H. G. REIST.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED MAR. 1, 1905.

900,781. Patented Oct. 13, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

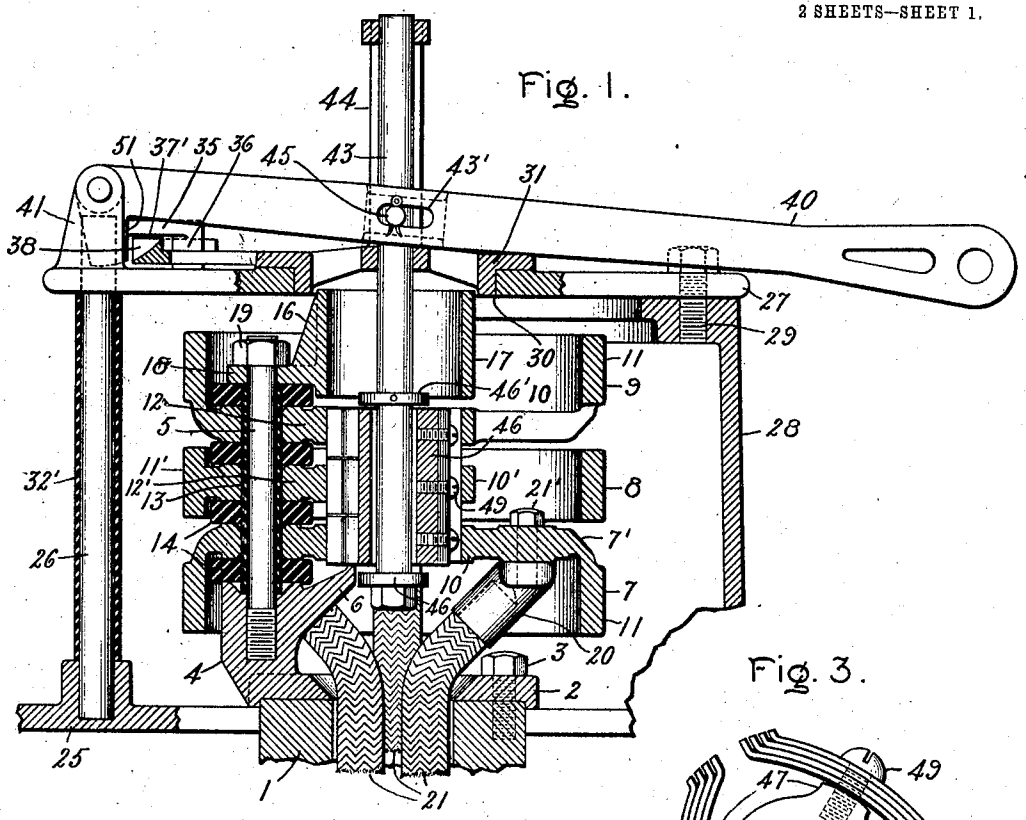


Fig. 2.

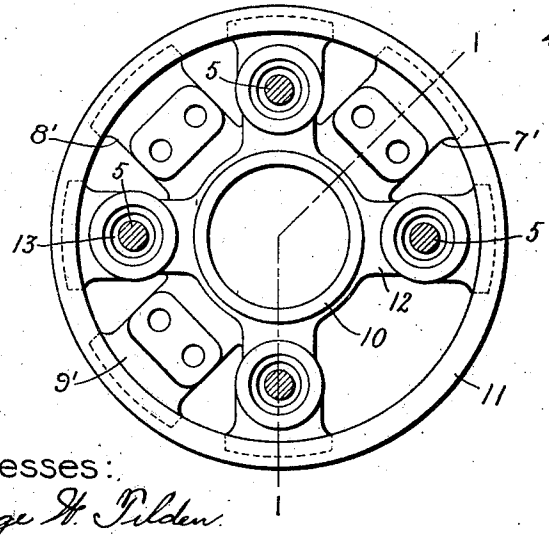


Fig. 3.

