(No Model.) 3 Sheets—Sheet 1.

# C. J. VAN DEPOELE.

## SYSTEM OF ELECTRICAL DISTRIBUTION.

No. 450,541. Patented Apr. 14, 1891.

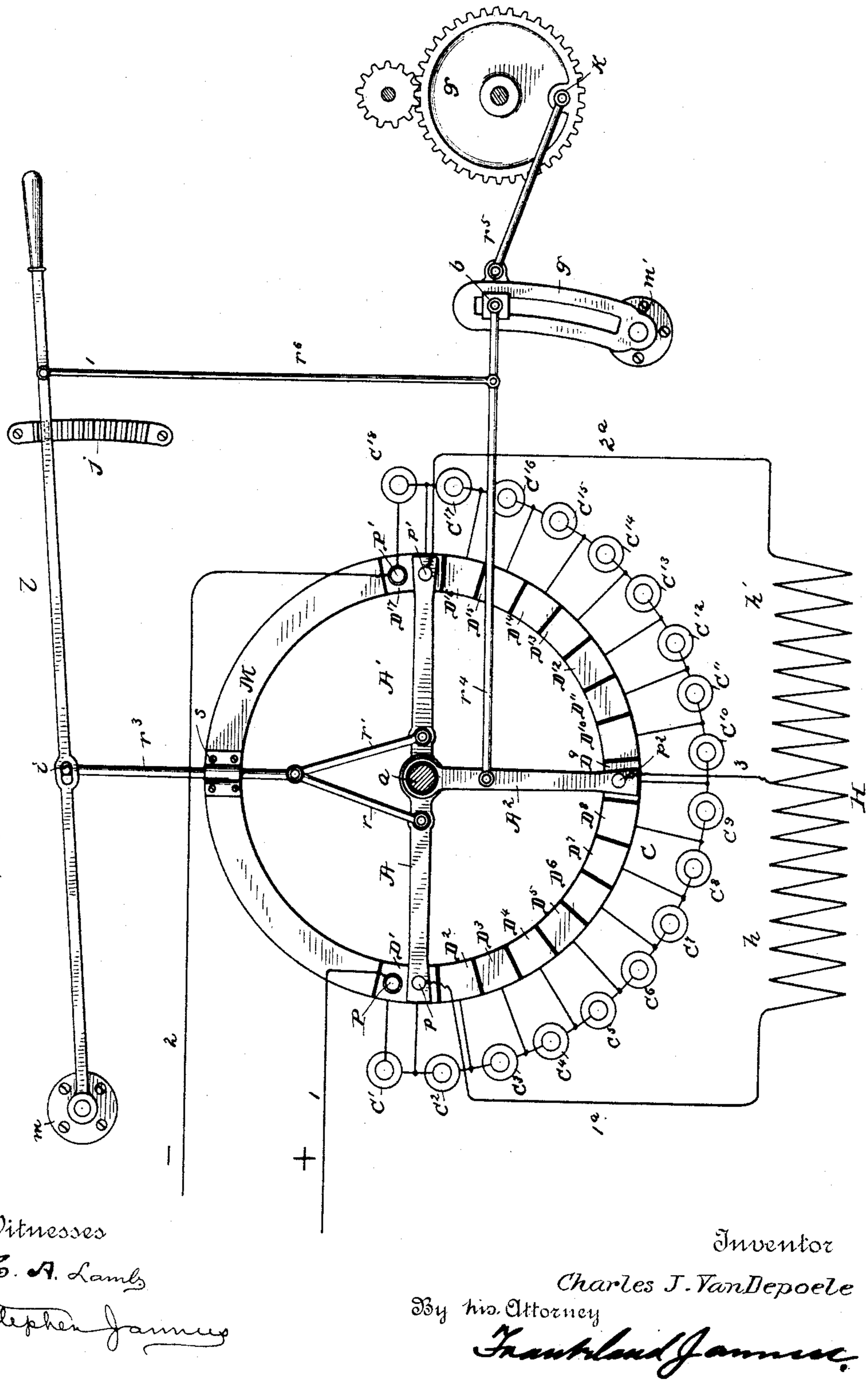

Fig. 1.

