(No Model.)

W. J. PAINE.

METHOD OF REGULATING ELECTRIC LIGHTS.

No. 321,846. Patented July 7, 1885.

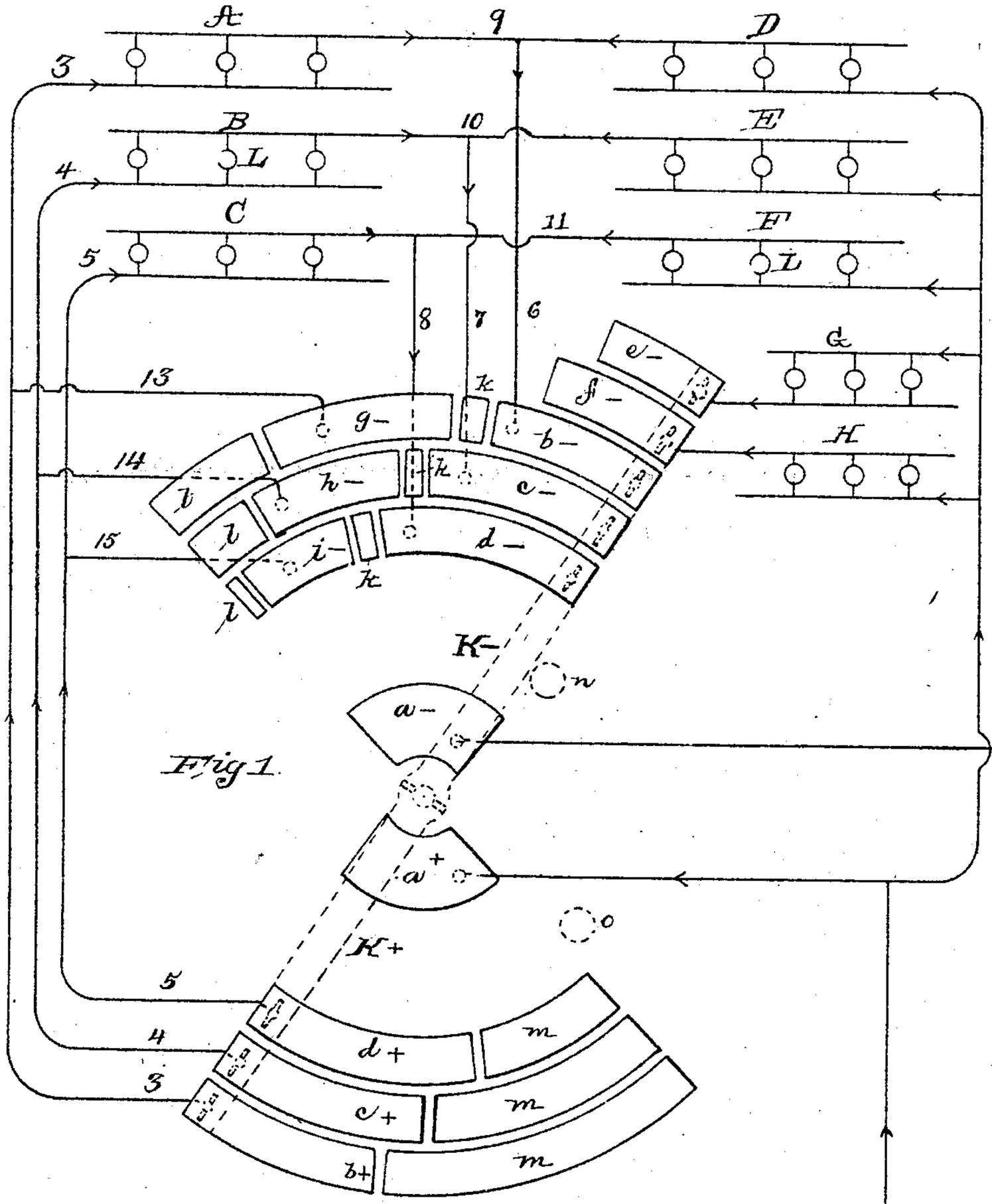

Fig 1.