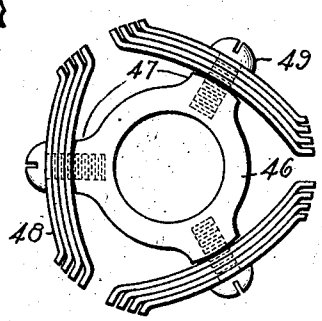
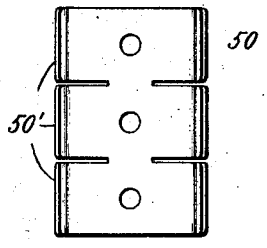


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

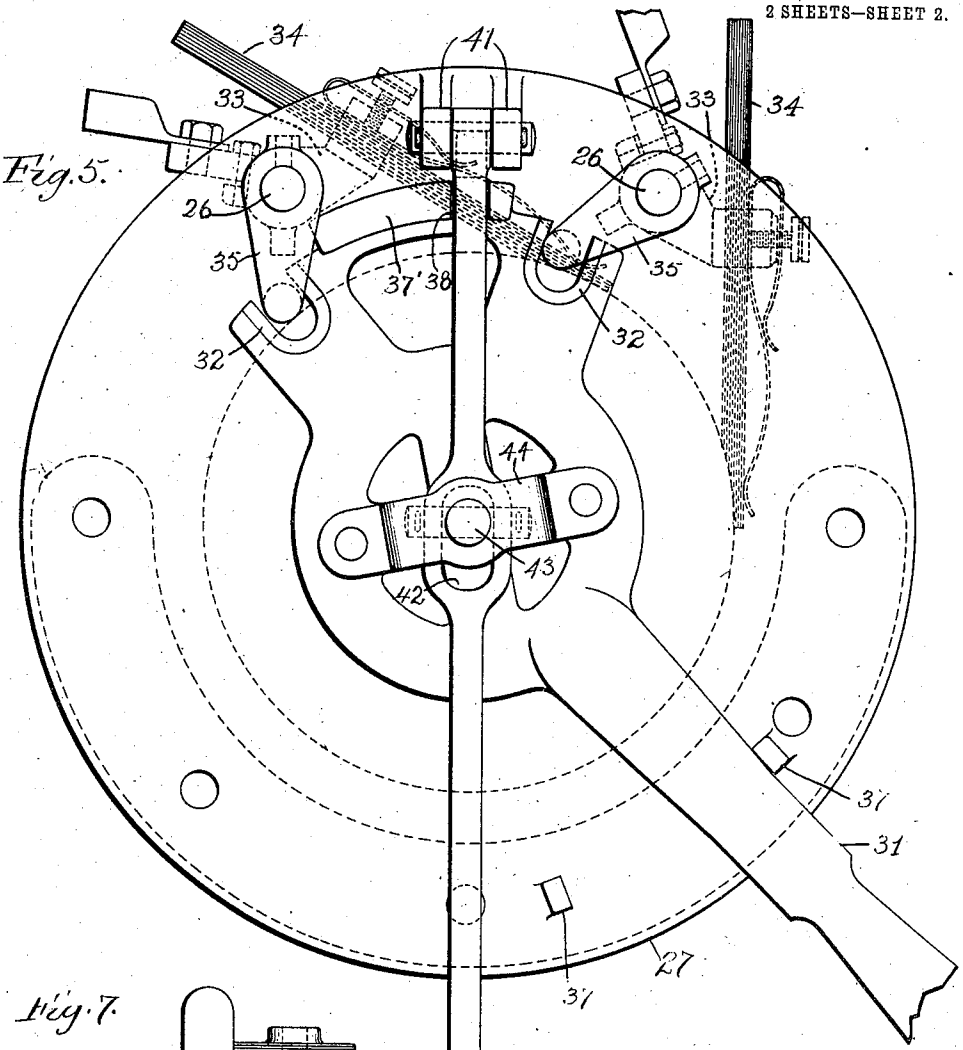


Fig. 7.

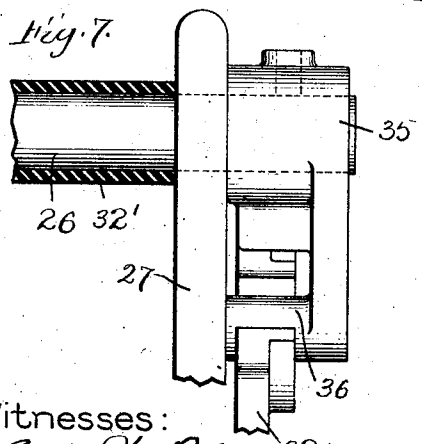
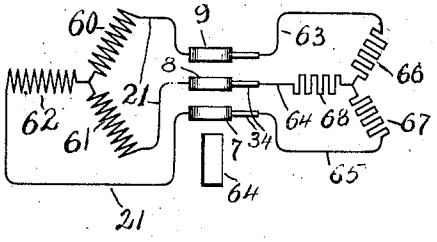


Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY G. REIST, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

DYNAMO-ELECTRIC MACHINE.

