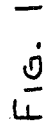


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3 Sheets-Sheet i

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Sept. 27, 1949.

F. A. GAUGER
AUTOMATIC LIGHTING AND CONTROL
MEANS FOR GAS BURNERS

2,483,191

Filed June 24, 1946

3 Sheets-Sheet 2

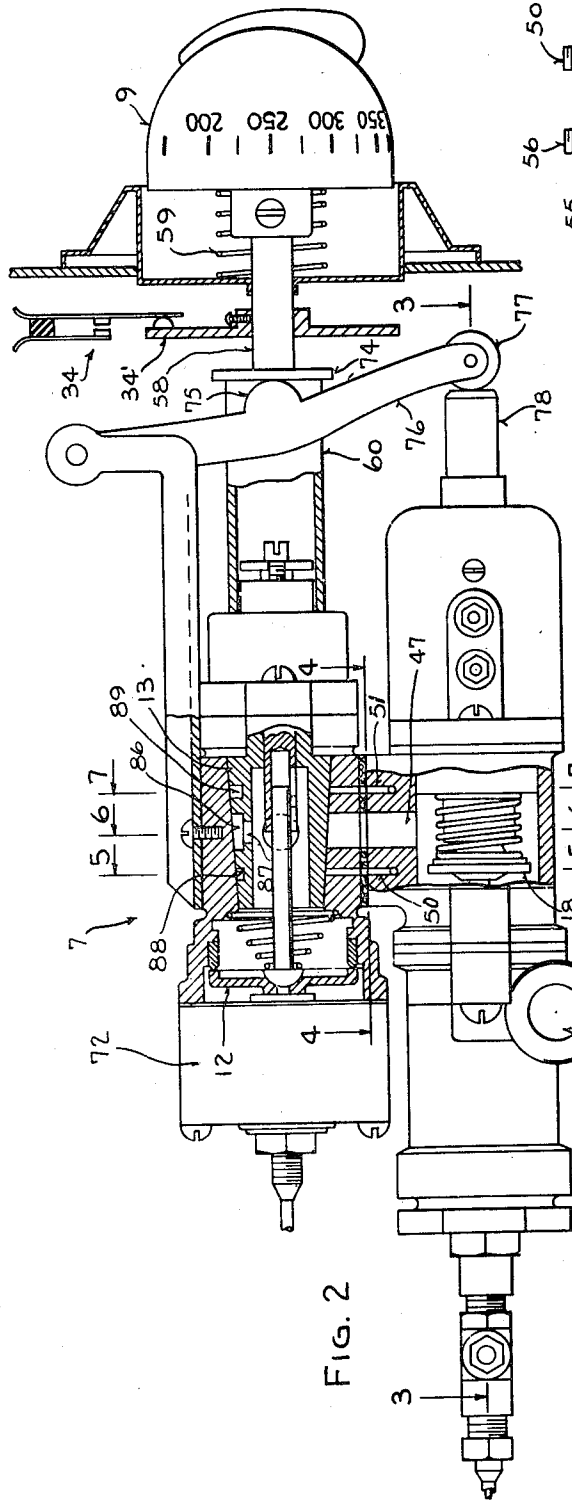


FIG. 2

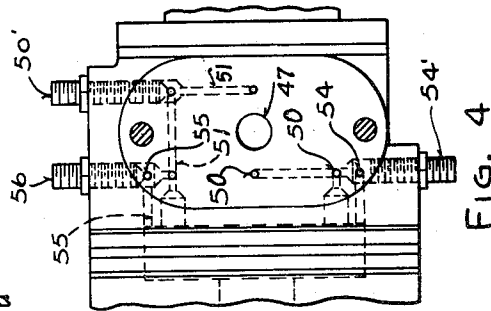


FIG. 4

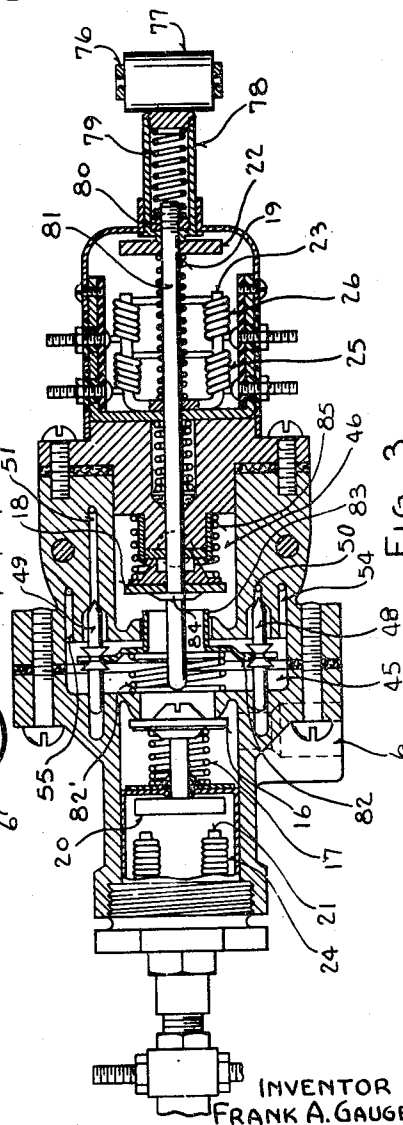


FIG. 3

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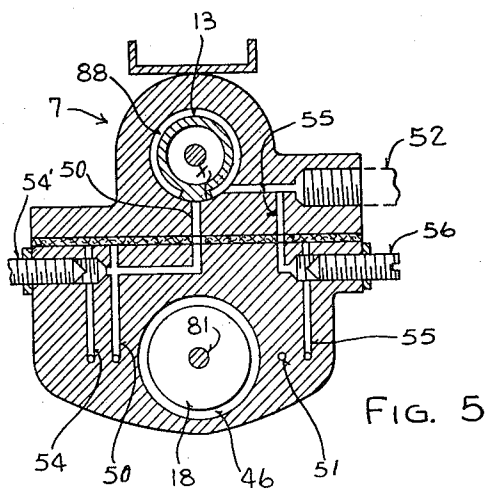


