(No Model.) 3 Sheets—Sheet 1.

H. M. BYLLESBY.

SYSTEM OF ELECTRICAL DISTRIBUTION.

No. 345,212. Patented July 6, 1886.

Fig. 1.

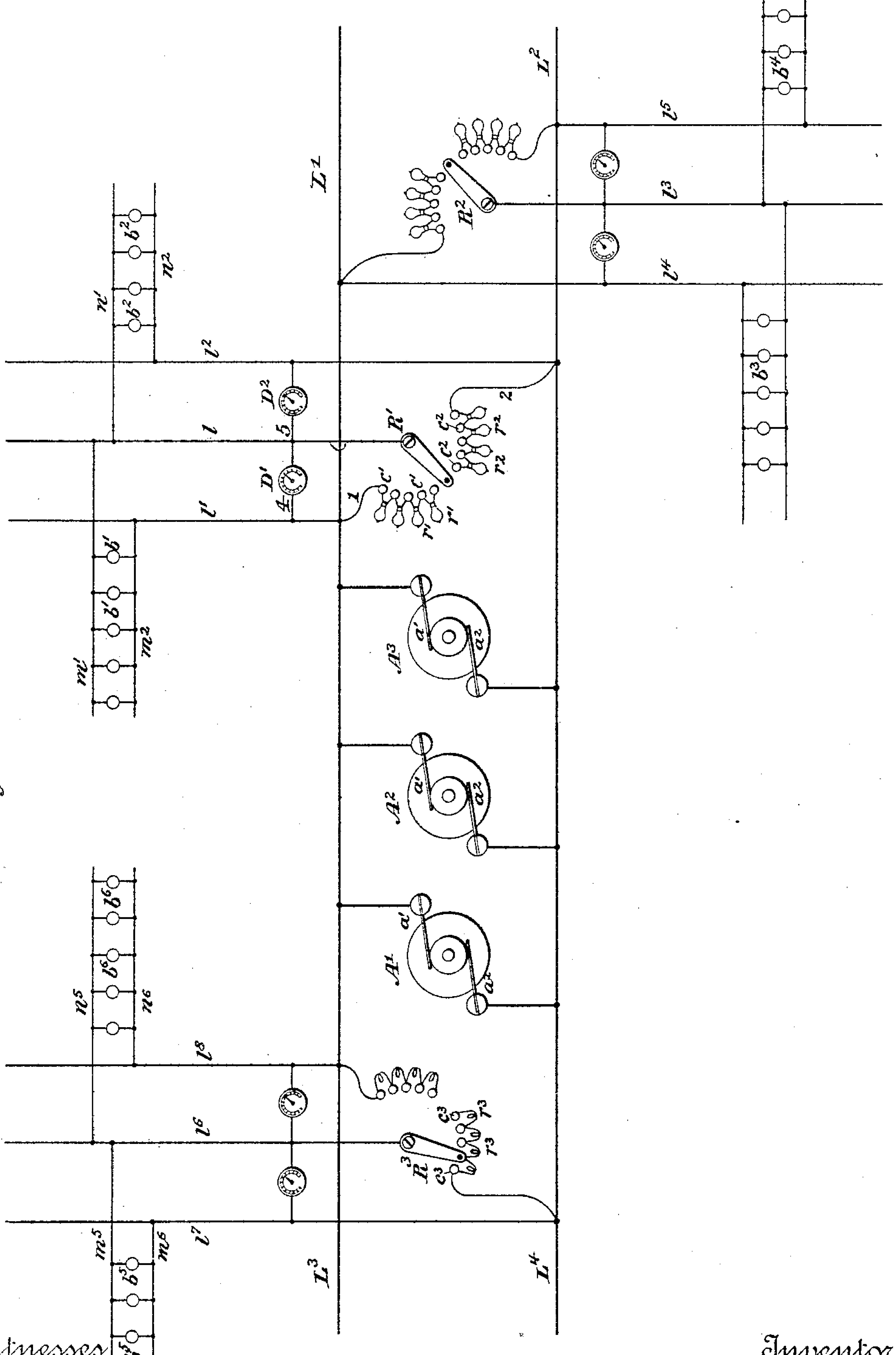

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Fig. 2,

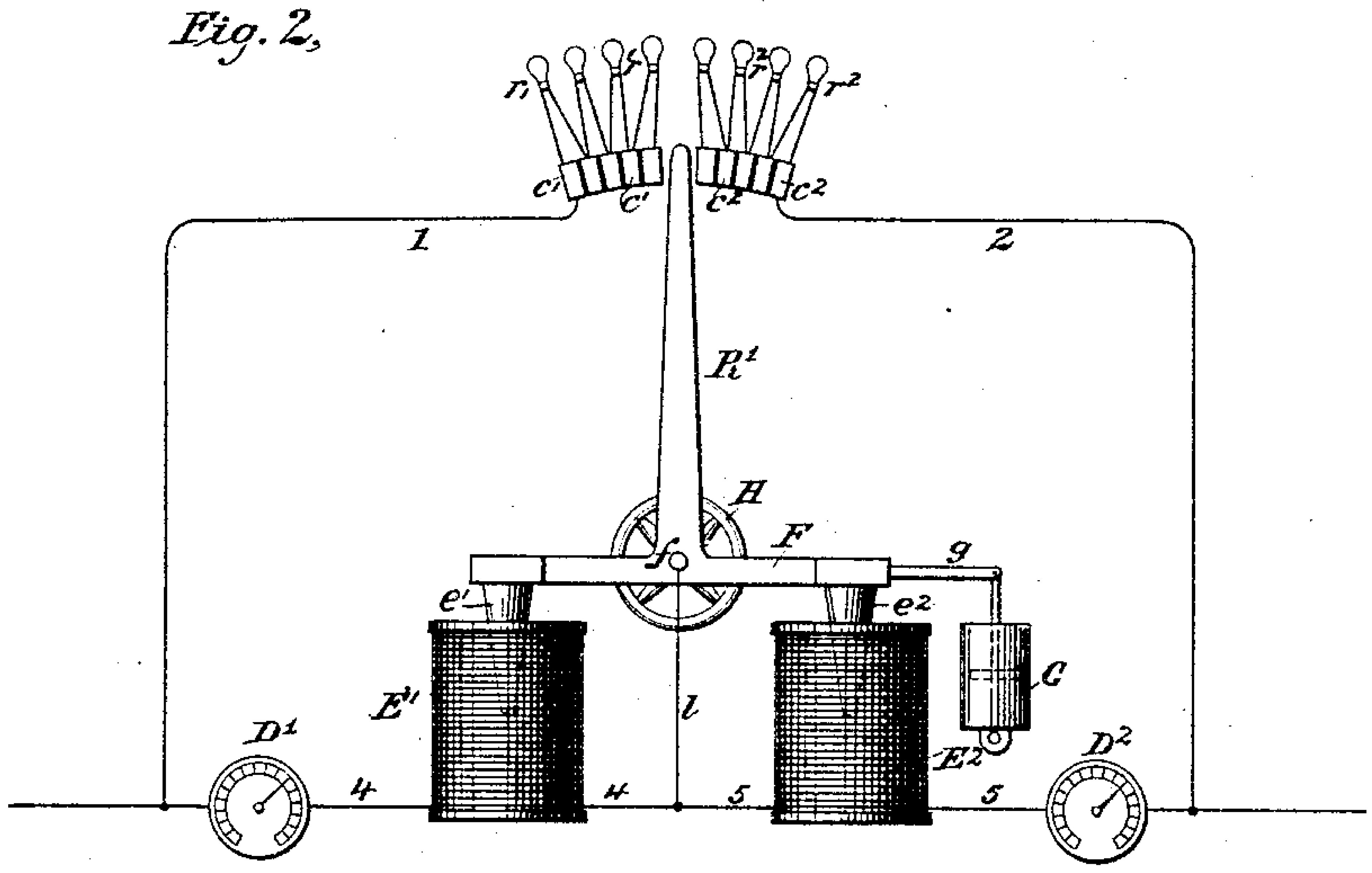

Fig. 3,

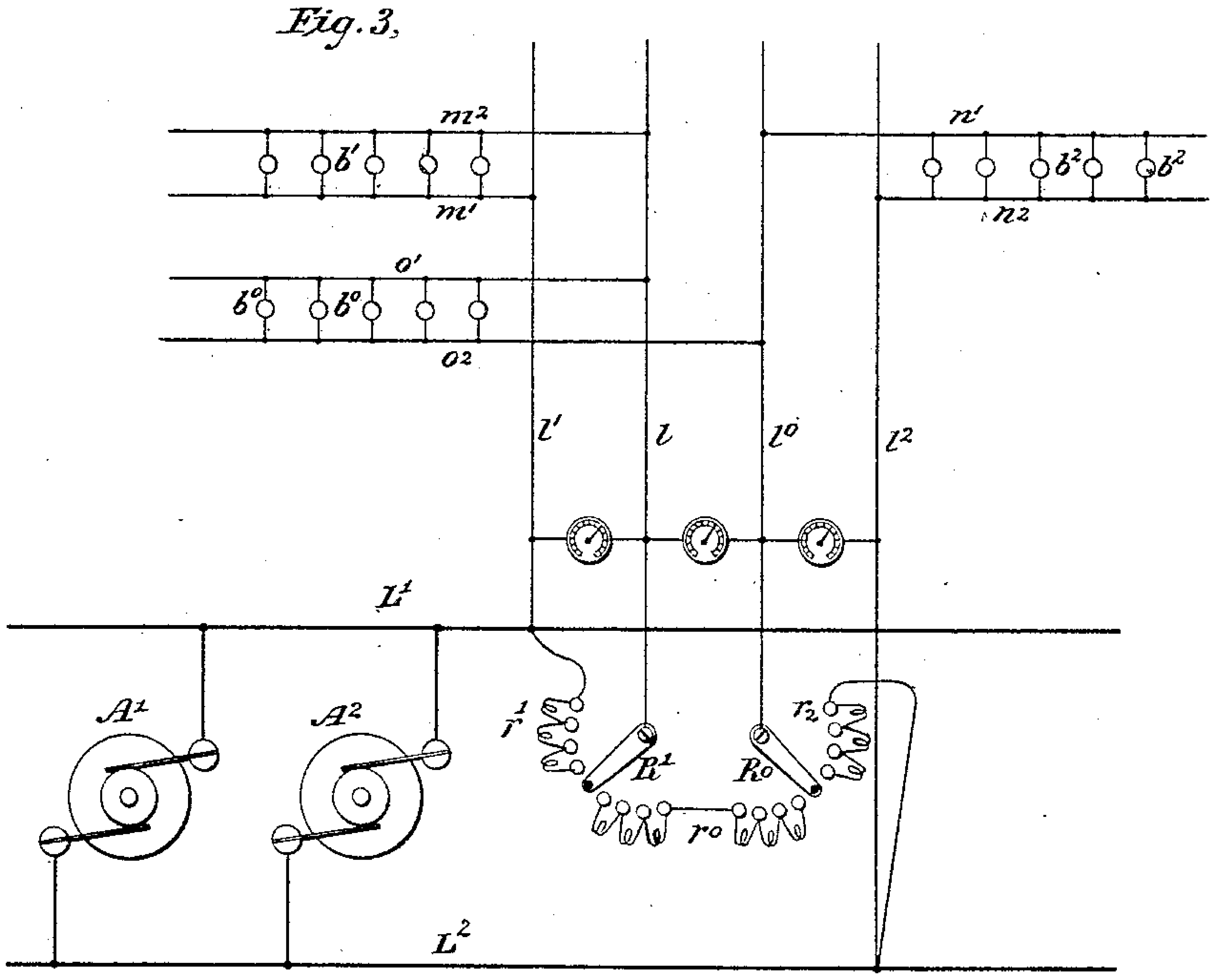

