(No Model.)

# H. R. BOISSIER.

## DYNAMO ELECTRIC MACHINE.

No. 408,206. Patented Aug. 6, 1889.

FIG. 1

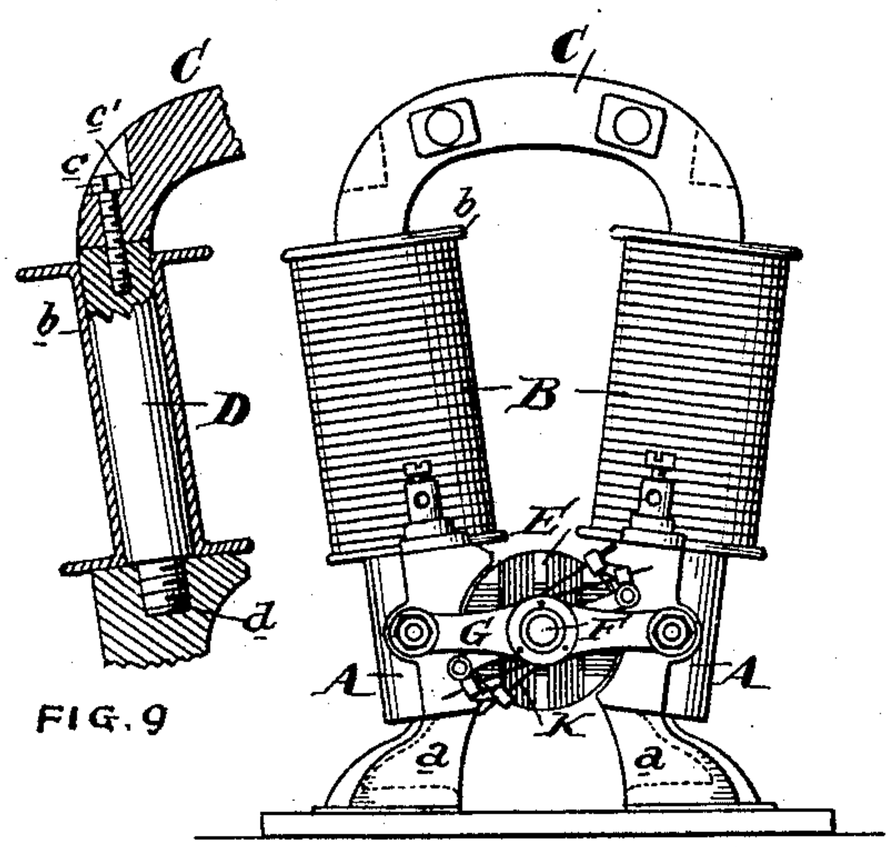



FIG. 9

FIG. 3

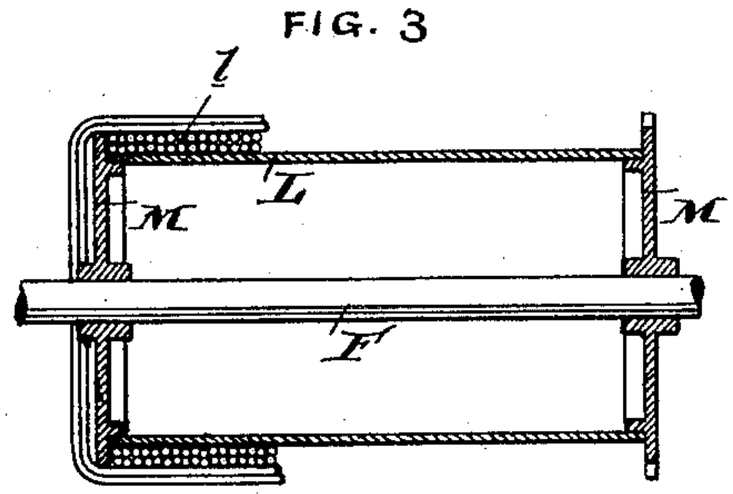



FIG. 4

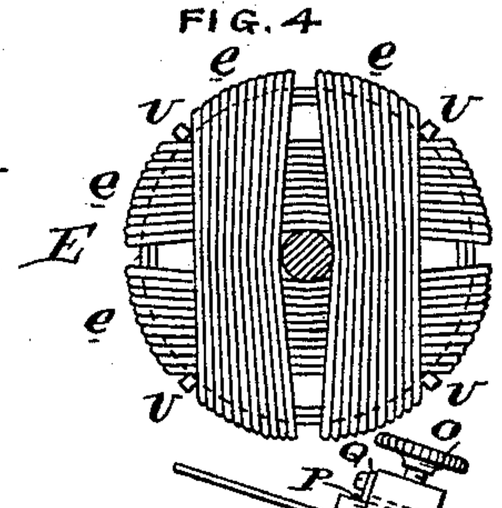



FIG. 10

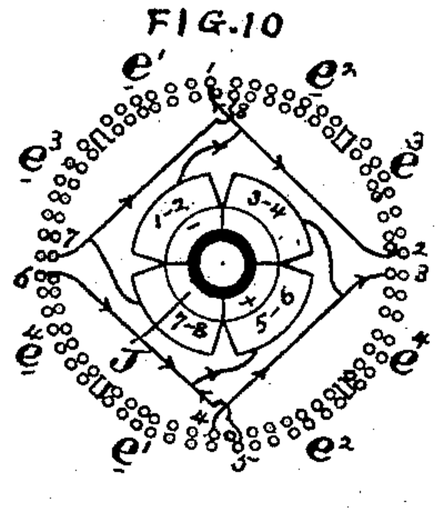



FIG. 5

