(No Model.)

A. G. WATERHOUSE.

COMMUTATOR FOR DYNAMO ELECTRIC MACHINES.

No. 252,405. Patented Jan. 17, 1882.

Fig. 1.

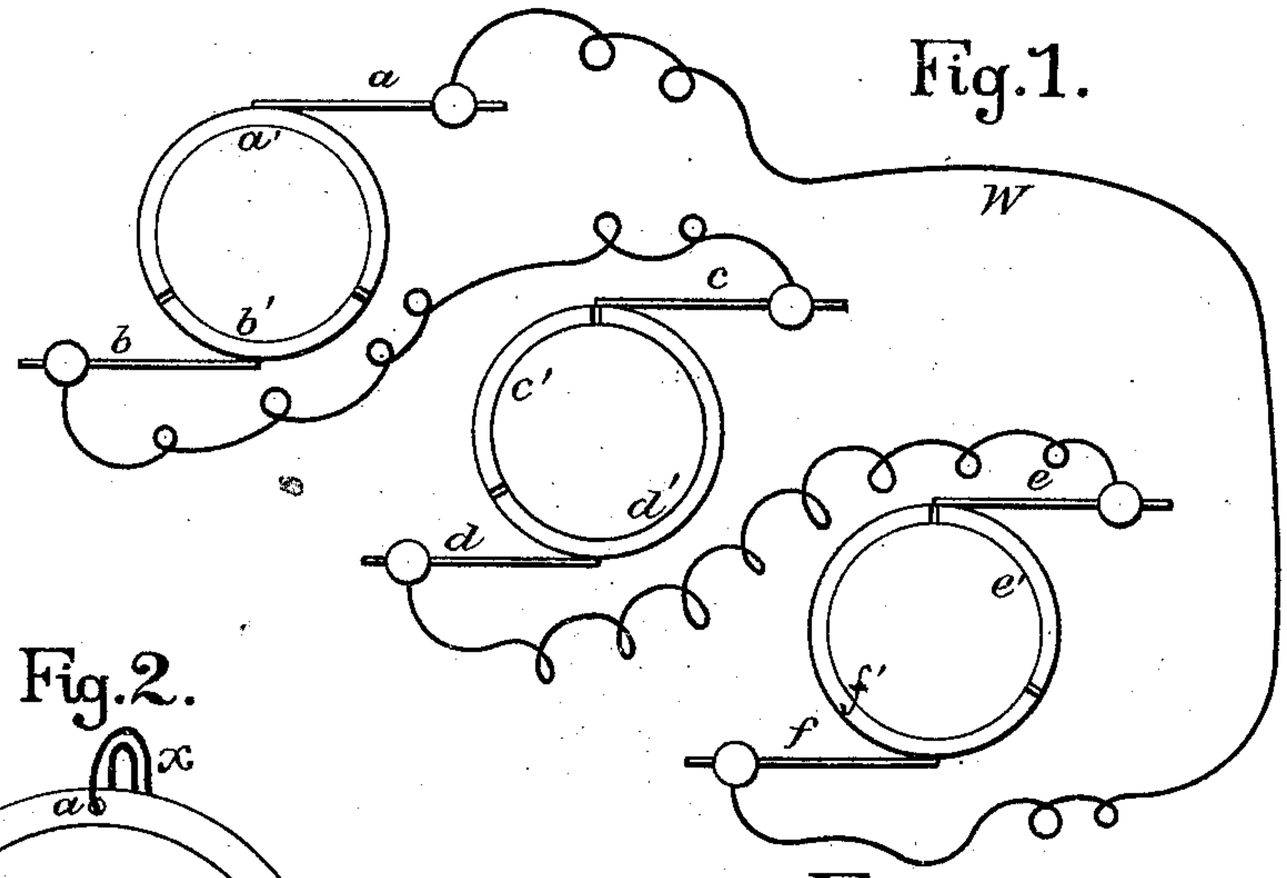


Fig. 2.