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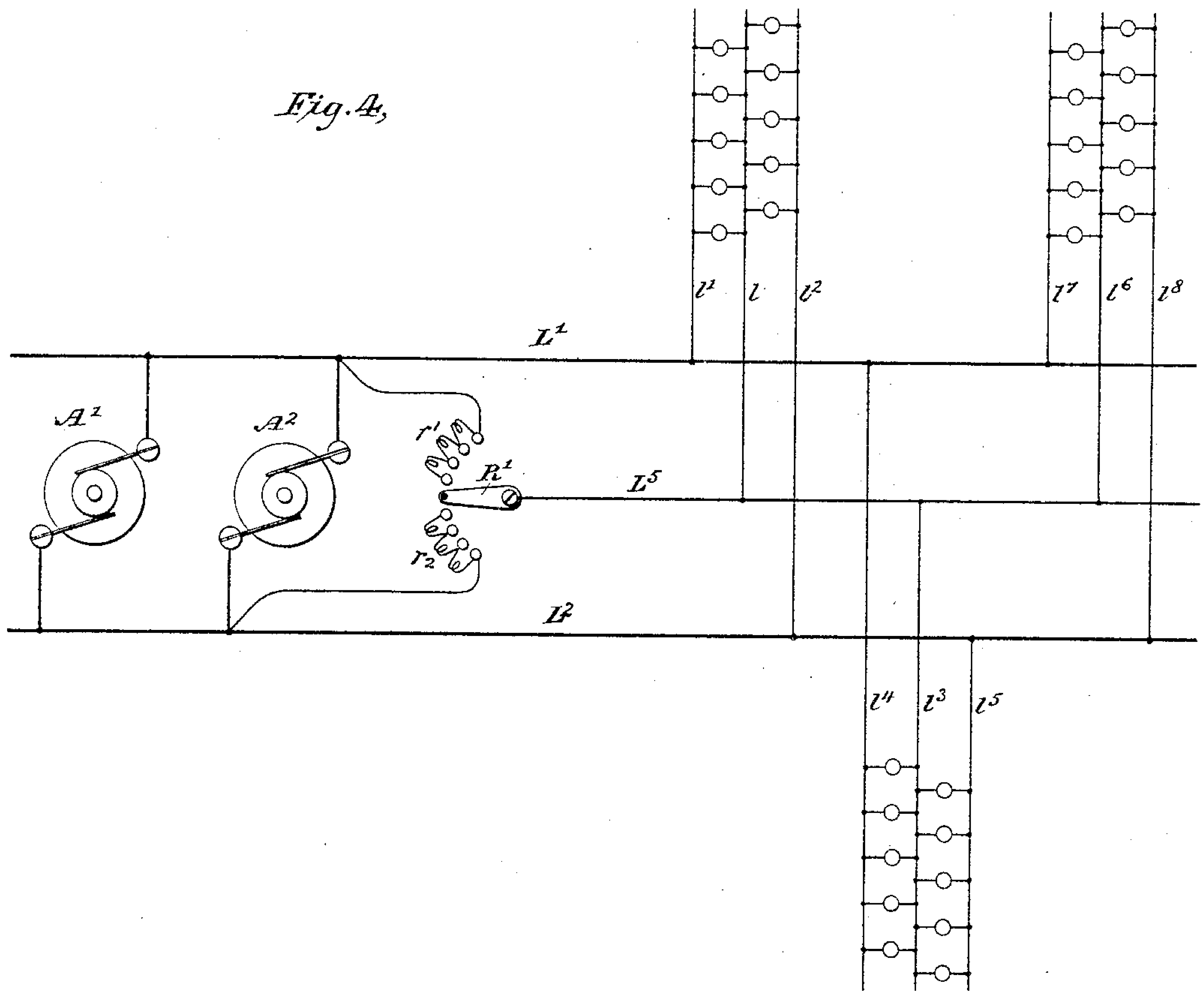
Fig. 4,



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UNITED STATES PATENT OFFICE.

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SYSTEM OF ELECTRICAL DISTRIBUTION.

SPECIFICATION forming part of Letters Patent No. 345,212, dated July 6, 1886.

Application filed March 18, 1886. Serial No. 195,625. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. BYLLESBY, a citizen of the United States, residing in Roselle, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Systems of Electrical Distribution, of which the following is a specification.

The invention relates to an organization of circuits and apparatus for distributing electric energy and regulating its supply to different portions of a system of translating-circuits.

The object of the invention is to provide convenient means for supplying electric currents of the required character to different translating devices, located at different points, and to economize in the construction of the plant by reducing as much as possible the amount of conductors required.

