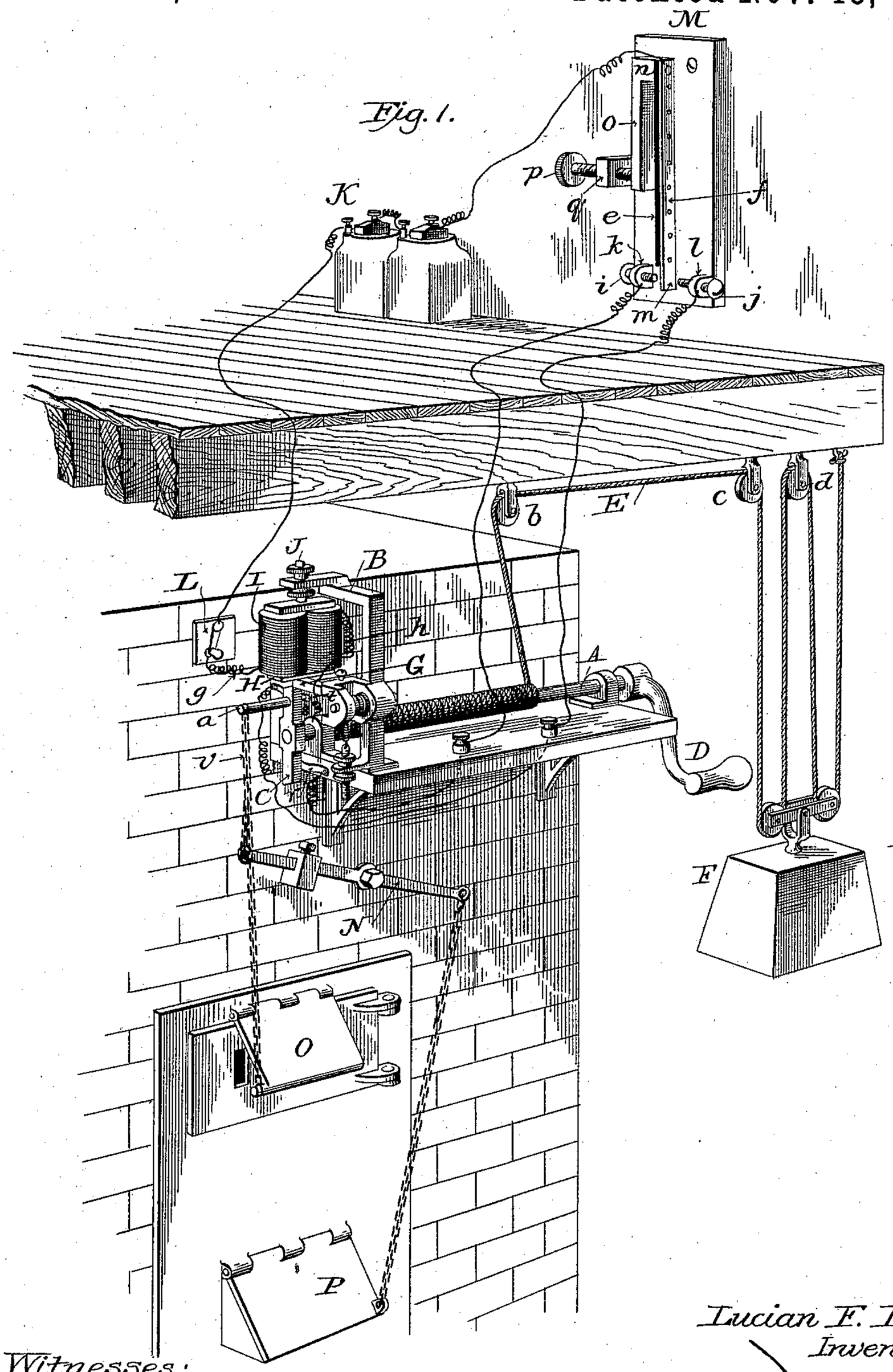
(No Model.) 2 Sheets—Sheet 1.

# L. F. EASTON.

## ELECTRIC TEMPERATURE REGULATOR.

No. 373,061. Patented Nov. 15, 1887.

Fig. 1.




Witnesses:
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Lucian F. Easton,
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(No Model.) 2 Sheets—Sheet 2.

