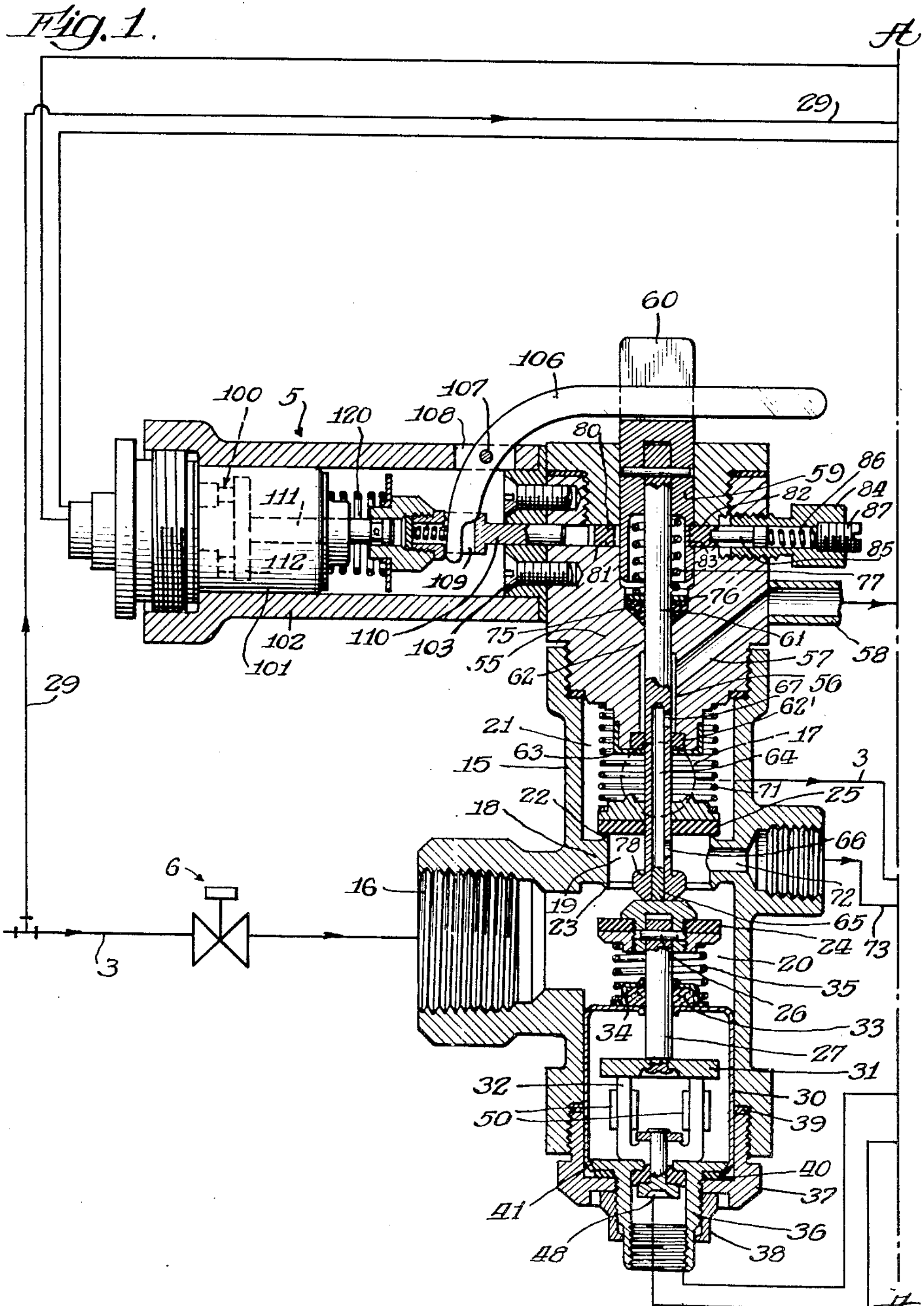
Dec. 11, 1951 R. MATTHEWS 2,578,194

THERMOELECTRIC BURNER CONTROL SYSTEM

Filed April 17, 1947 2 SHEETS—SHEET 1

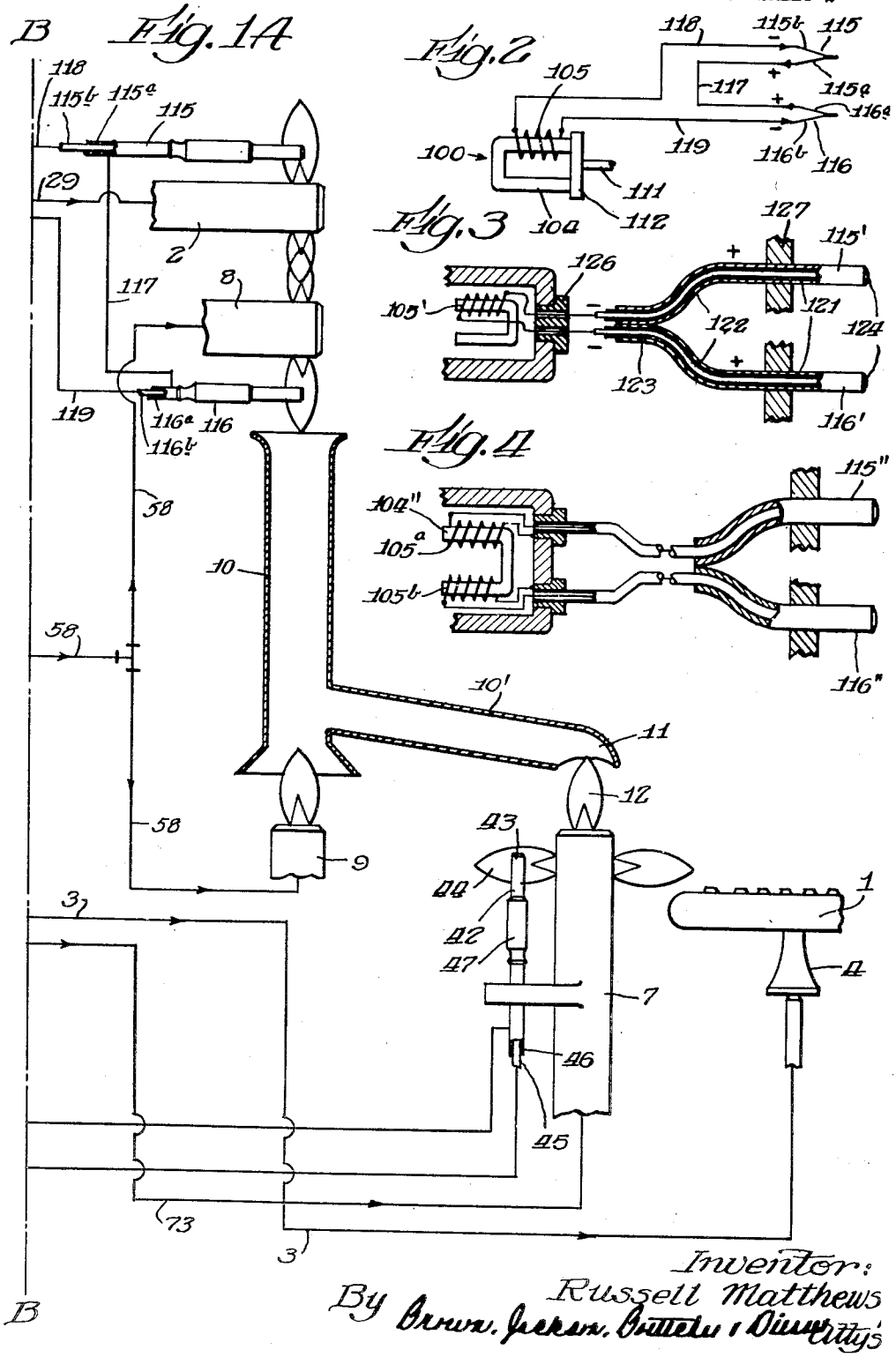


Inventor:
Russell Matthews
By Brown, Jackson, Boettcher & Dienner Attys.

Dec. 11, 1951 R. MATTHEWS 2,578,194

THERMOELECTRIC BURNER CONTROL SYSTEM

Filed April 17, 1947 2 SHEETS—SHEET 2



Inventor:
Russell Matthews
By Brown, Jackson, Boettcher & Dienner
Attys

Patented Dec. 11, 1951

2,578,194

UNITED STATES PATENT OFFICE

2,578,194

THERMOELECTRIC BURNER CONTROL SYSTEM

Russell Matthews, Wauwatosa, Wis., assignor to Milwaukee Gas Specialty Company, Milwaukee, Wis., a corporation of Wisconsin

Application April 17, 1947, Serial No. 742,017

11 Claims. (Cl. 158—117.1)

1

This invention relates, in general, to a thermoelectric control, and has particular relation to an improved thermoelectric control for single point ignition systems for gas burners and the like.

While the particular embodiment of the invention which I shall describe hereinafter in connection with the drawings is a thermoelectric control for one suitable single point ignition system, it is to be understood that the invention is not limited to use with this particular system but may be employed, for example, with any of the single point ignition systems illustrated and described in the copending application of Ernst Witzel, Serial No. 738,412, filed March 31, 1947, or with other forms of single point ignition systems, or elsewhere as suitable and desired.

