(No Model.)

R. EICKEMEYER.

DYNAMO ELECTRIC MACHINE.

No. 342,589. Patented May 25, 1886.

Fig. 1.

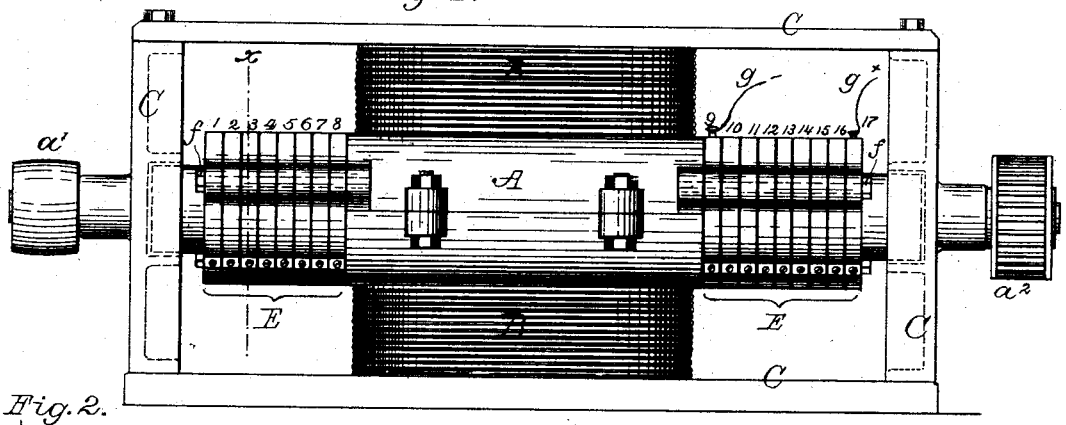


Fig. 2.

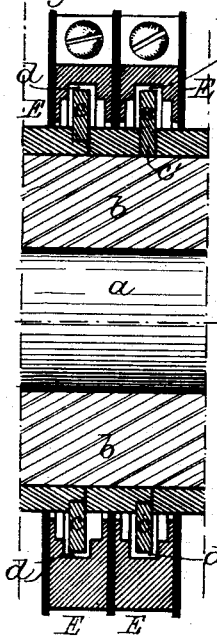


Fig. 5.

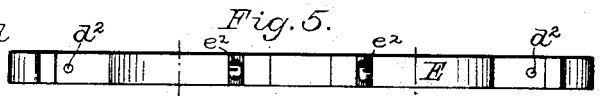


Fig. 4.

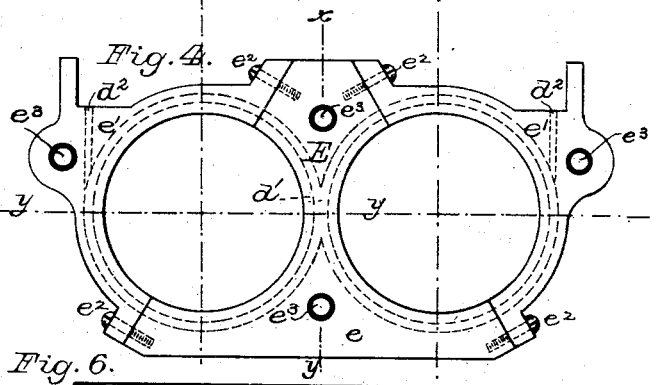


Fig. 6.

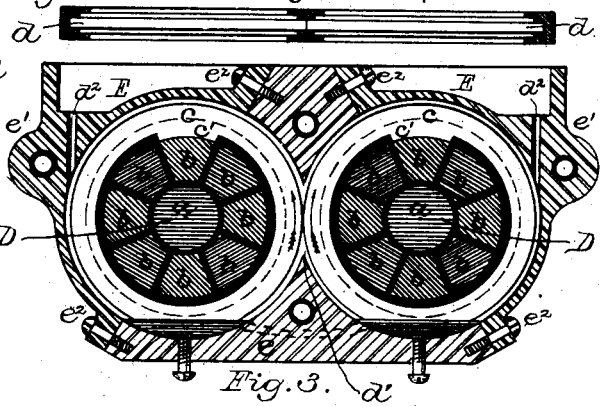
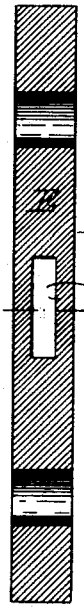


Fig. 3.

Fig. 7.



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UNITED STATES PATENT OFFICE.

RUDOLF EICKEMEYER, OF YONKERS, NEW YORK.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 342,589, dated May 25, 1886.

Application filed July 19, 1883. Serial No. 101,2-0. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF EICKEMEYER, of Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of my invention.

