(No Model.) 2 Sheets—Sheet 1.

# S. H. SHORT.

## COMMUTATOR AND LEAD.

No. 587,868. Patented Aug. 10, 1897.

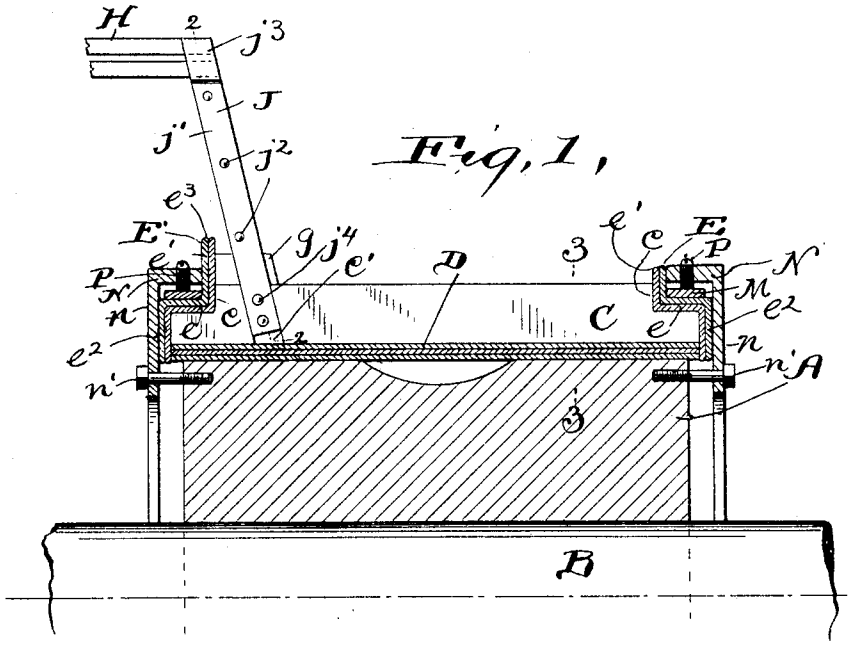


Fig. 1.

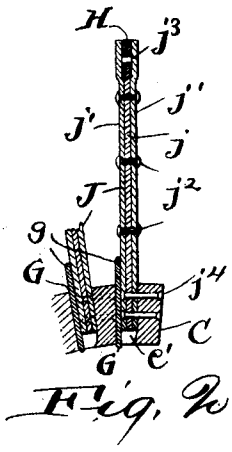


Fig. 2.

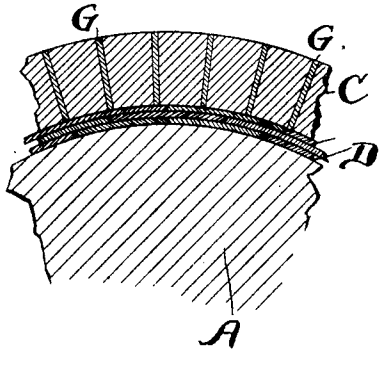


Fig. 3.

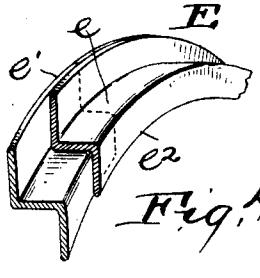


Fig. 4.

Witnesses.
E. B. Gilchrist
A. M. Rankin

Inventor
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By his attorneys,
Thurston & Bates.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

# S. H. SHORT.

## COMMUTATOR AND LEAD.

No. 587,868. Patented Aug. 10, 1897.

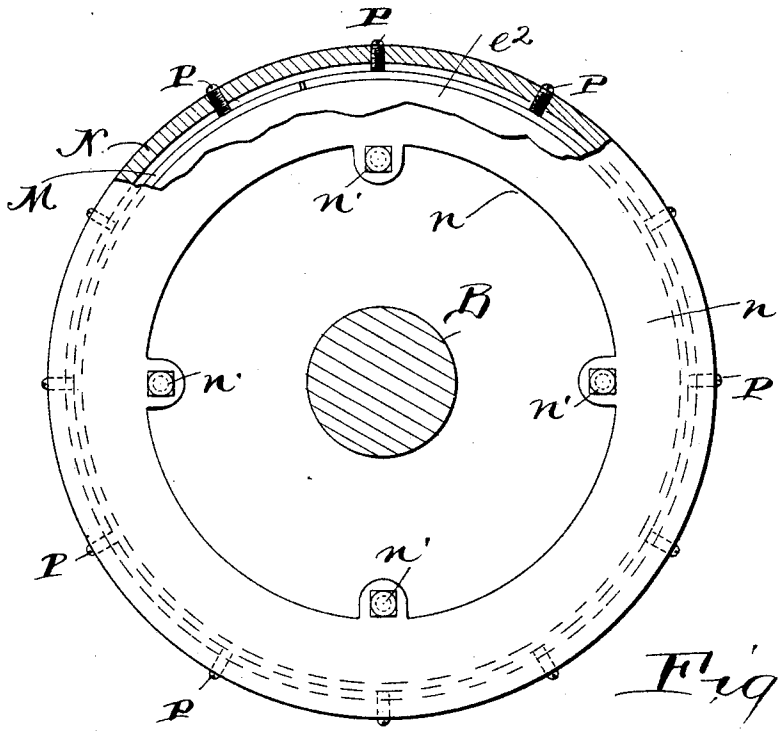


Fig. 5.

