(No Model.) 2 Sheets—Sheet 1.

C. J. VAN DEPOELE.

SYSTEM OF SUPPLYING CURRENTS TO RECIPROCATING ELECTRIC ENGINES.

No. 458,870. Patented Sept. 1, 1891.

Fig. 1.

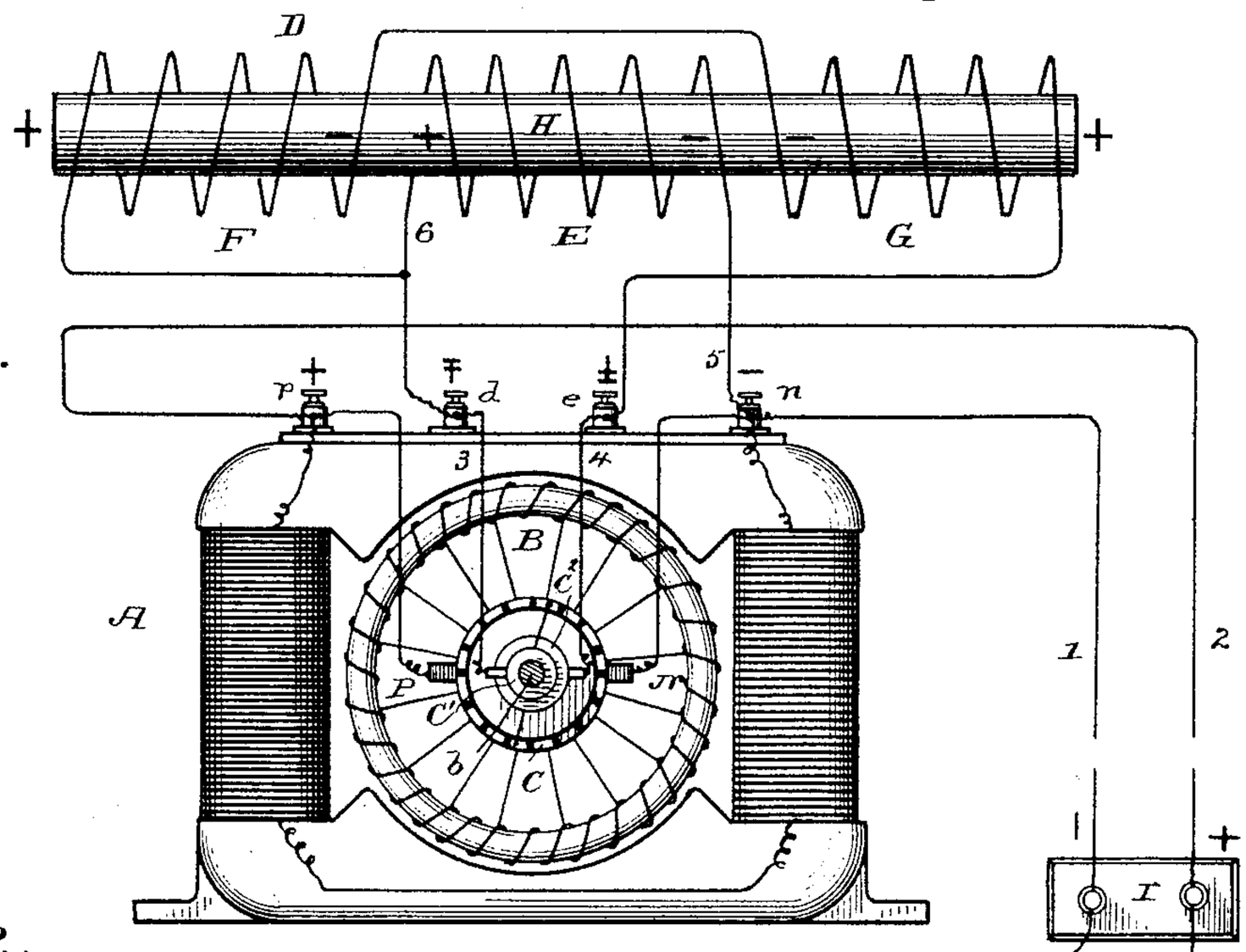
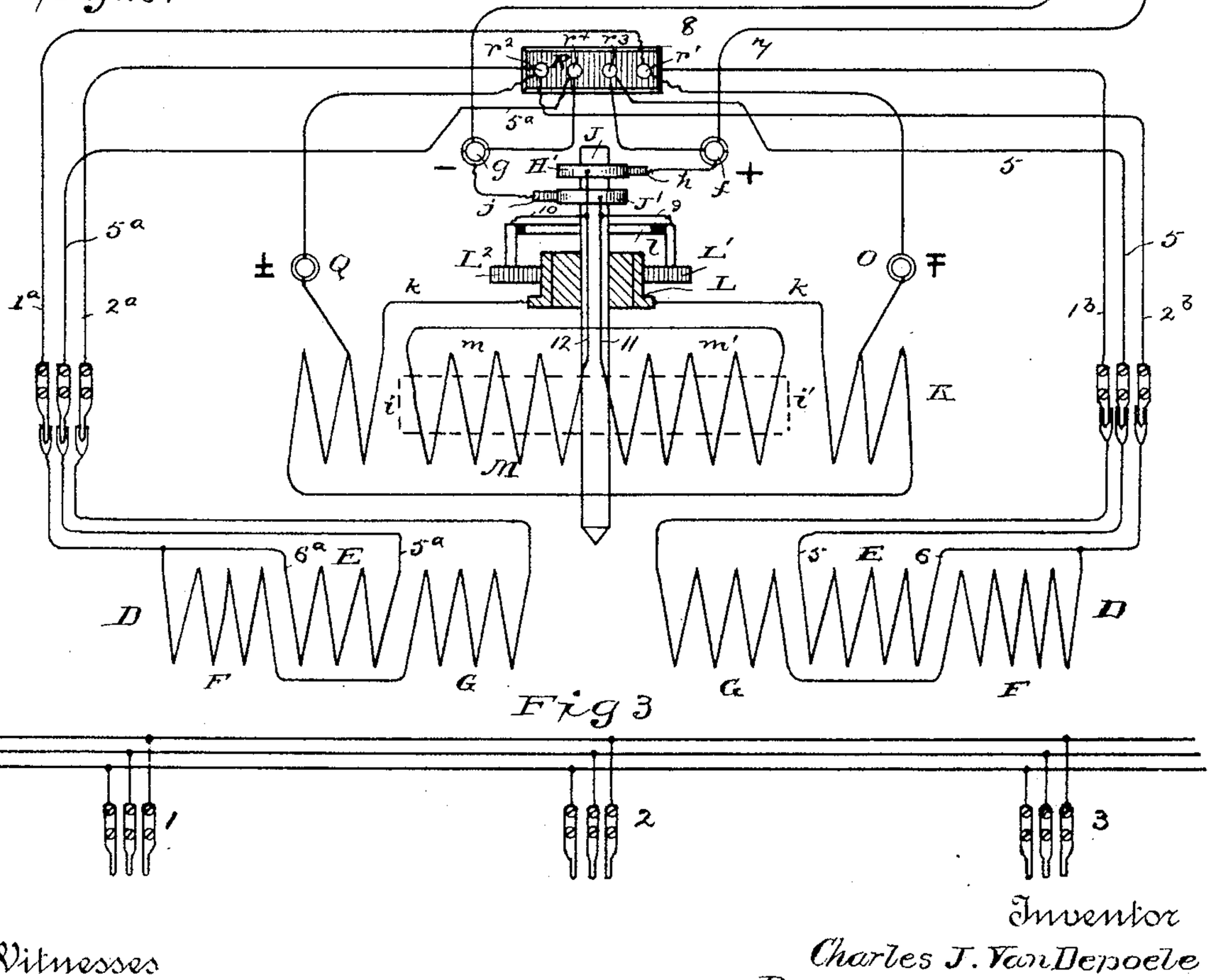


Fig. 2.