FIG. 5

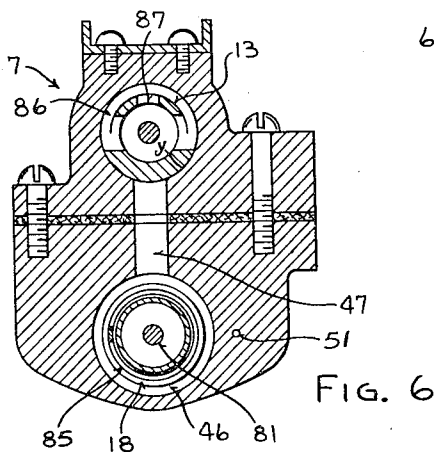


FIG. 6

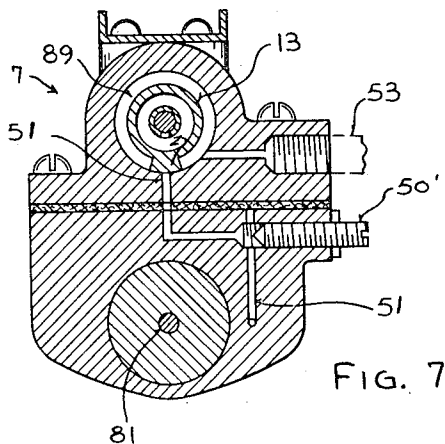


FIG. 7

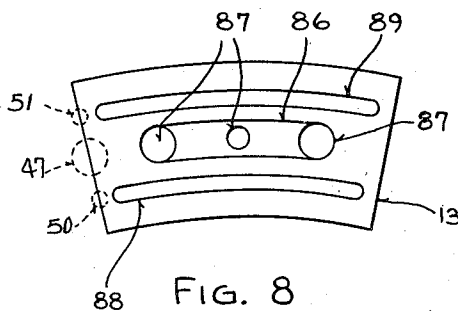


FIG. 8

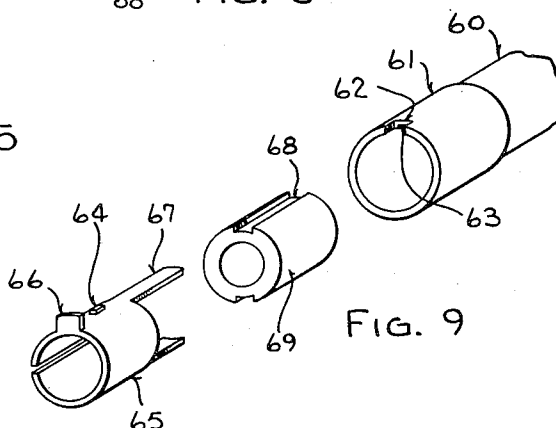


FIG. 9

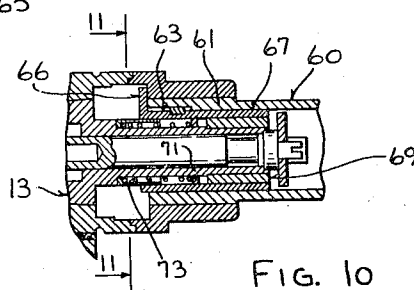


FIG. 10

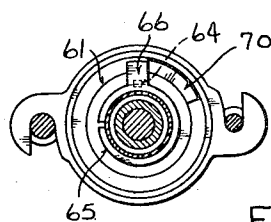


FIG. 11

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UNITED STATES PATENT OFFICE

2,483,191

AUTOMATIC LIGHTING AND CONTROL
MEANS FOR GAS BURNERS

Frank A. Gauger, Milwaukee, Wis.

Application June 24, 1946, Serial No. 678,989

3 Claims. (Cl. 158—117.1)

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This invention relates to automatic lighting and control means for gas burners, particularly for oven burners.

This invention is an improvement over that disclosed in my copending application Serial No. 614,970, filed September 7, 1945 and now matured into Patent No. 2,478,386 for Automatic lighting and control means for gas burners. In my copending application I disclosed means for lighting an oven burner located below and laterally of a constantly burning pilot burner, as in the type of gas stove known as the table top type.

In my copending application I disclosed electromagnetic valves controlled by thermocouple means associated with the main gas cock and oven regulator and with clock control of the electromagnetic valves. In the device which was disclosed in my copending application all of the control was from a main gas cock. In this copending application the disclosure included a dwell for the main gas cock so that it had to be turned first to a predetermined position and after a period of time turned to a second and final position.

This invention is designed to eliminate the necessity of waiting or allowing for a dwell in the operation of the main gas cock.

Objects of this invention, therefore, are to provide a valve assembly associated with thermocouple means so that control of all of these means is obtained from the main gas cock without requiring any dwell of the main gas cock but allowing the operator to set the main gas cock at the desired temperature immediately on the initial opening of the main gas cock and to provide novel time delay means which is thoroughly reliable and independent of any mechanical device which might get out of order.

Further objects are to provide a flash tube pilot burner and a second pilot burner and to provide for the transfer of the flame from the flash tube pilot burner to the second pilot burner and to thereafter cut off the gas supply to the flash tube pilot burner.

A further specific object is to provide a maintaining pilot burner adjacent the oven burner which is arranged to continue to burn after the main gas cock is closed until the thermocouple means becomes ineffective to hold the electromagnetic valve means in initial position, to thereby guard against failure of lighting the oven burner if the main gas cock was closed and immediately opened before the thermocouple means had cooled sufficiently to release the electromagnetic valve means.

