

No. 616,358.

Patented Dec. 20, 1898.

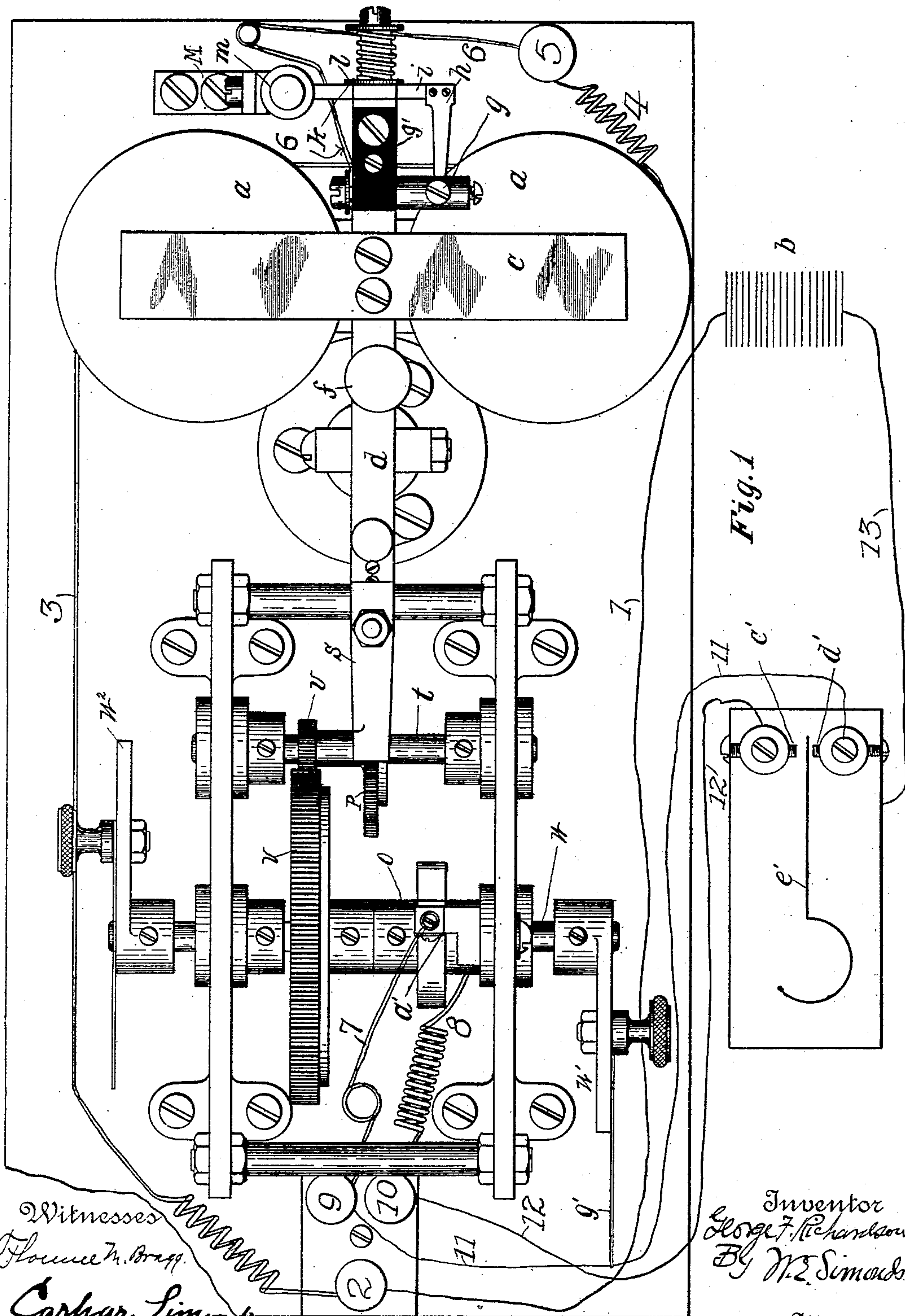
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ELECTRICALLY OPERATED REGULATOR FOR DAMPERS, &c.

