(No Model.)

# C. J. GREINER.

## COMMUTATOR.

No. 594,687. Patented Nov. 30, 1897.

Fig. 2.

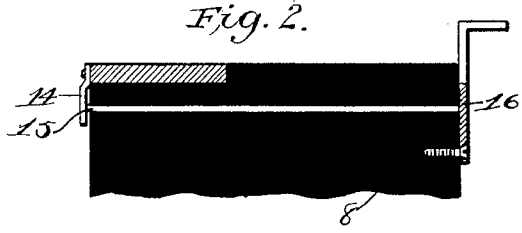


Fig. 1.

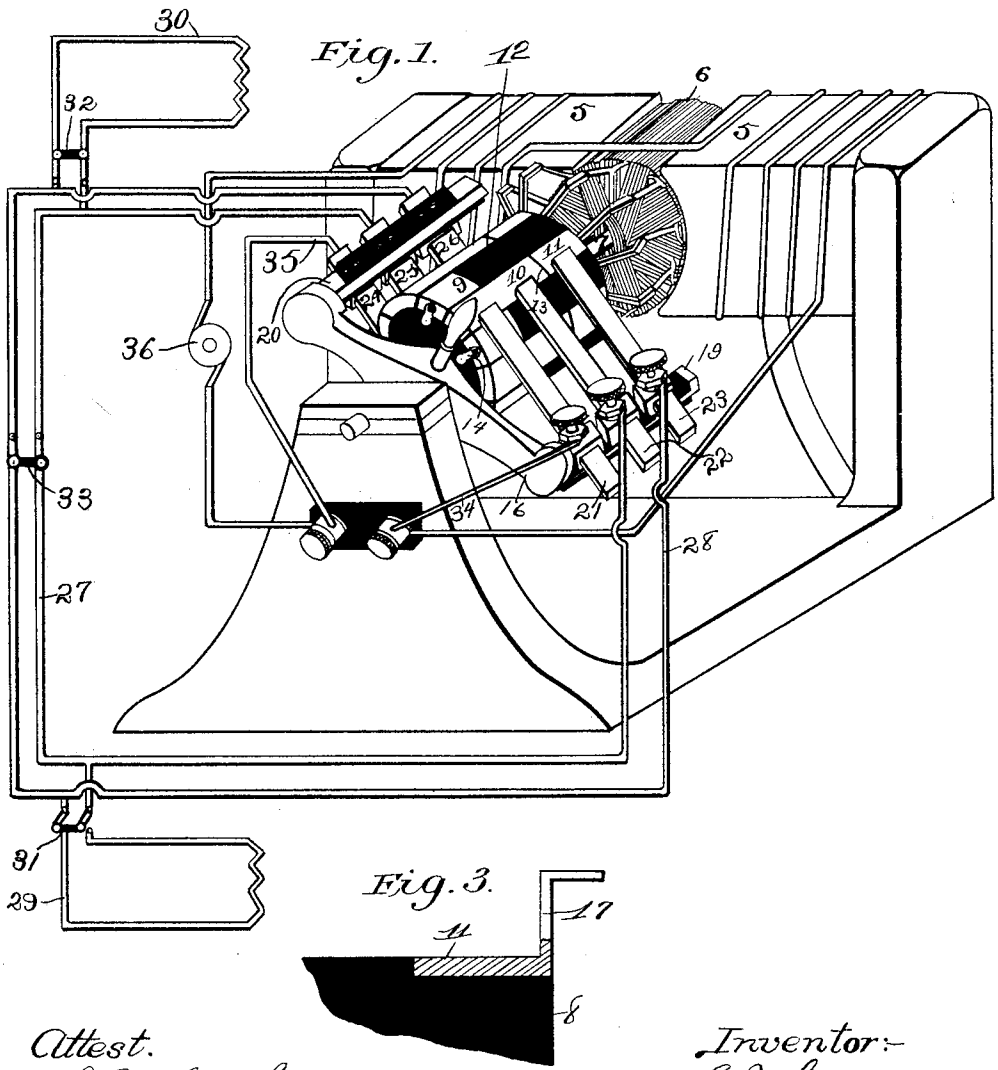


Fig. 3.




Attest.
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# UNITED STATES PATENT OFFICE.

CHARLES J. GREINER, OF ST. LOUIS, MISSOURI.

## COMMUTATOR.

SPECIFICATION forming part of Letters Patent No. 594,687, dated November 30, 1897.

Application filed August 31, 1897. Serial No. 650,208. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES J. GREINER, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Commutators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to commutators; and it consists of the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

My object is to construct a commutator which will either interrupt or alternate a direct current as the current is passed through the device.

