

R. H. READ.

SUPPRESSING SPARKING OF COMMUTATORS.

(Application filed Apr. 8, 1901. Renewed July 12, 1902.)

(No Model.)

4 Sheets—Sheet 1.

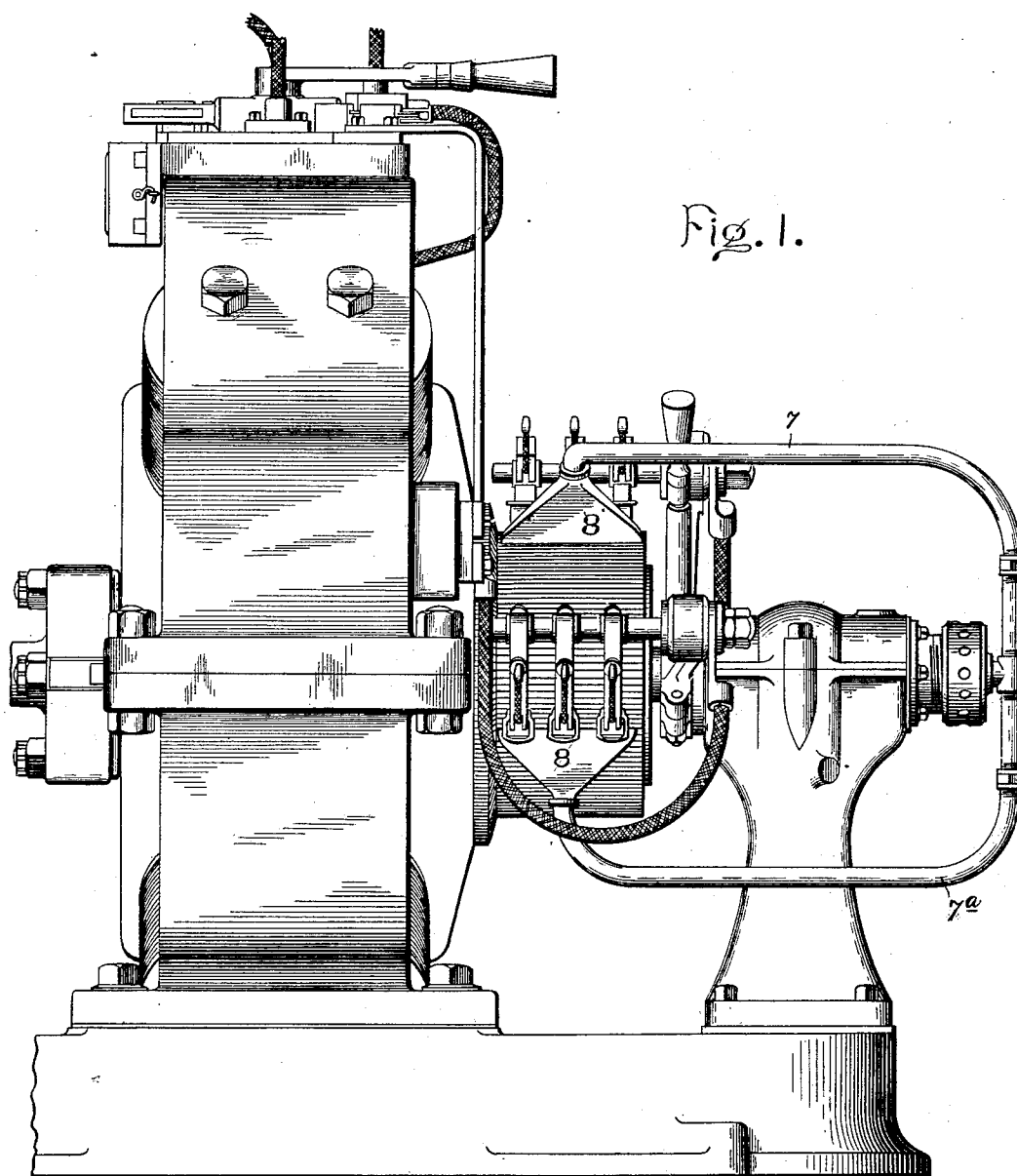


Fig. 1.

Witnesses.

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Robert H. Read,

by *Albert S. Davis*

Att'y.