(Application filed Apr. 15, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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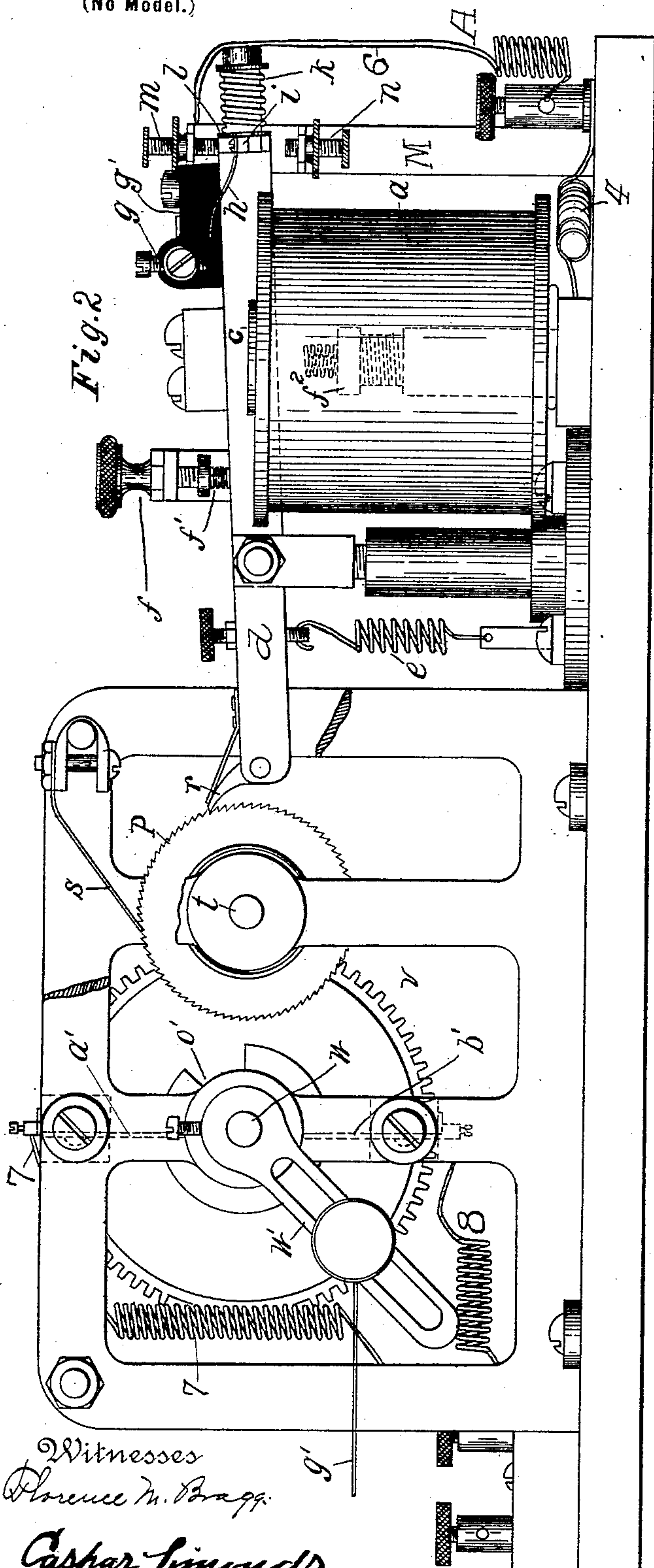
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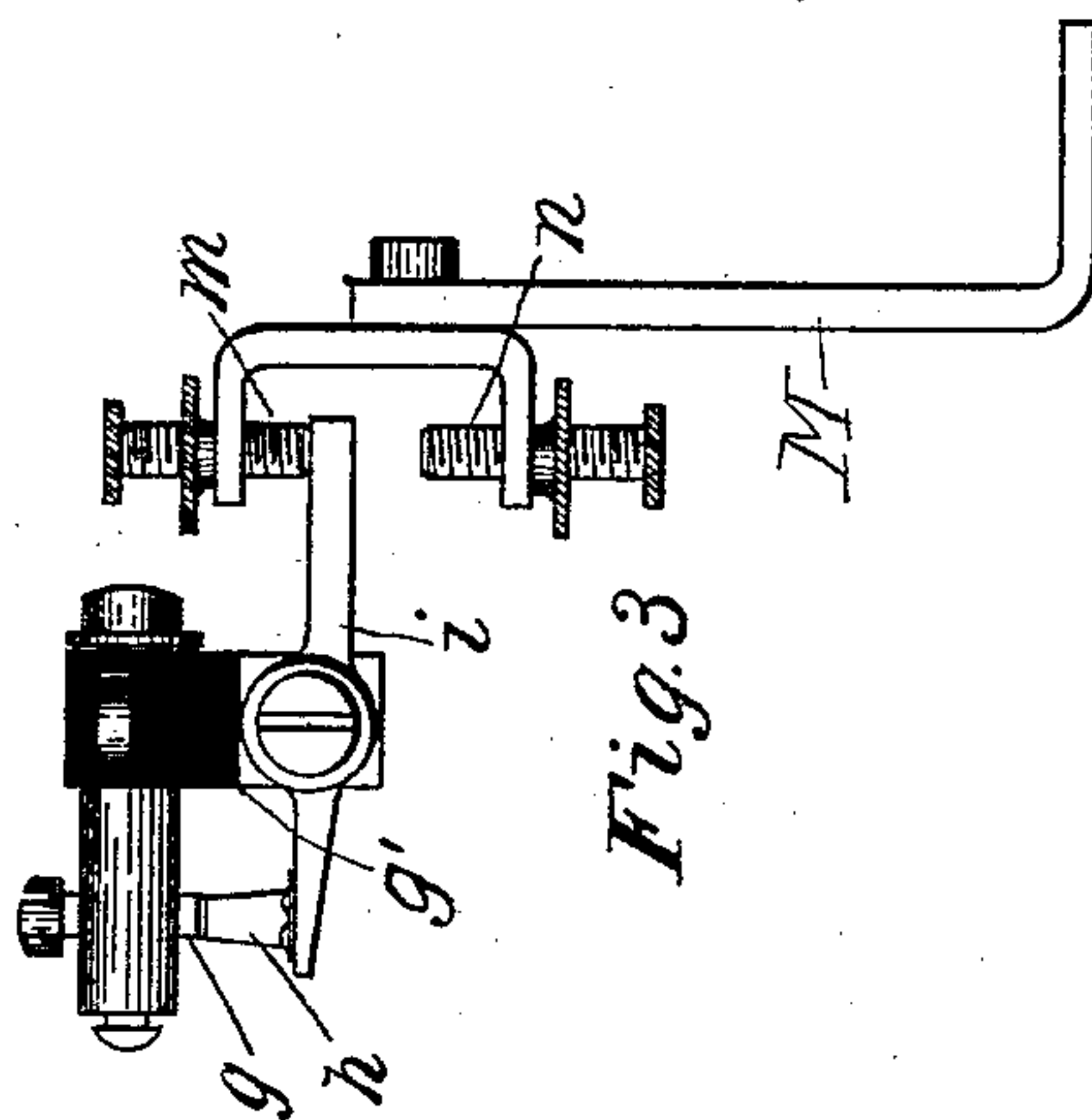
(No Model.)

