

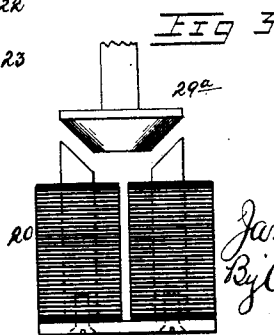
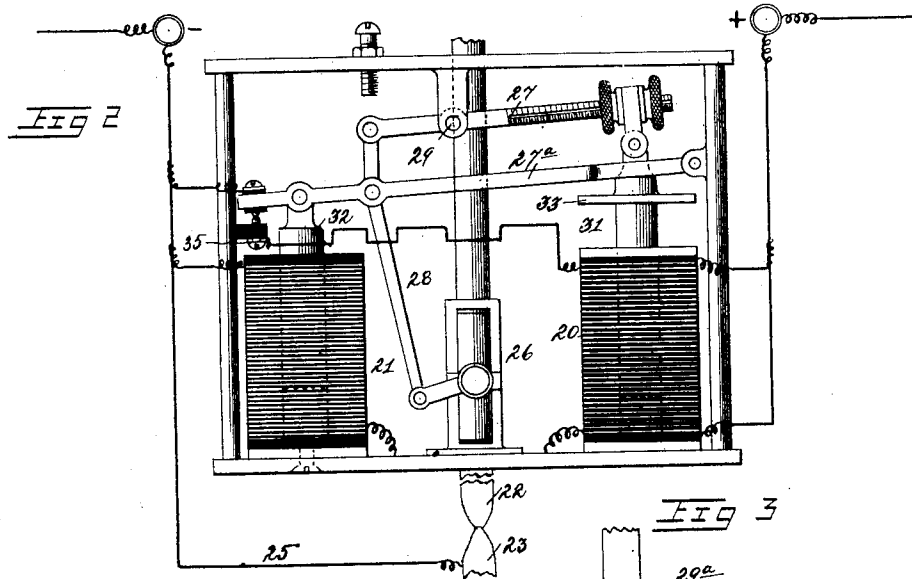
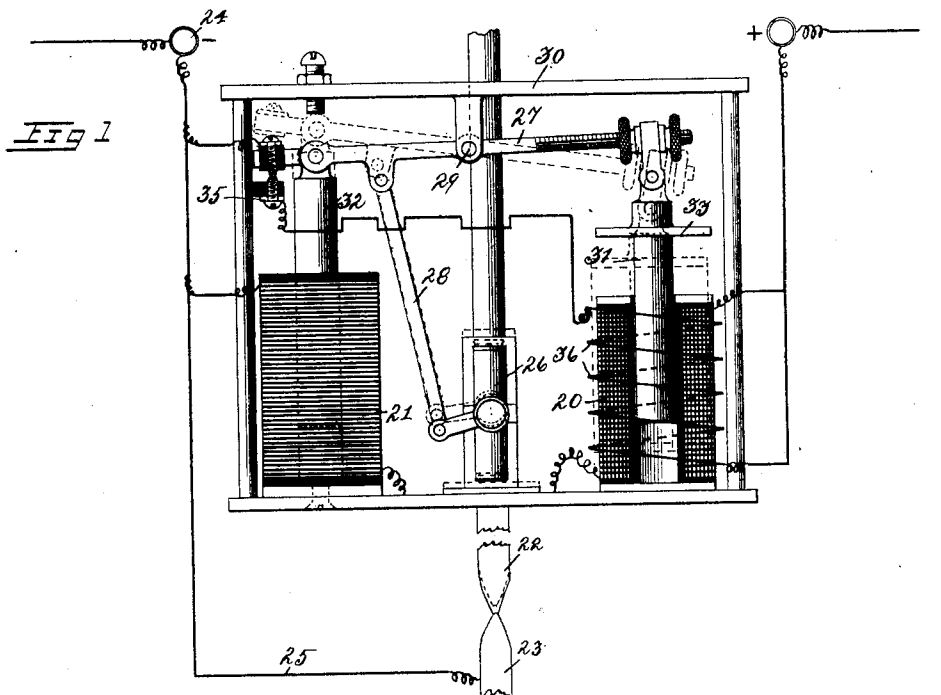
(No Model.)

3 Sheets—Sheet 1.

J. McLAUGHLIN.
ELECTRIC ARC LAMP.

No. 587,750.

Patented Aug. 10, 1897.



