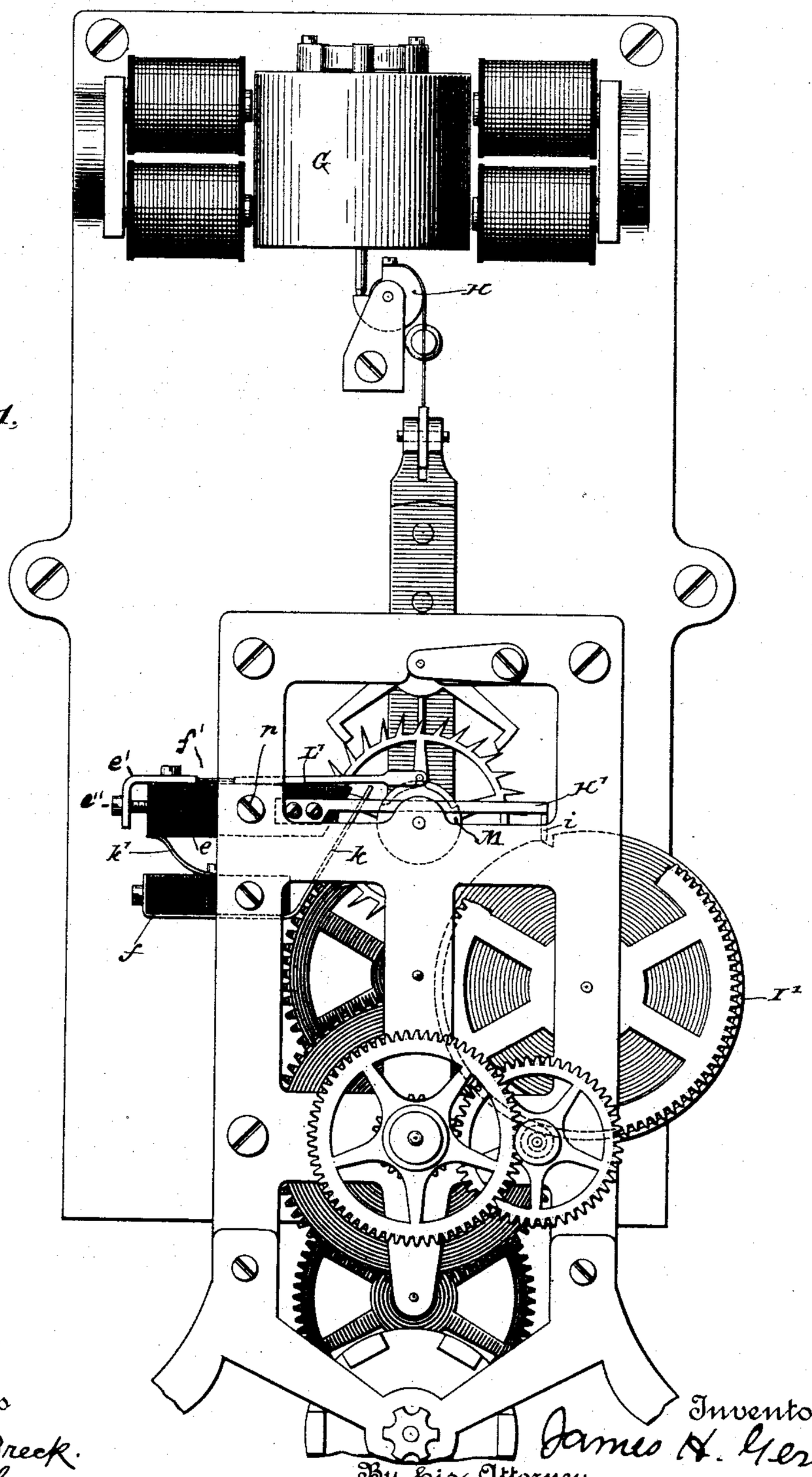
(No Model.) 3 Sheets—Sheet 1.

J. H. GERRY.

ELECTRIC REGULATOR FOR PENDULUM CLOCKS.

