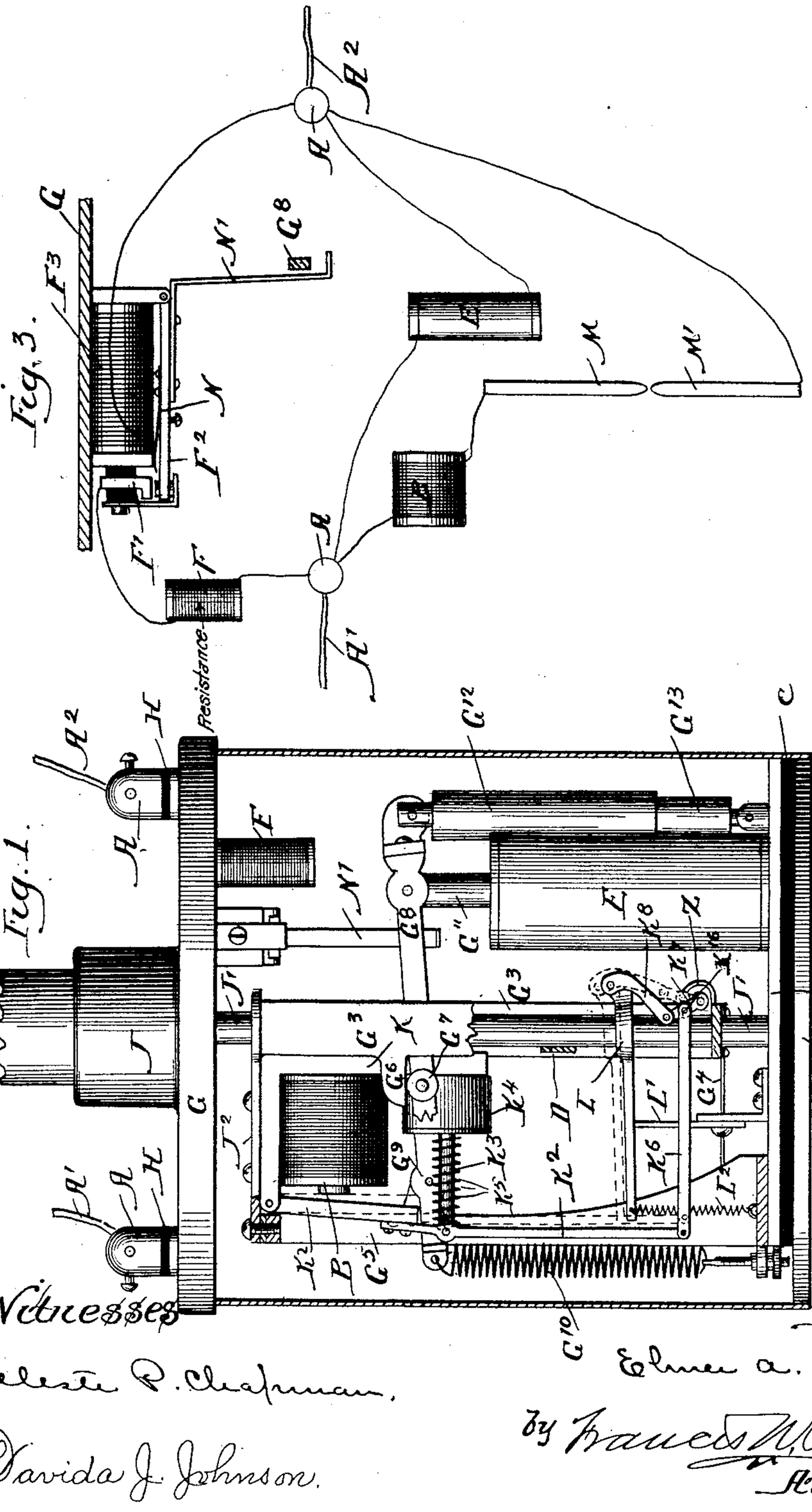
(No Model.) 2 Sheets—Sheet 1.