No. 900,781. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed March 1, 1905. Serial No. 247,850.

To all whom it may concern:

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

The object of my present invention is to improve the construction and arrangement of collector-rings of dynamo-electric machines.

The collector ring construction which I have invented is peculiarly adapted for use in machines such as induction motors where it is desirable, at certain stages in the operation of the machine, to have the collector rings and coöperating brushes connected in separate circuits, and at other stages in the operation of the machine to have the collector rings short-circuited together.

My present invention also comprises certain novel features of construction and arrangement of the short-circuiting means for the collector-rings and the brushes connecting the collector-rings in separate circuits. In this connection I have devised a certain novel short-circuiting device and have interlocked the short-circuiting device with the brushes connecting the collector-rings in separate circuits so that the brushes cannot be removed from the position of operative engagement with the collector-rings except when the collector-rings are short-circuited, thus doing away with the liability of having the surface of the collector-rings or brushes injured by sparking.

The features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention, however, reference may be had to the accompanying drawings and description in which I have illustrated and described one of the forms in which my invention may be embodied.

Of the drawings, Figure 1 is a sectional elevation on the line 1 1 of Fig. 2 showing a construction embodying my invention; Fig. 2 is a plan view of the assembled collector-rings; Fig. 3 is a plan view of the short-circuiting device; Fig. 4 is an elevation showing a detail of the short-circuiting device; Fig. 5 is a plan view of the construction shown in Fig. 1; Fig. 6 is a diagram illustrating certain circuit arrangements of the particular machine to which my invention is shown as applied; and Fig. 7 is an elevation with parts broken away and in section showing the construction of certain details.

In the drawings, 1 represents the vertical shaft of an induction motor, to the upper end of which collector rings are secured by means of which, and the coöperating brushes, etc., resistances may be inserted in the circuits of the rotor windings to facilitate the starting of the machine. To the upper end of the shaft 1 an annular member 2 is secured by bolts 3 tapped into the end of the shaft and extending parallel thereto. Four similar studs or posts 4 project upward from the upper side of the member 2 to which they are preferably integrally connected. Each of the posts 4 has a threaded opening formed in its upper end into which is secured the lower end of a stud bolt 5 which extends parallel to the shaft 1. Each post 4 is also formed with an inwardly-extending projection 6, the purpose of which will be hereinafter described.

Three collector rings, 7, 8 and 9, are placed on the bolts 5. The collector rings 7 and 9 are counterparts. Each comprises an internal annular portion 10 and an outer annular portion 11. The annular portions 10 and 11 of each ring are connected by four radially extending arms 12. The arms 12 are formed with holes to receive the supporting bolts 5. In the collector-rings 7 and 9 the outer ends of the arms 12 are bent so that the annular portion 11 of each ring is not in the same plane with the bodies of the arms 12 and the annular portion 10 of the same collector-ring. In assembling the collector-rings the collector-rings 7 and 9 are reversed with respect to each other so that the annular portion 11 of the collector-ring 7 is below its annular portion 10 while, in the collector ring 9, the annular portion 11 is above the annular portion 10. The collector-ring 8 is similar in construction to the collector-rings 7 and 9 except that the outer ends of its arms 12′ are straight and its annular portion 11′ corresponding to the annular portion 11 of the other collector rings is symmetrically placed with respect to its arms 12′ and annular portion 10′.

Each bolt 5 is surrounded by a tube 13 of suitable material which insulates the collector-rings from the bolts. Washers 14 are strung along the bolt 5 to separate the col-

lector-rings from each other, the ends of the posts 4, and an upper end member 16. The end member 16 comprises a tubular portion 17 from which arms 18 extend. The arms 18 are formed with openings through which the bolts 5 pass. The collector-ring construction is locked firmly in place by clamping nuts 19 which are screwed on to the outer threaded ends of the studs 5 and bear against the outer surface of the arms 18.

The outer surfaces of the annular portions 11 and 11′ of the collector rings are cylindrical and concentric with the shaft 1 as are the inner peripheries of the annular portions 10 and 10′ and the inner periphery of the tubular member 17. The internal diameter of the latter is equal to the internal diameter of the annular portions 10 and 10′. The collector-rings 7, 8 and 9 are provided each with a radially-extending arm or projection 7′, 8′ and 9′, respectively, from the inner annular portions of the collector-rings. These projections are located between adjacent pairs of arms 12 or 12′. As shown in Fig. 2, the projections 7′, 8′ and 9′ are staggered with respect to each other. The outer terminals 20 of three suitable conductors 21 are connected one each to the projections 7′, 8′ and 9′ by bolts 21′ passing through the projections and tapped into the terminals. The conductors 21 pass into the bore of the shaft 1, which is made hollow to receive them, and are connected at their inner ends to the winding of the rotor of the machine in a manner not shown.

