(No Model.) 3 Sheets—Sheet 1.

W. HOCHHAUSEN.

DYNAMO ELECTRIC MACHINE.

No. 294,043. Patented Feb. 26, 1884.

Fig. 1.

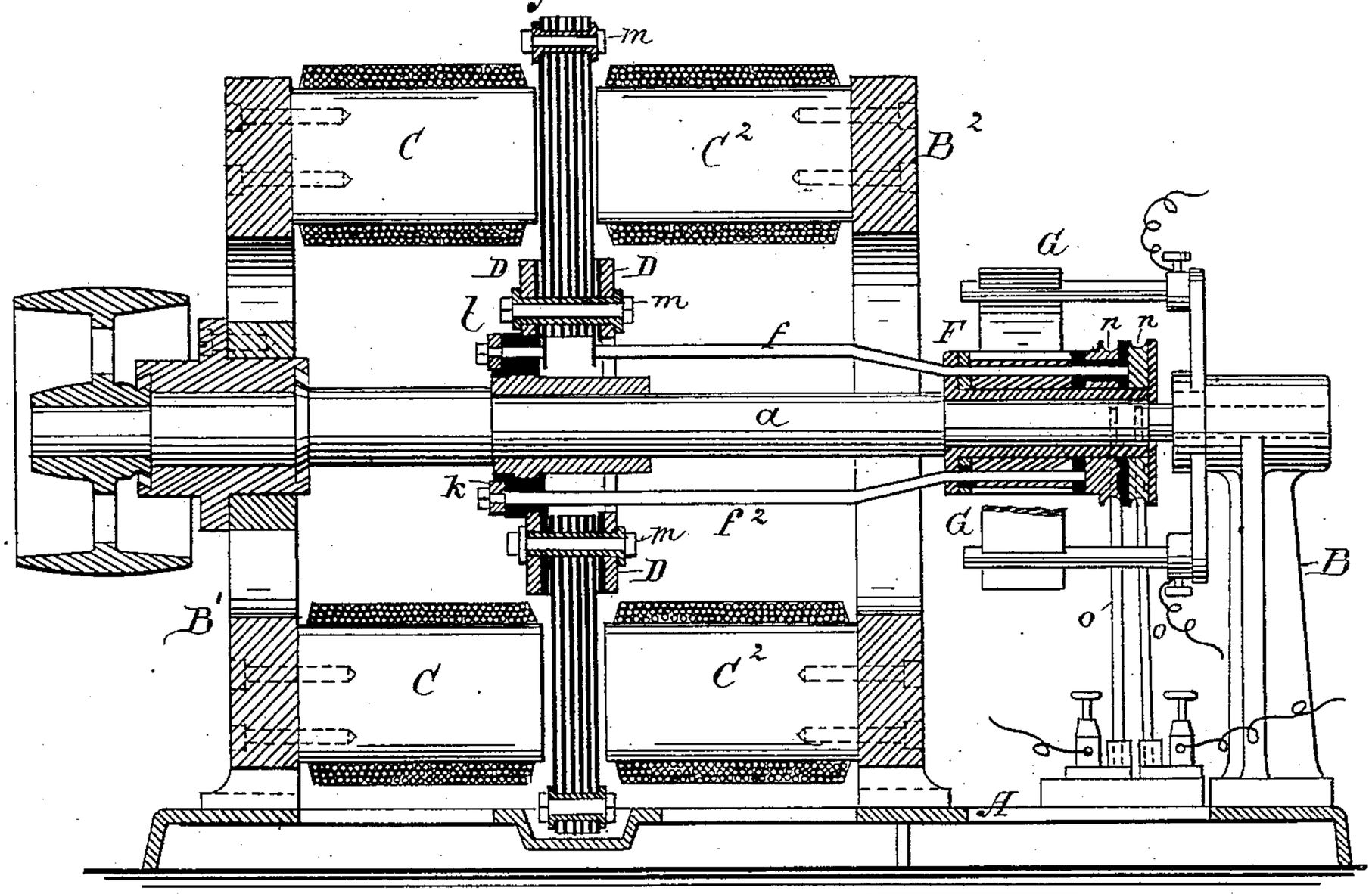


