(No Model.) 2 Sheets—Sheet 1.

C. M. DAVIS.

METHOD OF DISTRIBUTING ELECTRICITY TO ELECTRIC LIGHTING SYSTEMS.

No. 550,782. Patented Dec. 3, 1895.

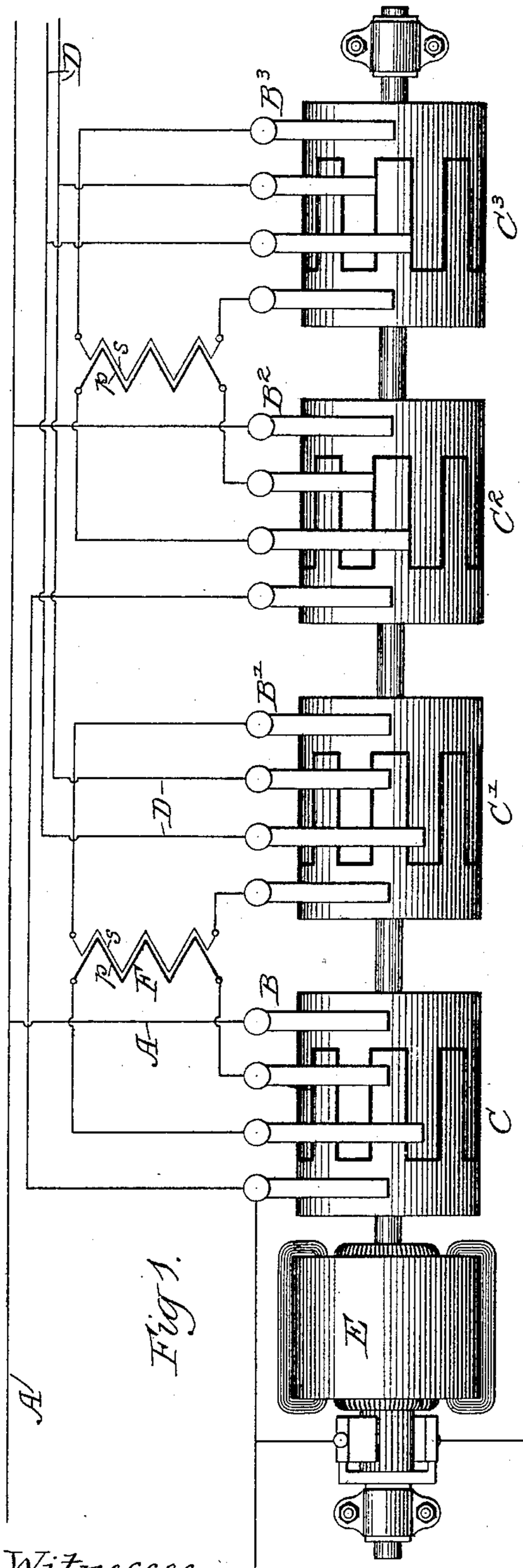

Fig 1.

