(No Model.) 2 Sheets—Sheet 1.

D. J. HAUSS, T. E. McNAMARA, & J. S. ZERBE.

ELECTRIC ARC LAMP.

No. 286,925. Patented Oct. 16, 1883.

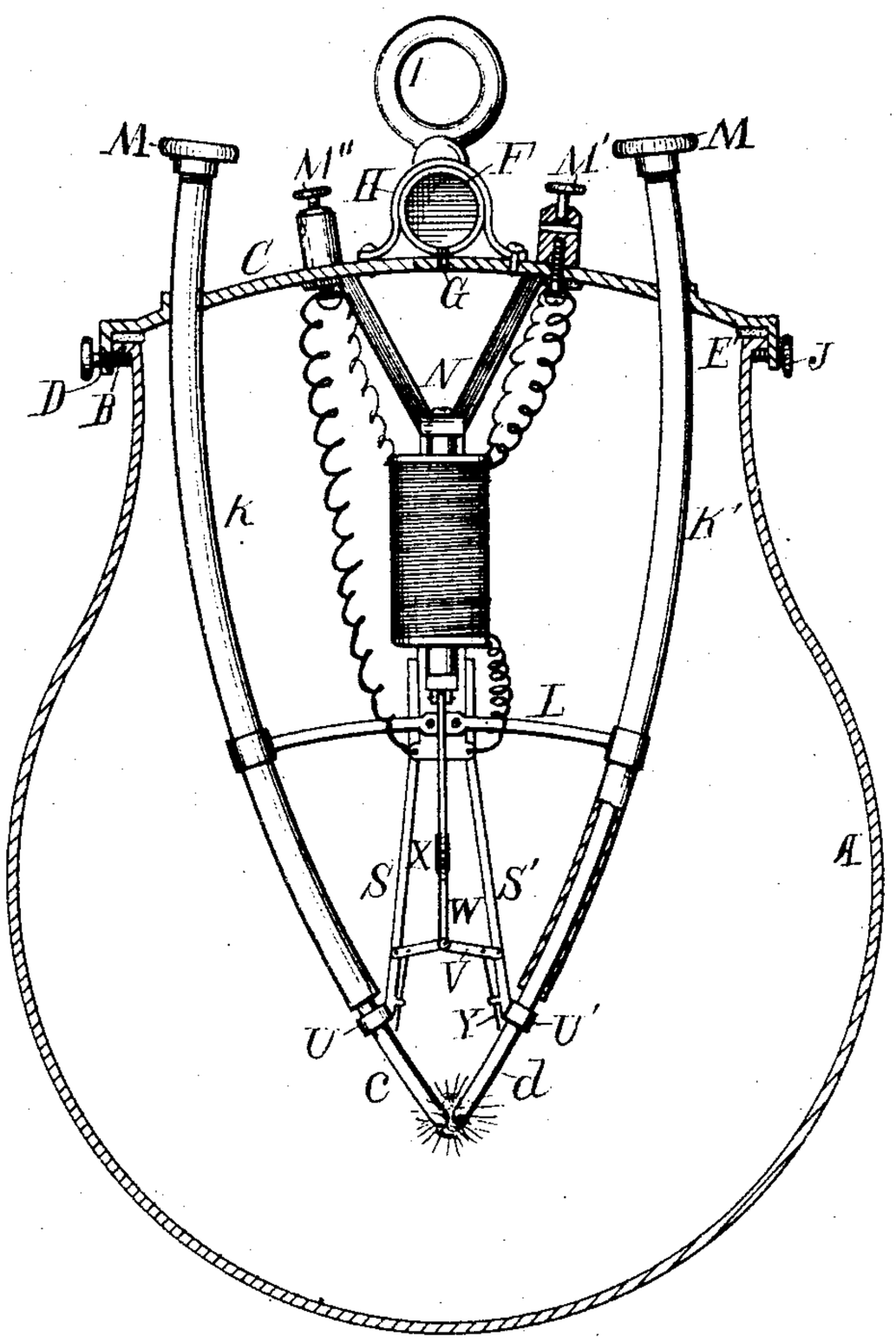

Fig. 1

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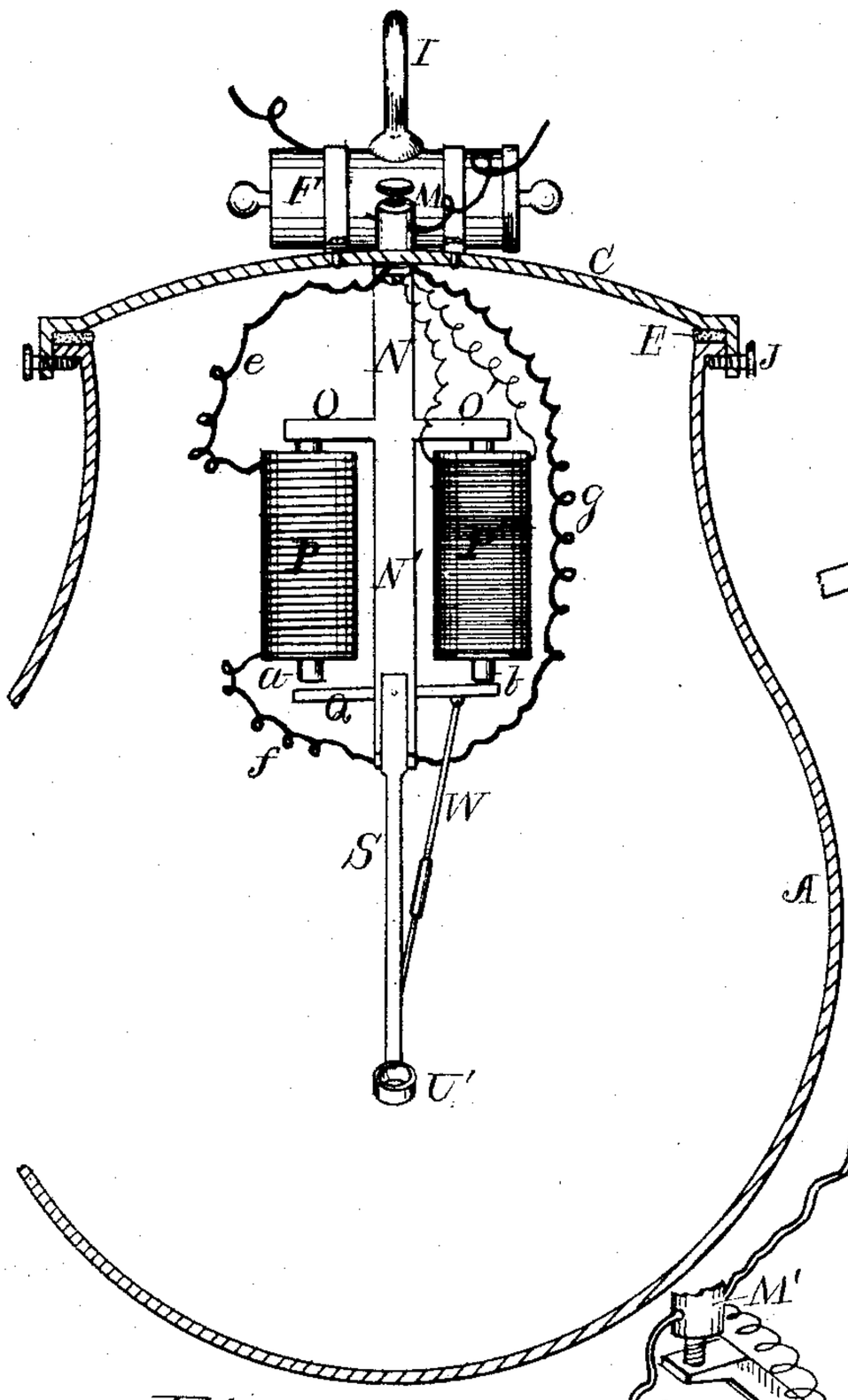

Fig. 2.

