(No Model.)

E. THOMSON.

CARBON BRUSH.

No. 539,453. Patented May 21, 1895.

FIG. 1.

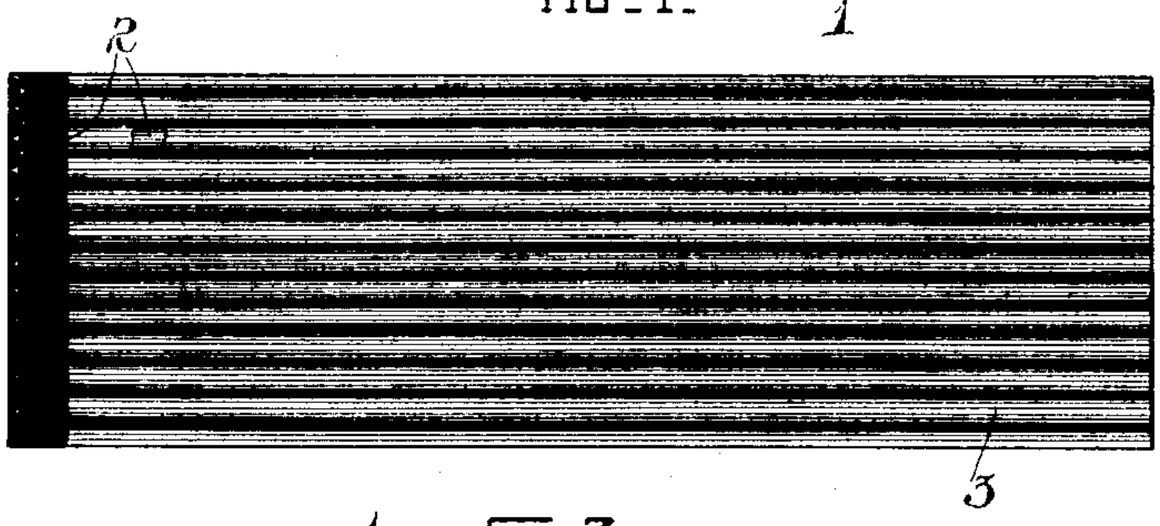


FIG. 2.

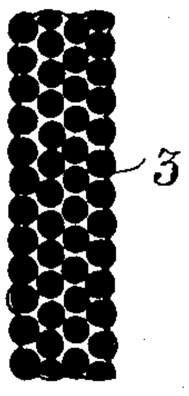


FIG. 3.

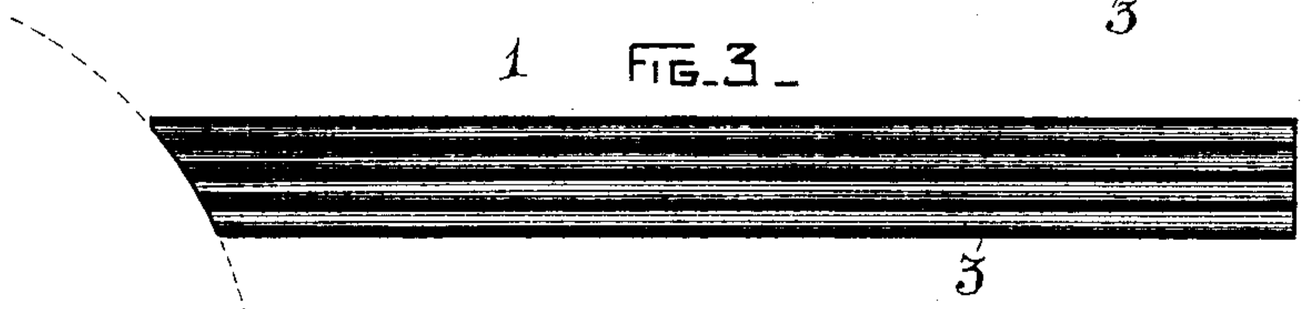
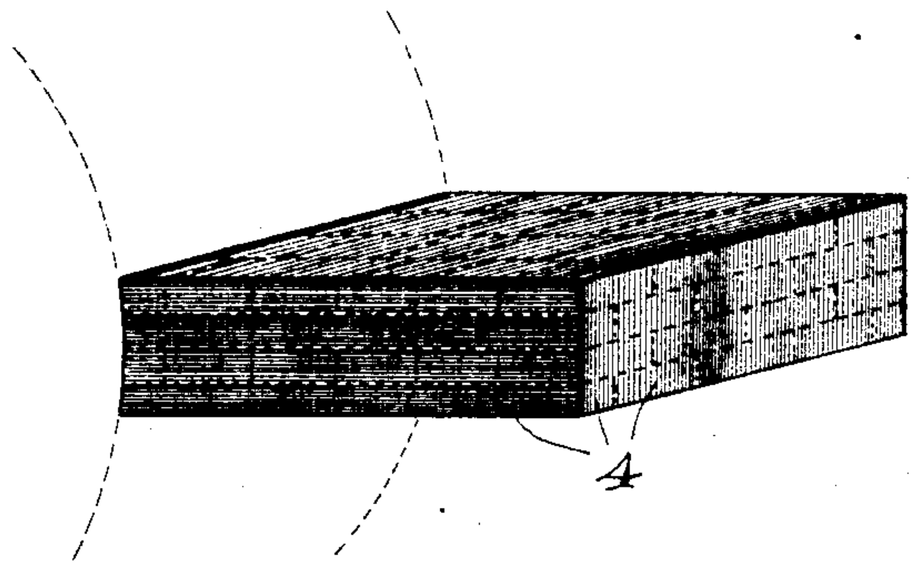