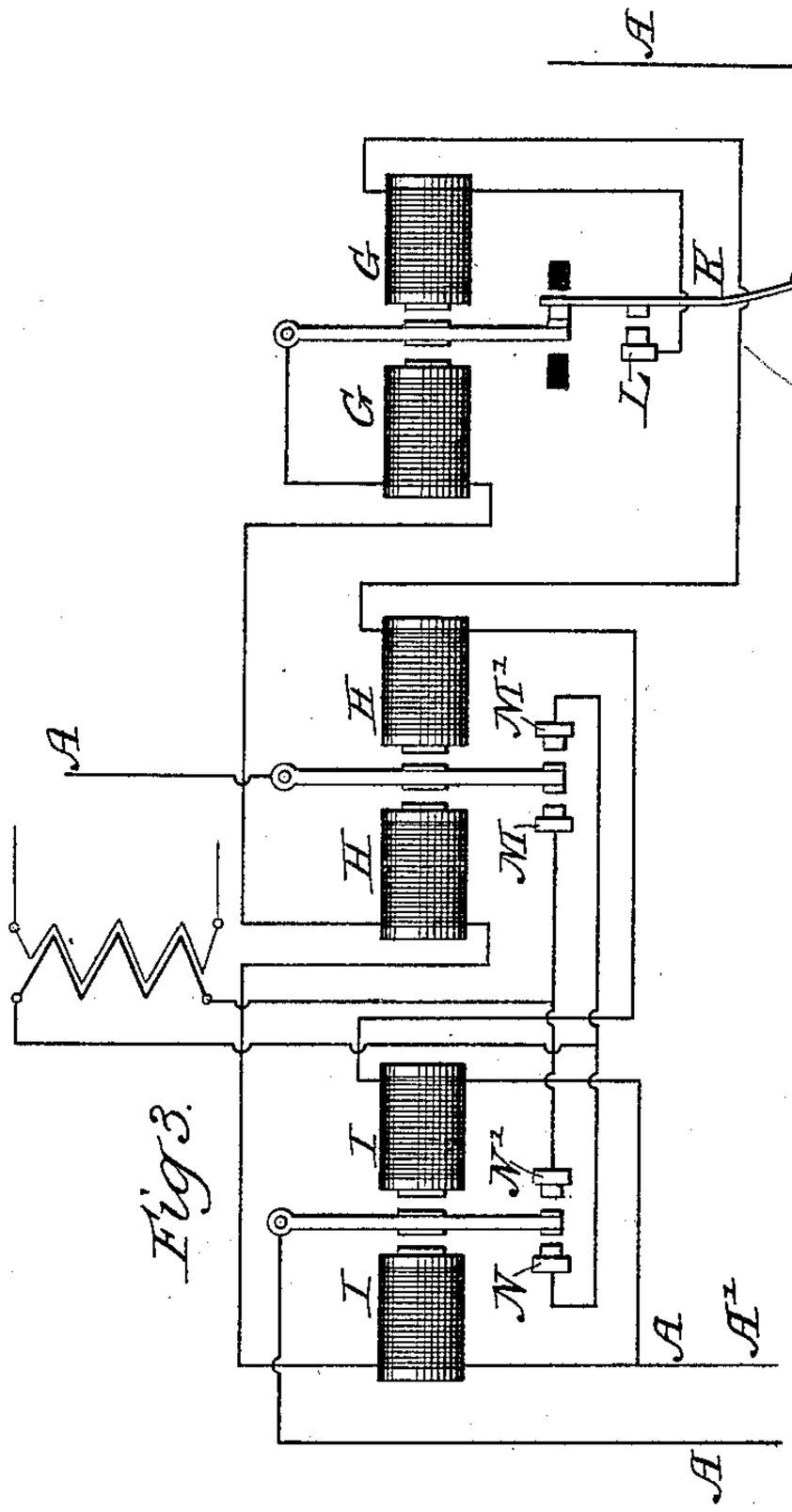

Fig 3.

