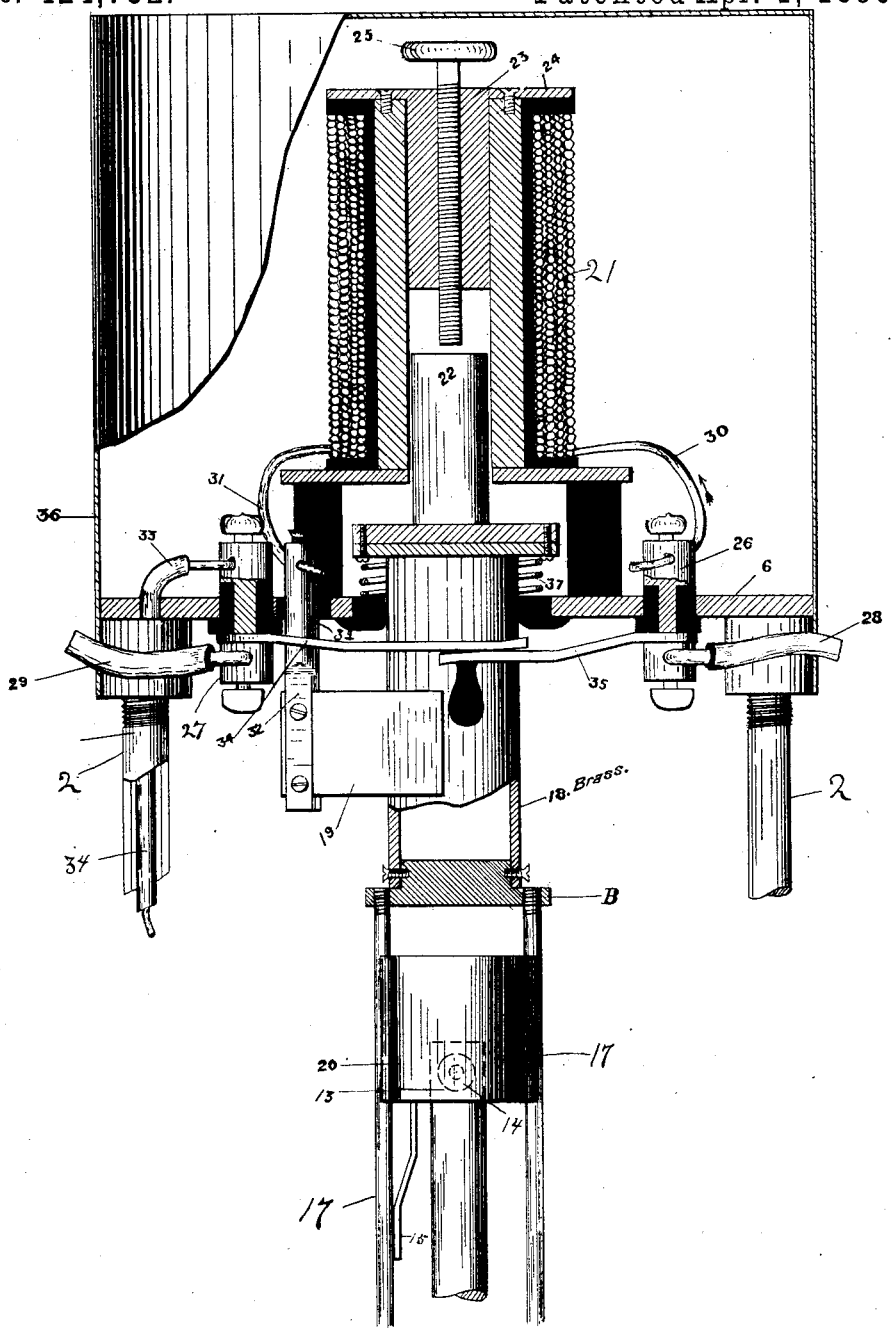
(No Model.) 2 Sheets—Sheet 1.

R. H. BEACH.

ARC LAMP.

No. 424,752. Fig. 1 Patented Apr. 1, 1890.



Witnesses.
S. W. Roberts
A. M. Gaskill

Inventor
Ralph H. Beach
By Paul Mumm Attys

(No Model.) 2 Sheets—Sheet 2.

R. H. BEACH.

ARC LAMP.

No. 424,752. Patented Apr. 1, 1890.

Fig. 2.

