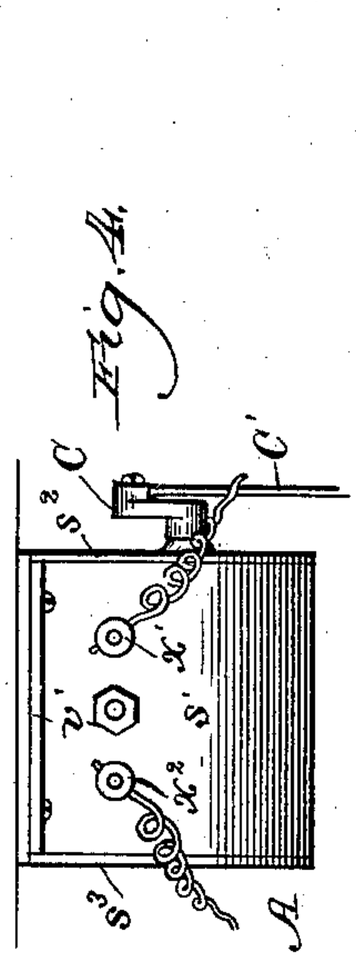
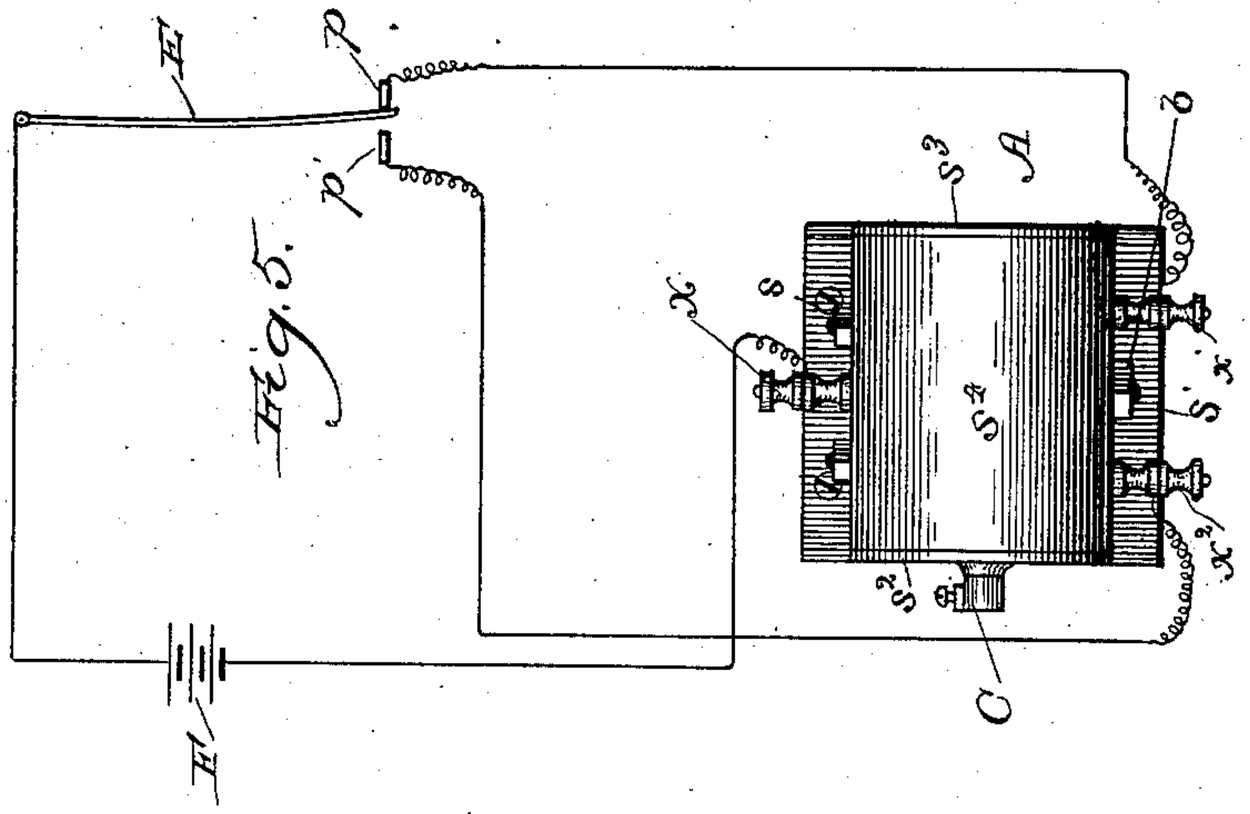
(No Model.) 3 Sheets—Sheet 1.