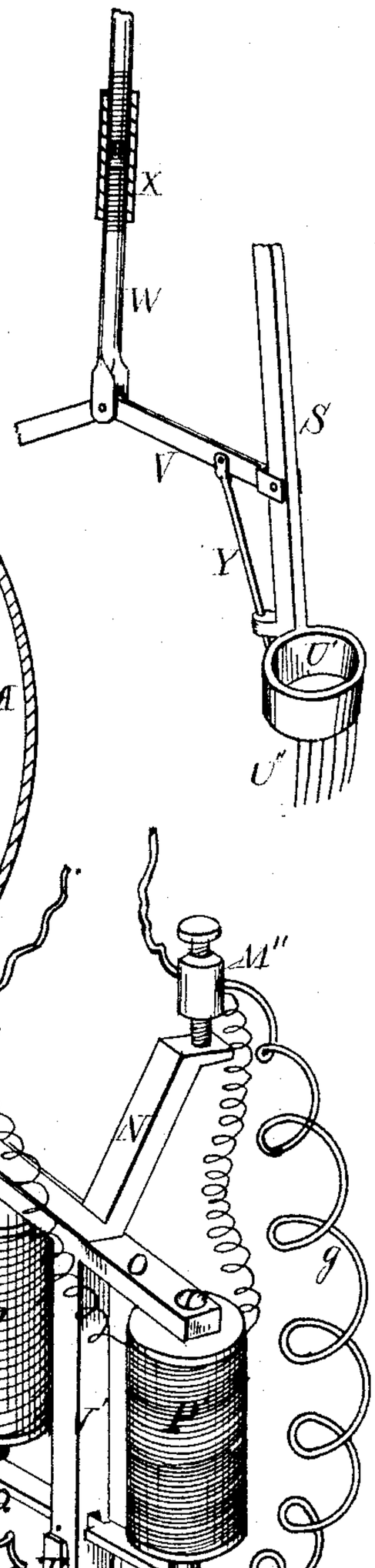

Fig. 4.