FIG. 4.



WITNESSES.
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By Geo. R. Blodgett
Atty.

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GENERAL ELECTRIC COMPANY, OF SCHENECTADY, NEW YORK.

CARBON BRUSH.

SPECIFICATION forming part of Letters Patent No. 539,453, dated May 21, 1895.

Application filed February 6, 1895. Serial No. 537,457. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Carbon Brushes for Electric Apparatus, of which the following is a specification.

My present invention relates to improvements in carbon commutator brushes or collectors used on dynamo machines for commutation of current from the revolving metal surfaces, and its object is to improve the structure of such brushes and better adapt them for taking off current from dynamos, or delivering current to motors, when the potential of the currents is low, by decreasing the resistance of the brush. Attempts have hitherto been made to accomplish a similar result by the admixture of more or less conducting material with carbon in order to lower its specific resistance as a mass. It is well known in the art that with sufficiently high potentials, and with moderate current, solid blocks of carbon held in frictional contact with the commutator surface serve the purpose of taking up the current. In cases where the amount of current to be so taken up is large and where the potential of the current is quite low, as, say, one hundred volts, more or less, a solid block of carbon does not possess the proper conductivity and may heat considerably, and heat also the commutator with which it is held in contact, while requiring a high pressure to so improve the contact of the brush upon the commutator that the electrical resistance may be kept down, thereby increasing the heat and loss of power.

It is the purpose of my invention to obviate these difficulties, and briefly stated, it consists of the assemblage of rods or definite pieces of carbon which are held in place by metallic envelopes surrounding them, and united in a more or less solid structure, as is more particularly specified in the claims.

It is preferable that, when the carbon pieces which are to compose the brush are first brought together and united, they as a whole should be incased in thin metal, which can be done by electro-plating, though other methods may be followed, as for example, by inserting the material forming the body of the brush in a thin metal case and soldering or fusing.

Referring to the drawings, Figure 1 is an elevation of a brush constructed in accordance with this invention. Fig. 2 is an end view of the same. Fig. 3 is an edge view, and Fig. 4 is a view in perspective, of a modified construction.

Referring to Figs. 1, 2, and 3, the commutator brush 1 is made as follows: A number of small rods of carbon 2 are plated with a thin film of metal, such as copper. These rods are assembled in the form required and of the required size so as to give the desired thickness, length and width of the brush, and the copper plated carbon pieces 2 are united by soldering, that is, by "sweating in" solder between them in a sufficient number of places to hold them together, or throughout the whole mass if desired. Instead of soldering the plated carbon pieces 2 together, they may be united by fusing their metal coating. The brush may now be considered finished, although in most cases it is preferable to incase the bundle of pieces so held together in an outer metallic coating 3 which may be put on by electro-plating, or a thin metallic case may be provided soldered to the mass. The soldering of the latter may be done when the soldering or "sweating" together of the pieces is effected. The end of the brush which is applied to the commutator, of course, has the metal removed, or may be left bare in the plating, so as to present the carbon to the commutator surface, as shown in Fig. 2.