No. 413,340. Patented Oct. 22, 1889.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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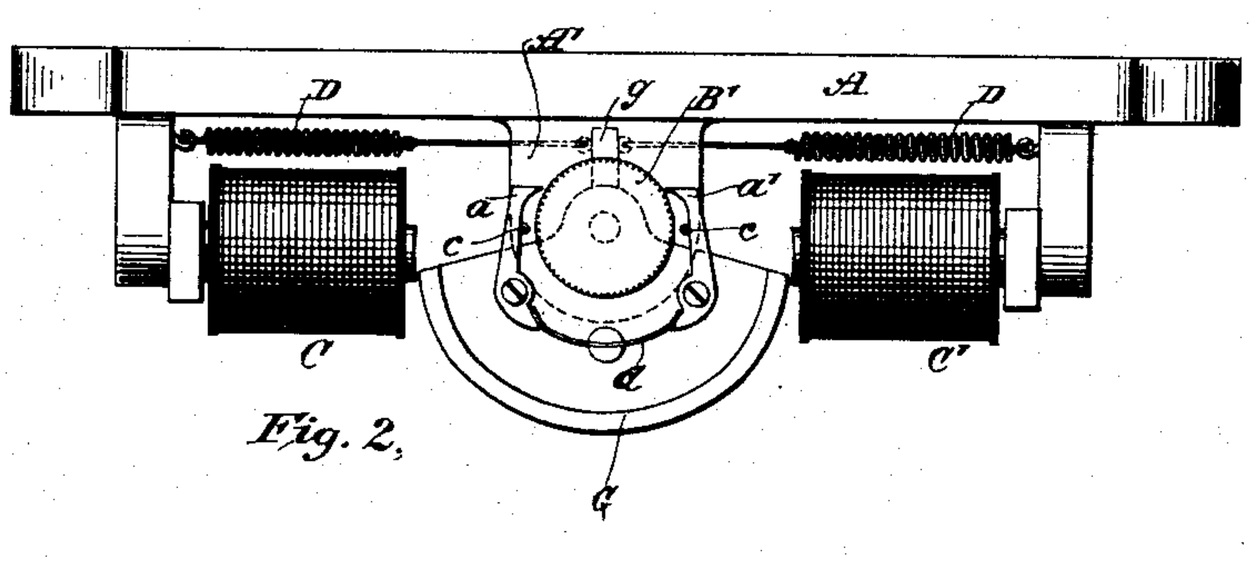


Fig. 2.

