(No Model.) 2 Sheets—Sheet 1.

W. E. IRISH.

ELECTRIC ARC LAMP.

No. 479,121. Patented July 19, 1892.

Fig. 1.

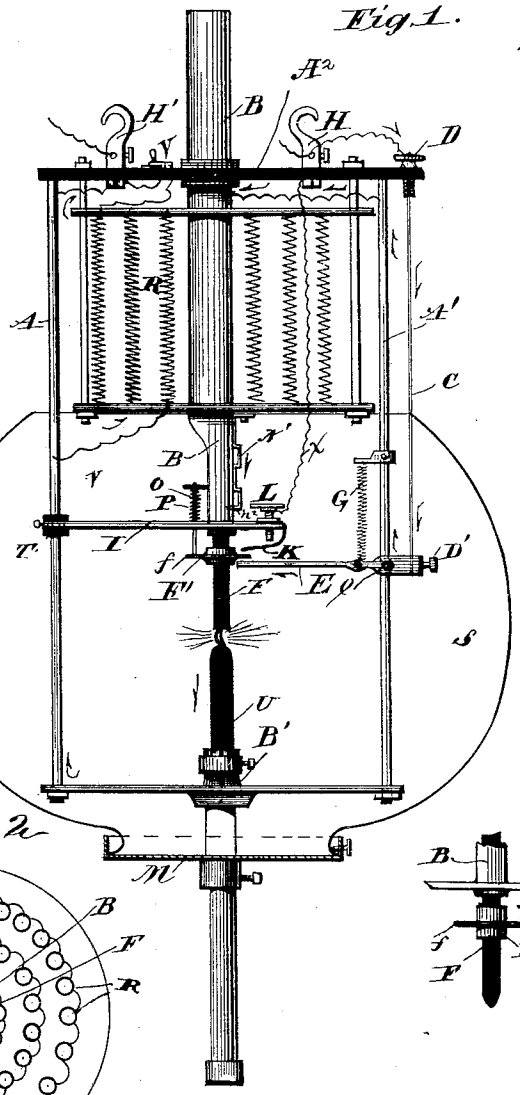


Fig. 3.

Fig. 4.

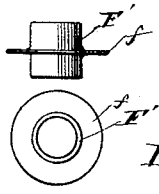


Fig. 2.

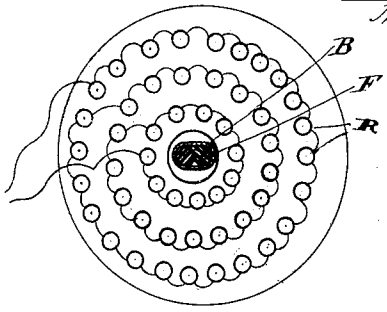
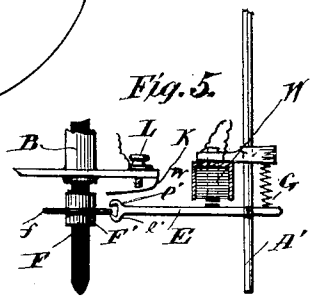


Fig. 5.



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(No Model.) 2 Sheets—Sheet 2.

W. E. IRISH.

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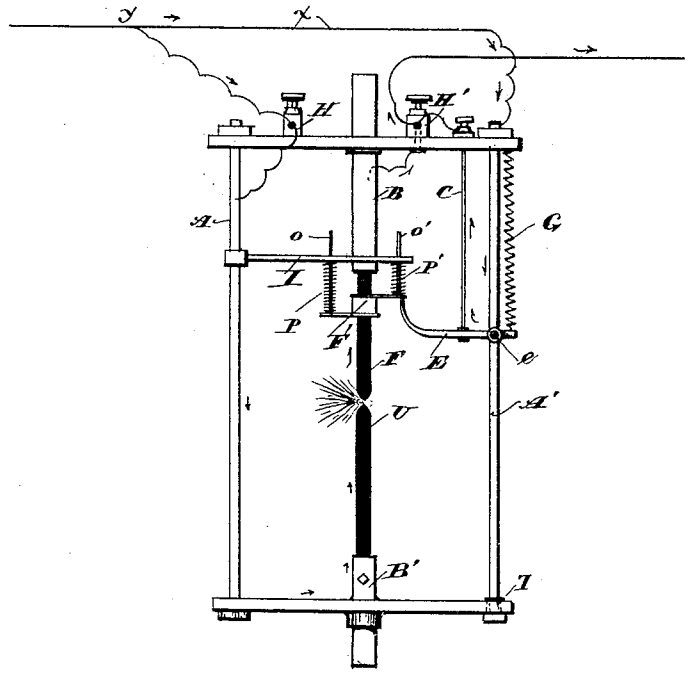
Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM E. IRISH, OF CHICAGO, ILLINOIS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 479,121, dated July 19, 1892.

