(No Model.)

3 Sheets—Sheet 1.

C. SCHMID.

ARC LAMP.

No. 480,285. Patented Aug. 9, 1892.

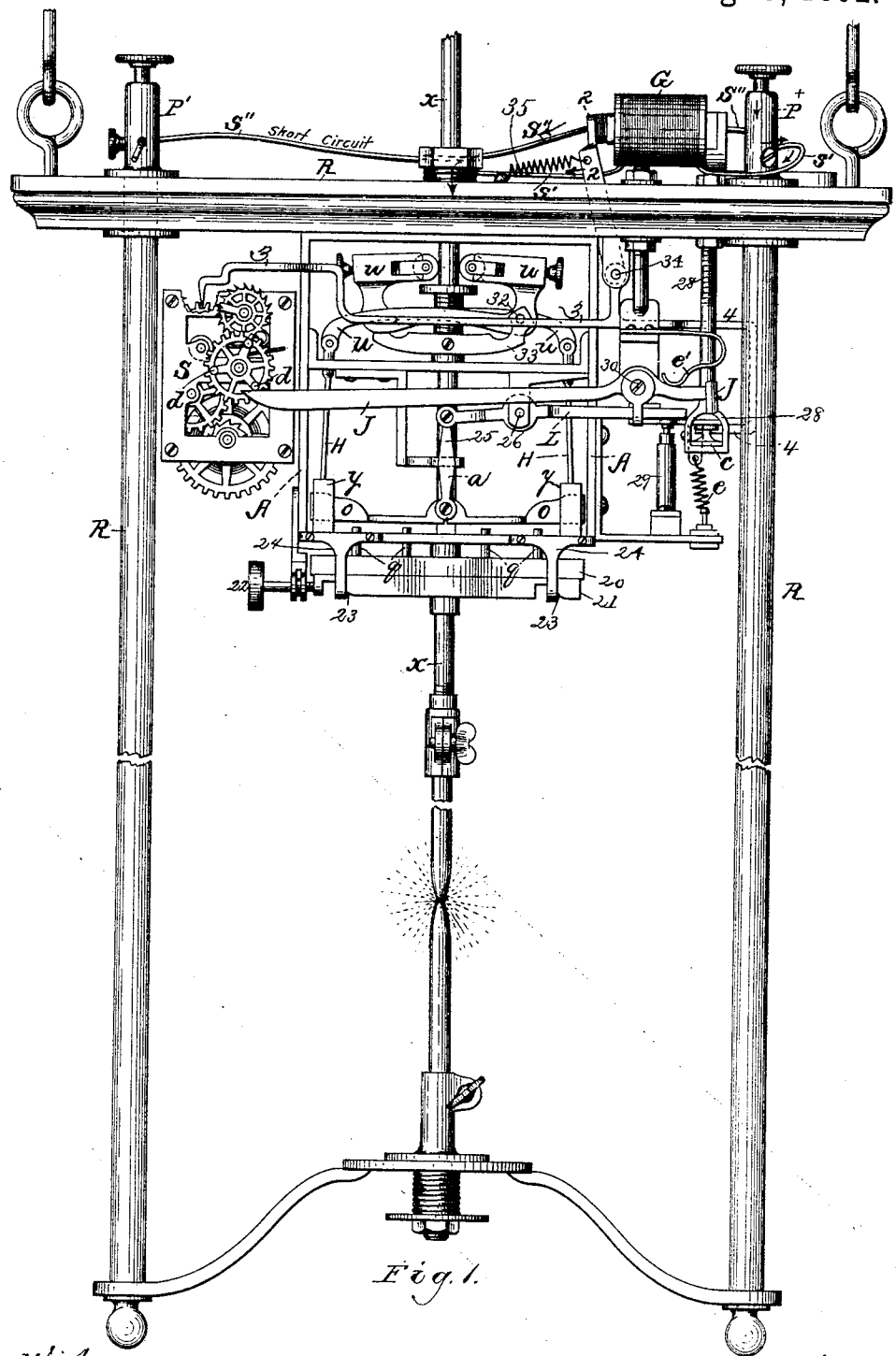

Fig. 1.

