(No Model.) 3 Sheets—Sheet 1.

F. J. HAERER & C. L. GIKELEITER.

COMMUTATOR.

No. 567,745. Patented Sept. 15, 1896.

fig. 1.

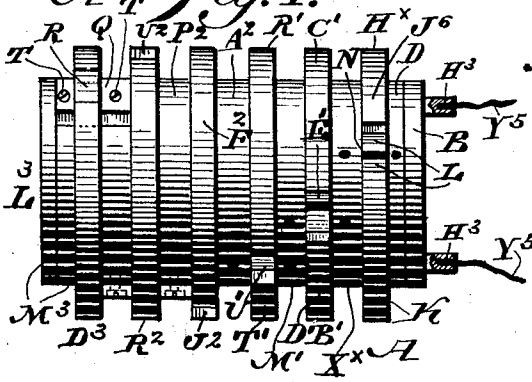


fig. 2.

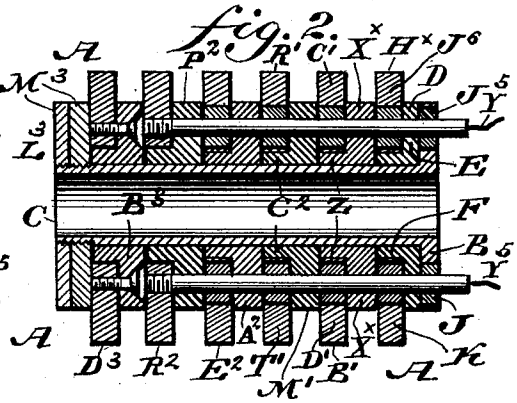


fig. 3.

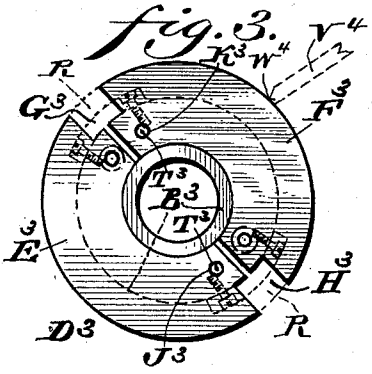


fig. 4.

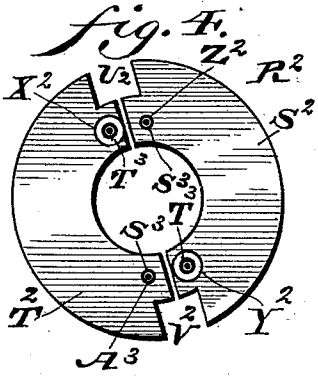


fig. 5.

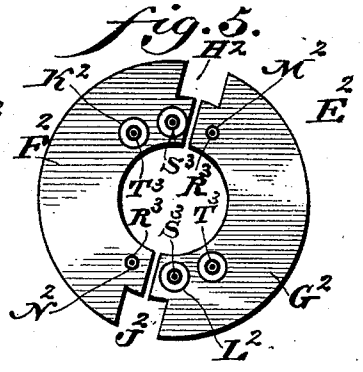


fig. 6.

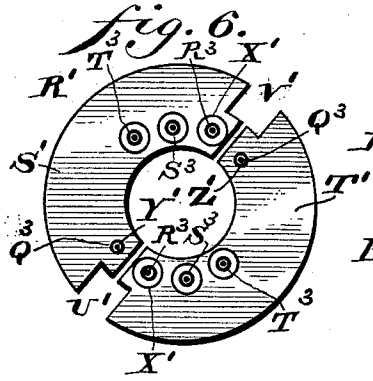


fig. 7.

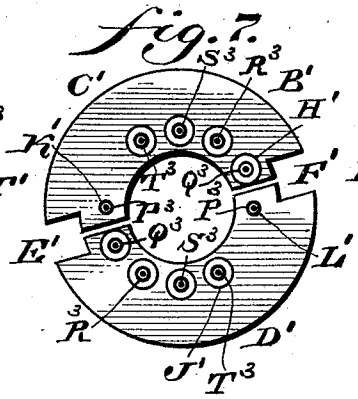


fig. 8.