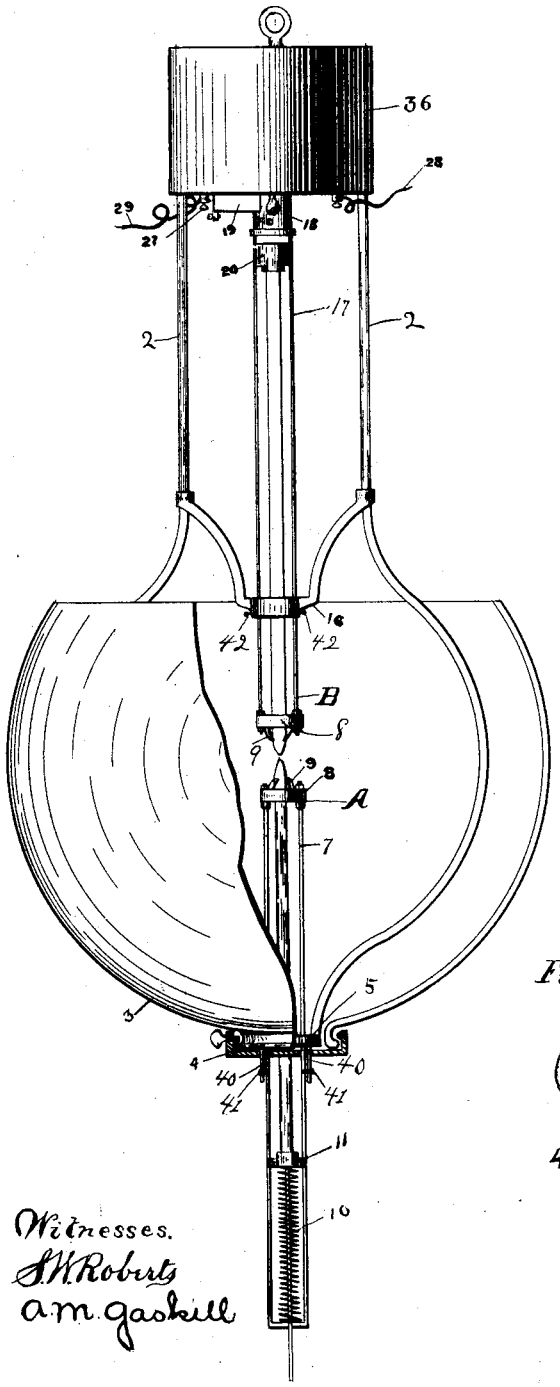


Fig. 4.

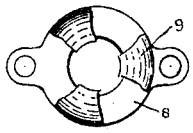


Fig. 3.

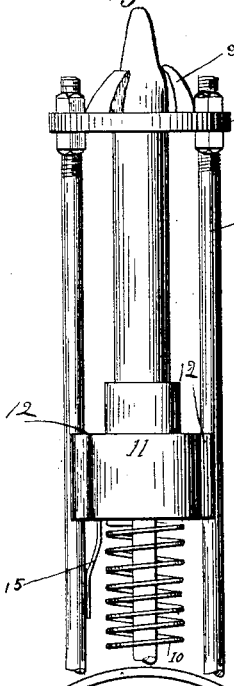


Fig. 6

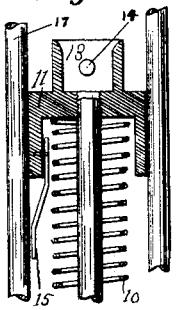
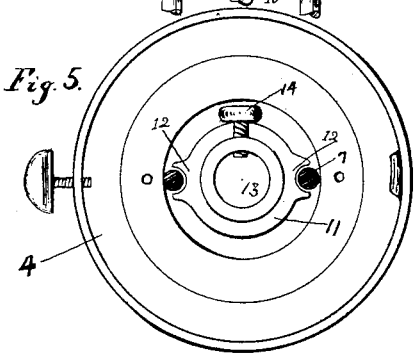


Fig. 5.



Witnesses.
S. W. Roberts
a. m. gaskill

Inventor.
Ralph H. Beach
By Paul Munn Attys

UNITED STATES PATENT OFFICE.

RALPH H. BEACH, OF ST. PAUL, MINNESOTA, ASSIGNOR TO CHARLES F. DIETHER, SAMUEL B. DIETHER, AND PETER RUENITZ, ALL OF SAME PLACE.

ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 424,752, dated April 1, 1890.

Application filed August 12, 1889. Serial No. 320,445. (No model.)

To all whom it may concern:

Be it known that I, RALPH H. BEACH, of St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new Improvements in Arc Lamps, of which the following is a specification.

My invention relates to improvements in electric-arc lamps, and its object is to provide means for automatically advancing or feeding both of the carbons as their substance is consumed, so as to maintain the point of light in an unvarying position and avoid flashing or flickering of the light; and it consists, generally, in the construction and combination hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is an elevation and partial section of my improved device, showing the means for adjusting and advancing the carbons. Fig. 2 is a detail of the solenoid and its connections by means of which the arc is established between the carbon points. Fig. 3 is a detail of the stops or abutments which engage the point of the carbon and control its forward movement, and also of the holder and follower of the carbon. Fig. 4 is a plan view of the carbon-stop; and Fig. 5 is a plan view, and Fig. 6 a vertical section, of the follower and its connections.

