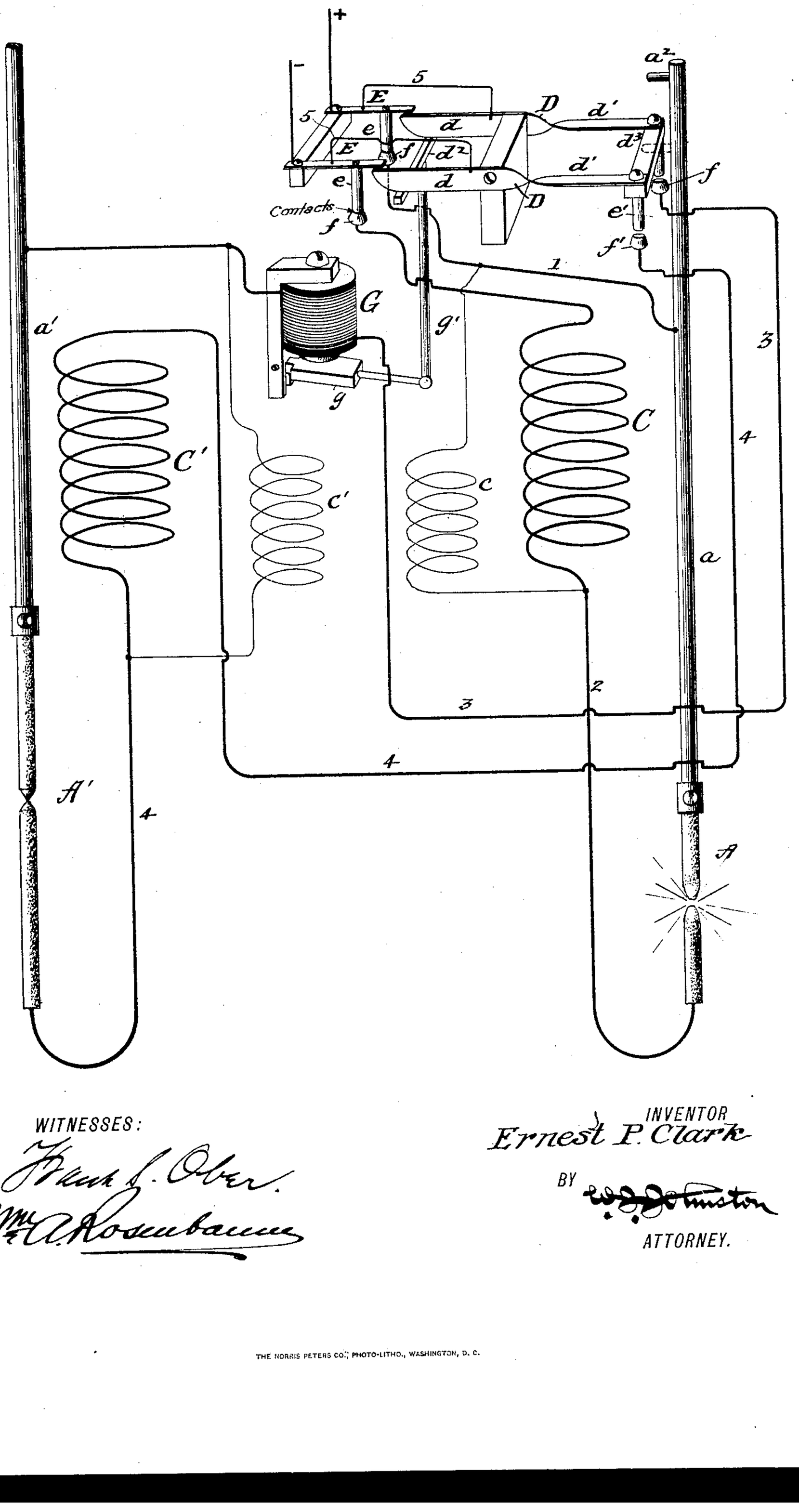
(No Model.)

# E. P. CLARK.

## DUPLEX ARC LAMP.

No. 463,595. Patented Nov. 17, 1891.

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## DUPLEX-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 463,595, dated November 17, 1891.

Application filed February 16, 1891. Serial No. 381,540. (No model.)

