(No Model.)

E. THOMSON.

COMMUTATOR BRUSH.

No. 345,336. Patented July 13, 1886.

Fig. 1.

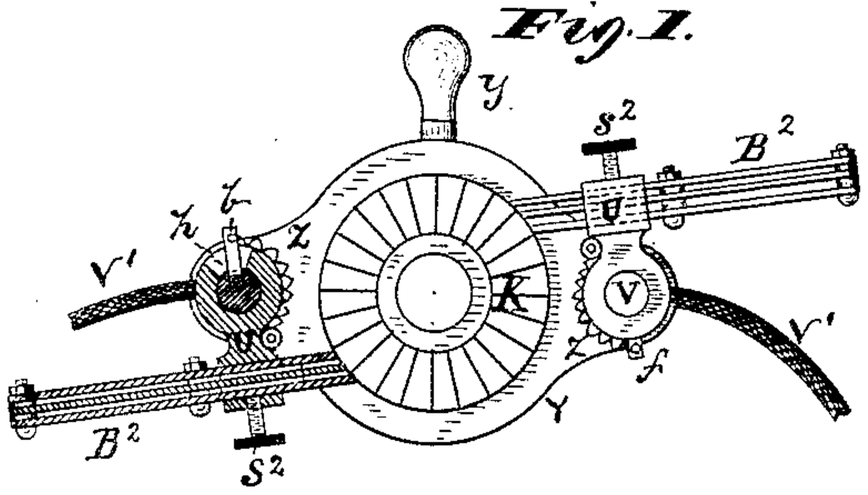

Fig. 2.

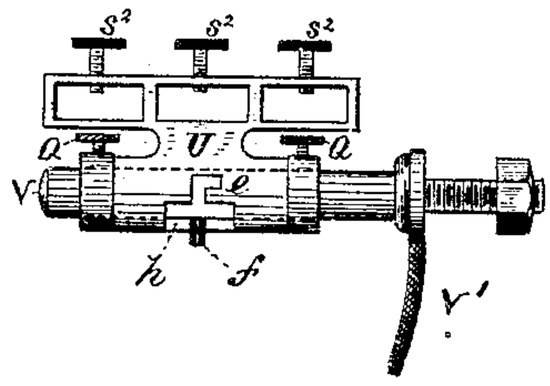

Fig. 3.

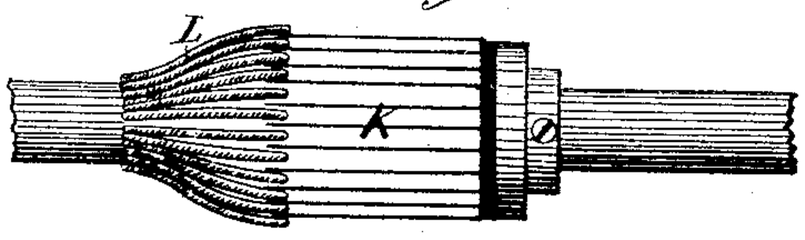

Fig. 4.

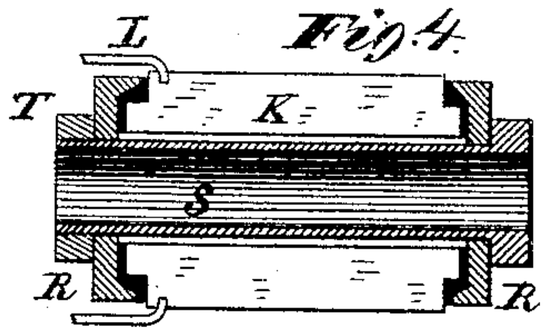

Fig. 5.

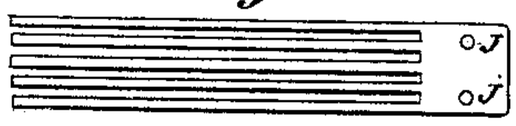

Fig. 7.

Fig. 6.

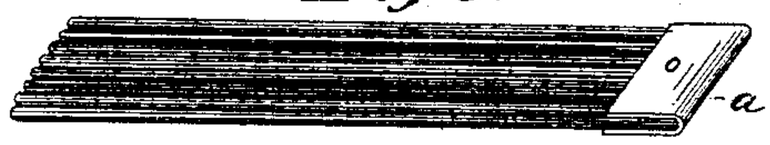

Fig. 8.

