No. 674,130. Patented May 14, 1901.

T. W. YOUNG.

ELECTRIC ARC LAMP.

(Application filed Aug. 4, 1900.

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

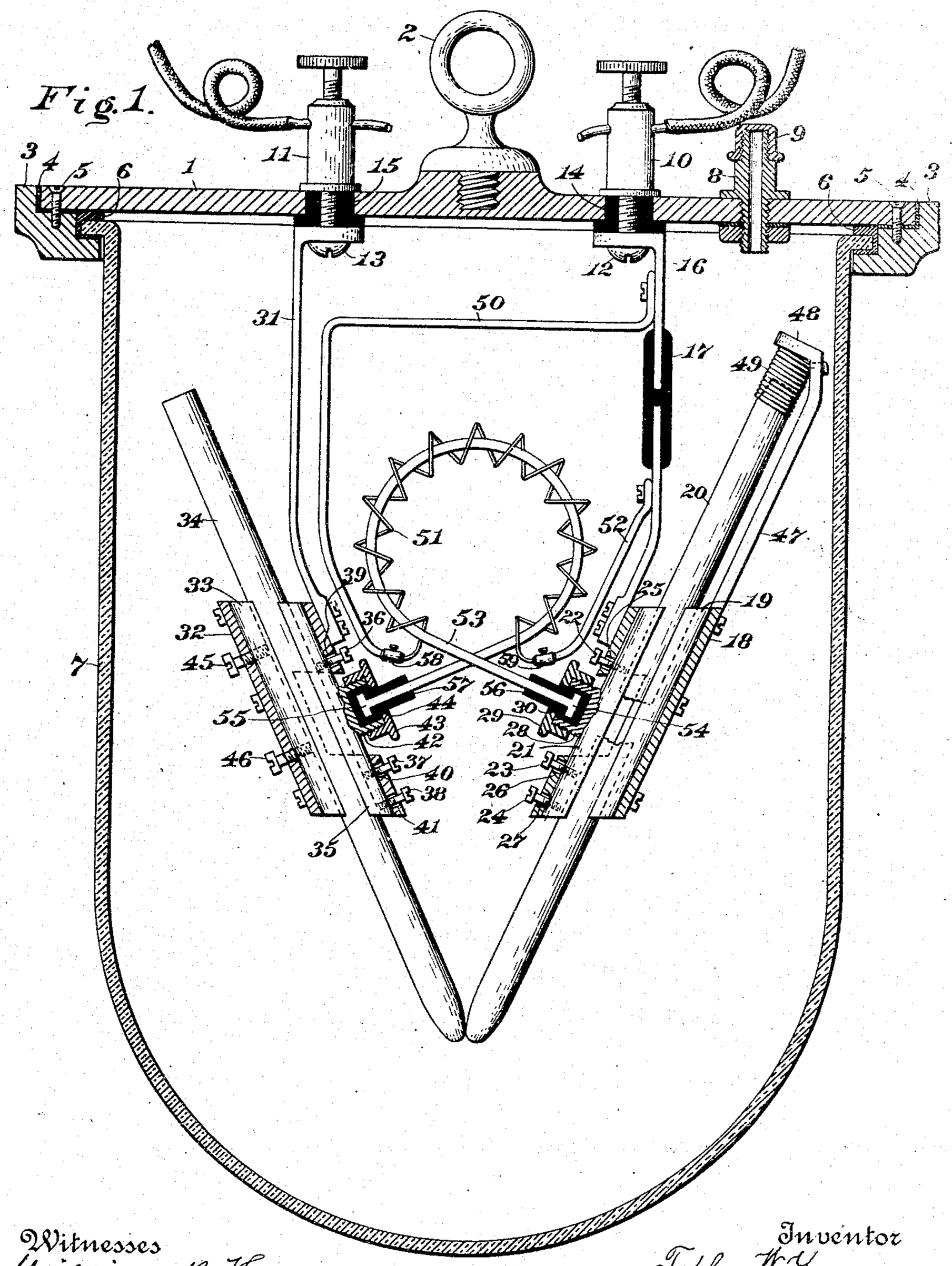

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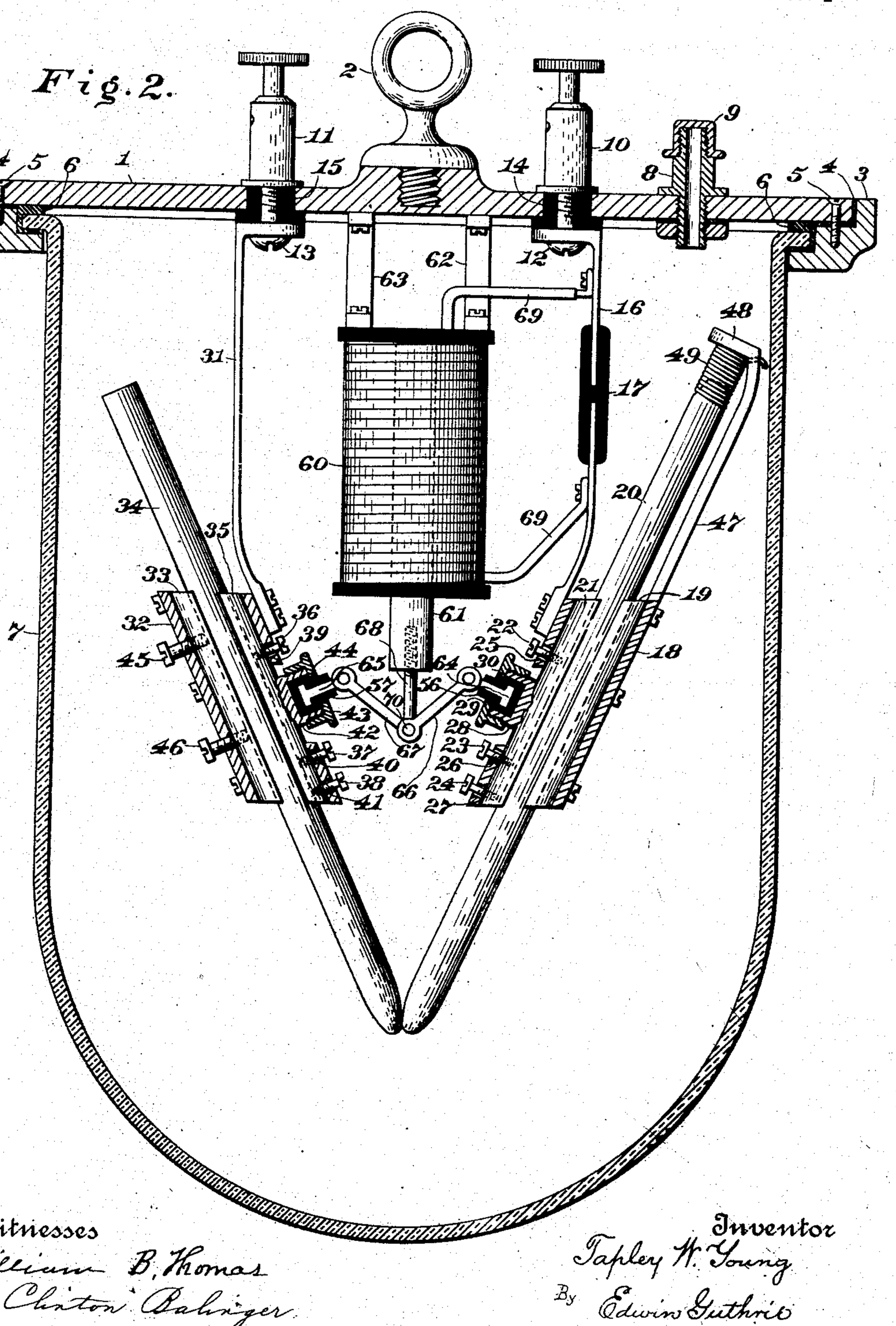
Fig. 2.



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UNITED STATES PATENT OFFICE.

TAPLEY W. YOUNG, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-HALF TO ANNIE CAMPBELL, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 674,130, dated May 14, 1901.

Application filed August 4, 1900. Serial No. 25,873. (No model.)

To all whom it may concern:

Be it known that I, TAPLEY W. YOUNG, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric-Arc Lamps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to electric-arc lamps, and particularly to the class of lamps, designed for use either in direct or alternating current circuits, the carbons of which may burn in the atmosphere, or they may be wholly inclosed and caused to burn surrounded by an inert gas or partial vacuum.

The object of my invention is the production of lamp mechanism belonging to the class stated wherein the carbons are convergently supported within guiding-sleeves held by spring-hangers, the sleeves constituting relatively the fixed members of twin clutches through which the carbons are fed by gravity. The movable clutch members are positively and directly actuated by devices put in motion upon making, breaking, or varying the lamp-circuit, and the clamping pressure serves to separate the points of the carbons, thereby forming the arc, as below set forth.