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W. S. Baker.

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(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

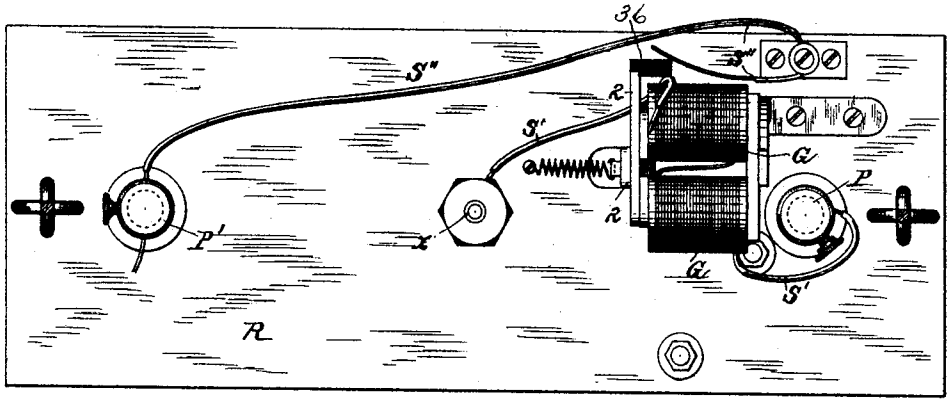


Fig. 3.

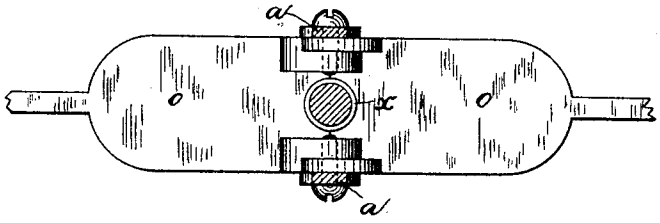
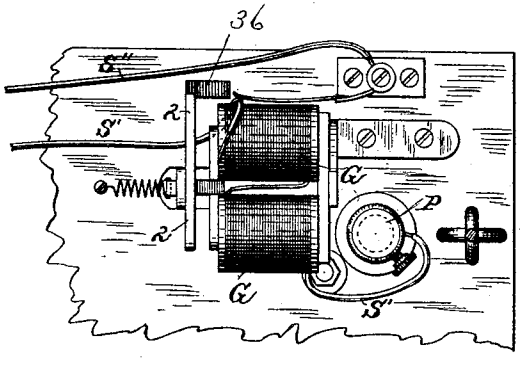


Fig. 4.



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(No Model.)

3 Sheets—Sheet 3.

C. SCHMID.

ARC LAMP.