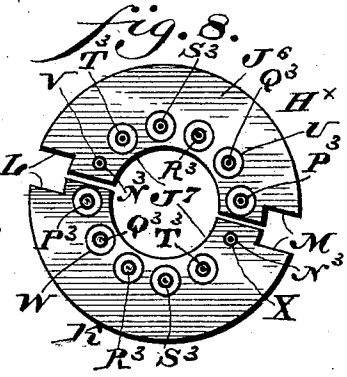


fig. 9.

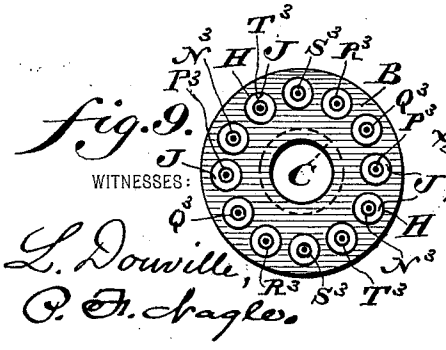


fig. 10.

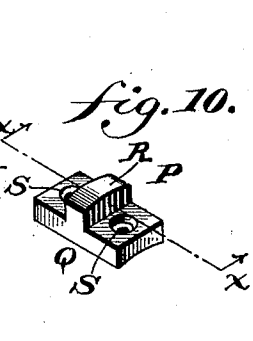
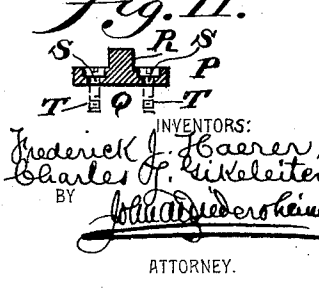


fig. 11.



WITNESSES:

L. Douville,

C. H. Nagle.

INVENTORS:

Frederick J. Haerer,

Charles L. Gikeleiter

BY

ATTORNEY.

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fig. 12.

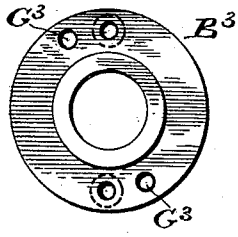


fig. 13.

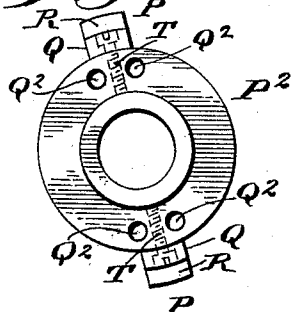


fig. 14.

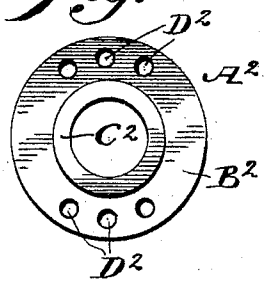


fig. 15.

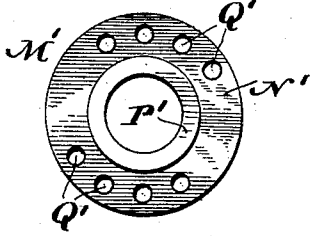


fig. 16.

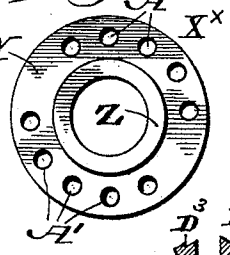


fig. 17.

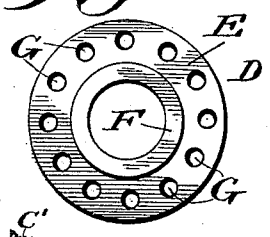


fig. 18.



fig. 30.

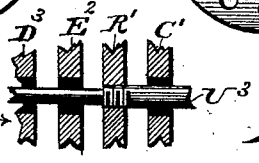


fig. 20.