# L. F. EASTON.

## ELECTRIC TEMPERATURE REGULATOR.

No. 373,061. Patented Nov. 15, 1887.

Fig. 2

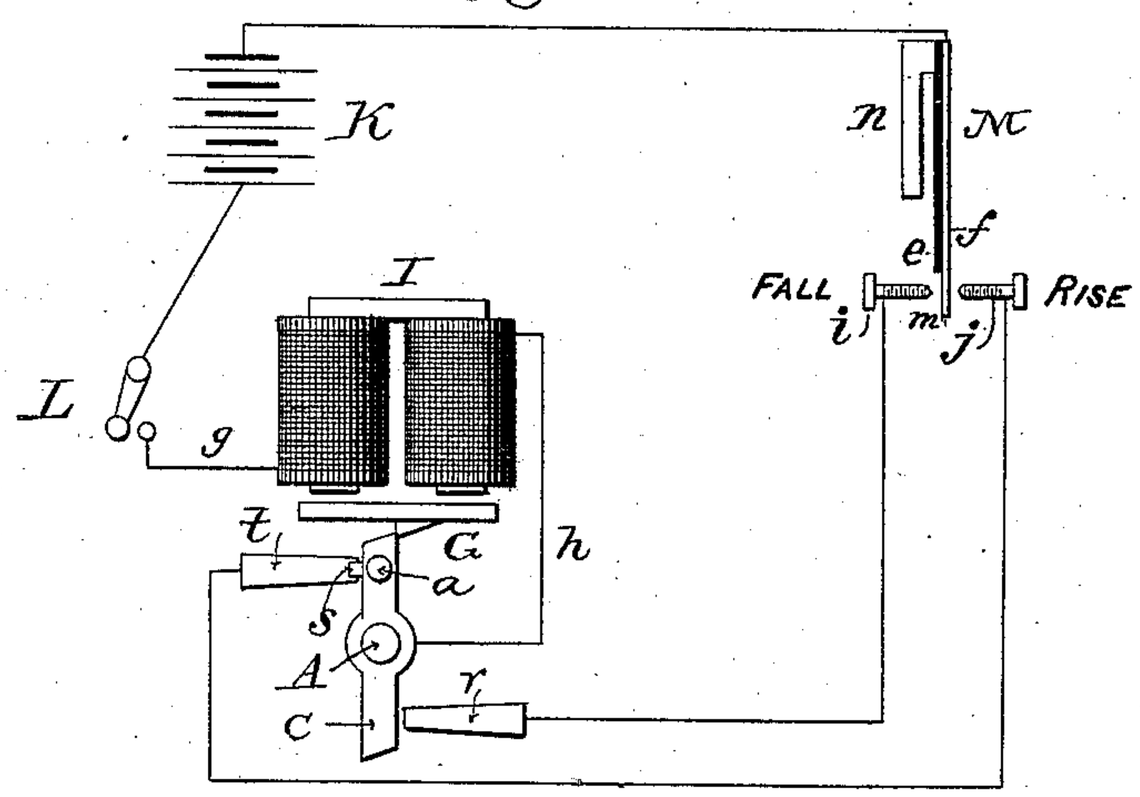



Fig. 3.

