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HOUSE HEATING SYSTEM

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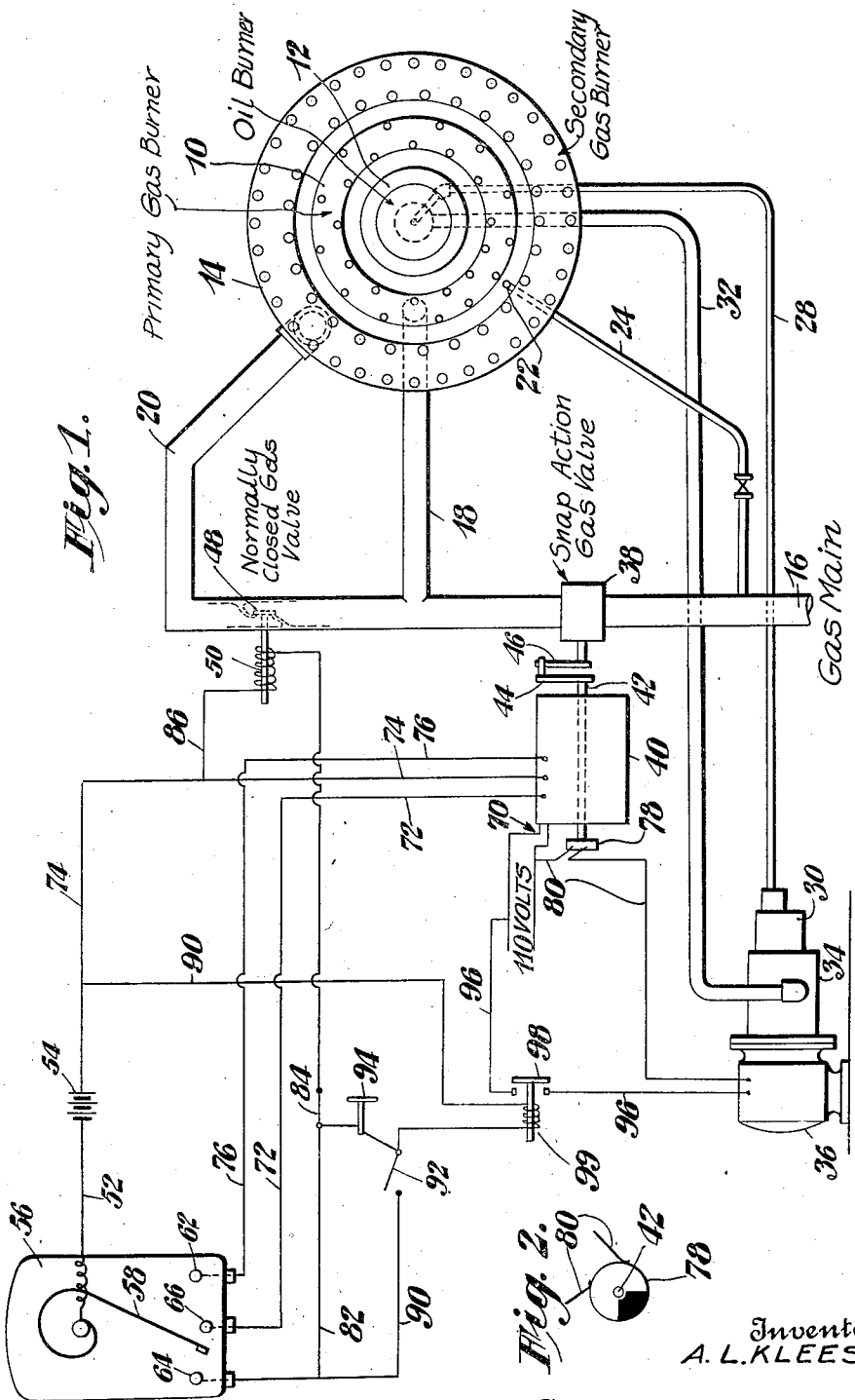


Fig. 1.

Fig. 2.

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HOUSE HEATING SYSTEM

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This invention relates to improvements in fluid fuel burning means which shall be particularly adapted for use with house heating furnaces originally designed to burn coal.

