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THERMOSTATIC DEVICE

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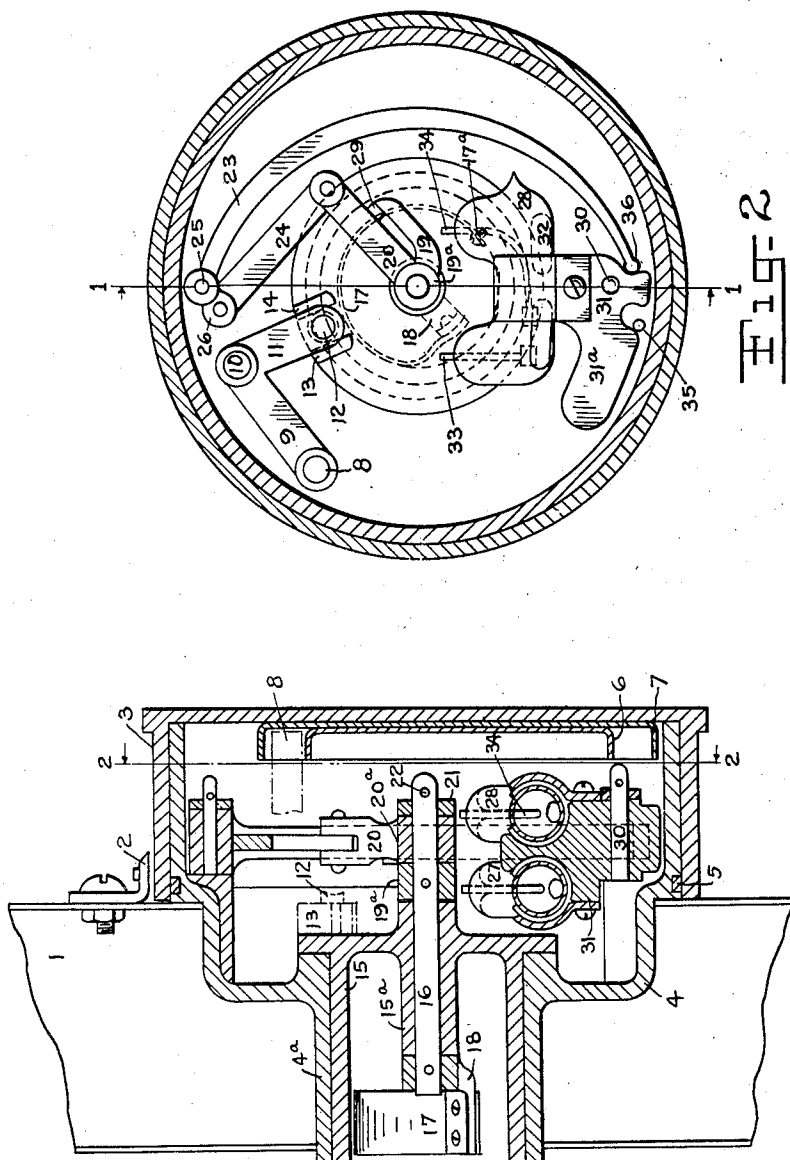


Fig-2

Fig-1

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THERMOSTATIC DEVICE.

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The improvements relate to devices for automatically controlling the temperature of ovens and the like, and primarily ovens arranged to be electrically heated. Their objects are, among others, the provision of a thermostatic control which may be adjusted and set so as to maintain various temperatures by acting upon the heating medium and preventing it from raising the temperature above or permitting it to fall below the predetermined point; to make the mechanism whereby the control is effected accurate and dependable in its operation, and to simplify and generally improve its construction.

The improvements are illustrated in the accompanying drawings, in which Figure 1 is a longitudinal vertical section substantially on the line 1—1 of Fig. 2, looking in the direction of the pointers in that figure, and Fig. 2 is a transverse vertical section substantially on the line 2—2 of Fig. 1, looking in the direction indicated by the pointers in that figure.