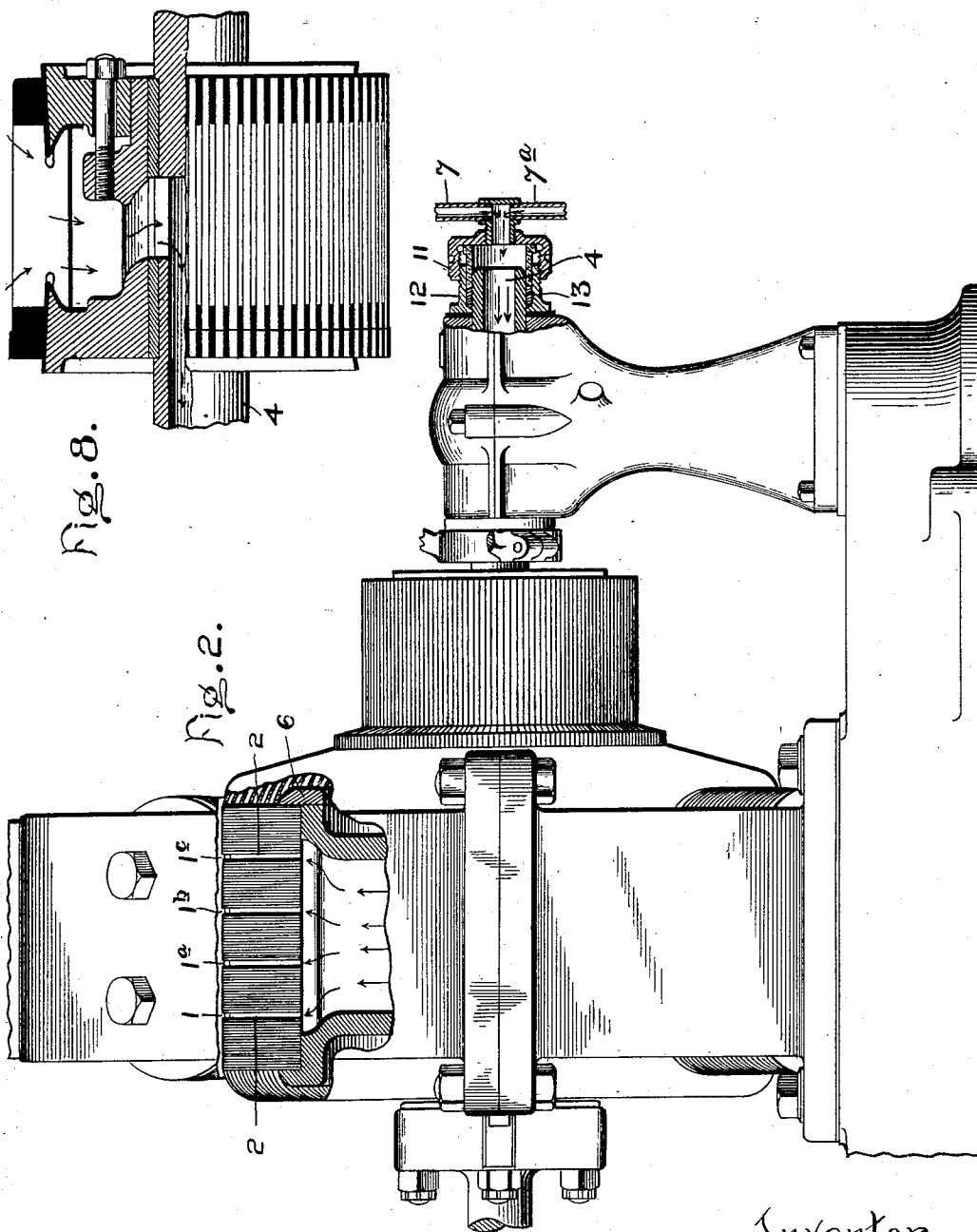
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4 Sheets—Sheet 3.

Fig. 3.

