(No Model.) 4 Sheets—Sheet 1.

J. HUNT.

MAGNETO ELECTRIC MACHINE.

No. 468,451. Patented Feb. 9, 1892.

FIG. 1.

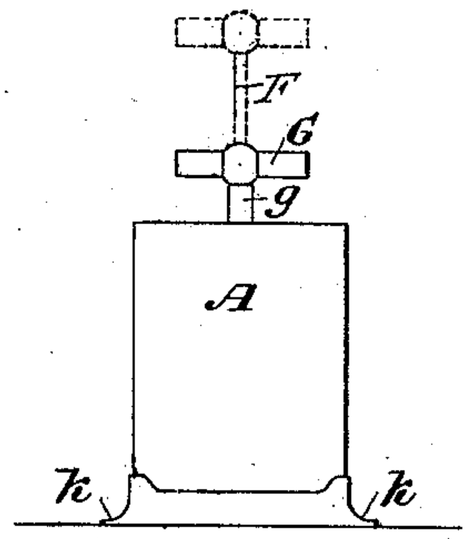


FIG. 2.

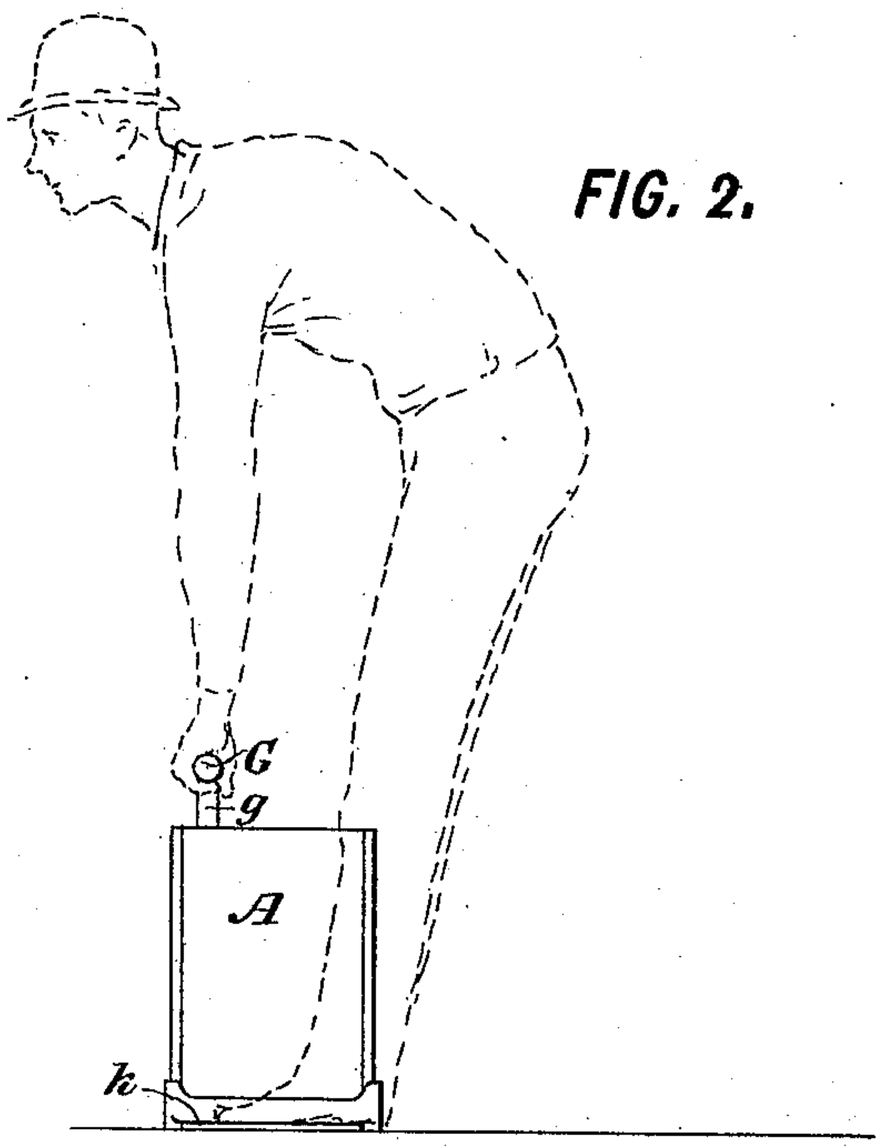


FIG. 8.

