No. 801,261. PATENTED OCT. 10, 1905.

G. E. PALMER.

ELECTRIC LIGHTING SYSTEM.

APPLICATION FILED NOV. 16, 1903.

4 SHEETS—SHEET 1.

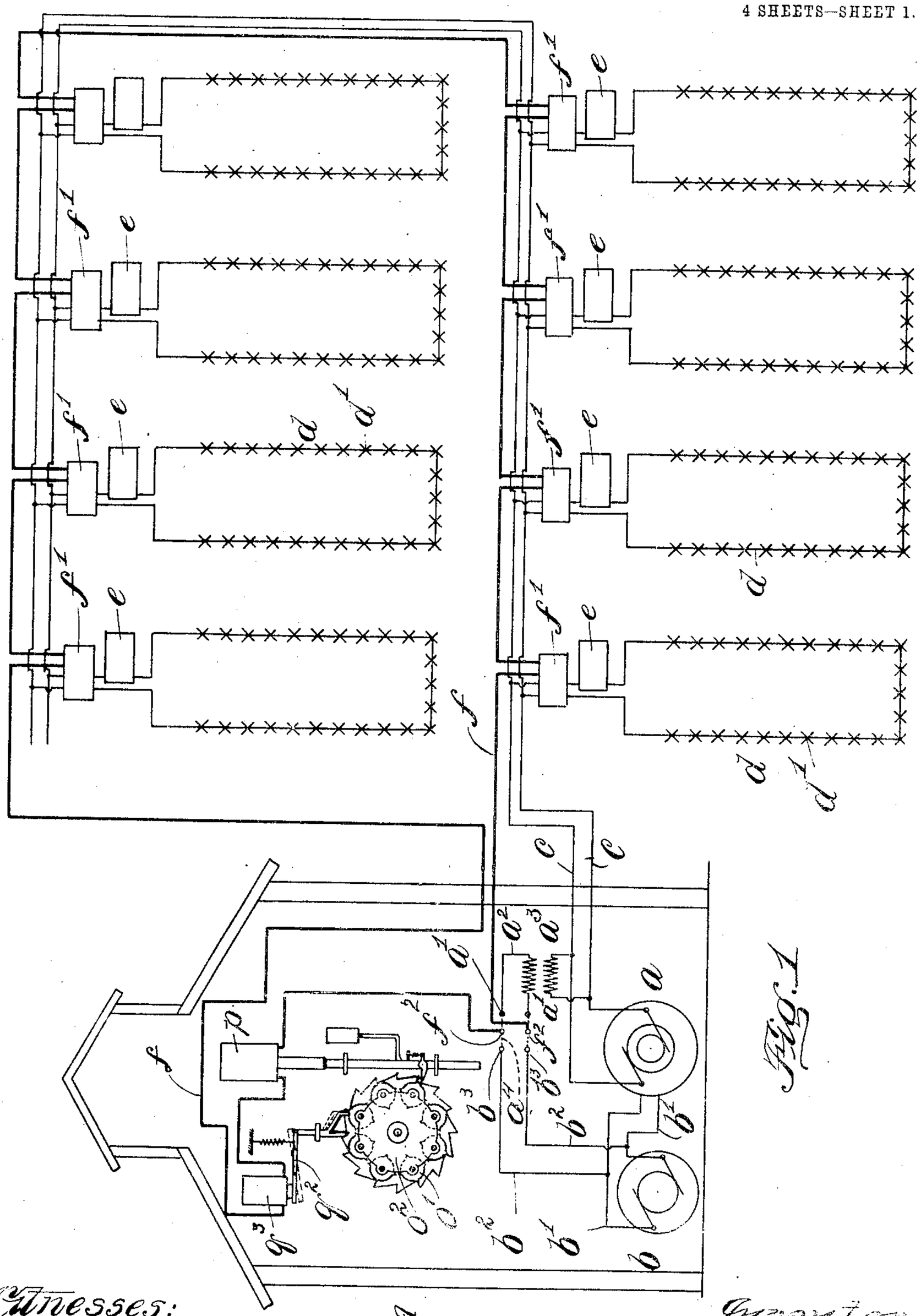

Fig. 1.

Witnesses:
Laurence Kennedy.
C. C. Stecher

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4 SHEETS—SHEET 2.

