(No Model.) 2 Sheets—Sheet 1.

G. J. SCOTT.

ELECTROMAGNETIC MACHINE.

No. 529,085. Patented Nov. 13, 1894.

FIG. 1.

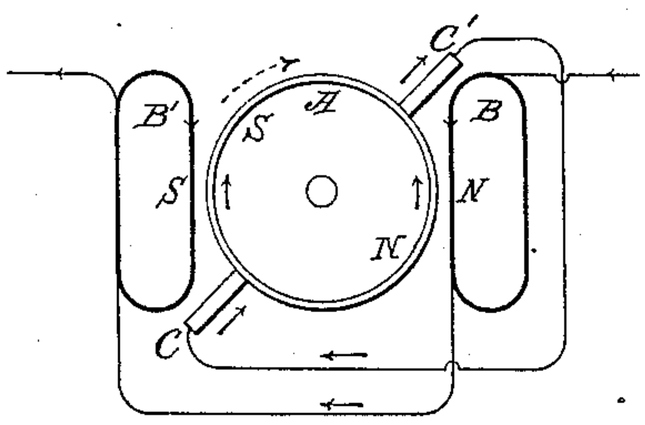


FIG. 7.

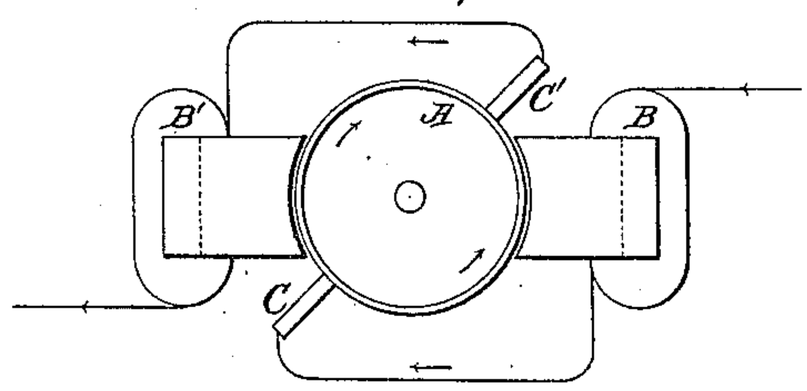


FIG. 8.

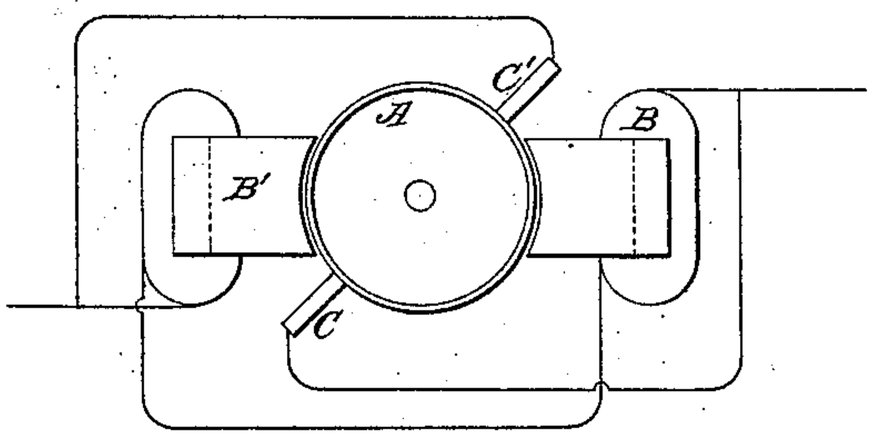


FIG. 9.

