(No Model.)

E. M. WARING.

DYNAMO ELECTRIC MACHINE OR MOTOR.

No. 457,754. Patented Aug. 11, 1891.

Fig. 1.

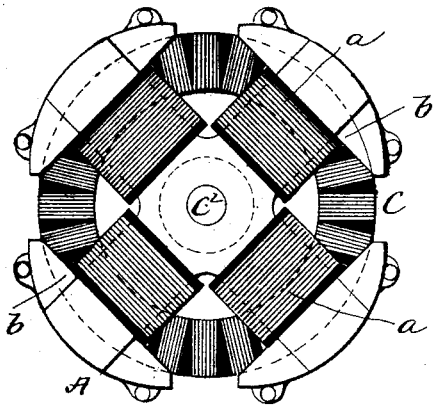


Fig. 2.

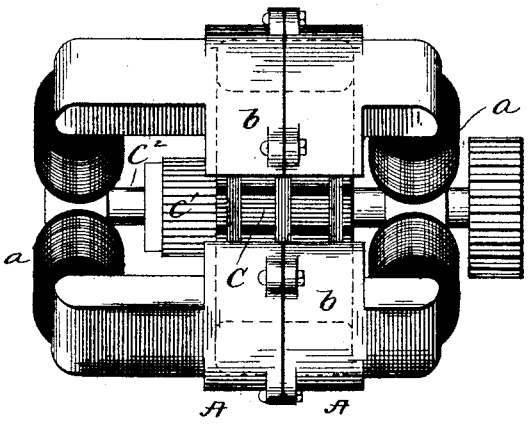
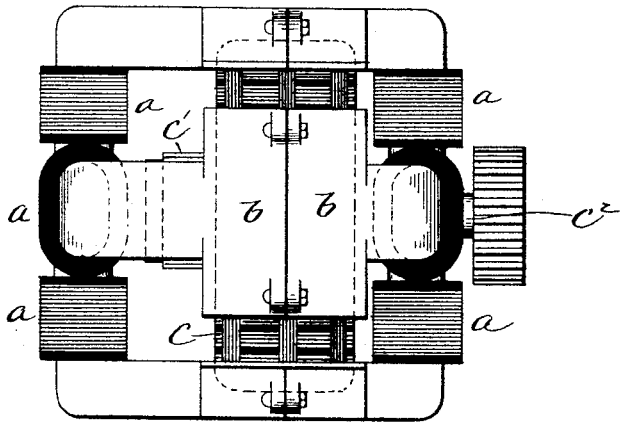


Fig. 3



WITNESSES:

Frank S. Ober.

Wm. A. Rosenbaum

INVENTOR

Edward M. Waring

BY

W. W. Johnston

ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWARD M. WARING, OF BROOKLYN, ASSIGNOR TO HIMSELF, AND JAMES G. WHITE AND JOSEPH F. PORTER, OF NEW YORK, N. Y.

DYNAMO-ELECTRIC MACHINE OR MOTOR.

SPECIFICATION forming part of Letters Patent No. 457,754, dated August 11, 1891.

Application filed March 23, 1891. Serial No. 386,157. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. WARING, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines and Motors, of which the following is a specification.

My invention relates to dynamo-electric machines and motors, the object being to provide such a machine which shall be cheap of manufacture, very compact in construction, and especially adapted as a motor for railway-vehicles.

In general terms, the invention consists of two field-magnet systems arranged one upon each side of the armature concentric with the armature-shaft or axis of rotation, the pole-pieces of each system being connected together to form consequent poles, the whole structure forming a cage inclosing and protecting the armature and commutator.

In the accompanying drawings, Figure. 1 represents an end elevation of my machine; Fig. 2, a side elevation thereof, and Fig. 3 a side elevation when the machine is turned forty-five degrees from the position shown in Fig. 2.

Referring to the drawings by letter, A A represent two castings, constituting the cores, yokes, and pole-pieces of the field-magnet system of the machine. These castings consist each of star-shaped portions occupying parallel planes and centered with respect to each other. Each arm of the castings constitutes a core of the field-magnet, upon which is placed a coil *a*. The arms or cores of the castings are placed, respectively, in the same radial planes, so that when their polar extensions *a'* are extended inward at right angles they will meet, as shown, thus forming a kind of cage. At the points where the pole-pieces meet they are enlarged and provided with cylindrical faces, forming the working pole-pieces *b b*, &c., of the machine. As shown in the drawings, the castings are divided on a plane midway of the pole-pieces. I prefer this construction. A division in the magnetic circuit at this point is less harmful than at any other point, but it is obvious that the castings may be connected on any desired plane or that they may be made in three or more parts. My invention comprehends simply this particular arrangement of the coils and pole-pieces without regard to the manner of constructing them. The magnet-cores on each side are joined together at the center, thus forming a star or cross, and the two combined forming a kind of cage.

C represents the armature, which, with this form of field-magnet, should be a Gramme ring of large diameter. C' represents the commutator located upon the shaft C^2, and the latter has its bearings in the center of the star-shaped portions of the casting. The star-shaped portions of the field-magnet and the coils therefore stand in planes at right angles to the armature-shaft.

In some types of railway-motors it is desirable to use a Gramme-ring armature of the largest possible diameter, and when the armature is very large it become necessary to contract the other parts of the machine in order that it will not occupy too much space on the vehicle. If the field-magnet coils were placed upon those parts of the magnetic circuit or pole-pieces which stand parallel to the armature-shaft, the machine would be unduly lengthened and would occupy too much space; but by placing the coils at right angles to the armature-shaft I can bring them very close to the ends of the armature, and the length of the machine will only be added to by the diameter of the coils, instead of their length. This is the peculiar advantage which my machine has. Another advantage is that I do away with all brackets or other similar supports for the shaft-bearings. The bearings are brought close together and are located in the most rigid and heavy portion of the machine.

My invention, obviously, is not confined to a four-pole machine. I may use any desired number of poles and secure the same advantages.

As shown is the drawings, the commutator is located on the shaft between the armature and one of the star-shaped castings, but, obviously, it may be inside of the armature, or at least a portion of it inside. In either case the field-circuit will be more evenly balanced and the machine more compact. The com-

mutator and armature, being located inside of the cage, are protected from injury and are in close relation for electrical connection.

I am aware that this general type of machine is not new, but so far as known to me the running parts have not all been located inside of the cage.

Having thus described my invention, I claim—

In a dynamo-electric machine or motor, a field-magnet consisting of two star-shaped formations carrying field-coils on their arms or branches standing in parallel planes, the arms or branches of the two formations being arranged in pairs in the same radial planes with their ends joined to form pole-pieces, in combination with an armature-shaft having its bearings in the center of each of said formations, and an armature and commutator located on the shaft and between the two said star-shaped formations, whereby a compact and symmetrical machine is produced in which the commutator and armature are protected from injury.

In witness whereof I have signed my name in the presence of two subscribing witnesses.

EDWARD M. WARING.

Witnesses:

FRANK S. OBER,

WM. A. ROSENBAUM.