In Fig. 3 is shown one of the ways of applying the brush to a commutator, the curved dotted line at the left of the figure representing the commutator surface to which the brush 1 is applied at an angle, as usual when brushes more or less tangible are employed, the revolution of the commutator being in either direction as desired, with reference to the position of the brush applied to it. The carbon surface applied to the commutator is broken away into facets, and the current which is taken from the commutator through the carbon faces is at once delivered to the metal which unites the various carbon pieces

and is conducted through the body of the brush by the metal chiefly. The metal is so thin that the moment it touches the commutator at any point, the extra conductivity causes it to shunt enough current to disintegrate it at once, so that at all times the carbon surfaces take the wear and the metal is eaten away a short distance as rapidly as the carbon is presented. This gives the advantage of the carbon serving as a wearing material on the commutator, an advantage which is now well appreciated; at the same time the brush itself being of comparatively good conductivity as compared with any form of carbon hitherto devised. Further, the conductivity may be varied to suit the current to be taken up, and the potential of the dynamo will determine the amount of metal which is to be used relatively to the carbon; that is, by plating the pieces more heavily the conductivity can be raised between limits, and by putting the merest film of metal on the carbon pieces, it can be lowered. Hence any tendency of the brush to short-circuit the segments of the commutator may be arranged to suit the potential of short-circuiting so as not to amount to any considerable factor in the working. In this way it is possible to preserve the essential virtue of the carbon brush when used as a solid mass.

In Fig. 4 is shown another construction which may be used, particularly when the carbon brush is more in the form of a square block and pressed end on toward the commutator, as indicated by the dotted lines. In this case instead of using rods which run lengthwise through the brush, it may be made of short pieces as shown in the brush in Fig. 4, consisting of a number of short blocks 4 plated on their sides and sweated or soldered together, as the long rods are in Fig. 1, after which, as before, if preferred, a suitable metallic casing may be plated on the outside, or the whole mass may be inclosed in a properly formed casing which forms a thin layer of metal over the exterior.

Other modifications in the definitely formed pieces which go to make up the brush, and which are united as indicated, may be made without departing from the spirit of my invention.

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

1. A commutator brush for dynamos, motors or similar electric apparatus, composed of rods or pieces of carbon assembled in a mass and held together by interposed films adhering to the pieces.

2. A commutator brush for dynamos, motors or similar electric apparatus, composed of rods or pieces of carbon assembled in a mass and held together by interposed metallic films adhering to the pieces, and provided with an external case.

3. A carbon brush composed of rods of carbon of greater or less length, plated over with metal and united by soldering, as described.

4. A carbon brush composed of rods coated or plated with metal in films over the exterior of the rods, and united laterally by soldering or fusing, as described.

5. A carbon brush composed of rods or pieces of carbon coated or plated over the exterior with thin layers of metal, soldered, plated or fused together into a mass, and incased by a thin casing of metal, as described.

6. The herein described method of forming commutator brushes, which consists in plating pieces of carbon with a thin film of metal, assembling said pieces of carbon together, and uniting them by soldering or sweating.

7. The herein described method of forming commutator brushes, which consists in assembling and soldering together pieces of carbon coated with a thin film of metal, and incasing the bundle of metallic coated carbons in an outer metallic coating.

In witness whereof I have hereunto set my hand this 2d day of February, 1895.

ELIHU THOMSON.

Witnesses:
JOHN W. GIBBONEY,
HENRY O. WESTENDARP.

Correction in Letters Patent No. 539,453.

It is hereby certified that in Letters Patent No. 539,453, granted May 21, 1895, upon the application of Elihu Thomson, of Swampscott, Massachusetts, for an improvement in "Carbon Brushes," an error appears in the printed specification requiring correction, as follows: In line 92, page 1, the word "tangible" should read *tangential;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 11th day of June, A. D. 1895.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.