(No Model.) 2 Sheets—Sheet 1.

W. E. NORRIS.

ELECTRIC VALVE CONTROLLER.

No. 401,200. Patented Apr. 9, 1889.

Fig. 1.

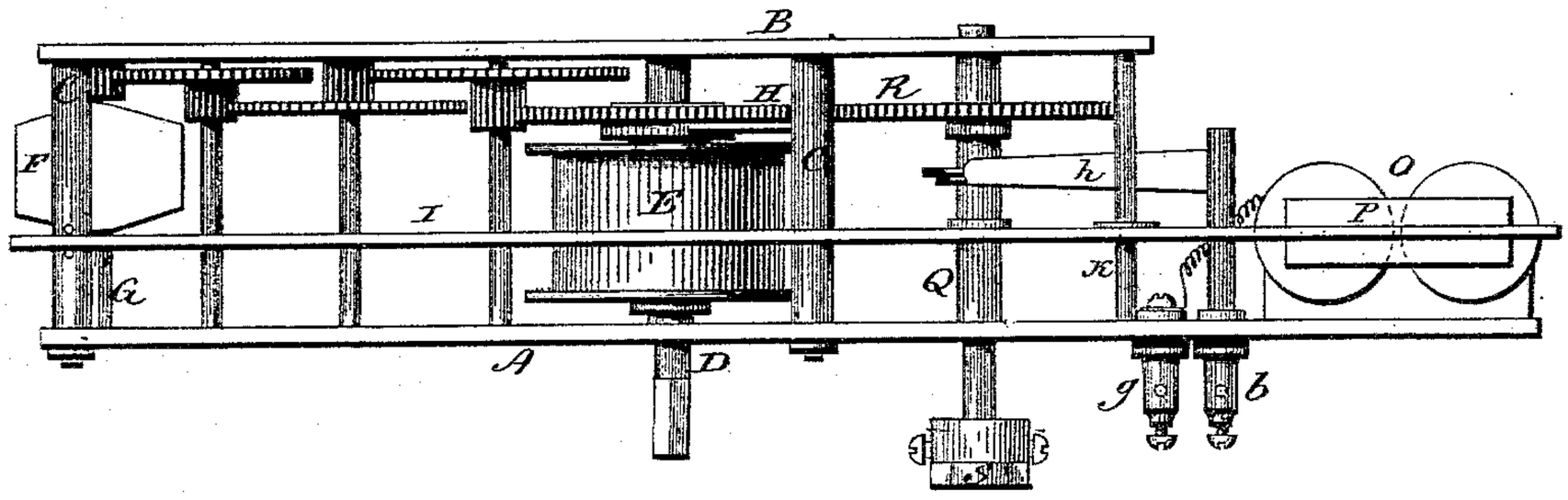


Fig. 2

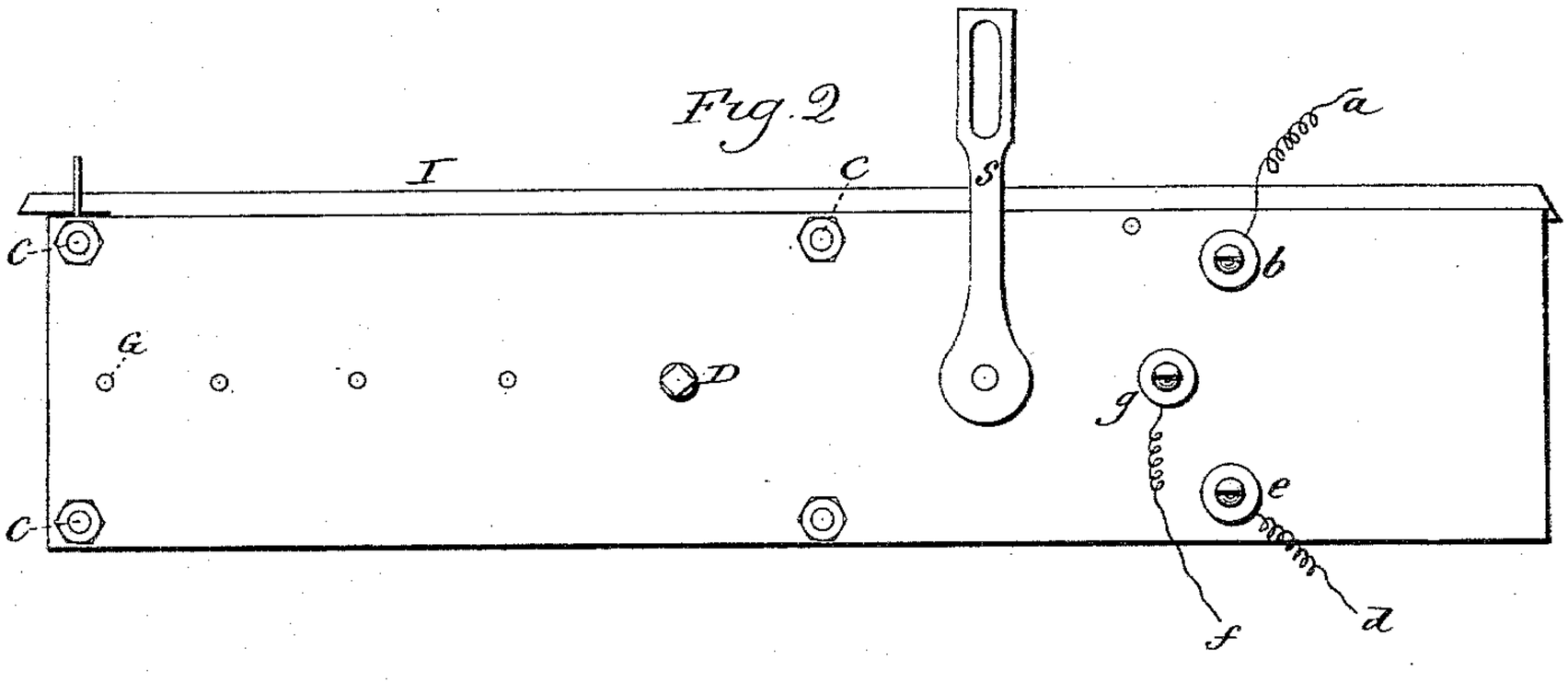
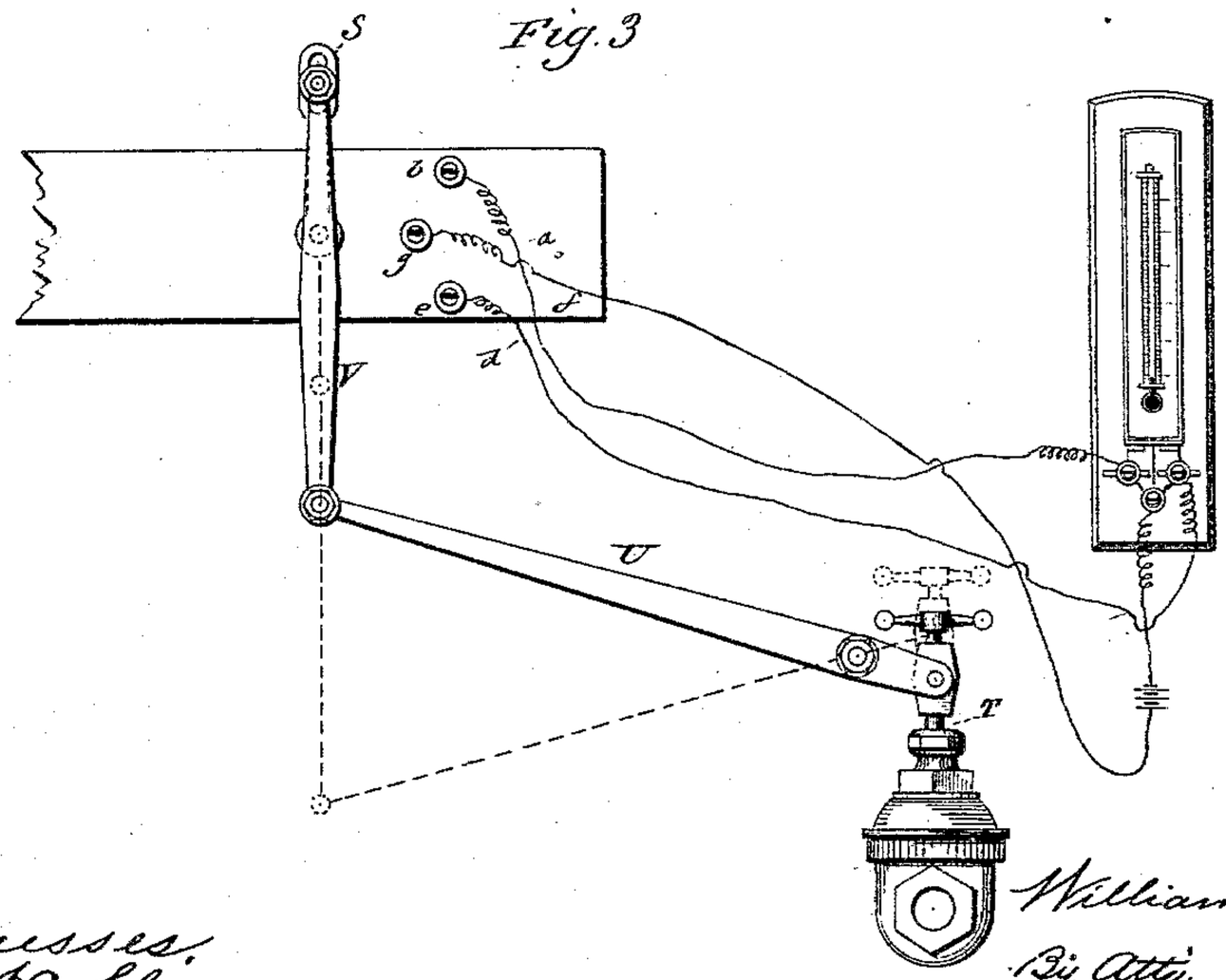


