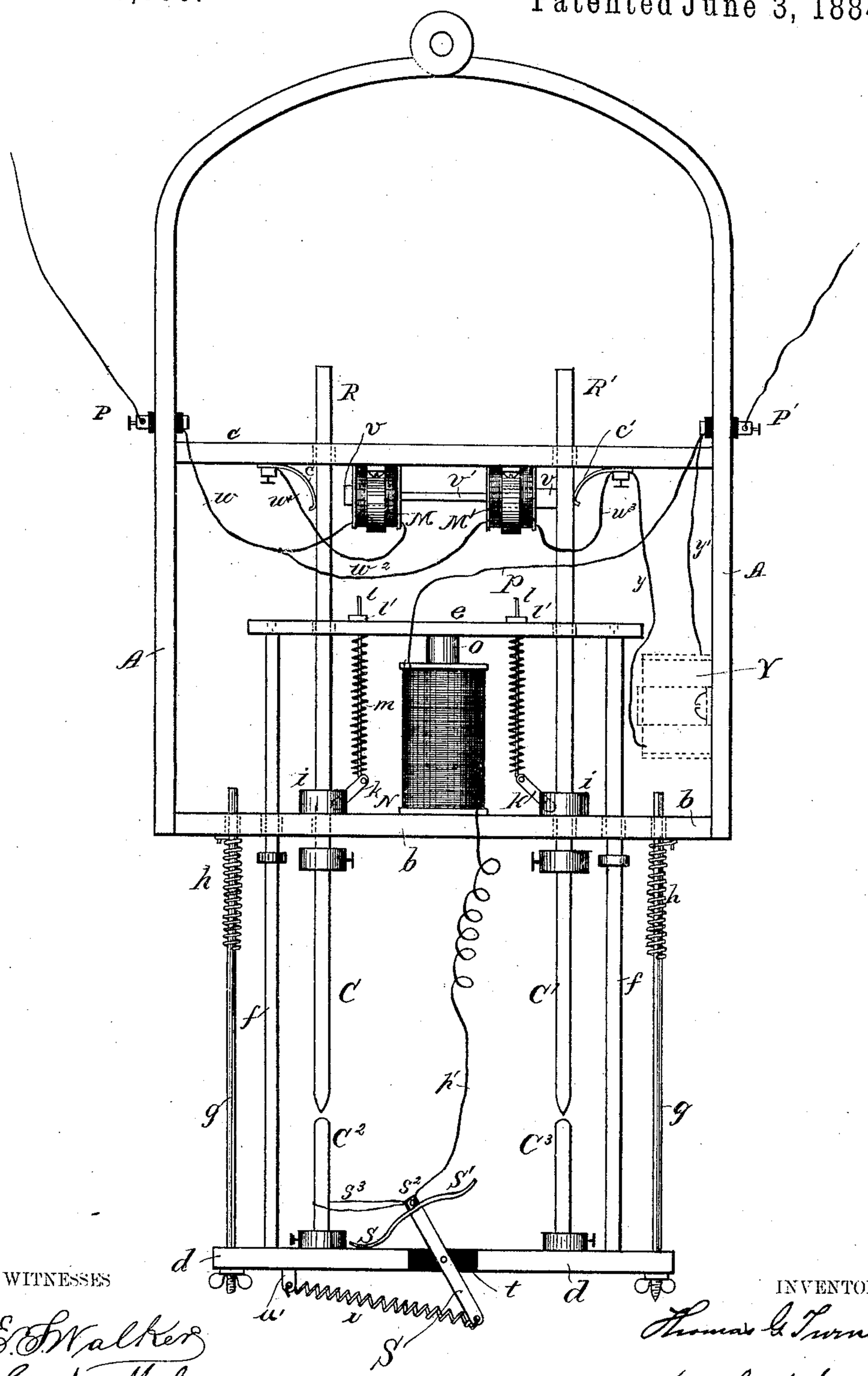
(No Model.)

T. G. TURNER.

ELECTRIC ARC LAMP.

No. 299,600. Patented June 3, 1884.



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ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 299,600, dated June 3, 1884.

Application filed November 16, 1882. Renewed January 29, 1884. (No model.)

To all whom it may concern:

Be it known that I, THOMAS G. TURNER, a citizen of the United States of America, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an electric lamp having two pairs of carbons, each composed of an upper and lower pencil, and said pairs to be used for illumination successively.

The object of the invention is to so control both of the upper carbons by means of the main current that one may be placed in circuit and fed forward automatically, while the other will be held out of circuit and stationary until the first is consumed, and be then thrown into circuit automatically and automatically fed forward as required.

The invention consists in certain novel constructions and combinations of devices which will be hereinafter particularly described, and pointed out in the appended claims.

The accompanying drawing represents a side elevation of a double-carbon electric lamp constructed according to my invention.