Witnesses
H. A. Lauls
Stephen Jamus

Inventor
Charles J. VanDepoele
By Frankland James
Attorney

(No Model.) 2 Sheets—Sheet 2.

C. J. VAN DEPOELE.

SYSTEM OF SUPPLYING CURRENTS TO RECIPROCATING ELECTRIC ENGINES.

No. 458,870. Patented Sept. 1, 1891.

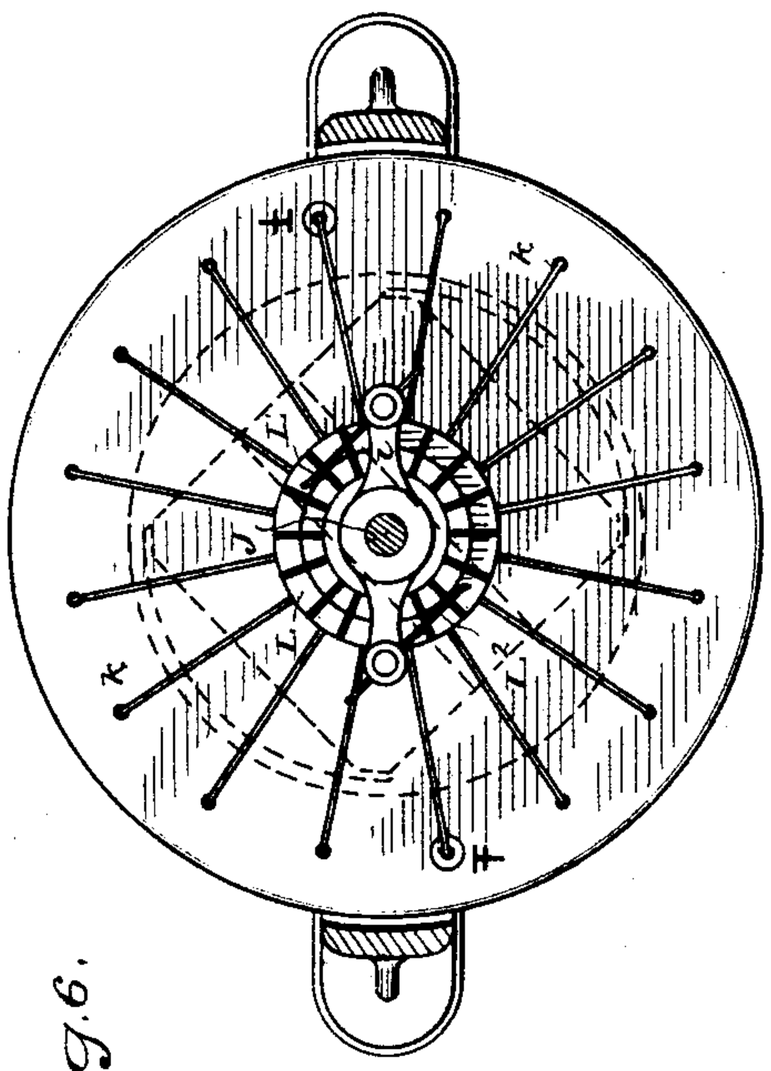


Fig. 6.