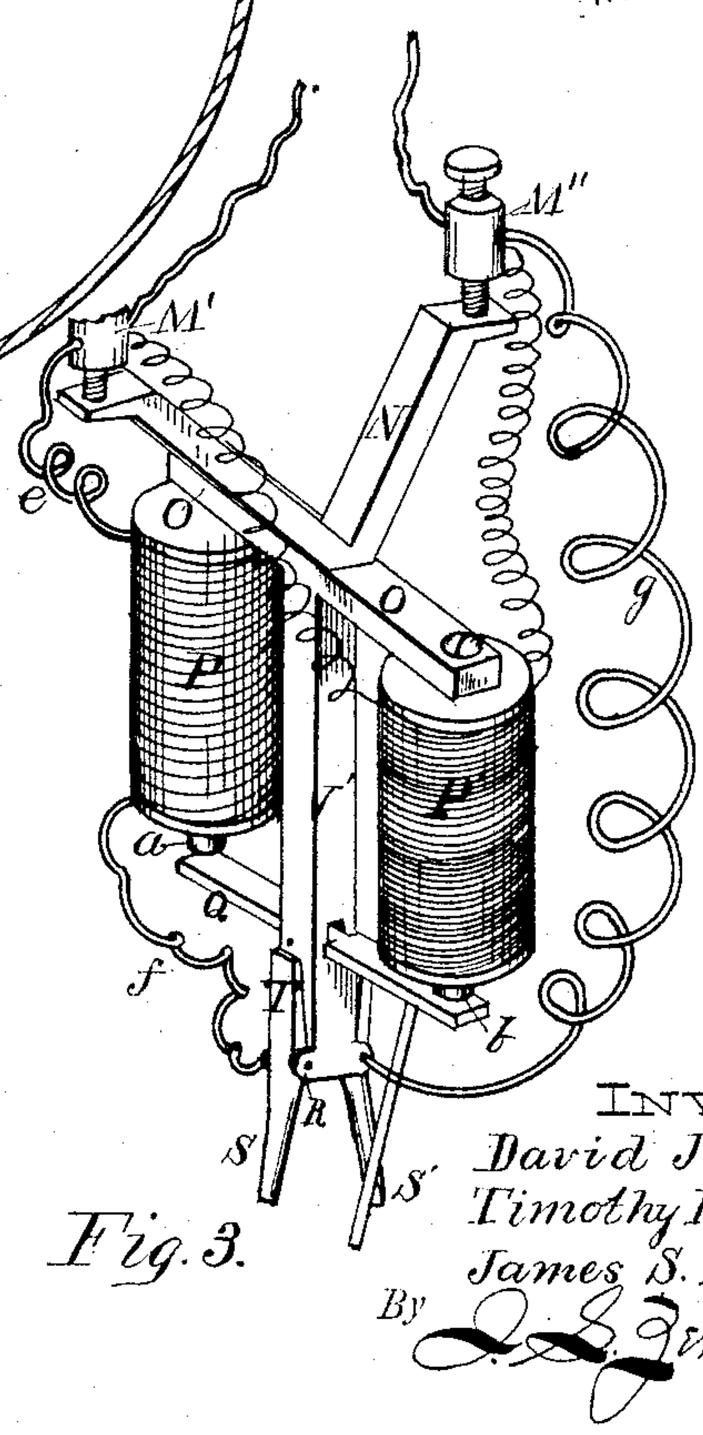

Fig. 3.

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UNITED STATES PATENT OFFICE.

DAVID J. HAUSS, TIMOTHY E. McNAMARA, AND JAMES S. ZERBE, OF CINCINNATI, OHIO, ASSIGNORS TO THE AMERICAN UNION ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 286,925, dated October 16, 1883.

Application filed May 25, 1883. (No model.)

To all whom it may concern:

Be it known that we, DAVID J. HAUSS, TIMOTHY E. McNAMARA, and JAMES S. ZERBE, all of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Electric-Arc Lamps, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a front view of the improved arc-lamp. Fig. 2 is a side view of same; Fig. 3, perspective view of the operative parts, showing the arrangement of circuits; and Fig. 4, detail view of the carbon-feeding arm.

The object of the present invention is to provide an improved electric lamp; and it consists, first, in the manner of feeding the carbons by having them approach each other at the same angle, both feeding downwardly and toward each other loosely within rigid tubes; second, in entirely inclosing within an air-tight globe or bulb above the arc the mechanism for feeding and regulating the same; third, the hermetically-closed globe provided with an air-pump permanently secured thereto, so as to produce a vacuum in the globe; fourth, to provide a means for supplying the carbons with the electric current at a point near to the arc end of the carbons; fifth, the employment of an armature-rod and two links hinged centrally, the said links being provided with fingers which project down to the carbon sticks, so that when the magnets move the armature-rod downward the motion of the arms to which the links are hinged will be outward, so as to separate the carbon before the fingers touch or check the carbon, all of which will now be set forth in detail.

In the accompanying drawings, A represents the globe of the improved form of lamp, made preferably pear-shaped, as shown, having an external annular flange, B, around the rim.

C is the head or top, composed of metal, having on its periphery the downwardly-projecting rim or flange D, which extends down over the edge of the flange B of the globe. A gasket, E, is placed between the head and globe-rim, as shown. Centrally the top or head C is equipped with a horizontal cylinder, F, communicating by one or more vent-holes, G, with the interior of the globe. The cylinder is supplied with a piston rod or head, the whole conforming in structure and arrangement with the ordinary air-pump, the object being to equip the top with means for exhausting air from the globe. The air-pump cylinder is permanently secured to the top C by means of the straps or clips H.

I is a ring secured to the cylinder F, by means of which the globe may be suspended.

Two or more thumb-nuts, J, through the flange D, below the flange B, are designed to hold the top securely to the globe in case the air within the globe has not been exhausted.

Two vertically-disposed curved tubes, K K′, are secured through the top C at opposing points near the periphery, with their curves outwardly, having their lower ends approaching each other to within a limited distance. The lower ends are held together by arms L. The upper ends of the tubes are each provided with screw-caps M, so constructed that the tubes can be hermetically sealed.

