(No Model.) 2 Sheets—Sheet 1.

J. N. McLEOD.

MAGNETO ELECTRIC MACHINE.

No. 495,138. Patented Apr. 11, 1893.

FIG. 1.

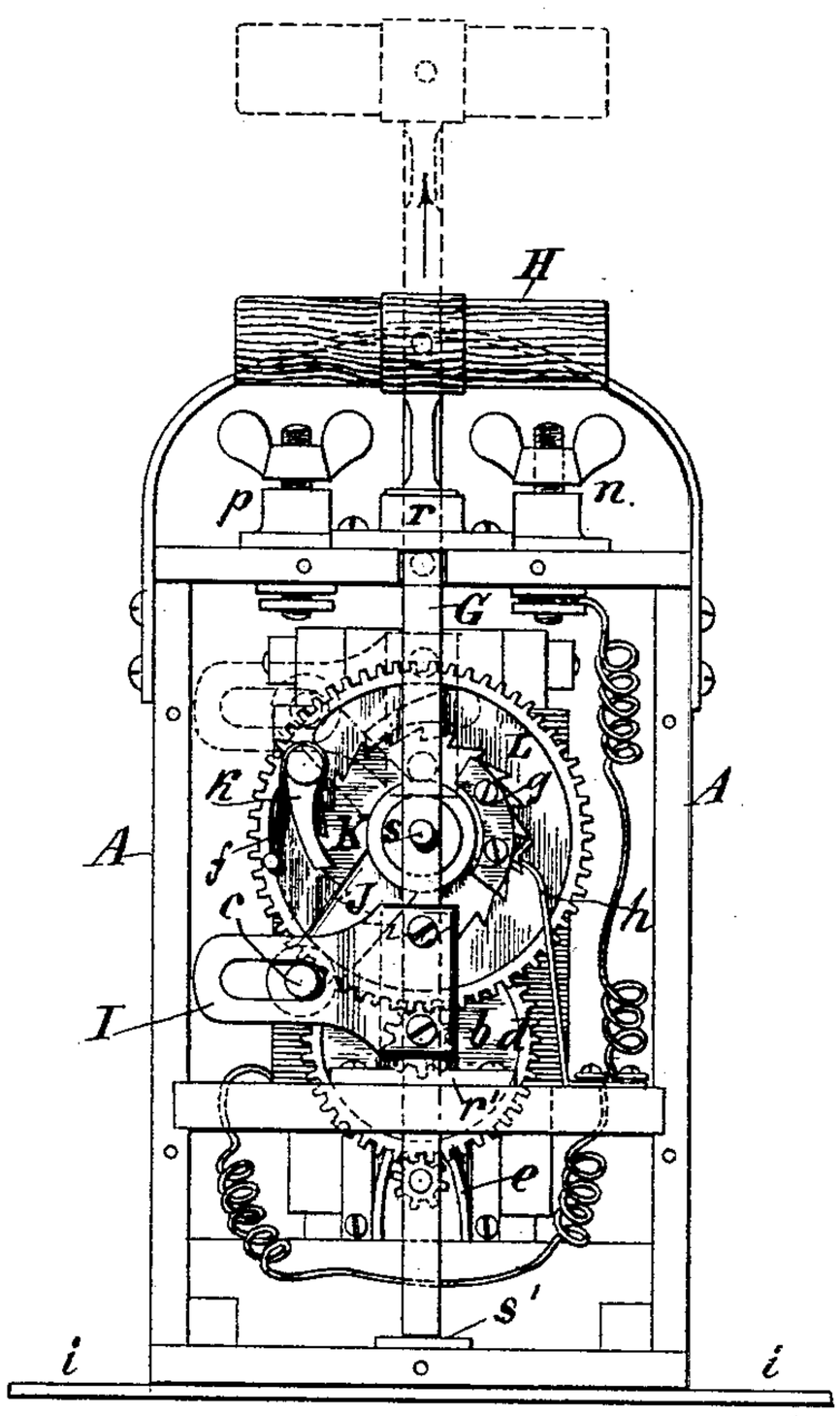


FIG. 2.

