H. H. RALSTON.

RECIPROCATING MECHANISM.

APPLICATION FILED APR. 20, 1907.

983,399. Patented Feb. 7, 1911.

3 SHEETS—SHEET 1.

Fig. 1

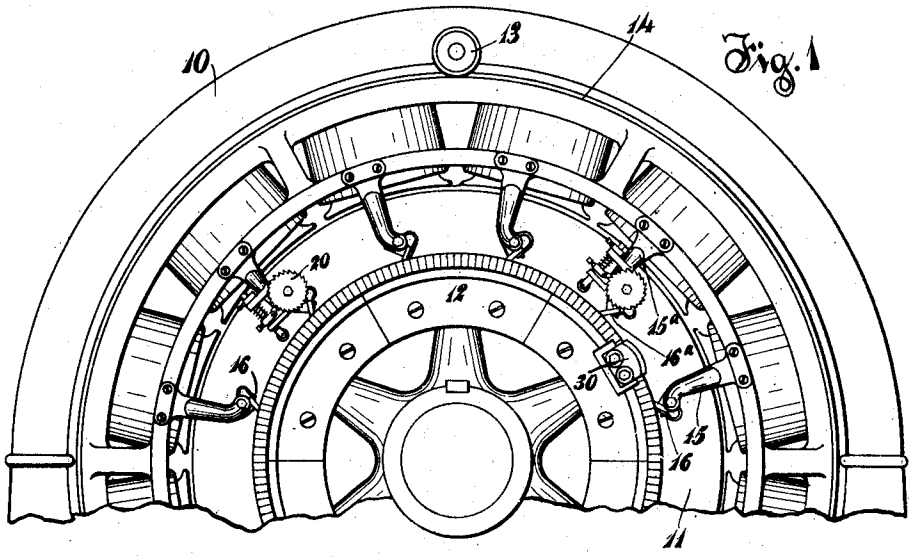
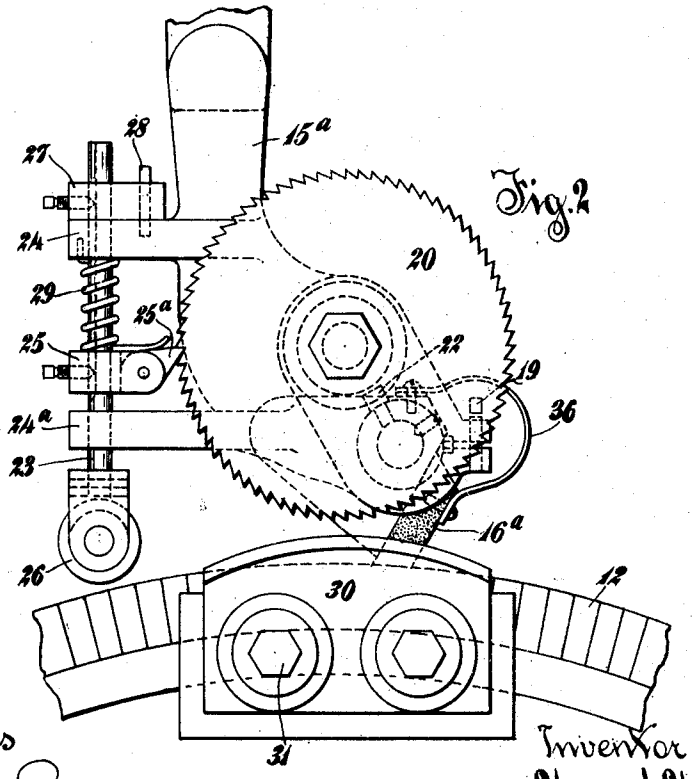


Fig. 2



Witnesses

Oliver Sherman

Fred J. Kinsey

Inventor

Howard H. Ralston

By Chas. E. Lord

Attorney

H. H. RALSTON.

RECIPROCATING MECHANISM.

APPLICATION FILED APR. 20, 1907.

983,399. Patented Feb. 7, 1911.

