(No Model.)

3 Sheets—Sheet 1.

J. A. JENNEY.

DYNAMO ELECTRIC MACHINE.

No. 262,544. Patented Aug. 8, 1882.

Fig. 2.

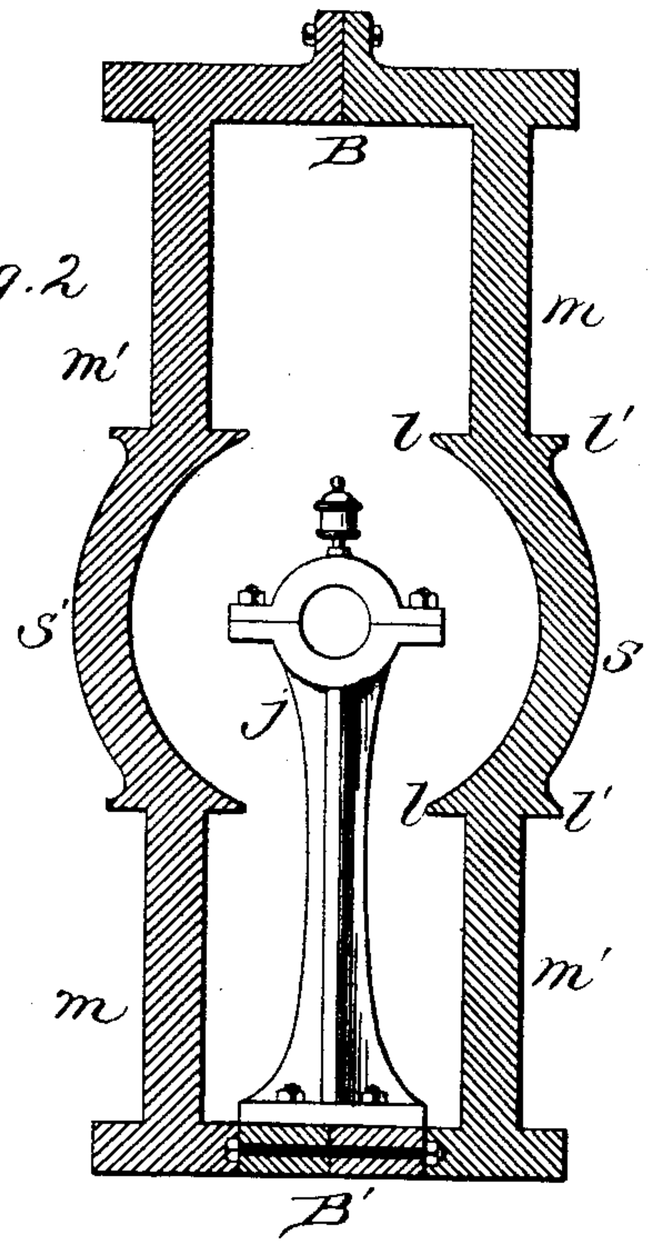


Fig. 1.