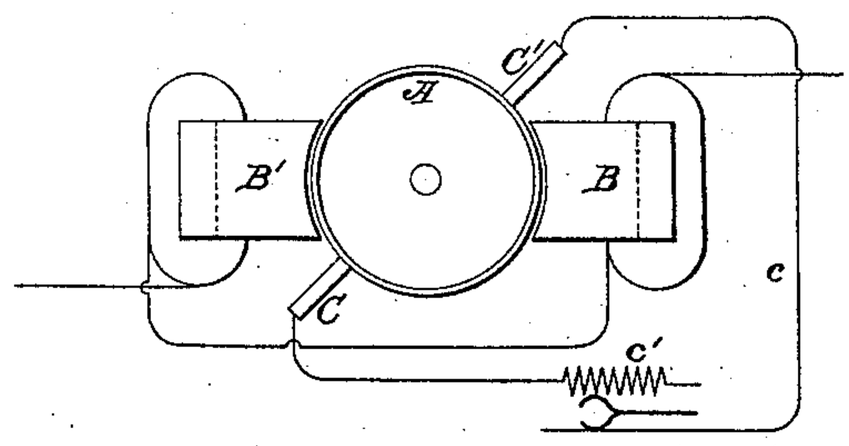
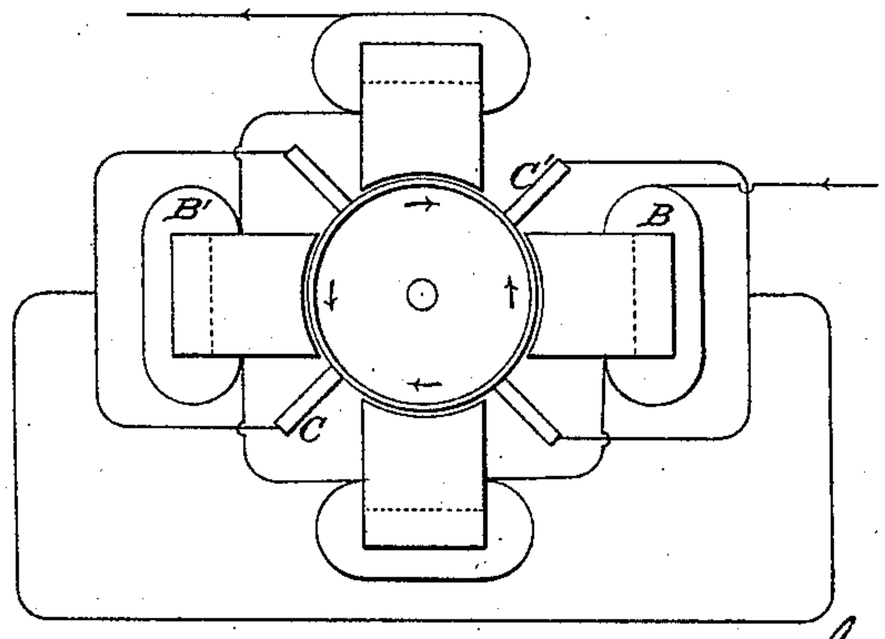


FIG. 10.



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(No Model.) 2 Sheets—Sheet 2.

G. J. SCOTT.

ELECTROMAGNETIC MACHINE.

No. 529,085. Patented Nov. 13, 1894.

FIG. 2.

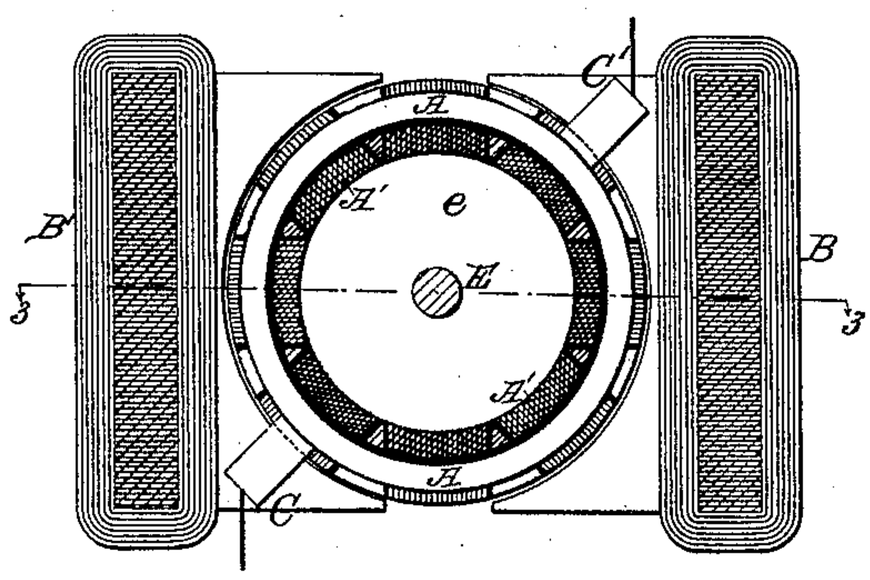


FIG. 3.