Fig. 9.

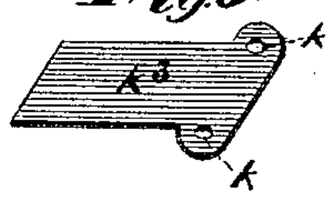

Fig. 10.

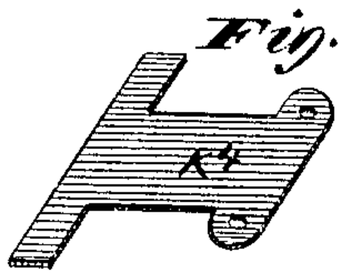

Fig. 11.

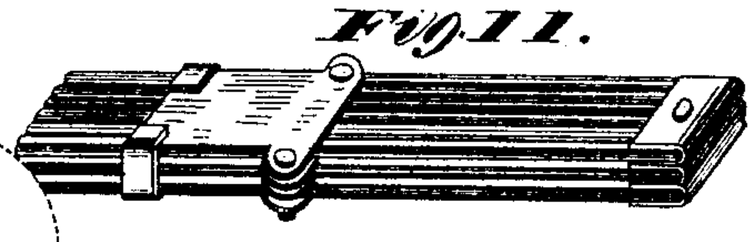

Fig. 12.

Fig. 13.

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ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

COMMUTATOR-BRUSH.

SPECIFICATION forming part of Letters Patent No. 345,336, dated July 13, 1886.

Application filed November 16, 1885. Serial No. 182,919. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Electric Switches and Commutators, of which the following is a specification.

My invention relates to the construction of switches and commutators generally, but is designed more especially to improve the construction and action of commutators for dynamo-electric machines and motors.

My invention consists, principally, of a novel commutator or switch brush composed of two or more layers or planes of conducting-pieces, the individual members of which in each plane are capable of making contact independently, not only of others in the same plane, but also of others in the adjoining planes, and are capable of being fed forward between the plates that separate them as they wear away by use.

My invention consists, also, of certain improved details of construction, that will be described in connection with the accompanying drawings, and then specified in the claims.

Figure 1 is a side view of a commutator embodying my invention, and designed especially for application to dynamo-electric machines and motors. Fig. 2 is a rear view of a brush-holder with the brushes removed. Fig. 3 is a plan of the commutator-cylinder. Fig. 4 is a longitudinal section of the same. Fig. 5 is a plan view showing one construction of a series of conducting-pieces making up the spring-pieces of a single plane. Fig. 6 illustrates a modified construction in which the individual parts of a single layer consist of wires. Fig. 7 is a cross-section of the same. Fig. 8 shows a modification in which wires are also employed. Fig. 9 is a perspective view of a metal piece or block employed for separating the various layers. Fig. 10 shows a modified form of block. Fig. 11 illustrates a compound brush made from wires in accordance with my invention. Fig. 12 is a cross-section of the same. Fig. 13 shows a similar form of brush clamped in the holder, which latter is shown in cross-section.

The construction of the commutator-cylinder is more fully shown in Figs. 3 and 4.

Each segment consists of a bar or segment, of copper or other suitable material, having a straight projection extending outwardly at its ends parallel with the axis of the commutator A. An annular rectangular recess is thus formed when a series of the segments are disposed in a circumference of a circle about a suitable hub or sleeve, S, which recess is adapted to receive an insulating-ring made in one or more parts, and to hold the same against longitudinal movement when the parts are clamped together in the manner to be presently described. Fitting around these projections at each end is the insulating-ring, (shown in black,) and shaped on its outside like a short frustum of a cone, while the interior surface of the ring fits the straight projections from the commutator-segments. Outside the rings of insulation are caps of metal, R R, coned internally to fit the insulating-pieces, and slid upon a sleeve, S, and bound firmly toward each other by a screw-nut, T, as shown. The commutator so constructed may be slipped upon the shaft of the machine, and the wires L from the armature connected to the segments in any desirable way.

