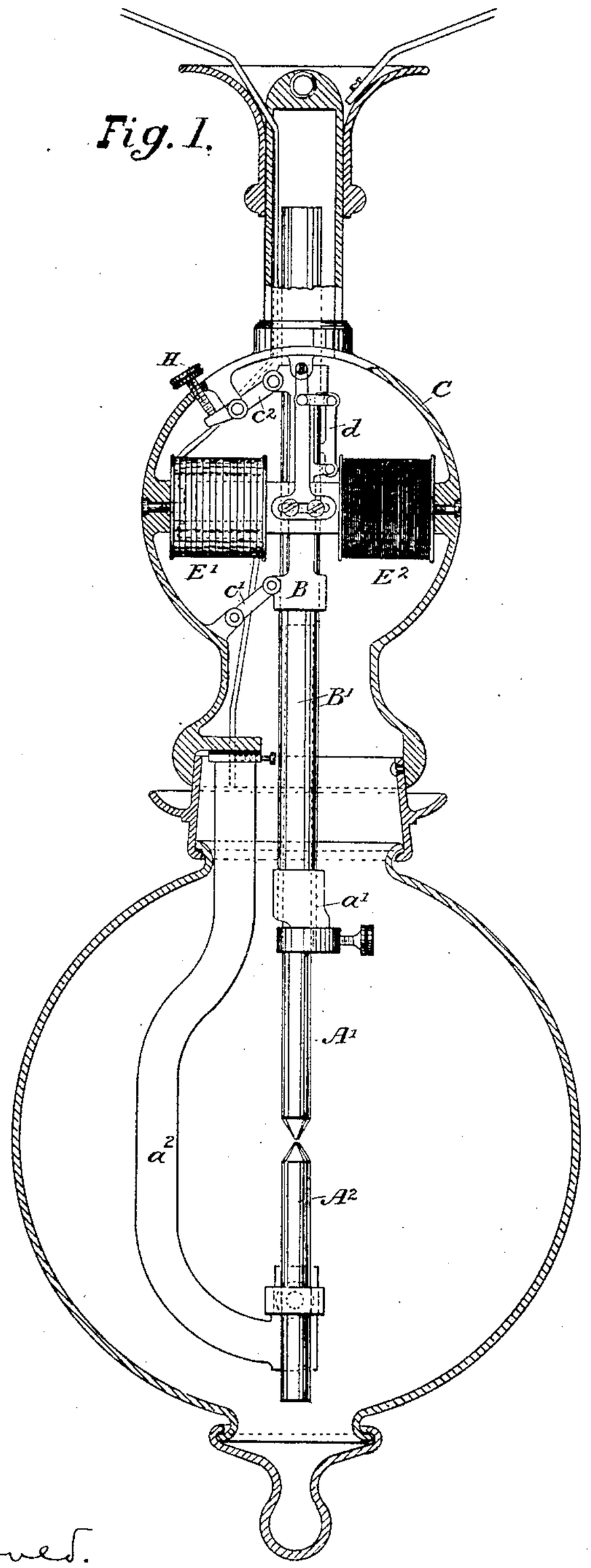
(No Model.) 2 Sheets—Sheet 1.

P. DIEHL.

ELECTRIC ARC LAMP.

No. 314,567. Patented Mar. 31, 1885.

Fig. 1.



WITNESSES:

Rowena C. Gould.

Charles A. Terry

INVENTOR.

