April 3, 1928. 1,665,088

H. A. L. FOWLER

AUTOMATIC LIGHTER FOR GAS WATER HEATERS

Filed June 24, 1927 4 Sheets-Sheet 1

Fig. 1.

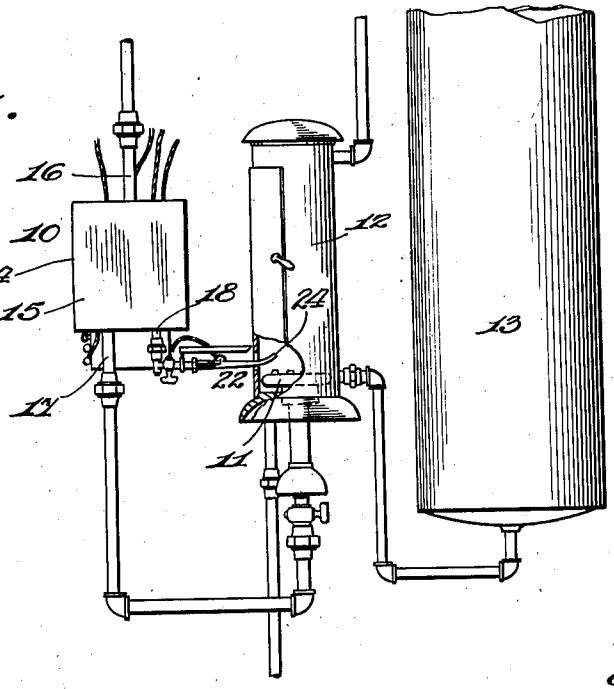
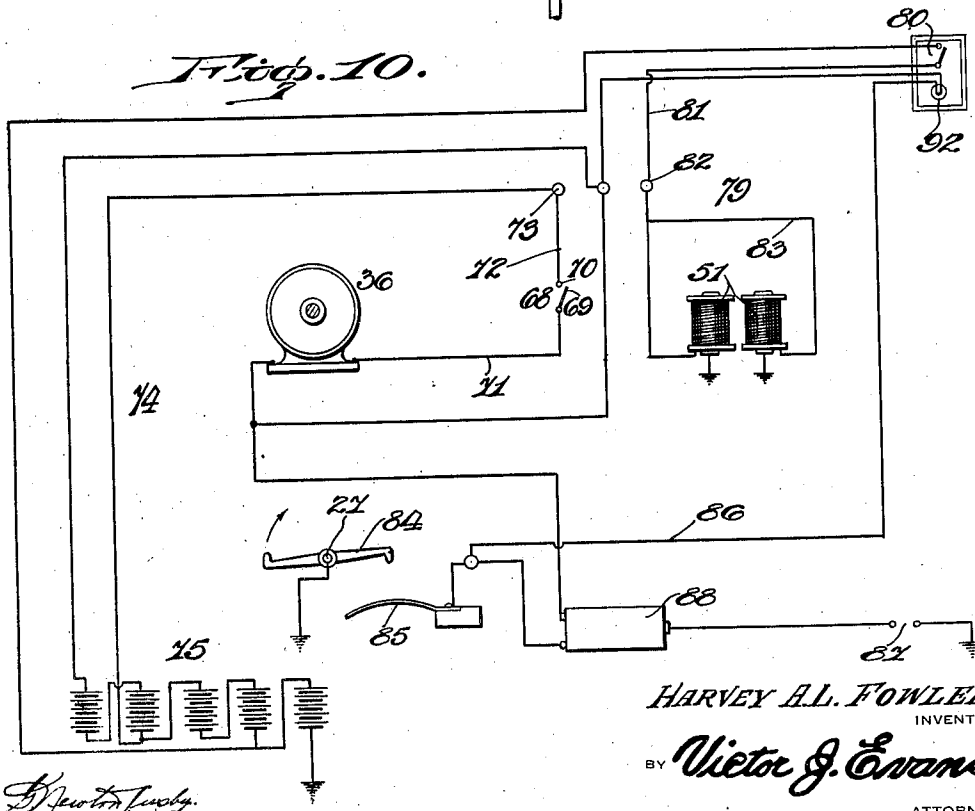


Fig. 10.