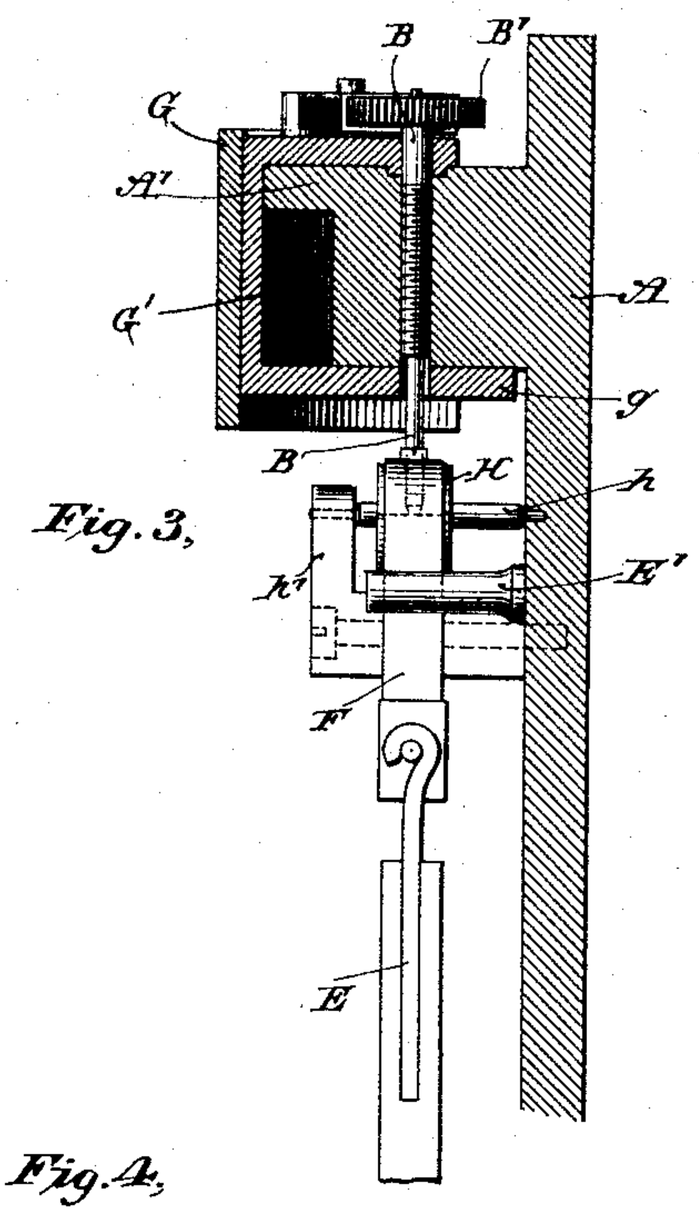
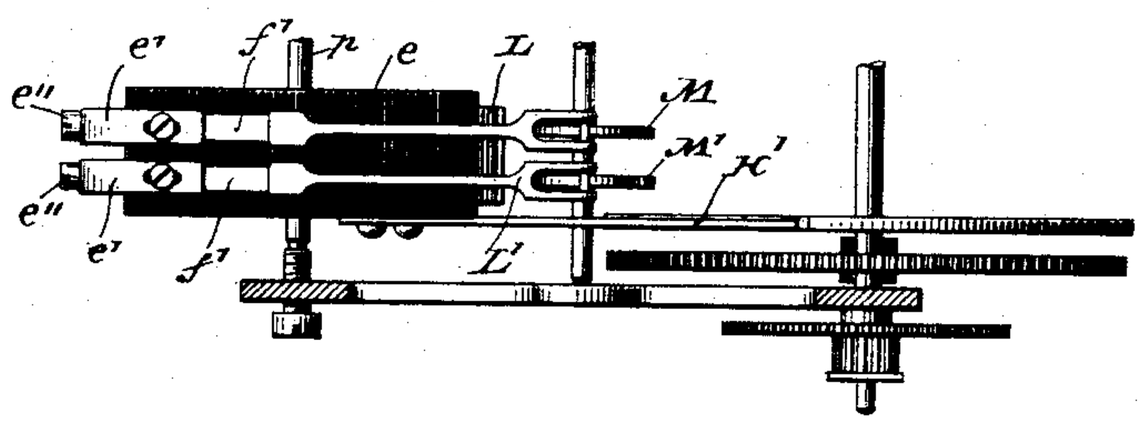


Fig. 3.

Fig. 4.



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3 Sheets—Sheet 3.

J. H. GERRY.

ELECTRIC REGULATOR FOR PENDULUM CLOCKS.