Each constituent element of my invention is described in detail, and its individual office, together with the mode of operation of the whole, fully explained herein.

Of the accompanying drawings, throughout which like numbers designate like parts, Figure 1 is a side view, partly in vertical section, showing the manner of hanging the clutches and carbons and including a thermal operating device; and Fig. 2 is a view similar to the first, in which electromagnetic elements are substituted for the thermal operating device.

Considering Fig. 1, representing the preferred form of the invention, numeral 1 marks the top plate, which may be provided with a centrally-placed ring 2 for convenience of hanging the lamp by means of a cord or chain. Numeral 3 designates the annular rim, constructed to fit around the edge of the top, leaving a narrow space, as shown, and which space I fill with suitable packing 4 when it is desired to effect a gas-tight joint, as explained hereinafter. Rim 3 is secured to the top by screws 5 5, located at intervals along the edge, and by means of these screws the needed pressure may be exerted upon the packing 4, as well as upon a grooved gasket 6, in the groove of which rests the turn or flange of the globe 7 of the lamp. It is therefore possible by setting up the series of screws to render the junction of the globe and the top practically gas-tight, while allowing for a certain amount of expansion of all those parts above described.

No special form is reserved for any of the elements introduced, so far as mere contour is concerned.

Through the top at the right of the figures will be seen a threaded nipple 8, closed by a screw-cap 9. The use of the nipple is to permit the air to be exhausted from the globe and another gas or gases substituted. It is not absolutely essential to the operation of the lamp that the globe should be exhausted or another gas introduced, as the natural combustion of the carbons would sooner or later produce an atmosphere wholly deprived of free oxygen.

Upon the top 1 are erected two binding-posts or equivalent terminals 10 and 11. These are held in position by the screws 12 and 13, encircled by the insulating-tubes 14 and 15. On the right, screw 12 secures the upper end of the spring-hanger 16, as shown, with which it is in metallic contact. Thus current may pass from post 10 to hanger 16 directly. Hanger 16 is interrupted by a coupling 17, composed of insulating material, in which the ends of the two parts of the hanger are embedded. The lower end of this hanger is screwed or otherwise electrically joined to the inclined sleeve 18, the front of which has a portion cut away, as drawn. This sleeve is connected at the back, or in the figure toward the right, with one half-19 of a divided sleeve or tube. This half-sleeve 19 constitutes the relatively-fixed member of the clutch

that holds the carbon 20, which for purposes of this description is to be regarded as the positive electrode. The movable clutch member is the complemental half 21 of the divided sleeve. Projecting from half-sleeve 21 will be observed the screws 22, 23, and 24, which are let into the movable half-sleeve through openings 25, 26, and 27 in the front wall of the first-mentioned inclined sleeve 18. It is believed to be now clear that the half-sleeve 21 may be moved laterally with reference to sleeve 18 and within it for a greater or smaller distance, depending upon the adjustment of the three screws. Upon the movable half-sleeve and usually cast integral therewith I form a cup 28, threaded exteriorly and covered by a screw-cap 29, the latter provided with a central aperture 30. These parts will be again referred to. On the left, screw 13 of post 11 secures the upper end of spring-hanger 31, as shown, with which it connects metallically, and this hanger is continuous. The two hangers, leaving the insulator-coupling out of consideration, are precisely alike. To improve their conductivity, I may employ copper-coated steel strips for the hangers, which are usually flat and of sufficient thickness and width for the purpose. The lower end of hanger 31 is joined to an inclined sleeve 32, in all respects the twin of sleeve 18, a portion of the front being cut away, as in the former case. One half 33 of a second longitudinally-divided sleeve is secured within the inclined sleeve 32 and forms the fixed member of the clutch for the negative carbon 34. A movable half-sleeve 35, precisely like half-sleeve 21, is the remaining clutch member on this side, and adjusting-screws 36, 37, and 38 project from it through the openings 39, 40, and 41 in the front wall of the inclined sleeve 32. Upon movable half-sleeve 35 or integral with it is constructed the cup 42, closed by the screw-cap 43, which has a central opening 44 and will be again referred to. Carbon 34 being that most slowly acted upon is not necessarily fed when the current is direct. It is my practice to prevent the undesired slipping downward of this carbon by introducing set-screws 45 and 46 through the back of the inclined sleeve and fixed half-sleeve, and when these screws are set up the carbon is firmly held, as will be readily understood.