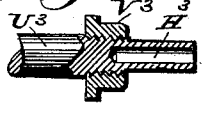
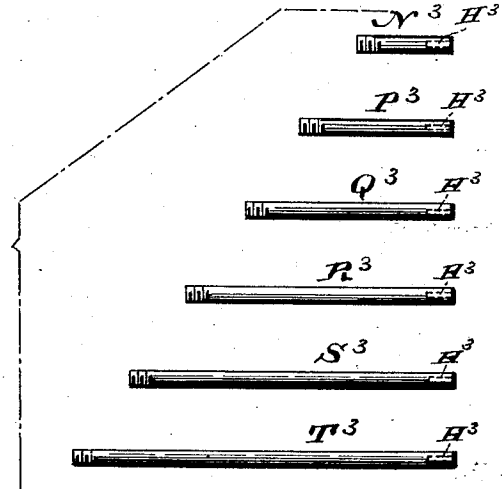


fig. 19



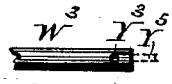


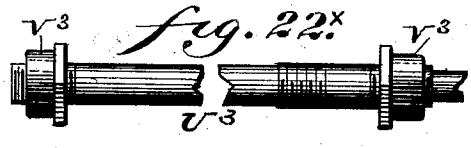
fig. 21.

WITNESSES:

L. Douville,

O. F. Nagler.

fig. 22x



INVENTORS:

Frederick J. Haerer

Charles L. Gikeleiter

BY Johnson & Siederschein

ATTORNEY.

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

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COMMUTATOR.

No. 567,745. Patented Sept. 15, 1896.

fig. 22.

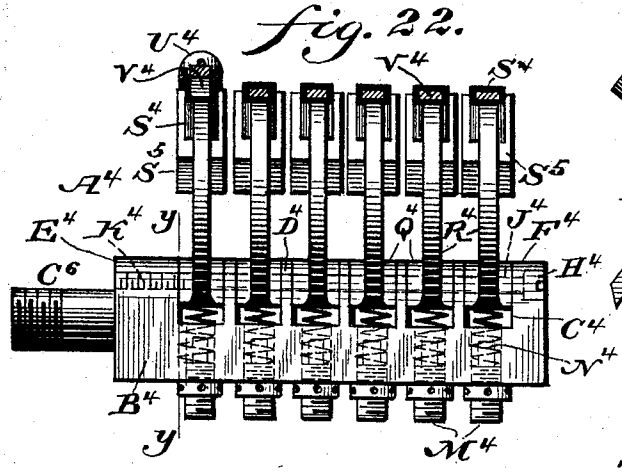


fig. 23.

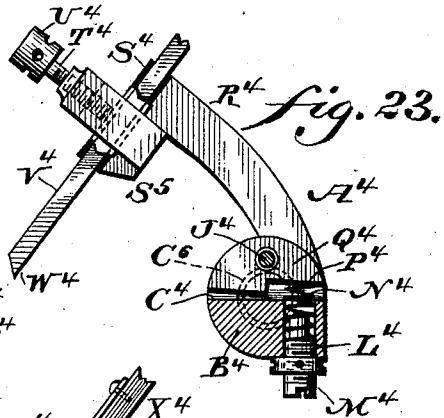


fig. 29.

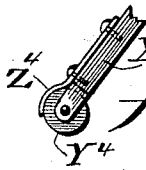


fig. 24.

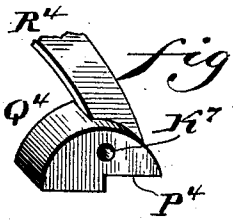


fig. 25.

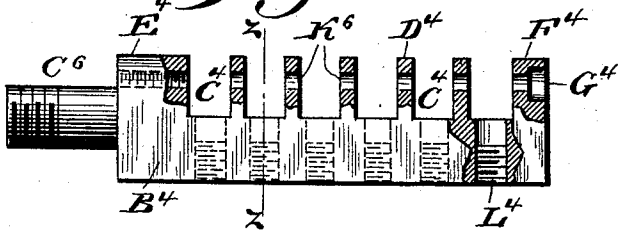


fig. 26.



fig. 27.

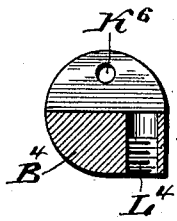
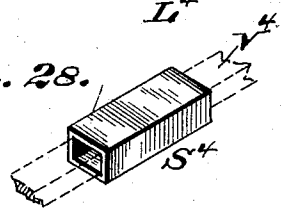


fig. 28.



WITNESSES:

L. Douville,

P. D. Eagle.

INVENTORS:

Frederick J. Haerer

Charles L. Gikeleiter

BY

Johnson & Sidersheim

ATTORNEY.

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

UNITED STATES PATENT OFFICE.

FREDERICK J. HAERER AND CHARLES L. GIKELEITER, OF PHILADELPHIA, PENNSYLVANIA.