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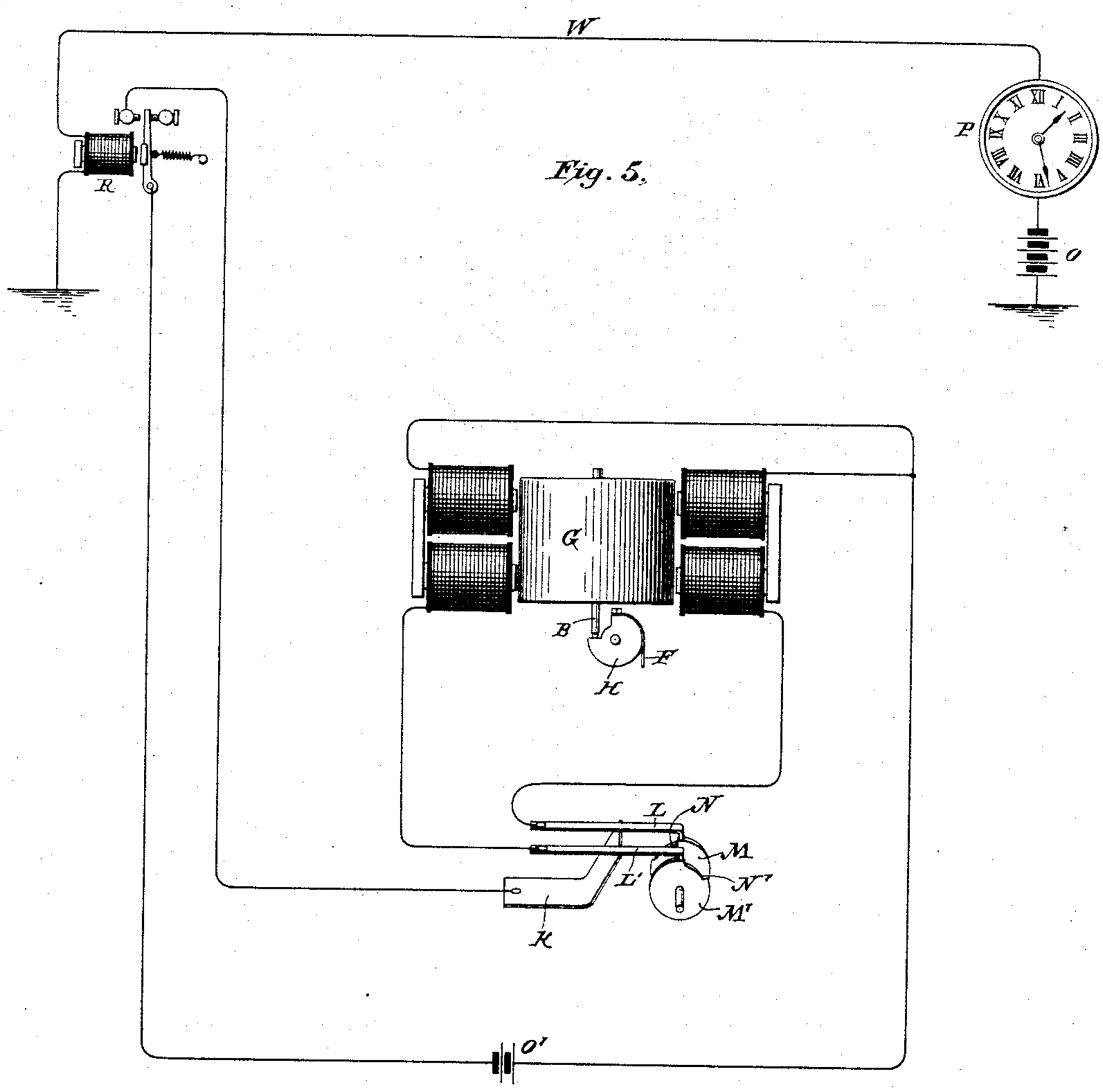

Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES H. GERRY, OF BROOKLYN, NEW YORK.

ELECTRIC REGULATOR FOR PENDULUM CLOCKS.

SPECIFICATION forming part of Letters Patent No. 413,340, dated October 22, 1889.

Application filed August 9, 1889. Serial No. 320,248. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. GERRY, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pendulum-Clock Regulators, of which the following is a specification.

This invention is an improvement in apparatus or means for regulating a pendulum clock from a given point remote from said clock—such as an observatory—the object being mainly to provide a reliable and accurate means for increasing or diminishing the vibrating length of the pendulum, according as the clock may be fast or slow, as compared with the master-clock, or that from which the regulation is effected.

The invention the subject of this application resides in the mechanism devised and employed by me for accomplishing this purpose, the character of such mechanism, generally stated, being as follows: In the clock to be regulated, and which may be either what I designate a "sub-master clock," or any one of a series of pendulum clocks, I support above the movement two electro-magnets or pairs of magnets and an armature held by equilibrium-springs in an intermediate position to the magnets, so that it may be acted upon and moved by the attractive force of either, as occasion may require. The armature-yoke carries two oppositely-acting pawls adapted to engage with a ratchet-wheel, by means of which a screw is turned to shorten the vibrating length of the pendulum if the clock be slow, or lengthen it if fast. Combined with the movement of the clock proper are two notched or recessed disks carried by the escape-arbor and two independent contacts kept normally open by a twenty-four-hour wheel, and these parts are so constructed and adjusted that, once in twenty-four hours, or any predetermined number of times in the twenty-four hours, if the clock is fast one magnet is operated by its appropriate contact to lower the pendulum, or if too slow the other is similarly brought into operation to raise the pendulum.

The details of these devices and their mode of operation will be understood from the accompanying drawings.

