Aug. 30, 1932. E. A. HALL ET AL 1,874,971

HIGH AND LOW FLAME CONTROL FOR GAS BURNERS

Filed Oct. 12, 1931 2 Sheets-Sheet 1

Fig. 1.

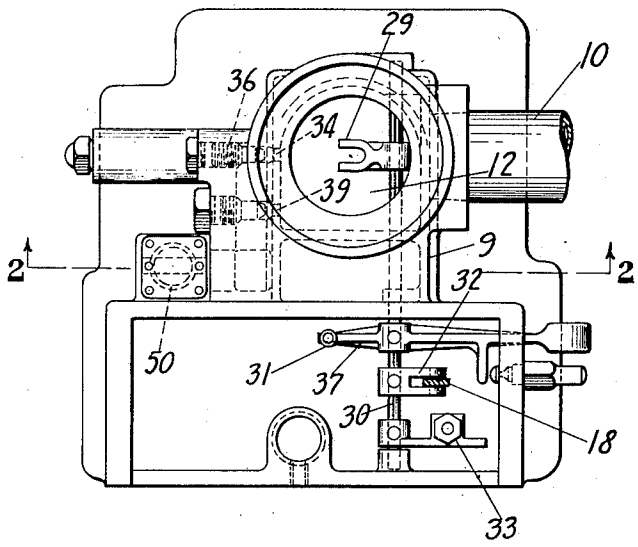

Fig. 2.

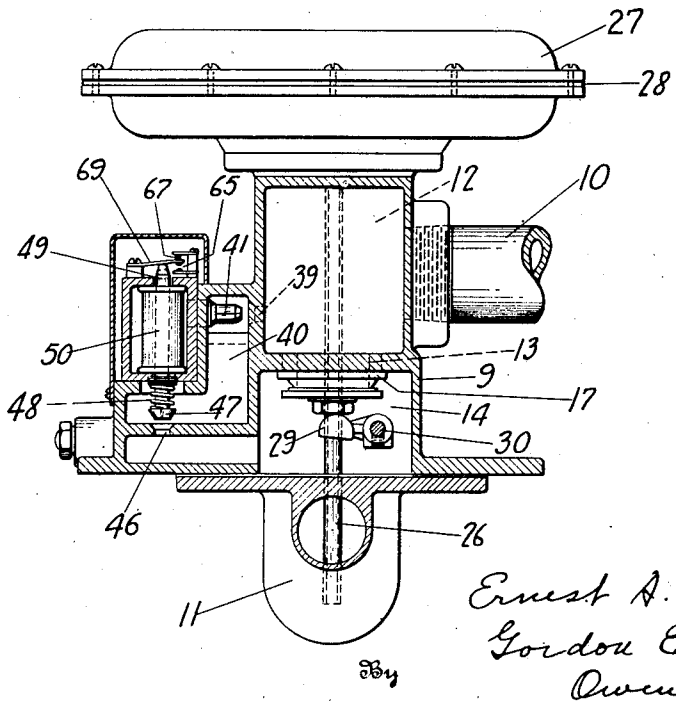

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Fig. 3.

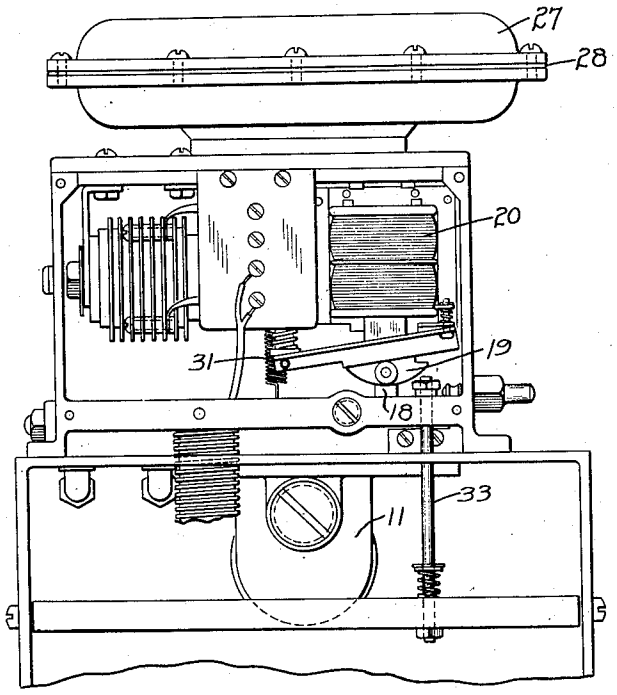
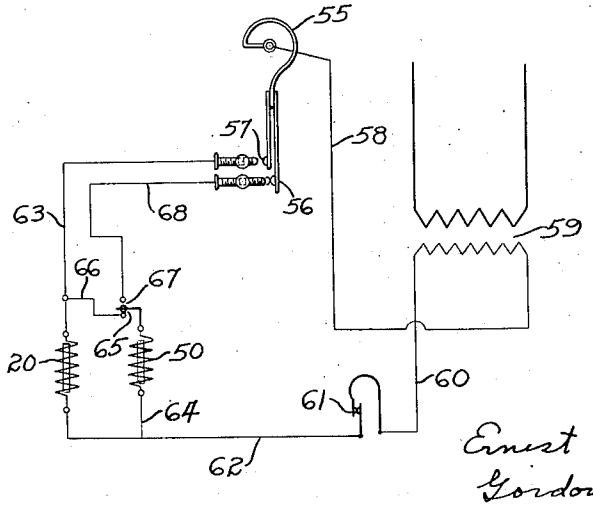