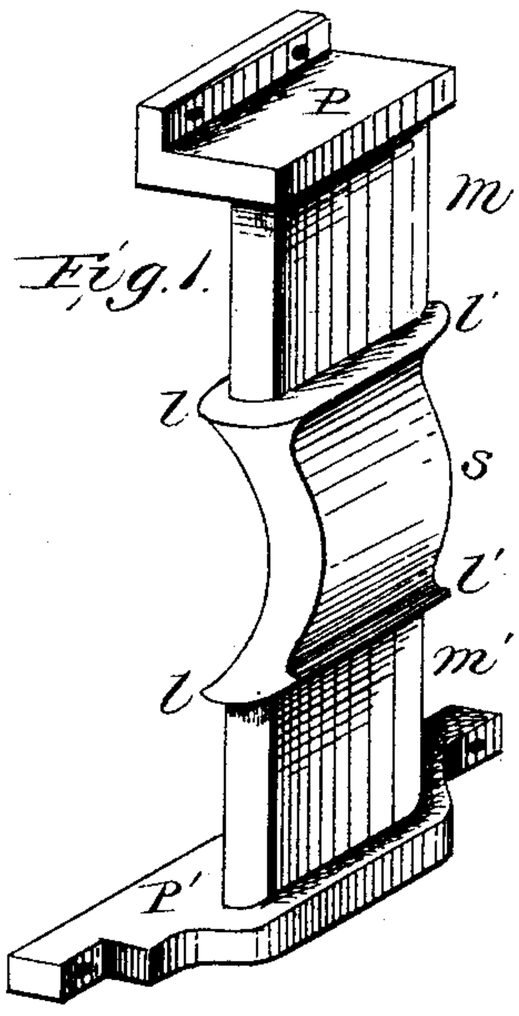
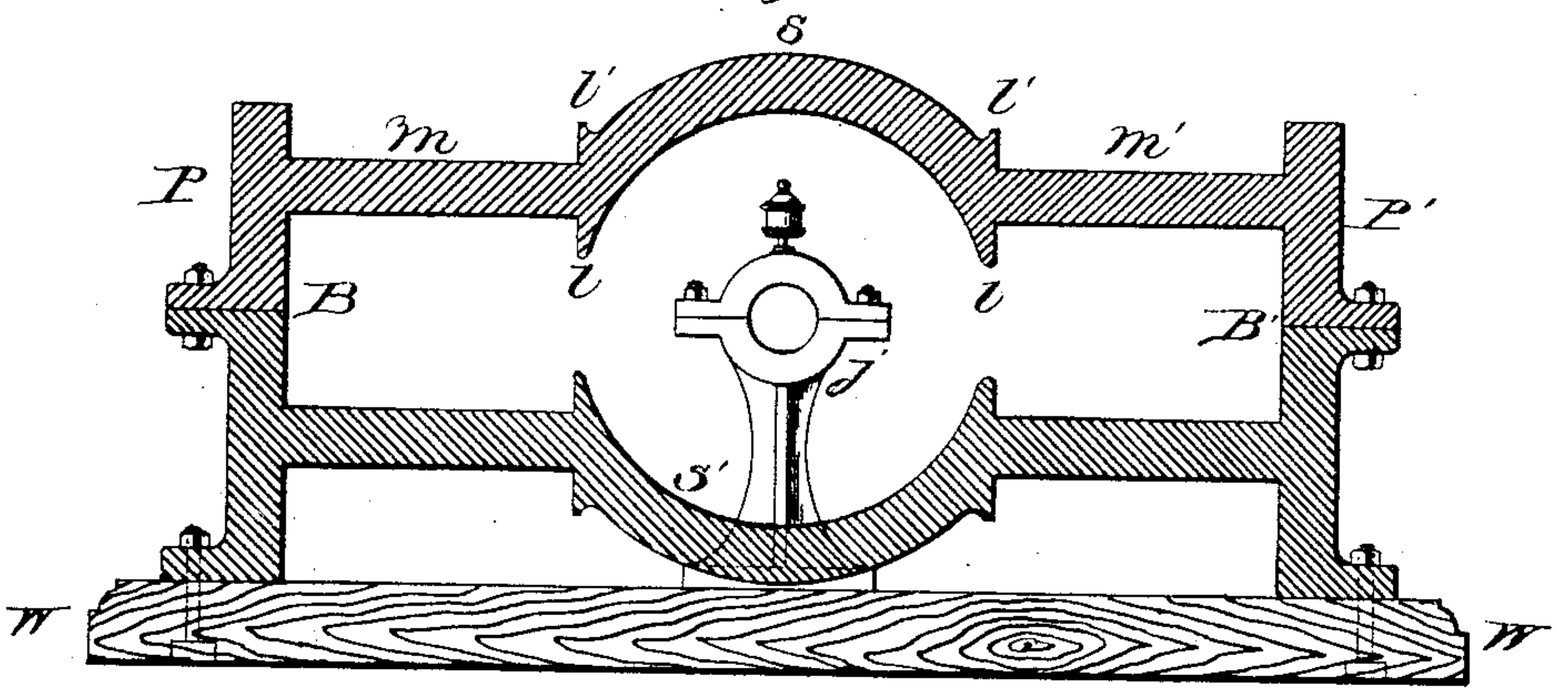


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 5.

