

Sept. 20, 1927.

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H. A. MOJE ET AL
OIL BURNER CONSTRUCTION

Filed March 28, 1924

5 Sheets-Sheet 1

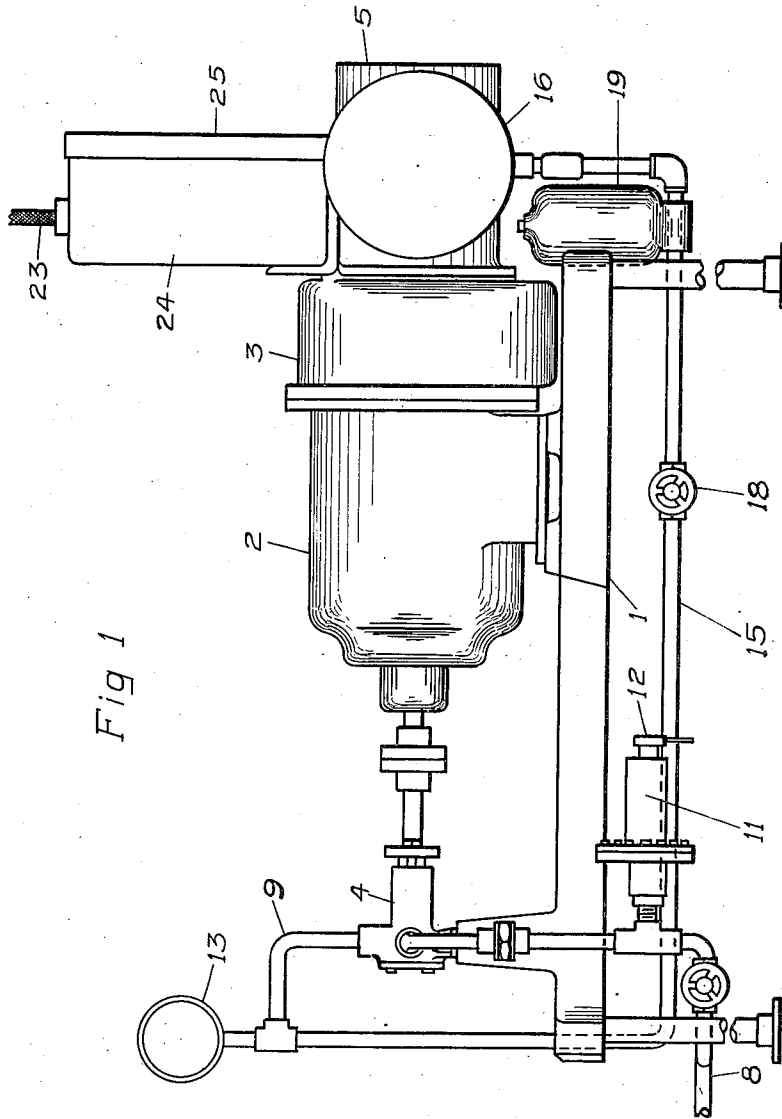


Fig 1

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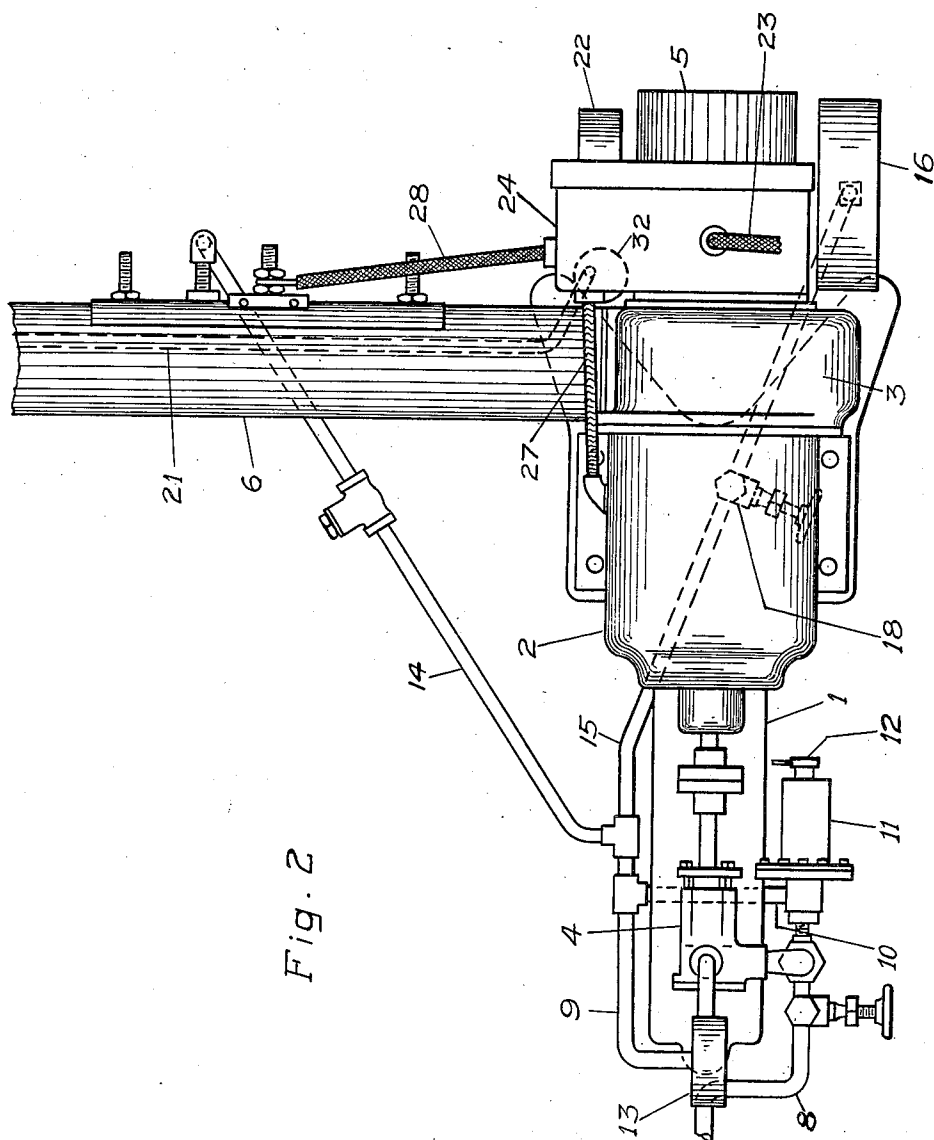


