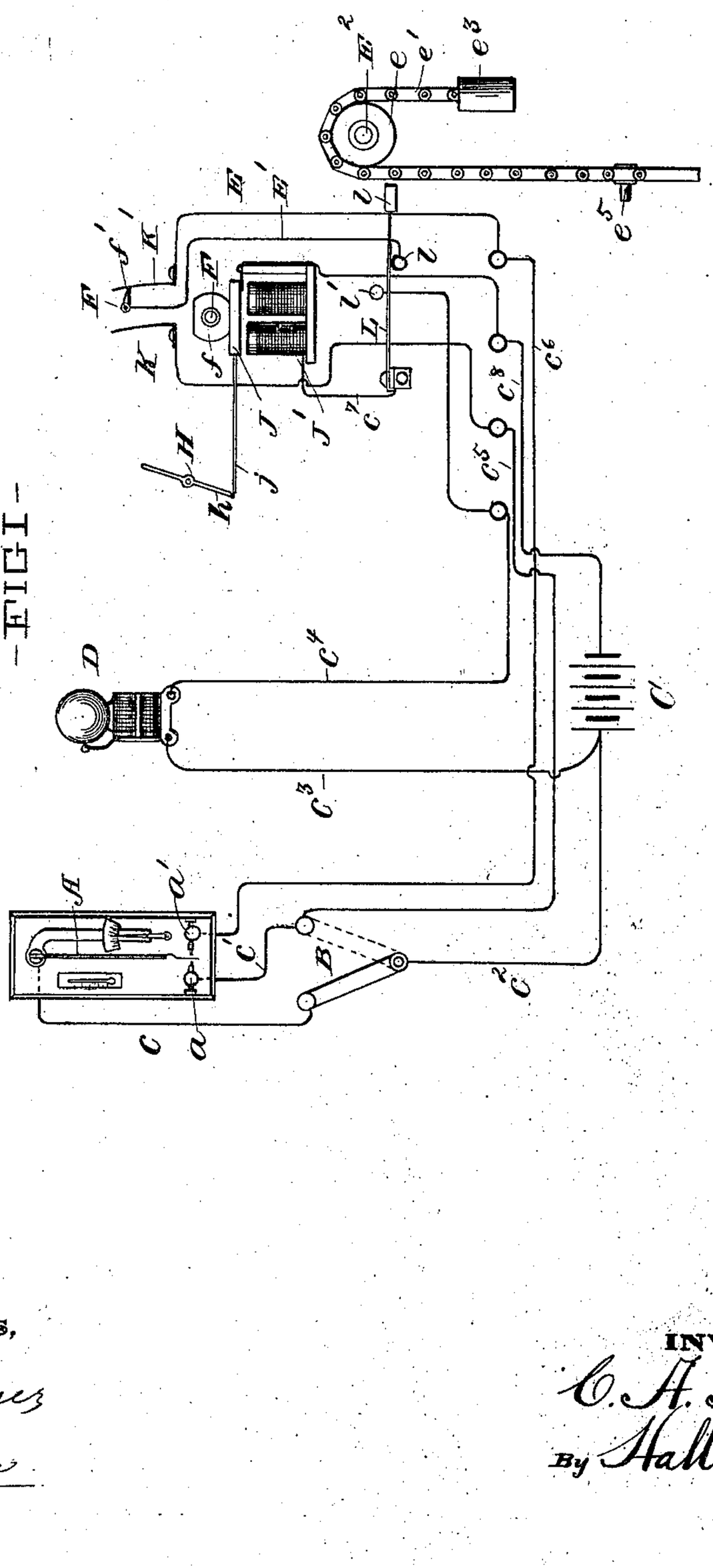
(No Model.) 2 Sheets—Sheet 1.

C. A. HALE.

THERMOSTATIC REGULATING DEVICE.

No. 551,959. Patented Dec. 24, 1895.

FIG. 1.



WITNESSES,

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(No Model.) 2 Sheets—Sheet 2.

