(No Model.)

# J. J. WOOD.

## ELECTRICAL ARMATURE.

No. 262,529. Patented Aug. 8, 1882.

FIG-1-

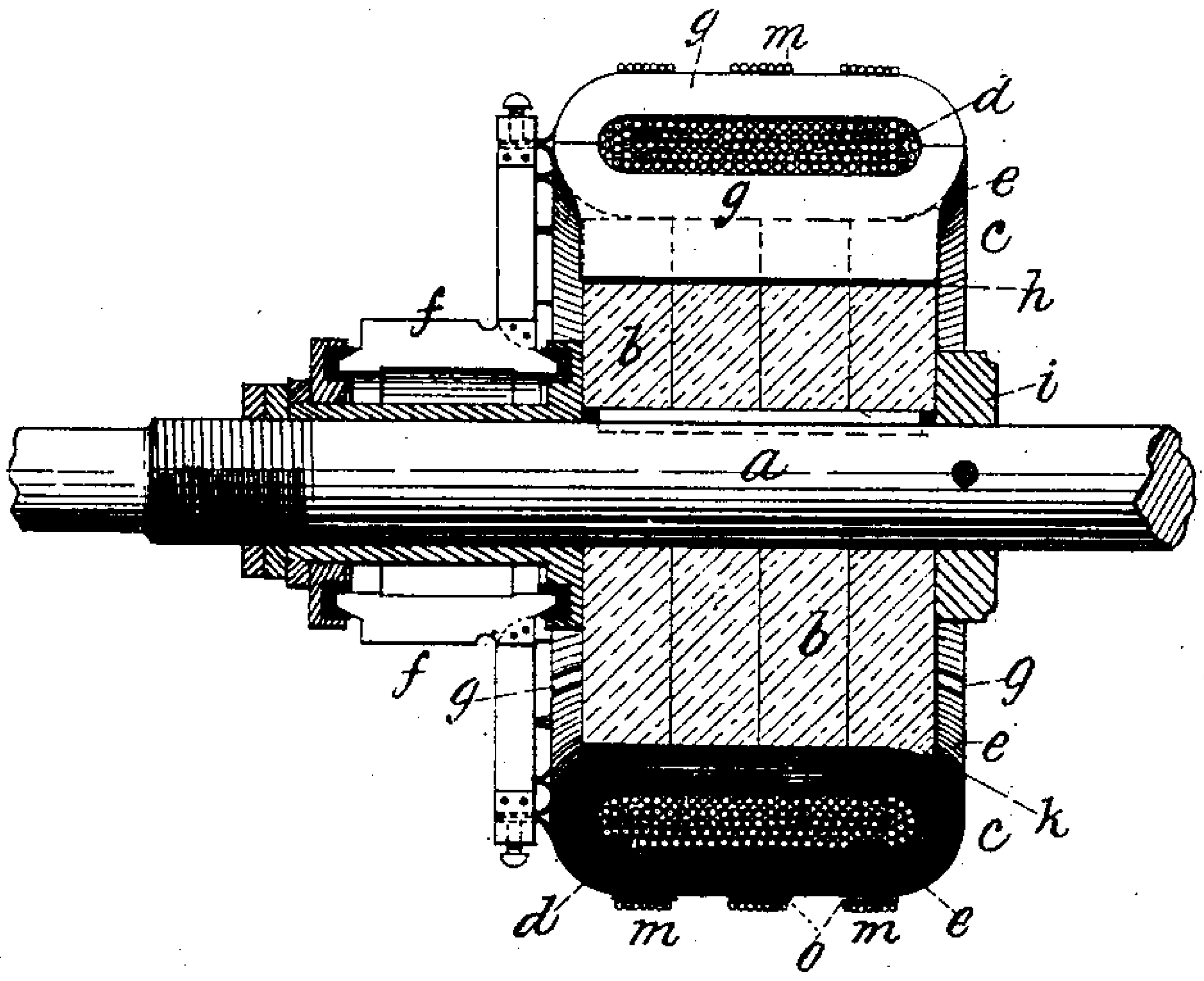