The invention is especially applicable to incandescent electric-lighting systems, and will be described with special reference thereto, although it is also useful to other systems of electric distribution and translation.

In systems of electrical distribution it is usually found more economical to convey the energy in the form of high potential currents rather than as currents of low potential, and for this reason it has been desired, in operating systems of translating devices requiring currents of comparatively low potential, to provide means for conveying the energy to the vicinity of the devices in the form of currents of high potential, and then utilizing it without material loss or waste. In systems of incandescent electric lighting, for instance, usually currents of about one hundred volts are required. The lights are usually connected in multiple arc between conductors leading from the source of electricity. It is evident that it is then necessary only to maintain the difference of potential between the two conductors at one hundred volts, and thus the currents transmitted from the source must be comparatively low in potential. Now, it is evident that the lights might be placed in multiple series instead of multiple arc, two or more being included in each of the conductors connecting the main or supply conductors, then the difference of potential required between the two supply-conductors would be correspondingly increased—as, for instance, if two lights were included in each series, then the difference of potential required would be two hundred volts. Heretofore such an organization has been found inexpedient for various reasons. For example, any injury to a light in one of the series—as, for instance, the interruption of the circuit therethrough—would necessarily extinguish the other light. The special purpose of this invention is, therefore, to provide a system in which any desired number of translating devices may be connected in multiple series, and the currents supplied to each of them be practically independent of the condition of the others.

The invention consists in leading from the opposite poles of a dynamo-electric machine or group of the same, or from other suitable sources of electricity, main conductors which supply the required currents to the derived or distributing conductors, and in supplying to each set of distributing-conductors an independent intermediate conductor. Incandescent lights or other translating devices are placed in circuit between this intermediate conductor and each derived conductor. In this manner currents from the positive pole of the source traverse the translating devices to the intermediate conductor; thence through a second group of translating devices to the conductor connected with the negative pole of the source. Means are provided for compensating for any material variation in resistance which may be encountered between either the positive or negative conductor and the intermediate conductor, such variations being due to the withdrawal or insertion of translating devices.

The invention further consists in employing automatically-operating means for introducing and withdrawing the resistance from one side or the other of the intermediate conductors, as required, and in certain minor features, which will be hereinafter pointed out.

In the accompanying drawings, Figure 1 is a diagram illustrating an organization of apparatus and circuits adapted to carry out the invention. Fig. 2 illustrates a form of automatic resistance-controller, and Figs. 3 and 4 are diagrams illustrating modifications in the system of circuits.

Referring to the figures, A' A^2 A^3 represent three electric generators of any suitable type, and a' a^2 their respective collector-brushes. The generators are here represented as being connected in multiple arc between two main conductors, L' and L^2. Currents of one polarity—say the positive—are supplied to the conductor L', and currents of the opposite polarity to the conductor L^2. Conductors l' and l^2 are respectively led from the conductors L' and L^2, and conductors m^2 and n^2 are derived from the conductors l' and l^2, respectively. An intermediate conductor, l, connected normally with neither the conductor L' nor L^2, is provided with two branches, m' and n'. Between the conductors m' and m^2 are included in multiple arc translating devices b' b', and between the conductors n' and n^2, in a similar manner, other translating devices, b^2 b^2, are included. There are thus two multiple-arc groups connected in series between the conductors l' and l^2.

Let it be supposed that the translating devices b' b' and b^2 b^2 require electric currents of one hundred volts upon the two conductors m' m^2 or n' n^2, between which they are placed, then the difference of potential required upon the lines L' and L^2 will be two hundred volts.