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(No Model.)

3 Sheets—Sheet 2.

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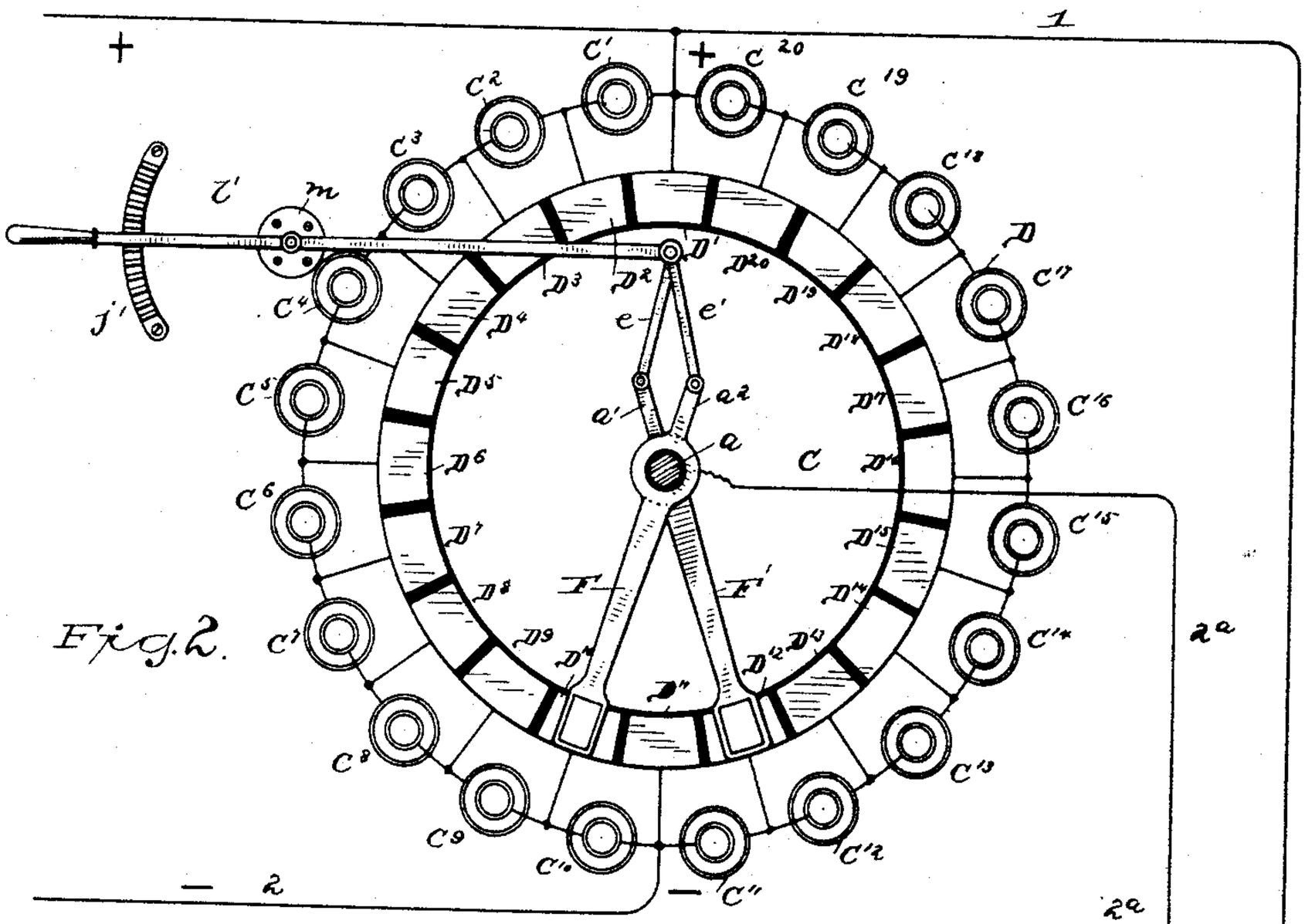
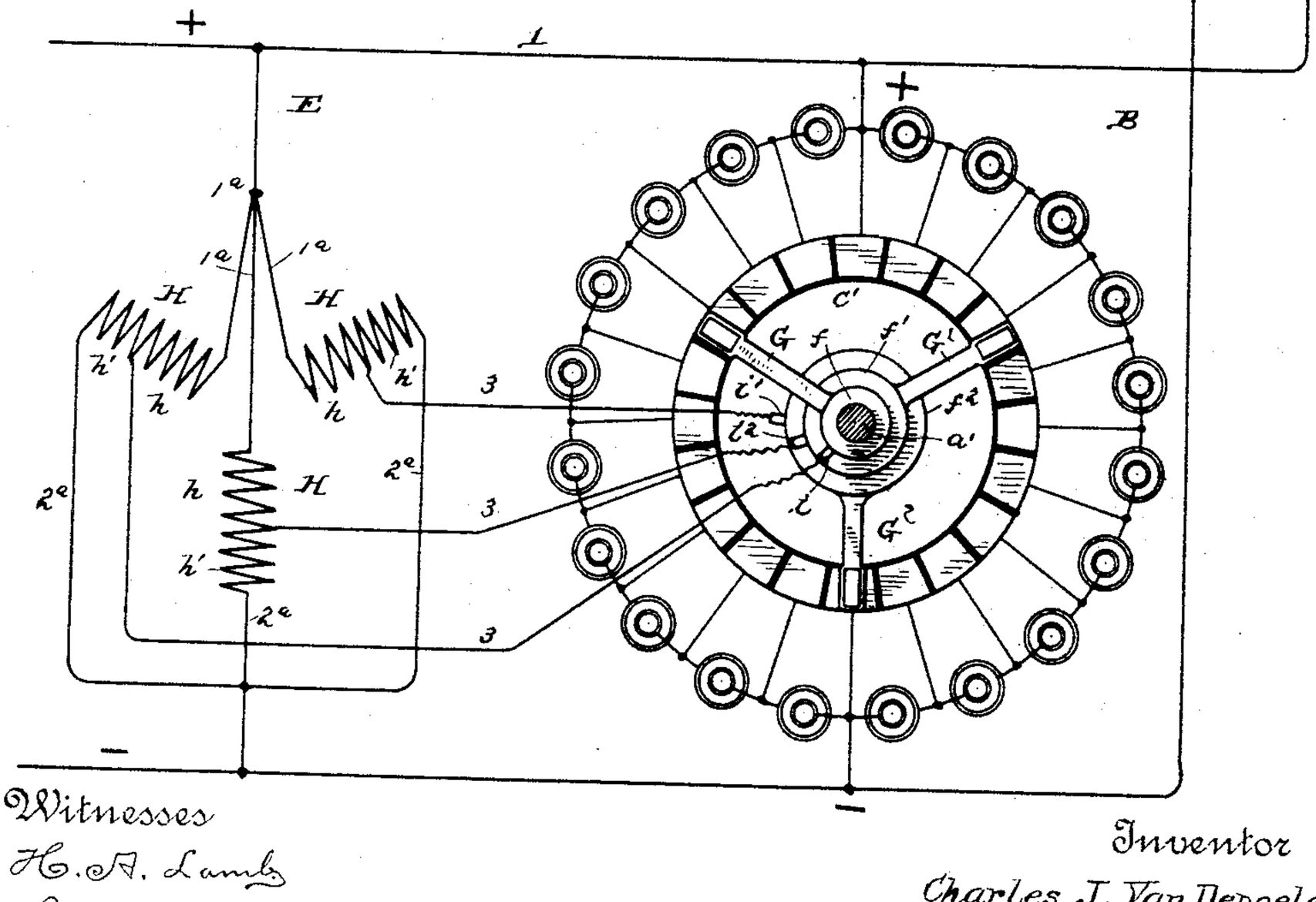



