(No Model.)

H. C. McDILL & J. E. GASTON.

ELECTRIC ARC LAMP.

No. 359,221. Patented Mar. 8, 1887.

Fig. 1.

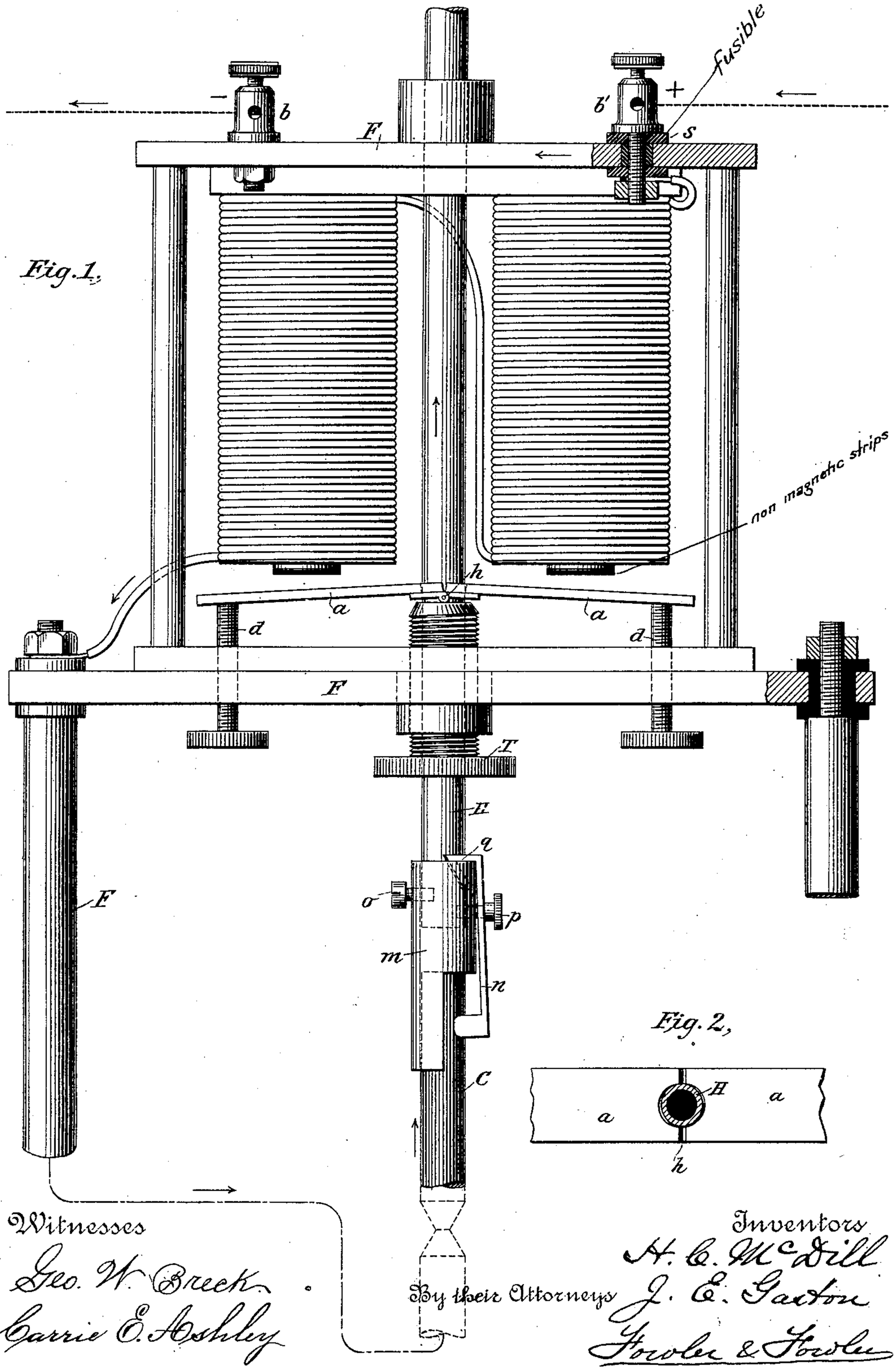

Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY C. McDILL AND JAMES E. GASTON, OF FORT WORTH, TEXAS, ASSIGNORS OF THREE-FIFTHS TO JOSEPH H. BROWN, WILLIAM G. NEWBY, AND WILLIAM H. McDILL, ALL OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 359,221, dated March 8, 1887.

Application filed July 30, 1886. Serial No. 209,523. (No model.)

To all whom it may concern:

Be it known that we, HENRY C. McDILL and JAMES E. GASTON, citizens of the United States, and residents of Fort Worth, in the county of Tarrant and State of Texas, have invented a new and useful Improved Electric-Arc Lamp, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same.

Our invention relates to arc lamps having a single magnet for controlling the lamp located in the main circuit and having a gravity-feed.