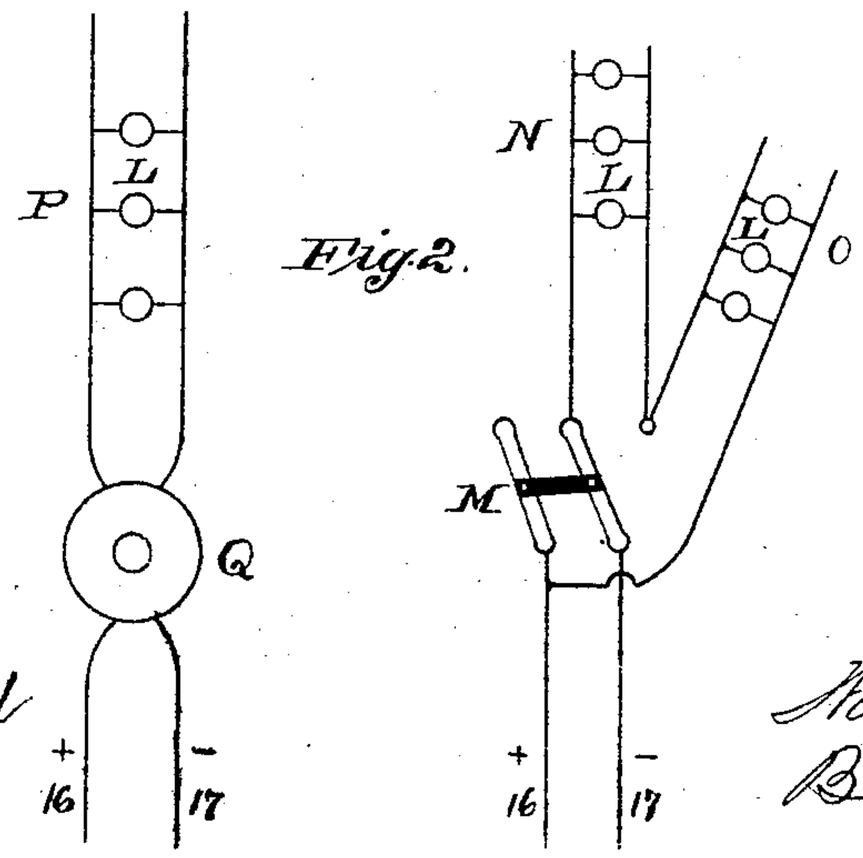

Fig 2.

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BELL BROS. PHOTO-LITHOGRAPHERS, WASHINGTON, D.C.

UNITED STATES PATENT OFFICE.

WALTER J. PAINE, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO SIDNEY B. PAINE, OF SAME PLACE.

METHOD OF REGULATING ELECTRIC LIGHTS.

SPECIFICATION forming part of Letters Patent No. 321,846, dated July 7, 1885.

Application filed May 23, 1885. (No model.)

To all whom it may concern:

Be it known that I, WALTER J. PAINE, of Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Improvement in Methods of Regulating Electric-Lights, of which the following is a specification.

The object I have in view is to do away with the bulky and expensive resistance-boxes heretofore used for lowering and raising the candle-power of incandescing electric lamps. These have been employed in theaters and other places of public amusement, and have been applied more especially to the stage-lights—the borders and foot lights—but also to the lights in the auditorium, it being necessary for proper scenic effect that the electric lamps should be capable of the same complete control that gas-jets are. I have discovered that the lamps themselves may be used as resistances for reducing the candle-power by throwing them into a proper series relation, and I have devised a method for accomplishing this end in a progressive manner.

