(No Model.)

F. K. FITCH.

ARMATURE FOR DYNAMO ELECTRIC MACHINES.

No. 312,111. Patented Feb. 10, 1885.

Fig. 2.

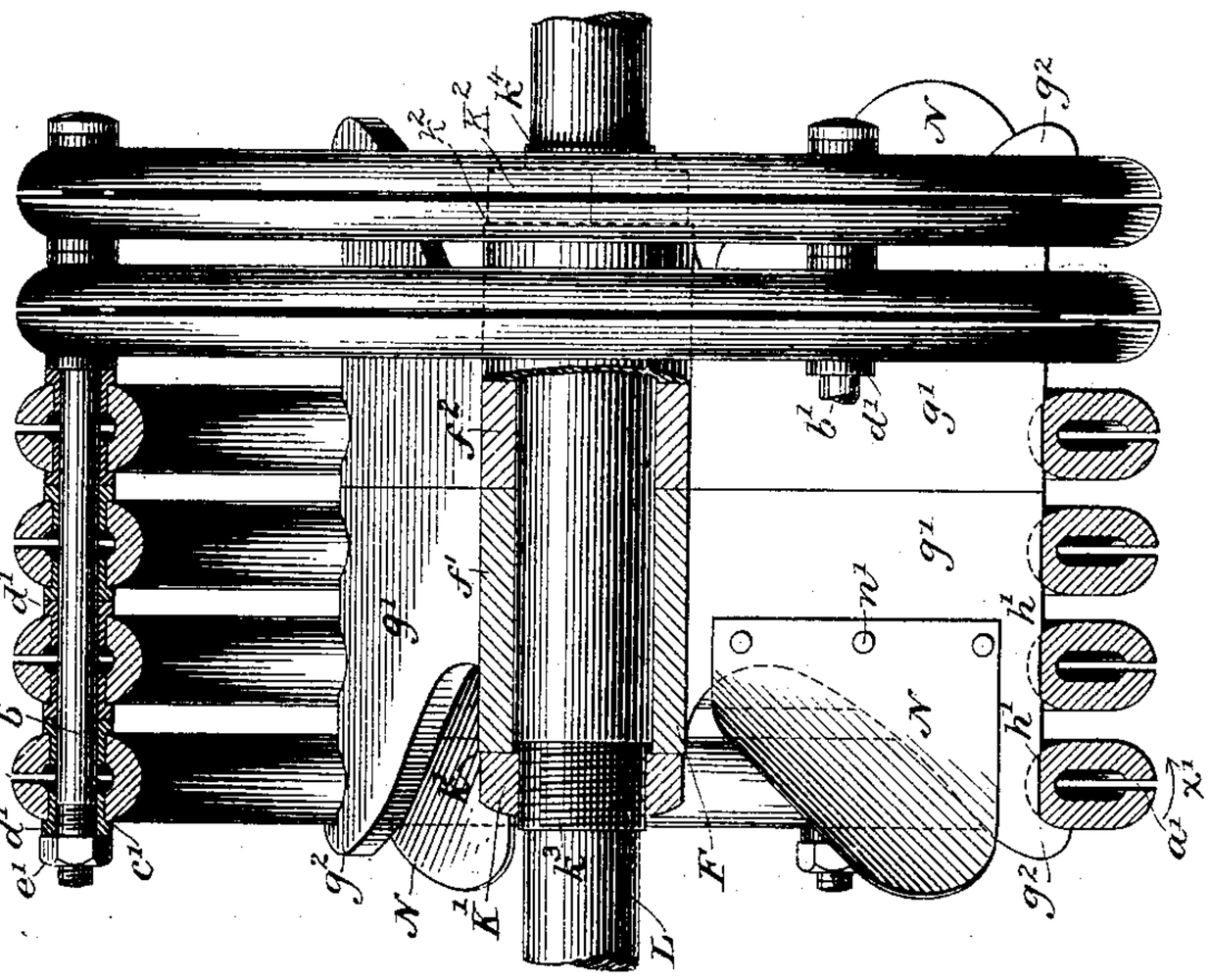
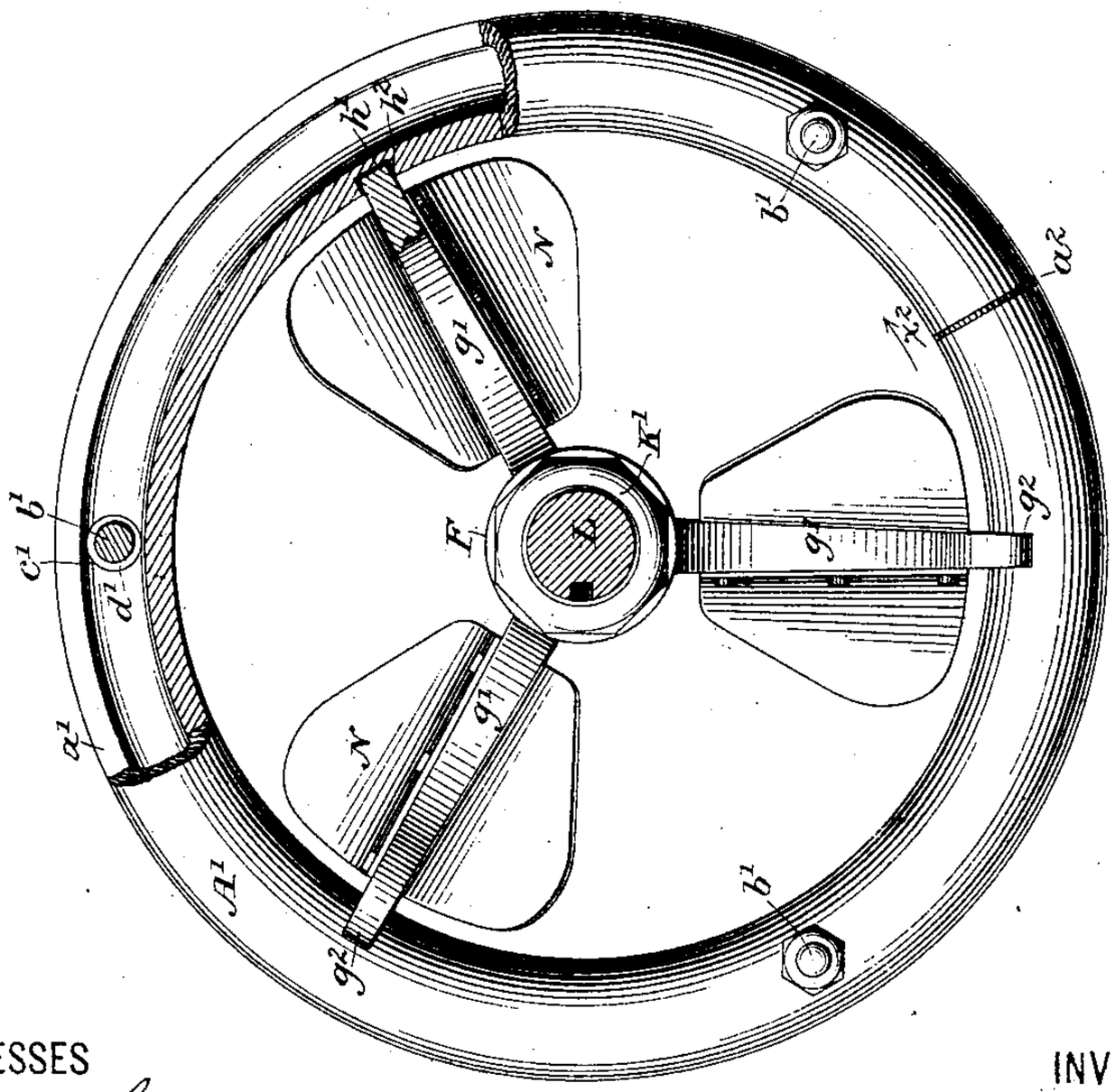


Fig. 1.



