March 15, 1949. J. A. LOGAN 2,464,698

AIR CONTROL MECHANISM FOR OIL BURNERS

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Fig. 1.

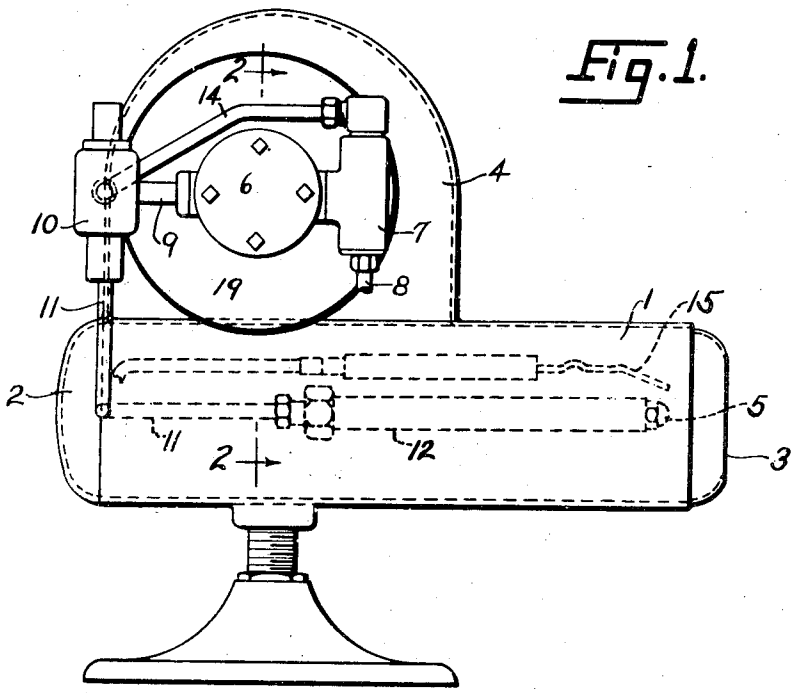
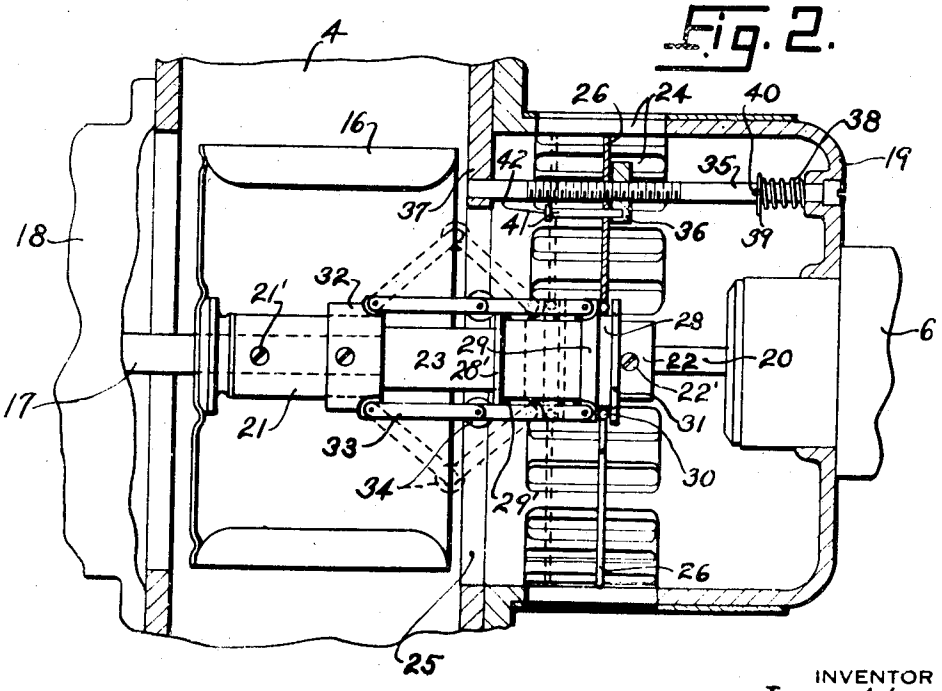


Fig. 2.