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April 3, 1928. 1,665,088

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AUTOMATIC LIGHTER FOR GAS WATER HEATERS

Filed June 24, 1927 4 Sheets-Sheet 2

Fig. 5.

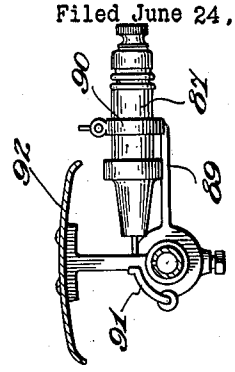


Fig. 2.

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AUTOMATIC LIGHTER FOR GAS WATER HEATERS

Filed June 24, 1927 4 Sheets-Sheet 3

Fig. 2.

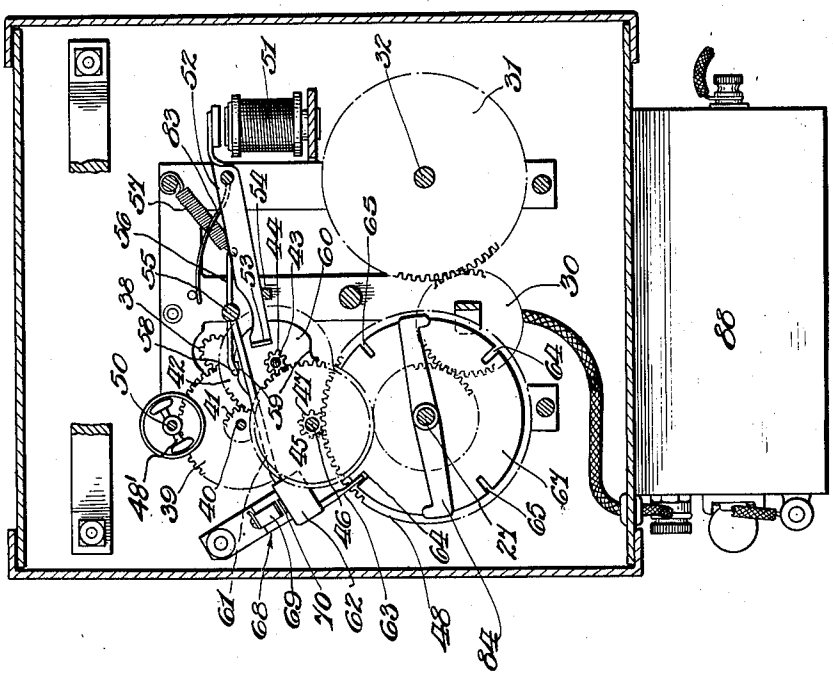
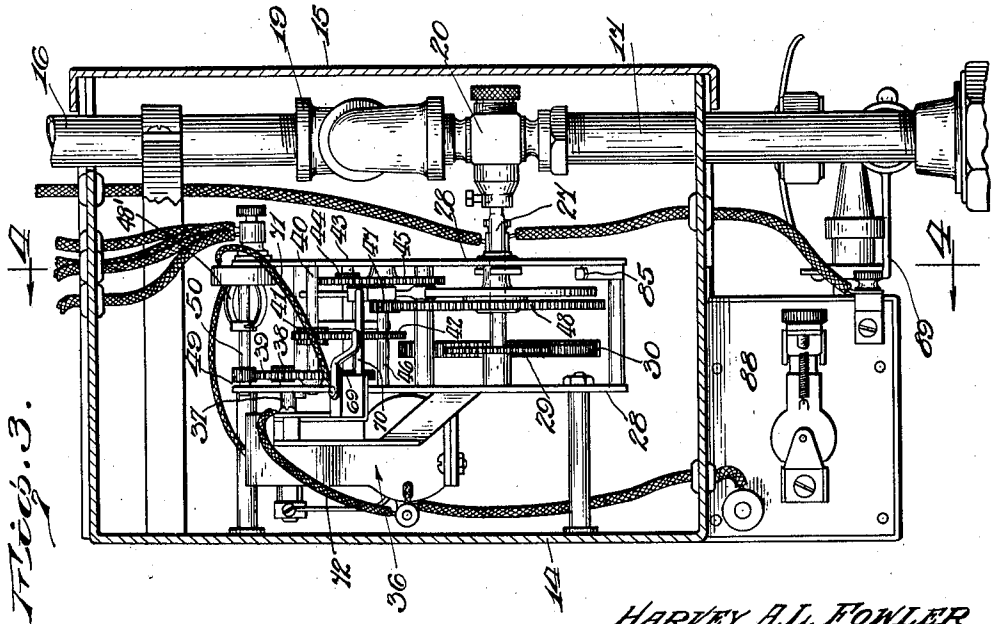


Fig. 3.



