

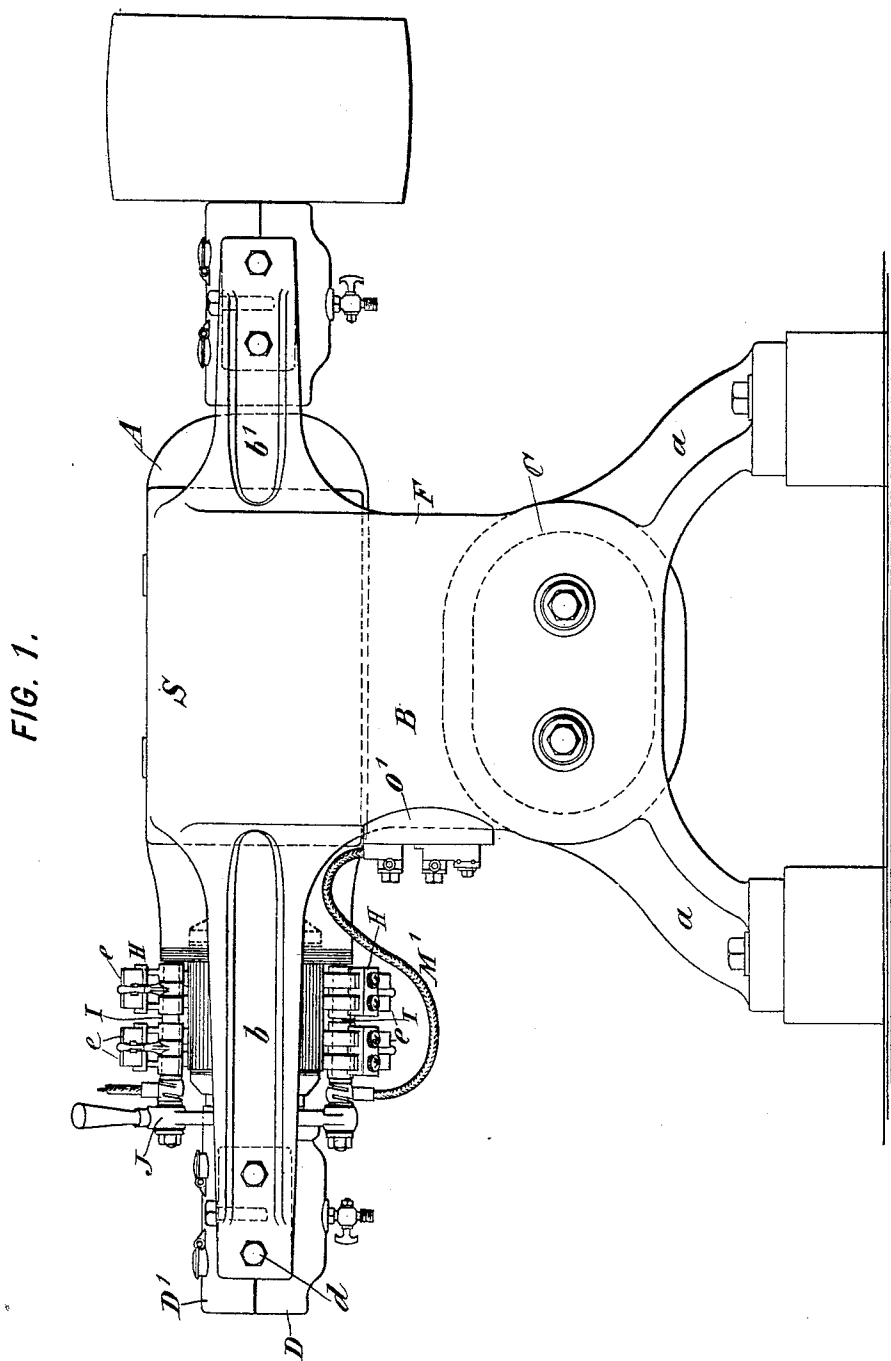
(No Model.)

