

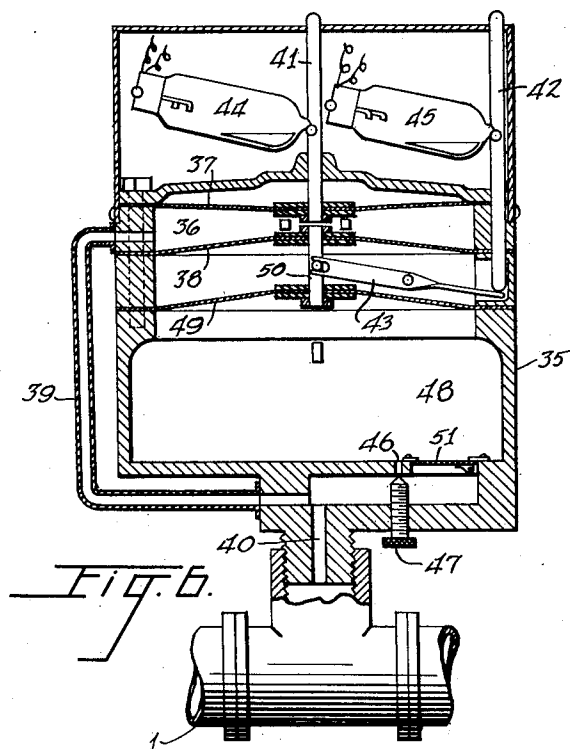
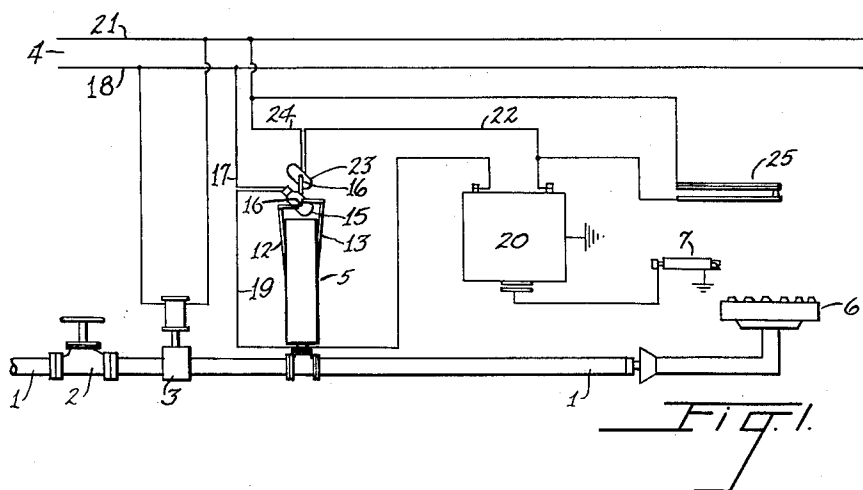
May 19, 1936.

