



# UNITED STATES PATENT OFFICE.

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## ELECTRIC REGULATOR OF HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 362,212, dated May 3, 1887.

Application filed November 20, 1886. Serial No. 219,449. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD L. GUION, of Elmira, in the county of Chemung, in the State of New York, have invented new and useful  
5 Improvements in Electric Regulators of Heating Apparatus, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

The object of this invention is to control the  
10 circuit of an electric motor by a thermostat, said motor being employed for regulating the valves or dampers of the apparatus supplying the heat to the apartment containing the thermostat; and the invention consists in the com-  
15 bination, with an electric circuit, of an electric thermostat, solenoids connected with said thermostat, an armature arranged movable longitudinally in the axis of the solenoids, a switch actuated by said armature, and an electric motor  
20 connected with the terminals of the switch, all as hereinafter more fully described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is an elevation of an apparatus embodying my invention;  
25 and Fig. 2 is a detached side view of the motor, showing the means for controlling the movement thereof and the means for transmitting motion therefrom.

A represents a thermostat located in the  
30 apartment in which the heat is to be automatically controlled. This thermostat may be of any suitable style and connected with an electric circuit, so as to open and close the circuit by the action of the thermostat under the  
35 influence of the changes of temperature.

The thermostat here represented consists of a bar, *d*, composed of longitudinal sections of different materials having different capacities of expansion by heat, said bar being supported  
40 at one end, and having its free end arranged between two contact-points, *e' e''*, similar to the thermostat for which I have filed an application for patent on the 11th day of March, 1886, Serial No. 194,782.

45 B denotes the battery, with which the thermostatic bar is permanently connected by a wire, *a*.

A' A'' represent two solenoids, arranged end to end, with a space between them, and in the  
50 axis of said solenoids is arranged movable longitudinally the armature C. Near the sides of the solenoids A' A'' is a metallic wall, I, which

is connected with the battery B by a wire, *n*; and on this wall is pivoted a switch-arm, *b*, also of metal, so that a current of electricity  
55 can be conveyed from the wall I to said switch-arm. The lower end of the switch-arm *b* is bifurcated, and straddles a pin, *p*, which projects from the side of the armature C, and the  
60 upper end of the arm *b* is weighted to carry it by gravity toward either side after passing a perpendicular position. At opposite sides of the upper end of the switch-arm *b* are contact-  
65 points or terminals *h' h''*, which are supported on but insulated from the wall I. These contact-points project sufficiently from said wall to be encountered by the switch-arm *b* during  
70 its oscillating motion, and thus arrest said motion. Elastic wire prongs *r r* project from opposite sides of the arm *b* in such positions as  
to strike the terminals or contact-points *h' h''* during the oscillations of said arm, and thus  
relieve the same from concussion.

At opposite sides of the pivot of the switch-  
arm *b* are insulated arms F F', on which are se-  
75 cured binding-posts *g' g''*, and from these binding-posts project spring-metal arms *o'* and *o''*, the free ends of which lie across a front pro-  
jection of the metallic axis of the switch-arm  
80 *b*, and below this axis the arm *b* has affixed to it a hard-rubber cam, *g*, which rises at oppo-  
site sides of the aforesaid axis sufficiently to  
85 cause the end of the cam at one side of the arm *b* to lift the spring-arm *o''* thereat when the upper end of the switch-arm *b* is swung toward  
the opposite side of the axis and in contact with  
90 the terminal *h'*, and conversely, when the switch-arm *b* is in contact with the terminal *h''*, the opposite end of the cam *g* lifts the spring-  
arm *o'*. The lifting of the arms *o' o''* throws them  
95 out of contact with the metallic axis of the switch-arm *b*. The arm *o'* is electrically connected with the solenoid A' and the arm *o''* is electrically connected with the solenoid A''.

On the supporting frame or base F' of the  
95 solenoids are two binding-posts, *f' f''*, and from the binding-post *f'* wires are extended to the solenoid A' and contact-points *e'* of the thermostat, and from the binding-post *f''* wires are extended to the solenoid A'' and contact-point  
100 *e''* of the thermostat.

M represents an electric motor, which may be of any suitable and well-known construction, and N represents the commutator of said

motor. The armature-shaft of the motor has attached to it a pinion, *s*, which meshes in a large gear-wheel, *S'*, mounted on the end of a shaft, *G*, which is pivoted on the frame of the motor. From the wheel *S'* projects a wrist-pin, *p*, to which is connected a cord or chain, which communicates with the damper or valve of the heating apparatus which supplies heat to the apartment containing the thermostat *A*. A crank may be attached to the opposite end of the shaft *G* and suitably connected with the front or draft damper of the heating apparatus in case the aforesaid wrist-pin of the wheel *S'* is made to operate the back or check damper; or the axis of a rotary valve of a heater may be coupled to the shaft *G*, so as to partake rotary motion from said shaft. On the shaft *G* is also fastened a metal disk, *j*, from opposite sides of which project metal pins or cams *c c*, said disk serving as a commutator to keep the circuit closed during one-half of a revolution of said shaft, so as to open or close the dampers or valves of the heating apparatus. Said disk is in electric communication with its support, and from the latter a wire, *k*, is extended to the commutator *N*, and the latter is connected with the battery by a wire, *m*. On a suitable support are two binding-posts, *t t*, from which project two spring-arms, *i' i''*, the free ends of which lie at opposite sides of the disk *j* and in the paths of the pins *c c* thereof. By wires *i'''* and *i''''* the two binding-posts *t t* are connected, respectively, with the switch-terminals *h''* and *h'*.