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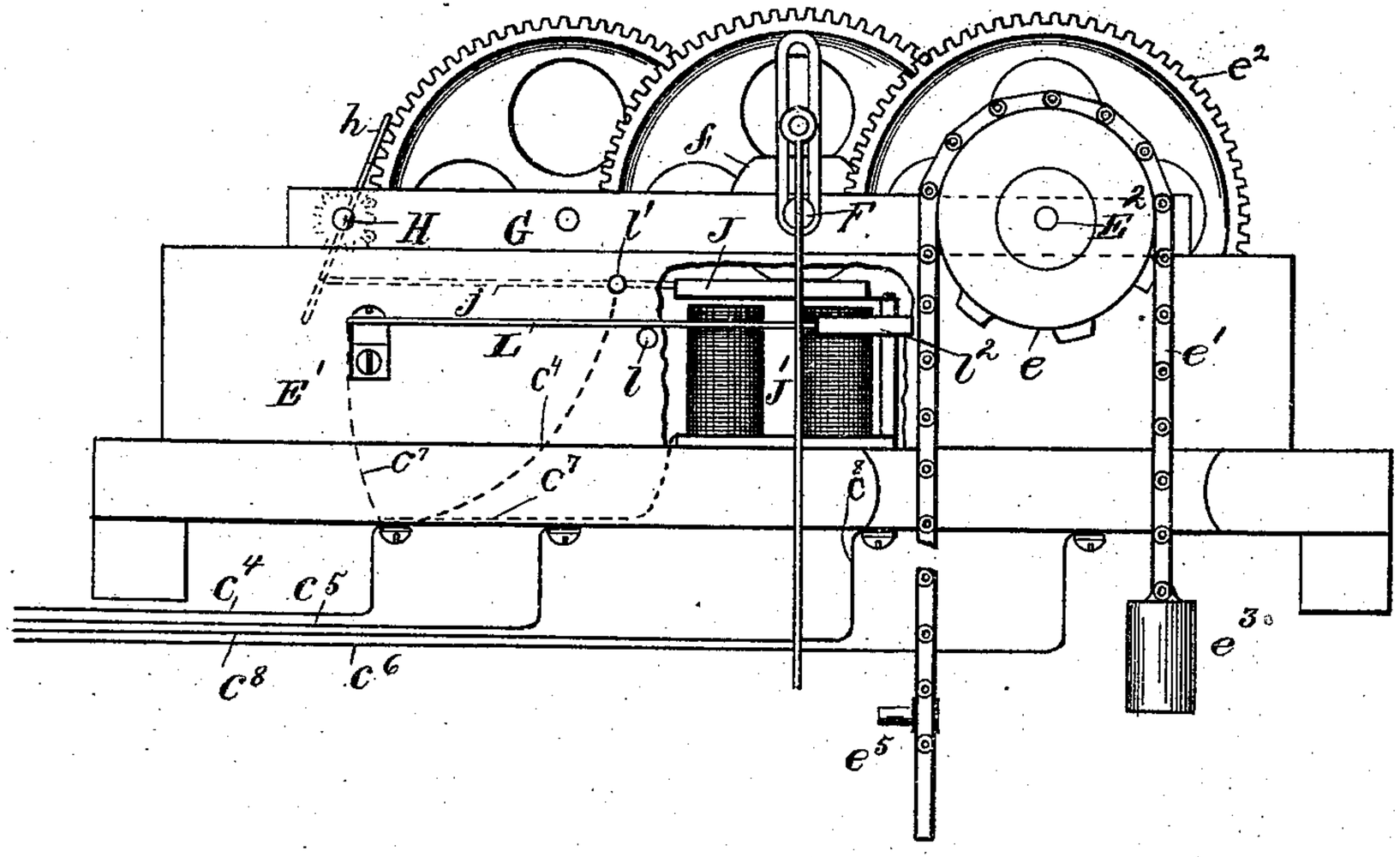