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Further objects are to provide a system of control for oven burners or other gas burners which is so organized that it may be used with clock control means to control the turning on of the gas to the main burner and the cutting off of the gas to the main burner, or in which clock control means may be employed only to cut off the gas to the main burner, or in which manual means alone may be relied upon without the use of clock control means, however, in all instances maintaining the safety features of insuring a time delay before the gas has been turned on to the main gas burner and to insure the lighting of a suitable pilot burner before any gas can reach the main gas burner and to provide against inadvertent turning on of the gas to the main gas burner at a time when no pilot burner is burning.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a diagrammatic view of the apparatus.

Figure 2 is a view partly in section showing the main valve assembly.

Figure 3 is a sectional view on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 2.

Figures 5, 6, and 7 are sectional views on the lines 5—5, 6—6, and 7—7, respectively, of Figure 2.

Figure 8 is a developed view of the valve of the main gas cock.

Figure 9 is an expanded view of a shank portion of the handle and parts associated therewith.

Figure 10 is a sectional view of a portion of the handle and associated parts.

Figure 11 is a sectional view on the line 11—11 of Figure 10.

Referring to the drawings, particularly Figure 1, it will be seen that an oven has been indicated by the reference character 1, the oven chamber by the reference character 2 and the burner chamber by the reference character 3. The burner is indicated by the reference character 4 and is located within the burner chamber 3. It is supplied with gas by means of a pipe 5 which, through the agency of valves hereinafter described, is arranged to connect the pipe 5 with the main gas supply or manifold 6. The main valve in the system consists of a combined main gas cock and oven regulator 7 controlled jointly by means of the thermostatic bulb 8 located in the oven chamber and the handle or manipulating member 9. The automatic thermostatic control means controls the valve 12, see Figure 2,

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which valve is connected in series with the main manually operable gas cock or valve indicated generally by the reference character 7 which latter is equipped with the manually operable rotary valve 13. The combined oven regulator and main gas cock is well known and a detailed description thereof will not be given. For instance, it could be of the general type disclosed in the patent to Weber et al., Serial No. 2,303,011 of November 24, 1942 for a Valve.

A normally closed valve indicated generally by the reference character 14 and a normally open valve indicated generally by the reference character 15 are in series with the main gas cock and oven regulator valve 7, and these three valves jointly control the flow of gas to the burner 5.

The valve 14 is provided with a disk 16 which is urged towards closed position by means of the spring 17. The valve 15 is provided with a disk 18 which is urged towards open position by means of a spring 19. For the sake of clearness in Figure 1 the spring 19 has been located exteriorly of the main casing, but from Figure 3 it will be seen that in reality the spring 19 is located interiorly of the casing. The valve 16 is connected to the armature 20 of an electromagnet 21 and the valve 18 is connected to the armature 22 of a double electromagnet 23. The electromagnet 21 is provided with windings 24 and the electromagnet 23 is provided with a pair of windings 25 and 26. The windings 24 are connected in circuit with a thermocouple 27 and, if desired, with a clock indicated generally by the reference character 28 and provided with a switch 29 which is normally closed. The windings 25 are connected in circuit with a thermocouple 30 and with a clock indicated generally by the reference character 31 provided with a switch 32 which is normally open. The windings 26 are connected in circuit with a thermocouple 33 and with a switch 34, which switch is opened when the main gas cock and regulator valve are in off position and is closed when the main gas cock and regulator valve are in open position. The clock 28 constitutes the "off" clock and the clock 31 the "on" clock. If desired, a manually operable switch 35 may be placed in parallel with the switch 32 of the clock 31 and a switch 36 may be placed in parallel with the switch 29 of the clock 28. If manual operation alone is desired, without clock control, both switches 35 and 36 are left closed. Obviously if it is desired to have no clock control at any time both clocks 28 and 31 and both switches 35 and 36 may be dispensed with and the electrical circuits permanently closed at these points.