In Fig. 1, Y is an ordinary movable yoke connecting with the shaft and adjustable around the same, and capable of being set in position by a set-screw, *y*. Upon this yoke are two pillars or studs, V, insulated therefrom in the usual manner, and projecting from the yoke Y, parallel to the axis of the commutator K. Upon each of these studs or pillars V is strung a brush-holder, U, capable of turning upon the pillar V through a limited range, and provided with set-screws S^2, for fastening the commutator-brushes B^2 in position in the holder. A pin, *f*, inserted into the pillar V serves to hold one end of the coiled spring Z, the other end of which latter is attached, as shown, to a hook or loop on the holder U, to press the brush B^2 upon the surface of the commutator-cylinder. Suitable cable connections, V′ V′, from the pillars V V, respectively, are provided, as usual.

A slot in that portion of the holder U which is upon the pillar V permits a limited swing of the holder. The pin *f*, passing outward through this slot, is shown in the section at the left of Fig. 1. The pillar V is provided with any suitable means of attachment and insulation

from the yoke Y. The brush-holder U is applied by slipping it on the pillar or stud V, after which the pin *f* is inserted and the spring Z attached to it at one end, as described.

The brush-holder is preferably composite in character—that is, it is capable of carrying more than one commutator-brush.

In the figure spaces for three brushes are shown, and set-screws S^2 S^2 S^2 for each. I sometimes provide collars with set-screws, whereby lateral motion or longitudinal adjustment along the pillar may be effected by changing the position of the collars longitudinally on the pillar V. By this means the brushes B^2 may be given an end or longitudinal adjustment along the commutator-cylinder. I also provide, in addition, a slot, *h*, Fig. 2, in which the pin *f* plays, and a slot bent as at *e*, which is virtually a continuation of the opening or slot *h*. Its purpose is to permit the drawing back of the brush-holder and brushes from the commutator, and by a longitudinal movement of the holder U on the stud to cause the slot *e* to embrace the pin *f* as a sort of catch, thus preventing the return of the brush to the commutator-surface until the movements of the brush-holder have been reversed. It is also desirable to make the slot *h* of such limited size that when the brushes are removed from the brush-holder U the spring Z cannot bring the brush-holder into contact with the surface of the commutator, the pin *f* acting as a stop to the movement.

With the brush-holder arrangements adjusted as described, one, two, or three brushes may be applied to the commutator, as occasion requires. Spaces for a larger number of brushes in the same holder may be readily provided.

In Fig. 5 is shown a simple way of securing proper subdivision of one of the parallel layers going to make up the compound brush. The separate pieces of a single layer or series in a single plane are obtained by simply slitting a sheet of metal, as is usual in the art, one end of the sheet being left intact to form a common support or attachment for the separate brush or comb-like teeth. Each of the teeth or pieces thus formed is obviously capable of exerting a separate and independent pressure on a commutator. A number of such series or sets of pieces piled upon one another alternately with separating-pieces of any form—such, for instance, as indicated at K^3 in Figs. 9 and 13—make up a compound commutator-brush embodying my invention. The separating-plates K^3 serve the purpose of keeping the pieces of one series or plane from pressing upon and interfering with the pieces of other series or planes, so that all the pieces of each plane are capable of pressing upon the commutator-surface with an independent pressure.

A single brush subdivided to make up the series of a single plane may be constructed from wires, as indicated in Fig. 6, and this is the form that I prefer. The wires placed side by side are soldered at one end into a piece of metal, forming a butt, *a*, which may be perforated or not. When designed for use in my compound brush, it is perforated, so that several such brushes superposed may be clamped together at their ends by bolts, as shown. Perforations at *j j*, Fig. 5, serve the same purpose.

In Fig. 8 the butt or tail piece *a* is a plain flat one, instead of being bent, as in Fig. 6.

The pieces K^3, employed for separating the layers, are preferably made of about the same width as the compound brush, and are made with perforated ears, through which bolts may pass for holding all the parts together. The mode of utilizing these parts in the construction of the composite brush is seen in Figs. 11 and 13. Several of the brushes, Figs. 5, 6, or 8, are piled alternately with separating-pieces K^3, Fig. 9, and bolts preferably inserted through the perforations at the end of the brushes, so as to hold the several layers or brushes firmly together, small thin washers being sometimes inserted between them at such points. The several series are made of such length that they may fit a cylindrical commutator-surface, *a*. (Shown in Fig. 13.) The pieces K^3 are placed above, below, and between the brushes forming the several series or planes of separate spring-pieces, and serve to separate the series of adjoining planes a small distance at their wearing ends. The pieces so used are tied together by a pair of pins, W, inserted in the openings K K, Fig. 9.