Fig. 2.

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3 Sheets—Sheet 3.

# C. J. VAN DEPOELE.

## SYSTEM OF ELECTRICAL DISTRIBUTION.

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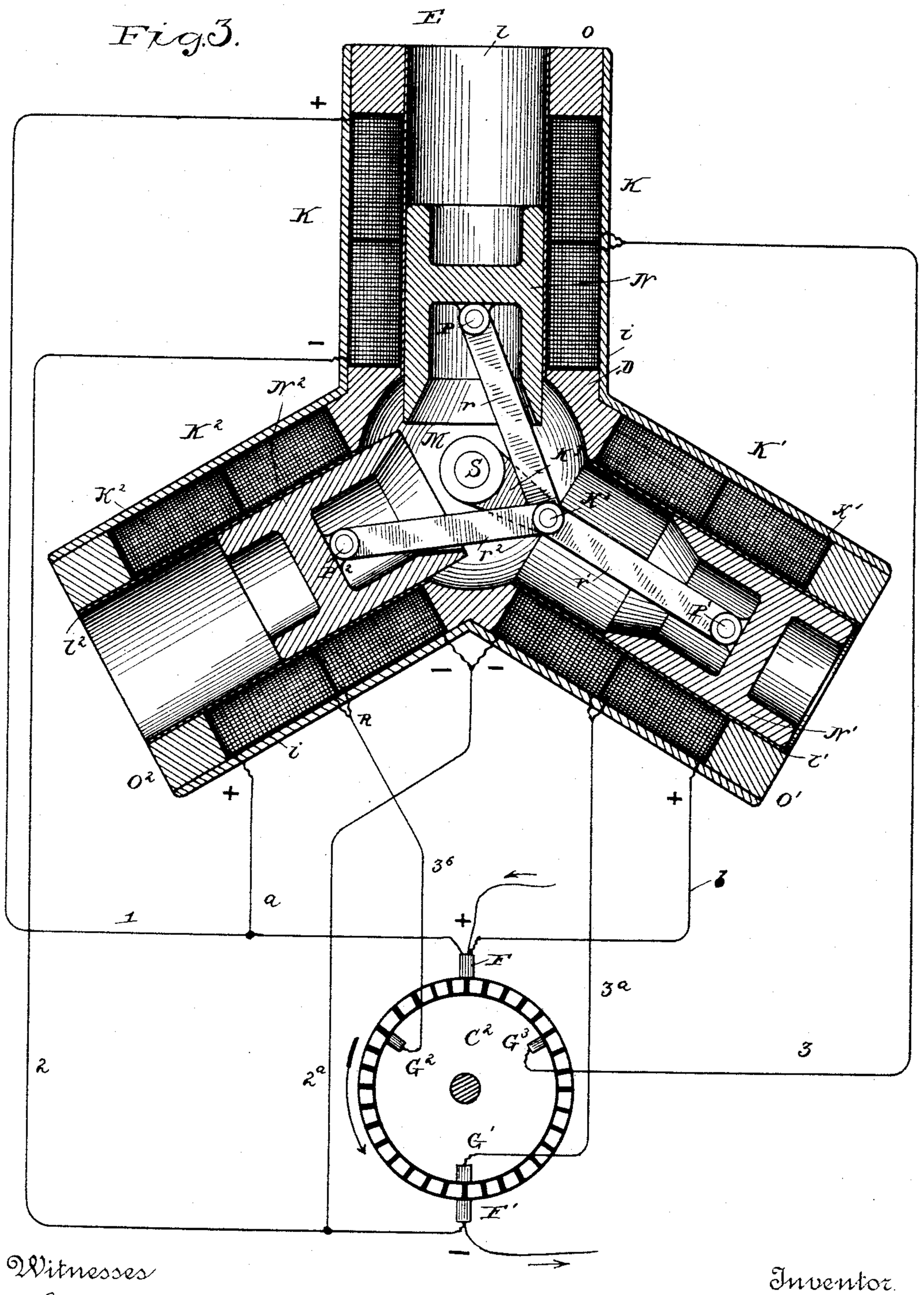
Fig. 3.

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# UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

## SYSTEM OF ELECTRICAL DISTRIBUTION.

SPECIFICATION forming part of Letters Patent No. 450,541, dated April 14, 1891.

Application filed September 19, 1890. Serial No. 365,542. (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 Electrical Distribution, 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 new and improved system of electrical distribution, and is, in part, an improvement upon the invention set forth in Letters Patent Nos. 436,275 and 436,276, granted to me September 9, 1890.