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AIR CONTROL MECHANISM FOR OIL BURNERS

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2 Claims. (Cl. 158—28)

1

This invention relates to improvements in automatic gun type oil burners.

More particularly, the invention has to do with the improvement of combustion during the starting and stopping intervals of operation of the burner. In the ordinary gun type burner, on starting, the oil is placed under proper atomizing pressure and is emitted from the atomizing nozzle before the flow of air is established at the proper velocity adjacent the nozzle. Also, on stopping the burner, the velocity of the air flow is decreased before flow of oil from the nozzle ceases. As a consequence, the mixture of oil and air tends to be over rich during the starting and stopping intervals of operation and combustion tends to be smoky and results in deposits of soot. To reduce to some extent, the faulty combustion, it has been the practice to adjust the air valve of the air-supply fan so that air is admitted at a much greater rate than is necessary for good combustion during the normal running intervals of operation of the burner. In this way, a compromise is made. Combustion is improved during the starting and stopping intervals but combustion during the normal running intervals is made less efficient. That is, much more than the theoretical amount of air necessary to consume the oil is admitted during running intervals of operation of the burner and this results in a relatively low percentage of CO_2.

This invention has for an object to provide means whereby the rate of air flow to the burner is automatically increased during the starting and stopping intervals of operation of the burner over the rate which exists during normal running intervals of operation.

According to the invention, the rate of air flow for running intervals of operation may be adjusted more nearly to the theoretical amount necessary to consume the oil, with a resulting substantially higher percentage of CO_2 and better combustion, since during the starting and stopping intervals the rate of air flow is automatically increased to reduce the smoky combustion which would otherwise occur during the starting and stopping intervals.

The invention is directed to the same broad object as that of my prior U. S. Patent No. 1,985,934, dated January 1, 1935, but it provides a means for the purpose, which is less expensive to manufacture and which is relatively easy to install and is advantageous in the conversion of existing oil burners to provide for improved combustion.

The invention will be disclosed with reference to the accompanying drawing in which—

2

Fig. 1 is a side elevational view of an oil burner embodying the invention; and

Fig. 2 is a fragmentary cross sectional view taken on the line 2—2 of Fig. 1 and drawn to a larger scale.

Referring to these drawings: there is shown in Fig. 1 by way of illustrative example, an oil burner of the so-called "gun" type for which the invention is particularly adapted. This burner includes a tube 1, having a closed end 2 and an open end 3. Air for combustion is forced through this tube and out of its outlet end 3 by means of a fan, the housing of which is shown at 4. Within tube 1 is a pressure atomizing nozzle 5 to which oil under relatively high pressure is supplied by a suitable pump 6. As shown, oil enters the pump from the side branch of a T 7, to one end branch of which a supply pipe 8 is connected. Oil leaves the pump by way of a fitting 9 and enters a valve casing 10 having therein a cut-off valve and a pressure-regulating and by-pass valve which may be of any of the well known forms. The outlet of the cut-off valve is connected by a pipe 11 and a conductor 12 to nozzle 5. The outlet of the pressure-regulating and by-pass valve is connected by a pipe 14 to the other end branch of T 7 and thus to the suction side of pump 6. The arrangement is the usual one, whereby the cut-off valve will not open until the oil has been placed under a predetermined minimum pressure, say for example 85 pounds per square inch, and whereby the pressure-regulating and by-pass valve opens when the oil reaches a predetermined maximum pressure, say for example from 90 to 125 pounds per square inch and allows oil to flow through by-pass 14 to the suction side of the pump. The oil issues from the nozzle 5 in a finely atomized conical spray and mixes with the air supplied through tube 1, the mixture being ignited, as by the electrodes 15.

