(No Model.) 2 Sheets—Sheet 1.

E. J. HOUSTON.

DYNAMO ELECTRIC MACHINE.

No. 283,343. Patented Aug. 14, 1883.

Fig. 1.

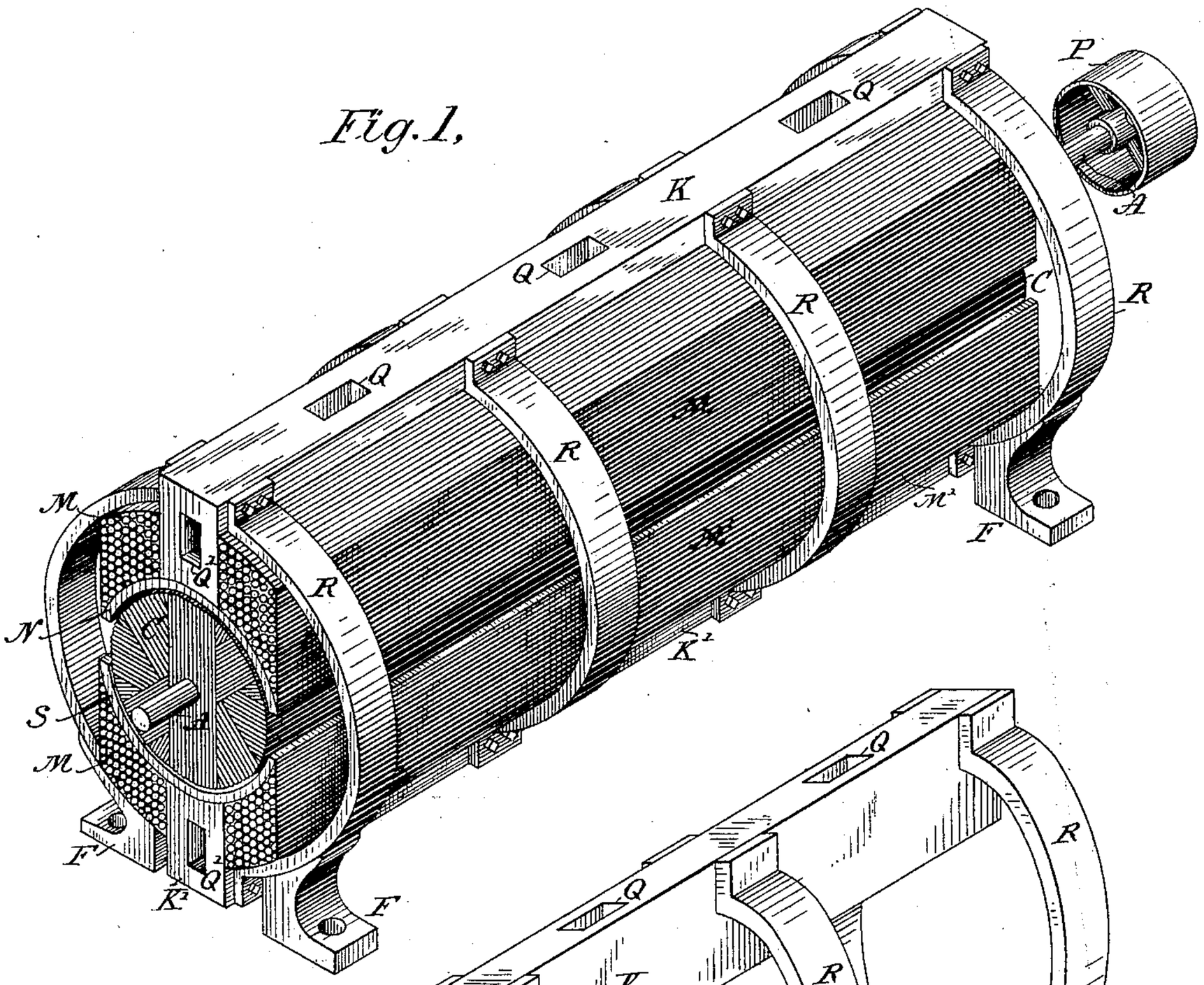

Fig. 2.