COMMUTATOR.

SPECIFICATION forming part of Letters Patent No. 567,745, dated September 15, 1896.

Application filed April 11, 1896. Serial No. 587,156. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK J. HAERER and CHARLES L. GIKELEITER, citizens of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Commutators, which improvement is fully set forth in the following specification and accompanying drawings.

Our invention consists of an improved construction of commutator, the novel features of which will be hereinafter set forth.

It further consists of a novel construction of brush-holder, which is so arranged as to act independently of each of the above disks and allow the easy removal of a brush at all times, there being thus a brush-holder and brush supplied for each coil, and each holder having an adjustable spring, whereby the amount of contact between the brush and the commutator can be adjusted according to requirements, each brush being insulated and separated from its neighbor.

It further consists of novel details of construction, all as will be hereinafter set forth, and specifically pointed out in the claims.

Figure 1 represents a side elevation of a commutator embodying our invention. Fig. 2 represents a longitudinal sectional view of the same. Fig. 3 represents an end view of Fig. 2 with the outside washers on the left hand of said figure removed. Figs. 4, 5, 6, 7, and 8 represent plan views of the different commutator-sections or half-rings employed seen in Fig. 2, the same being removed from position and being shown in the same relative position that each occupies respectively to its neighbor when the commutator-sections are assembled. Fig. 9 represents an end view of Fig. 2, viewed from the end opposite to which Fig. 3 is taken. Fig. 10 represents a perspective view of blocks or filling-pieces employed to interrupt the circuit in the sections of the commutator. Fig. 11 represents a section on line $x\,x$, Fig. 10. Figs. 12, 13, 14, 15, 16, and 17 represent plan views, respectively, of insulating washers or disks employed, which are interposed between the commutator-sections, said insulating-washers being shown in their relative position which they assume to each other when the parts are assembled. Fig. 18 represents a plan view of a check or jam nut employed. Fig. 19 represents a side elevation of the rods employed to hold the different sections of the commutator in assembled position, said rods also serving as conductors to conduct the electricity to their respective commutator-sections. Fig. 20 represents a partial sectional view of the end of the rod seen in Fig. $22^{\times}$, showing the socket therein for the reception of the conductor. Fig. 21 represents an end view of a conducting-rod employed, showing a different manner of making the connection therewith. Fig. 22 represents a side elevation, partly in section, of a brush-holder employed. Fig. $22^{\times}$ represents a side elevation of a rod which may be employed to hold all the sections of the commutator in assembled position. Fig. 23 represents a section on line $y\,y$, Fig. 22. Fig. 24 represents a perspective view of the lower portion of an arm to which the brushes are mounted. Fig. 25 represents a side elevation, partly in section, of a block on which the brushes are mounted. Fig. 26 represents a rod employed to hold the arms which carry the brushes in position. Fig. 27 represents a section on line $z\,z$, Fig. 25. Fig. 28 represents a perspective view of an insulating-sleeve employed, the brush being shown in dotted lines. Fig. 29 represents a side elevation of a modified construction of brush in which a roller is employed. Fig. 30 represents a section of a modification.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates a commutator, the same consisting of the disk B, which has a hollow sleeve C attached thereto, which serves as a support for the washers and held rings or disks of which the commutator is composed.

In order that the construction of the commutator may be best understood, a description of each section as it is placed in position will be given in order. The insulated washer D is first slipped upon the sleeve C and moved into contact with the disk or body B, as will be understood from Figs. 1 and 2, the said washer having a suitable body portion E and a hub F attached thereto, said body portion E having the holes G therethrough, which in

the present instance are twelve in number, the same corresponding in number to the holes H on said body B, which have therein the insulation J, as seen in Fig. 9, the number of holes in the washer D (seen in Fig. 17) and the body B being the same as the number of half rings or disks employed, as will be hereinafter explained.

Upon the hub F of the washer D is placed the commutator-section $H^{\times}$, which is composed of two half-rings J^6 and K, the same having a circular opening J^7, the diameter of which is slightly greater than that of the sleeve C, said sections being provided with the holes U and W, which are five in number in each section, as indicated in Fig. 8, and each section having a tap-hole V and X for a purpose to be hereinafter referred to.