The lower plate, K^4, is preferably formed, as shown in Fig. 10, with ears or projections, which may be bent up on the sides of the brush and over the top, so as to keep the parts in place. This is especially desirable when the brush is made up of wires. The clamping pressure in the brush-holder is brought upon the bundle so formed at the point where all the metal pieces are together, as indicated in Fig. 13. Since the long divided strips are the only parts that wear with the construction described, they may be fed forward and readjusted as often as need be, while the short pieces interposed may be preserved from all wear, and, in fact, since they occupy during use practically the same position in the brush-holder, may serve for use with other and new strips subsequently inserted.

The parts being simple and of easy construction, much expense is saved in the use of my present construction of brushes, and a multitude of spring-contacts with the surface of the commutator while revolving is secured, since the number of pieces into which the compound brush is split may be very great, and a considerable number of separate layers, each subdivided, may be piled together to form the complete brush.

What I claim as my invention is—

1. A switch or commutator brush consisting of two or more layers of separate spring conducting-pieces held apart at their contact ends by separating-blocks, between which the

brushes may be fed forward to compensate for wear, as and for the purpose described.

2. A compound commutator-brush subdivided in planes at right angles to one another, and having the parts in planes transverse to the line of pressure separated from one another by pieces independent of the brushes, so that the latter may be fed forward between the pieces to compensate for wear, while at the same time the individual parts of the brush may exert independent spring-pressure without interference from one another.

3. In a switch or commutator brush, the combination, with a series of conducting-wires, of a common butt-plate, to which the ends remote from the contact ends are secured, and separating-pieces placed between the layers of wire, but detached from the same, so that the brush may be fed forward between the separating-pieces to compensate for wear.

4. In a commutator-brush for a dynamo-electric machine or motor, a series of wearing-strips, each subdivided in the lines of pressure and inserted between sets of clamping-plates, between which the strips may be fed forward, said clamping-plates serving to hold the wearing-strips at a slight distance apart.

5. The combination, in a commutator-brush, of two or more series of spring conducting-pieces arranged in separate planes, separating blocks or pieces between the planes, and a holder and clamp-screw for clamping the whole together or relieving the same from pressure, to permit the conducting-pieces to be fed forward between the separating-blocks, as and for the purpose described.

6. The combination, in a commutator-brush, with two or more parallel layers of conducting-pieces, of separating blocks or plates, and a plate having ears that may be bent to hold the bundle firmly together.

7. In a dynamo-electric machine or motor, a commutator composed of segmental pieces having straight longitudinal projections whose bearing-surfaces are parallel with the commutator-axis, and are formed, as shown, with rectangular recesses, in combination with insulating-rings fitting thereon, said rings being tapered or conically formed on their outer surface, external caps with a tapering inner surface fitting on the rings, and means for forcing said caps together or toward one another, substantially as described.

8. The combination, with the sleeved brush-holder, of a locking-pin projecting from the supporting-stud on which the holder is sleeved, said holder being formed to lock with the pin on a rotation and sidewise movement, as and for the purpose described.

9. In a dynamo-electric machine, a brush-holder and brush-holding pillar, in combination with an angular slot, *e*, and pin *f*, for locking the said brush-holder in a position for holding the brushes off the commutator.

10. In a dynamo-electric machine, a commutator-brush constructed, substantially, of slit or subdivided layers of copper or other suitable metal and interposed separating-pieces of metal, said layers being fastened together at their outer extremities, as described.

11. In a commutator-brush for a dynamo-electric machine or motor, a series of wearing-strips, each subdivided in the lines of pressure and inserted between a set of clamping-plates movably strung on a suitable support, so as to hold said wearing-strips at a slight distance apart and to permit their being fed forward between said clamping-plates, as described.

12. In a dynamo-electric machine or motor, a commutator-brush composed of adjustable subdivided wearing-strips, in combination with a set of clamping-plates, between which the strips may be slipped, said clamping-plates being adapted to be clamped in the brush-holder of the machine, to transmit the pressure to each of the wearing-strips, as described.

13. In a commutator-brush, wearing-strips inserted between clamping-plates having perforated lateral ears, in combination with suitable guiding-pins, W W, upon which the clamping-plates are strung, as described.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 13th day of November, A. D. 1885.

ELIHU THOMSON.

Witnesses:
W. O. WAKEFIELD,
E. H. KIRFIELD.