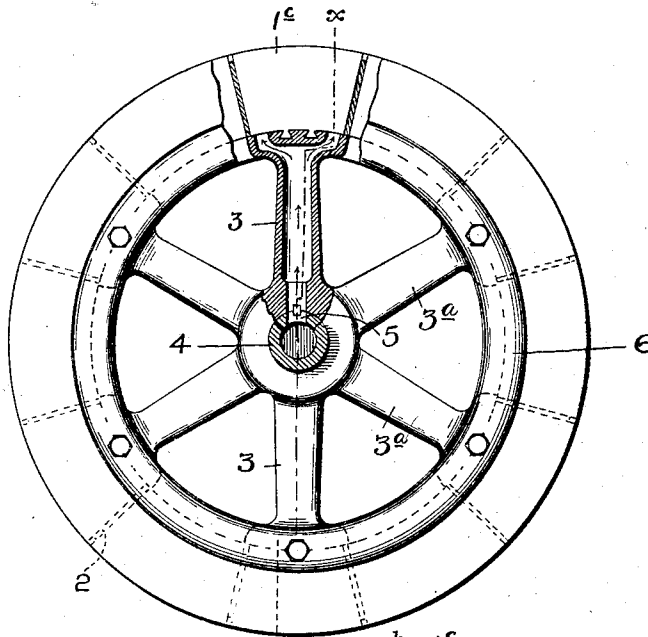
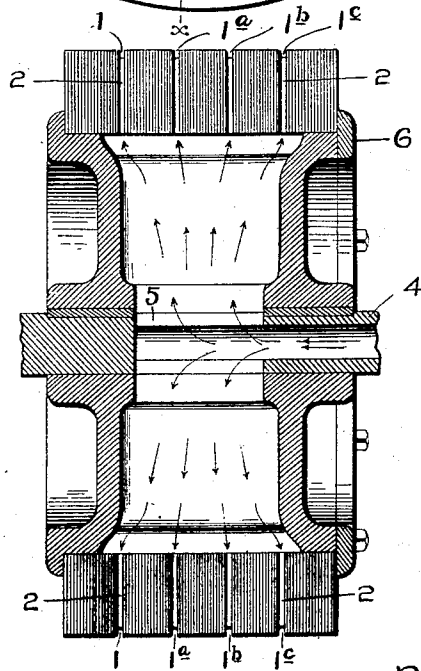


Fig. 4.



Witnesses.

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4 Sheets—Sheet 4.

Fig. 5.

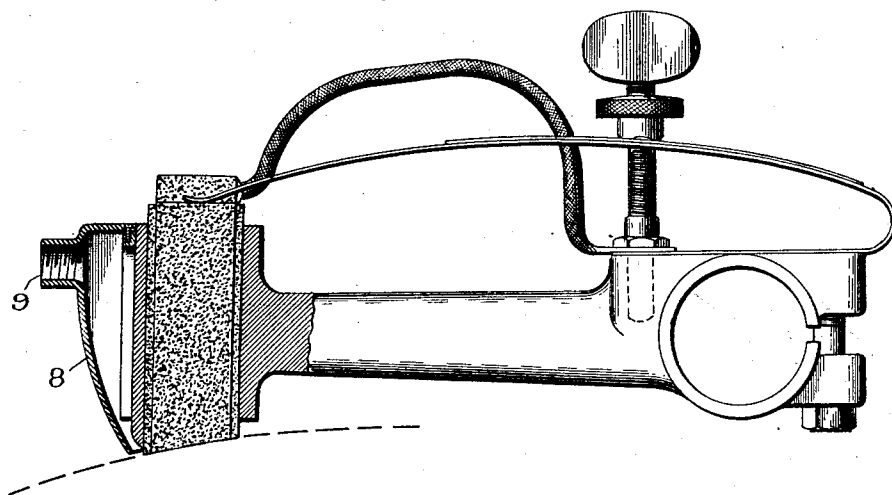


Fig. 6.

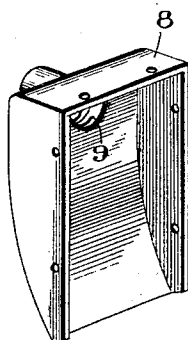
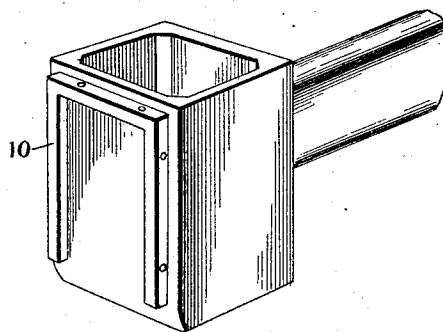


Fig. 7.



Witnesses.

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UNITED STATES PATENT OFFICE.