Fig. 4.



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UNITED STATES PATENT OFFICE

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HIGH AND LOW FLAME CONTROL FOR GAS BURNERS

Application filed October 12, 1931. Serial No. 568,244.

This invention relates to a control device for a high or low flame for gas burners with special reference to their use in heating plants.

Heretofore in using gas for heating purposes, it has been customary to provide for a large flow of gas to the burner whenever any heat is called for, and to cut off the flow entirely, leaving only the pilot in operation, when heat is no longer required. In buildings heated by such plants, whenever the weather is moderate, there is a continual fluctuation between maximum and minimum temperatures, with the burner turned fully on or fully off.

With the above conditions in mind, it is an object of the present invention to provide for maintaining a low or moderate flame in the burner in moderate weather and a high or full flame in colder weather, turning off all the gas except for the pilot, only when the weather is so warm that no heat at all is required.

The invention is so constructed however, that in turning on the gas after a period when no heat at all has been required, the full flow is first turned on so as to insure quick and full ignition and then, after the temperature in the space to be heated has risen somewhat above the point at which the gas was turned on, a low or moderate flow is maintained until the temperature exceeds or drops below a predetermined range for which the thermostat is set.

Our invention will be more particularly described in connection with the accompanying drawings, in which—

Figure 1 is a plan view of the control device, with some of the parts omitted;

Figure 2 is a vertical section taken substantially on the line 2—2 of Fig. 1;

Figure 3 is a front elevation with a portion of the casing removed; and

Figure 4 is a wiring diagram of the control device.

The control device to which my invention relates comprises a casing 9 provided with an inlet 10 adapted to be connected to the gas main and an outlet chamber 11 adapted to be connected to the burner. The inlet 10 leads into a chamber 12 which is provided with a comparatively large main orifice 13 leading into a chamber 14, whence the gas is delivered to the outlet chamber 11. A valve 17 controls the flow of gas through the main orifice 13 and may be termed the high flame valve since a full flow of gas for a high flame can be obtained only when this valve is open.

The valve 17 is secured to a stem 26 which is connected to a diaphragm 28 mounted within the diaphragm casing 27 in a well known manner. When the valve 17 is permitted to open, therefore, it acts normally as a pressure regulator, its position being determined by the pressure in the chamber 14.

Under certain conditions however, as for example, after a high flame has been maintained until a predetermined temperature is reached, the valve 17 is completely closed, regardless of the pressure in the chamber 14, by an arm 29 secured to a rock shaft 30, said rock shaft being held in this position by a spring 31 which connects an arm 37 on the rock shaft to some fixed part of the casing. Under conditions hereinafter explained, the shaft 30 is rocked in the opposite direction through the medium of an arm 32 which is connected by a link 18 to the core 19 of a solenoid 20, so that the arm 29 disengages the valve 17 and permits it to act as a pressure regulator. The rock shaft 30 also has a connection 33 for operating an air door or damper in accordance with the rate of gas flow through the orifice 13. The structure and operation of the air damper do not constitute a part of the present invention and need not be more particularly described.

