No. 659,829. Patented Oct. 16, 1900.

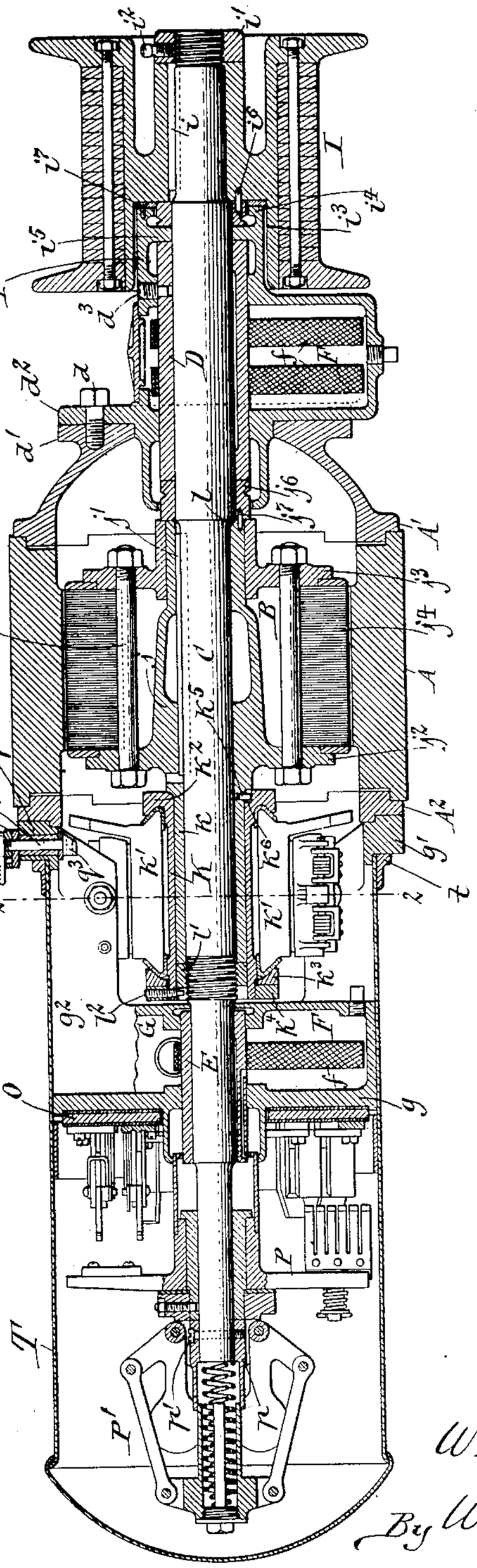
W. F. RICHARDS.

DYNAMO ELECTRIC MACHINE.