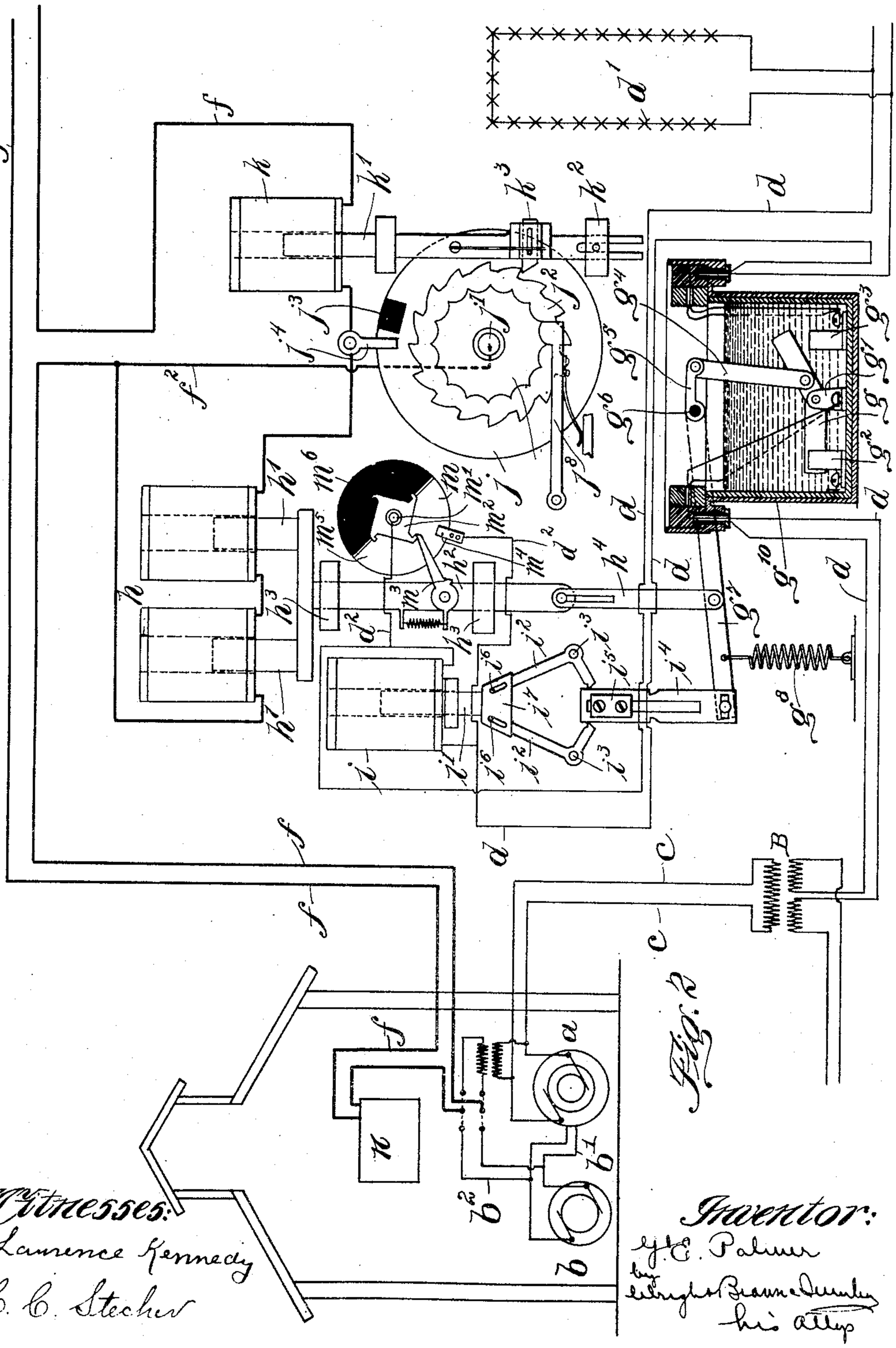

Fig. 2.

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4 SHEETS—SHEET 3.

