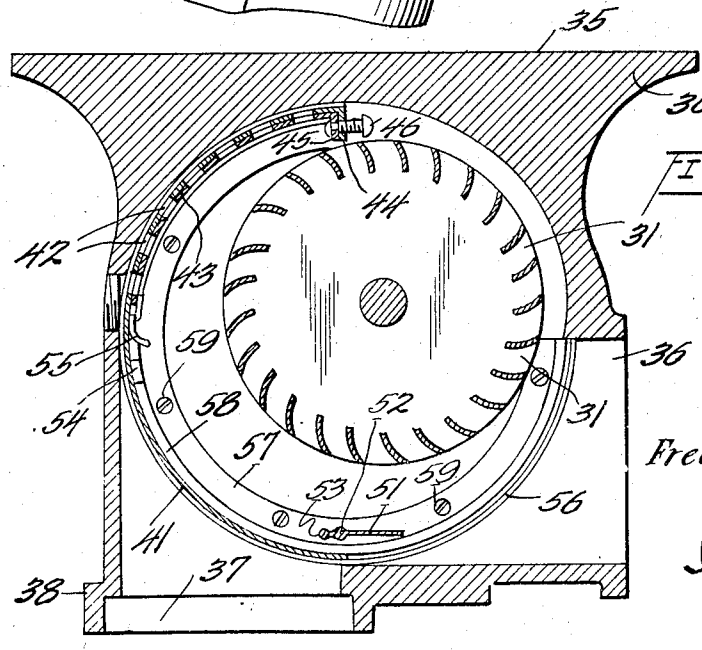

FIG. 4.

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FIG. 6.

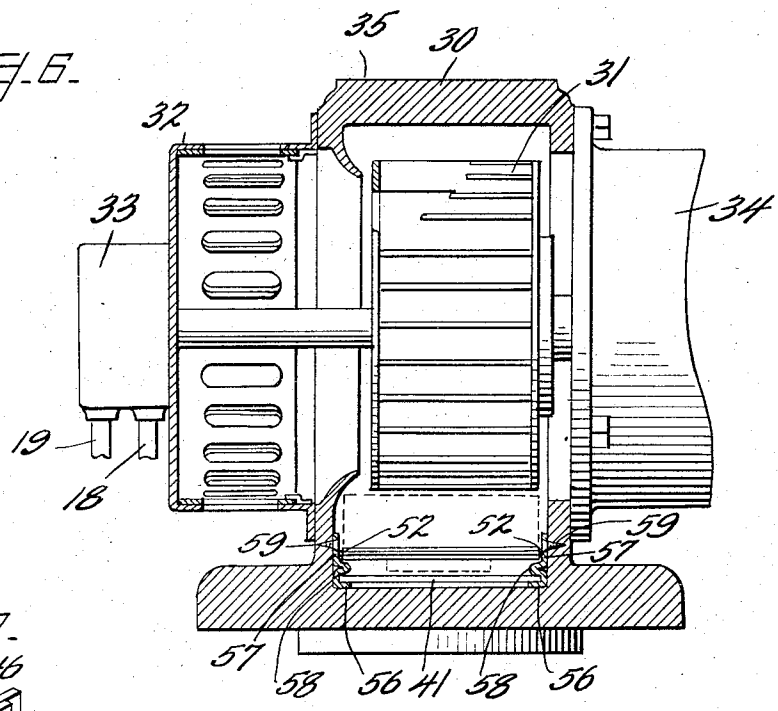
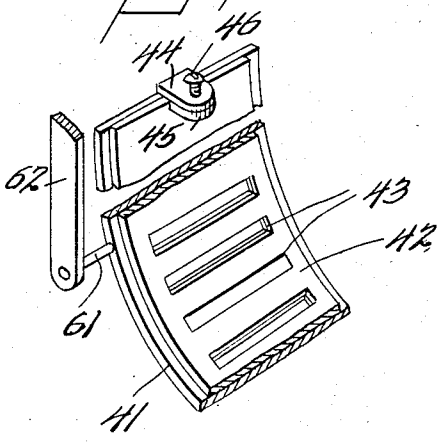


FIG. 7.



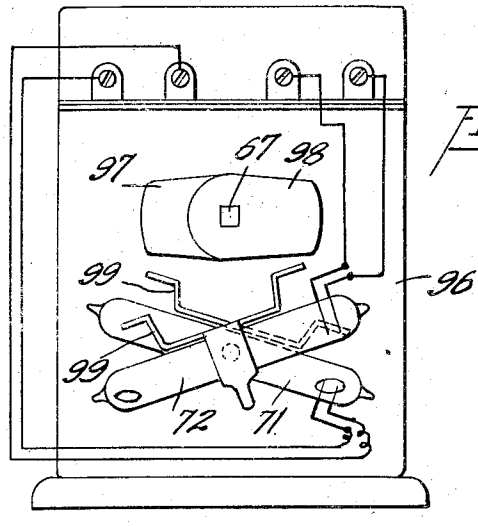


FIG. 9.

FIG. 8.