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April 3, 1928. 1,665,088

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AUTOMATIC LIGHTER FOR GAS WATER HEATERS

Filed June 24, 1927 4 Sheets-Sheet 4

Fig. 6.

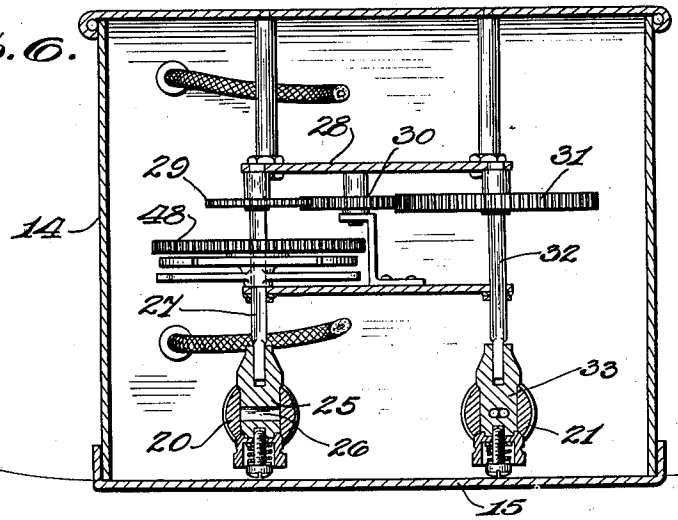


Fig. 7.

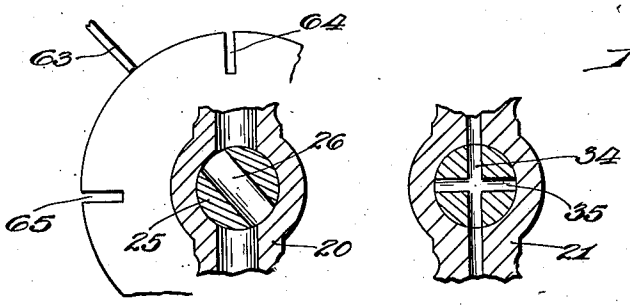


Fig. 8.

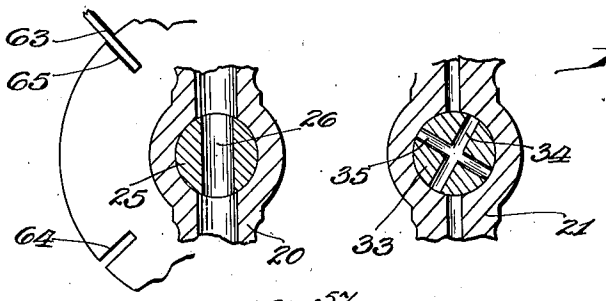
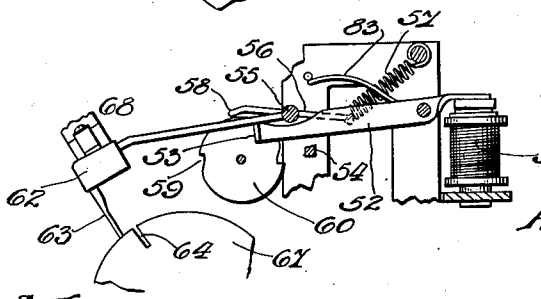


Fig. 9.



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Patented Apr. 3, 1928. 1,665,088

UNITED STATES PATENT OFFICE.

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AUTOMATIC LIGHTER FOR GAS WATER HEATERS.

Application filed June 24, 1927. Serial No. 201,254.

This invention relates to automatic lighters for gas water heaters.

The primary object of the invention resides in the provision of a device for attachment to the present gas water heater by which the burner of the heater may be lighted from a remote part of the house without necessitating a trip to the cellar or kitchen where most of such heaters are located.