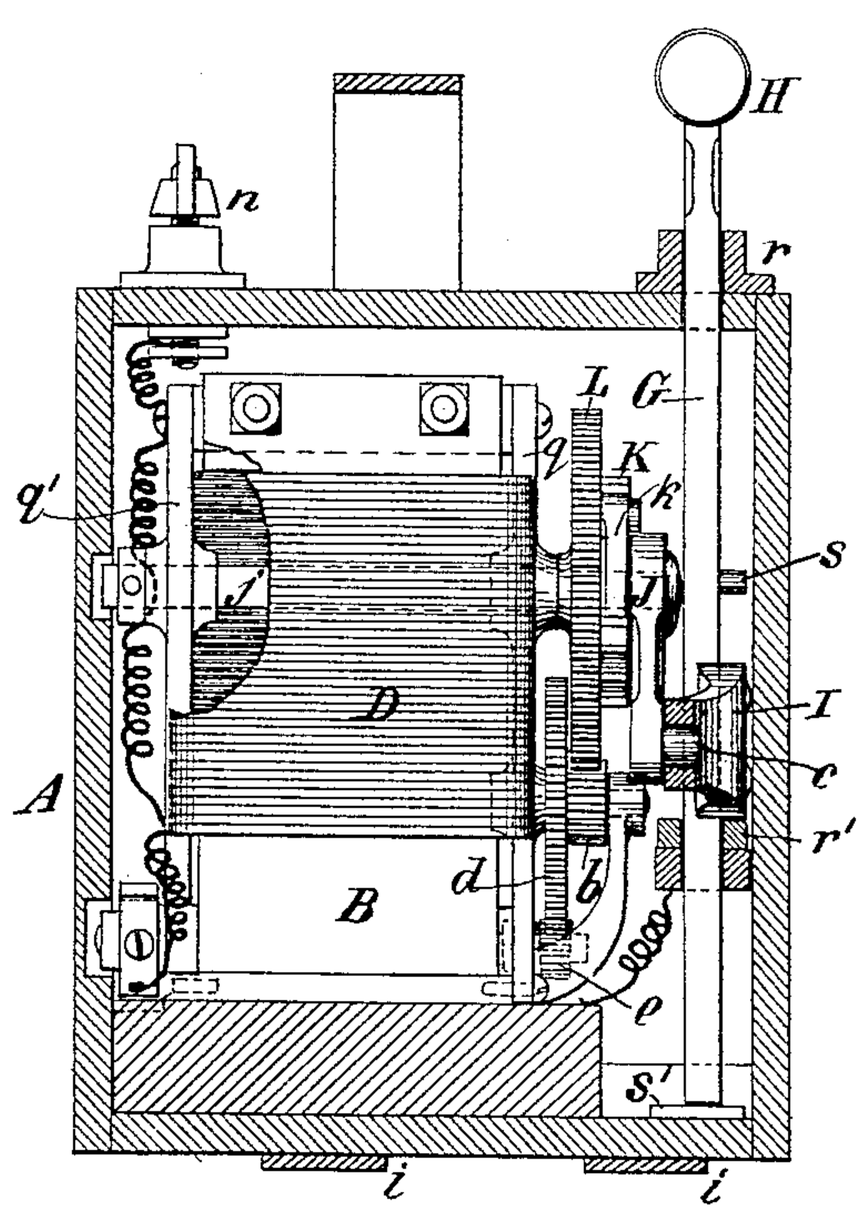
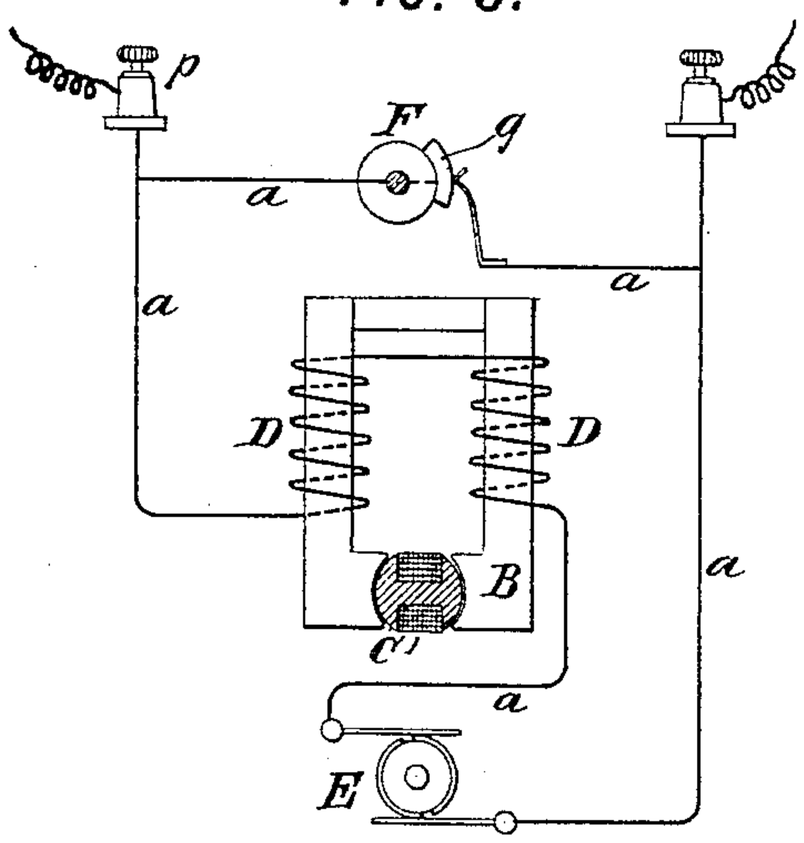