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2,041,014

AUTOMATIC LIGHTER FOR GAS FURNACES AND THE LIKE

Original Filed Jan. 14, 1932 2 Sheets-Sheet 1



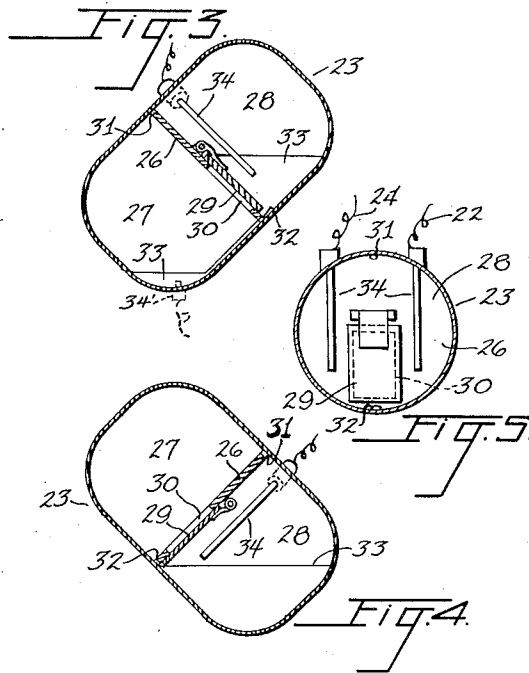
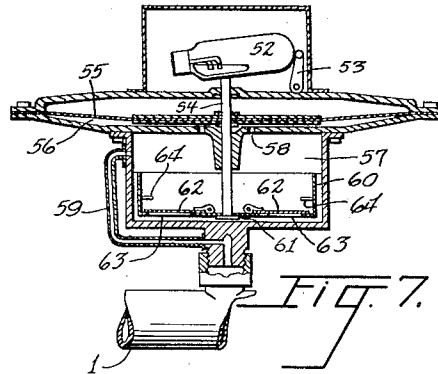
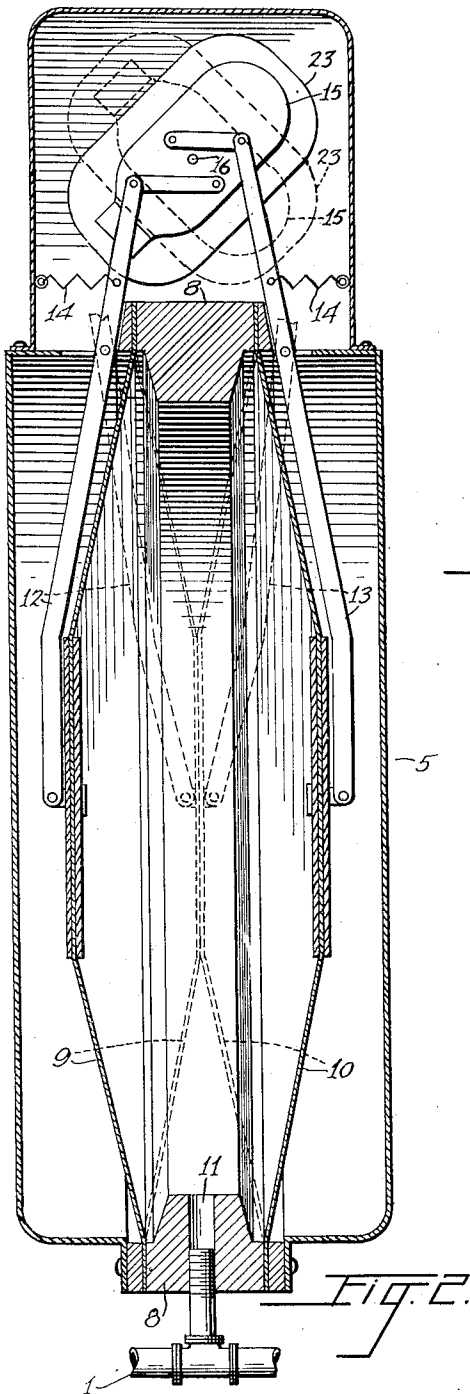
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AUTOMATIC LIGHTER FOR GAS FURNACES AND THE LIKE

Original Filed Jan. 14, 1932 2 Sheets-Sheet 2



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2,041,014

AUTOMATIC LIGHTER FOR GAS FURNACES
AND THE LIKE

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Application January 14, 1932, Serial No. 586,618
Renewed April 1, 1935

10 Claims. (Cl. 175-115)

My invention relates to improvements in automatic lighters for gas furnaces and the like.

An object of my invention is to provide an automatic lighter for gas furnaces, gas burners, and the like, which has novel means for controlling ignition of the gas issuing from a burner as soon as the gas has started to flow from the burner. This control is operative irrespective of whether gas flow is due to the manual opening of the furnace control valve or due to the resumption of gas supply from a temporarily disconnected gas main or gas meter to a previously-operating furnace whose gas valve is in an open position, in which latter case, the usual gas pilot igniter would be extinguished and useless.

I preferably provide a gas control valve of the usual magnetic push button or thermostatic type, and, inasmuch as the gas valve is opened by the same current which ignites the gas, it is obvious that there is no possibility of ignition current failure when opening the gas valve. The only possible condition under which the gas would fail to be ignited would be the remote possibility where, the furnace being in operation, both the main gas supply and the house lighting current are suddenly shut off, and the gas service is resumed before the electric service, with the furnace gas valve remaining in its original open position. To guard against such a possibility, a magnetic safety shut-off valve is provided and connected to the house-lighting circuit, which valve closes during any period of current failure.

An object of my invention is to eliminate a gas pilot for ignition means, a pilot being susceptible to extinguishment due to drop in gas supply pressure, sudden down drafts, popping of main burner when turned off, etc.

A further object of my invention is to supply an electrical ignition means whereby the gas may be re-lighted immediately after turning it off, without being delayed by having to wait for a stack thermostatic switch and the furnace-heating element to cool off.