In the drawings, 2 represents the side bars of the lamp-frame, made, preferably, of light tubing; 3, the globe, and 4 the globe-holder. The side bars 2 are connected together at the bottom by means of the ring or collar 5 and at the top by means of a cap or plate 6, to each of which they are rigidly secured. Arranged vertically in the ring or collar 5 is the lower-carbon holder A, consisting of the guides 7, preferably of light metallic rods of high conductivity, arranged parallel with each other in a vertical position and secured together at the top by means of the abutment-collar 8. This collar is provided with the points 9, preferably three in number, which converge together, leaving an opening between them slightly less than the diameter of a carbon pencil. This collar and its points are made, preferably, of material which will endure a high degree of heat without burning or fusing, such as lava.

The lower ends of the guides 7 are secured together in any suitable manner to hold them in a position parallel to each other and to furnish a support for the spiral spring 10, arranged between the guides. The guide-rods are held to the extensions 40 by set-screws 41, so as to be adjustable up and down. Arranged upon the top of the spiral spring is a follower 11, provided with the pronged ears 12, which engage with and slide along the guides 7 as the follower is carried up and down between them. This follower is provided, preferably, with a socket 13, into which the unpointed end of the carbon pencil may be closely fitted or secured by the set-screw 14, so as to insure good electrical contact. A contact spring or brush 15 may also be secured to the follower and brush one of the guides, so as to insure proper electrical connection. The guides 7 are of sufficient length and arranged at such distance apart as to admit of the insertion of a carbon pencil with its point projecting through the collar 8, with its shoulder bearing against the abutments or points 9, and its lower end secured to the follower 11, the spring 10 being of such character and dimensions that it will advance the pencil-point between the abutments 9 as it wears away until the pencil is consumed.

Secured at a proper position upon the side bars 2, so as to slide thereon, is the support or collar 16, in which is secured the upper-carbon holder B, having similar guides 17, secured together at the bottom by a like abutment-collar 8, having the points 9. The upper guide-rods 17 are secured to the frame or support 16 by set-screws 42. The other ends of the guides are preferably secured to the brass tube 18, which serves as a contact-surface for the spring 19 and passes through a suitable opening in the cap-plate 6. Arranged between the guides 17 is a follower 20, having a socket 13, and set-screws 14 and ears or grooves 12 in the side, engaging and sliding upon the guides, and preferably provided, also, with a spring or brush 15, the same as the one on the follower 11, and bearing upon

one of the guides 17. This follower 20 is of sufficient weight to positively advance the upper carbon by virtue of its gravity in the same manner as the spring 10 advances the lower carbon. If preferred, a spring-actuated follower may be substituted for the follower 20. The guides and their attachments are properly insulated from the supports 5 and 16 and the plate 6.

Supported upon and insulated from the plate 6 is the solenoid 21, in which is arranged the core 22, secured to the brass tube 18 of the upper-carbon holder. In order to increase the lifting power of the solenoid, I prefer to arrange in the upper end of the opening in the solenoid the iron plug 23, having a cross-bar 24, which is secured to the upper end of the solenoid, and to compensate for the weight of the follower 20 a spring 37 may be arranged around the tube 18 and above the plate 6, so as to partially support the holder. An adjusting-screw 25 passes through the plug 23, in which it is threaded, and projects downward to serve as a stop for the core 22, thereby limiting the upward movement of the core.

26 is the positive binding-post and 27 the negative, and the wires 28 and 29 secured thereto represent, respectively, the positive and negative ends of the main line-wire. The binding-post 26 is connected by the wire 30 to the solenoid, from which leads the wire 31 to the binding-post 32, having the contact-spring 19, by which the current is transmitted to the tube 18 and the upper-carbon holder B.

I prefer to connect the lower-carbon holder A with the negative binding-post by means of the insulated wire 33, which is carried down from the binding-post through or outside one of the frame tubes or rods 2 and connected to the lower guides in any suitable manner.

The various parts above described are insulated in any proper manner from the frame of the lamp. The contact-strip 34 and the switch-arm 35, connected, respectively, to the positive and negative binding-posts, serve to throw the lamp into or out of the working-circuit.

Instead of the guides 7 and 17, tubes may be used, if preferred, to hold the carbons and their followers and springs; but I prefer the above-described construction, for the reason that its open form prevents the heating of the parts, as would be the case with the closed tubes, and the lamp is readily trimmed by pressing down the follower and spring in the lower-carbon holder and slipping the carbon into place above and raising the carbon-follower in the upper holder and slipping the carbon in below it.