The chamber 12 also has a port 34 which is controlled by an adjustable plug or valve 38 to supply gas for the usual pilot. In addition to this, the chamber 12 has an orifice 39 leading into a by-pass 40 through which gas may be supplied to the burner for a low flame when the valve 17 is closed. The rate of flow through the orifice 39 may be fixed as desired by means of an adjustable plug or valve 41. From the passageway 40 the gas for a low flame flows into the chamber 14 through a port 46 which is controlled by a valve 47. The valve 47, which may be termed

the low flame valve, has a stem 49 which constitutes the core of a solenoid 50. Thus, when the solenoid 50 is energized, the valve is opened and when the solenoid is de-energized the valve is closed by a spring 48.

The electrical wiring for controlling the solenoids 20 and 50 and thereby controlling the operation of the valves 47 and 17 is illustrated in Fig. 4. The thermostat 55 is located in the space to be heated and is provided with two switches 56 and 57 which are adapted to be closed successively as the temperature drops through a predetermined range. Current is supplied through a transformer 59 and the system usually includes a switch 61 which is closed only when the pilot is functioning normally. When no heat is called for, the switches 56 and 57 are open, the switch 67 is open and the switch 65 is closed. As the temperature drops, the switch 56 first closes but this does not complete any circuit as long as the switch 67 is open. When the switch 57 closes, however, a circuit is completed from the transformer 59 through line 58, switch 57, line 63, solenoid 20 and lines 62 and 60. Thus the solenoid 20 is energized to raise the arm 32 and open the high flame valve 17. At the same time a branch circuit is completed through line 66, switch 65, solenoid 50 and line 64. This energizes the solenoid 50 and opens the low flame valve 49. At the same time, the core 49 of the solenoid 50 strikes the switch blade 69 (Fig. 2), opening the switch 65 and closing the switch 67. The solenoid 50 is now energized by the circuit through thermostat switch 56 and line 68. The high flame valve 17 remains open as long as the switch 57 remains closed. As the temperature rises and opens the switch 57, while the switch 56 remains closed, the low flame valve 47 still remains open until the switch 56 opens and no heat at all is required.

From the foregoing description, it will be seen that, with our control device, the temperature in the space to be heated may be very closely controlled. In first turning on the gas, the high flame valve 20, as well as the low flame valve 47, is first opened so that quick and full ignition is insured. The high flame is thereafter, maintained until the temperature rises sufficiently to open the switch 57 and then, if the weather is moderate, a uniform temperature will be maintained by means of the low flame control, as long as any heat at all is required.

While we have explained the invention in considerable detail, it is obvious that the construction and arrangement may be considerably modified without departing materially from the scope of the appended claims.

What is claimed is:

1. In a control device for gas burners, means actuated, as the temperature at a certain station drops below a predetermined degree, to initially establish and maintain a full flow of gas for a high flame, and means actuated, as the temperature rises above said predetermined degree, to maintain a smaller flow for a low flame after the full flow is cut off and as long as the temperature remains within a predetermined range.

2. In a control device for gas burners, the combination with a thermostat, of means actuated by the thermostat, as the temperature drops below a predetermined degree, for initially establishing a full flow of gas for a high flame, and means controlled by the thermostat for maintaining a smaller flow of gas for a low flame only, while the temperature rises a predetermined number of degrees above the temperature at which the full flow is cut off.

3. In a control device for gas burners, the combination with a thermostat provided with two switches adapted to be closed successively as the temperature drops, means for initially establishing and maintaining a full flow of gas for a high flame, only when both switches are closed, and means for subsequently maintaining a smaller flow of gas for a low flame while only one of said switches is open.

4. In a control device for gas burners, the combination with a thermostat provided with two switches adapted to be closed successively as the temperature drops, a gas conduit leading to the burner, said conduit being normally closed until both of said switches are closed, and means actuated by the closing of the second switch to establish and maintain a full flow of gas through said conduit until said second switch opens, and for maintaining a smaller flow of gas through said conduit, after said second switch opens, until the first switch also opens or until the second switch again closes.

5. In a control device for gas burners, two solenoids, means controlled by the first solenoid, when energized, to supply a full flow of gas for a high flame, means controlled by the second solenoid, when energized, to supply a smaller flow of gas for a low flame, a thermostat provided with two switches adapted to be closed successively as the temperature drops, the circuit through the first solenoid being completed only by the closing of the second thermostat switch, and means actuated upon the closing of said second thermostat switch to complete a circuit through the first thermostat switch and the second solenoid.

