April 29, 1952 R. J. SCHAEFER 2,595,171

ELECTRICAL REMOTE CONTROL FOR GAS BURNERS

Filed March 15, 1947 2 SHEETS—SHEET 1

FIG. 1.

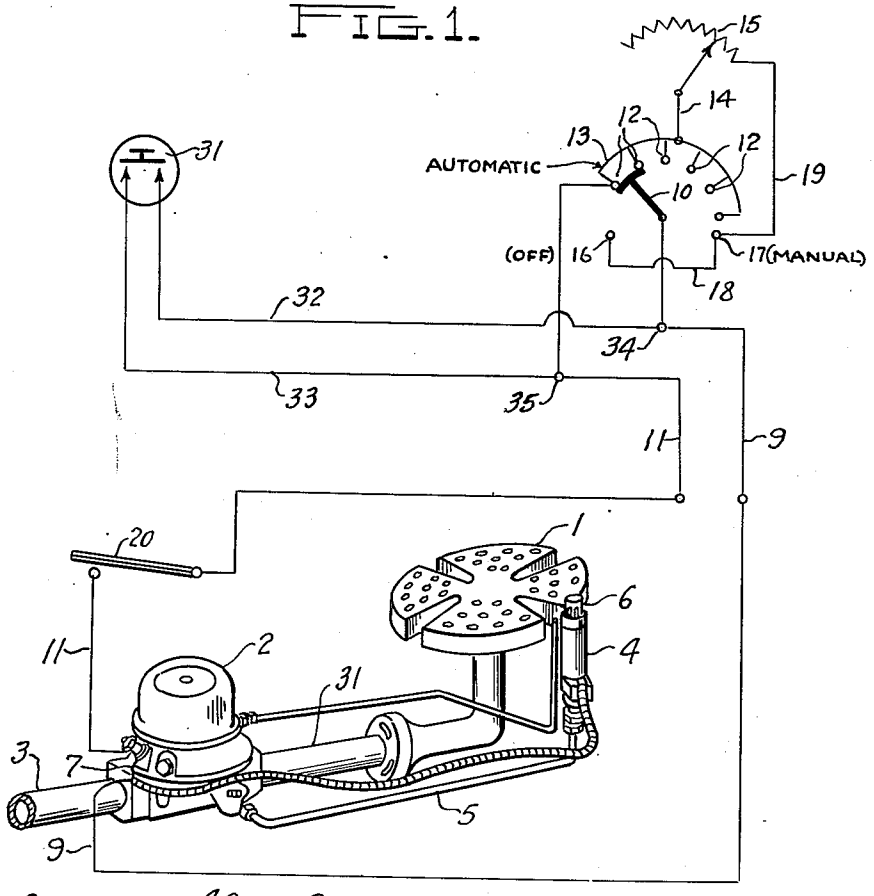
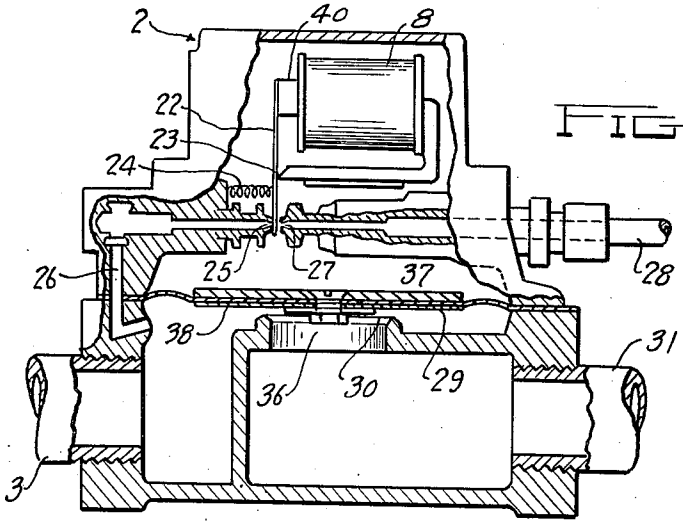


FIG. 2.