The above identified copending application of Ernst Witzel shows and describes a number of illustrative single point ignition systems wherein there is a constant burning pilot burner, a main burner remote from such constant burning pilot burner, an igniting pilot burner in juxtaposition to the main burner for igniting the same, an auxiliary pilot burner, and an intermediate pilot burner for assuring ignition of the igniting pilot burner from the constant burning pilot burner, a thermoelectric control device operable to position for establishing a supply of fuel to the intermediate and igniting pilot burners, and to another position for extinguishing the intermediate pilot burner and establishing a supply of fuel to the main burner, latch means for latching the thermoelectric control device in said first mentioned position, and latch releasing means for releasing the latch means for operation of the thermoelectric control device to said other position.

One of the main objects of the present invention is to provide an improved form of control for holding such latch releasing means in non-releasing position and for freeing the latch releasing means for movement to position releasing such latch means after a time delay following ignition of the igniting pilot burner.

Another object of the invention is to provide an improved form of control which will operate thermoelectrically to hold the latch releasing means in non-releasing position; also thermoelectrically to release the latch releasing means for operation to latch releasing position.

Another object of the invention is to provide an improved electric circuit arrangement including a plurality of thermocouples or other

2

thermoelectric generators (such as thermopiles) connected in circuit with each other in opposing relation for accomplishing the results set forth.

Another object of the invention is to provide a thermoelectric control of the character described, having various features of novelty and advantages, and which is particularly characterized by its simplicity in construction, its economy in manufacture and installation, and its effectiveness and reliability in operation.

Further objects and advantages of the invention will appear from the following detailed description, taken in connection with the accompanying drawings which illustrate certain embodiments of the invention.

In the drawings:

Figures 1 and 1A are parts of a diagrammatic view which, when placed with Figure 1A to the right of Figure 1 and the line B—B of Figure 1A on the line A—A of Figure 1, form a complete diagrammatic view showing the thermoelectric control of the present invention in connection with one illustrative form of single point ignition system;

Figure 2 is a circuit diagram of the thermoelectric control;

Figure 3 is a fragmentary and more or less diagrammatic view showing another manner in which the thermocouples may be connected in circuit with the coil of the electromagnet in accordance with the present invention; and

Figure 4 is a fragmentary and more or less diagrammatic view showing another embodiment of the invention.

Referring now to the drawings, in the embodiment of the invention shown in Figures 1 and 1A the burner 1 is a baking oven, broiler or other remote burner. It is usually located in the lower part of the gas range or other appliance.

The pilot burner 2 is the constant burning pilot burner. It may be, for example, the top pilot burner for the top burners of a gas range or other constantly burning pilot burner. The constant burning pilot burner 2 is usually located in the upper part of the appliance.

A fuel supply pipe 3 leads to the main burner 1 for the delivery of gaseous or other fuel thereto, for example, through a mixing chamber 4 to which air is admitted through adjustable air inlets (not shown), as well understood in the art. The flow of gas through the pipe 3 is controlled by a thermoelectric control valve 5 and by a gas cock 6 connected into the pipe 3 anterior of the valve 5.

The oven or like burner 1 is provided with an igniting pilot burner 7 for igniting it. Although such details may vary widely within the scope of the broader aspects of the present invention, the pilot burner means for assuring ignition of the igniting constant burning pilot burner 7 from the constant burning pilot burner 2, as shown in the drawings, comprises an auxiliary pilot burner 8 at an upper location and in juxtaposition to the constant burning pilot burner 2, and an intermediate pilot burner 9 at a lower location. A flash tube 10 opens at its upper end directly beneath the flame of the upper auxiliary pilot burner 8. This tube extends downwardly from the auxiliary pilot burner 8, and its lower end opens directly over the flame of the intermediate pilot burner 9. The pilot burner 9 is spaced laterally from the igniting pilot burner 7, and the tube 10 has a generally horizontally extending branch 10' which opens at 11 to the flame 12 and gas of the igniting pilot burner 7.

The thermoelectric control valve 5 comprises a valve body 15 having an inlet 16 and an outlet 17. Contiguous sections of the fuel supply pipe 3 are connected to the inlet 16 and outlet 17, for example, by screwing them into the inlet and outlet which are shown as internally threaded. Internally, the valve body 15 has a partition 18 provided with a port 19 for placing the inlet chamber 20 in communication with outlet chamber 21. Valve seats 22 and 23 are provided on the partition 18; one valve seat surrounding one end of the port 19 for cooperation with the main thermoelectric shutoff valve 24, and the other valve seat surrounding the other end of the port 19 for cooperation with a flow interrupter valve 25.

The valve 24 is fixed, for example, by a pin 26 upon the inner end of the valve stem 27, preferably for some relative movement so as to have self-accommodating seating engagement with the cooperating valve seat 23. The valve 24 is preferably provided with a valve gasket or yielding valve facing suitably secured in place and adapted to engage the valve seat 23 when the safety shutoff valve is closed. The constant burning pilot burner 2 is supplied with fuel by a pipe 29 leading, for example, from the fuel supply pipe 3 anterior of the gas cock 6.

