

(No Model.)

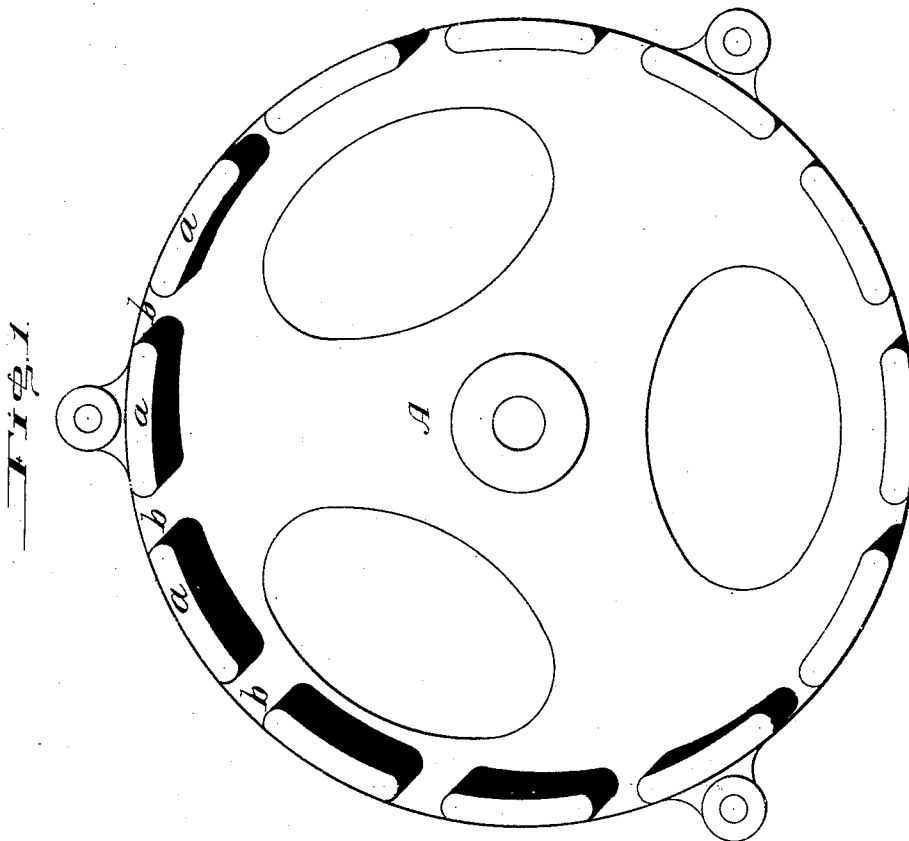
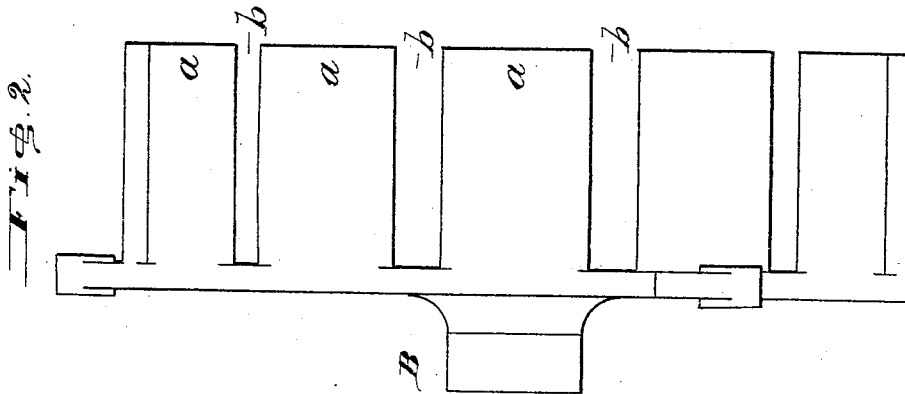
8 Sheets—Sheet 1.

H. M. PAINE.

MAGNETO ELECTRIC MACHINE.

No. 290,350.

Patented Dec. 18, 1883.



Attest:

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W. C. Reading

Inventor.

H. M. Paine

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Fig. 4.