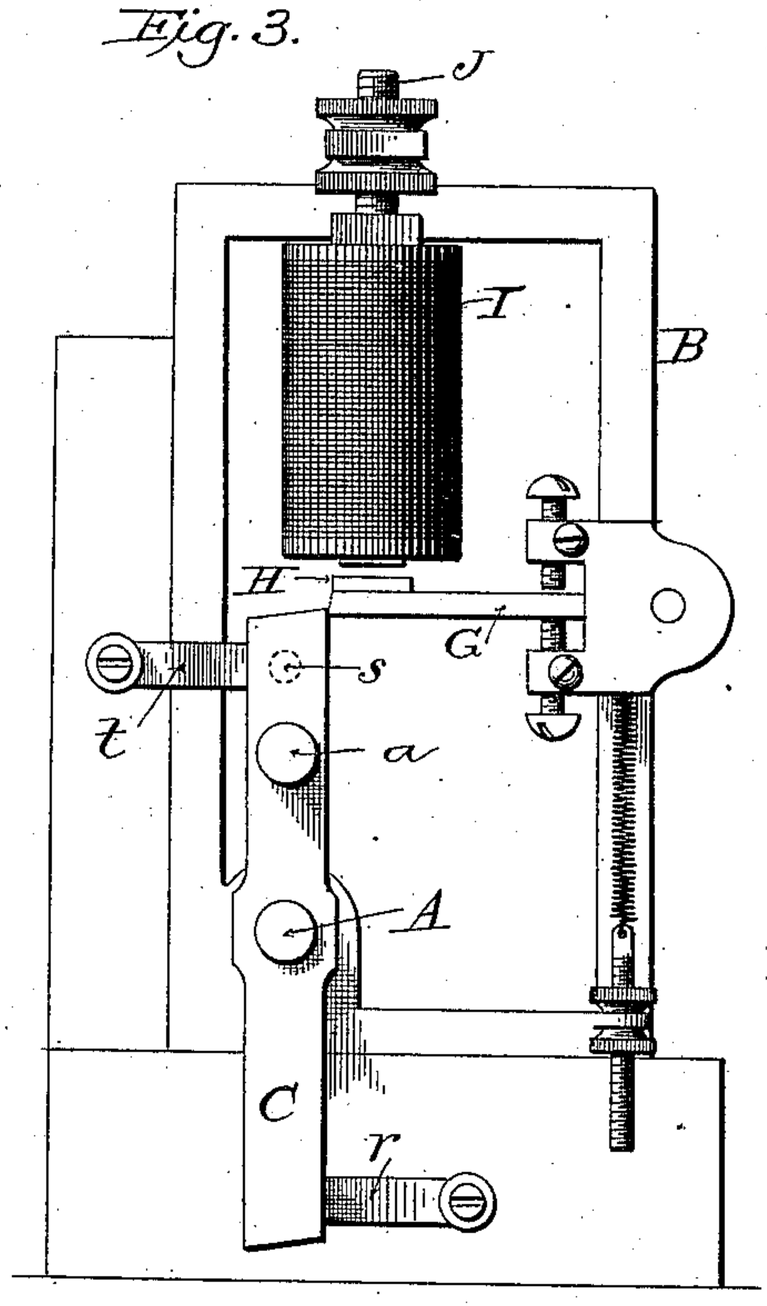
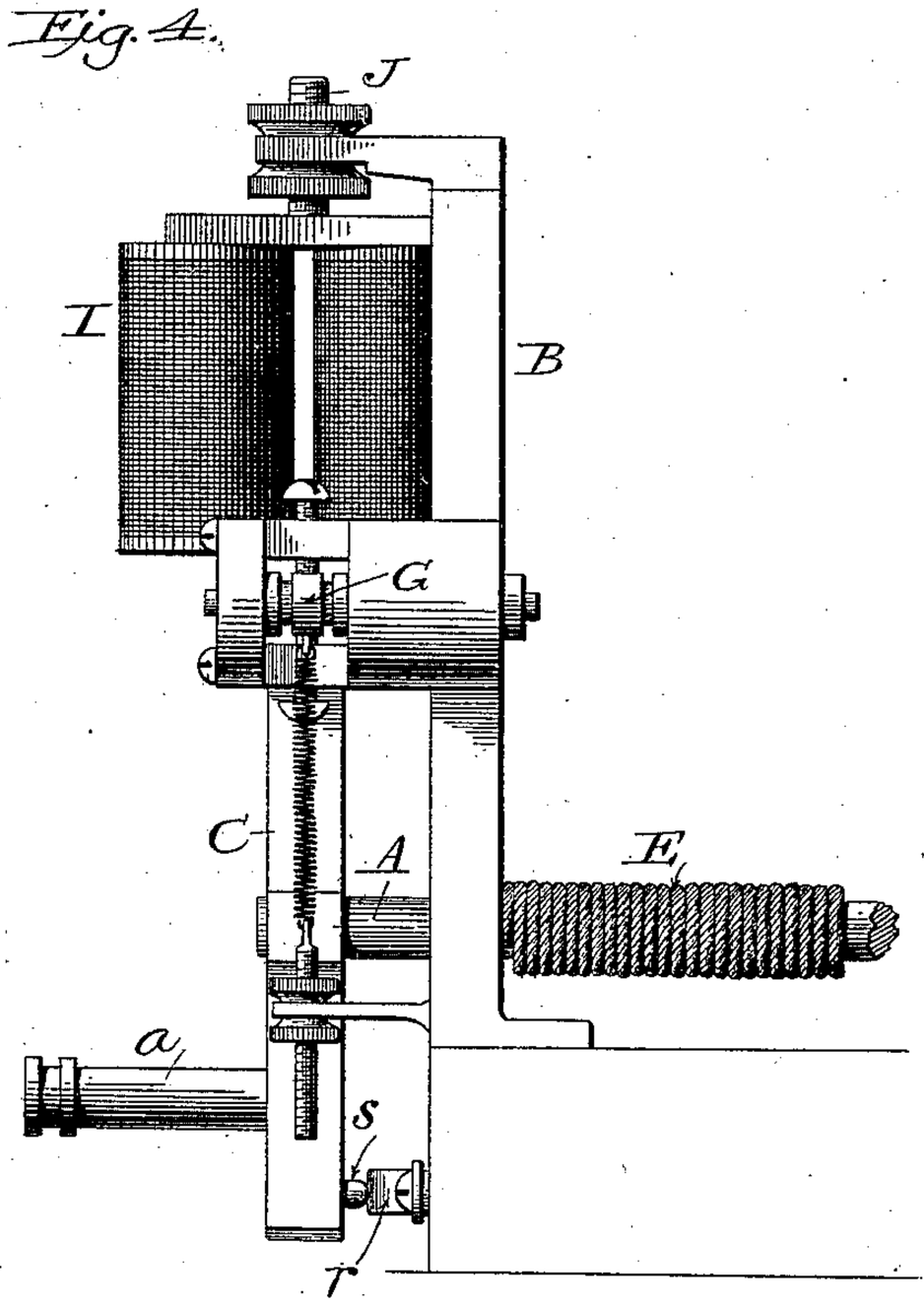