Another object is to provide an automatic device for gas appliances wherein a pilot light is disposed adjacent the burner of the appliance and lighted by an electric spark from a distant point and in which a signal is set off to assure an operator that the device is in operative condition to prevent any possibility of the gas being turned on without proper working of the spark, which might result in the escape of gas and loss of life by asphyxiation and damage to property by explosion.

Another object of the invention is to provide an automatic lighter which may be operated by actuating a push and pull button switch from any room of a house which lights a pilot light for a period of time necessary to light the burner of a gas appliance, after which the pilot is automatically extinguished, thus saving the expense of having a pilot light continuously lighted as is the present practice in automatic gas water heaters and by which switch the burner when lighted may be extinguished.

A further object of the invention is to provide an automatic lighter for gas water heaters positive and safe in operation.

With these and other objects in view, the invention resides in certain novel construction and combination and arrangement of parts, the essential features of which are hereinafter fully described, are particularly pointed out in the appended claims, and are illustrated in the accompanying drawing, in which:—

Figure 1 is an elevational view showing my improved automatic lighter in position with respect to a gas water heater.

Figure 2 is a vertical sectional view through the lighting device with the gas control valves in a shut off position.

Figure 3 is an end elevation of the same with the casing in section.

Figure 4 is a vertical sectional view on the line 4—4 of Figure 3.

Figure 5 is a vertical transverse sectional view on the line 5—5 of Figure 2.

Figure 6 is a horizontal sectional view on the line 6—6 of Figure 2.

Figure 7 is a detail sectional view showing the position of the burner control valve when the pilot control valve is in a fully open position.

Figure 8 is a similar view but showing the position of the pilot control valve when the burner control valve is in a fully open position.

Figure 9 is a detail view showing the automatic stop mechanism in a position responsive to the control magnets.

Figure 10 is a diagrammatic view of the electric circuits.

Referring more particularly to the drawing, the reference numeral 10 designates my improved automatic lighter in its entirety which is shown in the drawing, as applied to the gas burner 11 of a gas water heater 12, used for heating water in a boiler or tank 13.

The device 10 comprises a box-like casing or housing 14 having a removable front cover 15, which when removed as in Figure 2 of the drawing, reveals the inner working parts of the device.

Extending through the top wall of the casing is a gas supply pipe 16 to which a burner supply pipe 17 and a pilot burner pipe 18 are connected through a T-coupling 19. A burner control valve 20 is arranged in the pipe 17 while a pilot control valve 21 is arranged within the pipe 18, both of said valves being disposed within the casing 14 for controlling the flow of gas to the burner 11 and pilot burner 22. The pilot burner is of a tubular shape having flame openings 23 along the top thereof and by which the curved tip 24 of the pilot burner is lighted. The tip 24 extends within the gas heater 12

to a point above the burner 11 for effectively lighting the burner when the pilot is lighted.

The valve 20 is of the rotary type and includes a rotatable plug 25 having a straight passage or duct 26 therein which is normally disposed in a horizontal or closed position as shown in Figure 2 of the drawings, but which is moved to a vertical position to register with the passage in the pipe line 17. The rotary plug 25 is fixedly connected to a shaft 27 journalled in a frame structure 28 supported within the casing 14. Fixed to the shaft 27 rearward of the valve 20 is a gear 29, for constant meshing engagement with an idler gear 30, journalled in the frame structure, and which idler gear also meshes with a gear 31 fixed to a shaft 32, to which the plug 33 of the pilot valve 21 is connected. The gear 31 is twice the size of the gear 29 so as to rotate at one-half the speed of the gear 29 during the operation of the device.

The plug 33 of the pilot control valve 21 is provided with right angularly disposed straight passages 34 and 35 for successively establishing communication between the gas supply pipe 16 and pilot gas pipe 18. Normally the passages 34 and 35 are in a position as shown in Figure 2 of the drawings, whereupon the gas supply to the pilot is shut off.

