(No Model.) 3 Sheets—Sheet 1.

A. S. FITCH.

MAGNETO ELECTRIC MACHINE.

No. 410,964. Patented Sept. 10, 1889.

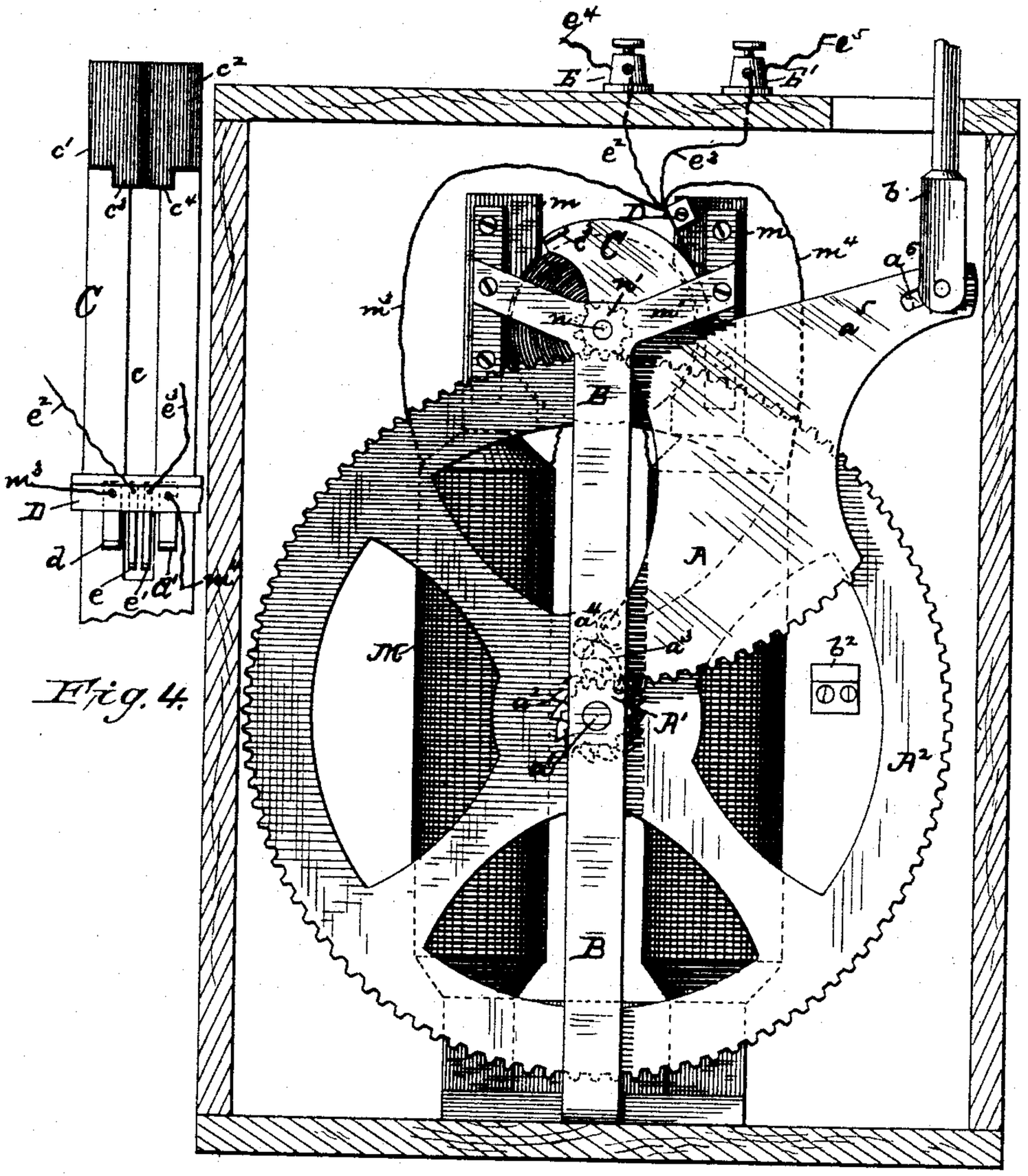

Fig. 4.

Fig. 1.

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MAGNETO ELECTRIC MACHINE.

