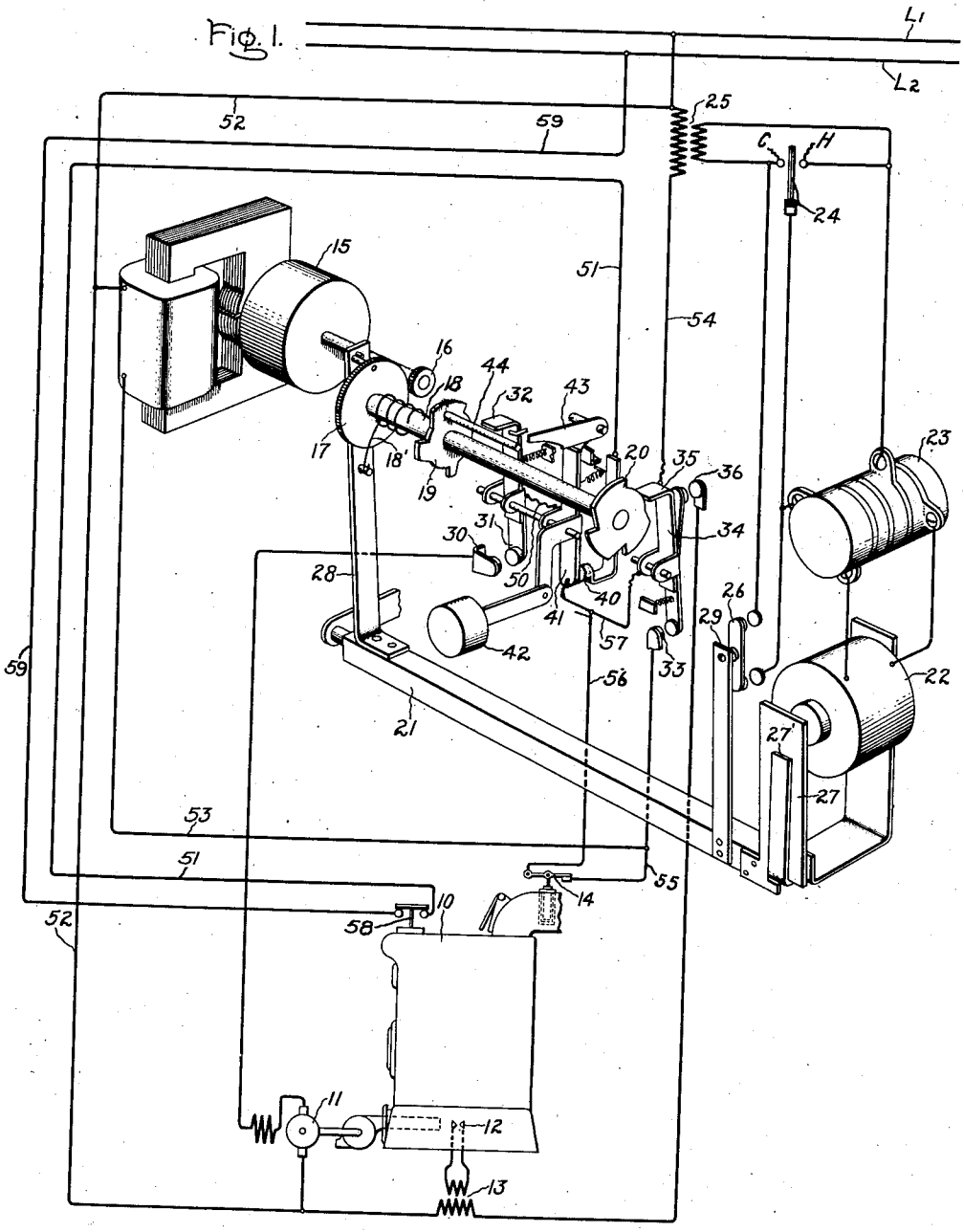
Jan. 1, 1935. G. R. TOWNSEND 1,986,032

HEATER CONTROL

Filed July 15, 1930 2 Sheets-Sheet 1

Fig. 1.