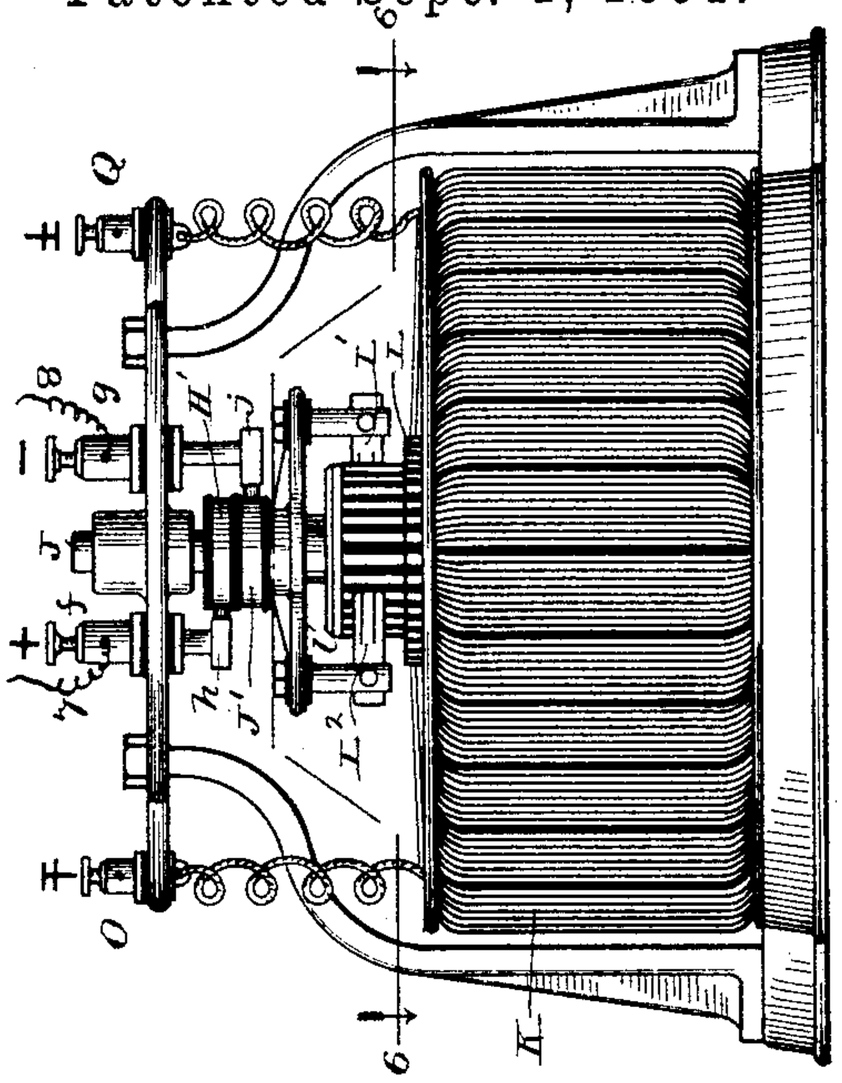


Fig. 4.

