(No Model.)

O. E. H. KRAMER.

ELECTRIC MOTOR.

No. 545,591. Patented Sept. 3, 1895.

Fig. 1.

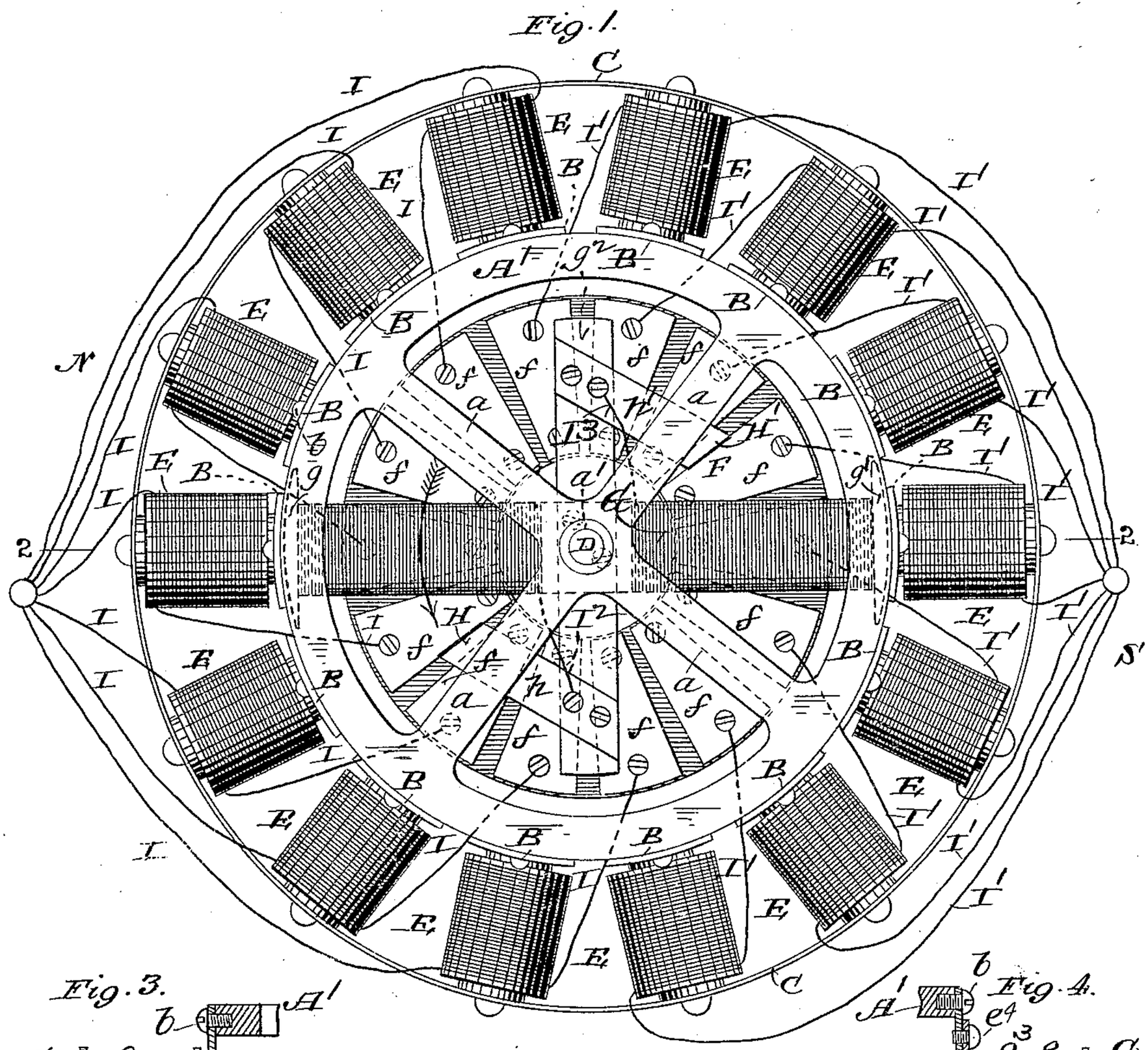

Fig. 3.