Figure 1 is a view in perspective of my improved commutator, the electric circuits being shown in diagram and the armature and magnetic field being shown. Fig. 2 is a sectional view through the cylindrical portions of the commutator and showing the electrical connections, parts being broken away to economize space. Fig. 3 is a view analogous to Fig. 2 and taken at a different point.

Referring by numerals to the drawings, 5 represents the magnetic field, and 6 the armature, said armature being wound with coils of insulated conductor. The commutator is fixed upon the shaft 7, which supports the armature, and consists of the core 8, of insulating or non-conducting material, such as hard rubber, and a series of segments 9, 10, and 11, arranged upon and embedded in the periphery of said core. The segments 9 are substantially one-third as long as the core and are arranged at the outer end of the core, thus leaving the surfaces 12 of the core bare. The segments 10 are twice as long as the segments 9 and are arranged alternately with said segments 9 around the periphery of the core and extending from the outer end of the core toward the inner end. The segments 11 are substantially the same length as the segments 9, are one-half the length of the segments 10, and are arranged in longitudinal alinement with the segments 10 and between the bare spaces 12 of the core, said segments 10 and 11 being separated by the surfaces 13 of the core. The segments 9, 10, and 11 are all of the same dimensions and on a circumferential line. The number of the segments 9 and 11 is equal to the number of coils on the armature. An arm 14 is attached to the outer end of each of the segments 9 and extends a short distance inwardly along the under face of the core 8. A conductor 15 leads from the inner end of the arm 14, through the core 8, to the bar 16, which is attached to the face of the inner end of the core 8, and the coils of the armature 6 are electrically connected to said bar 16. A bar 17 is attached to the inner end of each of the segments 11, and the coils of the armature are electrically connected to said bar 17, said bars 16 and 17 being connected with alternate ones of the coils of the armature, as indicated in Fig. 1. The segments 10 are not connected directly to the armature.

The brush-holder consists of the lever 18, mounted upon the shaft 7, the arm 19 extending inwardly from one end of said lever and the arm 20 extending inwardly from the opposite end of said lever. The brushes 21, 22, and 23 are attached to the arm 19 and insulated from said arm, and the brushes 24, 25, and 26 are attached to the arm 20 and insulated from said arm. The upper ends of the brushes 21 and 24 are at the outer end of the commutator-cylinder and contact with the segments 9 and 10. The brushes 22 and 25 are centrally located relative to the commutator-cylinder and contact with the inner ends of the segments 10 and with the non-conducting faces 12. The brushes 23 and 26 are at the inner end of the cylinder and contact with the segments 11 and the non-conducting faces 12. The brushes are arranged relative to the commutator-cylinder in such a way that when the brushes 21 and 22 are in contact with the segments 10 and the brush 23 is in contact with the segments 11 the brush 24 will be in contact with the segment 9 and the brushes 25 and 26 will be in contact with one of the non-conducting surfaces 12. I prefer to arrange the segments of the commutator in such a way that the segment 10 and the segment 9 will be diametrically opposite each other relative to the shaft 7 and to arrange the brushes accordingly. The brushes 22 and 25 are electrically connected by means of the conductor 27 and the brushes 23 and 26 are electrically connected by means of the conductor 28. Two circuits 29 and 30 are connected to the conductors 27 and 28, said cir-

cuits being supplied with switches 31 and 32, respectively, and a switch 33 is placed in the conductors 27 and 28 between the circuits 29 and 30. The conductors 34 and 35 connect the brushes 21 and 24 with the generator 36 and field-coils, as in a direct-current motor. The field-magnet coils may be joined either in series or shunt, or both in series and shunt, with the armature-coils, as in a direct-current motor. I have shown a series of connections.

The operation is as follows: Let the switches 32 and 33 be closed and the switch 31 be open and the relative positions of the brushes relative to the commutator-cylinder be as shown in Fig. 1 and suppose that the current enters at the brush 21. It will then pass along the segments 10 to the brush 22, along the conductor 27, around the circuit 30, back along the conductor 28 to the brush 23 and to the segment 11, thence through the bar 17 and through the armature-coils to the bar 16, then along the conductor 15 and arm 14 to the segment 9, then to the brush 24, then through the conductor 35 to the generator 36, and thence through the field-coils and back to the brush 21, causing the armature to revolve and with it the commutator-cylinder. When the commutator-cylinder revolves, so that the segment 9 will be in contact with the brush 21, then the brushes 22 and 23 will be in contact with the non-conducting surfaces 12, and the opposite set of brushes will be in contact with the segments 10 and 11, and the current will pass through the brush 21, through the segment 9, thence through the arm 14 to the conductor 15, to the bar 16, thence through the armature-coils, through the bar 17, through the segment 11, through the brush 26, along the conductor 28, around the circuit 30, back along the conductor 27 to the brush 25, along the segment 10 to the brush 24, thence through the generator and back to the field-coils. The current passes through the armature-coils in the same direction as in a direct-current motor, while at the same time it is alternated in the circuit 29. The number of alternations per the revolutions of the armature will be equal to the number of the segments 9. Assuming that the switch 33 is open and the switches 31 and 32 are closed, then there will be two interrupted circuits 29 and 30, and the number of interruptions per revolution in each circuit will be equal to the number of segments 9 in the commutator.