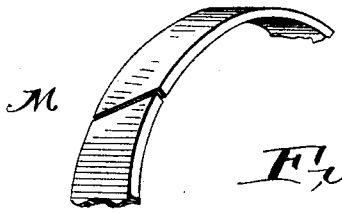


Fig. 6.

Witnesses.
E. B. Gilchrist
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Inventor:
Sidney H. Short.
By his Attorneys
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

SIDNEY H. SHORT, OF CLEVELAND, OHIO.

## COMMUTATOR AND LEAD.

SPECIFICATION forming part of Letters Patent No. 587,868, dated August 10, 1897.

Application filed March 12, 1897. Serial No. 627,169. (No model.)

*To all whom it may concern:*

Be it known that I, SIDNEY H. SHORT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Commutators and Their Leads; 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.

One of the objects of my invention is to provide a commutator for dynamo-electric machinery which shall be simple and economical in construction and in which the commutator-bars and their leads shall be effectively insulated from each other.

Another object is to provide efficient leads from the commutator-bars to the armature-inductors and satisfactory means for connecting the same to their respective parts.

The invention consists in the combinations of parts described, and definitely pointed out in the claims.

In the drawings which clearly illustrate my invention, Figure 1 is a longitudinal section of the upper half of the commutator with its attached leads, the lower half being of course similar and hence not represented. Fig. 2 is a section of a commutator-lead and commutator-bars, taken on the line 2 2 of Fig. 1. Fig. 3 is an enlarged transverse section of a portion of the commutator near its periphery, being taken on the line 3 3 of Fig. 1. Fig. 4 is a perspective view of the insulation at the ends of the commutator-bars. Fig. 5 is an end view of the commutator, and Fig. 6 is a perspective view of a part of the split spring-ring.

Referring to the parts by letters, A represents the commutator-hub, which is secured by suitable means to the shaft B of the armature.

C represent commutator-bars, which are of the usual segmental shape in section. As stated, one of the objects of my invention is to properly insulate these bars from the parts which hold them. As the first step in doing this I surround the hub with a sleeve of mica D, built up with broken joints, as shown in Fig. 3. The thin pieces of mica forming this sleeve are first cemented together, preferably by varnish, and dried and baked in a mold, whereby they are given the proper shape to nicely fit the hub A. This hub A is preferably made a little shorter than the commutator-bars, and thus the mica sleeve, which is the same length as the bars, projects beyond the hub at each end. This mica sleeve effectively insulates the bars from the hub.

The commutator-bars are formed in the shape shown, having a rabbet *c* at each end. A pair of mica rings E E′, each consisting of the cylindrical band *e* and the annular flanges *e′* and $e^2$, which respectively extend in opposite directions from the edge of said band, are provided for protecting the ends of the commutator-bars. These rings are built up in the same manner as that already described with reference to the sleeve D. They fit over the end of the commutator-bars and the rabbet thereon and thus insulate the bars from the devices which hold the commutator-bars in place.

I have shown novel means for holding the described parts upon the hub, but any suitable means might be employed without departing from the invention. The means shown at both ends of the commutator consist of a split spring-ring M, which embraces the band *e*, and by engaging with the flange *e′* holds said flange against the shoulders on the commutator-bars, which are formed by rabbeting the ends of said bars, thereby preventing endwise movement of said commutator-bars. This ring, which is preferably made in one piece, is split diagonally, as shown in Fig. 6, thereby preventing any commutator-bar from escaping the grasp of the ring. Surrounding this ring is a ring N, which may be a cylindrical flange on a disk *n*. A plurality of adjusting-screws P work through this ring N, and when set up press the split ring M down firmly upon the commutator-bars. The disk *n* may be secured to the hub by bolts *n′*.

The commutator-bars are insulated from each other by mica plates G, about one thirty-second of an inch thick, placed between them. It will thus be seen that each commutator-bar is virtually inclosed in an insulating-box,

except, of course, as to its outer surface. The insulation thus effected is easily applied and is very efficient in service.

