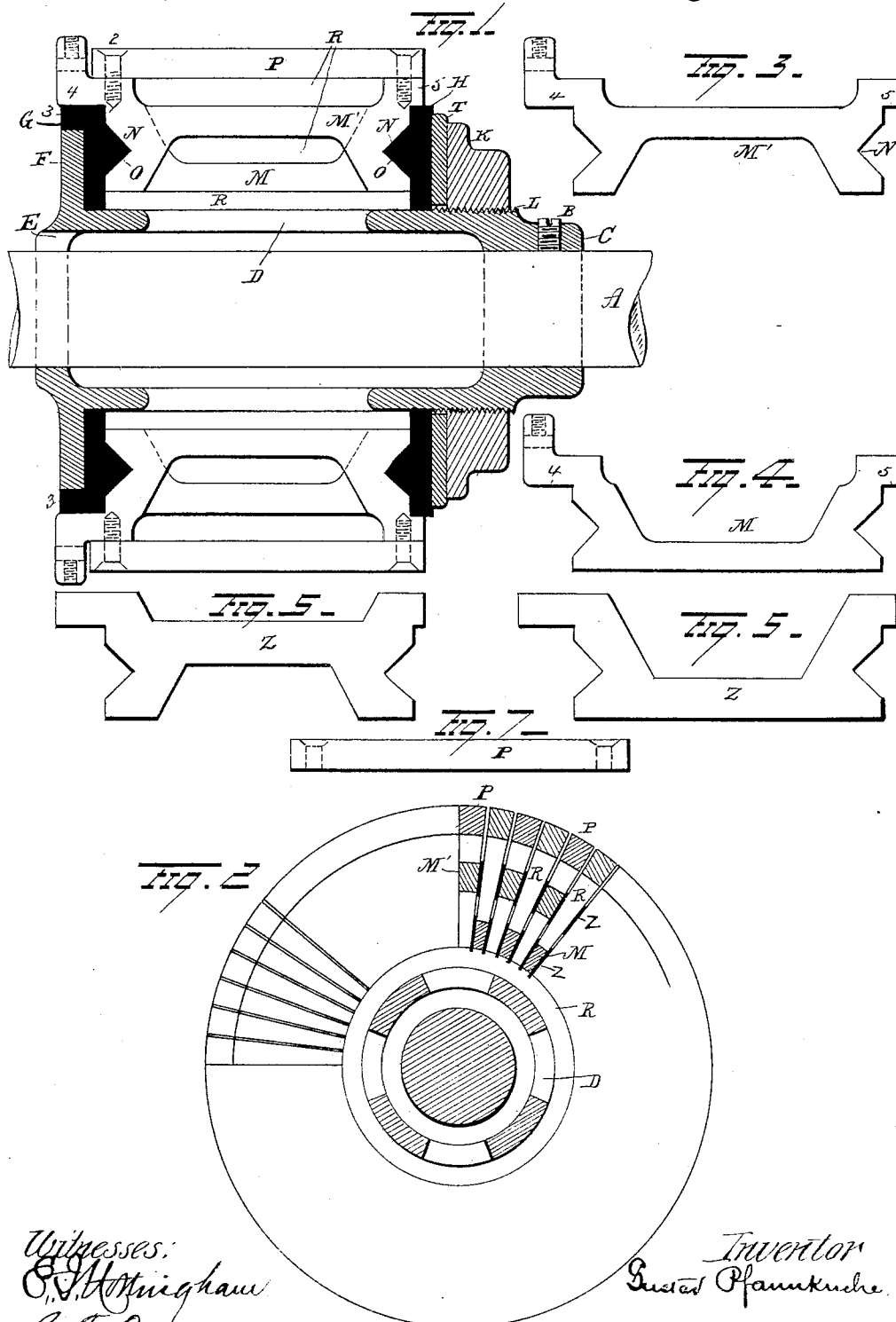


(No Model.)

G. PFANNKUCHE.  
COMMUTATOR FOR RING ARMATURES.

No. 480,780.

Patented Aug. 16, 1892.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

GUSTAV PFANNKUCHE, OF CLEVELAND, OHIO, ASSIGNOR TO THE BRUSH ELECTRIC COMPANY, OF SAME PLACE.

## COMMUTATOR FOR RING-ARMATURES.

**SPECIFICATION** forming part of Letters Patent No. 480,780, dated August 16, 1892.

Application filed July 8, 1890. Serial No. 358,120. (No model.)