FIG. 3.



WITNESSES:
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INVENTOR:
Joseph N. McLeod,
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(No Model.) 2 Sheets—Sheet 2.

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FIG. 4.

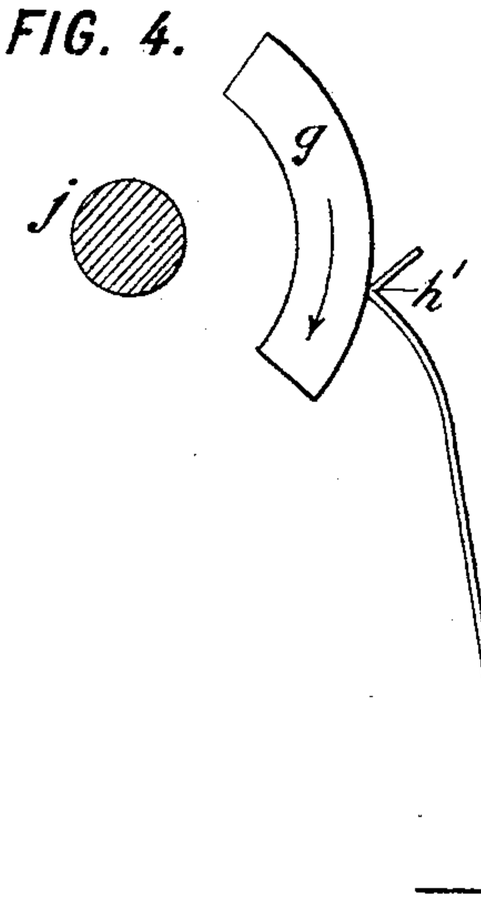


FIG. 5.

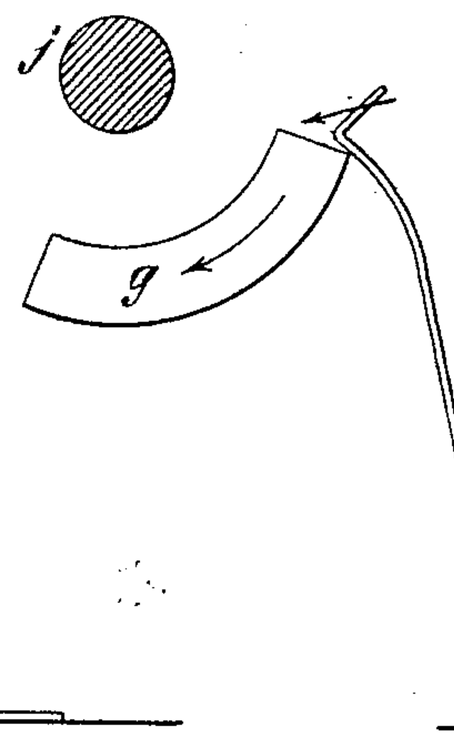


FIG. 6.