The invention consists, mainly, in the employment of electro-chemical counter-electromotive-force devices as a means for regulating and controlling the current supplied to reciprocating electric engines, and the invention also includes means for utilizing the counter electro-motive force of a variable number of electro-chemical elements, and also of employing two distinct groups of elements for this purpose, one group acting as a storage device for conserving electric energy, while the companion group may be used solely to produce currents having a defined rise and fall as supplied to the motor-coils of the translating devices. The said second group acts to impart to the currents the desired character.

The various details of construction, arrangement, and operation will be hereinafter fully set forth, and referred to in the appended claims.

In the drawings, Figure 1 is a diagrammatic view showing main and working circuits, a counter-electro-motive-force device embodying the invention and mechanism for operating the same. Fig. 2 is also a view in diagram and shows main and working circuits together with primary and secondary counter-electro-motive-force devices and mechanism for utilizing the same according to the invention. Fig. 3 is a view, partly in diagram, showing the circuits and connections of part of Fig. 2, together with a transverse elevation, partly in section, showing a triple reciprocating electric engine.

In Fig. 1 is shown an electro-chemical counter-electro-motive-force device located between the main positive and negative conductors 1 2, leading from any suitable source of current—such, for instance, as the power-station of an electric railway. The mains 1 2 are connected, respectively, to the segments D′ $D^{17}$ of the commutator C by binding-posts P P′. These two segments are connected to the cells C′ $C^{18}$, which are the first and last cells of the counter-electro-motive-force device shown, and the segments of the commutator between D′ and $D^{17}$ are severally connected to corresponding cells of the battery.

Mounted upon a central bearing *a* and thoroughly insulated therefrom are three contact-arms A A′ $A^2$, which are normally in electrical connection with some of the segments of the commutator. To binding-posts *p* *p′* $p^2$ upon these arms are connected, by means of conductors $1^a$ $2^a$ 3, the outside and inside terminals of the coils *h h′* of a reciprocating engine H. Two of these arms A A′ are held stationary during operation and are always at the same angle with respect to each other and the central pivot *a*, and therefore are always equidistant from the binding-posts P P′. The third arm $A^2$ is arranged to be reciprocated across the segments of the commutator lying between the arms A A′.

Upon the arms A A′, and at equal distances from the central pivot *a*, are pivoted two connecting-rods *r r′*, the opposite ends of which are engaged by a rod $r^3$. All these connections should be carefully insulated. The rod $r^3$ is held by a sleeve-bearing *s*, formed upon the ring M, which is a continuation of the support or frame upon which are mounted the segments of the commutator C. The opposite end of the said rod $r^3$ is provided with a pin *i*, engaging a slot in the lever *l*, which is mounted upon the wall-bracket *m* at one end and near its other end engages the rack *j*, upon which it may be secured at any desired point. The third arm $A^2$ has pivotally attached thereto one end of a connecting-rod $r^4$, the opposite end of which engages a block *b*, that slides in the link *g*. The link *g* is pivoted at one end to the wall-bracket or other suitable support *m′*, and is connected at its free end by pitman $r^5$ with the crank *k* upon the gear-wheel *g*. The said gear-wheel is rotated by any suitable means, and through pitman $r^5$ link *g* and rod $r^4$ reciprocates the

arm $A^2$ upon the segments of the commutator C. The lever *l* is connected to the rod $r^4$ by connecting-rod $r^6$, and any change of position of said lever *l* upon the rack *j* will therefore move the sliding block *b* toward or away from the point of support of the link *g*, reducing or increasing the arc described by said block and correspondingly affecting the throw of the arm $A^2$. Simultaneously the arms A A′ will be moved with respect to the binding-posts P P′, thereby compelling the current from the main to the working circuit to flow through a regulable number of the resistance-cells and correspondingly changing the amount of current supplied to the coils *h h′* of the engine H. The rapidity of the pulsations of current depends upon the speed of reciprocation of the arm $A^2$.