FIG-2-

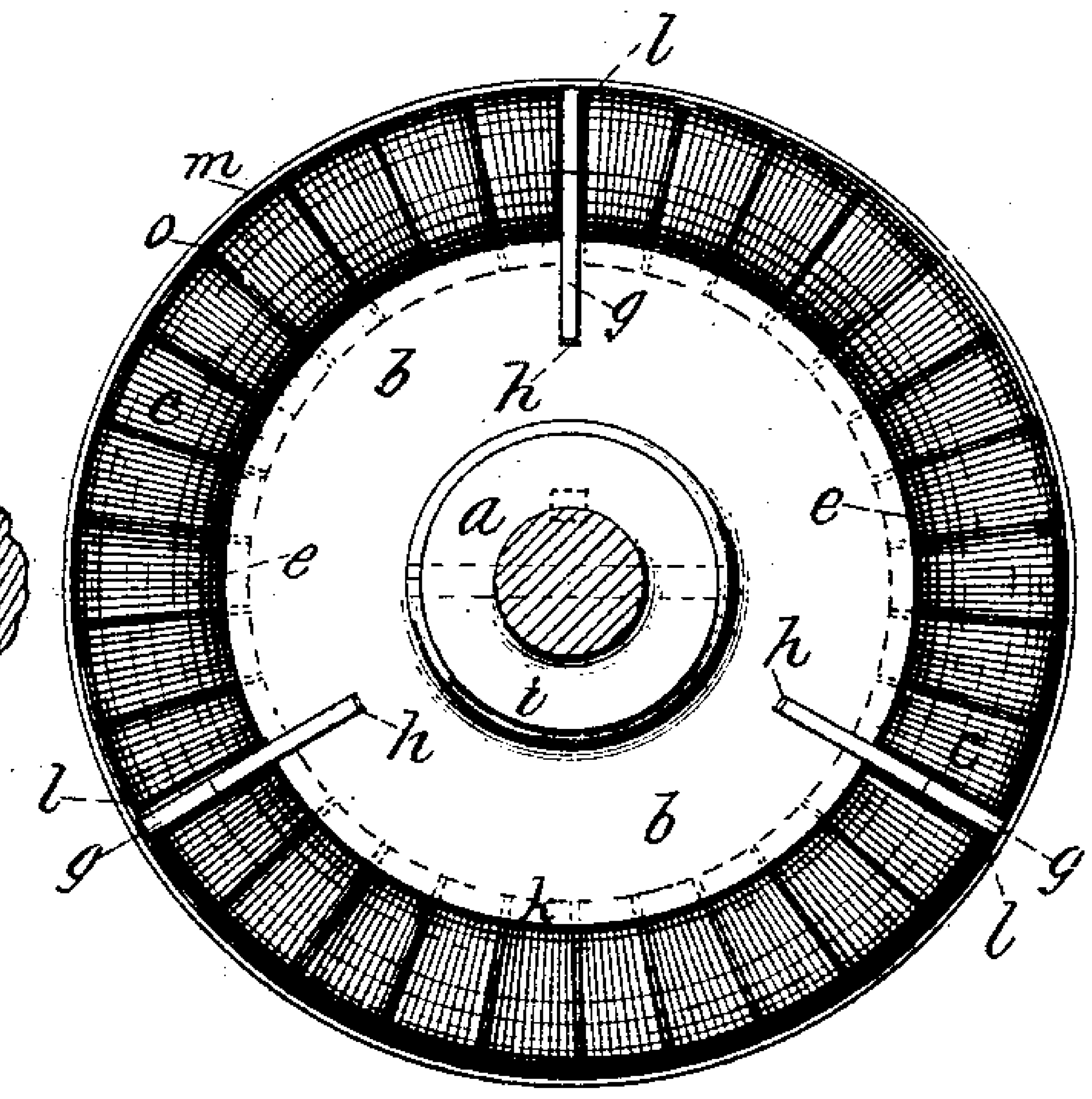



FIG-3-

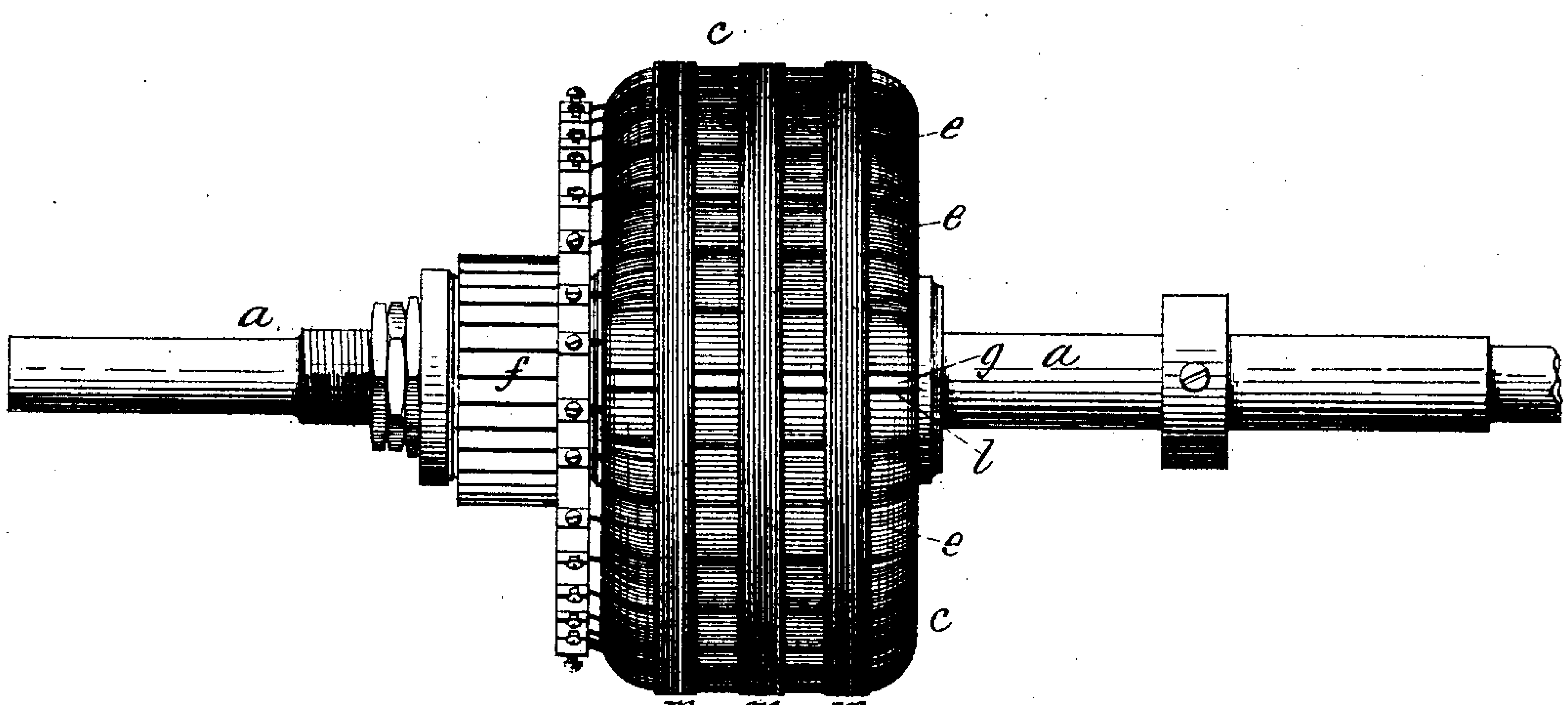