When city gas is used as fuel in a furnace originally designed for burning coal the heat developed by burning the full amount of available gas is so great as to necessitate frequent shutting off of the flow of gas to the burner. Furthermore when the full supply of gas is burned there is great wastage of heat due to the fact that the heat-absorbing surfaces of the furnace are not arranged in a manner to allow of the most efficient absorption of the heat. The present invention offers a method of burning gas whereby frequent shutting off of the gas is rendered unnecessary and whereby the loss of heat is reduced to a minimum.

In accordance with the present invention, the furnace is provided with two gas burners of which only one is normally relied upon to furnish heat under what may be termed normal weather conditions. When weather conditions are abnormal, that is to say when the weather is unusually cold, both burners are allowed to function. The gas burning capacity of the burners is such that when both are going all of the normally available gas may be burned whereas when only one of the burners is going only a limited amount of the available gas supply will be burned. The size of the normally going gas burner should be such that under normal weather conditions it will furnish enough heat to keep the house at the desired temperature without the necessity of frequent shutting off of the gas supply. This method of burning gas in a furnace originally designed for burning coal, permits gas to be economically burned without the necessity of replacing the furnace as a whole by a specially designed gas burning furnace. The heat generated by the normally going gas burner will not be in excess of what can be satisfactorily absorbed by the furnace. At such times as both gas burners must be operated in order to properly heat the house there may be some wastage of heat due to the inability of the furnace to efficiently absorb the heat but this disadvantage is more than offset by the advantage of being able to burn gas efficiently most of the time, that is to say during normal weather conditions.

It sometimes happens that during extremely cold weather the usual full supply of city gas is not available for various reasons. In order that the house may not suffer for lack of heat during such times the invention provides for burning oil. Moreover in accordance with the present invention the oil burning system is so combined with the gas burning system that the householder may, if he so desires, set the oil burning system for functioning along with the normally going gas burner when the latter is not able to supply the necessary amount of heat. This arrangement therefore allows the householder to burn a relatively cheap fuel along with the normally going gas burner when extremely cold weather requires or when the available gas supply is not sufficient to properly operate both gas burners at the same time.

Another object of the invention is to provide a simple and reliable system for controlling the operation of the supplementary heat generating means.

For a fuller understanding of the invention reference is made to the detailed description thereof in connection with the accompanying drawings and to the appended claim wherein the novel combinations are particularly set forth.

Referring to the drawings, Fig. 1 illustrates in a more or less diagrammatic manner the preferred combination of means for carrying the invention into effect and Fig. 2 is an end elevation on an enlarged scale of a rotary switch.

In the drawings, reference numeral 10 indicates a gas burner which is preferably in the form of a ring for a reason that will presently appear. This gas burner is the primary heat generating means and while not of a capacity sufficient to burn all of the gas available for burning is, nevertheless, of such capacity that ordinarily it will meet the normal heat requirements of the dwelling to be heated. Positioned concentrically with respect to the gas burner 10 is an oil burner 12.

By arranging the oil burner in the manner stated, the oil issuing from the oil burner will be ignited by the surrounding ring of gas flames from the burner 10. Surrounding the gas burner 10 is a gas burner 14. This gas burner 14 may be termed the secondary gas burner and is normally inoperative as is also the oil burner 12. As will hereinafter appear, the controlling system for the burners is such that the two gas burners may be operated together or the primary gas burner (that is to say, the smaller inner gas burner) and the oil burner may be operated together.

Both gas burners are supplied with gas from a common source of supply indicated as a gas main 16. Branch pipes 18 and 20 lead from the gas main to the inner and outer gas burners, respectively. Between the gas burners is a pilot burner 22 supplied with gas from the gas main through a pipe 24.

Oil is supplied to the oil burner through a pipe 28 which connects with an oil pump 30 of any approved type. Atomization of the oil at the burner is preferably effected or assisted by a current of air under pressure which enters the oil burner at an appropriate point. The air conduit is indicated at 32 and connects with a blower 34 of any approved type. The blower and oil pump are preferably driven in unison by an electric motor 36.

