(No Model.) 2 Sheets—Sheet 1.

H. VAN HOEVENBERGH.

THERMOSTAT.

No. 584,249. Patented June 8, 1897.

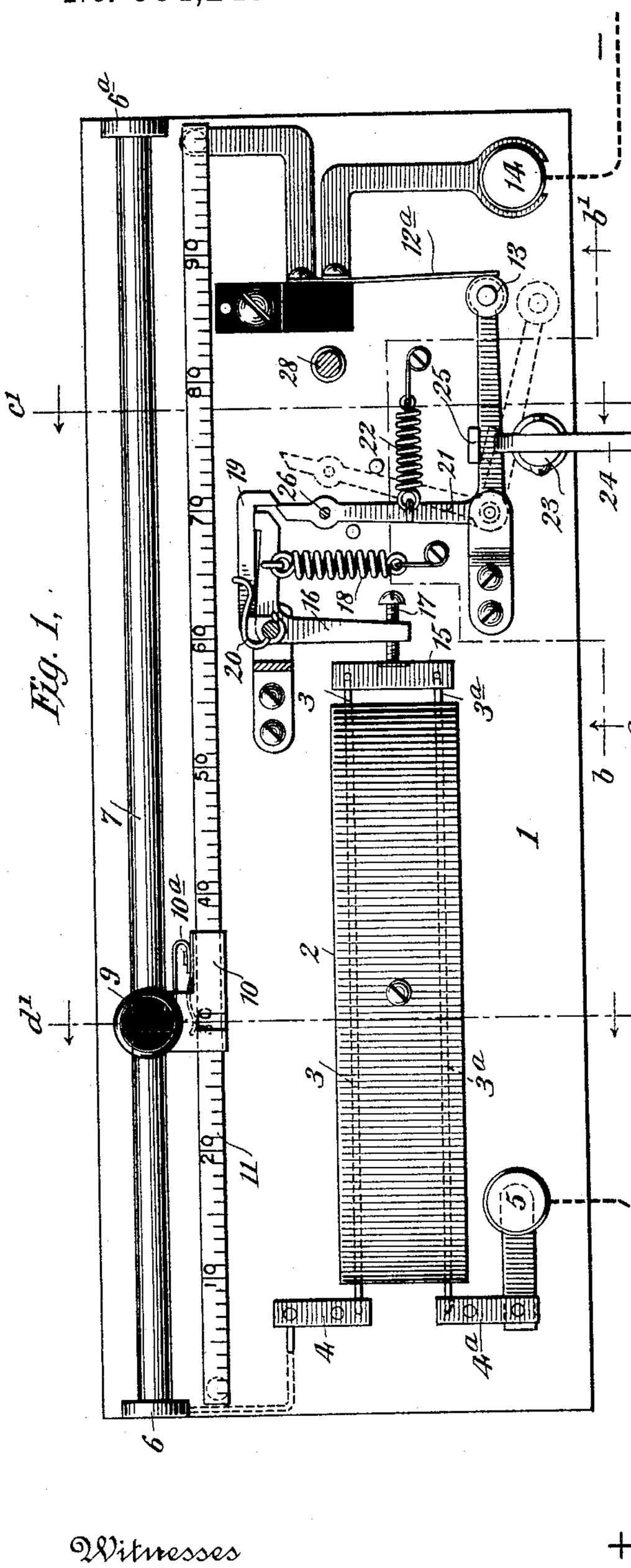

Fig. 1.