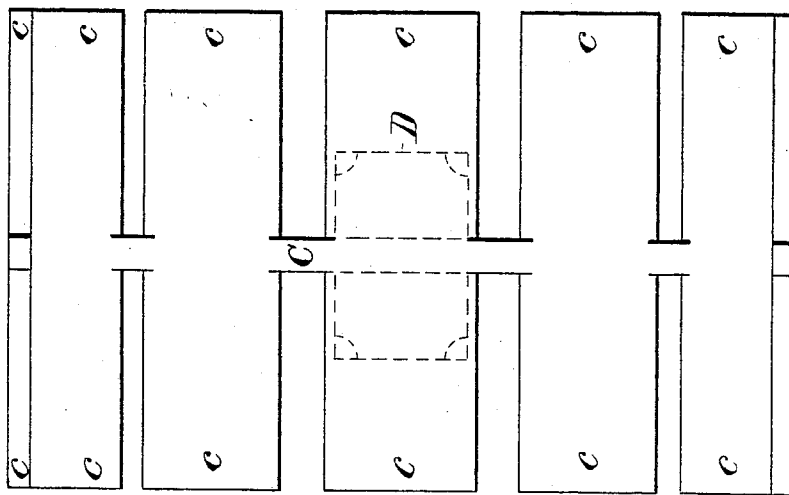
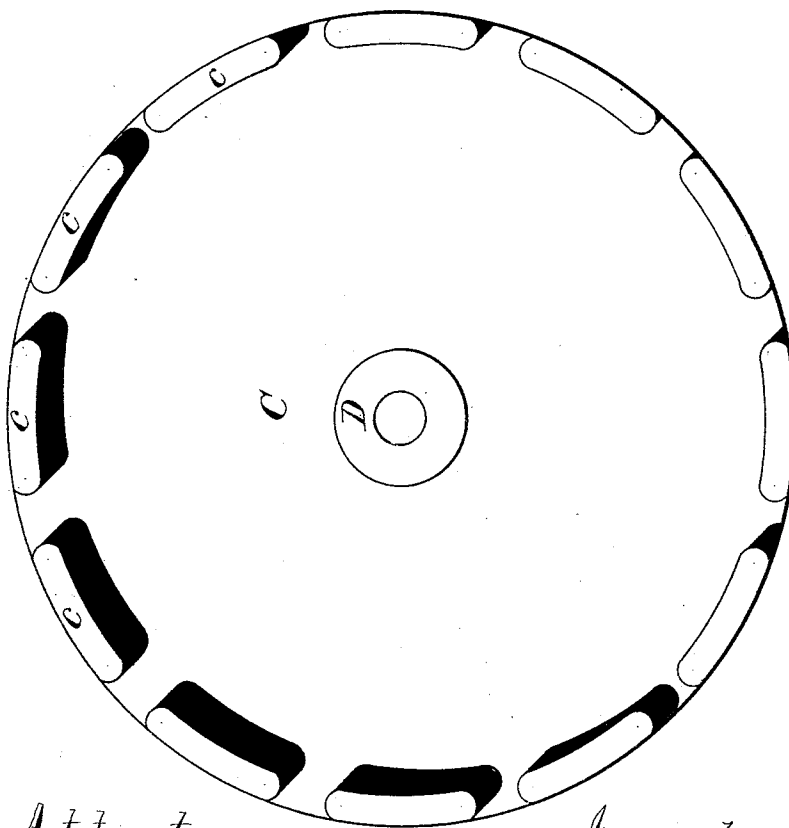


Fig. 3.



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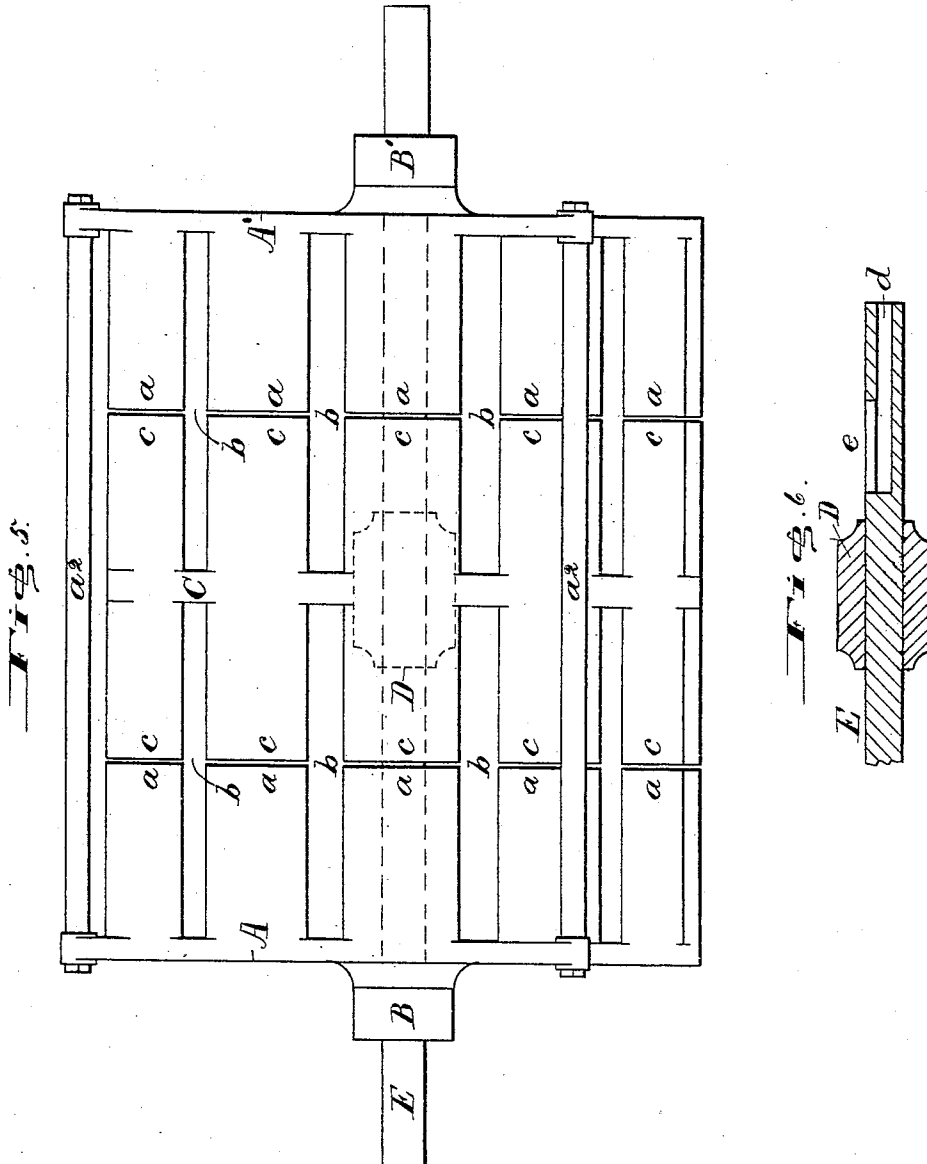
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Fig. 9.