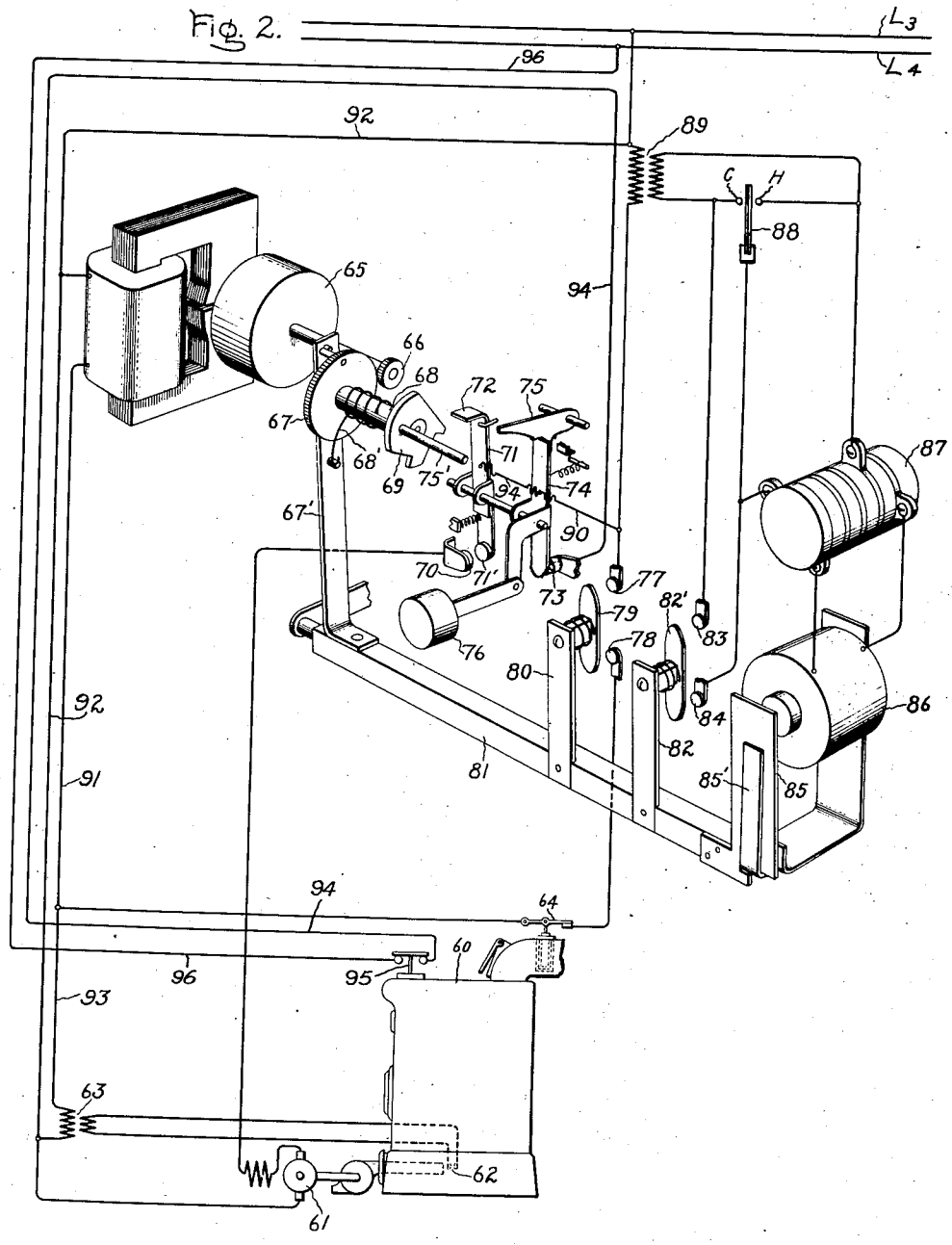
Inventor:
George R. Townsend,
by Charles R. Mullen
His Attorney.

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Filed July 15, 1930 2 Sheets-Sheet 2

Fig. 2.



Inventor:
George R. Townsend,
by Charles V. Mullen
His Attorney.

Patented Jan. 1, 1935 1,986,032

UNITED STATES PATENT OFFICE

1,986,032

HEATER CONTROL

George R. Townsend, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

Application July 15, 1930, Serial No. 468,050

9 Claims. (Cl. 158—28)

My invention relates to the control of heating devices and provides an improved form of fully automatic electric control for an oil burning heater although the control may be adapted to other types of burners which depend for ignition upon an electric spark or heating filament or a pilot gas or oil flame, and the like.

The present invention is an improvement of the heater control device disclosed in my copending application Serial No. 430,482, filed February 24, 1930, and assigned to the same assignee as the present application.

In my prior device a control mechanism is driven by means of a synchronous timing motor. This control or "recycling" mechanism, as it is called, opens and closes the fuel supply motor circuit at short intervals, the purpose of such operation being to give repeated opportunities for igniting the oil spray and thereby insure the establishment of combustion.