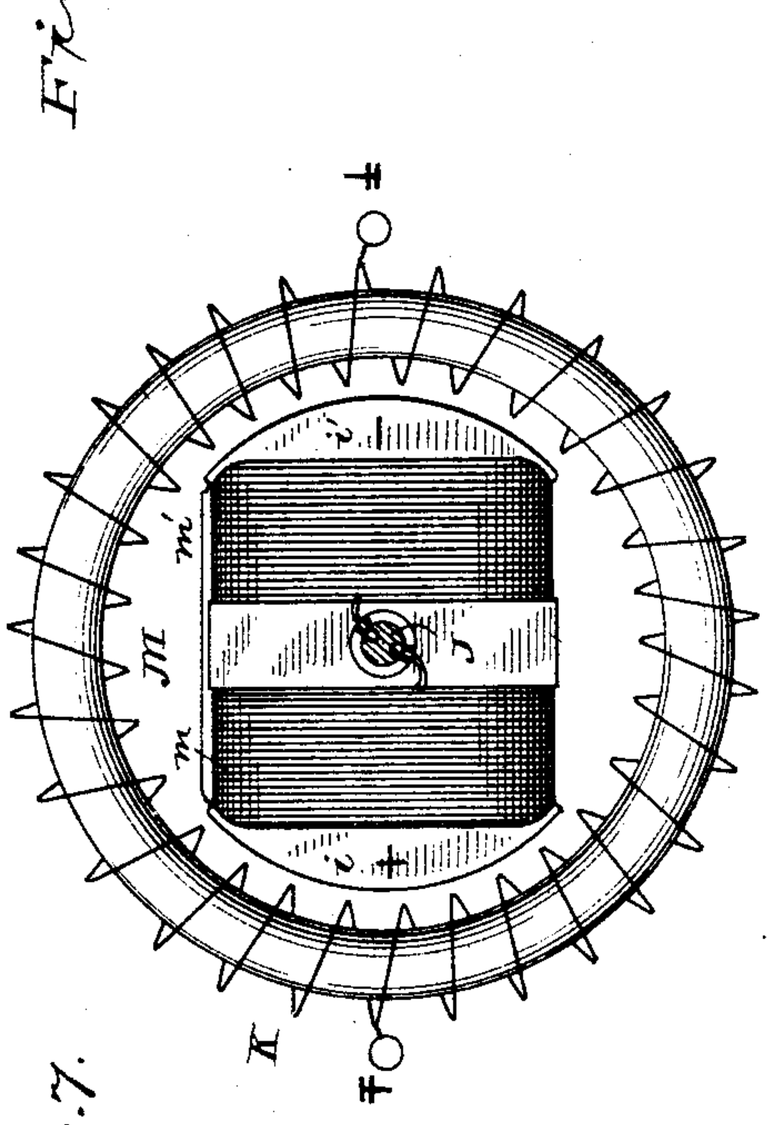


Fig. 7.

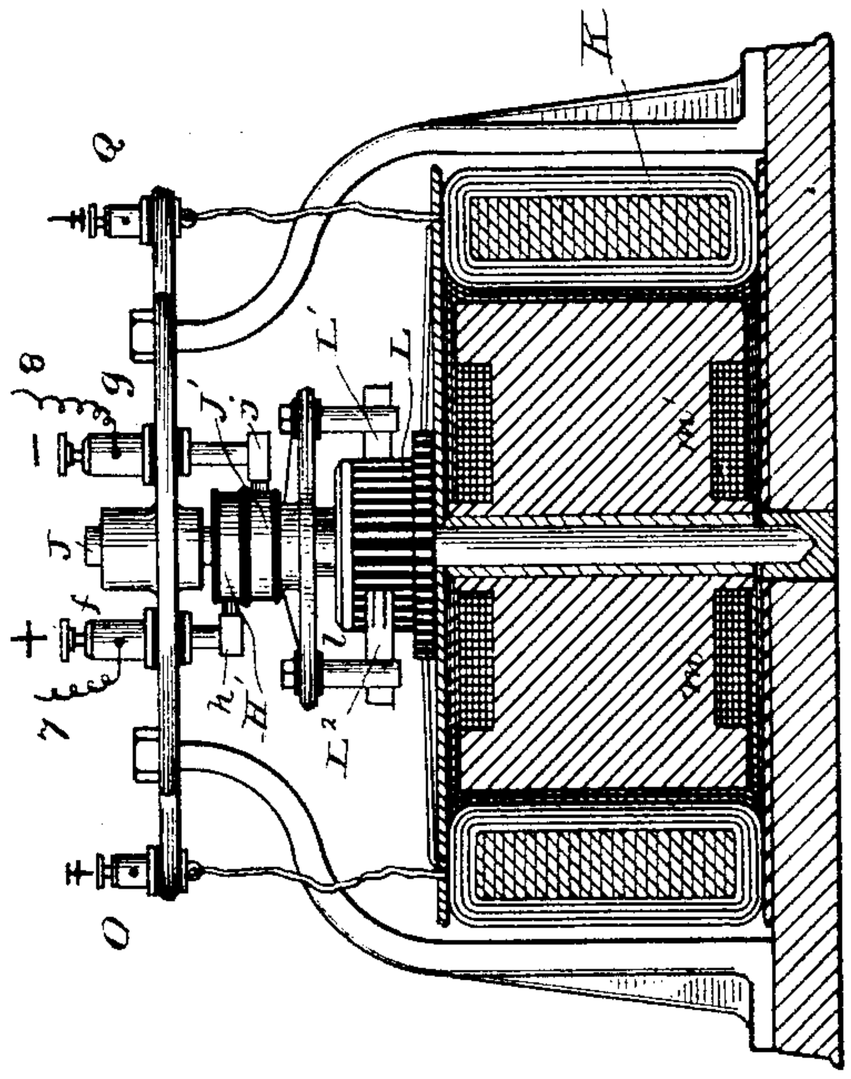


Fig. 5.

