(No Model.) 3 Sheets—Sheet 1.

C. G. CURTIS.

ARMATURE FOR DYNAMO ELECTRIC MACHINES OR MOTORS.

No. 473,568. Patented Apr. 26, 1892.

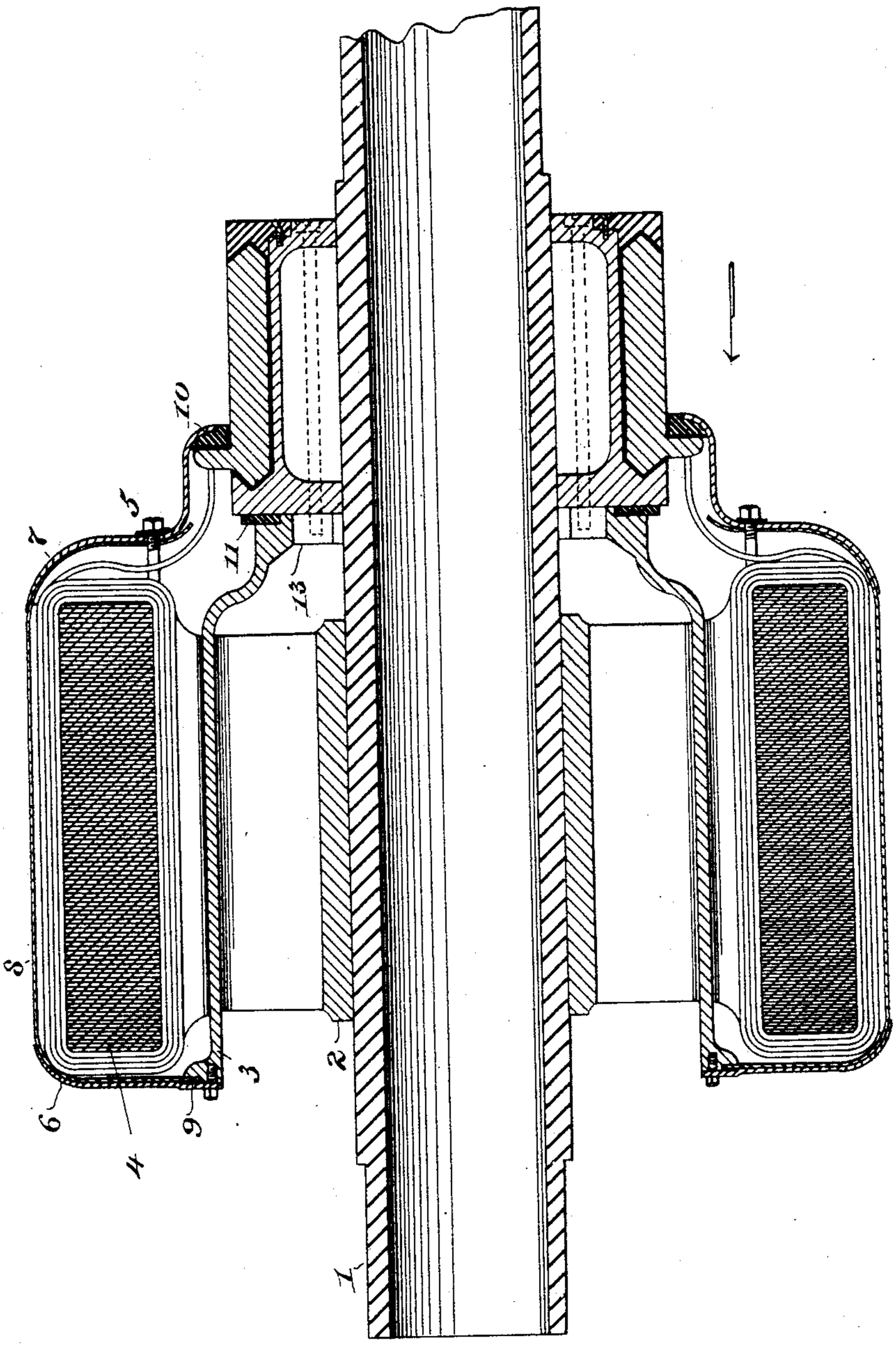

Fig. 1.