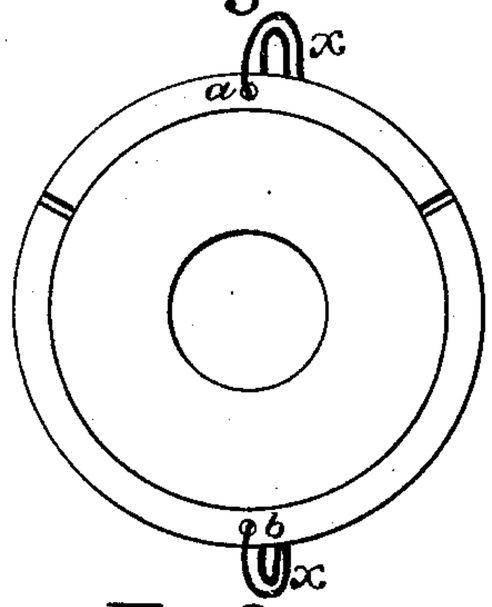


Fig. 3.

Fig. 6a. 7.

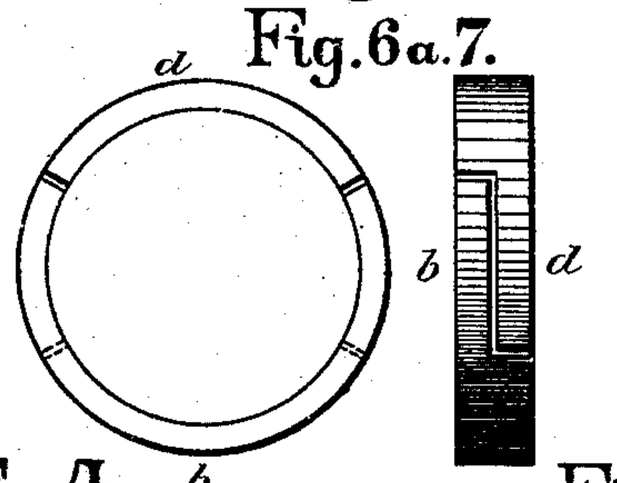
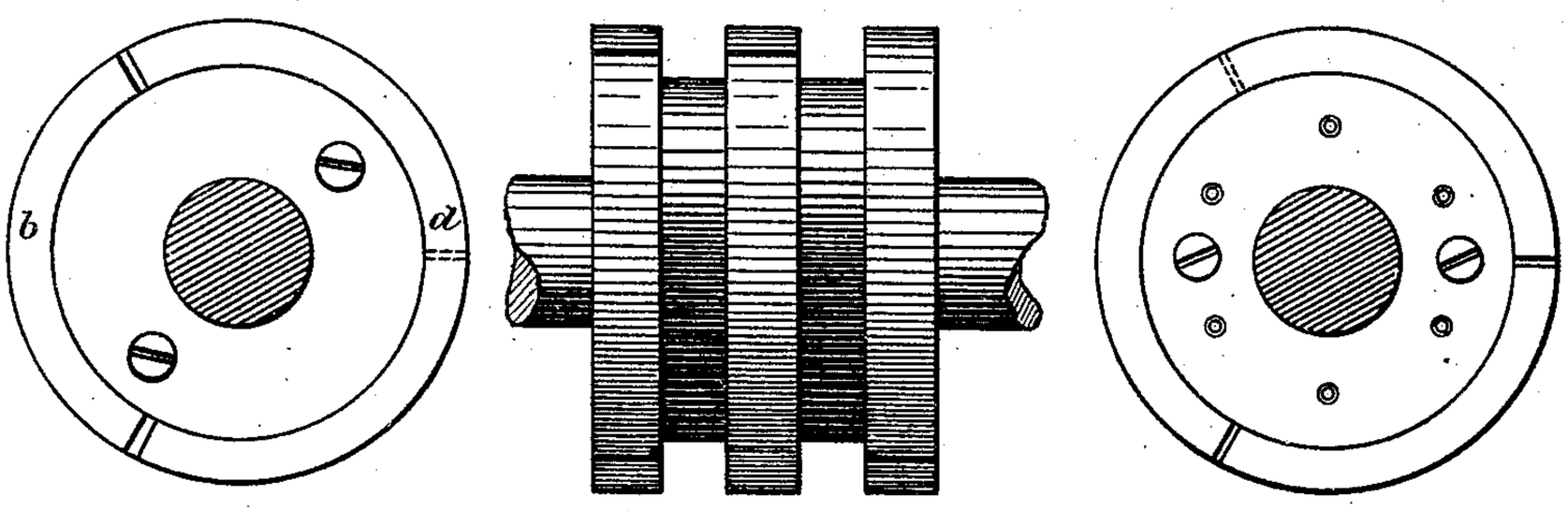


Fig. 4.