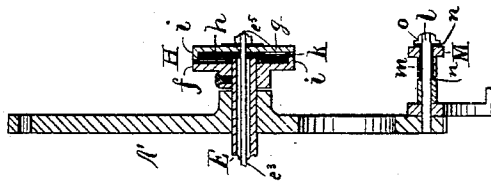


Fig. 8.

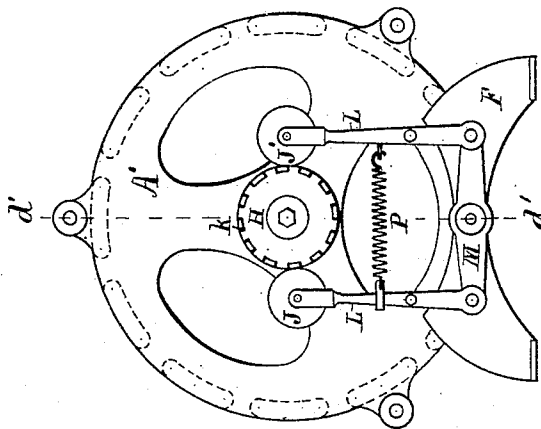
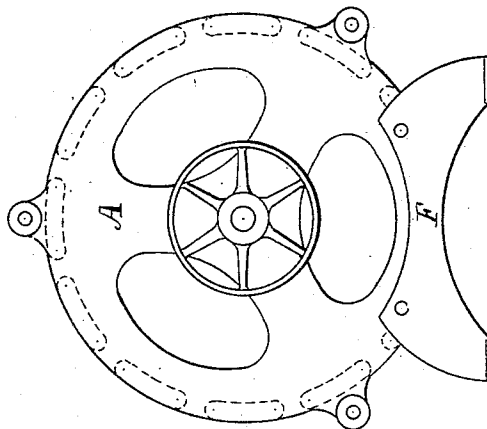


Fig. 7.



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Fig. 11.