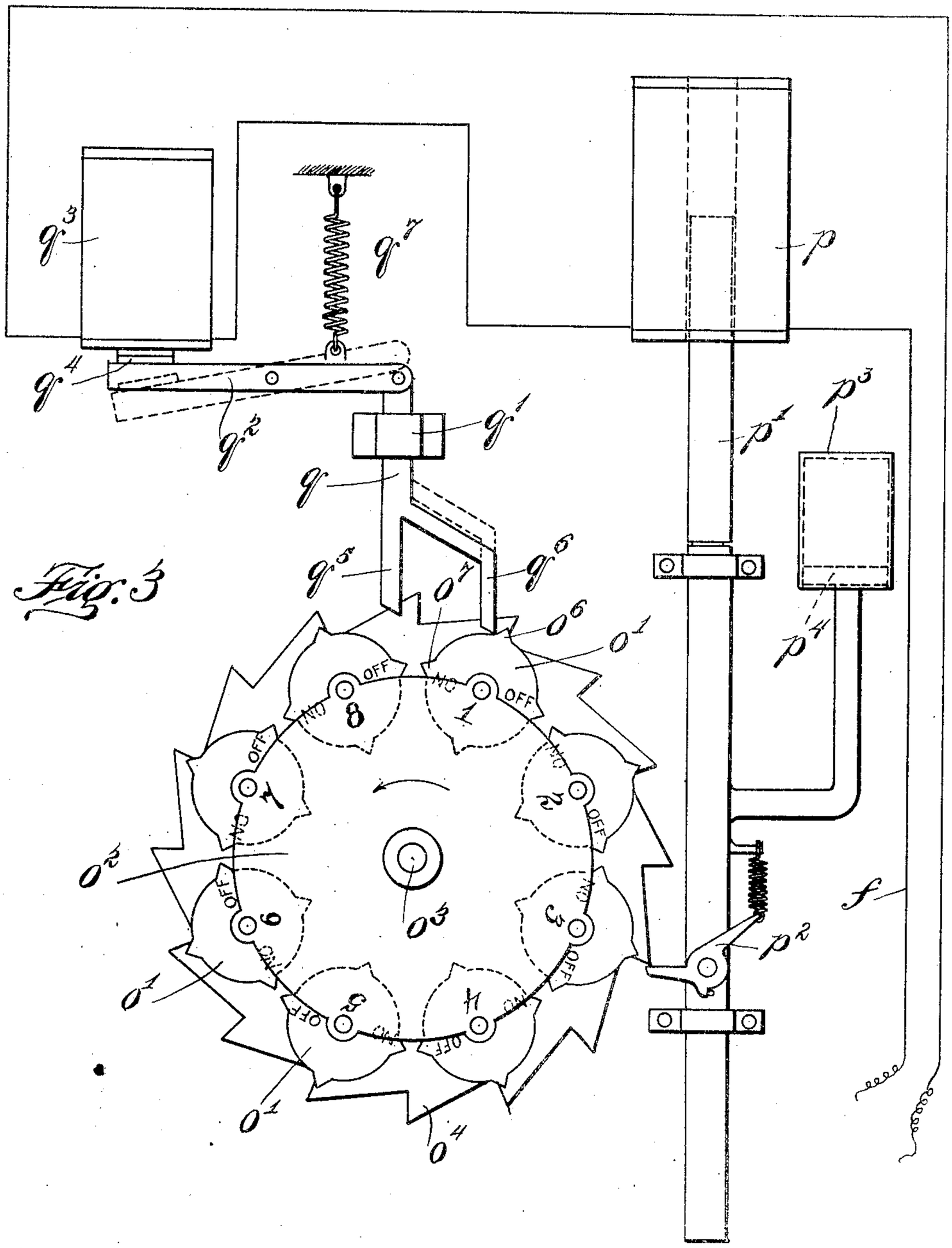

Fig. 3

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4 SHEETS—SHEET 4.

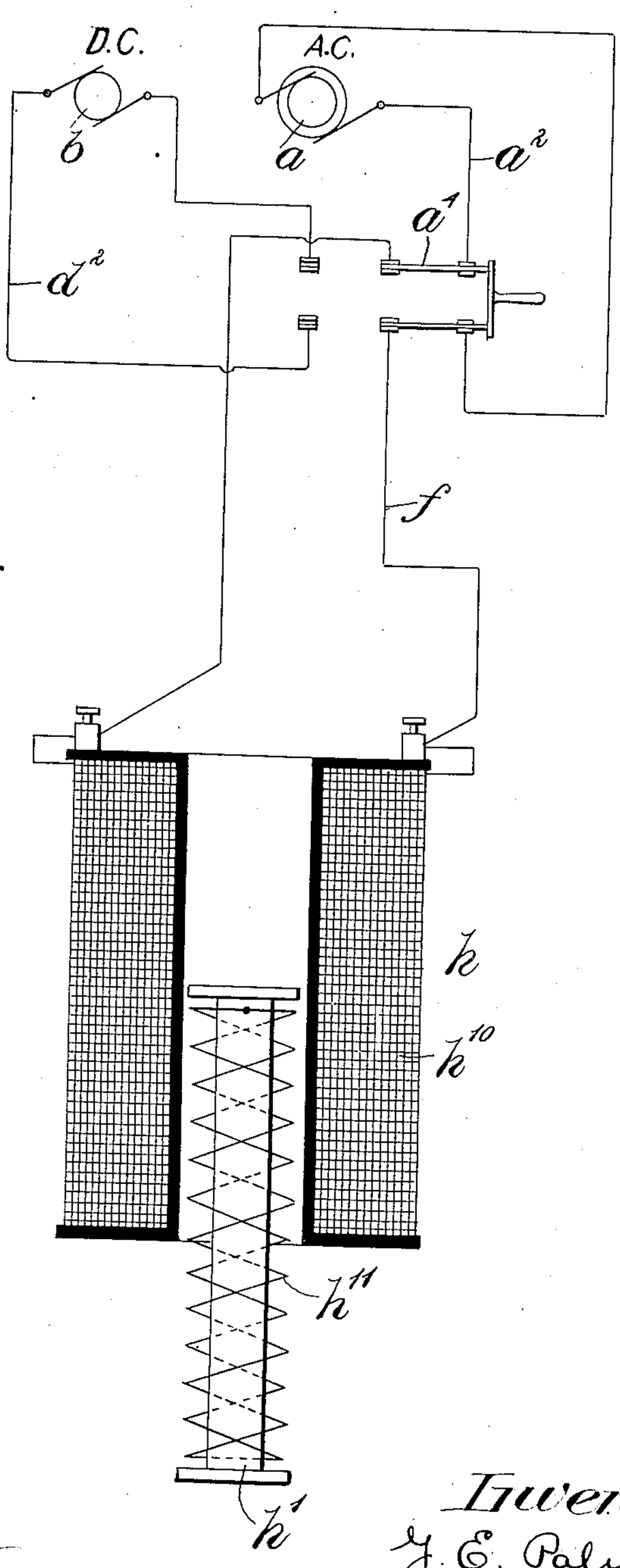

Fig. 4.

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UNITED STATES PATENT OFFICE.

GRANVILLE E. PALMER, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO CHARLES B. PRICE AND FRANK S. PRICE, OF BOSTON, MASSACHUSETTS.

ELECTRIC-LIGHTING SYSTEM.

No. 801,261. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed November 16, 1903. Serial No. 181,275.

To all whom it may concern:

Be it known that I, GRANVILLE E. PALMER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric-Lighting Systems, of which the following is a specification.

This invention has relation to electric-lighting systems, and it is illustrated as embodying a system in which arc-lamps are arranged in series and derive their power from a constant-potential electrogenerator. It has for its object to provide for each of the lamp-circuits a controller by means of which an operator at the central station may switch on or cut out any desired series of lamps independently of the others without interfering with the lamps of any other series. It further has for its object the provision of means at the point of control by which the operator may be informed of the condition of each lamp-circuit—that is, whether it is open or closed.