E. A. SPERRY.

ELECTRIC ARC LAMP.

No. 480,525. Patented Aug. 9, 1892.



(No Model.) 2 Sheets—Sheet 2.

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Fig. 4

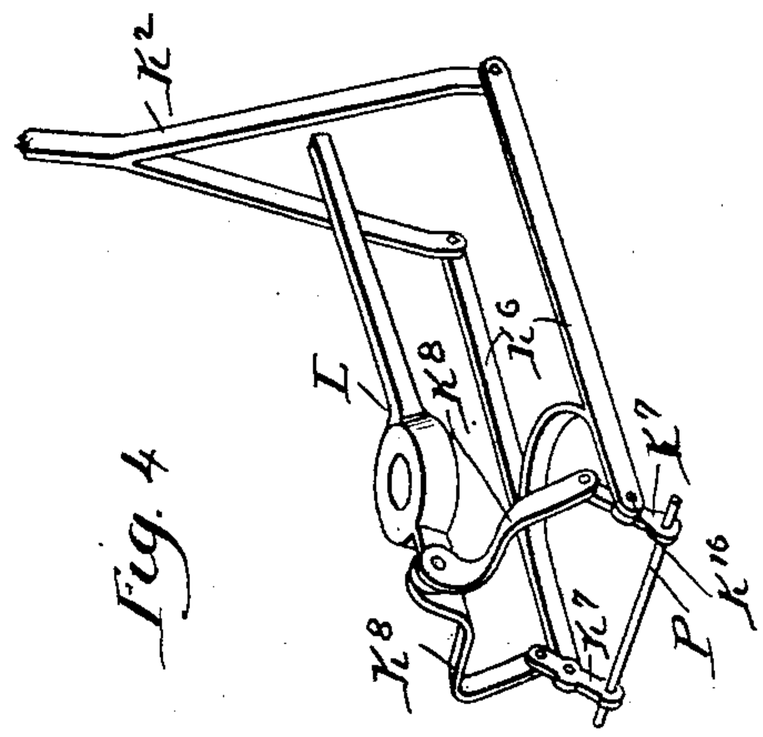
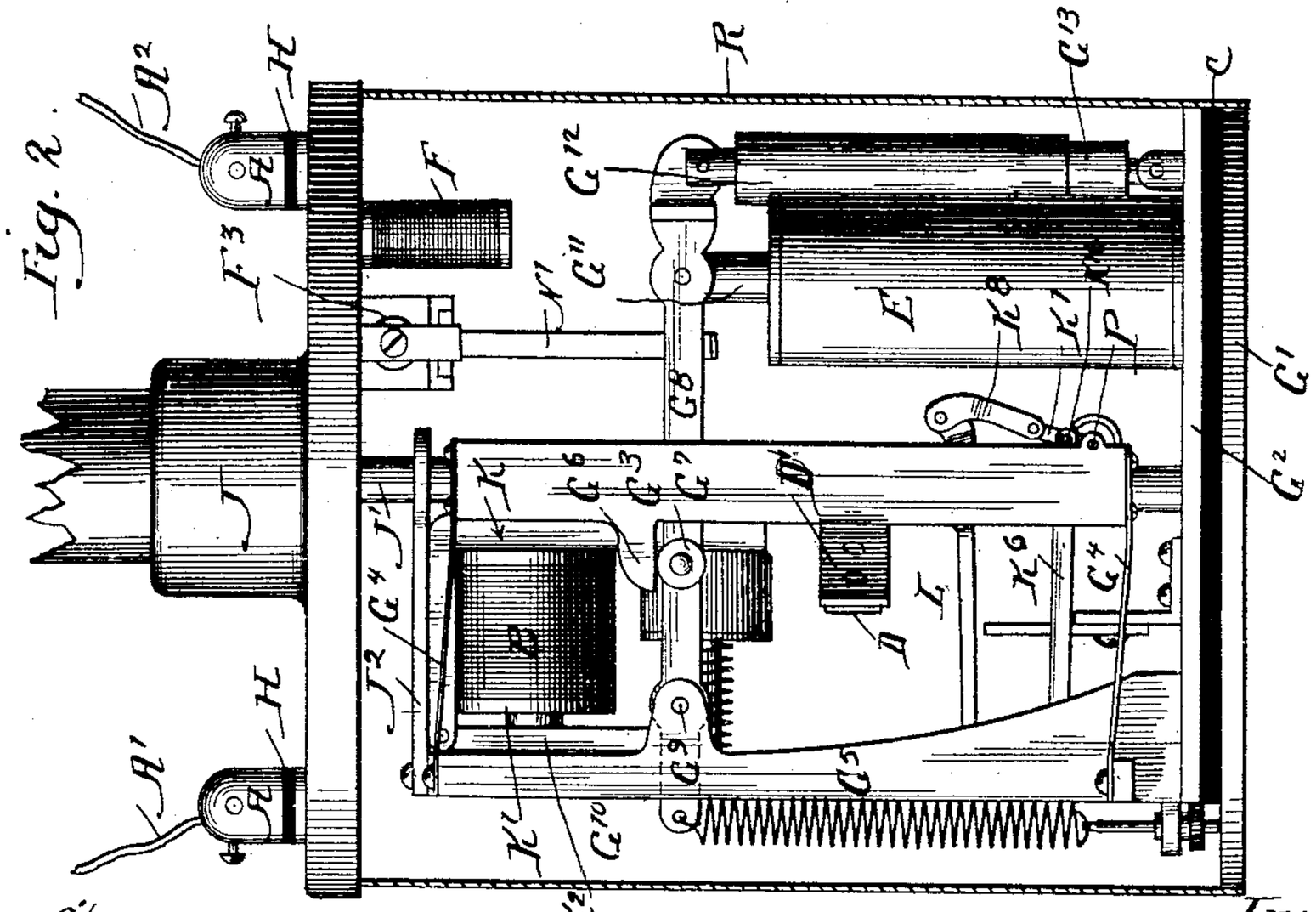


