(No Model.) 2 Sheets—Sheet 1.

A. S. FITCH.

MAGNETO ELECTRIC MACHINE.

No. 410,965. Patented Sept. 10, 1889.

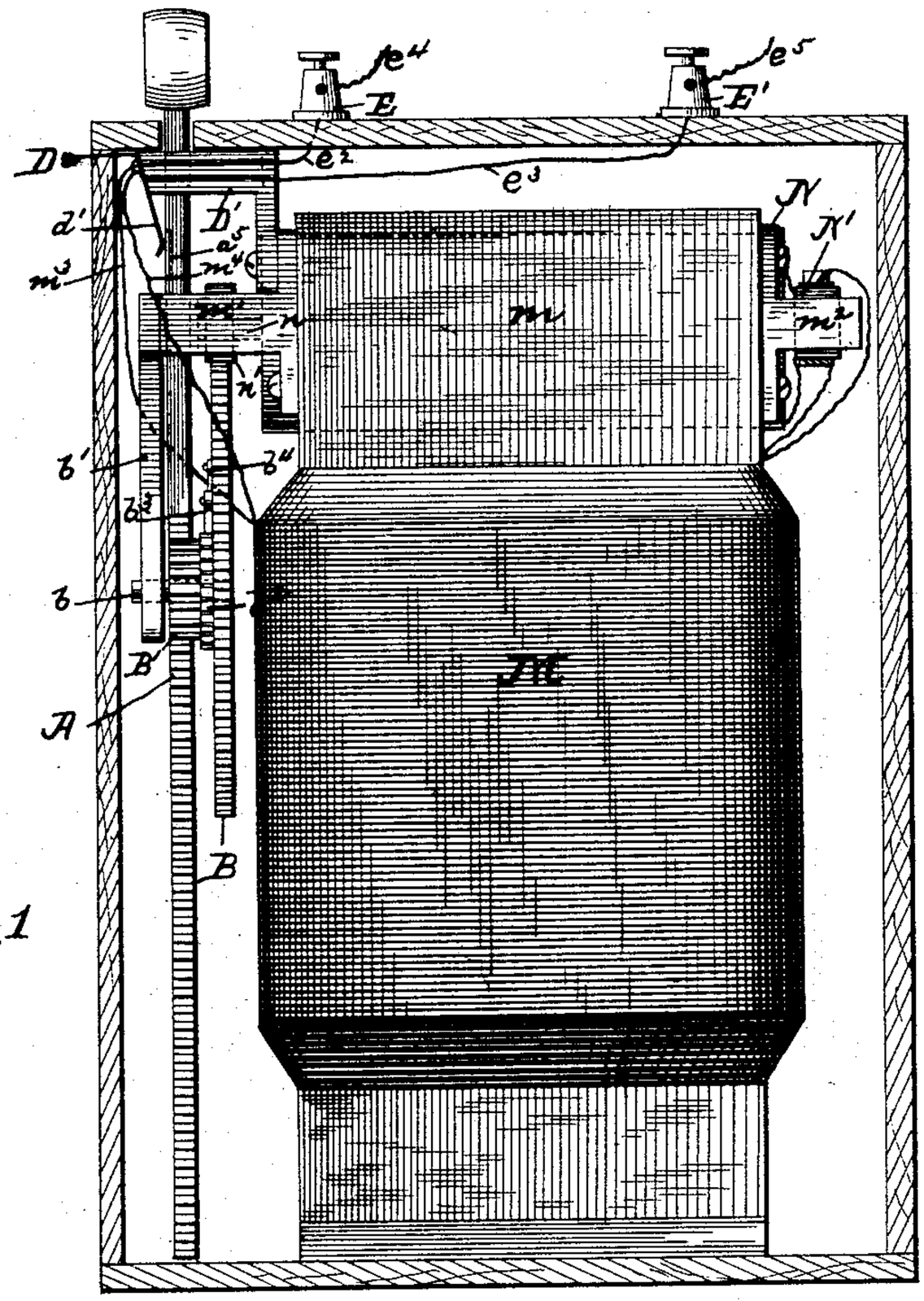

Fig. 1

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(No Model.) 2 Sheets—Sheet 2.