Other objects and advantages will appear in the following specification, and some novel features of the device will be particularly pointed out in the appended claims.

The present preferred form of my invention is illustrated in the accompanying drawings forming a part of this application, in which

Figure 1 is a schematic view of the device, and shows the wiring diagram;

Figure 2 is a vertical section through the automatic control unit;

Figures 3, 4 and 5 are sectional views of a mercury time-controlled switch;

Figure 6 shows another form of automatic control; and

Figure 7 illustrates still another form of a time-controlled switch.

In carrying out my invention, I make use of a fuel-conveying pipe 1, through which gas flows, and this gas is controlled by a manually-operated valve 2, of any desired construction, or a magnetic push button type, or a thermostatic valve. A magnetic valve, indicated generally at 3, is also disposed in the line 1 and is electrically connected to the house-lighting circuit 4, or other source of power, so that the valve 3 will remain open so long as the house-lighting circuit is on, but will automatically close when the lighting circuit is broken. An automatic control unit 5 is connected with the pipe 1, and this device will be described in detail later. The pipe, or line 1 leads to the burner 6 of a gas furnace not shown.

I dispose a spark plug 7 adjacent to the burner 6, and this spark plug is automatically placed in electrical connection with the house-lighting circuit 4 by means of the control unit 5, and the unit 5 in turn is actuated by the gas pressure in the line 1. In this way, the gas is lighted as soon as it issues from the burner 6.

I will now describe the automatic control unit 5 shown in Figure 2. A ring-shaped support 8 is closed by diaphragms 9 and 10. The gas in the pipe 1 has access to the compartment formed by the ring and the diaphragms through an inlet 11. Levers 12 and 13 are connected to the diaphragms 9 and 10 and are swung from the dotted-line position into the full-line position when the gas pressure is turned on. Springs 14 move the levers 12 and 13 back into the dotted-line position as soon as the gas pressure is turned off. The upper portions of the levers are broken away in the dotted-line position for the purpose of clarity.

I make use of the movements of the levers in swinging mercury switches from open to closed positions. The mercury switch 15 is mounted on a shaft 16 and is rotated thereby. The switch assumes the full-line position shown in Figure 2 when the gas is on. When the gas pressure is off, the levers 12 and 13 will swing the switch 15 approximately 90 degrees, and the switch will open. I have shown the switch 15 diagrammatically in Figure 1, the switch being shown in open position.

A wire 17 leads from the wire 18 of the house-lighting circuit 4 to the switch 15. A second wire 19 leads from the switch 15 to a high tension ignition transformer 20. A return circuit from the transformer 20 back to the other line 21 of the house-lighting circuit 4 consists of a wire 22 connected to a mercury time switch 23 and a wire 24 leading from the time switch 23 to the wire 21. The swinging of the switch 15 in a counter-clockwise direction from the position shown in Figure 1 into the full-line position shown in Figure 2 will also swing the switch 23 by means of the shaft 16, and the switch 23 will swing from

the position shown in Figure 4 into that shown in Figure 3.

The switches 15 and 23 are for the purpose of instantly closing a circuit to the primary of the transformer 20, and this will cause a spark to jump across the terminals of the spark plug 7, the spark igniting the gas issuing from the burner 6. Some means should be provided for stopping the functioning of the spark plug 7 after the burner 6 is lighted and it is for this reason that I provide the time-controlled switch 23. This switch will remain closed for a given time interval and then will automatically open, thus breaking the circuit to the primary of the transformer 20. Should the spark plug fail to ignite the gas during this time interval, I provide a safety factor in a thermostatic switch 25, which is connected in parallel with the switch 23. So long as the thermostatic switch 25 remains closed, the return circuit from the transformer 20 can pass through the switch 23 or through the switch 25.

When the switch 23 automatically opens after a predetermined time interval and the spark plug 7 still fails to ignite the gas 6, the switch 25 will not be heated and will remain closed, and thus the current will continue to flow through the switch 25 in place of the switch 23, and the spark plug 7 will continue to function until the gas is ignited.

The switch 23 is shown in Figures 3, 4 and 5, and it will be noted that a partition 26 divides the switch into two compartments 27 and 28. A spring-pressed flap valve 29 normally closes a large opening 30 in the partition 26. An air vent 31 is provided in the top of the partition, while a bleed hole 32 is provided in the bottom of the partition.