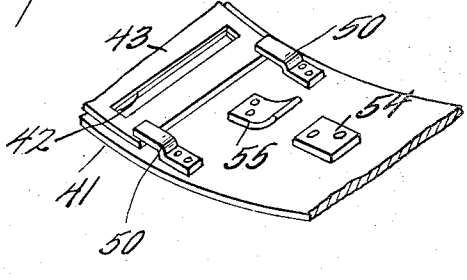


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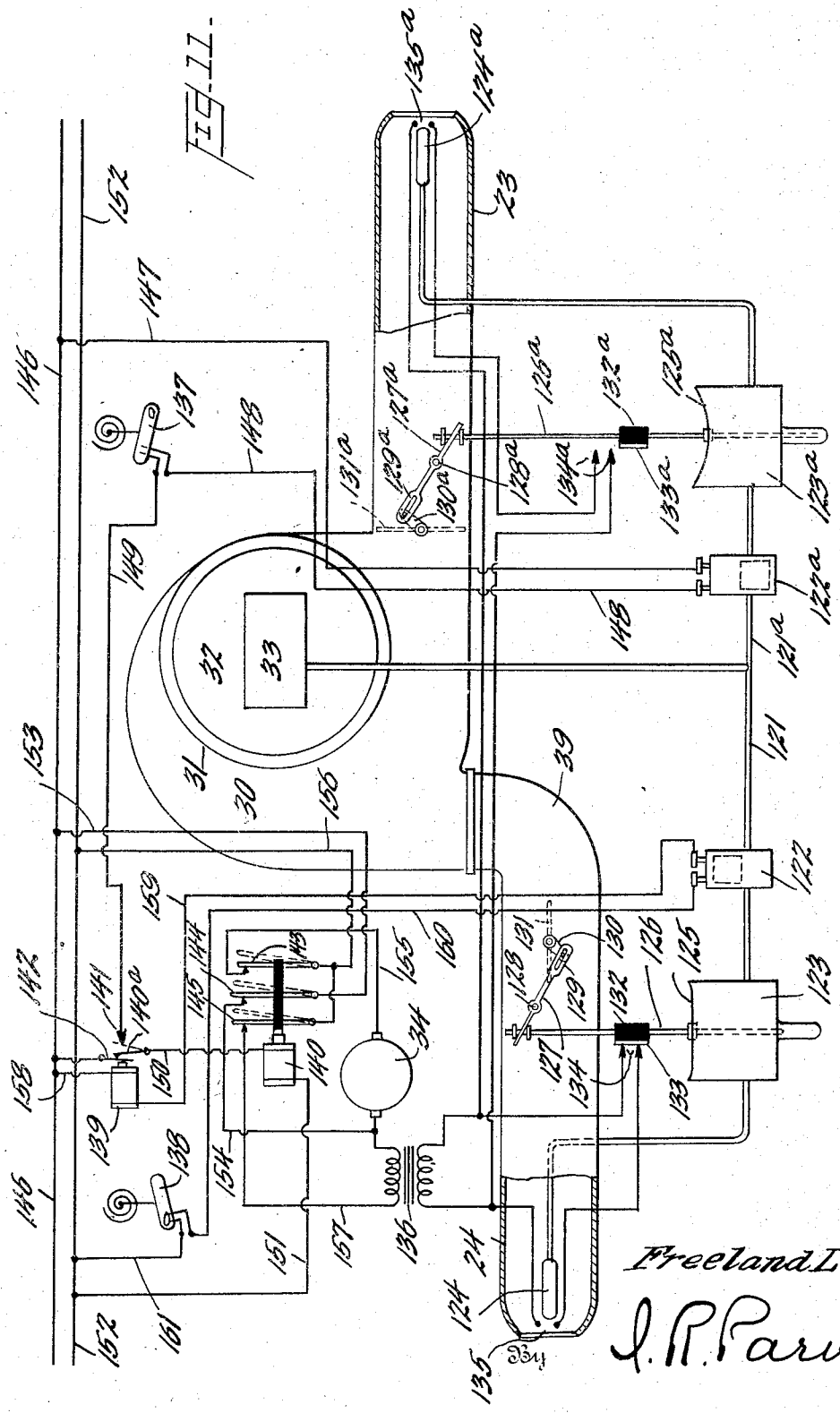
FIG. 11.



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Patented Sept. 26, 1944 2,358,809

UNITED STATES PATENT OFFICE

2,358,809

DUAL OIL BURNER APPARATUS

Freeland L. Jennings, Meriden, Conn.

Application May 16, 1940, Serial No. 335,587

26 Claims. (Cl. 237—8)

The present invention relates generally to a system and apparatus for firing a heating furnace and for heating a hot water storage tank and is more particularly directed to a dual oil burner apparatus for such a system and to an automatic control system for such apparatus.

It is the object of the present invention to provide a compact, integrated and unitary piece of apparatus which may be installed immediately adjacent to the furnace and hot water tank, the apparatus being provided with two burners, and the apparatus also housing a blower, a pump, and control elements for the proper operation of the two burners.

The present invention also provides an electrical control system of the apparatus which is automatically responsive to the needs or demands of the home or other space being heated and is also properly responsive to the demands upon the hot water system. The present invention further aims to provide a control system for a dual oil burner apparatus which will be biased in favor of the furnace burner so that the system will shut off the water heater burner and set the furnace burner in operation, in response to a call for heat from the thermostat in the space heated by the furnace.

More specifically the present invention aims to provide the two burners with all the operating and control devices necessary for the proper and safe automatic operation of the two burners, with, however, a minimum of duplication of control or operating elements. Thus the piece of apparatus which is installed immediately adjacent the furnace and hot water heater contains one, preferably centrifugal, air blower, the housing having a pair of outlets receiving oil burners; a single oil pump being also carried by the housing and a single motor for operating the air blower and pump. In addition, a single small low voltage control motor is employed and preferably mounted over the fan housing, this control motor serving to perform a plurality of controls over the two burners. Thus this single control motor operates an air valve for the purpose of directing the flow of air from the blower to one or the other burner; a three way valve to direct the flow of liquid fuel to one or the other burner; switching devices which control the starting and stopping of the main motor; the ignition sparking circuits of the two burners; and the control motor also operates to give preference to the furnace burner over the heater burner.

While the system and apparatus disclosed and described in greater detail hereinafter may be employed for a large variety of purposes and may generally be applicable for firing two separate heaters of any kind, the present system and apparatus as disclosed herein are more specifically adapted for employment in household installations and for firing a heating furnace and a hot water storage tank. Obviously the system may be employed in connection with any type of heating system such as hot water, steam, or air, although the system has particular use in combination with hot air heating systems.

Other objects and advantages of the present invention will become apparent to a person skilled in the art from the accompanying drawings and the following specification; it being understood, however, that the system and apparatus specifically disclosed herein are merely illustrative of the invention and that the specific construction may be varied without departing from the invention as set forth in the appended claims.

In the drawings:

Fig. 1 shows an installation of the type described;

Fig. 2 is a side view of the unitary compact apparatus which includes the operating and control elements installed at the furnace;

Fig. 3 is a transverse sectional view of the air blower housing;

Fig. 4 is a similiar section to Fig. 3 with the air valve in the second position;

Fig. 5 is a front view of the housing and control apparatus;

Fig. 6 is a longitudinal, vertical, sectional view of the housing;

Fig. 7 is a detailed view of the air valve;

Fig. 8 is a detailed view of the mid-portion of the air valve;

Fig. 9 shows the rear end of the control motor;

Fig. 10 is a diagrammatic view of the electrical control system;

Fig. 11 is a diagrammatic view of a modified control system;

The present system and apparatus is diagrammatically illustrated in Fig. 1 of the drawings which shows a furnace 20 and a hot water heater 21. The furnace may be of any type suitable for heating a dwelling or an office building or the like and may be a part of a hot water system or a steam heat system or a hot air heat system such as are commonly employed in air conditioning systems. The hot water heating apparatus 21 may also be of any suitable construction but is preferred to be so designed and constructed that it may be efficiently heated by an

oil burner. As shown in Fig. 1, the furnace 20 and hot water heater 21 are positioned facing each other with the oil burner apparatus 22 disposed between them and the burner 23 directed towards and into the water heater and the burner 24 directed toward the furnace. In many installations, however, it may be desirable to place the hot water heater in such a position that it does not face the front of the furnace. For this purpose the apparatus 22 is so designed and constructed that the oil burner 23 for the water heater may be rotated with reference to the apparatus 22 so as to direct the same towards the water heater 21. This construction is more fully described in the later portion of this specification and will be understood to permit considerable latitude in the arrangement of the furnace, water heater, and oil burner installation 22. The flues 15 and 25 of the furnace and water heater respectively are joined on to the common smoke stack 26. As is common in installations of this type the water heater 21 is provided with a by-pass which includes heating coil 27 disposed in the furnace and pipes 28 and 29 leading therefrom to the top and bottom of the water tank in the heater 21.