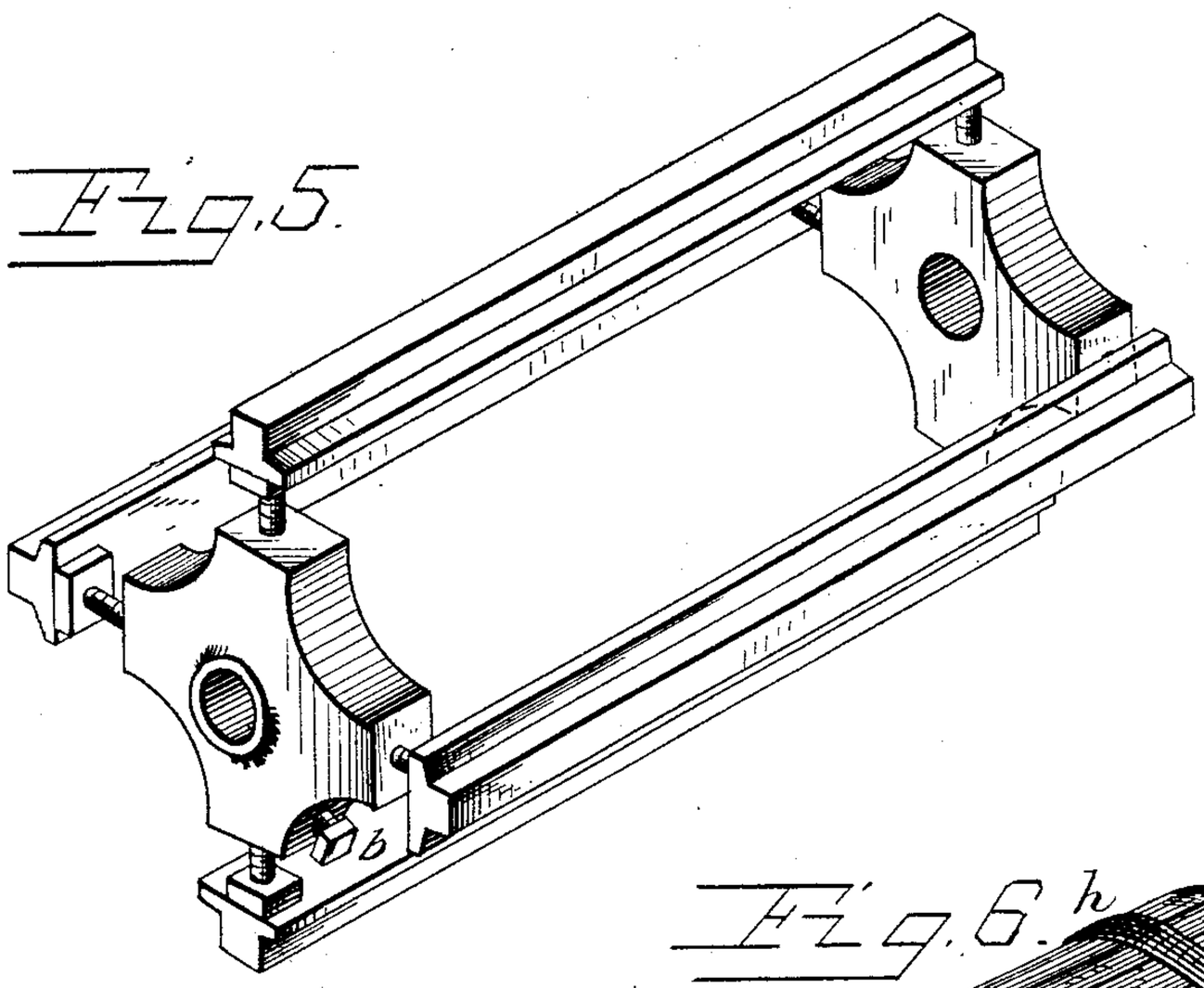


Fig. 4.