As shown further, referring to Figure 1, it will be seen that a constantly burning pilot burner 37 is provided and is preferably of the hooded, ventilating type used to light the top burners, not shown. This constantly burning pilot burner is located at a point above and usually laterally of the oven 1 as, for example, in the table top type of stove. A flame conducting tube-like member 38, of any suitable type, is employed and has its upper end adjacent the constantly burning pilot burner 37 and its lower end adjacent a charging burner means 39. This tube 38 constitutes a flame conducting or flash-back tube and has a lateral extension 40 which extends to a point adjacent a flash-back tube pilot burner 41 which is provided with a burner tip 42 and with a laterally positioned flame outlet 43. A pilot burner 44 is located in lighting relation to the flash tube pilot burner 41 and in lighting relation to the oven burner 4. As stated, the flash-back tube or flame

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conducting tube may be of any suitable type, such for example as that shown in my copending application, Serial No. 521,201, filed February 5, 1944, for Automatic lighting and control means for gas burners.

It is to be understood that the thermocouple 33 is constantly heated by the constantly burning remote pilot burner 37 and that the thermocouples 27 and 30 are arranged to be heated by the oven pilot burner 44.

It is to be understood in reference to Figure 1 that such figure is a diagrammatic view and that many of the various passages to and from the several valves are indicated as pipes, whereas in reality they are for the most part passages or ducts formed in the unitary valve assembly, the main gas cock 7 and the valves 14 and 15 being formed as a unitary valve assembly as shown in Figures 2 and 3 of the drawings. It will be seen from reference to Figure 1 that communication between the gas supply manifold or pipe 6 and the intermediate compartment 45 of the valve assembly is controlled by means of the valve 16 and that communication between the intermediate chamber 45 and the chamber 46 is controlled by means of the valve 18. The chamber 46 communicates by means of the passageway 47 with the main gas cock or valve 7, which in turn communicates by means of the pipe 5 with the oven burner 4 under certain conditions hereinafter set forth in detail. The valve assembly is shown in considerable detail in Figures 2 and 3 and diagrammatically in Figure 1. From these figures, particularly Figures 1 and 3, it will be seen that a pair of small auxiliary valves 48 and 49 are provided and control passageways 50 and 51. The passageways 50 and 51 under a certain setting of the main gas cock communicate, respectively, with the pipes 52 and 53 which lead to the oven burner 44 and the flash-back burner 41.

It is to be noted that a small passageway 54 extends from the intermediate chamber 45 to the passageway 50. This allows a regulated amount of gas to pass to the oven pilot burner 44, the regulation being determined by the setting of the needle valve 54', see Figure 4.

In addition to these passageways 50 and 54, a passageway 55 by-passes the main gas cock 7 and extends to the pipe 52 leading to the pilot burner 44. It is provided with an adjustable needle valve or screw 56, as shown in Figure 4, and as diagrammatically indicated in Figure 1. This minimum flame adjustment provides a very small flame sufficient to ignite the oven burner but insufficient to heat the thermocouple 27, or as a matter of fact the thermocouple 30. The purpose of this minimum by-pass will appear as the description proceeds. It is to be noted also that the flow of gas through the passageway 51 is determined by the setting of the needle valve 50', see Figure 7.