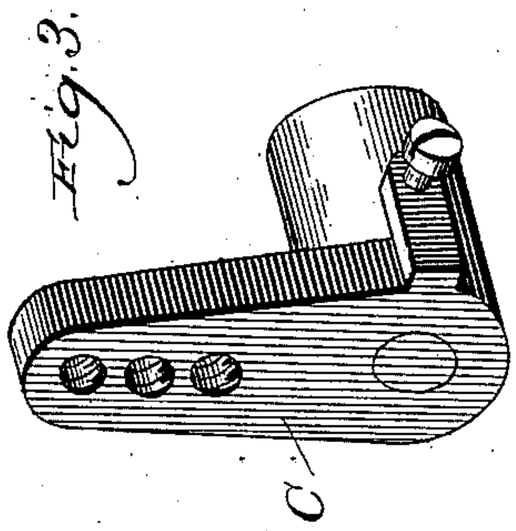
H. E. JACOBS.

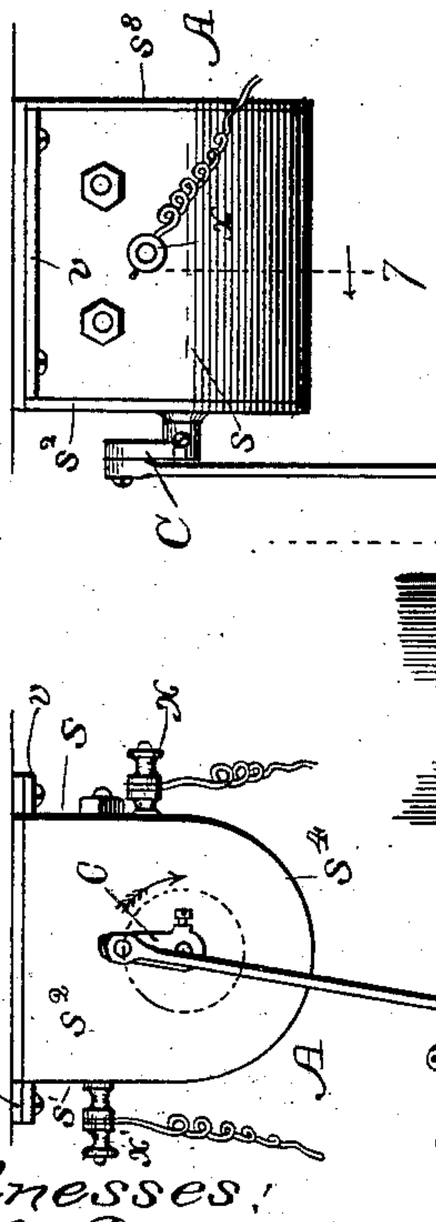
ELECTRIC TEMPERATURE CONTROLLING DEVICE.

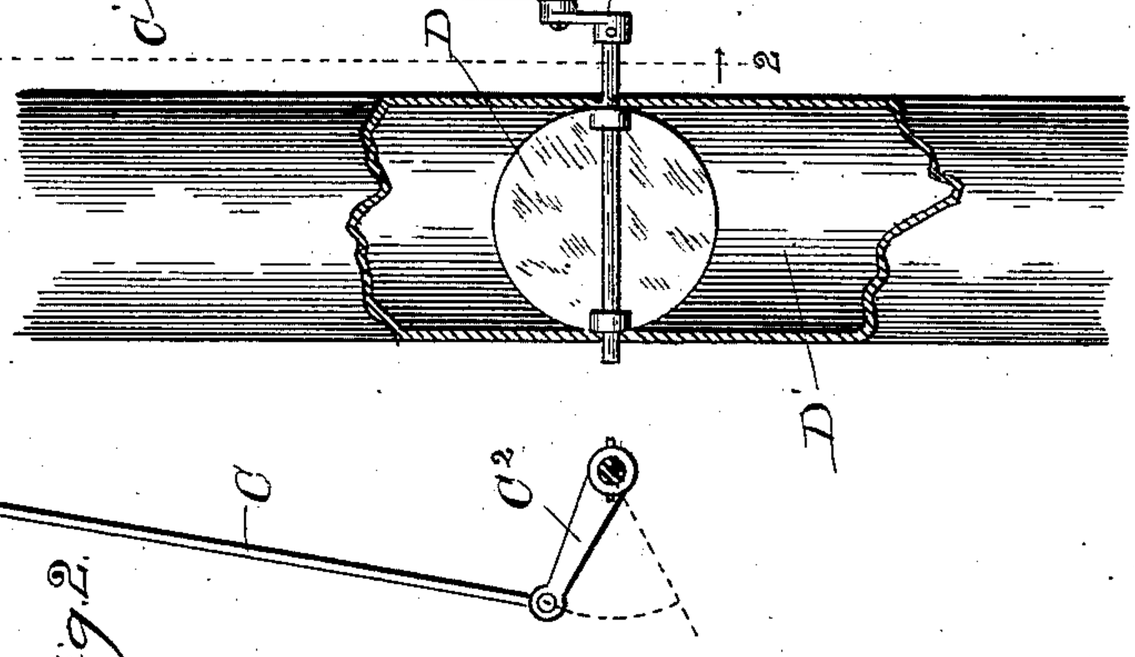
No. 365,600. Patented June 28, 1887.