6. In a control device for gas burners, two solenoids, means controlled by the first solenoid, when energized, to supply a full flow of gas for a high flame, means controlled by the second solenoid, when energized, to supply a smaller flow of gas for a low flame, a thermostat provided with two switches adapted to be closed successively as the temperature drops, the circuit through both sole-

noids being first completed simultaneously by the closing of the second thermostat switch, and means actuated upon the closing of said second thermostat switch for completing a circuit through the second solenoid and the first thermostat switch.

7. In a control device for gas burners, a supply line having a main orifice, a high flame valve therefor, a by-pass having a smaller orifice, means actuated, as the temperature at a certain station drops below a predetermined degree, to establish and maintain said high flame valve in open position, means for maintaining the low flame valve closed until the high flame valve is opened and means actuated as the temperature rises to another predetermined degree to close the high flame valve and to maintain the low flame valve thereafter in open position as long as the temperature remains within a predetermined range.

8. In a control device for gas burners, a supply line having a main orifice, a high flame valve therefor, a by-pass having a smaller orifice, a low flame valve for said smaller orifice, a thermostat, means actuated by the thermostat at a predetermined temperature to initially establish the high flame valve in open position, means for maintaining the low flame valve closed until the high flame is opened and means controlled by the thermostat to maintain the low flame valve in open position, while the high flame valve closes, whenever the temperature rises above the temperature at which the high flame valve is opened until a predetermined high temperature is reached.

9. In a control device for gas burners, a supply line having a main orifice, a high flame valve therefor, a by-pass having a smaller orifice, a low flame valve for said smaller orifice, a thermostat provided with two switches adapted to be closed successively as the temperature drops, means for initially establishing and maintaining the high flame valve in open position, only when both switches are closed, and means for subsequently maintaining the low flame valve in open position while only one of said switches is open and while the high flame valve is closed.

10. In a control device for gas burners, a supply line having a main orifice, a high flame valve therefor, a by-pass having a smaller orifice, a low flame valve for said smaller orifice, a thermostat provided with two switches adapted to be closed successively as the temperature drops, means for maintaining both of said valves closed until both of said switches are closed, means actuated by the closing of the second switch to establish and maintain the high flame valve in open position until said second switch opens, and means for maintaining the low flame valve open, after said second switch opens and the high flame valve closes, until the first switch also opens or until the second switch again closes.

11. In a control device for gas burners, a supply line having a main orifice, a high flame valve therefor, a by-pass having a smaller orifice, a low flame valve for said smaller orifice, two solenoids, means controlled by the first solenoid, when energized, to open the high flame valve, means controlled by the second solenoid, when energized to maintain the low flame valve open, a thermostat provided with two switches adapted to be closed successively as the temperature drops, the circuit through the first solenoid being completed only by the closing of the second thermostat switch, and means actuated upon the closing of said second thermostat switch to complete a circuit through the first thermostat switch and the second solenoid.

12. In a control device for gas burners, a supply line having a main orifice, a high flame valve therefor, a by-pass having a smaller orifice, a low flame valve for said smaller orifice, two solenoids, means controlled by the first solenoid, when energized, to open the high flame valve, means controlled by the second solenoid, when energized, to maintain the low flame valve open, a thermostat provided with two switches adapted to be closed successively as the temperature drops, the circuit through both solenoids being first completed simultaneously by the closing of the second thermostat switch, and means actuated upon the closing of said second thermostat switch for completing a circuit through the first thermostat switch and the second solenoid.

13. In a control device for gas burners, electrical operating means for supplying gas for a high flame, electrical operating means for supplying gas for a low flame only, a thermostat provided with two switches adapted to be closed successively as the temperature drops, a circuit through each of said electrical operating means being initially completed only through the second thermostat switch, and means operable by the low flame operating means, when thus energized, to immediately break the circuit from the second thermostat switch through the low flame operating means and at the same time to establish a circuit from the first thermostat switch through the low flame operating means.

14. In a control device for gas burners, gas supply means provided with a high flame valve and a low flame valve, means for simultaneously opening both valves as the temperature at a certain station drops below a predetermined degree, means for subsequently closing the high flame valve as the temperature rises above said predetermined degree, and means set by the valve opening op-

eration to maintain the low flame valve open, after the high flame valve closes, until the temperature rises to a higher predetermined degree.

In testimony whereof we have hereunto signed our names to this specification.

ERNEST A. HALL.
GORDON E. BURNS.