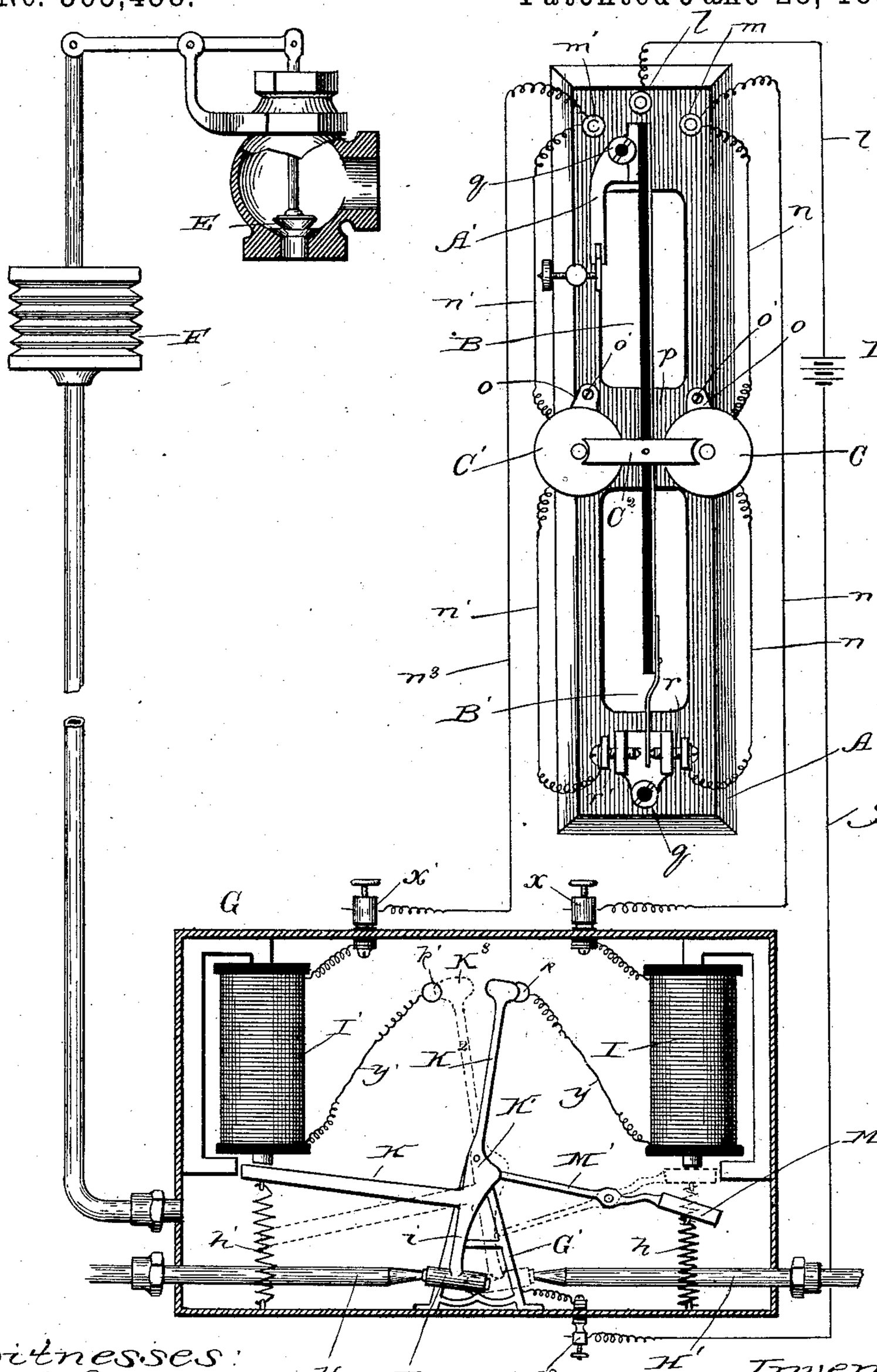
(No Model.)

H. E. JACOBS.

THERMOSTAT.

No. 365,438. Patented June 28, 1887.



Witnesses:
Chas. E. Gaylord.
Edward. Thorpe.

Inventor:
Henry E. Jacobs.
By Dyrenforth & Dyrenforth
Att'ys.

UNITED STATES PATENT OFFICE.

HENRY E. JACOBS, OF MILWAUKEE, WISCONSIN.

THERMOSTAT.

SPECIFICATION forming part of Letters Patent No. 365,438, dated June 28, 1887.

Application filed March 1, 1887. Serial No. 229,289. (No model.)

To all whom it may concern:

Be it known that I, HENRY E. JACOBS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Thermostats; and I hereby declare the following to be a full, clear, and exact description of the same.

It is the particular object of my present invention to improve the operation of thermostats in the especial connection thereof with electrical mechanisms for automatically controlling valves to admit to and shut off from apartments or inclosures the medium for affecting their temperature.