For transmitting rotary movement to the plugs of the control valves, I provide an electric motor 36 mounted upon the supporting frame 28, driven shaft 37 of which carries a relatively small gear 38 for constant meshing engagement with a larger gear 39 mounted on a counter-shaft 40 journalled in the frame structure. The shaft 40 also carries a smaller gear 41 for constant meshing engagement with a larger gear 42, which also carries a smaller gear 44 for meshing engagement with a gear 45 fixed to a counter-shaft 46 arranged in vertical alignment with the axis of the shaft 40. The shaft 46 also carries a smaller gear 47 for meshing engagement with a relatively large gear 48 fixed to the shaft 27 to which the plug 25 of the burner control valve is connected to rotate the shaft at a relatively slow rate of speed. A similar motion is transmitted to the plug 33 of the pilot control valve 21 through the gears 29, 30 and 31, and shaft 32. The gears above referred to constitute a gear train and turn in the direction of the arrows in Figure 4 of the drawings, and for controlling the speed of the same, I provide a centrifugal governor 48' driven by the gear 39 through a gear 49 and shaft 50.

For the purpose of electrically controlling the starting and for automatically stopping the device, I provide a pair of electro-magnets 51 mounted upon the frame structure for actuating one end of a pivoted arm 52, the other end of which is provided with an angularly disposed lip 53. A stop 54 normally supports the lever which drops thereon under its own weight.

Mounted above the arm 52 is a rocker shaft 55 having a rocker arm 56 extending from opposite sides thereof. One end of the rocker arm is connected to one end of a contractile spring 57 which has its other end secured to the frame structure, which spring normally holds the angular finger 58 of the rocker arm seated in one of a pair of diametrically opposed cam notches 59 provided in the periphery of a brake disk 60 fixed to the counter-shaft 44 forward of the gear 42. The angular lip 53 of the arm 52 is disposed in the path of the rocker arm 61 about to be described to lift the finger 58 out of the engaging notch 59 upon energizing of the solenoids 51 upon starting of the device.

Extending from the rocker shaft 55 at an angle with respect to the rocker arm 56 is an arm 61, the free end of which carries a block 62 of insulating material from which a flexible member 63 extends. The member 63 is normally seated in one of two sets of notches 64 and 65 spaced at intervals of 90° on the peripheral edge of a disk 67 fixed to the shaft 27. In Figure 4, the member 63 is seated in the notch 64 as the valves and parts are in normal position, but the same successively seats in the other of the notches during operation of the device. On each operation, to open and close the gas burner valve the disk 67 rotates one-half revolution.

A motor control switch 68 is disposed in the path of upward movement of the block 62 and which comprises a pair of normally spaced flat spring contacts 69 and 70. A wire 71 leads from the contacts 69 to a terminal 73 on the frame structure 28 while a wire 72 leads from the contact 70 to a terminal on the motor 36. It will be obvious that when the block moves upward to lift the member 63 out of the slots 64 and 65, the contact strip 70 will be moved into engagement with the contact 69 and the motor circuit 74 will automatically close. A battery 75 is arranged in the circuit 74 with the switch 68 and motor 36.

For energizing the electro-magnets 51 which control the actuation of the motor switch 68 through the arm 52, and arm 61, I provide an electro-magnet circuit 79 within which a push and pull button switch 80 is arranged. A wire 81 leads from one of the terminals of the switch 80 to a terminal 82 on the frame structure and which terminal is electrically connected to the magnets through a conductor 83. The electro-magnets are grounded together with the battery 75 to form a complete circuit. From the

description of the electro-magnet circuit, it will be seen that when the switch 80 is moved to a position to close the circuit 79, the magnets 51 will be energized to release the member 63 from its engaging notch 64 or 65, and the arm 52 will kick or lift the finger 58 out of its engaging cam slot 59 in the disk 60.

For igniting the pilot light 22 on each half revolution of the disk 67 for a predetermined interval of time, I provide a switch arm 84 on the shaft 27, which extends an equal distance from opposite sides thereof. A flexible contact strip 85 extends into the path of the ends of the switch arm 84 to be engaged thereby for a brief period of time twice on each full revolution of the disk 67.

The contact 85 is arranged in a circuit 86 with a spark plug 87, spark coil 88, through the battery 75 and ground to the arm 84. The spark plug 87 is of the usual construction and is supported in suitable spaced relation to the flame openings of the pilot burner 22 by a bracket 89 which has a clamp 90 thereon by which the spark plug may be adjusted with respect to an electrode 91 to produce a jump spark above the flame openings.