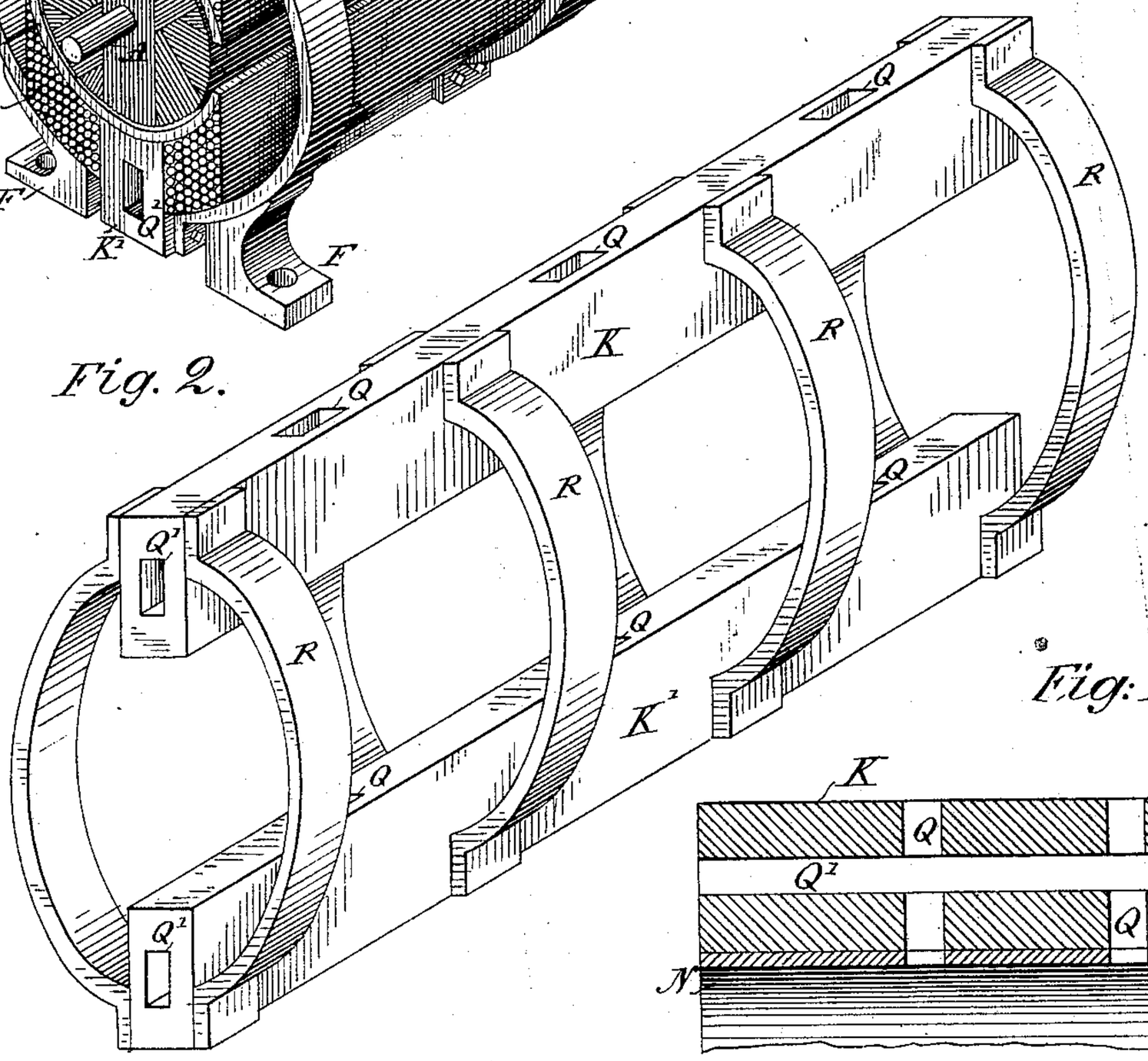

Fig. II.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

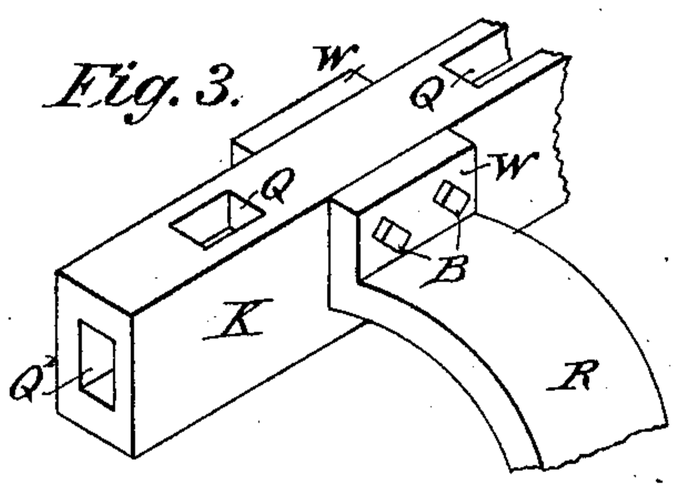


Fig. 4.

