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OIL BURNING MACHINE UTILIZING AIR BLAST

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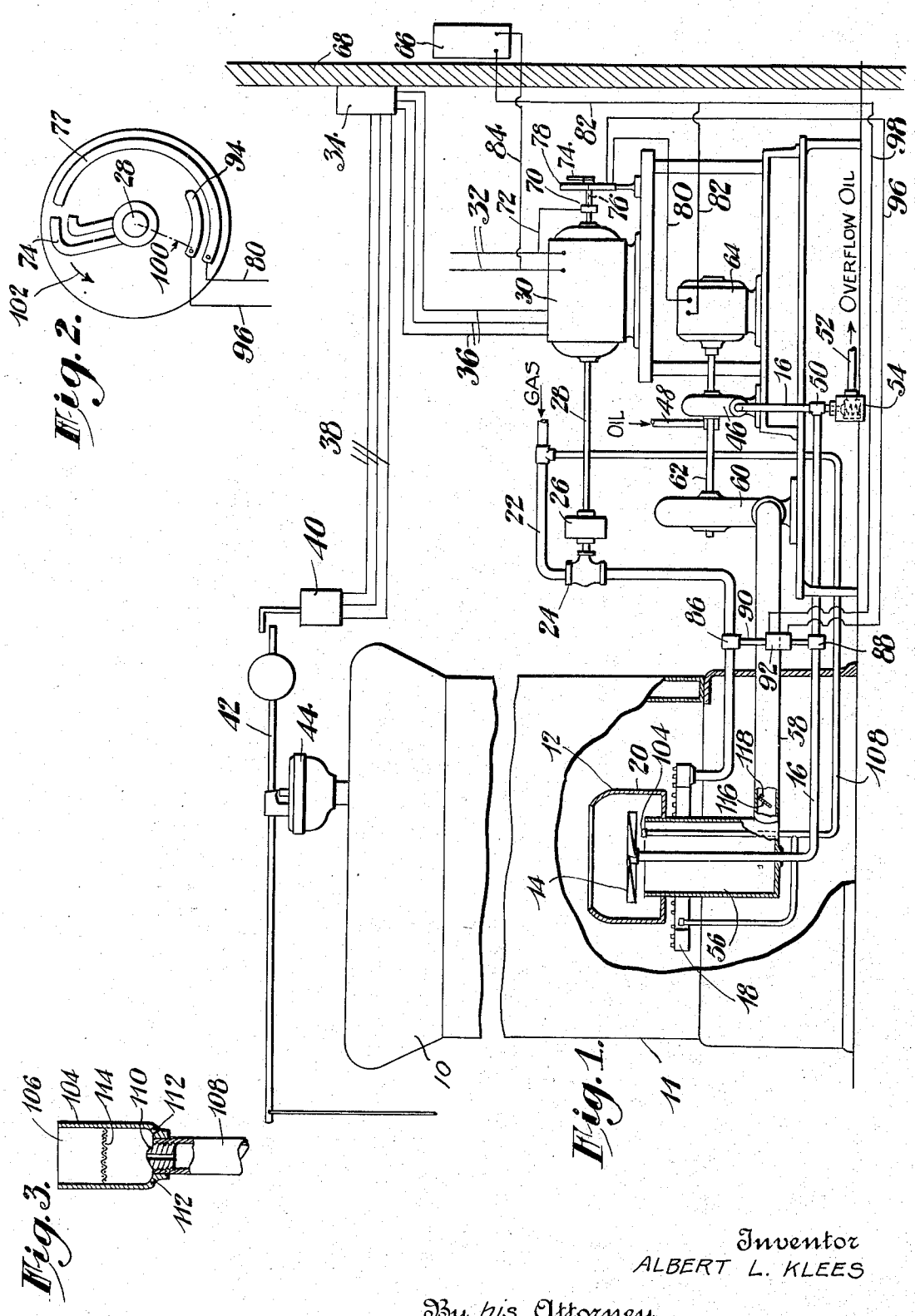

Fig. 1.

Fig. 2.

Fig. 3.

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OIL BURNING MACHINE UTILIZING AIR BLAST

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The present invention relates to a fuel burner.

It is well known to burn oil for house-heating and like purposes, but certain difficulties have been encountered in installations for this purpose. One difficulty has been that oil and carbon deposits have collected in the burner apparatus and have caused odors when the burner has been shut down and have sometimes caused accidents when starting up the apparatus after a shut down.