The ignition system for igniting the oil spray in my prior device, by means of the recycling mechanism, is caused to be energized and deenergized substantially simultaneously with the fuel supply motor.

The synchronous motor or timing mechanism is run continuously for the purpose of operating a day and night timing control mechanism.

The recycling mechanism of my prior device comprises circuit controlling members for the fuel supply motor and ignition means which are intermittently actuated by cams carried upon a movable frame. This frame is moved to an operating position by means of an electromagnetic coil energized in response to a room thermostat. Driving connections are established between the timing motor and the cam shaft for controlling operation of the circuit controlling members. When flame is established this electroresponsive coil is deenergized to permit the frame to return to initial position but the fuel supply motor circuit controlling member is held in closed position by means of a latching mechanism and a second electroresponsive coil which is then energized. These electroresponsive coils may be designed for either alternating current or direct current but in the case of alternating current circuits a special design is necessary to prevent humming or chattering.

In the preferred embodiment of my present invention the control mechanism is greatly simplified and improved. The day and night control mechanism is eliminated and in the present invention the timing motor is deenergized when combustion is established with the timing motor and the recycling cams in operative engagement with each other. By means of this construction I eliminate the necessity for using a second electroresponsive coil and a latching mechanism for maintaining the fuel supply motor energized upon the establishment of combustion. A rectifier may be used with the control apparatus when applied to alternating current systems thus deriving the quiet and smooth operation of a direct current electroresponsive coil which heretofore had not been provided.

In addition to the recycling mechanism for the fuel supply motor, in the preferred embodiment of my invention, the ignition system for igniting the oil spray may be either continuously energized until a flame is established or the recycling mechanism may cause the ignition system to be energized and deenergized substantially simultaneously with the fuel supply motor.

When the flame is established a heat responsive switch mechanism placed in the stack of the furnace and operated by the heat of the flame causes deenergization of the synchronous timing motor in such a position that the fuel supply motor remains energized and the ignition system becomes deenergized. Although the heat responsive mechanism is placed in the stack of the furnace it will operate successfully when placed in the firebox. Should the flame fail during operation, the heat responsive mechanism upon cooling causes reenergization of the timing motor and thus of the recycling mechanism to reignite the oil spray.

In one form of my invention, due to the fact that the control apparatus upon the establishment of flame assumes a particular position, when the heat responsive mechanism calls for reenergization of the recycling apparatus after flame failure, a definite time interval elapses before ignition can take place. This brief period designated as the "scavenging" period permits the natural draft of the furnace to dissipate any gases which may have accumulated in the firebox thus preventing explosion or "puffbacks".

The recycling operation is accomplished by means of cam actuated contacts which contacts are rendered operative whenever a starting coil is energized by the closing of a room thermostat calling for heat. In one form of my invention the starting coil operates a pivoted member upon which cams are mounted, the pivoted member also carrying circuit closing contacts for shorting the starting side of the thermostat. This brings the cam shaft into contact with a driving pinion on the synchronous timing motor. The rotation of

the cam actuates the contacts to open and close the ignition system and fuel supply motor circuit. In another form of my invention the fuel supply motor only is energized intermittently while the ignition system is continuously energized until flame is established. In the event that the recycling device fails to cause ignition of the oil after a predetermined number of operations of the fuel supply motor and ignition system, a tripping means is provided for rendering the recycling device inoperative thus inviting inspection to determine the cause of the failure of the apparatus to function.

A pressure safety switch is provided at the furnace boiler for opening the control circuit to one side of the line in case excessive boiler pressures develop.

Fig. 1 of the drawings shows one form of my invention. Fig. 2 shows a modification thereof.

In Fig. 1 the furnace 10 is provided with a fuel supply motor 11 adjacent which is placed an electric ignition device 12 the energy for which is supplied by the transformer 13. A flame detector 14 is placed in the stack of the furnace for purposes to be described later.

The control apparatus comprises a synchronous timing motor 15 which is used to drive the cam shaft 18 of the control apparatus when the driving pinion 16, carried by the synchronous motor shaft, and the gear 17, carried by the cam shaft, are caused to mesh. This cam shaft has mounted thereon a pair of cams 19 and 20, the cam 19 controlling the operation of the fuel supply motor circuit and the cam 20 controlling the operation of the ignition and synchronous timing motor circuits. A spring 18' which is tensioned during rotation of the cam shaft is used for the purpose of returning the cam shaft to initial position when the pinion and gear are demeshed.