3 SHEETS—SHEET 2.

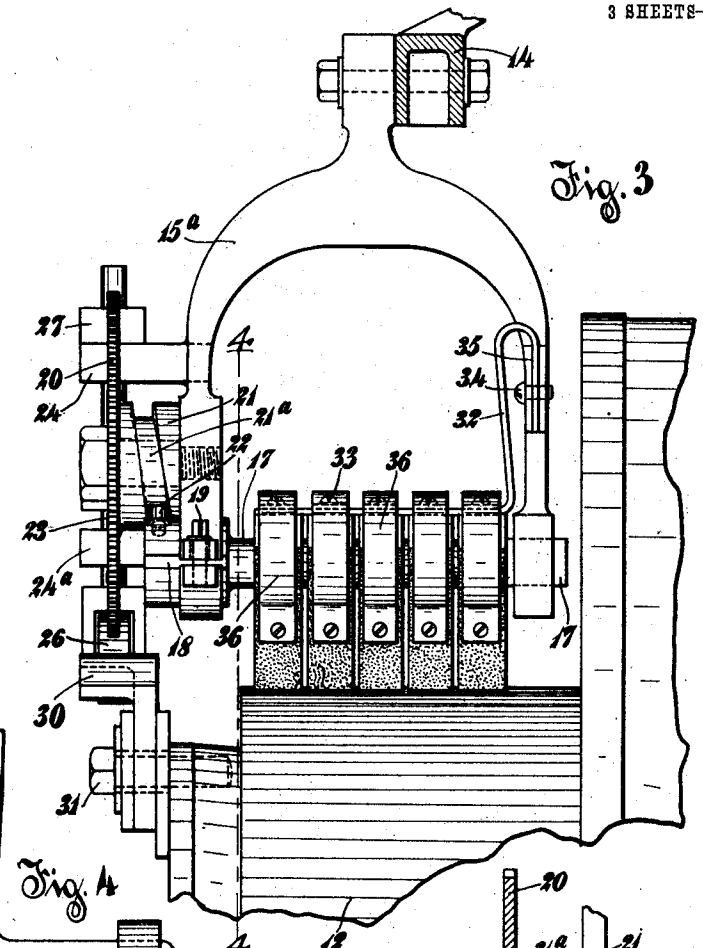


Fig. 3

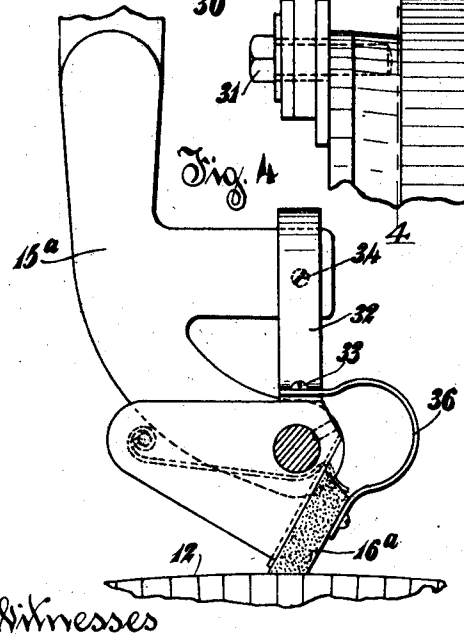


Fig. 4

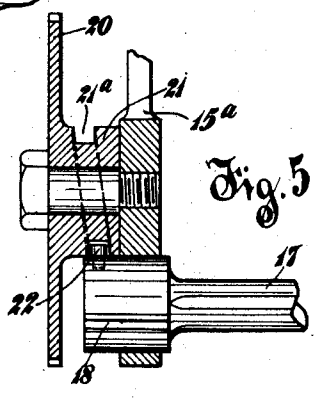


Fig. 5

Witnesses

Oliver L. Harman

Fred J. Kinsey

Inventor

Howard H. Ralston

By

Chas. E. Lord

Attorney

H. H. RALSTON.

RECIPROCATING MECHANISM.

APPLICATION FILED APR. 20, 1907.

983,399. Patented Feb. 7, 1911.