In the accompanying drawings, illustrating means for performing my method, Figure 1 is a top view of the switch, with connections, in diagram, the switch-arm being shown for clearness in dotted lines; and Fig. 2, a view in diagram of an arrangement for partially accomplishing the same end by separate switches.

The incandescing electric lamps L are shown in Fig. 1 as divided into eight groups or sections, A B C D E F G H. These are connected to the single switch shown and to the dynamo-electric machine I or other source of electric energy.

The eight groups of lamps may be the foot-lights of a theater, or the border-lights, or those of the auditorium. The lamps of each group are shown for clearness as located together; but in practice the lamps of the several groups will be properly intermingled or otherwise relatively arranged to produce the desired effect of a gradual raising or lowering of the lights.

The switch-bar is pivoted at its center, and is composed of two metal arms, K^+ K^-, which are insulated from each other at the pivot. These arms have spring or other contacts, also shown in dotted lines, which rest upon all the plates directly beneath them, there being one spring or other contact for each range of plates. Near the pivot of the switch-bar are the dynamo-plates a^+ a^-, which are connected by conductors 1 2 with the dynamo or other source of electric energy, I. Beneath K^+ are three curved plates, b^+ c^+ d^+. These extend from one limit of the movement of K^+ in the direction of its movement different distances, plate b^+ being shorter than c^+, and c^+ shorter than d^+. Beneath bar K^- are similar plates, b^- c^- d^-, over which it moves. Plates b^+ c^+ d^+ are connected by conductors 3 4 5 with one side of groups, A, B, and C, respectively, while b^- c^- d^- are connected by conductors 6 7 8 with wires 9, 10, and 11, running from groups A, B, and C to groups D, E, and F. The other side of groups D, E, and F are connected by conductor 12 with conductor 1 from the positive brush of dynamo. Beneath bar K^- are also plates e^- f^-, which commence at the same end of movement of bar K^- as do plates b^- c^- d^-. Plate e^- is shorter than f^-, and f^- shorter than b^-. Between the positive conductor 12 and the plates e^- f^- are connected the groups G H. The bar K^- also moves over plates g^- h^- i^-, which it reaches after leaving plates b^- c^- d^- when passing from position of full light (that indicated in the drawings) to position of no light. The plates g^- h^- i^- are separated from b^- c^- d^- by idle-plates k, preferably of non-conducting material, or of metal insulated from the active plates, while following plates g^- h^- i^- are other idle-plates l. The plates k prevent short circuits by preventing the contacts from bridging active plates. By reason of the difference in length of b^- c^- d^- the plates g^- h^- i^- are reached in succession by the contacts of K^-, and, terminating at different points, these plates are left in succession by such contacts.

Plates g^- h^- i^- are connected by conductors 13 14 15 with wires 3 4 5, extending from plates b^+ c^+ d^+ to groups A B C. The plates b^+ c^+ d^+ are followed by idle-plates m.

When the switch-bar is in the position shown, the course of the current is from I *via* 1 a^+ K^+ b^+ c^+ d^+ 3 4 5 to groups of lamps A B C, and *via* 9, 10, 11, 6, 7, 8, b^-, c^-, d^-, K^-, a^-, and 2

back to I, bringing lamps of groups A B C into circuit at full candle-power. Current also flows from I *via* 1 12, lamps of groups D E F, 9, 10, 11, 6, 7, 8, b^-, c^-, d^-, K$^-$, a^-, and 2 back to I, bringing lamps of groups D E F into circuit at full candle-power. Another circuit is from I *via* 1 12, lamps of groups G H, e^-, f^-, K$^-$, a^-, and 2 back to I, bringing lamps of groups G H into circuit at full candle-power. This position of the switch-bar is at one limit of its movement, it being stopped by *n*. The stop *o* is at the other limit of movement, bars K$^-$ K$^+$ then resting on idle-plates *l m*, and all the lamps being out of circuit.