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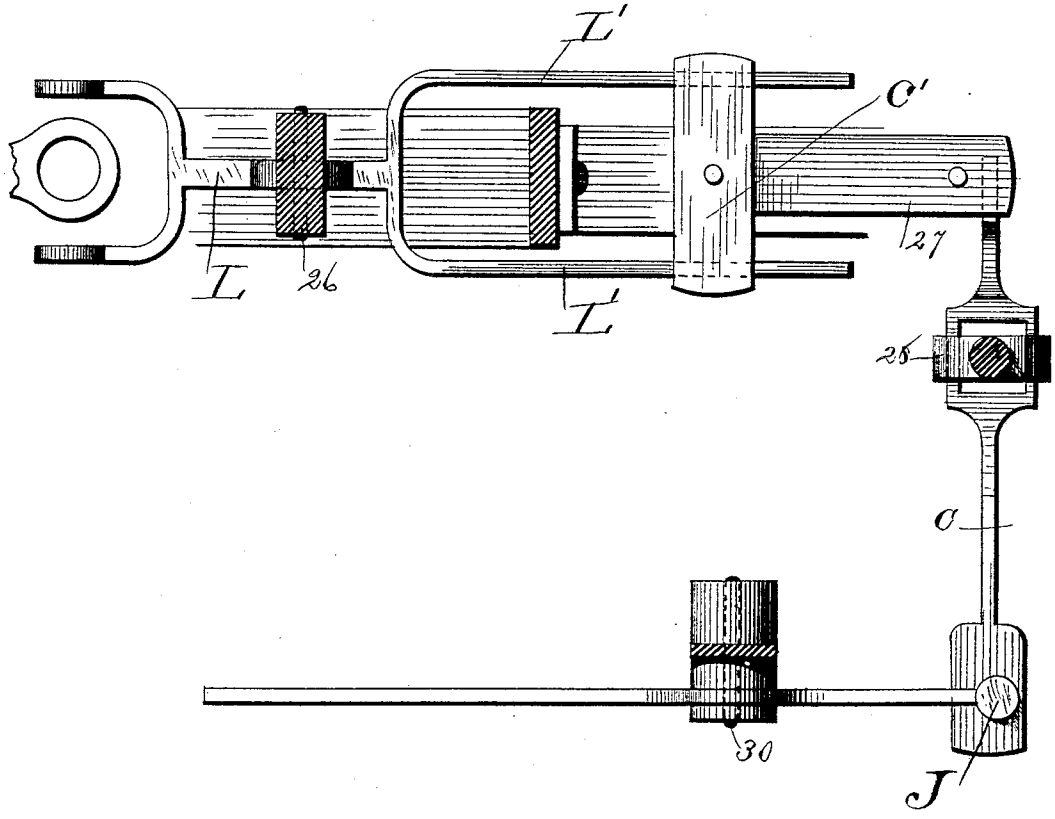
Fig. 5



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UNITED STATES PATENT OFFICE.

CHARLES SCHMID, OF CHICAGO, ILLINOIS, ASSIGNOR OF TWO-THIRDS TO HENRY SCHUETTLER AND PANCRATIUS FRIEDRICH, OF SAME PLACE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 480,285, dated August 9, 1892.

Application filed December 7, 1883. Renewed April 30, 1892. Serial No. 431,364. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SCHMID, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is hereby declared to be a full, clear, and exact description, sufficient to enable others skilled in the art to which such invention appertains to make and use the same.

In the accompanying drawings, forming part of this specification, like letters and figures of reference denote like features of structure throughout.

Figure 1 is a view of the improved lamp in side elevation; Fig. 2, a top view of the same, showing the shunt-switch open. Fig. 3 is a detail view of the feed clamp or clutch; Fig. 4, a top view of the shunt-circuit and its connection, showing the circuit closed; Fig. 5, a detail view, in plan, of a part of the intermittent feed mechanism to control the advance of the carbon.

The invention relates more especially to the devices used in electric-arc lamps for the purpose of feeding the carbons as these consume away. In many types of arc lamps as at present employed the feed of the carbons is made to depend upon the increasing resistance due to the gradual elongation of the arc itself. This resistance becomes so great that eventually a considerable portion of the electric current is diverted through a shunt-circuit around the lamp to bring the feed mechanism into play, which is thus under control of the shunt-current. In other words, the action of the feed mechanism is electrical and rests upon the cumulative resistance developed by the lengthening of the arc. The light tends to diminish in intensity, and just prior to the accomplishment of the feed movement becomes more or less unsteady or flickering, the latter peculiarity being chargeable in great measure to the pulsatory and wavering influence of the shunt-current upon the feed mechanism. The feed action is impending, but not yet effected, and so reflects the tremulous variations which are impressed upon the shunt-current by the irregularities in resistance at the arc proper.