For shutting off the flow of gas from the gas main 16 there is provided a main gas valve 38 which is preferably of a well-known snap-action type. This valve is opened and closed by an electric motor 40. At this point it is sufficient to say that the motor will close the valve when there is no immediate call for heat in the dwelling. The motor is of a type designed to rotate its driving shaft 42 a one-half revolution and then stop and is a type well-known in the art. In the present instance the motor shaft is shown as provided with a crank 44 for actuating the gas-main valve 38, the latter being shown as provided with a crank arm 46 which when moved through 180° will cause the valve to open or close as the case may be. The valve may be considered as open when the crank arm 46 and crank shaft 44 are in the positions shown.

In the branch gas pipe 20 leading to the secondary gas burner 14 is arranged a valve generally indicated at 48. This valve 48 is normally closed. The opening of this valve is conveniently controlled by a solenoid 50 which is energized in a manner hereinafter described.

The main or master controller of the heating system thus far described is a thermostat generally indicated at 56. This thermostat has a movable element or arm 58 whose range of movement depends on temperature differences within the dwelling or room in which it is placed. The fixed end of said arm is permanently connected with an electric wire 52 which connects with a battery 54 or other source of electrical energy.

The movable end of the arm is adapted within the range of its swing to make electrical contact with three contacts 62, 64 and 66 arranged in spaced relation to each other. These contacts connect with wires hereinafter mentioned. Contact 62 in accordance with the present showing marks the highest desired degree of room temperature for example 71°; contact 64 the lowest permissible degree of room temperature as for example 68°; and contact 66 an intermediate temperature, as for example 69°.

When the temperature in the room causes the thermostat arm 58 to swing over into engagement with contact 62 the gas valve 38 in the gas main is actuated by the motor 40 to shut off the flow of gas to the gas burner. When the room temperature falls thereby causing said arm 58 to swing over into engagement with contact 66, the gas valve 38 is opened by said motor 40. If the room temperature continues to fall and said arm swings into engagement with contact 64 one or the other of the supplementary heat generating means is automatically brought into operation along with the primary gas burner. If the apparatus has been set to allow the supplemental gas burner to go into operation, the normally closed gas valve 48 in the gas pipe 20 leading to the burner 14 is automatically opened thus allowing gas from the gas main to flow to said burner. If on the other hand the apparatus has been set to allow the oil burner to go into operation the motor 36 which actuates the oil pump and blower will be automatically started and the oil burner will go into operation along with the primary gas burner.

The electrical connections which permit the above operations to be effected will now be described. A brief description of the mode of operation of motor 40 will first be given. As previously stated this motor is well known in the art. The main power circuit is indicated at 70. Leading from the motor are three wires 72, 74 and 76. When the circuit between wires 72 and 74 is closed the motor will rotate its shaft 42 through 180° and then stop. The next 180° revolution occurs when the circuit between wires 74 and 76 is closed. In order therefore to obtain a complete revolution of the motor shaft first one of said circuits and then the other must be closed. The details of construction of the motor form no part of the present invention. In the present invention the motor shaft has been shown as provided with a rotary switch 78 which is so constructed that when the motor shaft is in one position of rest one side 80 of a power circuit leading to the pump motor 36 is closed and when it is in its other position of rest said power circuit is open. This switch has

been illustrated as a 90° segment of conducting material placed in a non-conducting disk affixed on the motor shaft, brushes being provided in the adjacent terminals of the wire 80 for operative engagement with the rotary switch. The purpose of this switch will presently appear. Wire 72 connects with contact 66 in the thermostat 56, wire 74 with movable arm 58 thereof by way of battery 54 and wire 52 and wire 76 with contact 62.