3 SHEETS—SHEET 3.

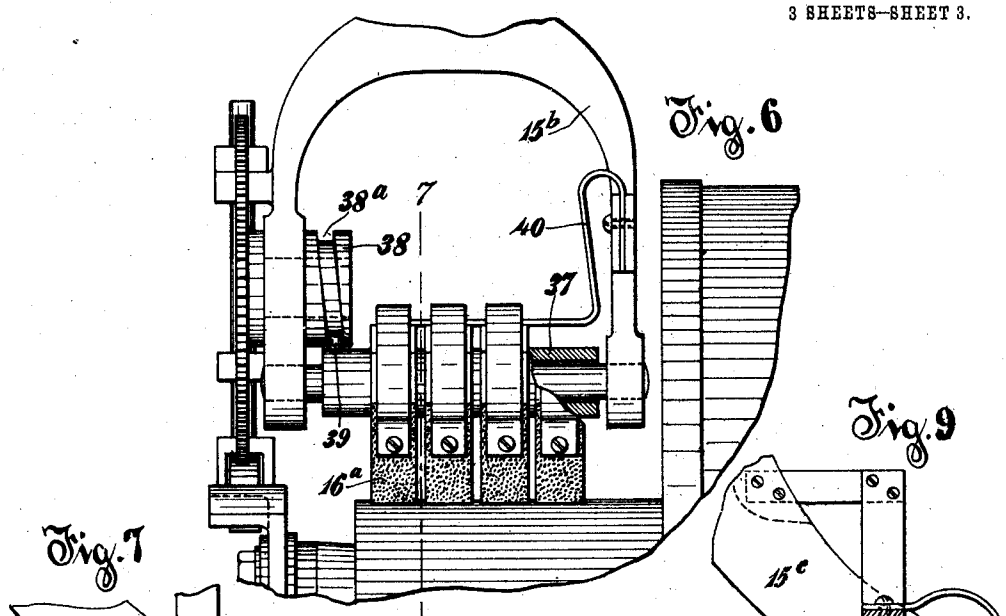


Fig. 6

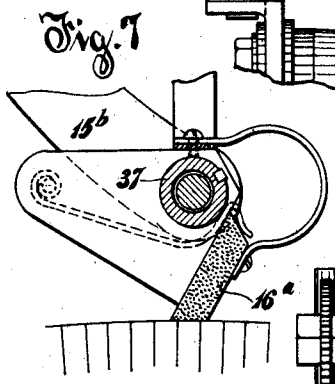


Fig. 7

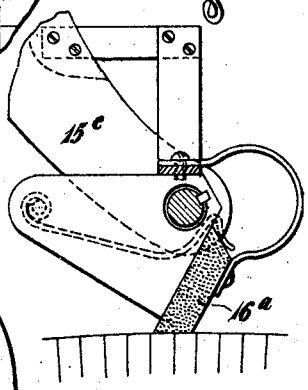


Fig. 9

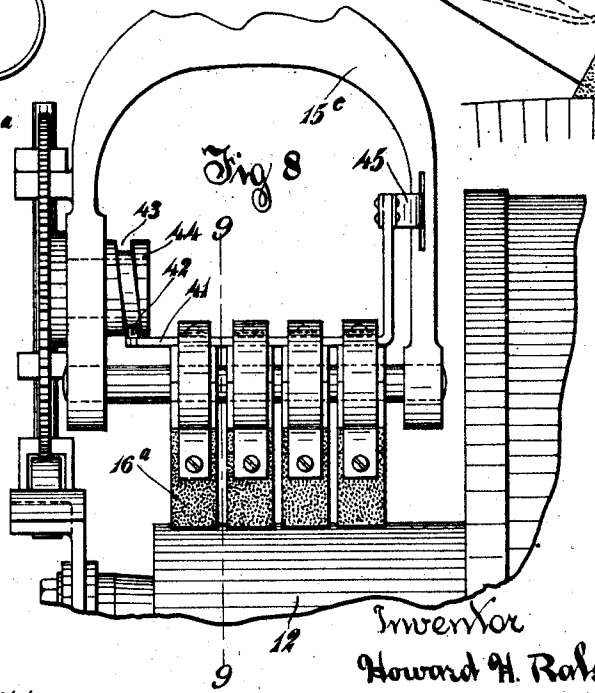


Fig 8

Witnesses

Oliver W. Harman

Fred J. Kinsey

Inventor

Howard H. Ralston

By Chas. E. Lord

Attorney

UNITED STATES PATENT OFFICE.