The present invention seeks to eliminate the wavering or flickering quality of the light, as above noted, and to that end avoids the use of the shunt or electro-motive feed, the design being to secure the orderly movement of the carbons at predetermined intervals during the use of the lamp by means of an automatic mechanism which acts with unvarying regularity wholly irrespective of the minor changes in electrical resistance arising within the lamp-circuit. The feed is mechanical and not electrical, its distinguishing peculiarity being a quick percussive stroke, which acts periodically to advance the feed at once and to its full limit, quite relieved from the flickering and irregular peculiarities of the electro-motive apparatus.

Mechanical feed devices for electric-arc lamps have been long known and in use; but the features of structure distinctive of the present improvement will appear from the description following, and be thereafter pointed out by claims, as will also the organization of a shunt-switch and connections intended to adapt the improved lamp for use in a series circuit.

The main frame R of the improved lamp comprises a top bar made, as usual, from some non-conducting material, and from which extend the metallic side rods joined together near their lower ends to the bottom or base cross-bar. The base-bar carries at its center the tubular holder, in which is mounted the lower carbon. Binding-posts P P′, fastened to the top bar of the frame, serve to secure the opposite poles of the line-circuit, the positive post P being insulated from the corresponding side rod of the frame beneath, while the negative post P′ is in electrical connection with its companion rod. The post P is joined electrically to the holder x of the upper carbon. The wire for this purpose is of the same size as that which constitutes the main-line circuit, but is wound in helical coil, thus forming part of an electro-magnet G, for a purpose to presently appear.

Secured beneath the top bar of the lamp is a metallic frame A, upon which are mounted the several parts of the feed mechanism and which serves, also, to receive and guide the tubular holder x for the upper carbon of the lamp.

The feed clamp or clutch *o* consists of two metal jaws hinged together and having a hole at the center, through which the carbon-holder *x* may pass. The outer or opposite ends of the clamp-jaws are received within slotted ways or guides of the uprights *y*, projecting from the metal frame A. Stops *q*, extending from the adjusting-bar 20, determine the downward play of the clamp-jaws *o*. The stops *q* are made to project more or less into the path of the jaws by means of the shift which is given to the lower adjusting-bar 21 (and in consequence to the upper bar 20) through the medium of the pinion 22 and the inclined notches 23, which bear against the brackets 24, extending from the frame A. The clamp-jaws *o* are pivotally sustained by means of the links 25, these being joined at their upper ends to the supending-lever L, pivoted, as at 26, to a lug on the frame A and extending outwardly toward one side of the lamp. Near its outer end the suspending-lever L is forked or bifurcated, as at L′, Fig. 5, and receives the slide C′, which can be shifted thereon, as desired, and carries a stem extension 27. Obviously the slide C′ and its extension constitute practically a part of the suspending-lever L, which is thus rendered adjustable as to its length to better maintain evenness of balance about the pivot 26.

At right angles to and just beneath the extension 27 is mounted the lever C, which in the form shown snugly seats within the stirrup 28 and turns thereon as a fulcrum. At its front end the lever C is furnished with an expanded head, against which the hammer J contacts at intervals to rock the lever C about its fulcrum, and thus to raise the outer end or extension 27 of the suspending-lever L. When the suspending-lever is raised, as described, its inner end is correspondingly depressed, whereby the links 25 lower the clamp-jaws *o* until they contact with the adjusting-pins *q*. These latter act to turn the jaws about their pivot connection, and thus to release the carbon-holder *x*, permitting the same to slip freely by gravity until the upper carbon is in contact with the lower. Immediately thereafter the reaction-spring *e*, which is fastened to the extension 27 of the suspending-lever L, draws such extension downward, and in consequence turns the lever L about its pivot 26, thus raising the link 25, and with it the clamp-jaws *o*. These latter tighten their grip upon the carbon-holder and lift the same, with its carbon, away from the lower carbon a determined distance sufficient to establish the electric arc. A stop 29, projecting from the metallic frame A, contacts with the extension 27 of the suspending-lever L to arrest the downward movement of such extension against the stress of the reaction-spring *e*. Such stop 29 may be adjustable, if desired, so that the upward movements of the links 25 and clamp-jaws *o* will be varied in keeping with the character of the carbons in use.