To insure the prompt downward feed of carbon 20, I extend a portion 47 of the inclined sleeve 18 and provide it with a bent end 48, against which abuts a coil-spring 49, having its opposite end fitted about the slightly-tapering extremity of the carbon. As the carbon feeds through the relaxed clutch mechanism the spring extends and aids the operation. It is believed to be within the scope of my invention to similarly lengthen sleeve 32 and provide a second coil-spring if both carbons are to be fed simultaneously.

Current enters the lamp by way of post 10 and hanger 16. It passes by way of conductor 50 through a high-resistance heating-coil 51, thence through conductor 52 again to hanger 16 by way of the clutches and carbon-points to hanger 31 and binding-post 11.

The heating-coil 51 progressively encircles a band 53 of highly-expansible metal or of combined strips of metal. A single heating-coil only is shown; but any convenient number may be used, separated sufficiently to avoid short-circuiting. It will be noted that the expansible band 53 is bent into the form of a loop, the ends crossing each other. This is found to be a particularly advantageous arrangement; but I do not confine myself thereto, as a band bent into a horseshoe shape would behave in the desired manner when heated. The ends of the expansible band I usually fashion T-shaped, substantially as drawn. These T-shaped ends are numbered 54 and 55 and are respectively embedded in compressible insulating-sockets 56 and 57, extending through the openings in the screw-caps 29 and 43, and the caps retain the sockets in the cups 28 and 42.

The operation is as follows: No current passing, the heating-coil and expansible band are comparatively cold and contracted, the half-sleeve 21 is drawn to the left against the inner front of inclined sleeve 18, and the carbon-points are in contact, as indicated—that is to say, the right-hand clutch mechanism is open and has no grasp upon carbon 20. This carbon cannot fall farther than the point of the negative carbon with which it is in contact. Current being applied, coil 51 is heated and communicates its heat to band 53, which elongates materially, forcing its ends farther and farther from each other, first closing the right-hand clutch upon the carbon 20, then by continued pressure in the same direction bending the spring-hangers outwardly and separating the carbon-points, thereby forming the arc in the usual manner. If the coil becomes unduly heated by reason of an excessive amount of current to which the lamp may be subjected from any cause, the gradual widening of the interval between the carbon-points due to over-expansion of the band introduces correspondingly-increasing resistance to the passage of the current, reducing its flow and allowing the coil and band to cool and narrow the interval. If, as is almost always the condition, the current is constant and uniform in strength, a mean position is attained and maintained by each of the parts described.

Numbers 58 and 59 mark small connectors which join the ends of the heating-coil 51 with the conductors 50 and 52.

In Fig. 2 the construction is exactly the same for all the parts but the heating-coil and expansible band. Under certain condition—for example, in air—I may substitute for the heating-coil and band an electromagnet having a vertically-placed coil 60 and a core 61, movable lengthwise within the coil.

The coil is upheld by the supports 62 and 63, attached to the upper head of the spool and to top 1. In place of the ends of the expansible band the insulating-sockets 56 and 57 now grasp the T-shaped ends of short arms 64 and 65, the remaining ends of which are pivotally connected to the links 66 and 67 of a knuckle-joint. At their meeting-point these links are pivotally joined to a vertical rod 68, the upper portion of which is threaded and screwed into the tapped end of core 61 of the magnet. The wire 69 of the magnet-coil has its ends connected with hanger 16 above and below the insulating-coupling 17, and the current instead of flowing through a heating-coil now passes through the coil 60 of the magnet and thence as already described. There being no current passing, the core 61 falls by gravity and the knuckle-joint draws the carbon-points together, first opening the right-hand clutch and permitting the positive carbon to feed, as previously explained. When the current passes, core 61 is drawn into the magnet-coil more or less, depending upon its length and weight, and, acting through the knuckle-joint, separates the carbon-points and forms the arc, as usual. The current being of practically constant strength, the interval between the carbon-points should be sensibly always the same to produce the light most effectively, and the weight and length of the core 61 is regulated by that requirement.

To resist the heat, the insulation should be asbestos throughout, and it is thought to be unnecessary to multiply drawings merely to show that coil 60 may be removed from directly over the arc by lengthening pivot-pin 70 and connecting its farther end rigidly with vertical rod 68.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric-arc lamp, the combination of the spring-hangers, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the said hangers, clutch mechanisms borne by the sleeves and adapted to grasp the carbons or to release them, electrically-actuated devices constructed and arranged to first operate the clutch mechanisms and then to separate the said sleeves by bending the spring-hangers outwardly when current is applied and to reverse those movements when the current diminishes or ceases.