Witnesses
H. A. Lamb
Stephen Jamieson

Inventor
Charles J. VanDepoele
By Fairbank Jamieson
Attorney

UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

SYSTEM OF SUPPLYING CURRENT TO RECIPROCATING ELECTRIC ENGINES.

SPECIFICATION forming part of Letters Patent No. 458,870, dated September 1, 1891.

Application filed February 26, 1891. Serial No. 382,877. (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 Systems of Supplying Currents to Reciprocating Electric Engines, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

My invention relates to a system of supplying current to reciprocating electric engines, and more particularly to electric engines of the type operated by two forms of current—as, for instance, by a combination of alternating current and continuous currents—and according to the present system the various types of currents are secured from an ordinary supply-circuit by the intervention of a current-modifying device at or near the point of consumption. In the practical employment of reciprocating electric engines for mining or analogous purposes it will often happen that the work must be, or may desirably be, carried on at numerous distant points. Frequently groups of engines will be operated at a distance from one another. According to the present invention a central generating-station is established in the most desirable locality, and continuous current of the desired voltage is supplied and conveyed over the most economical form of two-wire circuit from point to point. The main supply-circuit may therefore be required to extend over many miles of territory, and obviously may supply current for lighting as well as power purposes of all description. In my prior application, Serial No. 376,610, filed January 3, 1891, is described a reciprocating electric engine operated by a combination of both alternating currents and pulsating currents of constant direction, and in the present application a system is set forth whereby reciprocating engines of the type above referred to are supplied with proper current by the main circuit, whether singly or in groups and whether near to or remote from the central station.

In the accompanying drawings, Figure 1 is a view in elevation, partly in diagram, showing the source of supply and main circuit and a reciprocating engine connected therewith. Fig. 2 is a diagrammatic view showing a current-modifying device or converter in circuit with the supply-conductors and a group of reciprocating engines supplied from the converter. Fig. 3 shows a part of a converter-circuit. Fig. 4 is a view in elevation showing one of the converters. Fig. 5 is a view in elevation of the converter shown in Fig. 4, the armature and field-magnet being in vertical section. Fig. 6 is a top plan view on the line 6 6 of Fig. 4. Fig. 7 is a diagrammatic view showing the armature and field-magnet of the converter.

In Fig. 1 of the drawings, A is a dynamo-electric generator of the continuous-current type and of any desired capacity, it representing the central distributing-point or source of current. The generator-armature B is provided with the usual sectional commutator C and main stationary positive and negative commutator-brushes P N. The said commutator-brushes are connected to binding-posts *p n*, from which the main circuit extends, as will appear. As indicated, however, the generator A may be provided with special devices whereby it can supply current to a main outside circuit composed of conductors 1 2, but also operate a reciprocating engine D, and this without disturbing its functions as a generator.

For the purpose of supplying currents of different quality to an engine, the armature-shaft *b* is provided with two insulated contact-rings C′ C², each of which is connected to a diametrically-opposite section of the commutator C. Conductors 3 4 extend from contact-brushes bearing upon the rings C′ C² to binding-posts *d e*, which, being thus connected with the rings C′ C², receive uncommutated currents, first from one side and then from the other of the armature B, which therefore will have a distinct rising and falling quality, as well as being alternating in direction.