**2 Sheets—Sheet 2.**



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# UNITED STATES PATENT OFFICE.

GEORGE F. RICHARDSON, OF HARTFORD, CONNECTICUT.

## ELECTRICALLY-OPERATED REGULATOR FOR DAMPERS, &c.

SPECIFICATION forming part of Letters Patent No. 616,358, dated December 20, 1898.

Application filed April 15, 1898. Serial No. 677,666. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE F. RICHARDSON, a citizen of the United States of America, residing at Hartford, in the county of Hartford and State of Connecticut, have invented a certain new and useful Improvement in Electrically-Operated Regulators for Dampers or the Like, of which the following is a description, reference being had to the accompanying drawings, wherein—

Figure 1 is a plan view. Fig. 2 is a side elevation view. Fig. 3 is an end view (from end A) of the circuit-breaker, which vibrates synchronously with the vibrating armature of the electromagnet. Fig. 4 is a peripheral view of disk *o*, hereinafter described.

The object of the improvement is the production of an electrically-operated regulator applicable to the regulation of the damper or dampers of a furnace or the like.

In the accompanying drawings the letter *a* designates an electromagnet adapted for inclusion in an electric circuit in which the battery *b* may well supply the electromotive force. The letters *c d* denote the vibratory armature of this electromagnet, which consists of the plate *c*, borne on the pivoted lever *d*.

The letter *e* denotes a spring tending to pull the armature away from the magnet. *f* denotes an adjustable screw-stop for regulating and defining this motion, equipped with the spring-cushion *f'*, and *f*<sup>2</sup> shows in broken lines the adjustable spring-cushion for the downward stroke of the armature-lever *d*.

The latter also carries at its rear end a circuit-breaker which necessarily vibrates synchronously with the armature, and of this circuit-breaker *g* denotes one contact member, which is carried by a rubber or similar block *g'*, mounted on and insulated from the lever *d*, and is connected by wire *h* with the coils of the electromagnet, while *h* denotes the other contact, which is mounted on one end of a rocking lever *i*, pivoted across the rear end of the armature-lever at right angles thereto. If desired, a tension device may be employed consisting of a coiled spring *k* and washer *l*, bearing against the pivot of the lever *i* and causing it to remain for the time being with all necessary surety in the position to which it has been turned or rocked.

The letter *M* denotes a support for two adjustable screw-stops *m* and *n*, between which the free end of the lever *i* operates. In the

vibratory motions of the circuit-breaker the free end of the lever *i* strikes alternately against the adjustable screw-stops *m* and *n*, which causes it to have a rocking movement and which correspondingly makes and breaks the electrical connection at *g h*, the nature and function of which will be described below. Thus when the armature-lever *d* descends from the position shown in Fig. 3 the contacts *g h* remain in contact and the circuit is closed until the free end of the lever *i* strikes the set-screw *n*, and further descent of this end of the armature-lever will carry the pivot of the rocking lever *i* downward, and hence cause its other end and the contact *h* to be moved out of electrical contact with the contact *g*. The tension device (if employed) holds the rocking lever in this position even during the rise of the armature-lever until the free end of the former strikes the set-screw *m*, when it is again turned on its pivot (but in the opposite direction) and the electrical connection between the contacts *g h* is reestablished.

The letter *p* denotes a ratchet-wheel having rotary motion of a step-by-step nature. The lever *d* carries a spring-pressed pawl *r* at its forward end, which coöperates with said ratchet-wheel, so that the vibrations of the lever give the wheel its step-by-step motion, and the letter *s* denotes a spring-pawl which prevents the ratchet-wheel from having any backward motion. The step-by-step motion of the ratchet-wheel *p* is imparted to the disk *o* through the medium of shaft *t*, pinion *u*, gear *v*, and the shaft *w*, which carries the disk *o*. Said disk *o* is practically a terminal, having a circuit-breaking interval *o'* removed from its periphery, and is in electrical connection with the coils of the electromagnet by way of the vibratory circuit-breaker already described.

The letters *a'* and *b'*, respectively, denote terminals of two branch circuits, which terminals are in contact with the disk *o* except when one of them is coincident with the circuit-breaking interval *o'*.

The letter *e'* denotes the spring of a thermostat, and *c' d'* are set-screws connected with said branch circuits set opposite and adjacent the spring and forming points with which its free end may make electrical contact as it is moved. Heat of undue degree will cause the spring *e'* to make contact with the point



$d'$ , and cold in undue degree will cause the same spring to make contact with the point  $c'$ .

The course of the electric current is as follows: Starting with battery  $b$  it passes along wire 1, through binding-screw 2 and wire 3 to the electromagnet  $a$ , thence along wire 4, through binding-screw 5 and wire 6 to the insulated contact  $g$  on the armature-lever  $d$ . When this contact is in connection with the contact  $h$ , the current passes thence into and along the lever  $d$ , through pawl  $r$ , ratchet  $p$ , and the train of gearing to the terminal formed by the disk  $o$ , thence through one or both of the terminals  $a' b'$ , along the branch wires 7 and 8, respectively, through binding-screws 9 and 10, along wires 11 and 12, and to the points  $d'$  and  $c'$  of the thermostat, and, finally, when the spring  $e'$  is in contact with either point the circuit is closed through the spring and along wire 13 back to the battery.