(Application filed Jan. 2, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

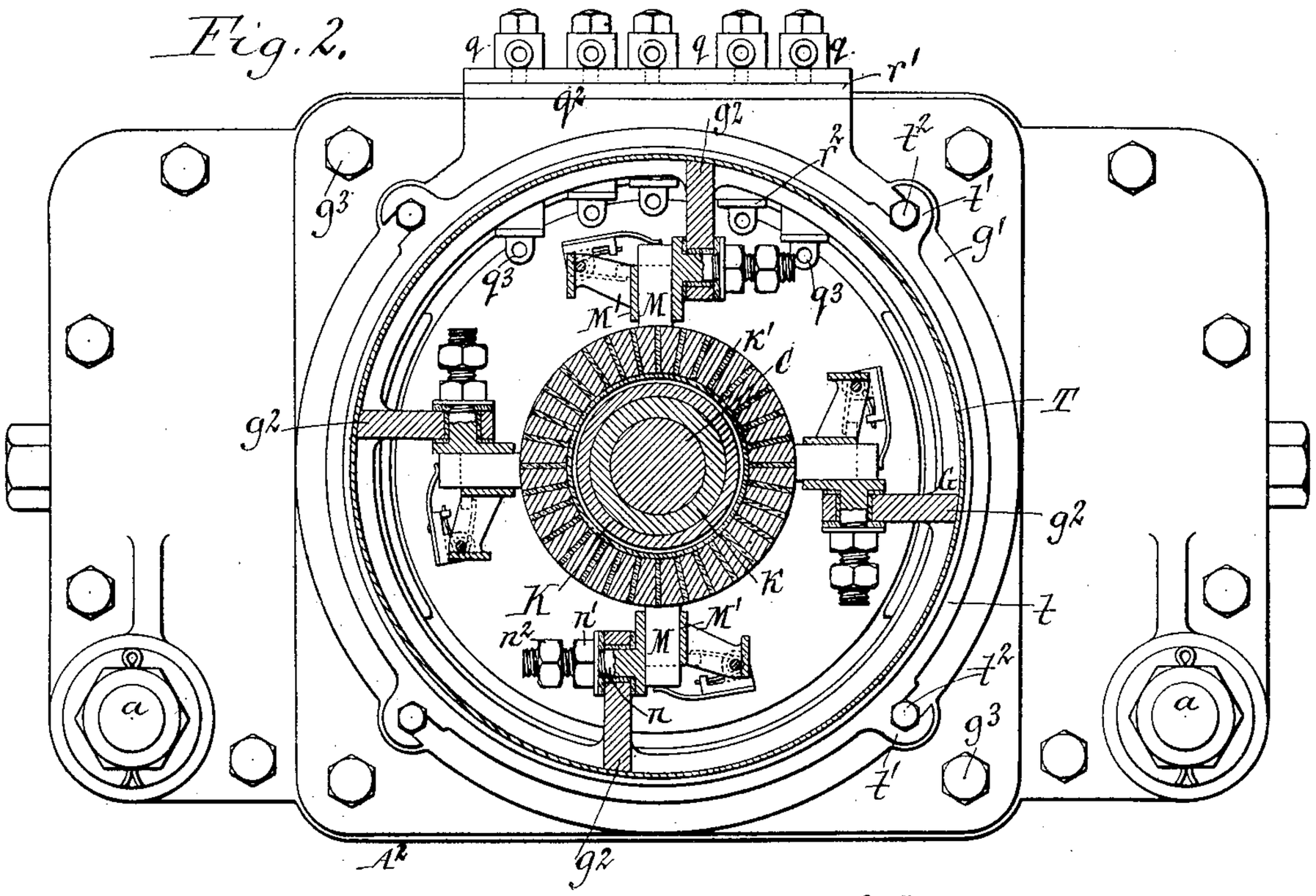
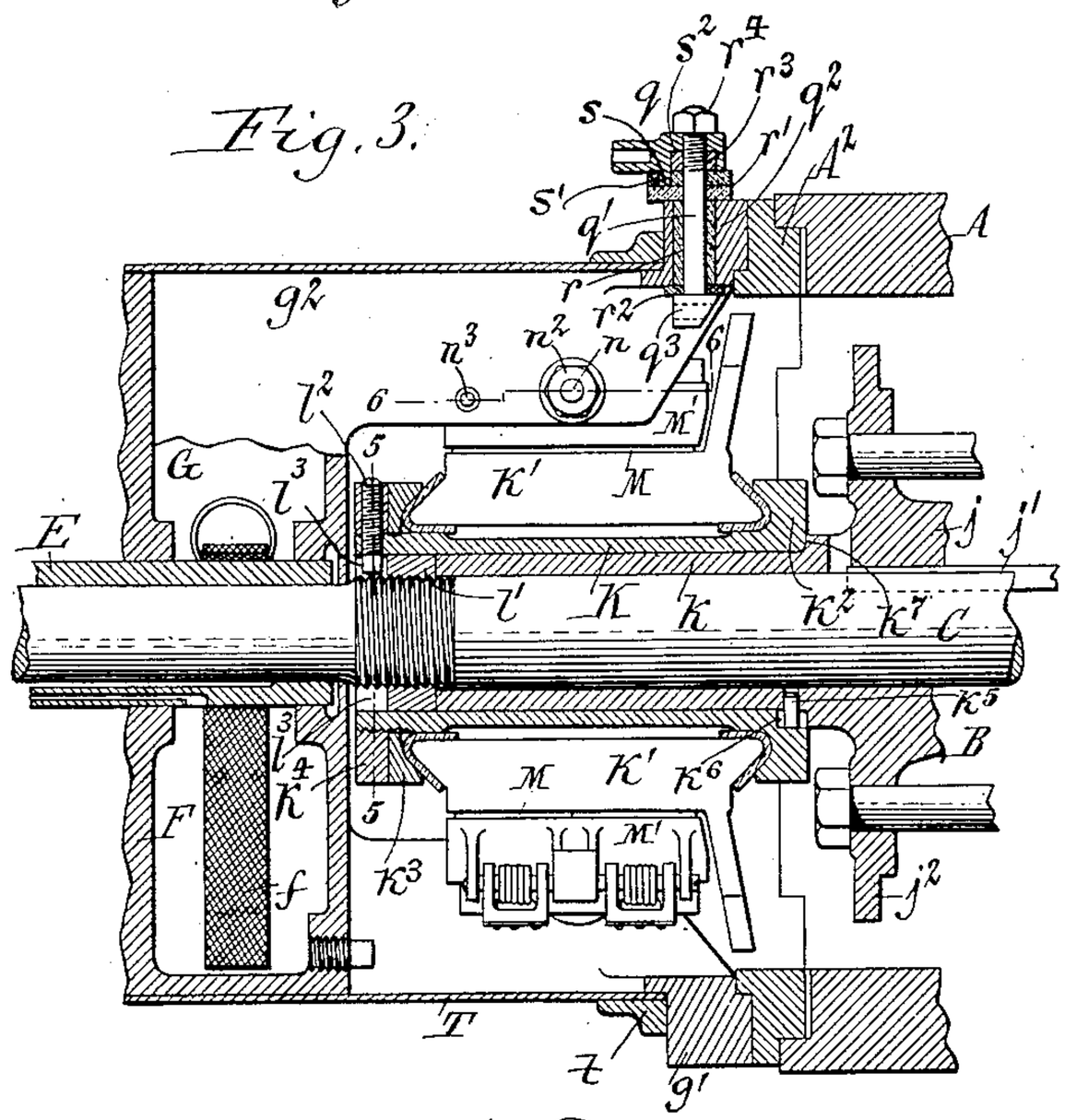