The conical valve 13 of the main gas cock 7 is rotated by means of the manually adjustable handle or member 9. This handle is carried by means of a shaft 58 spring-pressed outwardly as indicated at 59 and formed rigid with a sleeve 60, see Figures 2 and 9. The sleeve 60 is provided with an enlargement or collar-like portion 61 rigid therewith and equipped with a notch 62 and a small keyway 63 in its inner side as shown in Figure 9. The keyway 63 slidably receives a projection 64 on the split collar 65. The split collar 65 is also provided with a projection 66 which is adapted to fit within the notch 62. The split collar 65 has a pair of rearwardly extending

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fingers 67 which are slidably received within the slots or keyways 68 in a collar 69. The member 65 has a spring fit within the member 60 and its enlargement. The stop 66 is adapted to engage a stationary stop 70, see Figure 11, to limit the rotation of the manually operable valve 13. The member 69, see Figure 9, is rigidly fastened on the reduced extension 71 of the rotary valve 13. It is apparent, therefore, that as the handle 9 is turned the rotary valve 13 is also turned. The rotation of the rotary valve 13 determines the setting of the oven regulator section 72 of the valve assembly in accordance with the usual practice.

It is to be noted from Figure 10 that the inward sliding motion of the hollow shaft 60 or sleeve is yieldingly resisted by a spring 73 which serves to assist in returning the hollow shaft 60 to its original position.

The hollow shaft 60 is provided with a flange 74, see Figure 2, which coacts with a cam portion 75 to rock a lever 76 inwardly when the knob or handle portion 9 is pushed inwardly. The lever 75 is provided with a roller 77 at its outer end which depresses the member 78.

The member 78, see Figure 3, is provided with a spring 79 which holds the collar 80 of the rod 81 against the inner end of the member 78. The spring 79 is heavier or stronger than the spring 19. The rod 81 carries the valve 18 and is extended as shown in Figures 1 and 3 so as to depress or open the valve 16 when the rod 81 is pressed inwardly.

The small auxiliary valves 48 and 49 are carried by a spider-like member 82 which is provided with a sleeve 83 arranged to be depressed by the valve 18. The member 82 is urged towards valve closed position by the spring 82'. The rod 81 is slidable with reference to the valve 18 and is provided with an inner stop 84 against which the valve 18 is held by means of the spring 85.

The development of the manually operable rotary valve 13 of the main gas cock 7 is shown in Figure 8 and it will be seen that it has a main relatively large groove 86 which is arranged to communicate with the main passage 47, see Figure 2, and to allow gas to pass to the oven regulator valve 12 and from there to the burner 4 when the automatically controlled electromagnetic valves are in their proper position as will hereinafter be described. The rotary valve 13 is hollow and a plurality of apertures 87 open from the main slot 86 into the hollow interior of the valve 13. The valve 13 is also provided with elongated slots 88 and 89. The slot 88 is arranged to establish communication between the passageway 50 and the pipe 52 which leads to the oven pilot burner 44. The slot 89 is adapted to establish communication between the passageway 51 and the pipe 53 leading to the flash tube pilot burner 41. The segment X in Figure 5 closes the passage 50 in the position shown. The segment Y in Figure 6 closes the passage 47 in the position shown. The segment Z in Figure 7 closes the passage 51 in the position shown.

The switch 34, heretofore mentioned, is controlled from a cam disk 34' carried by the shaft 58. This switch is in series with the thermocouple 33 and the coils 26 of the electromagnet 23 and is open when the main gas cock is closed. It is arranged to close as soon as the knob or handle 9 is turned towards valve open position.

The operation of the apparatus is as follows: The knob or handle 9 of the main gas cock 7 is turned to the desired temperature indication and is pressed inwardly. This moves the rod 81 in-

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wardly as viewed in Figure 3 and moves the valve 18 to closed position and the armature 22 into engagement with the electromagnet 23. Also moving of the knob 9 closes the switch 34 and allows energization of the coil 26 of the electromagnet 23, through the agency of the thermocouple 33 which is heated from the constantly burning pilot burner 37. The rod 81 is, therefore, held in its innermost position. It is to be noted that when the valve 18 moves inwardly it engages the hub or collar 83 and moves the valves 48 and 49 to open position. This allows gas to pass through the passageway 51 through the manually controlled valve 7 to the charging pilot burner 41 which, through the medium of the charging tip 39, charges the flash tube 38 with a combustible mixture. Flame is now propagated through the tube 38 and its branch 40 and lights the tip 39 and the tip 42 as well as the combustible mixture passing from the lateral opening 43. Simultaneously, gas passes through the passageway 50 through the manual valve 7 to the oven pilot burner 44 which is in lighting relation to the opening 43 of the charging pilot burner 41. The oven pilot burner is, therefore, lighted.

