

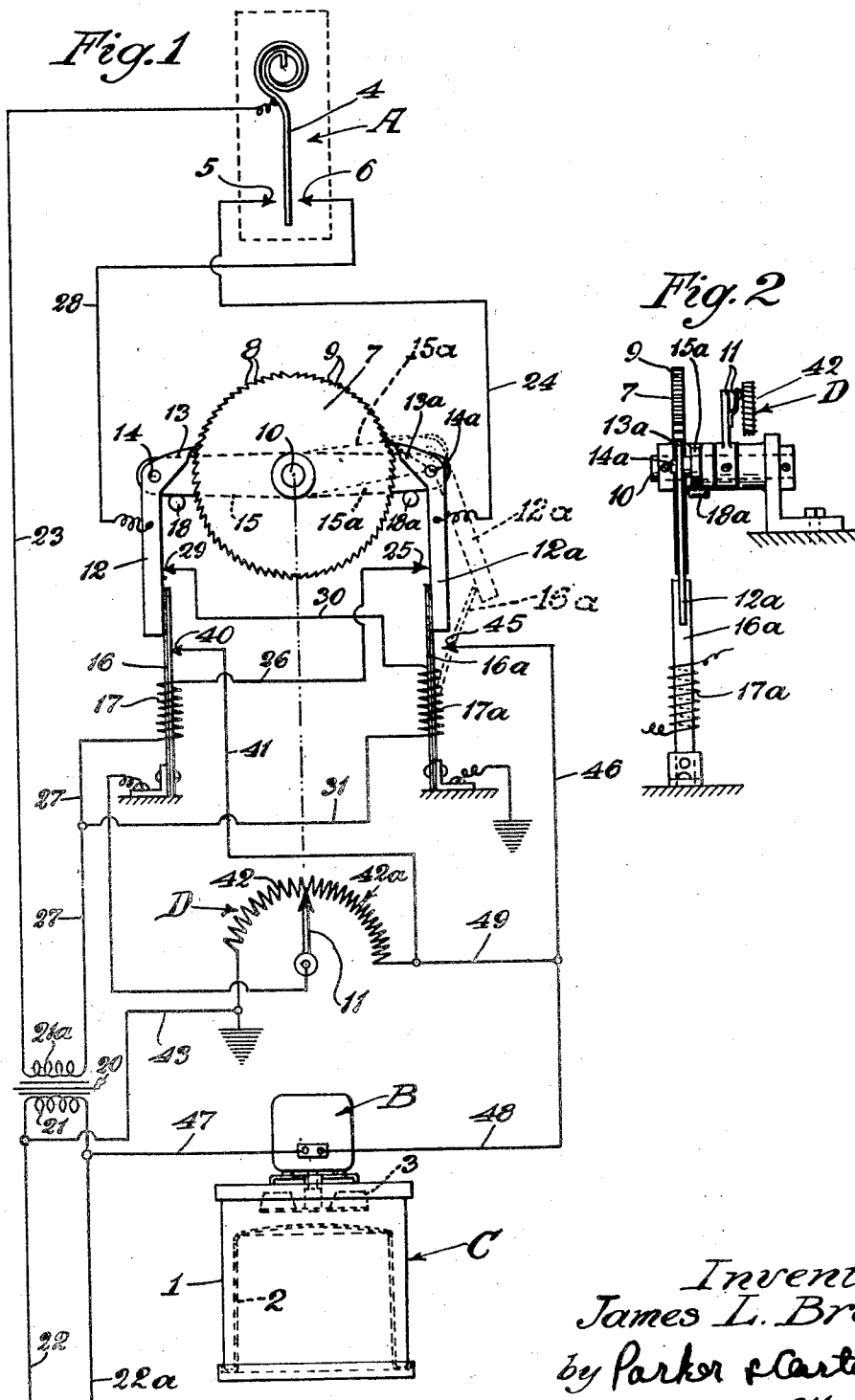
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**J. L. BREESE.**

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# TEMPERATURE RESPONSIVE MOTOR CONTROL SYSTEM

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## UNITED STATES PATENT OFFICE

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TEMPERATURE RESPONSIVE MOTOR  
CONTROL SYSTEMJames L. Breese, Santa Fe, N. Mex., assignor, by  
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8 Claims. (Cl. 318-334)

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My invention relates to an improvement in control means.