The relative position of the aforesaid holes will be understood from Fig. 8, the abutting edges of said half-rings being provided with the oppositely-located recesses L and M.

N designates insulation between said sections, the position of the same being understood from Figs. 1 and 8.

P designates a block or filling-piece which is inserted in each of the recesses L and M, the same having the body portion Q and the tongue R projecting therefrom, said tongue being curved on the same radius as the periphery of the commutator-sections thereof, forming an unbroken continuous surface with the same, as will be evident from the left-hand portion of Fig. 1.

S designates holes through the said body portion Q, through which the screws T are adapted to pass, the said screws entering the insulated washers on either side of each insulated section, as will be hereinafter explained.

Next to the commutator-section H is placed the washer $X^{\times}$, (seen in Fig. 16,) which consists of the body Y and the flange or hub Z, the same being in all respects similar to the washer D, (seen in Fig. 17,) except that the holes A′ therein are ten in number and are located relative to each other, as will be evident from said Fig. 16.

Upon the hub Z of the washer $X^{\times}$ is placed the commutator-sections B′, (seen in Fig. 7,) the same consisting of the members C′ and D′, which are provided with the diametrically opposite recesses E′ F′, in which the filling-piece P is inserted when the parts are assembled, the members C′ D′ being provided with holes H′ J′, in which a suitable insulation is placed, and the tap-holes or threaded sockets K′ L′, the relative position of which will be evident from Fig. 7, it being noted that when the parts are assembled the recess E′ is turned axially a short distance from the recess L of the section H, as seen in Fig. 1.

Next to the section E′ is placed a washer M′, whose construction will be evident from Fig. 15, the same having a body and a flange N′ P′ and being provided with the holes Q′, which it will be noted are eight in number. Upon the hub P′ of the washer M′ is supported the commutator-section R′, the same consisting of the half-rings S′ T′, in which are the oppositely-located recesses U′ V′, the said half-rings having the holes X′ therein, which are provided with insulation, and the tap-holes Y′ Z′, respectively, the position of the same being evident from Fig. 6.

Next to the commutator-section R′ is placed the insulating-washer A^2, (seen in Fig. 14,) the same having the body portion and hub B^2 C^2 and being provided with the holes D^2, which are opposite to each other and are six in number, as will be evident from said Fig. 14. Upon the hub C^2 of the washer A^2 is placed the commutator-section E^2, the same being composed of the members F^2 G^2, having the oppositely-located recesses H^2 J^2, and the insulated holes K^2 L^2, and the tap-holes M^2 N^2, the relative position of the same being evident from Fig. 5.

Next to the section E^2 is placed the washer P^2, (seen in Fig. 13,) the same having a body portion and hub substantially like the others already described, and having the holes Q^2 opposite each other, which are two in number. Upon the hub of the insulating-washer P^2 is placed the commutator-section R^2, the same being composed of the members S^2 T^2, which have the oppositely-located recesses U^2 V^2, and the insulated passages X^2 Y^2, and the tap-holes or threaded sockets Z^2 A^3, the relative position of the above being evident from Fig. 4.

Next the commutator-section R^2 is placed the insulating-washer B^3, the construction of the same being apparent from Fig. 12, the same having a hub and body portion and the oppositely-located passages G^3, which, it will be noted, are two in number. Upon the hub of said washer B^3 is placed the last of the commutator-sections D^3, (seen in Fig. 3,) the same being composed of the members E^3 F^3 and having the recesses G^3 H^3 and the tap-holes K^3 J^3 located relatively to each other, as seen in Fig. 3.

L designates a locking device which is composed of the washers M^3, which are held together by screws in the manner indicated at the left of Fig. 2, said device being internally threaded and adapted to be secured upon the extremity of the sleeve C, the inner washer being of insulating material.

N^3 to T^3, inclusive, designate conducting-rods which have the double function of serving to hold the several commutator-sections in position and to conduct electricity to their appropriate section, as will be explained.

U^3 designates a rod which may be employed, if desired, to extend longitudinally through all of the sections seen in assembled position in Figs. 1 and 2, and is provided with the jam-nuts V^3, which serve to lock the parts in assembled position and prevent any torsional movement thereof. The said conducting-rods N^3 T^3 may be provided with the hollow sockets H^3, as indicated in Figs. 1 to 20, in which the conducting-wires can be secured

in any suitable manner, or, if desired, said rods may be constructed as seen at W^3 in Fig. 21 and provided with an eye Y^3, in which the conductor Y^5 may be inserted.