4 Sheets—Sheet 1.

J. J. WOOD.
DYNAMO ELECTRIC MACHINE.

No. 477,729.

Patented June 28, 1892.



WITNESSES:

John Becker
Fred White

INVENTOR:

INVENTOR:
James J. Wood,

By his Attorneys,

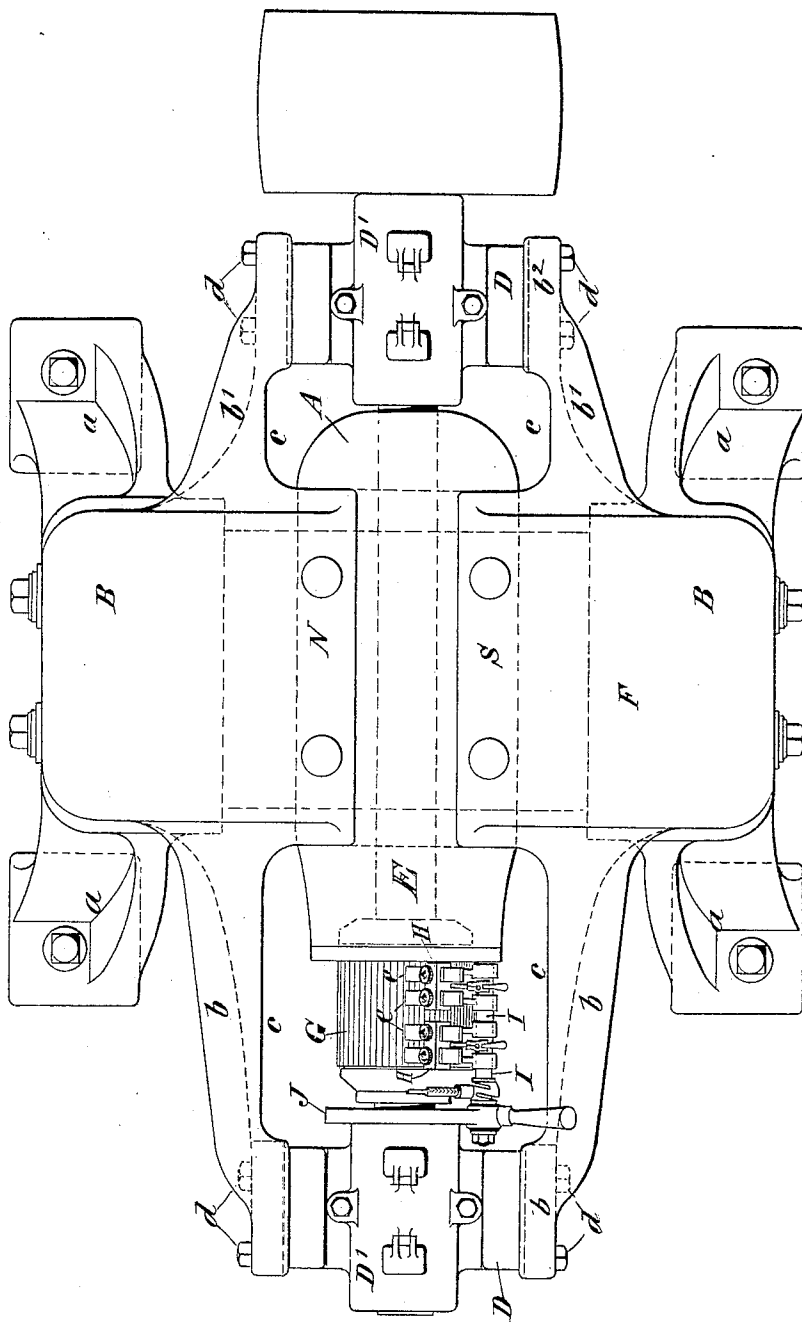
Arthur C. Fraser H.C.

J. J. WOOD.
DYNAMO ELECTRIC MACHINE.

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FIG. 2.