My said improvements are generally applicable to that class of so-called "unipolar dynamo machines" which embody one or more revolving armatures composed in part of longitudinal conducting-bars electrically connected in linear series, and I have illustrated the same in connection with that variety of machines included within said class which embody two revolving armatures, each composed in part of a series of bars serving as conductors and having the bars of both armatures connected in linear series, so that while in all the bars of one armature the electric current is moving in the same direction, and moving in all of the bars of the other armature in the opposite direction, said bars are electrically connected and enable a continuous current to pass through all the bars in both armatures.

In certain prior applications for Letters Patent filed by me November 8, 1882, December 5, 1882, and December 29, 1882, I illustrate and describe a variety of machines of the class referred to and various forms of electric contacts in connection therewith, whereby the bars of one armature are electrically connected with the bars of the other; and my present invention relates exclusively to certain novel electric contacts and to their combination with the annular conductors which are employed by me in connection with each bar of an armature.

Heretofore in these machines brushes in various forms have been employed as electric contacts co-operating with said annular conductors, as well as various forms of roller-contacts; and the object of my present invention is to obviate the friction and wear incident to said prior contacts, and to obtain reliable electric connections. In attaining this end I employ mercury in cups, within which said annular conductors revolve, and while I am aware that the use of mercury as a medium for assuring an electric contact between a stationary conductor co-operating with a revolving conductor is not broadly new, I have for the first time, as I believe, provided an annular mercury-cup with an annular recess, and so combined a revolving annular conductor therewith that the latter, while being rapidly rotated in a vertical plane, is enabled with a small quantity of mercury to maintain an electric contact throughout the whole or the main portion of its periphery with the mercury-cup, and at the same time afford ample receptive space for the mercury at the bottom of the cup when the revolving conductor is at rest, and I am also enabled to obtain a desirable receptive capacity for mercury in a narrow cup, and I am therefore enabled to mount in a dynamo-machine a series of cups side by side in close proximity to each other and so as to occupy but little space, and the cups thus placed side by side are provided with charging-ducts, whereby the mercury is introduced. I am also the first, as I believe, to employ with an armature composed in part of parallel bars serving as conductors and annular conductors for each of said bars a series of mercury-cups, one for each bar, whereby said bars may be electrically connected in linear series, either by a direct contact of the mercury in one cup with that in another or by the connection of the mercury-cups by means of outside stationary conductors.

After describing the machine illustrated in the drawings and obvious modifications of parts thereof the features deemed novel will be specified in the several claims hereunto annexed.

Figure 1 is a side elevation of a machine embodying two tubular pole-pieces and two revolving armatures with my present improvements applied thereto. Fig. 2 is an enlarged central vertical longitudinal section through one of said armatures, Fig. 1, near either end thereof. Fig. 3 is a transverse vertical section through both of said armatures at line *x*, Fig. 1, and through a double mercury-cup common to both of said armatures. Fig. 4 is a side view of said double mercury-cup detached. Fig. 5 is a top view of said cup. Fig. 6 is a horizontal section of said double cup on line *y*, Fig. 4. Fig. 7 is an enlarged central vertical section of said double cup on line *x y*, Fig. 4.

For the purposes of this specification it is deemed unnecessary to minutely describe such portions of the machine as do not specially pertain to my present improvements. I will state, however, that the magnet A has two tubular pole-pieces, oppositely-located helices B, and the frame C is composed of cast-iron and constitutes a portion of the magnet. The armatures D have, as in my prior machines, a central shaft, *a*, conducting-bars *b*, insulated from each other and from said shaft, and each bar has at each end an annular conducting-ring, *c*, which is in electric contact therewith, as seen at *c'*, Figs. 2 and 3, and these bars *b* in both armatures are electrically connected with each other, so that the electric current passes from one bar in one armature to the proper bar in the other, and so on until all the bars are thus embraced in one linear circuit. One of said armature-shafts *a* is provided with a driving-pulley, *a'*, and the two shafts are coupled by gearing, as at a^2, as heretofore constructed by me. As in some of my prior machines, these armatures D are polarized, the bars being composed of magnetic metal and constituting bar-magnets; but so far as my present invention is broadly concerned, it is to be understood that said bars may as well be composed of non-magnetic metal, and that certain features of my present invention may be applied to machines having but one armature, whether its bars be composed of magnetic or of non-magnetic metal; nor is it material, so far as relates to my present invention, whether the polarized axis *a* be rotated as described, or stationary, and a bar-armature rotated around it, as arranged in some of my prior machines, and in each case affording an annular field of force, because my present improvements are applicable to any dynamo-machines in which the bar-armatures are employed, provided each conducting-bar is in electric connection with annular or disk-shaped conductors or conducting-rings.

The mercury-cups E, considered separately, differ from others of which I have knowledge in that they are annular in form, occupy a vertical plane, and have the central annular recess, *d*, so that when occupied by an annular conducting-ring, *c*, and properly charged with mercury, the latter, when the disk is at rest, has ample space at the bottom of the cup, and also so that when the conducting-ring is very rapidly rotated the mercury will be annularly distributed throughout the recess *d* and in contact with the whole or the main portion of the periphery of the ring.