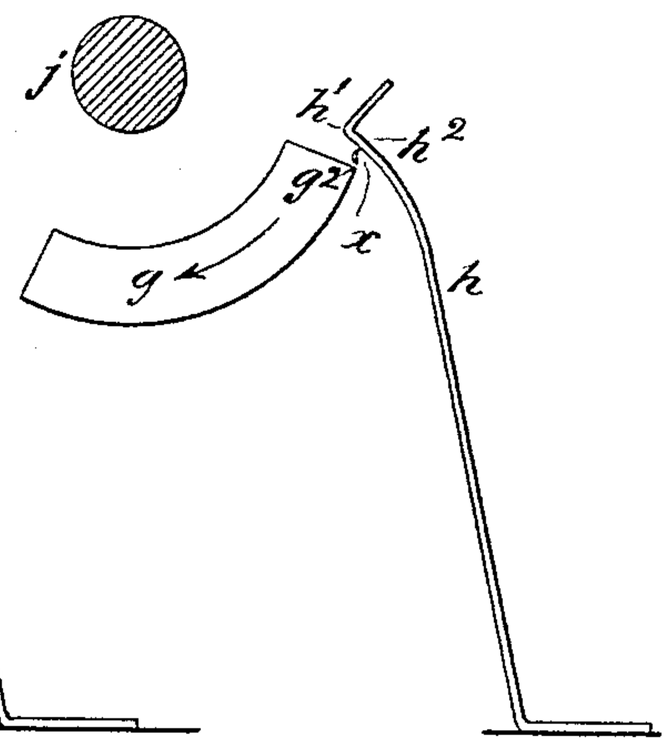


FIG. 7.

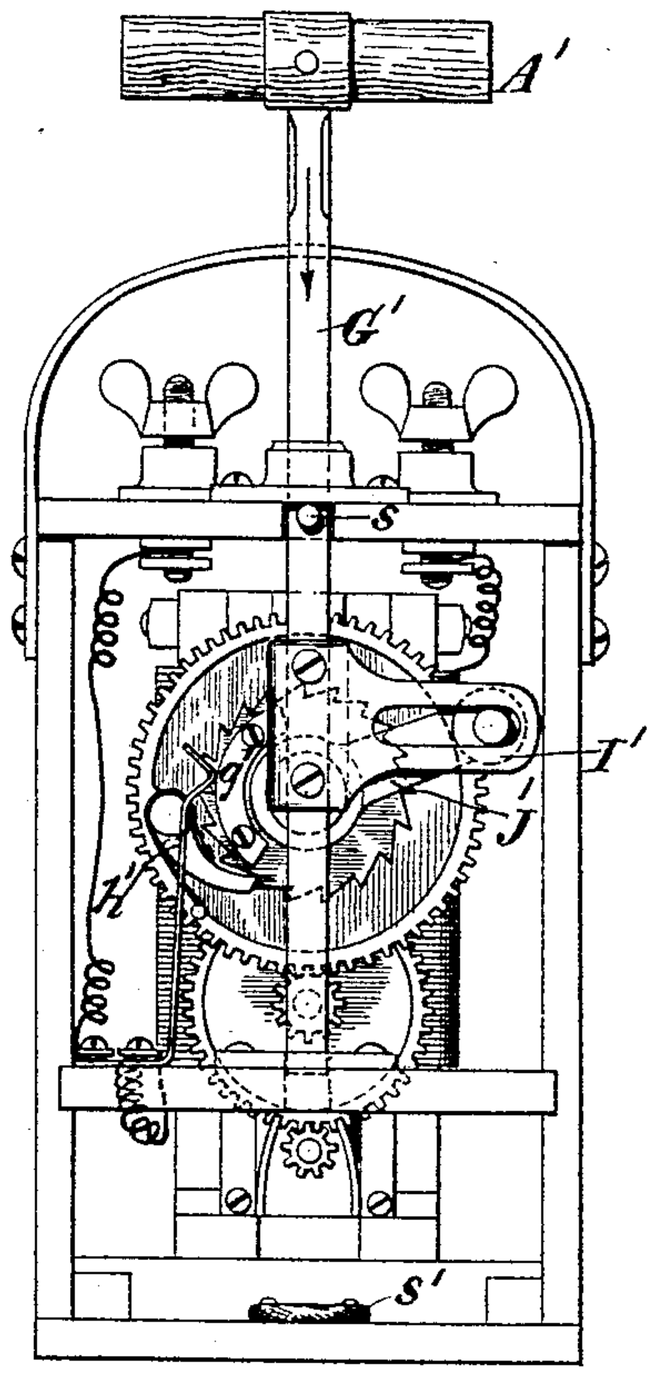
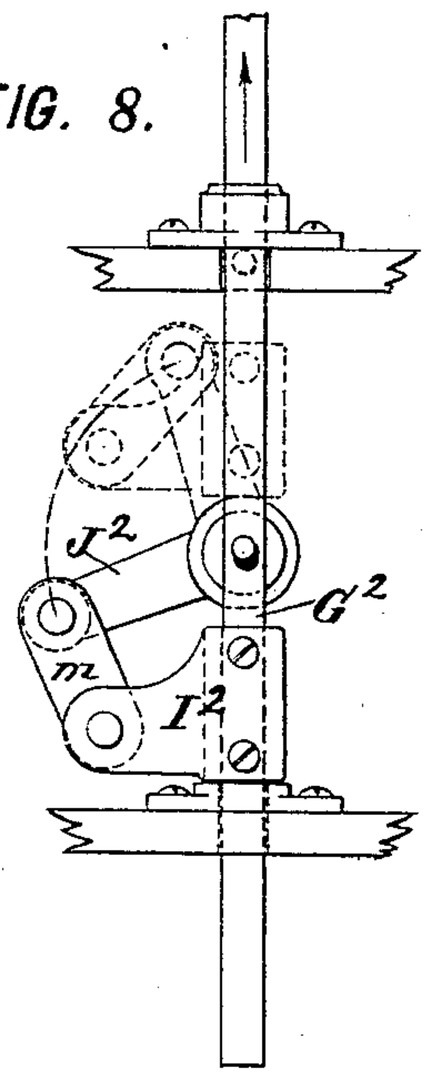