WITNESSES

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ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 312,111, dated February 10, 1885.

Application filed March 5, 1884. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK K. FITCH, a citizen of the United States, residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Armatures for Dynamo-Electric Machines, of which the following is a specification.

The invention relates to the class of apparatus employed for magnetically generating electric currents by causing a mass of inductive material to revolve within an electro-magnetic field.

The object of the invention is to provide an armature which is simple and economical in its construction, adapted to bring a sufficient mass of inductive material into a form convenient for revolving within a magnetic field, and which is not liable to become unduly heated when continuously revolved in the magnetic field.

The invention consists in constructing the foundation or inductive portion of an armature in substantially the following manner: A series of tubular rings having approximately the diameter which it is desired to give to the armature are placed side by side and secured together by bolts extending parallel with the axis. They are, however, prevented from making magnetic contact with each other, and are at the same time electrically insulated from each other by means of washers of non-magnetic and non-conducting material. The tubular rings are, moreover, preferably somewhat flattened, so that a cross-section of the same will be an oval in form. By this means a greater number of rings may be placed side by side in forming an armature of a given length, and the mass of metal is thus increased, the depth of tubes forming the rings being at the same time increased.

For the purpose of preventing the possibility of any electric currents circulating through the individual tubes forming the rings in planes cutting the axis of the armature a slot is preferably formed at some point—preferably the outer periphery—of each tubular ring, thereby rendering the cross-section of the same at any point incomplete or open at one point. The individual rings are also preferably opened by a transverse slit or cut at some point.

The entire series of rings having been secured together, they are placed upon an axis extending transversely through their centers and adapted to revolve them within a field of force, in a manner well understood. For the purpose of accomplishing this a supporting-hub is formed in two sections, which are adapted to slip over the supporting-shaft, and to be bound in position by means of suitable check-nuts placed upon the shaft at the opposite extremities of the two hub-sections. Suitable radial spokes extend from the hub to the rings constituting the outer circle of the armature. The ends of these spokes are preferably mechanically and electrically separated from the rings by means of caps of non-magnetic and non-conducting material. The outer ends of these spokes are provided with suitable lugs for preventing the rings from moving laterally. The armature thus constructed is wound with coils of insulated wire in any suitable manner, preferably after the form known as the "Gramme ring." An armature constructed in this manner has a large number of air-spaces, both upon the outer surfaces of the rings, as well as upon the inner surfaces of the tubes, through which cooling-currents of air may circulate during the operation of the machine. It may, however, be desirable in some instances to add still further to the cooling properties of the armature by adding to the spokes or web of the hub suitable fans or flanges, which are so disposed that they will force the air to enter into the interior of the armature when it is being revolved.

The invention will be more fully described in connection with the accompanying drawings, in which Figure 1 is a front elevation, partly in section, of the inductive portion of the armature. Fig. 2 is a vertical transverse section of the same.

Referring to these figures, A' A^2 A^3, &c., represent a series of tubular rings of soft iron, which form the essential portion of the inductive part of the armature. These rings are preferably flattened by being placed under a drop-forge, or in some other suitable manner,