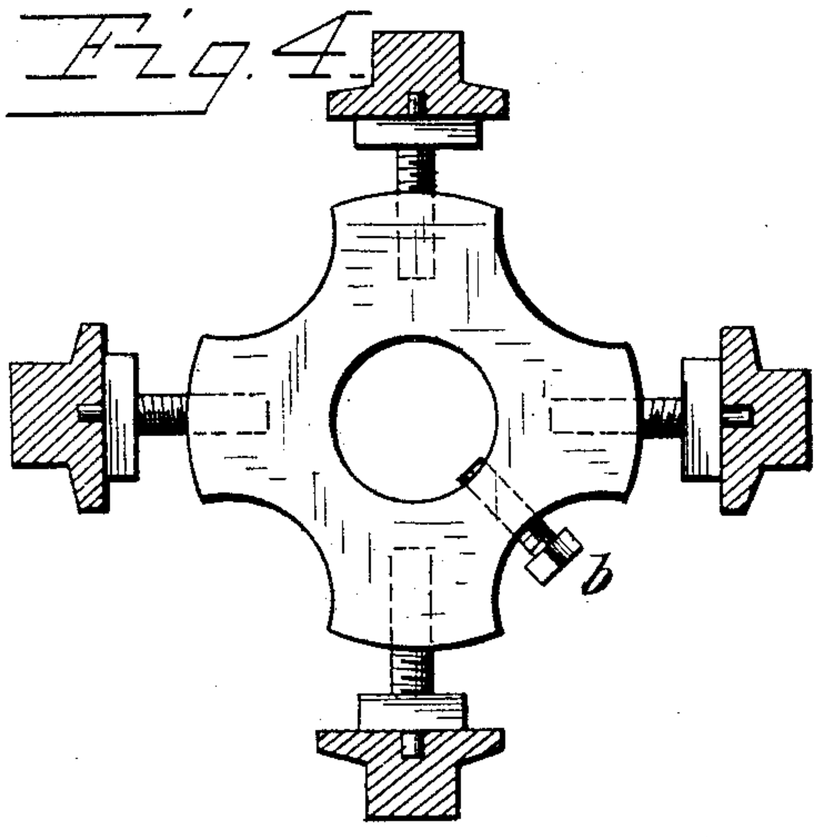
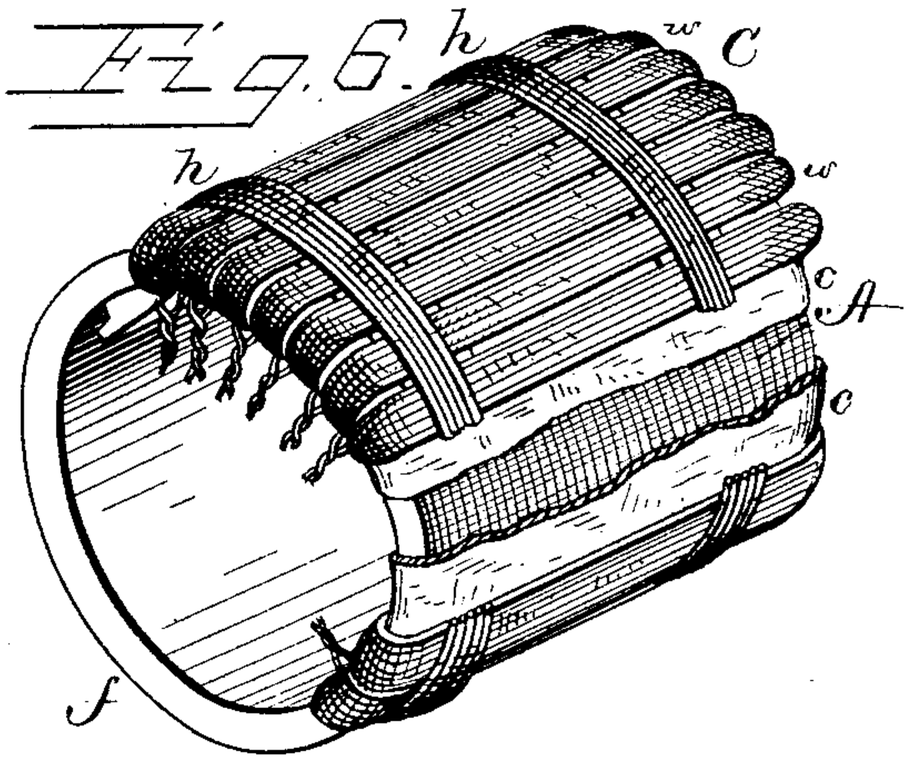


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

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DYNAMO ELECTRIC MACHINE.