A pair of bolts or shafts 26 are swiveled in bosses formed on the upper side of a suitable stationary support 25 which may be the end member of the motor proper. The shafts 26 are similar to each other and are each parallel to the shaft 1. The shafts near their upper ends have bearings in openings formed for the purpose in a disk-shaped member 27 which is supported by a shell 28, arc-shaped in cross-section, the lower end of which rests on and is secured to the supporting member 25. The member 27 is secured to the upper end of the shell 28 by bolts 29, and is formed with a centrally-located aperture 30 in which an annular flange projecting from the underside of a lever or member 31 has a rotatable fit. One end of the lever 31 is formed with two open-ended slots 32 separated from each other by the same angle from the axis of the shaft 1 as are the bolts or shafts 26. Upon each shaft 26 are secured three brush-holders 33. A shell of insulating material 32′ surrounds each bolt 26 and insulates the brushes from the shafts. The brush-holders each carry a brush 34 of the ordinary form which engages the external periphery of the outer annular portion of the appropriate collector-ring. The brushes on each shaft are arranged one above the other, the upper brush coöperating with the collector-ring 9, the intermediate brush with the collector-ring 8, and the lower brush with the collector-ring 7. It will be understood that each shaft 26 and brushes carried by it are duplicates of the other shaft and brushes. To the upper end of each shaft 26 is rigidly secured an arm 35. Each arm 35 is provided with a downwardly-extending projection 36 which engages with the walls of the corresponding slot 32. It will be readily understood that by oscillating the lever 31 between the stops 37 on the member 27 the brushes can be moved from the position shown in Fig. 5, in which case they engage the collector-rings, to the position where they do not engage the collector-rings. The short end of the lever 31 carries between the slots 32 an arc-shaped projection or guard 37′. A transverse slot 38 is formed in one end of the guard 37′.

A lever 40 is pivoted between ears 41 formed for the purpose on the upper side of the member 27 to turn in the axial plane passing midway between the bolts 26. Between its ends the lever 40 is formed with a slot 42 through which passes a rod 43 placed with its axis in line with the axis of the shaft 1. The rod 43 slides in an opening in the lever 31 and in another opening in an inverted U-shaped support 44, the ends of which are secured to the lever 31. The ends of a pin 45, passing transversely through the rod 43, extend into slots 43′ formed for the purpose in the lever 40, the arrangement being such that when the lever 40 is oscillated about its pivoted point of support, the rod 43 is reciprocated in the direction of its length. The lower end of the rod 43 has loosely and rotatably mounted on it between collars 46′ a member 46 provided on its outer surface with three longitudinally-extending ribs 47.

A short-circuiting brush 48 is secured to each rib 47 by screws 49. Each short-circuiting brush 48 is formed of a plurality of curved metal plates 50. The vertical edges of the plates 50 are bent so as to extend radially. In the construction shown in the drawings there are four plates 50 in each brush. The plates 50 are formed each with two horizontal kerfs extending in from each vertical edge of the brush, thus separating each plate 50 into six fingers 50′ which are so arranged and proportioned that a pair of fingers one at each side of the plate bears against the inner periphery of the inner annular portions of the collector-rings 7, 8 and 9, when the rod 43 is in its lower position, in which case the brushes 48 short-circuit the collector-rings.

When the lever 40 is elevated the brushes 48 are moved upward out of engagement with the collector-rings into the position in which they bear against the inner periphery of the tubular member 17, the friction between the brushes and the inner periphery

of the member 17 being sufficient to prevent displacement of the short-circuiting brushes from occurring easily. When the lever is down the short-circuiting device is supported by the projections 6 from the posts 4. The lever 40 is provided with a projection 51 which is so placed with reference to the guard or projection 37' that the lever 40 can be moved out of the position shown in Fig. 1 only when the lever 31 is turned to the position shown in Fig. 5 where the brushes 34 are in engagement with the collector-rings. In other words, the brushes 34 can be moved out of engagement with the collector-ring only when the short-circuiting brushes are in the position shown in Fig. 1.