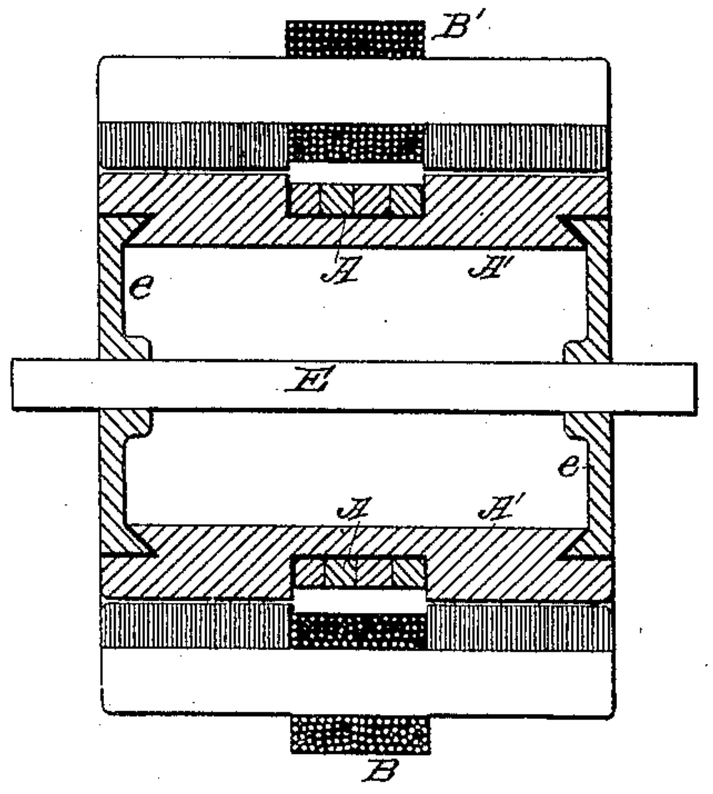


FIG. 4.

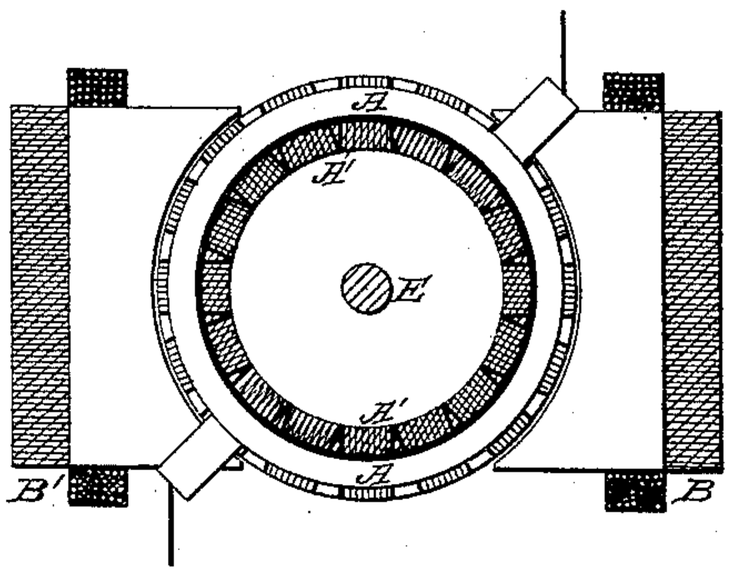


FIG. 5.

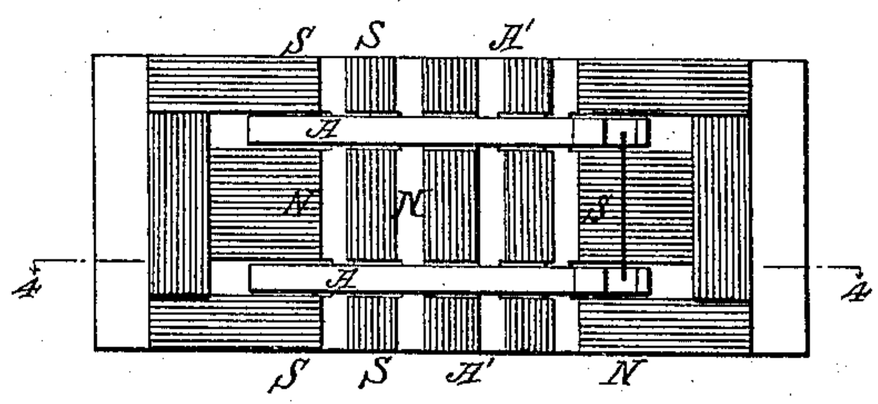
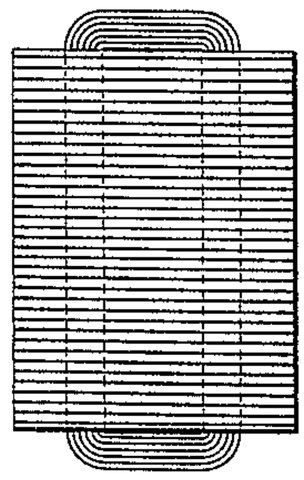


FIG. 6.