*To all whom it may concern:*

Be it known that I, ERNEST P. CLARK, a citizen of the United States, residing in New York, county of New York, and State of New York, have invented certain new and useful Improvements in Duplex-Arc Lamps, of which the following is a specification.

This invention relates to that class of electric-arc lamps designed to burn two or more pairs of carbons successively, and to certain improvements in the mechanism for operating the different pairs of carbons independently of each other, whereby each pair of carbons may be provided with its own operating mechanism and be adjusted and fed entirely independent of the other pair or pairs of carbons in the same lamp, and to so connect and operate the different pairs of carbons with their adjusting mechanism that only one pair shall be in any way connected to the line-wires at one and the same time. By this design of the electric-arc lamp several advantages are secured: First, as each pair of carbons is provided with its own regulating mechanism, the feeding devices are not overweighted with a number of rods and carbons, and can consequently be operated with less friction than is the case where two or more pairs of carbons are controlled by the same mechanism, and as the weight carried by each movement is only decreased in burning by the amount of one carbon it is possible to obtain a much better adjustment than can be had when the same movement controls two or more pairs of carbons, and the weight carried is diminished in burning by the amount of two or more carbons; second, as each pair of carbons, with its operating mechanism, is entirely independent of all others, and as only the carbons of each pair in actual operation are connected to the line at any one time, it becomes possible to renew one pair of carbons while the other pair is being burned, thus maintaining a constant illumination for an indefinite period without interruption—a feature of value in mine or tunnel work; third, the different pairs of carbons, with their operating mechanisms, being entirely independent of one another, (as much so as if each were in a separate lamp-case,) any accident which might occur to one movement would not necessarily involve the other, thus rendering a complete failure of the lamp highly improbable. One movement may be entirely destroyed without necessarily affecting the others in the slightest degree.

The manner in which I have carried out my invention is as follows: In one lamp-case are placed two independent arc-lamp movements insulated from each other and the case. Each of these operating mechanisms is provided with its carbon-carrying rod and with its lower-carbon holder electrically connected with its respective movement, but insulated from the other lower-carbon holders and the frame of the lamp. These mechanisms, which may be of any appropriate type, are connected to the line successively by an automatic switch, which switch is so constructed that the act of connecting one mechanism with the line-wires necessarily involves disconnecting the other movement entirely from the line.

The particular points of novelty in my invention are in the automatic switching device, which is constructed as hereinafter described.

The switch is a double-lever switch so arranged as to close one circuit before opening the other, and has connected with it an electro-magnet in the new circuit, or the one being closed, which magnet operates, first, to force the contact-points into more intimate connection, and, second, to open the other circuit by a further movement of the switch.

In the accompanying drawing, the figure is a diagrammatic view of the parts and connections of a double-carbon lamp, with some of the parts shown in perspective.

A and A′ represent the two pairs of carbons, and *a* and *a′* are respectively the rods of the upper carbons. The feeding devices are entirely independent of each other in construction and operation and may be of any suitable or preferred construction, being preferably of the kind known as "clock-work" feed.

At C and C′ and *c* and *c′* are indicated, respectively, the main and shunt coils of the feed mechanisms of the two pairs of carbons, and since such feeding mechanisms may be, as above stated, of any preferred form, the said coils are to be understood as indicating the complete mechanism.

The automatic switch is constructed as fol-

lows: To a suitable insulating-support two levers D D, of any suitable conducting and spring material, are pivoted, their ends $d$ being rigid and their ends $d'$ being elastic or yielding. The two levers are connected by suitable cross-strips $d^2$ $d^3$ of insulating material, and their spring ends $d'$ carry contacts $e'$ $e'$, which are electrically connected with said levers and which are adapted to make contact, respectively, with contacts $f'$ $f'$.

The positive and negative line wires + and — are connected to springs E, suitably supported at one end and projecting over the ends $d$ of the levers D. They carry contacts $e$, which are adapted to connect with contacts $f$ $f$, located beneath them.

G is a magnet having its pivoted armature $g$ connected by a rod $g'$ with the cross-strip $d^2$ of the levers D in such a manner that when the magnet is energized the ends $d$ of the levers are thrown upward.