Fig. 5.



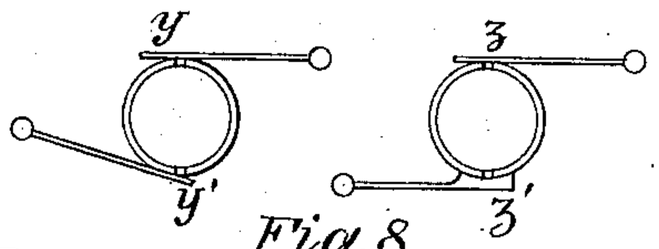


Fig. 8.

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COMMUTATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 252,405, dated January 17, 1882.

Application filed April 2, 1881. (No model.)

To all whom it may concern:

Be it known that I, ADDISON G. WATERHOUSE, a citizen of the United States, and resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Magneto or Dynamo Electric Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to improvements in the commutators for magneto or dynamo electric machines of a certain type, and to the methods of connecting up the armature-coils with the segments thereof, so that the current taken off will have the maximum electro-motive force of all or any predetermined number of coils by being caused to pass through the same in series; and the invention further relates to the devices employed in taking off the currents, said devices being composed of commutator rings and brushes, constructed and arranged in the manner hereinafter to be more fully described.

In the accompanying drawings, Figure 1 is a theoretical view of the commutator-rings, collecting and connecting brushes, showing the same in their proper relation when used in connection with an armature wound with three separate coils. Fig. 2 is a view of one of the rings detached, and shown as composed of two segments, to which the terminals of a coil are attached. Fig. 3, a detailed view of Fig. 4, which latter represents, in side elevation, a commutator for a three-coil armature. Fig. 5 is a view illustrating in detail the construction of the inside rings; Figs. 6 and 7, detached views of a single ring; and Fig. 8, an illustration of a slightly modified form.

In the several figures, from 1 to 7, inclusive, are shown the rings, each one consisting of two segments, *a* and *b*, insulated from each other in any proper manner, one of which is greater, the other less, than half the circumference. For each coil on the armature there is an independent ring, to the segments of which the ends of the coil are respectively attached. The segments may therefore be regarded simply as the terminals of the coils to which they correspond, it being borne in mind that in general there will always be as many rings or pairs of segments as there are coils on the armature, and, from the nature of the case, a collecting-brush for each segment.

Referring more particularly to Figs. 1, 2, and 4, a commutator is shown which is adapted for use with a three-coil armature. In general appearance the commutator, when completed, resembles that shown in Fig. 4, where the rings are shown fixed to a shaft and clamped together, with interposed disks of insulating material. The wires from the several coils pass through suitably-situated apertures in the two inside rings to connect with the opposite segments of the ring to which they belong, one of these coils being represented by the letter *x* in Fig 2.

For better purposes of illustration the several rings are laid out side by side in Fig. 1, to which reference is made for an explanation of the operations of the commutator.

W represents the external circuit of the machine, through which the current passes from one brush, as *f*, to the opposite brush, as *a*. The rings are secured to the shaft and to one another in such relation that when any two brushes are bearing on the opposite segments of a ring the coil corresponding is exerting its maximum electrical effect, while the opposite is true—that is, they are producing the minimum amount of current, or, in other words, are passing the neutral point—when both brushes are in contact with the same segment. The relative lengths of the segments and the disposition of the coils on the armature are such that two pairs of brushes will be in contact with the opposite segments and one pair with the same segment, while of the coils corresponding thereto two will be generating their maximum amount of current, while the third will be idle, or generating but little. This coil will therefore be cut out or short-circuited, as the case may be, the current from the preceding ring passing through the segment from one brush to the opposite one instead of through the coil. Thus in Fig. 1, assuming the current generated by the machine when in operation to start at segment *a'*, from this point it passes through the coil to *b'*, then through

brush *b* to *c*, and from thence to segment *d'*. As the bobbin or coil corresponding to this ring is inactive at this point in its revolution, the brush *d* will also be in contact with segment *d'*. To it then the current passes, and thence to brush *e* and segment *e'*, from thence through the coil connected therewith to *f'*, and out, by way of brush *f*, to line *w*, and back to the starting-point *a*.