Referring to the accompanying drawings, Figure 1 represents diagrammatically an electric-lighting system embodying the invention. This figure illustrates the central station having a generator, a main circuit, a series of arc-lamp circuits in multiple therewith, and a controlling-circuit and mechanism associated therewith. Fig. 2 represents the switch mechanism for one of the lamp-circuits. Fig. 3 represents the mechanism located usually at the central station for illustrating the condition of the various electric-lighting circuits. Fig. 4 represents a form of magnet which may be used in my system.

Referring to the drawings and first to Fig. 1, A indicates a central station having therein an alternating-current generator a with a direct-current exciter b, these being illustrated conventionally.

c represents the main lighting-circuit having connected in multiple a plurality of independent arc-lighting circuits d d. The lamps in each circuit are indicated at d'. Interposed between the main circuit and the lamp-circuits are constant-current regulators, (indicated conventionally at e.)

f indicates the controlling-circuit, which is connected in series with the switch mechanisms, (indicated in Fig. 1 conventionally at f,) so that whereas the lamp-circuits d d are all in multiple with relation to each other the switch mechanisms which control said circuits are all in series, as will be hereinafter explained in detail.

The terminals of the circuit f are indicated at f^2 f^2, there being connected to those terminals a double-throw switch by means of which the circuit f may receive either an alternating current from the circuit c or a direct current from the exciter b. To this end it will be observed that with the exciter-circuit b' there is connected in multiple a circuit b^2, having its conductors terminating at stationary contacts b^3 in juxtaposition to those at f^2.

a' a' indicate stationary contacts which are the terminals of a secondary circuit a^2, there being a primary circuit in multiple with the main circuit c c', with a static transformer a^3, as shown.

By the switch mechanism (indicated in dotted lines at a^4) the circuit f may be connected with the alternating circuit a^2 or with a direct circuit d^2, so that either an alternating current or a direct current may be thrown on the line. This is provided for accomplishing certain results, as will be hereinafter explained.

A switch mechanism f' is shown in detail in Fig. 2, and reference may now be had thereto for explanation of the details of construction, it being understood that said mechanisms are duplicates.

g indicates a double-pole switch substantially of the form shown in my copending application filed June 1, 1903, Serial No. 159,471. This switch is immersed in an oil-bath contained within a receptacle g^{10}. The two conductors forming a portion of the lighting-circuit d are connected with the arms g', in which the movable double-pole switch g is mounted. g^2 indicates the stationary contacts, which are electrically connected and with which the movable contact may be engaged to short-circuit the lamp-circuit d when the lamps are cut out. g^3 indicates the stationary contacts, which are respectively connected with the conductors of the lamp-circuit d. These parts are shown in side elevation; but it will be understood that there are two contacts g^2 and two contacts g^3 and that the two arms or poles of the switch are electrically disconnected.

To operate the switch g and cut out or cut in the lamps, there is connected to the switch,

by means of a link g^4, an arm g^5 on the rock-shaft g^6 at the top of the receptacle g^{10}. To this shaft is connected a long lever g^7, which is normally held downward by a spring g^8, so as to cut out the lamps in the lamp-circuit. This lever is adapted to be moved upward by electromagnetic mechanism controlled by the starting-circuit f. (Shown in heavy black lines in Fig. 2.)

h indicates an electromagnet of the solenoid type, in which the cores h' are connected to a plunger or bar h^2, moving in guides h^3. The lower end of the plunger has a pin-and-slot connection, with the link h^4 pivoted to the lever g^7. Consequently when the electromagnet is energized the bar h^2 is drawn upward to throw the switch g and cut in the lights.

In order that the switch may be held in its operative position, the light-circuit d has included therein in series a solenoid magnet i, the core i' of which is adapted to actuate a latch mechanism which engages a device carried by the end of said lever g^7. The latch mechanism consists of two angular levers or latches i^2 i^2, pivoted at i^3 i^3, respectively, and having their ends adapted to enter notches in the sides of a slide i^4, attached by a pin-and-slot connection with the end of the lever g^7. The shorter arms of the latches project toward each other, and the slide i^4 moves between them, being guided in its movement by a guide i^5. The longer arms of the latches i^2 are provided with pins i^6, projecting through converging slots in a head i^7 upon the lower end of the plunger or core i'. By virtue of this construction when the slide i^4 is moved upward by reason of the energizing of the magnet h the current passing through the circuit d causes the energizing of the magnet i and a consequent upward movement of the plunger i', so that the pins i^6 i^6 in the latches i^2 are moved away from each other and the ends of the smaller arms of said latches are caused to enter the notches in the sides of the slide i^4, whereby the lever i^7 will be locked in its raised position so long as current continues to flow through the magnet i.

The magnet h is so wound and constructed that it will operate to raise the plunger h^2 only when a direct current is passed through the starting-circuit and is not affected by the passage of an alternating current. This is for a particular purpose, as will be subsequently explained.

In Fig. 4 is illustrated a form of magnet in which the plunger will be raised when a direct current is passed through its coils, but which will not be raised when an alternating current is sent through said coils. Said electromagnet is wound with coils h^{10}, which when a direct current is sent through the line will raise the plunger h'. Around the plunger is wound an endless coil h^{11} of copper wire. The currents induced in the coil h^{11} by the alternating current in the coil h^{10} tends to effect a repulsion of said coil h^{11} sufficient to overcome the magnetic attraction of the core h', so as to prevent the said core or plunger from rising. I do not herein specifically claim a magnet and its core or plunger thus constructed.