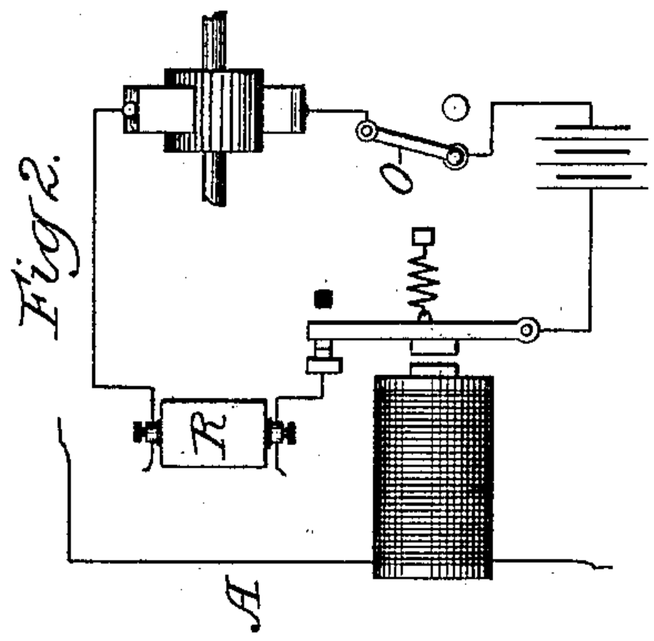

Fig 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