Another method of regulating the current in the working-circuit is shown in Fig. 2, in which an electro-chemical counter electro-motive-force device is located between the mains 1 2. The device consists of a number of cells C′ $C^2$ $C^3$ $C^4$ $C^5$ $C^6$ $C^7$ $C^8$ $C^9$ $C^{10}$ $C^{11}$ $C^{12}$ $C^{13}$ $C^{14}$ $C^{15}$ $C^{16}$ $C^{17}$ $C^{18}$ $C^{19}$ $C^{20}$, arranged in a circle for convenience of illustration, and each cell is connected to one of the segments of a circular commutator C. Two contact-arms F F′ are centrally pivoted at *a*, with respect to the commutator, and said arms have each a short extension *a′* $a^2$, extending beyond the point of support. To the extensions *a′* $a^2$ are attached rods *e e′*, which engage a hand-lever *l′*, mounted upon a wall-bracket *m* or other suitable support and provided with a rack *j′*. The arms F F′ are in electrical contact with each other and connected to conductor $2^a$, which is the return from the negative side of the resistance and translating device or devices in the working-circuit. The main positive conductor *l* is attached to a segment D′ of the commutator opposite to segment $D^{11}$, to which the main negative return 2 is attached. The conductor 1 is carried beyond the counter-electro-motive-force device D, and forms the positive lead of the translating and counter-electro-motive-force devices in the working-circuit. The working-circuit is formed therefor by the positive lead 1 and negative 2, which is connected to the arms F F′. By operating the hand-lever 1′ the arms F F′ can be moved toward or away from the main positive conductor 1 upon section D′ of the commutator C, and by so placing more or less of the resistance of the counter-electro-motive-force device D between the conductors $2^a$ and 2 increase or decrease the amount of current supplied to the translating devices in the working-circuit.

The translating devices shown comprise a triple reciprocating electric engine, each part thereof operating on the principles set forth in my patent, No. 422,855, March 4, 1890, and a suitable counter-electro-motive-force device B, comprising a number of electro-chemical cells and a commutator, the relation between the two being similar to that existing between the coils and commutator of a Gramme-ring armature. These elements, however, may be replaced by a rotary counter-electro-motive-force device such as I have shown in Patent No. 422,858, granted to me March 4, 1890. If chemical elements are used, they are only of such size as to carry the maximum current desired to operate the translating devices in the working-circuit, and are not intended to act as accumulators to any great extent, this being done by the counter-electro-motive-force device or distributer D, located directly between the main positive and negative conductors.

Mounted upon the axis *a′* of the commutator C′ of the counter-electro-motive-force device B of the working-circuit are three equidistant arms G G′ $G^2$, adapted to be moved round the commutator, and each carrying a contact-brush. The arms are formed with insulated annular contact surfaces or rings *f f′* $f^2$, with which contact is made by brushes *i i′* $i^2$, from which conductors 3 3 3 lead to the inner terminals of the coils of the engine E. The outer terminals are, as before stated, connected between the main positive lead 1 and negative return $2^a$.

It will be seen that as the brushes and arms G G′ $G^2$ revolve around the commutator of the distributer the current will be progressively shifted from coil to coil in the engine E, the action in each coil being similar to that which takes place in the single-cylinder reciprocating engines heretofore patented by me. In the present instance the three sets of motor-coils composing each engine are actuated simultaneously, and in carrying their pistons back and forward will impart a continuous rotary motion to any shaft to which they may be connected by corresponding cranks. This is clearly seen in Fig. 3, where a triple or three cylinder reciprocating engine is illustrated. In this figure my system of distribution is shown as applied to the solenoids of a three-cylinder engine E, adapted to produce rotary motion. The coils *k k′* $k^2$ of the solenoids K K′ $K^2$ are inclosed in a continuous iron envelope *i*, which forms the outside casing and frame of the engine. Inside the coils *k k′* $k^2$ are placed diamagnetic tubes *l l′* $l^2$, which are securely fastened to the heavy rings O O′ $O^2$ upon the outer ends of the cylinders and to the casting D, which forms the central crank-chamber M, into which the plungers N N′ $N^2$ are projected at the inner limit of their stroke. Upon the shaft S, which forms the axis of the engine E, is secured the crank $K^3$, upon the crank-pin $k^3$ of which are journaled the connecting-rods *r r′* $r^2$, which are severally pivoted to the plungers N N′ $N^2$ at *p p′* $p^2$. From the main positive and negative brushes F F′ of the commutators $C^2$, representing the counter-electro-motive-force device, extend conductors 1 $1^a$ $1^b$ and 2 $2^a$, which are connected to the outer terminals of the coils *k k′* $k^2$. The inner ter-