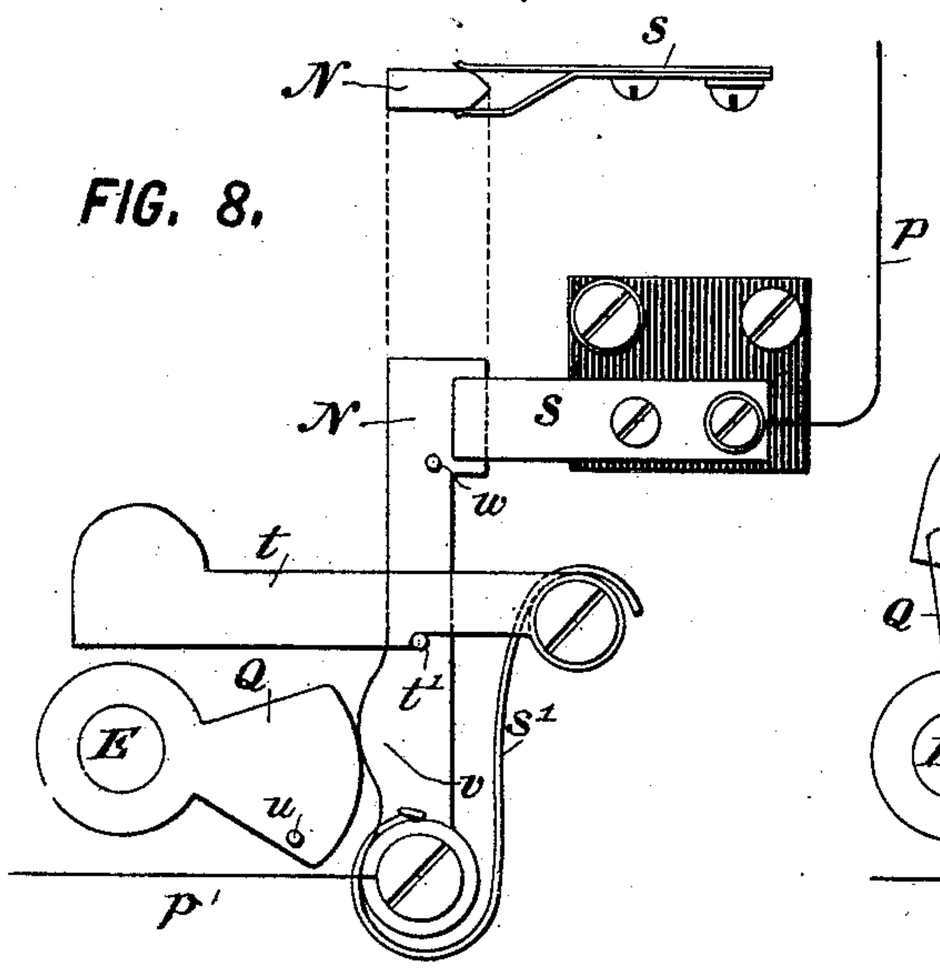
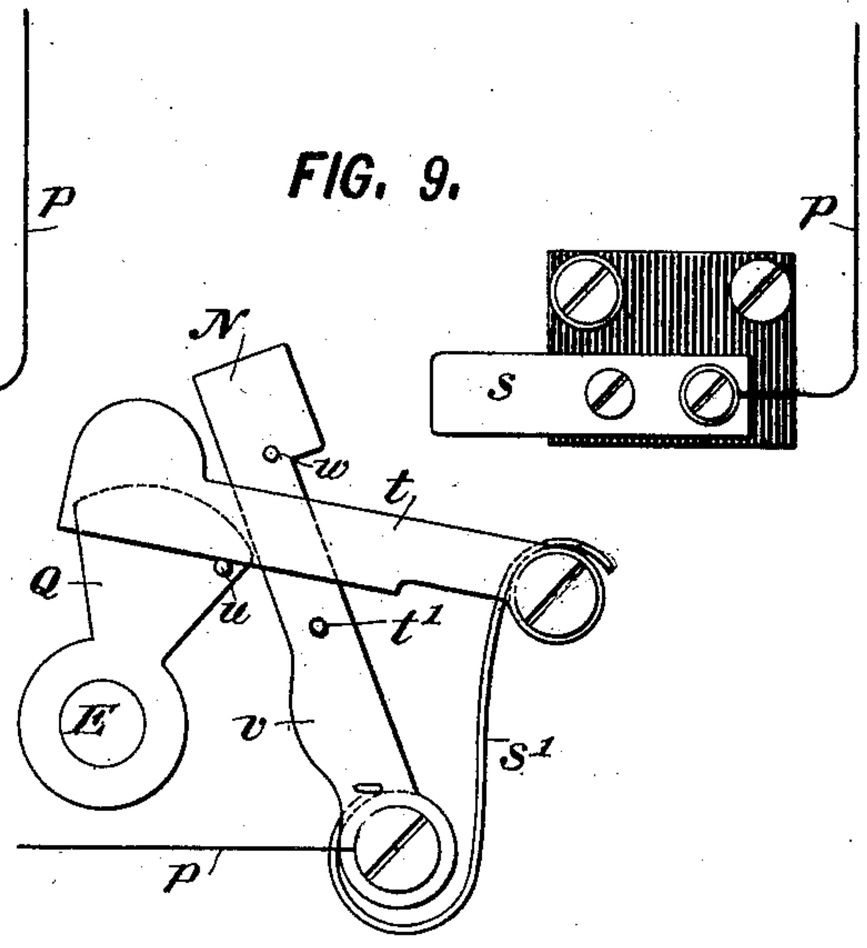


FIG. 9.