It is to be noted also that inward motion of the rod 81 opens the valve 16 and allows gas to pass from the manifold or supply pipe 6 past the valve 16 to the intermediate chamber 45 and from this chamber through the passages, immediately hereinabove described, to the charging pilot burner 41 and to the oven pilot burner 44. However, it is to be noted from reference to Figure 1 that the valve 18 is now closed and consequently no gas can pass through the passage 47 to the pipe 5 leading to the oven burner 4.

When the thermocouple 30 has been heated from the oven burner 4, the current generated thereby causes the bucking coil 25 of the electromagnet 23 to neutralize the holding effect of the coil 26 and consequently allows release of the armature 22, thus allowing the biased valve to move to open position. It is to be noted that the valve 16 does not close as its armature 20 is held by the electromagnet 21 as the coils 24 thereof have been energized due to the heating of the thermocouple 27. In this connection it is to be noted that the initial inward motion of the rod 81 forces the armature 20 of the valve 16 into engagement with the electromagnet 21.

Fuel is now supplied the burner and the burner lights from the oven pilot burner 44. It is to be noted that when the valve 18 has moved to open position that the small valves 48 and 49 are closed. The valve 49 cuts off a supply of gas to the flash tube charging pilot burner 41. The valve 48 cuts off the excess or line pressure supply of gas to the oven pilot burner 44. However, a regulated amount of gas passes through the passage 54 to the oven pilot burner 44 and maintains the proper size of pilot flame for heating the two thermocouples and for igniting the oven burner.

It is to be noted also that there is minimum flame adjustment provided by the needle valve 56 which controls the flow of gas through the passageway 55 as a by-pass supply around the valve 7 to the oven pilot burner 44. The purpose of this minimum supply is apparent when it is considered that sometimes the operator will cut off the manual valve 7, thus cutting off supply of gas to the oven burner and direct supply of gas to the oven pilot burner 44. However, there is a minimum supply of gas through the passageway 55 to the oven pilot burner 44 and this main-

tains a small flame at the oven pilot burner 44 so that if the operator should immediately re-open the manually controlled valve 7, the oven burner will be lighted and the safety of the apparatus will be maintained.

The reason for this is that the thermocouple 27 does not instantly cool and, therefore, the valve 16 will be held open for an appreciable length of time until the thermocouple 27 has cooled sufficiently. The minimum flame or minimum gas supply through the passage 55 is so regulated that it is not sufficient to maintain the heat necessary for the thermocouple 27 so that if the minimum supply alone were provided the thermocouple would cool and the valve 16 would drop to closed position.

It is apparent from the description thus far given that manual control alone can be used without the use of clock controlled switches. As described hereinabove, the switches 35 and 36 would remain closed at all times. However, if it is desired to use clock control the "On" clock would be set so as to close its switch 32 at the selected time and allow the thermocouple 30 to oppose the action of the thermocouple 23 in energization of the electromagnet 22 and thus determine the time at which the valve 16 would open and allow gas to be supplied the oven burner 4. The clock 31, therefore, determines the time at which the oven burner will be turned on. Its switch 32 is a normally open switch. The clock 28 has a switch 29 which is normally closed. This clock is the "Off" clock and determines the time at which the oven burner will be cut off. It is apparent that when the switch 29 is open that energization of the electromagnet 21 ceases and the valve 16 closes, thus cutting off all supply of gas to all portions of the apparatus. It is apparent that when the clocks are used, the switches 35 and 36 will remain open at all times. When it is desired to have manual operation solely, the switches 35 and 36 are at all times kept in a closed position.