Philip Diehl,

BY

Pope & Edgecomb

ATTORNEYS

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

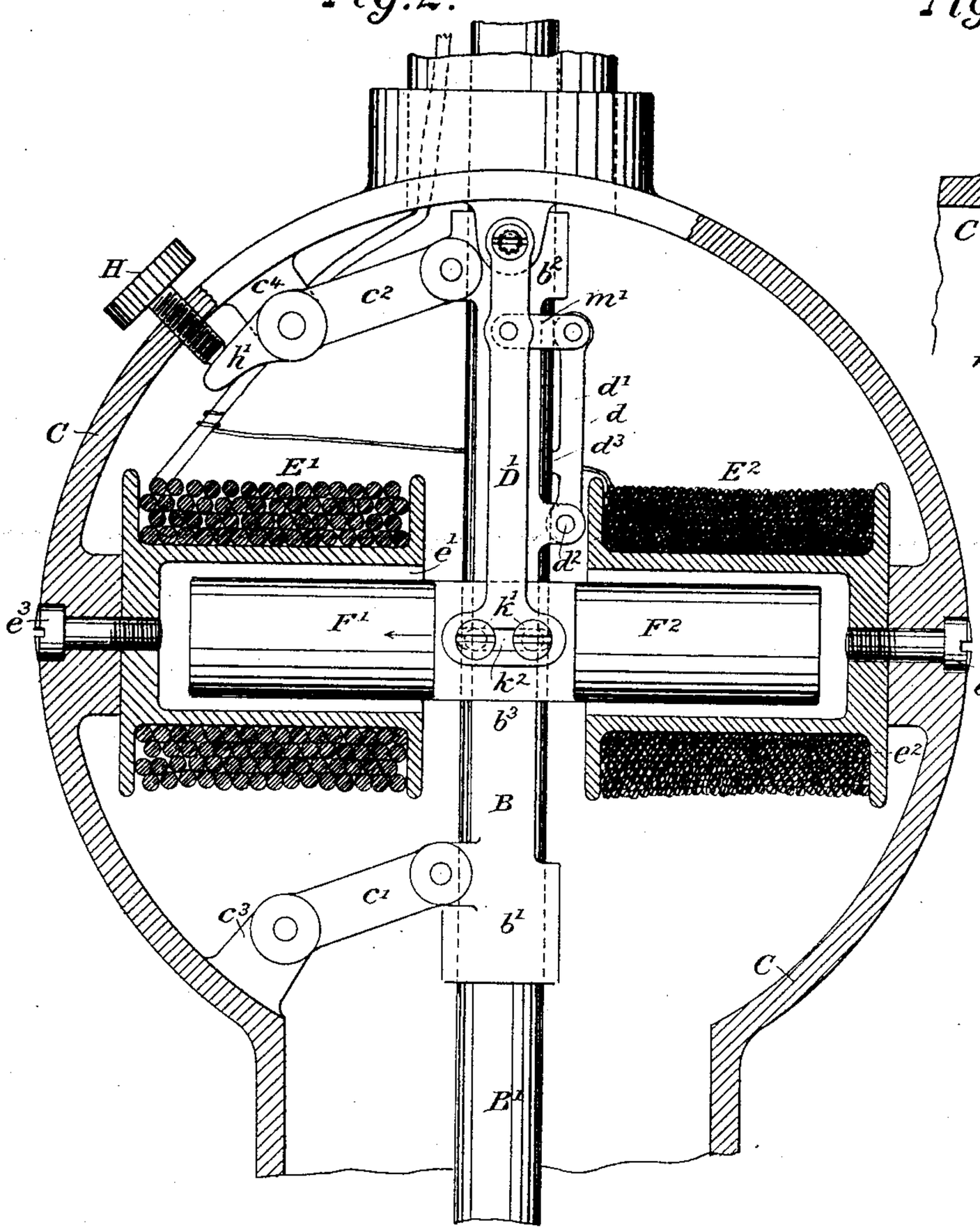


Fig. 3.