minals of said coils are connected to equidistant brushes G′ G² G³, which are moved around the commutator C² by any convenient means, as are the similar brushes G G′ G² in Fig. 2. Upon rotation of the brushes G G′ G² upon the commutator C² pulsating currents will flow successively through each half of the coils *k k′ k²*, alternately rising and falling therein, causing the plungers N N′ N² to be reciprocated and imparting rotary motion to the shaft S through connecting-rods *r r′ r²* and crank K³.

It will be understood that the within-described apparatus is merely by way of illustration, and that I do not restrict myself to any particular construction, and that my invention may be applied in a variety of ways without departing from the principles herein set forth.

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

1. In a system of electrical distribution, a chemical counter-electro-motive-force device between the leads of a supply-circuit, a commutator to the segments of which the elements of the device are connected, a working-circuit in connection with the commutator, a stationary brush or brushes bearing upon the commutator, and means for changing the relative position to the elements of the said device of the stationary brush or brushes, whereby the potential of the current supplied to the working-circuits will be varied.

2. In a system of electrical distribution, a chemical counter-electro-motive-force device spanning the main-supply circuit, a commutator to the segments of which the elements of the said device are connected, a working-circuit the main conductors of which extend from adjustable contacts bearing upon the said commutator, and a reciprocating brush making contact with the commutator-segments lying between the adjustable contacts, said reciprocating brush being electrically connected to the working-circuit.

3. In a system of electrical distribution, a chemical counter-electro-motive-force device in circuit with a source of current, a commutator to the sections of which the elements of the device are connected, and a working-circuit composed of one of the main supply-conductors of the said device, and a conductor connected to an adjustable contact or contacts upon the commutator thereof, and a distributer and translating devices in said working-circuit.

4. In a system of electrical distribution, the combination, with a reciprocating electric engine, of a distributer comprising a counter-electro-motive-force device and a commutator therefor, adjustable contacts for bringing more or less of the counter-electro-motive-force devices into circuit, a movable arm and means for reciprocating the same upon the contacts of the counter-electro-motive-force device, and means for simultaneously adjusting the positions of the stationary contacts and for limiting the throw of the movable arm.

5. In a system of distribution, a counter-electro-motive-force device in the supply-circuit, a working-circuit leading from said device, a translating device in the working-circuit, a current-controller in the working-circuit, having its main terminals in multiple arc with the main terminals of the translating device, a commutator for the controller, moving contacts upon said commutator, and separate connections between the inner terminals of the coil or coils of the translating device and the moving contact or contacts upon the commutator of the controller.

6. In a system of electrical distribution, a chemical counter-electro-motive-force device connected to a primary source of electricity, a commutator to the separate segments of which the elements of the said device are connected, a working-circuit consisting of one of the prime conductors, and a conductor leading to a movable contact upon the commutator, a translating device having the outer terminals of its coil or coils connected between said conductors, a current controller or distributer in multiple arc with the translating device or devices, and having moving contacts and connections between the inner terminals of the coils of the translating device and said moving contacts.

7. In a system of electrical distribution, a chemical counter-electro-motive-force device receiving current from a source of constant potential, a working-circuit proceeding from said device, means for varying the potential of the current supplied to the working-circuit, a multiple-cylinder engine having the outer terminals of its coils connected in the working-circuit, a distributer or controller in the working-circuit in multiple arc with the said engine, moving contacts upon the distributer, and connections between the inner terminals of the engine and the said moving contacts, whereby currents of rising and falling quality are supplied successively to the coils of the engine.

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

CHARLES J. VAN DEPOELE.

Witnesses:
FRANKLAND JANNUS,
K. MCKEE.