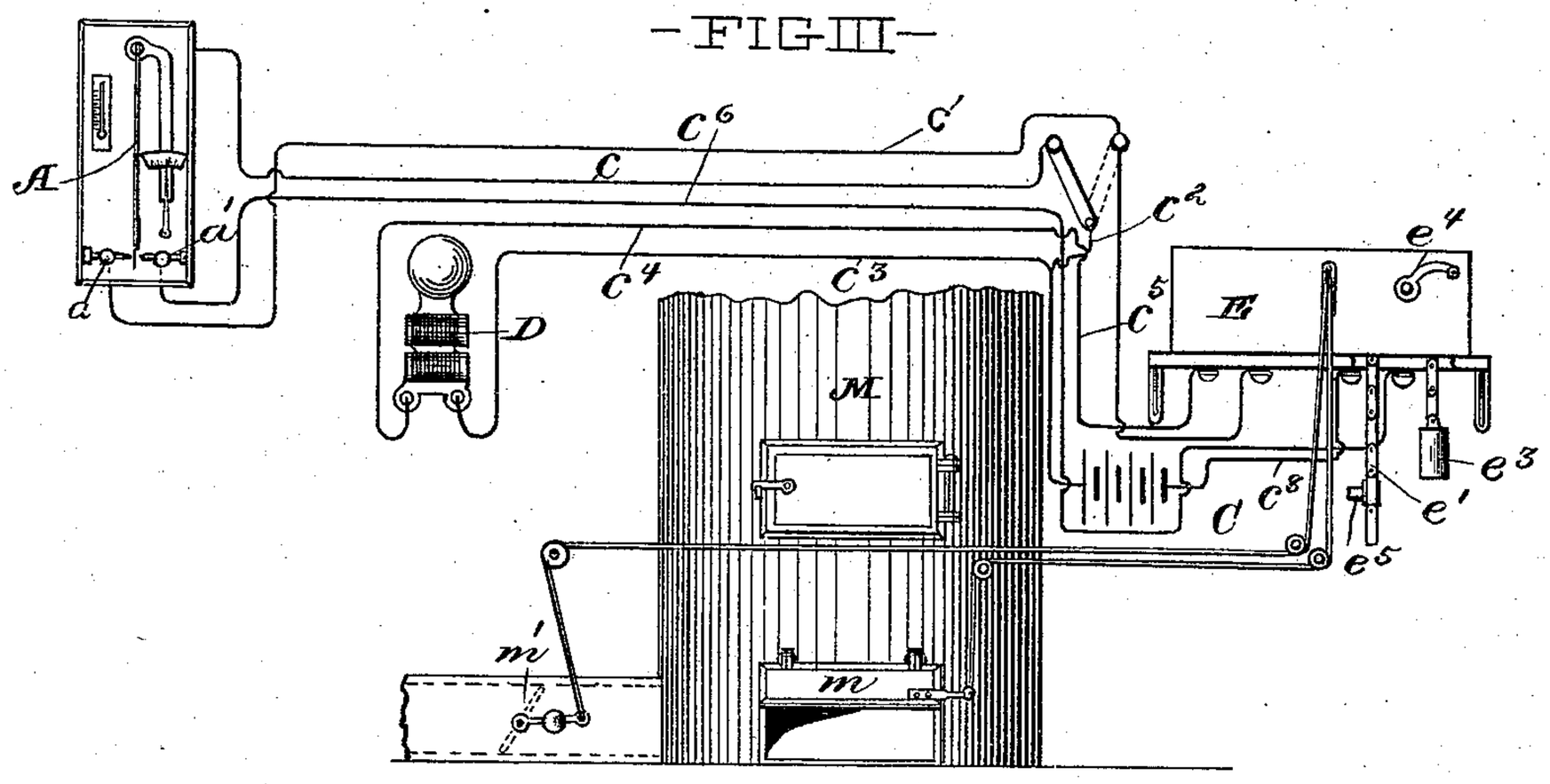
—FIG II—