The quick percussive stroke, which determines the feed of the carbons in manner just detailed, is effected by means of the hammer-lever J, pivoted, as at 30, to a suitable extension of the lamp-frame and projecting at its tail end into the path of a stud-wheel *d*, which may for convenience be the minute-wheel of a clock gear-train. Said wheel is furnished at suitable intervals with a series of projecting pins or studs, which during rotation encounter the tail end of the lever J and tend to turn the same about its pivot 30 and against the stress of the spring *e′*, bearing upon the front end thereof. The rotation of the pin-wheel *d* gradually lifts the hammer proper until finally the pin clears the tail of the lever J, whereupon the spring *e′* causes the hammer to descend quickly until it strikes against the expanded end of the vibrating lever C. This in turn raises the outer end of the suspension-lever L to effect the drop-feed of the carbon-holder in manner already detailed.

The jaw clamp or clutch *o* may have its outer ends furnished with vertical rods H, to which is pivoted at the upper ends one arm *u* of the bell-crank levers *w*. The levers *w* are fulcrumed, as at 32, to a support 33, carried by a cross-bar of the metallic frame A. Friction-rolls at the inner ends of the bell-crank levers *w* bear against opposite sides of the carbon-holder *x* and serve to delay the slip movement thereof, so that the descent of the holder shall be gradual when the grip of the clamp-jaws *o* is relaxed.

An armature 2 of the magnet G, pivoted, as at 34, beneath the top bar of the lamp-frame, carries in rigid piece therewith the opposite arms 3 4. The former of these arms 3 is designed to drop into one of the notches on the rim of a wheel of the gear-train, when the armature 2 is in retracted or release position, to stay the further movement of the train, and in consequence to arrest the feed action. The other arm 4 is bent, as shown, so as to come barely beneath the outer end of the lever extension 27 and to raise the same slightly when the armature 2 is relaxed. The raising of the extension 27 lowers the inner end of lever L, so that the clamp-jaws *o* release the carbon-holder *x* and permit the upper carbon to come to rest against the lower. It thus appears that on shifting the armature 2 to its open situation the time-feed or gear-train is dogged, and simultaneously the carbon-holder *x* is allowed to slip until its carbon stands in contact with the companion piece. This state of rest continues until current is caused to pass in the circuit which includes the lamp. At such juncture the impulse proceeds by binding-post P, connection S′, helix G, connection S^2, carbon-holder *x*, metallic frame A, and upper carbon to the lower carbon, base-bar and side rod, the negative binding-post P′, and so back to the main line. The helix G, being preferably wound with wire of the same diameter as that in the main circuit, presents much less resistance than if made finer, which is usually

necessary in working with electro-motive feed devices. The electric impulse energizes the helix-magnet, drawing the armature 2 to its seat against the tension of retraction-spring 35, thereby lifting the arm 3 from its dogging contact with the time-feed and permitting the same to begin its movement. Simultaneously the bent end of arm 4 drops away from beneath the lever extension 27, so that such extension is drawn downward by means of the spring *e*, thus lifting the inner end of lever L, and with it slightly raising the carbon-holder *x*, so that the carbons are separated and the arc light properly established. When the current ceases, armature 2 is withdrawn from helix-magnet G and the several parts are returned to condition of rest, as at the outset. While the lamp is in use, obviously the successive feed of the carbon proceeds in orderly fashion at intermittent and regular intervals determined by the action of the time-gear upon the striker J.

If for any reason the lamp becomes disorganized, so that the continuity of the electric current is broken, the armature 2 flies back, carrying with it the switch-piece 36, which enables the short connection S″ to contact with the frame by the helix G, thus shunting the current by wire S″ directly to negative post P′ and cutting out both the helix and lamp, so that the main current proceeds unbroken and the remaining lamps in the series kept unaffected by the break.

