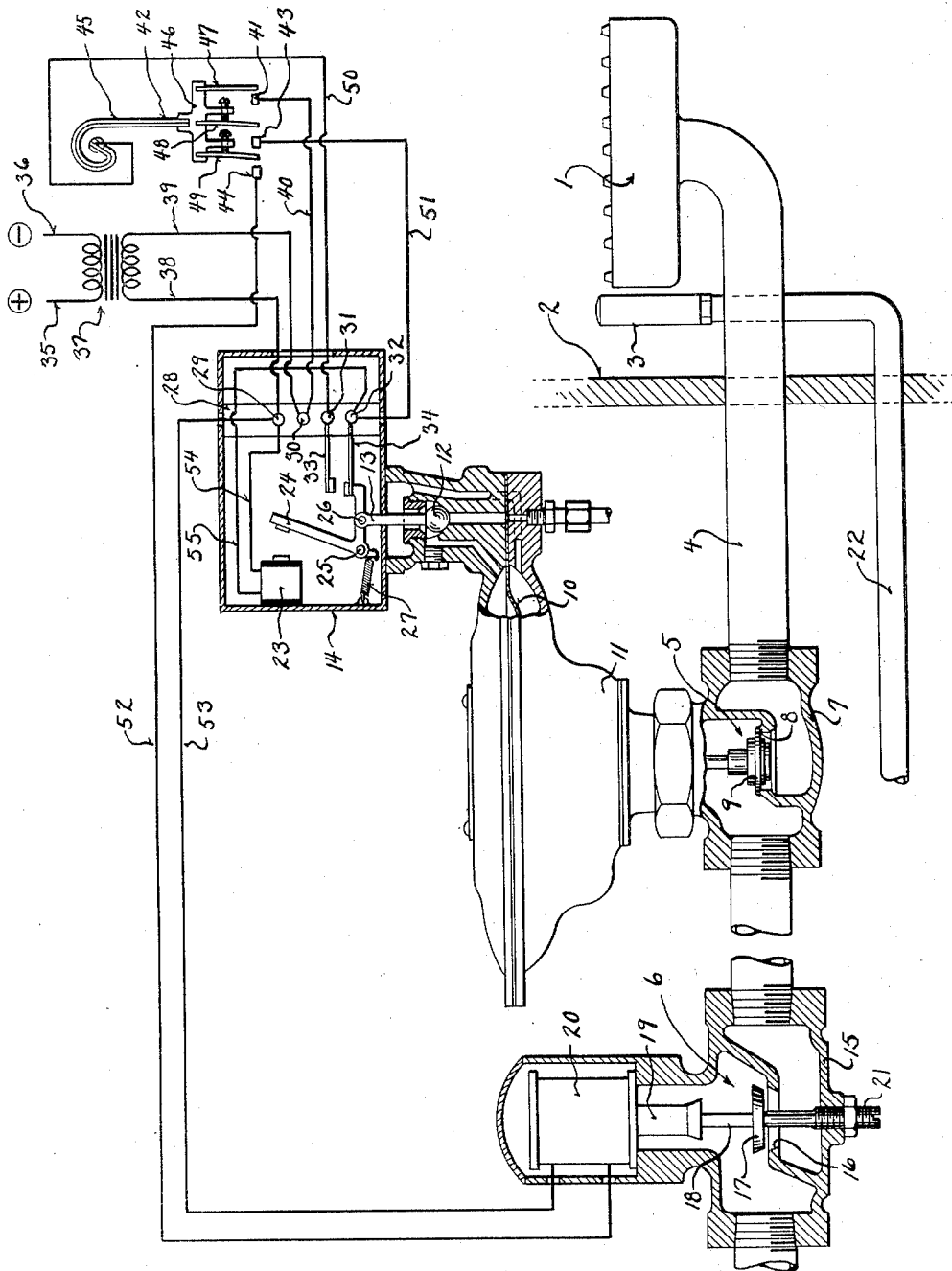


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S. V. BORST
HEAT CONTROLLING SYSTEM

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HEAT CONTROLLING SYSTEM

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1 Claim. (Cl. 236—1)

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This invention appertains to furnaces and boilers and more particularly to a novel control for the heating systems of buildings.

The primary object of my invention is to provide a simple means for maintaining a constant desired temperature in a home or other building, irrespective of outside temperature, through the use of a room thermostat arranged in a novel manner with the controls of a conventional heating system.

Another salient object of my invention is to provide novel means for holding the main valve of a gas burner for a domestic heating system open to its full extent, and for controlling the flow of a limited quantity of gas thereto through the use of a secondary valve, so that the burner will be maintained on a low flame to supply sufficient heat to the building to compensate for the heat loss of the building.

Another important object of my invention is to provide novel means incorporated with the room thermostat and operating in conjunction with a secondary control valve for maintaining a circuit closed through the operating mechanism of the main valve for holding said main valve open, after the building no longer calls for heat, so that a limited supply of gas can flow through the main valve for maintaining the burner on an extreme low flame to compensate for the heat loss of a building.