In the connection referred to it is the function of the thermostat, as the primary automatic agent, to make electrical contacts by bending in one or the other direction under the influence of temperature higher or lower than a given or normal degree. The making of such contact closes one of two normally-open circuits to actuate a suitable electrical apparatus to produce opening or closing, as required, of a valve controlling the passage through which the temperature-affecting medium gains access to the apartment or inclosure the temperature of which is to be regulated.

In the practical application to the purpose named of thermostats as hitherto constructed it frequently happens that the contacts between the end of the thermostat and the contact-points are so light that the current is grounded or flows back to the battery before it has exercised sufficient force to produce proper actuating effect upon the valve apparatus. The same undesirable result of such contacts by the thermostat-bar may also be occasioned by the presence of some foreign substance—such as dust—upon a contact-point, or between the latter and the operating end of the thermostat-bar. I overcome this difficulty by providing an electro-magnet adjacent to the thermostat-bar, which electro-magnet is in circuit with the contact mechanism, and an armature on the thermostat-bar to be attracted and held by the electro-magnet when the circuit containing the latter is closed.

In the drawing I show a thermostat of my improved construction in operative position with reference to an electrical valve-controlling apparatus of the construction set forth in my former application for Letters Patent of the United States, Serial No. 212,933, filed September 7, 1886. This particular connection for the thermostat is selected for convenience in illustrating the operation of my improvement. This thermostat is not necessarily, however, limited to any particular connection, but forms an improvement by itself, which may be manufactured and sold as such, and which I desire to be understood as claiming for whatever purpose and in whatever connection it may be used.

A is the frame for carrying the thermostat-bar B. The frame is preferably of polished metal, having the sides connected, as shown, near its center by a cross-piece, *p*, and is to be mounted on an ornamental wooden base, (not shown,) at which it may be secured or supported in the apartment the temperature of which it is desired to regulate automatically by the effect upon the thermostat of its excess or the opposite from the predetermined degree. The bar B, which may be of any ordinary construction of thermostat-bars, (though to make the connections hereinafter described it should be composed of two bars or strips of different metals secured flatwise together and affected in different degree by temperature,) is supported near its upper end on the frame A, as shown, and provided with suitable adjusting mechanism, A′, for the usual purpose. The lower end of the bar B carries a light metal finger, B′, secured to the metal side of the thermostat-bar, if one side shall be non-metallic, and extending between contact-points *r* and *r′* in the form of adjustable pointed screws supported in bearings near the lower end of the frame A. The posts *q*, which are slotted at their extremities and hollow, and shown as extending from the frame near its opposite ends, are intended for use in supporting a thermometer, which, however, is omitted from the drawing to avoid obstruction of other parts which it is desired to present to view.

On the cross-piece *p*, at opposite sides of the thermostat-bar, are electro-magnets C and C′, each supported on a finger or bracket, *o*, pivoted, as shown, by a screw, *o′*, to the frame at the cross-piece *p*. By loosening the screws *o′*

the magnets may be moved nearer to or farther from either or both concave ends of the armature C^2, which is secured transversely to the bar B in line with the projecting cores of the magnets, and when moved to the desired positions they may be tightened therein by means of the screws o'.

From the contact-point r there leads an insulated conducting-wire, n, through the magnet C to a binding-post, m, and from the contact-point r' there leads an insulated conducting-wire, n', through the magnet C' to a binding-post, m'.

Although the operation of my improvement is hereinafter described in the particular connection illustrated in the drawing, as it is not desired to limit it to such connection, its operation in any electrical circuit may properly be here set forth.

With the thermostat-bar connected by a conductor, l, at a binding-post, l', on the metal frame A with one pole of a battery, D, and the conductors n and n' both connected with the opposite pole of the same battery, whenever by the bending of the thermostat-bar contact of the same, however light or imperfect, is made with a screw, r or r', the magnet C or C' in the circuit is energized. This energizing of the magnet attracts the armature C^2, and with it the bar B, in the direction of the screw r or r', with which the contact is first made, and with the magnets properly adjusted produces or insures and holds the desired firmness and completeness of contact until the circuit is broken by the action of the bar B.

E is a valve for opening or closing a passage through which a temperature-affecting agent gains access to an inclosure.

F is a collapsible air-receiver, connected at its upper closed end by suitable lever mechanism, as shown, with the valve E to raise or lower it by its collapse or expansion with reference to its seat. The receiver F communicates from its opposite end with a box, G, which is air-tight when the cover is on. In the drawing the box is shown uncovered to display the details within it.

An air-inlet tube, H, to be connected with a suitable compressed-air supply, (not shown,) and an exhaust-tube, H', enter the box G from opposite sides on the same plane, and extend toward each other to leave a space, as shown.