The letter A designates the main supporting-frame having a lower cross-bar, *b*, and an upper cross-bar, *c*. The lower carbons, C^2 and C^3, are carried by a frame composed of a lower cross-bar, *d*, and an upper cross-bar, *e*, which are connected by rods *f f*, the upper cross-bar *e* being arranged above the lower bar, *b*, of the main frame, and the rods *f* passing loosely through apertures in said bar. The lower carbon-supporting frame is suspended from the bar *b* by means of rods *g* and spiral springs *h*, which are attached to said rods at their lower ends, and to the bar *b* at their upper ends, said rods *g* having their upper ends projecting loosely through said bar *b*. The upper carbons, C C′, are carried by metallic rods R R′, which play loosely through apertures in the cross-bars *b* and *c* of the main frame and the top cross-bar, *e*, of the lower-carbon supporting frame. These carbon-holding rods R R′ are guided by stationary non-conducting collars *i*, supported by the bar *b*, and will normally fall by gravity, so that the upper carbons will rest upon the tips of the lower ones.

In suitable notches in the collars *i* are pivoted small clamping-levers K, the lower and inner ends of which may press against the carbon-holding rods, while their upper ends are connected to rods *l*, which extend upward loosely through the cross-bars *e*, and are screw-threaded to receive nuts *l′*, by which they are adjusted, and which prevent them from being drawn downward through the bar *e*. Surrounding rods *l* are spiral springs *m*, the lower ends of which bear against the levers K, while their upper ends bear against the under side of cross-bar *e*, so that these springs tend to press the outer arms of the levers K downward, thus throwing their inner ends in contact with the carbon-holding rods R R′. The springs *h* normally hold up the lower-carbon-supporting frame, and the nuts *l′* are so adjusted that in the normal position of said frame the rods *l* will hold the levers K out of contact with the carbon-holding rods against the tension of the springs *m*.

The letter N indicates a hollow helix formed of insulated wire of low resistance and supported by the cross-bar *b* of the main frame.

The letter O indicates a soft-iron core secured to the cross-bar *e*, and projecting partly into the central cavity of the helix N. Said helix N has one of its terminals connected by a wire, *p*, with a binding-post, P′, secured in, but insulated from, one of the side bars of the frame A, the other terminal of said coil being connected by a wire, *p′*, to a metallic switch-lever, S, which is pivoted to a non-conducting block, *t*, secured at the middle of the lower cross-bar, *d*, of the lower-carbon frame. The lower end of said switch-lever is connected to one end of a spring, *u*, the other end of which is connected to a non-conducting stud, *u′*, projecting downward from the bar *d*. The upper end of the switch-lever S is provided with two oppositely-projecting springs *s* and *s′*, and an endwise-projecting hook, s^2. The tendency of the spring *u* is to so throw the lever S that its projecting spring *s′* will come in contact with the metallic bar *d*, near the foot of the lower carbon C^3; but, as shown in the drawings, this tendency of said spring

is overcome by means of a fine-wire loop, s^3, which takes over the hook s^2 and passes around the lower carbon C^2, thus holding the lever S in such a position that its spring *s* is brought in contact with the bar *d*, near the foot of said carbon C^2.

It will be understood that the non-conducting block *t* forms a portion of the cross-bar *d*, and divides said bar into two sections, which are by it insulated from each other. The upper cross-bar, *c*, is formed of wood or other non-conducting material, and to it are secured two metallic springs, *c'*, which bear against the metallic carbon-holding rods R and R', respectively, and serve to communicate the electrical current thereto. Between the rods R and R' are arranged two hollow helices, M and M', separated from each other by an intervening space, and secured to the cross-bar *c*. Said helices are provided with soft-iron cores *v v*, respectively, and these cores are connected by an intermediate non-magnetic bar, *v'*, preferably of brass. The cores *v* and connecting-bar are so arranged that when a current passes through one of the helices and its core *v* is drawn therein to a central position, the other core will be projected outward through its helix and in contact with the adjacent carbon-holding rod, and by its bearing against said rod serves to prevent it from falling, though it might otherwise be free. From one terminal of the helix M a wire, *w*, leads to a binding-post, P, secured to but insulated from one of the side bars of the frame A, while from the other terminal of said helix a wire, *w'*, leads to the metallic spring *c'*, which bears against the carbon-holding rod R. From the wire *w* a branch wire, w^2, connects with one terminal of the helix M', while from the other terminal of said helix a wire, w^3, leads to the contact-spring *c'*, which bears against the carbon-holding rod R'.

The letter Y designates a coil of high resistance, (shown in broken lines,) which has one terminal connected to the contact-spring bearing against the rod R' by means of a wire, *y*, and its other terminal is connected with the binding-post P' by means of a wire, *y'*. Such coil of high resistance and its connections are only used when a number of lamps are connected in series, as will be hereinafter explained.