Figure 1 is a view in elevation of a clock mechanism equipped with the regulating devices which constitute my invention. Fig. 2 is a top plan view of the electro-magnets and their appurtenances. Fig. 3 is a view showing in vertical central section the armature and in elevation the device for raising and lowering the pendulum. Fig. 4 is a top plan view of the circuit-controlling devices, and Fig. 5 is a diagram of the circuits and the relative disposition of the instruments therein.

Extending from the base-plate, to which the clock-movement is secured, and above the movement is a stud or projection A′, through which passes a threaded stem B, carrying at its upper end a ratchet-wheel B′. The lower end of said vertical stem B impinges upon a step or notch in a circular disk H, carried by a spindle *h*, mounted in a bracket or frame *h′*, secured to the base A. The pendulum E is connected to the disk H by a flexible strap or band passing through a slotted post E′, extending from the base A. By adjusting the stem B vertically the disk H is turned on its axis and the pendulum raised or lowered. The vibrating length, therefore, below the post E′ is correspondingly varied. This means of supporting and adjusting a pendulum has been patented to me, and I do not claim it herein except in combination with the other mechanism to be described.

The armature, composed of the parts G G′, is pivotally supported upon the stud A′, and is capable of a limited oscillatory movement concentrically with the axis of the stem B. The upper surface or end of the part G′ carries two pawls *a a′*, pivoted thereto and adapted to engage with the ratchet-wheel B′ on opposite sides of its axis. These pawls are held by a spring *d* in contact with the stops *c*, which serve also to limit the movement of oscillation of the armature, whereby the ratchet-wheel B′ can be moved through a predetermined distance, as the space of one tooth only, by the action of either magnet upon the armature.

The electro-magnets are designated C and C′. They are secured to the base A on opposite sides of the armature and in such relation to the same that the action of a current in either will turn the armature toward it sufficiently to move the ratchet-wheel B′ through the desired distance. Equilibrium-

springs D D, connected to opposite sides of a projection *g* from the armature and to fixed supports, respectively maintain said armature in proper relative position to the magnets.

A block of insulating material *e* is pivoted at *p* to the frame of the clock-movement. Two flexible contacts L L′ are secured to this block, as shown in Figs. 1 and 4. These contacts are made adjustable upon the block *e* in the following way: They are connected to the angle-pieces *e′* by flexible pieces *f′*. The parts *e′* are secured to the insulating-block by screws passing through slots therein.

Adjusting-screws *e″*, bearing against or entering the end of the block *e*, provide for a fine adjustment of the contacts on the block.

H′ is a light metallic arm attached to the pivoted block *e*, and provided with a downwardly-extending toe *i*. The said toe *i* rests upon the periphery of a twenty-four-hour wheel I′—that is to say, any member of the train which makes a complete revolution once in twenty-four hours. By this engagement the arm H′ is held in an elevated position and the contacts L L′ on the block *e* are held up out of engagement with a contact-plate *k*, secured to an insulating-block *f*. This position of the contacts and the block *e* is opposed by a spring *k′*, bearing upon the block. The periphery of the wheel I′ is formed with one or more notches, into which the toe *i* drops, which should be in position to lower or drop the arm H′ at about ten seconds or more prior to the time for regulation.

On the escapement-arbor are two circular disks M M′, in the peripheries of which are notches N N′. The ends of the contacts L L′ are immediately over the edges of these disks, and the relative adjustment is such that when the arm H′ drops into the notch in the twenty-four-hour wheel the said contacts should fall upon the edges of the disks. A short time before the hour of noon, or other predetermined times for regulating, a current for one second is sent from the main battery O over the line W by the regulating-clock P. This operates the relay R and closes a break in the local clock-circuit containing a battery O′. If the clock is right, however, the circuit of battery O′ is not closed because the contacts L L′ are not permitted to touch the plate *k*, being held up by the disks M M′; but if the clock is slow the notch N′ will not have passed from under the contact L′; hence the said contact will drop down upon the plate *k* and close the circuit through magnet G. This turns the ratchet B′ one tooth and shortens the vibrating length of the pendulum. On the other hand, if the clock is fast, whenever H′ encounters the notch in the twenty-four-hour wheel, the notch N will lie under the contact L, which permits said contact to come into contact with the plate *k* and to close the circuit through the magnet C′, and thereby lengthen the pendulum. The regulating-current may be sent by a key operated by hand or by any suitable form of mechanical circuit-closer. Its duration should not exceed one second, and for the purpose of facilitating the starting and adjustment of the clock it should be sent during the second of time immediately preceding the noon hour, although it may be sent at any other predetermined time.