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(No Model.) 4 Sheets—Sheet 2.

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FIG. 3.

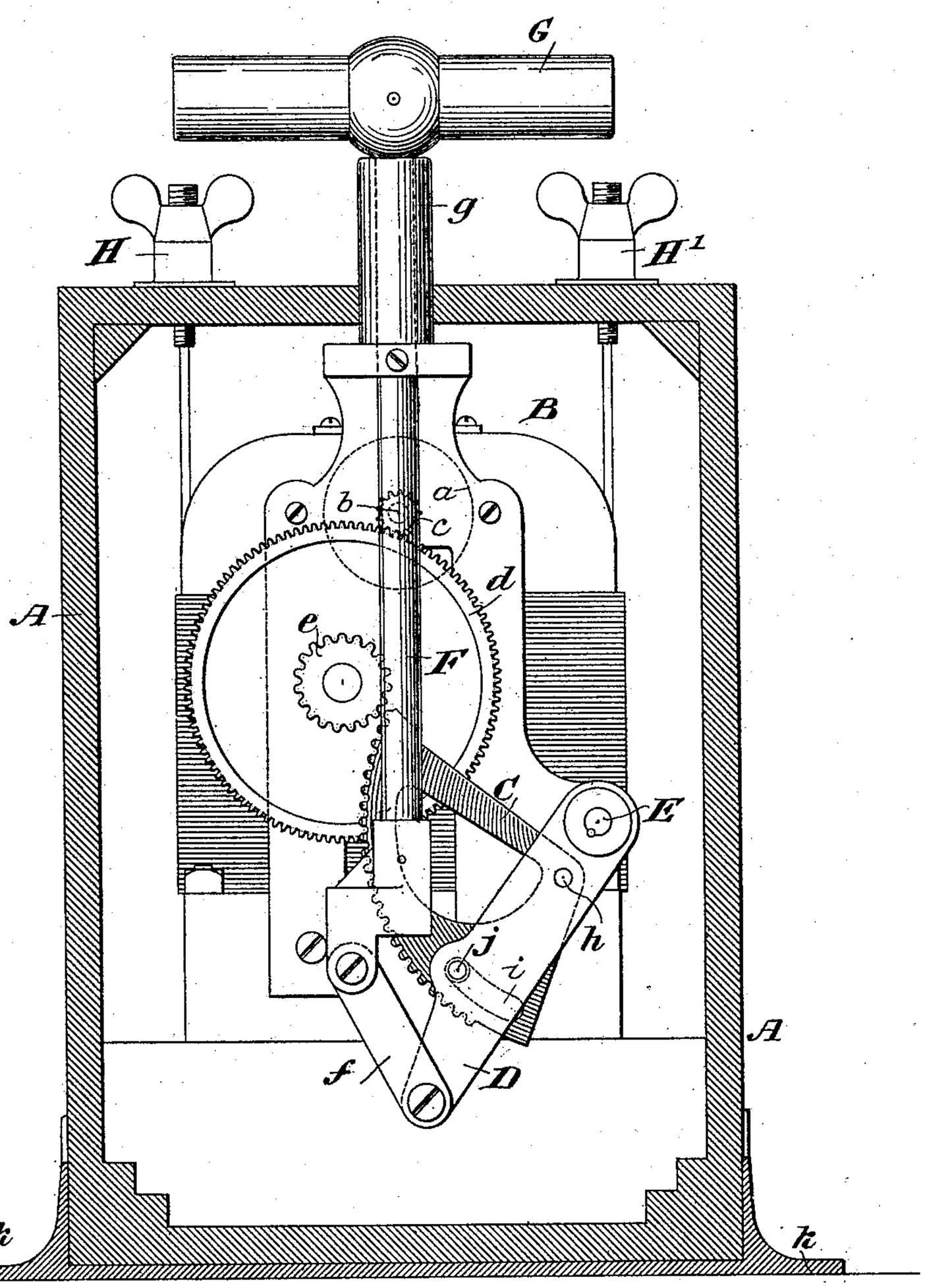

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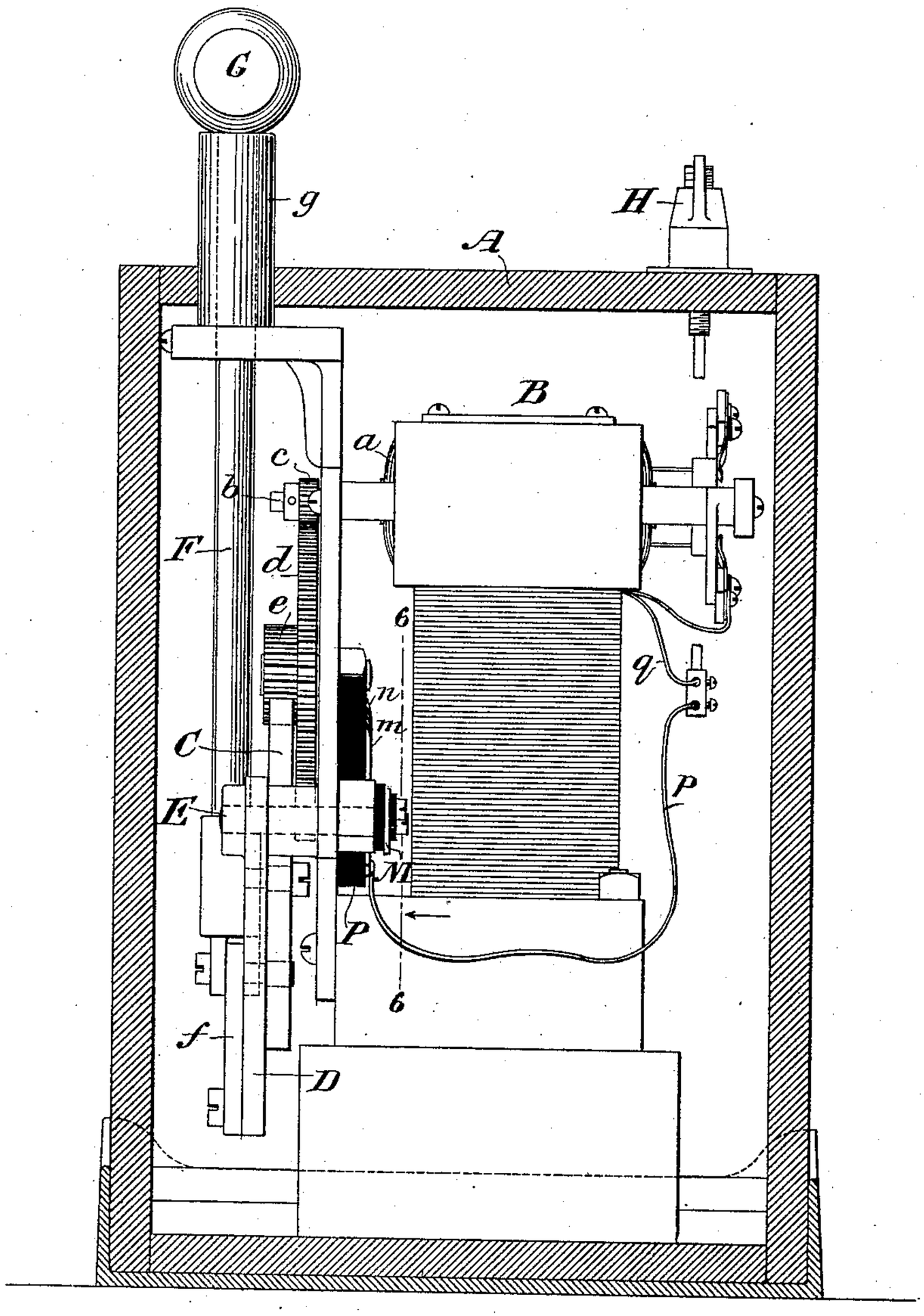
FIG. 4.



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(No Model.) 4 Sheets—Sheet 4.

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MAGNETO ELECTRIC MACHINE.

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FIG. 7.