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by Read & Price
his attorneys —

(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

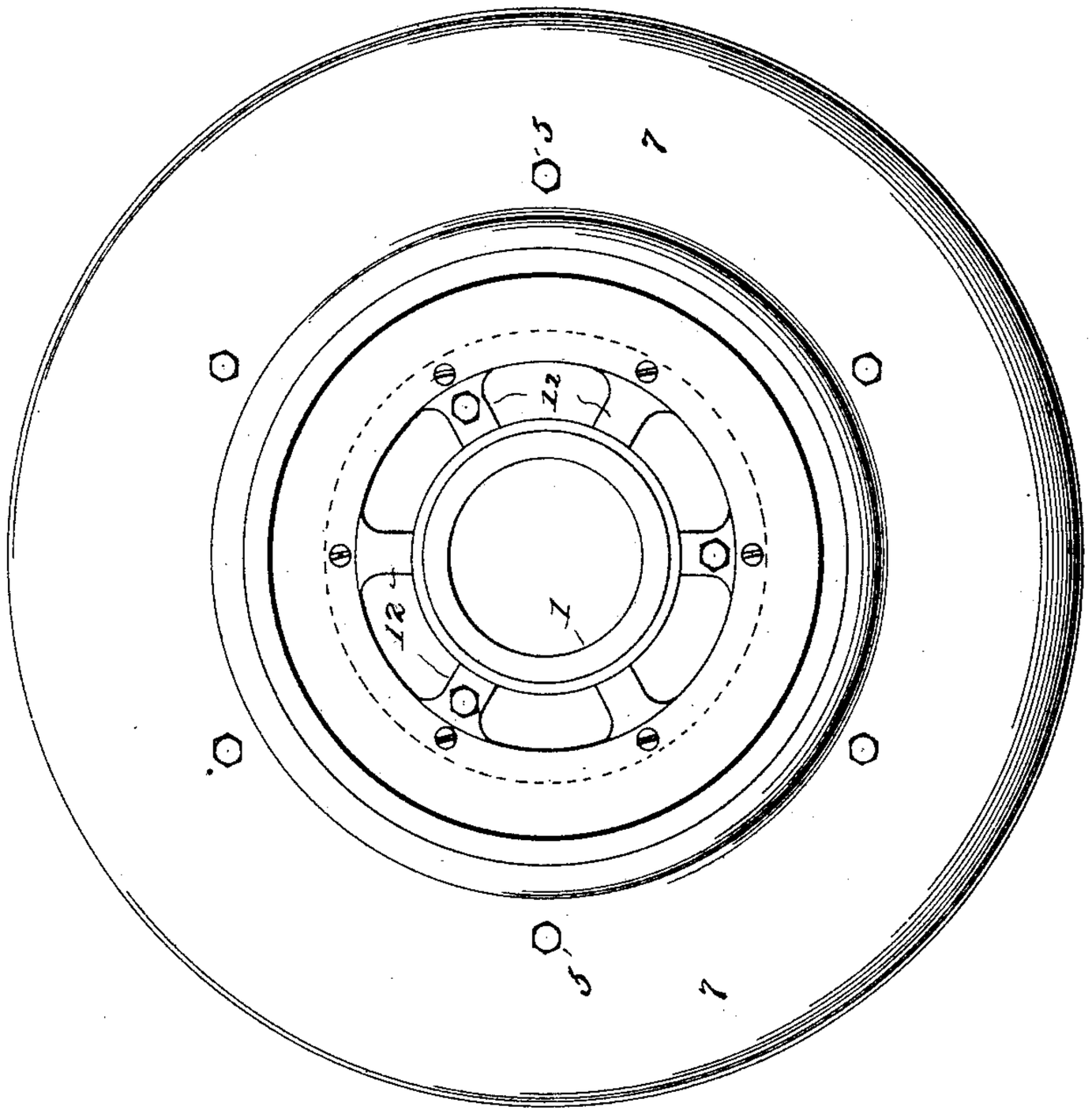


Fig. 2.