Fig. 4

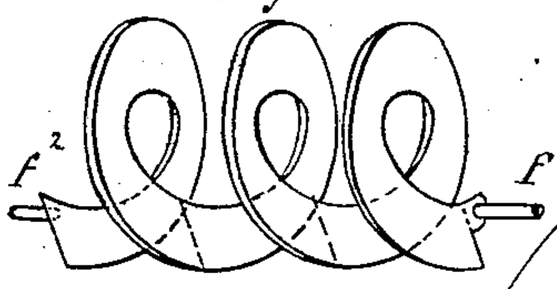


Fig. 2.

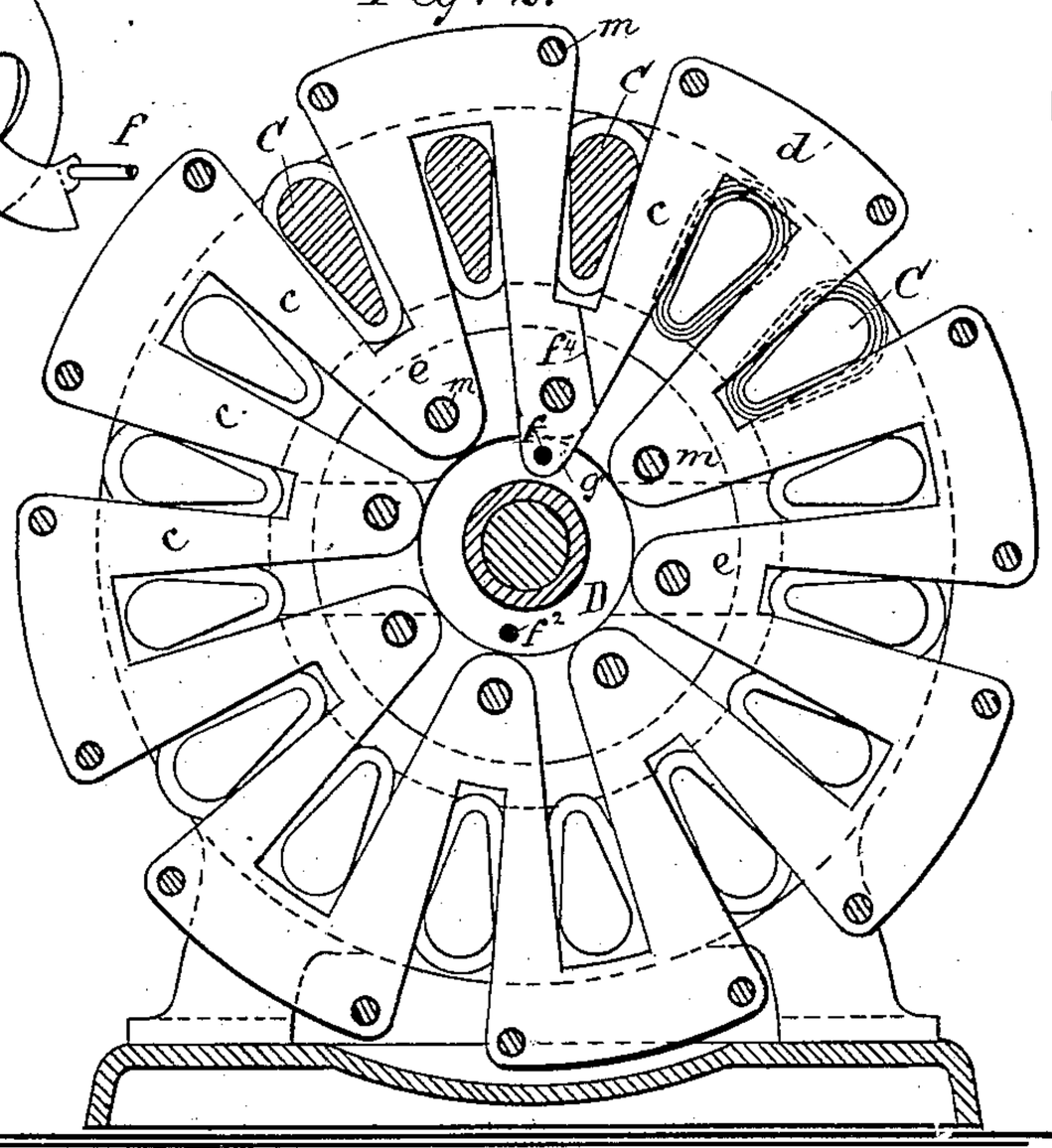
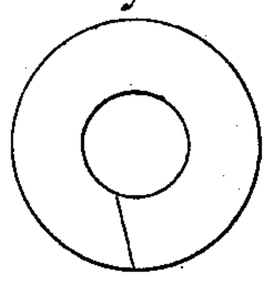