Many of the objects of the present invention will be clearly understood from a more detailed description of the apparatus 22. This apparatus comprises a cast housing 30, a blower 31 disposed within the housing and preferably of the centrifugal type, a louvred open faced chamber 32 mounted against one side of the housing, an oil pump 33 carried by the chamber 32 and mounted in such a manner that its shaft is in substantial alignment with the shaft of the blower 31, a motor 34 mounted on the opposite face of the housing 30 for driving the blower 31 and the pump 33. The pump 33 has an inlet 19 and a by-pass 18. The cast housing 30 is provided with a table top face 35, which is designed to have mounted thereon the several control elements which will be described in greater detail in the later portion of the specification. The casting 30 has a pair of outlets 36 and 37 respectively for communication with the oil burners 24 and 23 respectively. These outlets are disposed laterally of the blower so as to receive the air from the blower. With this limitation the outlets may be disposed in any positions desired. It is preferred, however, for the purpose of facilitating the installation of the present system and particularly for the purpose of permitting latitude in positioning the water heater with reference to the furnace, that at least one of these oulets be disposed in the bottom of the housing 30. In the present construction the outlet 37 is disposed in the bottom of housing 30 and is provided with a collar which receives an elbow 39 rotatable within the collar 38 and which may be clamped in any selected position by means of the set screws 40 or the like. The other end of the elbow 39 receives the water heater burner 23. Burner 24 may be installed directly in the outlet 36. It will now be understood that the water heater burner 23 may be adjusted within the range of more than 180° thus permitting the corresponding freedom in positioning the water heater.

The present system and apparatus is so designed and constructed that only one of the two burners may be operated at a time. An air valve 41 is, therefore, mounted within the housing which is operable to direct the flow of air from the blower either to the furnace burner 24 or to the heater burner 23. The system is also so designed and constructed that normally the air valve is in such a position as to close off the outlet 36 thereby cutting off the flow of air from the blower to the furnace burner, and maintaining the outlet 37 in communication with the blower 31 so that whenever the temperature of the water in the tank 21 falls below a predetermined minimum, the heater burner 23 may be set in operation without any movement of the air valve 41. Commonly the furnace burner is designed to operate at a greater rate with a consequent greater consumption of air and fuel than the heater burner. The air valve 41 is, therefore, so constructed and designed that in its normal position, while it cuts off communication between outlet 36 and the blower, it does not provide for full and free communication between outlet 37 and the blower. The air valve 41, therefore, consists of an arcuate plate which is substantially equal in length to about half the circumference of the inner lateral wall of the housing 30. The arcuate valve plate 41 is provided with apertures 42 over its upper half with the result that when the valve is in position so that its ends are disposed approximately horizontally as shown in Fig. 3, the outlet 36 is closed off by the valve 41 whereas the communication between outlet 37 and the blower is limited by the openings 42, thereby reducing the amount of air that will flow through the heater burner. In order to provide for the adjustment of the amount of air that may be supplied to the heater burner the valve 41 is provided with an adjustable plate 43 which has openings in registry with the openings 42 and may be slid over the face of the plate 41 so as to further restrict the openings 42. For this purpose, the plates 41 and 43 are provided with inwardly directed lugs 44 and 45 respectively. These are provided with openings to receive the screw 46 which threads into the opening of the lug 44 and is peened over onto the lug 45. The housing 30 is provided with a threaded opening 47 which gives access to the screw 46 for adjusting the valve 42. The threaded plug 48 closes the opening 47.

The valve 41 is provided at one end, as shown in Fig. 8, with a pair of strips 50 which overlie and hold the other end of the adjustable plate 43 against the valve 41 and which permit the plate 43 to slide between the arms 50 and the plate 41. The housing is also provided with a pivoted deflection plate 51 as shown in Figs. 3 and 4 and which is capable of occupying the two positions shown in these two figures. Thus in Fig. 3 the plate 51 is in its upright position and serves to deflect the air from the blower towards the outlet 37 whereas in Fig. 4 it is in horizontal position. The plate 51 is pivoted at 52 and has a dependent arm 53. The air valve 41 carries midway its ends a boss 54 which it will be understood engages the end 53 of the plate 51 so as to move the same from the vertical position shown in Fig. 3 to the horizontal position shown in Fig. 4, when the air valve is moved from the position shown in Fig. 3 to the position shown in Fig. 4. The air valve also carries the upwardly directed resilient finger 55 which engages the end 53 of the plate 51 on the reverse movement of the air valve so as to move the plate 51 back to its vertical and normal position.

In order to minimize the friction and facili-

tate the sliding of the air valve 41, the inner face of the housing against which the valve 42 is lodged is provided with a lining 56 of copper or bronze or similar material which will reduce the friction.

The lining 56 is in the form of a strip that lodges against the inner face of the wall and extends in the form of a pair of parallel strips along the sides of the outlets 37 and 36. The lining 56 also is provided with side flanges 57 which are crimped as shown at 58 so as to capture and hold the valve 41 in the channel formed by the crimping as is shown particularly in Fig. 6. The flanges 57 may be held in position by screws 59.

The face of the housing 30 is provided with an arcuate slot 60 through which extends the arm 61 which is integral with the valve preferably at a point approximately a quarter of the way down from the upper end thereof. An operating arm 62 is pivoted to the free end of the arm 61.

The louvred chamber 32 is also provided with an adjustable valve which is controlled by the screws 62 and may, therefore, be adjusted so as to permit the desired flow of air on the intake side of the blower. This, of course, is adjusted to the needs of the furnace burner. It will be seen that the housing has a circular chamber with the outlets 36 and 37 disposed at right angles to each other and that the blower is disposed eccentrically within this housing it being displaced away from the outlets 36 and 37.