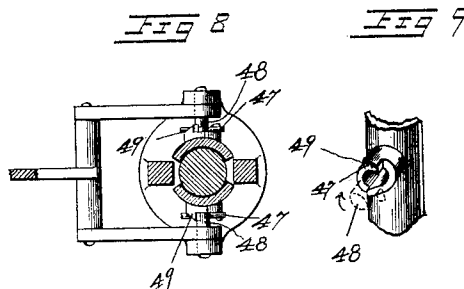
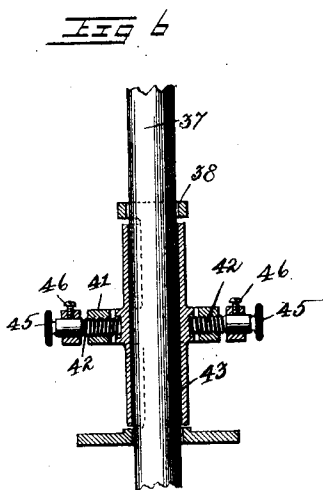
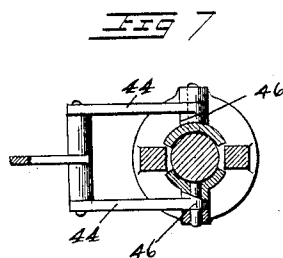
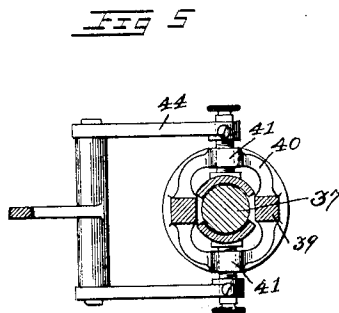
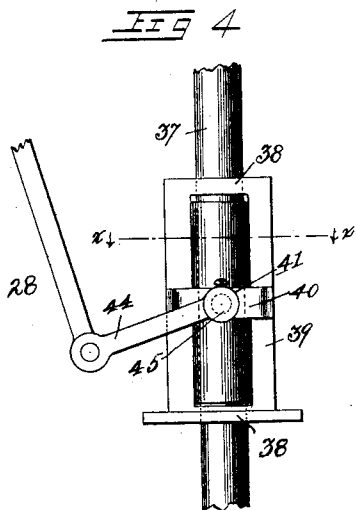
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Jean J. Graham

Inventor:
James McLaughlin
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J. McLAUGHLIN.
ELECTRIC ARC LAMP.

No. 587,750.

Patented Aug. 10, 1897.



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(No Model.)

3 Sheets—Sheet 3.

J. McLAUGHLIN.
ELECTRIC ARC LAMP.

No. 587,750.

Patented Aug. 10, 1897.

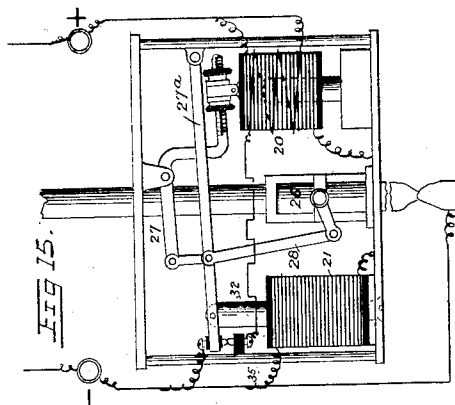
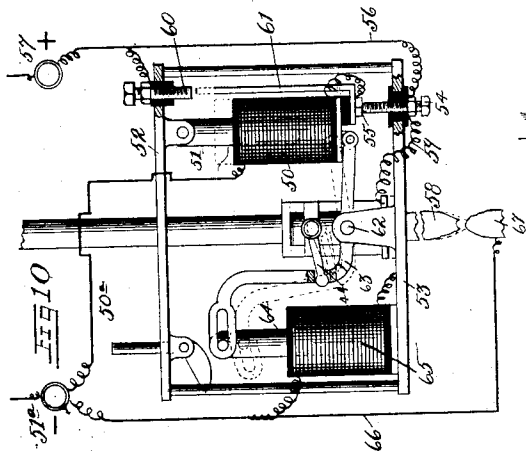
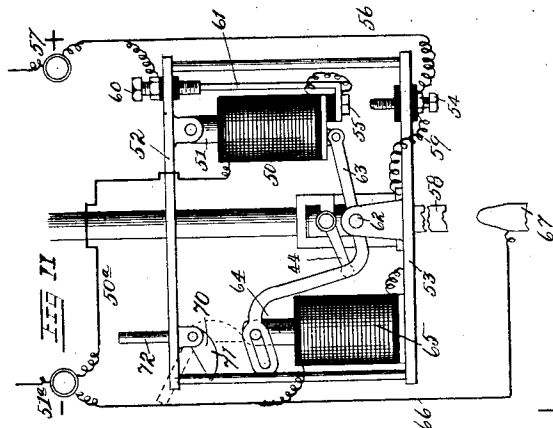
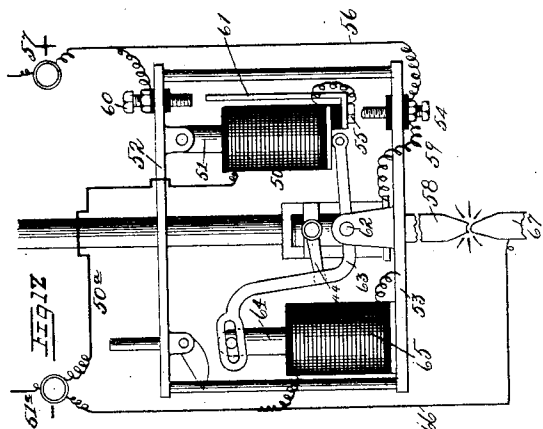