2. In an electric-arc lamp, the combination of the binding-posts, the spring-hangers in metallic connection with the said binding-posts, one of said hangers being interrupted, an insulating-coupling joining the ends of the hanger at its point of interruption, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the said hangers in metallic connection therewith, clutch mechanisms borne by the sleeves and adapted to grasp the carbons or to release them, electrothermal devices constructed and arranged to first actuate the clutches and then to separate the carbon-points by bending the spring-hangers when the current is applied and to reverse those movements upon cessation of the current, conductors connected with the said interrupted hanger above and below the said insulating-coupling and with the said electrothermal devices, substantially as described.

3. In an electric-arc lamp, the combination of the spring-hangers, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the said hangers, clutch mechanisms borne by the sleeves and adapted to grasp the carbons or to release them, an expansible band, a heating-coil encircling the said band, insulating connecting devices adapted to join the ends of the said band and the clutches, and electrical conductors arranged to direct the current through the said heating-coil to one of the clutches, substantially as described.

4. In an electric-arc lamp, the combination of the binding-posts, the spring-hangers in metallic connection with the binding-posts, one of said hangers being interrupted, an insulating-coupling joining the ends of the hanger at its point of interruption, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the said hangers in metallic connection therewith, clutch mechanisms borne by the sleeves and adapted to grasp the carbons or to release them, an expansible band, a heating-coil encircling said band, conductors connecting the heating-coil with the said interrupted hanger above and below the said insulating-coupling, and insulating connecting devices adapted to join the ends of the expansible band and the clutches, substantially as described.

5. In an electric-arc lamp, the combination of the spring-hangers, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the hangers, the half-sleeves fixed within the said inclined sleeves, the movable half-sleeves located within the inclined sleeves, means for retaining the movable half-sleeves in their positions, and electrothermal devices constructed and arranged to first actuate the said movable half-sleeves thereby clutching the carbons and then to separate the carbon-points by bending the hangers when current is applied and to reverse those movements upon cessation of the current, substantially as described.

6. In an electric-arc lamp, the combination of the spring-hangers, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the said hangers, the half-sleeves fixed within the said inclined sleeves, the movable half-sleeves located within the said inclined sleeves, means for retaining the movable half-sleeves in their positions, an expansible band, a heating-coil

encircling the said band, insulating connecting devices adapted to join the ends of the said band and the said movable half-sleeves, and electrical conductors arranged to direct the current through said heating-coil to one of said inclined sleeves, substantially as described.

7. In an electric-arc lamp, the combination of the binding-posts, the spring-hangers in metallic connection with the said binding-posts, one of said hangers being interrupted, an insulating-coupling joining the ends of the hanger at its point of interruption, the inclined sleeves for guiding the carbons convergently, the said sleeves being supported by the said hangers in metallic connection therewith, the half-sleeves fixed within said inclined sleeves, the movable half-sleeves located within said inclined sleeves, means for retaining the movable half-sleeves in their positions, an expansible band, a heating-coil encircling the band, conductors connecting the heating-coil with the said interrupted hanger above and below the said insulating-coupling, and insulating connecting devices adapted to join the ends of the band and the said movable half-sleeves, substantially as described.

8. In an electric-arc lamp, the combination of the spring-hangers, the inclined sleeves having openings in their front walls, the said inclined sleeves being supported by the hangers, the half-sleeves fixed within the inclined sleeves, the movable half-sleeves located within the inclined sleeves, cups erected upon the movable half-sleeves and projecting through the said openings in the inclined sleeves, the screw-caps closing the cups and having central orifices, the expansible band, the heating-coil encircling said band, compressible insulating-sockets adapted to receive the ends of the said band, said sockets passing through the screw-caps and fitting the cups, substantially as described.

9. In an electric-arc lamp, the combination of the spring-hangers, clutch mechanisms supported by the said hangers and adapted to hold and guide the carbons convergently, an expansible band having its ends crossing each other and connected with the movable members of the clutches, and means for electrically heating the said band, substantially as described.

10. In an electric-arc lamp, the combination of the spring-hangers, clutch mechanisms supported by the hangers and adapted to hold and guide the carbons convergently, electrically-actuated devices constructed and arranged to first operate the said clutch mechanisms and then to separate them by bending the said spring-hangers outwardly when current is applied and to reverse those movements when the current diminishes or ceases, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

TAPLEY W. YOUNG.

Witnesses:

WILLIAM THOMPSON HARRIS,

R. CLINTON BALINGER.