Fig. 3.



Witnesses.

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(No Model.) 3 Sheets—Sheet 2.

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DYNAMO ELECTRIC MACHINE.

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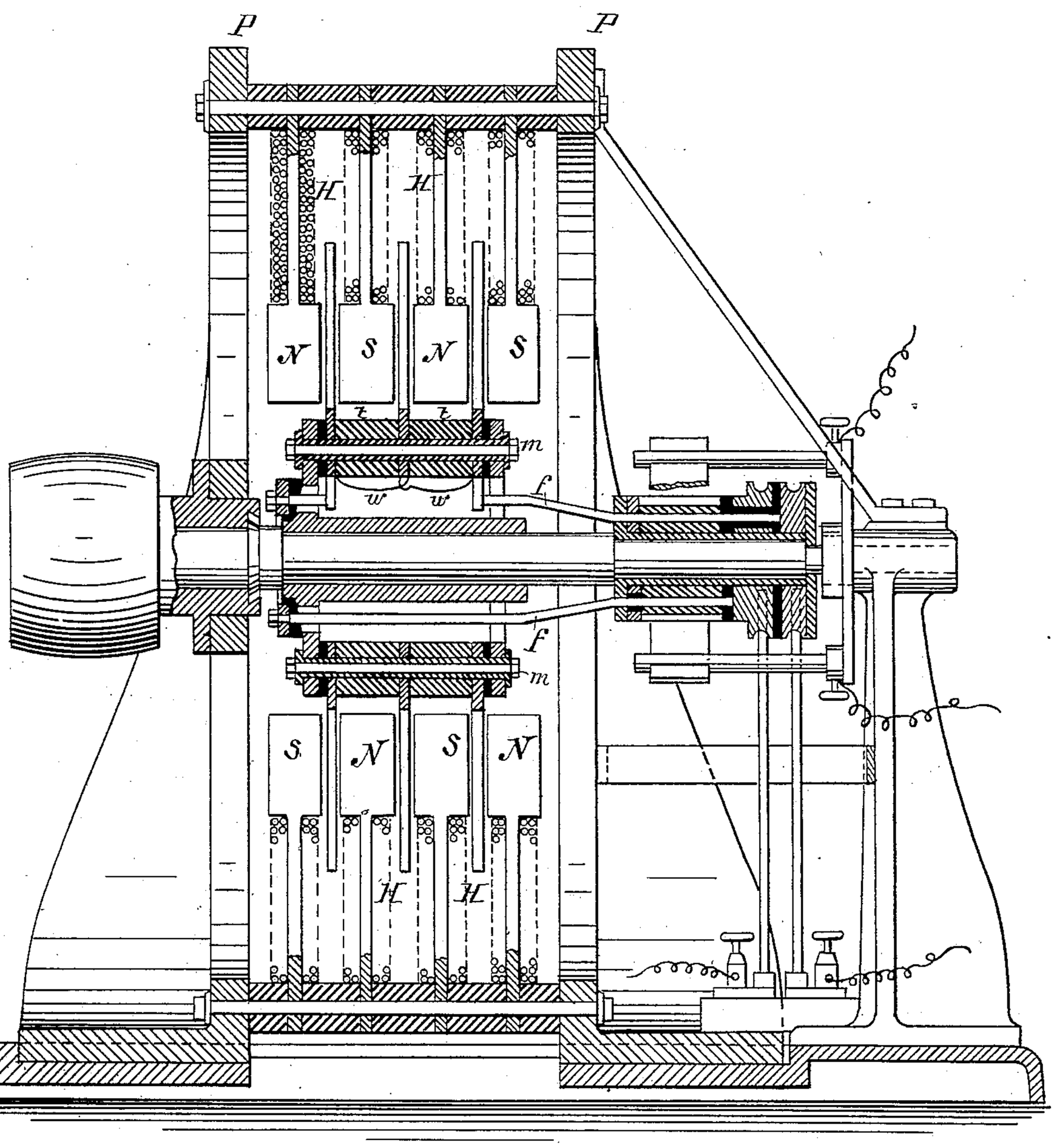
Fig. 5.



