(No Model.)

H. F. JOEL.

MAGNETO ELECTRIC MACHINE.

No. 299,551. Patented June 3, 1884.

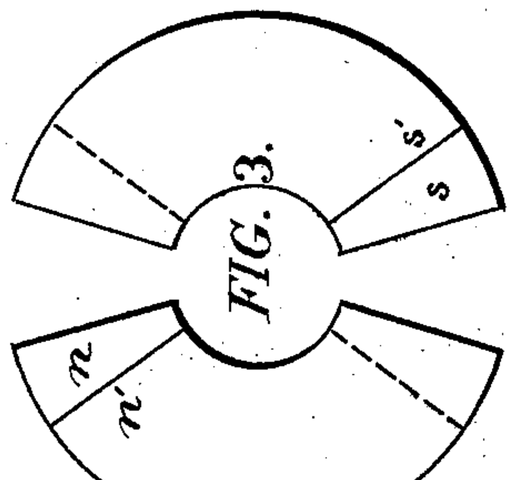

FIG. 3.

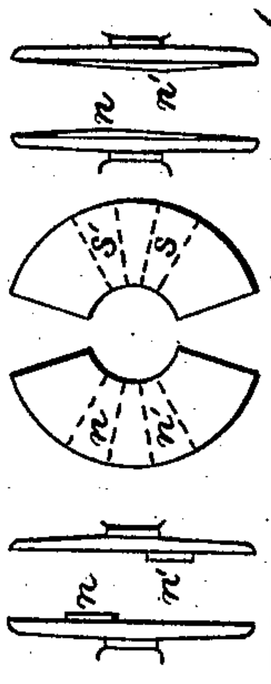

FIG. 6.

FIG. 5.

FIG. 4.

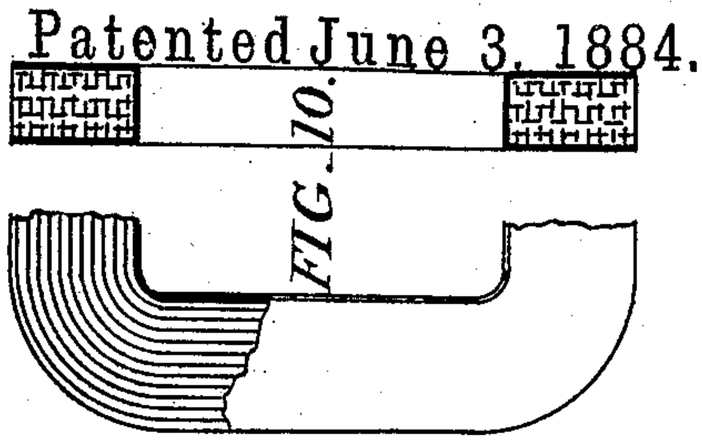

FIG. 10.