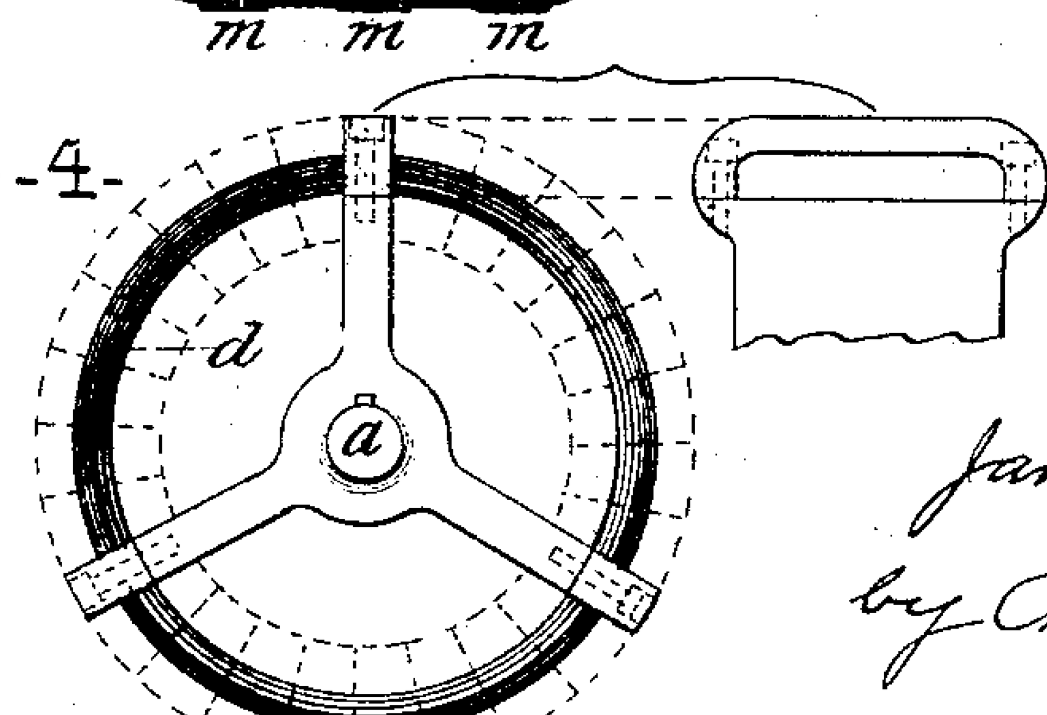



FIG-4-

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# UNITED STATES PATENT OFFICE.