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3 Sheets—Sheet 3.

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DYNAMO ELECTRIC MACHINE.

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Fig. 6

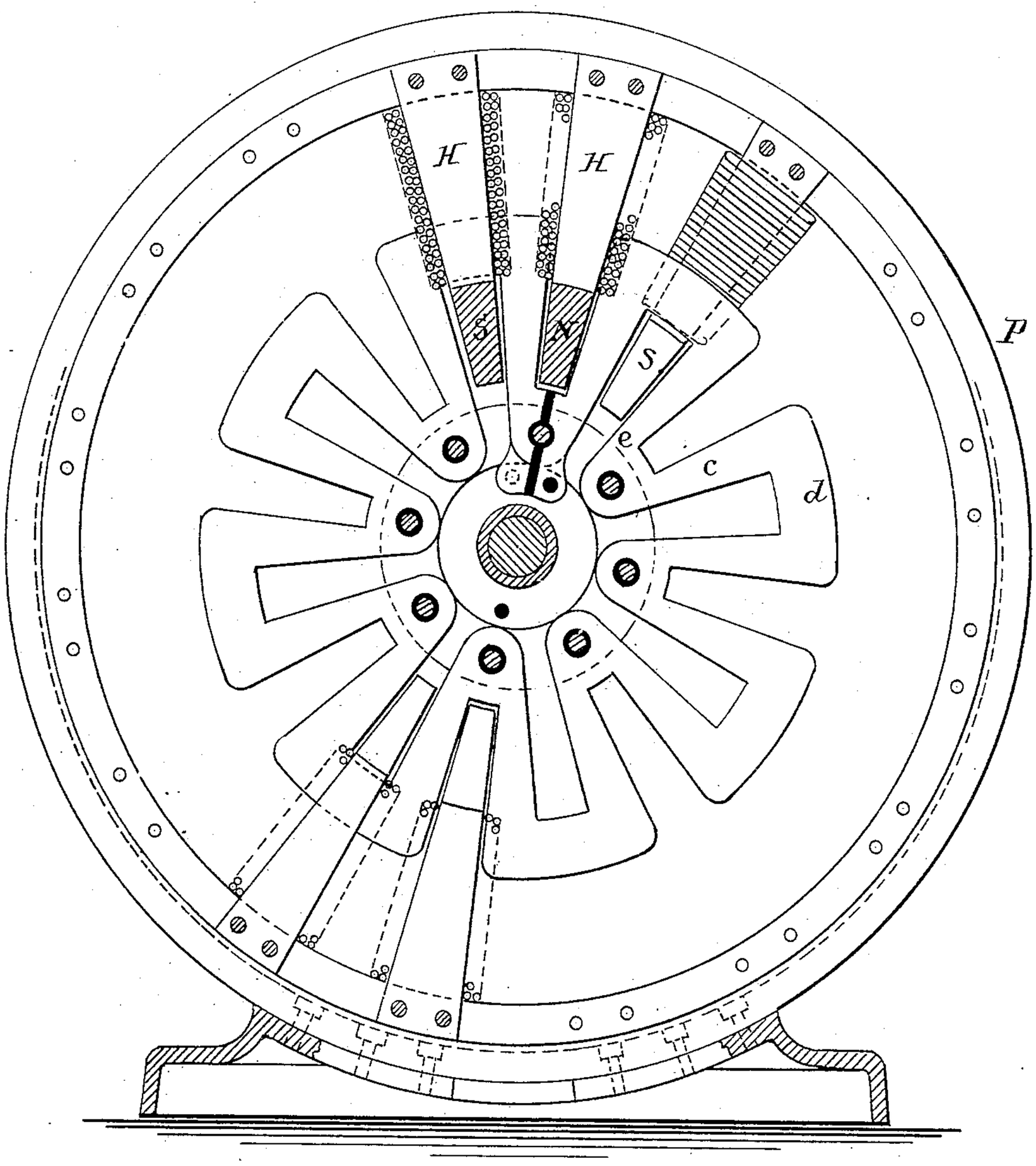
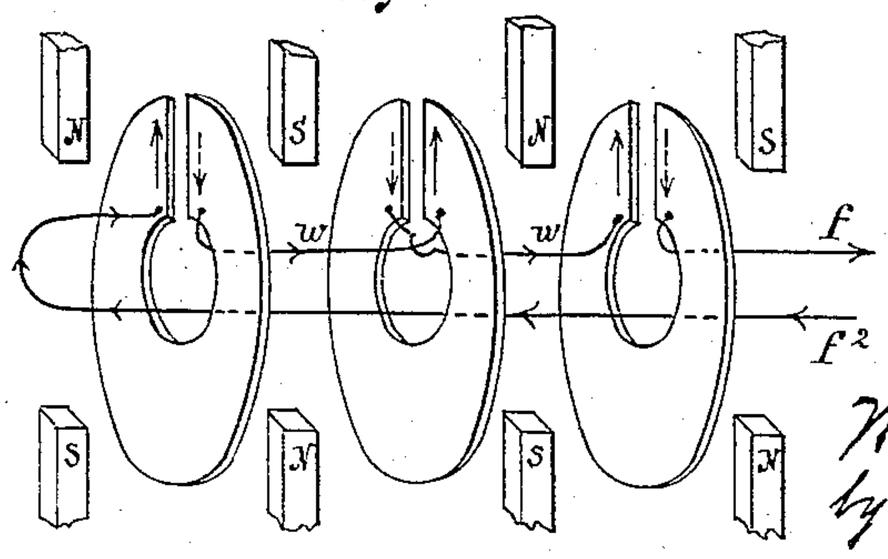