FIG. 8.



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INVENTOR:
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By his Attorneys,
Arthur C. Fraser & Co.

UNITED STATES PATENT OFFICE.

JOSEPH N. McLEOD, OF BROOKLYN, ASSIGNOR TO THE McLEOD ELECTRIC MANUFACTURING COMPANY, OF NEW YORK, N. Y.

MAGNETO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 495,138, dated April 11, 1893.

Application filed April 15, 1892. Serial No. 429,264. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH N. McLEOD, 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 Magneto-Electric Machines, (Case A,) of which the following is a specification.

This invention relates to magneto electric machines, and especially to such as are designed for use as blasting machines for exploding electric fuses.

The invention aims to provide a compact machine operated by a simple and effective movement, and the mechanism of which is so simple and cheap as to enable the machine to be constructed at a reasonable price.

The machine is constructed to be operated through the medium of a vertically sliding operating bar to which is applied a suitable handle. This bar is so connected through intervening multiplying gearing with the armature, that a single stroke of the bar drives the armature at sufficient speed, and for a sufficiently long time, to send out the proper electric discharge suited to the exploding of the fuses.

The machine is adapted to be operated by either a pull-up movement or a push-down movement of the bar by a simple modification of the internal construction.

Figure 1 of the accompanying drawings is a front elevation of a machine to be operated by a pull-up movement, the front side of the box being removed. Fig. 2 is a side elevation of the operative parts partly in section, and the inclosing case or box being wholly in section. Fig. 3 is a diagrammatic elevation showing the circuit connections. Figs. 4, 5 and 6 are fragmentary views showing the circuit-breaker in three different positions. Fig. 7 is a front view corresponding to Fig. 1, but showing a modified construction adapted to a push-down machine. Fig. 8 is a fragmentary view showing a further modification.

I will first describe the construction shown in Figs. 1, 2 and 3.

A designates the inclosing case or box, and B the field-magnet of the magneto machine mounted therein.

C is the armature, which as shown in Fig. 3, is or may be an ordinary shuttle-wound Siemens armature.

D D are the field exciting coils.

