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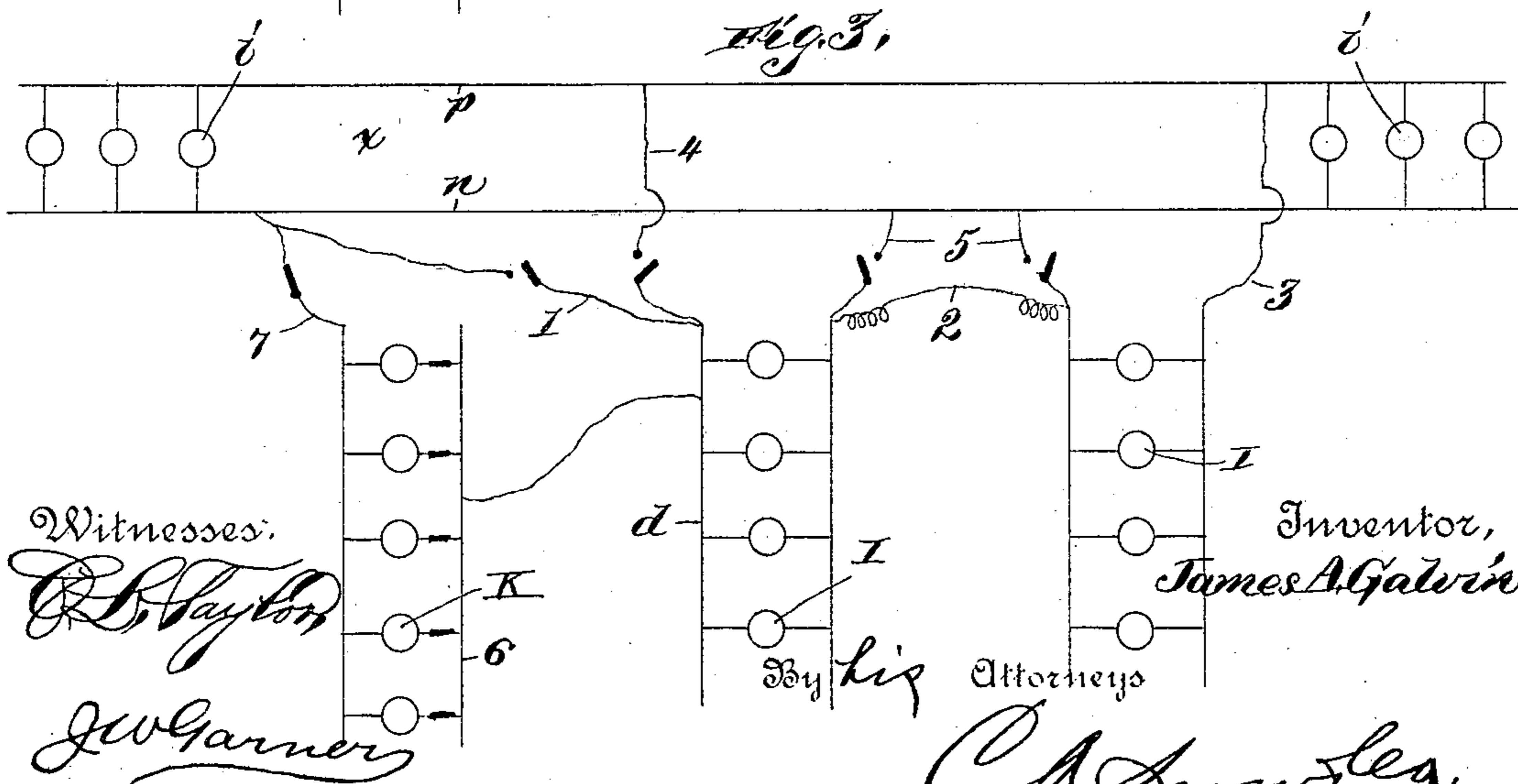
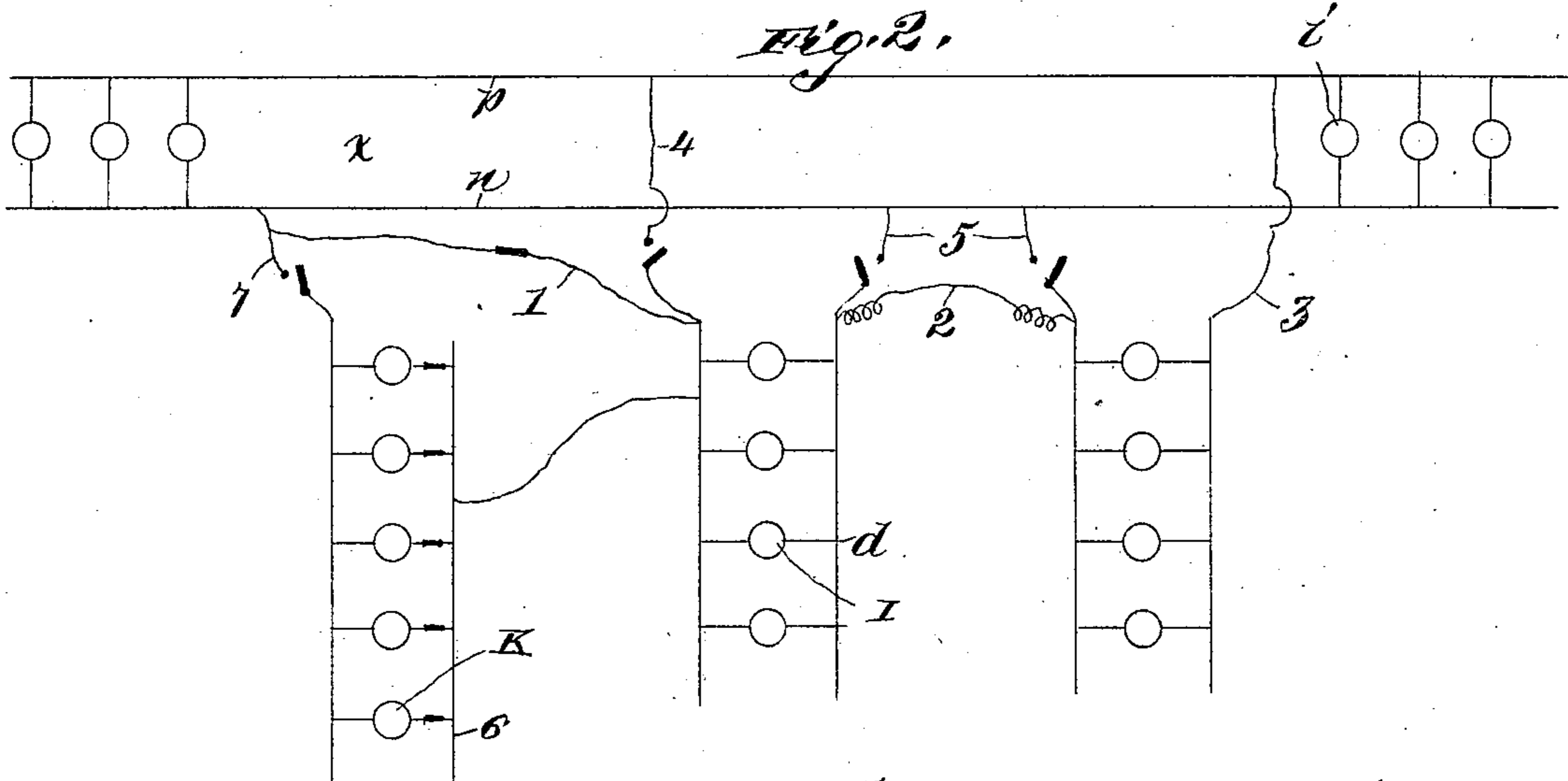