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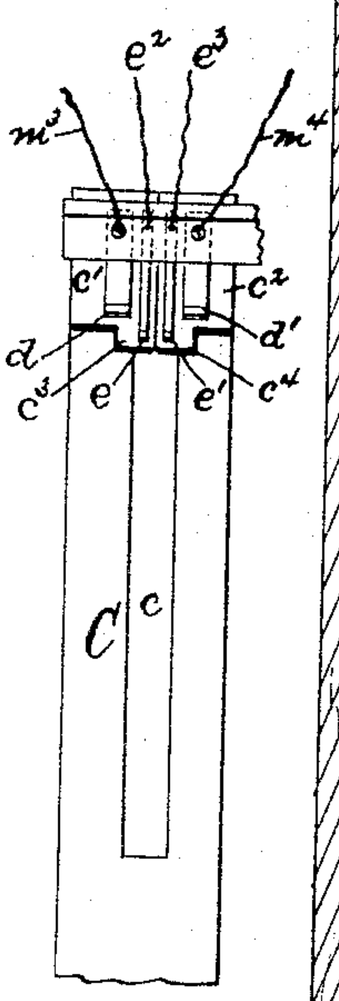

Fig. 5.

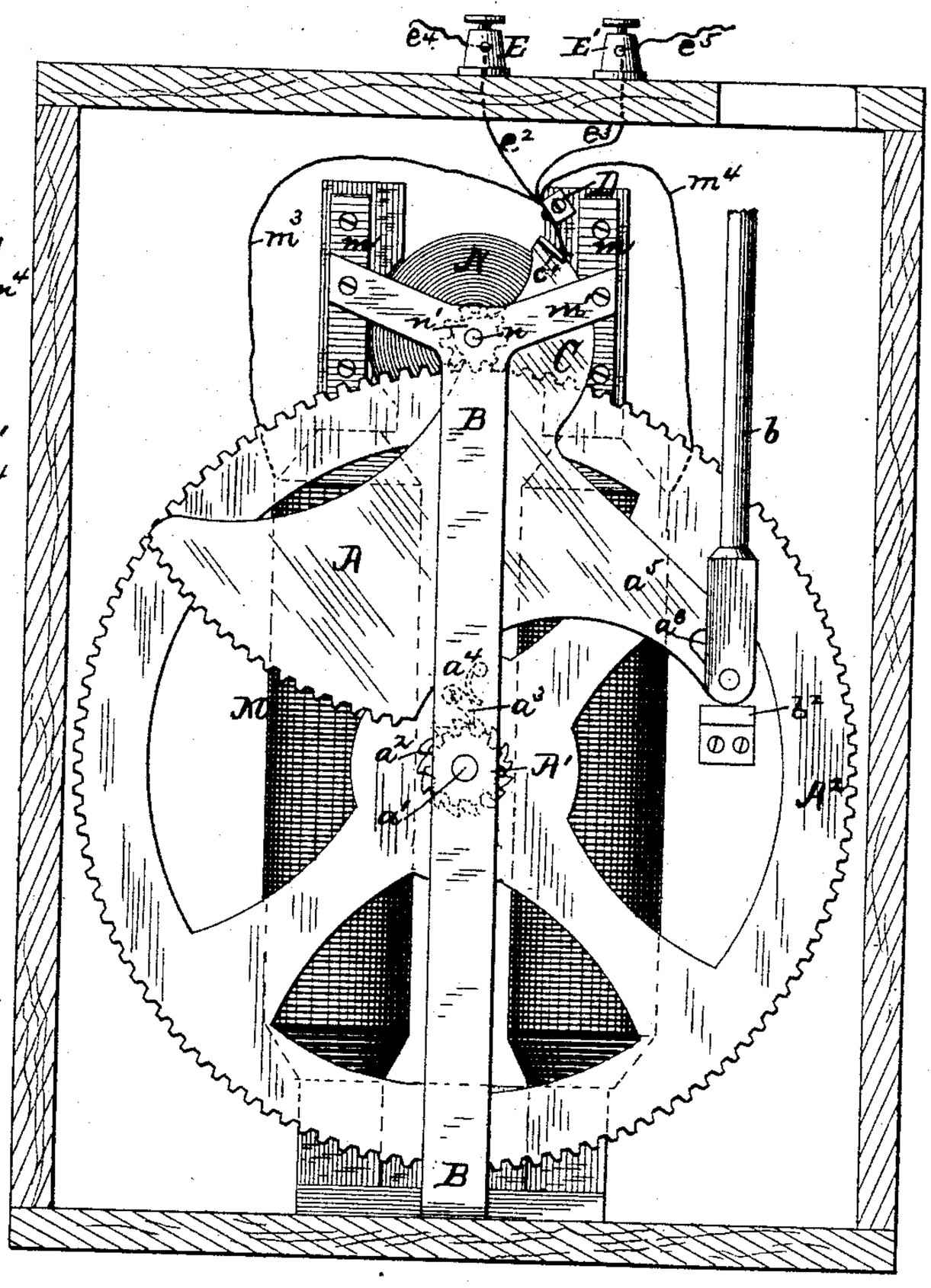

Fig. 2.