The cam shaft is mounted in a bearing carried by an arm 28 mounted at one end of a pivoted frame member 21. At the other end of the frame member 21 is the armature 27 rigidly fastened thereto and which causes the frame to be rotated about its axis in a clockwise direction to mesh the gears 16 and 17 when the electroresponsive starting coil 22 is energized. A stop 27' is provided for the armature 27 in its deenergized position.

A rectifier 23 furnishes rectified current to the electroresponsive coil 22 when the thermostat 24 closes its left-hand contact C, thus placing the rectifier 23 across the secondary of the transformer 25 which is energized from the lines L_1 and L_2. The thermostat 24 moves to close the right-hand contact H when sufficient heat has been furnished, thus short-circuiting the secondary of the transformer and deenergizing the electroresponsive coil 22 which permits the frame to return to its initial position. It will be noted that an arm 29 is carried by the frame 21 which has a bridging member 26 for shorting the thermostat blade, the purpose of this operation being to relieve the thermostat of carrying the current necessary to maintain the coil 22 energized when the thermostat 24 is calling for heat, or when the thermostat is in the open position between the contacts.

A stationary contact 30 is connected to the fuel supply motor 11 and cooperating therewith is the pivoted member 31, which is electrically connected to one side of the line L_2 when the pivoted member 41 is in the closed position. The circuit is completed from the other side of the motor through the conductor 52 which is connected to the line L_1. The pivoted member 31 has at its upper end the portion 32 which cooperates with the cam 19 to be actuated thereby to open and close the fuel supply motor circuit when the frame 21 has been moved to the operating position with the pinion and gears 16 and 17 meshed.

A contact 33 is connected to the synchronous timing motor 15 by means of the conductor 53. The lower contact on the pivoted member 34 cooperates therewith to complete a circuit to one side of the line L_2 through conductor 57, the contact 40 when closed, the conductor 51, pressure safety switch 58 and conductor 59. The other side of the synchronous motor is connected to the line L_1 by means of the conductor 52. It will be noted that a second circuit is provided for the synchronous motor by means of the conductor 55, the flame detector 14 and conductor 56 which parallels the circuit through the contact 33 and pivoted member 34. The purpose of this circuit will be described later.

The contact 36 is connected to the ignition transformer 13 and cooperates with the upper contact carried by the pivoted member 34 to close a circuit to one side of the line L_2 through the conductor 57, the contact 40, when the pivoted member 41 is closed, the conductor 51, pressure safety switch 58 and conductor 59. The other side of the ignition transformer 13 is connected to the line L_1 by means of the conductor 52. The portion 35 of member 34 cooperates with the cam 20.

The pivoted member 41 is normally closed upon the contact 40 and held in the closed position by means of the latch member 43 cooperating with the upper portion thereof. This pivoted member 41 is biased to open and when the latch 43 is released by means of the pin 44 carried on the cam 19 when the device cycles out in the case of the oil failing to ignite, it is necessary to manually reset this pivoted member by means of the button 42 which causes rotation of the pivoted member 41 in a counterclockwise direction to close on the contact 40. The pivoted members 31 and 34 for controlling the motor and ignition circuits are spring biased to an open position as shown. The timing motor is energized from the supply lines L_1 and L_2 except during combustion as follows: from line L_1 conductor 52 to one side of the motor windings and from the other side of the motor windings through conductor 53, conductor 55, switch 14, conductor 56, member 41, contact 40, conductor 51, switch 58, conductor 59, to line L_2. Opening of switch contacts 40 and 41 or switch 58 will deenergize motor 15, as well as all of the apparatus.

The operation of the device is as follows. Assuming the apparatus to be positioned as shown in Fig. 1, when the thermostat 24 calls for heat by closing on its left hand contact C, current is supplied to the rectifier 23 by means of the transformer 25 which is connected across the lines L_1 and L_2 by means of the conductor 54, pivoted member 34, conductor 57, contact 40, conductor 51, pressure safety switch 58 and conductor 59. Rectified current is then supplied from the rectifier 23 to the electroresponsive coil 22 to energize the same. This causes attraction of the armature 27 to the coil 22 and pivots the frame 21 in a clockwise direction thus causing meshing of the gear 17 carried by the cam shaft and the pinion 16 carried by the synchronous timing motor 15 which is continuously energized except when flame is established.

As the cam shaft rotates the first raised portion on the cam 20 contacts with the portion 35 on the pivoted member 34 to cause this pivoted

member to rotate in a clockwise direction closing its upper contact on the contact 36 which is connected to the ignition transformer and its lower contact on the contact 33 which is connected to the synchronous motor 15 and the flame detector 14. The circuit to the synchronous timing motor 15 may be traced from one side of the line L_2, conductor 59, pressure safety switch 58, conductor 51, contact 40, conductor 57, pivoted member 34, contact 33, conductor 53 to one side of the motor 15. The other side of the motor is connected to the supply line L_1 by means of the conductor 52.