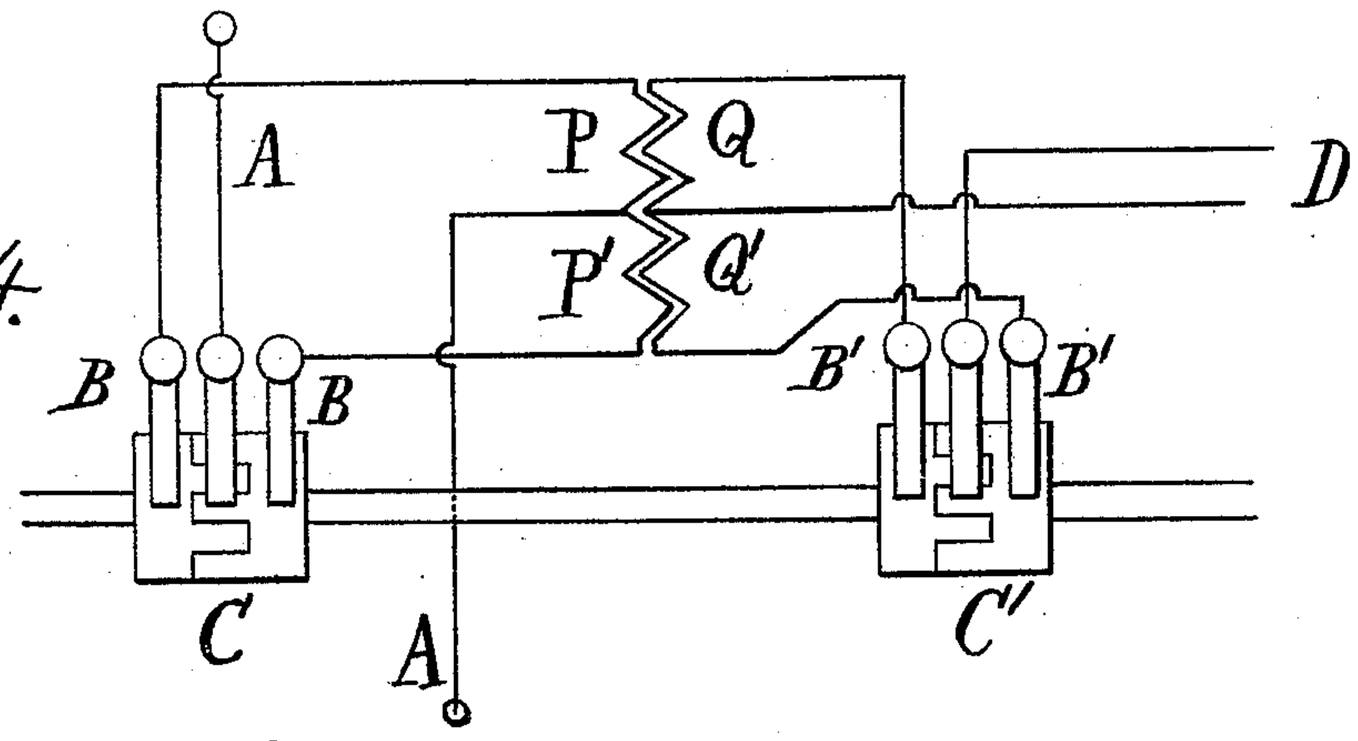
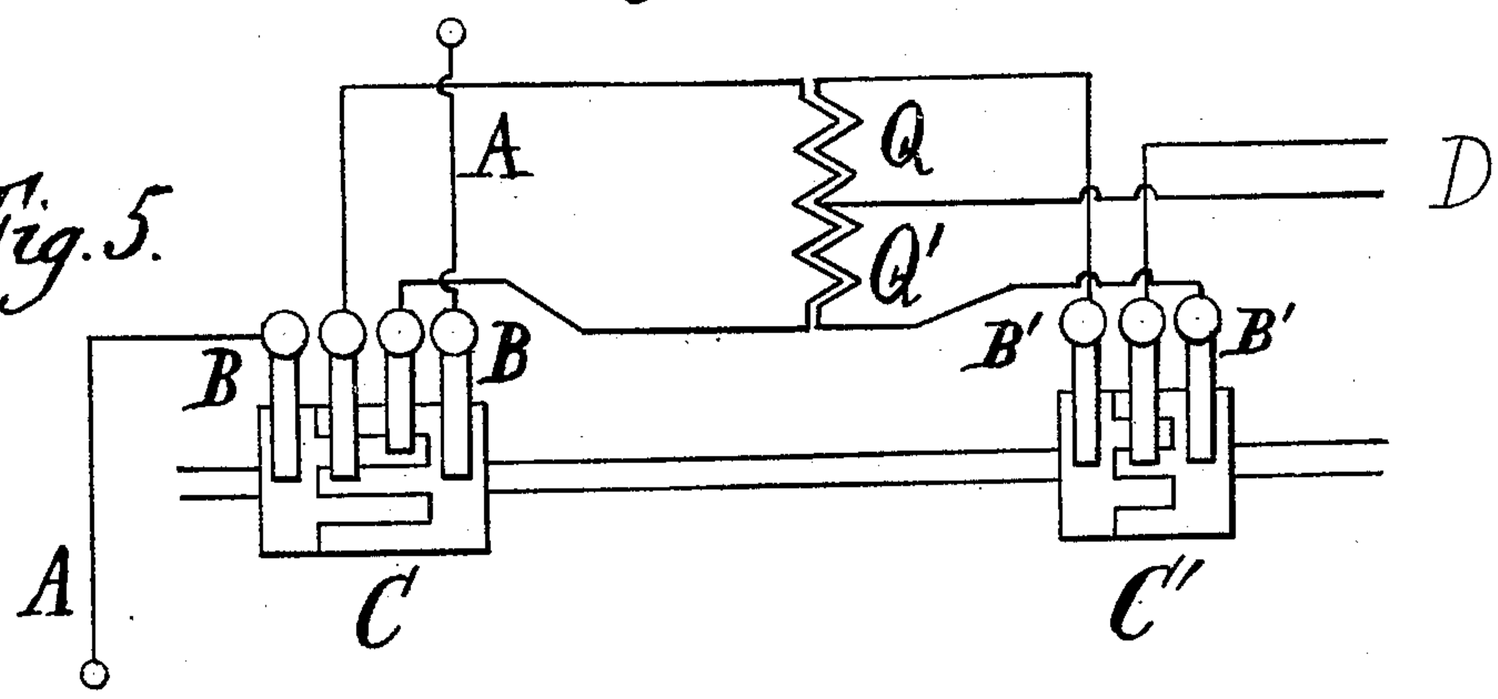