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## ELECTRICAL ARMATURE.

SPECIFICATION forming part of Letters Patent No. 262,529, dated August 8, 1882.

Application filed July 2, 1881. Renewed June 21, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES J. WOOD, of Brooklyn, Kings county, New York, (assignor to THE FULLER ELECTRICAL COMPANY, of New York,) have invented certain new and useful Improvements in Electrical Armatures, of which the following is a specification.

My present improvement applies especially to the well-known Gramme form of armature for dynamo-electrical machines, and it aims to secure the annular-coil portion or armarture proper to its hub or shaft in a positive and rigid manner in its direction of rotation, which will obviate the displacement of the armature or its coils by the strains to which it is subjected while in use.

The Gramme armature, as is well known, consists of an annular or cylindrical coil of iron wire, forming a central magnetic core on which the electrical generating-coils of copper wire are wound radially in closely-succeeding sections, each of which connects to corresponding sections of the commutator. The armature is thus a complete compound ring of closely-wound iron and copper wire, and hence possesses considerable weight. Heretofore this ring-armature has been simply forced onto a wooden hub, which is in turn keyed to the shaft, the tight frictional fit of the armature-ring on the hub being relied on to hold it from displacement; or in some cases, in accordance with a previous invention of mine, I have employed an expanding hub to obtain a better frictional grasp upon the armature. As the armature is, however, quite heavy, and is revolved at high speed, it is subjected to great centrifugal strain, which frequently causes it to expand appreciably and relax its grasp upon the hub, thus allowing it to slip and become displaced thereon. In addition to this centrifugal strain, there exists the radial attraction of the field-magnets, which constantly tends to expand and relax the armature on the hub in the same way. Again, if the armature is started quickly, or if the circuit of the machine is closed while the armature is being revolved rapidly in an open circuit, the great inertia of the heavy armature in the one case or the sudden resistance offered to its rotation in the other tends to make the hub turn in the armature, and thus relatively displace the two or injure some part of the generating-coils or their connections with the commutator, which in fact frequently happens in practice. In addition to these occasional strains, there is the steady and strong attraction of the field-magnets when the armature is in action, which offers a constant resistance to its rotation and tends to hold it stationary, while the tendency of the power-driven hub is to turn within it.

According to my improvement I introduce at intervals thin plates or similar projections between the coil-sections of the armature, embracing the iron core and projecting into or secured to the hub, thus producing a positive rotating connection between the armature and its hub, which entirely obviates the aforementioned objections.

My invention therefore consists mainly in this feature, and also in minor details, amplifying the same, as hereinafter fully set forth.

In the annexed drawings, Figure 1 gives a diametrical section of a Gramme armature embodying my improvement. Fig. 2 is an end elevation thereof, and Fig. 3 a plan view. Fig. 4 shows a modification.

In these drawings, A indicates the driving-shaft of the armature, which is formed, mounted, and driven in the usual way. To about the middle of this shaft is keyed a hub, *b*, preferably of wood, as usual, and of a size to fit the interior of the annular armature, which is indicated by *c*. In this case, however, the hub is an easy fit for the armature, instead of a tight-driving fit, as heretofore. The armature *c* is composed, as usual, of a core, *d*, of iron wire, wound in the preferred shape of a hollow cylindrical coil with rounded ends, as well shown in Fig. 1. On this core are wound radially the electrical generating-coils *e*, of copper wire, which follow each other in closely-succeeding radial layers around the iron core in the usual manner, the opposite ends of which connect to corresponding sections of the commutator *f* in the well-known manner, as illustrated. At one or more points, however, in the circumference of the armature thin projections or plates *g g* are introduced between the coils, which latter are wound tightly on either side thereof, and these plates project therefrom inwardly toward the hub, and are adapted to lie in and engage with corresponding slots *h* cut radially in the periphery of the hub *b*, thus making a positive rotating or driving connection between the annular armature and its central hub. The plates *g g* are made of thin brass or other non-magnetic material, and they are preferably so formed as to completely embrace the iron core and to exactly correspond in their external outline with the external outline of the copper coils, so as to rise flush with the exterior of the armature or slightly above the same on the periphery, and they have an inward prolongation or wing, which engages the slots in the hub, as before described, and fully illustrated in Figs. 1 and 2. The plates *g g* are preferably made in halves where they encircle the core *d*, so that the halves may be readily fitted onto the core and afterward soldered together at the joint, as will be understood from Fig. 1. These plates are preferably three in number, as seen in Fig. 2; but the number may be more or less, and they are of course placed on the core either before or during the operation of winding the copper coils thereon, and are arranged at the proper intervals apart and tightly embedded between the succeeding coils, as shown, while thin sheets *l*, of insulating material, are placed on either side of the plates to insure perfect insulation between the same and the adjacent coils.