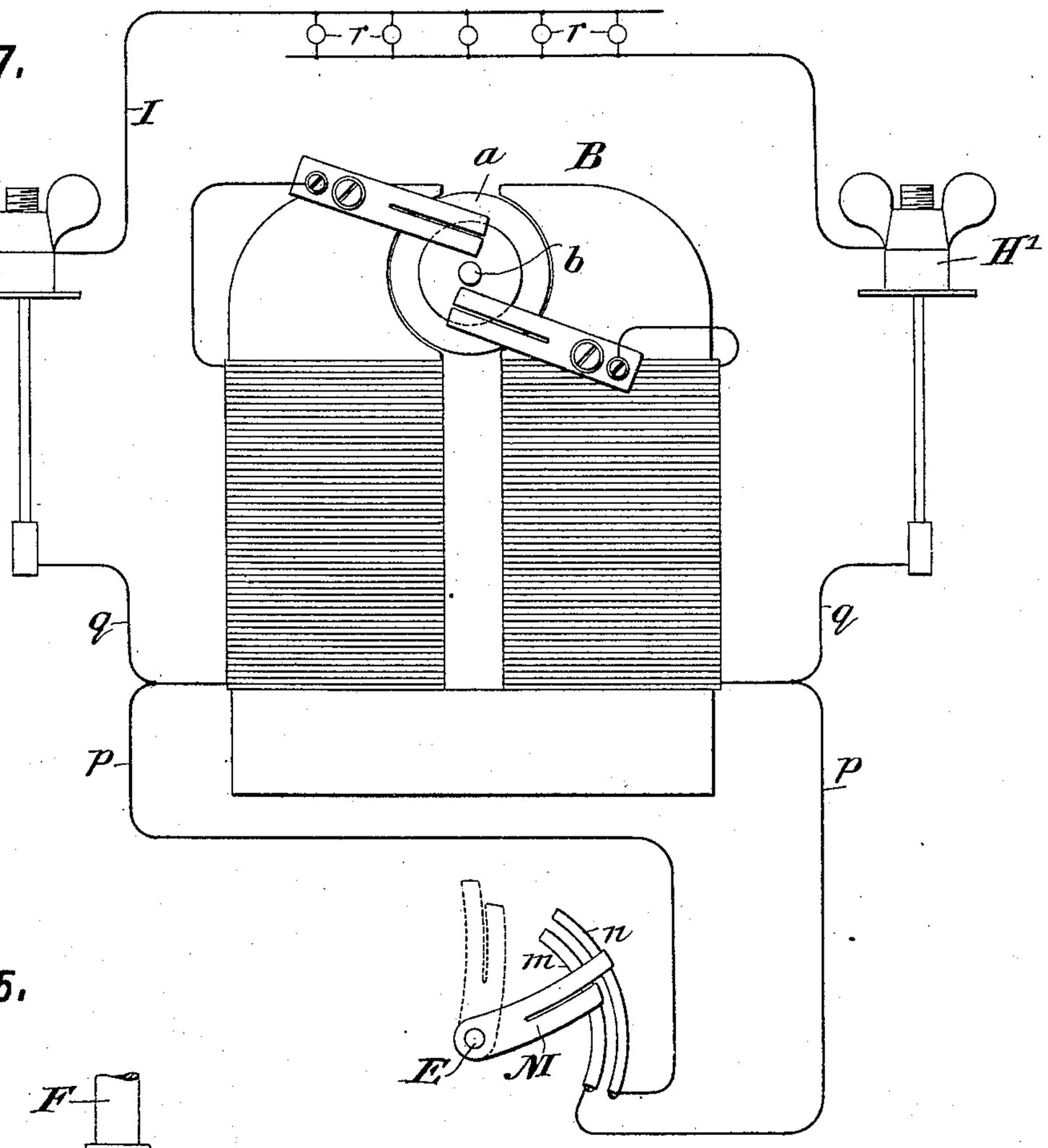


FIG. 5.

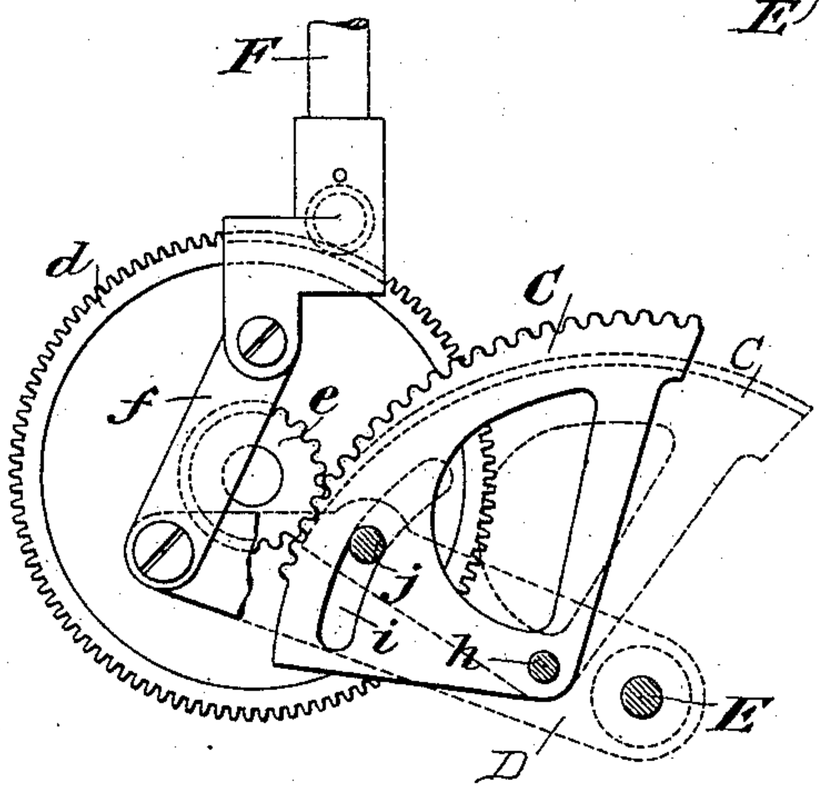
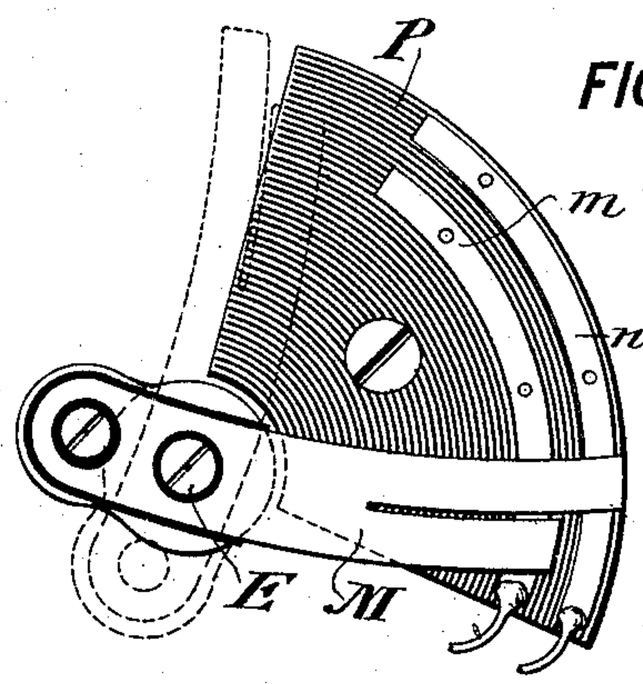


FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHN HUNT, OF NEW YORK, ASSIGNOR TO JAMES MACBETH, OF BROOKLYN, NEW YORK.

MAGNETO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 468,451, dated February 9, 1892.

Application filed April 24, 1891. Serial No. 390,315. (No model.)

To all whom it may concern:

Be it known that I, JOHN HUNT, of New York city, in the county and State of New York, have invented certain new and useful Improvements in Magneto-Electric Machines, of which the following is a specification.

This invention relates to magneto-electric machines employed for generating a single impulse of electric energy and sending it over a line or circuit. Such machines are most commonly used for blasting purposes for igniting electric fuses or primers. For this and other analogous purposes a powerful instantaneous current is required to be produced by the operation of a portable machine manipulated by hand. Machines of this character have been operated by a rotary crank, by a pull-over lever, and by a push-bar to be thrust or slid downward. My improved machine is constructed to be operated by pulling upwardly on a handle. In order to steady the machine, it is provided with projecting flanges or foot-rests on which the operator may place his feet, so that by his weight he holds the machine down firmly in place, while he is enabled to exert his strength to the best advantage in pulling upwardly on the handle. By this upward pull the armature of the magneto-machine is revolved through suitable intervening mechanism, thereby highly energizing the field-magnet and sending out a suitable current over the line.

Figure 1 of the accompanying drawings is a front elevation, and Fig. 2 is a side view, of my improved machine, illustrating its mode of operation. Fig. 3 is a front view of the machine with the inclosing case in section. Fig. 4 is a vertical transverse section of the inclosing case, showing the machine in side view. Fig. 5 is a fragmentary front view showing the mechanism in operation. Fig. 6 is a fragmentary section on the line 6 6 in Fig. 4 and looking toward the front. Fig. 7 is a diagram illustrating the electrical connections. Fig. 8 is a rear elevation answering to Fig. 6, but showing a modified construction of a circuit-breaker; and Fig. 9 is a similar view showing the parts in a different position.

Within an inclosing box or case A is mounted the magneto-electric machine proper B and the mechanism for driving it. This magneto-machine is constructed in any usual manner with a field-magnet wound with suitable exciting-coils and having an armature *a*, revolving in the polar gap of the field. On the shaft *b* of this armature is fixed a pinion *c*, with which meshes a driving-gear *d*, fixed to a pinion *e*. This latter pinion is engaged by a sector C, carried by a vibrating arm D, fixed on a rock-shaft E. The outer end of this arm is connected by a link *f* with a vertically-sliding pull-up bar F, which passes out through the top of the box and carries a handle G, being guided in its vertical motion by a tubular bearing *g*. By pulling up on the handle G the arm D is swung from its lowest position shown in Fig. 3 to or beyond the position (shown in Fig. 5,) and during its movement the sector C remains in mesh with the pinion *e* and through the train *d c* drives the armature at a multiplied velocity. At the extreme upstroke of the handle the sector C passes out of mesh with the pinion *e*, permitting the armature to freely revolve, and during the lowering or dropping back of the handle to its normal position the sector remains out of mesh with the pinion. To accomplish this result the sector, the pitch of the teeth of which when in the normal or engaging position is in the arc of a circle concentric to the axis of the shaft E, is itself pivoted to the arm D eccentrically on a pivotal stud *h*, so that by turning on this stud its gear-teeth are brought out of mesh with the teeth of the pinion. The shaft E is arranged sufficiently below the axis of the pinion *e*, so that when the operating-handle reaches the top of its movement the center of gravity of the sector passes to the right of its pivotal axis *h*, so that it falls outwardly to the position shown in dotted lines in Fig. 5. The extent of its movement relatively to the arm D is limited by suitably-acting reciprocal stops having the proper amount of lost motion between them. These are most readily constructed as a slot *i* in the sector engaged by a pin *j* on the arm D.