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES MILTON DAVIS, OF CHICAGO, ILLINOIS.

METHOD OF DISTRIBUTING ELECTRICITY TO ELECTRIC-LIGHTING SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 550,782, dated December 3, 1895.

Application filed April 14, 1892. Serial No. 429,234. (No model.)

To all whom it may concern:

Be it known that I, CHARLES MILTON DAVIS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Methods of Distributing Electricity to Electric-Lighting Systems, of which the following is a specification.

This invention relates more especially to a method of distributing electricity to electric-lighting systems, and it is also applicable for various other purposes—such as telegraphs, electric railways, motors, &c.

The invention consists in the construction and arrangement substantially as hereinafter described, and more particularly pointed out in the claims.

Like letters refer to similar parts in the several figures of the drawings, in which—

Figure 1 is a diagram of a preferred plan of applying my invention. Fig. 2 is a diagram of a modified arrangement for operating the motor. Fig. 3 is a diagram of a modified arrangement, including automatic vibrators. Figs. 4 and 5 are diagrams of other modifications coming within my generic invention.

My invention, generally speaking, may be said to relate to a distribution system in which the current is supplied from any suitable source in a continuous direction and is varied before it passes through the primary of a converter and is, after transformation by the converter, caused to be delivered to the translating devices in a continuous direction, the variations being corrected, this result being effected by any suitable apparatus, which, as shown in the drawings and set forth in the specification, I term an "alternator."

Referring to Fig. 1 of the drawings, the letters A A designate a portion of the connections to the two poles of any suitable source of electric energy, which causes the current to flow in one direction.

B designates a series of contact-brushes, which in Fig. 1 comprises four in number and rest upon a device which is composed of two parts insulated from each other and formed, respectively, of intermeshing segments by the arrangement of the insulation similar to a form of commutator now in use. This device forms one species of a class of devices which I denominate an "alternator," another species of which is shown in Fig. 3 and will be hereinafter more specifically described.

To the positive pole of the source of electric energy may be connected one of the series of brushes B, which latter may rest upon the main or collecting surface of the right half of the alternator. The like portion of the other half of the alternator may be connected by a similarly-positioned brush and suitable electric connections with the other pole of the source of electric energy. Intermediate of these two brushes I place a pair of brushes, which contact with segments separated by insulation, and these latter two brushes are joined to a loop which includes the primary coil of a converter. The secondary coil of the same converter is connected with a pair of brushes constituting the outer two of the series B′, which contact with and are positioned with relation to a second alternator C′, substantially as the brushes B are arranged with reference to the alternator C, except that in practice in some instances it may be found necessary to change the position of the second set of brushes upon their alternator to correspond with the "lag," as it is technically termed. The intermediate pair of this second set of brushes B′ may be connected by suitable devices with the loop-circuit, which includes the translating devices of any suitable character, and this loop-circuit I have designated by the letter D.

The two alternators B B′ should be made to act synchronously, and I have accordingly shown in Fig. 1 a construction in which they are mounted upon the same shaft, which latter is driven by a suitable electric motor E. This motor is preferably arranged to be operated by the main current and may be, as shown in Fig. 1, in series with the primary coils of the converters, or, if desired, may be arranged in multiple therewith. In the form shown in Fig. 1 it is in shunt with an adjustable rheostat, so that the amount of current supplied to it may be regulated by adjusting the rheostat. I have designated the rheostat by letter R.

The apparatus thus far described is capable of distinct use without the adjuncts shown in Fig. 1 of the drawings, and which will be hereinafter described, and I will now briefly

trace the circuit and describe the operation of this much of my invention.

Supposing a continuous positive current to pass from the source of electric energy over the wires to the brush constituting the right-hand brush of the series B, and thence through the third brush and the loop, including the primary coil of the converter F, and through the second brush of the series to the left-hand portion of the alternator, and thence through the fourth brush to the negative pole, it will result that a current will pass through the primary coil of the converter from the positive to the negative pole of the source of electric energy, or, as graphically represented in Fig. 1 of the drawings in a downward direction through such primary coil. This will induce a current of opposite direction in the secondary coil, which, passing upward through this coil, will flow through suitable conductors to the right-hand brush of the series B′ and thence to the right-hand portion of the alternator C′, and thence through the third brush of the series B′ to the top wire of the loop D, containing the translating devices, and back through the lower wire of such loop to the second brush of the series B′, counting from the right of the series, and thence through the left-hand portion of the alternator C′ and the fourth brush of the series and to the lower end of the secondary coil of the converter, thus completing the circuit through the secondary coil of the converter and including the translating devices. Inasmuch as the alternators C and C′ are actuated synchronously, as before mentioned, and the brushes are similarly positioned with reference to each of them, it follows that the current will always flow in the same direction through the loop-circuit containing the translating devices, which are included in the secondary circuit of the converter, and this notwithstanding the fact that the intermediate brushes bearing on the alternator C are constantly changing their position with reference to the segments. In other words, suppose the alternator to be modified so as to position the third contact-brush upon a segment of the left-hand portion of such alternator instead of upon a segment of the right-hand portion, as is shown in Fig. 1. The result of this change of position will be that the current from the positive source of electric energy will pass to the first or right-hand brush of the series B, and thence to the second brush of such series and through the primary coil of the converter in an upward direction and back through the third and fourth brushes to the negative pole. The induced current in the secondary coil of the converter will therefore take a downward course through the coil and pass to the fourth brush of the series B′ and thence to the third brush counting from the right, and to the upper wire of the loop-circuit D, containing the translating devices, and back through the second and first brushes of such series consecutively to the upper terminal of the secondary coil. So it appears that no matter in which direction the current passes through the coils of the converter it always is delivered to the translating devices in a continuous direction through the upper wire of the loop D.