Obviously the special features of structure heretofore detailed may be varied without essential departure from the spirit of the invention. Thus, for example, other forms of clamp than the jaw-clutch may be used to retain the carbon-holder. The intermediate lever C may be dispensed with and the hammer J caused to act directly upon the suspension-lever L. It is not material that the links 25 be employed to connect the lever L and clamp *o*, nor that the stroke imparted to said lever be strictly percussive. If the contact or release action be quick, decisive, and complete, (irrespective of the minor variations in circuit-resistance,) the trip-feed is effected in manner desired. The gear-wheel train can be changed or, in lieu thereof, resort be had to some equivalent mechanism which comes into play at definite predetermined intervals to accomplish the sudden release or contact stroke.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In electric-arc lamps, the combination, with the carbon-holder, of the mechanically-suspended retaining-clamp and the trip-feed coacting mechanically at determined intervals to release said clamp, substantially as described.

2. In electric-arc lamps, the combination, with the carbon-holder and with its retaining-clamp, of the mechanical suspender for said clamp and the trip-feed coacting mechanically at regular intervals to shift said suspender and release the clamp, substantially as described.

3. In electric-arc lamps, the combination, with the carbon-holder, of the retaining-clamp therefor, the lever suspending said clamp, and the trip-feed device coacting mechanically therewith at predetermined intervals to impart a quick impulsive shift to said lever, substantially as described.

4. In electric-arc lamps, the combination, with the carbon-holder, of the retaining-clamp, the lever-suspender therefor, the trip-hammer to shift said suspender, and the release mechanism to actuate said hammer at definite intervals, substantially as described.

5. In electric-arc lamps, the combination, with the carbon-holder, of the suspended retaining-clamp and the trip-hammer coacting mechanically at definite intervals to shift said suspended clamp, substantially as described.

6. In electric-arc lamps, the combination, with the carbon-holder, of the retaining-clamp therefor, the suspending-lever, the trip-hammer, and the clock mechanism to actuate said hammer at definite intervals, whereby the lever is shifted and the clamp released, substantially as described.

7. In electric-arc lamps, the combination, with the carbon-holder, of the jointed clamp retaining said holder between the sections thereof, the connecting-link secured to the hinged joint of the clamp-sections, the suspending-lever, the pivot-hammer to shift said lever at intervals, mechanism for actuating said hammer intermittently, and stops to determine the drop movement of the jointed clamp, substantially as described.

8. In electric-arc lamps, the combination, with the carbon-holder, of the jointed clamp retaining said holder between the sections thereof, stops to determine the drop movement of said clamp, the connecting-link secured to the hinged joint of the clamp-sections, the suspending-lever, the pivot-hammer to strike said lever at intervals, the reaction-springs to restore the lever and hammer to position, and the intermittent mechanism to operate said hammer, substantially as described.

9. In electric-arc lamps, the combination, with the carbon-holder, of the jointed clamp retaining said holder between the sections thereof, the suspending-lever for said clamp, the intermediate lever, the striking-hammer, and intermittent mechanism to actuate the same at intervals, substantially as described.

10. In electric-arc lamps, the combination, with the carbon-holder and with the retaining-clamp therefor, of the suspension device to maintain said clamp, the trip mechanism coacting at regular intervals to shift the suspension device, an electro-magnet energized from the lamp-current, and an armature therefor having movable arms to control said suspension device and trip mechanism, respectively, substantially as described.

11. In electric-arc lamps, the combination, with the carbon-holder, of the clamp to retain the same, the lever suspending said clamp, the clock mechanism to intermittently actuate said lever, an electro-magnet energized from the lamp-current, and an armature therefor, having movable arms to control the action of said suspending-lever and clock mechanism, respectively, substantially as described.

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