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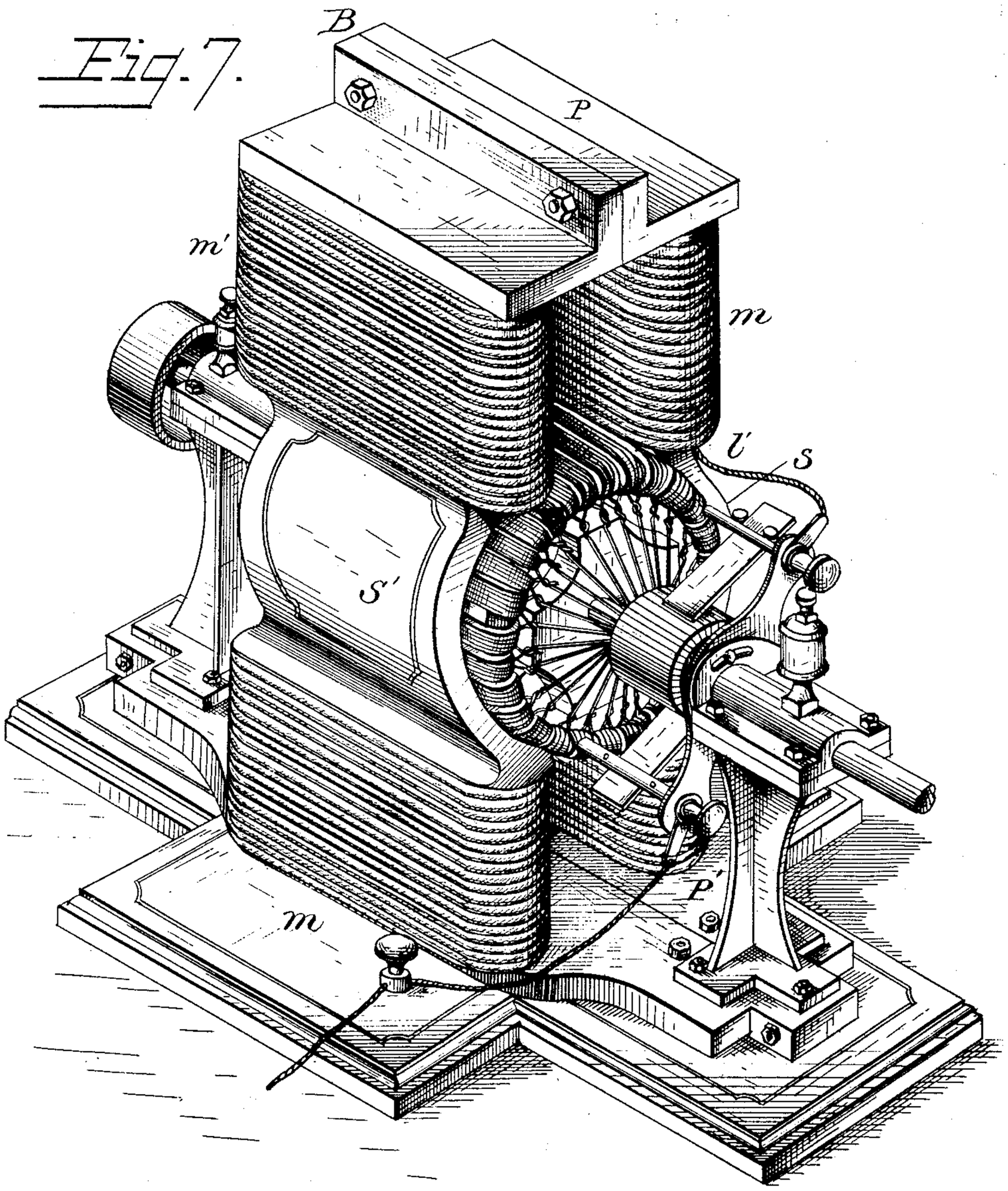
Fig. 7.



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UNITED STATES PATENT OFFICE.

JAMES A. JENNEY, OF FORT WAYNE, INDIANA, ASSIGNOR TO THE FORT WAYNE ELECTRIC LIGHT COMPANY, OF SAME PLACE.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 262,544, dated August 8, 1882.

Application filed April 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. JENNEY, of Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Dynamo-Electric Machines; and I do hereby declare that the following is a clear, full, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists in the application of certain principles, methods, forms, and combinations in the construction of dynamo-electric machines, whereby their cost may be cheapened, their internal resistance diminished, and a uniform and steady current of electricity produced by a minimum expenditure of motive power.

In the annexed drawings, Figure 1 represents one of my improved field-magnets detached. Fig. 2 represents the two magnet-castings joined in position. Fig. 3 represents the same castings as used in a machine constructed with horizontal field-magnets. Figs. 4, 5, and 6 are details of my armature construction. Fig. 7 is a machine complete.