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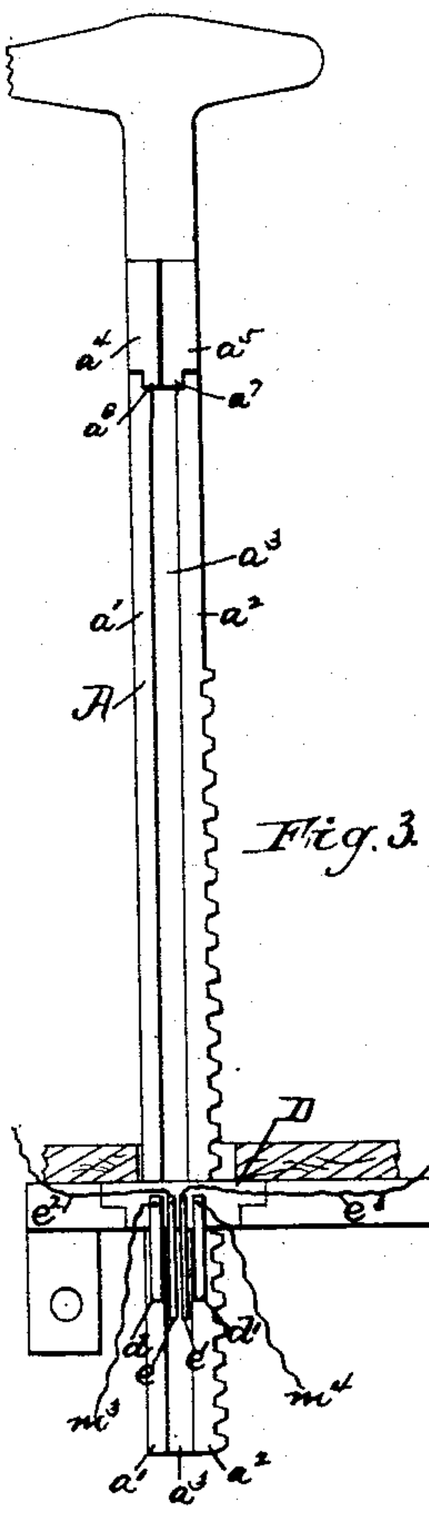

Fig. 3.