Referring now to Fig. 2, a central portion of the fan housing is shown and within it the fan rotor 16, which is fixed to one end of the shaft 17 of an electric motor, shown in part at 18 and supported from one side wall of the housing 4. Suitably fixed to the opposite side of housing 4 is a bell-shaped casing 19 on the end wall of which pump 6 is supported. The shaft 20 of pump 6 is connected by a flexible coupling to the motor shaft 17. This coupling involves cylindrical metallic ends 21 and 22 fixed as by screws 21' and 22' to shafts 17 and 20, respectively, and a connecting part 23 of suitable flexible material, such as a rubber tube for example.

The casing 19 has through its peripheral wall a plurality of openings 24 through which air enters and is drawn through the open end of the casing into the intake opening 25 of the fan housing 4. For regulating the rate of air supply to the fan, a valve 26 is provided which is movable longitudinally of the casing 19, by hand, and also automatically, to vary the effective area of the inlet openings. As shown, this valve is in the form of an annulus and is mounted in the groove 28 of a collar 29 which is slidable on, and axially of, the cylindrical coupling part 22. The valve near its central opening has a circular series of perforations each of which receives a ball 30. These balls 30 lie between, and ride on, the spaced side walls of groove 28, thus providing an anti-friction connection between the collar and the valve. The part 31 of the collar is threaded onto the part 29 whereby it is removable to enable the valve and balls to be assembled in the groove of the collar. The slidable collar 29 is connected to a collar 32, fixed on coupling part 21, by a plurality of sets of links. Each set comprises two links 33 having the inner ends pivotally connected together and to a weight 34. The outer ends of these links are pivotally connected one to collar 29 and the other to collar 32. The arrangement is such that the weights 34 fly out by centrifugal force when the shaft 17 reaches a predetermined speed and draw the collar 29 to the left and with it the valve 26, thereby decreasing the effective area available for air to flow to the fan. A spring 29' acts between the collar 29 and a flange 28' on collar 22 tending to move collar 29 and thus valve 26 to the right.

The valve 26 is movable manually by means of a screw 35 and a nut 36 threaded on the latter. The screw has its head end rotatably mounted in the end wall of casing 19 with its screw driver slot accessible from outside the casing. The other end of the screw is rotatably supported in a lug 37 formed on the fan housing 4 near its intake end. The screw 35 is held against axial movement by a coil spring 38, which encircles the screw and acts between the end wall of casing 19 and a washer 39, held in place on the screw by a pin 40, to press the screw axially to the left and hold its head in its seat in the casing. The screw passes freely through the air valve 26. The nut has fixed thereto a pin 41 which passes freely through valve 26 and has a flange 42 on its inner end. By turning the screw 35 in one direction, the nut 36 will abut the valve 26 and move it to the left and by turning the screw in the other direction, the flange 42 will eventually abut the valve and move it to the right. The valve can be moved by the speed-responsive device between the limits defined by the abutment of the valve with the nut and by the abutment of the valve with flange 42.

In use, the screw 35 is turned to adjust the inner limit of movement of valve 26 suitably for normal fire. The position of flange 42 is thus set to arrest valve 26, during its movement by the speed-responsive means, when it has reached the proper position to admit air at the desired rate for normal running intervals of operation of the burner. And this position may be chosen so that the air admitted may be much closer to the theoretical amount required for combustion with a resulting substantial increase in the percentage of CO_2. With this adjustment made to suit, the speed-responsive means will cause the valve 26 to be opened up during the starting and stopping intervals to aid in improving combustion and in avoiding the smoky fire that would otherwise occur. The amount of additional air admitted is controlled by the length of pin 41 and this length may be varied as desired and made to suit the particular conditions encountered.