WITNESSES:

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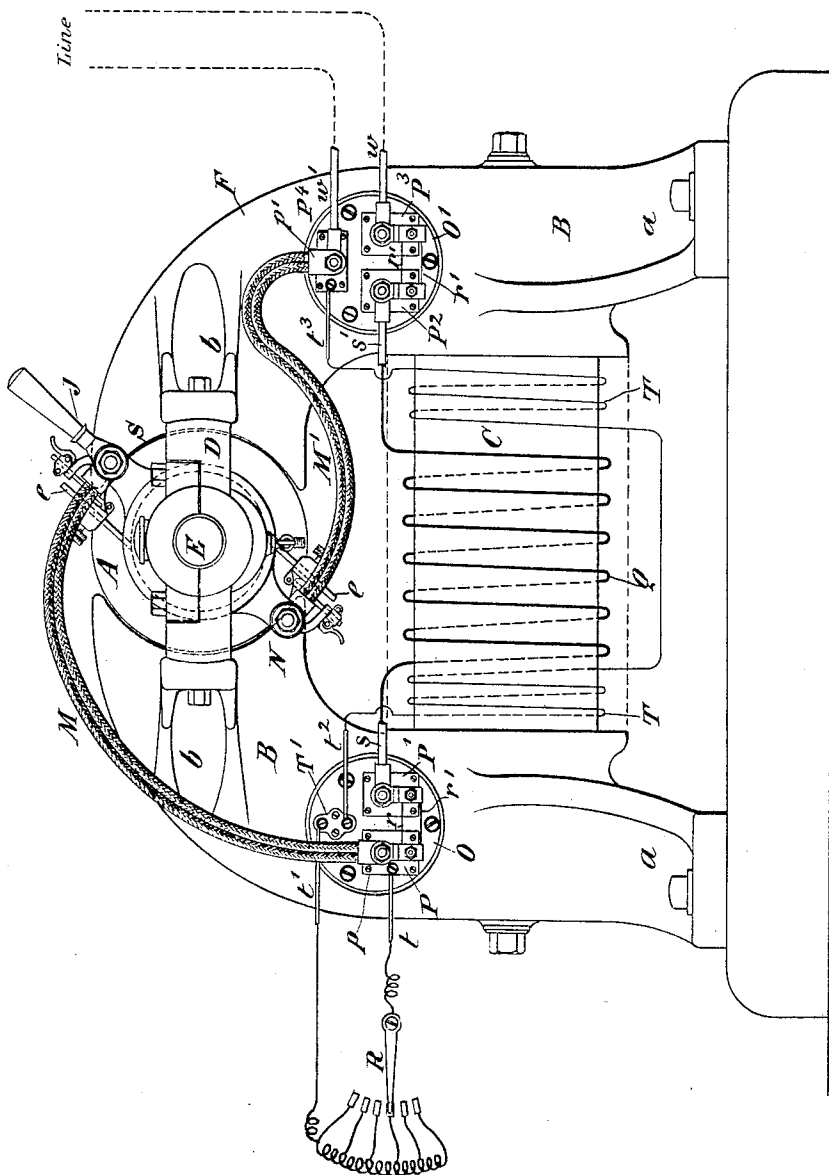
Arthur C. Fraser & Co.

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DYNAMO ELECTRIC MACHINE.

No. 477,729.

Patented June 28, 1892.

FIG. 3.



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J. J. WOOD.
DYNAMO ELECTRIC MACHINE.

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Patented June 28, 1892.