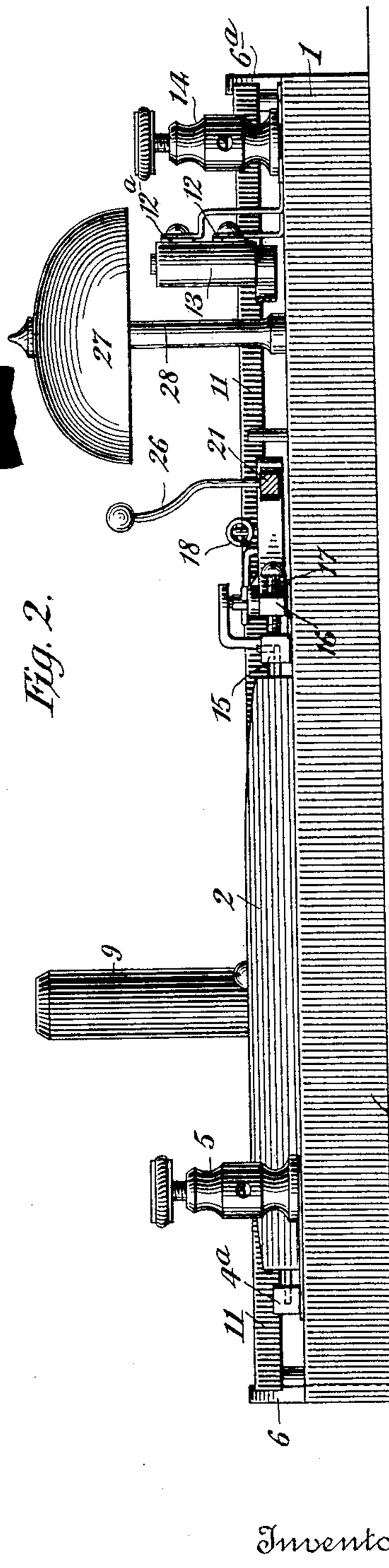

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3,

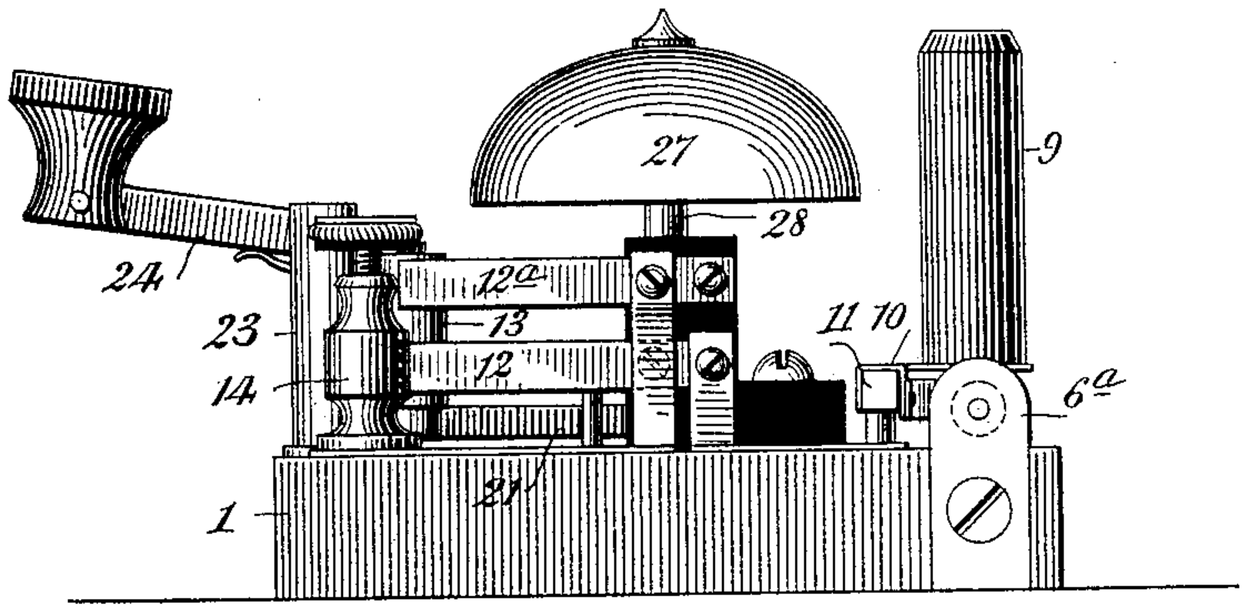


Fig. 4,

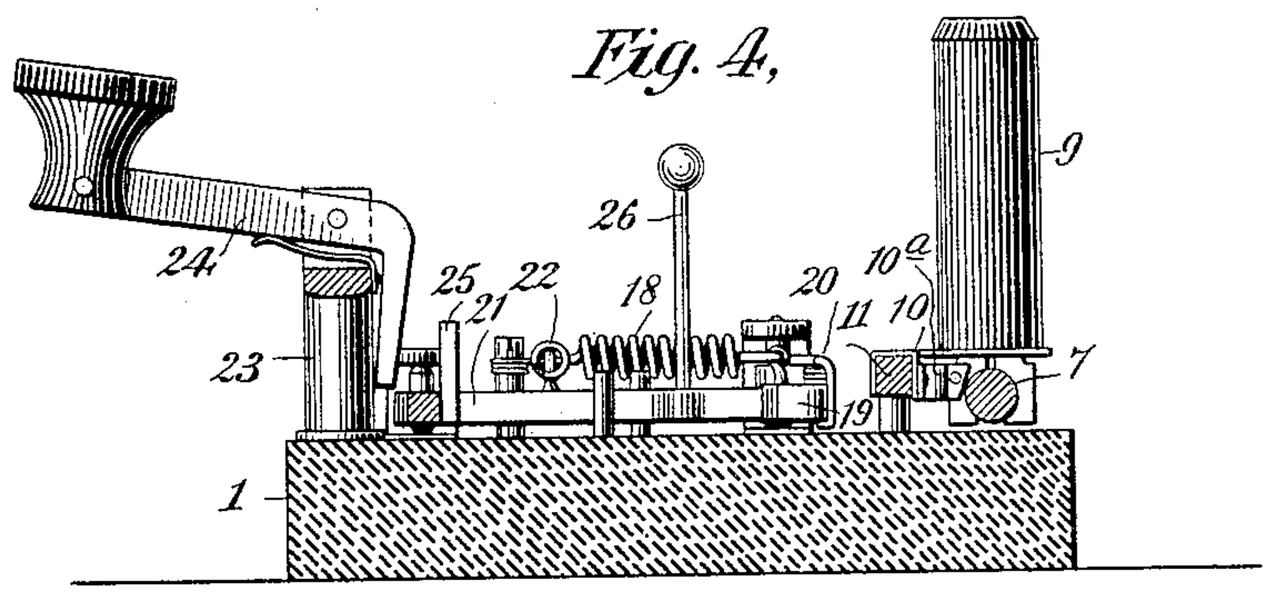
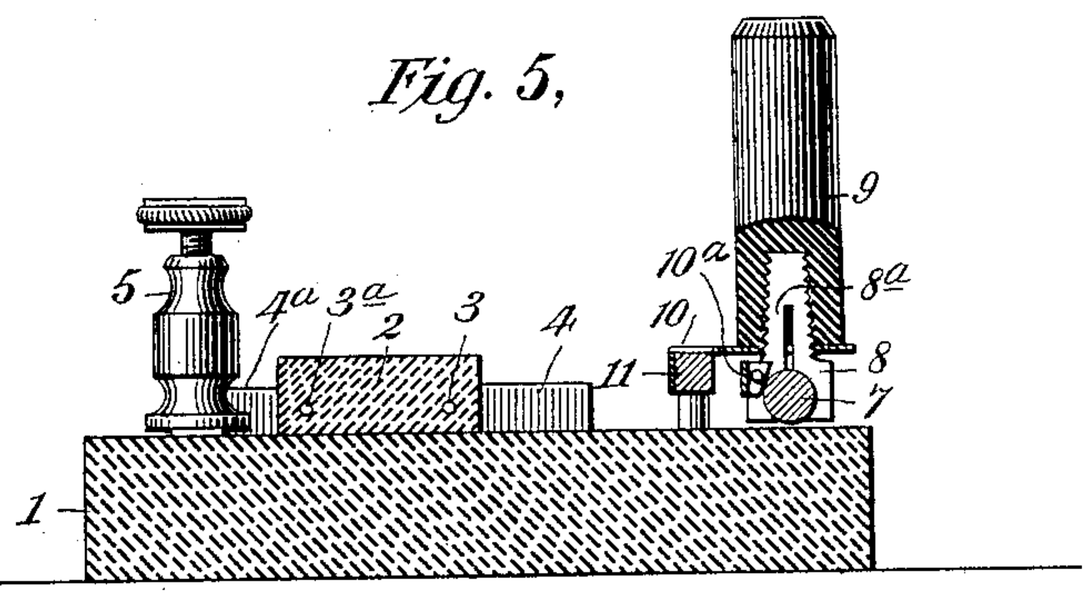


Fig. 5,



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UNITED STATES PATENT OFFICE.

HENRY VAN HOEVENBERGH, OF NEW YORK, N. Y., ASSIGNOR TO HENRIETTA LONSDALE FELLOWES, OF SAME PLACE.

THERMOSTAT.

SPECIFICATION forming part of Letters Patent No. 584,249, dated June 8, 1897.

Application filed January 16, 1895. Serial No. 535,065. (No model.)

To all whom it may concern:

Be it known that I, HENRY VAN HOEVENBERGH, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Thermostats, of which the following is a specification.