Fig. 3.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 4.

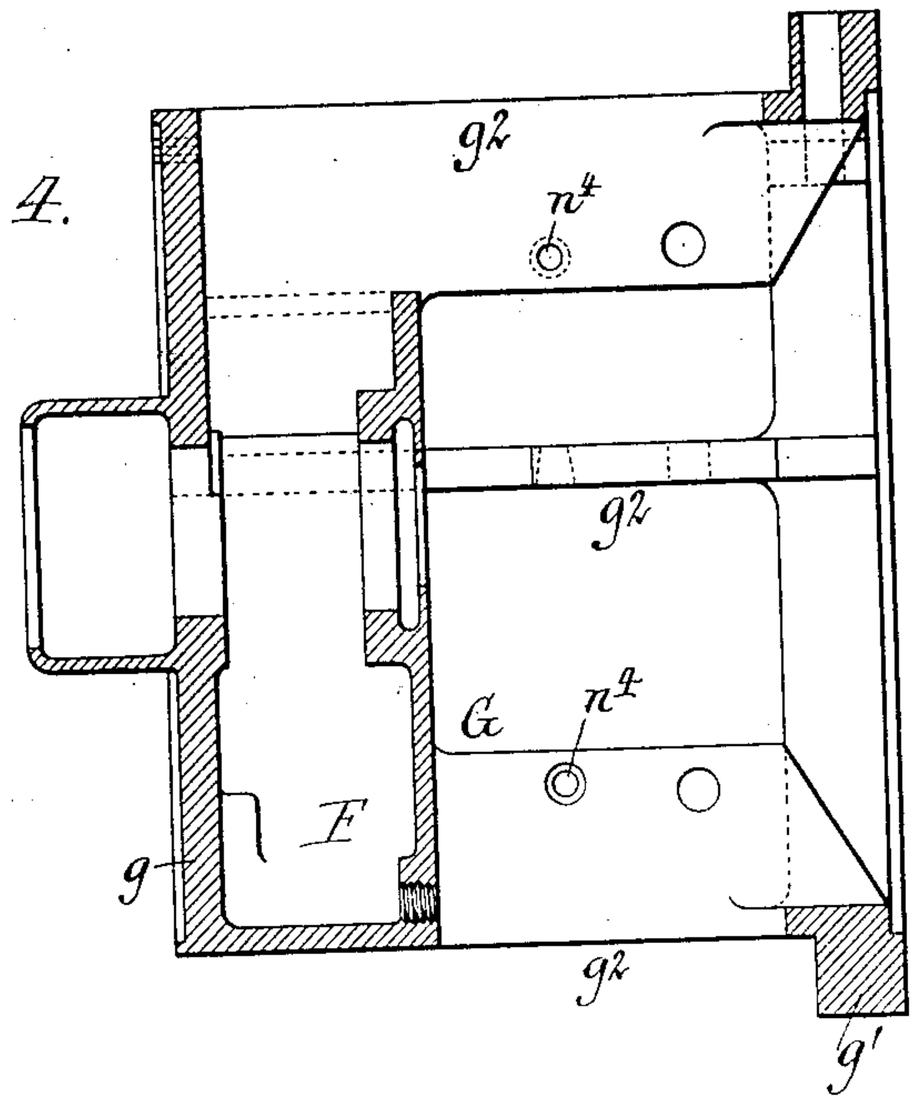


Fig. 5.