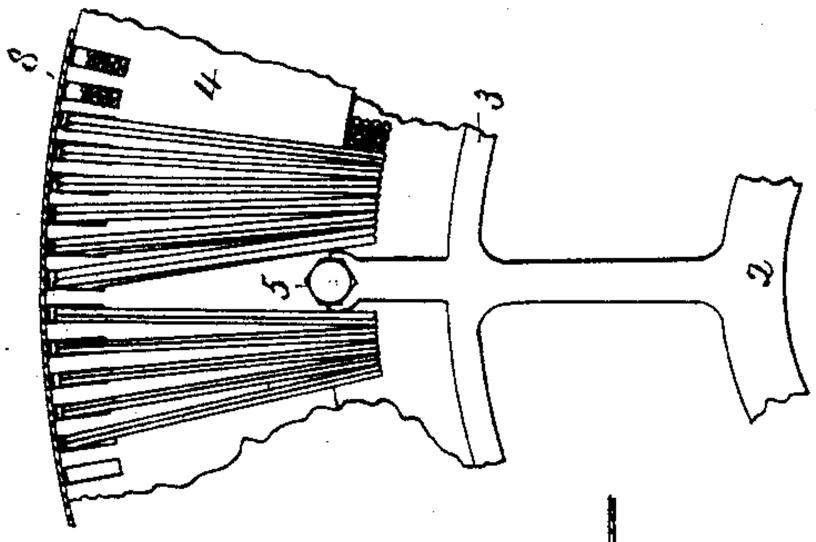


Fig. 4.

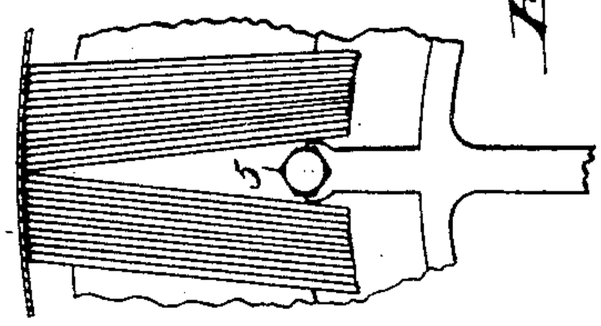


Fig. 5.

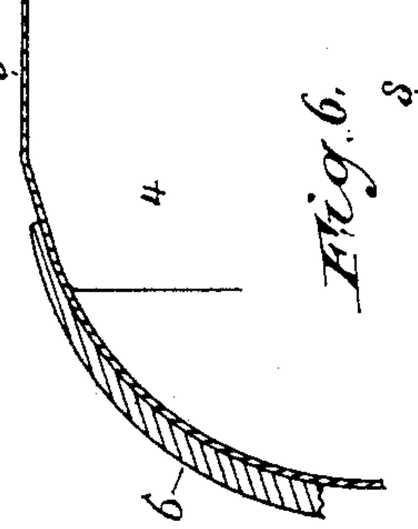
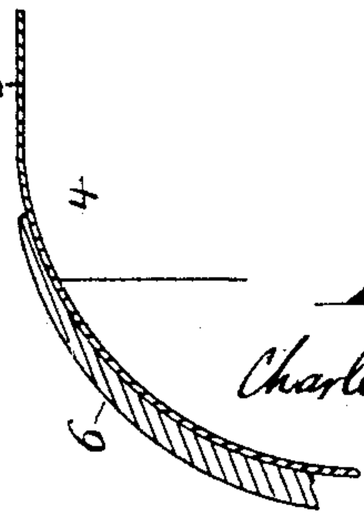


Fig. 6.