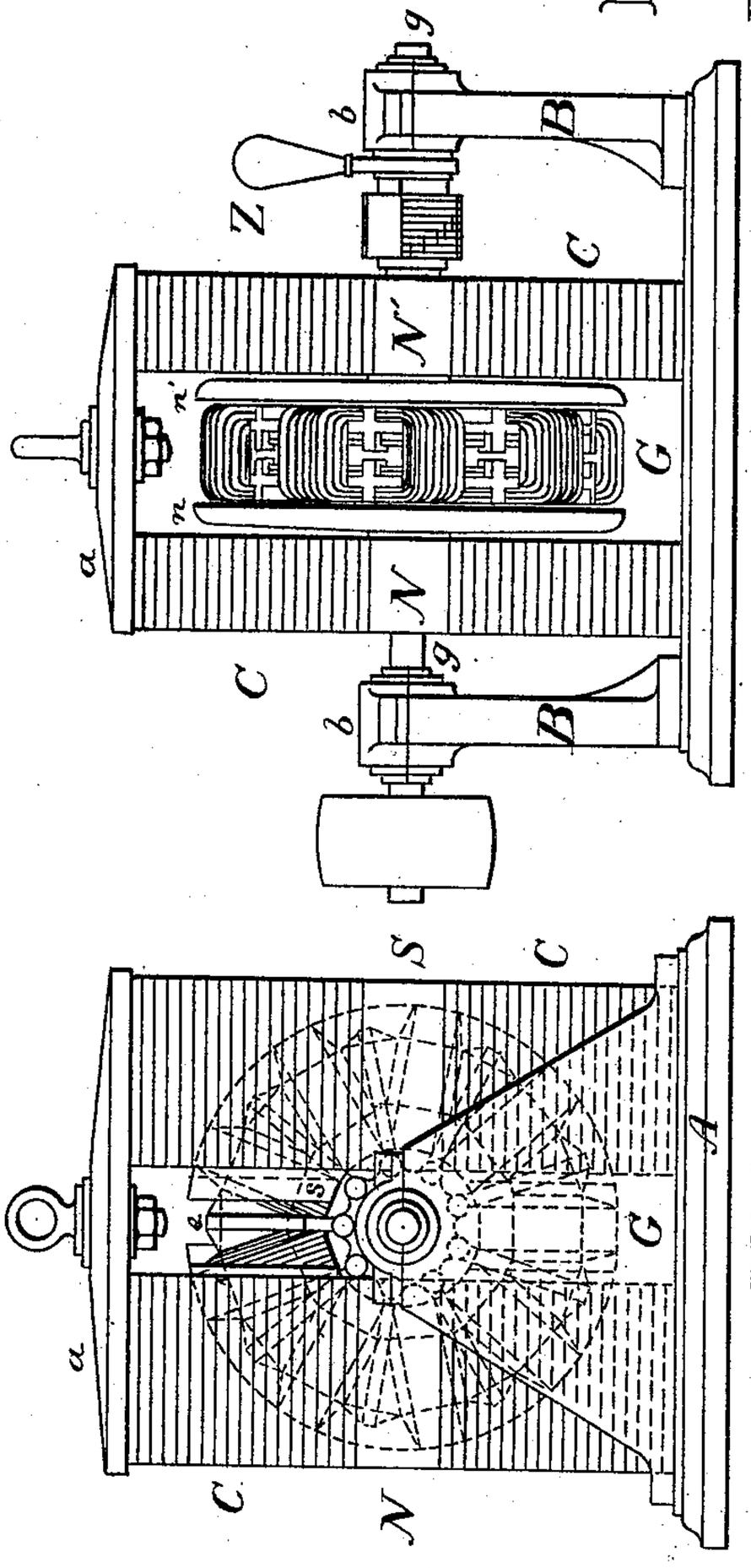

FIG. 2.

FIG. 1.