This invention relates to a thermic device capable of being set for automatic operation at predetermined temperature to regulate by its action other apparatus.

The invention is carried out by providing a metallic rod or rods provided with coöperating releasing apparatus, the rods being so arranged as to expand when traversed by a current and thereby operate the releasing apparatus. The apparatus is provided with means for varying the strength of current to graduate its rapidity of action and embodies other features which will be more particularly hereinafter described.

In the accompanying drawings, which illustrate the invention, Figure 1 is a top plan. Fig. 2 is a side elevation looking in the direction indicated by the arrow at *a*, some of the parts being shown in section on the plane indicated by the line *b b'*, Fig. 1. Fig. 3 is an end elevation looking from the right of Fig. 1. Fig. 4 is a sectional view on the plane indicated by the line *c c'* of Fig. 1, and Fig. 5 is a sectional view on the plane indicated by the line *d d'* of Fig. 1.

1 represents a base-plate, of slate, artificial stone, or other suitable fireproof insulating material. Firmly secured to the base-plate is a block 2 of the same material, through longitudinal perforations in which pass metal rods or wires 3 3ª, where, as in cases in which the device is to respond quickly or to currents of small heating power, the wires 3 3ª are small in cross-section. The latter form a a snug fit in the perforations which accommodate them to prevent buckling. A metal of a large coefficient of expansion is preferably used for the rods or wires in order to reduce the size of the apparatus. German silver may be used. These rods firmly abut at one end against blocks 4 4ª, insulated from each other and securely fastened to the base.

When the block 2 is formed of artificial stone, the mass may be molded around the rods and the latter withdrawn after the mass has set, or heated *in situ* while the mass is soft, so that on cooling sufficient contraction will occur to permit freedom of movement when the apparatus is in service and prevent cracking the block. One of the abutments, as 4ª, is connected with a binding-post 5, to which one terminal of the circuit supplying the current may be connected. The other block 4 is electrically connected with a standard 6, mounted on the end of the base-plate, between which and a similar standard 6ª, at the other end of the base-plate, extends a resistance-rod formed of a homogeneous mixture of graphite and clay. A rod of this composition about three-sixteenths of an inch in diameter and ten inches long may be given a resistance of one hundred ohms and is of considerable strength.

Embracing the rod 7 are two metallic jaws 8 8ª, preferably formed in one piece of metal by slotting it vertically, as seen in Figs. 4 and 5. The jaws embrace the rod so as to offer a slight resistance to displacement, and a stem is provided above them with a taper-screw, over which an operating knob or handle 9 may be screwed to pinch the jaws firmly to the rod. Mounted on the jaws or attached thereto is a metallic brush 10, which engages a metal rod 11, calibrated to correspond with the resistance of the rod 7. A notch or opening may be formed in the brush opposite the jaws to more accurately indicate the resistance of that part of the rod between standard 6 and the jaws. A spring 10ª connects the jaws and the brush, and the latter is bent from a piece of sheet metal to a rectangular form. The spring maintains a good electric contact with rod 11. With the organization thus far described it will be seen that by shifting the handle 9 along the rod 7 the amount of resistance may be adjusted to any degree less than the whole resistance of rod 7. One end of the rod 11 is electrically connected with a spring-contact 12, adapted to engage a metal roller 13, a coöperating spring-contact 12ª, lying adjacent to contact 12 and connected with a binding-post 14, forming the other terminal of the apparatus. The springs 12 12ª are suitably insulated from one another and for convenience are mounted on pillars or stand-

ards of insulating material, as shown. The free ends of the rods or wires 3 3ª are connected rigidly with a yoke of metal 15. It will thus be seen that current entering at binding-post 5 will pass over rods 3 3ª by way of connecting yoke or bridge 15, thence by abutment 4 to standard 6, thence over resistance-rod 7 to the jaws 8 8ª, through spring 10ª to brush 10, thence over rod 11 to brush 12, when, if roller 13 engages springs 12 12ª, a path will be closed to spring 12ª and out by way of binding-post 14. The current heats the rods 3 3ª and causes them to expand, forcing yoke 15 to the right. The yoke acts on tripping mechanism to open the circuit. This mechanism comprises a pivoted elbow-lever 16, one arm of which carries an adjusting-screw 17, and the other arm of which is acted upon by a stiff coil-spring 18. The axis of the elbow-lever carries a pivoted pawl or detent 19, acted upon by a light spring 20. Journaled in bearings secured to the base is an elbow-lever 21, one arm of which has a beveled tip adapted to engage a similar tip on pawl 19, and the other arm carries the metal roller 13, which bridges springs 12 12ª. A coil-spring 22 acts as a retractor for the lever 21. Journaled in a standard 23 (see Figs. 3 and 4) is a key 24, provided with a bent arm adapted to engage a spur 25 of the elbow-lever 21. A light spring, as shown in Figs. 3 and 4, holds the key normally out of engagement with the spur. One arm of the lever 21 carries a bell-hammer 26, which, when the lever is released, strikes a bell 27, mounted on a standard 28, and thus gives an audible indication that the circuit has been opened.