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MAGNETO ELECTRIC MACHINE.

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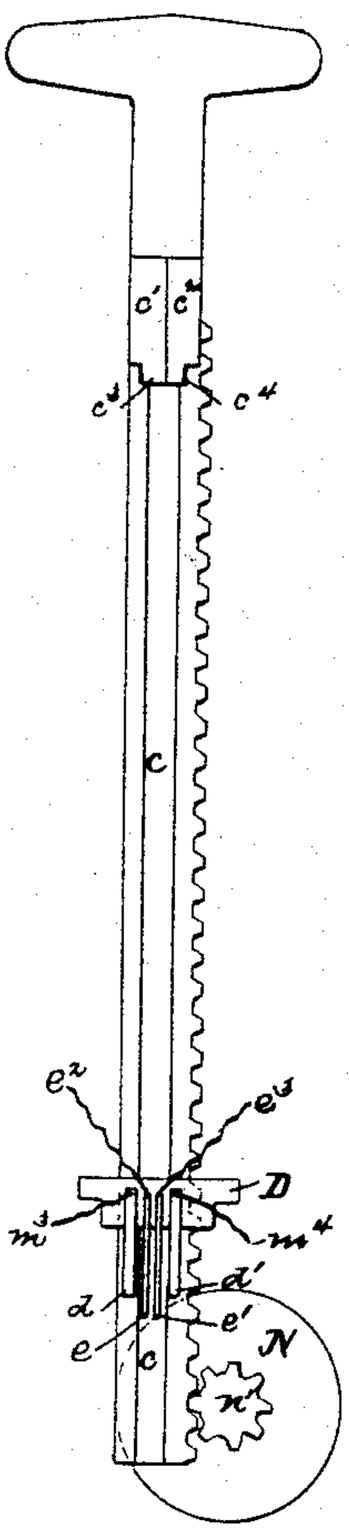

Fig. 6.