Fig. 3



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4

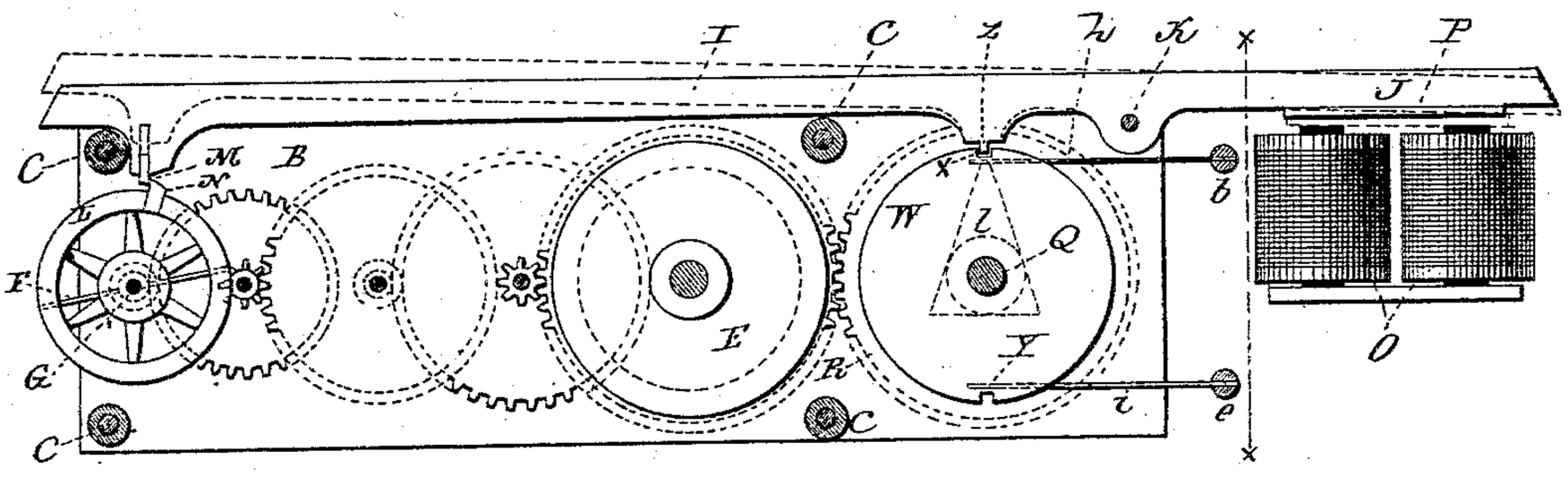


Fig. 5

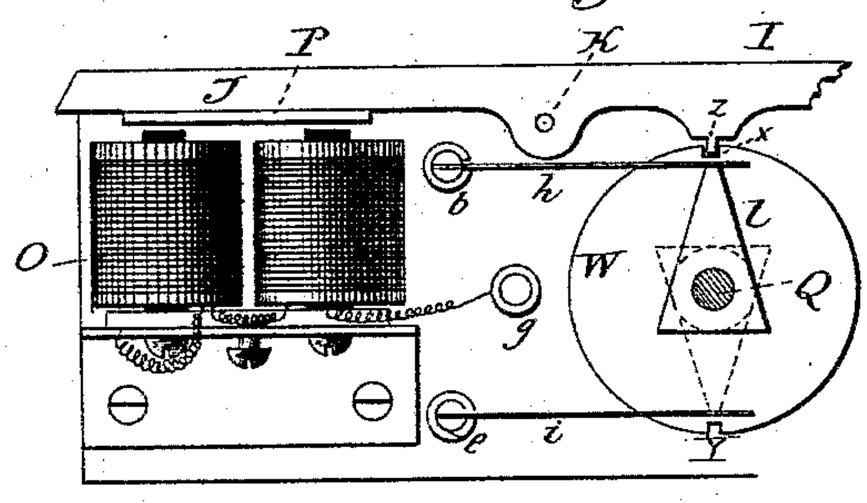
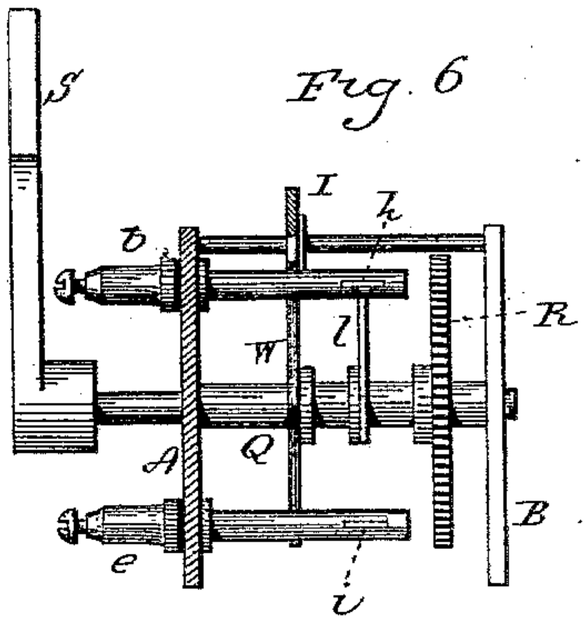


Fig. 6



Witnesses.
J. N. Shumway.
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UNITED STATES PATENT OFFICE.

WILLIAM E. NORRIS, OF WATERBURY, CONNECTICUT.

ELECTRIC VALVE-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 401,200, dated April 9, 1889.

Application filed November 19, 1888. Serial No. 291,269. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. NORRIS, of Waterbury, in the county of New Haven and State of Connecticut, have invented a new Improvement in Heat-Regulators; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a top or plan view of the apparatus; Fig. 2, a front view of the same; Fig. 3, a view, on a reduced scale, illustrating the apparatus in connection with a valve and thermostat; Fig. 4, a longitudinal section through the apparatus, looking from the front; Fig. 5, a partial longitudinal section, looking from the rear, illustrating the connections of the magnet; Fig. 6, a transverse section on line *x x*, looking toward the clock-work.

This invention relates to an improvement in that class of mechanism which is applied to heating apparatus, and which, in connection with a thermostat, regulates the heat by opening and closing dampers or valves, as the case may be, the invention relating particularly to the mechanism by which the valve or damper is operated, it being adapted to any of the well-known thermostats, which are arranged to open or close electric circuits, the object of the invention being a simple and reliable mechanism in combination with a magnet, and so that, as the circuit is closed or opened through the magnet, the mechanism will be set into operation and operate the damper or valve; and it consists in the construction of the mechanism, as hereinafter described, and more particularly recited in the claim.