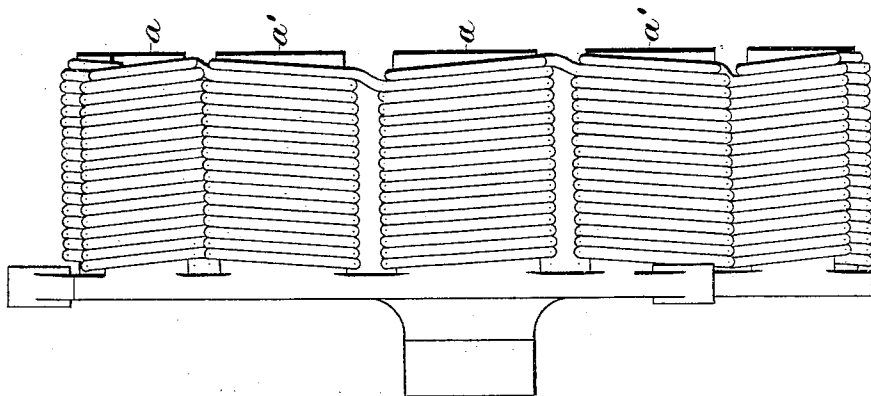
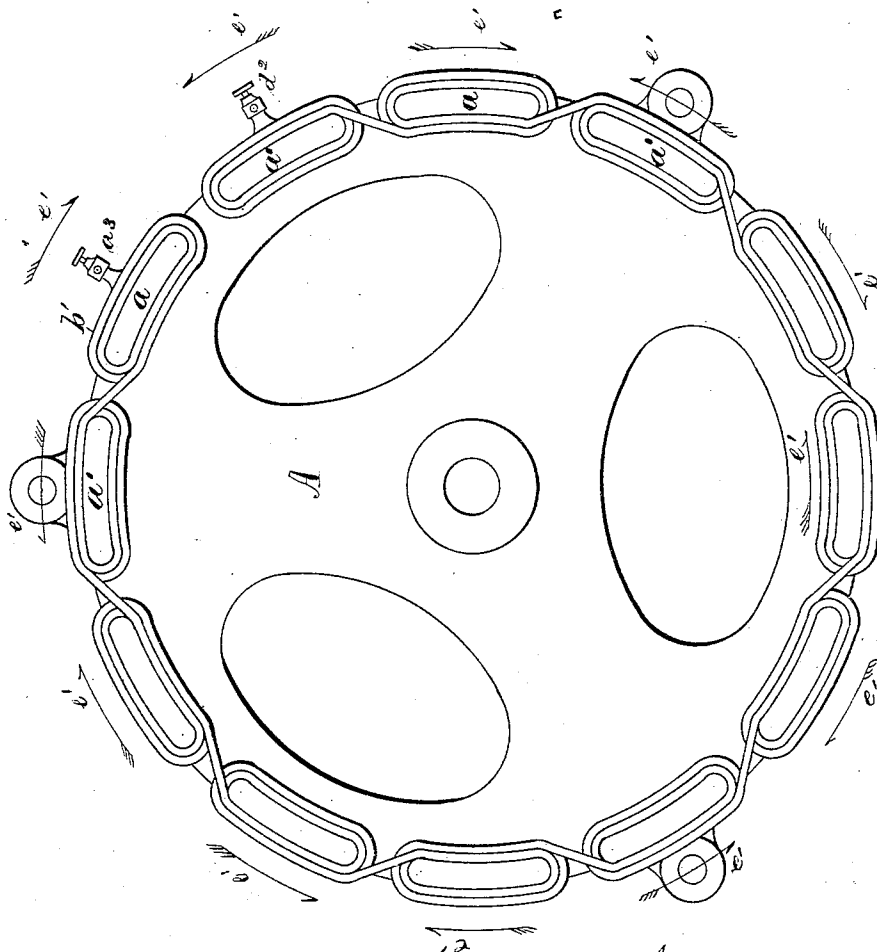


Fig. 10.



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Fig. 13.

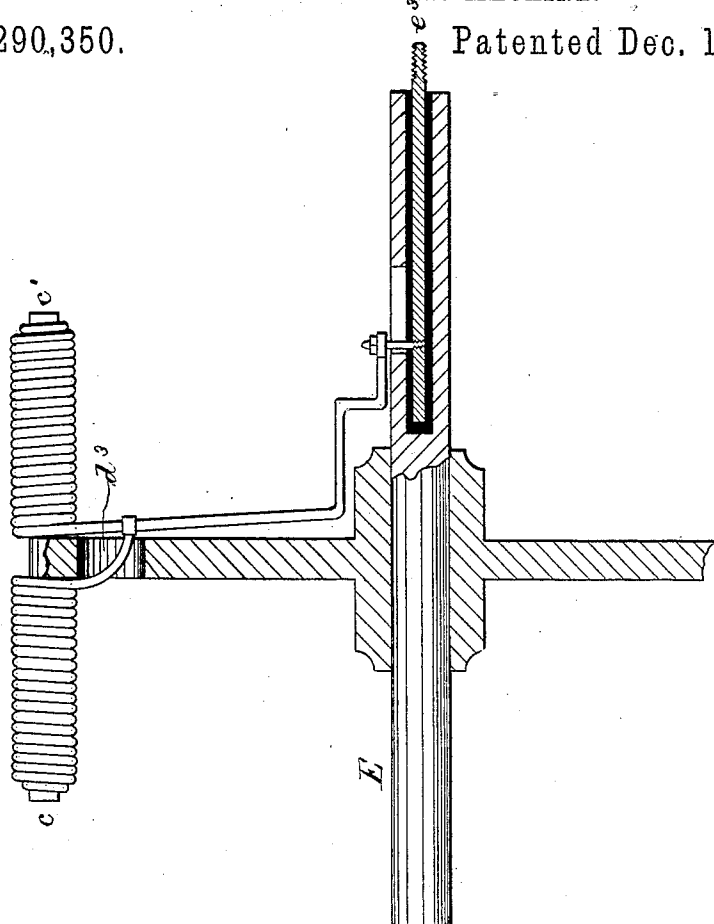
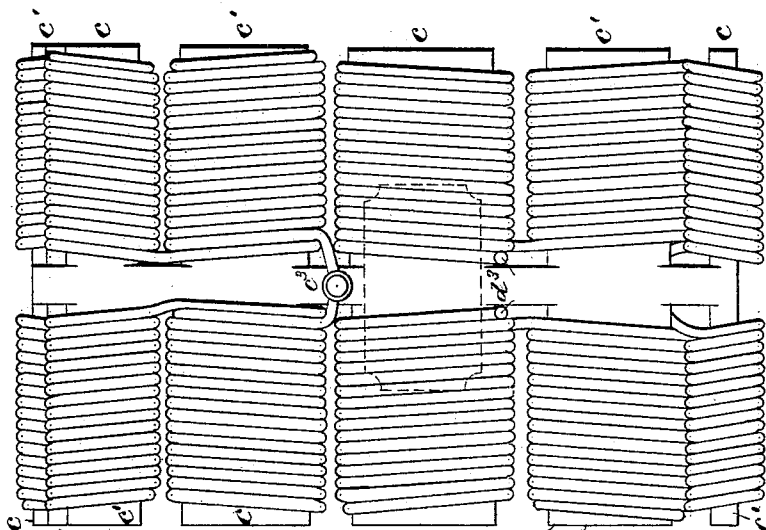


