(No Model.)

C. J. VAN DEPOELE.

ALTERNATE CURRENT PULSATING SYSTEM.

No. 422,857. Patented Mar. 4, 1890.

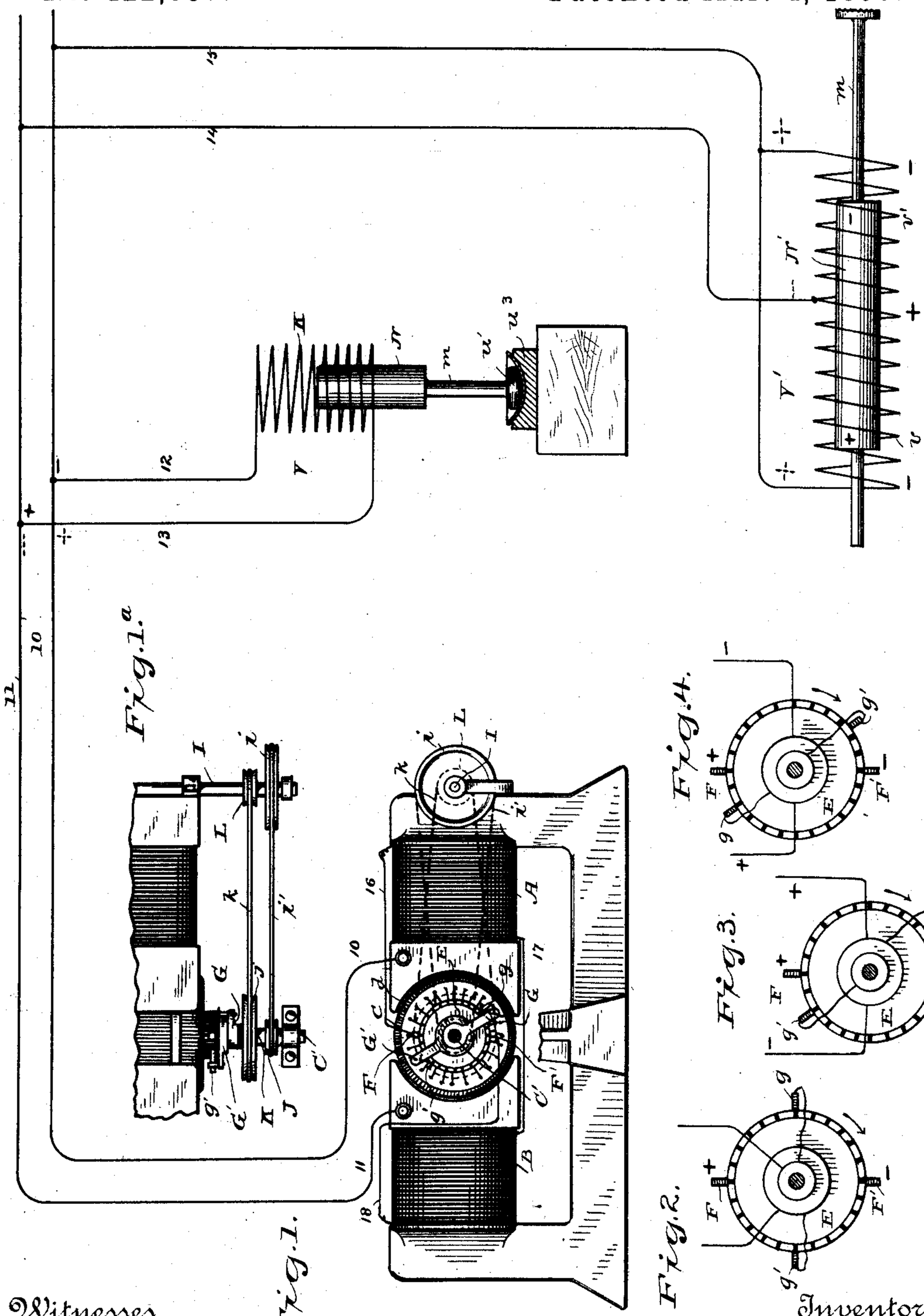

Fig. 1.

Fig. 1.a

Fig. 1.b

Fig. 2.

Fig. 3.

Fig. 4.

Witnesses
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ALTERNATE-CURRENT PULSATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 422,857, dated March 4, 1890.

Original application filed March 23, 1889, Serial No. 304,544. Divided and this application filed October 4, 1889. Serial No. 326,022. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Alternate-Current Pulsating Systems, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

This application is a division of my application filed March 23, 1889, Serial No. 304,544.

My invention relates to improvements in electric generators, more especially with reference to the production of currents having a defined rise and fall—that is to say, pulsating or intermittent currents—for example, such as are referred to in Patents Nos. 400,809 and 401,231, dated, respectively, April 2 and April 9, 1889, and particularly adapted for operating reciprocating electric engines.