into approximately the form shown at A'. The rings, having been thus flattened, are cut open by means of a slot, a', extending around the entire circumference, and thus rendering the cross-section of the same in the form of an oval open at one point. These slots a' will prevent the circulation of any electric currents in the armature in the direction indicated by the arow x'. It is found that during the revolution of the armature electric currents are liable also to be set up in a direction indicated by the arrow x^2 or in the opposite direction, according to the direction of revolution of the armature. For the purpose of preventing any such currents from being established, I prefer to open each ring at some point by means of a transverse cut, a^2. The two ends thus formed may, if desired, be united with each other mechanically by means of a suitable non-conducting material—such, for instance, as vulcanized fiber—the rings having been thus formed with the openings a' and a^2 placed side by side and secured together by transverse bolts or rods b' extending through apertures c'. These bolts are preferably insulated from the rings by means of washers d', surrounding the bolts, and the washers d' are also preferably constructed with heads e', which intervene between the adjacent surfaces of the rings. In this manner the rings A are kept from actual contact with each other. The material which I prefer to use for this purpose is vulcanized fiber, though other non-magnetic and insulating materials may be employed. The rings having been thus secured side by side in their proper relative positions are then placed upon a hub, F, which is formed in two sections, f' and f^2, each section being provided with radial arms or spokes g'. A series of spokes, g', preferably three or four in number, is provided for each of the hub-sections. These spokes are provided with widened ends, so that when the two hub-sections are placed in position upon the shaft a supporting-surface for the series of rings will be formed by each pair of spokes in length equal to the length of the series of armature-rings. The outer edges of the spokes are provided with lugs g^2, which project outwardly a sufficient distance to prevent the rings from moving laterally off from the spokes. Suitable apertures, h', are formed in the rings for receiving the ends of the spokes g'. The apertures are lined or the spokes are capped with sections of non-magnetic and insulating material, as shown at h^2.

The sections f' and f^2 of the hub F are designed to fit against each other upon their inner ends, while their outer ends are preferably provided with enlargements or seats k' and k^2, for receiving suitable nuts, K' and K^2, which turn in corresponding threads, k^3 and k^4, formed upon the shaft L. The rings having been placed upon the spokes, the nuts are screwed tightly, so that the two sections of the hub are bound together, and in this manner the entire armature is locked in position, the lugs g^2 serving to bind the rings upon the spokes laterally. Each section of the hub is preferably keyed to the shaft to hold it in its proper relative position. The armature having been put together in this manner, it is wound with insulated conductors in the manner employed in constructing a Gramme ring, or in any other suitable manner, and it may be placed in the field of any suitable form of field-magnets.

For the purpose of adding to the quantity of air which is caused to circulate in the armature through the openings between the rings, I prefer to place upon the outer spokes, g', suitable fans or webs, N, at each end of the armature. These fans serve, under the influence of the revolving motion given to the armature, to cause the air to circulate from without into the interior of the armature, thereby keeping a constant supply of cool air circulating through the armature. The fans N preferably consist of wide plates, which are secured to the spokes by bolts or screws n', and they are preferably placed at an angle to the axis of revolution. The fans may, however, be cast with and form a part of the hub-sections.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a series of tubular rings placed side by side, magnetically separated and electrically insulated from each other and supported upon a shaft, substantially as described.

2. An armature for dynamo-electric machines, consisting of a series of rings magnetically separated and electrically insulated from each other, each of which rings is constructed with a circumferential opening or slot and a supporting-hub for said rings.

3. An armature for dynamo-electric machines, consisting of a series of tubular incomplete rings having circumferential openings formed in the same, a hub for supporting said rings, and a shaft upon which said hub is carried.

4. The combination, substantially as hereinbefore set forth, of a series of tubular rings, a hub formed in two sections, upon which said rings are supported, and means, substantially such as described, for insulating said rings from said hub-sections, a shaft upon which said hub-sections are supported, and nuts for binding said sections in their proper relative positions upon said shaft.

5. The combination, substantially as hereinbefore set forth, with an armature for dynamo-electric machines, consisting of an annular mass of inductive material and radial spokes for supporting the same, of a series of fans or webs attached to said spokes and extending within said rings at an angle to the axis of revolution of said armature.

6. The combination, substantially as hereinbefore set forth, with a tubular ring forming a section of an armature for a dynamo-electric machine, of a bolt extending through

the same for binding it in its proper relative position with reference to the other sections, and an insulating-washer intervening between said bolt and said ring, and provided with a lateral enlargement for separating said ring from a succeeding ring, substantially as described.

7. The combination, substantially as hereinbefore set forth, of the series of flattened rings A, the rods binding them together, the supporting-hub, and the shaft carrying said hub.

In testimony whereof I have hereunto subscribed my name this 4th day of March, A. D. 1884.

FREDERICK K. FITCH.

Witnesses:
DANL. W. EDGECOMB,
CHARLES A. TERRY.