In order to selectively actuate any one of the switches g, the following mechanism is employed: A disk j of conductive material is rotatively mounted upon an arbor j' and is provided with a series of ratchet-teeth j^2 double in number to the light-circuits on the main line. This disk is provided with a section j^3 of insulating material, as indicated. j^4 indicates a brush which rests against the disk, and said brush and disk are connected in multiple with the magnet h by the branch circuit, (indicated at f^2.)

It will be understood that so long as the current can traverse the circuit f^2, including the disk j and the brush j^4, it will not traverse the coils of the magnet h, owing to the high resistance of the magnet. When, however, the brush j^4 rests upon the insulation j^3, the current in the starting-circuit f will be forced through the magnet h to energize the same and effect the actuation of the switch g. So long then as the brush j^4 rests upon the metallic portion of the disk j the passing of a current through the starting-circuit f will have no effect upon the magnet h and upon the switch g.

For the actuation or step-by-step rotation of the disk j a magnet k is placed in the circuit f, and its core or plunger k', which is guided by the guide k^2, carries a spring-pressed pawl k^3, adapted to engage the teeth of the ratchet j^2. The magnet k is so wound and constructed that it is energized to move the plunger k' by the passage of either a direct current or an alternating current through its coils. The purpose of this is that the rotary disk j for each of the lighting-circuits may be rotated each time a current is sent through the starting-circuit, whether the current be direct or alternating, whereas the mechanism which operates the switch g will be actuated only when a direct current is thrown onto the line.

Assuming that there are, for instance, eight lighting-circuits on the main line, and therefore eight independent switch mechanisms f', as indicated conventionally in Fig. 1, each disk j will be provided with sixteen teeth. For the purpose of centering or indexing the disk, it is provided with a toothed stop-wheel j^7, with which is adapted to coact a spring-pressed lazy-pawl j^8. Although but one disk j is illustrated, it will be understood that they are so arranged in the several switch mechanisms that no two of the insulated portions j^3 bear the same relation to the brush j^4 at the same time. This is, as described, in order that the magnets h may be selectively actuated one at a time. From this description it will be seen that by throwing the

switch a^4 to the right in Fig. 1, so as to throw the alternating current on the circuit f, the magnet k may be energized successively to effect the rotation of the disk j to a point until the insulated portion j^3 is just to the right of the brush j^4, as indicated in dotted lines in Fig. 2. Then by reversing the switch a^4 the direct current is thrown on the line. This causes the disk j to be advanced one step, and the brush j^4 will then rest upon the insulated portion j^3 of the disk. Thereupon the direct current will be caused to flow through the magnet h and the plunger h^2 will be raised to lift the switch-lever g^7 and cut in the lamp-circuit d. As soon as the lamp-circuit is cut in, of course, the current passes through the magnet i and the latch mechanism is actuated to maintain the switch g in its closed position through the medium of the devices hereinbefore described. The switch-lever a^4 is then moved to a neutral position to break the circuit f. From this description it has been made clear that an operator at the central station may cut in any one of the lamp-circuits d without cutting in the others, and it will be apparent that should the light-circuit be broken or opened the current will fail to pass through the magnet i, and consequently the latch mechanism i^2 will release the slide i^4, and the spring g^8 will open the switch g, so as to cut out the lamp-circuit d automatically by causing the arms of the switch g to engage the stationary contacts g^2. This is of particular value where the tub-transformer B is employed, as indicated conventionally in Fig. 2. Mechanism is provided, however, by means of which the operator at the central station may selectively cut out any one of the lamp-circuits b' without affecting any of the others of said circuits. This is accomplished by means of the following devices: m indicates a disk mounted to rotate upon a stud m'. This disk has associated with it a four-toothed ratchet m^2, adapted to be engaged and advanced with a step-by-step movement by a spring-tensioned pawl m^3, mounted upon the plunger h^2. A stationary brush m^4 bears upon the disk, and the arbor m' and the brush m^4 are connected in multiple with the lighting-circuit d by means of the conductors d^2. This branch circuit operates when closed to short-circuit the electromagnet i by reason of the greater resistance of the magnet. The disk m is formed of two sections, one, (indicated at m^5,) of metal, and the other, (indicated at m^6,) of insulating material. It has been stated that the ratchet m^2 has four teeth, so that it will be seen that for two steps of the disk the brush m^4 will rest upon the insulated section thereof, while for the next two succeeding steps the brush will rest upon the metallic portion.

When the branch circuit d^2 is closed by reason of the brush m^4 engaging the metallic section of the disk, the current through the lamp-circuit d (if the latter be closed) will fail to traverse the coils of the magnet i, but will be short-circuited through the disk m and the brush m^4; but when the disk occupies a position in which the brush m^4 engages the insulated section m^6, then the closing of the light-circuit d will cause the current to pass through the magnet i. The purpose of this construction will be explained in describing the operation of first cutting in and then cutting out the lamp-circuit.