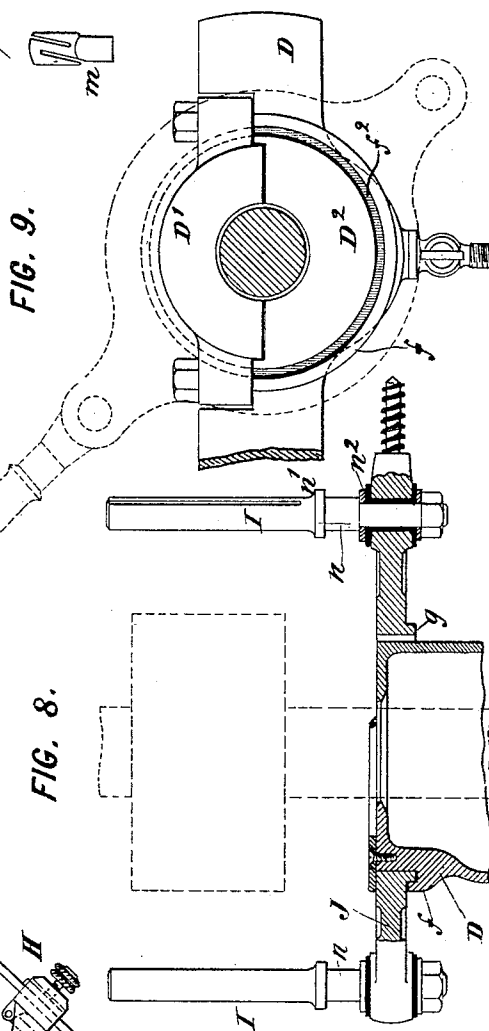
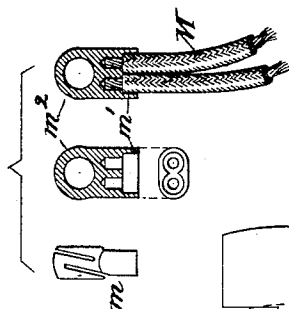
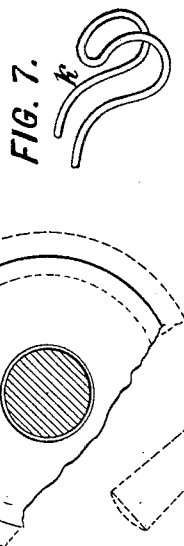
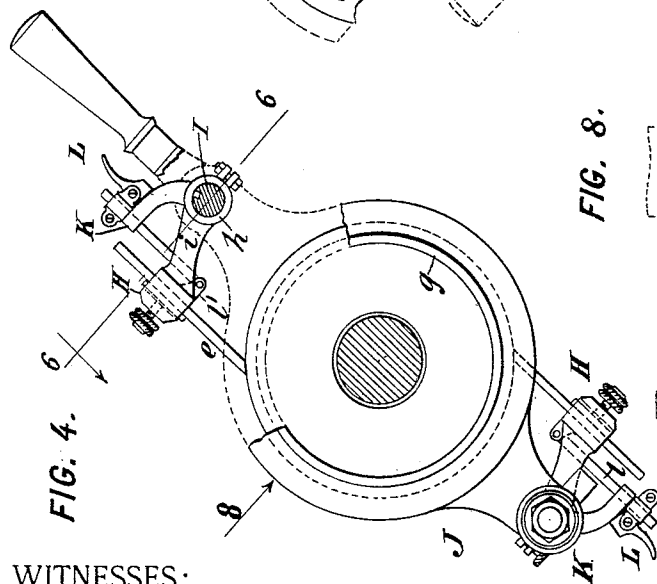
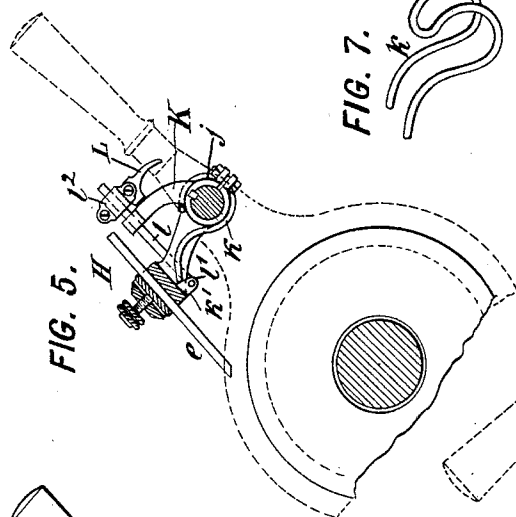
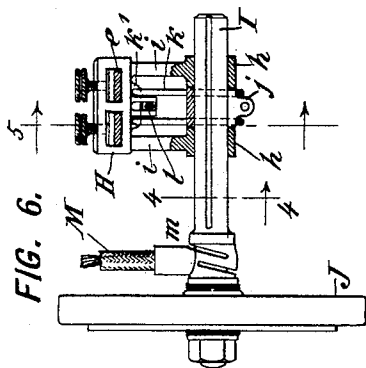