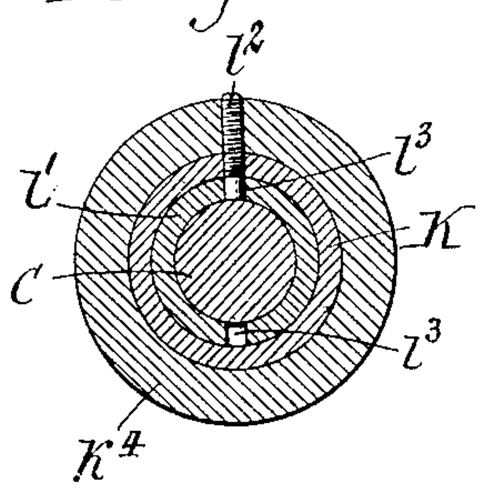


Fig. 6.

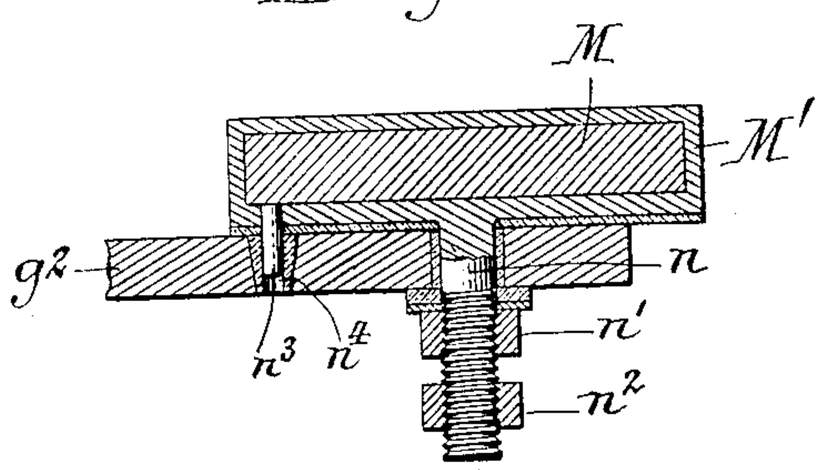
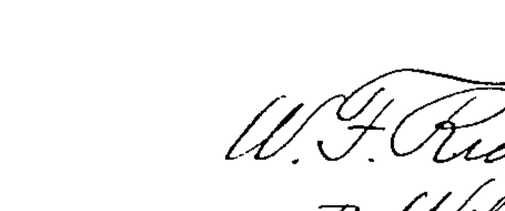


Fig. 7.