In order to secure perfect working of the lamp, the points of the carbon should be formed into the shape which they will assume under the action of the current when in use, the points 9 thus bearing upon the pencil just forward of the shoulder formed in the tapering of the point, the holders being adjusted to hold the points exactly in contact before the current passes, the distance which the upper holder is raised when the current passes determining the length of the arc. As the carbon pencils retain a substantially regular and uniform shape at the point in use in a given current, although varying in shape with different currents, it is essential that the pencils be made with points substantially of the form produced by the current in which they are to be used, for the reason that otherwise the points or abutments 9 will be brought so near to the point of light before the carbon has assumed the tapered form as to be burned or fused. A suitable cover or case 36 is arranged upon the top of the frame of the lamp, so as to inclose and protect the attachments in the ordinary manner.

Operation: The follower 11 is pressed downward against the tension of the spring 10, and a carbon pencil, with its point tapered to correspond to the shape it will assume in the current in which it is to be used, is slipped upward through the ring 5 and into engagement with the abutments 9, the points of which should bear upon the tapering surface of the point just forward of the shoulder, thus permitting the entire point to pass through between them, but preventing the passage of the full-sized pencil. The lower or square end of the carbon pencil is then inserted into the socket of the follower 11 and secured therein by the set-screw 14. The follower 20 is then raised, and the positive carbon, similarly pointed, is inserted downward beneath it, and its upper end is secured in the follower in the same manner as the other carbon has been secured in the follower 11. The holder A is then adjusted vertically in the ring or collar 5, so that the carbons as advanced by the spring 10 and the gravity-follower 20 shall bear against their respective abutment-points and the carbon points be in contact. The adjusting-screw 25 is then set to determine the exact length of arc desired, which will be equal to the distance between the end of the core and the screw-point. The connection is then made, as described, of the main wire with the binding-points 26 and 32 and the solenoid, and of the wire 33 with the binding-post 27 and the lower-carbon holder, the spring 19 bearing upon the tube 18 and the switch 35 being in contact with the strip 34. The current being now passed over the wires in the direction indicated by the arrow and the switch 35 being opened, the current is passed through the positive carbon to the negative and thence upward through the wire 33 to the negative binding-post and the other end of the main line wire. With the completing of the circuit through the solenoid, as described, it is energized by the current and attracts the core 22, raising it up into contact with the adjusting-screw 25, thus establishing the arc, which arc is maintained by the attraction of the solen-

oid for the core 22 so long as there is no interruption of the current. As the points of the carbon pencils are worn away the pencils are automatically and regularly advanced by the spring and gravity-followers, so that the arc is maintained of practically unvarying length until the carbons are consumed. Because of this regular movement of the carbons as consumed and the unvarying length of arc any flash or flicker of the light is absolutely prevented, and as the lower-carbon holder is stationary the focus or point of light remains fixed.

In case of the break or interruption of the current the solenoid is de-energized and the carbon-holder 20 is allowed to drop, and thus bring its carbon into contact with the negative carbon, so as to be in position to complete the circuit when the current is renewed, whereupon the same operation is accomplished as above described.

By constructing the guides of sufficient lengths second carbons may be inserted to follow the first as consumed, whereby the lamp may be made to burn for a longer period without attention. From the peculiar construction described the lamp may be used, as desired, in either a continuous or alternating current, which is of material advantage, and by the use of springs to advance the carbons the carbon-holders may be arranged in any desired position, if necessary, a spring being employed to withdraw the core from the solenoid on the cessation of current.

I claim as my invention—

1. The combination, with the lower adjustable carbon-holder carrying the spring-actuated follower for pressing forward the carbon, of the upper-carbon holder composed of the guide-rods 17, the collar 8, securing said rods together at their lower ends and provided with the points 9, the tube 18, having the upper ends of the rods 17 connected therewith, and the core 22, the solenoid 21, and the follower 20, formed with grooves to receive the rods 17 and guided in its movement by said rods and adapted to carry the carbon point, substantially as and for the purposes set forth.

2. The combination of the lower-carbon holder, the follower for depressing the upper carbon, the guide-rods on which said follower slides, the solenoid, the core of the solenoid, the tube connecting the solenoid and said guide-rods, and the spring for assisting in supporting the upper-carbon holder, substantially as and for the purposes set forth.

3. The combination of the upper-carbon holder, the solenoid, its core, the brass tube 18 between the core and the carbon-holder, and the spring-plate 19, bearing against said tube and connected with a binding-post having a connection with the coils of the solenoid, substantially as and for the purposes set forth.

4. The combination of the solenoid, its core, the carbon-holder, the brass tube intermediate of the core and holder and connected with said parts to move with them, the plate 19, bearing against said tube and having a connection with the solenoid, the binding-posts 26 and 27, the strip 34, the switch 35, and the wire-connections, substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand this 5th day of August, 1889.

RALPH H. BEACH.

In presence of—
T. D. MERWIN,
BESSIE BOOTH.