Also arranged in the spark plug circuit 86 is an electric tell-tale light 92 which may be positioned adjacent the switch 80 to visibly indicate whether the spark circuit is operating as the same lights up during the sparking of the spark plug.

In operation, the device is normally in the position shown in Figures 2, 3, 4, 5 and 6 of the drawings, that is, the valves 20 and 21 are shut off so that gas is prevented from flowing from the supply pipe 16 to the burners 11 and 22. To start the device in operation to light the burner 11, the operator closes the switch 80 which may be located in a room of a house remote from the location of the water heater which closes the electro-magnetic circuit 79 and energizes the electro-magnets 51. The switch 80 is turned on and immediately off as it is only necessary to energize the electro-magnets for a fraction of a second or enough to cause them to pull down upon one end of the arm 52, which lifts the opposite end to lift the arm 61 to close the motor circuit 69 and lift the rocker arm 56 out of the notch in the disk 60. As the switch 68 closes by reason of the upward movement of the block 62 during the lifting of the arm 61, the motor circuit is closed and starts the motor into operation, which in turn imparts rotation to the shafts 27 and 32 through the operation of the train of gears hereinbefore mentioned. As the disk 67 starts to rotate, the flexible member 63 will ride the periphery thereof after having been lifted out of the notch 64 and which serves to maintain the switch 68 in a closed position until such time as the next slot 65 comes into registration with the member 63 whereupon it drops therein and accordingly breaks the motor circuit. During the interval of a one-quarter revolution, the pilot valve plug 33 is moved to a position to cause the port 34 to register with the gas supply and to permit a free flow of gas to the pilot burner, while the plug 25 of the burner control valve 20 has moved to a partially open position as shown in Figure 7 of the drawings. When the valves are in the position as shown in Figure 7, the disk 67 has moved approximately one-eighth of a revolution but upon the further rotation of the same to bring the notch 65 into alignment with the flexible member 63, the valves will move to the position shown in Figure 8 of the drawings, whereupon the pilot control valve plug is moved to a full shut-off position while the burner control plug is in vertical alignment with the gas supply pipe to allow the free passage of gas therethrough. During a period of this one-quarter revolution, the switch arm 84 has engaged the contact 85 to close the spark circuit to produce a spark over the flame opening of the pilot burner sufficient to light the same, as it will be appreciated that gas has been admitted to the pilot burner. In the lighting of the pilot burner, a limited amount of gas is permitted to flow to the burner 11 and which burner 11 is lighted by the end of the pilot burner 24, which extends into the gas heater to a point directly above the burner. It is presumed that the disk 67 has made a quarter revolution whereupon the flexible member 63 has dropped into the next notch 65 while the finger 58 of the rocker arm 56 has engaged one of the notches 59 in the disk 60. The apparatus is now shut off as the spark circuit has been broken by the movement of the switch arm 84 past the contact 85. It is now desired to shut off the flow of gas to the main burner 11, whereupon the switch 80 is again actuated to close the electro-magnet circuit 79, after which it is immediately shut off but during which interval of time, the electro-magnets 51 have again been energized to lift the flexible member 63 from its engaging notch 65, which closes the motor circuit through the switch 68 which imparts rotation to the shafts 27 and 32 to move the plugs of the valves to original position shown in Figure 2 of the drawings. During this quarter revolution, the spark circuit is not closed as the switch arm 84 does not engage the contact 85.

A baffle plate or reflector 92 is supported above the spark plug and the pilot burner to spread the flame along the flame openings in the pilot burner 22.

While I have described what I deem to be the most desirable embodiment of my inven-

tion, it is obvious that many of the details may be varied without in any way departing from the spirit of my invention and I therefore do not limit myself to the exact details of construction herein set forth nor to anything less than the whole of my invention limited only by the appended claims.