In the diagram shown in Fig. 6, 60, 61 and 62 represent the rotor windings. One set of ends of the windings is connected together to give a three-phase Y-connection. The other ends of the windings are connected through the leads or conductors 21 to the collector-rings 7, 8 and 9. The brushes cooperating with the external surface of the collector-rings are connected by suitable conductors 63, 64 and 65 to resistance conductors 66, 67 and 68. The other ends of the resistance conductors are connected together to give a Y-connection. It will thus be observed that when the brushes engage the collector-rings the resistances are cut into the proper circuit relations with the windings 60, 61 and 62 to facilitate the starting of the motor, provided the short-circuiting brushes are in the inoperative position as shown in the diagram. When, however, the short-circuiting device is in the position in which the collector-rings are all connected together the resistances are short-circuited.

Interlocking the short-circuiting brushes and the other brushes in the manner hereinbefore described renders it impossible to move the brushes 34 out of engagement with the collector-rings except when the collector-rings are short-circuited. In consequence, no injurious sparking between the brushes and the collector-rings can take place from a separation of brushes and collector-rings while current is flowing through the brushes. At the same time the brushes may be moved out of engagement with the collector-rings when the latter are short-circuited to prevent wear of the brushes and of the collector-rings. The brushes on the short-circuiting device are so proportioned that the resiliency of the brushes causes the latter to engage the collector-rings with considerable force, thus establishing good electrical connections. It will be readily understood that the short-circuiting device rotates with the collector-rings when in engagement with them though the rod 43 does not.

The collector-ring construction described possesses advantages when used without the short-circuiting device as it is simply and strongly built and is well ventilated.

It will be obvious that changes may be made in the form in which my invention is embodied without departing from its spirit.

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

1. In combination, a rotating body, collector rings secured thereto, each of said collector rings being provided with a cylindrical external contact surface and with a cylindrical internal contact surface, and brushes for engaging each of said surfaces, each of said brushes for the internal contact surface being arranged to engage all the collector rings and thereby short-circuit them.

2. In a dynamo electric machine, a rotating shaft, a set of collector rings each having an internal cylindrical contact surface and an external cylindrical contact surface, said collector rings being secured to said shaft with the contact surfaces concentric with the axis of the shaft, brushes engaging the external contact surfaces of the rings, each brush being electrically insulated from the other brushes, and a short-circuiting device movable into and out of position in which it engages the inner contact surfaces of the collector rings to electrically connect them together, said device comprising brushes, each of said brushes engaging all the rings in the short-circuiting position.

3. In combination, a set of collector rings each of which has two contact surfaces, a set of coöperating brushes movable into and out of position in which they engage one of the contact surfaces on each ring, the brush or brushes engaging each collector ring being insulated from the others, short-circuiting means movable into and out of the position in which it engages the others of said contact surfaces to electrically connect the collector rings together, a lever pivoted to turn in one plane for moving said short-circuiting means, a lever pivoted to turn in a plane at right angles to the first-mentioned plane to move the brushes into and out of position in which they engage the collector rings, and an interlocking connection between said levers whereby the brush-operating means can be operatively moved only when the rings are short-circuited.

4. In combination, a set of collector rings each of which has two contact surfaces, a set of brushes movable into and out of the position in which they engage one of the contact surfaces on each ring, the brush or brushes engaging each collector ring being insulated from the others, short-circuiting means movable into and out of the position in which it engages the other of said contact surfaces to electrically connect the collector rings together, a lever pivoted to turn in one plane for moving said short-circuiting means, a lever pivoted to turn in a plane at right angles

to the first-mentioned plane to move the brushes into and out of position in which they engage the collector rings, and an interlocking connection between said levers whereby the brush-operating means can be operatively moved only when the rings are short-circuited, said interlocking means comprising a portion on one of said levers which engages the other lever to prevent the operation of the first-mentioned lever except when the second lever is in a predetermined position.

5. In combination, a rotating shaft, collector rings each having an internal cylindrical contact surface secured to the shaft with said surfaces concentric with the shaft, a tubular support secured to the end of the shaft having its inner surface concentric with the shaft, a short-circuiting device, and means for moving it from the position in which it engages the inner contact surface of the collector rings to a position in which it is engaged and supported by the friction of the inner surface of said support.

6. In a dynamo electric machine, a stationary member, a rotating element, collector rings carried thereby, brushes, a lever pivoted to said support for moving said brushes into and out of engagement with said collector rings, a device for short circuiting said collector rings comprising a lever pivoted to said support independently of the first mentioned lever, and an interlocking connection between said levers whereby the brushes can be moved out of engagement with the collector rings only when the collector rings are short circuited by said device.