HOWARD H. RALSTON, OF NORWOOD, OHIO, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY, AND THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

RECIPROCATING MECHANISM.

983,399. Specification of Letters Patent. Patented Feb. 7, 1911.

Application filed April 20, 1907. Serial No. 369,220.

To all whom it may concern:

Be it known that I, HOWARD H. RALSTON, a citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Reciprocating Mechanism, of which the following is a full, clear, and exact specification.

My invention relates to dynamo-electric machines and particularly to means for imparting an axial reciprocatory movement to the brushes.

If the brushes of a machine are fixed and bear for a considerable time on the same portions of the commutator or collector rings there is a liability that the commutator or collector rings will become grooved or roughened, thus shortening the life of the latter and resulting in sparking and an increase in frictional loss. To overcome this difficulty it has been proposed to slowly reciprocate the brushes in the direction of the longitudinal axis of the machines by reciprocating the brush yoke and auxiliary brush supporting members carried thereby. The means generally employed for reciprocating the brush yokes are those disclosed in the U. S. patents to Johnson, 788,049, April 25, 1905, and Rambeau, 826,526, July 17, 1906. As shown in these patents the yokes are slowly reciprocated by imparting thereto step-by-step reciprocatory movements by means of cams and ratchet mechanisms operated from the shafts of the machine.

The object of my invention is to improve the devices disclosed in the patents above referred to and to provide a novel form of brush reciprocating means which will be effective in operation, simple in construction, and inexpensive to manufacture.

In carrying out my invention, I provide means for imparting to the brushes an axial reciprocatory movement without reciprocating the yoke. The reciprocatory movements are preferably imparted to the different brushes or groups of brushes independently, so that if desired, part only of the brushes may be reciprocated, the positions of the others being fixed, it being unnecessary to reciprocate all the brushes to prevent grooving and roughening of the commutator. The brushes which are not reciprocated are supported in the usual brush forks or other supporting member connected to the yoke, and the brushes which are reciprocated are so mounted as to be movable relatively to the supporting members, which may be of special construction. Means are provided on each of said last named brush forks for reciprocating the brushes. A variety of forms of reciprocating means may be employed, the one here shown comprising ratchet and cam mechanisms driven or actuated by the rotation of the machine. Also the reciprocating brush holders may be supported and mounted in a variety of ways.

My invention further consists in certain novel means for supporting or mounting, connecting, and reciprocating the brushes and holders, all of which will be more fully described in the following detailed description.

In the drawings, which show several forms or embodiments of my invention, Figure 1 is a partial end elevation of a machine equipped with my invention; Fig. 2 is an enlarged end view showing the reciprocating mechanism; Fig. 3 is a partial side sectional elevation showing a brush fork and attached brush reciprocating mechanism; Fig. 4 is a sectional view along the line 4—4 of Fig. 3; Fig. 5 is a detail of a portion of the brush reciprocating mechanism; Fig. 6 is a view similar to Fig. 3 showing a modification; Fig. 7 is a section along the line 7—7 of Fig. 6; Fig. 8 is a view similar to Figs. 3 and 6 showing a further modification; and Fig. 9 is a section along the line 9—9 of Fig. 8.

Referring first to Figs. 1, 2, 3, 4 and 5 of the drawings, 10 indicates the field yoke, 11 the armature, and 12 the commutator of a direct current dynamo-electric machine equipped with my invention. Supported on rollers 13 on the side of the field frame is a brush yoke 14 of the usual construction. Mounted on the brush yoke are ordinary brush forks 15 having brushes and holders 16 which are fixed in position and forks 15^a which carry brushes and holders 16^a adapted to be reciprocated. The ratio of fixed and reciprocating brushes can be made anything desired and can be varied by substituting one form of fork for the other. In Fig. 1 the brushes and holders supported by every third brush fork are adapted to be reciprocated. The brushes and holders 16^a are so mounted