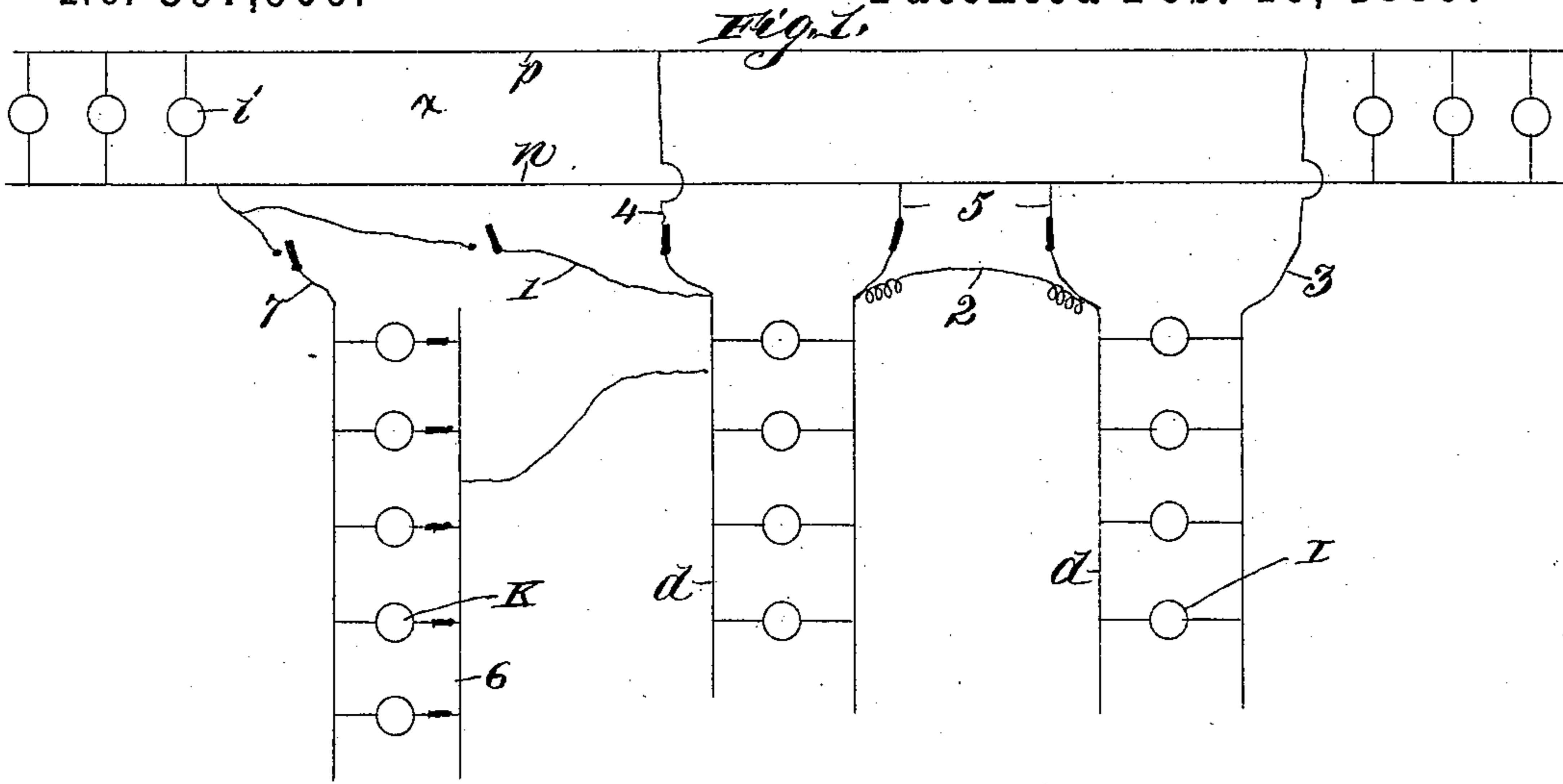
3 Sheets—Sheet 1.