A rubber or other vibration absorbing plate or gasket 63 is mounted on the table top 35 of the housing 30 and a metal plate 64 is disposed immediately over the gasket 63, the plate 64 being of substantially the same length as the top 35 of the housing 30 but being substantially wider than the housing 30 so that a portion thereof protrudes forwardly as is clearly seen in Fig. 2. A control motor 65 is mounted on a plate 64. This control motor is preferably designed to operate under low voltage and the step down transformer 66 shown diagrammatically in Fig. 10, and which preferably is also mounted on the plate 64 right alongside of the control motor 65, serves to supply low voltage current to the control motor. This motor 65 need not be described in detail herein except to state that it is provided with its own switch elements and speed reduction gearing so that while the armature of the motor may rotate at relatively high speed such as 1100 R. P. M., the operating shaft 67 of the motor, and which is employed for performing the various control operations, rotates slowly and approximately at the rate of two revolutions per minute. Furthermore, the motor 65 with its internal holding switches cooperates with the two-point thermostat 68 (see Fig. 10) in such a manner that when the thermostat is in one position such as in the position to close contact 69 which is the position where it calls for heat, the shaft 67 will make one half a revolution and stop. When the temperature of the space being heated by the furnace is raised to the predetermined point and the thermostat 68 moves to the second position, namely to close the contact 70, the shaft 67 of the motor 65 will make another half revolution thus returning all of the apparatus controlled thereby to the normal position. Thus it will now be understood that this motor is employed for operating the air valve 41, the three-way oil valve 169, the ignition circuits, and the mercury switches 71 and 72. For the operation of the air valve 41, the operating arm 62 thereof is pivotally connected at the upper end to a lever arm 73 which is fulcrumed at 74, the bifurcated end 75 of the lever end 73 cooperating with an eccentric 76 carried by the shaft 67. For the purpose of obviating and minimizing obstruction of the arm 73 by the oil valve control devices disposed in front of it, the position of the control motor 65 and the parts controlled thereby are shown in Fig. 5 as at the half revolution point. In other words, the positions of the parts shown in Fig. 5 are those which they assume after the thermostat 68 had moved to the left to close contact 69 and the shaft 67 had made one half a revolution. In this position the cam 76 is in its position where the right hand of lever arm 73 is at its lowermost position with the result that the link 62 is in its uppermost position and the air valve 41 is in its uppermost position as shown in Fig. 4. When thermostat 68 is satisfied it moves from contact 69 to contact 70 and the control motor 65 is again set into operation so that the shaft 67 makes another half revolution. This will bring the cam 76 to its opposite position, lower the lever 73 and thereby move the air valve 41 to the position shown in Fig. 3.

The three-way oil valve 169 is carried by the plate 64 as shown with its operating stem 77 extending upwardly. The lever 78 is fulcrumed at 79 and its bifurcated end 80 rides on the cam 81 carried by the shaft 67. The pipe 83 leads from the outlet end of the oil pump 33 to the inlet side of the valve. The outlet 84 is connected to the water heater oil burner 23 and the outlet 85 is connected to the furnace oil burner 24. Normally the stem 77 is in its lowered position whereby closing off the outlet 85 and establishing communication between the inlet 83 and the outlet 84 and providing for the flow of oil to the heater burner when the pump is started in operation. When the operating stem 77 is in its uppermost position, which is the position illustrated in Fig. 5 of the drawings, the outlet 84 is closed and communication is established between inlet 83 and outlet 85 of the valve thus providing for the flow of oil to the furnace burner. The previous description of the operation of the air valve 41 by means of the shaft 67 is also applicable to the operation of the oil valve 69 by means of the shaft 67. It will thus be understood that normally the air valve 41 is in the position shown in Fig. 3 shutting off air from the furnace burner and permitting the flow of air to the heater burner. Similarly, normally the oil valve 69 is in the position where it shuts off oil from the furnace burner and permits the flow of oil to the heater burner.

The control motor 65 also serves to control the sparking current in that it operates a pair of switching devices so that the secondary of the high tension transformer 86 is connected to the sparking device of one burner or the other but is never connected to the sparking devices of both burners at the same time. For this purpose a yoke shaped arm 82 is attached to the plate 64 as shown in Fig. 5, the upper portion of the yoke overlying the lever 78. The yoke 82 has mounted thereon a pair of fixed contacts 87 and 88 and a pair of movable contacts 89 and 90 cooperating with the fixed contacts 87 and 88 respectively. The lever arm 78 is provided with a pair of upstanding rods 91 and 92 disposed on opposite sides of the fulcrum 79. The rods 91 and 92 are disposed immediately below the movable contacts 89 and 90 respectively and are

guided in their travels by the guides 93 and 93a. The resilient movable contacts 89 and 90 normally tend to separate from the fixed contacts 87 and 88 respectively. The entire arrangement, however, is such that when the lever arm 78 is in its raised position as shown in Fig. 5 then the contacts 88 and 90 are closed while the contacts 87 and 89 are open. When the lever 78 is moved to the other and normal position, the contacts 88 and 90 will open and contacts 87 and 89 will close. As shown in Fig. 10, contacts 87, 89 when closed connect the high voltage side of the high tension transformer 86 to the sparking device or devices 94 which are part of the heater burner 23; and contacts 88 and 90 when closed connect the high voltage side of the transformer 86 to the sparking device 95 which is part of the furnace burner 24; it being understood, however, that normally contacts 87, 89 are closed and contacts 88, 90 are open and that the reverse is true when the oil burner 24 is in operation. It will now be seen that these spark control switches are controlled by the shaft 67 of the control motor 65 in the same manner in which this motor controls the air valve and oil valve.

The mercury switches 71 and 72 are pivotally mounted on a panel 96 which is disposed on the opposite end of the control motor 65. The opposite end of the shaft 67, as shown in Fig. 9, carries a pair of cams 97 and 98, these serving to tilt the mercury switches 71 and 72 respectively from one position to the other in the course of the rotation of the shaft 67.