ROBERT H. READ, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SUPPRESSING SPARKING OF COMMUTATORS.

SPECIFICATION forming part of Letters Patent No. 716,476, dated December 23, 1902.

Application filed April 8, 1901. Renewed July 12, 1902. Serial No. 115,314. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. READ, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful
5 Improvements in Suppressing Sparking of Commutators, (Case No. 1,573,) of which the following is a specification.

The object of the present invention is to relieve dynamo-electric machines or electric motors or other rotary electric apparatus for generating, transforming, or receiving electric currents of pitting at the commutator-bars due to the discharge of cut-out coils or from
10 flashing of arcs over the commutator in machines operating under high potentials. I have discovered that arcs may be suppressed with great ease and perfection by applying air or other gaseous pressure in such a way
20 as to squeeze the arc-vapor into a tubular duct in or through which a stream of moving gas is kept in rapid motion. In applying this principle to commutators I provide means for developing air-pressure, the simplest and most
25 effective of which I have found to be the use of a hollow shaft communicating through the hollow arms of a spider supporting the armature with the ventilating-spaces in the armature-core, the high speed of rotation of the
30 armature throwing out the air centrifugally through the hollow arms of the spider and the ventilating-spaces in the armature-core and developing a suction in the hollow shaft which may be brought to bear upon an ordinary commutator by a chamber inclosing the
35 trailing end of the brush and approximating within very close range of the commutator, or with a specially-constructed commutator may create suction through hollow spaces
40 formed between consecutive commutator-bars. The plan thus outlined differs from methods heretofore employed, in which a blast directed upon the commutator or laterally to the brushes was employed to extinguish
45 the arc, in that it prevents diffusion or scattering of the vapor of the arcs, and thereby renders their absorption more perfect and instantaneous.

The novel features will be more particularly hereinafter described and will be defi-

nately indicated in the claims attached to this specification.

In the accompanying drawings, which represent the invention as applied to a well-known type of electric generator, Figure 1 is
55 an elevation of a machine embodying the improvements. Fig. 2 is a side elevation, partly in section, of such a machine, the brushes being omitted. Figs. 3 and 4 are detail views of the armature construction, showing the
60 mode of developing air-pressure. Figs. 5, 6, and 7 are details of the brush construction as employed in one form of the invention, and Fig. 8 is a part-sectional view of a special
65 form of commutator with which the improvements may be carried out.

The type of generator shown is one in which hand-operated brush-shifting devices are shown. This, however, is not essential to the
70 practice of the invention, which may be employed in any type of rotary electric machine in which arcing at the contacts proves troublesome. It may be applied to generators, motors, rotary converters, commutated types of alternating machines, rotary circuit-interrupters, or generally any form of electric
75 apparatus in which a circuit is opened, closed, or materially varied in a way accompanied by arcing.

In the form of the invention shown in Figs. 80 1 and 2 I have taken advantage of the core construction of modern armatures to develop an air-pressure which may be utilized to extinguish the sparks. Such cores are commonly provided with ventilating-spaces
85 between groups of core-plates for cooling purposes. I put these spaces in communication with closed tubes, connecting them with a hollow shaft. These may be the hollow
90 arms of the spider on which the armature is mounted. The construction will be evident from Figs. 2, 3, and 4, in which 1 1^a 1^b 1^c represent the ventilating-spaces, provided at intervals in the length of the armature-core by radial space-blocks 2, secured to occasional
95 core-plates. Communicating with these open air-ducts are the hollow arms 3 3^a, &c., of a spider supporting the armature, which is mounted over the hollow shaft 4 and communicates with the interior of the same by 100