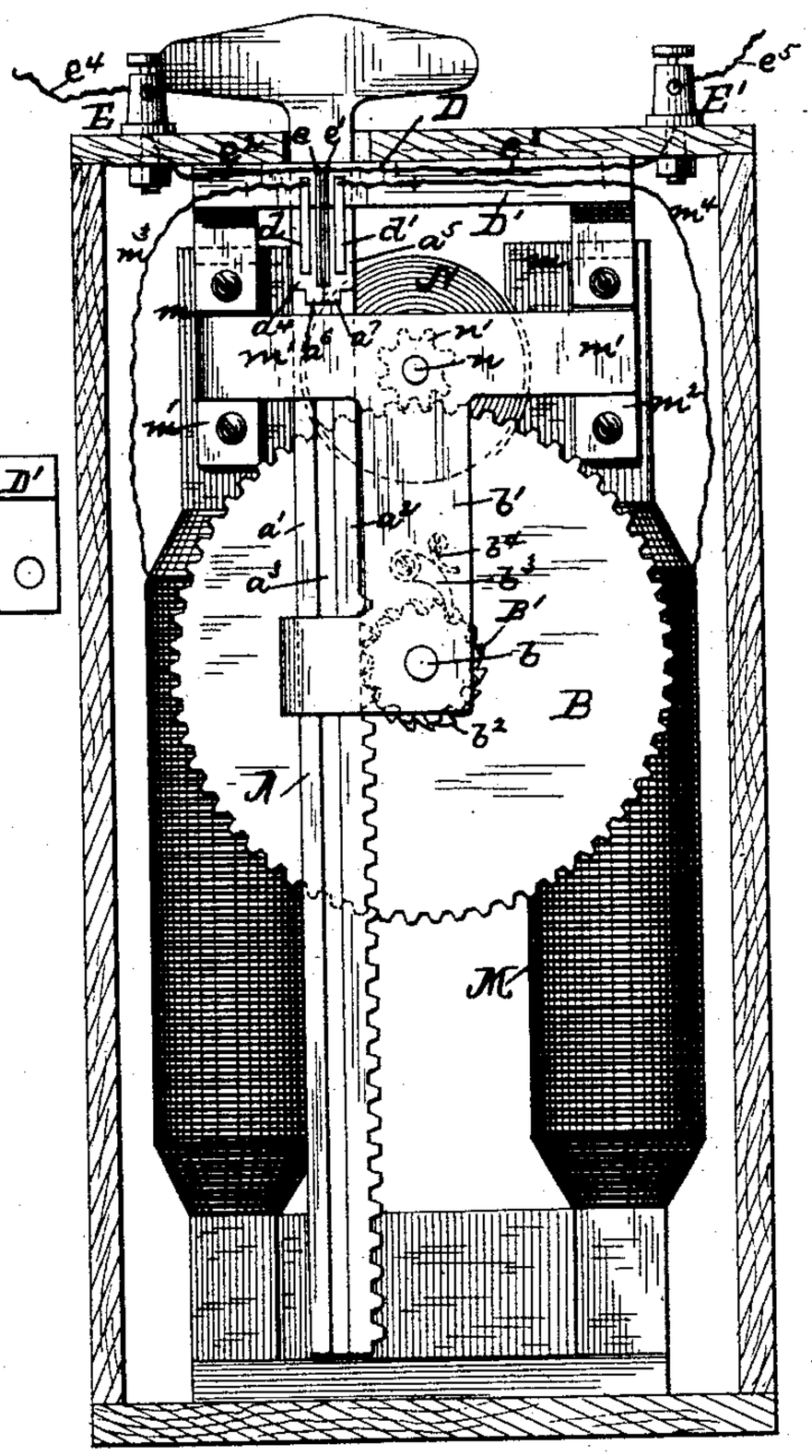

Fig. 2.