A B represent, respectively, the front and rear plates of the frame, between which the mechanism is arranged. These plates are connected by bars C in the usual manner for connecting the plates of a clock-movement.

D is the main arbor, on which is a drum, E. This drum is provided with a spring or weight to actuate it, in the usual manner of applying the power to clock-movements, the arbor fitted at its outer end so that a key may be applied for winding the weight or spring, as the case may be.

F is a fly arranged upon an arbor, G, and which is connected by a train of gears and pinions with a gear, H, on the main shaft, and so that a rapid revolution is imparted to the fly F, as in the striking mechanism of a clock-movement, the fly being designed to prevent a too rapid rotation of the driving-arbor.

I J represent the two arms of a lever, hung upon a fulcrum, K, and so as to swing in a plane at right angles to the arbors. It is best arranged above the arbors, as shown, and extends from the fulcrum near one end of the frame to the opposite end, where it is adapted to rest on a support in the frame—say, as upon the upper bar C at that end of the frame—and it stands over a wheel, L, arranged on the arbor of the fly. The lever is provided with a dog, M, which stands in the path of a finger or projection, N, in the periphery of the wheel L, and so that when the arm I of the lever is in its place of rest the finger N will strike the dog M of the lever, and so that the revolution of the fly will be prevented, and consequently the clock-work will be held in suspense.

At the opposite end of the frame a magnet, O, is arranged, and on the arm J of the lever is an armature, P, which is adapted to be drawn to the poles of the magnet or disengaged therefrom.

In Fig. 4 the lever is represented in the position of rest, with the armature out of contact with the magnet—that is, as with the circuit open. If the circuit be closed, the arm J of the lever will be drawn toward the magnet, which will correspondingly raise the arm I, disengage the lever from the finger, and leave the clock-work free to revolve under the power applied thereto until such time as the circuit is open, when the arm I will again fall and come into the path of the finger N and arrest the further movement of the clock-work.

Q represents an arbor parallel with the arbor of the main wheel, and which is connected therewith by a gear, R, so that the rotation of the main wheel will impart a corresponding rotation to the arbor Q. The arbor Q carries an arm, S, which revolves with the arbor. This arm is for connection with the damper or valve, according to the nature of the heating apparatus.

In Fig. 3 I represent the invention as ap-

plied to a valve as for steam-heating, in which the valve-stem T slides vertically to open or close the valve. To the valve-stem a lever, U, is connected by one end. The other end of the lever is connected with the arm S by means of a rod, V, as arranged in Fig. 3. When the arm S is in its up position, the valve is closed. Now, if the arm S be revolved one-half around, it will correspondingly turn the lever U, as indicated in broken lines, Fig. 3, and open the valve. Then if the lever S be again turned to its up position the valve will be closed. The mechanism is adjusted so that the rotation of the arbor Q, carrying the arm S, is arrested at both the up and down positions, it being brought to the up position when the heat is too great, and so as to cut off the supply of heat, and then when the temperature is reduced the arbor receives another half-revolution, bringing the arm T to its down position, and opens the valve for a supply of heat, or if the device be a damper the damper is closed to reduce the temperature and opened to raise the temperature. To thus arrest the arbor Q when either of the two positions shall have been attained, a wheel, W, is arranged upon the arbor S, and so as to revolve therewith, and this wheel is constructed with a notch, X, at one point in its periphery, and a like notch, Y, at a diametrically-opposite point, and the arm I of the lever is provided with a tooth, Z, which is adapted to drop into either of the said notches X or Y as they may be presented.

In Fig. 4 the lever is represented as with the tooth Z dropped into the notch X, and when the arm is in the up position, and as when the circuit is open. Now, if the circuit be closed, the arm I of the lever is raised, which leaves the clock-work free to operate and takes the tooth Z out of the notch X of the wheel W, and thus leaves the arbor Q free to revolve, the circuit being broken after the lever is thus raised, and before the notch Y is brought to the tooth Z the lever drops, bringing the tooth Z onto the periphery of the wheel W, where it rides until the notch Y comes into line with the tooth Z. Then the lever will drop, the tooth Z entering the notch Y, and the dog on the arm I again engages the finger N and stops the further movement of the clock-work, and this stop occurs when the arm S is in the down position.