In operation the handle will normally be held at the top of its stroke for a moment while the rotation of the armature under its momentum continues until stopped by the

magnetic drag of the field-poles, after which the handle will be released and dropped back to place, and during this return movement the sector C will fall back to its lower position. If the handle is dropped back quickly, the sector in falling back will remain out of contact with the pinion; but if the handle is lowered slowly the sector will drop against the pinion and its teeth will click over this pinion as it moves down.

The mechanical movement thus described is very simple and effective and takes the place of the ratchet and pawls heretofore used for imparting motion to an armature-shaft in one direction and running free therefrom on the return stroke. The use of this mechanism, however, is not essential, as it may be variously modified.

In order to hold the machine down and prevent its being lifted bodily by a sudden upward pull on the operating-handle, I construct the inclosing box with foot-rests consisting, preferably, of lateral projections or flanges *k k* at the opposite sides, upon which the operator may place his feet, so that he is enabled by his weight to hold the box firmly down in place while he is pulling upwardly on the handle. The reaction of his upward pull is consequently exerted against these foot-rests and consequently against the box, so that it is utilized to resist the pull and prevent the displacement of the machine thereby.

The distinctive feature of my invention is in the application of a pull-up handle as the means for operating the machine in lieu of a rotary crank, an angularly-moving lever, or a push-down bar, and in connection with foot-rests for holding the machine down by the weight of the operator thereon.

The advantages of a pull-up handle are, first, that a person can exert greater strength in an upward pull than in a downward push or a lateral thrust; second, that the firm anchoring of the machine during the operation is greatly facilitated, it being necessary that such machines shall be portable; third, an upward pull has no tendency to overthrow the machine, as is inevitably the case with a lateral thrust and as is liable to be the case with a downward thrust in case the operator is unskillful.

The operation of my machine requires no previous experience, the operator being merely directed to place his feet on the foot-rests and pull upwardly on the handle, commencing slowly and pulling continually faster and harder until the end of the stroke.

In machines of this character it is found practically desirable to short-circuit the machine at first in order that the current generated may be utilized in exciting the field-magnet to build up its magnetism to the requisite extent for generating in the armature the electro-motive force necessary for overcoming subsequently the resistance of the line. If the entire current were at first sent over the line, the resistance of the latter would reduce the current to very small volume and the magnetization of the field would consequently be very slight and the field would fail to build up sufficiently to generate the requisite electro-motive force in the armature for forcing a strong enough current against the line-resistance to insure the proper exploding of the fuses. It is hence customary in such machines to commence the operation of the machines on a short circuit in order that the entire electro-motive force generated may be utilized in driving a current of comparatively large volume through the coils of the field-magnet and toward the end of the operation to break this short circuit and thereby send the entire electro-motive force over the line. By thus accumulating energy in the field-magnet the current sent over the line is rendered much more energetic than could otherwise be the case. For accomplishing this purpose I provide the circuit-breaker shown in Fig. 6, consisting of two arc-shaped strips of metal *m n*, fastened against an insulating-plate P and traversed by an arm M of spring-metal mounted on, but insulated from, the rock-shaft E, by which this arm, starting from the position shown in full lines in Fig. 6, is caused to move angularly until it reaches the position shown in dotted lines. These arc-shaped strips are connected in the short circuit *p p* in the manner shown in Fig. 7, so that this short circuit is completed through the medium of the arm M. The short circuit continues to be thus maintained during the first part of the stroke, and as long as this arm M is sweeping over the arc-shaped strips, but toward the end of the stroke, the arm passes off these strips, the short circuit is broken, and the current is consequently forced over the connections *q q* to the binding-posts H H′, and hence over the exterior line I, thereby exploding the fuses *r r*. The circuit-breaker thus provided is very simple in construction, is not liable to get out of order, and has the advantage of keeping the conducting-surfaces always bright and free from oxide by reason of the rubbing of the elastic metal arm M over the strips *m n*.