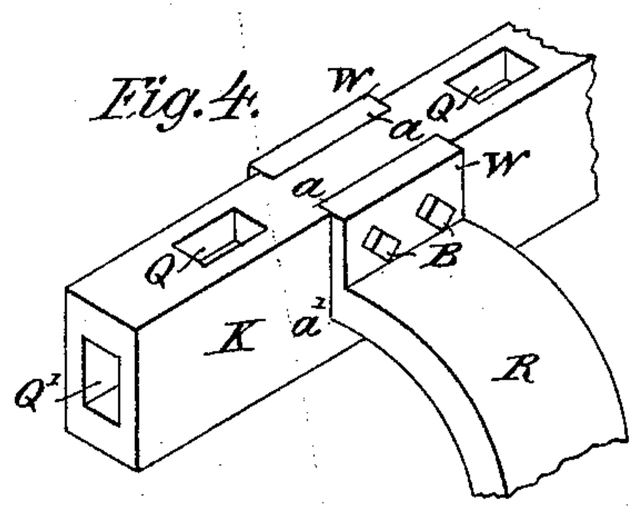


Fig. 5.

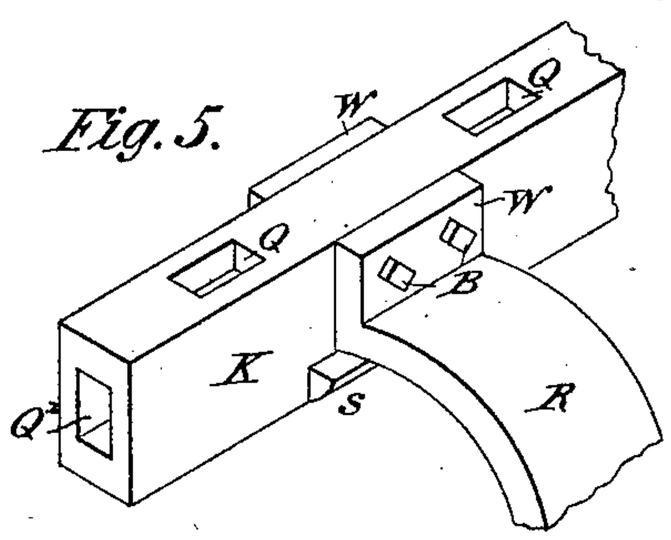


Fig. 8.

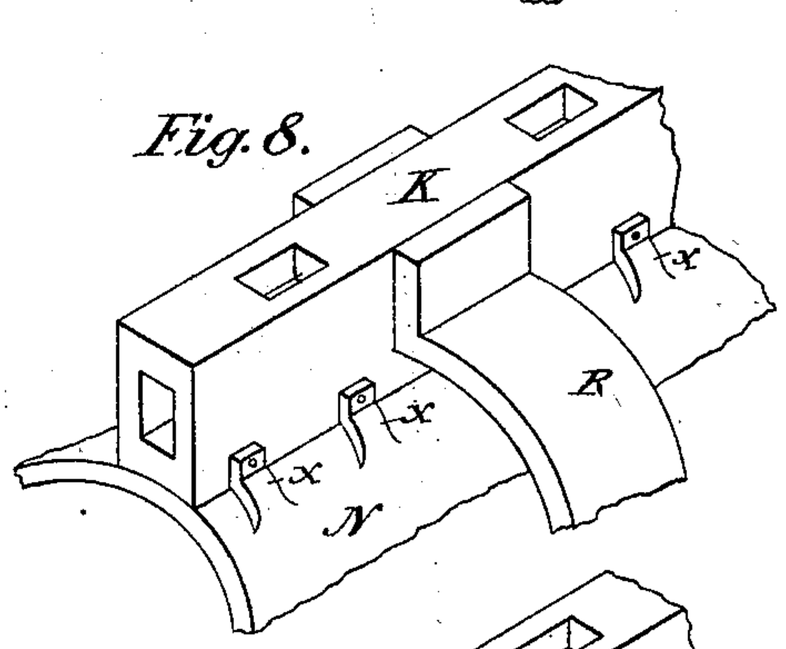


Fig. 9.