In Figs. 6 and 7 a modified form of ring is shown, in which both segments or plates extend beyond the center or around more than one-half of the ring. In this case the coil connecting each is at no time cut out, but imparts at all times its varying degrees of electrical force, while at the same time the main current, or that generated by the other coils, can be shunted through either or both of the two segments whenever the resistance of the coil connecting the two segments is greater than the electro-motive force given out by the said coil.

Fig. 8 shows other forms of the commutator, the equivalent to those already described. In these the plates or segments are of equal size, the cutting out or shunting being effected by means of the bearing strips or brushes. These, in one instance, are represented by *y y'*, and are composed of straight strips. One brush, *y*, is stationary, the other, *y'*, made adjustable around the commutator, so as to come in contact with the same plate that brush *y* rests upon, by which means the same result is obtained as though the plates were of unequal size. In the second case strips *z* and *z'* may both be stationary, one or both being so constructed as to come in contact with one segment before leaving the other.

For better purposes of illustration I have shown a commutator adapted for use with three coils only; but the same invention may be applied to an armature of any number of coils, and where the coils are so numbered as to be divided into pairs at, or nearly at, right angles with each other, then it is possible to use one pair of brushes for two pairs of rings, similar to other machines now in use.

I do not wish to be understood as claiming as new an armature with coils having their ends attached to a commutator-ring composed of two separate segments, such being old. The distinguishing feature of my present invention lies in the peculiar construction of the commutator and the method of connecting the coils with the plates therein, so that each coil or group of coils, as the case may be, will be connected in series, and so that when any one coil or group of coils fails to generate a current or to exert such a degree of electro-motive force as to fail to compensate for the resistance offered in such coil or group of coils to the current generated by the others, then such current will be free to pass around one or both of the segments of its corresponding commutator-ring without passing through the coil, and this I effect by forming a connection between the opposite brushes of a pair through the commutator-ring, either by the shape or size of the segments composing said ring or by the peculiar construction or position of the bearing-brushes themselves, the commutator as a whole being so placed with reference to the coil as to shunt or short-circuit the current around those coils only which are at the time inactive or exerting their minimum electrical effect. It follows from the method of connecting up coils above described that I obtain the maximum electro-motive force of all the active coils with only the quantity of one.

I do not confine myself to the exact method of connecting each coil in the armature so that they will be brought in the exact succession shown, as it is obvious that either of their ends can be reversed, so as to cause the current to flow in alternating directions and still pass through the brushes in series, there being, too, other methods of carrying out or applying this invention, for which I design making future application for patent.

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

1. The combination, in a dynamo or magneto electric machine, with the revolving armature and two or more coils wound thereon, of brushes adapted to connect the same in series, and plates forming the rings of a commutator, constructed or placed, as described, to form through any given ring a metallic connection between the brushes of the coil belonging thereto at times when the said coil is passing the neutral points, as described.

2. A commutator-ring composed of two segments to which the two ends of an armature-coil are connected, one or both of said segments being so formed as to extend more than one-half way around the said ring, substantially as and for the purpose set forth.

3. A commutator composed of a ring or a series of rings, each of which is divided into two segments, to which segments or pair of segments the opposite ends of armature-coils are connected, in combination with commutator-brushes, the relative arrangement of the said segments and brushes being such that both brushes belonging to each ring will be in contact with a single segment while the armature-coil belonging to such ring is passing the neutral points of its revolution, substantially as and for the purpose set forth.

4. In a dynamo-electric machine, two or more pairs of collecting brushes, in combination with commutator-rings, each composed of two insulated metallic segments connecting with separate coils on the armature, and one or both of the segments of each pair being formed to extend to more than one-half way around the circumference of the ring, substantially as and for the purpose set forth.

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