Fig. 12.



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Fig. 14.

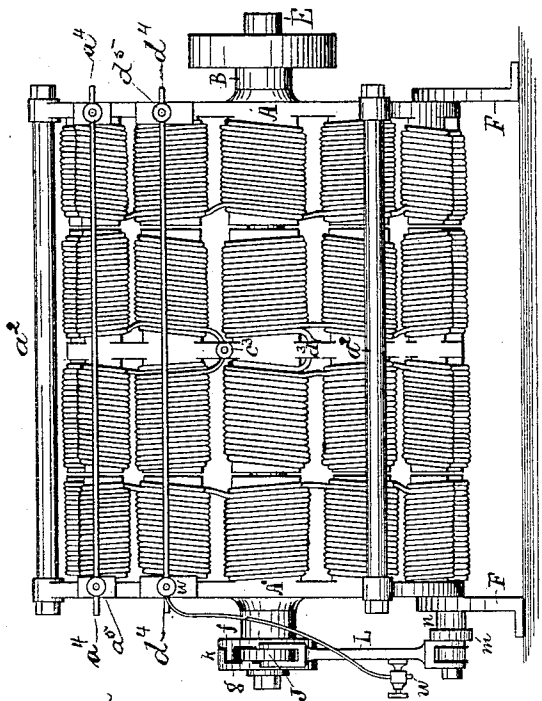
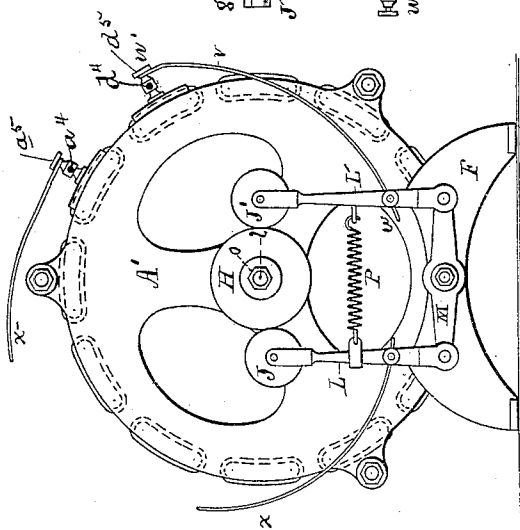


Fig. 15.