Fig. 4.




Witnesses;
James F. DuHamel
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Inventor,
by Dodger Son
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# UNITED STATES PATENT OFFICE.

LUCIAN FRED EASTON, OF LA CROSSE, WISCONSIN.

## ELECTRIC TEMPERATURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 373,061, dated November 15, 1887.

Application filed December 8, 1886. Serial No. 221,045. (No model.)

*To all whom it may concern:*

Be it known that I, LUCIAN FRED EASTON, of La Crosse, in the county of La Crosse and State of Wisconsin, have invented certain new and useful Improvements in Temperature-Regulators, of which the following is a specification.

My invention relates to apparatus for automatically controlling dampers, drafts, valves, &c., through the agency of changes in temperature, the improvements consisting in novel apparatus, hereinafter more fully set forth and described.

Prior to my invention various forms of apparatus have been devised for accomplishing the object stated, such being commonly applied to heating apparatus, ventilators, &c.

In the annexed drawings, Figure 1 is a perspective view of my improved apparatus applied to a heating-furnace; Fig. 2, a larger view in the nature of a diagram illustrating more clearly the several electric circuits; Figs. 3 and 4, views illustrating details of construction.

A indicates a shaft mounted and arranged to rotate in a frame, B, which is preferably made of metal and made to form a part of the battery-circuit, hereinafter described, though obviously the circuit may be otherwise formed or completed, if preferred.

To one end of the shaft is secured a cross-bar, C, carrying a laterally-projecting arm or stud, *a*, which is designed to be connected with the valve, damper, or other device which it is designed to control. The shaft A is further provided, preferably at the opposite end, with a winch or crank, D, by which it may be turned for the purpose of winding upon it a rope or band, E, which passes thence about a pulley or a series of pulleys, *b c d*, and is furnished with a weight, F, which, drawing down upon the rope or band, exerts a constant tendency to rotate the shaft in one direction.

The rotation of the shaft is prevented, except when certain conditions arise, by a pivoted latch or detent, G, the free end of which falls into the path of the cross-bar C and holds it against movement in its plane of rotation until the latch or detent is raised or moved clear of the cross-bar.

