Dec. 29, 1925. **1,567,589**

L. J. GREENAWALT

THERMOSTAT

Filed April 29, 1922

Fig. 1.

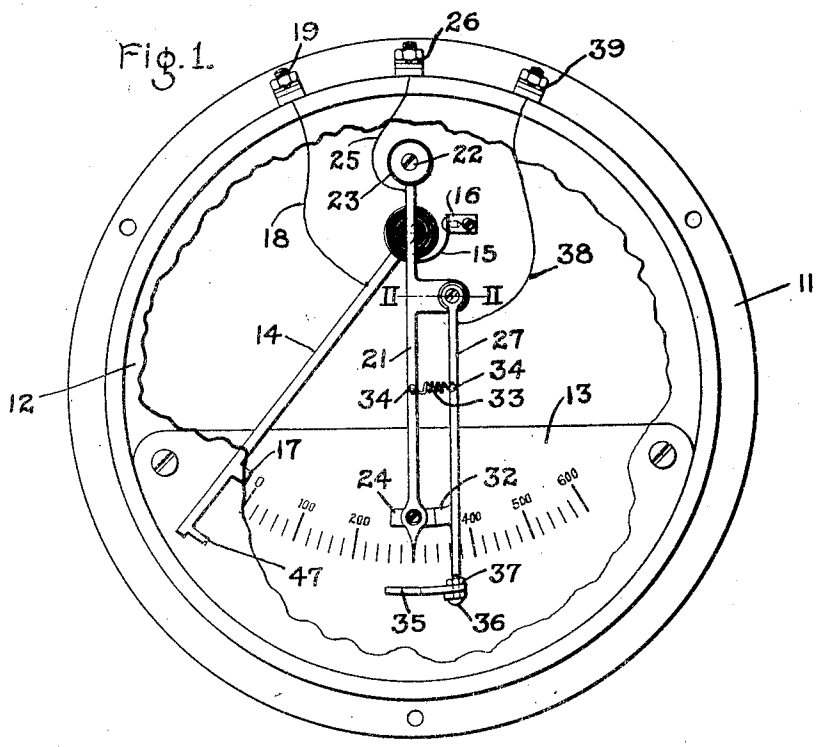


Fig. 3.

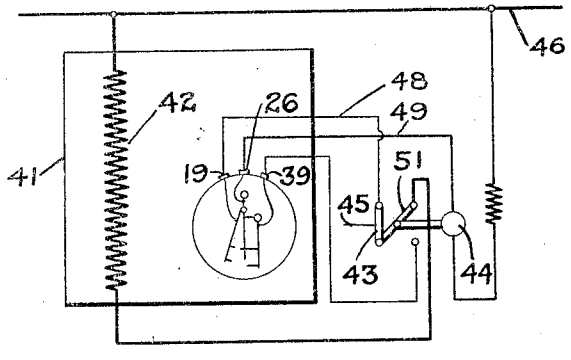
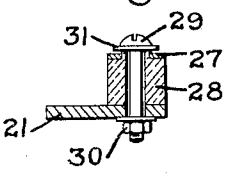


Fig. 2.



WITNESSES:

P. H. Crocker.

H. M. Bichel

INVENTOR

Lewis J. Greenawalt.

BY

Mosley & Barr

ATTORNEY

Patented Dec. 29, 1925. 1,567,569

UNITED STATES PATENT OFFICE.

LEWIS J. GREENAWALT, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE METALLIC PRODUCTS COMPANY, A CORPORATION OF MICHIGAN.

THERMOSTAT.

Application filed April 28, 1922. Serial No. 557,268.

To all whom it may concern:

Be it known that I, LEWIS J. GREENAWALT, a citizen of the United States, and a resident of Mansfield, in the county of Richland and State of Ohio, have invented a new and useful Improvement in Thermostats, of which the following is a specification.

My invention relates to electrical control apparatus and particularly to thermostatic controlling devices, and it has for one of its objects to provide a relatively simple temperature-controlling device comprising a minimum number of operative parts.

Another object of my invention is to provide a thermostat that shall be so constructed as to permit of the thermally controlled lever arm having free movement from the ordinary room temperature up to the maximum operating temperature of the device.

In practicing my invention, I provide a suitable thermostatically controlled lever arm comprising contact terminals and suitably connected to a control circuit conductor. A manually adjustable arm is provided with contact members and carries an auxiliary lever arm having one end thereof insulatedly mounted on the manually adjustable arm, a spring being provided to yieldingly maintain the contact member on the auxiliary arm in normal operative engagement with the contact member on the manually adjustable arm. A stop member is provided at the outer end of the auxiliary arm and is manually adjustable thereon and laterally thereof.