Fig. 7



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UNITED STATES PATENT OFFICE.

WILLIAM HOCHHAUSEN, OF NEW YORK, N. Y.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 294,043, dated February 26, 1884.

Application filed February 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, WM. HOCHHAUSEN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

The object of my invention is to utilize in a practical way the well-known discovery made by Faraday, that when a disk or plate of metal is set between the poles of a magnet and rotated an electric current will be set up in the material of said plate and will travel from the center toward the circumference thereof, or in a contrary direction, according to the direction of rotation.

The special object of my invention is to obtain currents of any desired electro-motive force by employing the principle of action or operation that is present when a continuous plate or disk is used; and my invention consists in certain novel features of construction and form of rotating plate having the desired end in view, the result being a perfectly practical form of dynamo-electric machine.

A further special object of my invention is to reduce as far as possible the resistance of the rotating plate to the currents set up therein.

The nature of my invention will be readily understood from the annexed description and drawings, and the novel features of said invention will be specified in the claims hereto annexed.

Figure 1 is a vertical longitudinal section of a machine embodying my invention. Fig. 2 is a vertical central cross-section through the armature. Fig. 3 is a theoretical illustration of one of the armature-plates. Fig. 4 illustrates theoretically the connection of parallel plates. Fig. 5 is a vertical longitudinal section of a modification of the invention. Fig. 6 is an enlarged vertical cross-section of Fig. 5. Fig. 7 illustrates theoretically the principle of action of the machine shown in Figs. 5 and 6.

In Fig. 1, A represents the base plate of the machine, and B a standard supporting the armature-shaft *a* at one end, while B′ is a plate at the other end, supporting the armature-shaft, and also a series of field-magnets on one side of the armature. Said plate B′ is circular in outline, and the field-magnets C, supported thereby, are placed in a circular range, as shown in Fig. 2. B^2 is a similar plate supporting a series of magnets, C^2, projecting toward the series C, a suitable space being left between the poles of the two series for the armature. The magnets C are made of alternately north and south polarity at their polar ends by a suitable winding or connection of their magnetizing-coils, while the series C^2 are also of alternately north and south polarity, but are so arranged that a north pole of the range C^2 is opposite a south pole of the range C.