M′ M″ are binding-posts on the top, on opposite sides of the air-pump. On the under side of the top is a bracket, N, having its limbs at the upper ends secured permanently to the top, as shown. At the juncture of the two arms N are two cross-arms, O O′, to which the magnets are attached or from which the magnets depend. Below the cross-arms is a single stem, N′, between the magnets, which extends down some distance below the magnets. P represents the magnet-coil, composed of preferably the same grade wire as constitutes the arc-circuit, and P′ the magnet-coil, composed of very fine grade wire, being also in circuit with the main line. Below the magnets is an armature, Q, pivoted centrally to the stem N, so that said armature will vibrate against the two magnets *a b*. The extreme lower end of the stem N has four ears, R, on the two opposite sides, between which the slightly-radiating arms S S′ are hinged. These arms have short produced ends T above

their pivoted points, so that the swing of the arms may be limited, the produced ends T being only a slight distance from the stem N′ when in their normal condition. These arms extend downward, radiating from each other slightly, terminating in loops U U′ below and in close juxtaposition with the lower ends of the curved tubes K K′. On the under side of the loops are several fingers, U″, extending downwardly, on which the carbons rest in their descent, and it is by means of these fingers that the electrical medium is communicated to the carbons. It will be observed that by this arrangement the current engages with the carbon near the arc end, thus obviating the necessity of having the circuit travel through the entire carbons, and by this means greatly decreasing the resistance of the current. Near the lower ends of these arms, and connecting each other, are two links, V, and from their centrally-hinged points a rod, W, extends upward and is attached to the end of the armature Q, directly beneath the magnet *b*. This rod is preferably composed of two parts united by a screw-threaded thimble, X, whereby the operator is enabled to shorten or lengthen the rod. Each of the links V has a downwardly-projecting finger, Y, pivoted to it near the hinged outer end of the link, each finger being adapted, as shown, to pass down through a guide near the loop, and designed, when in operation to act against the carbon, so as to regulate its descent, as will hereinafter be more fully set forth.

The curved tubes K K′ are designed to receive curved carbon sticks, which are placed loosely within the tubes, passing through the loops U U′ of the arms S S′. Several very important advantages are claimed for the curved carbons and for the manner in which they are here disposed. It is obvious that in all cases where the carbons approach on a line with each other it is necessary to provide mechanism of some character on two opposite sides of the arc, and it is also required to provide mechanical connections from one side of the arc to the other. In addition to this, the long carbon sticks necessitate making the lamp long and unwieldy, whereas by disposing the carbons in the manner here shown there is no obstruction to the rays of light below or on the sides: hence no shadows.

We are aware that arc lamps have been produced where both carbons are curved; but in such cases the opposite carbons were so disposed that they together formed an arc or circle. We do not contemplate this, for the reason that to so arrange them the carbons must necessarily be short or the globe or bulb within which they are placed must be large or unwieldy. It is also well known in the art to dispose straight carbons at an angle to each other—**V**-shaped or otherwise. This in a measure overcomes the objection urged against the circular carbons; but it is obvious that with the straight carbons the upper part of the lamp must necessarily be very large, or short carbons are necessary. Our invention, as herein shown, in curving the carbons and disposing them at an angle, enable us to use very long carbons in a small globe, and thus solves the difficulty heretofore mentioned. The entire regulating and feeding mechanism being within the globe, the whole presents a more attractive appearance, and the entire lamp is made more compact.

Before proceeding to set forth its operation, the electrical connections will be noted. The binding-posts M′ M″ are connected with opposite poles of the dynamo or secondary battery, the former being, for convenience, here termed the "positive" and the latter the "negative" pole. One pole of the main coil P is first joined up to the positive pole M′ by the wire *e*, and the opposite pole of the coil with the arm S through the medium of the wire *f*. This conveys the current to the positive carbon *c*. The opposite arm, S′, through the loop of which passes the negative carbon *d*, is connected up with the negative pole M″ by the wire *g*, thus forming a complete circuit through the carbons. The secondary coil P′ has one of its ends connected up with the positive pole M′ and the opposite end with the negative pole M″. It should be observed that the stem N′ is insulated from the arms S S′, so that the proper circuits are formed electrically, as stated.