The circuit to the ignition transformer can be traced from one side of the line L_2, conductor 59, pressure safety switch 58, conductor 51, contact 40, conductor 57, pivoted member 34, contact 36 to one side of the transformer 13. The other side of the transformer 13 is connected to the line L_1 by means of the conductor 52. It will thus be seen that both the synchronous motor and the ignition transformer are energized. It is of course understood that the parallel circuit to the synchronous timing motor by means of the flame detector 14 always maintains this motor energized in the absence of flame regardless of the position of the cam actuated circuit controlling member.

As the cam shaft rotates further, the first raised portion of the cam 19 comes into contact with the portion 32 of the member 31 to pivot the member 31 in a clockwise direction to close the contact carried on its lower end on the contact 30. This establishes a circuit through the motor 11 to energize the same. The circuit may be traced from the line L_2, conductor 59, safety pressure switch 58, conductor 51, contact 40, pivoted member 41, conductor 50, pivoted member 31, contact 30 to one side of the fuel supply motor 11. The other side of the fuel supply motor 11 is connected to the line L_1 by means of the conductor 52.

When the oil spray comes into contact with the electrodes 12 the spray will usually ignite to cause a flame. If flame is established the flame detector 14 responds to the heat thereof and opens, thus opening one of the parallel circuits to the synchronous motor 15. As the cam shaft continues to rotate the portion 35 of pivoted member 34 reaches the end of the first raised portion of cam 20 and due to its bias will move with a snap action in a counterclockwise direction. This opens the circuit to the transformer 13 and to the synchronous motor 15 thus preventing further rotation of the cam shaft 18. However, due to the overlapping action of the cams, the pivoted member 31 which controls the circuit to the fuel supply motor is still retained in a closed position by means of the cam 19 since the design of the cam is such that the portion 32 of the member 31 remains in contact with a raised portion of the cam 19. Thus the ignition and synchronous motor circuits are deenergized while the fuel supply motor circuit is maintained energized to supply fuel to the firebox of the furnace 10.

If, however, flame is not established upon the initial trial the synchronous motor circuit remains energized because the parallel circuit through the flame detector 14 remains closed thus completing a circuit through the synchronous motor although the pivoted member 34 has now moved to an open position. As the cam shaft continues to rotate, the portion 32 of the pivoted member 31 drops off the raised portion of the cam 19 and due to its bias is moved to an open position thus deenergizing the fuel supply motor circuit. Since the synchronous motor is still energized the cam shaft continues to rotate and the second raised portion on the cam 20 contacts with the portion 35 to again close the ignition circuit and the parallel circuit to the timing motor. The fuel supply motor cam 19 then causes the fuel supply motor circuit to be reenergized and the cycle is repeated for several such attempts, the number of the attempts being governed by the design of the cams. If no flame is established during one of these attempts the pin 44 carried by the cam 19 which will have rotated to such a position as to contact with the latch member 43, will raise this latch member and permit the bias of the pivoted member 41 to move this member in a clockwise direction to open the circuit at the contact 40. This causes a complete deenergization of the entire apparatus and the apparatus will not again function until the pivoted member 41 has been closed on the contact 40 by means of the manual reset button 42.

If for any reason the flame should become extinguished before the room thermostat responds to the heating conditions to cause a deenergization of the control apparatus the flame detector 14 upon again closing after cooling causes the synchronous motor 15 to be reenergized. As has been pointed out, since the motor contact is in the closed position fuel will be momentarily supplied to the firebox of the furnace. However, no flame will be established since the ignition system is deenergized. As the cam shaft is rotated the portion 32 which is cooperating with the cam 19 drops off the raised portion shortly after the synchronous motor 15 has been reenergized and causes the fuel supply motor 11 to be deenergized. A short period is then provided for scavenging any oil vapors or gases which may be present in the firebox of the furnace. As the cam shaft continues to rotate the recycling operations as set forth above are continued to reestablish a flame in the firebox of the furnace 10. If the flame had been previously established on the last step of the cycle the device would trip out thus calling for a manual resetting.

After the flame has been reestablished and the heating conditions have reached the desired temperatures the room thermostat 24 will respond to close the right-hand contact H thereof. This short circuits the secondary of the transformer 25 which causes a deenergization of the electro-responsive coil 22. This permits the frame 21 to return to its open position to deenergize the fuel supply motor. The ignition system has been previously deenergized. This condition is maintained until the room thermostat 24 again calls for heat. The timing motor becomes energized again upon closing of the flame detector.

