No. 771,285. PATENTED OCT. 4, 1904.

C. P. STEINMETZ.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED JAN. 25, 1904.

NO MODEL.

Fig. 1.

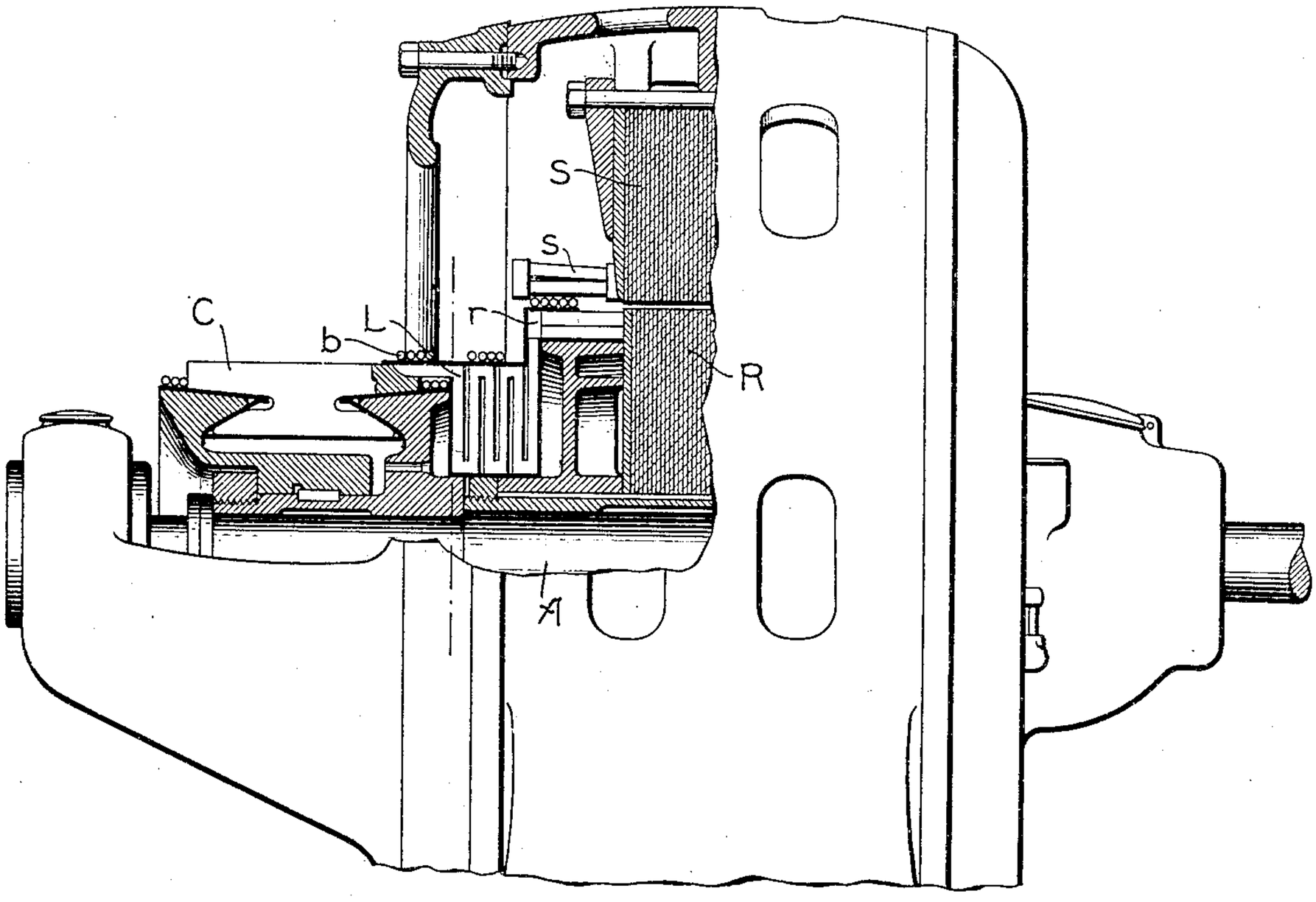


Fig. 4.

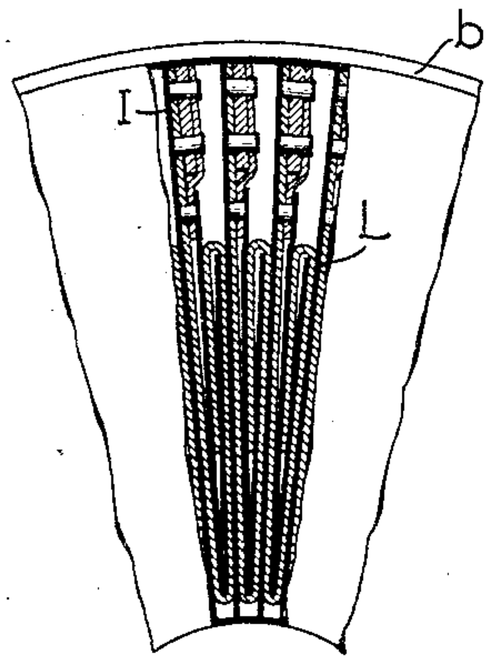


Fig. 2.