In the said drawings 1 represents a portion of the door or wall of an oven or similar chamber, 2 is a pointer fixed thereon and arranged to indicate temperatures, which may be displayed on the rotatable cap 3, 4 is the housing of the thermostat secured in the opening of the wall 1, and having its inwardly extending cylindrical portion 4^a exposed to the heated air of the oven interior. The cap 3 is mounted on the housing 4 by means of a key 5 engaging a suitable annular groove therein.

Fixed on the inside of the cap 3 is a cam device consisting of disks having inturned annular flanges 6 and 7, forming a channel eccentric to the axis on which the cap 3 rotates, so that the pin 8 which extends between the flanges will be moved radially when the disk is rotated.

The pin 8 is carried by one arm 9 of a bell-crank pivoted at 10, and the other arm 11 of this bell-crank has a pin 12 projecting in the opposite direction to that of the pin 8 and extending into the way formed by the parallel ribs 13 and 14 on the bottom or inner surface of the cup-shaped member 15, which is rotatably mounted in the cylindrical portion 4^a of the housing. Within the cup member 15 a thermostatic band 17 is secured, one end of the band being fixed

to the inner wall thereof, as shown at 17^a, and the other to the shaft 16 through an arm 18 projecting from a collar keyed thereon. The shaft extends loosely through the central hub portion 15^a and has a dog 19 keyed thereon near its opposite end by means of a collar 19^a integral with said dog. By these means provision is made for the adjustment of the position of the dog 19, and as this member is operated by the thermostatic band, and in turn operates the circuit breaking mechanism, the degree of expansion of the thermostatic band necessary to break the circuit—and correspondingly the degree of temperature required to do this—can be accurately predetermined.

On the shaft next to the dog 19 an arm 20 is loosely mounted, by means of a hub 20^a, and is held against longitudinal movement thereon by a collar 21 and cotter pin 22. This arm extends radially, and is connected with the curved switch operating arm 23 by a link 24, the former pivoted at 25 and connected with the latter by means of a short arm 26 extending from the pivot 25 and pivotally connected to the said link 24.

The dog 19 has a shoe 29 at its outer end, which engages the arm 20 and moves it counter-clockwise, as illustrated in Fig. 2, when the band 17 has expanded to a sufficient extent to bring the shoe in contact with the arm.

The switch employed comprises vessels 27 and 28 of non-conductive material, pivoted on a spindle 30 through a supporting frame 31 and each having a drop of fluent conductive material 32 in its horizontal bottom. The electric terminals 33 and 34 extend into the vessel and have enlarged contact points in proximity to each other at one end thereof, so that when the fluent conductor is in that end of the vessel it will be in contact with both terminals and will close the circuit, thus energizing the heating coils or the like. The pivoted frame 31 has a weighted extension 31^a on one side of its pivot, which normally holds the vessel slightly canted toward that side and the fluent conductor in circuit-closing position. A stop pin 35 limits the rocking movement of the vessel-supporting frame in both directions. When the thermostatic band has been expanded by the heat in the oven to a sufficient extent to move the dog 19 into contact with

the arm 20, and the temperature continues to rise, the arm 20 is moved and caused to rock the curved arm 23, through the link 24, and press its lower extremity 36 against the frame 31 below its pivot, thus canting the vessel slightly and causing its bottom to incline away from the terminals, and permit the fluent globule 32 to gravitate away from said terminals, thus breaking the circuit. If now the temperature falls below the given point the dog 19 will be withdrawn from the arm 20 and the arm 23 permitted to move to the left (Fig. 2) under the influence of the weighted extension 31^a, so that the vessel is canted in the opposite direction and the fluid moved to circuit-closing position. To raise the temperature of the oven the dial cap 3 is rotated so as to withdraw the dog 19 from the arm 20, so that the circuit will remain closed until the temperature has risen to a point sufficiently high to bring the dog in contact with the arm, through the expansion of the band 17. If it is desired to lower the temperature the cap is rotated in the opposite direction thus causing the dog to press against the arm 20 and break the circuit; and this condition will continue until the temperature has fallen to a point sufficient to cause a contraction of the thermostatic band which will withdraw the dog 19 from the arm 20.