7. In a dynamo electric machine, a rotating shaft, collector rings carried thereby, brushes insulated from each other in coöperative relation with said collector rings, a stationary support, a lever pivoted thereon for moving said brushes into and out of position in which they engage the collector rings, a short-circuiting device for the collector rings, a lever for operating it also pivoted to said support, and an interlocking connection between said levers for preventing operation of the brush moving lever except when the short circuiting device is in a predetermined position.

8. In combination, a set of rotating collector rings each provided with internal and external contact surfaces concentric with the axis of rotation, coöperating brushes for the external contact surface, a short-circuiting device having a member upon which a second set of brushes are mounted for engaging the interior contact surfaces, each brush of said second set engaging all the rings in the short-circuiting position, a support, a member carried thereby for moving the brushes into and out of the position of engagement with the external surface of the collector rings, a device for operating the short-circuiting device movably secured to said support, and an interlocking connection between said member and device for preventing a movement of the brushes out of engagement with the collector rings except when the latter are short-circuited by said device.

9. In combination, a set of rotating collector rings each provided with internal and external contact surfaces concentric to the axis of rotation, brushes engaging the exterior contact surfaces, a short-circuiting device for engaging the interior contact surfaces, a stationary support, means mounted thereon for moving said brushes into and out of engagement with the collector rings, means also mounted thereon for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and interlocking connections between said means so arranged that the short-circuiting device can be moved out of the short-circuiting position only when the brushes are in engagement with the collector rings.

10. In combination, a set of rotating collector rings provided with external and internal contact surfaces concentric to the axis of rotation, brushes engaging the exterior contact surfaces, a short-circuiting device for engaging the interior contact surfaces, a stationary support, a lever mounted thereon for moving said brushes into and out of engagement with the collector rings, a second lever also mounted thereon for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and an interlocking connection between the levers whereby the brushes can be moved out of engagement with the collector rings only when the short-circuiting device is in the short-circuiting position.

11. In combination, a rotating shaft, bolts connected to and extended from the ends thereof in a direction parallel to the axis of the shaft, a set of collector rings and an end member secured on said bolts, each of said collector rings having internal contact surfaces, said end member being formed with an opening in it, and a short-circuiting device movable from the position in which it is located in and supported by the friction of the walls of said opening into the position in which it engages the inner contact surfaces of said collector rings to connect them together electrically.

12. In combination, a set of rotating collector rings, brushes therefor, a device for short-circuiting said collector rings, means for moving the brushes into and out of engagement with the collector rings, means for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and interlocking connections between said means so arranged that the short-circuiting device can be moved out of the short-circuiting position only when

the brushes are in engagement with the collector rings.

13. In combination, a set of rotating collector rings, brushes therefor, a device for short-circuiting said collector rings, a stationary support, means mounted thereon for moving the brushes into and out of engagement with the collector rings, means for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and interlocking connections between said means so arranged that the short-circuiting device can be moved out of the short-circuiting position only when the brushes are in engagement with the collector rings.

14. In combination, a set of rotating collector rings, brushes therefor, a device for short-circuiting said collector rings, a stationary support, means mounted thereon for moving the brushes into and out of engagement with the collector rings, means also mounted thereon for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and interlocking connections between said means so arranged that the short-circuiting device can be moved out of the short-circuiting position only when the brushes are in engagement with the collector rings.

15. In combination, a set of rotating collector rings, brushes therefor, a device for short-circuiting said collector rings, a pivoted lever for moving the brushes into and out of engagement with the collector rings, a member for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and interlocking connections between said member and said lever so arranged that the short-circuiting device can be moved out of the short-circuiting position only when the brushes are in engagement with the collector rings, said interlocking connections comprising a projection on said member which engages said lever to prevent the operation of said short-circuiting device except when said lever is in a predetermined position.

16. In combination, a set of rotating collector rings, brushes therefor, a device for short-circuiting said collector rings, a pivoted lever for moving the brushes into and out of engagement with the collector rings, a second lever for moving the short-circuiting device into and out of the position in which it connects the collector rings together, and interlocking connections between said levers so arranged that the short-circuiting device can be moved out of the short-circuiting positions only when the brushes are in engagement with the collector rings, said interlocking connections comprising a projection on one of said levers which engages the other lever to prevent the operation of the second-mentioned lever except when the first lever is in a predetermined position.

In witness whereof I have hereunto set my hand this 16th day of February, 1905.

HENRY G. REIST.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.