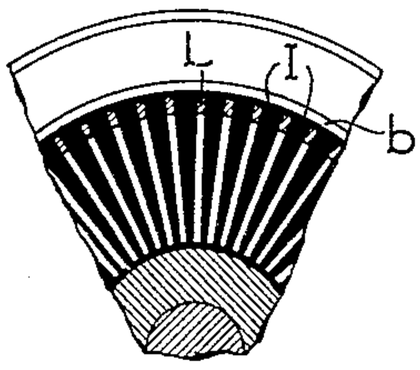
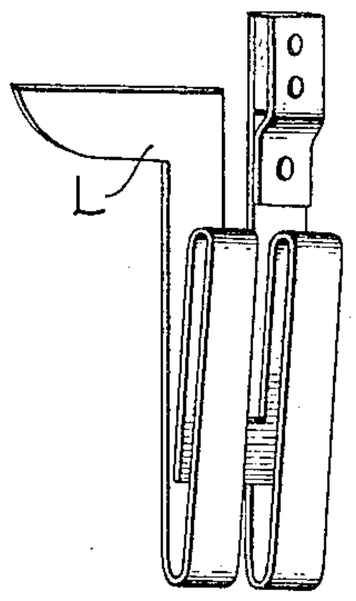


Fig. 3.



Witnesses.

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No. 771,285. Patented October 4, 1904.

UNITED STATES PATENT OFFICE.

CHARLES P. STEINMETZ, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 771,285, dated October 4, 1904.

Application filed January 25, 1904. Serial No. 190,436. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. STEINMETZ, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines, and is particularly applicable to alternating-current machines of the commutator type, such as repulsion-motors. In alternating-current machines of the commutator type each coil of the rotor at the time when it is short-circuited by the commutator-brush is subject to an alternating magnetic flux, which in such machines as ordinarily constructed induces large currents in the short-circuited coils, which result in objectionable sparking. It has been proposed to reduce the sparking caused by these induced currents in the coils short-circuited by the brush by inserting in the leads between the rotor-coils and the commutator resistances which act to cut down the amount of current-flow.

The object of my invention is to provide a construction and arrangement of commutator-leads of high resistance which shall be more simple, economical, and compact than any structure heretofore devised.

In the accompanying drawings, Figure 1 shows a repulsion-motor constructed in accordance with my invention. Fig. 2 shows a cross-section through the leads. Fig. 3 shows a perspective view of a modified form of commutator-lead, and Fig. 4 shows an end view in cross-section of the same when assembled.

In Fig. 1, S represents the stator or primary member carrying the stator-coils *s*, embedded in slots in the usual manner. R represents the rotor or secondary member provided with the rotor or armature coils *r*. The windings of both stator and rotor may be of any well-known type. A represents the shaft on which the rotor is mounted. C represents a commutator-bar supported from the shaft and joined to the armature-coil *r* by the commutator-lead L. The commutator-leads L are formed of thin strips of resistance material slotted, as shown in the drawings, so as to form a zigzag conductor of considerable length, but of compact form. These leads may be formed from sheet metal stamped out in the shape shown. The resistance of each lead is small compared to the total armature resistance, but is large compared to the resistance of an individual coil. It accordingly acts to choke down the amount of current when its coil is short-circuited by a commutator-brush. In order to provide the necessary amount of resistance and at the same time obtain a commutator-lead of small dimensions which will permit of an economical and compact structure, it is necessary that the cross-section of the lead be made small. This means that the amount of heat produced per unit of length must be large, and consequently the structure must be well adapted for heat radiation. This is partially accomplished by forming the commutator-leads of thin flat strips, so as to give a large radiating-surface, and for further facilitating heat radiation I fill the space between adjacent leads with mica or other suitable insulation, as indicated at I in Fig. 2. As shown in Fig. 2, the strips and insulation form a compact mass well adapted for absorbing and radiating the heat generated in each lead at the instant its coil is short-circuited by a commutator-brush. *b* represents binding-wires for the compact body formed by the commutator-leads and the insulation.

In Fig. 3 I have shown a modified form of commutator-lead. The lead is narrower than the lead shown in Fig. 1, and it is bent back on itself, as indicated in the drawings. With this arrangement a reduction of space in an axial direction is obtained, while the amount of mica or other insulation necessary to fill the spaces between leads, so as to make a compact mass, is less than with the lead shown in Fig. 1. This is evident from an inspection of Fig. 4, which shows a cross-section through the commutator-leads of a machine supplied with the modified form. In both the forms, however, the radiation of heat is facilitated

by the large amount of radiating-surface of the conductor and by the insulation filling the spaces between the leads and forming a compact mass suitable for absorbing and radiating the heat, which is instantaneously generated when each rotor-coil is short-circuited by a commutator-brush.

It is evident that the form of the commutator-lead may be varied without departing from the spirit of my invention, and accordingly I do not desire to limit myself to the particular construction and arrangement of parts here shown, since changes which do not depart from the spirit of my invention and which are within the scope of the appended claims will be obvious to those skilled in the art.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a dynamo-electric machine, commutator-leads formed of thin strips of resistance material, and insulation filling the spaces between said strips and forming therewith a compact mass.

2. In a dynamo-electric machine, commutator-leads formed of flat, zigzag strips of resistance material, and insulation filling the spaces between said strips and forming therewith a compact mass.

3. In a dynamo-electric machine, commutator-leads formed of flat plates of resistance material slotted to form elongated conductors, and insulation filling the spaces between said strips.

4. In a dynamo-electric machine, commutator-leads formed of flat plates of resistance material slotted to form elongated conductors.

5. In a dynamo-electric machine, commutator-leads formed of flat, zigzag strips of resistance material.

6. In a dynamo-electric machine, commutator-leads formed of thin, zigzag strips of resistance material embedded in insulation.

7. In a dynamo-electric machine, commutator-leads formed of flat parallel strips connected to form an elongated conductor, and insulation filling the spaces between said leads.

In witness whereof I have hereunto set my hand this 22d day of January, 1904.

CHARLES P. STEINMETZ.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.