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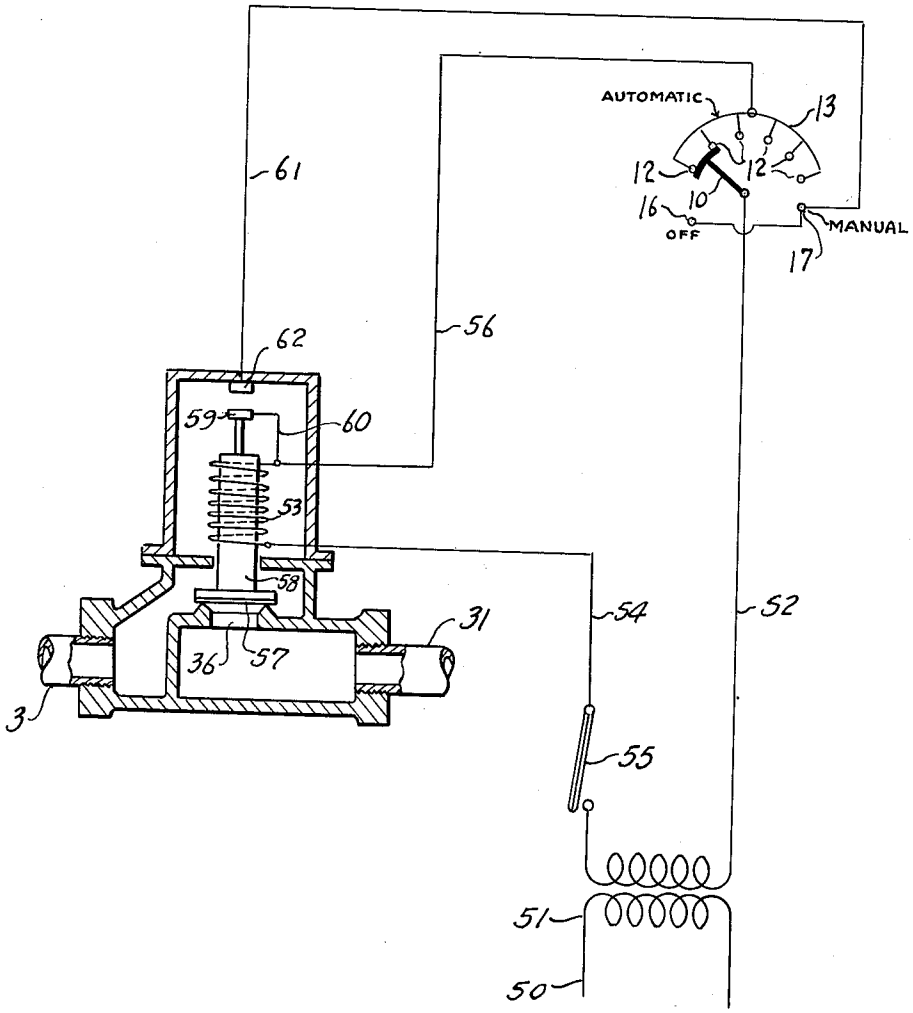
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FIG. 3.



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ELECTRICAL REMOTE CONTROL FOR GAS BURNERS

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8 Claims. (Cl. 158—123)

1

This invention relates to an electrical remote control for a gas burner.

It is the object of this invention to produce a remote control for a gas burner which is of simple structure, reliable and efficient in operation and which permits a gas burner, for example, the gas burner of a domestic hot water heater, to be controlled from any part of the house.

Fig. 1 is a schematic or diagrammatic showing of my electrical control circuit.

Fig. 2 is a detail showing of the control valve.

Fig. 3 is a diagrammatic showing of a modified form of my electrical control circuit.

The parts of my electrical control system are as follows: gas burner 1, gas control valve assembly 2, gas supply line 3, gas pilot light or pilot generator 4, pilot light gas supply line 5, thermo-couples in series 6 positioned so that the pilot flame will play upon the thermo-couples, wire 7 connecting one of the cold ends of thermo-couples 6 with one of the ends of electromagnet coil 8, wire 9 connecting the other cold end of thermo-couples 6 with rotary switch arm 10, wire 11 connecting the other end of magnet coil 8 with rotary switch contacts 12, wire 13 connecting contacts 12 in parallel, wire 14 connecting wire 13 with adjustable resistance or rheostat 15, contacts 16 and 17, wire 18 connecting contacts 16 and 17, wire 19 connecting contact 17 with adjustable resistance 15, bimetal thermostat 20 connected into line 11. Thermostat 20 will be mounted on the hot water tank or immersed in the tank so that it is in thermal exchange relation with the liquid or fluid being heated. If the gas burner 1 is utilized in a space heater for heating the ambient air, then thermostat 20 will be located in thermal exchange with the air in the room or space being heated.