The opposite brushes of the commutator E are connected in a local or short-circuit *a a*, Fig. 3, which is normally closed through a circuit-breaker F, while on opposite sides of this circuit-breaker wires are connected to the binding posts *p* and *n* to which the line wires extending to the fuses are to be connected. It will be seen that the field coils are in series with the armature, and the field-magnet being an electro magnet, the first rotation of the armature serves by induction from the residual magnetism in the field-magnet to generate a current which by being maintained on the short-circuit *a a*, is caused to traverse only the low resistance of the coils D D, and of the armature coil, so that by its inductive effect upon the field-magnet, it quickly builds up the magnetism thereof, and thereby in turn increases the electro-motive force generated in the armature, so that by the time the rotation of the latter has been continued sufficiently long to bring it to full speed, the electro-motive force has been increased sufficiently to enable it to force a current of sufficient volume over the resistance of the line to explode the fuses. The circuit-breaker F is adapted to break the local circuit toward the end of the operating stroke, so that the electro-motive force so accumulated is thus discharged over the line. In this respect the machine is of the construction usually adopted in magnetic electric blasting machines.

The armature is driven through multiplying gearing from an operating bar G mounted to slide vertically in the case. The upper end of this bar passes out through the top of the case, and carries a handle H by which it may be worked. The operating stroke may be given by pushing the bar downwardly or by pulling it upwardly as may be desired. In Figs. 1 and 2 it is shown as a pull-up machine. The sliding bar G has fixed to it a slotted cross-arm or head I, in the slot of which works a pin or roller *c* on the end of a vibrating arm or crank J. This arm is preferably fixed on a shaft *j* extending across the machine and having bearings in frames *q q'*, in which the armature shaft also has bearings.

As the handle is pulled up, this arm J is vibrated from the position shown in full lines to that shown in dotted lines in Fig. 1.

To the arm J is fixed a ratchet-wheel K which is engaged by a pawl *k* mounted on a gear-wheel L. This gear-wheel meshes with a pinion *b* fixed to the gear *d*, which meshes with a pinion *e* fixed on the armature shaft.

The gears L, *b*, *d*, *e*, constitute multiplying gearing for communicating the advancing movement of the vibratory arm J to the armature. This advancing movement is communicated through the ratchet-wheel K and pawl *k*, while the retractile vibration of the arm J is not transmitted, the ratchet-wheel K returning idly, while the pawl *k* clicks over its teeth. The pawl *k* is pressed toward it by a spring *f*. The operating bar G slides through bearing plates *r* and *r'*, and is stopped at the opposite limits of its movement by suitable stops. A stop-pin *s* strikes the plate *r* to limit its upward movement, while its downward movement is limited by its bottom end striking a stop-plate or cushion *s'*.

The circuit-breaker F consists of two parts, namely, a conducting sector *g* carried by the wheel K or otherwise connected to the arm J so as to vibrate therewith, and a spring contact arm *h* arranged normally to press against the periphery of the sector to complete electrical connection therethrough, as shown in Fig. 3. The sector *g* is in communication with the binding post *p* through the frame and gearing of the magneto machine which constitutes a part of the circuit. As the arm J swings toward the position shown in dotted lines, this sector *g* swings downwardly in the direction shown in Figs. 4, 5 and 6. Shortly before the end of the movement of the arm the end of the sector passes out from under the end of the spring *h* as shown in Fig. 5, and in so doing the spring *h* by its elasticity follows it and for an instant remains in contact with it, but at the next instant the spring reaches the limit of its movement and the sector breaks contact with it, thereby causing a spark to fly between, as shown at *x* in Fig. 6. This spark, which always follows the breaking of the contact of the respective members of the circuit-breaker, and which varies in intensity with the variations in potential at the opposite contacts of the circuit-breaker, has as is well known the effect of oxidizing the contact surfaces, so that in course of time they become covered with an insulating coating of oxide. My improved construction of circuit-breaker causes this oxidation to occur in a different place from where the normal conductive contact between the respective members of the circut-breaker takes place. During the ordinary contact, the nose *h'* of the spring is in contact with the periphery of the sector, and is kept polished by the rubbing of the latter against it, and also in turn keeps the surface of the sector polished and free from oxide. At the instant of breaking contact, however, by reason of the inward movement of the spring *h* past the end of the sector as shown in Fig. 5, the spark passes not between the conducting portion *h'* and the sector, but between the point h^2 and the sector, as shown in Fig. 6. The oxidation is thus to this extent removed from the surface *h'*, so that no amount of oxidation will impair the conductivity between the spring and sector prior to the instant of breaking the circuit, the only oxidation occurring at the point h^2 of the spring, and at the corner g^2 of the sector.