All the parts described are located in one lamp case or frame, (not shown,) and the electrical connections will be given in the description of the operation, which is as follows: When there is no current through the lamp, the weight of the armature $g$ and link $g'$ is sufficient to hold the levers in the position shown in the drawings, and when the current is turned on it passes as follows: from terminal + through spring E, contacts $e$ and $f$, wire 1, carbons A, wire 2, and main coil C, contacts $f$ $e$, and spring E to terminal —. There being no contact at $e'$ and $f'$, no current can pass beyond those points, and the carbons A′ with their coils are entirely disconnected from the circuit; but upon the burning out of the carbons of pair A the rod $a$ as it descends brings its lug $a^2$ down on the cross-piece $d^3$ of the levers D, and so tilts the latter. This causes connections to be made between $e'$ $f'$ before the ends $d$ of the levers D connect with the springs E and establishes a new path for the current, as follows: from terminal + through spring E, wire 5, lever D, and contacts $e'$ $f'$, wire 3, magnet G, carbons A′, wire 4, main coil C′, contacts $f'$ $e'$, lever D, wire 5, and spring E to terminal —. Since the resistance of this new circuit is at this instant much lower than that of the first circuit, owing to the resistance of the arc between carbons A, most of the current will take this new path, when the said arc will break, and the whole current will take the said new path. The magnet G attracts armature $g$ and through the link $g'$ forces upward the ends $d$ of the levers D, lifts springs E, breaks both the contacts at $e$ and $f$, and the operation of the mechanism controlling carbons A′ causes the appearance of the arc between them. The yielding of the ends $d'$ of the levers D permits the lifting of ends $d$ by the magnet, as described, and at the same time causes a better contact at $e'$ $f'$, owing to the pressure and the drawing or rubbing action due to the bending of said spring ends. If now it is desired to renew the carbons at A, it may be done in the usual manner and entirely without reference to pair A′, which may continue to burn while pair A is being renewed, for, since the whole current is passing through the coil of magnet G, the switch is held firmly in place, and pair A is to all intents a separate lamp and is not connected to the circuit in any way. If it is desired to change the arc back again to pair A after renewing, it may be done by simply establishing a short circuit for an instant between terminals + and —, as between the two springs E. This causes magnet G to lose its power, and the weight of armature and link $g$ $g'$ causes the switch to assume its original position, as shown in the drawing, and then the short circuit being broken the carbons A will be in action and carbons A′ disconnected and ready for renewal, if desired. This short-circuiting operation will usually be performed with the switch of the lamp and may be done as quickly as desired, the effect on the light being only a "wink" or flash for a small fraction of a second.

Having thus described my invention, I claim—

1. The combination, with the levers D D, each having one rigid end and the other end elastic, of contacts carried by the said elastic ends, and spring-operated contacts located adjacent to the rigid ends and adapted to be operated by them, substantially as described.

2. The combination, with the levers D D and two pairs of contacts operated thereby, of the magnet G in the circuit of one pair of contacts, the armature of said magnet being connected to the said levers, substantially as described.

3. In an electric-arc lamp having a plurality of pairs of carbons and separate regulating mechanism therefor, an automatic switch for controlling the circuits, and an independent electro-magnet located in the circuit of one pair of carbons and having its armature connected with the switch, substantially as described.

4. In an electric-arc lamp, two pairs of carbons included in separate circuits, in combination with a switch controlling both circuits and an electro-magnet in one of said circuits adapted to operate the switch, and means for operating the switch mechanically to close the circuit including said electro-magnet, for the purpose set forth.

5. In a duplex-arc lamp, a duplex double-pole switching device controlling, respectively, the circuits of the two sets of carbons, said switching device consisting of two pairs of levers, the members of each pair being permanently connected to the main circuit, the two pairs of levers controlling, respectively, the circuits of said carbons, one pair of levers being moved when the first set of carbons is exhausted and the other pair moved immediately thereafter, the movement of the first pair establishing a circuit through the

second pair of carbons and the movement of the second pair breaking the circuit of the first pair of carbons, substantially as described.

6. In an arc lamp, the combination of two sets of carbons and their regulating mechanism, two circuits including the sets of carbons and regulating mechanism, respectively, and a switch controlling two openings or breaks in each circuit, the carbon and regulating mechanism being located between the openings or breaks in their respective circuits, for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ERNEST P. CLARK.

Witnesses:
FRANK S. OBER,
EDWARD WAGNER.