It is the principal object of the present invention to provide a method of and apparatus for burning fuel which shall avoid the above mentioned difficulty

Further objects and advantages of the present invention will be apparent to those skilled in the art from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is an elevational view, partly diagrammatic in character, of a fuel burning apparatus embodying the present invention, parts being broken away and parts being shown in section for purposes of illustration;

Fig. 2 is a detail view of a switch used in the apparatus of Fig. 1 and having a rotating contact;

Fig. 3 is a detail view of a pilot burner used in the apparatus of Fig. 1.

In the drawings, 10 indicates a boiler which may be of the ordinary household type and which has a furnace 11. A burner 12 is illustrated within furnace 11. Preferably, burner 12 is of the combined gas and oil burning type, but certain aspects of the present invention are not limited to the combined type of burner.

It has been found that a combined oil and gas burner permits a wider application of gas fuel to household heating than would otherwise be the case, as the oil burner can be used in colder weather when the gas plant is heavily loaded and the gas burner can be used in milder weather when the gas plant has surplus capacity. The house heating load can therefore be relieved of certain fixed charges which it would otherwise have to carry. As illustrated, the burner 12 includes an oil distributing and burning head 14. Head or burner 14 forms no part of the present invention Burner 14 receives oil through a pipe 16. The gas burner 18 is illustrated as surrounding a hood 20 of the oil burner 12. By this arrangement the hood 20 is kept hot when the oil burner 12 is not in operation and the oil burning portion of the apparatus is maintained in condition to start operation at maximum efficiency.

Gas is supplied to burner 18 by pipe 22. The passage of gas to burner 18 is desirably controlled by automatic means. In the arrangement shown, a valve 24 is placed in pipe 22. Valve 24 is directly operated by a spring operating mechanism 26, mechanism 26 being so arranged that valve 24 opens and closes with a quick snap, and is held either wide open or tight shut. Mechanism 26 is operated by the shaft 28 of a "Honeywell" motor 30, the construction and wiring arrangements of which are well known and are not described or shown in detail. Motor 30 is connected to be operated from the ordinary 110 volt supply circuit 32 and is controlled by a thermostat 34 which is placed in a room of the house. Thermostat 34 causes the motor 30 to throw valve 24 into position to turn on the gas to burner 18 whenever the temperature at the thermostat falls below the low point for which the thermostat is set and into position to turn off the gas when the temperature at the thermostat rises above the high point for which it has been set. Moreover, in order to provide for the safe operation of the apparatus, the circuits 36 connected to thermostat 34 are extended as indicated at 38 to an emergency control 40. Control 40 is arranged to be operated by a lever 42 which is controlled in turn by a diaphragm 44 operated by an excessive steam pressure in boiler 10 to cause motor 30 to turn off the gas at valve 24.

Oil for burner head 14 is supplied by a pump 46, the suction pipe of which is indicated at 48. Oil is delivered from the pump 46 to the pipe 16 previously mentioned by which it is delivered to the burner 14. Pipe 16 contains a T 50 which connects to an overflow pipe 52 by which excess oil from the pump 46 is delivered back to the oil reservoir

(not shown). Intermediate the T 50 and pipe 52 is a spring pressed overflow valve 54 serving to maintain a substantially constant pressure on the oil in pipe 16. The air for the burner 14 is delivered to an air chamber 56 beneath the burner 14 by means of pipe 58 which conducts the air from draft fan 60. As illustrated, the pump 46 and fan 60 both are operated by shaft 62 of electric motor 64.