H indicates a soft-iron armature secured to the back of the latch or detent G, and I an electro-magnet, the poles of which face the armature and are a short distance removed therefrom, the magnet being advisably carried by an adjusting-screw, J, as shown. Under this arrangement, if the electro-magnet be energized, the armature will be attracted, the latch or detent G withdrawn from in front of the cross-bar C, and the shaft A permitted to revolve until the latch is allowed or caused to fall again into the path of the cross-bar.

K indicates a galvanic battery, or it may be any other form of electric generator, though a battery is preferred. One pole of this battery connects with a switch, L, by which the circuit may be opened or closed when otherwise complete and the other pole of which connects with a thermostat, M, as shown in Fig. 1.

From the switch a wire or conductor, *g*, runs to and connects with one end of the helices of the electro-magnet I, the other end of which helices connects with frame B by a wire, *h*, and through it with shaft A and cross-bar C.

The thermostat may be of any approved pattern, that represented in the drawings consisting of a flat bar composed, preferably, of a strip, *e*, of hard rubber and a strip, *f*, of brass riveted together and adapted, by reason of the different expansion and contraction of the two materials under variations in temperature, to bend to one or the other side of a given line, and to make contact, when thus bent a given distance, with one or the other of two contact-points, *i j*.

To provide for nicety and variation of adjustment the contact-points *i* and *j* are made in the form of screws, as shown, and are passed through fixed blocks *k* and *l*, through which they may be screwed toward or from the projecting end *m* of the brass strip *f*. To further provide for adjustment, the compound bar *e f* is secured to a pivoted block, *n*, having an arm, *o*, which is moved by a set-screw, *p*, passing through a fixed block, *q*, as shown in Fig. 1. This form of thermostat and the adjusting devices thereof are now in common use, and are not claimed by me; nor is it essential to the success of my apparatus that they be employed. A bimetallic bar may be used instead of the bar of rubber and brass, a column of mercury, a balanced thermometer, or

any equivalent and equally well-known device for establishing contact with one or another of two points whenever the temperature rises or falls to one or the other of two predetermined degrees.

From the contact-point *i* a wire or conductor runs to a contact-spring, *r*, which is in such position that it will be pressed against by a stud or knob, *s*, on the cross-bar, C, when that end of the cross-bar is below the shaft A, with the parts arranged as shown in Figs. 1 and 3 of the drawings.

From the contact-point *j* a wire or conductor runs to a second contact-spring, *t*, above the shaft A or diametrically opposite to the contact-spring *r*, whatever the position of the latter may be, it being obviously immaterial what position be chosen, provided the two springs be placed on diametrically-opposite sides of the shaft and in position to be pressed by the stud or knob *s* of the cross-bar C. From this arrangement of conductors and contacts it will be seen that when the switch L is closed a fall of temperature below the predetermined limit—usually 60° to 65°—will cause a deflection of the compound bar *e f* of the thermostat M, sufficient to throw the projecting end or nose *m* of the brass strip *f* into contact with the point of screw *i*, and when this occurs a circuit will be completed from the battery K, through brass strip *f* of the thermostat, contact-point *i*, spring *r*, stud *s* of cross-bar C, and the cross-bar itself, shaft A, frame B, wire *h*, electro-magnet I, wire *g*, and switch L back to battery K. The circuit being thus completed, the electro-magnet becomes energized, lifts armature H and latch or detent G, releases cross-bar C, and permits shaft A to rotate by reason of the action of weight F. As soon as the shaft rotates a very short distance, stud *s* of cross-bar C rides off of spring *r* and the circuit is broken, the magnet I becomes inert, the armature is consequently released, and the latch or detent falls into the path of the cross-bar and stops the movement thereof and of the shaft A when a half-revolution is completed. As the half-revolution is being completed, the stud *s* of cross-bar C rides upon or against contact-spring *t*, which completes a new circuit, with the exception of a break between the compound bar of the thermostat and the contact-point *j*, which will be closed by the movement of the compound bar toward it by reason of a rise in temperature to a prescribed point, usually 68° to 70°. When the temperature thus rises, the circuit is from battery K to switch L, thence by wire *g*, the helices of electro-magnet I, wire *h*, to frame B, thence by shaft A to cross-bar C, and stud *s* to contact-spring *t*, which, as before stated, connects by wire or conductor with contact-screw *j*. The rise of the temperature deflecting the bar *e f* toward screw *j* and causing it to touch said screw, and the strip *f* being connected with one pole of the battery, the circuit is thus completed, the armature and latch retracted, and the shaft and cross-bar C permitted to make a half-revolution under the impelling force of weight F, whereupon the parts will be stopped in the same manner as before.