The parts of control valve 2 are as follows: armature 22 which acts as valve for controlling orifices 25 and 27, fulcrum 23, compression spring 24, inlet jet 25, inlet passageway 26, vent jet 27, vent tube 28 to atmosphere, main diaphragm 29, valve seat 30, gas supply pipe line 31 to burner 1.

A normally open push button switch 31 is connected by wires 32 and 33 to wires 9 and 11 at 34 and 35 respectively.

The current for energizing magnet coil 8 is obtained from the thermo-couples 6. As shown in Fig. 2, control valve 2 is open and gas is flowing from the main supply line 3 through port 36 and line 31 to burner 1. To open valve 2 current generated by thermo-couples 6 is applied to coil 8 which attracts the armature 22 and brings the lower end of the armature into closing contact

2

with the inlet jet 25. The lower end of armature 22 serves as a valve for closing jets 25 and 27. When jet 25 is closed, vent jet 27 is open which relieves the gas pressure from the upper diaphragm chamber 37 through line 28 to atmosphere. Since the pressure below diaphragm 29 now exceeds the pressure above the diaphragm, the diaphragm is forced upward opening the main valve port 36 and allows the gas to flow to the burner, as shown in Fig. 2. As long as magnet 8 is energized, that valve 38 will remain open. When the electrical circuit is broken by thermostat 20 the magnet releases the armature and spring 24 moves the armature counterclockwise thus closing vent jet 27 and opening inlet jet 25. This allows the pressure above and below the diaphragm to equalize and when these pressures become equal the weight of the diaphragm valve 38 moves the diaphragm assembly and valve 38 downward on to seat 30 closing off the flow of gas through port 36.

If there is no current flowing through magnet 8, then spring 24 moves armature 22 counterclockwise to close vent 27 and open inlet jet 25 which permits the gas from the line 3 to flow through passageway 26 and jet 25 into chamber 37. As described above, this equalizes the pressure above and below diaphragm 29 and closes valve 38.

When my remote control is used for a gas water heater, then thermostat 20 is preferably adjustably mounted upon the outside of the water tank from about one-third to one-half way down from the top of the tank. Gas burner 1 will usually be located in the basement remote from the rotary switch which will usually be located in the kitchen. The rotary switch has three positions; namely, off position when switch arm 10 is in contact with contact 16, automatic position when switch arm 10 is in contact with any of contacts 12, and manual position when switch arm 10 is in contact with contact 17. My rotary switch is a make-before-break type, that is, when switch arm 10 is rotated from one contact 12 to another or from the right hand contact 12 to contact 17, it will make or complete the circuit with the one contact before it breaks the circuit with the other contact. When switch arm 10 is swung from contact 12 into contact with contact 16, it will break the circuit as it leaves contact 12 before it makes contact with, and completes the circuit through, contact 16.

It is well known that the amount of power required to move the armature of a magnet varies as the square of the distance between the armature and the magnet. Thus, it will take much

less current to hold armature 22 against core 40 of magnet 8 than it will to pivot armature 22 clockwise from the the position wherein armature 22 is closing vent 27. In other words, solenoid 8 will take much less power to hold valve 38 open than it will to open valve 36 from closed position.

When rotary switch arm 10 is in contact with any of the contacts 12, then full voltage is applied to solenoid 8 and diaphragm valve 38 will open. The circuit in such case will consist of wire 9, thermo-couples 6, wires 7, 11, thermostat 20, contact 12 and arm 10. Gas will flow to burner 1 as long as thermostat 20 calls for heat and closes the circuit. If thermostat 20 does not call for heat, it will then open, break the circuit and shut off burner 1.