—FIG III—



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES A. HALE, OF CLEVELAND, OHIO, ASSIGNOR TO THE TIME ELECTRIC COMPANY, OF SAME PLACE.

THERMOSTATIC REGULATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 551,959, dated December 24, 1895.

Application filed January 8, 1894. Renewed February 18, 1895. Serial No. 538,856. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. HALE, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Thermostatic Regulating Devices, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

In the accompanying drawings, Figure I represents a diagram of my improved thermostatic regulating device, illustrating the electrical connections and details of the same; Fig. II, a side view of the check and draft operating mechanism, and Fig. III a diagrammatic view of the device, illustrating the electrical and mechanical connections of the several parts.

While the device is illustrated as employed for regulating the draft to a fireplace and the admission of cold air for a heating-furnace, the device is capable of application to numerous other purposes, such as the regulation of ventilation and temperature of buildings by opening or closing windows or other ventilating means; to the opening of exits in buildings containing a large number of persons whenever the temperature at the thermostat rises to a certain point, such as in case of a fire; to set extinguishing apparatus in play in case of a fire, or for any other purpose where a change in the temperature at the thermostat requires certain mechanical movement to be performed.

The thermostat may be of any suitable or desired construction, and consists of a compound bar A and two contact-points a and a'. A two-point switch B is arranged to have a wire c, which is connected to the compound bar of the thermostat secured to one of its contacts. A wire c' is secured to the other contact of the switch and to the contact-point a, toward which the compound bar of the thermostat will bend on reduction of temperature. A wire c^2 extends from the pivot of the switch to a battery C. An electric bell D is arranged at a suitable point where its alarm is most liable to be observed, and said bell has a wire c^3 connected to one of its posts and to the battery and a wire c^4 connected to the other post and to an insulated contact upon the operating mechanism, which contact will later be referred to.

The operating mechanism E is provided with a metallic frame E′, insulated from its support and having journal-bearings for four shafts, respectively lettered E^2, F, G and H. The shaft E^2 carries a sprocket-wheel e, over which a chain e' passes, and a cog-wheel e^2. A weight e^3 is attached to one end of the chain and a crank e^4 is secured upon a shaft to serve as means for winding the weight. The cog-wheel e^2 drives the shaft F by suitable gearing, and said shaft again drives the shafts G and H, which latter shaft carries a fan h, which retards the revolution of the clockwork. The shaft F has cranks secured to it, by means of which the draft-door m and the cold-air check m' for the furnace M may be operated, said cranks having suitable flexible connections to said draft-door and cold-air check. The shaft has furthermore a disk f, having two diametrically-opposite flattened portions in its periphery, and a radially-projecting arm f'. The disk f bears with its periphery against an armature J of an electromagnet J′, said disk being at such distance above the armature that it will keep the armature depressed and in contact with the poles of the magnet when the unbroken periphery of the disk is in contact with the armature, while it will allow the armature to rise from contact with the poles of the magnet when the flattened portions of the periphery of the disk bear against the armature. The armature is secured to a spring, which serves to raise it when released from the attraction of the magnet, and the armature has, furthermore, an arm j, which may engage the fan and stop the same when the armature is raised by its spring.

Two metallic strips or brushes K and K′ are arranged one at each side of the shaft F, so that the end of the arm f' upon the same may have alternate contact with said brushes when the shaft is revolved. A wire c^5 connects the brush K and the contact-point a of the thermostat, and a wire c^6 connects the brush K′ and the contact-point a' of the thermostat. A metallic spring-switch L is secured upon and insulated from the frame, and

the rigid end of said switch is connected to one terminal of the coil of the electromagnet by a wire c^7. The other terminal of the magnet-coil is connected to the battery by a wire c^8. The spring-switch bears normally against a contact-stud l upon and in electrical contact with the frame, and the switch may be raised into contact with a contact-stud l'—insulated from the frame and connected to the bell by a wire c^4, as above referred to—by a lug e^5, projecting from the unweighted end of the motor-chain e'. The end of the spring-switch is covered by an insulating-sleeve l^2, which prevents short-circuiting through the chain. The weight will thus raise the spring when it has run down and requires winding, thereby closing the alarm-circuit and ringing the bell.