FIG. 8.

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UNITED STATES PATENT OFFICE.

JAMES J. WOOD, OF FORT WAYNE, INDIANA.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 477,729, dated June 28, 1892.

Application filed December 1, 1891. Serial No. 413,645. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. WOOD, a citizen of the United States, residing in Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

This invention provides certain improvements in the construction of dynamo-electric machines, which are also in part applicable to electromotors.

The improvements relate to the construction of the dynamo-frame for supporting the armature-shaft bearings to the mounting of the brush-carrying yoke to the construction of the brush-holders.

The accompanying drawings illustrate a dynamo-machine designed especially for the generation of electric energy for driving cars on electric railways, and commonly called "railway-generator," although a machine of the construction shown may be applicable with proper modifications for any of the uses to which dynamo-electric machines are put.

Figure 1 is a side elevation of the machine. Fig. 2 is a plan thereof. Fig. 3 is an end elevation thereof. The remaining views are drawn to a larger scale. Fig. 4 is an end elevation of the brush-holders and their carrying-yoke, partly in section, on the line 4 4 in Fig. 6. Fig. 5 is a fragmentary section of one of the brush-holders on the line 5 5 in Fig. 6. Fig. 6 is a sectional elevation on the line 6 6 in Fig. 4. Fig. 7 is a perspective view of the brush-holder spring. Fig. 8 is an oblique elevation of the brush-carrying studs and brush-yokes, showing the latter in section, the view being taken in the direction of the arrow 8 in Fig. 4. Fig. 9 is an inside end elevation of the bearing by which the brush-yoke is supported, the latter being shown in dotted lines. Fig. 10 shows in detail one of the terminal sockets for the connection of the flexible conducting-cables which carry off the current from the brush-holders.

Let A designate the armature, and F the field-magnet as a whole. In the construction shown the field-magnet is constructed of two castings B B, united by an iron core C, bolted between them. Each casting B is formed with wide-spreading legs a a, and with its body

extending upwardly from the core C and curving inwardly, as shown in Fig. 3, the upper ends of the two castings approaching each other and being bored out to form the polar ends N S of the field-magnet. The castings are formed at their upper portions with arms b b' extending from the opposite sides in directions parallel with the armature-shaft, and between the ends of the opposite pairs of arms are fastened cross-heads or bearing-heads D D, which constitute the supports for the bearings for the armature-shaft E. As the respective bearing-arms b b and b' b' are of opposite polarity, the bearing-heads D D are made of non-magnetic material, in order not to short-circuit the lines of magnetic force. I make them, preferably, of bronze. The bearing-caps D' D', which are made considerably shorter, may be made of iron, provided they do not so closely approach the bearing-arms as to short-circuit the magnetic lines of force.

The polar faces of the field-magnet between which the armature revolves are bored out cylindrically and concentrically with the axis of rotation, or substantially so, in the usual manner. The end portions of the bearing-arms b b' are also bored out concentrically from the same center, which may be conveniently done by cutters carried by the same boring-bar that bores out the polar faces. The end portions of the arms b b' are thus concaved, as best shown in Fig. 3, being, however, bored of a larger radius than the polar faces, as shown, in order to avoid any liability of injury to the armature during the operations of inserting it into and removing it from the machine. The end portions of the arms b b' that are thus concaved are lettered b² b². These end portions are formed to approach each other somewhat more closely than the remaining portions of the arms, the latter being recessed back at their portions c c, as shown, to leave ample spaces for getting access to the working parts. Preferably the arms b b' are channeled or formed with top and bottom flanges, as shown, to impart the greatest stiffness consistent with the least weight. The ends of the bearing-heads D D are turned off cylindrically, as shown in Figs. 3, 18, and 19, in order to fit the cylindrically-concaved end portions of the bearing-arms,

and they are fastened to the latter by bolts d , passing through the ends of the arms and screwing into the ends of the head.