J. A. GALVIN.

ELECTRIC LIGHTING SYSTEM.

No. 397,906.

Patented Feb. 19, 1889.



Witnesses:

R. B. Taylor

J. W. Garner

Inventor,
James A. Galvin,

By *his* Attorneys

C. A. Howells,

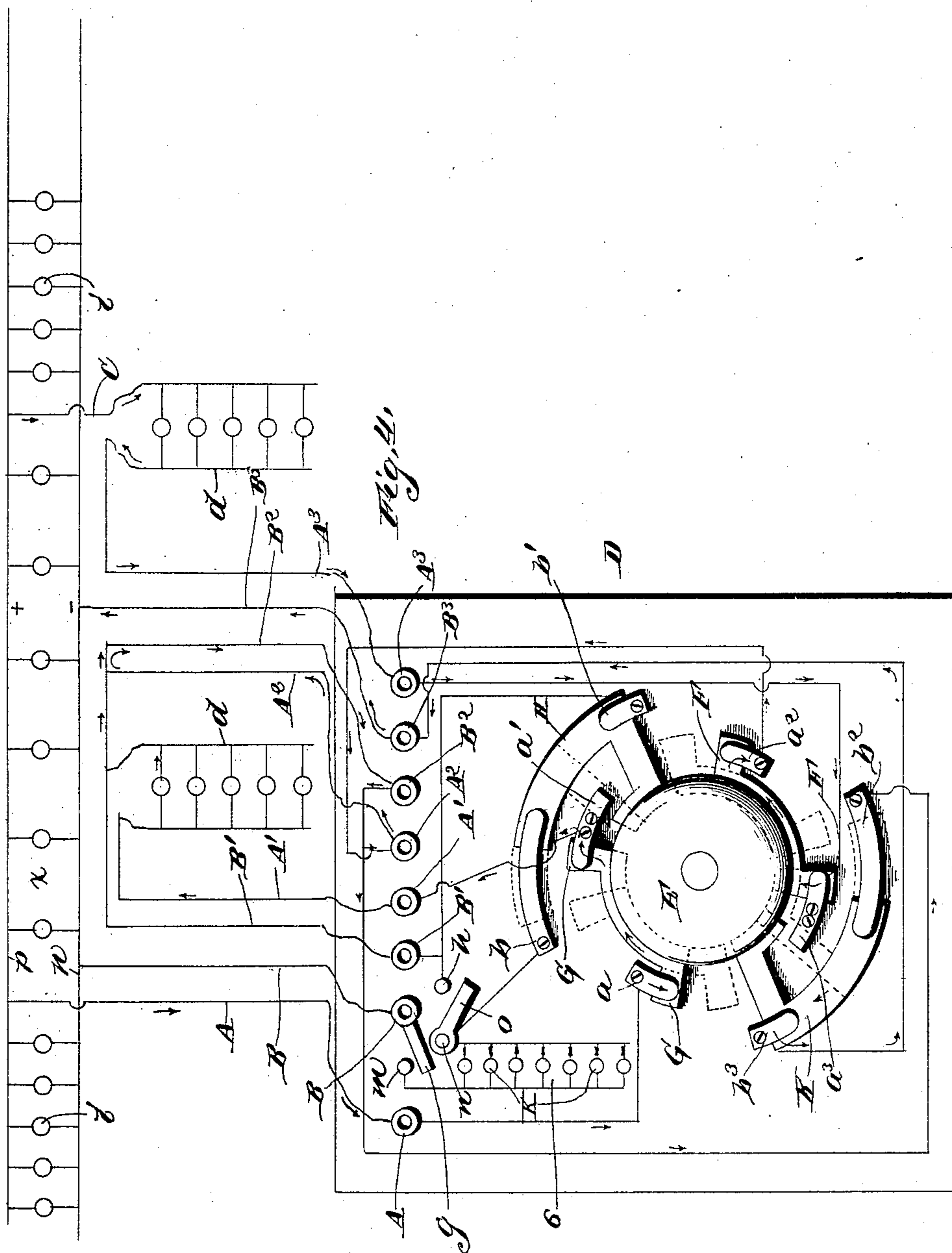
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3 Sheets—Sheet 3.

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Fig. 5.