In the operation of the present system, the circuits of motor 34 and of the primary side of the high tension transformer 86 are always broken during the period of movement of the air shutter 41 and the oil valve 169. This is accomplished by the arrangement of the cams 97 and 98 with reference to the arms 99 which extend from the brackets supporting the mercury switches 71 and 72. The arms 99 are contacted by the cams 97 and 98 so as to first tilt the closed switch so as to bring the same to open position and subsequently and substantially at the end of the half revolution of the shaft 67 the same cam contacts an arm on the other mercury switch so as to tilt the same to the closed position. The pair of arms 99 on each switch are displaced laterally so that one such arm will be contacted by the cam 97 and the other such arm will be contacted by the cam 98. Cams 97 and 98 are carried by the end of shaft 67 and are in different and parallel planes. Normally the cams are in the position shown in Fig. 9. Immediately, however, upon the beginning of rotation of the control motor 65, caused by the movement of the thermostat 68 to contact 69, the cam 97 will contact with the arm 99 of switch 71 so as to tilt the same to the open position. And at the end of the half revolution of the shaft 67 (the shaft 67 operating counter-clockwise in Fig. 9) the cam 97 will contact the arm of switch 72 so as to move the same to the closed position. The cams 76 and 81 on the other end of the shaft 67 are so designed that at the beginning of each half revolution of the shaft 67 no substantial movement of the linkage system associated with such cams takes place. Thus it will be seen that the flow of oil and air is cut off from all the burners immediately upon the beginning of movement of the control motor 65. At the same time sparking current is cut off from the burners at the very beginning of movement of the control motor 65. At the very end of the half revolution of shaft 67 the cam 97 reaches the upper arm 99 of mercury switch 72 and moves the same to closed position. This brings about the closure of the switch 104 thus connecting the motor 34 and the primary side of the transformer 86 to the source of current. Similarly when the contact 68 is moved back to its normal position to contact 70, another half revolution of the shaft 67 brings about the cooperation of the cam 98 with the other pair of arms 99 on the switches 71 and 72 so that at the very beginning of the half revolution of shaft 67 cam 98 contacts the arm 99 of switch 72 so as to move the same to open position and at the end of the half revolution of the shaft the cam 98 contacts switch 71 so as to move the same to closed position.

Normally the switch 71 is in closed position and the switch 72 is in open position. In series with the switch 71 is a normally open thermostatically controlled switch 100. The switch 100 is controlled by an aquastat mounted in the hot water side of the water heater 21. Within the dotted lines shown in Fig. 10 is a diagrammatic showing of a protector relay 103 and its associated devices which constitute a unitary construction mounted on the smoke stack 26 and are designed to so control the entire system as to protect the same against a variety of contingencies such as the over heating of the entire system or the prevention of the flow of oil if there is a failure in the ignition system and other contingencies. For the purposes of the present invention it is not necessary to describe this piece of apparatus in detail except to state that it comprises a step down transformer 101 and a relay 102 which is normally connected at one side to the transformer 101, the connection on the other side being interrupted by the mercury switches 71, 72 or 100. The relay 102 when energized operates to close switch 104 thus establishing electrical connection between the motor 34 and the source of current 105. The switch 104 also serves to connect or disconnect the source of current 105 to the primary side of the high tension transformer 86. This connection being further controlled by the mercury switch 106 which is part of the protector relay 103 and whose operation is controlled by a thermostatic helix 107 which is part of the protector relay and is disposed in the smoke stack 26.

It will now be understood that with the system in its normal position as shown in Fig. 10 the thermostat 68 closes contact 70 and the motor 34 and high tension transformer 86 are disconnected from the source of current. When the temperature of the water in the water heater drops below a predetermined point the aquastat 100 is tilted to its closed position and the relay 102 is energized from the transformer 101 by conductors 108, 109, closed switch 71, closed aquastat 100, conductors 110, 111, 112 through the relay 102 and conductor 113 back to the other side of the transformer 101. Energization of the relay closes switch 104 thereby connecting the source of power to motor 34 and to high tension transformer 86. The motor 34 operates the blower and the oil pump so as to direct oil and air to water heater burner 23. When the temperature of the water is raised to the desired point the aquastat 100 will return to the normal position shown in 110 and the relay 102 will deenergize and the switch 104 will open thereby disconnecting the source of power from motor 34 and high tension transformer 86.

Should the temperature of the space heated by the furnace drop below a predetermined point the thermostat 68 will move from the position shown in Fig. 10 to its second position to close contact 69. The motor 65 will then operate so that its shaft 67 will make half a revolution and stop. This will move the air valve 41 to the position shown in Fig. 4 so as to establish free communication between furnace burner 24 and the blower and to close off communication between the blower and the heater burner. This movement of the air valve will also move the deflector plate 51 to the position shown in Fig. 4. At the same time the oil valve will be operated so as to shut off communication between the heater burner and the pump and establish communication between the furnace burner and the pump. The operation of the oil valve also serves to open spark control switch 89 and close the spark control switch 90. The other end of the shaft 67 will move mercury switch 71 to its open position and mercury switch 72 to its closed position thereby establishing connection between relay 102 and transformer 101 by means of conductors 113, 108, 114, switch 72, and conductors 115, 111 and 112. The energization of relay 102 closes switch 104.

The furnace burner 24 is now provided with sparking current and the operation of the motor 34 supplies the same with oil and air. After the thermostat 68 is satisfied it moves back to its normal position bridging contact 70, motor 65 operates so that its shaft 67 makes another half revolution in the same direction, and the air valve, the oil valve, the spark control switch, and the mercury switches 71 and 72 are returned to normal position shown in Fig. 10.

It will now be understood that the present system is so set that the heater burner is normally ready to operate. Nevertheless the furnace has precedence over the heater burner. Whenever there is a call for heat by the thermostat 68, the system will move so as to set the furnace burner in operation whether or not the heater burner is in operation at the time.

Fig. 11 shows a modified control system for the dual burner apparatus shown and described hereinabove. The modified system contemplates the use of the same housing 30 with the burners 23 and 24, the blower 31, the air inlet 32 and the pump 33. In lieu, however, of the control devices associated with the apparatus as hitherto described the modified system seeks to substitute other control devices.

Referring to Fig. 11 the housing 30, heater burner 23, elbow 39, furnace burner 24, oil pump 33, and motor 34 shown correspond to the same elements hitherto described. In the present system the oil flow is controlled by electromagnetic valves, the energization of the electromagnets of the valves being controlled by thermostats. In operation of nozzle 124 the pressure builds up against the nozzle and in the chamber 123 which causes diaphragm 125 to distend outwardly. The rod 126 is carried by the diaphragm 125 and is connected at its upper end to the lever 127 which is pivoted at 128 and is connected by the links 129 and 130 to the valve 131. Normally the valve 122 is closed, the pump 33 is not in operation and the pressure in chamber 123 is normal or atmospheric with the result that the valve 131 is in position to shut off the flow of air through the burner 23. When the valve 122 is opened and the pump 33 operated the pressure in chamber 123 will move the valve 131 to the position shown in Fig. 11 thereby establishing the desired communication between burner 24 and the blower in the housing 30.

The rod 126 also carries fixedly mounted thereon a block of insulating material 132 having a bridging contact element 133 on one face thereof. The contact 133 is designed to bridge the fixed contacts 134. Normally without the flow of oil through the chamber 123 the contacts 134 are open so that the spark gap 135 is not connected to the transformer 136. With the flow of oil through the nozzle the movement of the rod 126 will bring the bridging element 133 in bridging relation with contacts 134 thereby connecting the spark gap 135 to the transformer 136. An identical arrangement of elements 121 to 135 inclusive will be seen in Fig. 11 as associated with the heater burner 23, except that these elements which are indicated by the same reference characters with an exponent *a* are shown in inoperative position, the valve 122*a* being closed, the switch 132*a* being in open position and the air valve 131*a* being closed.