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(No Model.) 3 Sheets—Sheet 2.

H. E. JACOBS.

ELECTRIC TEMPERATURE CONTROLLING DEVICE.

No. 365,600. Patented June 28, 1887.

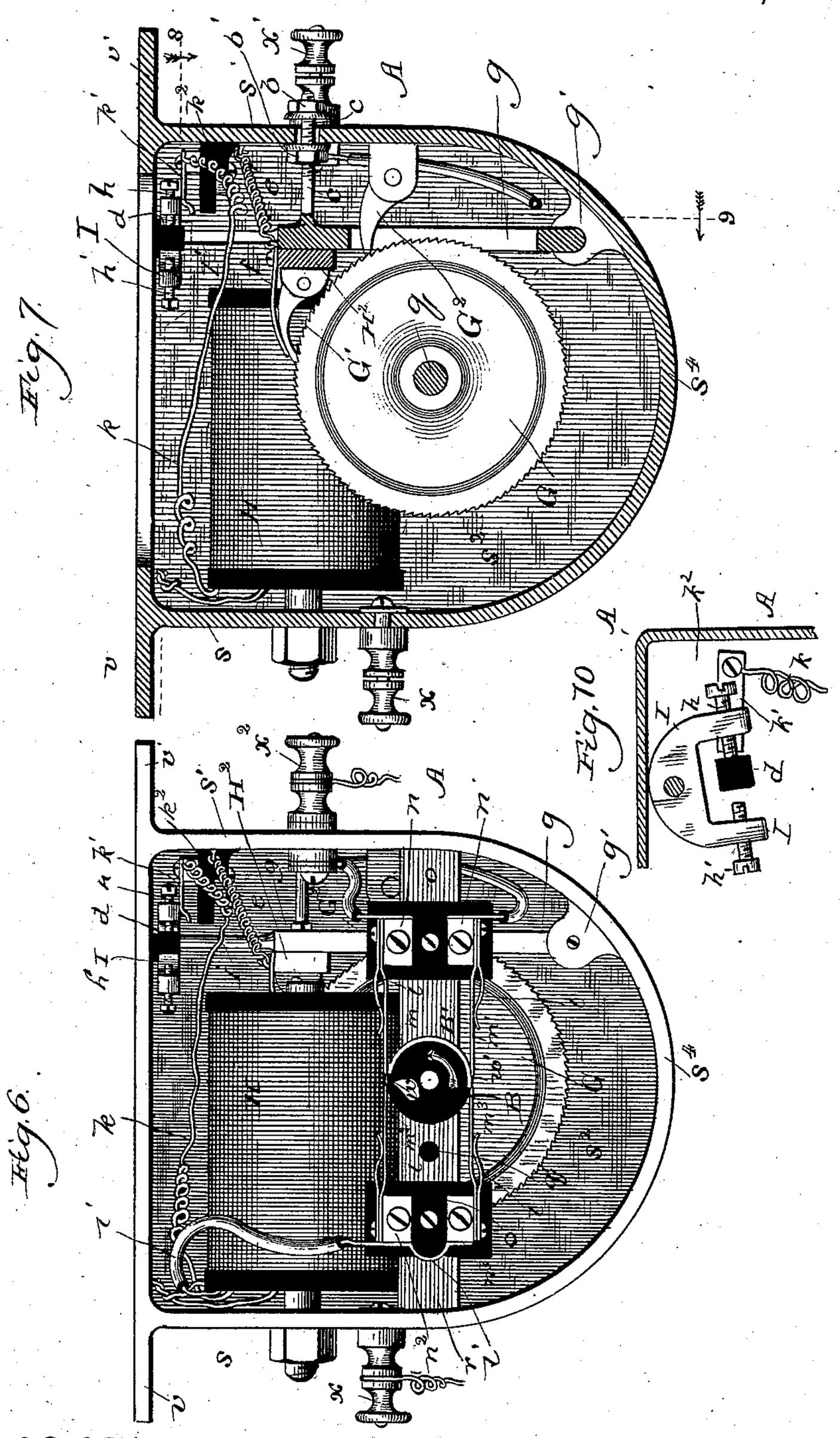

Fig. 7.