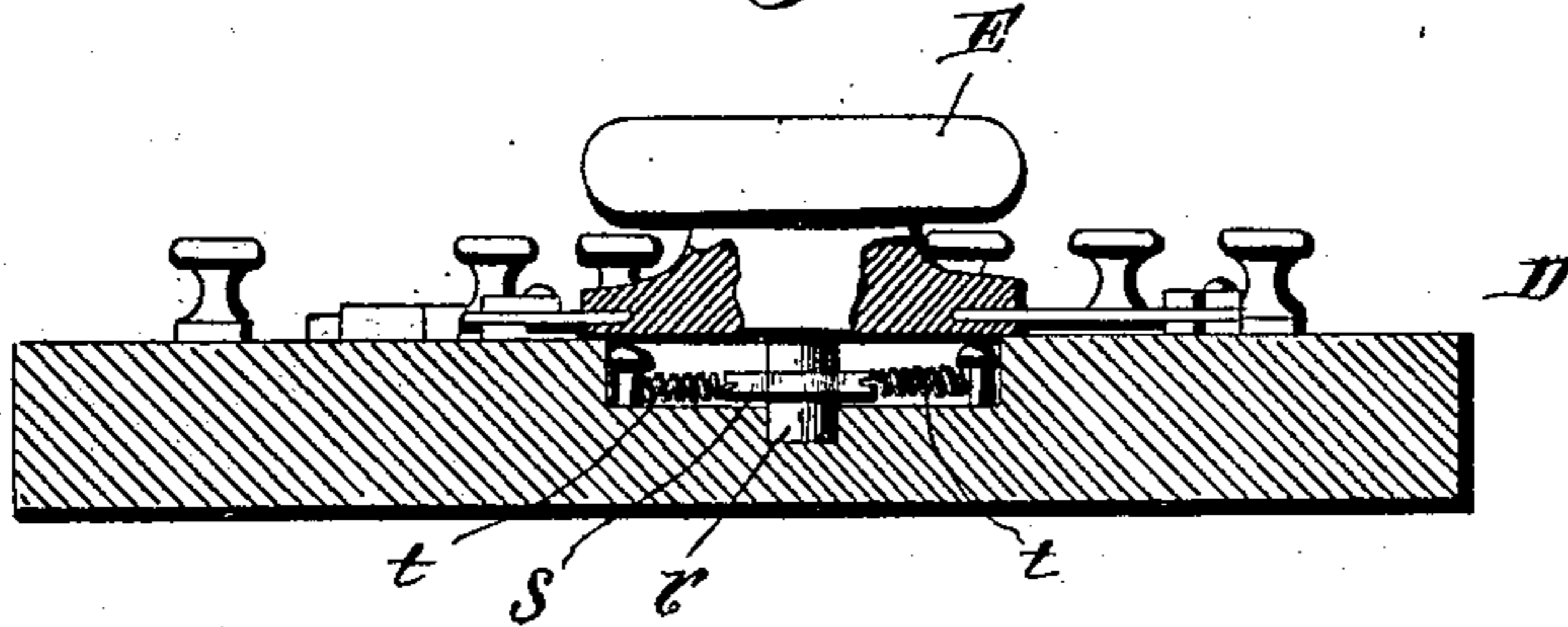
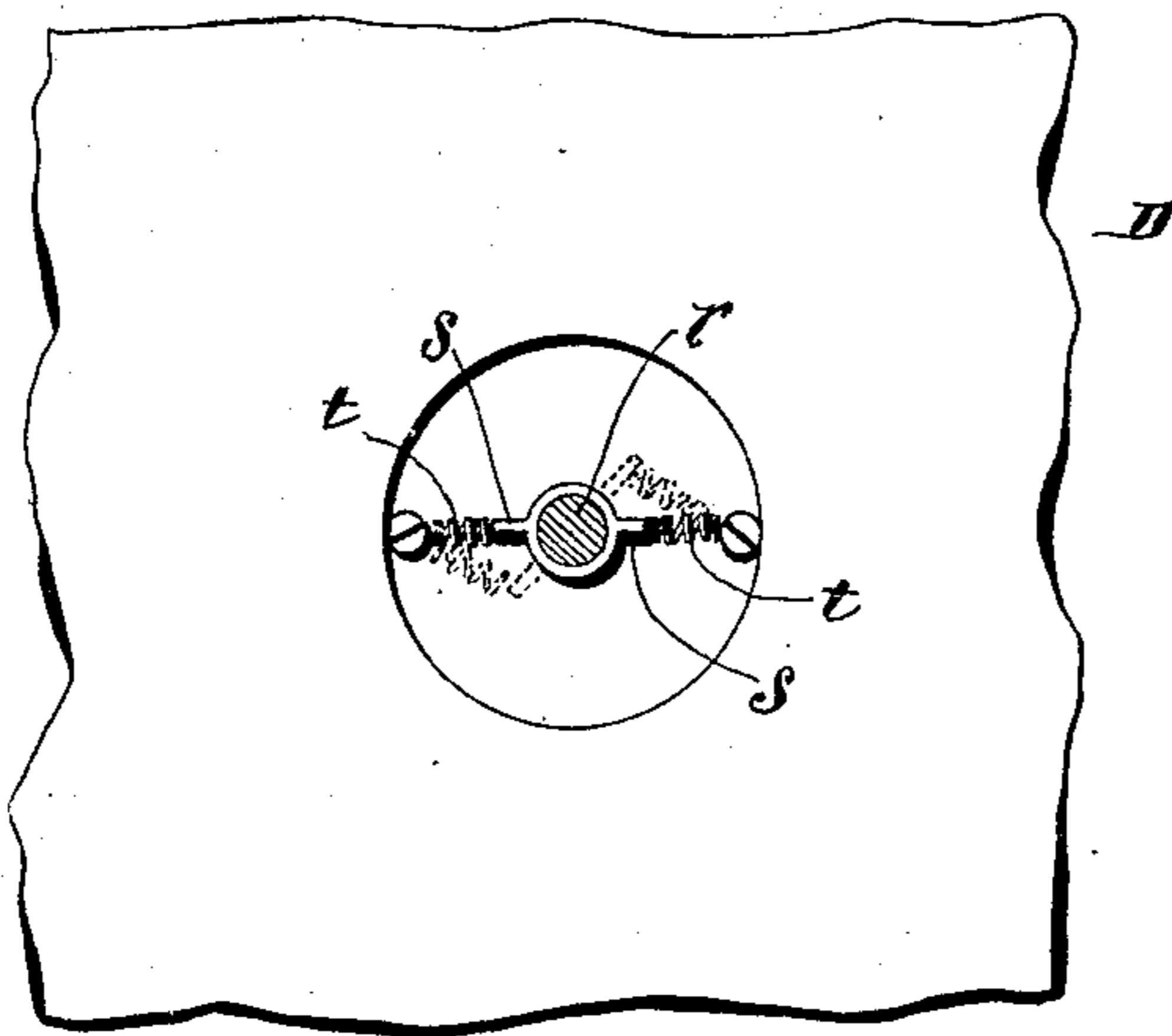