In practice the thermostat is supported at some convenient place where it will be exposed to any change in the temperature generated by the furnace. The bell is arranged at a place where its alarm will be conveniently noticeable, and the draft and check operating mechanism is arranged conveniently near to the furnace, with its crank-arms suitably connected to the cold-air check and the draft-door of the furnace by means of cords, chains, or other flexible connections, which are suitably guided by pulleys or other means to simultaneously open the check and close the draft-door, or vice versa. The electric-wire connections between the several parts of the apparatus are suitably strung, and the apparatus is then ready for operation as soon as the weight has been wound up. The thermostat is suitably adjusted in such manner that any change in the desired temperature will cause the compound bar to close the circuit at either one or the other contact-points, the compound bar closing against the contact-point a' by increasing temperature and closing against the contact-point a by decreasing temperature. We will now assume that the temperature is rising above the desired degree, in which case the compound bar will, as above stated, close the circuit at the contact-point a'. The circuit will thus pass from the battery through the two-point switch, the wire c, the compound bar, the contact-point a', the wire c^6, the brush K', the arm f', the shaft F, the frame of the draft and check operating mechanism, the stud l, the switch L, the wire c^7, the coil of the magnet, and the wire c^8 back to the battery. The magnet will thus be energized and will attract its armature, so as to allow the fan to be released and the clockwork of the operating mechanism to be revolved. The mutilated disk f upon the shaft F will keep the armature depressed until said shaft has made a one-half revolution, and the crank-arms upon said shaft will by their revolution cause the cold-air check to be opened and the draft-door to be closed, thereby reducing the temperature. When the shaft F and its mutilated disk have made a one-half revolution and the check and draft have been changed, the armature may again be released against the flat portion of the periphery of the mutilated disk, so that the stop-arm j will engage the fan and stop the latter. It is obvious that the circuit has been broken as soon as the arm f' has left the brush K', and that another circuit may be established through said arm f' and the brush K after the shaft has made its one-half revolution, as the arm then bears against said last-mentioned brush. When the temperature now becomes reduced below the predetermined degree, the compound bar will close the circuit against the contact-point a, thus forming another circuit from the battery through the wire c^2, switch B, wire c, compound bar A, contact-point a, wire c', wire c^5, brush K, arm f', shaft F, frame E', contact-point l, spring-switch L, wire c^7, the coil of the magnet and the wire c^8 back to the battery. The armature will again be attracted, the clockwork will again be revolved, and the draft and check will again be changed so as to cause the draft to be opened and the cold-air check to be partly closed. The arm f' will now again be in contact with the brush K', so that the device will again be ready to operate by increasing temperature. When the weight has run down the lug e^5 upon the chain will engage the end of the spring-switch and raise the latter out of contact with the stud l and into contact with the stud l', thereby closing the bell-circuit and causing the bell to ring, while at the same time cutting out the circuit for the operating mechanism. When the furnace for some cause or other requires attention and again is to be started up, with draft beneath the fire-place and the cold-air check partly closed, the switch B is turned so as to connect the battery-wire c^2 with the wire c^5 leading to the brush K, whence the circuit will be continued through the shaft F and the frame of the operating mechanism to the magnet, energizing the same and releasing the mechanism, which will start the draft and partly close the cold-air check. This above-described action will take place if the compound bar is at rest between the two contact-points and the arm f' upon the shaft F is in contact with the brush K. If the compound bar is in contact with the "hot" contact-point a', the current will cause the operating mechanism to close the draft, whereupon the shifting of the switch will reverse said movement. If the compound bar is in contact with the "cold" contact-point a, the shifting of the switch will have no effect, as the same circuit will be closed by shifting the switch as by having the compound bar close contact with the cold contact-point a.

What I claim is—

In a thermostatic regulating device, the combination of a clockwork for operating the temperature regulating devices and provided with a projecting lug upon its drive mechanism, a source of electricity, a thermostat in the circuit of said source, an electric alarm

in another circuit connected to said source and normally open, an electro-magnet in the circuit of the thermostat and connected to be energized from the action of the latter and having an armature provided with a stop adapted to stop and release the operating clockwork, and a spring switch having its free end in the path of the lug upon the drive mechanism and normally closing the circuit of the thermostat and electro-magnet and closing the alarm circuit when engaged and moved by the lug upon the drive mechanism, substantially as set forth.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 4th day of January, A. D. 1894.

CHARLES A. HALE.

Witnesses:
WM. SECHER,
J. C. TURNER.