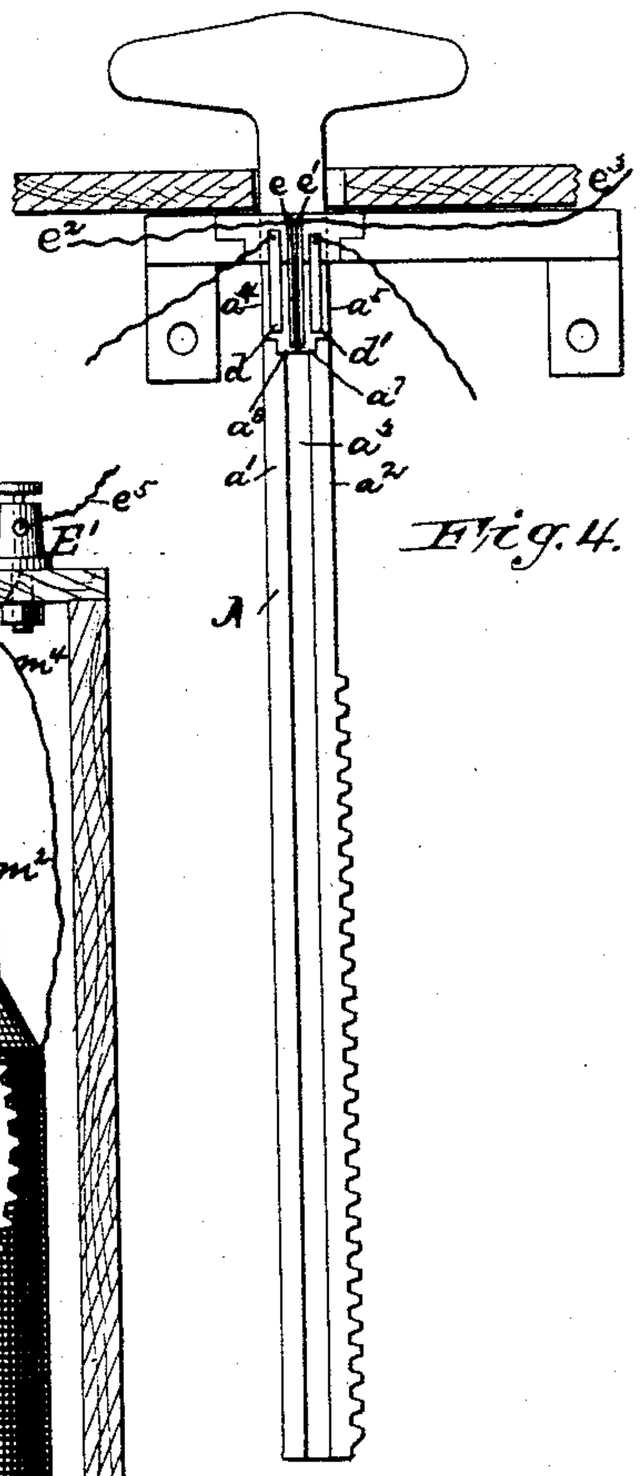

Fig. 4.

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UNITED STATES PATENT OFFICE.

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MAGNETO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 410,965, dated September 10, 1889.

Application filed June 20, 1889. Serial No. 314,950. (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 that class of magneto-electric machines adapted to develop an electric current for firing fuses in blasting operations and similar purposes; and my invention consists in the combination, in a magneto-electric machine of this class, with a rack-bar, which actuates the mechanism which rotates the rotary armature by a single movement in one direction, of a circuit-controller carried by and having concurrent and similar movement with said rack-bar and adapted to maintain the described circuits in said machine in the condition specified during the movement of the parts to rotate the armature, and to establish connection between said circuits at the conclusion of said movement, as and for the purpose hereinafter set forth; and my invention also consists in the combination, with said rack-bar carrying said circuit-controller, of a gear engaging a pinion fixed on the arbor of the rotary armature and a clutch-pinion on the gear-shaft and engaging said rack-bar, with its clutch adapted to engage and rotate said gear in one direction only, substantially as and for the purpose specified.

Figure 1 is a side elevation of a magneto-electric machine containing my invention. Fig. 2 is an end elevation of the same. Figs. 3 and 4 are side views in detail of the operating rack-bar with the circuit-controller carried thereby, and respectively showing it at its limit of movement upward and downward in the operation of the machine.

M is the electro-magnet, and N is the rotary armature working between the suitably-recessed inner faces of the enlarged ends of poles *m m* of said magnet. The armature has the arbor *n*, journaled in brackets *m'* m^2, attached to the magnet-poles. The armature is of the usual construction in machines of this class, and has a commutator N' of well-known form on its arbor *n*. 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.

A is a rack-bar capable of reciprocatory movement in the machine.

B is a gear journaled on a shaft *b*, which may be fixed on a frame-piece *b'*, secured to and depending from the bracket *m'* on the magnet-poles, as shown. The gear B engages a pinion *m'*, which is fixed on the arbor of the armature.