One purpose is to provide a modulating control adapted for use for example in controlling temperatures of heated spaces.

Another purpose is to provide a control system for remote control of elements, such as burners, in response to temperature fluctuations either within the house or outside of the house.

Another purpose is to provide a modulating control for burners and the like.

Other purposes will appear from time to time in the course of the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings wherein:

Figure 1 is a diagrammatic and schematic layout of a house heating and thermostatic control system; and

Figure 2 is a side elevation.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to Figure 1 it illustrates a two contact thermostat, generally illustrated at A, which may respond, for example, to fluctuations in temperature of a space to be heated. B generally indicates a booster motor for a pot type burner generally indicated at C. D generally indicates a rheostat for controlling the motor B. While my invention may be applied to a wide variety of heating structures, I show it, illustratively, in connection with a pot type burner having an outer housing 1 and a burner pot 2 the circumferential wall of which is foraminous, whereby air admitted to the space between the members 1 and 2 is delivered to the interior of the pot 2 for mixture with vaporized fuel therein. As the burner does not of itself form part of the present invention it is not illustrated in detail. It will be understood, however, that a booster motor B rotates a fan 3 which is adapted to increase the air supply to the burner.

A purpose of the structure as shown in Figure 1 is to provide means for controlling the top speed of the motor B in such fashion that when the house tends to be overheated the rheostat D is downwardly adjusted, and when the house tends to be underheated the rheostat D is upwardly adjusted, so far as its ensuing effect on the speed of rotation of the motor B is concerned. Thus the system tends to hunt for a proper adjustment for steady operation.

Referring to the drawings, I illustrate a thermostat A having a temperature responsive leaf 4 which may flex in one direction to engage the

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fixed contact 5 and may flex in the opposite direction to engage the fixed contact 6. 7 is a ratchet wheel having two sets of teeth 8, 9 which are oppositely faced. It is rotatable around a center 10 and rotates, in unison with it, the rheostat arm 11. The wheel 7 and the rheostat arm 11 are shown at separate points in the diagram, but will be understood to be mounted on a common shaft as illustrated in Figure 2 or to have some suitable means for causing their unitary movement.

Opposed to each set of teeth 8, 9 is a pawl including an arm 12 or 12a and a tooth 13, or 13a. Each such pawl is pivoted as at 14 or 14a on an actuating arm 15 or 15a mounted for movement about the center 10. Each pawl 12, 12a is opposed to a warping bar or bimetallic leaf 16 or 16a. Each warping bar has a resistance 17 or 17a. A stop 18 or 18a limits the downward movement of the arms 15, 15a. 20 indicates any suitable transformer having a primary coil 21 in circuit with line connections 22, 22a and a secondary coil 21a. A conductor 23 extends from the secondary 21a to the thermostatic leaf 4. A conductor 24 extends from the fixed contact 5 of the thermostat to the pawl arm 12a. When the pawl is in the position in full line as shown in Figure 1 the arm 12a engages a fixed contact 25 of the conductor 26, whereby current may be delivered to the coil 17 of the warping bar 16. The circuit may be completed by the conductor 27 extending to the secondary coil 21a. 28 is a conductor extending from the fixed contact 6 to the pawl portion 12. When the pawl portion 12 is in the position shown in Figure 1 it engages the fixed contact 29 of the conductor 30 which is in circuit with the resistance 17a of the warping bar 16a which is connected by the conductor 31 to the secondary coil 21a through the conductor 27.