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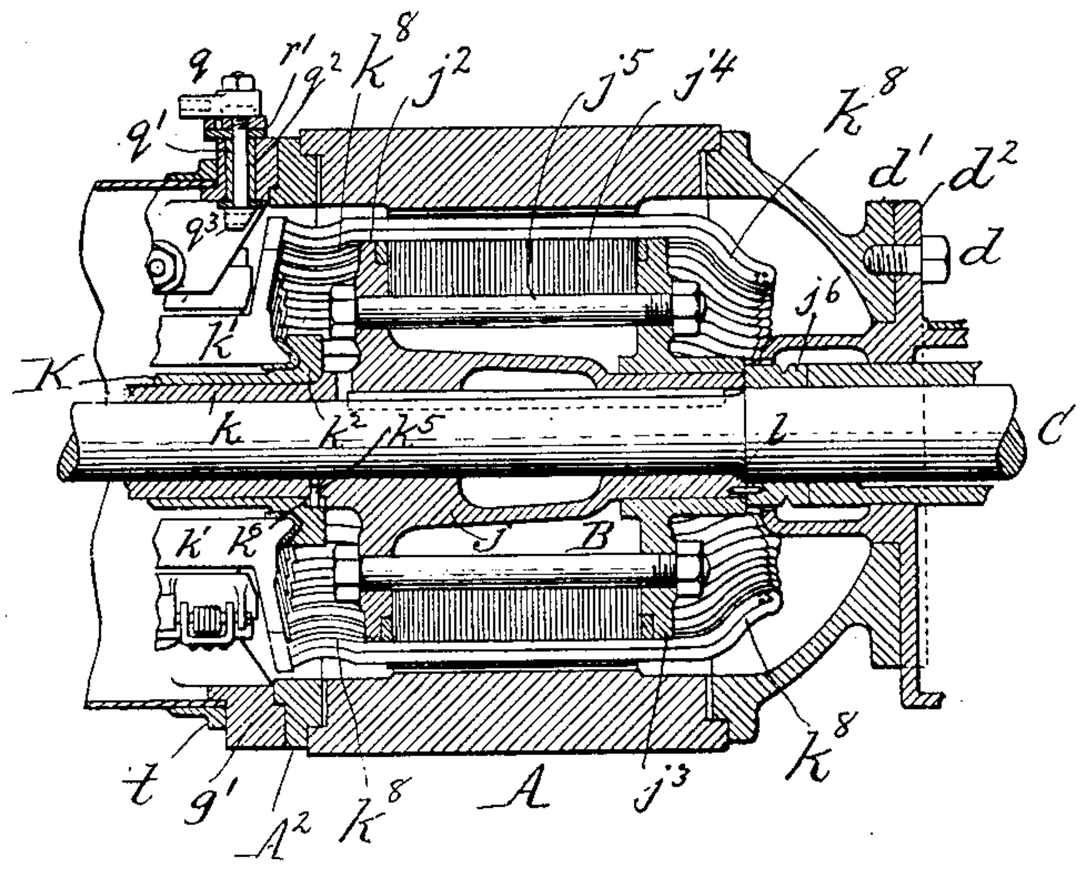
DYNAMO ELECTRIC MACHINE.

(Application filed Jan. 2, 1900.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 659,829, dated October 16, 1900.

Application filed January 2, 1900. Serial No. 7. (No model.)

To all whom it may concern:

Be it known that I, WILLARD F. RICHARDS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Dynamos, of which the following is a specification.

This invention relates more especially to the dynamos which are employed in connection with the electric-lighting apparatus of railway-cars. Dynamos of this type are shown, for instance, in Letters Patent of the United States No. 602,182, granted April 12, 1898, to E. J. Preston and A. B. Gill, and Letters Patent No. 604,081, granted to me May 17, 1898.

The principal object of my invention is to so construct the dynamo that its parts can be readily removed for repairing and renewing the same without requiring the body or main portion of the machine to be detached from the car.

The invention has the further objects to simplify the construction of the dynamo and reduce its cost of manufacture and to improve the machine in other respects.

In the accompanying drawings, consisting of four sheets, Figure 1 is a longitudinal sectional elevation of my improved dynamo. Fig. 2 is a transverse section of the machine, on an enlarged scale, in line 2 2, Fig. 1. Fig. 3 is a longitudinal section of the commutator and adjacent parts on an enlarged scale. Fig. 4 is a detached longitudinal section of the frame which carries the brush-holders. Fig. 5 is a transverse section in line 5 5, Fig. 3. Fig. 6 is an enlarged longitudinal section of one of the brush-holders and its support, the plane of the section being in line 6 6, Fig. 3. Fig. 7 is a detached bottom plan view of the socket of one of the dynamo-terminals. Fig. 8 is a longitudinal section of the central portion of the dynamo, showing the wires which connect the commutator with the armature.

Like letters of reference refer to like parts in the several figures.

A is a rectangular body or main casing of the machine, which is preferably cast in one piece, and A' A^2 are the heads or plates, which are bolted or otherwise secured to the ends of the body.

The dynamo may be supported on or suspended from the railway-car by any suitable or well-known means. The dynamo illustrated in the drawings is adapted to be suspended from the car by four links, as shown, for example, in the Letters Patent hereinbefore referred to. The lower ends of the suspension-links, which are not shown in the drawings, are adapted to be pivoted to horizontal studs or pivot-bolts *a*, projecting from the heads A' A^2 of the dynamo-body and located at the lower corners thereof.

The body or casing A is provided centrally with the usual circular chamber, which receives the armature B, and the rectangular portions of the casing on opposite sides of this circular chamber contain the usual field-magnets, which are not shown in the drawings and form no part of my invention.