Fig. 2.



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UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE SPERRY ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 480,525, dated August 9, 1892.

Application filed June 7, 1890. Serial No. 354,604. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Arc Lamps, of which the following is a full, clear, and exact specification.

My invention relates to arc lights, and has for its object to provide an arc light with a regulating mechanism which shall be exceedingly sensitive and delicate in its operation and a cut-out which shall so operate as to cause the lamp when extinguished to automatically re-establish an arc and shall have various other advantages hereinafter more fully set forth.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side part-sectional view with the parts shown when the lamp is out of operation. Fig. 2 is a somewhat similar view with the arc established. Fig. 3 is a diagrammatic view of the connections of the cut-out, and Fig. 4 is a detail of the carbon-lifting or arc-establishing mechanism.

Like parts are indicated by the same letter in all the figures.

A A are the binding-posts whereby the line conductors A′ A^2 are connected with the lamp. From A′ the conductor leads into the main-circuit magnet B and thence to the frame, which is insulated at C. To this frame the brush D is secured, and it bears against the upper-carbon rod. The lower carbon is electrically connected with the line conductor A^2. From the conductor A′ a shunt-conductor leads to the covered solenoid E and thence to the conductor A^2. Another shunt-circuit leads from the conductor A′ to the resistance-coil F and thence to the fixed insulated piece F′, which serves as a contact-point for the armature F^2, which is controlled by the magnet F^3 and spring N. From this magnet-coil leads a conductor to the binding-post connected with the circuit-conductor A^2. These connections are shown diagrammatically in Fig. 3.

G is the top of the lamp-case; G′, the bottom; G^2, an inner plate above the insulation C, on which the regulating mechanism is secured.

G^3 G^3 are the sides of a frame, supported on elastic arms G^4 G^4, which project from the rear standard G^5. Each of the pieces G^3 G^3 has a lug G^6, which rides upon the trunnions G^7 G^7 on the arm G^8, which is pivoted to the standard G^5 at G^9 and is adjustably held at its rear end by the spring G^{10} and at its other extremity carries the core G^{11} for the solenoid E and the cylinder G^{12}, which slides upon the plunger G^{13} to form a dash-pot. The binding-posts A A are insulated at H H.