Fig. 2

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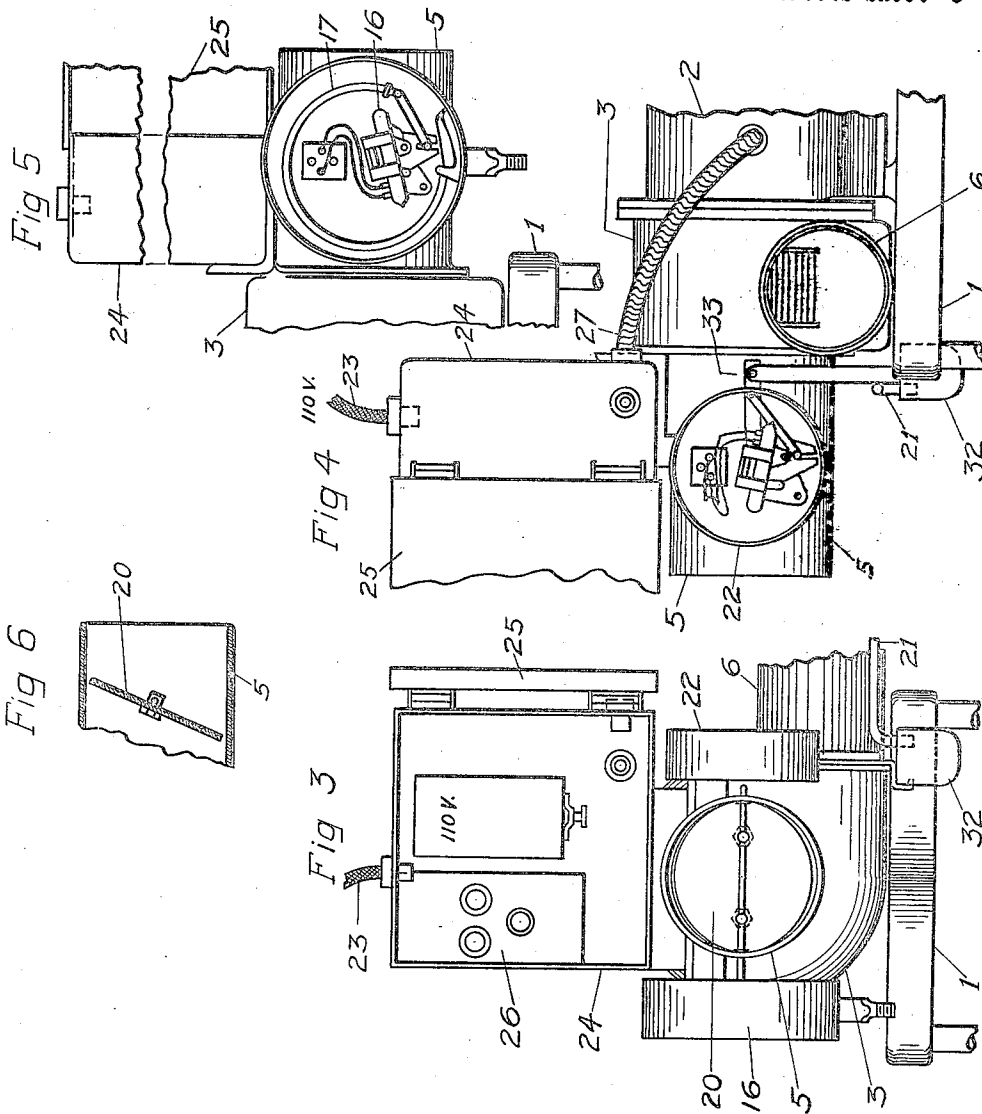