C is the armature-shaft, which is supported in suitable bearings D and E, arranged on opposite sides of the body A. The bearings shown in the drawings are provided with oil wells or reservoirs F, containing wicks *f*, which supply the oil to the shaft. The rear bearing D consists of a tube or sleeve, which is supported in the upper portion of the adjacent oil-reservoir F. This reservoir is removably secured to the adjacent head A' of the body by horizontal bolts *d*, which pass through outwardly-projecting flanges d' d^2, formed on said head and said bearing. The bearing-sleeve D is held against turning by a screw d^3 or other means.

The front bearing E of the armature-shaft is arranged at some distance from the body of the dynamo and consists of a tube similar to the sleeve D, which is supported in a removable frame G. This frame is composed of front and rear heads g g' and longitudinal bars or webs g^2, connecting said heads and preferably cast in one piece therewith, four of such bars being shown in the drawings. The inner head g' is removably secured to the adjacent head A^2 of the dynamo-body by bolts g^3 or other suitable means. The outer portion of the bearing E is arranged in an opening formed centrally in the front head g, while its inner portion is arranged in an opening formed in the rear wall of the adjacent oil-reservoir F.

I is the driving-pulley of the armature-shaft, which is removably secured to the portion of the shaft projecting beyond the rear bearing D. The portion of the shaft on which this pulley is mounted is reduced and the pulley and shaft are keyed together by a spline i. The pulley and the spline are retained in place by a screw-nut i', applied to the screw-threaded rear end of the shaft and locked upon the shaft by a set-screw i^2. To render the machine more compact, the front end of the pulley-hub is recessed, as shown at i^3, so as to overlap the adjacent portion of the bearing-tube D.

i^4 is a thrust-collar surrounding the armature-shaft between the inner end of the pulley-recess i^3 and an inwardly-extending flange or web i^5, arranged within and carried by a tubular extension or sleeve F', formed on the rear side of the adjacent oil-reservoir F, as shown in Fig. 1. The thrust-collar i^4 is compelled to turn with the armature-shaft by one or more longitudinal pins i^6, secured to the collar and engaging in recesses formed in the opposing portion of the pulley-hub. The contacting surface of the thrust-collar i^4 and the web i^5 are lubricated by the oil fed upon the top of the shaft by the wick f. Dust and grit are prevented from entering the rear bearing-tube D through the pulley-recess i^3 by a packing-washer i^7, secured to the rear end of the tubular extension F' and bearing at its flat face against the inner end of the pulley-recess and at its periphery against the wall of said recess, as shown in Fig. 1.

The armature B is mounted on the shaft C and comprises a hub j, keyed to the shaft, as shown at j', and provided at one end with a projecting flange j^2, a ring or disk j^3, mounted on the opposite end of said hub, and the core j^4, which is clamped between the flange j^2 and the ring j^3 by longitudinal bolts j^5 passing through said parts.

j^6 is a second thrust-collar which surrounds the armature-shaft between the hub of the armature and the sleeve D and which is pinned to the armature-hub, as shown at j^7 in Fig. 1, so as to turn with the same and the shaft.

K is the hub of the commutator, which is mounted on a sleeve or tubular extension k of the armature-hub.

k' represents the usual commutator-segments, which are clamped between a projecting flange k^2, arranged at the inner end of the commutator-hub, and a ring k^3, applied to the opposite end of the hub. This ring is forced against the adjacent ends of the commutator-segments by a clamping-nut k^4, applied to the screw-threaded outer end of the commutator-hub.

The commutator-hub is compelled to turn with the armature-hub by any suitable means—for instance, a radial connecting-pin k^5, secured to the armature-hub and engaging in a groove k^6, formed in the bore of the commutator-hub, as shown in Fig. 3. This groove opens at the inner end of the commutator-hub to permit the latter to be slipped on and off the tubular extension of the armature-hub.

The commutator-hub abuts at its inner end against a shoulder k^7 of the armature-hub and is retained upon the extension of the armature-hub by the usual connecting-wires k^8 between the commutator and the armature, as shown in Fig. 8. For the sake of clearance these wires are omitted in Figs. 1 and 3. The armature-hub is confined against endwise movement between a shoulder l of the armature-shaft and a screw-nut l', engaging with an external screw-thread of said shaft, as shown in Figs. 1 and 3.

l^2 is a locking-screw which passes radially through the clamping-nut k^4 and the hub of the commutator and engages at its inner end in one of a number of notches l^3, formed in the edge of the clamping-nut l' of the armature-hub, as most clearly shown in Figs. 3 and 5. By this construction the screw l^2 serves to lock the clamping-nuts of both the armature-shaft and the commutator-shaft. As shown in the drawings, the tubular extension k of the armature-hub terminates short of the outer end of the commutator-hub, and the clamping-nut l' is arranged within the outer portion of the commutator-hub, as shown. By this construction the machine is rendered more compact.