FIG 14.

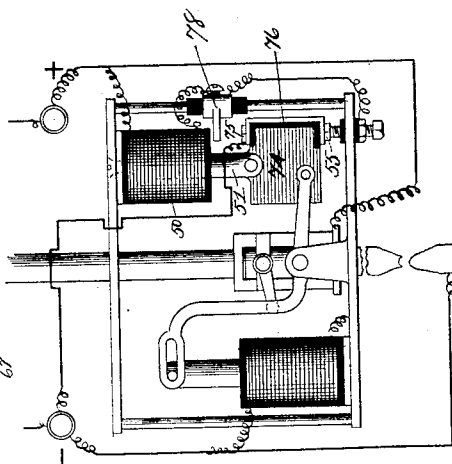
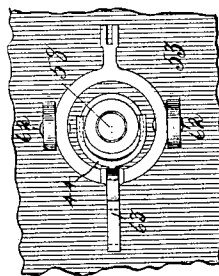


FIG 13.

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UNITED STATES PATENT OFFICE.

JAMES McLAUGHLIN, OF CHICAGO, ILLINOIS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 587,750, dated August 10, 1897.

Application filed August 26, 1895. Serial No. 560,558. (No model.)

To all whom it may concern:

Be it known that I, JAMES McLAUGHLIN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has for its object the provision of means whereby the mechanism employed to establish and maintain the arc interval is materially simplified and whereby instrumentalities are employed which are invariably positive in action and not subject to changes in structure or condition by time or use or atmospheric or other changes.

My invention has a further object in the provision of means whereby the clutch seizes upon the carbon-rod to separate the carbons more positively and firmly.

My invention has a further object in the provision of means whereby the main magnet or solenoid is instantly and completely demagnetized when the cut-out circuit is closed, and thus prevents the said main magnet or solenoid from breaking the cut-out circuit when the lamp is in an abnormal condition.

My invention, further, has for its object the provision of means whereby when the lamp is in operation and the arc in a normal condition the current passes directly to the positive carbon without traversing the coils of any magnets or solenoids, and has in view certain other objects in this connection which will appear hereinafter.

My invention has certain other objects; and it consists in certain features of construction and arrangement and combinations of parts to be described, and pointed out in my claims, reference being now had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved carbon-regulating mechanism, the main magnet or solenoid being in section, the dotted lines indicating the raised or elevated position of the main magnet or solenoid, also showing the means for demagnetizing the main magnet. Fig. 2 is a like view of a modified form of this type of regulating mechanism. Fig. 3 is a detail view of a modified

form of main magnet or solenoid. Fig. 4 is a detail side view of the clutch. Fig. 5 is a cross-section on the line xx of Fig. 4. Fig. 6 is a vertical sectional view of the clutch. Fig. 7 is a cross-sectional view of a modified form of clutch of the type shown in Fig. 4. Fig. 8 is a cross-sectional view of another modified form of clutch of this type. Fig. 9 is a perspective detail view of a form of operating connection employed in that form of clutch shown in Fig. 8. Fig. 10 is a view of another type of lamp in which the current passes directly to the positive carbon when the arc is established, this view showing the position of the parts when the lamp is not in use, the dotted lines indicating the position of the parts when the arc is established. Fig. 11 is a view showing the position of the parts when the cut-out circuit is closed. Fig. 12 is a view showing the position of the parts when the lamp is in operation. Fig. 13 is a view of a modified form of lamp of this type. Fig. 14 is a detail plan view of the clutch connections. Fig. 15 is a view of a modified form of the type of lamp shown in Figs. 1 and 2.