The apparatus herein shown and described is primarily designed for use in connection with electrically heated ovens and the like, but may, with small modifications, be adapted for use in connection with other heating media. Various changes in the construction and arrangement of the parts may also be made without departing from the invention.

What we claim is:

1. In a device of the character described, a rotatable member, a housing on which said member is mounted, a metallic member adapted to be expanded by the action of heat, a connection between said rotatable member and said metallic member comprising a cam connected with said rotatable member, an arm engaging said cam and an operative connection between the cam and the metallic member whereby movement of the former causes a change in the position of the latter, a heat generating device control comprising means for making and breaking an electric circuit, and connecting means comprising a movable arm having a portion adjacent to said making and breaking means, a member connected with said metallic member and movable therewith into and out of connection with the said arm.

2. In a device of the character described, the combination of a vessel, fluent conductive material therein, electric terminals extending into said vessel and into the path of said fluent material, means for mounting said vessel to be canted, and thereby to cause

the said fluent material to move to and from the electric terminals, and automatic means for normally maintaining said vessel in a given position and causing it to return to said position after being moved therefrom comprising a weighted portion associated with said last-named means, and thermostatically controlled and adjustable means for moving said vessel from such position, said fluent conductive material being in the form of a globule and said vessel having a bottom in approximately horizontal position, but arranged to assume positions slightly angular thereto when the vessel is canted and to cause the said conductive material to flow from one portion to another of said bottom.

3. In combination with an electric heat generating device and open terminals for a circuit for supplying electric energy thereto, of a thermostatic opening and closing device therefor, comprising a movable member, means for indicating the position of said member in terms of temperature, a heat expansible device arranged to be exposed to the heat of the generator, a fluent metallic member adjacent to said terminals and mounted to be moved into and out of contact therewith, automatic means for holding the same normally in contact therewith, connecting members between the last named member and the heat expansible device whereby the expansion and contraction of the latter is communicated to the former, and operating connections between the movable member and the said connecting members whereby movement of the former varies the operative relationship between said heat expansible member and the fluent metallic member adjacent to said terminals said operating connections comprising a vessel along the bottom of which the said fluent member moves into and out of contact with the said terminals.

4. In the combination specified in claim 3, said automatic means comprising a pivoted frame on which said fluent metallic member is mounted above its pivot, the center of gravity of said frame being at one side of said pivot.

5. In the combination specified in claim 3 said automatic means comprising a pivoted frame and a weight on one side of the pivot thereof constantly tending to move the same on its pivot by gravity.

6. In a device of the character described a cap comprising a cover member and a flange extending therefrom, a fixed member on which said cap is mounted to rotate, a cam fixed to the cap and enclosed thereby, a heat expansible metallic member and a connection between the same and said cam, whereby movement of the cap changes the position of the said heat expansible member.

7. In combination with the devices speci-

5 fied in claim 6, a scale and an index operable by the cap to indicate the movement of the heat expansible member in terms of temperature.

8. In an apparatus of the character described, a base, a responsive device to one side of said base, an electric switch mounted on the other side of said base, means operated by said device to control said switch, a rotary cover fixed against axial movement and housing said switch, and adjustable means between said cover and controlling means whereby the latter may be set when the cover is rotatably adjusted.

9. In an apparatus of the character de-

scribed, a base, a responsive device to one side of said base, an electric switch mounted on the other side of said base, means operated by said device to control said switch, a rotary cover fixed against axial movement and housing said switch, and a connection between said cover and controlling means whereby the latter may be set and the relation between it and the switch varied.

Witness our hands this 21st day of April, 1923, at the city of Milwaukee, in the county of Milwaukee, State of Wisconsin.

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