In cutting in the lamp-circuit, the disk m will be in the relative position shown in Fig. 2, and the disk j will have been rotated until the insulated portion j^3 occupies the dotted position. Then the direct current will be thrown onto the line f with the result that the disk j will be given one step to bring the insulated portion j^3 under the brush j^4, in consequence of which the magnet h will be energized and the switch g move to cut in the lamp-circuit with the consequent result that the slide i^4 will be locked in its raised position by the closing of the current through the magnet i, the moving of the plunger h^2 will advance the disk m until the brush m^4 rests on the section m^6, and the lighting-current will be caused to pass through said magnet i, inasmuch as the branch circuit d^2 is now broken. Then the circuit f is interrupted and with the failure of current in the magnet h the plunger h^2 will drop, due to the pin-and-slot connection with the link h^4, although at this time the slide i^4 will remain locked in its raised position. The direct current will then be thrown a second time upon the line by the operator to advance the disk j one step; but before the magnet k has had time to mechanically actuate the disk the current will have passed through the magnet h to raise the plunger h^2 and rotate the disk m another step. As soon as the insulated section j^3 of the disk j passes beyond the brush j^4 the current through the magnet h is cut out by the circuit f^2 and the plunger h^2 will again drop. This leaves the switch-lever still raised and locked in its raised position by the passage of the current through the magnet i, so that upon the failure of the current in the lighting-circuit d the magnet i will be deënergized to automatically cut out said lighting-circuit. The reason for effecting this second step in the rotation of the disk m is to place the disk m in position to permit the operator to cut out the lighting-circuit upon the next step of said disk. While the disk m remains in the position to which it was last moved, according to this description the operator is free to send alternating and direct currents through the starting-circuit to rotate the disk j and other switch mechanisms f' without disturbing said disk m, for it will be remembered that except when the brush j^4 is engaged with the insulated section j^3 of the disk j, either an alternating current or a direct current may be thrown by the operator on

the line *f* to control some other lighting-circuit without affecting in any way the magnet *h* or the disk *m*, for the reason previously explained, and it will be further seen that by means of an alternating current the disk *j* in any one of the switch mechanisms may be brought to a proper position to permit the actuation of the magnet *h* by a direct current without disturbing or otherwise interfering with the other lighting-circuits.

Now the operation of selectively cutting out any one of the lighting-circuits will be explained. When a current is traversing the light-circuit *d* from the main circuit *c*, the disk *m* is in position with the brush m^4 upon the insulated section m^6, so that the next step of the disk will cause the brush to engage the metallic section to short-circuit the magnet *i*, and consequently to cut out the lamp-circuit the disk *j* is rotated with a step-by-step movement by intermittently throwing onto the line *f* the alternating current until the insulated section j^3 occupies the position shown in Fig. 2. Then the operator throws onto the line *f* the direct current with the result that the disk *j* is advanced one step, the magnet *h* is energized to raise the plunger h^2 and rotate the disk *m* one step, whereupon the magnet *i* is immediately short-circuited to permit its core to drop and effect the release of the slide j^4 by the latches, in consequence of which the switch *g* will be opened and the lighting-current short-circuited through the contacts g^2. Although the lamps in the circuit *d* are out, yet it is necessary for the operator to again throw the direct current onto the line to effect a second rotative step of the disk *m* in order that the circuit may be again thrown on the line by performing the steps hereinbefore described in that connection.

According to the foregoing description it is essential for the operator to selectively cut in and to selectively cut out the lamp-circuit to throw the direct current four times upon the line. This is by reason of the provision of the four-toothed ratchet. By the substitution, however, of a mechanical equivalent for the pawl-and-ratchet mechanism it is possible to cut in the light-circuit with a single energization of the magnet *h* and cut out the light-circuit with but one energization, so that it will be understood that there is no intention to limit the invention to the particular means which I have seen fit to illustrate.

One of the striking features of the invention is the employment of electric currents of different characteristics for effecting the rotation of the selective disks *j* and the actuation of the switches *g*. The employment of these currents enables the operator to freely rotate the disks to bring any one of them to a position to cut in or cut out a light without affecting any of the other light-circuits, since although the insulated section j^3 of any disk may during its rotation be engaged with the brush j^4, yet the magnet *h* will not be energized since to effect the rotation of the disk the operator is using alternating current.

It is quite apparent that to secure the best results the operator should be apprised at all times of the conditions of the various switch mechanisms and of the light-circuits, and to this end there is located at the central station a registering or indicating apparatus, (illustrated conventionally at *n* in Fig, 2, but shown in detail in Figs. 1 and 3.)

Referring to the last-mentioned figure, it will be observed that this indicating apparatus includes a plurality of indicating toothed disks *o'*, independently journaled upon a wheel or disk o^2, itself mounted to rotate upon an arbor o^3. Associated with the disk is a sixteen-toothed ratchet o^4, which when rotated with a step-by-step movement effects a similar rotation of the disk o^2, with a constant revolution of the disks *o'*. There is one indicating-disk *o'* for each lamp-circuit, and as eight circuits have been illustrated in Fig. 1 there are eight disks, and they bear the words "On" and "Off" for the purpose of indicating whether or not the lights are turned on or turned off. For each disk there is a symbol corresponding to the light-circuit.

p indicates a solenoid-magnet which is so wound and constructed that it will be energized to effect the actuation of the plunger or core *p'* by either an alternating or a direct current. This plunger carries a spring-tensioned pawl p^2, whereby when the plunger is raised the ratchet o^4 will be advanced one step. To the core *p'* is attached the piston p^4 of the dash-pot p^3, so that the ratchet will not throw over.