M represents the brushes, and M' the holders which carry the brushes. The sockets of the holders in which the brushes are seated and the means for holding the brushes in yielding contact with the commutator form no part of my invention and may be of any ordinary construction. The brush-holders are supported upon the central portion of the longitudinal bars or webs g^2 of the removable frame G. These bars are offset sufficiently from a radial line to the commutator to permit the brushes to bear radially against the commutator, as shown in Fig. 2. Each brush-holder is provided at its rear side with a cylindrical stud n, which passes through an opening formed in the adjacent supporting-bar g^2 and which is clamped therein by a nut n'. The stud n also forms a terminal and is provided with an additional nut n^2, between which and the nut n' the usual conducting-wire is clamped. The stud is insulated from its supporting-bar by a bushing of vulcanized fiber or other suitable non-conducting material, as shown. This insulation is liable to shrink in time, and when this occurs the stud n becomes loose and allows the brush-holder to turn out of place. To prevent this, each brush-holder is provided on its rear side, on one side of the stud n, with a stop pin or teat n^3, which engages in an opening n^4, formed in the supporting-bar g^2, thereby reliably holding the brush-holder against displacement even if its stud should become loose. By mounting the brush-holders and

brushes on the connecting-bars g^2 these parts are easily accessible for renewing the brushes and adjusting their tension devices.

O is a switchboard of any suitable construction which carries the usual terminal contacts of the lamp, battery, and field-circuits and which is secured to the front head of the removable frame G.

P is the reversible switch-lever, which cooperates with the switchboard, and P′ a centrifugal governor which controls said lever. The main sleeve p of the governor is detachably secured to the armature-shaft by a transverse screw p', and upon removing this screw the governor and the switch-lever P can be slipped off the armature-shaft.

The switch-lever and the centrifugal governor herein shown form no part of my present improvement, but are claimed in another application for patent filed by me on the 5th day of June, 1899, Serial No. 719,434.

q represents the binding-posts or terminal sockets of the dynamo, which are secured to the inner head of the removable frame G by vertical bolts q'. Each of these bolts passes through a boss q^2, formed at the top of said head, and is provided at its lower end with the usual eye q^3 for receiving a conducting-wire. The bolt is insulated from the head g by a bushing r, of vulcanized fiber or other non-conducting material, and the terminal socket q and the eye q^3 of the bolt are insulated from said head by fiber washers r' r^2, respectively, as shown in Fig. 3. The bolt is clamped in place by a nut r^3, which bears against the upper insulating-washer r', and the terminal socket is provided with an opening for the passage of the bolt and is clamped between the nut r^3 and a nut r^4, applied to the upper end of the bolt and bearing upon the socket. This socket is prevented from turning on the bolt by a teat s, projecting from its under side and engaging in an opening s', formed in the washer r'. By this construction the terminal sockets are effectually prevented from turning out of place even if they should become loose by the shrinkage of the insulating fiber, thereby preventing short-circuiting of the dynamo, which occurs when the sockets become displaced and come in contact with each other. In order to prevent loosening of the upper nut r^3 of the bolt and maintain an efficient contact between the bolt and the terminal socket q at all times, this socket is provided in its under side with a recess s^2, which receives said nut and is shaped to fit the same, as shown in Figs. 3 and 7. The terminal socket thus forms a lock for said nut, and a reliable contact is thereby maintained between the bolt and the socket even in the event of the bolt becoming loose in its opening by the skrinkage of its insulating fiber.

T is the usual dome or hood, which incloses the commutator, the switchboard O, the switch-lever P, and the centrifugal governor P′. The inner end of this dome is removably secured to the head g' of the detachable frame G by any suitable fastening. In the construction shown in the drawings the ring t at the inner end of the dome is provided at its periphery with hooks or lips t', which interlock with bolts t^2, projecting from the head g', and which are engaged with and disengaged from said bolts by a partial turn of the dome.