The field-magnet shown in Fig. 1 may be made of any soft iron, either cast or wrought, cast-iron being in my opinion, all things considered, preferable, and in the following description each separate piece is for convenience and brevity called a "casting." This casting is made in one solid piece. The parts *m* and *m'* are the field-magnet cores, and all made with rounded edges to receive the field-coil of insulated conducting-wire. At *l l' l' l'* are projecting lips, which serve as collars to hold the wire of the field-coils in place. The cap and base plates P and P' serve incidentally the same purpose. The curved portion S of the casting between the two magnet-cores, which for convenience I call the "field-segment," presents on its inner face, *l l*, a segment of a cylindrical surface. This casting is of uniform thickness from edge to edge, and the two magnet-cores *m* and *m'* are alike in all their dimensions, and the top and base plates, P and P', alike in thickness, and not less in thickness than the magnet-cores. The field-coils of insulated conducting-wire are to be wound on the magnet-cores *m* and *m'* in contrary directions, one to the right and one to left, so that when they are both joined in the same electric circuit there will be located in the field-segment S the similar poles of the two electro-magnets *m* and *m'*.

Fig. 2 shows the positions and relations of the two castings in the completed machine. They are bolted together at B and B'.

In order to make the most perfect machine, the contact-surfaces of the two castings at B and B' should be planed smooth and made to fit each other as closely as possible; but the perfection of the workmanship in this particular is not essential to the application of my invention.

In the operation of the machine the four field-coils are to be electrically connected with the main circuit, and they are to be wound in such direction with respect to each other that the magnetic polarity of the field-segment S shall be opposite to that of S'.

The armature of my machine is constructed as follows: Upon the central axle, which is preferably of steel, though iron or other material will answer, are fixed two hubs, made of brass or other non-magnetic material, with radiating, adjusting, and centering screws of the same material. A cross-section of this hub, with its attachments, is shown in Fig. 5, in which *b* is a binding-screw for fastening the hub to the axle. Upon the adjusting screws or arms of these hubs are placed four wooden bars, the whole forming a skeleton or spider, as shown in Fig. 5. Upon this skeleton the armature is fitted by means of the adjusting-screws aforesaid. The armature is made upon a cylindrical spool of common sheet-tin or other suitable material, the tin being preferable, with an outwardly-projecting flange at each end. Around this spool is wound iron wire, preferably annealed, in continuous layers, like thread on a spool, until a sufficient thickness is obtained to constitute the body of the armature. The flanges at the ends of the spool are then turned down over the wire, so as to form rounded edges for the reception of the conducting-coils, hereinafter named, and the

whole is covered with cotton cloth inside and out to secure perfect insulation.

In Fig. 6 there is shown the armature-spool with its rounded flange at *f*, and its body of wire at A, and its cloth covering at *c c*. Upon the cylinder thus formed are wound longitudinal coils of insulated copper wire, from the outer surface to the inner and back, as shown at C in Fig. 6. At one end of the armature the outgoing wire of each coil is electrically connected with the ingoing wire of the following coil, and from the point of junction a conducting-wire is electrically connected with an insulated section of the commutator, as shown in Fig. 7.

The commutator may be in any one of many forms in common use, and need not be particularly described. On the inner side of the armature the conducting-coils are in contact, except where separated by the wooden bars of the armature-frame. On the outside they are separated by short wooden blocks, (shown at *w w* in Fig. 6,) and over these blocks bands of insulated wire or metal ribbon are bound firmly round the armature to hold its coils in place. The bands are shown at *h h*, Fig. 6. It is most convenient to complete the armature-cylinder with its coils, as described, and then place it upon its frame by means of the bars and set-screws above described. The mounting of the armature in the cylindrical space between the two field-segments S and S′ is shown in Fig. 7.

In the operation of the machine the field-coils, armature-coils, and external circuit are all electrically joined in one circuit.

The machine above described is in respect to the materials of which it is made, the general proportion and arrangement of its parts, and the manner of its operation substantially similar to dynamo-electric machines in common use. It exhibits in the details specified the best method so far devised by me of applying my invention, and I believe that all the particulars of its construction which I have specified contribute in some degree to the economy of its manufacture and the perfection of its operation; but the only particulars of its construction which are essential to the application of my invention are the following:

First. That the field-magnet castings and their connecting-plates at the top and bottom or ends, as the case may be, shall be in two solid pieces joined together in a plane cutting the center of the armature-axis, and that the field-magnet cores in each piece shall be in line with each other, and in the two pieces parallel to each other in the completed machine. By this form and combination are secured simplicity and economy not only in the construction and joining of the magnet-castings, but also in the winding of the field-coils, which is ordinarily a difficult and expensive process, but which, by centering the castings described in a lathe, is done with great ease and perfection.