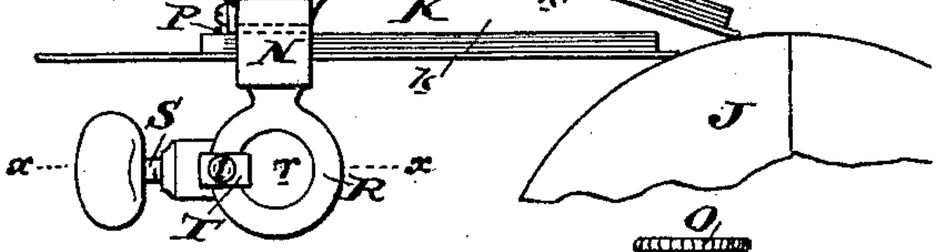



FIG. 2

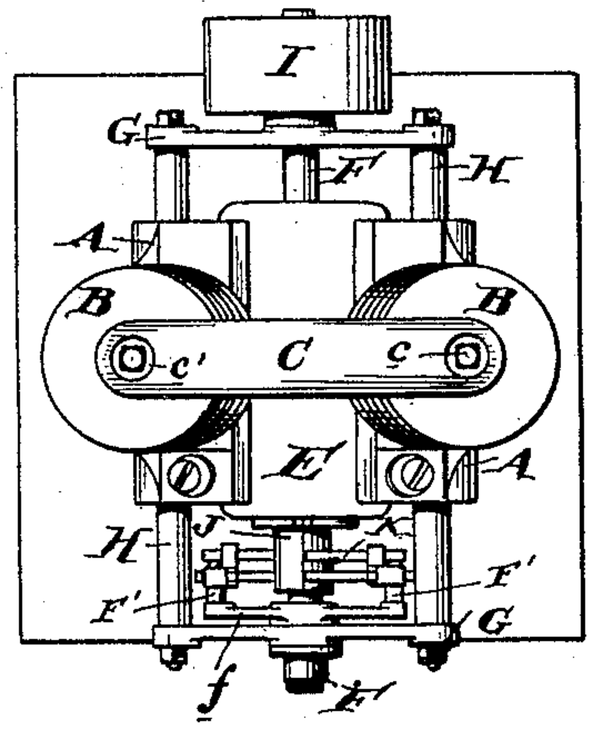



FIG. 6

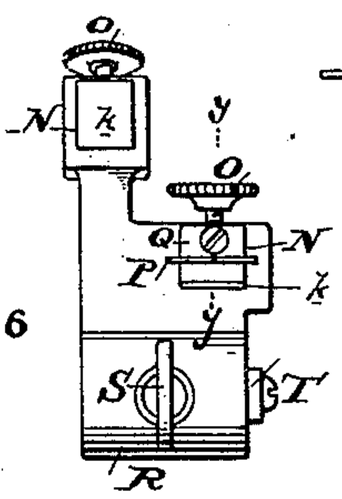



FIG. 7

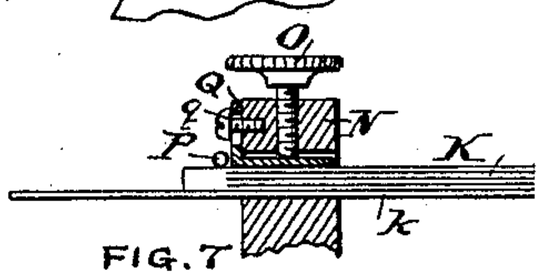
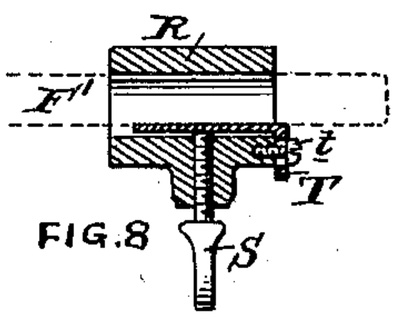



FIG. 8

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# UNITED STATES PATENT OFFICE.