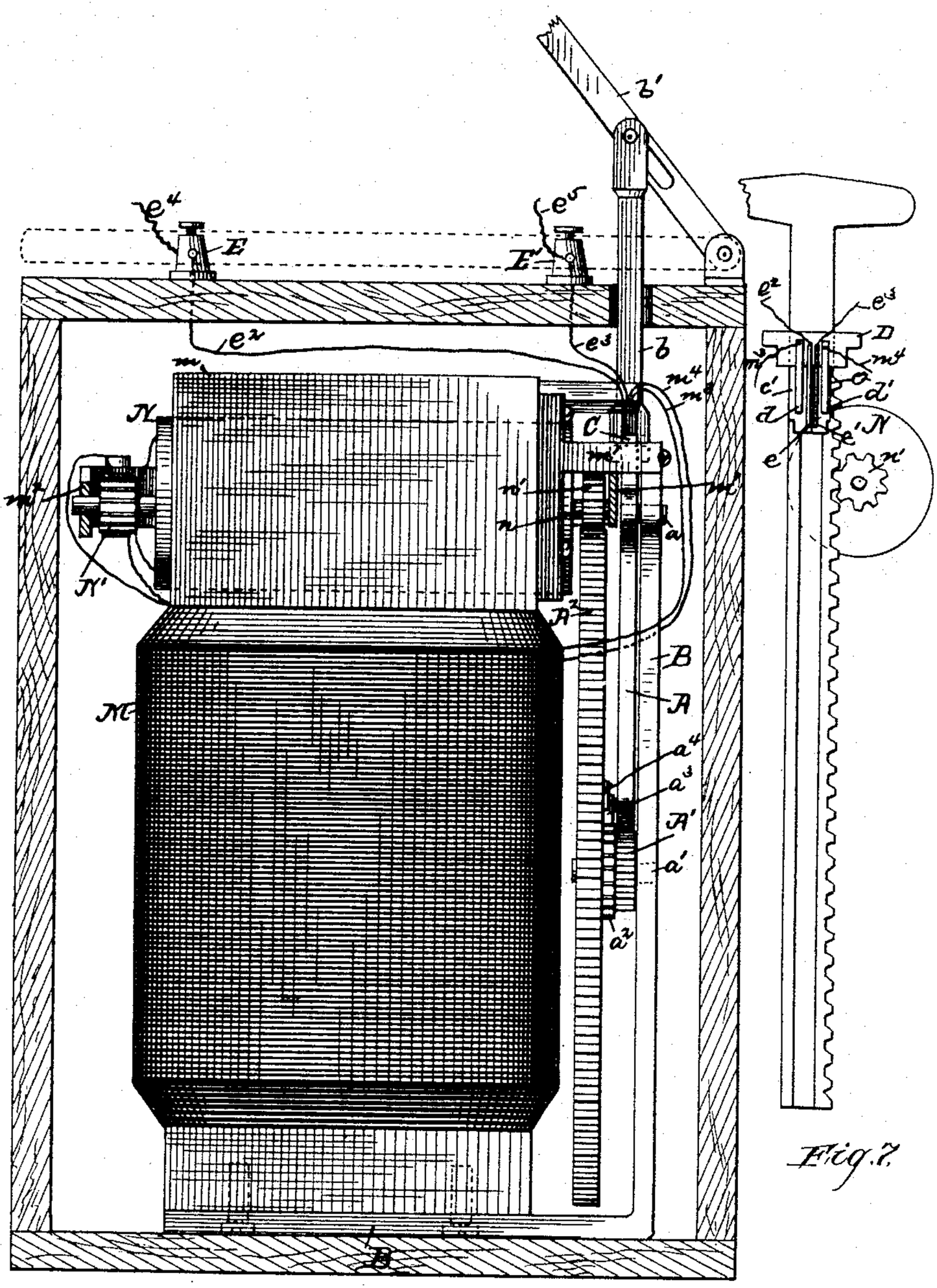

Fig. 3.

Fig. 7.

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UNITED STATES PATENT OFFICE.

ARDEN S. FITCH, OF NEW YORK, N. Y.

MAGNETO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 410,964, dated September 10, 1889.

Application filed June 20, 1889. Serial No. 314,949. (No model.)

To all whom it may concern:

Be it known that I, ARDEN S. FITCH, of the city, county, and State of New York, a citizen of the United States, have invented certain new and useful Improvements in Magneto-Electric Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to magneto-electric machines which are specially adapted for developing a current of electricity for firing fuses in blasting operations and kindred uses; and my invention consists in the combination, with the device which operates the rotary armature of a magneto-electric machine in which are two distinct and separate circuits, one including the armature, magnet-coils, and connections inside the machine, and the other comprising the working-circuit, in which are the fuses outside of the machine, of the hereinafter-described circuit-controller common to both said circuits and adapted to have motion concurrent with said armature-operating device, and to maintain the inside circuit closed and the outside circuit open or broken during the movement of said operating device in one direction to rotate said armature, and to establish electrical connection between said inside and outside circuits at the conclusion of said movement of said operating device, whereby during the development of electricity in the machine by the rotation of the armature the entire current is accumulated in the magnet-coils in the inside circuit and no part thereof passes to the outside circuit, and whereby at the conclusion of said movement of said operating device, when said armature has attained the maximum of its velocity in its rotation, the thus accumulated entire current is automatically and instantly transferred in its full volume and intensity to said outside or working circuit; and my invention also consists in the combination, with said rotary armature and a pinion fixed on its arbor, of a gear engaging said pinion, a clutch-pinion on the shaft of said gear and adapted to rotate said gear in one direction only, as described, together with an actuating device adapted to engage and rotate said clutch-pinion through one revolution, and the hereinafter-described circuit-controller carried by and adapted to have concurrent motion with said actuating device, substantially as and for the purpose set forth.