If for any reason excessive boiler pressures should develop during operation at the burner, the pressure safety switch 58 will open thereby opening the circuit to one side of the line L_2 and thus deenergize the system and prevent its further operation until normal boiler pressure is reached, when the switch 58 again closes.

In Fig. 2 is shown a modification of my control device. This form of my device is a still further simplified mechanism which does not provide for a scavenging period in case of flame failure. In some installations such a scavenging period is not deemed necessary and the modification shown in Fig. 2 has been designed to provide a control of a most simply designed construction.

The furnace 60 is provided with the electrically driven oil burner mechanism 61 and the elec-

trodes 62 for igniting the oil spray. 64 is a flame detector for detecting the presence of flame to control the apparatus as will be described later. The transformer 63 furnishes the energy for the ignition electrodes 62.

The synchronous timing motor 65 is energized when the frame 81 is in an operative position and when there is no flame. The pinion 66 driven thereby cooperates with the gear 67 carried upon the arm 67' supported by the pivoted frame 81. The gear 67 is attached to the cam shaft 68 upon which is supported the cam 69. A spring 68' returns the cam shaft to initial position when the frame moves to its open position during operation.

The cam 69 cooperates with the portion 72 of the pivoted member 71 which controls the circuit to the fuel supply motor 61 by opening and closing the contacts 71' and 70 when the pivoted member is actuated by the cam 69 during operation of the control mechanism. The pivoted member 71 is biased to an open position. The pivoted member 74 forms part of the "lockout" mechanism and is normally closed upon the contact 73 which is connected to one side of the line L_4 by means of conductor 94, pressure safety switch 95 and conductor 96. A latch member 75 normally maintains the pivoted member 74 in its closed position. The pin 75' carried by cam 69 cooperates with the latch member 75 in case of the oil failing to ignite the trip the latch to permit the pivoted member 74 to open the contacts. The member 74 is biased to open when the latch is tripped. The pivoted member 74 after it has been released may be manually reset to close the contacts by pushing in on the button 76 to rotate the member 74 in a counterclockwise direction.

The transformer 89 furnishes the energy necessary to operate the closing coil 86 which initiates operation of the control apparatus by moving the frame 81 to closed position. The current from the transformer 89 is rectified by means of the rectifier 87. When the coil 86 is energized by the operation of the thermostat 88 it attracts the armature 85 of the frame member 81 to move this frame member to its operating position. A stop 85' is provided for the armature 85 in its deenergized position.

Carried upon the frame member by means of the arms 80 and 82 are the bridging members 79 and 82'. The bridging member 79 cooperates with the contacts 77 and 78 to connect the flame detector 64 to one side of the line as will be described later. The bridging member 82' cooperates with the contacts 83 and 84 to short circuit the thermostat blade and to maintain the circuit through the rectifier 87 energized when the thermostat blade is in a neutral position.

The operation of the device is as follows: Assume the apparatus to be in the position shown in Fig. 2, when the room thermostat 88 closes upon its left-hand contact C as shown, energy is supplied from the secondary of the transformer 89 to the rectifier 87 which in turn furnishes current for the starting coil 86. The circuit of the primary of the transformer which is normally energized may be traced from line L_3 through the transformer, conductor 90, pivoted member 74, contact 73, conductor 94, pressure safety switch 95, conductor 96 to the other side of the line L_4.

When the starting coil 86 is energized the armature 85 is attracted thereto thus moving the frame member 81 in a clockwise direction to cause meshing of the pinion 66 and gear 67. At the same time the bridging members 79 and 82' bridge the contacts 77 and 78, 83 and 84 thereby completing a circuit through the ignition transformer 63 and the synchronous driving control motor 65, and shorting the blade of the thermostat 88. The circuit to the control motor may be traced from one side of the line L_4, conductor 96, pressure safety switch 95, conductor 94, to contact 73, through pivoted member 74, conductor 90, contact 77, bridging member 79, contact 78, through the flame detector 64, conductor 91, to one side of the motor 65 and from the other side of the motor through the conductor 92 to the other side of the line L_3.

The circuit through the ignition transformer may be traced from one side of the line L_4, conductor 96, pressure safety switch 95, conductor 94, contact 73, pivoted member 74, conductor 90, contact 77, bridging member 79, contact 78, through the flame detector 64, conductor 93, to one side of the transformer 63 and from the other side of the transformer through conductor 92 to the other side of the line L_3.