Second. That the field-coils shall be so wound that the similar poles of the two electro field-magnets embraced in each casting shall be located in its central field-segment, and that the two field-segments shall be of opposite magnetic polarity from each other.

Third. That the armature shall be a smooth symmetrical cylinder, uniform and regular in form and outline, without any polar projections or other irregularities of shape or surface, and mounted on ā frame-work or skeleton of light and open construction, made of non-magnetic material and adjustable in all directions from the center, substantially in the manner described.

It is claimed, however, that by the combination of the parts described, in the manner described, advantages are secured far exceeding mere simplicity and economy of construction.

By the combination of two electro-magnets in one mass of iron so wound as to locate their similar poles in one central segment there is developed a magnetic field of force whose point of maximum intensity is not fixed or controlled in its location by the presence of any terminal points or projections on the surface of the electro-magnet, but is entirely free to be located or shifted in obedience to the forces operating in the machine; and in like manner the armature, being a smooth cylinder of uniform thickness and outline, presents no projection or irregularity of surface to become an intensifying-point in the magnetic field.

The construction and form of the field-magnet castings, by which all detached collars, caps, and plates are avoided, and the continuity of the iron preserved, except at two points in the central plane, prevent the development of free magnetism where it is not wanted, and consequent waste of electric energy.

By the parallel positions of the field-magnets on the two sides of the machine with respect to each other the inductive influence of the field-coils upon each other is made uniform and harmonious throughout their length.

The mounting of the armature upon an open and non-magnetic frame-work secures free ventilation and guards against disturbing magnetic conditions; and the distribution of the metal contained in the machine in masses, which are balanced as nearly as possible about the center of the armature-axis, tends to preserve an equilibrium of forces in the operation of the machine.

I do not undertake to state whether in the operation of the machine constructed as described the points of maximum magnetic intensity in the segments S and S′ remain constant at points in the centers or other parts of those segments or are in a state of continual vibration between varying forces; or whether there may or may not be a dispersion or diffusion of magnetic intensity in or about said segments in consequence of the mutual repulsion of similar poles of the two electro-magnets joined in one mass of iron; or whether there

may or may not be developed in those segments by such repulsion an indefinite number of consequent magnets; neither do I undertake to state whether the poles of the cylindrical armature constructed and combined as described do in the operation of the machine remain constant in opposite sides of the armature-path or elsewhere, or are in a state of continual vibration sympathetically with the points of maximum intensity in the field-magnets; but whatever the truth may be in these respects, it is certain, as I believe, that the combination of the four field-magnets in two solid masses of iron, joined and wound in the manner described, with a smooth symmetrical armature mounted and revolving between them, as described, affords to the electric and magnetic forces of the machine that free, harmonious, and reciprocal play by which a minimum of magnetic and electrical resistance can be secured; and it is in this combination that the chief merit of my invention consists.

Having thus described my invention, what I claim as novel, and desire to secure by Letters Patent, is—

1. The combination, in a dynamo-electric machine, of four electro field-magnets, which, with their connecting-plates and field-segments, are made in two solid continuous masses of iron, so formed and joined in a plane passing either vertically or horizontally through the center of the armature-axis that the field-magnets in such casting shall be in line with each other and in the two castings parallel with each other, and which are wound with their field-coils in such directions that the two magnets in each casting shall have their similar poles joined in the field-segment connecting them, and that the two field-segments shall be of opposite magnetic polarity with respect to each other, said two castings to constitute, when joined and bolted together, the entire iron frame-work of the machine, exclusive of the armature and its mounting, with a cylindrical soft-iron armature, smooth and uniform in thickness in surface, mounted and revolving between the field-segments aforesaid, upon an open skeleton or frame-work of wood and brass or other non-magnetic material, adjustable in all directions from its central axis, the whole constructed, combined, and operating substantially as described and set forth.

2. In a dynamo-electric machine, a skeleton or frame-work for the mounting and carrying of a cylindrical iron armature, consisting of two hubs, made of brass or other non-magnetic material, with radiating arms of like material, adjustable in length by being set as screws into their hubs, and supporting at their extremities wooden bars pressing against the inner surface of the armature, substantially as described and set forth.

In testimony that I claim the foregoing as my own I have herto affixed my signature, in the presence of two witnesses, this 10th day of April, A. D. 1882.

JAMES A. JENNEY.

Witnesses:

W. FLEMING,

L. M. FLEMING.