As set forth in my said prior applications, my improved electro-magnetic reciprocating engines are operated synchronously with the generator or source of defined currents, each current energizing a coil in the engine for the purpose of imparting movement to the working parts.

Since the rapidity of alternation in what are known as "alternate currents" in electric-lighting machines is altogether too great and beyond the speed at which the piston of a direct-acting engine of any size is required to be moved, and since it is impracticable to operate known forms of alternate-current electric-light generators at a speed low enough to accomplish my purpose, I have provided special means whereby I am enabled to convert a continuous current into undulating or pulsating currents having any desired rate of succession or phase and without any regard to the speed of the generator.

The object of the present invention is to provide currents of alternating polarity the rapidity of which shall be entirely under control and which will possess the pulsating or steadily rising and falling quality referred to in my said prior application. This object is attained by the combination, with the commutator of an ordinary continuous-current generator, of a pair of contacts or brushes arranged to be moved continuously about the commutator-cylinder toward and away from the points of highest potential usually presented by stationary positive and negative commutator-brushes. The conductors of the working-circuit are connected to the moving brushes only, and, since said moving brushes approach and recede from the diameter of commutation, herein indicated by the main positive and negative brushes, alternately, it will be understood that the currents flowing out through said moving brushes will be of alternating polarity, as the said brushes alternately approach and recede from the main points of opposite polarity upon the commutator.

In the drawings two sets of commutator-brushes are seen, one the usual stationary positive and negative brushes, the other a moving pair.

The present invention deals principally with the moving brushes, as will appear; but the others are also shown, since by their use the machine, motor, or generator provided with the moving brushes can be operated as an automatic or self-exciting apparatus.

An arrangement and organization of parts embodying the invention will be also seen in the accompanying drawings, and will be hereinafter described, and referred to in the appended claims.

In the drawings, Figure 1 is a view showing a generator with rotating brushes and working-circuits and apparatus in diagram, said generator being arranged to supply pulsating currents of alternating polarity. Fig. 1ª is an enlarged detail showing mechanism for rotating the moving brushes. Figs. 2, 3, and 4 are detail views showing the commutator and brushes of the generator in Fig. 1 with the moving brushes in different positions.

In the drawings, V indicates a single-coil reciprocating engine similar to those shown (K and L) in connection with Fig. 1 of my aforesaid application, the motor-coil K being connected to the working-circuit 10 11 by conductors 12 13. The engine V is provided with a piston N of magnetic material, as iron, and is provided with a piston-rod *m*, which may carry a hammer *u'* at its extremity. When a current-wave of one polarity flows

through the coil K, the piston N will be attracted and raised thereby. On the fall of this phase, and before the succeeding phase has acquired any strength, the piston will be released. The succeeding phase, which will be of opposite polarity, will in turn attract and raise the plunger or piston, which, as before, will fall and perform work during the interval between the succeeding phases. As here indicated, the hammer will perform work by striking upon whatever is placed between the hammer w' and anvil w^3. The effective blow of the hammer w' can of course be increased by the addition of a spring; but, as indicated, the blow is effected by the weight of the piston N.

V′ indicates a double-acting electro-magnetic engine adapted to be operated by alternating currents. The engine V′ is provided with two motor-coils v v', connected in multiple arc by conductors 14 15, extending to the line-conductors 10 11, and the passage therethrough of currents of alternating polarity will produce, for example, positive poles at each end of said coils and a negative pole in the center, the succeeding phase reversing the polarities, as indicated by the signs in full and dotted lines. The engine V′ is provided with a polarized or permanently-magnetized steel piston N′. Since the magnetism of the piston does not change and the shifting of the polarity in the coils v v' will be changed with each succeeding phase of the currents of alternating polarity flowing therethrough, the said piston will be reciprocated in synchronism therewith.

The generator (seen in Fig. 1) may be an ordinary continuous-current generator of any type, and said generator is provided with a pair of stationary commutator-brushes F F′, which should be set upon the diameter of commutation, and which, according to the present invention, are connected to the coils A B of the field-magnets by conductors 16 17 18, so that a part of the output of the said generator passes through the stationary commutator-brushes and the field-magnet coils, rendering the machine self-exciting.

The armature C might be operated as a motor if a continuous current were supplied to the main commutator-brushes F F′, or said armature can be operated as a generator and be driven by steam or other power applied to the armature-shaft C.′ A pair of moving commutator-brushes g g' are carried by brush-holders G G′.

Various means for rotating the moving brushes g g' around the commutator-cylinder might be employed, separate adjustable means being set forth in the application of which this is a division. In the present instance, however, I have shown means actuated by the armature-shaft.