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES A. GALVIN, OF STEELTON, PENNSYLVANIA.

ELECTRIC-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 397,906, dated February 19, 1889.

Application filed April 16, 1888. Serial No. 270,799. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. GALVIN, a citizen of the United States, residing at Steelton, in the county of Dauphin and State of Pennsylvania, have invented a new and useful Improvement in Incandescent Electric-Light Systems, of which the following is a specification.

My invention relates to an improvement in incandescent electric-light systems; and it consists in the combination of the main lines having lamps in multiple arc and branch lines having groups of lamps in multiple arc, said branch lines being arranged in series with relation to each other and connected to the main lines, whereby the power of the lamps in the said branch lines will be reduced without affecting the power of the lamps in the main lines.

My invention further consists in the combination of the main line, the branch lines having the electric lamps, the switch for connecting said branch lines with the main lines either in series with each other or with the main lines in multiple arc, and the shunt-circuit, including one or more electric lamps and adapted to be connected to or disconnected from the main line; and my invention further consists in the peculiar construction and combination of devices that will be more fully set forth hereinafter, and particularly pointed out in the claims.

The object of my invention is to provide a means for reducing the intensity of the electric lamps included in the branch circuits without affecting the lamps in the main circuit and without including rheostats or other resistances in the branch lines to preserve the electrical balance.

In the accompanying drawings, Figure 1 is a diagram of an electric-light system embodying my improvements, showing the branch conductors connected with the main conducting-wires in multiple arc and arranged for burning the lamps with full brilliancy. Fig. 2 is a similar view showing the branch lines or conductors connected with the main conducting-lines in series, so as to reduce the brilliancy of the lights; and Fig. 3 is a similar view showing the branch lines connected with the shunt-circuit and with the main line

in series, so as to still further reduce the brilliancy of the lights. Fig. 4 is a similar view showing the system arranged for lighting a theater or other building, and illustrating my improved switch for connecting the branch lines or conductors with the main lines or conductors either in series or in multiple arc. Figs. 5 and 6 are detail views of my improved switch.

I have discovered that by connecting branch lines or conductors of an electric-light system with the main line or conductor in series with each other the brilliancy of the lights will be reduced, and I have further discovered that by including a shunt-circuit or conductor having electric lamps with the main and branch lines in series the brilliancy of the lights in the branch lines will be still further reduced.

It becomes of importance in theaters, hotels, depots, and other public edifices employing the incandescent system of electric lamps to vary the brilliancy of the lamps in the branch lines without affecting the brilliancy of the lamps, if any, included in the main line of conductors. This has been heretofore accomplished by including rheostats with the branch lines, so as to offer additional resistances to the electric current. This mode is objectionable on account of the cost of the rheostats and of their liability to get out of order; and is further objectionable on account of impracticability of providing every building in which electric lights are used with such rheostats by reason of the cost of the same.

Reverting to my improved apparatus for varying the intensity of the lights in the branch lines, in Figs. 1, 2, and 3, x represents the main wires or conductors, of which p is the positive wire and n is the negative wire. The usual incandescent lamps, i , are connected to the said negative and positive wires of the main line in the usual manner, as shown.

d represents branch lines or conductors, of which there are two or more, and in each of which is included one or a series of incandescent lamps, l .

1 represents a conducting-wire, which connects one pole of one of the branch lines with the main negative wire n .

2 represents a conducting-wire, which con-

nects opposite poles of the branch lines, and 3 represents a conducting-wire, which connects one pole of the last of the series of branch lines with the main positive wire p .

5 4 represents a conducting-wire, which connects one pole of one of the branch lines with the main positive wire p , and 5 represents conducting-wires, which connect similar poles of the branch lines to the main negative wire
10 n . The wires 1 and 4 would be supposed to be each provided with a device to interrupt or make complete circuits therethrough.