The disks *o'* are each provided with four teeth to correspond to the number of teeth on the disks *m*, and it is desired that each time one of the disks *m* is actuated the corresponding disk *o'* will be actuated. To this end there is arranged above the disks *o'* a forked slide *q*, movable in a guide *q'*. To the slide is attached the outer end of a lever q^2, bearing the armature q^4 of an electromagnet q^3. This magnet q^3 is similar to those at *h* in so far as it responds only to direct currents. The magnet *p* and the magnet *q* are both in series in the circuit *f*, so that each time an impulse is sent over the line the plunger *p'* is actuated irrespective of whether the current be direct or alternating, whereas the slide *q* is moved downward only when the direct current is sent over the line. The slide *q* is bifurcated, as stated, having the two fingers q^5 q^6. When the slide occupies its uppermost position, as indicated in dotted lines in Fig. 3, the disk o^2 may be rotated freely without the engagement of any of the disks or indicator-wheels *o'* with the fingers. The spring q^7 holds the slide in this position normally. When, however, the operator has effected the simultaneous rotation of all of the disks *j* in

the switch mechanism to bring the insulated section j^3 on any one of them into position to cut in or cut out one of the light-circuits, the ratchet o^4 is advanced step by step simultaneously with said disks, and if it be assumed, for instance, that the light-circuit d in Fig. 2 be numbered "1," so as to correspond with the number "1" indicator-wheel on the disk o^2 in Fig. 3, then said disk o^2 will occupy the position shown in Fig. 3 when the disk j in Fig. 2 occupies the position there shown. Then upon the turning of the direct current on the line the magnet q^3 will be energized coincidently with the energizing of the magnet p, so that instantly the slide q will be forced downwardly. The movement of the plunger p' will be necessarily slow on account of the dash-pot p^3, so that before the ratchet o^4 is rotated one step the finger q^6 will be in such position that it will engage one of the teeth o^6 on number "1" wheel o', so that as the wheel moves by it it will be given a quarter-turn. Then when the operator turns the direct current for a second time upon the line the rotation of the ratchet o^4 will cause the next tooth o^7 of number "1" wheel o' to engage the finger q^5, so that by this time number "1" wheel o' will have been given a half-turn, so that either the word "On" or "Off" will be exposed, corresponding to whether the lights in the circuit d are turned on or off. In this way the operator secures an automatic control over the indicating mechanism, so that said mechanism shows the condition of the various electric-light circuits. The words "On" and "Off" upon the several wheels or disks o' are alternately exposed and concealed, as illustrated. In selecting and turning on and off any one circuit the proper indicator-disk is selected and actuated simultaneously.

It is quite apparent that instead of employing an alternating current and a direct current any other currents having different characteristics may be employed either from the same generator or from two generators, as illustrated upon the drawings.

The lamp-circuits constitute a plurality of elements which are selected by an alternating current, but which are acted upon (cut in or cut out in this case) by a direct current. It is evident that other translating devices may be utilized in the work-circuits d d instead of lamps and that the selective system may be employed for a variety of purposes.

Having thus explained the nature of the invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches, means operable from one point and independent of said lamp-circuits for selectively cutting out said lamp-circuits, and means under the control of the first-mentioned means for automatically cutting out each lamp-circuit independently of the others on the failure of said circuit.

2. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches, each having an independent switch, means independent of said circuits for selectively actuating said switches to cut out the said circuits, and means made ready by the said selective means for automatically cutting out each lamp-circuit independently of the others upon the failure of said circuit.

3. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches, each lamp-circuit having a switch for cutting in or cutting out the lamp or lamps, and having an electromagnet in series therewith for holding the switch in closed position, electrically-actuated means for moving said switch to closed position, and means independent of said lamp-circuit and operable remotely from said switch for effecting the deënergization of said electromagnet for cutting out each lamp-circuit independently of the others upon the failure of said circuit.

4. An electric-lighting system comprising a lamp-circuit, a switch in said circuit, and means for automatically operating said switch to cut out said lamp-circuit upon the breaking or opening thereof, in combination with means operatable remotely from said switch for actuating said switch at will to cut out said lamp-circuit.

5. An electric-lighting system comprising a lamp-circuit, a switch in said circuit, and means for automatically operating said switch to cut out said lamp-circuit upon the breaking or opening thereof, in combination with means operatable remotely from said switch for opening or closing said switch at will.

6. An electric-lighting system comprising a lamp-circuit, a switch in said circuit, and means for automatically operating said switch to cut out said lamp-circuit upon the breaking or opening thereof, in combination with an operating-circuit having electromagnetic means for actuating said switch to cut out said lamp-circuit.

7. An electric-lighting system comprising a lamp-circuit, a switch in said circuit, and means for automatically operating said switch to cut out said lamp-circuit upon the breaking or opening thereof, in combination with an operating-circuit having electromagnetic means for opening or closing the said switch at will.

8. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches, each having an independent switch, in combination with a circuit independent of the lamp-circuits having a normally deënergized electromagnet for actuating each switch, a switch-holding magnet in each lamp-circuit, and means in said independent circuit for effect-

ing the selective energization of said switch-magnets to deënergize any one of the holding-magnets and cut out its lamp-circuit.

9. An electric-lighting system comprising a plurality of lamp-circuits, each having an independent switch, an electromagnetic device to hold said switch in a closed position, and a make-and-break appliance for said electromagnetic device, in combination with a circuit having means for actuating said switches and said make-and-break appliances.

10. An electric-lighting system comprising a lamp-circuit having a switch, an electromagnet for holding said switch in closed position, a make-and-break appliance for said electromagnet, in combination with means remotely controlled, for actuating said appliance whereby said electromagnet may be cut in or cut out at will.

11. An electric-lighting system comprising a lamp-circuit having a switch, an electromagnet in series in said circuit for holding said switch in closed position, a make-and-break appliance for said electromagnet, in combination with an independent circuit having electromagnetic mechanism for actuating said make-and-break appliance and means in said independent circuit for actuating said switch.