as to be axially movable relatively to the forks 15ª, the latter being provided with reciprocating devices or mechanisms which are preferably actuated independently and successively by the rotary member. In the embodiment of my invention here shown the reciprocatory brush holders are secured to studs 17 which have a sliding fit in the ends of the brush forks 15ª and are adapted to be reciprocated therein. The inner ends of the studs and openings in the inner arms of the forks are preferably cylindrical for convenience in construction. The outer ends of the studs and openings in the outer brush forks may be so shaped as to prevent the studs from turning in the brush forks, or the studs or forks may be provided with keys or splines 18 for this purpose. As here shown the outer arms of the forks are split and the pressure of the bearings on the stud can be adjusted by screws 19. In this instance each stud 17 is adapted to be reciprocated by a separate ratchet mechanism and cam mounted on the brush fork. Mounted on a pin or stud on the outer arm of each brush fork 15ª is a rotary member forming part of said mechanism having a disk 20 toothed or notched on its periphery and a hub 21 having a cam slot 21ª engaged by a pin, screw or other projection 22 on the outer end of the stud 17. The disk and cam are adapted to be rotated by a pawl comprising a vertically movable rod 23 supported on a pair of arms 24 and 24ª extending outwardly from the brush fork, said rod having a finger 25 with a pivoted or hinged nose 25ª adapted to engage the teeth of the disk, and on its lower end a roller or wheel 26. The rod is adapted to move freely in the arms 24 and 24ª, the downward movement being limited by a block 27 adjustably secured to the upper end of the rod above the arm 24 and adapted to engage the upper face of said arm. A pin 28 secured to the arm passes through the block 27 and serves as a guide for the pawl. A spring 29 on the rod between the arm 24 and the finger 25 holds the rod normally in its innermost position. The end of the spring bears on the nose 25ª to hold the latter in position to engage the teeth of the disk 20 when the rod is moved outward. The ratchet mechanism on each fork 15ª is adapted to be operated in this instance by one or more shoes 30 (one being here shown) adjustably secured to the end of the commutator by screws 31, in such a position as to engage the roller 26 and lift the rod 23 when the armature and commutator are rotated. The outer face of the shoe is curved as shown and is preferably covered by some comparatively soft material such as leather to reduce to a minimum the shock and noise of contact with the rollers. To provide paths of low resistance between the brushes and holders which are reciprocated and the corresponding brush forks, I connect all the holders mounted on each stud 17 to the fork 15ª by a low resistance flexible conductor 32. As is shown, the conductor 32 is secured to the top of each brush holder by a screw 33 and is secured at one end to the fork by being clamped by one or more screws 34 in a slot 35 in the arm of the fork. The brushes are electrically connected to the holders and to the conductor 32 by flexible shunts or pig-tails 36 the end of the shunts being preferably clamped to the conductor 32 by the screws 33. The use of this conductor 32 connecting the brush-holders and fork is not confined to holders which are reciprocated relatively to a fork, but may be used with advantage when the brushes are fixed, as the bearing surfaces between the holders and studs, and studs and forks are sometimes small. When the machine is in operation, the shoe 30 mounted on the face of the armature engages successively the rollers 26 of the reciprocating mechanisms on the brush forks 15ª. Each roller is in turn lifted a distance depending upon the adjusted positions of the shoe and roller, rotating the notched disk 20 and the cam slotted hub 21, and thus slowly reciprocating step-by-step the studs 17 on which the brushes and holders 16ª are mounted. The period of reciprocation can be varied by adjusting either the position of the shoe 30 or the positions of the vertically movable rod 23 and rollers 26, or by varying the number of shoes 30 employed. If desired, different rates of reciprocation can at the same time be imparted to the different groups of brushes by so adjusting the normal positions of the rods and rollers that the movements of the rods and arcs through which the notched disks are moved at each rotation are different.