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Fig. 7

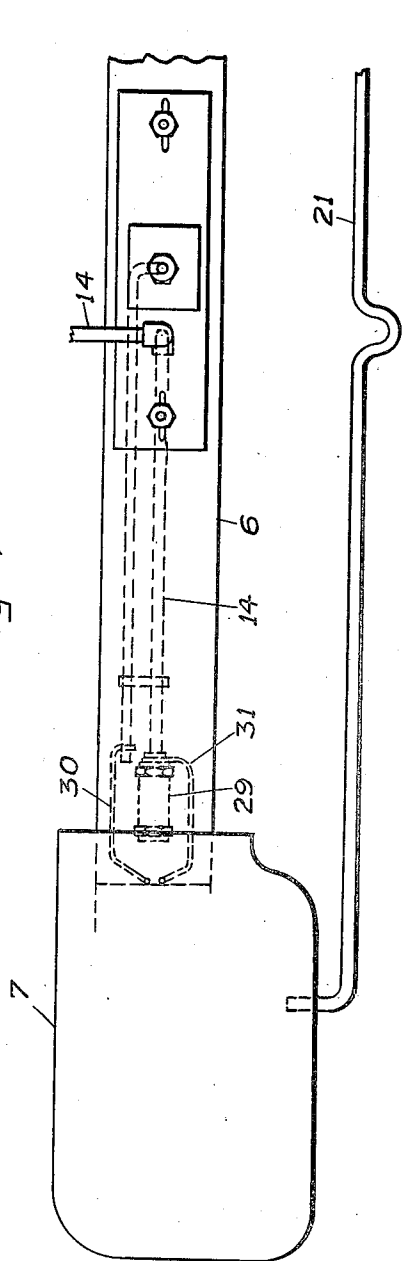
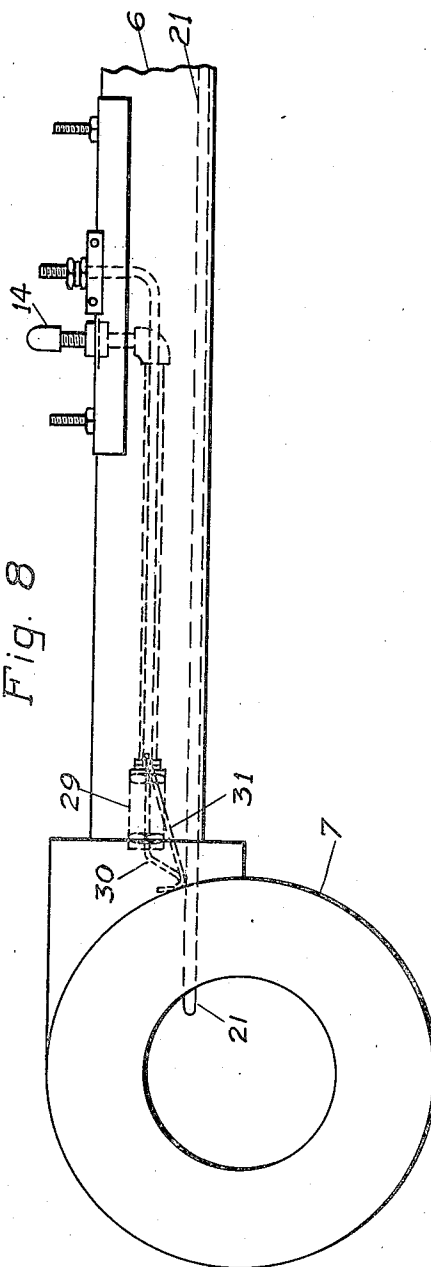