I and I' are sub-permanent electro-magnets, supported in the box, and connected, respectively, at their upper ends, through binding-posts x and x' and conductors n^2 and n^3, with the conductors n and n' at the binding-posts m and m' on the frame A of the thermostat. At their lower ends the magnets I and I' are respectively connected by conductors y and y' with metallic contact-points k and k'. The armature K of the magnet I' extends across the core of the latter from a metal shoe, K', pivoted between metal brackets G' (only one of which is shown, owing to the nature of the view) centrally below the contacts k and k', and from the upper end of the shoe extends a metal rod, K^2, having a cross-head, K^3, to oscillate from one contact, k or k', to the other. From the lower end of the shoe K' extends an arm, i, curved on one side, as shown, and carrying the valve device L in the space between and in line with the tubes H and H'.

The armature M of the magnet I has extending from it toward the shoe K' a finger, M', at which it is pivotally supported in the box. The armatures M and K are maintained normally out of contact with their respective magnets by springs h and h'. A conductor, g, connects the cross-head K^3 through the brackets G' and a binding-post, x^2, with the opposite pole of the battery D.

When the thermostat, by reason of a rise above the predetermined degree in the temperature of the apartment containing it, makes contact with the point r, the current will flow over the wire l, bar B B', screw r, wires n and n^2, magnet I, wire y, contact k, and cross-head K^3, by way of the rod K^2 and wire g, back to the battery. In its course the current energizes the magnet C on the thermostat, for the purpose already stated, and also the magnet I, causing the latter to attract its armature, thereby releasing the shoe K' from the locking effect of the finger M', and permitting the spring h' to draw the armature K to the position shown by dotted lines. In such position the cross-head is moved into contact with the point k' to continue the circuit when the thermostat shall make contact at r' and break the circuit containing the magnet I, and thereby, also, the valve L is moved to close the exhaust-pipe H' and open the inlet-pipe H, through which compressed air enters the receiver F and expands it to close the valve E and "shut off" the heat-supply.

Fall in the temperature of the apartment below the predetermined degree produces contact of the thermostat with the point r', when the current will flow over the wire l, bar B B', screw r', wires n' and n^3, magnet I', wire y', contact k', and cross-head K^3, by way of the rod K^2 and wire g, back to the battery. In its course the current energizes the magnet C' on the thermostat, for the purpose already stated, and also the magnet I', causing the latter to attract its armature, which is held in its attracted position, after the circuit is broken with the movement of the cross-head K^3 to the position shown by the full lines, by the finger M', raised against the shoe K' by the action of the spring h. This operation also closes and locks the valve L against the mouth of the inlet-pipe H, and permits the contents of the receiver F to escape through the exhaust-tube H', thereby causing the receiver to collapse and open the valve E and "turn on" the heat-supply.

To produce the operations hereinbefore described, the magnets I and I' must be sub-permanent and the part i curved, as shown, since otherwise, to illustrate the effect, if they were ordinary magnetizable and demagnetizable electro-magnets with the head K^3 in contact

with point *k*, the armature M will be attracted as soon as a current runs through the magnet I, and at the same time spring *h'* acts to break the circuit. As soon as the circuit is broken spring *h* would act and the extension or finger M' in rising would meet the lower end of the rod K' and prevent the head K^3 from reaching the point *k'*; or, if point *k'* should be reached by the head K^3, the rod K' would remain in the position shown in dotted lines until a current passes through the magnet I'; but before the armature K could rise, in obedience to the attractive force of this magnet, the circuit is broken at the point *k'*, whereby the magnet I ceases to act, whereupon, provided the finger M' allows any movement, the head K^3 would probably make a series of vibrations, being acted upon by the spring *h'* and magnet I' through the armature K. By making the magnets I and I' sub-permanent and curving part *i* to allow the extension M' to act, I prevent the aforesaid difficulties.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a thermostat, of an electro-magnet adjacent to the thermostat-bar, an armature for the electro-magnet upon the thermostat-bar, and contact mechanism having electrical connection with the said electro-magnet, substantially as and for the purpose set forth.

2. The combination, with a thermostat, of an electro-magnet adjustably supported adjacent to the thermostat-bar, an armature for the electro-magnet upon the thermostat-bar, and contact mechanism having electrical connection with the said electro-magnet, substantially as and for the purpose set forth.

3. The combination, with a thermostat, of electro-magnets C and C' on opposite sides of the thermostat-bar, an armature, C^2, secured transversely upon the thermostat-bar to extend between the cores of the said magnets, contact-points *r* and *r'*, and conductors *n* and *n'*, connecting the said contact-points and electro-magnets, substantially as and for the purpose set forth.

4. A thermostat comprising, in combination, a bar, B, having an extension, B', a frame, A, carrying the bar, an armature, C^2, secured transversely upon the bar, electro-magnets C and C', supported on the frame at opposite sides of the bar to have their cores in line with the armature and adjustable with relation to the armature, adjustable contacts *r* and *r'*, supported on the frame and between which the extension B' projects, and conductors *n* and *n'*, connecting the said contact-points with the said electro-magnets, substantially as and for the purpose set forth.

HENRY E. JACOBS.

In presence of—
N. T. MURPHY,
E. H. WILSON.