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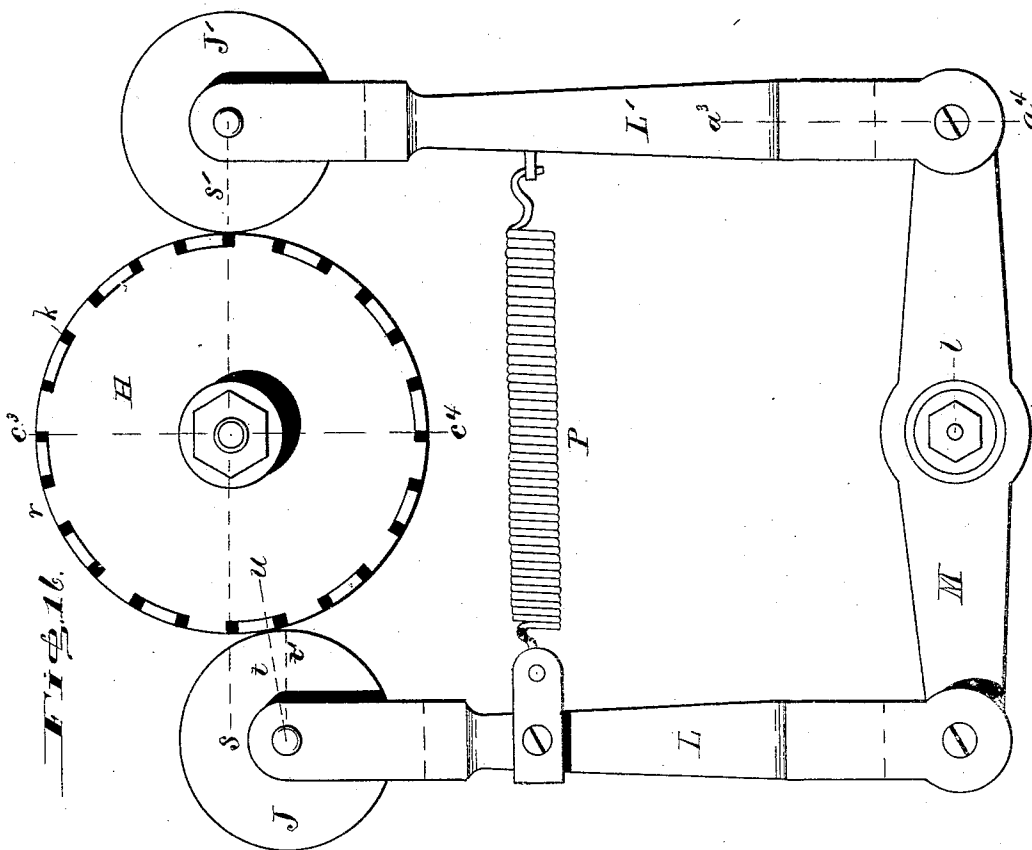
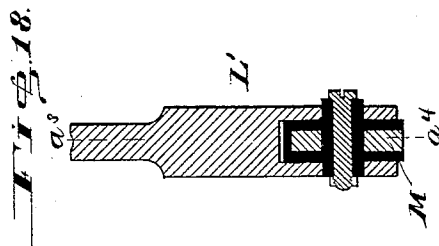
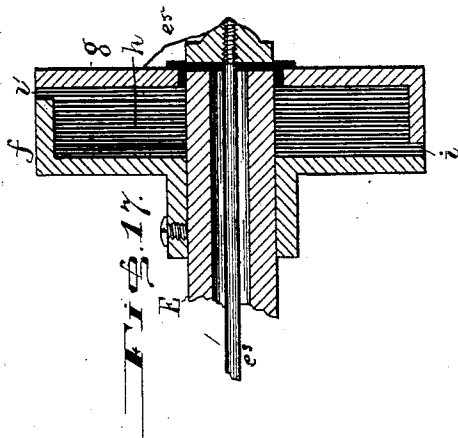
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UNITED STATES PATENT OFFICE.

HENRY M. PAINE, OF NEWARK, NEW JERSEY, ASSIGNOR TO HENRY W. MOREHOUSE AND BENNET OSBORN, BOTH OF SAME PLACE.

MAGNETO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 290,350, dated December 18, 1883.

Application filed March 20, 1883. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. PAINE, a citizen of the United States, residing at Newark, in the county of Essex, State of New Jersey, have invented a new and useful Magneto-Electric Machine; and I do hereby declare that the following is a full, clear, and exact description, which will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is the construction of a magneto-electric machine possessing the dual property of accumulating electrical energy and discharging the same under conditions of impact. The usual and common action of magneto-electric machines produce a continuous disturbance or flow of electric energy during the passage of the armature through the magnetic field, and consequently, when working under a closed circuit, a constant force equal to the duty to be performed is required to maintain its motion. I have found, however, during my experiments that a series of impacts in a given time develop greater results than a continuous action for the same period under like conditions of applied force. When the armatures or helices of a magneto-electric apparatus approach or recede from the center of the magnetic field, an electric current is induced in the wire surrounding them, and in the ordinary dynamo apparatus this induced current is constantly conveyed by the commutator to its point of duty. In my apparatus the circuit is open, and no current passes through the coils of the armature, as they traverse the magnetic field, until the axis of the armature and the neutral center of the magnetic field are coincident, when the circuit, being established, the stored magnetism is released, and a powerful current is generated, and as the armature is in motion under the conditions of an open circuit till the incidence of neutral center and axis occurs, it follows that the force required to rotate the armature is only one sufficient to overcome the inertia of the armature and its accompanying details, together with the friction of its bearings—a condition of things the reverse of all magneto-electric action heretofore known.