The armature-shaft carries a commutator 5 G, consisting of segments connected to the terminals of the armature-coils in the manner commonly employed with Siemen's drum-armatures, from which the currents are taken off by stationary brushes $e e$, carried in brush-holders H H, mounted on studs I I, carried by 10 a brush-yoke J, all in general of usual construction and arrangement, except in those particulars hereinafter specified.

The brush-holder yoke J is mounted on the 15 inner end of one of the armature-shaft bearings in such manner that it may be turned by means of its handle to vary the lead of the brushes, while it is held with sufficient friction to retain it in any position to which it 20 may be turned. The bearing cross-head D is formed with a bearing boss or shell D^2 , as usual, which constitutes the lower half of the bearing, while the bearing-cap D' forms the upper half. This shell D^2 of the bearing adjacent to the yoke is formed with a projecting 25 rib or flange f , as shown in Figs. 8 and 9, and is turned down exteriorly concentrically with the axis of the armature-shaft to form a cylindrical bearing-surface f' , which is extended back within the flange f , forming a 30 groove f^2 . The yoke J is formed with a flange g on its outer side, which fits into this groove f^2 , while the yoke is turned out concentrically to fit over the bearing-face f' , as shown 35 in Fig. 8. A metal fastening g' is applied to the bearing-shell to hold the yoke J in place, thereby retaining its flange g in engagement with the groove. This fastening is preferably a half-round strip of sheet metal applied as 40 shown in Fig. 8 and overhanging the yoke. By this construction only the lower half of the yoke is in engagement with the bearing, the upper half being out of contact therewith, as shown in Fig. 8. It follows from this that the 45 cap D' may be removed without disturbing the yoke J. The yoke is prevented from dropping down by the engagement of its flange g with the groove in the flange f , as shown in Fig. 8.

50 The yoke J carries, as usual, two brush-holder studs I I, fastened fixedly to but insulated from it, as shown in Fig. 8. On these studs are mounted the brush-holders H H, carrying the brushes $e e$. The brush-holders 55 are constructed in the usual manner with sockets for receiving the brushes and with gibbs and set-screws for clamping the brushes. Each brush-holder is connected to the supporting-stud by means of bosses $h h$, bored 60 out to fit loosely over the stud and connected to the brush-sockets by arms $i i$. Between the bosses $h h$ is fastened the hub j of a fixed arm K. This hub is preferably split and drawn together by a screw, in order that it 65 may be conveniently clamped upon the stud in different positions. It makes a close fit between the bosses $h h$, and thus prevents the