The thermoelectric safety shutoff valve 5 is, in general, of the type shown in the prior patents of Clarence Wantz Nos. 2,307,870 and 2,307,871, patented January 12, 1943. The valve stem 27 extends outwardly for reciprocatory movement through an opening in the inner end of an electromagnet and armature housing 30. The armature 31 is secured to the outer end of the valve stem 27 preferably sufficiently loosely to permit self-accommodation of the armature to the pole ends of the magnet frame 32. The stem 27 is disposed generally concentrically of the housing 30, and the armature and magnet are disposed within the housing. The housing 30 fits telescopically in the valve body 15. Packing 33, around the valve stem 27, is interposed between a spring seating member 34 and the inner end of the housing 30. A coiled compression spring 35, for seating the valve 24 against its seat 23, is interposed between the valve 24 and the spring seating member 34.

The magnet frame 32 is secured to a terminal bushing 36. The shank of the bushing 36 extends, for example, through an opening in a sleeve 37 screwed into the valve body 15 and is externally threaded for threaded engagement

with a nut 38 by means of which the bushing 36 is clamped to the sleeve 37. Sealing gaskets are provided at 39 and 40. The outer end of the housing 30 is peened, for example, at 41, over the flanged or headed outer end of the bushing 36.

In the illustrated embodiment of the invention, a thermocouple indicated at 42 is positioned so that the hot junction 43 thereof will be heated by the flame 44 as long as the igniting pilot burner 7 is burning. The thermocouple and leads therefor selected for illustration may be similar to the thermocouple and leads more fully disclosed in Oscar J. Leins' Patent No. 2,126,564, patented August 9, 1938, or the thermocouple or thermoelectric generator (such as a thermopile) and leads may be of any other suitable or preferred form.

For the purpose of the present description, suffice it to state that the particular thermocouple selected for illustration comprises an outer tubular metallic thermocouple element and an inner metallic thermocouple element of different thermoelectric characteristics. The inner thermocouple element is joined at one end to the outer end of the outer thermocouple element to form the thermojunction 43 which is placed in position to be heated by the igniting pilot burner 7. An inner lead conductor 45 is joined to the inner thermocouple element to form an internal thermojunction, and an outer tubular lead conductor 46 surrounds the inner lead conductor and is connected to the outer thermocouple element, for example, through a sleeve 47, to form a third thermojunction. The inner lead conductor is insulated from the outer lead conductor, for example, by a wrapping of insulation on the inner lead conductor.

A quick detachable or removable connection is preferably provided between the electromagnet of the safety shutoff device and the ends of the leads 45 and 46 opposite the ends which are connected to the thermocouple elements. To this end the terminal tip 48 has a conical depression in its outer end, and a connector or terminal cone (not shown) on the end of the conductor 45 is adapted to be detachably clamped in contact therewith by a sleeve (not shown) threaded into the outer end of the bushing 36. The adjacent end of the outer tubular lead conductor 46 is connected in circuit with one side of the coil 50 which surrounds the legs of the magnet frame, for example, through the bushing 36. The other side of the coil 50 is connected in circuit with the inner lead conductor 45 through the terminal tip 48. The use of other forms of thermocouples or thermopiles is, of course, contemplated within the scope of the present invention.

A cap nut 55 is screwed into the opposite end of the valve body 15 in axial alignment with the magnet housing 30. This cap has at its inner end a bore 56 opening through a passage 57 into a tube 58 which is connected to the auxiliary and intermediate pilot burners 8 and 9 for the purpose of supplying fuel thereto, as will hereinafter appear. At its outer end the cap nut 55 has a bore 59 in which a reset button 60 is mounted for reciprocatory movement. The button 60 is aligned axially with the valve stem 27 and has fixed thereto a reset stem 61. The reset stem 61 is guided at 62 in the cap nut 55 and extends inwardly through the bore 56, with annular space between it and the inner periphery of the bore.

The inner end of the stem 61 extends inwardly from the cap nut 55 and into the valve body 15, and is headed at its inner end. The inner end of the bore 56 is closed and sealed by closure and packing or sealing means 62' held in place by retainer means 63. The inner end of the stem 61 has an axial bore 64 closed at the inner end of the stem, for example, by a plug 65. A laterally opening port 66 is adapted to admit gas or other fuel into the bore 64, and a laterally opening port 67 is adapted for delivering this fuel into the bore 56 and thereby to the fuel supply line leading to the auxiliary and intermediate pilot burners 8 and 9.