In order to illustrate the structure of my invention, I will proceed to describe an apparatus which comprises, generally, the result of my experiments made during the last thirty years.

In the accompanying drawings, which form a part of this specification, Figures 1 and 2 are front and side elevations, respectively, of a plate, A, of fine gray iron, having cast on one side of its periphery projections *a*, in sections, which projections form the cores of the field-magnets, with intervening spaces, *b*, and on its center a hub, B. There are two plates of this kind, which form the end plates of the machine, (marked A and A'.)

Figs. 3 and 4 illustrate a plate, C, of fine gray iron, having cast on both sides of its periphery projections *c*, equal in all their dimensions and spacings with the projections on plate A, and the center of this plate is supplemented with a hub, D. The projections *c* form the armature-cores.

Figs. 5 and 6 show the two plates A A' in position with the plate C adjusted between them, and a shaft, E, traverses the centerings of the several plates, the center plate, C, being secured to the shaft E by a spline or setscrew, and the hubs B and B' act as bearings for the shaft E. The plates A A' are held in position by tie-rods *a'*. The faces of the projections *a* on plates A A' must be true with the axis of the shaft, and the faces of the central-plate projections, together with their inner and outer circumference, and also the body of the plate itself, must be turned true with the axis of the shaft in order that the central plate may rotate freely between the end plates with just spacings enough between their several projections to prevent contact, and without shake or end motion. One end of shaft E should be bored out, as shown at *d*, Fig. 6, nearly into the hub, the diameter of bore to be about one-third that of the bearing of the shaft, and a mortise, *e*, equal to the bore's diameter, and about one inch long, made to connect with the bore.

Figs. 7 and 8 are views of both ends of the frame of the machine, and Fig. 9 a vertical section through the line *d'*. The machine rests on the cradle-legs F, bolted to the end

plates. The current-wheel H is shown in elevation in Fig. 8 and in section in Fig. 9. It should be cast of fine copper, and the hub-plate *f* secured to the shaft E by a set-screw. It will be described in detail further on in connection with Figs. 16 and 17.

The following figures show the frame-work, as above described, wound and adjusted to form a magneto-electric machine:

Fig. 10 represents the plate A, having the wire *c* wound or disposed on its various cores *a*, in the manner indicated by the arrows *c'*, so that the current in moving from *a*³ around the cores to *a*² must acquire an accumulated intensity proportional to the number of cores traversed, the action, in fact, bearing a strong analogy to that of the combined elements of the galvanic order, the quantity being determined by the area and length of wire on one core and the intensity by the number of cores in circuit. The cores should be always of even number, in order that they may be grouped in polar couplets, as shown by *a a'*. The drawing shows six of these groups composed of twelve cores, and we have the quantity of one couplet and the intensity of six.

Fig. 11 is a side elevation of Fig. 10, showing the cores clothed with the insulated wire, and illustrating their connections in circuit.

Fig. 12 is a side elevation of the armature-plate with its poles wire-clothed and grouped in similar couplets with those of the field-magnets on plate A, one end of each series being secured to the plate at *c*³, and their other terminals passing down to the shaft E, as shown in section in Fig. 13, the two series making a common circuit at *d*³ and terminating in the insulated rod *e*³, which extends through the shaft and is electrically connected with the commutator by a wire, *e*⁵.

In Fig. 14 the armature is shown in position between the two field-magnet plates A and A', and these field-magnets are brought into one circuit by the rods *a*⁴ and *d*⁴, which are fitted into suitable binding-posts, *a*⁵ *d*⁵, and serve to electrically connect the coils of the respective magnet-poles.

Fig. 15 is an end elevation, supplementing Fig. 14.

Fig. 16 is a front elevation of the commutator, the same as shown in Fig. 8, which consists of a beam, M, working on a stud, *l*, that is screwed into the plate A', and the hub *m* of said beam is mortised so as to receive an insulating-sleeve, *n*. The outer end of the stud *l* is provided with a binding nut, which rests against the insulating-sleeve and does not come in contact with the beam M. Two arms, L L', are jointed to the beam and carry two disks, J J', of copper, which are kept in close contact with a current-wheel, H, by means of a spiral spring, P. The spiral spring is insulated at its connection with arm L. The arm L' is insulated from the beam M, as shown in section by Fig. 18, (the section being on line *a*³ *a*⁴.) The current-wheel H is shown in sec-

tion by Fig. 17, and also by Fig. 9, the back plate, *f*, being secured to the shaft E by a set-screw, and the front plate, *g*, is held in position by the insulating-disk *h*. The current-spacings *r* should coincide with the grouping of the field-magnets, and the insulated spacings *k* should never exceed one-sixth in measurement the current-spacing. The axis of the disk J' is in line with that of the current-wheel; but the arm L is shortened, so that the axis of the disk J, when the beam is horizontal, is below the axial line of the current-wheel, as shown by the dotted lines *s s'* and *t t'*. When the disk J' is in contact with the insulating-space *k*, the disk J should engage the current-space *r* about one-third of its width, as shown at *u*.