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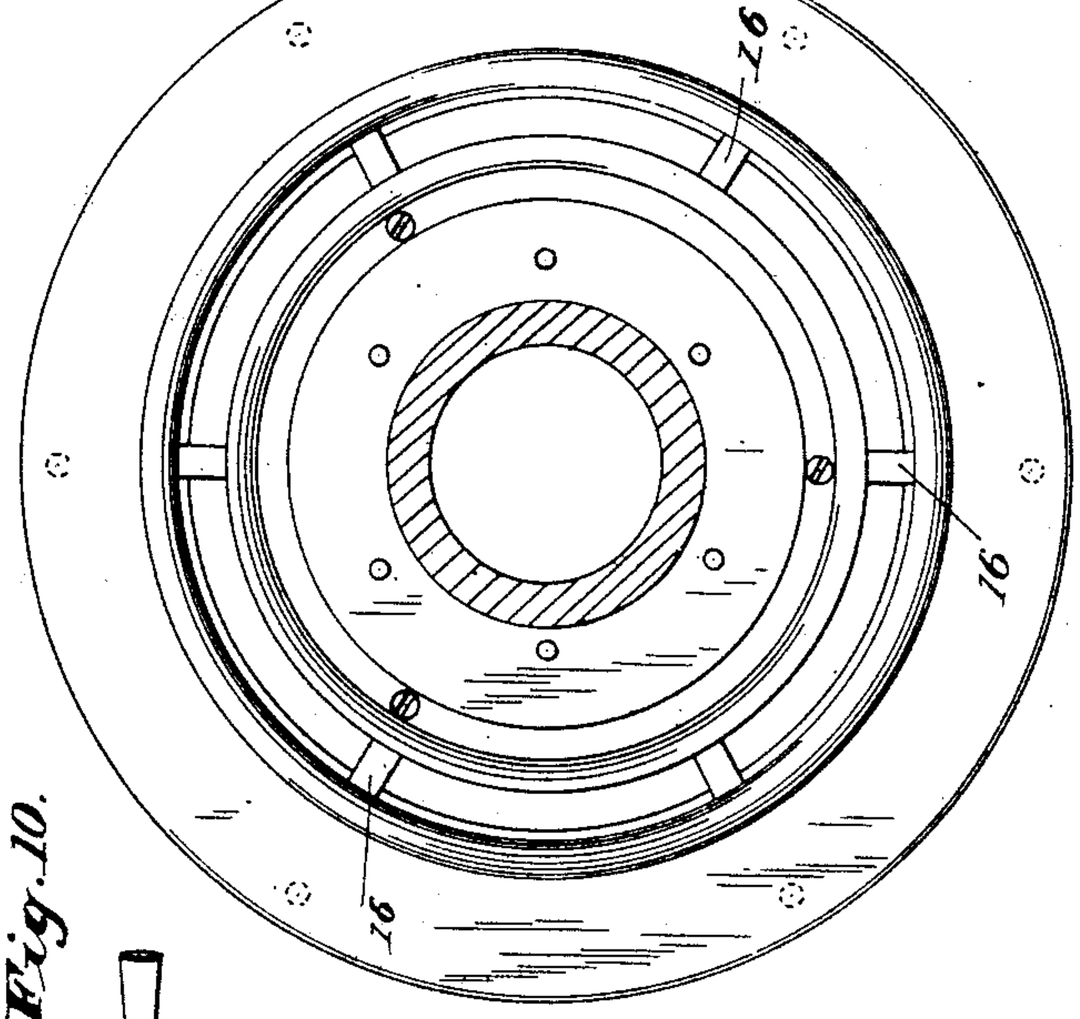

Fig. 9.

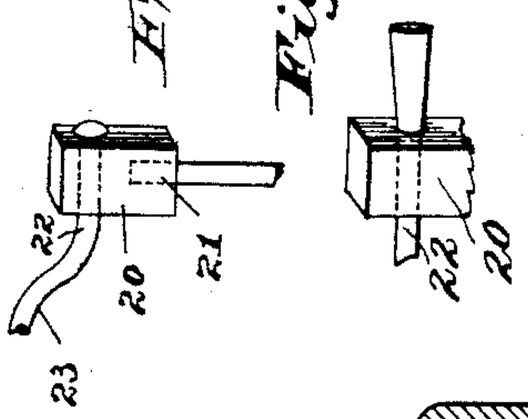

Fig. 8.

Fig. 10.

Fig. 7.

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UNITED STATES PATENT OFFICE.

CHARLES G. CURTIS, OF NEW YORK, N. Y., ASSIGNOR TO THE CURTIS ELECTRIC MANUFACTURING COMPANY, OF WEST VIRGINIA.

ARMATURE FOR DYNAMO-ELECTRIC MACHINES OR MOTORS.

SPECIFICATION forming part of Letters Patent No. 473,568, dated April 26, 1892.

Application filed November 12, 1891. Serial No. 411,656. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. CURTIS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Armatures for Dynamo-Electric Machines or Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to protect the winding of an armature for a dynamo-electric machine or motor from the injurious action of moisture or oil to which it is subjected in practice when no special provision is made to guard against such a result.

Another object is to prevent the winding from injury by shocks with external objects.