Application filed January 2, 1892. Serial No. 416,786. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. IRISH, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Lamps, of which I hereby declare the following to be a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of the invention is to provide an improved construction of a class of lamp in which a thermo-expansive strip is employed to operate the clutch.

The invention consists of elements and combination of elements as set forth in the accompanying drawings and description thereof.

In the accompanying drawings, Figure 1 is a vertical elevation, partly in section, of my lamp. Fig. 2 is a plan of the rheostat-coils and supporting-disk. Fig. 3 is a detail of upper-carbon holder spring. Fig. 4 is a detail of clutch or grip for adjusting carbons. Fig. 5 is a modified form, and Fig. 6 shows a similar arrangement of circuit.

In the figures, A and A′ are frame-supports.

B and B′ are the upper and lower carbon holders.

C is an expansion-strip, preferably of a thin narrow band of metal, the tension of which can be regulated by the adjusting-screw D at one end where the strip is secured to the upper disk A^2 of the lamp. This strip C is secured removably at its lower end to the vibrating arm E, pivoted at *e* to the supporting-rod A. The inner end of this arm is adapted to engage with a carbon clutch or grip F′, which raises or lowers the carbon F. A tension-spring G, secured at one end to the rod A′ and having its other end connected with the arm E, counteracts the tension of the strip C in such a manner as to move the arm E proportionally to the expansion of the strip C. On the opposite side of the clutch F is seen the rod P, which moves vertically in the bar I, which supports the carbon-holder B, which again is provided with binding-screw L and dependent insulating-spring K. The function of the rod P is to depress the edge of the grip F′ on that side of the holder and assist the action of the lever E when raising the opposite side thereof. A spring O insures the constant engagement of the rod and rim *f* of the grip F′. In the detail of this part (shown in Fig. 4) F′ is the clutch or grip, consisting in a short sleeve with squared faces and a flange *f*, as shown.

H and H′ are binding-screws for terminals of the lamp-circuit.

R is a rheostat of a series of coils connected.

M is the disk upon which the globe rests.

S is the globe.

T represents insulation and points of separation of the metallic portions of the frame.

The upper disk A^2 of the lamp is wholly insulated from the other parts.

The upper carbon is clamped to the lower end of the movable cylindrical holder N, as seen in Fig. 3, the upper end of which is provided with a grooved head *n*. A spring N′ of irregular shape is secured within the longer portion of the carbon-holder at the side in such a manner as to give more perfect contact for the traversing current, and the lower portion of the spring is bent inwardly at n^2 to lodge in the groove *n* in the head *n′*, so as to arrest the feed of the carbon, when of course the current will be broken and the arc will disappear.

The globe-holder M contains a disk of transparent mica for the purpose of catching the falling particles of carbon dust without obscuring the light or throwing down a shadow.

In operating the lamp it will be observed by following the arrow-points that the current passes from the binding-post H through the expanding strip C, thence by the vibrating arm E to the supporting-rod A′ and the carbon-holder B, and also by the vibrating arm E to the clutch F′, thence to the upper carbon, from which it passes to the lower carbon U, thence by the rod A to the binding-post H′, except in the case where the rheostat R is employed, as in the figure, when the current passes through that before reaching the binding-post, a switch, as V, being employed to change the direction of the current through the rheostat.

To adjust the lamp, the tension of the spring G is first made strong enough to easily lift the arm E and raise the upper carbon by means of the clutch F. The expanding strip C is then adjusted until it counteracts the spring G to such an extent as to release the

carbon and allow it to fall readily by its own weight again in contact with the lower carbon U. If the current is now turned on, the strip C will immediately expand and the spring G will be left free to lift the arm E against the clutch F and raise the upper carbon out of contact with the lower carbon and make the arc.

When the lamp is employed on an incandescent circuit, the resistance becomes greater as the arc becomes longer. Consequently less current will pass through the strip C, which contracts proportionally, overcoming the tension of the spring G, and thereby causing the end of the arm E to release its grip on the upper carbon, which immediately gravitates toward the lower one, thereby reducing the resistance and causing the strip to again expand and raise the grip F′, with the carbon F.