The engine D comprises a central coil E and end coils F G, an iron plunger H being arranged to be reciprocated within the combined coils. The coils F G are connected in series with each other between the binding-posts *d e*, the windings of said coils, however, being in opposite directions, or equivalent connections are made. In the operation of

the generator A so equipped rising and falling currents of alternating polarity will be sent through said coils in synchronism with the speed of rotation of the said armature. One terminal of the central coil E is connected to one of the main binding-posts, as by conductor 5, to post *n*, its other terminal 6 being connected to the alternate current-circuit of the coils F G. With this arrangement current will pass through the central coil intermittently—that is, during every alternate phase—and the current passing therethrough will consequently always be of the same polarity. This will act to create a rising and falling magnetization in the plunger H; but on account of the mass thereof and the rapidity of the succession of the magnetizing-impulses it will always retain sufficient magnetism, due to the effect of the central or continuous-current coil to respond promptly to the changes in the field of force of the alternating-current coils. The details of the engine D may of course be varied, as, for instance, as set forth in my patent, No. 431,495, dated July 1, 1890, and in my pending application, Serial No. 365,546, filed September 19, 1890, and Serial No. 376,610, filed January 3, 1891. The main supply-circuit 1 2 extends from the generator A, and at points where it is desired to convert any portion of the current for use with reciprocating engines connections are taken off, as by conductors 7 8, which for convenience are led from the switch-board I, to which the main conductors are connected. The conductors 7 8 extend to the positive and negative binding-posts *f g*. The binding-post *f* is connected to a contact-brush *h* upon a contact-ring H′, carried upon a spindle J. A second ring J′ is carried upon the same spindle and connected by brush *j* and suitable conductor with the negative binding-post *g*. A stationary wire-wound armature K, of the Gramme or Pacinotti type, is indicated in the diagram, Fig. 2, and seen in full and in section in Figs. 4 and 5. The several coils or sections of the armature K are connected each by a separate conductor *k* with a segment of a commutator L, which is supported upon and remains stationary with said armature, the spindle J passing through said commutator without connection therewith. A pair of commutator-brushes L′ L^2 is carried in a suitable yoke *l*, from which they are of course thoroughly insulated, and said yoke is secured to and rotated by the spindle J. The lower part of the spindle J is carried in a suitable bearing arranged within the armature K, and at its lower portion carries a field-magnet M. The field-magnet M comprises an iron core substantially I-shaped having rounded extremities or pole-pieces and a central portion of iron. This magnet is wound with energizing-coils *m m′*, which, when supplied with current, maintain north and south poles, respectively, at their extremities, which form the polar extensions *i i′*. The main current passes from binding-posts *f g* through rings H′ J′, thence by conductors 9 10 to the commutator-brushes L′ L^2, through the sections of the commutator L, and by the conductors *k* from there to the coils of the stationary armature K. Other conductors 11 12 extend also from the rings H′ J′ to the coils *m m′* of the field-magnet M, thereby placing same in derivation between the main binding-posts and supplying it, as well as the armature, with continuous current. The commutator-brushes upon the commutator L being arranged at or about at right angles to the poles of the field-magnet, it will revolve within the armature K, it being understood that the field-magnet M and commutator-brushes L′ L^2 and the rings H′ J′ all move together with the spindle J, thereby preserving the desired relationships. As the field-magnet rotates part of the main current will be sent through the commutator-brushes L′ L^2 to the coils of the armature, and in their continued rotation the said current will, although of constant direction, be first positive and then negative with respect to opposite fixed points O Q, from which alternating currents are taken, the rate of alternation depending, of course, upon the rate of rotation of the field-magnet M and connected parts.

For convenience of distribution the conductors from the various parts of the converter are brought to a switch-board R, from which the conductors extend to the machines to be operated, two of the engines D being indicated in Fig. 2. The alternate-current binding-posts O Q are connected to posts r' r^2, which by conductors 1^a 2^a and 1^b 2^b include the end coils F G of the engine D. The central motor-coils E E are supplied through conductors 5 6 and 5^a 6^a, extending from binding-post r^3 r^4, the action of the apparatus being as already described—viz., that of supplying alternating currents to part of the coils for actuating the piston and a continuous current of intermittent character to the other coil for imparting to and maintaining in the plunger always the same polarity, which causes it to be reacted upon with great effect by the alternating polarities of the motor-coils.