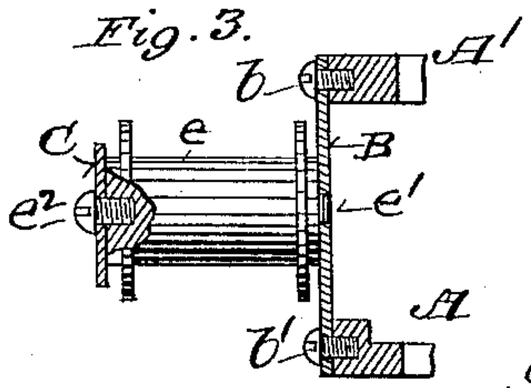

Fig. 4.

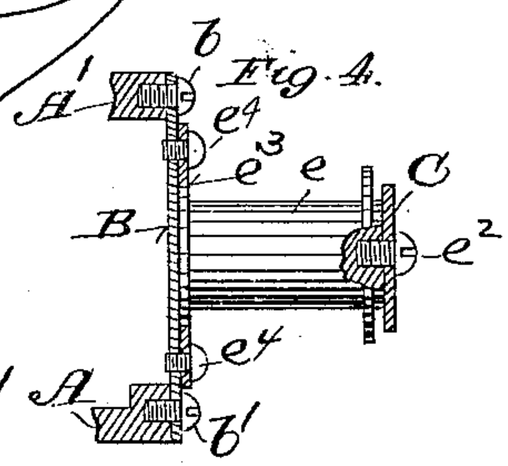

Fig. 2.

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OTTO E. H. KRAMER, OF ST. LOUIS, MISSOURI.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 545,591, dated September 3, 1895.

Application filed April 23, 1894. Serial No. 508,707. (No model.)

To all whom it may concern:

Be it known that I, OTTO E. H. KRAMER, of St. Louis, Missouri, have made a new and useful Improvement in Electric Motors, of which the following is a full, clear, and exact description.

An electric motor constructed according to the principle of the present improvement possesses several advantages. Its weight is light in proportion to its power. Its framing is well adapted to resist the strains incident to the uses of the motor. Its general form is a desirable one for many situations in which an electric motor is required to be placed. Its principal parts, especially the magnets, can, and without necessitating the dissection of the entire machine, be readily separated for repair or renewal. The construction is also a simple and compact one.

Considered generally, the motor is composed of an outer circular series of stationary magnets and an inner rotating armature; and it consists substantially as is hereinafter set forth and claimed, aided by the annexed drawings, making part of this specification, in which—

Figure 1 is a plan of the improved motor; Fig. 2, a vertical section on the line 2 2 of Fig. 1; Fig. 3, a sectional elevation showing one of the magnet-spools and the parts immediately therewith associated; and Fig. 4, a view analogous to that of Fig. 3, but showing a modified construction.

The same letters of reference denote the same parts.

The frame of the motor consists mainly of the under ring A, the upper ring A′, and the magnet-pole pieces B. An outer ring C is also employed, partly as an additional element of the frame, but more especially for magnetic purposes. The rings A A′ are of any non-magnetizable metal, and they are united and suitably spaced apart, substantially as shown, by means of the pole-pieces B, and the pieces are connected with the rings preferably by means of the screws *b b′*. The rings have inwardly-extending arms *a*, that at their inner ends are shaped to form, or are provided with bearings *a′* for sustaining the motor-shaft D, substantially as shown.

E E E represent a series of magnets extending circularly around the described frame. They are sustained in position by attaching them respectively to their pole-pieces B. The ring C is of iron, and it is attached to the magnet-spools *e* at the outer end thereof.

F represents the commutator. It consists of a series of suitable metallic plates, in number corresponding to that of the magnets and arranged to form a circular series, substantially as shown. The plates are sustained by the lower ring A and are suitably insulated by means of insulating material *f′*, substantially as shown.

G represents the armature. It is of suitable material, and it is in the form of a bar wound as shown and having pole-pieces *g g′* at its ends, respectively, and it is as long as the circle of pole-pieces B will permit, and it is fastened to the shaft D.