It will be apparent that for the successful operation of the system the resistance between the conductors l and l' should be approximately equal to the resistance between the conductors l and l^2—that is to say, the number of translating devices between the conductors m' and m^2 should be approximately the same as between the conductors n' and n^2. It is found, however, that the resistance between these two pairs of conductors may be varied considerably without any material detrimental effect. For instance, several lights b' may be withdrawn from the circuit without materially modifying the brilliancy of the lights b^2; but beyond a certain point this would not be possible, and therefore means must be provided for maintaining an approximately constant balance between the line l and l' and l and l^2. To accomplish this in a convenient manner, a series of artificial resistances, r' r', are arranged so that they may be conveniently placed in circuit between the conductor l' or the main conductor L' and the conductor l when it is necessary to compensate for a withdrawal of the lamps from the group b' b', and likewise a second series of resistance, r^2 r^2, is arranged to be placed in circuit between the conductors l and l^2, to compensate for the withdrawal of lights from the group b^2 b^2. A switch, R', is for this reason connected with the line l, and a conductor, 1, leads from the line to the end of the series of artificial resistances r' r'. In like manner, the end of the series of resistances r^2 r^2 is connected by a conductor, 2, with the main line L^2. By moving the arm R' along the range of contacts c' c', between which the resistances r' r' are connected, the conductors l and l' may be connected with each other through a greater or less amount of resistance, and likewise the conductors l and l^2 may be connected through a greater or less resistance by moving a switch, R', along a series of points, c^2 c^2, between which the resistances r^2 r^2 are placed. These artificial resistances may with convenience be the imperfect lamps which constitute the by-product of the factory, and in this manner the energy consumed in traversing the artificial resistances will be productive of light, and thus to a certain extent utilized.

For the purpose of readily determining the condition of either group of lights and the amount of resistance necessary to be inserted to maintain the balance, any convenient form of volt-meters may be connected in conductors 4 and 5, as shown at D' and D^2, between the conductors l and l' and l and l^2, respectively.

The system of conductors l' and l^2 may be duplicated to any required extent, and a second system is indicated, l^3, l^4, and l^5, the organization being essentially the same as that described, and the currents traversing the conductors being employed for operating translating devices b^3 b^3 and b^4 b^4. A switch, R^2, is applied to the conductors l^3, l^4, and l^5 in the same manner as described with reference to the switch R', and for similar purposes. Other conductors, similar to the conductors m' and m^2, may be derived from the conductors l' and l, and the system generally may be expanded to any desired extent, and in practice it may be desired to organize the system with several of such supply-conductors, so that the resistances between the two sides of the system will be more likely to be approximately equal in the normal operation of the system.

The conductors L' and L^2 are respectively represented as being continued from the dynamos in the opposite direction, as shown at L^3 and L^4, and subsidiary supply-conductors l^6 l^7 l^8 are led from these conductors. Currents thus derived are employed for supplying translating devices b^5 b^5 and b^6 b^6, included between conductors m^5 and m^6 and n^5 and n^6, respectively. In this instance the number of lights included between the conductors m^5 and m^6 is represented as less than between the conductors n^5 and n^6, and therefore the switch R^3 is moved into contact with one of the switch-points c^3, which serves to connect the conductor l^7 with the conductor l^6 through an artificial resistance, r^3, of such value as to compensate for the relative increase of resistance which is occasioned between the conductors m^5 and m^6.

In Fig. 2 there is represented a special form of resistance-controller adapted to automatically introduce and withdraw the resistance from one side or the other, as is required by the operations in the translating-circuits. This consists of two electro-magnets, E' and E^2, which are respectively included in the conductors 4 and 5, including the volt-meters D' and D^2 upon the opposite sides of the conductors l. A lever, F, pivoted at f, carries two soft-iron cores, e' e^2, which respectively enter the coils E' and E^2, and serve to tilt the bar F

in one direction or the other, according as the attraction exerted by either coil preponderates over that exerted by the other. Should the resistance between the conductor l and l' be increased, and more current forced to traverse the coil E', then the lever F will be tilted to the left; or should the current through the coil E^2 exceed that through the coil E', then it will be tilted toward the right hand. The lever F carries the switch-arm R', and this is applied to the series of contact-points c' and c' and c^2 and c^2, so that the resistances r' and r' or r^2 r^2 will be automatically introduced and withdrawn from circuit, as required. A dash-pot, G, may be applied to an extension, g, at one end of the lever, if it is desired, for the purpose of rendering the movement of the lever gradual, and preventing it from responding too quickly to slight changes in the resistance of the circuit. As it may be desired in some instances to adjust this resistance by hand, a sprocket-wheel or other convenient device, H, is attached to the arbor f of the lever F, as shown.