6 represents a branch line having a series of incandescent lamps in multiple arc, and
15 the said branch line is connected to the wire 1 and to one of the branch lines d by means of conducting-wires 7, one of which is also provided with a device to make and break the circuit. By means of the wire 7 the branch
20 line 6 is connected in shunt-circuit with the main and branch lines, as will be understood.

In order to cause the lamps in the branch wires d to burn with full power, the wires or
25 conductors 1 and 7 are opened, so as to cause the current to pass from the main wires p and n , through the wires 4, 5, and 3, to the branch lines d in multiple arc in the usual manner. In order to reduce the power of the
30 lamps I, the wire 4 is opened, so as to break the circuit, and the wire 1 is closed, so as to make the circuit, and the current then flows from the main wires through the branch wires
35 d , the latter being thereby connected to the main wires in series and causing the lamps I to add so much resistance to the branch lines as to reduce the brilliancy of the lights.

In order to still further reduce the brilliancy of the lamps I, the wire 1 is open, so as
40 to interpose the branch line 6 in the circuit with the main lines and branch lines d , and thereby interposing so much additional resistance to the branch lines connected in series that the lamps I will burn very dimly. By cutting out one or more of the lamps K in
45 the branch circuit 6, the lamps I in the branch circuits d will burn still less brilliantly, and this process of cutting out the lamps K in the branch circuit 6 may be continued until the
50 current passing through the filaments in the lamps I will be only sufficient to heat said filaments to a red heat, and thereby almost entirely extinguish the light.

Figs. 1, 2, and 3 and the foregoing description disclose the elementary principles of my
55 invention. I will now proceed to describe my improved system of electric lights as reduced to practice and adapted for use in theaters or other buildings, in which it may be desirable to vary the brilliancy of the lights in the
60 branch lines without affecting the lights in the main line.

Referring to Figs. 4 and 5, a is the main line of conductors, in which are the lamps i in
65 multiple arc. d represents the branch lines of conductors. A represents a conducting-wire, which is connected to one of the wires—say, the positive wire—of the main line. B

represents a conducting-wire which is connected to the opposite wire—say, the negative
70 wire—of the main line. B^3 represents a conducting-wire which is connected to the negative wire of the main line at a point between the branch lines d . One pole of one of the
75 branch lines has a conducting-wire, A' , attached thereto, and from the opposite pole of the said branch line extends a wire, B^2 , which connects with a wire, B' , and also connects
80 with a wire, A^2 . From one pole of the other branch line, d , extends a conducting-wire, A^3 , and from the opposite pole of the latter branch line extends a conducting-wire, C, which connects with the positive wire of the
main line.

D represents a switch-board, which is provided with a series of binding-posts, A, B, B',
85 A' , A^2 , B^2 , B^3 , and A^3 , which are connected to the similarly-lettered conducting-wires before described.

a represents a conducting-plate, which is
90 arranged on the switch-board and is connected to the binding-post A. b represents a conducting-plate, which is connected to a suitable wire or electrical conductor having a switch which is adapted to be connected to
95 or disconnected from the post B by means of a switch-arm, g . a' is a conducting-plate which is electrically connected to the post A' . b' represents a conducting-plate which is electrically connected to the post B' and to
100 a contact-point, h . a^2 represents a conducting-plate which is electrically connected to the post A^2 . a^3 represents a conducting-plate, which is electrically connected to the post A^3 . b^3 represents a conducting-plate
105 which is electrically connected to the post B^3 , and b^2 represents a conducting-plate which is electrically connected to the post B^2 . The said conducting-plates are arranged in two concentric circles, the plates a , a' , a^2 , and a^3
110 constituting arcs of the inner circle, and the plates b , b' , b^2 , and b^3 constituting arcs of the outer circle, and all of said plates being arranged at such a distance apart that the space
between them cannot be traveled by an electric arc when said plates are disconnected. 115

E represents a revoluble hub or disk which is pivoted on the switch-board and is arranged
concentrically with the conducting-plates. The said hub or disk is provided with a pair
120 of radial connected conducting-arms, F, which are adapted to make and break connection between the plates a^2 and a^3 , a similar pair of
connected radial conducting-arms, G, which are adapted to make and break connections
125 between the plates a and a' , a sector-shaped connecting-arm, H, which is adapted to make and break connection between the plates b' and a' , and is at all times in electrical contact with the
plate b ; and said hub or disk is further provided with a similar sector-shaped conducting-
130 arm, which is adapted to make and break connection between the plates b^3 and a^3 , and is at all times in electrical contact with the plate b^2 .