Another further important object of my invention is to provide means controlled by the room thermostat for entirely shutting off the main supply valve for the burner, should the temperature in the building rise above an undesired degree.

A still further object of my invention is to provide a control of the above character which will be extremely simple and durable in construction, one that will be easy and inexpensive to construct and one which can be incorporated in the standard controls for a gas burner at a low cost.

With these and other objects in view the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described, claimed, and illustrated in the accompanying drawing, in which

The figure is a diagrammatic view illustrating my novel arrangement of circuits and room thermostat in a conventional gas heating system for maintaining an even constant temperature in a building.

Referring to the drawing, the numeral 1 indi-

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cates a gas burner for a furnace or a domestic heating system 2. The burner 1 is provided with a pilot burner 3 disposed in relative close proximity thereto. The burner 1 is supplied with illuminating gas through a supply line 4 and the flow of gas through the line 4 is controlled by a main supply valve 5 and a secondary or by-pass valve 6.

The elements, so far described, are all of a standard type now found in the open market and will not be described in minute detail.

It is to be noted, however, that the valve 5 is of the type commonly known as an electric diaphragm gas valve and can be considered as the same valve No. V117, manufactured by the Minneapolis-Honeywell Regulator Company, of Minneapolis, Minnesota. The valve 5 includes a casing 7 having a valve seat 8 for the valve body 9. The valve body 9 is operated from a diaphragm 10, enclosed in a housing 11. Movement of the diaphragm for opening and closing the valve body 9 is controlled by a ball valve 12, the stem 13 of which slidably extends through a casing 14. The casing 14 encloses certain electrical mechanism which will be later described. When the valve 12 is moved to an open position by this electrical mechanism, the valve body 9 is moved off of its seat and when the valve 12 is closed the valve body 9 is moved on its seat.

The valve 6 also controls the flow of gas through the line 4 and the same includes a valve casing 15 having a valve seat 16. Movable on and off of the seat is a valve body 17. This valve 6 is supplied with gas from any suitable source of supply. Connected with stem 18 of the valve body 17 is the movable core 19 of an electric solenoid 20. When the solenoid 20 is energized the valve body 17 is raised from off of its seat and free flow of gas through the valve is permitted and such gas will flow in full volume to the main valve 5. The low end of the valve casing 15 carries an adjustable rod 21 and this rod is so positioned as to normally hold the valve body 17 in a raised position slightly off of its seat so that a limited quantity of gas will flow at all times through the valve casing 15.

The pilot burner 3 is connected by a pipe 22 to a suitable source of gas supply to maintain the pilot lit at all times.

Now referring to the electrical mechanism within the box 14, it will be noted that the same includes an electromagnet 23 utilized for attracting an armature 24. This armature is in the nature of a bell crank 24 and the bell crank is pivoted at its angle, as at 25 within the box 14.

The stem 13 of the ball valve 12 is pivotally connected as at 26 to the lower leg of the bell crank shaped armature 24. When the electromagnet 23 is de-energized the armature 24 can be normally held away from the same by a spring 27.

Also located within the box 14 is a terminal block 28 formed of insulation and this block 28 carries spaced terminals 29, 30, 31 and 32. The terminals 31 and 32 carry and have electrically connected therewith contact blades 33 and 34 and these blades are normally held out of contact with one another through their inherent resiliency. The lower leg of the bell crank shaped armature 24 engages the blade 34 and when the armature is attracted by the electromagnet 23, the blade 34 is moved into electric contact with the blade 33.

Current is supplied to the electric system from any suitable source, to wires 35 and 36 and these wires lead to a transformer 37. Leading from the output coil of the transformer are lead and return wires 38 and 39. The transformer 37 is utilized for reducing the voltage to the solenoid 20 and the electromagnet 23. The lead wire 38 is electrically connected to the terminal 29 and the return wire 39 is electrically connected to the terminal 30. A branch return wire 40 is also electrically connected to the terminal 30 and this wire is electrically connected to a contact 41 which constitutes a part of a room thermostat 42.

The room thermostat 42 also includes contacts 43 and 44, the purpose of which will later appear. The room thermostat 42 is also of a standard make now found on the open market and includes a bi-metallic arm 45. Connected with the arm 45 is a head 46 carrying spaced contact blades 47, 48 and 49. The blades are of a resilient nature and means is provided for initially adjusting or setting the position thereof. It is to be noted that the blades 47, 48 and 49 and the contacts 41, 43 and 44 are spaced different distances apart so that upon movement of the head 46 to the left the blade 47 will engage contact 41 after which the blade 49 will engage contact 44 and finally blade 48 will engage contact 43. Electrically connected with the arm 45 is a wire 50 and this wire is electrically connected with terminal 31. Electrically connected with terminal 32 is a wire 51 which is in electrical connection with contact 43. Leading from contact 44 is an electric conducting wire 52 and this wire returns to one terminal of the solenoid 20, the other terminal of the solenoid 20 has electrically connected therewith a return wire 53 which is electrically connected with terminal 29. This terminal 29 also has electrically connected therewith a wire 54 which is electrically connected with one terminal of the electromagnet 23. The other terminal of the electromagnet has electrically connected therewith a wire 55 which leads to and is electrically connected with terminal 32.