The reset stem 61 has reciprocatory movement through an axial opening in the flow interrupter valve 25. A coiled compression spring 71, interposed between the valve 25 and the inner end of cap nut 55, seats the valve 25 on its seat 22 to shut off the delivery of fuel to the main or oven burner 1 through the outlet 17 when the reset stem 61 is depressed inwardly. The valve 25 is preferably provided with a valve gasket or yielding valve facing suitably secured in place and adapted to engage the valve seat 22 when the valve 25 is closed.

A port or passage 72 leads laterally from the port 19 for the delivery of fuel to the igniting pilot burner 7 through fuel supply line 73 whenever the valve 24 and gas cock 6 are open.

The outer end of the bore in which the stem 61 is guided at 62 is sealed against leakage of gas by suitable packing 75. A washer is provided at 76, and surrounding the stem 61 and interposed between the washer 76 and the reset button 60 is a coiled spring 77 which acts to move the reset button 60 and stem 61 to their outwardly projected positions, as will presently appear.

An annular raised lip 78 on the headed inner end of the stem 61 is adapted, in the movement of the reset stem to its outwardly projected position, to engage the yielding facing of the valve 25 and move this valve to open position away from its seat 22 against the action of the spring 71.

A snap ring 80, mounted for movement in a lateral direction in an opening 81 in the cap 55, has a detent 82 which is adapted to engage in a notch 83 in the periphery of the reset stem 60 to hold the reset stem in depressed or inwardly projected position. In this position of the reset stem the valve 25 is closed by the spring 71, and the port 66 is positioned outwardly of the valve 25 for delivery of gas to the auxiliary and intermediate pilot burners 8 and 9.

A screw 84 is screwed into the cap 55 in register with the ring 80. A plunger 85, pressed inwardly by a spring 86 confined between it and an adjusting screw 87 screwed into the screw 84, has engagement at its inner end with the ring 80 and tends to yieldingly urge the ring 80 to the position shown in Figure 1.

An electromagnet 100 is mounted in a housing 101 which fits telescopically in a tubular body 102 fastened at 103 to the cap 55 in appropriate register with the snap or locking ring 80. As shown in Figure 2, the electromagnet 100 comprises a magnet frame 104 and coil 105. A curved lever 106 is pivoted at 107 in an opening 108 in the wall of the tubular body 102. One end of this lever extends through a notch in the outer end of the reset button 60. The other end of the lever 106 is disposed within the tubular body 102 and engages in an opening 109 in a release plunger 110. The plunger 110 is connected to the stem 111 of the armature 112.

In the illustrated embodiment of the invention, the electric circuit arrangement for holding the plunger 110 in non-releasing position and for freeing it for movement to position releasing the latch ring 80, and thereby the reset stem 61, comprises a pair of thermocouples 115 and 116 or other thermoelectric generators (such as thermopiles or the like).

The thermocouples 115 and 116 and leads therefor are shown of construction like the construction of the thermocouple 42, but any other desired forms of thermocouples or thermopiles may be used within the scope of the present invention.

The thermocouple 115 is positioned in juxtaposition to the constant burning pilot burner 2 so that its hot junction will be heated by this pilot burner when it is ignited. The thermocouple 116 is positioned in juxtaposition to the auxiliary pilot burner 8 so that its hot junction will be heated by this pilot burner when it is ignited.

The thermocouples 115 and 116 are connected in circuit with the coil 105 of the electromagnet 100, and with each other in opposing relation, for example, with the particular form of thermocouples shown in the drawing, by connecting the outer tubular thermocouple member 115*a* of the thermocouple 115 with the outer thermocouple member 116*a* of the thermocouple 116 by a conductor 117 and by connecting the respective inner thermocouple members 115*b* and 116*b* to opposite sides of the coil 105, for example, by conductors 118, 119. The outer thermocouple members may, of course, be grounded. The thermocouples 115 and 116 and electromagnet 100 are thus connected in series with the thermocouples in opposing relation.

It is also possible to accomplish the same results by connecting two thermocouples 115'' and 116'' to two coils 105*a* and 105*b* on the same magnet frame 104'' as shown in Figure 4, with the magnetic field produced by the coils arranged in opposition. The principle previously described utilizes opposing currents through a common coil, and the principle of the embodiment of the invention shown in Figure 4 utilizes opposing magnetic fields generated by two or more coils.

The operation of the reset stem, latch and release mechanism is as follows:

In conjunction with or before opening the valve 6, the lever 106 is depressed and moves the reset stem 61 to depressed position, closing valve 25 and opening ports 72 and 66 for delivery of fuel to the igniting pilot burner 7 and to the auxiliary and intermediate pilot burners 8 and 9. The auxiliary pilot burner 8 is ignited by the constant burning pilot burner 2, and the unburned gas from the intermediate pilot burner 9 and auxiliary pilot burner 7 rises in the tube 10 which is relatively cool to permit this action. As it reaches the flame of auxiliary pilot burner 8, the gas is ignited and then recedes or flashes back to light the intermediate pilot burner 9 and igniting pilot burner 7.