6 represents a multiple-arc series of lamps,

K, which are connected electrically to a contact-point, *m*, and to a contact-point, *n*, which latter has a switch-arm, *o*, that is adapted to make and break connection with the point *h*.

5 The switch-arm *g* before described is adapted to make and break connections between the post B and either of the points *m n*.

In the center of the switch-board D, on the front side thereof or in the opposing side of
10 the disk or hub, is made a recess, through which extends the pivotal shaft *r* of said disk or hub, and attached rigidly to the said shaft is an arm, *s*, which projects in opposite directions therefrom. *t* represents a pair of ex-
15 tensile coiled springs, which have their outer ends connected to fixed points in line with the center of the shaft, and have their inner ends connected to the ends of the arms *s*.

The operation of my invention is as follows:

20 When the switch-lever *g* is in contact with the point *n* and the disk or hub of the switch is turned so as to make connection between the plates *a a'*, the plates *b* and *b'*, the plates *a²* and *a³*, and the plates *b²* and *b³*, the branch
25 lines *d* are connected with the main line in multiple arc, as shown in solid lines in Fig. 4, and illustrated diagrammatically in Fig. 1. When the switch, disk, or hub is turned so as to disconnect the plates *a*, *b³*, *a²*, and *b'* and
30 establish connection between the plates *a'*, *b*, *a³*, and *b²*, as illustrated by dotted lines in Fig. 4, the branch lines *d* will be connected with each other in series and with the main line, the wires A, B', A², and B³ being dead or
35 open-circuited. When thus arranged with the branch lines connected in series with the main line, the brilliancy of the lamps in said branch lines will be very much reduced, and will only give forth a soft mellow light. This arrange-
40 ment of the system corresponds with that illustrated diagrammatically in Fig. 2. In order to still further reduce the power of the lamps in the branch circuits *d*, the switch-arm *g* is caused to make contact with the con-
45 tact-point *m* of the multiple-arc circuit 6, so as to connect said circuit in series with the branch circuits *d* and the main line, this arrangement corresponding with that illustrated diagrammatically in Fig. 3. By cutting out
50 one or more of the lamps in the circuit 6 the lights will still further be reduced, as before stated. By cutting off all of the lamps in the said circuit 6 the connection between the branch and main lines will be broken, and
55 the lamps in the branch lines will be entirely extinguished, as will be readily understood. When the hub or disk of the switch is turned, its initial movement is resisted by the springs *t*, as the latter become compressed by the
60 arms *s*, until said arms reach the dead-center,

or, in other words, align with the outer ends of the springs. As the disk or hub is turned past the dead-center, the said springs expand and thereby throw the switch instantaneously to the end of its movement, and thus cause
65 the switch to so rapidly change the connections between the wires as to almost entirely prevent sparking.

For the purpose of description, I have here-
inbefore referred to the terminals of the
70 branch circuits as being connected, respectively, with the positive and negative wires of the main line; but I do not wish to limit myself to the precise arrangement of the con-
ducting-wires hereinbefore described, as the
75 same may be varied without impairing the efficiency of the system or departing from the spirit of my invention.

Having thus described my invention, I
claim—

1. The combination of the main conductors having the lamps in multiple arc, the branch conductors having the lamps in multiple arc, and having one terminal connected to one
85 main conductor and the other connected to an electrode, *a³*, the similar branch conductor with multiple-arc lamps, and having one terminal provided with an electrode, *a'*, and the other connected to electrodes *b'*, *b²*, and *a²*, the electrode *a*, connected to the same main
90 conductor, the electrodes *b³* and *b*, connected to the other main conductor, and the circuit-closers between the electrodes *b b' b² b³ a a' a² a³*, substantially as described.

2. The combination of the main conductors
95 having the lamps in multiple arc, the branch conductors having the lamps in multiple arc and having one terminal connected to one main conductor and the other terminal con-
nected to an electrode, *a³*, the similar branch
100 conductors with multiple-arc lamps and having one terminal provided with an electrode, *a'*, and the other connected to electrodes *b'*, *b²*, and *a²*, the electrode *a*, connected to the same main conductor, the electrodes *b³* and *b*,
105 connected to the other main conductor, the circuit-closers between the electrodes *b b'*, *b² b³ a a'*, and *a² a³*, and the shunt-circuit with multiple-arc lamps, and the switches to connect the terminals of said shunt-circuit to the
110 electrodes *b b'*, for the purpose set forth, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

JAMES A. GALVIN.

Witnesses:

J. H. SIGGERS,
E. G. SIGGERS.