(No Model.)

J. NEBEL.

ARMATURE FOR DYNAMO ELECTRIC MACHINES.

No. 482,265. Patented Sept. 6, 1892.

Fig. 2.

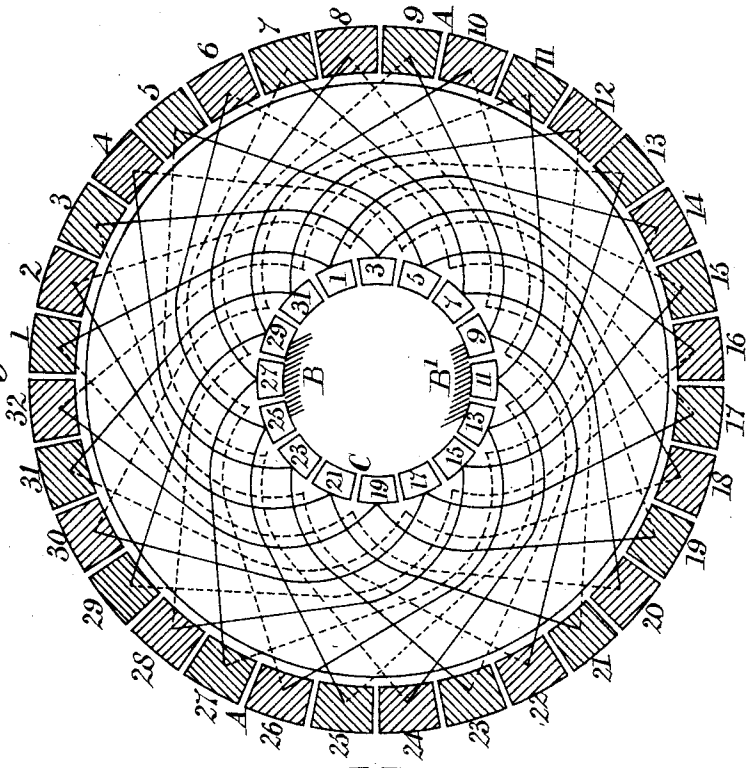
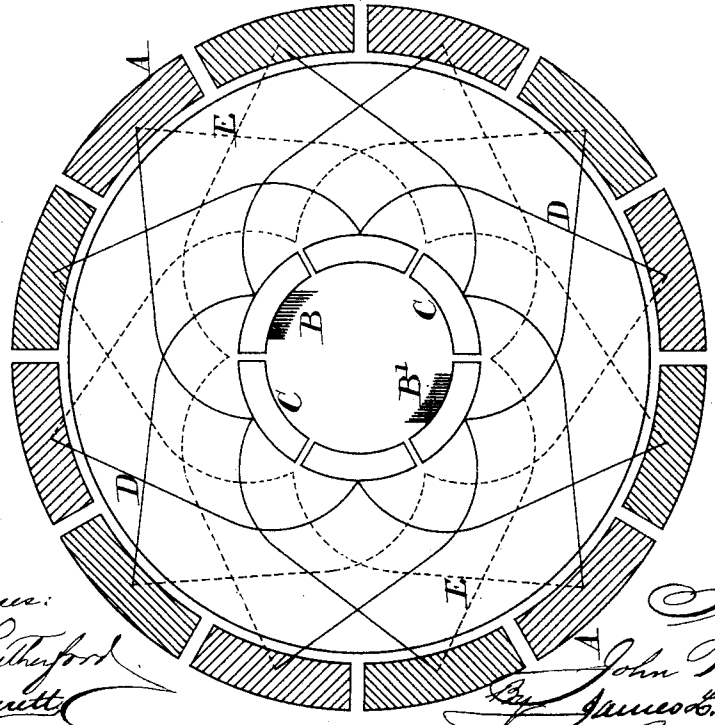


Fig. 1.



Witnesses:
J. A. Rutherford
Robert Everitt

Inventor:
John Nebel
By James L. Norris.
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN NEBEL, OF CHARLTON, ASSIGNOR TO THE SIEMENS BROTHERS & CO., LIMITED, OF WESTMINSTER, ENGLAND.

ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 482,265, dated September 6, 1892.

Application filed November 11, 1891. Serial No. 411,596. (No model.) Patented in Germany February 22, 1891, No. 61,059; in England November 30, 1891, No. 20,840; in France December 24, 1891, No. 204,633, and in Belgium December 31, 1891, No. 97,772.