Fig. 6.

Fig. 10.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 9.

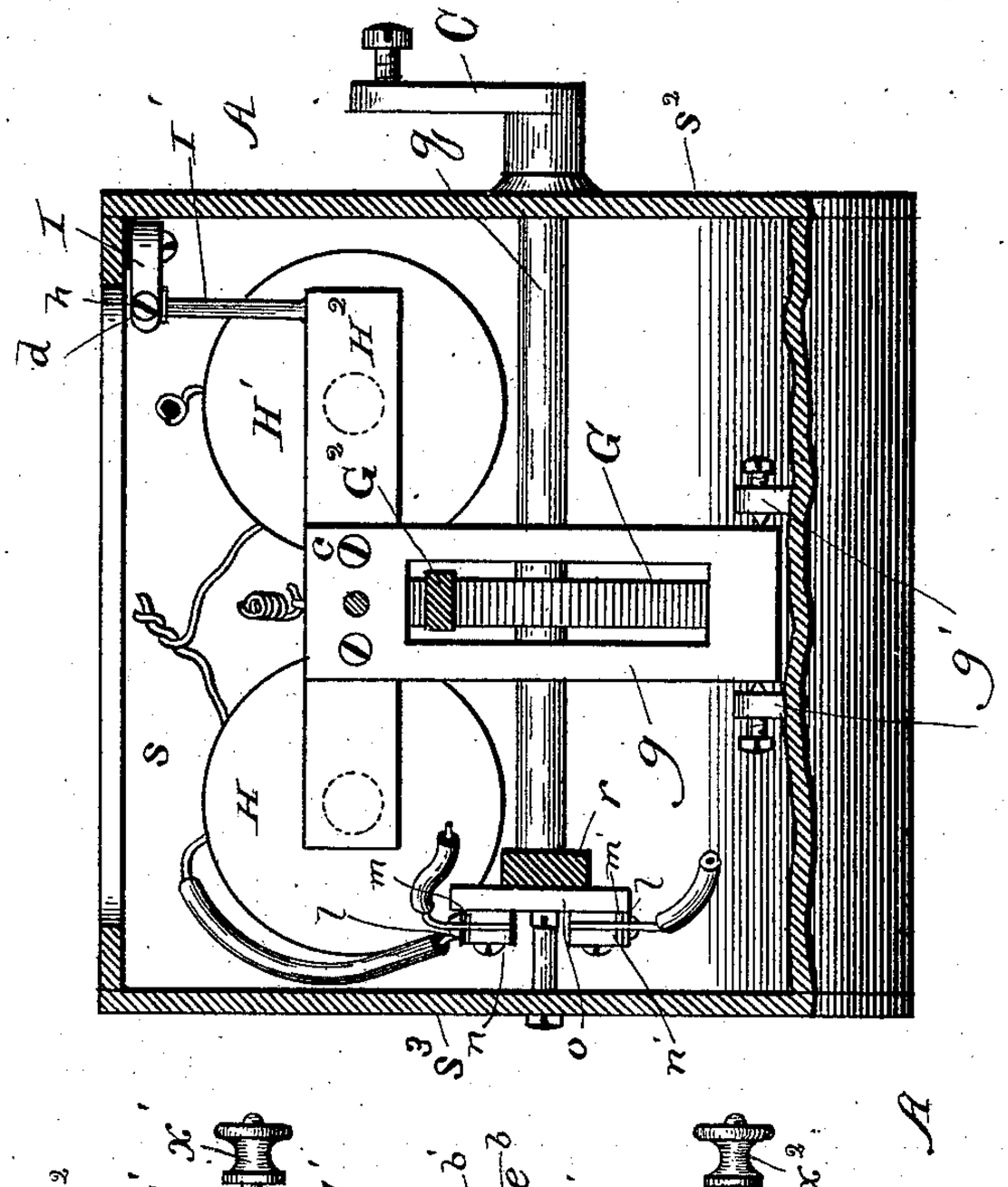
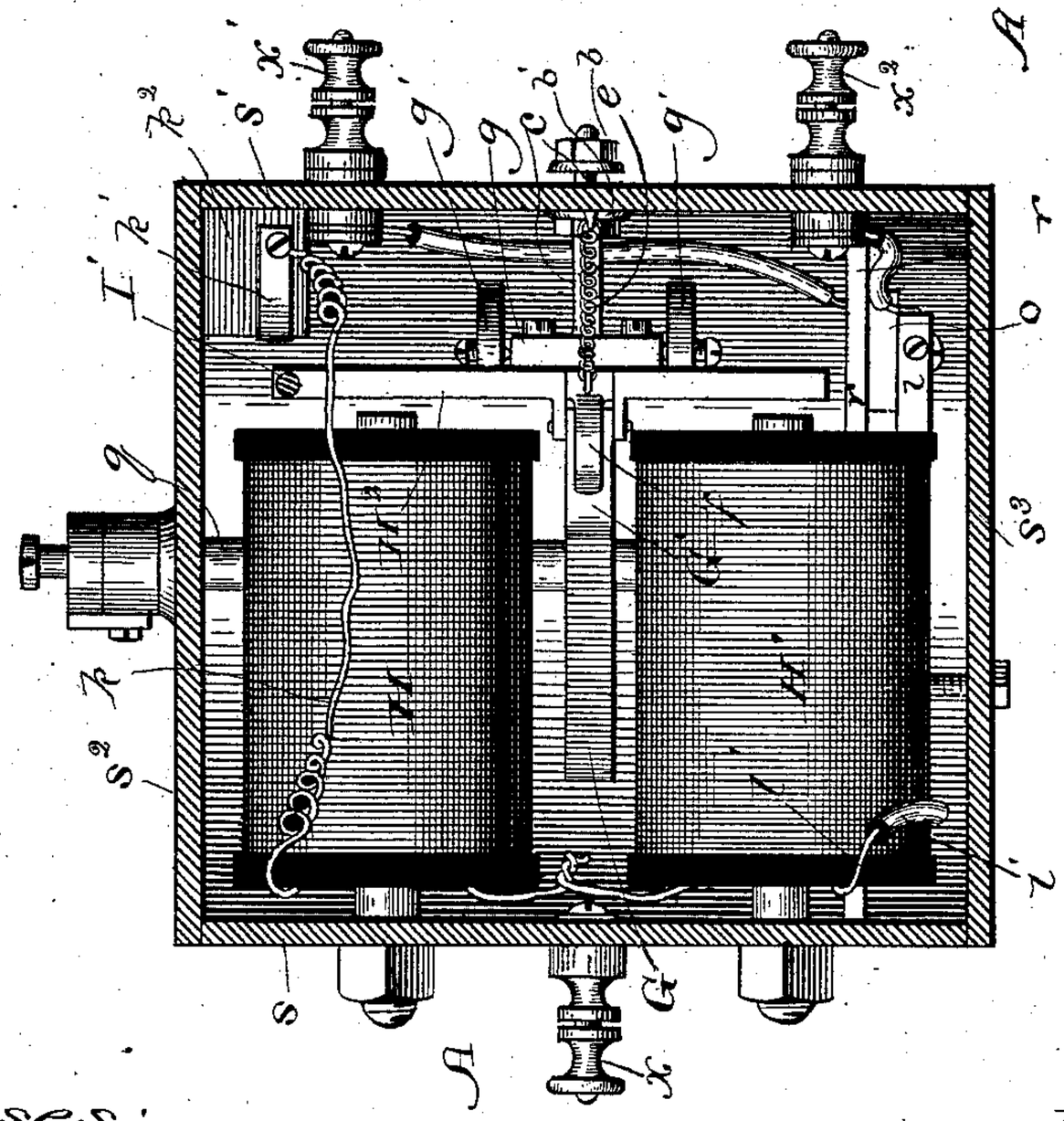