It will be understood that normally when neither of the burners is in operation the aquastat 137 is in its open position and the thermostat 138 is also in its open position. The valves 122 and 122*a* are, therefore, both closed, the air valves 131 and 131*a* are both closed, and the relays 139 and 140 are deenergized. Under such normal conditions when neither burner is in operation the contact 140*a* of the relay 139 is in the dotted line position and in contact with the fixed contact 141 and is out of contact with the fixed contact 142. The movable contacts 143, 144 and 145 are in the dotted line position thereby breaking their respective circuits.

The operation of the system shown in Fig. 11 will now be understood. When the temperature of the water in the hot water heater drops below a predetermined minimum the aquastat 137 will move to the closed position. The following circuit will then be established: line 146, conductor 147, electromagnetic valve 122*a*, conductor 148, aquastat switch 137, conductor 149, normally closed contacts 141 and 140*a*, conductor 150, relay 140 and conductor 151 back to the main line 152. This, it will be seen, will energize valve 122*a* and open same, thus establishing communication between the nozzle 124*a* and the oil pump 33. The motor 34 will be operated by the following circuit: main line 146, conductor 153, switch 144, conductor 154, motor 34, conductor 155, switch 143, and conductor 156 back to the other side of the line 152. The primary winding of the transformer 136 is also connected to the main line by the energization of the relay 140 through the following circuit: main line 146, conductor 153, closed switch 144, conductor 154, primary winding of the transformer 136, conductor 157, closed switch 145, and conductor 156 back to the main line 152. The secondary winding of the high tension transformer 136 becomes connected to the spark gap 135*a* immediately by the pressure generated by the flow of oil in the chamber 123*a* which moves the rod 126*a* to open the air valve and to bridge the contacts 134*a*, thereby setting the water heater burner 23 in operation. When the temperature of the water heater has reached its desired point the aquastat 137 is moved back to normal, the valve 122*a* is closed, the relay 140 is deenergized, thus breaking the circuits for the motor 34 and the primary of the high tension transformer 136.

When the room temperature drops, the thermostat 138 is operated to close its circuit as shown in Fig. 11 thereby establishing the following circuit: main line 146, conductor 158, relay 139, conductor 159, electromagnetic valve 122, conductor 160, thermostatic switch 138, and conductor 161 to the main line 152. Valve 122 is thereby opened and main control relay 139 is thereby energized. The energization of relay 139 draws movable contact 140a into position in contact with 142 and opens its contact with 141. It will be seen that by means of this relay the control system is biased in favor of the furnace burner and will set the furnace burner in operation whenever the thermostat 138 calls for heat. By the movement of the contact 140a away from contact 141 the circuit for the valve 122a is broken thereby causing the shutting off of the burner 23. The energization of relay 139 causes the energization of relay 140 over the following circuit: main 146, switch 142, 140a, conductor 150, relay 140 and conductor 151 back to main 152. This, it will now be understood, establishes circuit for the motor 134 and for the high tension transformer 136 and the furnace burner 24 will be set in operation.

It will now be understood that in the present system one burner (the furnace burner) is the primary burner in that it has priority and precedence over the other burner (the hot water burner) which is the secondary burner. Whenever there is a call for heat from the primary burner the control devices will prevent operation of the secondary burner and set the primary burner in operation. When demand upon the primary is satisfied, the primary burner will cease operating and the system is restored to its normal condition and the secondary burner is ready to operate in response to demand. Thus in its normal condition the present system permits the secondary burner to come on and off intermittently as the demand varies and substantially in the manner in which thermostatically controlled single burner systems have been known to operate. When a demand for heat from the primary burner arises the control system operates so as to render the demand devices associated with the second burner ineffective as long as the demand upon the primary burner exists and until this demand is satisfied. When this demand is satisfied then the source of fuel is again placed under the control of the demand devices of the secondary burner, even if at that moment there is no demand for heat from the secondary burner. It will be understood that this principle of operation is applicable to many types of systems and burners.

I claim:

1. An oil burner installation, comprising a housing, a centrifugal blower disposed within the housing, a pump carried by said housing, a motor for operation of said blower and said pump, the housing also having a pair of outlets, a burner for a water heater communicating with one outlet, a burner for a furnace communicating with the other outlet, an air valve disposed within the housing and movable to close one or the other outlet, an oil valve operable to direct the flow of fuel to one or the other burner, said valves having normal positions permitting the flow of oil and air to the water heater burner, thermostatic means, responsive to water heater temperature, controlling the operation of said motor to supply air and fuel to the water heater burner, and motor means operable in response to demand for furnace heat to move the said valves to positions to supply air and fuel to the furnace burner.

2. An oil burner installation, comprising a housing, a centrifugal blower disposed within the housing, a pump carried by said housing, a motor for operation of said blower and said pump, the housing also having a pair of outlets, a burner for a water heater communicating with one outlet, a burner for a furnace communicating with the other outlet, an air valve disposed within the housing and movable to close one or the other outlet, an oil valve operable to direct the flow of fuel to one or the other burner, said valves having normal positions permitting the flow of oil and air to the water heater burner, thermostatic means, responsive to water heater temperature, controlling the operation of said motor to supply air and fuel to the water heater burner, and motor means operable in response to demand for furnace heat to move the said valves to positions to supply air and fuel to the furnace burner, said last named motor means also having switching means associated therewith to interrupt the control of the first named thermostatic means during the operation of the furnace burner.

3. An oil burner installation, comprising a housing, a centrifugal blower disposed within the housing, a pump carried by said housing, a motor for operation of said blower and said pump, the housing also having a pair of outlets, a burner for a water heater communicating with one outlet, a burner for a furnace communicating with the other outlet, an air valve disposed within the housing and movable to close one or the other outlet, an oil valve operable to direct the flow of fuel to one or the other burner, said valves having normal positions permitting the flow of oil and air to the water heater burner, thermostatic means, responsive to water heater temperature, controlling the operation of said motor to supply air and fuel to the water heater burner, a two position thermostat means operable in response to temperature of furnace heated space to move from one position to the other, and electric motor means electrically connected to and controlled by the last named thermostat to move the valves to positions to supply air and fuel to the furnace burner and to operate the motor when the thermostat is in one position and to return the valves to normal position and stop the motor when the thermostat is in the other position.