In the single sheet of drawings,

Figure 1 is a view, in front elevation of a device embodying my invention, certain parts being cut away.

Fig. 2 is a view, in lateral cross-section, of a portion of the manually adjustable arm, taken on the line II—II of Fig. 1, and

Fig. 3 is a diagram of connections of an electrically heated device controlled by the device embodying my invention.

A suitable metallic casing 11 may be provided with a glass cover member 12 and have located therein a suitably marked plate 13 to provide a suitable scale of degrees of temperature to co-operate with the members to be hereinafter described.

A lever arm 14, in the casing 11, has a turning movement on its supporting axis adjacent one end thereof, caused by any suitable temperature-controlled means operatively connected thereto, here illustrated as a bimetallic strip 15, the other end of which is suitably connected to a supporting member 16. Adjacent the free end of the lever 14, is provided a contact member 17 which may be integral with the member 14 or may be provided with a suitable tip comprising a material usually employed for such purposes. A flexible conductor 18 is connected, at one end, to the lever arm 14 and is connected, at its other end, to a terminal member 19 insulatedly mounted on the periphery of the metallic casing 11.

A manually adjustable lever arm 21 is mounted, at one end, on a pivot 22 and is provided with a knurled knob 23 to permit of manually adjusting the lever arm on its pivot over the scale on the plate 13. It is, of course, understood that the adjusting member 23 is located outside of the glass cover 12 of the device. A two-part contact member 24 is suitably secured to the lever arm 21 near the outer end thereof. A flexible control circuit conductor 25 is connected to the arm 21, at one end, and is connected, at its other end, to a terminal member 26 insulatedly mounted on the casing 11.

An auxiliary arm 27 is secured, at one of its ends, on the arm 21 intermediate its ends and is suitably insulated therefrom, the construction illustrated in Fig. 2 of the drawing being employed. An insulating bushing 28 has pivotally mounted thereon the inner end of the arm 27 and is held in position by a bolt 29 and a nut 30, an insulating washer 31 being provided beneath the head of the bolt to suitably insulate the arm 27. The arm 27 is provided, adjacent its outer end, with a contact member 32 normally engaging the contact member 24 on the arm 21, a spring 33, located intermediate the ends of the main and the auxiliary arm, being provided to resiliently maintain the terminal 32 in engagement with the terminal member 24. The spring 33 operatively engages insulating studs or posts 34 on the two arms so that, if the terminal 32 is disengaged from the terminal 24, the circuit therethrough will be completely interrupted. Immediately adjacent the outer end of the arm 27 is provided a laterally extending stop member 35 of a suitable insulating material which is so constructed as to be laterally adjustable relatively to the arm 27 and may be held in a

predetermined position thereon by a small screw 36 and a nut 37. A flexible conductor 38 has one of its ends connected to the auxiliary lever arm 27 and is connected, at its other end, to a terminal member 39 insulatedly mounted on the casing 11.

The operation of the device will be described more particularly with reference to an electrically heated device or furnace, represented generally by the numeral 41 in Fig. 3, which is provided with a heating element 42. The device embodying my invention is there illustrated as controlling a circuit-interrupting device comprising a snap switch 43 operated by a motor 44, a device which is more particularly illustrated and claimed in a copending application, Serial No. 328,033, filed Oct. 2, 1919, by R. A. Bolze and E. W. Denman, and assigned to the Westinghouse Electric & Manufacturing Company.