When the thermostat arm 58 swings into engagement with contact 62 the room temperature is at the desired maximum. When said arm is in engagement with contact 62 the circuit between wires 74 and 76 is closed whereupon the motor shaft 42 makes a one-half revolution and in so doing causes the gas valve 38 to close. Flow of gas to the primary gas burner 10 is therefore shut off. When arm 58 swings back into engagement with contact 66 the circuit between wires 74 and 72 is closed whereupon the motor shaft again rotates through a one-half revolution and in so doing opens the gas valve 38 whereupon gas burner 10 starts going. If the temperature of the room continues to fall the arm 58 will continue to swing back until it makes engagement with contact 64. When this occurs the additional gas burner 14 will be set into operation or the oil burner 12 will be set into operation depending on how the mechanism has been set. The manner of setting the additional gas burner into operation will first be described. When arm 58 makes electrical engagement with contact 64 the normally closed gas valve 48 in the gas line 20 is opened. As previously indicated said valve is controlled by a solenoid 50. When this solenoid is energized the valve is opened. The circuit which energizes said solenoid is as follows: Leading from contact 64 to the solenoid is a wire generally indicated at 82. Interposed in this wire is a switch 84. When this switch is closed wire 82 is electrically continuous. Wire 86 (shown as connecting with wire 74) completes the circuit between the solenoid and the thermostat arm. When this circuit is closed the battery 54 in the circuit energizes the solenoid to open the valve 48 as will now be understood and the valve will be kept open as long as arm 58 is in electrical engagement with contact 64. When the room temperature rises arm 58 will move away from contact 64 thus de-energizing solenoid 54 whereupon the valve 48 closes and the flow of gas to the secondary gas burner 14 is cut off. It will be understood that the primary gas burner continues to function until such time as the arm 58 makes engagement with the contact 62.

The manner of bringing the oil burner into operation instead of the secondary gas burner will next be explained. It will be remembered that valve 48 in the gas line 20 leading to the secondary gas burner is normally closed and is only opened when the solenoid 50 is energized. By opening the switch 84 in wire 82 leading to said solenoid the valve 48 will automatically close thus cutting off the supply of gas to the secondary gas burner 14. Leading from the contact 64 and arm 58, the battery 54 being in between, is a wire 90 which is electrically continuous when a switch 92 in the wire is closed. The two switches 84 and 92 are preferably operated in unison as by a handle 94. Wire 80 has been previously described as being one side of the power circuit leading to the pump motor 36. Wire 96 constitutes the other side of the pump motor circuit. Wire 96 is electrically continuous when a switch 98 is closed. This switch has been shown as operated by a solenoid 99 and is normally open. The switch is closed by the solenoid 99 when current passes through the wire 90.

It will be remembered that motor 40 carries a rotary switch 78 on its shaft and that when the motor shaft is in one position of rest the switch is closed and in its second position of rest is open. Said switch is closed when the main gas valve 38 is open and is open when the latter is closed. In other words as long as gas is flowing to the primary gas burner 10 the rotary switch 78 is closed and upon the other side 96 of the motor power circuit being closed by switch 98 the oil and blower motor 36 will rotate to supply oil and air to the oil burner 12. The oil issuing from burner 12 will be ignited by the surrounding ring of gas flames from the going primary gas burner 10. When the arm 58 moves away from contact 64 under an increase in temperature the solenoid 99 is de-energized and the switch 98 in circuit 96 opens thus stopping motor 36. Arm 58 in swinging back to contact 62 makes engagement with contact 66 but without disturbing motor 40 because as previously pointed out motor 40 is actuated by the alternate closing of the controlling circuits 72–74 and 74–76. It will now be understood that when motor 40 has once been actuated to open the gas valve 38 by arm 58 making electrical engagement with contact 66, said arm must make engagement with contact 62 in order to again actuate the motor 40 to close the gas valve 38.

It will now be seen that the invention offers a simple and practical method of utilizing gas as the base fuel in a furnace originally designed for burning coal and that only a part of the available gas supply is utilized to satisfy the normal heat requirements, the abnormal heat requirements being satisfied by burning the balance of the available gas supply or by burning oil in conjunction with the normally going gas burner.

The various elements making up the im-

proved heating system form no part of the present invention and it is within the spirit of the invention to employ any suitable type of elements which will serve the required purpose or purposes indicated.

What is claimed is:

In space heating apparatus, in combination, a primary fluid fuel burner having a capacity sufficient to meet only the normal heat demands of the space, two auxiliary fluid fuel burners, means for supplying fuel and air to each of said burners, a thermostat responsive to changes in heat demand of said space, and separate means under the control of said thermostat for throwing said primary burner and either of said auxiliary burners into and out of operation in accordance with variations in the heat demand of said space.

In testimony whereof I affix my signature.

ALBERT L. KLEES.