4. A dual oil burner unit, comprising a housing having a pair of opposing coaxial circular openings in the front and rear walls, a centrifugal blower disposed within the housing coaxially with said openings, a lowered open faced chamber carried by said housing with its open face against one of said openings, a pump carried by said chamber on its exterior wall, a motor for operation of said blower and said pump, the housing also having a bottom outlet and a lateral outlet, a dependent collar surrounding said bottom outlet, a rotatable elbow tube carried by said collar, means to hold said tube in any desired adjusted position, a burner communicating with the other end of said tube, a second burner communicating with said housing at the lateral outlet; one of said burners being a primary burner a slidable elongated air valve lodged against the inner face of a lateral wall, said air valve comprising a strip having a perforate and an imperforate portion, the imperforate portion being normally disposed so as to close one of the outlets, and means operative in response to demand or satisfaction or demand for heat from said primary burner to

move said valve to close the other outlet and open the first outlet.

5. A dual oil burner unit, comprising a housing having a pair of opposing coaxial circular openings in the front and rear walls, a centrifugal blower disposed within the housing coaxially with said openings, a louvred open faced chamber carried by said housing with its open face against one of said openings, a pump carried by said chamber on its exterior wall, a motor for operation of said blower and said pump, the housing also having a bottom outlet and a lateral outlet, a dependent collar surrounding said bottom outlet, a rotatable elbow tube carried by said collar, means to hold said tube in any desired adjusted position, a burner communicating with the other end of said tube, a second burner communicating with said housing at the lateral outlet; one of said burners being a primary burner a slidable elongated air valve lodged against the inner face of a lateral wall, said air valve comprising a strip having a perforate and an imperforate portion, the imperforate portion being normally disposed so as to close one of the outlets, and means operative in response to demand or satisfaction or demand for heat from said primary burner to move said valve to close the other outlet and open the first outlet, said last named means comprising a motor operable in response to predetermined temperature conditions and operative connections between said last named motor and said valve.

6. A dual oil burner unit, comprising a housing, a centrifugal blower disposed within the housing, a pump carried by said housing, a motor carried by said housing for operation of said blower and said pump, the housing also having a pair of outlets disposed laterally of the blower, a burner carried by said housing at each outlet, one for a furnace and the other for a water heater; a slidable elongated air valve lodged against said lateral wall, said air valve comprising of a strip having a perforate and an imperforate portion, the imperforate portion being normally disposed so as to close the outlet to the furnace burner, the perforate portion being normally disposed against the outlet to the hot water burner, said housing having a slot, said air valve having an arm extending through said slot, and motor means, including operative connections between the motor means and the air valve, cooperating with said arm and operative in response to demand for furnace heat to move said valve to a second position to establish free communication between the furnace burner and the blower and to close the outlet of the water heater burner, said motor means being operative in response to satisfaction of demand for furnace heat to move said valve to its normal position.

7. A dual oil burner unit, comprising a housing having a pair of opposing coaxial circular openings in the front and rear walls, a centrifugal blower disposed within the housing coaxially with said openings, an open face louvred chamber carried by said housing with its open face against one of said openings, a pump carried by said chamber on its exterior wall, a motor carried by said housing against the other of said openings for operation of said blower and said pump, the housing also having a bottom outlet and another lateral outlet, a dependent collar surrounding said bottom outlet, a rotatable elbow tube carried by said collar, means to hold said elbow in any desired adjusted position, a burner communicating with the other end of said elbow, a furnace burner communicating with the housing at the lateral outlet; a strip of sheet metal fixedly lodged against the interior face of the lateral wall of the housing, a slidable elongated air valve lodged against said lateral wall, said air valve comprising a strip having a perforate and an imperforate portion, the imperforate portion being normally disposed so as to close the said lateral outlet, the perforate portion being normally disposed against the bottom outlet and motor means, including operative connections between the motor means and said arm, cooperating with said arm and operative in response to demand for furnace heat to move said valve to a second position to establish free communication between the lateral outlet and the blower and to close the bottom outlet, said motor means being also operative in response to satisfaction of said demand to move said valve to its normal position.

8. A dual oil burner system comprising a furnace burner, a water heater burner, an oil pump, an air blower, a motor for said pump and blower, an air valve for directing the flow of air selectively to the one burner or the other, an oil valve for directing the oil to one burner or the other, said valves being normally in position permitting the flow of air and fuel to the water heater burner, an aquastat associated with said water heater controlling the operation of said motor to supply air and fuel to the water heater burner, and control means operative in response to demand for furnace heat to move said valves to a position permitting the flow of air and fuel to the furnace burner and shutting off the flow of air and fuel to the other burner, said control means being operative in response to satisfaction of said demand to return said valves to normal positions, said control means comprising rotary motor means having a shaft and cam means cooperating therewith to move said valves in one direction by a half revolution of the shaft and in the opposite direction by another half revolution of said shaft.

9. A dual oil burner system comprising a furnace burner, a water heater burner, an oil pump, an air blower, a motor for said pump and blower, an air valve for directing the flow of air selectively to the one burner or the other, an oil valve for directing the oil to one burner or the other, said valves being normally in position permitting the flow of air and fuel to the water heater burner, an aquastat associated with said water heater controlling the operation of said motor to supply air and fuel to the water heater burner, and rotary control means operative by a partial revolution in response to demand for furnace heat to move said valves to a position permitting the flow of air and fuel to the furnace burner and shutting off the flow of air and fuel to the other burner, said control means being operative by another partial revolution in response to satisfaction of said demand to return said valves to normal positions.

10. A dual oil burner system comprising a furnace burner, a water heater burner, an oil pump, an air blower, a motor for said pump and blower, an air valve for directing the flow of air selectively to the one burner or the other, an oil valve for directing the oil to one burner or the other, said valves being normally in position permitting the flow of air and fuel to the water heater burner, an aquastat associated with said water heater controlling the operation of said motor to supply air and fuel to the water heater burner, a source of ignition current for said burners, and rotary control means opera-

tive by a partial revolution in response to demand for furnace heat to move said valves to a position permitting the flow of air and fuel to the furnace burner and shutting off the flow of air and fuel to the other burner, said control means being operative by another partial revolution in response to satisfaction of said demand to return said valves to normal positions.

11. A dual oil burner system comprising a furnace burner, a water heater burner, an oil pump, an air blower, a motor for said pump and blower, an air valve for directing the flow of air selectively to the one burner or the other, an oil valve for directing the oil to one burner or the other, said valves being normally in position permitting the flow of air and fuel to the water heater burner, an aquastat associated with said water heater controlling the operation of said motor to supply air and fuel to the water heater burner, a source of ignition current for said burners, and rotary control means operative by a partial revolution in response to demand for furnace heat to transfer said source of ignition current to said furnace burner, to move said valves to a position permitting the flow of air and fuel to the furnace burner and shutting off the flow of air and fuel to the other burner. said control means being operative by another partial revolution in response to satisfaction of said demand to disconnect said source of ignition current from said furnace burner and to return said valves to normal positions.