What is claimed as new is:—

1. In a device of the class described, the combination with a gas supply pipe having branch pipes leading therefrom to a gas burner and pilot light burner therefor, a burner control valve arranged in the branch pipe leading to the burner, a pilot control valve in the branch pipe leading to the pilot light burner, motor driven means for actuating the control valves, said motor driven means including an electric motor arranged in an electric circuit with a battery and normally open switch, a gear train, electromagnetic means for actuating said switch to close said motor circuit, and automatic means for opening said switch when said control valves have been moved to predetermined positions.

2. In a device of the class described, the combination with a gas supply pipe having branch pipes leading to a gas burner and a pilot light burner therefor, a burner control valve in the branch pipe leading to said gas burner, a pilot control valve in the branch pipe leading to the pilot light burner, each of said control valves having rotatable plugs with passages therein for establishing communication between the gas supply pipe and the gas burner and pilot light burner, motor driven means for imparting simultaneous rotation to the plugs of both of said valves to cause the establishing of communication between the gas supply pipe and the pilot branch pipe through the passage in the plug of said pilot control valve prior to the full opening of the gas burner control valve by establishing communication through the passage in the plug thereof with the gas supply pipe and the branch leading to the gas burner.

3. In a device of the class described, the combination with a gas supply pipe having branch pipes leading to a gas burner and a pilot light burner therefor, a burner control valve in the branch pipe leading to said gas burner, a pilot control valve in the branch pipe leading to the pilot light burner, each of said control valves having rotatable plugs with passages therein for establishing communication between the gas supply pipe and the gas burner and pilot light burner, motor driven means for imparting simultaneous rotation to the plugs of both of said valves to cause the establishing of communication between the gas supply pipe and the pilot branch pipe through the passage in the plug of said pilot control valve prior to the full opening of the gas burner control valve by establishing communication through the passage in the plug thereof with the gas supply pipe and the branch leading to the gas burner, control means remotely operated for starting said motor driven means, and automatic means for stopping said motor driven means when the plugs of said valves reach a predetermined point during their rotation.

4. In a lighter for gas appliances, a gas control valve having a rotatable plug, a shaft extending from said plug, a disk mounted on said shaft and having notches in its peripheral edge, a movable member seated in one of said notches, an electric motor operatively connected to said shaft by a gear train, said motor being arranged in an electric circuit with a source of electric energy, a motor control switch normally open and disposed in the path of movement of said movable member, and manually operated means for lifting said member out of its engaging notch to actuate said switch to close said motor circuit whereby said motor will impart rotation to said plug to move the same to open and closed position, said member automatically dropping into the next notch in said disk during partial rotation thereof to disengage said switch.

5. In a lighter for gas appliances, a gas control valve having a rotatable plug, a shaft extending from said plug, a disk mounted on said shaft and having notches in its peripheral edge, a movable member seated in one of said notches, an electric motor operatively connected to said shaft by a gear train, said motor being arranged in an electric circuit with a source of electric energy, a motor control switch normally open and disposed in the path of movement of said movable member, and manually operated means for lifting said member out of its engaging notch to actuate said switch to close said motor circuit whereby said motor will impart rotation to said plug to move the same to open and closed position, said member automatically dropping into the next notch in said disk during partial rotation thereof to disengage said switch, said manually operated means including electro-magnet arranged in an electric circuit with a source of electrical energy and a control switch, and means responsive to the action of said electro-magnets upon energizing of the same for lifting said movable member out of its engaging notch.

6. In a lighter for gas appliances, a gas control valve having a rotatable plug, a shaft extending from said plug, a disk mounted on said shaft and having notches in its peripheral edge, a movable member seated in one of said notches, an electric motor operatively connected to said shaft by a gear train, said motor being arranged in an electric circuit with a source of electric energy, a motor control switch normally open and disposed in the path of movement of said movable member.

and manually operated means for lifting said member out of its engaging notch to actuate said switch to close said motor circuit whereby said motor will impart rotation to said plug to move the same to open and closed position, said member automatically dropping into the next notch in said disk during partial rotation thereof to disengage said switch, an electric spark device, a switch arm mounted on said shaft, a contact disposed in the path of rotation of said contact, said switch arm, contact and spark device being arranged in an electric circuit with a source of electric energy, whereby said arm may engage said contact to close said circuit to actuate said spark device during rotation of said shaft.

In testimony whereof I have affixed my signature.

HARVEY A. L. FOWLER.