The operation of my invention is as follows: When the temperature in the apartment containing the thermostat *A* falls, the bar *d* moves to the left, making contact with contact-point *e'*, and thereby completes the circuit from the battery *B* through the wire to the binding-post *f'*, from thence through the coil of the solenoid *A'* to the binding-post *g'*, which supports the spring-arm *o'*, through which latter the electric current passes to the switch-arm *b* through the axis thereof. From the axis of this switch-arm the electric current passes through the metallic wall *I*, and then through the wire *n* back of the battery *B*. When this circuit is completed, the core or armature *C* is drawn into the solenoid *A'*, and this movement of said armature throws the switch-arm *b* over onto the terminal *h''*. In this latter movement the rubber cam *g* lifts the spring-arm *o'* out of contact with the axis of the switch-arm *b*, and allows the spring-arm *o''* to drop into contact with the aforesaid axis, thereby breaking the circuit through *e' f'*, solenoid *A'*, binding-post *g'*, spring-arm *o'*, and wall *I*, and switching the circuit onto the wire connecting the binding-post *e''* of the thermostat with the binding-post *f''*, thence through the solenoid *A''* to the binding-post *g''* and spring-arm *o''* to the axis of the switch-arm *b*, thence through the wall *I*, back to the battery *B*, through the wire *n*, ready to be charged when the thermostatic bar *d* shall be moved to the right by the rise of temperature. When the

switch-arm *b* falls into contact with the terminal *h''*, it closes the circuit from the battery *B* through the wire *m* and through the motor *M* to the disk *j*, thence through the spring-arm *i''*, which at that time is in contact with one of the pins on said disk, thence through the wire *i'''*, contact-point *h''*, switch-arm *b*, wall *I*, and wire *n* back to the battery. This circuit moves the motor *M*, which in turn revolves the shaft *G* and disk *j*, connected with said shaft, and also moves the valves or dampers of the heating apparatus by the hereinbefore-described connections thereof with the shaft *G*. When the disk *j* has made a half-revolution, it breaks the connection with the spring-arm *i''*, and thus breaks the circuit through the motor and stops the latter, leaving the valves or dampers open or closed, as required. At the same time the disk *j* makes connection with the spring-arm *i'*, leaving the circuit ready to be completed by a reversal of the position of the switch-arm *b*. The operation of this switch is such that it opens the circuit from the thermostat, which may be a long circuit, and puts the battery as a local circuit directly on the motor, so that there is only the resistance of the motor in the circuit, thus giving the motor the whole force of the battery.

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

1. The combination, with the electric circuit, of an electric thermostat, two solenoids connected, respectively, with the opposite contacts of the thermostat, an armature arranged movably longitudinally in the axis of the solenoids, and a switch actuated by said armature, as set forth and shown.

2. In an electric circuit, the combination of an electric thermostatic bar having its free ends arranged between two contact-points, two solenoids connected, respectively, with said contact-points, an armature arranged movably longitudinally in the axis of the solenoids, a switch actuated by said armature, an electric motor, a commutator interposed between the motor and switch, and mechanisms for transmitting motion from the motor to the valves or dampers of the heating apparatus, substantially as described and shown.

3. The combination, with an electric circuit, of an electric thermostat having two contact-points, the solenoids *A' A''*, reciprocating armature *C*, the pivoted switch-arm *b*, having its lower end bifurcated and astride a projection on the armature and its upper end weighted, contact-points *h' h''* at opposite sides of the upper end of the switch-arm, binding-posts *g' g''* at opposite sides of the pivot of the switch-arm, spring-arms *o' o''*, projecting from said binding-posts and having their free end lying across an axial projection on the switch-arm, the insulated cam *g*, attached to the switch-arm, the disk *j*, having pins projecting from opposite sides, the spring-arms *i' i''*, electrically connected with the contact-points *h' h''*, the motor *M*, electric-

ally connected with the disk *j*, and mechanism for transmitting motion from the motor to the valves or dampers of the heating apparatus, substantially as described and shown.

5 4. In an electric circuit, the combination of the solenoids *A' A''*, reciprocating armature *C*, the pivoted switch-arm *b*, bifurcated at its lower end and astride a projection on said ar-  
10 mure and having its upper end weighted, the contact-points *h' h''* at opposite sides of the upper end of the switch-arm, the springs  
15 *r r'*, projecting from opposite sides of said end of the switch arm and adapted to encounter the aforesaid contact-points, binding-posts *g'*  
*g''*, the spring-arms *o' o''*, projecting from said

binding-posts and lying across an axial projection of the switch-arm, and the hard-rubber cam attached to the switch-arm below the pivot thereof and rising at opposite sides of said pivot to engage one of the spring-arms *o' o''* at 20 a time, substantially as described and shown.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence of two attesting witnesses, at Elmira, in the county of Chemung, in the State of New York, 25 this 29th day of March, 1886.

RICHARD L. GUION. [L. S.]

Witnesses:

A. E. BAXTER,  
THEO. G. SMITH.