Means are provided whereby motor 64 is kept idle unless both the out-door temperature and the room temperature are below given points. The circuit of motor 64 contains thermostat 66 on the outer wall of the building 68. Thermostat 66 is constructed so that the circuit of the motor 64 is open when the temperature is above a given point. The temperature point selected is one found by experience to be approximately the lowest at which the gas works has any surplus gas making capacity. When the outdoor temperature falls below the given point, thermostat 66 closes and permits motor 64 to run. Moreover, automatic means are provided in series with the thermostat 66 whereby the motor 64 may be controlled by the motor 30 and so by the interior house thermostat 34. The automatic means just mentioned includes a contact 70 on the shaft 28 which is connected to one side of the circuit 32 by wire 72 and which is connected to a radial contact arm 74 at the outer end of the shaft 28 by means of an insulated wire 76 within the shaft 28. The arm 74 cooperates with a fixed segmental contact 77 mounted on the fixed insulating disk 78 which is illustrated as mounted upon the shaft 28 near its outer end. (See Fig. 2). The fixed contact 77 connects with the motor 64 by the wire 80. Motor 64 moreover is connected to the thermostat 66 by the wire 82, and thermostat 66 is connected to the other side of the circuit 32 by wire 84. It will be seen therefore that the circuit of motor 64 includes circuit 32, wire 72, contact 70, wire 76, arm 74, contact 77, wire 80, wire 82, thermostat 66, and wire 84. It will be understood that, in the operation of the apparatus herein disclosed, the oil burner 14 of the motor 64 can only operate when thermostat 34 is in a position calling for additional heating and the thermostat 66 indicating cold weather. The arm 74 is so positioned with respect to the contact 77 and the shaft 28 that the motor 64 runs only when the motor 30 is in position to turn on the gas at the valve 24. This occurs only when the thermostat 34 requires more heat.

Unless special means were provided therefore, the gas burner 18 would always operate at the same time that the burner 14 is in operation. This is unnecessary and would create a drain on the gas mains at the times they are heavily loaded. It is desired therefore to cut off the gas burner 18 when the oil burner is in operation, but it will be seen from the foregoing that this cannot be done by the valve 24 and that special means for this purpose must be provided. In the arrangement illustrated, means for this purpose comprises a pair of cutoff valves 86 and 88 in the gas pipe 22 and oil pipe 16 respectively. The moving members of valves 86 and 88 are both fixed to the rod 90 which forms part of the plunger of solenoid 92. When solenoid 92 is energized, the rod 90 is raised so that valve 86 cuts off the gas in pipe 22 and valve 88 opens to permit the flow of oil in pipe 16. When the circuit of the solenoid 92 is broken so that it is de-energized, the rod 90 drops by its own weight so that the valve 88 cuts off the oil in pipe 16 and opens pipe 22 to the flow of gas. The circuit of the solenoid 92 is connected so as to be controlled by the thermostat 66 and the contact arm 74 previously mentioned. The circuit of the solenoid 92 includes the circuit 32, wire 72, contact 70, wire 76, arm 74, short fixed contact 94 on the disk 78, wire 96, the winding of the solenoid 92, wire 98, wire 82, thermostat 66, and wire 84. The solenoid 92 therefore opens the valve 88 in the oil pipe and closes the valve 86 in the gas pipe, whenever the motor 64 is in operation.

If the draft to burner 12 is cut off at the same instant as the oil supply to the burner, a certain amount of unburned oil remains on the surface of head 14 and collects under the hood 20 so that it is apt to produce an odor and may create other difficulties. In order to avoid these difficulties, means are provided so that the motor 64 shall continue to run for a material length of time, preferably 3 minutes, after the oil has been cut off by the valve 88. For this purpose, the contact 94 in the circuit of the solenoid 92 is made much shorter than the contact 77 in the circuit of motor 64. It will be noted that the contacts 77 and 94 each have one end at a given radius 100 of the disk 78. It will be understood that the contact arm 74 is so related to the armature and shaft of the motor 30 that arm 74 always comes to rest at radius 100 when the gas or oil burner is to start into operation, but if thermostat 34 changes to the position to shut down the gas or oil burner, the motor 30 thereupon turns arm 74 in the direction of arrow 102 for approximately 180°. Owing to the gearing between the armature of motor 30 and the shaft 28 the movement of the arm 74 is relatively very slow. However, as the contact 94 is relatively short, the circuit of solenoid 92 is opened soon after contact arm begins to move from the position 100. The contact 77, however, being relatively long the circuit of motor 64 is maintained closed until the arm 74 has moved nearly through the full 180°. The movement of the arm 74 is sufficiently slow so that the motor 64 remains in operation nearly three

minutes after the oil has been cut off to burner 14.