Fig. 8.



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Inventor:
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UNITED STATES PATENT OFFICE.

HENRY E. JACOBS, OF MILWAUKEE, WISCONSIN.

ELECTRIC TEMPERATURE-CONTROLLING DEVICE.

SPECIFICATION forming part of Letters Patent No. 365,600, dated June 28, 1887.

Application filed March 1, 1887. Serial No. 229,288. (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 Electric Temperature-Controlling Devices; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in devices for electrical connection with a thermostat or analogous temperature-indicating appliance, and for mechanical connection with a valve or damper, opening and closing of which produces increase or decrease in the temperature of an apartment by controlling the temperature-affecting medium.

In apparatus of the class in which my improved device may be used the damper or valve is automatically opened and closed, according to the condition of the temperature, by the effect of the latter upon the temperature-indicating instrument, whereby such instrument makes alternate contact to close one of two circuits respectively controlling the two functions of the valve or damper.

Some devices of the general nature of my improvement are indirectly connected with the valve or damper device to be controlled by expansible receiver or diaphragm mechanism actuated by fluid-pressure controlled by the action of the thermostat. Others are directly connected with such valve or damper mechanism and depend for their actuating control over the same upon the effect of the current passed through them by the automatic action of the thermostat to make the necessary contact.

My present improvement falls within the kind of devices last referred to.

It is my object to provide a simple, compact, and highly-effective mechanism for the purpose; and to this end my invention consists in the general construction of my improved device; and it also consists in certain details of construction and combinations of parts, all as hereinafter more fully set forth.

In the drawings, Figure 1 is an external view of my improved device secured to a support above it and displaying the side at which connection of the interior mechanism is made with a damper, the view being taken on the line 2 of Fig. 1 and viewed in the direction of the arrow. Fig. 2 is a similar view of the same, displaying an adjacent side and the connection of the interior mechanism with the damper, shown in elevation through a flue having a portion broken away. Fig. 3 is a perspective view of a detail; Fig. 4, a view like that shown in Fig. 3, but displaying the opposite external side of the device with the damper-connection broken off. Fig. 5 shows a bottom external plan view of the device when supported overhead with reference to the damper it controls in circuit with a thermostat and contacts supposed to be in a room communicating with the furnace and the temperature of which is to be controlled. Fig. 6 is an enlarged view of the device in side elevation with the cover removed to display the construction of internal mechanism; Fig. 7, an enlarged sectional view taken on the line 7 of Fig. 1 between the spools of the electromagnet to one side of the ratchet-wheel and viewed in the direction of the arrow; Fig. 8, a sectional view taken on the line 8 of Fig. 7 and viewed in the direction of the arrow; Fig. 9, a similar view taken on the line 9 of Fig. 7 and viewed in the direction of the arrow, and Fig. 10 a plan view of the pivotal bracket detail.

A is a metal case, preferably of the form shown, cast as a whole, and having straight sides s and s' and ends s^2 and s^3, the last-named of which is a removable cover. At its top—relatively speaking when the device is secured to a support above it—it is open. From the opposite sides, s and s', extend horizontal flanges v and v', at which to bolt the device in position against a support overhead or above it. The bottom s^4 is arched, as shown.

Inside the case, extending from one side, s, to the other, s', near the end s^3, is a bearing, r, Figs. 6 and 9, for one end of a rotary shaft, q, the opposite end of which is journaled in the end s^2, and both ends of the shaft project beyond their journal-bearings. The end of the shaft extending from the bearing r carries, to turn with it, a wheel, B, of insulating material, having a rim, B′, Fig. 6, of metal, of half the circumference of the wheel, sunk into the latter to be flush with the surface of the remaining half; and in the bearing r is a hole, q', to receive a screw-bolt

which secures the cover s^3 in place. The opposite projecting end of the shaft q carries a crank, C, (provided with adjustment-holes, as shown in Fig. 3,) connected by a rod, C′, (adjusted as to its length in the said adjustment-holes,) with a crank, C^2, on a damper, D, in a flue, D′.

For convenience I illustrate and confine the description of my improvement in connection with a damper in a flue. It will be understood, however, that it is equally applicable for controlling any other form of valve in a passage. When turned one-half of the way around, the shaft q moves the crank C to open the damper D, and when turned the rest of the way it moves the crank to open the damper.

Turning of the shaft q is effected automatically for the desired purpose by the mechanism inside the case, under the influence of a current produced by the action of a thermostat, E, which is connected with one pole of a battery, F, Fig. 5, in making contact with one of two contact-points, p and p', connected with the opposite pole of the battery through the mechanism contained within the case A.

Following is a description of the mechanism inside the case: Secured upon the shaft q centrally within the case is a ratchet-wheel, G. On opposite sides of the ratchet-wheel, extending from the inner face of the side s of the case, are spools H and H′ of an electro-magnet, connected together at adjacent ends. On the outer side of the bearing r, at opposite sides of the wheel B B′, are strips or blocks o and o', Fig. 6, of insulating material, secured in position, the former carrying above and below the screw which secures it metallic blocks n and n', and the latter metallic blocks n^2 and n^3. Metal strips m and m^2 are secured, respectively, on the upper sides of the blocks n and n^2, to extend toward each other and rest at their adjacent extremities upon the periphery of the wheel B B′ above the same, but without meeting, a space, w, being between them, and metal strips m' and m^3 are secured, respectively, on the under sides of the blocks n' and n^3, to extend like the strips n and n^2, but below the wheel B B′, and leave a space, w', between them. The strips are maintained in contact with the periphery of the wheel by flat springs l, and a conductor, l', connects the blocks n^3 and n^2 together and with the spool H′, as shown.