The object of the invention is to construct an arc lamp with as few parts as possible and to make these parts as light as possible, dispensing with counter-weights, dash-pots, &c., and also to secure an arc lamp which has an instantaneous feed, so that the feed of the lamp is not perceptible to the eye, thus producing a light that does not flicker and which has no blink.

The invention consists of a hinged armature which is free to vibrate throughout its length with a carbon-rod carrier which is adapted to clutch at the hinged portion, and having a horseshoe-magnet located in the circuit of the main line for acting on the ends of said hinged armature by variations of current in said magnet corresponding to variations in the arc which is in the circuit of the magnet, and having also an adjustable trip and limiting-stops for said armature upon the outside of the casing.

It consists, also, in placing shunt material, fusible material, or fusible shunt material around one of the binding-posts with which the circuit is connected; and it consists, further, in a new and useful carbon-clutch, whereby the clamping-jaw of the clutch is kept in alignment with the carbon and always substantially parallel with the carbon.

Figure 1 shows an elevation of our invention and the path of the circuit therein. Fig. 2 is a detailed view of the hinged armature and carbon-rod holder, looking down upon the apparatus shown in Fig. 1.

The apparatus is supported upon a frame-work, F, and has depending from the top of a horizontal portion of this frame-work an electro-magnet of the horseshoe type, located in the main line, which is connected with the binding-posts *b* and *b'*. Passing through this portion of the frame and another horizontal portion of it, which carries the adjustable trip T and the limiting-stops *d d*, is a carbon-rod holder, H, which carries at its lower end the upper carbon. This magnet is provided with a hinged armature, *a a*, having an opening at the hinge *h*, through which the carbon-rod holder also passes, and by which it is adapted to be clutched when the ends *a a* of the armature are raised. This armature is free to vibrate throughout its entire length, and is not pivoted to any part of the apparatus. It is provided at each side with adjustable stops *d d*, which limit the play of the end of the armature, and has at its middle or hinged portion an adjustable screw-threaded trip, T, through which the carbon-rod holder passes. By means of this trip the hinged portion of the armature is regulated—that is to say, when the trip is raised the armature-clutch is tripped off from the carbon-rod holder sooner, and when lowered this action is deferred. By means of the limiting-stops and trip the play of the armature can be adjusted as desired.

The magnet and armature are designed to be inclosed by a casing, (not shown in the drawings,) and the adjustable trip and limiting-stops are designed to project below the casing and to be provided with milled heads, so that the lamp may be regulated readily.

The line-wire is connected to two binding-posts, *b* and *b'*, located upon the frame-work, as shown. The latter binding-post, *b'*, at which the current enters, has shunt material *s* placed around it as a bushing. This material may be fusible, so as to melt away from the binding-post *b'* and let the binding-post down upon the frame-work in case of an abnormal rise of current, whereby the lamp will be cut out of the circuit and a short circuit established between the two binding-posts through the frame-work. The material *s* may therefore serve as a shunt or as a cut-out, or as both combined. It may be composed of any suitable substance having a high resistance—such as carbon, paper, selenium, a composition of sulphur and plumbago—or any other substance that will perform the functions desired. This shunt material affords a by-path or shunt for the current when

the arc becomes abnormally long, the current in this instance passing from the binding-post *b'* through the shunt material and frame of the apparatus to the binding-post *b*, which is in metallic contact with the frame. This arrangement affords a simple, inexpensive, and a very efficient means for shunting by a portion of the current when the arc becomes abnormally long. We therefore dispense with a resistance-coil and a derived-circuit magnet for accomplishing this same purpose, and provide means for rendering successful the operation of arc lamps depending upon one magnet for their operation.

The lower end of the carbon-rod holder H is notched and adapted to receive the upper end of a clamp-jaw, *n*, which is hooked at *q*, as shown, and takes over a tubular piece, *m*, having half of its body cut away below the center, which tubular body embraces the carbon-rod holder and is secured thereto by a screw, *o*, and receives at its lower or cut-away portion the carbon C, which is clamped by the jaw *n* by means of a screw, *p*, which turns in the tubular body *m* and the carbon-rod holder. The angular portion *q* is free to move to the right or the left through a small space. It will be seen, therefore, that when the screw *p* is screwed in or out to clamp or unclamp the carbon the jaw *n* will remain substantially parallel with the position shown, which is nearly parallel with the carbon, and that in no matter what position the jaw *n* is adjusted it will be substantially parallel with the carbon. It will be seen, also, that that jaw *n* being held in position at the point *q* and at the point *p*, it will be always kept in alignment with the carbon. We have shown in the drawings this carbon-clamp as holding in position the upper carbon only; but we design to have each carbon held in place by such a clamp. We have also shown only the upper carbon and the essential features of our invention, and have omitted the lower portion of the frame-work, in order to illustrate our invention more clearly upon an enlarged scale.

The rods that support the lower part of the frame-work are shown as broken away in the drawings. They are insulated from the frame-work by vulcanized fiber or any other insulating material, as shown at the right hand of the figure.

The shunt material *s*, used as a bushing about the binding-post, has the particular advantage of being easily replaced, is very inexpensive and efficacious.