The invention also involves improvements in the commutator and its connections with the winding, important not only with water-proofed armatures, but which are applicable to armatures generally. The winding of the armature is ordinarily covered with a casing of canvas, which serves in a measure to exclude moisture. Such protection is insufficient for machines subjected to out-of-door service or which are operated in an atmosphere highly charged with moisture. In locomotion, especially where the motors are supported under car-bodies and are exposed to all sorts of weather and the motor is frequently splashed with water or oil and sometimes actually submerged in water, the armature is often burned out by reason of short circuits resulting from a breaking down of the conductor insulation, due to leakage through a weak spot developed by the exposure. I construct an armature which is completely inclosed in a water-proof casing, thereby materially lengthening its period of service.

It has heretofore been proposed to completely inclose the wound core of an armature in a metallic casing. Such a mode of protection is, however, thoroughly impracticable by reason of both the great hinderance to motion occasioned by rotation of the metallic shell in the field of force and by reason of the great heat developed by the circulation of Foucault currents. I avoid these difficulties by forming that portion of the inclosing envelope which lies in the field of force of a non-conducting material.

My invention therefore, in its broadest phase, comprises an armature provided with a water-proof covering over the winding, that part of the covering which lies in the path of the lines of force being formed of non-conducting material.

More specifically considered, the invention comprises an armature inclosed in a water-proof envelope, the outer covering lying within the field of force being of non-conducting material, and adjustable caps at the end for forming a water-proof joint at the line of junction and preventing injury to the winding from external shocks.

The invention also embodies an improved connector for the commutator and coils.

My invention also involves other novel features, which will be hereinafter more specifically described, and definitely indicated in the appended claims.

In the accompanying drawings, which illustrate the invention, Figure 1 is a central longitudinal section of an armature embodying one form of my invention as applied to a ring-armature in which the coils are laid in grooves on the exterior of the core. Fig. 2 is an enlarged detail view of the construction shown in Fig. 1. Fig. 3 is an end view of the armature on the commutator side. Fig. 4 is a detail view of my improvements as applied to an ordinary ring-winding. Figs. 5 and 6 are enlarged detail views of the plan I adopt to form a water-tight joint between the end caps and the surface of the armature. Fig. 7 illustrates a sectional view of a modified form of commutator and protecting-cap, showing also my improved connecting devices for establishing electrical communication between the commutator and coils. Fig. 8 is a detail view of the connector. Fig. 9 is a view of Fig. 7, looking in the direction of the arrow, the connecting-wires being omitted. Fig. 10 is a detail view showing the method of making the joint between two conductors.

1 represents a shaft, upon which is forced a hub 2, carrying a spider and an exterior shell 3. The arms of the spider extend be-

yond the shell 3 and are locked to a laminated core 4 in a manner indicated in Fig. 2, a longitudinal hole being drilled through the core and spider-arm, and a bolt 5 passed through the hole to lock the parts together. As illustrated in Fig. 1, the convolutions of the winding are laid on the external surface of the core in grooves formed therein. I make the ends of the core beveled, as indicated in Fig. 5, and provide flaring end caps 6 and 7, which engage the core upon the beveled surface, or, in lieu of beveling, the core may be otherwise shaped, so that a water-tight joint may be produced by clamping the two together. The bolts 5, which lock the armature-core to the spider, are made sufficiently long to project through these caps, and nuts are provided co-operating with threads cut on the ends of the bolts to draw the caps toward the armature and force the rims thereof to ride over the beveled end of the armature, thus forming an intimate contact between the rims of the caps and the canvas covering 8, surrounding the armature. This covering is preferably made sufficiently long to lap over the ends of the core, so that it may be conveniently drawn taut before adjustment of the end caps. One of the caps may be conveniently mounted upon the shell 3, the joint between the cap and the shell being made water-proof by means of a gasket 9. The end of the canvas covering may be clamped between the shell and the cap and then drawn snugly over the armature. The other cap may be dished, so as to cover the conductors connecting the coils with the commutator-bars, its inner edge resting upon a shoulder formed upon a ring 10, supported by the commutator, the joint between the ring and commutator being protected both as to its insulation and sealing by insulating-gaskets.