The circuits to the ignition transformer and the synchronous motor being thus completed the transformer 63 is energized to cause sparking at the electrodes 62. The synchronous motor 65 being energized causes rotation of the cam 69. A brief period elapses before the cam 69 contacts with the portion 72 of the pivoted member 71 to actuate the same to close the contacts 71' and 70 to energize the fuel supply motor 61. Upon closing of the contacts 70 and 71' the fuel supply motor is energized to furnish a spray of oil to the firebox of the furnace.

The circuit through this fuel supply motor may be traced from one side of the line L_4, conductor 96, pressure safety switch 95, conductor 94, contact 73, pivoted member 74, conductor 94, pivoted member 71, contacts 71' and 70 to one side of the fuel supply motor 61 and from the other side of the fuel supply motor 61 through the conductor 92 to the line L_3.

When the oil spray comes in contact with the electrodes ignition will normally take place and the flame will be established. The flame detector 64 in response to the heat of the flame opens the circuit to the ignition transformer and synchronous motor 65 thus deenergizing the transformer and motor. Since the coil 86 remains energized until the room thermostat 88 closes upon the right-hand contact to short the primary of the transformer and since cam 69 maintains the contacts 70 and 71' closed the fuel supply motor 61 will remain energized until sufficient heat has been generated to cause the room thermostat 88 to respond to the heating conditions. When these conditions have been established the room thermostat 88 moves to close the right-hand contact H thus shorting the secondary of the transformer 89. This deenergizes the starting coil 86 and permits the frame to open to its initial position to deenergize the apparatus. The control apparatus is then in a position to again cause operation of the fuel supply motor when the thermostat 88 again calls for heat.

If the flame for any reason should go out just after the flame detector has opened in response to initiation of heating conditions, upon cooling of the flame detector the synchronous motor 65 and the ignition transformer 63 will again be energized to reestablish heating conditions.

If flame is not established upon initial trial, the cam 69 continues to rotate so that the portion 72 of the pivoted member 71 will drop into

the first depression in the cam member thus opening the contacts 71' and 70 to deenergize the fuel supply motor. A brief interval is provided for scavenging the furnace the natural draft of the furnace acting to draw off any oil vapors. A second raised portion on the cam then cooperates with the pivoted member 71 to reenergize the fuel supply motor to present a second attempt to establish heating conditions. The cam may be so designed as to present several such opportunities to establish flame. In the event that flame is not established after a predetermined number of trials the cam member will have rotated to such a position that the pin 75' carried thereon will cooperate with the latch member 75 to raise the same. When this takes place the bias upon the pivoted member 74 causes rotation thereof in a clockwise direction to open the circuit to one side of the line at the contact 73 thus deenergizing the entire apparatus. Operating conditions cannot be again established until the apparatus is manually reset by operating the push button 76 to reestablish connections to the supply lines L_3 and L_4.

Excessive boiler pressures, if developed, will open the pressure safety switch 95. This opens the circuit to one side of the line and thus deenergizes the apparatus. When normal boiler pressure returns the switch 95 again closes to permit operation of the apparatus.

It will thus be seen that I have provided an improved and simplified automatic control apparatus for an oil burner.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use, and I, therefore, aim to cover by the appended claims all of the modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A heating system including an electrically operated combustion heating device, a thermostat movable between two positions, an electric timing motor operable under the control of the thermostat, a movable member adapted to be actuated by said motor through a series of positions in timed sequence, electro-magnetic means for controlling operation of said movable member by said timing motor and energized when said thermostat moves to one of said positions, circuit controlling means for the heating device operated by said member in each of said series of positions to energize said heating device for initiating combustion conditions, and means responsive to the establishment of combustion for deenergizing the timing motor with said member in one of said series of positions to maintain combustion established, said thermostat moving to said other position to short-circuit said electro-magnetic means to cause deenergization of said electrically operated heating device.

2. A control for a heating system including an electrically driven heating means, a device for intermittently energizing said heating means to initiate heating conditions, electrical timing means adapted to operatively engage said intermittent device, a thermostatically controlled electroresponsive device for controlling the operative engagement between said electrical timing means and said intermittent energizing device, and means responsive to heating conditions for deenergizing said electrical timing means with said intermittent energizing device in energizing position to maintain said heating means energized.

3. A control device for an oil burner including, a circuit making and breaking device for intermittently energizing the oil burner, an electrical ignition device therefor, a timing motor, a movable frame carrying means adapted to be driven by said timing motor to operate said circuit making and breaking device, a thermostatically controlled electro-responsive device for moving said frame to establish driving connections between said timing motor and said circuit making and breaking operating means, and means for energizing said ignition system, and a heat responsive means for deenergizing said ignition system and said timing motor during a period of energization of said burner to maintain said burner energized when flame is established.