In the position of the switch 43 illustrated in the drawing, a circuit is established between the positive conductor 45 of the supply circuit through the resistor 42 to the negative supply circuit conductor 46. If it is assumed that the thermostat illustrated in Fig. 1 of the drawing be applied to the furnace when both it and the furnace are at substantially room temperature, it is evident that the position of the thermally controlled arm 14 will be substantially that illustrated in Fig. 1 of the drawing, that is, at one end of its turning movement. As the temperature of the furnace or of the electrically heated device is increased by reason of the energization of the heating element 42, it being assumed that the circuit has been closed therethrough, as illustrated in Fig 3, the arm 14 is given a turning movement on its axis under the influence of the bimetallic strip 15 until an integral abutment 47 located immediately adjacent the free end thereof engages the member 35 and causes the contact terminal 32 to be disengaged from the contact member 24. A still further increase of temperature causes a further turning movement of the arm 14, and the engagement of the contact member 17 with the contact member 24 closes a control circuit substantially as follows: from the supply-circuit conductor 45 through a conductor 48 to contact terminal 19 and conductor 18 to the lever arm 14, contact members 17 and 24, lever arm 21, conductor 25, terminal 26, a conductor 49, through the armature and field winding of the motor 44 to the supply conductor 46, causing the motor to operate to move the contact bridging member 51 to a position substantially 90° from that illustrated in the drawing, thereby interrupting the circuit through the heating element 42. As the temperature of the device 41 is reduced, owing to the de-energization of the heating element 42, the lever arm 14 is caused to move in a clockwise direction, thereby initially disengaging the contact member 17 from the contact member 24 and then permitting the arm 27 to have a turning movement on its support in a clockwise direction, finally permitting the engagement of the contact member 32 with the contact member 24, thereby closing a control circuit through the motor, causing the same to operate to again energize the heating element 42. While I have illustrated a particular type of switching means, as actuated by the device embodying my invention, I do not desire to be restricted thereto, as any suitable or desired switching means may be employed.

The device embodying my invention thus provides a thermal indicating and controlling means in which a thermally controlled lever arm has entire freedom of turning movement between normal room temperature and the maximum operating temperature of the device with which it is to be operatively associated and no complicated link-motion or lost-motion mechanism is necessary.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof and I desire that only such limitations shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

I claim as my invention:

1. A combined temperature-indicating, limiting and controlling device, comprising a manually adjustable member having a plurality of contact members thereon, an auxiliary arm insulated from and carried by said adjustable member and having a contact member normally resiliently engaging one of the contact members on said adjustable member, an indicating member having a contact member thereon and thermally responsive means for controlling the position of said indicating member and effective to cause the contact member thereon to engage the other of said contact members on said adjustable arm at a predetermined temperature.

2. A combined temperature-indicating, limiting, and controlling device, comprising a manually adjustable member having a plurality of contact members thereon, an auxiliary arm insulated from and carried by said adjustable member and having a contact member normally resiliently engaging one of the contact members on said adjustable member, a spacing member on said auxiliary arm, an indicating member having a contact member thereon and thermally responsive means for so moving said indicating member with an increase of temperature as to cause it to initially operatively engage said spacing member to thereby disengage the contact member on the auxiliary arm from the contact member on the adjustable

member and to cause the contact member on the indicating member to operatively engage the other contact member on the adjustable arm.

3. In a combined temperature-indicating, limiting and controlling device, in combination, a manually adjustable arm, an auxiliary arm secured on and insulated from said adjustable arm, co-operating contact members on said adjustable and said auxiliary arm normally in engagement, a thermally controlled arm having a contact member thereon and movable in accordance with an increase of temperature to initially disengage said contact members and, upon further increase in temperature, to cause the contact member on said thermally controlled arm to engage the contact member on said adjustable arm.

4. In a combined temperature-indicating, limiting and controlling device, in combination, a manually adjustable arm having a contact member thereon, an auxiliary arm pivotally mounted on and insulated from said adjustable arm and having a contact member normally resiliently engaging the contact member on said adjustable arm, and an arm movable in response to increase in temperature and having a contact member and means thereon for initially interrupting the engagement between the contact members on the adjustable and the auxiliary arms, and operative, upon further increase of temperature, to cause the contact member thereon to engage the contact member on the adjustable arm.

5. In a combined temperature-indicating, limiting and controlling device, in combination, a normally adjustable two-part arm, the two parts being insulated from each other and each having co-operating contact members, resilient means for normally causing said contact members to engage, and a thermally controlled arm having a contact member and responsive, upon increases in temperature, to cause the contact members on said two arms to disengage and then to cause the contact member on the thermally controlled arm to engage the contact member on the manually adjustable arm.

6. In a combined temperature-indicating, limiting and controlling device, in combination, a normally adjustable two-part arm, the two parts being insulated from each other and each having co-operating contact members, resilient means for normally causing said contact members to engage, a thermally controlled arm having a contact member and responsive, upon increases in temperature, to cause the contact members on said two arms to disengage and then to cause the contact members on the thermally controlled arm to engage the contact member on the normally adjustable arm, and means for varying the temperature interval between the disengagement and the engagement of the respective co-operating contact members.

In testimony whereof, I have hereunto subscribed my name this 22 day of April, 1922.

LEWIS J. GREENAWALT.