Figure 1 is an end elevation of a magneto-electric machine, showing my improvements in side elevation and with the armature-operating device at the limit of its movement in one direction. Fig. 2 is a similar view of the same parts, showing the armature-operating device at the limit of its movement in the opposite direction. Fig. 3 is a side elevation of the machine, showing my improvements in end elevation. Figs. 4 and 5 are enlarged plans, in detail, of the circuit-controller and terminals shown in elevation in Figs. 1 and 2, and illustrating the same in their respective relative positions when the armature-operating device is at the limits of its movement in the directions exhibited in Figs. 1 and 2; and Figs. 6 and 7 illustrate a modified form of the armature-operating device having a circuit-controller and terminals combined therewith in accordance with my invention.

M represents the electro-magnet, and N the rotary armature working between the suitably-recessed inner faces of the enlarged poles *m m* of the magnet, said armature having the arbor *n*, journaled in brackets $m' m^2$, attached to said magnet-poles. The armature is of the usual construction in machines of this class, and upon the arbor thereof is a commutator N′ of the well-known form. The necessary connections are established between the respective commutator-plates and the terminals of the armature-coils and between the commutator-springs and one of the coil-terminals of each leg of the magnet.

In carrying out my invention I prefer to employ a toothed segment A as the armature-operating device through the medium of the gearing shown. This segment has pivotal bearing upon a pin or short shaft *a*, which may be on the upper part of a frame-piece B and preferably about in line with the arbor of the armature, as shown, said frame-piece being conveniently attached at the top to the magnet-poles and extended thence downward to and carried under the transverse bar of the magnet and fastened thereto.

The segment A meshes with a pinion A′, which turns on a short shaft *a*′, which may be fixed in the frame-piece B, and the toothed

face of the segment is so proportioned in length relatively to the circumference of the pinion A′ that the traverse of the segment on the pinion will operate to rotate the pinion through the distance of one complete revolution only on its shaft.

A^2 is a gear on the same shaft with the pinion A′, and a clutch device connects said pinion and gear, so that when the segment rotates the pinion in the direction to effect the rotation of the armature the gear will also be rotated, but that when it is reversely rotated by the segment the clutch will disengage the gear and the latter remain idle. To accomplish this I prefer to employ a ratchet a^2, fixed on the pinion and a pawl a^3, pivoted on the gear and engaging said ratchet, as shown A spring a^4 may be advantageously employed to hold the pawl to engagement with the ratchet.

The gear A^2 meshes with a pinion n', which is fixed on the arbor of the armature, and the diameter of this gear should be such that its rotation through the distance of one revolution will give to the armature the number of revolutions requisite and desirable in developing the electricity in the machine.

It is evident when the segment is swung from the position shown in Fig. 1 to that in Fig. 2 that the armature N will be thereby given the desired rotation, and that the segment being adapted, as is preferable, to swing at the conclusion of said movement clear of the pinion A′, as shown in Fig. 2, the sudden checking of the rotation of the armature and jar upon or derangement of its parts or bearings are wholly avoided.

The segment may have an extension or arm a^5, by which it is actuated through a duly-proportioned rod b, pivoted thereto in a slot a^6 therein, as shown, said rod desirably extending through an opening in the lid of the inclosing-case of the machine and being linked to a lever b', fulcrumed on said lid, as shown. A stop b^2 may be fixed inside the case and adapted to limit the downward movement of the segment, as hereinbefore described.

The described construction will be found convenient and effective for several reasons, among others the compactness of the apparatus and the comparatively small bulk thereof when inclosed in its case, the readiness with which the machine may be operated, it being necessary to simply swing the lever b' upward and then press it downward to its limit of movement, the effectiveness of the operating devices in causing the armature to attain a constantly-increasing velocity of rotation during the downward thrust of the lever, the gearing shown greatly facilitating this result, and also the decreased liability of the machine to get out of order or be injured when not in use by contact with the operating-lever of external objects, the said lever being folded down to the box-lid and the segment being wholly disengaged from the gearing and armature.