When the gas is off, the switch 23 assumes the position shown in Figure 4, and when the gas is turned on, the switch is swung into the position shown in Figure 3. The mercury 33 will close the terminals 34, and the circuit will be closed until the mercury uncovers the terminals. The mercury will pass through the bleed hole 32 and down to the compartment 27. The amount of mercury and the size of the bleed hole control the timing of the switch. As soon as the mercury uncovers the terminals 34, the switch will open and will remain open until it is again swung into the position shown in Figure 4 and then back into the position shown in Figure 3. The swinging of the switch from that shown in Figure 3 into that shown in Figure 4 will cause the mercury in the compartment 27 to rush through the large opening 30 and pass into the compartment 28. The flap valve 29 permits the quick movement of the mercury. As soon as the mercury is received in the compartment 28, the flap valve 29 closes and the switch is ready for further operation.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

When the operator opens the manually-controlled valve 2, or a thermostat calls for gas flow past valve 2, or valve 2 is otherwise opened, the gas will flow to the burner 6 and will also move the diaphragms 9 and 10 into the full-line position shown in Figure 2. Both switches 15 and 23 will close in the manner already described, and the spark from the spark plug 7 will ignite the gas. The switch 15 will remain closed so long as the gas pressure is on, while the switch 23 will open after a predetermined time interval. If the gas has not ignited during this time interval, the

thermostatic switch 25 will be in series with the switch 15 and will keep the circuit closed until the gas is ignited, whereupon, the switch 25 will open and the spark plug 7 will cease to function.

Should the gas suddenly go off now and then go back on again before the switch 25 has had a chance to close, the switches 15 and 23 will have been swung into open position and back into closed position, whereupon the circuit will be closed and the spark plug 7 will function even though the switch 25 remains open. The same is true when the valve 2 is manually turned off and then turned on again before the thermostatic switch 25 has had a chance to cool.

In Figure 6, I show a modified form of the device. A casing 35 has a compartment 36, and two of the walls of the compartment consist of diaphragms 37 and 38. The compartment 36 is in communication with the pipe line 1 by means of a conduit 39 and a passageway 40. The diaphragm 37 is connected to a plunger 41, while the diaphragm 38 is connected to a plunger 42 by means of a lever 43. A mercury switch 44 takes the place of the switch 15, and a mercury switch 45 takes the place of the switch 23. As soon as gas enters the chamber 36, the plungers 41 and 42 are raised by the diaphragms 37 and 38 moving away from each other, and these plungers rock the switches 44 and 45 into closed position.

A bleed hole 46, controlled by a needle valve 47, permits gas to slowly enter a compartment 48, and in time, this compartment fills with gas and the gas pressure will bear against a diaphragm 49 with the same force as the gas pressure bearing against the diaphragm 38. The two diaphragms are interconnected by a rod 50, and, therefore, as soon as the gas pressure balances in the compartments 36 and 48, the weight of the plunger 42 and associate parts will permit the switch 45 to swing into open position while the switch 44 still remains closed. The device will therefore function in the same manner as the switches 15 and 23 and can be substituted for the switches. When the gas pressure in the line 1 is turned off, the compartment 48 is quickly relieved of its pressure by a spring-pressed flap valve 51. This valve closes as soon as gas pressure again tends to fill the compartment 48.

In Figure 7, I show another modified form of a time-controlled switch, indicated generally at 52, which may be used in connection with the switch 15 or 44. The switch 52 is mounted upon a link 53 and is swung into open and closed position by means of a rod 54. The switch 52 is normally closed when the gas pressure is off rather than being open. The rod is connected to a diaphragm 55, and the diaphragm forms one wall of a compartment 56. The compartment 56 in turn is placed in communication with a compartment 57 by openings 58. A conduit 59 places the compartments 57 and 56 in communication with the gas line 1.

When the gas pressure is turned on, the gas will flow through the conduit 59 into the compartment 57 and then into the compartment 56, whereupon it will raise the diaphragm 55, the plunger 54 and will open the switch 52. However, a time interval will elapse between the turning on of the gas and the opening of the switch 52.

The means for accomplishing this comprises a liquid-holding cup 60 connected to the rod 54, the liquid in the cup being heavy enough to overcome gas pressure against the diaphragm 55 and therefore preventing the immediate upward movement of the rod 54. A small bleed hole 61

is provided in the bottom of the cup 60, and the tendency of the rod 54 to raise the cup will cause the liquid to pass through the bleed hole and into the bottom of the compartment 57. The upward movement of the rod 54 is controlled by the flow of liquid through the bleed hole 61. This is timed in such a manner that the switch 52 will open after a predetermined time interval.