It is clear also that if desired the "On" clock could be dispensed with and the "Off" clock would be relied upon to cut off the oven burner. Under these conditions, the oven burner would immediately come into action after the thermocouple had heated up following manual opening of the main gas cock 7. It is also clear that if neither clock were desired, the circuit would remain permanently closed at these points and no clocks would be placed in the apparatus.

It is to be noted particularly that time delay is provided to insure lighting of the oven pilot burner 44 without any reliance being placed on the operation of a delicate mechanical instrumentality. Instead this time delay or this insuring of the lighting of the oven pilot burner 44 is obtained by the bucking action due to the operation of the thermocouple 30 which is heated by the oven pilot burner 44.

This invention, therefore, is an improvement over that disclosed in my above noted copending application.

In the above noted copending application it was necessary to have a dwell between the initial inward pushing of the gas cock control knob or handle and the final setting of such knob or handle at the desired temperature. In the present invention there is no dwell required. Instead the operator merely turns the control knob or handle to the desired temperature setting and immediately pushes it in, thus setting the parts

into their correct positions as hereinabove described.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. The combination of a main burner, a remote constantly burning pilot burner, a second pilot burner for said main burner, flame conducting means between said constantly burning pilot burner and said second pilot burner, charging means for charging said flame conducting means with a combustible mixture, electromagnetic valve means for controlling the flow of fuel to said charging means and said main burner and including an electromagnet having a first winding and a bucking winding and arranged to hold said electromagnetic valve means in a first position to interrupt fuel flow to said main burner and allow fuel flow to said charging means when said electromagnetic valve means has been moved to said first position and said first winding is energized, means for energizing said first winding, a thermocouple arranged to be heated from said second pilot burner and to energize said bucking winding to release said electromagnetic valve means for motion to a second position to allow fuel flow to said main burner and cut off fuel flow to said charging means, means for moving said electromagnetic valve means to said second position when said bucking winding is energized, a main gas cock in series with said electromagnetic valve means and controlling the flow of fuel to both said main burner and said charging means, and a switch for opening the circuit of said first winding when said main gas cock is closed.

2. The combination of a burner, a first pilot burner therefor, a constantly burning remote pilot burner, flame conducting means for lighting said first pilot burner from said constantly burning pilot burner, charging means for charging said flame conducting means with a combustible mixture, a main gas cock controlling the flow of fuel to said burner and charging means and first pilot burner, an electromagnetic valve biased towards open position in series with said main gas cock and said burner, thermocouple means heated by said constantly burning pilot burner for energizing said electromagnetic valve to hold such valve closed, a second thermocouple means arranged to be heated by said first pilot burner to neutralize the effect of said first thermocouple means to allow said electromagnetic valve to move to open position when said first pilot burner has heated said second thermocouple means, an auxiliary valve controlled from said electromagnetic valve for cutting off fuel supply to said charging means when said electromagnetic valve moves to open position, and a clock controlled switch for controlling the circuit of said second thermocouple means.

3. The combination of a main burner, a remote constantly burning pilot burner, a first thermocouple heated by said pilot burner, a second pilot burner for said main burner, a second and a third thermocouple arranged to be heated by said second pilot burner, a first and a second electromagnetic valve biased respectively towards open and closed positions and controlling the flow of fuel to said main burner, a main gas cock connected in series with said first and second electromagnetic valve, means controlled from said main

gas cock for moving said first and second electromagnetic valves to closed and open position, said first electromagnetic valve including a main coil energized by said first thermocouple for holding said first and second electromagnetic valves in closed and open position and having a bucking coil arranged to be energized by said second thermocouple for neutralizing the effect of said main coil to release said first electromagnetic valve for motion to open position, said second electromagnetic valve having a coil for holding such valve in open position and arranged to be energized by said third thermocouple, and clock

controlled switches in circuit with said first and third thermocouples.

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