The projecting arm or stem *a* of cross-bar C may connect either directly or indirectly with a damper, draft, or check-draft door, steam-valve, ventilator, or other contrivance, whereby the temperature of the room in which the thermostat is located may be caused to change.

For the purpose of illustration merely, and without meaning either to claim the particular arrangement of drafts or doors, or to limit myself to such arrangement, I have shown the arm *a* connected by a chain, *v*, with the counterweighted end of a lever, N, which end connects by chain or rod with the check-draft or door O of a furnace, and the other end of which connects in a similar manner with the lower or draft door P of the furnace. When the cross-bar C occupies the position shown in Fig. 1, which position it assumes when the temperature exceeds the prescribed height and causes the thermostat to close the circuit through contact-point *j*, the arm *a* of the cross-bar is at its highest point, and, drawing the chain *v* upward, lifts the weighted end of lever N, thus opening the check-draft O and closing the lower draft-door P. This of course checks the fire and permits the room in which the thermostat is located to cool off somewhat; but if the temperature falls below the prescribed limit the circuit is closed through contact *i*, and the action just explained is reversed. In this way the control of the furnace or other apparatus is rendered automatic, and by adjusting the screws *i* and *j* the limits of change may be brought as close together, and thus the action made as sensitive as desired.

It is manifestly immaterial what power be employed to rotate the shaft. Hence I wish it understood that I do not limit myself to any particular form or class of motor, intending to use springs, weights, fluid-pressure, or whatever may be best available at any particular time or place.

Suitable binding-posts will be provided for convenience in connecting and disconnecting the apparatus; but these require no special explanation.

A wheel or other body may of course be substituted for the cross-bar, if provided with two diametrically-opposite shoulders for the latch to engage with.

Having thus described my invention, what I claim is—

1. In combination with a draft, valve, damper, or like device, the regulating apparatus, consisting of shaft A, a motor for rotating the shaft, a supporting-frame, as B, a cross-bar, C, carried by shaft A, and provided with arm *a* and stud *s*, latch G, provided with armature H, contact-springs *r* and *t*, thermostat M, contact-points *i* and *j*, electro-magnet I, facing-armature H, electric generator K, a conductor connecting said generator with the helices of electro-magnet I and the helices of

the magnet with cross-bar C, and conductors respectively connecting the contacts *i* and *r* and *j* and *t*.

2. In combination with a draft, valve, or heat-regulating device, a rotary shaft carrying a cross-bar provided with a contact-button, a motor for rotating the shaft, a latch for holding the shaft against rotation provided with an armature, an electro-magnet for attracting the armature and withdrawing the latch, a battery, a thermostat, two contact-points with which the thermostat connects alternately when the temperatnre rises and falls above and below predetermined limits, and two contact-springs with which the button of the cross-bar alternately makes contact, said parts being arranged substantially as described and shown, whereby the latch is withdrawn, the shaft caused to make a half-revolution, and the latch again made to stop the rotation of the cross-bar whenever the temperature varies beyond the predetermined limits.

3. In combination with a heat-controlling valve, door, or damper, a shaft provided with a cross-bar, a connection between the cross-bar and the valve, door, or damper, a motor for imparting rotary motion to the shaft and cross-head, a latch or detent movable into and out of the path of the cross-bar and provided with an armature, an electro-magnet facing said armature, two electrical contacts located close to the ends of the cross-bar on opposite sides of its axis of rotation and in position to be pressed by a stud thereon, an electric generator, a thermostat, two contact-points arranged in such relation to the thermostat that one or the other shall connect therewith when the thermostat is subjected to given degrees of temperature, electric conductors connecting one pole of the battery with the electro-magnet and through it with the cross-head, and connecting the other pole thereof with the thermostat, an electric conductor connecting one of the contact-points of the thermostat with one of the contacts of the cross-bar, and a separate conductor connecting the other contact-point of the thermostat with the second contact of the cross-bar, whereby the circuit is automatically completed and the shaft permitted to make a half-revolution whenever the temperature rises or falls above or below certain predetermined points.

LUCIAN FRED EASTON.

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