If switch arm 10 is swung to manual position, that is, in contact with contact 17, then resistance 15 is placed in circuit with the thermo-couples and in series with solenoid 8. The resistance 15 is so adjusted as to cause the solenoid 8 to hold the armature against the magnet and thus cause valve 38 to open and remain open, but if armature 22 has closed vent 27 and valve 38 is closed, then there will not be enough power in the circuit due to resistance 15 to permit solenoid 8 to attract and swing armature 22 to open vent 27 and close valve 38. In other words, when rotary switch 10 is in manual position, resistor 15 is in circuit so only partial voltage is applied to electromagnet 8. In this condition the circuit will hold valve 38 closed when it is closed and magnet 8 has insufficient power to close valve 38 if the valve is open.

When switch 10 is in manual position, that is, in contact with contact 17 and burner 1 is on, then burner 1 will not shut off, that is, valve 38 will not close until thermostat 20 breaks the circuit. However, if thermostat 20 again closes, the burner will not go on because, due to resistance 15 in the circuit, magnet 8 will not have enough power to attract armature 22 and again open valve 38.

If switch arm 10 is swung from contact 12 to off position, the circuit will be broken momentarily thereby closing valve 38 and when switch arm 10 contacts contact 16 the valve 38 will not open because resistor 15 will again be in series with magnet 8 and thermo-couples 6 and armature 22 will be away from magnet 8.

In either off or manual position the closing of push button switch 31 will apply full voltage to electromagnet 8 and open valve 38 thereby turning on the burner. Thus, by looking at the rotary switch one can always tell what position the circuit is in and no tell-tale light is necessary.

When the user places the switch in automatic position, burner 1 will turn on whenever thermostat 20 calls for heat and burner 1 will turn off when thremostat 20 opens and does not call for heat. In other words, the burner will be controlled automatically by thermostat 20.

When the switch is placed in manual position burner 1 is ignited and continues to burn until the thermostat opens the circuit and shuts the burner off. The burner will not turn on again until the switch is moved to automatic position. Manual position eliminates the necessity of having to worry about shutting off the water heater if a limited amount of hot water is desired.

In the modification shown in Fig. 3 the rotary switch is the same as in the principal form of the invention except that resistance 15 is omitted. Power is obtained from a 110 volt line 50 through transformer 51. The secondary coil of the transformer is connected to rotary switch arm 10 by wire 52 and to solenoid 53 by wire 54. A thermostat 55 is positioned in line 54. The solenoid coil 53 is connected by wire 56 with wire 13. Valve 57, which controls port 36, is mounted on solenoid core 58. A movable contact 59 is mounted on the upper end of solenoid core 58 and is connected by wire 60 with wire 56 between coil 53 and the rotary switch. Wire 61 connects stationary contact 62 with manual contact 17.

As shown, the control circuit is set for automatic operation. As long as the thermostat 55 is closed and calls for heat, current will flow through line 52, switch arm 10, contact 12, wire 13, line 56, solenoid 53, line 54 and through the thermostat back to the secondary coil. Solenoid 53 will be energized and valve 57 will be open. If thermostat 55 is satisfied and opens the circuit, then solenoid 53 will be deenergized and valve 57 will close port 36 shutting off the gas to the burner. If rotary switch 10 is now moved to manual position, it will make the circuit through contact 17 before it breaks contact with contact 12. The circuit now will be from the secondary coil line 52, switch arm 10, contact 17, line 61 through contacts 62 and 59, line 60, coil 53, line 54 and thermostat 55. If, like in the principal form of the invention, thermostatic switch 55 breaks the circuit, coil 53 will be deenergized and valve 57 will close and contacts 59 and 62 will be disengaged. If the thermostat 55 again closes valve 57 will not open because the break between contacts 59 and 62 will prevent current from flowing through solenoid 53.

If rotary switch arm 10 is swung counterclockwise to "off" position, it will break the circuit from passing from the left hand contact 12 to off contact 16. Hence, if solenoid 53 is energized at the time the switch is thrown to "off" position, the solenoid will be deenergized and valve 57 will close. Valve 57 will close regardless of whether thermostat 55 is closed or open whenever switch 10 is moved to "off" position.

I claim:

1. In combination a gas burner adapted to be connected to a source of gas under pressure, an electromagnetically controlled valve for controlling the flow of gas to the burner, a source of electricity in series with said electromagnetic valve, and a manual switch in circuit with said source of electricity, a thermostatic switch in series circuit with said manual switch and source of electricity, said manual switch having at least two positions, a resistance adapted to be placed in series circuit with said source of electricity, thermostatic switch, and valve when the manual switch is in one of its positions whereby only partial voltage from said source of electricity will be applied to said electromagnetic valve, the electromagnetic valve being constructed and arranged so that when said partial voltage is applied thereto the valve will remain open if open and will not open if closed, said manual switch in the other position shunting out said resistance so that said valve will be opened and closed in response to the opening and closing of said thermostatic switch.