The operation will now be described in detail. For the purpose of utilizing the carbon as greatly as possible, and also for the purpose of producing a more steady and efficient light, the globe and top are formed, as hereinbefore shown, so that the air can be exhausted from the globe. To accomplish this the permanent air-pump is brought into requisition after the carbons *c d* have been placed in the tubes and the screw-caps replaced, and as much as possible of the air exhausted. The current is then produced which traverses the circuit *e f g* through the carbons, causing the well-known electric arc. When the electrical current is set into operation, it flows through the light resistance-coil P, which causes its magnet *a* to attract one end of the armature Q, thus depressing the opposite end, which carries downward the rod W, and, by the medium of the toggle point or links, spreads the arms S S′. At the same time the fingers Y descend and grip the carbons, thereby permitting the electric arc to form between the ends of the carbons. When the space between the ends of the carbons becomes too great, the resistance becomes greater, and the resistance in the fine coil becomes proportionately smaller, thereby diverting the current through the coil P′, causing the magnet *b* to attract the end of the armature and draw up the rod W, thereby releasing the carbons and causing the arms S S′, carrying the carbons, to approach each other. When the resistance in the coil P is again decreased and the bulk of the current passing through the main coil, the

magnet *a* again attracts the armature, which motion of the armature lowers the rod W and holds the carbons from approaching each other too rapidly. Thus, whenever the equilibrium between the heavy and light resistance coil is disturbed, the armature Q will vibrate from the one to the other, each motion serving the purpose of either retarding the carbon or freeing it from restraint, as may be necessary. By this means the varying intensity of the current is instantaneously employed to regulate the carbon.

It is obvious that where the carbons approach each other at an angle, as here shown, the arc will always be practically at one point within the globe, so that no focusing-lamp is necessary, and no mechanism is required for each separate carbon to move it forward or to cause them to approach each other, and it is not necessary to provide for the varying speed at which the positive and negative carbons are fed or move toward each other. This forms an important feature in the present invention.

We are aware it is not new to have a high and a low resistance coil in the circuit, whereby the carbons are regulated, and we do not, therefore, claim this, broadly.

What we claim is—

1. The curved carbons, arranged as shown, branching from each other at the same general angle or inclination, and both feeding downward loosely within rigid tubes and toward each other, substantially as and for the purposes set forth.

2. In an electric-arc or carbon lamp having curved carbons with curved guide-tubes, and mechanism, as described, for regulating and feeding said curved carbons, the entire mechanism being placed within an air-tight globe which contains the arc, but above the same, substantially as herein set forth.

3. As a new article of manufacture, the globe for electric-arc or carbon lamps, having a cover or top provided with an air-pump for exhausting said globe, substantially as herein set forth.

4. The combination of the curved rigid tubes for loosely holding the carbons in an electric lamp, with the curved carbons, substantially as herein set forth.

5. In an electric lamp, the combination of the following elements, viz: a low-resistance coil in the arc-circuit, said coil having coacting therewith one end of a pivoted armature, and a high-resistance coil in a closed derived circuit coacting with the opposite end of the pivoted armature, said armature being mechanically connected with the carbons, so that when the flow of the electricity is normal the carbons are permitted to approach each other regularly, but whenever the current varies in intensity the proportionate flow of electricity through the two coils varies, and causes either one or the other magnet to attract greater or less, and thus check or accelerate the movement of the carbons, with the hinged radiating-arms S S′, having the loops and fingers, the armature-rod W, the links V, and fingers Y, substantially as herein set forth.

6. In an electric-arc lamp, the arms in circuit, with loops and resting-fingers for the curved carbons near the arc ends of the latter, whereby said curved carbons are supplied through these arms with the currents near to the arc end, substantially as herein set forth.

7. An electric-arc lamp, as herein shown, having the carbons curved and placed loosely in tubes, so that both carbons are permitted to move toward each other by force of gravity, substantially as herein set forth.

8. The combination of the curved carbons loosely placed within tubes, disposed at an angle, so that said carbons move downwardly toward each other by force of gravity, with the arms S S′, the pivoted armature-rod and holding-fingers, and electrical connections for manipulating said arms, substantially as herein set forth.

In testimony that we claim the foregoing we have hereunto set our hands this 18th day of May, 1883, in the presence of witnesses.

DAVID J. HAUSS.
TIMOTHY E. McNAMARA.
JAMES S. ZERBE.

Witnesses:
S. S. POTTER,
F. H. WILLIAMS.