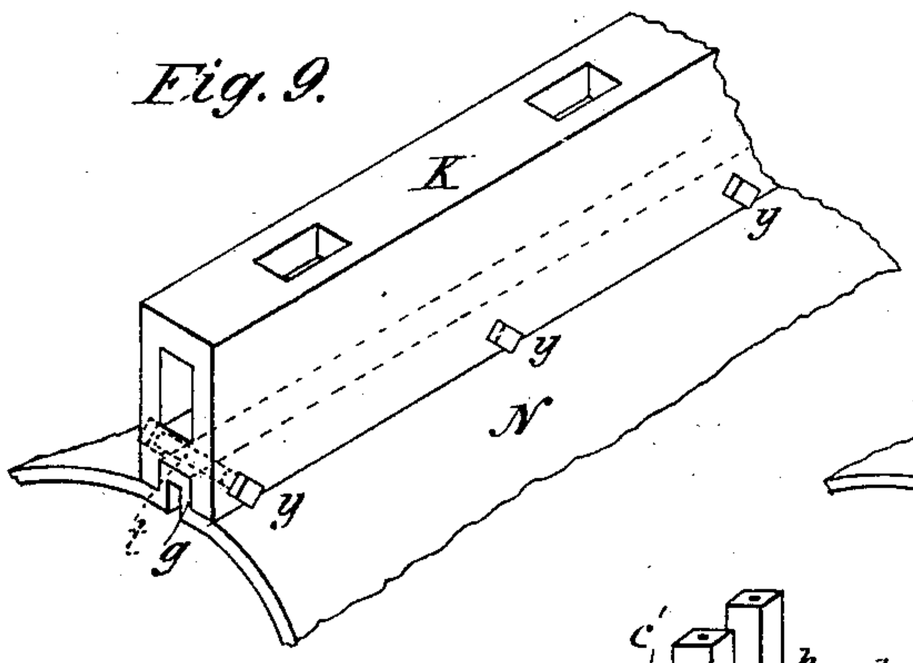


Fig. 10.

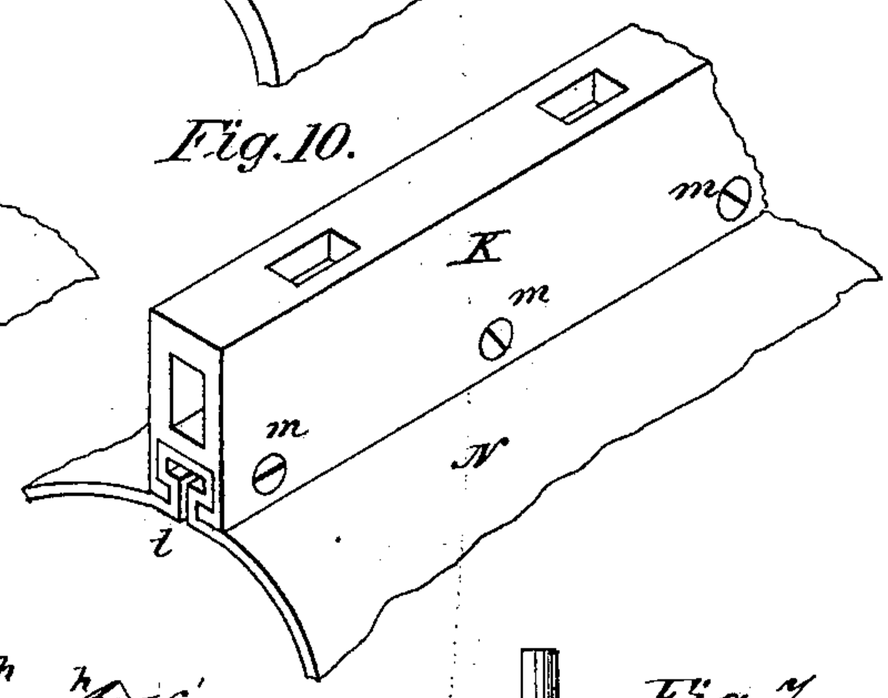


Fig. 6.