B' is a clutch-pinion journaled on the gear-shaft and adapted to be engaged by the rack-bar A. The clutch is adapted to engage the gear so as to rotate it in one direction only—namely, in the direction to effect the rotation of the armature, and for this purpose a ratchet, b^2, fixed on the pinion, and a pawl b^3, pivoted on the gear and adapted to engage said ratchet, as shown, constitute a preferable form of clutch. A spring b^4 may serve to hold the pawl to engagement with said ratchet. It is apparent that when the rack-bar is drawn upward the pinion B' will alone be rotated thereby, the pawls b^3 riding the ratchet b^2, and that when the bar is thrust downward such single movement thereof will operate to rotate the gear B, and hence the armature N, thereby effecting the development of the electric current in the machine.

Heretofore in machines of this class, in which a rack-bar has been employed as the armature-operating device, said bar has engaged directly a pinion running loose on the armature-arbor and provided with a clutch fast on the arbor and adapted to engage the pinion, so as to effect the rotation of the armature in one direction only; but such construction has been found objectionable, for the reason that the arbor-pinion, being of necessity comparatively small and loose on the arbor, is exceedingly liable to fracture or be otherwise injured and rendered useless by the direct engagement of the bar, and also because the bar itself, in order to give to the pinion in its downward thrust the requisite number of revolutions for the effective development of electricity by the armature, has to be of considerable length, and, in fact, to be of greater length than the height of the mag-

net and its armature, thus necessitating the employment of a long and bulky inclosing-case.

It is evident that in the construction I have described the pinion n' may be made integral with the arbor n, and hence have augmented strength and durability, and that being driven by engagement with the gear B said pinion will be subjected to less strain in the operation of the machine than if in direct engagement with a rectilinear rack-bar; also, that by the employment of the said gear B, I am enabled to so shorten the rack-bar, while still effecting the requisite rotation of the armature, as to reduce the bulk or size of the inclosing-case, as shown, to substantially the dimensions of the magnet and its attachments. The machine in the form described may thus be more economically constructed and be produced in a shape more convenient for transport, than when the rack-bar alone is employed in direct engagement with a pinion on the armature-arbor.

At d d' are shown spring-terminals, preferably mounted on an insulated support D, which may be held by a bracket D', secured to the top of the magnet-poles, as shown, so as to be in the upper end of the inclosing-case of the machine, as shown. To the terminals d d' extend, respectively, the coil-terminals m^3 m^4 of the magnet, which are opposite ones to those extending from the magnet to the armature. Upon the side of the bar A, I constitute the bearing-faces a' and a^2, and the terminals d d' are so located relatively to the bar as to bear upon and traverse said faces a' a^2, respectively, during the reciprocatory movements of the bar.

At e e' are shown spring-terminals, preferably mounted on said support D, and desirably between the terminals d d' thereon. From these terminals e e' extend, respectively, the wires which constitute the working-circuit of the machine—namely, the circuit in which are the fuses to be ignited—and such wires are shown in preferable arrangement at e^2 e^3 running to binding-posts E E' on the exterior of the inclosing-case, from which the main-line wires e^4 e^5 detachably extend. The terminals e e' project toward the bar A, as shown, and are insulated from said bar at their contact ends, preferably by means of a channel a^3, formed in and extending longitudinally of the bar between the faces a' a^2 thereon, as shown, and which channel is thus adapted to be traversed by the terminals e e', which project into it without contact with the bar during the reciprocatory movements of the bar.

At a^4 a^5 are shown metal plates mounted upon and insulated from the rack-bar and from each other, and adapted in location upon the bar, at the upper end thereof, to engage, respectively, the terminals d e and d' e' when the bar has reached the conclusion of its reciprocation in the direction to effect the rotation of the armature. The downward thrust of the bar being the reciprocatory movement thereof to rotate the armature, the plates a^4 a^5 are located as shown in Fig. 4, and engage the said respective terminals, as illustrated in said figure. During the reciprocation of the bar in either direction the terminals d d' traverse the faces a' a^2 of the bar, and the terminals e e' project into and traverse the longitudinal channel a^3 therein, as illustrated in Fig. 3.