The double mercury-cup shown is composed of the two separate cups or compartments E, as before described; but the annular recesses *d* thereof communicate at *d'* substantially in the horizontal plane occupied by the axial lines of both cups and by the centers of both armature-shafts, as clearly indicated in Figs. 3, 4, 6, and 7, thus electrically connecting each pair of coincident conducting-rings. The bodies of mercury in the two compartments may, if desired, be also connected by way of a duct near the bottom, as indicated in dotted lines in Fig. 3; but no such communication is absolutely necessary if the cup or the base-section thereof be composed of good conducting metal.

The mercury-cups, whether single or double, must be made in sections in order that they may be placed in position with relation to the rings, and although said cups are mounted closely side by side, each is rendered internally accessible by being provided with a vertical charging-duct, d^2, by way of which mercury in sufficient quantity is introduced, and a proper charge of mercury having been once ascertained it can be kept up from time to time should any loss by escape occur. It will be in some cases desirable that each cup have a discharging-duct at its bottom, occupied by a tightly-fitting but easily removable screw-plug, so that the cups may be readily emptied, if desired.

As clearly shown, the double cup is made in three sections. The base-section *e* constitutes a part of two cups, and the two side sections, *e'*, are counterparts applicable to either cup, thus providing for cheap construction. The several sections are bolted together, as at e^2, and numerous lateral bolt-holes, e^3, are provided for enabling the several cups to be securely mounted side by side in position in the machine by means of the bolts *f*, Fig. 1, and if said cups are composed of metal they are carefully insulated from each other and from said bolts; but if said cups are composed of insulating material they may be placed directly in contact with each other. As a rule, I prefer to employ cups composed of cast-iron, and to attach them to the pole-pieces substantially as shown, so as to be practically extensions of said pole-pieces.

It will be seen that each armature has eight bars, *b*, and that the electric terminals *g* are at one end of the machine, and that I have eight double cups at one end and nine at the other, respectively numbered from one to seventeen. The entering current at cup 17, for instance, passes to one bar in one of the armatures, and thence to the opposite end of the machine, through cup 8 to a bar in the other armature, and so on through all the cups and bars until cup 9 is reached, from which the current leaves the machine, thus connecting all the conducting-bars in linear or continuous circuit, the bars of either armature serving as outside conductors for the bars of the other armature.

In operation it will be obvious that with the double cup each conducting-ring will always carry more or less mercury to the communicating aperture *d'*, and that the opposing bodies of mercury at that point will prevent either compartment of the cup from receiving mercury from the other, while assuring perfect electric contact as between the two coincident rings. The coincident conducting-rings being of the same size and revolving in

opposite directions at the same speed, may be in conducting-contact or slightly separated, the mercury in the one case augmenting and in the other constituting a reliable electric connection.

It will be readily understood that if a machine have but one revolving armature single mercury cups will be employed, and that those at one end of the armature may be connected with those at the other by outside communicating conductors, as heretofore provided for by me in connection with brush and roller contacts; or, in lieu of the said outside conducting-wires, outside pipes or tubes containing mercury may be employed, so that the mercury in the bottom of any two cups can be connected by a body of mercury serving as an outside conductor within a pipe or tube, thus obtaining a practically integral metallic circuit without that objectionable friction which is incident to the use of metallic brushes and roller-contacts. It will also be readily seen that the mercury-cups as constructed and organized by me can be employed in connection with some other suitable liquid-conducting medium in lieu of mercury, although I know of nothing superior or equal thereto for this purpose.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, substantially as hereinbefore described, of a revolving armature embodying a series of bar-conductors, conducting-rings for each bar, and an annular mercury-cup for each conducting-ring.

2. The combination, substantially as hereinbefore described, of a tubular pole-piece, a series of bar-conductors revolving within said pole-piece in an annular field of force, annular rotating conductors in electric connection with both ends of each bar-conductor, a mercury-cup for each annular rotating conductor, and conductors for electrically connecting said cups and their bar-conductors in a linear or continuous circuit.

3. The combination, substantially as hereinbefore described, of a revolving armature embodying a series of bar-conductors, conducting-rings for each bar, and for each ring an annular mercury-cup constructed in sections, embracing said ring, and provided with an annular recess occupied by the periphery of the ring, as set forth.

4. The combination of the co-operating armatures, each embodying a series of bar-conductors, conducting-rings for each bar, and a double mercury-cup for each coincident pair of conducting-rings, as set forth.

5. The double mercury-cup constructed in sections and bolted together, substantially as described.

6. An annular mercury-cup provided with a vertical charging-duct in its periphery, substantially as described, whereby a series of said cups may be mounted closely side by side and each rendered internally accessible for charging, as set forth.

RUDOLF EICKEMEYER.

Witnesses:
HENRY OSTERHELD,
GEORGE NARR.