4. A heating system including, an electrically driven heating device, means for intermittently energizing said electrically driven heating device, ignition means cooperating therewith for initiating heating conditions, timing means adapted to have an operative connection with said intermittent energizing means, an electroresponsive means for establishing said operative connection, means operative as a result of failure of the establishment of heating conditions after a predetermined number of intermittent operations of said heating device for rendering said connections inoperative, and a heat responsive device cooperating with said timing means and said ignition means for deenergizing said ignition means and said timing means with said intermittent energizing means in energizing positions to maintain heating conditions upon establishing the same.

5. A control for an electrically driven oil burner including, an ignition device therefor, an intermittent circuit making and breaking device, an electric timing motor adapted to operate said intermittent circuit making and breaking device, said device comprising circuit controlling means movable between open and closed position, said means controlling circuits to said electrically driven oil-burner, ignition means and timing motor, means for controlling operation of said circuit making and breaking device by said timing motor, a thermostat movable between two positions, an electro-magnetic device controlled thereby for operating said controlling means for said timing motor when said thermostat moves to one of said positions to energize said electroresponsive device, a second circuit to said timing motor to energize said motor independently of said first circuit thereto and a heat responsive device for controlling said last circuit for opening the circuit when flame is established to cause said timing motor to become deenergized when said ignition and timing motor controlling means is opened and while said electrically driven oil burner is energized whereby the oil burner will remain energized, said thermostat moving to said other position to short said electro-magnetic means to cause deenergization of said oil burner.

6. A control device for a heating system, including an electrically operated combustion heating device, an electric ignition system therefor, a thermostat movable between two positions, an electric timing motor, a movable member adapted to be actuated by said timing motor through a series of positions in timed sequence, electromagnetic means controlled by said thermostat when said thermostat moves to one of said posi-

tions for rendering said timing motor effective to actuate said movable member, separate circuit controlling means for the heating device and for the ignition system operated by said movable member in overlapping periods during operation of said member through said series of positions for repeatedly initiating combustion conditions, and means responsive to the establishment of combustion for deenergizing the timing motor with said member in position to deenergize the ignition system and maintain combustion established, said thermostat moving to the other position to short-circuit said electro-magnetic means to deenergize said heating device to stop combustion.

7. An oil burner control including, an electrically driven fuel supply device, an ignition system therefor, a timing motor, a plurality of cam actuated circuit controlling members for said fuel supply device, ignition system and timing means, a movable shaft having cams mounted thereon movable through a series of positions in timed sequence for intermittently actuating said circuit controlling members to initiate heating conditions, said shaft being adapted to have an operative connection with said timing means to be driven thereby, electroresponsive means to move said shaft and cams to an operating position to initiate heating conditions, means cooperating with one of said circuit controlling members and responsive to the establishment of combustion conditions for deenergizing said timing means with said cams in one of said series of positions to maintain said electrically driven fuel supply device energized.

8. A control for an oil burner including, a circuit making and breaking device operable through a series of positions in timed sequence for intermittently opening and closing circuits to said burner to initiate heating conditions, a timing means for said circuit making and breaking device, a thermostat movable between two positions, means for providing a circuit to said timing means to energize the same, electro-responsive means controlled by said thermostat to operate said circuit providing means when said thermostat moves to one of said positions to energize said electro-responsive means, means operated by said electro-responsive means for shunting said thermostat when said thermostat has moved to said one position, whereby said electro-responsive means will remain energized when said thermostat moves to a position intermediate said two positions, a heat responsive means for controlling said circuit to said timing means to continuously energize the same in the absence of heating conditions and to open said circuit in the presence of heating conditions to cause said timing means to stop in a predetermined one of said series of positions with said burner energized to maintain heating conditions, said thermostat moving to said other position to stop said burner.

9. A control device for an electrically operated combustion heating device including, an ignition system therefor, a thermostat, an electric timing motor, a movable member adapted to be operated by said motor through a series of positions in timed sequence, a circuit controlling member for closing a circuit to said ignition means, an electroresponsive means operable under the control of said thermostat for closing said ignition circuit controlling member and for establishing an operative connection between said timing motor and said movable member, circuit controlling means for the heating device operated by said movable member in each of said series of positions for initiating combustion conditions, and means responsive to the establishment of combustion for opening the circuit to said ignition system and deenergizing the timing motor with said member in one of said series of positions to maintain combustion established.

GEORGE R. TOWNSEND.