In order to make the electromotive force of the current supplied to the translating devices more uniform, I may add to the apparatus thus far described a pair of alternators C^2 C^3 and sets of brushes B^2 B^3, a converter and appropriate conductors, and, if desired, may multiply these sets of alternators and brushes and converters to an indefinite extent.

In Fig. 1 the alternators C^2 C^3 are mounted upon the same shaft with the previously-described alternators and the connections are substantially the same, except that the intermediate brushes of B^2 B^3 are positioned differently with reference to their alternators from the position of the intermediate brushes of the alternators C C′. For instance, in Fig. 1 of the drawings the intermediate brushes of the series B^2 B^3 are shown as placed upon the insulation of the alternators, while the intermediate brushes of the series B B′ are shown as positioned half-way of a segment on opposite halves of their alternators. The purpose of the adjunctive alternators, converters, and brushes adjusted as described is to supply impulses from any one of the secondary coils of the converters in the adjunctive apparatus at a time different from that when the impulses are supplied from any other of the secondary coils, and consequently make the supply to the translating devices more uniform. For instance, if three sets of alternators and brushes were used it would be proper to adjust the intermediate brushes of each set a distance of one-third of a segment away from the adjustment of the corresponding brushes in any other set. If four sets were used, to adjust the intermediate brushes of each set a distance of one-fourth of a segment away from the corresponding brushes of any other set, &c.

Instead of arranging the coils of the adjunctive devices in multiple with the coils of the main apparatus and of each other, they may be arranged in series, as will be readily understood by one skilled in the art.

Turn now to Fig. 3 in the drawings. I have illustrated in lieu of the form of alternator shown in Fig. 1 a species of the automatic vibrator class. It will be observed that three pairs of magnets (lettered, respectively, G, H, and I) have an armature placed between each pair and that the respective magnets of each pair on opposite sides of each armature are in circuit with each other—that is to say, the corresponding magnet of one pair is in circuit with a like magnet of the other pairs. The spring-contact K is in connection with the source of supply and the conductor A′ is in connection with the other pole of such source. The spring-contact K, as it is shown,

bears against the armature located between the pair of magnets G, and thus closes the circuit through such armature and the left-hand magnets of the several pairs to the opposite pole of the source of supply. Adjacent to the spring-contact K is a contact-stop L, with which the spring contacts when the left-hand magnet G has attracted its armature and carried it away from the spring. On opposite sides of the lower end of each of the other armatures are arranged contact-stops, with which the respective armatures engage alternately as the right or left hand magnets are energized. As a result of this construction, the left-hand magnets I H G will all attract their armatures when the spring K is in the position shown. As soon as the armature of G has been attracted away from contact with K the current will pass through K to L through the right-hand magnets G, H, and I and thereby cause the armatures of H and I to be shifted against the opposite stops and the armature of G to again contact with K, pressing K away from L. These phenomena are repeated indefinitely and cause all the armatures to vibrate rapidly. The left-hand contact N is electrically connected with the right-hand contact M′ and the right-hand contact N′ is electrically connected with the left-hand contact M. The primary coil of the converter is connected at its lower end with the conductor N′ M and at its upper end with the conductor N M′. When the armatures of I and H are against their right-hand stops, the current will pass through the converter from the top downward, (supposing the current to enter at the top conductor A,) and when the armatures are against their left-hand stops N and M the course of the current is upward through the converter. So it will be seen that the action of these various armatures and magnets are similar to the action of the brushes and divided drums in Fig. 1, and, in fact, constitute alternators in precisely the same way.