It will of course be apparent that other devices may be employed for attaching the wires leading from the armature-coils to the conductor-rods, as, *e. g.*, a wire may be wound around an end of said rods and held in position by a nut, as V^3, and it will be further evident that one of the nuts V^3 (seen in Fig. $22^\times$) may be omitted, if desired, when the rod U^3 is employed to hold the commutator-sections in position.

The manner of assembling the sections of the commutator will be apparent from the foregoing, the insulating-washer being first placed upon the sleeve C and moved into juxtaposition to the body B, as indicated in Fig. 2, after which the conducting-rod N^3 is inserted through the proper holes H and G and its threaded ends are screwed into the tap-holes V and X of the section H. Next comes the washer $X^\times$, (seen in Fig. 16,) and upon this are placed the members of the commutator-section B′, (seen in Fig. 7,) and the next longer conducting-rods P^3 are inserted through the proper holes of the body portion B, the washer D, the section H, and the washer X, the threaded ends of said rods P^3 being screwed into the tap-holes K′ and L′, and so on, after which the filling-pieces P are placed in position, as indicated at the left of Fig. 1 and in Figs. 3 and 13, the tongue R of said filling-piece bridging the space in the recessed members of each commutator-section, as will be evident from Fig. 1, it being further apparent that each filling-piece P is turned axially a short distance from the filling-piece of the adjacent section, as will be understood from the location of the recesses L, E′, U′, and J^2, as seen in Fig. 1, whereupon it will be seen that upon the connection being made between each coil of the armature and the appropriate conductor-rod N^3 to T^3 all the lines of force generated will be conducted from the respective coils of the armature to the appropriate commutator-sections, the same being so arranged that they thus come into action one after the other, like an endless screw, for as soon as a brush leaves the last commutator-section or pair of disks the first ones start into operation again, and so on over and over again.

By arranging the above commutator-sections in the manner described an opportunity is given for using each pair of armature-coils independently and for independent working, the arrangement of the half-rings or sections enabling the operator to take off any brush connected with the coil or coils which may have burned out or become damaged from any reason, thereby enabling the machine to still run without any interference whatever.

The commutator sections or disks can be arranged in almost any number, although it will be apparent that should there be as many coil-armatures as two, three, or four as many commutators as is necessary should be placed on each machine, it being apparent that in case a plurality of commutators are employed, as suggested, they would be arranged in the same manner, so as to get the above-described endless-screw action.

Referring now to Figs. 22 to 28, inclusive, in which the brush-holder and brushes are shown, and the preferred manner of mounting the same, A^4 designates the brush-holder having its different elements in assembled position.

B^4 designates a supporting block or body, which has a threaded stem C^6 thereon, whereby said brush-holder can be readily attached to any desired point.

C^4 designates a series of recesses which are cut in said block or body B^4, said recesses having the partitions D^4 therebetween, the outermost of said partitions being thickened, as at E^4 and F^4, and the said partition E^4 having a threaded opening therein, while the portion F^4 has a seat G^4 therein for the head H^4 of the rod J^4, which has a threaded end K^4, which is adapted to be passed through the holes K^6 and engage the threaded hole in the portion E^4.

L^4 designates a series of threaded passages in the body B^4, which are arranged in alinement with the recesses C^4 and have seated therein the threaded plugs M^4, which serve to hold in position the springs N^4, one end of each of said springs abutting against said plugs, while their other ends abut against the portions P^4 of the bases Q^4 of the brush-holders, each of said bases having an arm R^4 projecting therefrom. Near the extremity of each arm is located the head S^5, in which the insulating-sleeve S^4 is located, said sleeve having passing therethrough the brush V^4, whose end W^4 is adapted to contact with its proper commutator-section, as seen in Fig. 3, the aforesaid brushes being held in position by means of the screws T^4, which are provided with the heads U^4, it being of course understood that suitable connections are made to the brushes V^4, whereby the electricity can be conducted therefrom to any desired point.

In Fig. 29 is a modified construction of brush, the same having the body portion X^4 and the roller Y^4, journaled in the extremity thereof, said roller having bearing thereon the spring Z^4.