When the lamp is employed on an arc circuit, the arm E in raising the carbon forces the rim of the clutch against the spring K, which is carried on the end of the bar I, and so adjusted that when the arc is of greater than the required length the spring K will be forced into contact with the adjustable contact-screw L, which is directly in contact with the terminal H, as by the circuit X. This forms a shunt-circuit having a lower resistance than C. The current passing through the strip C being less will contract it by reason thereof and adjust the length of the arc and again open the shunt-circuit. The current will pass immediately through and between the carbons; but its strength may be slightly varied. The double connection of the circuit with the carbon and holder gives a greater security of contact. It will be seen that the spring-actuated lever E, with the contractile strip C, takes the place of the electro-magnets commonly employed in arc lamps to regulate the position of the upper carbon, while it is far more simple and easily adjustable.

I do not claim any special sectional form of strip C, but find that a tubular ribbon or rod form may be adapted to varying circumstances.

In Fig. 5 is shown a modified form of extremity of rod E in the form of a double clutch, which in some circumstances works better than the single point. In this figure, E is the bar. *e′ e′* are the extremities of such form as to alternately engage the flange *f* and lift it. It is more positive in action. The other form of construction shows an electro-magnet W in place of an expanding rod, the function being similar. An iron jacket *u* is placed over the magnet.

In Fig. 6 is shown a modified form of shunt for an arc circuit. The shunt-circuit employed on arc-circuit lamps permits the carbons to feed together gradually. In the figure the current on entering the lamp is divided at Y, when the lamp is burning, one half passing through the rod A to the lower carbon, the other passing to rod A′, and so to the upper-carbon holder B and expanding strip C, thence to the binding-post B′. Normally the carbons are separated, the upper one being raised by the tension of the contracting strip C. When the current first enters the lamp, it passes through the expanding strip C, which expanding releases the grip and allows the carbon to fall in contact with the lower one. The current when the carbons meet is divided, and but a small proportion will pass through the expanding strip, which will therefore contract and raise the upper carbon out of contact with the lower one, forming the arc. More current will then go through the strip C by reason of the extra resistance introduced by the arc. The strip will therefore expand, allowing the carbons to feed together. This feeding together again reduces the arc resistance, and less current will again pass through the strip, and it will contract again, and so on.

At O′ and P′ is an additional spring and rod, which assist the action of the grip.

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

1. In a lamp for an arc current, the adjustable strip C, located in the main circuit, the pivoted lever E, provided with operating-spring G, the clutch E, spring K, and shunt-circuit X, substantially as described.

2. In a lamp, the combination of side rods A A′, &c., upper disk A^2, supporting the carbon-holder B, expansible strip C, adjustably secured by screw D to said strip-lever E, pivoted at *e* upon rod A′, having one end secured to one extremity of the expansible strip and connected by spring G with rod A′, the clutch F′, rod P, spring C, and guide I, substantially as described.

3. In a lamp, the combination of an upper-carbon holder, a spring of irregular shape within the holder at the side thereof, a movable clamp within the holder, provided with a grooved head, and an inwardly-bent extremity to the spring adapted to engage said groove when the clamp is down in the lower end of the holder, substantially as described.

4. In an arc lamp, means for controlling automatically the upper carbon, consisting in the carbon-holder B, rod I, clutch F′, provided with flanges *f* and *f′*, pins O and O′, springs P and P′, pivoted lever E, and expanding strip C, substantially as described.

5. In an arc lamp, means for controlling automatically the movement of the upper electrode, consisting of the combination of a tube surrounding loosely the electrode, outwardly-projecting flanges surrounding and attached to said tube at the upper and lower ends, springs resisting the upward movement of said flanges, an operating pivoted lever upon which one of the said flanges rests, and a thermo-expansive electric conductor and actuating-spring connected with and controlling said lever.

6. In an arc lamp, the combination of a thermo-expansive electric conductor in the main circuit, a clutch upon the electrode, a lever provided with a retractile spring and connected to said conductor and engaged with said clutch, a spring terminal K, a shunt-circuit conductor, and a terminal L therefor, lying in the path of said spring K, which lies in the path of said clutch or lever.

7. In an arc lamp, the combination, with the upper electrode, which is provided with a notch in its upper end, of a holder therefor provided with a slot and a spring passing through said slot and pressing upon said electrode.

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