C is a circuit-controller composed of a metal block, upon the face of which and in electrical contact therewith bear spring-terminals $d\ d'$, which are mounted on a fixed insular support D, which may be secured to the magnet-poles, as shown. To these terminals extend, respectively, the coil-terminals $m^3\ m^4$ of the magnet, which are the opposite ones to those extending from the magnet to the armature. I combine the circuit-controller C with the armature-operating device, so that it is adapted to move concurrently with and to the same extent as said device, and to accomplish this I preferably constitute the controller C as a part of the said operating device—as, for example, in the form of a segmental disk as an extension of the toothed segment A beyond its pivotal bearing, as shown clearly in Figs. 1, 2, and 3. The terminals $d\ d'$ traverse the peripheral face of this disk as said disk moves concurrently with the segment A. At $e\ e'$ are spring-terminals, preferably mounted on the insular support D, and desirably between the terminals $d\ d'$, as shown, and adapted to project toward the periphery of the disk C. From said terminals $e\ e'$, respectively, wires $e^2\ e^3$ extend to binding-posts E E′, which may be arranged externally of the inclosing-case, as shown. To the posts the line-wires (shown at $e^4\ e^5$ running to the fuses) may be attached.

It is apparent that in the machine as thus constructed there are two separate and distinct circuits, one including the armature, magnet-coils, connections, and terminals inside the machine, and the other comprising the wires $e^2\ e^3$, their terminals $e\ e'$, and the line-wires $e^4\ e^5$ outside the machine, and that the circuit-controller C is common to both these circuits and maintains said inside circuits closed during its movement concurrently with the segment A. While effecting this result the controller C is also adapted to maintain the outside circuit open or broken during and until the conclusion of its movement concurrently with that of the armature-operating device in the direction to rotate the armature, and, furthermore, to establish connection between said inside and outside circuits at the conclusion of said movement. To accomplish the first of these results, I prevent the terminals $e\ e'$ from having contact with the face of the controller throughout the path thereon traversed by them during the movement of said controller, as described, preferably by forming a channel c in the face of said controller along said path, into which the ends of the terminals may project, at shown, and I accomplish the other of these results by means of metal plates $c'\ c^2$, placed upon the face of the controller, insulated therefrom and from each other, and so located thereon as to engage, respectively, the terminals of similar polarity $d\ e$ and $d'\ e'$ of the said circuits at the conclusion of the described movement of the said controller concurrently with that of the segment A in the direction to rotate the armature. It is

desirable that said plates c' c^2 should have the extended portions c^3 c^4 respectively adapted to enable the terminals d d' to establish connection with the respective plates before leaving the bearing-face of the controller, and that the terminals e e' should be of such length and so located relatively to the terminals d d' and the plates c' c^2 as to enable said terminals e e' to engage their respective plates just as the terminals d d' wholly escape from the face of the controller, as thereby no actual breaking of the electric current ensues, but a shunting or switching thereof from the inside to the outside circuits is effected.

In the practical operation of the machine it is evident when the segment is swung from the position shown in Fig. 1 to that in Fig. 2 that during such movement, and while the armature is being thereby rotated, the circuit-controller C will have a concurrent movement and the terminals d d' will traverse the face thereof, maintaining the inside circuit closed, while the terminals e e' will traverse the channel c, thereby maintaining the outside circuit open or broken, so that the entire electrical current developed will be accumulated in the magnet-coils in said inside circuit, none of it passing to or through said outside circuit, and when the segment has concluded its said movement and the rotating armature attains its maximum of velocity that the terminals d e and d' e' will respectively engage the switch-plates c' and c^2 on the controller C, and the entire accumulated current be thus automatically and instantly transferred in its full volume and intensity to the outside or working circuit. Thereafter the swinging of the segment A, and concurrently the controller C, in the reverse direction will disengage the circuit terminals from the switch-plates and restore the parts to the positions shown in Figs. 1 and 4 in readiness for another operation of the machine.

In Figs. 6 and 7 I show a rack-bar engaging with an operating-pinion on the armature-arbor as a modified form of armature-operating device, with which is combined a circuit-controller in accordance with my invention. In this construction the downward thrust of the rack-bar rotates the pinion and the rack-bar itself carries or constitutes the circuit-controller. For this purpose one of its faces is longitudinally channeled at c to permit the traverse therein during the downward thrust of the bar of the terminals e e' of the outside circuit, the insulated support D of said terminals being for convenience placed at or near the lid of the case through which the bar works. The terminals d d' of the inside circuit are arranged on said support, as hereinbefore described, and bear upon the face of the bar in its reciprocal movements. The insulated switch-plates c' c^2 being placed at the upper end of the bar on said face are adapted to engage the said terminals of similar polarity when the bar has reached the limit of its downward thrust in rotating the armature. The result attained is the same as that in the case of the segment A and the controller carried by it, as hereinbefore described.