The pole of the battery F opposite that with which the thermostat is connected (see Fig. 5) is connected with the metal case A on its side s at a binding-post, x, and the contacts p and p' are connected with the same on its side s' at binding-posts x' and x^2, respectively. The post x is connected by an insulated conductor, as shown, (see Fig. 6,) with the metallic block n, and the post x' in a similar manner with the block n'.

The initial adjustment of the crank C with reference to the damper is such that when the crank is up, as shown in Fig. 1, the damper is open, and when down, by being moved half-way around, the damper is shut. The turning of the crank C is produced by turning the shaft q through the action of a current when the thermostat makes contact upon the magnet H H′, which vibrates a pivoted armature, H^2, (owing to the construction hereinafter described,) carrying a dog, G′, in engagement with the ratchet-wheel G.

When the temperature of the apartment containing the thermostat E falls below a predetermined degree, the thermostat makes contact at p, closing the circuit and causing the current to flow by way of the binding-post x', block n, strips m and m^2—then connected by the metal portion B′ of the periphery of the wheel B—conductor l', to the magnet, and back from the binding-post x to the battery. Vibration of the armature—produced by a suitable circuit-breaker and spring, hereinafter described—turns the shaft q, by the engagement of the dog G′ with the ratchet-wheel G, until the wheel B B′ on the shaft is rotated half-way around. The half-turn of the shaft q turns the crank C to its position in which the damper is raised, and it is prevented from further turning by the separation of the connection between the strips m and m^2, produced by the half-rotation of the wheel B B′, whereby the metallic part B′ thereof is removed from its position of connecting electrically the strips m and m^2 to that of connecting the strips m' and m^3, in which the circuit is prepared to be closed when the thermostat shall make contact at p'.

In Fig. 6 of the drawings the relative positions shown of the parts B′ and strips m m^2 and m' m^3 are illustrative of their condition resulting from the operation thus described. This contact takes place by a rise in the temperature above the desired predetermined degrees, rendering necessary closing of the damper D, which is produced through turning of the shaft q and crank with the vibratory action of the armature to turn the ratchet-wheel G with the dog G′ which action results from the closing of the circuit, causing the current to pass by way of the binding-post x^2, block n', strips m' and m^3, and intermediate metal, B′, conductor l', and magnet, back from the binding-post x to the battery. The half-turn of the wheel B B′ (which thus makes a complete revolution with the two opening and closing operations of the damper) will bring the metal portion B′ into position to connect the strips m and m^2, and thus prepare the circuit to be closed when the thermostat shall again make contact at p.

Connection of the magnet H H′ with the binding-post x is made indirectly by connecting the spool H by means of an insulated conductor, k, with a metal spring, k', Figs. 6 and 7, supported on an insulating-block, k^2, in turn supported against the wall s' of the case A, as seen in the upper right-hand corner. The spring k' projects into contact with a bracket, I, pivotally supported to extend from the under side of the case A, and carrying

adjustable screw-stops *h* and *h'*. Thus when the spring *k'* is against the bracket I and the circuit elsewhere closed, in the manner already described, the current returns to the battery by reaching the binding-post *x* from the spool H over the conductor *k*, spring *k'*, bracket I, and case A, and whenever the spring *k'* and bracket I are separated the circuit is broken. During each semi-revolution of the wheel B B' the circuit is made and broken intermittingly by the vibratory movements of the armature H^2. The latter is carried, to be in the field of the magnet, by a bar, *g*, pivotally supported between lugs *g'*, as shown, and slotted to admit through it a portion of the periphery of the ratchet-wheel G, adjacent to which it extends in an upward direction.

Near its center the armature H^2 carries the pivotal dog G', maintained in engagement with the teeth of the ratchet-wheel by a flat spring, *f*, and a spiral spring, *e*, connects the armature with the case and maintains it normally out of contact with the magnet in the usual manner and for the ordinary purpose in vibratory armatures. A dog, G^2, prevents backward turning of the ratchet-wheel.