The main magnet or solenoid of my improved lamp is designated at 20 and the shunt-magnet at 21, the construction and operation of the main magnet or solenoid 20 being peculiar and novel in character, which features will be particularly pointed out after describing the mechanism generally.

22 designates the upper carbon of the lamp, and 23 the lower carbon, the latter being electrically connected with the negative binding-post 24 by the lead 25.

The clutch 26 is connected with a horizontal lever 27 by the connecting-rod 28, the former being pivotally held at 29 from the frame of the lamp. The horizontal lever 27 is connected at one end to the armature or core 31 of the solenoid or main magnet 20 and at the other end to the armature or core 32 of the shunt solenoid or magnet 21.

The main magnet or solenoid 20 is unconnected with the frame of the lamp and may be said to be slidably or movably mounted upon the core or armature 31.

Mounted upon the core or armature 31 is a keeper-bar or armature 33, and when the main magnet or solenoid 20 is energized the

core 31 and keeper-bar 33 are thereby attracted, causing the main magnet 20 to raise itself bodily from the frame on which it rests when no current is in the lamp and move upwardly upon the core or armature 31, as indicated by the dotted lines, and at the same time causing the end of the lever 27 over the main magnet or solenoid, the core 31, and the keeper-bar 33 to move downwardly toward and into the said main magnet or solenoid and by this movement of the horizontal lever 27 establishing the arc, the keeper-bar 33 holding the main magnet in its suspended position and establishing the arc. It is evident that the same or approximately the same result may be accomplished by permitting the main magnet to remain at rest upon the bed of the lamp during the establishment of the arc and pulling the core and its keeper into a keeper position, the shunt-magnet raising the main magnet into a suspended position in feeding the carbon, which main magnet then becomes a weight to act counter to the shunt-magnet. As the resistance of the arc increases the shunt magnet or solenoid 21 is energized, attracting and pulling down upon the core or armature 32 of the shunt-magnet against the mechanical resistance of the suspended main magnet or solenoid 20, which acts as a weight and causes or permits a feed of the carbon to maintain a normal arc.

The end of the horizontal lever 27 adjacent to the shunt magnet or solenoid 21 forms one member or contact of a cut-out device, the other member or contact of which is designated at 35, secured to the frame, which contacts are included in the cut-out circuit.

I provide means whereby the main magnet or solenoid 20 is completely and instantly demagnetized upon the establishment or closing of the cut-out circuit by winding the resistance-coils 36 of the cut-out about the main magnet or solenoid, so that when the cut-out circuit is closed the current traverses the said resistance-coils and thereby neutralizes any residual or other magnetism of the main magnet or solenoid 20. When this occurs, the main magnet or solenoid 20, which during the normal operation of the lamp is suspended, is released and assumes a position at rest upon the bed of the lamp, in which position the main magnet 20 remains until the arc is again established, thus preventing the main magnet 20 from opening the cut-out circuit when the lamp is in an abnormal condition.

In Fig. 2 I have shown the same character of lamp, except that the intermediate mechanism between the main and shunt magnets differs in respect of the connecting-lever 27, a horizontal lever 27^a being provided, pivoted at one end to the frame and connected at the other to the shunt-magnet core 32, a supplemental lever 27 being pivotally suspended from the top plate 30 and connected at one end to the core 31 of the main magnet 20 and at the other to the horizontal lever 27^a.

Fig. 3 shows a type of main magnet 20 in

which the cores are fixed in the coil and the whole adapted to move relative to the armature 29^a.

In Figs. 4 to 9, inclusive, I have shown forms of clutch which are employed to seize and raise the carbon-rod.