The operation of my invention as now described is as follows: In placing the lamp in condition for use, the switch-lever S is swung to the left until its spring *s* comes in contact with the bar *d*, and the fine-wire loop s^3 is passed over the lower carbon C^2 and hook s^2, to hold the lever in this position. When the current is turned on, it enters the lamp by the post P, passes over wire *w*, helix M, wire *w'*, spring *c'*, carbon-rod R, carbon C, lower carbon C^2, bar *d*, spring *s*, switch-lever S, wire *p'*, helix N, wire *p*, post P', and off to the line. The current thus passing through the lamp causes the small helix M to draw in its core *v*, thus causing the core of the helix M' to be forced out against the carbon-holding rod R', so as to hold said rod from falling. At the same time the helix N draws in its core O, thus pulling down the cross-bar *e* and entire lower-carbon-supporting frame against the tension of the springs *h*. As the frame descends, the springs *m* move the clamping-levers *k*, so that they will clamp the carbon-holding rods R and R' in the collars *i*, and the lower carbons are separated from the upper carbons a sufficient distance to establish the normal arc. The arc, however, will only be established between the upper carbon C and lower carbon C^2, as the other two carbons are not in circuit, the circuit being established from the lower carbon C^2, as already described, and excluding the carbons C' and C^3. When the carbons have burned away to such an extent as to create a resistance at the arc, which prevents a sufficient quantity of the current from passing over helix N, to enable said helix to hold its core drawn inward, the lower carbon-frame will rise, and the cross-bar *e*, acting against the nuts *l'*, will cause the rods *l* to raise the outer ends of the levers *k* and release the carbon-rods R R' so far as these clamping-levers are concerned. The rod R' will still be held by the core of the helix M'; but the rod R will fall a sufficient distance to so decrease the resistance at the arc that the quantity of current flowing over the helix N will cause said helix to again draw downward its core, thus depressing the lower-carbon frame and its carbons to re-establish an arc of proper length between the carbons C and C^2, the upper-carbon holder R being engaged by the clamping-lever *k*, as before. When the carbons C and C^2 have been so far consumed that the arc reaches the fine-wire loop s^3, said loop will be fused and release the switch-lever S, and said lever will then, by the action of the spring *u*, be thrown over, so that its spring *s'* will strike the bar *d* near the foot of the carbon C^3. The carbon C and C^2 will be thus cut out of circuit, and the carbon C' and C^3 thrown into circuit, as follows: The current will now pass from the wire *w* over the branch wire w^2, helix M', wire w^3, and the spring *c'*, which bears against the rod R', being thus communicated to said rod and passing over it and the carbons C' and C^3, and thence over the spring *s'* to the switch-lever and off to the line, as before. It will now be understood that the helix M', being in circuit, draws in its core *v* to release the rod R', and to project the core of helix M to lock the rod R. The feeding of the second pair of carbons will at the proper times be performed the same as described for the first pair. The function of the coil of high resistance Y is to cause a sufficient normal quantity of the current to flow over the helices M' and N for the proper working of the lamp, as heretofore described, and also to afford a path to the next lamp in series for that portion of the current which is prevented from flowing over the carbons by the

increase of resistance at the arc. This coil of high resistance, as will be observed, is always in a derived or shunt circuit, but is only useful, as before stated, when the lamps are connected in series.

Having now fully described my invention, I wish it to be understood that I do not confine myself to the precise details of construction shown in my drawings, but may vary the same in any manner for the better carrying out of my invention, while not departing from the essential principle thereof.

What I claim is—

1. In a double-carbon electric-arc lamp, the combination, with two upper and two lower carbon pencils, of an electro-magnet arranged to move the lower away from the upper carbons, automatic devices controlled by said magnet for feeding the carbons, and two electro-magnets arranged to automatically prevent the feeding of one or the other of the upper carbons, substantially as described.

2. In a double-carbon electric-arc lamp, a movable support for the lower carbons, in combination with a single electro-magnet arranged to move said support for separating the upper from the lower carbons, clamping devices operated by said magnet for preventing the upper carbons from falling as the lower are moved away, and an automatic switch for throwing a second set of carbons into circuit when a first set has been consumed, substantially as described.

3. In a double-carbon electric-arc lamp, the combination, substantially as before set forth, of electro-magnetic devices in the main circuit for separating the carbons to form the arc and to control the feed of the upper carbon, which is in circuit, and independent electro-magnetic devices in, and actuated by, the main circuit, to prevent the feeding of the upper carbon, which is not in circuit.

4. The combination, with the lower-carbon-supporting frame constructed and supported, substantially as described, of the core O, projecting from the upper bar of said frame, the helix N, surrounding said core, the upper-carbon holders mounted in suitable guides, the clamping devices connected with said lower-carbon-supporting frame, and automatic and electro-magnetic devices arranged to be automatically thrown into circuit for alternately locking said upper-carbon holders, substantially as and for the purpose set forth.

5. In a double-carbon electric-arc lamp, the combination, with the movable lower-carbon-supporting frame, the electro-magnet arranged to move said frame, the suitably-guided upper-carbon holders, the clamps connected with the lower-carbon frame and arranged to hold said upper-carbon holders, and the automatic switch arranged to change the circuit from one pair of carbons to the other, of the helices M M′, and their movable cores arranged to lock the upper-carbon holders alternately, and the intermediate electrical connections, essentially as set forth.

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

THOMAS G. TURNER.

Witnesses:
RUFUS K. MCHARG,
H. W. SHIPMAN.