In Fig. 15, *v v'* represent pliant connections between the arm L' L and the binding-posts *a*⁴ *d*⁴. *w w'* and *x x'* are the electrical terminals of the several coils around the magnet-cores.

Referring to the description thus given of the details and connections, it will be seen that the currents generated are compelled to traverse the coils around the magnet-cores under condition of mutual acceleration, and the quantity condition will be as the number grouped, and the intensity as the number of groups. If, for instance, we start from *c*³, Fig. 12, and continue through to *d*³, then we will have the quantity of one and intensity of twelve, (the number of cores;) but if we divide the coils into two groups of six each, then we have the quantity of two and intensity of six, and so on, until we reverse it and have the quantity of twelve and intensity of one. This description of the armature-magnets is applicable to the field-magnets, with the exception that I have obtained better results when the field-magnets were grouped for high intensity and those of the armature for a lower grade.

The construction of the current-wheel does not differ in itself materially from the usual current-wheels of magneto-electric machines; but the peculiar arrangements of the rotating disks making connections with it give entirely different results. Were the axes of the two disks and the current-wheel in the same plane, then the electric currents generated by the motion of the armature would flow continuously from their source to their duty, and a continuous resistance be the result; but by arranging one disk below (or above) the axial line, as herein set forth, the circuit is open, because the arrangements of the disks are such that both disks are for a certain period on the same plate, front or back, and while this condition of things exist the magnetic energy is accumulating without sensible resistance to the force applied to rotate the armature; but there are periods when the disks for an instant of time engage separate plates, and then the dynamic energy discharges or passes off to its duty. Now, at the moment of discharge there will be

the same resistance to the applied force by the act of discharge that is met with in any and every other magneto-electric machine; but if the current-wheel is so adjusted on the shaft
 5 with relation to the neutral axis of the cores of field-magnets and armature-magnets that when the neutral axes of the different magnets are coincident the two disks engage the separate plates, then the discharge will occur without any resistance to the applied force, for the reason that all resistant properties of the machine are at that moment in equilibrium.

The beam being adjusted by means of its binding-nut on the stud, the exact position of
 15 the disks with reference to the current-wheel, when the best results are obtained, is ascertained by adjusting the same while the machine is in motion, care being taken that the range be not too great, in which instance deflagration of the current-spacings will occur.

I have, in giving this description of my invention, confined myself to its structure when specially designed to decompose fluid bodies. My experiments have determined the fact that
 25 impulse or impact of the electric energy is an essential element in disintegrating or otherwise resolving fluid bodies, or bodies possessing in themselves the property of diffusing the electric currents. Therefore the apparatus
 30 thus described is not designed for purposes of light when the voltaic arc or incandescent lamp is concerned, but for electrolytic and other purposes, where a pulsating current can be advantageously employed. When the machine is designed for the former purposes, the
 35 axis of both disks $J J'$ should be in line with the axis of the current-wheel H , and the insulating-space K be adjusted so that the disks will simultaneously engage the insulating-space at the moment that the neutral axis of the cores of the field and armature magnets are coincident. The grouping for intensity or
 40 quantity may be the same as when the machine is designed for decomposing purposes.

A critical examination of the commutator-disks, adjusted as just described, will show
 45 that the disks engage at all times the different current-spaces, and that their action results, like the usual commutator, in a constant flow of the electric current.

Having thus described my invention, what I claim as new is—

1. In a magneto-electric machine, the combination of stationary field-magnets, revolving armatures, and a commutator mechanism
 55 which establishes a closed circuit through the armature-coils at or about the instant when the magnetic axes of the armature and field magnets are coincident, and at all other times leaves the circuit open, substantially as and for the
 60 purpose set forth.

2. In a magneto-electric machine, an adjustable commutator-beam having hinged arms of unequal length carrying contact-wheels, in combination with a current-wheel on the armature-shaft, substantially as and for the purpose set forth.

3. In a magneto-electric machine, the combination, with a current-wheel having two plates insulated from each other, of two contact-wheels and devices for supporting the same, the contact-wheels being arranged so that for certain periods during the rotation of the armature they are in contact with the same plate and at other periods with separate plates
 75 or surfaces of the current-wheel, substantially as and for the purpose set forth.

4. In a magneto-electric machine, the rods a' and d' , in combination with the end plates, $A A'$, having projections which form the cores
 80 of the field-magnets, substantially as herein set forth.

HENRY M. PAINE.

In presence of—

W. E. REDDING,
 BENNET OSBORN, Jr.