Fig. 8



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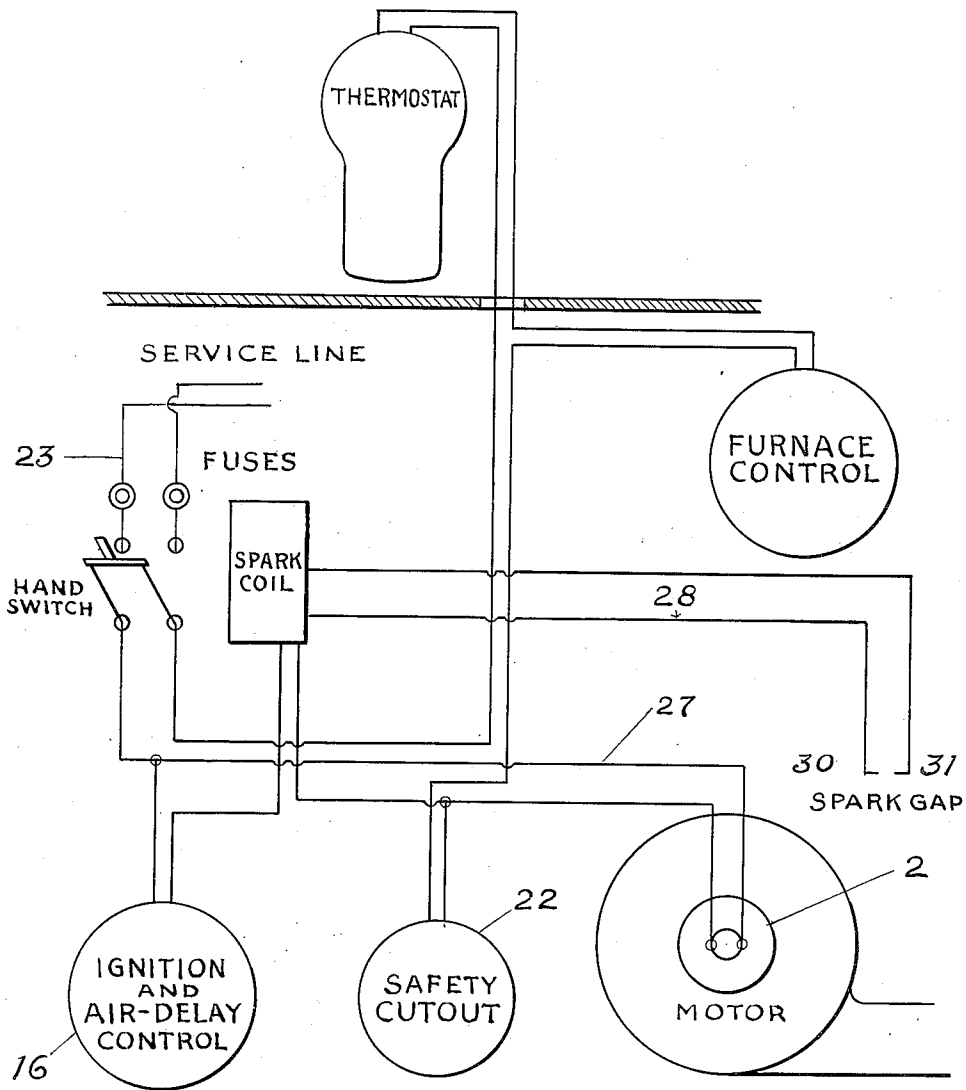