H H′ represent suitably-insulated commutator-brushes, which coact with the plates *f* as the armature is rotated. They are connected with the armature as follows: The brushes are attached to arms *h h′*, respectively, that in turn are attached to the ends, respectively, of an arm g^2 of the armature and that rotates with it. The motor has a north half N and a south half S. The electric current is led to the north half of the magnets over the wires I and from the south half over the wires I′. The wire I of each north magnet, after being wound around the magnet-spool, leads to the commutator-plate *f* belonging to the magnet.

I^2 represents a wire leading from the commutator-brush H to the armature and that is wound upon one end thereof. I^3 represents another wire leading from the other commutator-brush H′ and wound upon the other end of the armature. The wires I^2 I^3 are joined substantially as shown at *i*, Fig. 2.

The magnets coact in pairs—that is, each magnet and its commutator-plate in turn coact with the magnet and commutator-plate diametrically opposite; that is, the electric current passing to the motor passes to the north magnets over their wires I, thence to the commutator-plates, respectively, belonging to those magnets, thence to the brush H and over the wire I^2 to that end of the armature that is associated with the brush H, thence over the wire I^3 (the wires I^2 and I^3 being connected substantially as shown at *i*) to the

other end of the armature, and thence to the other commutator-brush H′ and plates *f*, and thence to the magnets at the opposite side of the motor, and out of the motor, and the armature carrying the shaft D and the commutator-brushes is in consequence caused to rotate, and as it rotates the current is transmitted through the pairs of magnets successively as the magnets of each pair become electrically connected through the commutator and armature, and each pair of magnets by means of the connecting-ring C becomes in succession a horseshoe-magnet.

The preferred mode of attaching the magnets to their support is shown in Figs. 3 and 4. The magnet-spool *e* at its inner end is provided with a threaded extension *e′*, that is adapted to be screwed into the pole-piece B, which in turn is suitably perforated to receive it, and the ring C is attached to the magnet-spools by means of the screws e^2. When it is desired to remove a magnet, its wires are loosened from their points of connection with the motor, the screw e^2 is removed, and the magnet-spool is unscrewed from its pole-piece. The ring C in small motors is sufficiently yielding to enable the magnet-spool to be unscrewed, as described, and when the spool is detached at both of its ends it can be withdrawn from its position. To reinstate it the described procedure is reversed.

In large motors it is preferable, instead of attaching the magnet-spool directly to the pole-piece, to provide it with an arm e^3, that in turn is by means of screws e^4 fastened to the pole-piece substantially as shown in Fig. 4. It is also obvious that by loosening the pole-pieces B from the rings A A′ the interior portion of the motor can be readily taken apart.

The ring C may be single or composite. No casing or support for the motor is shown. Such features of a construction such as is under consideration are well understood, and they may be varied in form to suit requirements.

I claim—

1. In an electric motor the combination of the field magnets radially arranged, the two diamagnetic frame pieces and a pole piece for each magnet whose ends are attached to said frame pieces and support the magnet, substantially as described.

2. The circular series of field magnets supported on an inner diamagnetic frame, an outer paramagnetic ring connecting the cores of the magnets, and an armature, substantially as described.

3. In an electric motor, the combination of a series of field magnets supported on an inner diamagnetic ring and having their outer poles connected by means of a paramagnetic ring, substantially as described.

4. In an electric motor, the combination of a series of field magnets each having a pole piece a frame within which the armature of the motor revolves, composed of two side pieces of diamagnetic material and to which the ends of the pole pieces of said field magnets are attached and a straight spool wound armature, and commutators for leading electricity from the field magnets to the armature coils and from the latter coils to the field magnets, substantially as described.

5. In an electric motor the combination of the outer circular series of magnets and the inner circular frame, the pole pieces of said magnets being parts of said frame, substantially as described.

Witness my hand this 18th day of April, 1894.

OTTO E. H. KRAMER.

Witnesses:
C. D. MOODY,
A. BONVILLE.