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UNITED STATES PATENT OFFICE.

GORDON J. SCOTT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO ALBERT H. HENDERSON, OF SAME PLACE.

ELECTROMAGNETIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 529,085, dated November 13, 1894.

Application filed June 12, 1894. Serial No. 514,326. (No model.)

To all whom it may concern:

Be it known that I, GORDON J. SCOTT, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented an Electromagnetic Machine, of which the following is a specification.

The object of my invention is to construct an electro-magnetic machine which, used as a motor, will be self-starting without any commutator and yet be quite light and small relatively to the power developed.

My invention is primarily designed for the construction of an alternating current motor which while embodying the advantages just referred to, will operate with a single phase current and be non-synchronous.

In the accompanying drawings, Figure 1 is a diagram illustrative of my invention. Fig. 2 is a vertical section, and Fig. 3 a sectional plan on the line 3—3, Fig. 2, of one form of motor constructed in accordance with my invention. Fig. 4 is a sectional view on the line 4—4, Fig. 5. Fig. 5 is a plan view, and Fig. 6 an end view, of another form. Figs. 7, 8, 9, and 10 are diagrams.

While my invention may be employed in the construction of direct current motors, it is more particularly designed for alternating current work, and I will first consider the invention with reference to its action as an alternating current motor.

If there be arranged on opposite sides of a closed conducting ring A, Fig. 1, two coils B and B′ wound to generate opposite poles on opposite sides of the ring A, and an alternating current or currents be supplied to the said coils, B, B′, the poles generated will tend to induce in the ring A in its opposite halves, opposed currents in the direction of its circumferential length. The full line arrows in the diagram, Fig. 1, may be taken as indicating the direction of flow at a given instant. If now, means be provided, as for instance, collectors C C′ in contact with the ring with their ends connected to afford a closed or other circuit for the flow of the currents induced in the ring A, there will be a continued flow through the ring as long as the coils B B′ are supplied with alternating currents. Such magnetic poles will be formed with such action and reaction upon each other that if the collectors be arranged in proper position with reference to the poles, at points displaced from the neutral plane to produce a distorted field, as indicated for instance in diagram, and the ring A be free to turn on its axis, it will tend to go into a symmetrical position by turning in the direction of the dotted arrow, and as such motion will only magnetically bring a fresh part of the ring into position, while keeping the poles stationary, I thus obtain a continued torque.

In applying my invention to practice for the construction of alternating current motors for power purposes, I need hardly say that the inducing coils and the closed ring are to be provided with laminated iron cores, but for some purposes, as in the case of a meter, an iron core for the closed ring A is not essential.

It should be understood at the outset that my invention may assume many different forms and shapes, and those illustrated in the drawings are only given by way of example. In these constructions, the part which carries the closed ring may be termed an armature, while the part which carries the inducing coils may be termed the field magnets. In practice it will be preferable that this armature part shall be the one to rotate, while the field-magnets and collectors are stationary, although as will be readily understood, the machine may be constructed with the armature stationary, while the field magnets and collectors rotate.

In the construction shown in Figs. 2 and 3, the iron core A′ of the armature is made up of a number of laminated iron sections insulated both electrically and magnetically from each other, and these sections are suitably mounted on, but insulated from, end plates or spiders *e* on the armature shaft E, which is to be mounted to turn in suitable bearings. In an annular groove in the armature body, but carefully insulated therefrom, there is secured a conducting ring A of copper or other suitable material closed upon itself so as to form a perfect hoop. The ring thus lies with its plane at right angles to the axis of rotation; or in other words, the ring lies in the plane of rotation of the armature or moving part. In practice, it will be well to laminate the ring circumferentially, as indicated in Fig. 3, to avoid hysteresis.

In the construction under consideration I have shown the motor as provided with two field magnets B and B′, with their polar projections on opposite edges of the ring A (Fig. 3), and the cores of these field magnets are so wound that the polar projections of the field magnet B on one side of the ring will be of the opposite polarities to those of the field magnet B′ on the other side of the ring.