The warping bar 16, when in the cold position in which it is shown in Figure 1, engages the fixed contact 40 of the conductor 41 which extends to the resistance 42 of the rheostat D. Thence the conductor 43 connects to the line 22. When the warping bar 16a is in its warped or dotted line position as shown in Figure 1 it engages the fixed contact 45 of the conductor 46. The booster motor B receives current through a circuit which extends from the line 22a through the conductor 47, the conductor 48 and the conductor 49. As will appear later, under some circumstances the entire resistance coil 42 is in circuit with the motor, under other circumstances only part of it, under other circumstances it is entirely shorted out.

Referring now to the actual operation of the device, assume that in response to a predetermined temperature drop the thermostat leaf 4 flexes to the left, referring to the position of the parts as shown in Figure 1 and engages the fixed contact 5. Current then flows through the conductor pawl 12a, contact 25, conductor 26 and resistance 17. The warping leaf 16 will then warp to the left and will first rotate the pawl tooth 13 about its center 14 until it engages a tooth of the ratchet wheel 7. Continuing warping of the leaf will rotate the bar 15 about the center 10 and will cause a predetermined clockwise rotation of the ratchet wheel 7 which, for convenience, may be for the length of one tooth. At the same time the rheostat arm 11 will be moved a corresponding distance along the resistance 42. The movement of the warping bar 16 breaks the circuit with the fixed contact 40 and cuts in the entire resistance coil 42, slowing the booster motor. It will be understood that when the bimetal 16 engages the contact 40 only part of the resistance 42 is effective. At the same time the movement of the pawl member 12 from the fixed contact 25 opens the opposite thermostatic circuit, to prevent jamming, and energization of the resistance 17a by manual movement of the leaf 4 is rendered impossible.

When the house is satisfied as to heat, and cools to the point where the thermostatic leaf 4 takes up an intermediate position, the pawl 12, 13 returns to its initial position, but the rheostat arm 11 is left in its new position. The booster circuit is again closed by contact between the leaf 16 and the fixed contact 40 and current again passes through the rheostat arm 11 and the limited and now altered resistance portion 42a. The booster fan thereby increases its rate of rotation over that of the cooling period, but rotates at a rate less than it did before the circuit was initially closed through the fixed contact 5. In other words, the amount of resistance through which the current passes in the rheostat coil 42 is one step more than it was before the starting of the above described cycle.

Assume that house becomes too cold, and that the leaf 4 contacts the opposite fixed thermostat contact 5, the result is to move the ratchet wheel 7 one step counterclockwise, by engaging the pawl 13a with one of the opposed teeth. This carries the rheostat arm 11 to a position which decreases the resistance in the booster circuit motor. During the movement of the ratchet arm 12a the circuit through the rheostat arm 11 is again broken, and current flows directly to the booster with the rheostat coil shorted out. The rheostat and its resistance 42 as a whole are short circuited by the engagement of the warping bar 16a with the fixed contact 45 associated with the conductor 46. Thus the booster circuit is completed through the warping bar 16a to ground.

It will be realized that whereas I have described and shown a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing.

I claim:

1. In a modulating control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm, in said motor

circuit, a thermostat responsive to ambient temperature, including a heat responsive movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member responds to a predetermined drop in temperature and the other when it responds to a predetermined rise in temperature, means for moving the rheostat arm in one direction, in response to contact of said movable member of the thermostat with one said contact, and means for moving said arm in the opposite direction, in response to contact of said movable member with the other said contact, part of the rheostat resistance, and the rheostat arm, being in circuit with the motor when the movable thermostat member is in a position intermediate said two contacts, and means for putting the entire rheostat resistance in circuit with the motor in response to the engagement of one of said contacts by the movable member in response to a rise in temperature.

2. In a modulating control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm, in said motor circuit, a thermostat responsive to ambient temperature, including a heat responsive movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member responds to a predetermined drop in temperature and the other when it responds to a predetermined rise in temperature, means for moving the rheostat arm in one direction, in response to contact of said movable member of the thermostat with one said contact, and means for moving said arm in the opposite direction, in response to contact of said movable member with the other said contact, part of the rheostat resistance, and the rheostat arm, being in circuit with the motor when the movable thermostat member is in a position intermediate said two contacts, and means for eliminating the rheostat resistance from the motor circuit when the movable member engages one of said contacts in response to a drop in temperature.