The hub *b* abuts at one end against a collar, *i*, fixed on the shaft *a*, and this end of the hub is formed with a slight enlargement or flange, *k*, at its peripheral edge, against which one end of the annular armature fits, as shown in Fig. 1, thus restraining the armature from further endwise movement in this direction. The opposite end of the hub, as well as the middle portion, is a free fit for the interior of the armature, so that when the projecting plates *h h* of the armature are properly registered with the slots of the hub the armature may be easily slid upon the hub from this end, as will be understood by Fig. 1, and when the commutator is secured on this end of the shaft and forced against the end of the hub and the connections made with the coils of the armature the armature will thus be secure against longitudinal displacement in either direction on the hub. When, however, the commutator is loosened, the armature may be readily slid off the hub when occasion requires it—such, for instance, as to repair a damaged or short-circuited coil, as will be readily understood.

It will hence be seen that by the described construction not only do I form a positive rotating connection between the armature and its hub of both a simple and certain character, which, while not interfering with the functions of the armature, entirely obviates the difficulties before named, and enables the parts to resist the strains to which they are subjected and completely prevents the turning or loosening of the hub in the armature, whether by the centrifugal strain of rotation, the attraction of the field-magnets, or the inertia or momentum of the armature; but, in addition to this security, the armature is yet capable of being easily removed and replaced when required, thus fulfilling the object of my invention and presenting a material improvement in armatures of this class. When the winding of the coil portion of the armature is completed the external periphery of the armature is wound, as is now usual, with three parallel bands, *m*, of strong brass wire, as shown best in Figs. 1 and 3, which bands are soldered either to the edges of the plates *g* or to transverse copper strips placed under them, tapes *o o* being previously wound under the wires to insure insulation. These brass-wire bands thus serve to bind the armature firmly and protect the periphery of the coils from any friction or contacts while revolving in the polar or armature socket of the field-magnets.

I prefer to employ the construction already described and illustrated—that is, using a wooden hub with peripheral slots, and radial plates fixed in and to the armature to engage with the slots of the hub, as set forth, as this construction is efficient and cheap, as well as light by reason of the wooden hub. In some cases, however, the hub may be made of brass, as in Fig. 4, with thin radial blades or spokes, which are embedded between the sections of the armature in the same way as the plates *g g*. The outer ends of the spokes are divided in a line with the inner periphery of the armature-core, but connected with the inner portion of the spokes by screws, as illustrated in Fig. 4, so as to permit of the attachment and detachment of the armature from the hub, as will be readily understood.

What I claim is—

1. An annular or Gramme armature formed with radial plates or bars embedded between its coils embracing the core, and a hub or shaft to which the radial plates are secured, substantially as herein set forth.

2. The combination, with an annular armature and its driving-hub, of plates or projections extending radially from the armature, embedded between the coils or sections and engaging with the hub, substantially as and for the purpose set forth.

3. An annular armature formed with one or more radial plates or projections introduced or embedded between its coils or sections, in combination with a central hub formed with corresponding slots to engage therewith, substantially as and for the purpose set forth.

4. An annular or Gramme armature constructed with a plate or plates, *g*, introduced or embedded radially between its coils and encircling the core thereof, with a prolongation extending therefrom and adapted to engage with the driving-hub, substantially as and for the purpose set forth.

5. A Gramme or annular armature con-

structed with one or more plates or projections extending radially therefrom, in combination with a driving-hub adapted to enter the armature from one end, and provided with one or more peripheral slots or recesses to engage said projections, and a projecting peripheral flange or shoulder on one end, whereby the armature may be easily slid onto or off from the hub, yet obtains a positive driving connection therewith when placed thereon, substantially as herein shown and described.

JAMES J. WOOD.

Witnesses:
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