The operation will now be understood. The apparatus is set by depressing key 24, thus latching lever 21 under pawl 19 and causing roller 13 to bridge springs 12 12ª. The passage of current heats and expands rods 3 3ª. When sufficient expansion has occurred, lever 21 is released from pawl 19 and the circuit is opened by the roller 13 being drawn away from the springs 12 12ª by spring 22. It will be seen that the organization described permits the pawl 19 to be shifted by a slight effort when the apparatus is set, since only the opposition of the light spring 20 must be overcome, whereas considerable power must be exerted to unlatch it, since the stouter spring 18 must be overcome. This renders the action more reliable and prevents an accidental opening of the circuit. The degree of heat at which the circuit will be opened may be graduated by adjustment of the screw 17, and the time may be varied by shifting the jaws 8 8ª along the resistance-rod. The resistance-rod also serves to regulate the strength of current in other apparatus with which the thermostat may be employed. As, for example, when used in connection with an electric branding device of the kind described in an application filed by me, Serial No. 519,255, and dated August 2, 1894, the circuit may be automatically opened at exactly the point where the desired depth of burning has been done.

The device may be applied to numerous uses. It may, for example, be used as a cut-out to open an electric circuit upon excessive variation in current strength, or as a regulator to automatically open the same or another circuit after a definite interval of closure. The expansion-rods might be left exposed for some uses, so as to be acted upon by other sources of heat—as, for example, the atmosphere—and thereby cut off the source of heat when a predetermined temperature of the air is reached. When used in connection with an electric branding device of the kind hereinabove referred to, it is of particular advantage in limiting the depth or degree of burning to exactly the point desired, thus rendering the work of the brand uniform.

It will be observed that the spring 18 acts constantly in a direction to oppose expansion. This is of great practical advantage, when a sensitive apparatus having small expansion-wires is employed in assisting the wire when cooling to go back to its initial length. If the spring tended to assist expansion, the wire when heated would be lengthened, and upon cooling would not be carried back to its original position, so that its operations would not be uniform, as it would be stretched more or less by each actuation.

In the construction described the spring opposes expansion and the wire infallibly goes back to its initial length. The non-conducting casing assists in this result by preventing the wire increasing in cross-section when heated. The extremities of the wires are in contact with relatively large conducting and radiating bodies 4 4ª 15, which keep the ends cooler than the central portions and thus permit change of length at these points.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A thermostat comprising a slender metallic rod or wire extending through a non-conducting casing closely embracing it, said conductor being fixed at one end and coöperating with a detent at the other, means for closing an electric circuit through the wire to expand the wire and thereby exert a positive thrust against the detent, and a circuit-closer controlled by the detent.

2. A thermostat comprising a metallic wire or wires, extending through a non-conducting casing closely embracing it, said wire being fixed at one end and coöperating with a detent at the other, means for closing an electric circuit through the wire, and a relatively large conducting-body in contact with the wire or wires at or near its extremity to lower the temperature at those points.

3. A thermostat comprising a conducting-rod adapted to be included in an electric circuit and fixed at one end and coöperating with a detent at the other end, said detent

comprising a latch or pawl 19 controlled by a light spring and a heavy spring holding the detent in firm engagement with a spring-actuated controller for apparatus regulated by the thermostat.

4. A thermostat comprising a metallic rod or rods fixed at one end, inclosed in a fireproof insulated casing and having the free end engaging a compound detent 16, 19, a circuit-closer controlled by the detent, a variable resistance in circuit with the rod, and a key for bringing the circuit-closer into engagement with the detent.

In testimony whereof I have hereunto subscribed my name this 14th day of January, A. D. 1895.

HENRY VAN HOEVENBERGH.

Witnesses:

ROBT. H. READ,

GEORGE A. ADAMS.