To all whom it may concern:

Be it known that I, JOHN NEBEL, a citizen of England, residing at 35 Maryon Road, Charlton, in the county of Kent, England, have invented new and useful Improvements in Armatures for Dynamo-Electric Machines, (for which I have obtained a patent in Great Britain, dated November 30, 1891, No. 20,840; in France, dated December 24, 1891, No. 204,633; in Belgium, dated December 31, 1891, No. 97,772, and in Germany, dated February 22, 1891, No. 61,059,) of which the following is a specification.

This invention relates to armatures of continuous-current dynamo-electric machines which are employed to give currents very large as compared to the diameter of the armature. The conductors of such armatures must be of very large section and are usually copper bars of rectangular section, solid, laminated, or stranded, arranged in a single layer around the periphery of the armature. Such machines are subject to great sparking at the commutator and to great heating of the armature, resulting from eddy-currents set up in the bars, and the currents which they produce are of a very pulsating character.

The object of my invention is to reduce these evils, which I effect by certain subdivision of the conductors, as I shall explain, referring to the accompanying drawings.

Figure 1 shows diagrammatically the usual arrangement of conductors of a drum-armature. Fig. 2 shows the arrangement according to my invention.

Referring to Fig. 1, A indicates the rectangular copper bars, the curved dotted lines E indicate the connections at one end of the drum, and the full curved lines D indicate the connections at the other end of the drum and to the commutator-segments C.

B B′ indicate the brushes. As there are from brush B to brush B′ two parallel paths, each bar A has to carry half the total current produced by the machine. The diagram shows only twelve bars. When the number of bars is increased, the objections still exist, though to a less degree.

Now according to my invention in dealing with an armature which has not less than eight conducting-bars I divide each of the conducting-bars into two, three, or more—say n—sections, and then add or subtract 2, 4, or $2n-2$ bars, according as the conductors have been divided into two, three, or n parts, and I make the end connections and commutator-segments proportional to the number of bars. Each bar is then connected by the curved end connections, not to the bar exactly opposite, but to the second, third, or nth bar before the opposite one, according as the conductors have been divided into two, three, or n parts. Each brush is arranged to touch always two, three, or n commutator-segments, according as the bars consist of two, three, or n parts. The bars are thus connected in series or in one continuous circuit over the armature, so that from brush to brush there are four, six, or two n parallel paths for current, and consequently each bar has to carry only one-fourth, one-sixth, or one-half nth of the total current. If, for instance, the original armature had twelve bars and it were desired to divide each into two sections, making twenty-four bars, to this number there should be added two bars, making a total of twenty-six; or, from twenty-four should be subtracted two bars, leaving a total of twenty-two. In like manner each of the twelve bars might be divided into three sections, and then to the thirty-six so obtained should be added four bars, or from the thirty-six should be subtracted four, thus giving a total of forty or thirty-two bars.

Fig. 2 shows, diagrammatically, such an arrangement for conductors divided into three sections, with four bars subtracted, making a total of thirty-two bars and sixteen commutator-segments. In this case each bar has to be connected by the curved end connections to the third bar next before the bar directly opposite, following always the same direction round the periphery. Thus the bar 1, to which 17 is directly opposite, is connected through the n commutator-segments to 14. Again, 14 has its end connection not to 30, directly opposite, but to 27, and so on. The brushes on each side never touch less than three segments.

In this case from brush to brush there are six parallel paths. Therefore each bar has to carry only one-sixth of the current.

It is an advantage of this arrangement as compared with a system of independent parallel circuits that it is quite symmetrical, whatever be the number of the parallel circuits, requiring at both ends of the armature exactly similar end connections, such as cannot always be used with independent parallel circuits.

I have described my invention applied to an armature having originally twelve bars; but it is to be understood that the invention is applicable to armatures having more or less than twelve, but not less than eight, bars.

Having thus described the nature of this invention and the best means I know for carrying the same into practical effect, I claim—

An armature of a dynamo-electric machine, having its conducting-bars, not less than eight in number, divided into two, three, or n sections and this number increased or diminished by adding or subtracting 2, 4, or $2n-2$, each bar of the number so determined being connected, not to that opposite to it, but to the second, third, or nth before the opposite, and each brush touching two, three, or n commutator-segments, of which there are half as many as there are bars, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 16th day of October, A. D. 1891.

JOHN NEBEL.

Witnesses:
GEO. P. SIMPSON,
M. THOMAS.