Another method of mounting the cap on the commutator end of the armature is shown in Figs. 7 and 8. In this form, which is applicable alike to ring or drum wound armatures, the inner end of the commutator-frame is provided with a shoulder, upon which is mounted a ring 15, provided with openings between radial webs 16, through which the connecting-wires 17 and 18 may be led to the commutator-blocks. Upon the outer edge of the ring is mounted the cap 7. The combined commutator and cap may be adjusted toward the covered end of the armature by the screws 19, co-operating with a projection of the armature-spider or with a ring secured to the shaft. One end of the shell 3 is extended beyond the core and forms an abutment for the commutator, a water-proof gasket 11 being used to seal the joint. The canvas covering 8 is thoroughly waterproofed, and the end caps are adjusted into firm engagement with the armature. It will be noted that the entire winding is inclosed in a water-tight envelope. The commutator is supported upon the shaft by interiorly-projecting arms 12, between which are open spaces, as indicated in Fig. 3, which communicate with the space between the shell 3 and the shaft and permit thorough ventilation. The commutator may be clamped to interiorly-projecting lugs 13, cast integral with the shell 3. The joints formed by the beveled edges of the armature and flaring caps are especially important in an armature in which the coils do not lie beneath the exterior surface of the core, since the caps will form an intimate engagement with the canvas and make a water-proof joint. The end caps are preferably formed of metal, so as to protect the ends of the armatures against injury from shocks to which it may be subjected, and will also serve to protect the coils from injury by the pole-pieces in case the bearing should wear sufficiently to permit the outside of the armature to scrape against them. They may be pressed into shape from steel blanks, if desired.

While I have described the joint of the caps and covering as produced by compression, and although this is the preferable way of doing it, the joint may be sealed in any other suitable way and still be within my invention.

In order to make a good connection between the coils and the connecting wires 17 18, I use the connector 20. This is provided with a threaded hole 21 and a transverse perforation 22. A thread is cut on the connecting-wire and the connector screwed upon it. The end of the coil-section is pushed through the perforation 22 and the end enlarged. The enlarged end is then forced back into the perforation and forms an intimate contact by the wedging action on the wall of the perforation. The perforation is of a size to just accommodate the bared conductor, which, when enlarged, makes a tight joint with the connector and an efficient and durable electric connection, and at the same time permits of ready disconnection in case it becomes necessary to rewind any of the armature-coils or repair the commutator. The connecting-wires should preferably be made sufficiently heavy so as to insure their safety under all conditions of use. When repair becomes necessary, the terminals 23 of the coils can be clipped close to the connectors and the defective coil removed. After rewinding the terminal of a new coil can be readily fastened. Such a joint has many advantages over a soldered connection, which will be apparent to those familiar with the art.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An armature inclosed in a water-proof covering, that part of the covering in the path of the lines of force being of non-conducting material, and rigid caps protecting the ends of the armature.

2. An armature inclosed in a non-conducting water-proof covering and provided with end caps co-operating with the covering, so as to form a water-tight joint.

3. An armature provided with a compressible non-conducting water-proof covering and end caps compressing the covering against the armature-winding and sealing the commutator connections, thereby rendering the armature water-proof at all points.

4. An armature provided with a water-proofed canvas covering and metallic end caps having their rims firmly compressing the canvas, so as to form a water-tight joint.

5. An armature provided with a water-proof covering of flexible non-conducting material and rigid flaring end caps firmly engaging the covering at the ends of the armature.

6. A ring-armature provided with a water-proof envelope about the winding, said envelope being formed on the inside by a water-proof shell, a non-conducting water-proof covering on the outside, and caps for forming water-proof joints at the ends.

7. A ring-armature provided with a water-proof covering inclosing the winding and commutator connections, the interior of the ring and commutator being in open communication with the atmosphere to promote ventilation.

8. A water-proof armature having at the ends protective caps, one of said caps being mounted upon a flange at the inner end of the commutator, the connecting-wires extending to the commutator-segments beneath their surface of contact.

9. In an armature, a commutator having its inner head flanged and carrying a protective cap inclosing the end of the armature, the commutator connections being beneath the surface of the segments to protect them from external injury.

10. A wire joint formed by a conductor with an enlarged end forced into an opening of substantially the size of the body of the conductor, whereby the two are wedged into intimate contact.

11. The combination of a perforated connector and a conductor extending through the perforation and having an expanded or enlarged end forced back into the opening.

In testimony whereof I affix my signature in presence of two witnesses.

CHAS. G. CURTIS.

Witnesses:
VICTOR E. BURKE,
E. C. GRIGG.