In Fig. 3 an organization is illustrated in which the invention is applied to a system requiring a difference of potential of three hundred volts. In this instance the main lines L' and L^2 are supplied by one or more dynamo-electric machines, A' A^2, as before. These furnish a current of three hundred volts. The line l' leads from the line L', as before, and likewise the line l^2 leads from the line L^2. Instead of one intermediate conductor, however, l, two of such conductors, l and l^0, are employed, each leading from a switch, as shown at R' and R^0, respectively. The lights b' b' are included between the conductors m' and m^2, as before, and likewise the lights b^2 b^2 are placed between the conductors n' and n^2. The resistances r' and r^2 are inserted and withdrawn in the same manner as described with reference to Fig. 1. Another system of lights, b^0, is inserted between two conductors, o' and o^2, respectively, leading from the conductors l and l^0, so that the currents in passing from the conductor l' to the conductor l^2 traverse three groups of translating devices, and these absorb the current of three hundred volts. The resistance between the lines l and l' is regulated in the same manner as described in Fig. 1, and likewise the resistance between the line l^0 and l^2 by a switch-arm, R^0; but the resistance and consequent difference of potential between l and l^0 is regulated by another set of resistances, r^0, which may be brought into circuit by the combined action of the switches R' and R^0 when the resistance offered by the translating devices b^0 between these two becomes excessive.

In Fig. 4 an organization is illustrated in which the resistances r' and r^2 are applied directly to the conductors L' and L^2 at the generators A' and A^2, and the switch R' is employed for connecting the intermediate conductor L^5 through more or less of either resistance. This organization is desirable when a number of leads, l' l^2, l^4 l^5, and l^7 l^8, are derived from the conductors L' and L^2, for then only the unbalanced resistance occurring throughout the system need be compensated for. The intermediate conductors l, l^3, and l^6 are derived from the conductor L^5. It is evident that should the resistance between the lines l l' become greater than that between the lines l and l^2, and at the same time the resistance between the lines l^3 and l^5 become correspondingly greater than that between the lines l^6 and l^4, then these two differences will compensate for each other. In this manner the algebraic sum of the differences in the several derived systems may be compensated for by either the resistances r' or r^2.

I claim as my invention—

1. The combination, with a source of electricity and supply-conductors leading therefrom, of a normally-disconnected conductor and two groups of translating devices respectively included between said supply-conductors and said normally-disconnected conductor, substantially as described.

2. The combination, substantially as hereinbefore set forth, with a source of electricity and two supply-conductors leading therefrom, of a normally-disconnected conductor, two groups of translating devices respectively included between said supply-conductors and said normally-disconnected conductor, an adjustable artificial resistance, and a switch for inserting said resistance between one of said supply-conductors and said independent conductor at will.

3. The combination, with a source of electricity and conductors leading from the opposite poles thereof, of an independent conductor normally in connection with neither pole, two systems of translating devices respectively included between said independent conductor and the two supply-conductors, an adjustable artificial resistance normally out of circuit, and means for connecting said independent conductor with one or the other of said supply-conductors through more or less of said resistance.

4. The combination, substantially as hereinbefore set forth, with a source of electricity and supply-conductors leading therefrom, of two series of derived conductors leading from said supply-conductors, translating devices included in circuit between said derived conductors in multiple series, two artificial resistances normally out of circuit, and means for substituting more or less of either of said resistances for said translating devices.

5. The combination, with a source of electricity and two conductors leading from the respective poles thereof, of an independent conductor normally out of circuit with the generator, translating devices included between each of said supply-conductors and said independent conductor, two magnetizing-coils respectively included between said supply-conductors and said independent conductor, a lever tilted in one direction or the opposite by

a preponderance of current through the one or the other of said coils, and two artificial resistances, more or less of one or the other of which is introduced into circuit between one or the other of said supply-conductors and said independent conductor, according as the attractive force of the coil included between the same conductors preponderates over that of the other coil.

In testimony whereof I have hereunto subscribed my name this 15th day of March, A. D. 1886.

HENRY M. BYLLESBY.

Witnesses:
WM. LEE CHURCH,
CHARLES A. TERRY.