12. An electric-lighting system comprising a lamp-circuit having a switch, an electromagnet in series therewith for holding said switch in closed position, a rotatory make-and-break appliance for said electromagnet, in combination with remotely-controlled means for imparting a step-by-step rotation to said appliance, means for actuating said switch, and a single circuit including said remotely-controlled means and said actuating means.

13. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches, each having in series both a switch and an electromagnetic device for holding the switch in a closed position, means for opening each switch when it is released by said holding device, an independent circuit having a make-and-break appliance for short-circuiting each of said holding devices, and also having means for closing said switches.

14. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches, each branch having in series a switch, an electromagnetic device for holding said switch in closed position, a make-and-break appliance in each lamp-circuit in multiple with the holding device therein to short-circuit said holding device, and an independent circuit including electromagnetic mechanism for actuating said make-and-break appliances and also including electromagnetic mechanism for closing said switches.

15. An electric-lighting system comprising a plurality of lamp-circuits each having a switch, in combination with means, one for each circuit, for moving each switch in opposite directions, a selector for each of said means, and provisions including a single circuit for operating said selectors simultaneously and effecting the actuation of a single means.

16. An electric-lighting system comprising a plurality of lamp-circuits in multiple branches each branch having a switch in series, in combination with an actuator for each switch, a selector for each actuator, provisions in consequence of which each actuator effects the opening or closing of its switch, and a single circuit controlling said selectors.

17. An electric-lighting system comprising a plurality of lamp-circuits, and a circuit having mechanism by which a lamp-circuit is selected by an electrical current having certain characteristics, and cut in or cut out by electrical current having certain other characteristics, said currents being employed successively.

18. An electric-lighting system comprising a plurality of lamp-circuits each having a switch, an electromagnetic selector for each switch, an electromagnetic actuator for each switch, and a circuit including said electromagnetic selectors and said electromagnetic actuators, and means for throwing on said circuit either an alternating current or a direct current whereby a lamp-circuit is selected by one of said currents and is cut in or out by the other of said currents.

19. An electric-lighting system comprising a lamp-circuit and a switch therefor, in combination with a circuit having an electromagnetic switch-actuator and an electromagnetic selector, and means for throwing onto said circuit either an alternating current or a direct current, said actuator and selector being constructed and arranged whereby said actuator responds to one of said currents and the selector responds to both of said currents.

20. An electric-lighting system comprising a lamp-circuit and mechanism by which the lamp-circuit is cut in or cut out by a direct current, and is selected for cutting in or cutting out by an alternating current.

21. An electric-lighting system comprising a plurality of lamp-circuits, and a circuit having selecting and actuating mechanism by which a lamp-circuit is selected by an alternating current and cut in or cut out by a direct current.

22. An electric-lighting system comprising a plurality of lamp-circuits, and a circuit having mechanism by which a lamp-circuit is selected by an electrical current having certain characteristics, and cut in or cut out by an electrical current having certain other characteristics, and means for connecting said circuit with different sources of electrical supply.

23. An electric-lighting system comprising a plurality of lamp-circuits, and a circuit having selecting and actuating mechanism by which a lamp-circuit is selected by an alternating current and cut in or cut out by a di-

rect current, and means for throwing on said circuit either an alternating or a direct current.

24. An electric-lighting system comprising a lamp-circuit, and a switch therefor, in combination with a circuit having an electromagnetic switch-actuator, and an electromagnetic selector for said actuator, said actuator and selector being constructed and arranged whereby they both respond to a current having certain characteristics whereas only one of them responds to a current having different characteristics.

25. An electric-lighting system comprising a lamp-circuit, and a switch therefor, in combination with a circuit having an electromagnetic switch-actuator, and an electromagnetic selector for said actuator, said actuator and selector being constructed and arranged whereby the actuator responds to a direct current, and the selector responds to both a direct and an alternating current.

26. An electric-lighting system comprising a plurality of lamp-circuits, selective mechanism independent of said circuits and operable remotely from said circuits for controlling said circuits, and indicating mechanism for showing the condition of said circuits, said indicating mechanism having a support with a separate automatic indicator for each circuit.

27. An electric-lighting system comprising a plurality of lamp-circuits, selective mechanism independent of said circuits and operable remotely from said circuits for controlling said circuits, and indicating mechanism located at the point of control for simultaneously indicating the condition of all of said circuits, said indicating mechanism having a single indicator for each circuit, and means for automatically operating each indicator.

28. An electric-lighting system comprising a plurality of lamp-circuits, a circuit having mechanism for selectively controlling each of said lamp-circuits, and electromagnetic mechanism in said controlling-circuit for showing the condition of said circuits, said mechanism having a movable support, an electromagnet for actuating said support, an indicator on said support for each circuit, and an electromagnet for controlling said indicators.

29. An electric-lighting system comprising a plurality of lamp-circuits, a circuit having a switch-actuator and a selector for each circuit controlled by currents of different characteristics, and indicating mechanism in said controlling-circuit including selecting and actuating mechanism controlled by said currents of different characteristics.

30. The combination with a movable member having one or more stops in its sides, of one or more latches pivoted between their ends to engage said stops, an electromagnet, and an armature having connected thereto a member with inclined edges to engage and move the free end or ends of said latch or latches and cause the engagement of the latch or latches with the stop or stops on the movable member.

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

GRANVILLE E. PALMER.

Witnesses:

C. C. STECHER,

M. B. MAY.