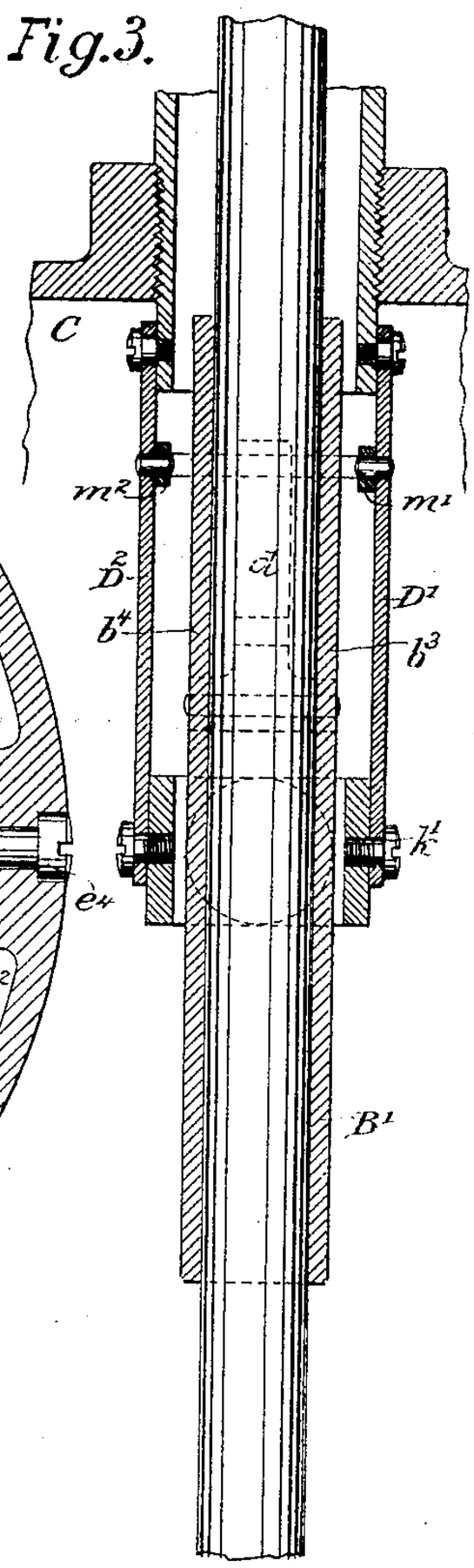
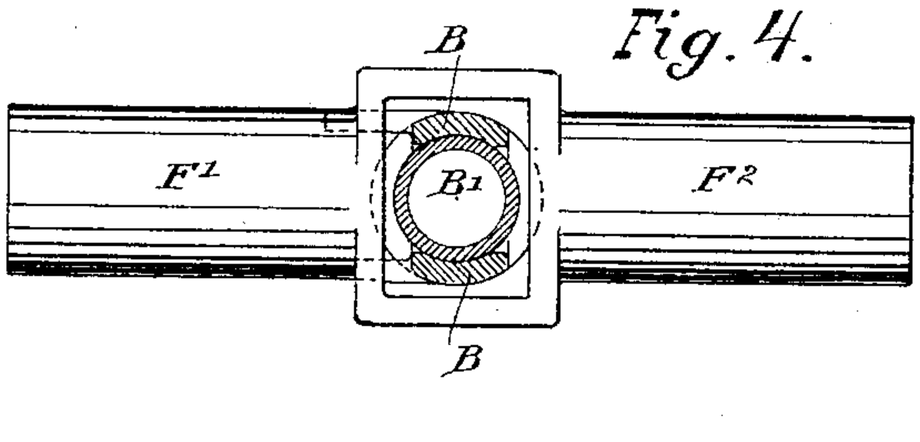


Fig. 4.



WITNESSES:

Romeva R. Gould

Charles A. Terry

INVENTOR.

Philip Diehl.

BY

Pope & Edgecomb

ATTORNEYS

UNITED STATES PATENT OFFICE.

PHILIP DIEHL, OF ELIZABETH, NEW JERSEY.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 314,567, dated March 31, 1885.

Application filed July 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, PHILIP DIEHL, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Regulators for Electric-Arc Lights, of which the following is a specification.

My invention relates to the class of apparatus employed for governing the movements of the upper electrode of an arc lamp and causing it to be maintained at the proper distance from the lower electrode, while permitting it to be fed forward as required to compensate for the consumption of both electrodes.

The object of the invention is to provide a regulator of the above character which shall operate with entire uniformity and shall insure a steady and unvarying light by maintaining the arc as constant as possible.