In many burners of the class described, there is an air valve of circular disk form with a nut affixed thereto and the nut and valve are moved by a screw similar to 35 and mounted as herein shown. Burners of this type may be readily converted to the form herein shown. One simply removes the casing 19 after the coupling screw 22' has been loosened (as by a screw driver inserted through one of the openings 24). The air valve and the coupling are then removed and replaced by a coupling, on which the speed-responsive device and air valve of this invention are mounted. The same screw may be used with the new nut and when the screw has been assembled in the nut, the casing 19 is replaced, taking care to get the free end of the screw properly inserted in the hole in lug 37. The casing 19 is then bolted in place and the screw 22' tightened to fix the coupling to the pump shaft 20. The conversion may be easily made in the field because it involves only the removal of a few old parts and the substitution of new ones. No cutting or fitting is required. And the cost of the conversion is relatively low because the new parts required are few and of simple and relatively inexpensive construction and the labor cost is relatively low.

The invention offers a means for improving the combustion of oil burners during the starting and stopping intervals of operation. The invention aims at accomplishing work similar to that accomplished by the invention of my prior patent, above identified, but provides a less expensive means for the purpose and one which is particularly desirable in effecting the conversion of existing burners in the field although obviously it is not limited to such use.

I claim:

1. In an oil burner of the oil pressure atomizing type adapted for intermittent "on" and "off" operation under thermostat control, said burner including in combination a pressure-atomizing nozzle, a pump for supplying oil to the nozzle under relatively high pressure, an oil conduit connecting the pump and nozzle, a pressure-responsive valve in said oil conduit opening only after the pump has built up the requisite pressure, a fan housing having an air inlet opening and an air outlet opening, a fan in said housing for supplying air at low pressure, an air conduit connected to said outlet opening for receiving air from said fan and conducting it to the nozzle to mix with the atomized oil, a constant speed electric motor connected to drive the fan and pump at constant speed and supply air and oil at predetermined rates which are constant during the normal running intervals of operation of the burner, except during the short starting and stopping intervals of the burner when the motor is respectively accelerating and decelerating, an air valve cooperating with one of said openings and movable to vary the effective area thereof, manually-operable means to move said air valve to adjust said effective area to produce the desired rate of air flow when the fan is moving at its normal constant speed, and automatic means for moving said air valve, said automatic means being responsive to speeds of said motor less than

the constant speed at which it operates during said normal running intervals of operation and being operable only during said starting and stopping intervals of operation of the burner, said automatic means being operable to increase the effective area of the valve controlled opening from the amount determined by said manually-operable means to a larger amount as the motor speed decreases during said stopping interval and approaches zero and to decrease such effective area from said larger amount to the amount determined by said manually operable means as the motor speed increases during the starting interval and approaches said constant full speed.

2. In an oil burner of the oil pressure atomizing type adapted for intermittent "on" and "off" operation under thermostat control, said burner including in combination, a pressure atomizing nozzle, a pump for supplying oil to the nozzle under relatively high pressure, an oil conduit connecting the pump and nozzle, a pressure-responsive valve in said oil conduit opening to permit flow to the nozzle only after the pump has placed the oil under the desired predetermined pressure, a fan housing having an air inlet opening and an air outlet opening, a fan in said housing for supplying air at low pressure, an air conduit connected to said outlet opening to receive air from the fan and conduct it to said nozzle to mix with the oil emitted from the latter, a motor for driving the pump and fan, an air valve cooperating with one of said openings and movable relatively to such opening to vary the effective area thereof, a member having two spaced stops for limiting the movement of said air valve, means responsive to the speed of said motor for moving the air valve between said stops from a position of relatively large effective area of valve opening when the motor is stopped or moving at very low speeds to a position of substantially less effective area of valve opening when the motor is moving at full speed, and manually operable means for bodily moving said member and the limit stops thereon to effect a precision adjustment of the high speed position of said air valve.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
329,567	Kahl	Nov. 3, 1885
1,603,955	Johnson	Oct. 19, 1926
1,741,529	Marion	Dec. 31, 1929
1,985,934	Logan	Jan. 1, 1935
2,012,037	Drew	Aug. 20, 1935
2,405,243	Speare	Aug. 6, 1946