3. In a modulating control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm, in said motor circuit, a thermostat including a heat responsive movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member responds to a predetermined drop in temperature and the other when it responds to a predetermined rise in temperature, part of the rheostat resistance, and the rheostat arm, being in circuit with the motor when the movable thermostat member is in a position intermediate said two contacts, and means for putting the entire rheostat resistance in circuit with the motor in response to the engagement of one of said contacts by the movable member in response to a rise in temperature, and means for eliminating the rheostat resistance from the motor circuit when the movable member engages the other of said contacts in response to a drop in temperature.

4. In a modulating control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm, in said motor circuit, a thermostat responsive to ambient temperature, including a heat responsive movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member responds to a predetermined drop in temperature and the other when it responds to a predetermined rise in temperature, part of the

rheostat resistance, and the rheostat arm, being in circuit with the motor when the movable thermostat member is in a position intermediate said two contacts, and means for moving said rheostat arm along said rheostat resistance in response to the engagement of either contact by the heat responsive movable member including a ratchet wheel movable in unison with the rheostat arm, and a pair of pawls mounted to move said ratchet wheel in opposite directions, means for actuating one of said pawls in response to the engagement of said movable member with one of said contacts and means for moving the opposite pawl in response to the engagement of said movable member with the other contact.

5. In a modulating control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm, in said motor circuit, a thermostat responsive to ambient temperature, including a heat responsive movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member responds to a predetermined drop in temperature and the other when it responds to a predetermined rise in temperature, part of the rheostat resistance, and the rheostat arm, being in circuit with the motor when the movable thermostat member is in a position intermediate said two contacts, and means for moving said rheostat arm along said rheostat resistance in response to the engagement of either contact by the heat responsive movable member including a ratchet wheel movable in unison with the rheostat arm, and a pair of pawls mounted to move said ratchet wheel in opposite directions, means for actuating one of said pawls in response to the engagement of said movable member with one of said contacts and means for moving the opposite pawl in response to the engagement of said movable member with the other contact, each said moving means including a bimetal member and a resistance in circuit with one of said contacts.

6. In a control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm in said motor circuit, a movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member moves in one direction and the other when it moves in an opposite direction, means for moving the rheostat arm in one direction, in response to contact of the thermostat with one of said contacts, and means for moving said arm in the opposite direction in response to contact of said movable member with the other of said contacts, and means for closing a circuit including said motor, through the rheostat arm and part of the rheostat resistance when the mov-

able member is in an intermediate position out of contact with either of said two contacts.

7. In a control system, a motor and an actuating circuit therefor, a rheostat including a resistance and a rheostat arm in said motor circuit, a movable member and a plurality of contacts adapted to be engaged thereby, one when the movable member moves in one direction and the other when it moves in an opposite direction, means for closing a circuit including said motor, through the rheostat arm and part of the rheostat resistance when the movable member is in an intermediate position out of contact with either of said two contacts, means for eliminating the entire rheostat resistance from the motor circuit when the movable member engages one of said contacts and means for including the entire rheostat resistance in the motor circuit when the movable member engages the other contact.

8. In a control device for electric circuits, a ratchet wheel, a rheostat resistance, a rheostat arm mounted for movement in unison with the ratchet wheel and means for moving said ratchet wheel and rheostat arm in either direction of rotation including a pair of pawls having each an oppositely faced tooth adapted for engagement with opposed teeth of the ratchet wheel, a bimetal associated with each said pawl, a resistance associated with each said bimetal, and means for energizing said resistances one at a time and for thereby causing movement of one said bimetal effective to move the pawl associated therewith and to cause a limited rotation of said ratchet wheel, and a consequent limited movement of said rheostat arm in relation to said rheostat resistances.

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