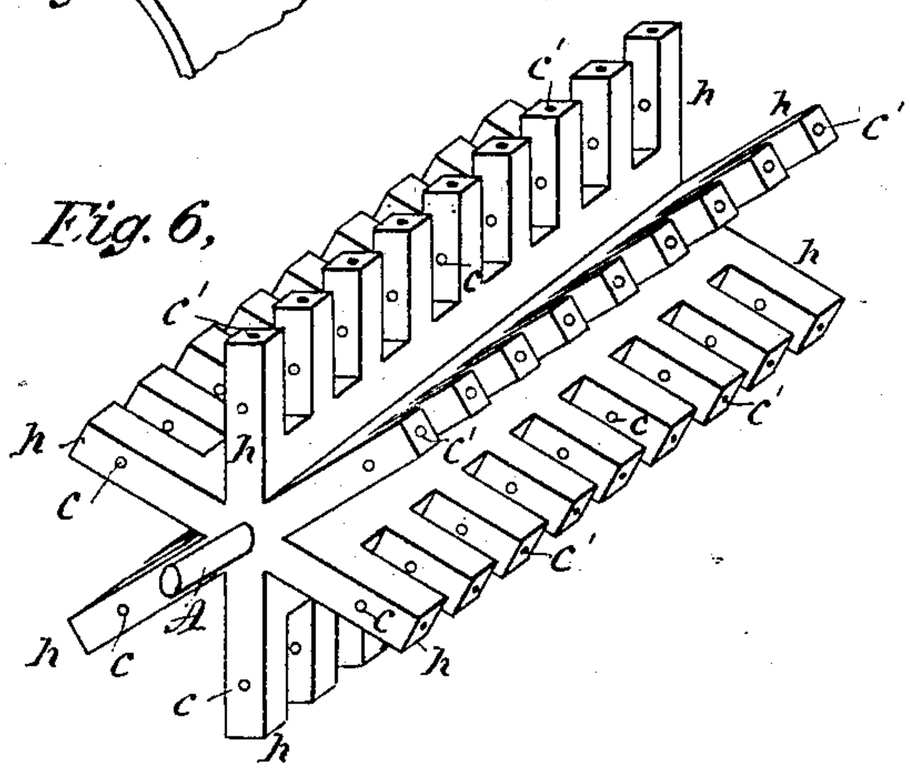
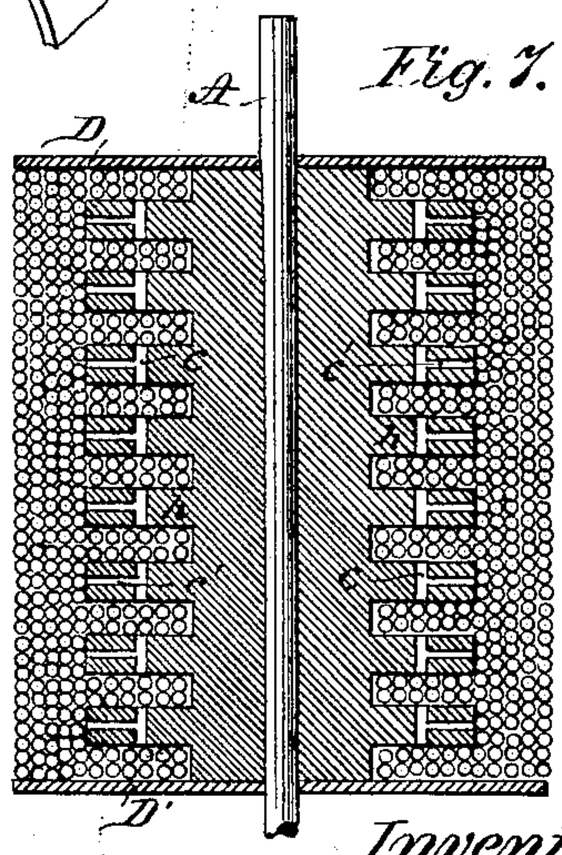


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWIN J. HOUSTON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE THOMSON HOUSTON ELECTRIC COMPANY, OF NEW BRITAIN, CONN.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 283,343, dated August 14, 1883.

Application filed December 30, 1882. (No model.)