means of a slot 5, covered by the hub of the spider. The arms of the spider may connect with the armature-core by a tongue-and-groove connection such as indicated in Fig. 6 and a fairly air-tight closure or seal effected by a cap 6, holding the parts together. The outer ends of the spokes of the spider may be spread out to cover any desired peripheral extent of the core and the size of the hollow space in the arms may cover as many ventilating-spaces in the core-plate as desired. When the rotary element is in movement, the air in the spaces is thrown outward by centrifugal force, forming a partial vacuum within the hollow spider, and thereby establishing a suction which causes a movement of air through the hollow shaft, which not only contributes to keep the parts cool, but creates the difference of pressure desirable for the purposes of this invention. The hollow shaft may communicate by a fairly good air-tight joint with tubes 7^a, by which the suction is delivered to the trailing edge of the brushes. On the outside of the brush-holder, so as to cover the trailing edge, is a box 8, with which one of the tubes 7^a connects at a threaded opening 9. The chamber may be easily provided by securing on the end of the brush-holder a rib of inverted-U shape, as indicated at 10, on which may be screwed or otherwise fastened a hollow cap forming the outer walls of the suction-chamber, (shown at 8, Figs. 5 and 6.) This may be formed of metal or of insulating material. As shown in the drawings, the lower edge approaches within close relation to the commutator, and in some cases might even touch the same, thereby creating a suction on the surrounding air, leading it into the casing and over paths radial to the edge of the chamber-walls, thereby drawing in the gaseous products of the arcs and removing the vapor from the contiguous points of the circuit being disrupted and rapidly and effectively extinguishing the arc. The arc is elongated and caused to snap, the arc-gases absolutely removed from the neighborhood of the terminals, and the parts at which the differences of electric potential exist are cooled, all being factors in the resultant effective prevention of sparking.

The type of brush shown in the drawings is a carbon brush. This, however, is a matter of choice, as the invention is equally applicable to copper or other types of brushes. The joint between the shaft and the tubes 7^a is by preference made air-tight, although absolute perfection in this particular is not necessary, as the amount of delivery of air under the centrifugal action of the armature is sufficient to maintain practical differences of pressure, even with leakage at the joints, especially if the tubes are sufficient in diameter to compensate for such leakage. The tube 7^a are by preference, however, connected with the shaft by an air-tight joint, a screw-cup 11 connecting with a cap 12,

screwed or bolted to the bearing, and the joint packed, as indicated at 13. This connection is preferably established at the end of the shaft, though it might be made with one of the journals or elsewhere, if desired.

Instead of drawing the arc outward, as illustrated in Figs. 1 and 5, it might be drawn inwardly if the commutator be provided with openings between consecutive bars. Such a modification is shown in Fig. 8, where narrow air-spaces are provided between consecutive bars, communicating with a slot in the hollow shaft. In this form the arc is drawn down through the commutator-bars as the rear edge of the bar leaves the trailing end of the brush, as indicated by the arrows in the figure. I am aware that a blast of air has been used to disrupt arcs at commutators, as in the Thomson-Houston arc-machines; but in such application the arc products were not confined to a definite path, but were more or less scattered by the blast, and the interruption is not so effective as when their only line of travel is through a confined chamber, and greater pressures are necessary than where the products are led by the moving air into a chamber.

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

1. Means for suppressing arcing at commutators or current-interrupters, comprising a tubular duct communicating with one point of contact, and means for forcing the arc products through said duct.

2. Means for suppressing arcing at commutators, or circuit-interrupters, comprising a tubular duct communicating with one point of contact, and means for lowering air-pressure in the duct to draw the arc products into the same.

3. Means for suppressing arcing at commutators or other rotary circuit-changers, comprising a chamber communicating with the parting contact edges, and centrifugal means for inducing suction in said chamber.

4. Means for suppressing arcing at commutators, comprising a tubular duct having its mouth at the trailing edge of the brush, and means for establishing suction in the duct.

5. Means for suppressing arcing at commutators, comprising a tubular duct having an opening near the commutator at the trailing end of the brush, and means for establishing suction in the duct.

6. Means for suppressing arcing at commutators, comprising a tubular duct having an opening near the trailing edge of the brush, and closed passages connecting said duct with an opening near the periphery of the armature.

7. Means for suppressing arcing at commutators or other rotary circuit-changers, comprising a duct-opening near one of the points of changing contact, an opening near the periphery of the revolving element, and a closed passage connecting the two.

8. Means for suppressing arcing at commu-

tators, comprising a suction-tube near the trailing end of the brush, and a closed passage connecting it with the ventilating-spaces in the armature-core.

5 9. Means for suppressing arcing at commutators, comprising a suction-opening near the trailing edge of the brush, a hollow shaft, a tubular connection between the two, and a

tubular connection between the shaft and the ventilating-spaces of the armature-core. 10

In witness whereof I have hereunto set my hand this 5th day of April, 1901.

ROBERT H. READ.

Witnesses:

BENJAMIN B. HULL,

MARGARET E. WOOLLEY.