A normal and desired degree of heat should hold the spring  $e'$  between the two points  $c'$  and  $d'$ , these being adjustable to regulate that matter. If the heat rises unduly, spring  $e'$  makes contact with the point  $d'$ , and the terminal  $a'$  then being in contact with the disk  $o$  the entire circuit is closed and the armature of the electromagnet sets up its vibratory motion, giving the disk  $o$  said step-by-step rotation until it brings the interval  $o'$  coincident with the terminal  $a'$ , breaking the circuit and stopping further rotation. It will be seen that the crank-arm  $w'$  in Fig. 2 is set on the shaft  $w$  about opposite said interval  $o'$ , and hence when the latter comes opposite the terminal  $a'$  the arm  $w'$  will be down. Whenever the heat subsides unduly, the spring  $e'$  makes contact with the point  $c'$  and the circuit is closed through the other terminal  $b'$  and the disk  $o$ . The electromagnet then immediately sets up its step-by-step motion and the disk is rotated until the interval  $o'$  is brought opposite the terminal  $b'$ , when the crank-arm  $w'$  will be up. Said crank-arm is connected by means of a link, rod, wire, or the like  $g'$  with a damper which it is desired to regulate, and, if desired, another crank-arm  $w^2$  may be mounted on the shaft  $w$  for a similar purpose, it being understood that the arrangement is such that when the arm  $w'$  is down the damper is closed and when it is up the damper is open.

What I claim as new is—

1. The combination with an electromagnet, a vibratory armature, a spring-pawl at one end thereof, a circuit maker and breaker consisting of a lever pivoted to the other end of the armature, a contact on one end of the lever, a second contact on the armature but insulated therefrom, and means for making and breaking the connection between these contacts; of a ratchet-wheel engaged by the pawl and having a step-by-step rotation imparted thereto by the vibrations of the armature, a disk included in the same circuit with the magnet and provided with a circuit-breaking interval, said disk being rotated by the

ratchet-wheel, two terminals each in electrical contact with said disk except when coincident with said interval, and connections between the shaft of said disk and a damper or the like for operating the latter, substantially as described.

2. The combination with an electromagnet, a vibratory armature, a pawl at one end thereof, a circuit maker and breaker consisting of a lever pivoted at right angles to the other end of the armature, a contact on the lever, a second contact carried by but insulated from the armature, and stops for rocking the lever; of a ratchet-wheel engaged by the pawl, a disk in the same circuit with the magnet and having an interval removed from its periphery, the disk being rotated from said ratchet-wheel, two terminals contacting with said disk except when its interval interposes, branch circuits leading from these terminals to independent points, of a thermostat included in the main circuit, with its free end adapted to make contact with either of said points, and mechanical connections between the disk and a damper or the like for operating the latter, substantially as described.

3. The combination with an electromagnet, a vibratory armature in circuit with the magnet, a circuit maker and breaker consisting of a lever pivoted to and across the end of the armature, a spring pressing upon the lever adjacent its pivot, means for adjusting the tension of the spring, a contact on one end of the lever, a second contact upon but insulated from the armature, and stop-screws engaged by the free end of the lever as the armature vibrates; of a disk having an interval removed from its periphery, said disk being rotated by the movements of and in circuit with the armature, two terminals contacting with said disk, branch circuits leading from these terminals to a main circuit and thence through a source of electricity to the insulated contact on the armature, and means for closing or breaking either circuit, as and for the purpose set forth.

4. The combination with an electromagnet, a vibratory armature in circuit therewith, adjustable spring-cushions for defining the movements of the armature, a circuit maker and breaker consisting of a lever pivoted to the armature, a contact on one end of the lever, a second contact insulated from the armature, and stops engaged by the free end of the lever as the armature vibrates; of a disk having an interval removed from its periphery, said disk being rotated by the movements of and in circuit with the armature, two terminals contacting with said disk, branch circuits leading from these terminals to the insulated contact, and means for closing and breaking either circuit, as and for the purpose set forth.

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