To make connection with the thermostat, and so that arrest of the mechanism will be made at the two points which I have mentioned, one line, *a*, runs from one side of the thermostat to the post *b*, insulated from the frame. The second line, *d*, runs from the other side of the thermostat to the post *e*, also insulated from the frame, thus connecting these two posts with the opposite points of the thermostat. The line *f* runs from one member of the battery to the insulated post *g* in the frame, which is in connection with the magnet, as seen in Figs. 1 and 5, the magnet also in connection with the frame, as seen in Fig. 5, and the other line from the battery runs to the thermostat, all as clearly seen in Fig. 3. The post *b* extends within the frame and carries a spring-contact, *h*, which extends over the arbor Q, as seen in Figs. 4, 5, and 6. The other post, *e*, extends inside the frame and carries a like spring-contact, *i*, which extends to a position below the arbor Q, as seen in Figs. 4 and 5. The arbor Q carries a radially-projecting arm, *l*, which revolves with it in a path in the plane of the contacts *h i*, and so that its outer end may engage either of the said contacts.

In Fig. 4 the arm *l* is represented as in connection with the contact *h*, so that the circuit is now made through the frame and the finger *h* to the thermostat. Now, if the circuit through the magnet be closed, so as to draw the armature end of the lever onto its magnet, as seen in broken lines, Fig. 4, the mechanism is released, and rotation will be imparted to the arbor Q, which will carry the arm *l* away from the contact *h;* but before the arm *l* leaves the contact *h* the notch X will have passed beyond the tooth Z, so that it cannot again enter that notch. As the arm *l* passes from the contact *h* the circuit will be broken and the lever will drop, bringing the tooth X onto the periphery of the arbor Q, and so as to support the lever in a position with the dog M out of the path of the finger N of the fly, and so that the mechanism will continue its movement until the notch Y is presented to the tooth Z, when the lever will fall into that notch and arrest the mechanism. This will have brought the arm S to its down position, as before described, and will also have brought the arm *l* into engagement with the contact *i* below, and there will stand until the circuit is again closed, which will occur when the opposite extreme is reached from that which first closed the circuit, one extreme being the highest point and the other extreme the lowest point of temperature. The rotation of the wheel W is so slow that the circuit closed by the thermostat at one point will have been broken before the other contact is reached in the rotation of the wheel W.

The thermostat to be used in connection with this apparatus is immaterial to the invention. I, however, for the purposes of illustration, represent a well-known thermostat in connection with the apparatus in Fig. 3, for which any other thermostat may be substituted, or any device which in an electric circuit under the operation of the heat will open and close the circuit.

In representing the invention as the arm S to be up for reducing and down for increasing the heat, it will be understood that whether these positions be up or down will depend upon the system of levers between the said arm and the valve or damper in connection therewith.

I claim—

In a heat-regulator, the combination of a clock-work, an arm revolved thereby, connec-

tions from the said arm to the valve or damper of the heating apparatus, a magnet, a lever one arm of which forms the armature for said magnet, the other arm provided with a dog, and the rapidly-revolving part of the clock-work provided with a finger revolving in a path corresponding to the said dog of the armature-lever and adapted to engage therewith when the circuit is broken or disengage therefrom when the circuit is closed, a wheel in connection with said clock-work and adapted to revolve therewith, the said wheel constructed with notches in its periphery at opposite points, the said points corresponding to the extreme positions of the said arm, and the armature-lever constructed with a finger adapted to engage said notches when the circuit is open, but adapted to ride upon the periphery of said wheel between the said notches, two spring-contacts in connection with one line of the electric circuit, but arranged upon opposite sides of a revolving arbor in said clock-work, the said revolving arbor carrying an arm which is adapted to engage said contacts at predetermined points in its revolution and make connection with the magnet through the frame at either of said points, as the case may be, the said magnet having one end of its wire in connection with the frame of the clock-work and the other end in connection with the other line of the electric circuit, substantially as described.

WILLIAM E. NORRIS.

Witnesses:
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L. C. WHITE.