The operation is as follows: The brush-holders are assembled in position by placing the bases Q^4 in the recesses E^4, after which the rod J^4 is passed through the passages K^6 and K^7. The springs N^4 of the screws M^4 are then placed in position, after which the brushes V^4 can be adjusted as desired, it being apparent that each brush-holder acts independently upon each commutator disk or section, and that the easy removal of a brush at any time is permitted, each brush-holder

being arranged to suit the width of its appropriate half-rings or commutator-section, and it being further apparent that a separate and independent brush is supplied for each coil. By means of the spring and adjusting-screw each brush-holder can be regulated and set so as to give perfect contact of the commutator-sections, and it will further be apparent that each brush is insulated and separated from its neighbor.

In Fig. 30 we show the bolt U^3 secured to the section R' and passing through and insulated from the other sections and members, it being observed here that each of the other bolts are secured to a different section, and consequently insulated from the other sections.

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

1. In a commutator, a plurality of half-disks, having recesses near their periphery, means for holding said disks in assembled position and filling-piece for recesses, substantially as described.

2. A commutator, composed of sections, suitably insulated and supported, each section comprising, a half-disk having recesses therein substantially opposite to each other, and filling-pieces for said recesses, the latter being arranged spirally relative to each other, substantially as described.

3. A commutator composed of the body portion having a longitudinally-extending sleeve attached thereto, a series of washers provided with hubs mounted on said sleeve, a series of commutator-sections mounted on the hubs of each washer, each commutator-section having a conducting-rod for securing the commutator-section being provided with recesses substantially opposite to each other and a conducting-rod for securing said section in position, each rod being adapted to have connection to an independent coil of the armature, in combination with filling-pieces for said recesses, substantially as described.

4. A commutator composed of washers, and commutator-sections each comprising a half ring or disk, all of said commutator-sections except an external one being provided with insulated passages, and all of said sections having threaded sockets, each section having recesses substantially opposite to each other, and filling-pieces for said recesses, substantially as described.

5. A commutator consisting of a body portion, having a longitudinally-extending sleeve attached thereto, washers mounted on said sleeve, commutator-sections interposed between said washers, each section comprising a half ring or disk having recesses located substantially opposite to each other, filling-pieces for said recesses, and means for holding said sections in assembled position, substantially as described.

6. A commutator, composed of a sleeve, commutator-sections suitably insulated and mounted on said sleeve, said sections comprising a half ring or disk having recesses substantially opposite to each other, and filling-pieces for said recesses, substantially as described.

7. A commutator composed of a sleeve, commutator-sections mounted thereupon and suitably insulated, each section comprising a half ring or disk, having recesses oppositely located to each other, filling-pieces for said recesses, and conducting-rods adapted to engage each appropriate commutator-section, and to be insulated from the other sections, substantially as described.

8. A commutator composed of sections suitably insulated from each other, each comprising a half ring or disk having oppositely-located recesses therein, filling-pieces for said recesses turned axially with respect to each other, and conducting-rods attached to said sections, each rod being adapted to have a connection to an independent coil of the armature, substantially as described.

9. A brush-holder, comprising a block, a series of recesses therein, having partitions therebetween, a series of threaded passages in said block, in alinement with said recesses, plugs in said passages and springs resting on said plugs, in combination with a series of arms, having bases pivotally mounted in said block and in contact with said springs, and brushes suitably supported and insulated upon said arms, substantially as described.

10. A brush-holder, comprising a supporting-block, having a series of recesses therein, a series of threaded passages in said block, having plugs therein, and springs supported on said plugs, in combination with arms pivotally mounted in said block, and held in position by said springs, insulated brushes carried in the extremities of said arms and means for holding said brushes in position, substantially as described.

11. A brush-holder, consisting of a supporting-block, having a recess therein, a threaded passage thereunder, an adjusting plug and spring in said passage, an arm pivotally mounted in said recess, and an insulated brush carried in the extremity of said arm, substantially as described.

12. A brush-holder, consisting of a supporting-block, having an arm pivotally mounted therein, a passage under said arm, an adjusting device for the latter located in said passage, and a brush carried by said arm, substantially as described.

FREDERICK J. HAERER.
CHARLES L. GIKELEITER.

Witnesses:
CAROLINE HAERER,
J. FREDK. BAECHLER.