A modified construction of circuit-breaker is shown in Figs. 8 and 9. On the shaft E is fixed, in lieu of the spring-arm M, a cam or sector Q. A contact-arm N enters at its upper end between two springs *s*, the short circuit *p* being completed through the springs *s* and arm N, as shown in Fig. 8. The arm N has a spring *s′* tending to throw it away from the springs *s* to the position shown in Fig. 9; but it is normally held against the contact-springs by a catch *t*, having a shoulder engaging a pin *t′* on a contact-lever. On lifting the operating-handle the cam Q is oscillated from the position shown in Fig. 8 to that shown in Fig. 9, and toward the end of its movement a pin *u*, carried thereby, strikes the under side of the catch and lifts it, thereby freeing the pin *t′* from its shoulder, whereby the contact-arm N is set free and flies out-

ward under the tension of its spring, thus breaking the short circuit, as shown in Fig. 9. During the return or downward movement of the operating-handle the cam Q in oscillating back to its normal position strikes a projection *v* on the arm N and forces this arm back to its normal position, so that the catch lever or pawl *t*, which is lowered by the descent of the pin *u* until it rests on the pin *t'*, is finally dropped into its normal position with its shoulder engaging this pin. The pin *w* is designed solely for the purpose of preventing the catch *t* being thrown too high. This construction affords a quick-action or "snap" switch, so called. The construction of switch first described is preferable on account of its greater simplicity and the ease with which the conducting-surfaces are kept bright.

My invention may be greatly modified in matters of detail without departing from its essential features. Thus the details of the cut-out are not broadly essential; nor is it broadly essential to my invention what construction of intervening mechanism for imparting motion from the operating-bar to the armature-shaft is employed.

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

1. An electric generator comprising a portable box constructed with opposite foot-rests upon which the operator may stand, a magneto-electric machine inclosed in said box, a pull-up operating-handle above the latter, a vertically-movable connection passing from said handle through the top of the box, and mechanism connected thereto for imparting rotation to the armature of the magneto-electric machine upon pulling said connection upwardly, whereby the weight of the operator standing on said foot-rests and the reaction of his upward pull are utilized for holding the box down in place during the operating-stroke.

2. An electric generator comprising a box having foot-rests constructed as lateral projections at its base, on which the operator may stand to hold down the box, a pull-up operating-handle, and a magneto-electric machine with its armature connected to said handle to be revolved by the upward movement thereof.

3. An electric generator comprising a box, a vertically-sliding pull-up bar movable through the top of said box, a magneto-electric machine in said box, a pinion in connection with the armature-shaft of said machine, a sector meshing therewith and connected to said bar, whereby during the upward movement of said bar it drives said armature, and means for disconnecting said sector from the armature during the downward movement of the bar.

4. An electric generator comprising a box, a vertically-sliding pull-up bar movable through the top of said box, a magneto-electric machine in said box, a pinion in connection with the armature-shaft of said machine, a sector meshing therewith, an arm connected to said pull-up bar and to which said sector is eccentrically pivoted, and stops on the arm and sector adapted to hold the sector in mesh and concentric with the axis of said arm during the upward thrust from said bar and to permit displacement of the sector eccentrically to bring it out of mesh with said pinion during the downward movement of said bar.

5. The combination, with the armature of a magneto-electric machine, of a pinion *e* for driving it, a toothed sector C, a vibrating arm D, pivoted concentrically to the teeth of said sector and to which the sector is eccentrically pivoted, reciprocal stops applied to the sector and arm, and a vertically-sliding pull-up bar connected to said arm, whereby on pulling up said bar motion is transmitted through said arm to said sector to drive said pinion and during the downward stroke said sector by rocking on its eccentric pivot may move out of mesh with said pinion.

6. A magneto-machine comprising a reciprocating operating-bar for driving the armature, a short circuit for said machine, and a circuit-breaker for said short circuit, comprising a conducting-strip and a conducting-arm sweeping over and beyond said strip to break the circuit on passing beyond it and said arm connected to and moved by said operating-bar.

7. A magneto-machine comprising an operating-bar, a sector connected thereto, the armature of the magneto-electric machine driven from a pinion engaged by said sector, a short circuit for said magneto-machine, and a circuit-breaker in said short circuit, consisting of a conducting-strip and a conducting-arm sweeping over it connected to the sector and arranged to move beyond the strip and thereby break the circuit before the termination of the stroke of the sector.

8. A magneto-machine comprising an operating-bar, a sector connected thereto, the armature of the magneto-electric machine driven from a pinion engaged by said sector, a short circuit for said magneto-machine, and a circuit-breaker in said short circuit, consisting of two conducting-strips connected to the respective terminals of said short circuit and a conducting-arm sweeping over said strips to form a circuit-completing bridge between them, connected mechanically to the sector and arranged to move beyond the strips and thereby break the circuit before the termination of the stroke of the sector.

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

JOHN HUNT.

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