As stated before, the particular supports or mountings for the reciprocatory brushes and holders may be widely varied. In the modification shown in Figs. 6 and 7 the brush stud is fixed in the brush forks 15ᵇ and the brushes and brush holders are mounted on a sleeve 37 which has a sliding fit on the brush stud and is adapted to be reciprocated by mechanism similar to that previously described. In this case the notched or toothed disk and member 38 having a cam slot 38ª are mounted on a pin or spindle passing through the outer arm of the brush fork, the member 38 being located on the inside of the arm. The sleeve 37 is provided with a pin, screw or other projection 39 which engages the cam slot 38ª. The reciprocating mechanism is otherwise the same as that first described. When the machine is in operation the ratchet and cam are actuated, slowly reciprocating the sleeve 37 and the brushes and holders carried thereby. The brush holders are con-

nected to the brush fork as in the first instance by a flexible conductor 40.

In Figs. 8 and 9 I have shown a still further modification. In this case the brush holders have a sliding fit on the brush stud, which is fixed in the brush fork 15^c as in the construction last described. As here shown the brush holders are secured together by a rigid bar 41 preferably of conducting material, one end of which bar is provided with a lug or projection 42 which engages the cam slot 43 of a rotary member 44 arranged and actuated as in the case last described. The other end of bar 41 extends upward and is connected to one end of a flexible conductor 45 the other end of which is clamped or otherwise secured to the brush fork. Thus when the armature and commutator are rotated the ratchet and cam mechanism is actuated, slowly reciprocating the bar 41 and the brush holders attached thereto.

It will be seen that the details can be modified considerably without departing from the spirit and scope of my invention and I aim in my claims to cover all such modifications.

What I claim as new and desire to secure by Letters Patent is:—

1. In a dynamo-electric machine, a plurality of fixed brushes, a plurality of movable brushes, and means for imparting an axial reciprocatory movement to said movable brushes.

2. In a dynamo-electric machine, a brush yoke, a brush supporting member secured to said yoke, a group of brushes, and means carried by said brush supporting member for imparting an axial reciprocatory movement to the brushes independently of the yoke.

3. In a dynamo-electric machine, a brush yoke, a plurality of brush supporting members secured thereto, brushes supported by said members, and means carried by one or more of said members for imparting an axial reciprocatory movement to the brushes supported thereby independently of the yoke.

4. In a dynamo-electric machine, a brush yoke, a plurality of brush supporting members secured thereto, a plurality of relatively fixed brushes carried by some of said members, a plurality of brushes mounted for movement in the direction of the axis of the machine and carried by other of said members, and means carried by said last named brush supporting members for imparting an axial reciprocatory movement to said movable brushes.

5. In a dynamo-electric machine, a brush yoke, a brush fork, a plurality of brushes and holders supported by said fork and movable relatively thereto in an axial direction, means carried by said fork for imparting an axial reciprocatory movement to said brushes independently of the yoke, and means for operating said first named means by the rotation of the machine.

6. In a dynamo-electric machine, a brush yoke, a brush supporting member secured thereto, a plurality of brushes and holders carried by said member, and means carried by said member for imparting to said brushes and holders an axial reciprocatory movement independently of the yoke, said means comprising a rotary cam member.

7. In a dynamo-electric machine, a brush yoke, a brush fork, a brush stud carried by said fork, a brush and holder carried by said stud, and means dependent upon the operation of the machine for moving said brush and holder axially of the machine and relatively to the brush fork.

8. In a dynamo-electric machine, a brush yoke, a brush fork, a brush stud carried by said fork, a plurality of brushes and holders mounted on said stud, and means dependent upon the operation of the machine for moving said brushes and holders axially of the machine and relatively to said fork.

9. In a dynamo-electric machine, a brush yoke, a brush fork, a brush stud carried by said fork, a brush and holder mounted on said stud and movable relatively to said fork, and means for reciprocating said brush and holder.

10. In a dynamo-electric machine, the combination of the commutator, a plurality of brushes coöperating therewith, and means for automatically moving less than all of the said brushes relatively both to the commutator and to the remainder of said brushes.

11. In a dynamo-electric machine, the combination of a commutator, a plurality of brushes coöperating therewith, and means for automatically moving less than all of said brushes axially of the commutator and relatively to the remainder of said brushes.

In testimony whereof I affix my signature, in the presence of two witnesses.

HOWARD H. RALSTON.

Witnesses:

GEO. B. SCHLEY,

FRED J. KINSEY.