*To all whom it may concern:*

Be it known that I, GUSTAV PFANNKUCHE, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Commutators or Collectors for Ring-Armatures; 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.

This invention relates more particularly to the commutators or collectors for ring-armatures, which commutators are ordinarily made of a number of parallel insulated sections or bars placed circumferentially about the armature-shaft and connected with the coils progressively; but the improvements constituting the said invention are included for all the uses to which they may severally be adapted.

The new or improved commutators may be used on generators of electricity or on motors.

In accordance with said invention the commutator is provided with air-passages which terminate at the periphery or contact-surface of the commutator in contracted openings, so that the air forced through said openings will issue in the form of jets. These openings may be variously arranged, but practically they constitute contracted slots or slits between the commutator-sections. In like manner various modes of forcing the air through the passages may be resorted to, but practically use is made of centrifugal force generated in rotating the commutator, the said air-passages leading from outside air in the vicinity of the axis of rotation to the periphery of the commutator. The air passing through the passages and issuing in jets will blow out sparks caused by the brushes leaving the different sections of the commutator and will also dissipate all heat caused by the friction of the brushes or the passage of electric currents and will carry off dust and particles of metal which may be abraded from the brushes or the commutator.

The invention also comprises a special construction or mode of forming air-passages through a commutator, which may terminate in contracted openings or otherwise. For this purpose the commutator-sections are recessed

or cut away behind the peripheral or contact surfaces at their lateral faces, so as to form vacant spaces, which extend radially between the sections and which may be of any appropriate size, while at the periphery of the commutator said sections are separated by slots, which communicate with the vacant spaces formed by the recessing or cutting away the sections and are themselves left vacant for the escape of the air. Preferably the peripheral portion of each section is formed by a metal facing detachably secured to the body or the base of the section. Preferably, also, the vacant spaces referred to are formed by openings through the sections from side to side, or, in other words, are constituted by transverse perforations. These transverse perforations may be open, like a staple, or they may be closed, like a ring, and they may be of various shapes. Those in adjacent sections are so placed as to form with each other or with other recesses air-passages or air-spaces having a general radial direction. The use of the recessed or transversely-perforated sections has the further advantage of exposing the interior of the commutator more thoroughly to the air.

The invention also comprises a perforate mounting for commutator-sections provided with intervening air-passages, which mounting has two heads, between which the sections are placed, the perforations or openings in the mounting serving to put the said air-passages in communication with the atmosphere near the axis of the commutator.

The invention further comprises certain other special constructions and arrangements of parts in the commutator, some of which may be used independently of a system of passages, whereby air may be forced through the commutator, although mainly designed for use in that connection.

In the accompanying drawings, which form part of this specification, Figure 1 is a longitudinal section through the axis of a commutator constructed in accordance with the invention and mounted on the armature-shaft of a dynamo. Fig. 2 is a cross-section of the same, and Figs. 3 to 7 are detail views.

As shown, the commutator-sections consist each of a body or base M or M', respectively,

and a facing P, which constitutes the peripheral or contact surface of the section, and which is detachably fastened to the base piece or body by screws 2, and the mounting of the section comprises a sleeve C, which is fixed on the shaft A by set-screw B and heads F and K, between which the sections M P and M' P are held, insulating material G and H being interposed at the respective ends of the sections. The sections are insulated from each other by pieces Z, of mica or other suitable insulating material, interposed between the bases M M'.

Through the commutator are formed air-passages R, which terminate at the periphery in contracted openings in the form of narrow slots or slits between the sections of less sectional area than the passages, so that the air may issue in the form of thin flat jets at the places where it is best adapted to blow out sparks and to carry off dirt and metallic dust likely to interfere with the insulation of the sections from each other. These passages, as shown, (see Figs. 1 and 2,) are formed partly in and between the commutator-sections M M' and partly in the mounting, which is perforated, being provided with openings E and D in the sleeve C, so that the passages lead from the vicinity of the axis of the commutator to the periphery. The result is that the rotation of the armature sucks in the air through the openings E D and expels it through the slots at the periphery after it has passed through the passages R. By having the openings E in the end of the sleeve or mounting it is not necessary to have a hollow shaft, with holes through it into the openings D, but the commutator can be applied to any shaft, (which constitutes a special improvement.) In either construction the passages R would communicate with the atmosphere in the vicinity of the axis of rotation, so that the air would be sucked in by the rotation.