In depressing the stem 61 the snap ring 80 operates to lock this stem depressed and to provide a time delay permitting the electromagnet connected in circuit with thermocouple 42 to be energized sufficiently by the heat of the igniting pilot burner 7 on the thermocouple 42 to hold the armature 31 in attracted position and the valve 24 open. The depression of lever 106 also simultaneously moves the armature 112 to attracted position, and since the thermocouple 115 for

energizing the electromagnet 100 is subject to the heat of the constant burning pilot burner 2 the armature 112 is held in attracted position and the ring 80 holds the reset stem in depressed position.

With the depression of the reset stem 61 the admission of gas to the auxiliary pilot burner 8 results in ignition of this pilot burner in the manner previously described. The auxiliary pilot burner 8 heats the hot junction of the thermocouple 116 and, as a result, a thermoelectric current is gradually set up counter or in opposition to the thermoelectric current set up by the heating of thermocouple 115 by constant burning pilot burner 2. After a predetermined time, which may be varied or determined in advance, the electromagnet 100 is deenergized sufficiently to release the armature 112. When the armature 112 is released, a spring 120 (Figure 1) moves the release plunger 110 against the snap ring 80. The snap ring 80 is thus moved to the right, as the device is viewed in Figure 1, in its opening 81, being thereby released from engagement with the reset button 60 at 82.

The reset stem then moves outwardly under the action of the spring 77. The edge or lip 78 on the inner end of the reset stem engages the valve 25 and moves it to open position. The contacting of the edge 78 with the valve 25 shuts off the flow of fuel to the auxiliary and intermediate pilot burners 8 and 9 so that these pilot burners may immediately cool and thereby be in readiness for a succeeding operation, even where such operation follows immediately. With the valve 25 open, gas passes through the outlet 17 to the oven burner 1 which is ignited by the igniting pilot burner 7 which continues to be supplied with gas through the port 72.

During the time delay at the very start of the operation, the reset stem is depressed, closing the valve 25 to the oven burner but opening the valve 24 by cooperation therewith (as shown in Figure 1), which also moves the armature 31 into contact with the magnet frame 32. At this time the ports 66 and 72 are open for the supply of fuel to the auxiliary, intermediate and igniting pilot burners 8, 9 and 7. As previously pointed out, the delay is timed so that the thermocouple 42 will be energized sufficiently to retain the valve 24 in open position by the energization of the electromagnet therefor.

If the igniting pilot burner 7 should fail to ignite or to maintain the pilot flame, the thermocouple 42 will not be energized sufficiently to hold the valve 24 open, and this valve will operate to closed position to shut off the main gas supply to the oven burner; also the gas supply to the igniting pilot burner 7 and to the auxiliary and intermediate pilot burners 8 and 9. In case the constant burning pilot burner is extinguished, the pilot burners 8, 9 and 7 cannot, of course, be ignited therefrom, and if it is extinguished while the igniting pilot burner is burning and the igniting pilot burner is later extinguished, the system cannot be again placed in operation until the constant burning pilot burner 2 is relighted.

With the valve 5 linked to the valve 6 in such manner that the reset button 60 must be depressed before or while the valve 6 is being opened, or by depressing the button 60 before or while the valve 6 is being opened as described, the flow interrupter valve 25 operates to close the passage to the main burner 1 and open the port leading to the auxiliary and intermediate pilot burners 8 and 9, thus insuring ignition of pilot burners 8, 9 and 7 before the supply line to the oven burner is opened and causing a time delay to reestablish fully energy of the electromagnet.

This invention is not limited to use of auxiliary and intermediate pilot burners, but contemplates use of the improved thermoelectric control with one or more than one intermediate pilot burners. Where there are auxiliary and intermediate pilot burners, they may be variously arranged.

The invention also contemplates locating the thermocouple 116 in position to be heated by an auxiliary or intermediate pilot burner at any other desired position. For example, the thermocouple 116 may be located to be heated by the intermediate pilot burner 9, eliminating auxiliary pilot burner 8. The arrangement as shown in the drawings, however, has advantages. It may happen that intermediate pilot burner 9 does not ignite. In such case, the mechanism will be released just the same, and be brought into original position in case igniting pilot burner 7 also fails to ignite. In the illustrated system, auxiliary pilot burner 8 is so located that it can hardly fail to ignite. Thus in case of a flash back in the flash tube 10 smothering the auxiliary pilot burner 8, the constant burning pilot burner 1 will not be affected. Pilot burners 2 and 8, and thermocouples 115 and 116, may be conveniently assembled in a compact unit properly adjusted for a specific time delay in the factory.