As indicated, a counter-shaft I is rotatably mounted upon some convenient portion of the frame of the generator. Upon the counter-shaft is placed a driving-pulley i, which is rotated by a belt i', or the like passing over a pulley J, secured to the armature-shaft C′.

The commutator-brush holders G G′ are secured to a sleeve K, placed upon the armature-shaft G′. The sleeve K and commutator-brush holders are rotated by a pulley j, to which motion is imparted by a belt k, driven by a pulley L upon the counter-shaft I. With this arrangement the speed of rotation of the moving brushes about the commutator will depend upon and vary with that of the armature C; but obviously very little variation need occur, and therefore the speed of the rotating brushes may be considered practically constant. Whenever it is desired to vary the rate of movement of the traveling brushes g g', a larger or smaller driving-pulley can be substituted for the pulley i on the counter-shaft.

The precise details of the commutator-brush-rotating mechanism may be varied in many ways known to the skilled mechanic, and it will be quite evident that cog-gearing might be substituted for the belts and pulleys seen in the drawings, since the invention is not limited to the precise details shown by way of necessary illustration.

In Fig. 2 the moving brushes g g' are at zero, being in positions equidistant from the stationary brushes F F′. In these positions the circuits will be balanced and no currents will pass to the working-conductors. Current will, however, flow uninterruptedly through the circuits of the generator proper, the field-magnet coils thereof being shown as connected by conductors 16 17 with the stationary continuous-current brushes F F′. As the brush g approaches the brush F and the brush g' the brush F′ a constantly-increasing current will flow through said brushes to the working-conductors, the maximum currents passing when said rotating brushes are nearest to the stationary brushes toward which they are moving and diminishing as the moving brushes travel away from the stationary brushes until the zero-point is reached, when the brushes g g' will be upon the opposite sides of the commutator in positions the reverse of those indicated in Fig. 2.

In Fig. 3 the brushes are seen as having moved from the zero-point about half-way toward the stationary brushes, when currents, as indicated by the signs, flow through the main or working conductors.

In Fig. 4 the relative positions are the same as those seen in Fig. 3, the lettering indicating that the brushes g g' have passed the zero-point and are now approaching the opposite set of stationary brushes from those indicated in Fig. 3, under which conditions currents of opposite sign are flowing in the main or working conductors, as indicated. With this arrangement, therefore, there will be two reversals of the current during each complete rotation of the collecting-brushes, and I not only claim the means herein described for producing such result, but also any equivalent therefor.

The invention is not limited to the details shown and described, and may be modified and varied in many ways without departing therefrom.

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

1. The combination, with an electric machine of the continuous-current type, of working-conductors and means for changing the continuous current into pulsatory or defined currents of alternating polarity and supplying the same direct to the said working-conductors, said means comprising commutator-brushes arranged to be constantly moved around the commutator toward and away from the points of maximum and zero electro-motive force, and connections between said distributing-brushes and the working-conductors, whereby said conductors are supplied wholly from said brushes.

2. The combination of an electric machine of the continuous-current type provided with a set of distributing commutator-brushes upon the commutator thereof, means for constantly moving the distributing-brushes around said commutator, and working-circuits connected to said moving brushes only and supplied therethrough with currents of alternating polarity.

3. The combination, with a sectional commutator and a source of electric currents, of a set of brushes constantly moved about said commutator toward and away from the points of maximum and zero electro-motive force, and suitable working-circuits wholly supplied from said moving brushes, and direct-acting driving-connections between the axis of the commutator and the moving brushes.

4. The combination of an electric generator of the continuous-current type, a set of stationary brushes therefor, and connections between the stationary brushes and the field-magnet coils for exciting the same, a set of brushes arranged to be constantly moved about the commutator, and working-conductors connected to said moving brushes and supplied thereby with currents of alternating polarity.

5. The combination of an electric machine of the continuous-current type provided with distributing commutator-brushes arranged to move about the commutator thereof, working-conductors connected to said moving brushes and supplied with currents of alternating polarity, and driving-connections between the moving commutator-brushes and the moving part of the electric machine, whereby the said brushes may be moved at a rate of speed relative to that of the commutator for determining the rate of phase in the working-conductors.

6. The combination of an armature rotating in a field of force and a sectional commutator therefor, and a set or sets of brushes arranged to be constantly moved about said commutator to and from the points of maximum and zero potential, and driving-gear connected to and actuated by the armature-shaft for continuously moving the said movable brushes about the commutator.

7. The combination of an armature rotating in a field of force and having a sectional commutator, a set or sets of brushes arranged to be movable about said commutator to and from the points of maximum and zero potential, a wheel or gearing moving concentrically with but independent of the commutator and arranged to carry the moving brush or brushes, a counter-shaft, and mechanical connections extending from the commutator-shaft to the said counter-shaft and from the counter-shaft to the support of the moving brush or brushes.

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

CHARLES J. VAN DEPOELE.

Witnesses:

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