HERMANN R. BOISSIER, OF NEW YORK, N. Y.

## DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 408,206, dated August 6, 1889.

Application filed October 17, 1888. Serial No. 288,389. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN R. BOISSIER, of the city, county, and State of New York, have invented an Improvement in Dynamo-Electric Machines or Motors, of which the following is a specification.

My invention has reference to dynamo-electric machines or electric motors; and it consists of certain improvements, which are fully set forth in the following specification, and shown in the accompanying drawings, which form part thereof.

My improvements relate more particularly to the winding of the armature and connection with the commutator and the brushes; but also embodies certain improvements in the field-magnets, all of which improvements will be understood from the drawings, in which—

Figure 1 is a side elevation of a dynamo-electric machine or motor embodying my invention. Fig. 2 is a plan view of same. Fig. 3 is a longitudinal sectional elevation of the armature with part of the windings removed. Fig. 4 is an end view of the armature, showing the winding at the end opposite to that of the commutator. Fig. 5 is a side elevation of one of the double commutator-brushes. Fig. 6 is an end view of same. Fig. 7 is a sectional elevation through one of the brush-holders, on line *y y* of Fig. 6. Fig. 8 is a cross-section on line *x x* of Fig. 5. Fig. 9 is a sectional elevation showing the construction of the field-magnet core and the arrangement of the bobbins or spools for the field-coils thereon; and Fig. 10 is an end elevation of the commutator, showing its connection with the various coils of the armature.

A A are the two pole-pieces of the field-magnets, and are preferably formed of cast metal; or they may be forgings, if desired.

D D are two upright wrought-iron cores screwed firmly into pole-pieces, as shown in Fig. 9, and preferably flaring outward as we approach their upper end. The upper ends of these cores are connected by a wrought-iron yoke-piece C, which is formed like a semi-ellipse, or, if desired, a semicircle, and said yoke is united to the cores by means of screws *c*, which are received and have their heads protected by recesses C′ in the said yoke-piece. The spools *b* may be made of brass or other suitable material, and are adapted to fit down upon the cores D, being placed thereon before the yoke is secured in place. Upon these spools the coils B of the field-magnets are wound, and such coils may be in series or shunt relation with respect to the armature, as is well known in series-wound or shunt-wound machines in common use upon the market. The under parts of the pole-pieces A are extended downwardly in castings or brackets, as at *a*, to act as pedestals or supports for the machine upon its foundation.

E represents the armature, and has its shaft F supported in end brackets G G, provided with suitable bearings and supported to the pole-pieces A by heavy studs H.

I is the band-wheel by which, in the case of the dynamo-electric machine, the armature may be rotated, and in the case of the motor the power may be transmitted. Upon the armature-shaft is secured two heads M M, of brass, a supporting-tube L, of the same material, and upon this tube are wound two or more layers of well-annealed iron wire. Over the drum so formed I wind the coils, which are four in number, as shown in Figs. 4 and 10, of two layers in thickness, and the winding is of such a nature that where the coils pass over the head of the armature they do not cross and intercross, as is customary in most drum-armature windings, making bulky ends needlessly extending the length of the armature and interposing useless resistance. By the simplicity of my winding I overcome these defects, and, furthermore, I am enabled to use a commutator J, having but four sections, which is a matter of great importance on account of its simplicity, durability, and easy repair. Upon the drum of the armature (which is its core) I place upon its extreme ends and equidistant about its circumference four short pins or projections U or series of pins or projections, the object of which is to prevent shifting of the coils in view of the peculiarity of the winding—that is to say, that each coil is wound wholly to one side of the armature-shaft and occupies two sections of the circumference of the armature to one side of a vertical plane through the said armature-