The secondary coil in Fig. 3 should be arranged in a corresponding manner, as will be clearly manifest to any one skilled in the art.

Fig. 2 illustrates a modification for operating the motor, which consists in arranging said motor in a local circuit, in which is included an adjustable rheostat. This local circuit is closed by a magnet in the main circuit and may be broken by manipulating the switch O.

The automatic vibrators, Fig. 3, may be operated by a local circuit in a way similar to that indicated for operating the motor in Fig. 2.

Fig. 4 represents a modified arrangement in which each coil of the converter is divided into two parts and only a single intermediate brush is employed, which of course necessitates a different set of connections between the brushes and the other parts, as is clearly shown.

In Fig. 5 the secondary coil of the converter is arranged in a similar manner to that exhibited in Fig. 4; but the primary coil is arranged as in Fig. 1. Referring to Fig. 4, the current may pass from above to the secondary contact-brush of B, thence to the segment on the right-hand part of the alternator C, thence through the first or right-hand brush to the lower terminal of the lower part of the primary coil of the converter and thence through such lower part out, which of course will induce in the lower part of the secondary coil of the converter a current of opposite direction flowing downward through such lower part and thence to the right-hand brush of the alternator C′, and by way of the right-hand portion of such alternator through the intermediate brush B′ and the top wire of the loop-circuit D, including the translating devices, and thence through the bottom wire of such loop-circuit to the top connection of the lower half of the secondary coil of the converter. I have designated the lower portion of the primary coil by the letter P′ and the lower portion of the secondary coil by the letter Q′, and the upper portion of the primary and secondary coils, respectively, by P and Q. In case the position of the alternator C has been changed so as to bring the intermediate brush in contact with the left-hand portion of such alternator the current will flow through such left-hand portion and the left-hand or third contact-brush B, across to and downwardly through the upper half of the primary coil of the converter, and thence out to the negative pole. This will induce a current of opposite direction in the secondary coil Q, which will pass through the left-hand brush B′ the intermediate brush of the same series, the top wire of the loop D, the translating device, and back to the bottom connection with the upper half of the secondary coil of the converter. It will thus be seen no matter in what direction the current flows through the primary coil it will always be directed or delivered to the translating devices through the upper wire of the loop in a continuous direction. This result must also be effected in the construction shown in Fig. 5.

Reverting to Fig. 1, it may be observed that the switch S may be employed to stop the whole mechanism by opening the same.

It is obvious that many other variations may be made in the details of my invention without departing from the principle thereof, and that such modifications will readily suggest themselves to those skilled in the art after they have understood the apparatus herein shown and described and its method of operation. It would extend the limits of this specification and these drawings to too great an extent for me to attempt to detail all the variations which I have contemplated or which might be made.

I mention an advantage in using a source of electric energy of continuous direction—to wit, that human contact with the conductors on poles or elsewhere is less danger-

ous than if the electric energy were alternating. I also point out that if desired alternating currents may be obtained for any suitable use from the coils of the converters by attaching conductors to the terminals thereof.

In Fig. 4 the converter may be considered as one having two divisions in both the primary and secondary coil, or it may be considered as being two separate converters.

It is evident that I may use any number of converters, connected either in series or multiple, in connection with any of the alternators.

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

1. The combination of a source of electrical energy of continuous direction, a converter, synchronously operated alternators in the primary and secondary circuits, said alternators being set at different phases, whereby the current in the secondary circuit is rendered uniform in direction and more even in strength; substantially as and for the purpose set forth.

2. The combination of a source of electrical energy of continuous direction, sets of converters and alternators, the several sets being arranged at different phases and in multiple one with the other, substantially as and for the purpose set forth.

3. The combination of a source of electrical energy of continuous direction, converters, and a number of alternators one for each converter, the respective sets of alternators being set at different phases in relation to each other whereby the direction is rendered uniform and the strength of the current in the working circuit is made more even, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

CHARLES MILTON DAVIS.

Witnesses:

J. LAWRENCE GERRY,

FRANK T. BROWN.