As shown in Fig. 1, the head A^2 of the dynamo-body A is provided with a central opening of sufficient size to permit the introduction and removal of the armature through the same.

By my improved construction of the dynamo the body A, with its heads A' A^2, may be permanently attached to the car by means of the usual suspension-links or other attaching or supporting devices, while all of the remaining parts of the machine are easily removed and convenient of access for inspecting, repairing, or renewing the parts, thus avoiding the laborious task of removing the entire dynamo from the car for such purposes and saving the time incident thereto and also facilitating the assemblage of the parts and reducing the cost of the machine.

In order to detach the main bearing D and the driving-pulley, the fastening-bolts d of the bearing are removed, the set-screw i^2 is loosened, and the retaining-nut i' removed, whereupon the pulley and the bearing can be slipped off the end of the armature-shaft without disturbing the body A or any other part of the dynamo. When it is desired to remove the armature and the commutator, the dome T, the centrifugal governor P′, and the switch-lever P are removed, and the removable frame G is detached from the body A by removing the fastening-bolts g^3. The radial locking-screw l^2 is then unscrewed to release the clamping-nut l^4 and the latter is removed, thereby leaving the armature-hub free to be withdrawn from the body A through the opening in the head A^2.

As the improvements herein shown and described relate only to the mechanical construction of the dynamo, the wires which connect the binding-posts of the switchboard with the binding-posts of the dynamo and the other connecting-wires of the machine are omitted.

I claim as my invention—

1. The combination with the body of a dynamo and the armature-shaft, of a driving-pulley secured to the shaft at a distance from the dynamo-body and having its hub provided in its inner end with a recess, and a shaft-bearing arranged between said pulley and the opposing head of the dynamo-body and extending into the recess of the pulley-hub, substantially as set forth.

2. The combination with the body of a dynamo and the armature-shaft, of a driving-pulley secured to the shaft at a distance from the dynamo-body and having its hub provided in its inner end with a recess, and a shaft-bearing arranged between said pulley and the opposing head of the dynamo-body and

extending into the recess of the pulley-hub, and provided at its outer end with a packing which bears against the bottom of the peripheral wall of said pulley-recess, substantially as set forth.

3. The combination with the body of a dynamo and the armature-shaft, of a driving-pulley secured to the shaft at a distance from the dynamo-body, a shaft-bearing arranged between said pulley and the dynamo-body and provided near its outer end with an internal web or abutment, and a thrust-collar surrounding the shaft between the pulley and said web or abutment, substantially as set forth.

4. The combination with the armature-shaft and an armature-hub mounted thereon and having an extension, of a clamping-nut engaging with a screw-thread of the armature-shaft and confining the armature-hub on the shaft, a commutator-hub mounted on said extension and having a flange or shoulder at one end and a clamping-nut at its opposite end, commutator-segments which are clamped against said flange or shoulder by the last-named clamping-nut, and a locking screw or bolt engaging with both of said clamping-nuts, substantially as set forth.

5. The combination with the body or main casing of the dynamo, the armature and its shaft, of a removable supporting-frame arranged at one end of the body and composed of an outer head, an inner head secured to the adjacent end of the dynamo-body and longitudinal bars connecting said inner and outer heads, and a bearing for the armature-shaft supported on said outer head, substantially as set forth.

6. The combination with the body or main casing of the dynamo, the armature and its shaft and the commutator, of an open supporting-frame surrounding the commutator and composed of inner and outer heads or rings and longitudinal bars connecting the same, and brush-holders mounted on said connecting-bars, substantially as set forth.

7. In a dynamo, the combination with a support, of a brush-holder having a cylindrical stud arranged in a corresponding opening of said support and a stop or teat arranged on one side of said stud and engaging in an opening formed in said support, whereby the brush-holder is held against turning, substantially as set forth.

8. In a dynamo, the combination with a support, of a terminal socket having a clamping-bolt for securing the same to said support and a stop or teat arranged on one side of said socket, and engaging in an opening or recess formed in said support, substantially as set forth.

9. In a dynamo, the combination with a support, of a terminal socket having a clamping-bolt for securing the same to said support and a stop-teat arranged on one side of said socket and engaging in an opening formed in said support, said bolt being provided with upper and lower nuts between which said socket is clamped and said socket being provided in its under side with a recess constructed to fit the lower clamping-nut of said bolt, substantially as set forth.

Witness my hand this 23d day of December, 1899.

WILLARD F. RICHARDS.

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