12. A dual oil burner system comprising a furnace burner, a water heater burner, an oil pump, an air blower, a motor for said pump and blower. an air valve for directing the flow of air selectively to the one burner or the other, an oil valve for directing the oil to one burner or the other, said valves being normally in position permitting the flow of air and fuel to the water heater burner. an aquastat associated with said water heater controlling the operation of said motor to supply air and fuel to the water heater burner. a source of ignition current for said burners. normally available only to the water heater burner. and rotary control means operative by a partial revolution in response to demand for furnace heat to transfer said ignition current to the furnace burner, to move said valves to a position permitting the flow of air and fuel to the furnace burner and shutting off the flow of air and fuel to the other burner, said control means being operative by another partial revolution in response to satisfaction of said demand to restore ignition current to water heater burner and to return said valves to normal positions.

13. A dual oil burner system for firing a furnace and a water heater comprising a water heater oil burner, a furnace oil burner, an air blower, an oil pump, a motor for operating the blower and pump, to provide oil and air for said burners and control means operable to direct oil and air from said blower and pump selectively to one or the other burner, in response to predetermined water temperature or the temperature of the space heated by the furnace respectively, and said control means being operable to shut off the operation of the heater burner and operate the furnace burner and to maintain operation of said furnace burner in response to the temperature of the space heated by the furnace.

14. A dual oil burner system for firing a furnace and a water heater, comprising a furnace oil burner, a water heater oil burner, an air blower, an oil pump, a motor for said blower and pump, a movable air valve for establishing communication between said blower and one or the other burner selectively, and means operative in response to demand or satisfaction of demand for furnace heat to render the motor inoperative during the movement of said valve from one position to the other.

15. An oil burner apparatus comprising an air blower, a fuel pump, a motor and a source of high tension ignition current; in combination with two oil burners and means operative in response to demand or satisfaction of demand of heat from one of said burners for selectively directing the supply of air, fuel and ignition current to only one or the other of said burners and means for preventing the flow of air, fuel and ignition current during the rotation of said control means.

16. An oil burner apparatus comprising an air blower, a fuel pump, a motor, and a source of high tension ignition current; in combination with two oil burners and rotatable control means normally maintaining paths for the supply of air fuel and ignition current to only one of said burners and by a partial revolution to close such paths and provide paths for the other burner in response to heat demand upon said other burner, said control means also serving to reestablish the said normal paths in response to satifaction of said heat demand by another partial revolution in the same direction.

17. An oil burner apparatus comprising an air blower, a fuel pump, a motor, and a source of high tension ignition current; in combination with two oil burners and unidirectionally rotatable control means normally maintaining paths for the supply of air fuel and ignition current to only one of said burners, said means serving by a half revolution to close such paths and provide paths for the other burner in response to heat demand upon said other burner, said control means being operable in response to satisfaction of said heat demand to reestablish said normal paths by another half revolution in the same direction.

18. In a dual oil burner system: two burners, sources of air, fuel and ignition current for said burners, a rotatable control motor normally maintaining paths for air fuel and ignition current to only one burner, means operable by the rotation of said motor in response to demand for heat from the other burner to close said normal paths and to open other paths to said other burner, and means operable by the initiation of said rotation to prevent the operation of said sources and operable by the termination of said rotation to permit operation of said sources.

19. In a dual oil burner system: two burners, sources of air, fuel and ignition current for said burners, a rotatable control motor normally maintaining paths for air fuel and ignition current to only one burner, means operable by the rotation of said motor in response to demand for heat from the other burner to close said normal paths and to open other paths to said other burner, and thereafter upon further rotation in the same direction in response to satisfaction of said demand to reestablish said normal paths, and means operable by the initiation of said rotation to prevent the operation of said sources and operable by the termination of said rotation to permit operation of said sources.

20. The system set forth in claim 19 in which the last named means comprises cam means

rotatable by said control motor and a pair of electric switches operable by said cam means.

21. The system set forth in claim 19 in which the last named means comprises an electric switch normally closed, another electric switch normally open, and cam means operable by said motor to open said closed switch upon initiation of its rotation and to close said open switch at the end of its rotation.

22. The apparatus as set forth in claim 13 in which the control means is further operative in response to other temperature conditions in the furnace heated space to shut off the operation of the furnace burner and to establish paths for the flow of air and fuel to said heater burner.

23. A dual oil burner system, comprising a housing, a blower within the housing, a pump, a motor for operation of said blower and pump, the housing having a pair of outlets, a burner for a water heater communicating with one outlet, a burner for a furnace communicating with the other outlet, a source of ignition current, an air valve movable to close one or the other outlet, an oil valve operable to direct the flow of fuel to one or the other burner, said valves having normal positions permitting the flow of air and fuel to the water heater burner, a two position thermostat operable in response to demand or satisfaction of demand for furnace heat to move from one position to the other, and electric motor means electrically connected to and operable in response to movement of said thermostat from one position to the other to render said source of ignition current and said burner motor inoperative, then to move the valves from one position to the other, and thereafter to render said source of ignition current and burner motor operative.

24. A dual oil burner system, comprising a housing, a blower within the housing, a pump, a motor for operation of said blower and pump, the housing having a pair of outlets, a burner for a water heater communicating with one outlet, a burner for a furnace communicating with the other outlet, a source of ignition current, an air valve movable to close one or the other outlet, an oil valve operable to direct the flow of fuel to one or the other burner, said valves having normal positions permitting the flow of air and fuel to the water heater burner, and electric motor means operable in response to demand or satisfaction of demand for furnace heat to render said burner motor and said source of ignition current inoperative, then to move the valves from one position to the other, and then to render said source of ignition current and said burner motor operative.

25. In combination, a primary fuel burning device, a secondary fuel burning device, means for supplying a combustible fuel mixture to said devices selectively and normally operative in response to demand for heat from said secondary device, and control means operative in response to demand for heat from said primary device to prevent the operation of said secondary burner and to cause said first named means to supply fuel mixture to said primary device.

26. A dual oil burner system for firing a furnace and a water heater, comprising a furnace oil burner, a water heater oil burner, an air blower, an oil pump, a motor for said blower and pump, an electric ignition device associated with each burner, a source of ignition current for said burners, a movable air valve for establishing communication between said blower and one or the other burner selectively, a thermostat in the space heated by said furnace, and means operative in response to demand by said thermostat for furnace heat or satisfaction of such demand to render the motor and said source of ignition current temporarily inoperative.

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