The operation is as follows:—In operating the pull-up machine shown in Figs. 1 and 2 (the circuit terminals having been properly connected to the binding posts *p* and *n*) the workman places his feet on the projecting foot rests *i i* to hold the machine firmly down, and then grasping the handle H, he pulls the latter upward to the position shown in dotted lines, commencing slowly and increasing the speed at which he pulls continually until the end of the stroke. This movement swings the arm J to the position shown in dotted lines, and its vibration is communicated through the multiplying gears to the armature, driving the latter at a rapid rotation and generating a continually increasing electro-motive force, until just before the end of the stroke the circuit-breaker acts to break the local circuit, whereupon the electro-motive force is made effective to generate the current over the line to explode the fuses.

In the modified construction shown in Fig. 7, the machine is operated by pushing the handle downwardly. The slotted arm I is accordingly arranged on the opposite side, as shown at I', and the vibrating arm J is also on the opposite side, as shown at J'. This results in driving the armature in the same direction as before. By constructing the armature and commutator to revolve in the opposite direction, the construction shown in Fig. 1 need not be altered except by reversing the teeth of the ratchet and the direction of the pawl. The construction shown in Fig. 7, however, is deemed preferable. The sector *g* (here lettered *g'*) and spring contact arms *h* (here lettered *h'*) are also transposed, being placed at the left instead of at the right. The operation is the same as before described, except that the operator first pulls up the handle H' thereby sliding up the operating bar G' to the top of its stroke and causing the ratchet-wheel to click idly past the pawl; the operator then forcibly thrusts down the handle at a continually increasing speed until the bottom of the stroke is reached.

Instead of communicating the motion through the operating bar to the vibrating arm J or J' through the medium of a slotted arm or cross-head engaging a pin or roller on the vibrating arm, the motion may be communicated in some other way if preferred. One such way is shown in Fig. 8, where the vibrating arm here lettered J^2 is connected

by a link *m* to a pivotal piece I² fixed on the operating bar G². The operating bar might, however, be otherwise connected or geared to the arm J′, or directly to the oscillating member of the ratchet and pawl connection. Obviously the power may be communicated either through a ratchet wheel to the pawl and thence to the multiplying gear, or it may be communicated through the pawl to the ratchet wheel and thence to the multiplying train.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. In a magneto electric machine, the combination with the rotary armature of an operating mechanism consisting of a vertically sliding operating bar, a vibrating crank arm connected thereto, a circuit-breaker connected to said arm, and a ratchet and pawl and multiplying gear mounted concentrically with said arm to be driven therefrom, said gear forming the first of a train interposed between the ratchet-and-pawl and the rotary armature for communicating the forward oscillations of said arm to the armature during the operative stroke of the bar.

2. In a magneto electric machine, the combination with the rotary armature of an operating mechanism consisting of a vertically sliding operating bar, a slotted cross-arm carried thereby, a vibrating crank arm having a pin engaged by the slot in said cross-arm so as to be vibrated by the longitudinal movement of the bar, a ratchet and pawl and multiplying gearing between said arm and the rotary armature, and a circuit-breaker the oscillating member of which is carried by said arm, and arranged to break contact with the stationary member toward the end of the working stroke of the operating bar.

3. In a magneto machine, the combination with the rotary armature of an operating handle movable back and forth over a predetermined stroke, a ratchet and pawl and multiplying gearing interposed between said handle and the armature, and a circuit-breaker consisting of an oscillating sector connected to said operating handle, and a spring contact arm, the nose of which normally contacts with the periphery of the sector, arranged to break circuit toward the end of the working stroke of the operating handle by the movement of the sector out of contact with said spring arm, whereby during such movement the arm follows the end of the sector before breaking contact therewith, and thereby causes the resulting spark to pass between the sector and a point on the spring arm beyond the normal contacting nose thereof, so that the oxidation of said nose and the consequent insulation of the members of the circuit-breaker from each other is avoided.

4. The combination with the rotary armature of an operating mechanism consisting of a vertically-sliding operating bar G, a slotted cross-arm I carried thereby, a vibrating crank-arm J having a pin engaged by the slot in said arm, a ratchet-wheel K pivoted concentrically with said arm, a pawl *k*, a gear-wheel L concentric with said arm and driven by said arm through said ratchet-and-pawl, and multiplying gears for communicating accelerated rotation therefrom to said armature.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEPH N. McLEOD.

Witnesses:
ARTHUR C. FRASER,
GEORGE H. FRASER.