In Figure 3 the outer tubular thermocouple members 121 of the thermocouples 115' and 116' (which correspond with the thermocouples 115 and 116 of Figure 1A) are bent at 122 to bring their ends opposite the ends at which the hot junctions 124 are disposed into contact at 123. This provides a simple and compact arrangement for connecting the thermocouples in opposition. The electromagnet and its magnet frame and coil in Figure 3 are similar to the electromagnet of the preceding embodiment of the invention and are designated by primed reference characters corresponding with the reference characters used in Figure 2. In Figure 3, the circuit connections between the coil 105' of the electromagnet and the thermocouples 115' and 116' enter the housing 101 through an insulating member 126, and a bracket or member 127 supports thermocouples 115' and 116' in proper relation to each other.

Many other combinations are contemplated within the scope of the present invention. Therefore the embodiments of the invention shown in the drawings are for illustrative purposes only, and it is to be expressly understood that the drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. In a single point ignition system of the class wherein there is a constantly burning pilot burner, a main burner remote from said constantly burning pilot burner, an igniting pilot burner in juxtaposition to said main burner for igniting the same, at least one auxiliary pilot burner for assuring ignition of the igniting pilot burner from said constantly burning pilot burner, a thermoelectric device operable to a position for establishing a supply of fuel to said auxiliary and igniting pilot burners and to an-

other position for extinguishing said auxiliary pilot burner and establishing a supply of fuel to said main burner, latch means for latching said thermoelectric control device in said first mentioned position, and latch releasing means, the combination with said system of an electromagnet, a thermoelectric generator connected in circuit with said electromagnet and subject to the heat of the constantly burning pilot burner for energizing said electromagnet to hold said latch releasing member in non-releasing position, and a second thermoelectric generator connected in circuit with said electromagnet and said first thermoelectric generator in opposing relation thereto and subject to the heat of the auxiliary pilot burner for de-energizing said electromagnet and thereby releasing said latch releasing member after a time delay following ignition of the burner pilot.

2. In combination, an electromagnetically operated device comprising a core, a coil for said core, an armature adapted to be magnetically held in attracted position by said core, means for actuating said armature to retracted position, a constantly burning pilot burner, an auxiliary pilot burner positioned to be ignited by said constantly burning pilot burner, means for establishing and shutting off a supply of fuel to said auxiliary pilot burner, a pair of thermoelectric generators each having a junction that acts only as a "hot" junction and junction means that acts only as "cold" junction means, said thermoelectric generators being arranged with the "hot" junction of one of said thermoelectric generators subject to the heat of the constantly burning pilot and the "hot" junction of the other thermoelectric generator subject to the heat of said auxiliary pilot burner, and means connecting said thermoelectric generators and the coil of the electromagnetically operated device in constant series circuit relation and said thermoelectric generators in constant opposed relation, the thermoelectric generator which has its "hot" junction subject to the heat of the constantly burning pilot being adapted by the heat of said pilot to produce an electromotive force which will energize said electromagnetically operated device sufficiently to hold said armature in attracted position and the thermoelectric generator which has its "hot" junction subject to the heat of said auxiliary pilot burner being adapted by the heat of said auxiliary pilot burner upon ignition thereof to produce sufficient electromotive force in opposition to the electromotive force of the other thermoelectric generator to release said armature for movement to retracted position.

3. The combination of claim 2, wherein there is a thermoelectric control device, a latch for said thermoelectric control device, and a latch releasing member held in non-releasing position by energization of the electromagnetically operated device by the thermoelectric generator, the "hot" junction of which is subject to the heat of the constantly burning pilot, said latch releasing member being freed for movement to latch releasing position by the electromotive force produced by the heat of the auxiliary pilot burner on the "hot" junction of the other thermoelectric generator.

4. In combination, an electromagnet, an armature, a constantly burning pilot burner, an auxiliary pilot burner positioned to be ignited by said constantly burning pilot burner, means for establishing and shutting off a supply of fuel to said auxiliary pilot burner, a first thermoelectric generator subject to the heat of said constantly burning pilot burner and connected in circuit with said electromagnet to energize said electromagnet sufficiently to hold said armature in attracted position when said first thermoelectric generator is heated by said constantly burning pilot burner and said auxiliary pilot burner is extinguished, and a second thermoelectric generator subject to the heat of said auxiliary pilot burner and connected in constant opposed circuit relation with said first thermoelectric generator, said second thermoelectric generator being adapted by the heat of said auxiliary pilot burner thereon to produce sufficient electromotive force in opposition to the electromotive force of said first thermoelectric generator to release said armature for movement to retracted position upon ignition of said auxiliary pilot burner.