Toward the end of the armature nearest the bracket I it carries a rod, I', capped by a piece of leather, *d*, or other insulating material, which extends between the adjustable stops *h* and *h'* on the bracket. When the armature is attracted, the dog G' turns the ratchet-wheel G the extent of one tooth, the rod I' is pressed at the cap *d* against the stop *h'*, thereby turning the bracket, breaking the contact between the spring *k'* and bracket I, and interrupting the current, to be immediately continued by the action of the spring *e* in drawing the armature back, causing the cap *d* to strike against the stop *h* and turn the bracket to produce contact between the latter and the spring *k'*. Until the circuit is broken by the wheel B in the manner already described the armature will vibrate rapidly and, obviously, turn the ratchet-wheel half-way around, with the attendant desired effect upon the crank C and damper D.

The play of the armature is made adjustable by means of a threaded rod, *c*, Fig. 7, extending from the pivotal bar *g* through the side *s'* of the case, and provided with a nut-locking device, *b* and *b'*.

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

1. In an electrical apparatus for use in controlling temperature by the action of a suitable temperature-indicating instrument, the combination of a rotary shaft, an electro-magnet, a vibratory armature, a ratchet-wheel on the shaft rotated by the vibrations of the armature, circuit making and breaking mechanism, substantially as described, on and connected with the shaft, and a pivotal bracket, I, electrically connected normally with the electro-magnet, and horizontally and alternately movable into and out of such connection by the vibrations of the armature, while the circuit is closed by the said circuit making and breaking mechanism on and connected with the shaft, substantially as and for the purpose set forth.

2. In an electrical apparatus for use in controlling temperature by the action of a suitable temperature-indicating instrument, the combination of a rotary shaft, *q*, carrying a wheel, B B', composed of conducting and non-conducting material, metallic strips *m* m^2 and *m'* m^3, respectively on opposite sides of the wheel B B', in contact with the same and separated at their adjacent extremities, an electro-magnet in electrical connection with the said strips, a vibratory armature, a ratchet-wheel, G, on the shaft *q*, rotated by the vibrations of the armature, and a circuit opener and closer operated by the vibrations of the armature while the circuit is closed by the wheel B B', substantially as and for the purpose set forth.

3. In an electrical apparatus for use in controlling temperature by the action of a suitable temperature-indicating instrument, the combination of a rotary shaft, *q*, carrying a wheel, B B', composed of conducting and non-conducting material, metallic strips *m* m^2 and *m'* m^3, respectively on opposite sides of the wheel B B', in contact with the same and separated at their adjacent extremities, an electro-magnet in electrical connection with the said strips, a vibratory armature, a ratchet-wheel, G, on the shaft *q*, rotated by the vibrations of the armature, and a pivotal bracket, I, electrically connected normally with the electro-magnet and moved alternately into and out of such connection by the vibrations of the armature, substantially as and for the purpose set forth.

4. In an electrical apparatus for use in controlling temperature by the action of a suitable temperature-indicating instrument, the combination of a case, A, a rotary shaft, *q*, supported in bearings in the case and carrying a crank, C, and a wheel, B B', composed of conducting and non-conducting material, metallic strips *m* m^2 and *m'* m^3, respectively on opposite sides of the wheel B B', in contact with the same and separated at their adjacent extremities, an electro magnet in electrical connection with the said strips, a vibratory armature, a ratchet-wheel, G, on the shaft *q*, rotated by the vibrations of the armature, a spring, *k'*, electrically connected with the electro-magnet, and a pivotal bracket, I, moved alternately into and out of contact with the spring *k'* by the vibrations of the armature, substantially as and for the purpose set forth.

5. In an electrical apparatus for use in controlling temperature by the action of a suitable temperature-indicating instrument, the combination of a case, A, a rotary shaft, *q*, supported in bearings in the case and carrying a crank, C, for connection of the shaft with a valve, and a wheel, B B', composed of conducting and non conducting material, metallic strips *m* m^2 and *m'* m^3, respectively on opposite sides of the wheel B B', in contact with

the same and separated at their adjacent extremities, an electro-magnet, H H′, in electrical connection with the said strips, a ratchet-wheel, G, on the shaft *q*, a vibratory armature, H^2, carrying a dog, G′, to engage with and rotate the ratchet-wheel by the vibrations of the armature, a spring, *k*′, electrically connected with the electro-magnet, a pivotal bracket, I, normally in contact with the spring *k*′, and a rod, I′, extending from the armature between the arms of the bracket and operating to make and break the contact between the said bracket and spring *k*′, substantially as and for the purpose set forth.

HENRY E. JACOBS.

In presence of—
N. S. MURPHEY,
E. H. WILSON.