In passing from the first to the second limit the following changes take place: Bar K$^-$ first leaves plate e^- and then f^-, breaking the circuit of groups G and H in succession, these groups being thrown out of circuit at full candle-power. Then bar K$^-$ leaves plate b^- and reaches g^-, and at the same time bar K$^+$ leaves plate b^+. The effect of this change is to throw all the lamps of group A into service with the lamps of group D, the current passing from I *via* 1, 12, D, 9, A, 3, 13, g^-, K$^-$, a^-, and 2 back to I. The lamps of the groups thus thrown into series are reduced in candle-power. The movement being continued bar K$^-$ leaves c^- and reaches b^-, and bar K$^+$ leaves c^+, throwing groups B and E into series. Then plate i^- is reached in the same manner, throwing C and F into series. At this point the six groups are in three series, the lamps all being at low candle-power. The movement being continued, bar K$^-$ leaves g^- h^- i^- in succession, breaking the circuit, first, of A D, then of B E, and, finally, of C F.

The reverse movement of the switch-bar throws the lamps into circuit in the reverse order from that just described, the groups being first thrown into circuit in series of two groups each, with the lamps at low candle-power, and then these series being divided in succession, bringing the lamps to full candle-power, and, finally, the groups G H being thrown in at full candle-power. In this way the effect of a gradual lowering and raising of the lights will be produced in a simple manner and without the use of resistances.

The use of the principle described of throwing the lamps into series to reduce their candle-power is one capable of extensive application. The switch may be used for the lights of a room, and even for those of a single fixture. As many groups as desired may be controlled by the switch, or as small a number, (two or more,) and each group may have as many lamps as desired, (two or more.) The plates e^- f^- for groups G H, which are thrown on and off at full candle-power, may or may not be employed.

In Fig. 2, M is a two-arm switch controlling groups of lamps N O. The two switch-arms are parallel and work together, being connected by an insulating-bar. They are connected at their pivots to the dynamo-wires 16 17. The two groups of lamps are connected together, and at their junction is a contact-plate for the switch. The outer side of group N is connected to another switch-plate, and the outer side of O is connected to the positive dynamo wire 16.

In the position of the switch shown the groups are in series and the lamps at low candle-power. A movement of switch to the left would break the circuit of both groups, while a movement to the right, causing the switch-arms to rest upon the two contact-plates, would throw the lamps into separate circuits and bring them up to full candle-power. The group of lamps P is thrown into and out of circuit at full candle-power by a simple circuit making and breaking switch, Q.

The wires 16 and 17 of the group P and the same wires of the groups N O are connected with the same supply-circuit or dynamo, which is not shown.

The apparatus hereinbefore described is not claimed, since it is the subject of a separate application (Case A) for Letters Patent, Serial No. 152,557.

What I claim is—

1. The method herein described of lowering and raising the candle-power of groups of incandescing electric lamps, consisting in changing the relation of the groups from multiple arc to series, and vice versa.

2. The method herein described of lowering and raising the candle-power of incandescing electric lamps, consisting in throwing groups of lamps into and out of circuit successively, raising the candle-power of the groups after throwing them into circuit, and lowering the candle-power before throwing them out of circuit.

3. The method herein described of lowering and raising the candle-power of incandescing electric lamps, consisting in throwing groups of lamps into and out of circuit successively, raising the candle-power of the groups after throwing them into circuit, and lowering the candle-power before throwing them out of circuit, and throwing into and out of circuit other groups of lamps at full candle-power.

4. The method herein described of lowering and raising the candle-power of incandescing electric lamps, consisting in throwing groups of lamps into and out of circuit successively, each group being thrown into circuit at low candle-power in a series arrangement, and then raised to full candle-power in a multiple-arc arrangement, and before thrown out of circuit being reduced in candle-power by changing it from a multiple-arc to a series arrangement.

This specification signed and witnessed this 16th day of May, 1885.

WALTER J. PAINE.

Witnesses:

HENRY W. WILLIAMS,

A. W. KIDDLE.