Fig 9

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Patented Sept. 20, 1927.

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UNITED STATES PATENT OFFICE.

HERMAN A. MOJÉ AND IRA E. McCABE, OF CHICAGO, ILLINOIS.

OIL-BURNER CONSTRUCTION.

Application filed March 28, 1924. Serial No. 702,504.

This invention relates to improvements in oil burner construction and more particularly to an electrically operated control for burners of this type especially adapted for use in heating units for houses and other buildings.

It is an object of this invention to provide an oil burner adapted for use in connection with boilers for heating purposes, the ignition and shutting off of which will be accomplished by an arrangement of a simple electrical control apparatus. It is a further object to provide the proper mixture of oil and air in the burner by the employment of an electric motor operated directly from commercial current, the same current being employed to feed the oil to the burner, ignite the burner, place the oil under pressure and at a predetermined pressure discontinue the ignition means, withholding part of the air from the mixture during the ignition of the oil, and when the igniting means is discontinued admit the air to form the mixture for combustion under the boiler. It is a further object to provide means which upon failure of the burner flame to ignite, or should it become extinguished during the feeding of the oil, to break the electric circuit and thereby shut off the oil and air supply. One of the main objects is to so construct and arrange the elements above described as to form a compact unit of few simple parts which are easy to install, difficult to get out of order and inexpensive to manufacture.

Among the advantages of this construction and arrangement are that commercial current of electricity actuates the operating parts and is only consumed while the burner is operating, it does away with the necessity of a pilot light, the same motor provides the pressure of the oil and the air for the burner, the oil pressure controls the operations of the electric ignition, the extinguishing of the burner flame breaks the circuit and cuts off the oil and air supply. Furthermore the electric wiring system is simple, comprising a main switch with fuse plugs and spark coil and two mercury tube tilting switches, one acting as the safety switch and the other actuated by the oil pressure to control the ignition device and air intake. Also the initial closing of the circuit for igniting the burner and the breaking of the circuit for shutting off the burner, respectively, in service may be manually op-

erated or actuated by a pressure or thermally operated control in the boiler or a thermostat located in the building, the latter being preferable when this invention is employed in connection with a heating unit for houses or other building, it being understood, of course, that this construction and arrangement may be employed for other purposes without departing from the scope of this invention.

While the preferred form of this invention is illustrated in the accompanying sheets of drawing, yet it is to be understood that minor detail changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a view in side elevation of this invention as applied to a building heating unit looking in the direction of the boiler.

Figure 2 is a top plan view of Figure 1.

Figure 3 is a view in end elevation of Figure 1.

Figure 4 is a detail view in elevation of the side opposite Figure 1 adjacent the end shown in Figure 3.

Figure 5 is a detail view in elevation of the side opposite Figure 4.

Figure 6 is a detail view in section illustrating the butterfly valve in the air intake.

Figure 7 is a detail view in side elevation of the burner tube and combustion chamber.