The generator A is here shown as specially equipped to give currents to one form of my electric reciprocating engine. This, however, is merely for convenience, it being understood that the generator could be far removed from the reciprocating engine and give currents of the ordinary character over a two-wire circuit. Furthermore, the converters can be readily arranged to modify the potential of the supply-current by employing two circuits instead of one, using one as a primary and the other as a secondary, and it will also be apparent that two or more separate currents may be taken from the armature K by placing additional connections at equidistant points.

Various modifications will suggest them-

selves in the hereinbefore-described system, and various changes may be made in the details and apparatus without departing from the invention.

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

1. A system of supplying currents to reciprocating electric engines, comprising an electric engine having sets of coils energized by currents of different character, a source of continuous current and circuit connections therefrom to the engine, and means in the vicinity of the engine for dividing said continuous current into alternating currents and intermittent or pulsating currents of continuous direction and supplying the same to the different sets of coils in the engine.

2. A system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, comprising a distant source of continuous current and circuit connections therefrom to part of the coils of the engine and means for pulsating the current so supplied, and a converter receiving part of the continuous current and supplying currents of alternating polarity to the remaining coils of the engine.

3. A system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, comprising a continuous-current supply-circuit connected with part of the engine and means for imparting a pulsating character to said currents, and a converter receiving part of the main current and supplying current of alternating polarity to the remaining coils of the engine simultaneously.

4. A system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, comprising the combination of a continuous-current supply-circuit connected with part of the engine and means for pulsating the currents so supplied, and a rotary converter connected with the main supply-circuit and supplying currents of alternating polarity to the remaining coils of the said engine.

5. A system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, comprising a distant source of continuous current and circuit connections therefrom to part of the coils of the engine, a converter receiving part of the continuous current and to supply currents of alternating polarity to the remaining coils of the engine, and connections between the continuous and alternating current coils, whereby a pulsating character is imparted to the said currents of continuous direction.

6. A system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, comprising a distant source of continuous current, connections therefrom to part of the coils of the engine, a rotary converter located near the engine and receiving and operated by a continuous current to supply currents of alternating polarity to the remaining coils of the engine, and connections between the other coils and terminals of the converter, whereby a pulsating character is imparted to the current of continuous direction supplied thereto.

7. A system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, comprising a distant source of continuous current and connections therefrom to a converter in the vicinity of the engine or engines to be operated, said converter transforming the continuous currents into alternating currents to be supplied to part of the engine-coils, and connections between the remaining coils and suitable terminals of the converter, whereby a rising and falling quality is imparted to the current supplied to the said remaining coils.

8. The combination, with a continuous-current supply-circuit, of a reciprocating engine or engines operated by alternating currents and pulsating currents of constant direction, a converter in the vicinity of the engine or engines and connections between said converter and the main supply-circuit, means actuated by the converter for transforming part of the current into currents of alternating polarity and supplying the same to part of the motor-coil, and connections between the alternating-current circuit and continuous-current circuit, whereby the continuous current supplied thereto is caused to pulsate.

9. In a system of supplying alternating currents and pulsating currents of continuous direction to a reciprocating engine, a continuous-current supply-circuit, a rotary converter located near the engine and comprising a set of coils and means for passing part of the main current through said coils and transforming the same into currents of alternating polarity, connections between the converter and the alternating-current coils of the engine, and connections between the continuous current and the remaining coil of the engine and the alternating circuit.

10. In a system of reciprocating electric engines, a source of continuous current, means for converting the continuous current into two independent sets of currents, one of alternating polarity and the other of rising and falling constant polarity, and connections from the source of currents to the motor-coils of the engine.

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

CHARLES J. VAN DEPOELE.

Witnesses:
JOHN W. GIBBONEY,
FRANKLAND JANNUS.