The passages R are formed in the sections by providing the same with recesses or cut-away portions so arranged that vacant places extend to the slots or slits in the periphery from the openings D in the central sleeve C. It is preferred to make the sections with transverse recesses and to arrange the adjacent sections (made of suitable form to that end) so that the recesses in adjacent sections overlap and by the communication with one another form passages running radially. One advantage of this construction is that the sections or their base-pieces can be readily stamped out or cast. Thus each of the base-pieces M has or may have, as shown in detail in Fig. 3, the flat ends connected at the bottom by a bar or longitudinal member of less depth, leaving above the bar a transverse opening or perforation, and each of the base-pieces M' may have its flat ends connected at a suitable distance above the bottom by a similar bar or longitudinal member having a transverse opening on each side of the same. The base-pieces M being arranged alternately with the

base-pieces M', the bars or longitudinal members are at such different distances from the bottom that they do not come together, but allow the spaces under the bars of the bases M' to communicate with the spaces above the bars of bases M. Further, as shown, the facings or the contact-bars P are supported in each section at the ends, leaving an air-space under the facings P. As shown, the facings P are the same in width as the outer parts of the bases M M', and the slits or slots between them are equal in width to the thickness of the insulation Z, interposed between the base-pieces M M'.

In order to support the sections, their ends are notched at N to receive a rib O on the face of the insulating-rings G and H. The ring G has a projection 3, which surrounds the head F of sleeve C, and the sections have projections 4 and 5, which fit over the rings G and H. The head F is cast on or formed in one piece with the sleeve C, and the head K is made in the form of a nut, which is tapped on the said sleeve and engages the thread L, so that by screwing up said head the sections are clamped and held firmly. A metal washer T is interposed between the nut or adjustable screw-head and the insulating-ring H.

The peripheral or contact faces of the commutator-sections have been shown as being detachably secured to the bases or bodies of the sections, which is desirable, as permitting their ready renewal when worn; but it is evident that the wearing-faces could be made integral or in one piece with the rest of the sections, and so also various other modifications in the details of construction could be made.

Any ordinary or suitable arrangement of brushes or rubbers may be employed. The wires of the armature may be connected with lugs shown on the bases M M'.

In operation, the commutator being mounted on a revolving armature-shaft A, the centrifugal force expels the air from between the sections through the slits or slots between the facings P at the periphery and the air flows in through the openings D E to supply its place and be in turn expelled by the centrifugal force.

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

1. A commutator having the sections provided with transverse recesses and arranged so that said recesses in adjacent sections overlap, substantially as described.

2. A commutator having sections with flat ends and connecting members of less depth arranged so that said connecting members in one section are opposite vacant spaces in an adjacent section, substantially as described.

3. The commutator-sections recessed or cut away behind the periphery and separated at the periphery by slots or slits, in combination with a perforate mounting giving access from the vicinity of the axis to the spaces formed by said recesses or cut-away portions,

which spaces extend to terminate in said slots or slits, and facing-plates located on said cut-away or recessed sections so as to leave an air-space beneath them, substantially as described.

4. In a commutator, the combination, with a hollow bearing, of two series of commutator-sections, each having transverse recesses, the sections of one series being disposed so that their recesses will overlap the recesses of the sections of the other series, the sections of the commutator being separated from each other by slits which communicate at the periphery of the commutator with air-spaces, said hollow bearing having an opening for the passage of air between the commutator-sections, substantially as set forth.

5. The combination of the recessed or cut-away bases of the commutator-sections, the facings for said bases, and the perforate mounting, substantially as described.

6. The combination of the transversely-recessed bases of the commutator-sections,

the facings for said bases, and the perforate mounting, substantially as described.

7. The combination, with a perforate sleeve having heads, of a transversely-recessed sectional base and facing-plates over the recesses in said sectional base, substantially as set forth.

8. A plate or section for a commutator, having a transverse recess therein for producing an air-space, substantially as set forth.

9. The combination, with a commutator plate or section having a recess or cut-away portion in its outer edge, of a plate on said outer edge, adapted to cover said recess or cut-away portion to produce an air-space, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GUSTAV PFANNKUCHE.

Witnesses:

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C. J. LEEPHART.