Mounted on the armature-shaft *a* is a series of thin metal plates, each of the form shown in Fig. 2, and consisting of radial portions *c*, joined alternately at their inner and outer ends by the portions *d e*, so as to make a continuous conducting-path through the whole plate back and forth radially to and from the armature-shaft. Said plate may be made in any desirable manner, either by stamping out of sheet metal or otherwise. It is cut at f^4, Fig. 2, to form the terminals, one of said terminals being bent out of the plane of the plate and soldered to the opposite terminal of a contiguous plate on one side, while the other is bent and soldered to the opposite terminal of a contiguous plate on the other side, thus joining all the plates in a continuous conducting-path, as indicated in Fig. 4. The two outside plates of the parallel plates have enlarged inwardly-projecting ends at *g*, to which are connected the conductors f f^2, leading to the commutator or collector. Conductor f^2 is upon the opposite side of the armature-shaft *a* from *f*, and is connected to its terminal of the series of plates through a metallic ring, *k*, and a bolt or stud at *l*, this construction being adopted because of the high velocity at which the machine is run and the consequent necessity for balancing the armature accurately. The armature-plates are secured together at their inner and outer portions by bolts *m*, passing through insulating-sleeves, as indicated, and the contiguous plates are kept out of metallic connection with one another, excepting at their terminals, which are soldered together, by suitable pieces of insulating material. The inner

bolts, *m*, pass through clamping and supporting plates D, suitably secured to the armature-shaft. The radial portions *c* of the plates are parallel to one another, and are as many in number as the pairs of opposite magnets, C C^2. As will be readily seen, the distances between the centers of the armature-plates are the same as the distances between the centers of the field-magnets C or C^2 on the same side of the armature; and, by reason of the magnetic polarities stated, the direction of current in any one radial portion will, in accordance with well-known laws, be in the opposite direction from that in the contiguous radial portions—that is, if in one portion it be toward the center it will in contiguous portions be away from the center, so that the current in all the radial portions will, by means of the connecting portions *d* and *e*, be combined in series in every plate, and by proper connections between the plates, as described, the currents of the several plates will be combined in series or for tension. It will, moreover, be seen that the current will reverse in all the plates simultaneously, owing to the symmetrical arrangement of the plates with relation to the magnets.

It will be observed that in the construction here shown the radial portions *c* only are efficient in generating current, and that the portions *d e*, while serving the useful purpose of connecting the parts *c*, interpose useless resistance. I accordingly give the portions *d e* a much larger area of cross-section than the portion *c*, so as to diminish this injurious effect as far as possible; and this I do by widening the plates at these parts, although the same effect might be attained by thickening them. With the latter plan, however, it would not be possible to use so large a number of plates between the field-magnets, so that there would be less electro-motive force of current obtainable. The conductors *f* f^2 are connected in the ordinary or any suitable manner to an ordinary commutator indicated at F, for straightening or converting into continuous currents the alternating currents generated in the armature-plates. Said conductors are also connected to the continuous rings *n n*, from which, if desired, alternating currents may be taken off by the brushes or springs *o o*. These parts being well known in the art need not be described in detail. In this form of machine the armature is peculiarly free from heating, as its form allows ready circulation of air between and around the conductors.

In the modification shown in Figs. 5 and 6 the plates rotate in separate magnetic fields instead of all in the same circular range of magnetic fields.

H H H indicate ordinary electro-magnets bolted between two rings or plates, P P, and having the polarities indicated by the letters N S—that is to say, the pole-pieces of said magnets in the same circular range are alternately north and south, while those in the line parallel to the shaft are also alternately north and south. Between the three interpolar spaces formed by the four ranges rotate the three separate armature-plates shown, of substantially the form before described, secured by bolts *m*, and insulated from one another by the blocks *t* of insulating material. The three plates are connected at their terminals to one another by wires *w*, and to the conductors f^2 by the means before described, or in any other suitable manner, so as to combine the currents in said plates for tension, the proper terminals being connected as indicated in Fig. 7, having regard to the polarities of current that will be produced therein by the arrangement of field-magnets, so as to prevent any conflict of currents. In this form of the machine the armature-plates can be made much thicker, while at the same time the poles of the field-magnets can be brought nearer together, so as to subject the plates to stronger magnetic action. The armature-plates being comparatively thick and rigid need not be bound together at their circumference.