The invention consists in organizing the apparatus in substantially the following manner: The lower electrode is maintained in a stationary position in the usual manner, while the upper electrode is secured to a holder capable of being moved toward and away from the lower electrode. The holder passes through a movable frame, and this frame is so supported that it is capable of a slight movement in a direction diagonal to the axis of the holder. This result is secured by pivoting the respective ends of the holder to two parallel arms, which are also pivoted to the supporting-frame of the regulating mechanism. Any stress applied to the holder in one direction causes it to move in that direction, and, by reason of the positions of the parallel arms or links, causes it at the same time to be raised. A superior force applied in the opposite direction causes the holder to move laterally in the corresponding direction and at the same time downward. These two movements of the holder are employed for controlling the position of the upper electrode, and they are occasioned by means of two stationary helices or coils of insulated wire surrounding two soft-iron cores which are suspended from the frame of the lamp, and are movable independently of their respective coils. These cores act through a clutch applied to the holder to control the position of the movable frame. One of the helices is composed of a few convolutions of thick wire, while the other comprises many convolutions of fine wire. The former is connected in a main-line circuit in the usual manner, while the latter constitutes a shunt around the arc of the lamp. When the two electrodes rest in contact with each other, and the lamp is placed in circuit, almost the entire current traverses the helix comprised of a few convolutions of thick wire, and the inductive effect thus produced upon the corresponding core causes the core to be drawn within the helix and the holder to be clutched. The movable frame is thus moved upward in a slightly diagonal direction, thus causing the electrodes to be separated. As the arc thus formed increases in length, and consequently in resistance, a greater portion of the current is forced to traverse the helix included in the shunt around the arc, and the effect produced by this upon its core is to counteract the attraction exerted by the helix of larger wire, and the movable frame is thus held in a position of equilibrium. It is evident, however, that some means must be provided for causing the holder to be grasped and released in the proper manner to feed the upper electrode forward to compensate for the consumption which continually takes place at the carbon points. For this purpose the clutch before referred to is employed. This clutch consists of an arm suspended from the supporting-arm of the cores, to which it is pivoted at its upper extremity, while its lower extremity is pivoted to a portion of the movable frame surrounding the carbon-holder. A lug upon the clutch-arm is designed to press against the holder upon one side, while the opposite side is grasped by the movable frame. The movement of the cores under the superior influence of the coil of thick wire causes the clutch to grasp the holder, and the subsequent movement of the frame secures the required separation of the carbons. When the arc becomes of too great resistance, the movement of the cores in the opposite direction at first lowers the carbon, and ultimately causes the holder to be released, and the carbon is permitted to drop by its own weight a sufficient distance to maintain the required arc.

The invention involves certain details of

construction and organization, which will be fully described in connection with the drawings.

In the accompanying drawings, Figure 1 is a front elevation, partly in section, of a lamp embodying the features of my invention. Fig. 2 is an enlarged view of the clutch mechanism, together with the electro-magnets and movable frame for controlling the same. Fig. 3 is a vertical transverse section of the clutch and its supporting-arms, and Fig. 4 is a plan section showing the movable cores and a portion of the movable frame.

Referring to these figures, A′ represents the upper and A² the lower electrodes of an arc light. The latter of these electrodes is supported in a stationary arm, a^2, in any convenient manner. The upper electrode, A′, however, is secured by any suitable form of clamp, a', to a movable holder, B′. The holder B′ passes through a movable frame, B, consisting of two rings or short cylindrical sections, b' b^2, which are united by vertical bars b^3 and b^4. The entire movable frame is pivoted to the frame-work C of the lamp by means of two parallel arms or links, c' and c^2. The link c' is pivoted at one end to the lower portion of the movable frame B, and at the other end to a lug, c^3, extending from the case C. In like manner the link c^2 is pivoted at one end to the upper portion, b^2, of the movable frame B, and at the other end to a lug, c^4, extending from the frame C. The two arms c' and c^2 are so located that they extend upward in a diagonal direction, as shown in Figs. 1 and 2. The rod B is of such size that it may be moved freely through the sections b' and b^2 of the frame; but it is designed that it shall be pressed against the sides adjacent to the links c' and c^2 when the lamp is in operation. For this purpose a clutch controlled by two electro-magnets is employed. This clutch consists of an arm, d, the upper extremity, d', of which is pivoted to two links, m' and m^2, which in turn are pivoted to two swinging arms, D′ and D², near their upper extremities. The lower extremity of the arm d is pivoted to lugs d^2, formed on the connecting-bars b^3 and b^4 of the frame B. The swinging arms D′ and D², when moved toward the left hand, (see Fig. 2,) cause a lug, d^3, upon the arm d to press against the carbon-holder B′, and to thereby bind the same by pressing it against the inner surfaces of the rings b' and b^2. For the purpose of thus causing the arm d to be moved in the proper direction for clamping the carbon-holder, two helices of insulated wire, E′ and E², are employed. The former of these consists of a few convolutions of thick wire, while the latter consists of many convolutions of thin wire. The helix E′ surrounds a suitable spool, e', which is secured to the frame or case C by means of a screw, e^3, or in any other convenient manner. Likewise the helix E² is wound upon a spool, e^2, and is supported upon the frame C by a screw, e^4. The two helices themselves confront each other, the former, E′, being upon the side of the frame B, carrying the lugs C^3 and C^4. Two cores, F′ and F², are respectively applied to the helices E′ and E². The cores are movable into and out of the helices E′ and E², respectively, by reason of their being supported upon the swinging arms D′ and D². When the position of the electrodes is such that the magnetism induced in the core F′ by the coil E′ exceeds that induced in the core F² by the coil E², then both cores will move in the direction indicated by the arrow, and thereby cause the upper end of the arm d to also move in the same direction. The lug d^3 will thereby be pressed against the carbon-holder B′, and the further movements of the cores will cause the holder to raise the frame B, moving it in the direction which it is forced to take by reason of the arms c' or c^2. This movement of the holder causes the required separation of one electrode. When by reason of the increased resistance of the arc, occasioned by the consumption of the electrodes, the magnetism induced in the core F² by the coil E² increases, the frame B will drop slightly, thereby bringing the electrodes nearer together. After the electrode A′ has been fed forward in this manner as great a distance as the movement of the frame B will permit, the clutch-arm will release the holder and allow it to drop a slight distance in the frame, and the operation will be repeated. By means of this organization of mechanism a very constant arc may be maintained.