The current from the armature-inductors, which are represented by H, is brought to the commutator by the leads J. The construction of these leads I believe to be new, and it is one of the parts of my invention. I make the leads by riveting together ribbons of metal, preferably copper. I prefer to provide three ribbons, the interior one, $j$, being stiffer than the other two, $j'$, through which the rivets $j^2$ pass. This construction gives the lead flexibility enough to allow it to be bent to one side or the other in making connection with the armature, and also prevents it from being broken by vibration in the rapid rotation of the armature, while they are stiff enough so that there is no danger of two proximate leads contacting with each other. This construction also allows a fork $j^3$ for embracing the ends of the inductors to be economically formed at the outer end of the lead. The inner end of the lead is secured to a groove $c'$, milled obliquely across the commutator-bar by rivets with the countersunk heads $j^4$. The commutator-leads are therefore set obliquely to the face of the commutator which furnishes an abundance of clearance for the brush-holding devices. After the lead is riveted to the bar the crevices remaining are filled with soft solder of a high melting-point, the excess solder being removed with a file. The fork $j^3$ is similarly soldered to the inductors.

In order to prevent dirt which may happen to lodge on the commutator between the leads from establishing a short circuit, the mica plates G have a wing $g$, which extends outward, as shown, and to prevent such dirt from establishing a contact with the clamp N the flange $e'$ of the ring E is extended, as indicated at $e^3$, beyond the clamp. These constructions render innocuous any dirt that may lodge on the commutator between the leads, the only place about the commutator not easily cleaned.

Having described my invention, I claim—

1. In a commutator, a hub, commutator-bars and alternate insulating-plates arranged around the same, said bars and plates having a rabbeted surface at one end, in combination with an insulating-ring which is fitted to said rabbeted surface and has at its inner edge an outwardly-turned flange and at its outer edge an inwardly-turned flange, the outwardly-turned flange covering the end of the commutator-bars, and a clamp engaging said ring and holding it and the commutator-bars in the position described, substantially as and for the purpose specified.

2. A lead for connecting an armature-inductor with its commutator-bar, consisting of a plurality of metallic ribbons riveted together and adapted to be connected at one end to a commutator-bar and at the other end to an armature-inductor, substantially as and for the purpose specified.

3. A lead for connecting an armature-inductor with its commutator-bar consisting of a plurality of metallic ribbons riveted together, and having a fork at one end adapted to receive between its furcations an armature-inductor, in combination with a commutator-bar having a transverse groove adapted to receive the other end of the lead, substantially as and for the purpose specified.

4. An insulating-ring for covering the ends of commutator-bars consisting of a substantially cylindrical portion and two annular flanges projecting in opposite directions from opposite edges of said cylindrical portion, substantially as and for the purpose specified.

5. In a commutator, in combination, a hub, commutator-bars surrounding the same and having leads projecting therefrom near the end, an insulating-ring at the lead end of the commutator covering the end of the commutator-bars, a clamp bearing against said ring and holding the commutator-bars in place, said insulating-ring projecting annularly beyond the clamp and beyond the end of the commutator-bars, whereby contact between the clamp and bars, directly or by means of dirt lodging between the leads is prevented, substantially as and for the purpose specified.

6. In a commutator, in combination, a hub, commutator-bars surrounding the same and having leads projecting therefrom near the end, insulating-plates placed between the commutator-bars and having integral wings projecting from them between the leads, an insulating-ring at the lead end of the commutator covering the end of the commutator-bars, a clamp bearing against said ring and holding the commutator-bars in place, said insulating-ring projecting annularly beyond the clamp and substantially contacting with said wings, whereby contact between the clamp and bars, directly or by means of dirt lodging between the leads, is prevented, substantially as and for the purpose specified.

7. The combination of a cylindrical commutator-hub with its cylindrical face embraced by an insulating-sleeve formed of segmental mica plates, arranged in two or more layers, breaking joints, and commutator-bars with their inner surface resting on said mica insulation, and insulating-rings embracing the ends of the commutator-bars and formed of mica segments arranged in two or more layers breaking joints, and insulating-plates between the commutator-bars whereby the commutator-bars are inclosed in insulation except upon the surface where the brushes are in contact, substantially as and for the purpose specified.

8. The combination with the commutator-bars, of an insulating-ring embracing the ends of said bars, a split spring-ring embracing the insulating-ring, and means carried by the

commutator-hub for holding said split ring in close contact with the insulating-ring and thereby holding the commutator-bars in place, substantially as and for the purpose specified.

9. The combination with the commutator-bars, of an insulating-ring embracing the ends of said bars, a split spring-ring embracing the insulating-ring, a solid ring around the spring-ring, and adjustable set-screws whereby the commutator-bars are clamped to the face of a cylindrical commutator-hub, substantially as and for the purpose specified.

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

SIDNEY H. SHORT.

Witnesses:
E. L. THURSTON,
ALBERT H. BATES.