I make no specific claim herein to the arrangement of field-magnets and plates just described, but reserve the same for a separate patent.

I do not limit myself as to the construction of the field-magnets, as these may be made in many ways, nor to any particular method of mounting or connecting the parallel plates. When the machine is to be used for obtaining continuous currents, it is preferable to reduce the number of the field-magnets and radial portions of the plates.

I am aware that it is not new to rotate radial conducting-wires between the poles of magnets, and I therefore make no claim to such a construction of machine.

I have herein described the rotating plates as connected for tension effects. It is obvious that they might be connected in multiple arc, or for quantity, in the well-known manner.

What I claim as my invention is—

1. In a dynamo-electric machine, a conducting armature-plate having radial portions *c*, and alternate interior and exterior connecting portions *e d*, as and for the purpose described.

2. The combination, with the armature-shaft *a*, of a conducting sheet-metal plate stamped or formed in the shape described, with radial portions *c* and connecting portions *e d*.

3. The combination, with the armature-shaft *a*, of a conducting sheet-metal plate, *c e d*, and a series of fixed magnets, as and for the purpose described.

4. The combination, with a series of parallel conducting-plates connected in series, and each formed with the radial and connecting portions, as described, of a series of field-magnets between whose poles said plates are made to rotate.

5. In a dynamo-electric machine, an armature-plate composed of radial portions and alternate interior and exterior connecting portions, said plate being provided with a pro-

jecting portion, *g*, as and for the purpose described.

6. The combination, with the series of conducting armature-plates having parallel radial portions *c*, of the bolts *m*.

7. The combination of the series of plates *c e d*, the bolts *m*, and clamp rings or plate D, as and for the purpose described.

8. The combination, with the radial conductors capable of rotation, of the conductors $f f^2$, arranged on opposite sides of the shaft, and the conducting-ring between one of said conductors and a terminal of the radial conductors, whereby the armature is balanced.

9. The combination, with the parallel conducting-plates *c e d*, electrically connected in series, of the bolts *m*, insulated from said plates, and two circular ranges of magnets, between which the radial portions of said plates are made to pass.

10. The armature-plate, as described, made with connecting portions *d e*, larger in cross-section than the radial portions *c*, which they unite.

11. The armature-plate *c e d*, having portions *e* and *d* wider than the radial portion *c*.

12. The combination, with the two circular ranges of magnets $C C^2$, of a series of conducting-plates formed as described, and having their radial portions in the same lines parallel with the armature-shaft, said plates being bolted together, and adapted to rotate in the interpolar space between the two ranges of magnets.

Signed at New York, in the county of New York and State of New York, this 15th day of February, 1883.

WILLIAM HOCHHAUSEN.

Witnesses:
THOS. TOOMEY,
H. C. TOWNSEND.

Correction in Letters Patent No. 294,043.

It is hereby certified that Letters Patent No. 294,043, granted February 26, 1884, upon the application of William Hochhausen, of New York, New York, for an improvement in "Dynamo-Electric Machines," should have contained the following clause, setting forth a certain foreign patent which had been obtained by the said William Hochhausen, viz: "Subject to the limitation prescribed by section 4887 of the Revised Statutes, by reason of English patent No. 2,670, dated May 29, 1883."

It is further certified that the United States Letters Patent No. 294,043 should be read with this clause inserted in the grant thereof, thereby limiting its term, and to make it conform to the files and records pertaining to the case in the Patent Office.

Signed, countersigned, and sealed this 25th day of March, A. D. 1884.

[SEAL.]

M. L. JOSLYN,
Acting Secretary of the Interior.

Countersigned:

BENJ. BUTTERWORTH,
Commissioner of Patents.