To all whom it may concern:

Be it known that I, EDWIN J. HOUSTON, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

My invention relates to the construction of the field-of-force magnet and frame for a dynamo-electric machine; and its object is to secure simplicity of structure, ease of manufacture, and a better utilization and concentration of the magnetism upon the revolving armature.

A further object of my invention is to so construct the armature as to prevent the circulation of induced currents in the material of said armature.

My invention consists in a certain improved form and construction of the field-of-force magnet and frame, that will be described, and then pointed out in the claims.

My invention consists, further, in a novel construction of the armature, to be described, and then specified in the claims.

In the accompanying drawings, Figure 1 is a perspective view of a dynamo-machine embodying the first part of my invention. Fig. 2 is a perspective view of a frame differing in outline from that of Fig. 1. Figs. 3, 4, and 5 show methods of fastening the parts of the frame and magnet together. Fig. 6 is a perspective view of the armature. Fig. 7 is a horizontal section of said armature. Figs. 8, 9, and 10 show improved methods of attaching the pole of the field-of-force magnet to its core. Fig. 11 is a longitudinal vertical section of a magnet-core.

Figure 1 shows a field-of-force magnet whose frame is of cylindrical outline, and that provides for a cylindrical space between the pole-piece N N and S S for the rotation of any suitable armature, C. The long magnet-cores K K′, with their pole-pieces N and S, either cast in one piece with the cores or removably attached thereto, as may be desired, are provided with openings Q′ and Q Q Q, for securing their proper ventilation. The opening Q′ extends through the entire length of K or K′, while the openings Q Q Q extend completely through in a vertical direction.

The cores K and K′, with their pole-pieces N and S, are securely held in position and brought into proper magnetic connection with one another by means of ribs R R R, &c., of suitable magnetizable material, so shaped as to make a circular or curved outline for that portion of the magnet-frame of which they form a part. When these ribs R R R, &c., which may be either of cast or wrought iron, are placed in position, a magnet-frame of a cylindrical outline is produced, which acts powerfully to concentrate the entire magnetism of the field on the long cylindrical armature rotated within it. In producing this effect the continuously-curved form given to the frame is of importance, since this shape is calculated to prevent the short-circuiting or formation of magnetic lines of force between either magnet and the side of the frame connecting it with the opposite magnet, thus compelling the concentration of the magnetism at the extremities of the magnets, while at the same time it forms as direct a magnetic connection between the opposite cores as is possible consistently with the prevention of the cross magnetic connection referred to. The size of the ribs R R R, &c., and their number are such as to furnish a sufficient mass of magnetizable material to thoroughly close the opposite poles of the field-magnet coils that are farthest from the pole-piece. The ribs R R R, &c., are most conveniently cast in the shape of half-circles. At suitable intervals feet F F F, &c., secured to the ribs or cast with them, are provided for the proper support of the machine.

Any mode of suitably attaching the ribs R R R, &c., to the cores K′ may be adopted. In Figs. 3, 4, and 5 I have shown some of the more obvious methods. In Fig. 3 the rib R is shown as bolted to K by bolts or screws B B, passing through flange W on the end of the rib. In Fig. 4 the flange W is more securely attached to K by being sunk into a recess at *a a*, cut in K, and then attached thereto by bolts or screws B B, as before. In Fig. 5 the flange W rests on a narrow step or projection, S, and is attached by bolts or screws, as before. In all these cases it is of course under-

stood that the depth of the flange, as from *a* to *a'*, Fig. 4, be such as to leave sufficient room below it for the coils of the cores K or K'. I sometimes secure greater ease of construction by casting the entire magnet-frame in one piece. In such cases, in order to provide for the ready winding of the coils, the pole-pieces N and S are separably connected to the cores K K' by any suitable joint. The coils are then wound on suitable forms, slipped on the cores, and the pole-pieces afterward attached. This form greatly reduces the cost of manufacture and increases the simplicity of construction.

Any suitable method may be employed for fastening the pole-pieces to the cores. I have shown in Figs. 8, 9, and 10 some of the ways of joining them. In Fig. 8 the pole-piece N has projections X X X X cast on it, which are bolted or secured to the core K. The method, however, that I generally prefer is to cut a groove, *g*, in the core and slide a tongue, *t*, therein, and then bolt it securely to the core K by bolts *y y y*, as shown in Fig. 9. Or, still better, as in Fig. 10, the tongue *t* is run into the groove, shaped as shown, and there fastened in place by set-screws *m m*, &c.