displacement of the brush-holder in direction longitudinally of the axis of rotation. To 70 shift the brush-holder and bring the brushes to bear on a different part of the commutator, it is necessary only to slacken the clamp-screw and slide the hub of the arm K in either direction along the stud, clamping it in the 75 desired position. The hub j is provided with a key or spline entering a longitudinal groove in the stud, as shown in Fig. 5, so that the displacement of the arm K in angular direction around the stud is prevented. The bosses 80 $h h$, however, have no keys, and consequently the brush-holder is free to move or swing angularly around the stud. The brush-holder is, however, pressed toward the commutator by a spring k , which reacts on the arm K. 85 This spring is preferably constructed, as shown in Fig. 7, of a single piece of spring-wire having a loop which comes against the arm K, a curved portion which extends thence around the hub j , whereby the spring is firmly 90 seated and the free end portions or terminal arms resting against ledges k' on the brush-holder. It is sometimes necessary to draw the brushes away from the commutator, in order to examine them, renew them, or adjust them. For this purpose I provide a rod l , 95 pivoted at its end to pivotal ears l' on the brush-holder, and passing through a hole in the end of the arm K. On the end of the rod beyond this arm is clamped or fixed a head l^2 , to which is pivoted a cam-lever L, which 100 is movable from the position shown in Fig. 4 to that shown in Fig. 5. In the former position the rod l is not acted upon, and the commutator-brushes are pressed by the spring k against the commutator; but in case the 105 operator wishes to withdraw the brushes from the commutator he throws the lever L down to the position shown in Fig. 5, thereby bringing its cam-surface to act upon the arm K, and thereby drawing the rod l outward and 110 pulling the brush-holder away from the commutator, thereby lifting off the brushes, as shown in Fig. 5. My invention thus provides a very simple means for accomplishing this purpose, whereby the brushes may be oper- 115 ated very quickly and conveniently. It will be observed that the arm K has the threefold function of serving to receive the reaction of the spring, acting as a collar to prevent longitudinal displacement of the brush-holder, 120 and affording a bearing for the throw-off lever L. In practice it is preferable to duplicate the brush-holders, as shown in Figs. 1 and 2, so that either one may be drawn back from the commutator while the machine is running, 125 leaving the other to take off the current.

The current taken off by the brushes flows through the brush-holders into the stud I and thence, as shown in Figs. 1 and 3, by a flexible cable M or M' to the terminals of the machine, as usual, the flexibility of the cables 130 adapting them to the varying positions to which the brushes may be adjusted around the commutator. For connecting the ends of

the cables to the respective studs I provide terminal connections m m' , the construction of which is best seen in Fig. 10. Each of these connections consists of a socket m' , applied to the end of the cable, and a boss m^2 , embracing the portion n , Fig. 8, of the stud and confined thereon between the collar n' and a metal washer n^2 . It is necessary that the socket shall be free to turn on the stud, and yet an intimate surface-contact must be maintained in order to provide the greatest conductivity for taking off the current. To accomplish these results, I make the boss m^2 laterally expansible, so that it shall spring outwardly and be maintained by its own elasticity in firm contact with the faces of the collar n' and washer n^2 , between which it is confined. This is accomplished by slitting the boss in the manner clearly shown in Fig. 10. The length of the neck n is made such as to slightly compress the elastic boss between the faces of the collar and washer.

The ends of the flexible cables M M' are connected to the respective terminal connections in a novel manner, as shown in Fig. 10. Ordinarily such terminal connections have sockets adapted to receive the wire core only of the cable, the insulation stopping at the end of the socket; but with such a construction the cable is liable to too great flexure at the point of junction with the socket-piece, since the insulated portion of the cable is in no wise supported. I form the socket-piece with a large socket at its outer end receiving and fitting the insulated end portion of the cable, and with a deeper socket of smaller diameter fitting and united to the conducting portion only of the cable, preferably by running in solder. With this construction the end of the insulation of the cable is fastened tightly in the outer socket, and flexure of the cable at the denuded portion is prevented, whereby the liability of impairing the connection between the ends of the cable and the socket-pieces is greatly reduced. I employ this construction both for the socket-piece or connector m and for the connections p and p' for the opposite ends of the cables, Fig. 3.

In the drawings I have shown the cables M M' as duplicates, being thus made to afford the requisite conductivity with greater flexibility than if the entire area of conducting-wires were inclosed in one cable.