It is apparent that in the construction shown and described two distinct and separate circuits are constituted, one of which includes the magnet, rotary armature-connections, and terminals d d' and the other comprises the working-circuit and its terminals e e', and that the rack-bar carries and in part itself constitutes a circuit-controller, which is common to both circuits and which has movement concurrent with that of the bar, and which, by the engagement and traverse of the faces a' a^2 by the said terminals of the magnet-circuit during the reciprocation of the bar, maintains said magnet-circuit closed, and by the traverse of the channel a^3 by the said terminals of the working-circuit during said reciprocation maintains said working-circuit open or broken, and which by the engagement of the plates a^4 a^5, respectively, by the terminals of similar polarity of both circuits at the conclusion of the reciprocation of the bar in the direction to effect the rotation of the armature establishes connection between said circuits, whereby during the reciprocation of the bar in the direction to rotate the armature the electricity thus developed is wholly accumulated in the magnet-circuit and none passes to the working-circuit, and whereby at the conclusion of said reciprocation of said bar the entire accumulated current is automatically and instantly transferred from the magnet-circuit to the working-circuit.

It will be found desirable to form the plates a^4 and a^5 with the extensions a^6 a^7, respectively adapted to enable the terminals d d' of the magnet-circuit to establish connection with their respective plates before leaving the faces a' a^2 on the bar, and also that the terminals e e' of the working-circuit should be of such proportions and so located relatively to the terminals d d' and said plates a' a^2 as to enable said terminals e e' to engage said plates respectively just as the terminals d d' wholly escape from the faces a' a^2, as thereby no actual breaking of the electric current ensues, but a shunting or switching of said current from the magnet-circuit to the working-circuit is effected.

I am aware that a reciprocatory rack-bar has been heretofore employed in a magneto-electric machine as the rotary armature-operating device, and hence I make no claim herein, broadly, thereto for such purpose.

I do not claim herein, broadly, the combination, with the rotary armature-operating device in a magneto-electric machine having the said two separate circuits, of a circuit-con-

troller common to both circuits and adapted to have movement concurrent with that of said operating device, and to maintain the magnet-circuit closed and the working-circuit open during the single movement of said operating device in one direction to rotate the armature, and to establish connection between said circuits at the conclusion of said movement of said operating device, as the same is made the subject-matter of claims in a separate application for patent filed by me simultaneously herewith, Serial No. 314,949; but I limit my claim herein, in this regard, to the combination, with the described reciprocatory rack-bar, of a circuit-controller, substantially as set forth.

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

1. In a magneto-electric machine having one circuit comprising the magnet, rotary armature, and connections and another and separate circuit comprising the working-circuit, the combination, with a reciprocatory rack-bar, which operates by a single movement in one direction to rotate said armature, of a circuit-controller carried by and adapted to move concurrently with said rack-bar and fixed contacts connected with said circuits and in electrical relations with said circuit-controller to maintain said circuits, respectively, closed and open during the reciprocation of said bar, and to establish connection between said circuits at the conclusion of the movement of said bar in the direction to effect the rotation of the armature, substantially as and for the purpose specified.

2. In a magneto-electric machine having one circuit comprising the magnet-armature and connections and terminals $d\ d'$ and another and separate circuit comprising the working-circuit and terminals $e\ e'$, the combination, with the armature, of the reciprocatory rack-bar A, adapted by a single movement in one direction to effect the rotation of said armature, and provided with the longitudinal faces $a'\ a^2$, for engagement and traverse by said terminals $d\ d'$, and the longitudinal channel a^3, for traverse by said terminals $e\ e'$ during the reciprocation of the bar, together with the described plates a^4 and a^5, located on said bar to engage, respectively, the said terminals of similar polarity of both said circuits at the conclusion of said movement of said bar to effect the rotation of said armature, substantially as and for the purpose specified.

ARDEN S. FITCH.

Witnesses:
A. G. N. VERMILYA,
JOHN THORPE.