Upon the freeing of the gas pressure, the cup 60 will quickly return to its lowermost position because the flap valves 62 uncover openings 63 in the bottom of the cup and the liquid can quickly pass into the cup. Stops 64 limit the movement of the flap valves into open position.

It should be noted that the partition 26 in the switch 28 may constitute one of the terminals 34, and in this event, only one terminal would be disposed in the compartment 28. Mercury in the compartment 28 will electrically connect the partition 26 and one terminal 34 until the mercury level drops below the lower end of the terminal. It is also possible to place one terminal in each compartment 27 and 28. In this case, the terminal 34 in the compartment 28 and the terminal 34' in the compartment 27 would be electrically connected together by the mercury flowing from the compartment 28 to the compartment 27 and would stay connected until the level of the mercury drops below terminal 34.

While I have shown only the preferred forms of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. In combination, a gas line, a burner connected thereto, an electrically-actuated lighter disposed near the burner, a source of current, a switch and a time-controlled switch connected in series with each other and with the lighter, means controlled by the pressure of the gas for closing both switches for connecting the lighter with the source of current, said time-controlled switch opening after a predetermined time interval for breaking the circuit.

2. In combination, a gas line, a burner connected thereto, an electrically-actuated lighter disposed near the burner, a source of current, a switch and a time-controlled switch connected in series with each other and with the lighter, means controlled by the pressure of the gas for closing both switches for connecting the lighter with the source of current, said time-controlled switch opening after a predetermined time interval for breaking the circuit, and a thermostatic switch opened when affected by heat from the burner and being shunted across the time-controlled switch, whereby the current to the lighter will be unbroken until the thermostatic switch opens.

3. In combination, a gas line, a burner connected thereto, an electrically actuated lighter disposed near the burner, a source of current, and a time controlled switch connecting the lighter with the source of current, said switch being closed by gas pressure in the line.

4. In combination, a gas line, a source of current, a magnetic valve for the gas line and being opened when electrically connected to the current source, a burner connected to the gas line, an electrically actuated lighter disposed near the burner, and a time controlled switch connect-

ing the lighter with the current source, said switch being closed by gas pressure in the gas line.

5. In combination, a gas line, a burner connected thereto, an electrically actuated lighter disposed near the burner, a source of current, a switch and a time-controlled switch connected in series with each other and with the lighter, means controlled by the pressure of the gas for closing both switches for connecting the lighter with the source of current, said time-controlled switch opening after a predetermined time interval for breaking the circuit, a magnetic valve for the gas line, said valve being electrically connected to the current source and remaining open so long as the current source is alive, said valve automatically closing the gas line when the current source fails.

6. In combination, a gas line, a burner connected thereto, electric ignition means for said burner, and means responsive to pressure in said gas line for energizing said ignition means for only a predetermined time interval.

7. In combination, a gas line, a burner connected thereto, electric ignition means for said burner, means responsive to pressure in said gas line for energizing said ignition means for only a predetermined time interval and thermally responsive means responsive to ignition of gas on said burner for continuing operation of said ignition means after said time interval.

8. In consideration, a gas line, a burner connected thereto, electric ignition means for said burner, means responsive to pressure in said gas line for energizing said ignition means for only a predetermined time interval, and other pressure responsive means operable upon a failure of pressure in said line for disabling entirely said ignition means until said pressure in said line is restored.

9. In combination, a gas line, a burner connected thereto, electric ignition means for said burner, means responsive to pressure in said gas line for energizing said ignition means for only a predetermined time interval and thermally responsive means responsive to ignition of gas on said burner for continuing operation of said ignition means after said time interval, and other pressure responsive means operable upon a failure of pressure in said line for disabling entirely said ignition means until said pressure in said line is restored.

10. In combination, a gas line, a magnetic valve in said line, a burner connected thereto, an electrically-actuated lighter disposed near the burner, a source of current, a switch and a time-controlled switch connected in series with each other and with the lighter, means controlled by the pressure of the gas for closing both switches for connecting the lighter with the source of current, said time-controlled switch opening after a predetermined time interval for breaking the circuit, and a thermostatic switch opened when affected by heat from the burner and being shunted across the time-controlled switch, whereby the current to the lighter will be unbroken until the thermostatic switch opens, said magnetic valve being electrically connected to the current source and remaining open so long as the current source is alive, said valve automatically closing the gas line when the current source fails.

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