In my improved dynamo the terminal, field, shunt, and fuse connections are all made on two insulating connection-plates O O' , fastened against the field-magnet in the positions shown best in Fig. 3, so that all the connections are readily accessible and visible at a glance. The plates O and O' are of insulating material, being preferably blocks of wood or slate fastened by screws to the dynamo-frame, and to which the several terminal connections are fastened by screws or otherwise. The cable M leads to the connection-plate O , where its end is fastened in the socket-piece p , while the cable M' leads to the connection-

plate O' , and its end is fastened in the socket-piece p' . The direct or series circuit passes from cable M and its socket p to fuse-connector P , by fuse-wires r r' to fuse-connector P' , thence by wire s through the main or series field-exciting coil Q , Fig. 3, wound on the core C , which terminates in wire s' , thence by fuse-connector P^2 , fuse-wires r' r' , and fuse-connector P^3 , which constitutes a terminal binding-post, to the line-wire w , and thence over the line, returning by wire w' to terminal connector P^4 , constituting the opposite binding-post, and through socket p' thereof to cable M' , all as shown in Fig. 3. The shunt-circuit passes from connector P by wire t to rheostat R , returning by wire t' to the shunt connection-piece T' , thence by wire t^2 to the shunt field-exciting coils T T , terminating in wire t^3 , which is joined to the connector P^4 .

My invention may be modified in many structural respects without necessarily departing from its essential features, and certain parts of my invention may be used without the other parts.

I claim as my invention the following-defined novel features or improvements, substantially as hereinbefore specified, namely:

1. In a dynamo or motor, a field-magnet the poles of which are formed with bearing-arms projecting laterally from them parallel with the axis of rotation, spaced wider apart than the diameter of the armature, and the polar faces and inner end faces of said arms bored cylindrically concentric with said axis, the said inner end faces being bored of a larger radius than the polar faces, combined with bearing-heads of non-magnetic material having their ends turned as segments of cylinders to fit between the bored ends of said arms, and bolted thereto.

2. In a dynamo or motor, the combination of the commutator-brush yoke and the adjacent bearing, the one formed with a concentric cylindrically-projecting flange and the other with a corresponding groove embracing said flange, and a fastening applied to hold said parts together and prevent the disengagement of the groove and flange.

3. In a dynamo or motor, the commutator-brush yoke, having a concentric cylindrically-projecting flange, an armature-shaft bearing formed with a groove to receive the flange on said yoke, and a removable fastening applied to the end of the bearing and overhanging the yoke to hold the latter with its flange in said groove.

4. In a dynamo or motor, the commutator-brush yoke, an armature-shaft bearing having a bearing-cap and the bearing but not the cap formed on its end with a groove to receive the yoke, and a fastening applied to the bearing to hold the yoke in engagement with said groove, whereby the yoke is supported independently of the bearing-cap and the latter may be taken off without disturbing the yoke.

5. In a dynamo or motor, the commutator-

brush yoke having a concentric cylindrically-projecting flange, an armature-shaft bearing having a bearing-cap, and the bearing but not the cap formed with a groove in its end to receive said flange, and a removable plate fastened to the end of the bearing to hold the yoke with its flange in said groove, whereby the yoke is supported independently of the bearing-cap, and the latter may be taken off without disturbing the yoke.

6. The commutator-brush yoke having brush-carrying studs fixed to but insulated from it, and conducting-cables connected to said studs, respectively, combined with a terminal connection for joining said cables to said studs, consisting each of a socket applied to the end of the cable and formed with a boss embracing the stud, confined between opposite shoulders thereon, and slitted to render its faces against said shoulders yielding and enable them to adapt themselves to said shoulders and make an extended contact therewith.

7. In a dynamo or motor, a terminal connection for the flexible conducting-cables leading from the brush-holders, consisting of

a socket-piece having at its outer end a large socket receiving and fitting the insulated end portion of the cable, and a deeper socket of smaller diameter fitting and united to the conducting portion only of the cable, whereby the end of the insulation of the cable is fastened tightly in said outer socket and flexure of the cable at the denuded portion is prevented.

8. The combination of a brush-holder, a stud on which it is pivoted, an arm fixed to and projecting from the stud, a retractile device for drawing back the brush-holder reacting against said arm, and a spring *k* for pressing the brush-holder toward the commutator, consisting of a looped wire with its loop engaging said arm, coiled thence around the stud, and its ends engaging the brush-holder.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES J. WOOD.

Witnesses:

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T. H. DASCOMB.