2. The combination as set forth in claim 1 wherein said manual switch is a rotary switch of the make-before-break type so that the switch in passing from one position to another will make the circuit through said resistance before it breaks the circuit wherein the current is shunted around said resistance.

3. The combination as set forth in claim 2 in-

cluding a push button type of switch in parallel with said rotary switch whereby closing of said push button switch while said thermostatic switch is closed causes full voltage to be applied to said electromagnetic valve and open the same even when said rotary valve is positioned so that the resistance is in series with said source of electricity.

4. In combination a gas burner adapted to be connected to a source of gas under pressure, a valve between said gas burner and source of gas, means including an electromagnet and armature for opening and closing said gas valve, a source of current and a thermostatic switch in series circuit with said electromagnet, a manual two position switch in said circuit, a resistance adapted to be placed in series circuit with said source of current, thermostatic switch, and electromagnet when the manual switch is in one position whereby only part of the voltage from said source of electricity is impressed upon said electromagnet when the thermostatic switch is closed, the said manual switch in the other position cutting out said resistance and impressing the full voltage from said source of electricity upon said electromagnet when said thermostatic switch is closed, said armature being coordinated with the power of said electromagnet whereby when the armature is away from said electromagnet and full voltage is applied to said magnet the armature will be drawn to said magnet and the gas valve will open and when said part of said voltage is applied to the magnet the armature will remain in its said position away from the magnet and the valve will remain closed.

5. In combination a gas burner adapted to be connected to a source of gas under pressure, a valve controlling the flow of gas to the burner, an electromagnet having an armature arranged to open and close said valve when said electromagnet is energized and deenergized, respectively, a source of electricity, a rotary switch in series with said electromagnet and source of electricity, a thermostatic switch in said circuit, said rotary switch being of the make-before-break type and having an automatic operation contact and a manual operation contact and being shiftable to corresponding automatic and manual positions, the automatic operation contact being in series circuit with the electromagnet, thermostatic switch and source of electricity when said rotary switch is in automatic position whereby the thermostatic switch controls the flow of current through said electromagnet when the rotary switch is in the automatic position, the manual operation contact being in series circuit with the electromagnet, thermostatic switch and source of electricity through a resistance when the rotary switch is in manual position, the said resistance being such that whenever the thermostatic switch opens to break the circuit and close said valve, closing of the thermostatic switch will be ineffective to sufficiently energize the electromagnet to reopen said valve when the rotary switch is in manual position.

6. In combination a gas burner adapted to be connected to a source of gas under pressure, a valve controlling the flow of gas to the burner, an electromagnet having an armature arranged to open and close said valve when said electromagnet is energized and deenergized, respectively, a source of electricity, a rotary switch in series with said electromagnet and source of electricity, a thermostatic switch in said circuit, said rotary switch being of the make-before-break type and having an automatic operation contact and a manual operation contact and being shiftable to corresponding automatic and manual positions, the automatic operation contact being in series circuit with the electromagnet, thermostatic switch and source of electricity when said rotary switch is in automatic position whereby the thermostatic switch controls the flow of current through said electromagnet when the rotary switch is in the automatic position, the manual operation contact being in series circuit with the electromagnet and thermostatic switch when the rotary switch is in manual position whereby when the rotary switch is shifted from automatic to manual position and the thermostatic switch is closed said valve will remain open until the thermostatic switch opens and breaks the circuit, and means interposed in said last mentioned circuit for rendering the electromagnet ineffective to again open said valve when the thermostatic switch again closes and the rotary switch is in manual position.

7. The combination as set forth in claim 6 wherein the last mentioned means comprises a resistance in series circuit with the manual operation contact, electromagnet and source of electricity when the rotary switch is in manual position.

8. The combination as set forth in claim 6 wherein said means comprises a switch in series circuit with said manual operation contact, solenoid and source of electricity, said switch being closed by said solenoid when the latter is energized and opening whenever the solenoid is deenergized.

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