If the forced air draft to burner 14 is continued after the oil has been cut off, the ordinary type of pilot light or burner would be extinguished by the draft and serious difficulty would be encountered when the oil came on again. The pilot light or burner for oil burner 14 is indicated at 104. In order to prevent difficulties arising from extinction of the burner 104, it is a feature of the present invention to provide a pilot burner of the persistent burning type adapted to remain lighted when the air blast is continued after the oil flame has been extinguished. The pilot burner 104 according to the present invention is illustrated in detail in Fig. 3. Burner 104 comprises a cylindrical burner mouth 106 wide open at its upper end and connected at its lower end to the gas pipe 108. At the junction of the mouth 106 and the pipe 108, there is a restricted nozzle or burner spud 110 so arranged that a fine jet of gas is projected into the mouth 106 along the central axis of the mouth. The pipe 108 has a relatively small diameter as compared with the body 106 so that the body projects outwardly from the pipe at their point of connection. Adjacent its connection to the pipe 108, the body 106 is provided with a series of air inlets 112—112. The orifice in the spud 110 and the air inlets 112—112 are so proportioned and arranged that the burner 106 delivers a Bunsen flame when the draft fan 60 is stationary. When, however, the fan 60 is in operation, the draft in the chamber 56 passes up through the apertures 112 to increase the amount of air supplied to burner 104 and it is proportioned and arranged so that the burner thereupon delivers the typical flame of a blast lamp which is well-known to be very difficult to extinguish. Furthermore, in order to increase the difficulty of extinguishing the pilot burner 104, a wire gauze 114 is placed transversely within the mouth 106 well away from its open end. When the burner 104 is operating as a Bunsen burner, the wire gauze 114 becomes highly heated and assists in maintaining a flame within the mouth 106 under the blast conditions. Preferably the gauze 114 is of Monel metal. If the pipe 58 is open when the fan is still, air is drawn through fan 60 and pipe 58 by natural draft thereby undesirably cooling the hood 12. In order to prevent the draft through pipe 58 when the fan is shut down, it is preferred to put a flap valve in pipe 58 adapted to open automatically by the air pressure created by the fan, but adapted to close against the pressure of the natural draft in the apparatus. In the arrangement illustrated, an aluminum valve 116 is pivoted at 118 in pipe 58. Pivot 118 is at the upper edge of valve 116 and the weight of the valve, in the absence of air pressure, causes it to hang against the inner surface of the pipe to close it. When fan 60 is running, the air pressure on the fan side of valve 116 is sufficient to swing the valve far enough from the vertical through pivot 118 to permit the air from fan 60 to pass to the burner. Valve 116 is illustrated as in the act of closing when the fan 60 has been shut down, but before the passage through pipe 58 has been closed.

Having thus described my invention, I claim:

1. The combination of an oil burner, means for supplying air and oil, respectively, under pressure to said burner, and unitary means for turning on and off said supplying means, said last means being operative to continue the air supply to said burner for a predetermined brief period after the oil supply has been cut off.

2. The combination as set out in claim 1, and in which the said unitary means is adapted to continue the air supply at the said pressures for as much as two and one-half minutes after the oil has been cut off.

3. The combination as set out in claim 1, together with a pilot burner of the persistent burning type disposed adjacent the oil burner in the direct path of the pressure air supply and adapted to produce a Bunsen type flame when said air supply is cut off.

4. The combination as set out in claim 1, together with a pilot burner disposed adjacent the oil burner in the direct path of the pressure air supply, and constructed and arranged to give a blast flame when the air supply is on and a Bunsen flame when the air supply is off.

5. A burner apparatus including an air conduit to a main burner a draft fan and a pilot burner having a metal gauze set transversely across and at some distance behind its open mouth and located within the air conduit.

6. The apparatus as set forth in claim 5 and in which the pilot burner is equipped with a restricted gas nozzle and a number of restricted air apertures so proportioned and arranged as to act as a Bunsen burner when the fan is not working and to act as a blast burner when the fan is working.

7. Oil burning apparatus comprising, in combination, a forced draft conduit, a blower for supplying air under pressure to said conduit, an oil vaporizing plate mounted over the discharge end of the conduit, means for supplying oil under a positive pressure to the vaporizing face of said plate, and thermostatically controlled mechanism for turning on and off said air and oil supply, said mechanism including means for continuing the air supply to said burner under substantially undiminished pressure for a brief predetermined period after the oil supply has been cut off.

8. The combination with an oil burner of

means controlled by a room thermostat for supplying air and oil respectively under a determinate pressure to the said burner, and for cutting off such supplies of air and oil, and automatic means associated with the first named means adapted to cut off the flow of oil to the burner while maintaining the supply of air at the said pressure to the burner for a determinate period thereafter.

In testimony whereof I affix my signature.

ALBERT L. KLEES.