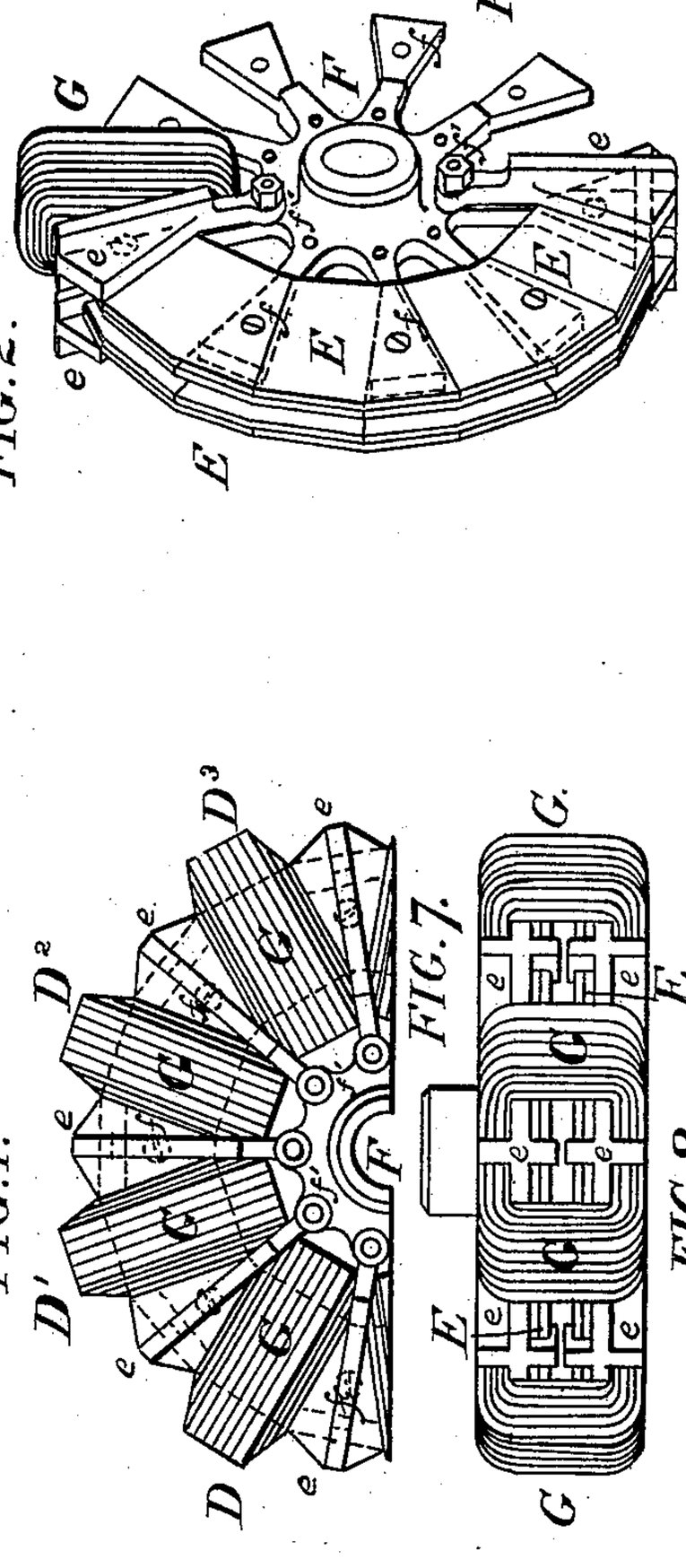

FIG. 9.

FIG. 7.

FIG. 8.

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HENRY FRANCIS JOEL, OF LONDON, ENGLAND.

MAGNETO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 299,551, dated June 3, 1884.

Application filed October 2, 1883. (No model.) Patented in England October 21, 1881, No, 4,607; in France April 21, 1882, No. 148,533; in Germany April 22, 1882, No. 21,193; in Belgium May 5, 1882, No. 57,818, and in Austria-Hungary September 6, 1882, No. 15,812.

To all whom it may concern:

Be it known that I, HENRY FRANCIS JOEL, electrician, a subject of her Britannic Majesty, the Queen of Great Britain and Ireland, residing in London, England, have invented a new and useful Improvement in Magneto-Electric Machines, (for which I have obtained Letters Patent in England, dated October 21, 1881, No. 4,607; in France, dated April 21, 1882, No. 148,533; in Germany, dated April 22, 1882, No. 21,193; in Belgium, dated May 5, 1882, No. 57,818, and in Austria-Hungary, dated September 6, 1882, No. 15,812,) of which the following is a specification.

My invention relates to structural improvements in magneto-electric machines constructed on the Pacinotti principle, whereby they are rendered less costly in maintenance and construction and the force of the generated current is improved.

My improvements are essentially in the construction of the armature-frame, in that of the armature-coils, and in the novel disposition of the magnets relatively to the armature.

In order that my invention may be the better understood, reference is had to the drawings hereunto annexed and to the letters and figures marked thereon.

Like letters refer to like parts in the different views.

Figure 1 is an end elevation of my improved magneto-electric machine. Fig. 2 is a side elevation of the same. Figs. 3, 4, 5, and 6 show different views of the pole-plates which I use with my field-magnets. Figs. 7 and 8 are a half front elevation and plan of my armature. Fig. 9 is a perspective view of the frame of my armature with one series of coils and two pairs of cheeks affixed. Fig. 10 is a detail of one of the coil-sections.

Upon a suitable base-plate, A, the field electro-magnets C are mounted, and upon the two upright standards B B are bearings and caps *b b*, to carry the revolving armature G by a suitable shaft, *g*. This arrangement allows the armature and shaft to be removed without disturbing the rest of the machine. I arrange the said magnets C in pairs, with the wire so coiled as to make the north and south poles of each pair in the center of the magnets and opposite to one another, as shown at N and S. To these poles I attach extending pole-plates *n s*, as shown in detail in Figs. 3, 4, 5, and 6, and hereinafter more particularly specified.