I make no claim, specifically, herein for the combination, with the rack-bar as the armature-operating device in this machine, of the described circuit-controller, reserving the same as the subject-matter of a separate application for patent, filed by me simultaneously herewith, Serial No. 314,950.

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

1. In a magneto-electric machine having two separate circuits, one including the rotary armature, magnet-coils, and connections inside the machine and the other comprising the working-circuit outside the machine, the combination, with the armature-operating device, of a circuit-controller common to both said circuits and having motion concurrently with said armature-operating device, and fixed contacts connected with said circuits and in electrical relation to said circuit-controller to maintain the inside circuit closed and the outside circuit open or broken during the movement of said operating device in the direction to rotate the armature and to establish electrical connection between said inside and outside circuits at the conclusion of said movement of said operating device, substantially as and for the purpose set forth.

2. In a magneto-electric machine having two separate circuits, one including the rotary armature, magnet-coils, and connections inside the machine, and the other comprising the working-circuit outside the machine, the combination, with the rotary armature-operating device adapted to rotate said armature by a single movement in one direction, of a circuit-controller common to both said circuits and carried by said armature-operating device, and having movement therewith, and comprising fixed contacts connected with said circuits and in electrical relation to said circuit-controller to maintain the inside circuit closed and the outside circuit open or broken during said movement of said operating device, and to establish electrical connection between said circuits at the conclusion of said movement, substantially as and for the purpose set forth.

3. In a magneto-electric machine having two separate circuits, one including the rotary armature, magnet-coils, and connections inside the machine and the other comprising the working-circuit outside the machine, the combination, with the rotary armature and a pinion fixed on the arbor thereof, of a gear engaging said pinion, a clutch-pinion on the shaft of said gear and adapted to rotate said gear in one direction only, and a toothed segment engaging said clutch-pinion and adapted to rotate it through a single revolution, together with a circuit-controller common to

both said circuits and carried by said segment, and adapted in its movement therewith in the direction to rotate said armature to maintain said inside circuit closed and said outside circuit open, and to establish electrical connection between said circuits at the conclusion of said movement, substantially as and for the purpose set forth.

4. In a magneto-electric machine having two separate circuits, one including the rotary armature, magnet-coils, and connections, and spring-terminals for said coils carried by an insulating-support, and the other comprising the main or working circuit having spring-terminals carried by said insulating-support, the combination, with the operating device adapted to rotate the armature by a single movement in one direction only, of a circuit-controller consisting of a metal block carried by and moving with said operating device, and provided with bearing-faces for the terminals of the magnet-circuit, and with a channel in its face for the traverse of the terminals of the working-circuit during its movement with said operating device in the direction to rotate the armature, and with insulated switch-plates adapted to engage the terminals of similar polarity of both said circuits at the conclusion of its said movement, substantially as and for the purpose set forth.

5. In a magneto-electric machine having the separate magnet-circuit and working-circuit, as described, the combination, with the rotary armature-operating device adapted to rotate said armature by a single movement in one direction, of a circuit-controller C, carried by and moving with said armature-operating device and consisting of a metal block having bearing-faces for the spring-terminals d d' of said magnet-circuit, and a channel c in its face for the traverse of spring-terminals e e' of the working-circuit during its movement with the said operating device in the direction to rotate the armature, and the switch-plates c' c^2, provided with the extensions c^3 c^4, adapted to enable said terminals of the magnet-circuit to establish connection with said plates before leaving said bearing-faces of the controller, and thereafter to establish connection between the terminals of similar polarity of both circuits, substantially as and for the purpose set forth.

6. In a magneto-electric machine of the class described having an inclosing-case, the combination, with the segment A, adapted to actuate the gearing by a single movement in one direction to rotate the armature, and provided with the extension-arm a^5, of a lever b', fulcrumed on the exterior of the inclosing-case, and a rod b, pivotally connecting said arm and lever through an opening in the case-wall, substantially as and for the purpose set forth.

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Witnesses:
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