The circuits are shown in part by broken and dotted lines, and the course of the current is indicated by arrows, and the lower carbon represented in dotted lines.

We have aimed in our invention to make the parts as light as possible and to dispense with all cumbersome parts, and to construct a lamp that is very sensitive to changes in the length of the arc, and to make a lamp that is instantaneous in action, so as to render the feed of the lamp imperceptible to the eye. Our lamp, also, is regulated by but one magnet. We have striven to dispense with all of the magnets and parts that are not absolutely required, and have secured an arc lamp which is perfect in operation, simple in construction, and gives a steady and brilliant light.

So far as we are aware, in other lamps the object has been to make the parts heavy, so as to render the movements of the lamp slow. The object of our invention, however, is just the reverse of this, and the success of our lamp leads us to believe our theory is a correct one.

The operation of our apparatus is, briefly, as follows: When there is no current on line, the parts assume the positions shown in the figures, and the two carbons are together, completing the circuit from the binding-post *b'* through the magnet, the carbons, and carbon-holder to the binding-post *b*. When a current flows over the line, the magnet is immediately vitalized, the armature *a a* is drawn up so as to clutch the carbon-rod holder, which draws the same up until the armature is in contact with the poles of the magnet. The arc is thus established, and the carbons burn away until the arc becomes abnormally long and its resistance increases by virtue of its length. When the current in the magnet is decreased by the increase of the resistance of the arc, the armature begins to fall until it reaches the adjustable trip, whereupon the clutch at the hinged portion is taken off and the carbon-rod holder is free to descend by its own weight. The current now increases in the magnet, as the length of the arc has become less by the feed, and the armature is immediately drawn up again performing the same function as before. This action takes place so rapidly that no perceptible blink of the light can be discerned. To prevent the sticking of the armature to the pole-pieces, we provide the same with non-magnetic strips, which completely obviates this difficulty and renders the operation of the lamp perfect.

We are aware that an armature free to vibrate throughout its entire length and hinged at its middle, where it clutches the carbon-holder, is not new, the same being shown in English Patents Nos. 4,046 of 1882, and 898 of 1882; but in our invention the armature is a gravity-operated one and has means for adjusting it upon the outside of the casing, so as to be of easy access.

Having now fully set forth our invention and described its operation, we desire to have it known that we do not limit ourselves to the exact construction and arrangement shown, as the same may be varied without departing from the spirit of our invention, and we reserve the right in practice, should we see fit, to make such changes as come within the scope of the invention; but

What we desire to claim, and secure by Letters Patent, is—

1. An arc lamp having its leading-in wires connected to binding-posts, one of which is

partially insulated from the other by shunt material placed as a bushing around said binding-post.

2. An arc lamp having its leading-in wires connected to binding-posts, one of which is partially insulated from the other by fusible material placed as a bushing around said binding-post.

3. An arc lamp having its leading-in wires connected to binding-posts, one of which is partially insulated from the other by fusible shunt material placed as a bushing around said binding-post for shunting off from the arc.

4. An arc lamp having but one magnet for regulating the lamp located in the main circuit, two binding-posts connected with the line mounted upon the frame of the lamp, the positive one of which has shunt material around it to afford a shunt around its arc when it becomes abnormally great.

5. In combination with an arc lamp, a carbon-clamp embodying a tubular body, *m*, a clamping-jaw, *n*, having a hooked hinge, *q*, a set-screw, *o*, and clamp-screw *p*.

6. In an arc lamp, a carbon-rod holder having a notch near its end, a tube fastened thereto having a cut-away portion for receiving the carbon rod, a clamping-jaw with a hooked hinge embracing the edge of tube and working in said notch, whereby the clamping-jaw is always kept substantially parallel with carbon rod, and a clamp-screw for the jaw secured in the tube, whereby the jaw is kept in alignment with the carbon.

7. An arc lamp having an electro-magnet in the main line, a gravity-armature hinged at its middle and embracing the carbon-holder rod at this point, acted upon at its ends by said magnet, an adjustable screw-threaded trip surrounding said carbon holder, and limiting-stops adjustable to or from said armature, said trip and limiting-stops regulating the lamp and extending upon the outside of the casing, so as to be of easy access.

8. In an arc lamp, the combination of a single horseshoe electro-magnet in the circuit of a main line, connected on the positive side to a binding-post having shunt material as a bushing around it, an armature hinged at its center and free to vibrate throughout its length with a carbon-rod holder, which it is adapted to clutch at the hinged part, said magnet acting upon the ends of the armature only, and an adjustable trip and limiting-stops, and means permitting both to be readily adjusted upon the outside of the casing to regulate the lamp.

In testimony whereof we have hereunto set our hands and seals, this 16th day of July, 1886, in the presence of the two subscribing witnesses.

HENRY C. McDILL. [L. S.]
JAMES E. GASTON. [L. S.]

Witnesses:
A. H. PEACOCK,
D. S. BROWN.