J is the upper portion of the lamp, in which the carbon-rod J′ reciprocates, which rod passes through suitable guides—as, for example, through the guide-arm J^2.

Rigid upon the standard G^5 is the piece K, to which the main-circuit magnet B is fixed, so that the said magnet has no motion. In front of this magnet, however, is disposed the pivoted armature K^2, which is attached midway to the plunger K^3 of the dash-pot K^4, which is also fixed on the frame-piece K to which the main-circuit magnet is secured. Around the plunger is the spring K^5, which tends to force the armature away from the magnet.

At the end of the armature K^2 is the rod or pitman K^6, which engages the pivoted bar K^7 by means of a loose or lost motion pivotal connection K^{16}, the bar K^7 being pivoted to the bar K^8, so as to form a knuckle-joint. The bar K^7 is pivoted on the elastic frame or on a frame-piece connected with the pieces G^3 G^3, and hence is vertically movable on the elastic supports G^4. At the upper extremity of the bar K^8 is the carbon-clutch rod L, which encircles such rod and normally rests upon the fulcrum L′ and is held at its rear end by the spiral spring L^2.

M and M′ are the carbons, suitably supported in the usual manner. The supports of the lower carbon are not shown, as they are familiarly understood. The pivoted armature F^2 is normally forced away from the contact F′ by the spring N, and to this armature is secured the hook N′, adapted to be engaged by the arm G^8 when the latter is abnormally depressed.

The detail shown in Fig. 4 exhibits more fully the arrangement of the lifting mechanism, wherein it is seen that there are dupli-

cates of the bars K^6, K^7, and K^8, and the lower end of the bar K^2 is bifurcated. The whole of the operating mechanism is inclosed by the cylinder R. Of course it is apparent that a considerable change could be made in this device without departing from the spirit of my invention—as, for instance, it would require no great modification to substitute magnets for solenoids and solenoids for magnets—and otherwise changes could be made as to size of parts and character of the springs, and so on. The spring G^{10} might be reversed and placed between the fulcrum G^9 and the core G^{11}. The conducting-wires are not shown in Figs. 1 and 2, as they would only confuse, and are sufficiently set out in the descriptive matter to show the connection of the parts. The brush D is of course adjustably secured upon the portion D′, which projects from the elastic frame. By this arrangement of parts it will be seen that the parts to be moved by the operation of the solenoid E are exceedingly light, consisting of the elastic frame, the carbon-clutching mechanism, and the upper carbon and rod only. The lost-motion connection K^{16} permits the knuckle-bars to straighten out and the pivotal point between the bars K^7 and K^8 to pass the vertical line at the end of their motion in either direction, and thus they are given a free movement and the operation of the feeding mechanism is unobstructed. The bar K^6 exercises no power over the bars K^7 and K^8 after the arc has been established until by relaxation of the current in the main magnet the said bar is moved to the left to cause the release of the upper-carbon rod. The stop Z is provided to stop the motion of the knuckle-joint bars if there should be any tendency for them to move too far.