The revolving armature consists of a brass-spoked frame, F, Figs. 7, 8, and 9, which has as many spokes as there are magnet-coils. These are preferably nine in number. To the extremity of these spokes are screwed the soft-iron coil-cores consisting of plates E, fixed together in parallel and opposite pairs, (with an air-space between,) each pair being composed of two plates half overlapping. Upon and embracing the two parallel pairs of core-plates is fixed a series of coils, Fig. 10, conveniently wound in a lathe upon a paper form. The core-plates of the armature thus form a series of separately-wound sections with projecting ends, and the projecting ends of each section alternately overlap and are attached to those of the next. The screws *f*, which both attach the plates to each other and to the spokes, must be of non-magnetic material, so as to keep the two sides in magnetic insulation. The spaces between the coiled sections are filled by cast-iron "cheeks" *e*, of special form. Their inner ends are formed into an eye, through which they are secured to the armature by the brass bolts *f'* through the spokes. The backs of the cheeks have projecting ribs, and the outer end of each rib laps over with a lip, as seen in Fig. 8, so as to embrace the core-plates and further secure the same against flying outward under the centrifugal force. The cheeks also cover the heads of the smaller core-plate screws, as seen in Fig. 7. The holding bolts and screws are all arranged across the direction of the centrifugal force, and thus have no tendency to fly out during rotation.

I have found that the strongest action obtainable from ring-armatures with projecting cheeks of my or other construction occurs when the projecting cheeks make and break from the ends of the extending pole-plates. I intensify this action by arranging the pairs *n n'* and *s s'* of extending pole-plates to alternately overlap or be in advance of one another, as

shown in Fig. 3. In this case the coil passing across the center of the pole-plates is at the moment of passage comparatively neutral, while at the same moment (in consequence of the odd number of coils) there is no neutral coil in front of the other poles. This arrangement I show in Figs. 1, 2, 7, 8, and 9, where the armature is made up of nine coils, and which enables me to cut out the coils singly and at alternate poles in place of in pairs, as hitherto practiced in other machines, and thus to minimize the neutral portion and avoid sparking at the commutator by the decreased change of resistance from the single coil in place of the pair of coils cut out.

Another modification of the extending pole-plates that I may adopt is by fixing thereto or forming thereupon in pairs *n n'* and *s s'* projections. (Shown by dotted lines in Fig. 5 and in profile in Figs. 4 and 6.) In this modification the neutral coils are cut out between the pole-plates (similarly to the position in the ordinary ring-armature) and not in the center, as specified in regard to Fig. 3, and the magnetic make and break takes place at or near the centers of the pole-plates. This construction I may apply to machines with armatures made up of an even number of coils, or to armatures of ordinary construction without projecting cheeks, and I may apply the projections on pole-plates in opposite pairs and not overlapping or stepped. By this construction of pole-plates I have the advantage of the currents from the inductive action being added to the currents made from the magnetic make and break. The currents from the coils are carried to a suitable commutator upon the axle of the armature, and thence by means of brushes to a working-circuit.

I may sum up the advantages of my improved magneto-electric machine, as of the preferred construction hereinbefore specified, and shown in the accompanying drawings, as follows: Simplicity and economy in the construction of the whole machine, the disposition of the armature in an odd number of coils enabling me to cut out a single coil in place of a pair of coils. All screws and holding-bolts are across the centrifugal action, and have not therefore any tendency to fly out during the rotation of the machine. The core-plates and coil-sections are detachably attached, thus offering great facilities for repairs, and allowing the coils to be separately wound in a lathe. The built-up construction of core-plates permits their manufacture in small pieces at a low cost by stamping. The double-ring construction of armature not only offers the advantages of a hollow and ventilated core, but enables the double-magnetic make and break to be utilized to its fullest extent.

Having now described and ascertained the nature of my invention and the manner of carrying the same into effect, be it known that what I consider novel, and desire to protect by Letters Patent, is—

1. In a magneto-electric machine, an annular armature-core composed of two parallel magnetically-insulated rings, formed by overlapping plates, attached by transverse screws to a spoked frame, substantially as hereinbefore described.

2. In a magneto-electric machine, the combination, in an annular armature, of a core composed of two parallel magnetically-insulated rings, formed by overlapping plates in pairs, attached by transverse screws to a spoked frame, and insulated armature-coils surrounding the respective pairs of core-plates, substantially as described, for the purposes set forth.

3. In a magneto-electric machine, the combination, in an annular armature, of a core composed of two parallel magnetically-insulated rings, formed by overlapping plates in pairs, attached by transverse screws to a spoked frame, insulated armature-coils surrounding the respective pairs of core-plates, and the within-described cheeks attached to the respective sides of the armature between its coils, substantially as shown.

4. In a magneto-electric machine, the combination, with the coiled-plate armature and side cheeks, of stepped or overlapped field-magnet poles, and projections thereon to obtain many magnetic makes and breaks, substantially as described.

London, September 15, 1883.

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