shaft, as is clearly shown in Fig. 4. In winding an armature of this kind great difficulty is experienced in arranging the winding so as to make it maintain its position upon the drum or core, particularly when in the act of winding the wire. It is evident that if we were to attempt to wind downward from, say, the inner layer of coil at *l*, Fig. 10, toward the pins U, we could not maintain the wire in position, as it would be wrapping around a curved surface having increasing obliquity and would tend to slip off. To overcome this difficulty it has been found necessary to first ascertain the length of the wire upon one of the coils, then locate the part corresponding to the place at the end of the inner coil and beginning of the outer coil, and commence winding with one part of the wire from the pins upward upon the core of the armature forming the inner coil, and when this is done proceed to wind upward upon the outer surface of the inner coil with the remaining portion of the wire to form the outer coil. This form of winding brings both terminals at one end of each section of the coil of the armature. The four coils so wound are then coupled up, as shown in Fig. 10—that is to say, the outer terminals 1 and 2 of coils $e'$ and $e^3$ are connected together and with one section of the commutator marked 1 2. The inner terminal 3 of coil $e^4$ is connected with the inner terminal 4 of the coil $e'$, and also to the section 3 4 of the commutator adjacent to the previous section referred to. The outer terminal 5 of winding $e^2$ is connected with the outer terminal 6 of winding $e^4$, and to the next succeeding section to commutator 5 6. Finally, the inner terminal 7 of winding $e^3$ is connected with the inner terminal 8 of winding $e^2$, and to the next succeeding and last section of the commutator 7 8. It will be observed from this that the coils whose terminals are connected together are at right angles to each other. The effect of this winding is that we have three parallel layers of the coils in position in front of each of the poles, and of these the two outer or front and rear are the ones from which the main effect is derived. If we refer to Fig. 10, the lower or left-hand part of coils $e'$, $e^3$, and $e^4$ may be in front of one pole, and the right-hand or upper part of the coils $e^3$, $e^4$, and $e^2$ would be in front of the other pole of the field. Of course it is evident that the positions of these coils are constantly being shifted, and when one coil moves away from the pole another takes its place.

The direction of the currents through the armature is indicated by the arrows in Fig. 10, the 5 6 commutator-section giving off the positive current and the section 1 2 giving off the negative current. By following the circuits it will be seen that there are one-half of each of the four complete coils occupying the spaces between the pole edges, and in the central parts of the poles I have the effect of eight coils of the Gramme armature with only four sections of commutator. The few number of sections of the commutator is of great importance from a mechanical standpoint. Experience has shown that this winding of armature gives large torque in motors, large generation of current in dynamo-electric machines, with inappreciable sparking at the commutator.

The commutator-brushes are supported in a double holder R, having two brush slots or sockets N N, so as to arrange the two brushes for collecting current of the same polarity, one slightly in advance of the other, and so as to arrange said brushes laterally with respect to each other that they shall make contact with different portions of the commutator—that is to say, their line of contact will be in different radial planes. The brushes consist of the upper or pressure brush K, formed elastic and preferably of many layers united together at one end, and having a cross-bar or wire P to prevent longitudinal movement through the holder toward the commutator, and so as to maintain the said pressure-brush out of contact with the commutator, and a second or contact brush *k*, consisting of a long thin strip of copper or other metal adapted to be shifted under the pressure-brush and to be pressed thereby onto the commutator. This construction reduces the actual consumption of the brushes, and requires the adjusting or replacing of only that portion which is very inexpensive.

The clamping-screws O are employed to press upon clamping-plates Q (loosely held by screws) to produce a holding-friction on and holding the brushes in their sockets. The lower part of the holder is provided with a transverse aperture *r*, for fitting upon the stud F′ of brush-shifting lever *f*, journaled concentric with the armature-shaft. This holder is provided with a clamping-plate P, held in position for provision of movement by a screw *t*, and which plate is adapted to be forced against the stud F′ by a screw S. By pressing the brushes against the commutator and then tightening the screw S upon the plate P it is made to bind upon the stud F′, and the desired pressure of the brushes upon the commutator may be had and maintained.

While I prefer the construction shown, the details may be modified without departing from my invention.

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

1. An armature for a dynamo-electric machine or motor, consisting of a suitable magnetic core wound with four complete coils of wire, in which all active parts of the same coil are located upon the core to one side of a plane passed through its axis, a commutator made in four sections, and connections for coupling the coils in series and uniting their terminals in pairs to separate sections of the commutator.

2. An armature for a dynamo-electric ma-

chine or motor, consisting of a suitable magnetic core wound with four complete coils of wire, in which all active parts of the same coil are located upon the core to one side of a plane passed through its axis, and in which a terminal from each coil is connected to a terminal of other coils separated from the coils of the first-mentioned terminals by intermediate coils, a commutator and connections between the coil, terminal connections, and sections of the coil.

3. An armature having its coils wound substantially as set out, and consisting of a core with four coils $e'$ $e^2$ $e^3$ $e^4$, arranged in pairs side by side, in which one terminal of coil $e'$ is connected with one terminal of coil $e^3$ perpendicular thereto and with one commutator-section, the other terminal of coil $e^3$ connected with one terminal of coil $e^2$, parallel with coil $e'$ and with the next section of the commutator, the remaining terminal of coil $e^2$ connected with one terminal of coil $e^4$, parallel with coil $e^3$ and to the next section of the commutator, and, finally, the remaining terminal of the coil $e^4$ connected with the remaining terminal of coil $e'$ and the last section of the commutator.

In testimony of which invention I hereunto set my hand.

HERMANN R. BOISSIER.

Witnesses:
HENRY H. KUHN,
THEODORE HERRMANN.