Figure 8 is a top plan view of Figure 7.

Figure 9 is a wiring diagram for the electric circuit.

In the embodiment of this invention illustrated the table 1 supports an electric motor 2 directly operating a fan blower 3 and an oil pump 4.

The fan blower 2 is provided with an intake pipe 5 extending from the side opposite the motor and a discharge pipe or air conduit 6 extending at right angles thereto and adapted to act as a burner tube leading to the combustion chamber 7 under the boiler. In the form illustrated the combustion chamber 7 is of the circular type in which the air conduit 6 enters at a tangent.

The oil is drawn from a removed tank through an intake pipe 8 to the oil pump 4 and as it leaves the pump under pressure it is conducted through pipes 9 and 10 around a diaphragm by-pass regulator 11 connected at one side to the intake pipe 8 so that oil in excess of the desired amount passes through the by-pass regulator to the intake

pipe 8. At one end of the by-pass regulator there is an adjusting screw 12 to regulate the amount of oil pressure and an oil pressure gauge 13 is arranged in the discharge pipe 9 leading from the oil pump. From the pipe 9 beyond the by-pass connecting pipe 10 branch pipes 14 and 15 are provided of which pipe 14 leads to the burner and pipe 15 to a pressure operated electric switch 16 actuated by a Bourdon tube 17. This pipe 15 is provided with a needle valve 18 to regulate the pressure and an air dome or pressure accumulator 19 between the needle valve and Bourdon tube. A butterfly valve 20 is provided in the intake 5 of the fan blower which is so mounted and connected as to be opened and closed by the operation of the mechanism of the electric switch 16. From the bottom of fire pit of the combustion chamber 7 an oil pipe 21 leads to a safety switch 22.

The commercial 110 volt current, direct or alternating, is employed and is led through electrical conductors 23 to a connection box 24 having a door 25, shown open in Figures 3, 4 and 5, which box is preferably mounted above the blower intake 5. The conductors 23 enter into a fuse box 26 and the current is led therefrom through the safety switch 22 and electric conductors 27, to the motor 2 and through the Bourdon tube operated mercury tube tilting switch 16 and through a 110 volt spark coil of the induction type to the oil ignition means by means of the electric conductor 28.

The oil pipe 14 leads to the air conduit 6 and enters therein between the blower and combustion chamber and thence along the center line of said air conduit or tube 6 to the oil discharge nozzle 29, preferably of the tangential delivery type which atomizes the oil and delivers it to the entrance of the combustion chamber 7. The atomized oil is ignited by a spark gap between connections 30 and 31 leading from the spark coil and arranged in advance of the nozzle in the direction of the combustion chamber.

The operation of this burner is primarily controlled by the interposing in the main circuit between the connection box 24 and source of a pressure or thermal operated switch connected with the boiler or thermostat switch within the building. These switches being of known commercial construction are not illustrated as they need no particular description. When the pressure or thermostat switch, as the case may be, closes the main circuit the electric tilting tube switches 16 and 22 are in normal position, that is the safety switch 22 passes the current therethrough and the switch 16 connects the spark coil to the spark gap with the Bourdon tube 17 contracted and butterfly 20 closing the intake to the blower. The closing of the circuit energizes and op-

erates the motor which in turn operates the oil pump and fan. Oil is thereby atomized at the nozzle of the burner and sprayed over the sparks passing between the connections 30 and 31 whereby the oil is ignited as it enters the combustion chamber, at the same time oil under pressure passes through the branch pipe 15 to the Bourdon tube 16 which pressure first accumulates in the dome 19 and when it reaches the regulated degree expands the Bourdon tube to tilt the mercury switch 16 breaking the ignition circuit and at the same time operating the butterfly valve 20 to allow free ingress of air through the air intake to the blower only after the oil from the nozzle has been ignited which imparts initial heat to the fire box and delays the air under pressure from the blower and allows the fire box to heat. The blower forces the air through the tube or air conduit 6 to mix with the atomized oil to form the desired mixture within the combustion chamber 7. Upon the normal breaking of the main circuit the operation is reversed, the motor, fan blower, and oil pump cease operating, discharge of oil through the nozzle and discharge of air through the air conduit tube also cease, however the tilting tube switch and butterfly are not thrown until the pressure first in the accumulator and then in the Bourdon tube has allowed the Bourdon tube to contract. The contraction of the Bourdon tube operates the butterfly to close the intake preventing the natural draft through the air conduit, pipe and blower from cooling the combustion chamber and connects the spark coil with the spark gap connection.