The room thermostat 42 is, of course, positioned within the upper part of a home or building at a desired place.

In operation of my improved controls and considering that the room thermostat is calling for heat and that the burner 1 is out, then the arm 45 of the thermostat moves to the left and the blade 47 will engage contact 41. This blade and the thermostat is then electrically connected with the branch return wire 40 and the main return wire 39. Upon continued movement of the head 46 to the left the blade 49 will engage con-

tact 44 and flow of current will be established through the solenoid 20. The supplemental or by-pass valve 6 will then be open to its full extent and current flow is as follows: from wire 38 through terminal 29 through wire 53, through solenoid 20, through wire 52, through contact 44, blade 49, head 46, blade 47, contact 41, through wires 40 and 39. Upon continued movement of the head 46 to the left the blade 48 will engage contact 43 and the electromagnet 23 will be energized. The armature 24 will be drawn over and the ball valve 12 will be raised. This will permit the opening of the main valve 5 and the burner 1 will be lit by the pilot 3. When blade 48 engages contact 43 current flow is as follows: through wire 38 to terminal 29, through wire 54, through electromagnet 23, through wire 51, contact 43, blade 48, head 46, blade 47, contact 41, through return wires 40 and 39. At this time the armature 24 will bring blade 34 into electrical contact with blade 33 and this constitutes a part of a circuit to maintain the electromagnet 23 energized so that the main valve 5 will be held open.

As the house becomes heated and the desired degree is reached, the arm 45 moves to the right. The salient feature of the invention is to provide means for maintaining the main valve 5 open and the secondary valve 6 in a partly closed position after the thermostat no longer calls for heat so that the burner 1 can be maintained on a low flame and thereby compensate for a heat loss in the building. By doing this, the temperature can be maintained at any desired degree of heat.

When the head 46 of the room thermostat moves to the right the blade 48 disengages first from its contact 43 and both the main and secondary valves 5 and 6 are held open. Upon continued movement of the arm 45 to the right the blade 49 will move away from its contact 44 and consequently the circuit through the solenoid 20 will be broken and the valve body 17 of the secondary valve 6 will drop under its own weight against the adjustable stem 21. This stem will hold the secondary valve open a desired slight distance and the burner will be maintained upon low flame; due to the fact that the main valve 5 is held open by the engagement of the hold over contact blades 33 and 34. It can be seen that current flow in this instance is as follows: through wires 38 and 54, through electromagnet 23, through wire 55, to terminal 32, through blades 34 and 33, through wire 50, arm 45, head 46, blade 47 and contact 41 back through return wires 40 and 39. If the temperature of a building continues to rise above the desired degree, then the head 46 of the thermostat 42 will continue to move to the right and blade 47 will be carried away from its contact 41. Consequently the circuit will be broken through the electromagnet 23 and the armature 24 will be pulled away from the magnet by the spring 27. The hold over blade 34 will move away from and out of electric contact with the blade 33. The main valve 5 will now move to its closed position and the burner 1 will be extinguished.

When the building calls for heat, the arm 45 will move to the left and the circuits will be closed as previously described.

Changes in details may be made without departing from the spirit or the scope of my invention, but what I claim as new is:

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The combination with a heating system including a burner, a pipe for supplying fuel to the burner, a main and secondary valve for controlling the flow of fuel through the pipe, said valves being normally movable toward a closed position, adjustable means for holding the secondary valve in a partially opened position, electric means including a solenoid for moving the secondary valve to a fully opened position, electric means for opening the main valve including an electromagnet, an armature adapted to be attracted by said magnet, hold over contacts normally spaced but movable into electrical contact upon movement of the armature toward its electromagnet, a room thermostat including a bi-metallic arm effected by change in temperatures, a head movable with the arm, stationary contacts unequally spaced and contact blades carried by the head movable toward and away from the contacts with said head, feed and return wires, the feed wire being connected to one terminal of the magnet and return wire being electrically connected to one contact of the room thermostat, means electrically connecting the other terminal of the electro-magnet to one hold over contact, the other hold over contact being electrically connected with the arm of the thermostat, said first mentioned hold over contact being electrically connected with an intermediate

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contact of the thermostat, and another of said thermostat contacts being electrically connected with one terminal of the solenoid to the feed wire, the thermostat being set whereby when heat is being called for a blade will first engage the contact for the wire leading to the solenoid and upon further movement a blade will engage the intermediate contact so that the solenoid will be first energized to open the secondary valve and then the electromagnet will be energized to open the main valve and whereby upon movement of the thermostat arm and head in an opposite direction the circuit to the solenoid will be first broken and the circuit to the electromagnet will be finally broken.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,048,162	Kriechbaum	July 21, 1936
2,139,344	Andersen	Dec. 6, 1938
2,164,511	Furlong	July 4, 1939
2,184,982	Tornquist	Dec. 26, 1939
2,329,636	McGrath	Sept. 14, 1943
2,335,071	Lynch	Nov. 23, 1943