The device may be used to generate the circuit to be interrupted or alternated by applying power to rotate the armature-shaft and connecting the brushes 21 and 24 with the field-coils, as in a direct-current dynamo, or the brushes 21 and 24 may be short-circuited and the fields separately excited.

I claim—

1. In a device of the class described, a commutator-cylinder; said commutator-cylinder having a periphery consisting of metal segments of equal dimensions circumferentially, one-third of said segments being twice as long as the others and said segments being arranged with a long segment and a short segment alternating and with a short segment in longitudinal alinement with each long segment, and with a non-conducting surface in longitudinal alinement with each of said alternate short segments and each of said metal segments insulated from the others, and with said longitudinally-alined short segments out of circumferential alinement with said alternate short segments; electrical connections between said short segments and the armature, brushes mounted to contact with said commutator-cylinder and electrical connections leading to said brushes, substantially as specified.

2. In a device of the class described, a commutator-cylinder having a periphery consisting of the segments 9, the segments 10 arranged alternately with the segments 9, the segments 11 arranged in longitudinal alinement with said segments 10, and the non-conducting surfaces 12 arranged in alinement with said segments 9, substantially as specified.

3. In a device of the class described, a pair of brushes connected to the magnetic field, a second pair of brushes connected together, a third pair of brushes connected together, a circuit connected to the connections between said brushes, and a commutator-cylinder engaging said brushes, the periphery of said cylinder consisting of metal segments of equal dimensions circumferentially, one-third of said segments being twice as long as the others and said segments being arranged with a long segment and a short segment alternating and with a short segment in longitudinal alinement with each long segment, and with a non-conducting surface in longitudinal alinement with each of said alternate short segments and each of said metal segments insulated from the others, and with said longitudinally-alined short segments out of circumferential alinement with said alternate short segments; electrical connections between said short segments and the armature, brushes mounted to contact with said commutator-cylinder and electrical connections leading to said brushes, substantially as specified.

4. In a device of the class described, a pair of brushes connected to the magnetic field, a second pair of brushes and a third pair of brushes mounted beside the first pair of brushes, electrical connections between corresponding ones of the second and third pairs of brushes, electrical connections between the other ones of said second and third pairs of brushes, a commutator-cylinder in position to be engaged by all of said brushes, the periphery of said commutator-cylinder consisting of a series of metal segments in permanent electrical connection with the coils of the armature, a non-conducting substance in longitudinal alinement with each of said metal segments, a second series of metal segments

of double the length of the first-mentioned series arranged alternately with the first-mentioned series and having no direct connection with the armature, a third series of metal segments arranged in longitudinal alinement with the second series of segments and insulated therefrom and in permanent electrical connection with the armature, substantially as specified.

5. In a device of the class described, a commutator-cylinder having a periphery consisting of the segments 9, the segments 10 arranged alternately with the segments 9, the segments 11 arranged in longitudinal alinement with the segments 10 and the non-conducting surfaces 12 arranged in alinement with said segments 9, the brushes 21, 22, 23, 24, 25 and 26 mounted in positions to engage said commutator-cylinder, the conductor 27 connecting the brushes 22 and 25, the conductor 28 connecting the brushes 23 and 26, the circuit 29, the circuit 30, the switch 31 connecting the conductors 27 and 28 to the circuit 29, the switch 32 connecting the conductors 27 and 28 to the circuit 30, the switch 33 connecting the conductors 27 and 28 as required to disconnect the circuits 29 and 30, a generator connected to the brush 24, an armature permanently connected to the segments 9 and 11, a magnetic field around said armature, a conductor leading from the generator to said magnetic field and a conductor leading from said magnetic field to the brush 21, substantially as specified.

6. In a device of the class described, the commutator-cylinder having the metallic segments 9, 10 and 11 arranged upon its periphery, three pairs of brushes arranged to contact with said segments, conductors forming permanent electrical connections between the segments 9 and 11 and the armature, the conductor 27 connecting one pair of said brushes, the conductor 28 connecting a second pair of said brushes, the circuit 29, the circuit 30, the switch 31 connecting the circuit 29 to the conductors 27 and 28, the switch 32 connecting the circuit 30 to the conductors 27 and 28, the switch 33 connecting the conductors 27 and 28 as required to disconnect the circuits 29 and 30, a magnetic field connected to the third pair of said brushes, and to a generator, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES J. GREINER.

Witnesses:

EDWARD E. LONGAN,

ALBERT J. MCCAULEY.