The cores K and K' are wrapped with coils, M and M', of wire, in the usual manner. One advantage which I derive from magnet-coils of this shape is due to the close proximity of the wire to the pole-pieces N and S.

In order to increase the depth of the magnet-cores K and K'—that is, their length in the direction of their magnetic axis—without increasing the diameter of the circle formed by the ribs R R R, &c., I sometimes make the ribs R R R, &c., of such a shape as to produce an elliptical outline, as shown in Fig. 2, in which similar letters refer to the parts described in connection with Fig. 1. This form permits of the production of a very powerful field.

I do not limit myself to ribs R R R, &c., of the precise shape shown in the drawings, since any form may be given to them which is not inconsistent with the production of a cylindrical or curved outline for the frame. Thus they may be increased in number and be placed nearer together. They may be decreased in number, but considerably broadened, so that most of the cylindrical outline is occupied by metal; or the ribs R R R, &c., may be merged in one. The magnet-frame then becomes a cylinder with interior pole-pieces. In this case, however, I provide occasional slots or openings to permit the free ventilation of the armature.

Within the cylindrical space between the pole-piece N and S is rotated any suitably-constructed armature and its coils of wire. I have shown in the drawings a three-coil armature, though it is evident that other forms could also be employed. Figs. 6 and 7 show an impressed form of armature-core, designed to prevent the formation of induced currents in the metal of the core, and at the same time easy of construction and efficient in operation.

From an axis, A, extend a series of radial projections, *h h h h h h*, Fig. 6, of earthenware, hard rubber, or suitable metal. These radial projections are connected to the shaft in any suitable way, or may all be made in one piece, with a central hub-like portion. They are provided with holes *c c c c c*, &c., extending transversely through the teeth, and openings *c' c' c' c'*, &c., extending radially through them. These openings are provided for the ventilation of the core. Fig. 6 shows the axis A with these radial projections or arms. Flanges D and D' (shown in Fig. 7) are placed at the ends of the core so produced, and the teeth and a sufficient depth of the entire surface wrapped with iron wire carried around the structure circumferentially. The core so made is wrapped with coils of insulated wire in any manner well known in the art.

What I claim as my invention is—

1. A field-magnet and frame composed of the two diametrically-opposite inwardly-projecting cores K K' for the field-magnet coils, having curved pole-pieces, and the plain continuously-curved connecting-ribs R, suitably connected at their ends with said cores and free from internal projections, said ribs being curved from their point of connection, so as to bring their sides out of proximity with the field-magnets, as and for the purpose described.

2. The combination, with the cores K K', diametrically opposite one another, of a series of curved ribs whose ends are attached to the outer ends of the cores K K'.

3. A machine and magnet-frame composed of the curved ribs, connected at their ends to the ends of the internally-projecting cores upon which the field-magnet coils are wound, and provided with the feet F.

4. A cylindrical or ovoidal field dynamo-machine frame, with internally-projecting magnet-cores extending toward one another, in combination with separately-attachable pole-pieces for said inwardly-projecting cores, as and for the purpose described.

5. The combination, with the magnet-cores K K', of curved ribs R, provided with flanges W, substantially as described.

6. The combination, with the magnet-core K, recessed at *a a*, of the curved rib R and head or flange W, resting in said recess.

7. The combination, with the cores K or K' for the field-magnet of a dynamo-machine having a groove on its end, of the removable pole-piece N or S, having a tongue which enters said groove.

8. The combination, with the core K or K' for the field-magnet of a dynamo-machine having a groove in its end shaped as described, of a pole-piece having a T-shaped tongue and set-screws *m m*.

9. The combination, with the armature-shaft, of the notched projections and the circumferentially-wound wire.

10. An armature or carrier for a dynamo-electric machine, constructed with radially-

extending projections wound circumferentially, as described, and provided with the end plates or flanges.

11. The combination, with the radially-extending serrated projection forming the base of the armature-carrier, of the transverse and radial openings in the teeth.

Signed at Philadelphia, in the county of Philadelphia and State of Pennsylvania, this 29th day of December, A. D. 1882.

EDWIN J. HOUSTON.

Witnesses:

C. HOWARD COLKET,

HOWARD T. JEFFERIS.