In the present instance, if a section be taken through the machine in a plane parallel with the axis of the armature, as at 3—3 in Fig. 2, it will be seen, as in Fig. 3, that the cores of the armature and the field magnets are of U-shape or horse-shoe section. In any case, whether one or both cores be of the shape described, there should be left but a small clearance between the polar faces of the armature and field-magnets, and the construction should be such as to form practically complete magnetic fields around and including the ring A (Fig. 5).

The brushes or collectors which are to bear upon the ring A at different points in its circumferential length to provide a circuit for the currents in the ring may be mounted in any suitable holders, but such holders form no part of my present invention. I have indicated these collectors at C, C′ in Fig. 2, as arranged within the open spaces left between the projecting polar faces of the cores of the field magnets. These collectors may be connected upon closed circuit as indicated in Fig. 1, or they may be connected up with the mains, either in series with the coils B, B′, as indicated in the diagram, Fig. 7, or in shunt, as indicated in Fig. 8. It is however preferable for the alternating current motor to connect them up in closed circuit, as indicated in Fig. 1, because then the relation of the winding of the field-magnets to the ring is no longer of importance, and the field magnet coils may be wound for currents of comparatively high voltage. By providing in the closed circuit *c* an adjustable resistance, as at *c′*, Fig. 9, it will be readily seen that the torque or power of the motor may be controlled. The same result can be accomplished by adjusting the collectors and their holders in one direction or the other around the ring A.

The number of field magnets may be increased, of course, as may be found desirable for different machines or for different constructions of machines. Thus in Fig. 10, I have shown a machine with four field magnets or four groups of field magnets and as many collectors as there are field magnets, and these collectors may be connected in series or parallel with each other. I have shown them in parallel in this figure. So, again, the armature may be made up with as many closed rings A as the requirements of the machine may demand, each ring having its two or more collectors, and the collectors on the two rings may be connected up in series or in parallel with each other. Thus in Figs. 4, 5, and 6, I have shown the armature as provided with two closed rings A, A, with collectors connected up in series with each other. In this case, the cores of the field magnets are shown as of E-section with the coils wound on the middle legs, but as before, the winding is such as to give opposite poles on opposite sides of the rings A A and to form magnetic fields inclosing the rings A A. I have indicated by the north and south magnetic signs N and S in these figures the relative polarities at a given moment.

From the foregoing explanation it will be readily seen that my electro-magnetic motor when operating with alternating currents, and the collectors of the armature on closed circuit, is in the nature of a transformer with the secondary as the moving part and the construction is such that the primary and secondary coils and the magnetic fields and poles generated by those coils act together in their attractive and repulsive actions upon each other. My alternating current motor is therefore, no longer dependent on synchronism for efficiency, but is a non-synchronous self-starting machine which takes current in direct proportion to the load upon it. It may also be observed that my above described construction of motor possesses the advantage that the static pull or torque is the same for all positions of the armature with any given arrangement of the collectors and of the circuit including those collectors.

As I have heretofore indicated, my invention is applicable for use with direct currents but in such case the collectors would have to be connected up with the mains either in series with the field magnet coils (Fig. 7), or in shunt (Fig. 8).

I claim as my invention—

1. An electro-magnetic machine having an armature provided with a closed ring conductor or conductors lying in the plane of rotation, field magnets, and collectors bearing upon such ring or rings at points displaced from the neutral plane to produce a distorted field, and connected up in a suitable circuit for the flow of currents in opposite directions along the circumferential length of the ring or rings, substantially as and for the purpose set forth.

2. An alternating current electric motor having an armature provided with a closed ring conductor or conductors lying in the plane of rotation, field magnets to induce in said ring or rings opposed currents flowing along its or their circumferential length, and collectors bearing upon such ring conductor or conductors at points displaced from the neutral plane to produce a distorted field, and connected up in a suitable circuit, substantially as and for the purpose set forth.

3. An alternating current electric motor having an armature provided with a closed ring conductor or conductors and field magnets to induce in said ring or rings opposed currents in the direction of its or their circumferential length, and collectors bearing

upon such ring or rings at different points, displaced from the neutral plane to produce a distorted field and connected up in closed circuit, substantially as described.

4. An alternating current electric motor having an armature provided with a laminated core and a closed ring conductor or conductors carried by but insulated from said core, and field magnets having laminated cores and coils wound thereon, to form magnetic fields inclosing said ring or rings to induce therein opposed currents along the circumferential length of the ring or rings and collectors bearing upon the latter, at points displaced from the neutral plane to produce a distorted field, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GORDON J. SCOTT.

Witnesses:
H. F. REARDON,
FRANK E. BECHTOLD.