I would state that the twenty-four-hour wheel is not indispensable to the proper operation of the regulating mechanism. To illustrate this, assume that the flexible contacts L L′ rest directly upon the peripheries of the disks M M′. They will be held thereby out of contact with the conductor K, and no effect, therefore, will be produced upon the regulating mechanism. If the clock is right, the contacts should be in the position shown in Fig. 5 at the moment when the regulating-current is sent from the master-clock. If, on the other hand, the clock be fast or slow, one of the notches, as N or N′, will permit the corresponding contact to drop down into the conductor K, as above described.

The advantage of the twenty-four-hour wheel is that stray or accidental currents on the line are prevented from acting upon the regulator.

I do not claim as an invention the broad idea of regulating or varying the vibrating length of a clock-pendulum, either directly or by the simple interposition of electro-magnetic devices by which such regulation may be effected at a greater or less distance from the clock, my invention being confined to the special means which I have herein shown and described for accomplishing this result.

What I claim is—

1. In a clock, the combination, with the threaded spindle for adjusting the vibrating length of the pendulum and a ratchet-wheel secured thereto, of an oscillating armature, pawls carried thereby and adapted to engage with said ratchet on opposite sides of its axis, electro-magnets on opposite sides of said armature, and circuit-controlling mechanism adapted to energize one or the other of said magnets, as set forth.

2. The combination, with the two electro-magnets for varying the vibrating length of a clock-pendulum, of contacts included in the independent circuits of said magnets, two means for holding said contacts open—one a twenty-four-hour wheel, notched at a given point, the other two disks on the escapement-arbor with portions of their edges cut away, these parts being adjusted relatively to each other, in the manner herein described.

3. The combination, with the disk to the periphery of which the pendulum is connected by a flexible band, the threaded spindle for adjusting the disk and thereby varying the length of the pendulum, and a ratchet-wheel carried by said spindle, of an oscillating armature mounted concentrically with the spindle and ratchet, pawls carried thereby and adapted to engage with the ratchet on opposite sides of its center, electro-magnets on op-

posite sides of the armature, and circuit-controlling mechanism for energizing either of said magnets, as set forth.

4. The pendulum raising and lowering mechanism consisting of the combination of the adjusting-spindle and ratchet-wheel passing through the stud A′, the armature with curved or circular face mounted concentrically with the spindle and ratchet, the spring-actuated pawls engaging with the ratchet, the equilibrium-springs secured to the armature, and the electro-magnets C and C′, adapted to swing the armature in opposite directions, as set forth.

5. The current-controlling device for electro-magnetically-regulated pendulum clocks, consisting in the combination of a fixed conductor, two flexible or yielding contacts secured to a pivoted insulating-support, and two disks secured to the escapement-arbor under the yielding contacts, respectively, each disk being formed with a notch or depression in its edge so placed that one contact and notch will pass into and out of engagement before the others, whereby one or the other will be permitted to encounter the fixed conductor, according as the clock is fast or slow, as set forth.

6. The current-controlling device for electro-magnetically-regulated pendulum clocks, consisting in the combination of a fixed contact, two flexible or yielding contacts secured to a pivoted insulating-support, an arm extending from said support and resting upon the periphery of a twenty-four-hour wheel, whereby the yielding contacts are maintained out of engagement with the fixed contact, and two disks secured to the escapement-arbor under the yielding contacts, respectively, each disk and the twenty-four-hour wheel being formed with a notch or depression in its edge, these parts being adjusted so that the notch in the twenty-four-hour wheel and that in one of the disks on the escapement-arbor will register and permit the depression of the corresponding yielding contact when the clock is either fast or slow, as set forth.

In testimony whereof I have hereunto subscribed my name this 8th day of August, A. D. 1889.

JAMES H. GERRY.

Witnesses:
PARKER W. PAGE,
CAROLINE E. DAVIDSON.