The use and operation of my invention are as follows: Having reference first to the establishment of the arc, it is assumed that when the lamp is out of operation the carbons are in contact and none of the magnets energized, so that the armature K^2 will be in the position indicated in full lines in Fig. 1 and the armature F^2 will be separated from its contact F′. If now the current passes through the lamp, the first action is to energize the main-circuit magnet B, thus forcing the armature K^2 into the position shown in dotted lines in Fig. 1 and full lines in Fig. 2, and this forces forward the rod or rods K^6 and moves the members of the knuckle-joint so that their parts come into the positions indicated in dotted lines in Fig. 1 and full lines in Fig. 2. Of course as soon as the clutch-rod L rises in the slightest degree it will separate itself from the fulcrum L′, and, being lifted upward at one end and pulled down by the spring L^2 at the other, it will clamp the carbon-rod J′ and lift the upper carbon and establish the arc, since the same current that energizes the main-circuit magnet is passing through the carbons. When the lamp is shunted out or the current is discontinued, the parts will resume their normal positions. The parts are protected from injury in the motion of the armature K^2 toward its magnet B by means of the dash-pot K^4, and when the current is cut out the parts are restored to their original positions by the springs K^5 and L^2 and the fulcrum L′, which is so adjusted with reference to the spring L^2 that a very slight motion will be sufficient to cause it to free the carbon-rod J. This motion is so slight that it is impossible to illustrate it, as the dotted lines seem to be almost parallel with the full lines in the two positions of the clutch-rod L. It will be observed that the main-circuit magnet is rigid and not secured upon the swinging frame, and the same is true of its armature; but it will also be observed that inasmuch as the bars which constitute the knuckle-joint are pivoted upon the elastic frame or frame-pieces, which are supported by the elastic arm G^4, the upper-carbon rod with these portions of the arc being established are supported upon an elastic frame capable of vertical motion. With reference to the feeding mechanism, that arm G^8 is also rigidly pivoted at one end, and the shunt-circuit passes at the same time as the main circuit through the shunt-magnet E, thus energizing it and exercising an influence over the core G^{11}, which is drawn downward in opposition to the spring G^{10} and the dash-pot G^{12}; but now it will be observed that the elastic frame rests upon the trunnions G^7 G^7, and hence is moved vertically with the motion of the arms G^8. This of course raises and lowers the clamping mechanism, and thus feeds the upper carbon without releasing it from its clutch by vertically moving the clutch mechanism responsive to the changes in the current; but as the core descends it will lower the elastic frame and clutch mechanism until the carbon-rod is free from its clutch, either by the engagement of the clutch-rod L with the fulcrum L′ or otherwise, and immediately the carbons will be brought near together, a greater proportion of current pass through them, and the shunt-magnet will release its core to that degree, and the operation will continue in this manner, the arc being sustained with great delicacy and regularity. With respect to the cut-out mechanism, if the current passing through the carbons should be interfered with by separation of the carbors or if the motion of the upper carbon should tend to cease or become difficult a greater proportion of current would be diverted through the shunt E. Thereupon the core G^{11} would be drawn into the magnet E and the arm G^8 be drawn down until it engaged the end of the hook N′, whereupon a continued motion in this direction would raise the armature F^2 in opposition to the spring N until it engaged the contact F′, whereupon the current would be diverted from the shunt through the resistance-coil F and magnet F^3. This diversion of the current would immediately free the core G^{11} and permit the rod G^8 to rise. At the same time the diversion of

current would free the magnet B from the current, so that it would release its armature K^2 and the parts would come into the position shown in Fig. 1 and the upper carbon would fall upon the lower. This would immediately re-establish the circuit, for the resistance F would shunt a certain amount of current through the circuit including the magnet B, and that amount of shunted current would be sufficient when shunted from the coil F^3 to permit the spring N to overcome the power of such coil and break the circuit, and thus send the entire current through the main-circuit magnet B and shunt-coil E. In this manner the arc will be automatically re-established. In the event of any slight imperfection or want of operativeness in the feeding mechanism, and should any permanent difficulty arise to prevent the continuance of the arc, the extra loss of current in the arc would be represented solely by the resistance-coil F.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is as follows:

In an arc lamp, the combination of a vertically-movable frame with a carbon-separating mechanism thereon, containing a clutch supported at one end by toggle-bars with a spring from the other end of such clutch to the fixed frame, an intermediate adjustable stop, a main-circuit magnet fixed in position, provided with an armature connected with such toggle-bars, so that the main-circuit magnet when energized will cause the carbons to separate, and a fixed shunt-magnet provided with an armature on which the frame is suspended, so that by the action of the shunt-magnet the frame is moved to disconnect the clutch and permit the upper carbon to fall upon the lower.

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