For the purpose of limiting the movements of the frame B, a suitable adjusting-screw, H, is applied to an extension, h', of the link c^2, the screw passing through the wall of the frame C.

For the purpose of preventing the lug d^3 from indenting the rod or carbon-holder B′, the inner surface of the lug is curved to correspond to the outer surface of the rod.

It is desirable that the parts be so constructed that the cores F′ and F² may be adjusted with reference to the distance they normally extend into their respective helices. For this purpose the lower ends of the swinging arms D′ and D² are preferably secured to the cores by set-screws k' passing through elongated openings k^2, formed in the arms.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, in an electric-arc lamp, with the upper electrode and a holder for the same, of a frame surrounding said holder, parallel supporting-links for said frame, two movable cores and arms supporting said cores, two helices, the one of thick and the other of fine wire, respectively, surrounding said cores, and a clutch-arm pivoted at one end to said arms, and at the other to said movable frame.

2. The combination, substantially as hereinbefore set forth, with the upper electrode of an arc lamp, a movable frame for supporting the same, means, substantially such as de-

scribed, for permitting an upward movement of said frame, and two electro-magnets having movable cores secured to each other, through the differential action of which the position of said frame is controlled, a swinging arm supporting said cores, and a clutch-arm connected from said swinging arm to said movable frame, substantially as described.

3. The combination, substantially as hereinbefore set forth, with two coils of insulated wire, the one included in the main-line circuit of an electric-arc lamp and the other in a circuit around the arc of the same, of two cores respectively applied to said helices, a swinging arm supporting said cores, an electrode-holder, an arm pivoted to said holder and linked to said swinging arm, and two parallel arms supporting said holder, substantially as described.

4. The combination, with the upper electrode of an electric lamp, of a guiding frame or bracket for the same, which frame is so supported that it is capable of a diagonal movement with reference to the axis of the electrode, a pivoted arm, and means, substantially such as described, for moving said arm in one direction or another, accordingly as the arc of the lamp increases or decreases in resistance, and a linked connection between said frame and said pivoted arm, whereby the movement of the latter in one direction causes the electrode to be clutched and raised, while the movement of the arm in the other direction causes it to be lowered and released.

5. In an electric lamp, the combination, substantially as hereinbefore set forth, of the upper electrode, a guiding bracket or frame for the same, links or arms pivoted at one end to a stationary support and at their remaining ends to said frame, and extending at an angle to the direction of movement of the electrode, electro-magnetic devices for controlling the movements of said frame, an arm pivoted to a stationary support at one end and connected with said electro-magnetic devices, and the clutch-arm d and links m' and m^2, connecting said frame and said arm.

6. In an electric lamp, the combination, substantially as hereinbefore set forth, of the frame B, the cores F′ and F² and their respective helices, and one or more arms, D, for supporting the cores, and having the slots k' and the screws k^2, for adjusting the point of support of said cores.

In testimony whereof I have hereunto subscribed my name this 18th day of July, A. D. 1884.

PHILIP DIEHL.

Witnesses:
CHAS. A. MILLER,
WM. W. BRUCE.