Should the oil at the burner nozzle fail to ignite initially or should the flame become extinguished during operation, the oil collecting at the bottom of the combustion chamber 7 is led through a pipe 21 to the safety switch 22 which comprises a mercury tilting switch in the main circuit having a bucket 32 suspended from its operating arm 33 into which the oil from pipe 21 discharges so that as the bucket fills, the mercury tube will be tilted and the main circuit broken and the motor disconnected.

The oil is fed under pressure to the nozzle and is not fed by gravity so that when the pump is cut out no oil can reach the nozzle. To atomize the oil at the nozzle a pressure of at least thirty-five pounds has been thought necessary although it has been found by practice a better result is obtained by feeding the oil under a pressure ranging from seventy-five to one hundred and seventy-five pounds per square inch, in the construction described herein.

The butterfly valve in the air intake pipe is not an air tight valve so that when the burner is initially ignited sufficient air will be drawn through for the combustion of the

oil but not enough to cool the fire box of the combustion chamber which is initially heated by the flame of the burner before the air under pressure is admitted. The butterfly valve closing when the burner flame is extinguished conserves the heat in the fire box so that when the burner flame is again ignited the fire box will not have been entirely cooled by the natural draft through the air conduit pipe, blower and intake.

What we claim is:

1. In an oil burner construction, a source of oil, a combustion chamber, an air conduit leading thereto, an oil nozzle therein adjacent the said chamber, an electrical ignition device in front of the nozzle, electrically operated means for feeding oil under pressure to the nozzle and air under pressure to the conduit, a source of electricity, a switch between said source and feeding means, in combination with means controlled by accumulation of oil pressure to place in circuit the ignition device, with-holding the feeding of air under pressure until a predetermined oil pressure is reached and thereupon disconnecting the ignition device and admitting air under pressure to the said conduit, said means upon the breaking of the circuit and discontinuance of operation of the oil and air feeding means placing the ignition device in circuit and partially closing the air intake to the air conduit.

2. In an oil burner construction, a source of electricity, a source of oil, a combustion chamber, an air conduit leading thereto, an oil nozzle therein adjacent the said chamber, an electrical ignition device in front of the nozzle, an electric motor adapted to be placed in circuit with said source of electricity for operating simultaneously an oil pump for feeding oil under pressure to the

nozzle and a fan for feeding air under pressure to the conduit, a switch in the motor circuit normally including the ignition device in a shunt from that circuit, a damper in the air conduit normally withholding the feeding of air under pressure therethrough, means actuated by the accumulation of pressure of oil from the oil pump to a predetermined degree to throw the switch to cut out the ignition shunt from the motor circuit and at the same time open the damper in the air conduit, said means upon the breaking of the motor circuit operating to return the ignition switch and damper to normal position.

3. In an oil burner construction a source of oil, a source of electricity, a combustion chamber, an air conduit leading thereto, an oil nozzle therein adjacent the said chamber, an electrical ignition device in front of the nozzle, an electric motor adapted to be placed in circuit with said source of electricity for operating simultaneously an oil pump for feeding oil under pressure to the nozzle and a fan for feeding air under pressure to the conduit, a switch normally including the ignition device in a shunt from the motor circuit, a damper in the air conduit normally withholding the feeding of air under pressure thereto, a Bourdon tube having operative connections with the ignition switch and with the damper adapted to be expanded by the pressure of oil from the oil pump and at a predetermined pressure open the switch in the ignition circuit and open the damper in the air conduit, said Bourdon tube contracting, when the motor ceases operation and the oil pressure reduces, to return said switch and damper to their normal positions.

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