5. The combination according to claim 4 wherein there is valve means operable to open position to establish a flow of fuel to said auxiliary pilot burner and adapted to be held in said position and wherein the movement of said armature to retracted position releases said valve means for movement to position to shut off the flow of fuel to said auxiliary pilot burner.

6. In apparatus of the class described, in combination, a pair of electromagnets arranged in angular relation, a first armature for one of said electromagnets, a second armature for the other electromagnet, a first reciprocatory plunger in actuating relation to said first armature, a second reciprocatory plunger arranged in angular relation to said first plunger and in actuating relation to said second armature, a lever pivoted between its ends and having one end extending in a direction to cooperate with said first plunger and its other end extending in a different direction and cooperating with said second plunger whereby swinging movement of said lever about its pivot simultaneously actuates both said armatures to attracted positions, latch means engageable with said first plunger to hold it in position for holding said first armature in attracted position, and latch releasing means actuated in a direction to release said latch means by the movement of said second armature to retracted position.

7. In apparatus of the class described, in combination, a pair of electromagnets arranged in angular relation, a first armature for one of said electromagnets, a second armature for the other electromagnet, a first reciprocatory plunger in actuating relation to said first armature, a second reciprocatory plunger arranged in angular relation to said first plunger and in actuating relation to said second armature, a lever pivoted between its ends and having one end extending in a direction to cooperate with said first plunger and its other end extending in a different direction and cooperating with said second plunger whereby swinging movement of said lever about its pivot simultaneously actuates both said armatures to attracted positions, a constantly burning pilot burner, an auxiliary pilot burner arranged in juxtaposition to said constantly burning pilot burner for ignition by said constantly burning pilot burner, a first thermoelectric generator subject to the heat of said constantly burning pilot burner, a second thermoelectric generator subject to the heat of said auxiliary pilot burner, and means connecting said thermoelectric generators and one of said electromag-

nets in constant series circuit relation and said thermoelectric generator in constant opposed relation.

8. In combination, a valve member for controlling the supply of fuel through a conduit, a movable armature operable to control said valve member, a first electromagnet for said armature, a thermoelectric generator connected to said electromagnet for energizing said electromagnet, reset means for resetting said armature with respect to said electromagnet, latch means having mechanical cooperation with said reset means for latching said reset means in resetting position, a second electromagnet controlling said latch means, and means for deenergizing said second electromagnet after said thermoelectric generator has energized said first electromagnet sufficiently to hold said armature in attracted position.

9. The combination according to claim 8 wherein there is a latch releasing member under the control of said second electromagnet and operable upon deenergization of said second electromagnet to release said latch means.

10. A thermoelectric control device comprising a valve body having a fuel inlet, a fuel outlet for supplying fuel to a main burner, a fuel outlet for supplying fuel to an igniting pilot burner, and a fuel outlet for supplying fuel to an intermediate pilot burner, a first movable valve member having a closed position shutting off all of said fuel outlets and an open position, a movable armature connected to said first valve member, a first electromagnet operable when energized to hold said armature in attracted position and said first valve member in open position, a thermoelectric generator having hot junction means for positioning where it will be heated by the igniting pilot burner and connected in circuit with said first electromagnet, reset means for resetting said armature to attracted position and said first valve member to open position, second valve means under the control of said reset means and operable during resetting operation of said reset means to shut off the flow of fuel through the fuel outlet for supplying fuel to the main burner and for establishing a flow of fuel through the fuel outlet for supplying fuel to the intermediate pilot burner, latch means having mechanical cooperation with said reset means for latching said reset means in resetting position, a second electromagnet controlling said latch means, and means for deenergizing said second electromagnet after said thermoelectric generator has energized said first electromagnet sufficiently to hold said armature in attracted position.

11. The combination according to claim 10 wherein the reset means comprises a reset stem and wherein the second valve means under the control of said reset means comprises a valve member slidable on said reset stem and a ported passage in said reset stem.

RUSSELL MATTHEWS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,519,257	Hellmund	Dec. 16, 1924
1,603,873	Sandell	Oct. 19, 1926
1,775,682	Martin	Sept. 16, 1930
1,920,080	Jenkins	July 25, 1933
1,971,704	Castonguay	Aug. 28, 1934
2,049,960	Jones et al.	Aug. 4, 1936
2,063,834	Bast et al.	Dec. 8, 1936
2,072,552	Gauger	Mar. 2, 1937
2,098,192	Matthews	Nov. 2, 1937
2,257,927	Wunsch et al.	Oct. 7, 1941
2,262,061	Somers	Nov. 11, 1941
2,265,294	Lange	Dec. 9, 1941
2,351,277	Mantz	June 13, 1944
2,385,530	Paille	Sept. 25, 1945
2,391,753	Strobel	Dec. 25, 1945
2,443,892	Caparone	June 22, 1948