Referring first to the form shown in Figs. 4, 5, and 6, the carbon-rod is designated at 37 and is surrounded by the collars 38, connected by the connecting-pieces 39, which also support the journal-holding ring 40. The interiors of the journals 41 in the journal-holding ring 40 are screw-threaded, Fig. 6, with a right and left thread, which receives the right and left hand threads on the shoe-actuators 42, which operate the gripping-shoes 43. The outer ends of the shoe-actuators 42 are secured to the arms 44, Fig. 5, which latter are secured to the connecting-rod 28. The ends of the shoe-actuators 42 are provided with thumb-wheels 45, Fig. 6, by which they may be manually adjusted, the set-screws 46 holding them in the adjusted position. When the rod 28 is pulled upward, it is evident that a movement of slight rotation is imparted to the shoe-actuators 42, which, by reason of the right and left screw-thread connection, causes said actuators to move inwardly, carrying and causing the shoes 43 to bear against and firmly and positively grip the carbon-rod 37. It is evident that this mechanism affords a direct action which is uniform and positive, and it will be further apparent that when the shoe-actuators are rotated in an opposite direction to release the shoes from the carbon-rod that this release is effected steadily, uniformly, and gradually, instead of with that character of abrupt or sudden release which permits the carbon-rod and carbon to feed down too far.

In Fig. 7 I have shown cams 46, which are employed as shoe-actuators and which are operated by the arms 44.

In Figs. 8 and 9 I have shown shoe-actuators, consisting of pins 47, carried on axial shafts 48, which pins ride upon inclined ways 49 and thus press the shoes 43 upon the carbon-rod. In Figs. 10 to 14, inclusive, I have shown a type of lamp in which the current is conducted directly to the positive carbon when the arc is in a normal condition and the lamp in operation. In carrying out this feature of my invention and certain other features I provide what may be termed a "governor magnet or solenoid," in that it performs several functions in the operation of the lamp and in fact determines and controls its proper operation under the various different conditions of practical use. This magnet or solenoid establishes the arc interval, provides a mechanical resistance controlling the action of the shunt magnet or solenoid in feeding the carbon, constitutes a cut-out resistance, and also maintains established the cut-out circuit.

The governor magnet or solenoid is designated at 50 and is adapted to move or slide upon the core 51 when energized by magnetic

attraction between the said core and magnet and to be suspended upon said core, which latter is held in a stationary position upon the top plate 52. In the bed-plate 53 and insulated therefrom is a contact-screw 54, adapted to contact with a contact-point 55, carried on the governor-magnet 50 and connected with the coils thereof, the contact-screw 54 on one side being connected by the lead 56 with the positive binding-post 57 and on the other with the positive carbon 58 by the lead 59.

The governor-magnet 50 is connected by the lead 50^a with the negative binding-post 51^a. Also held on the top-plate 52 is a cut-out-contact point 60, which establishes the circuit through the governor-magnet 50 when the lamp is in an abnormal condition, in a manner to be more fully described, the governor-magnet 50 carrying a cut-out-contact rod 61, which contacts with the contact-point 60.

Pivoted at 62 is a connecting-lever 63, pivotally secured at one end to the governor-magnet 50 and at the other to the core or armature 64 of the shunt magnet or solenoid 65. Also pivotally secured to the connecting-lever 63 are the arms 44 of the clutch. A lead 66 connects the negative carbon 67 with the negative binding-post 51^a, the shunt magnet or solenoid 65 being connected in circuit with the frame of the lamp and with the said lead 66.

The operation of this type of lamp is as follows: It will be observed, preliminarily, in this type of lamp when no current is passing there-through that the carbons are apart, and therefore it is necessary to first close the carbons together and then separate them the required distance to establish the proper arc interval. The current entering upon the lead 61, Fig. 1, passes through the contacts 54 and 55 into the governor-magnet 50, energizing the same, which then moves upwardly upon the core or armature 51, into the position as shown by the dotted lines, and at the same time raising that end of the connecting-lever 63 to which it is attached depresses the other end portion, thereby lowering or releasing the clutch to permit a feed of the positive carbon 58 into contact with the negative carbon 67. When this occurs, the current instead of passing through the governor-magnet 50 now passes through the carbons, thereby discharging the governor-magnet 50, which then by gravity travels downward upon the core 51, and in so doing depresses the end of the lever 63, with which it is connected, raising the other end thereof, thereby causing the clutch to engage and raise the positive carbon 58 and establish the arc interval, as shown in Fig. 3. The governor-magnet 50 is prevented from resuming its first position, in which the contacts 54 and 55 are closed by means of the shunt magnet or solenoid 65, which, when the carbons are separated, is energized and holds the governor-magnet 50 in a suspended position, discharged of current and non-magnetic.

In order to feed the positive carbon 58, the

shunt-magnet 65 pulls down upon the end of the lever 63 and thus lowers or releases the clutch and carbon, and in so doing operates against the counteracting influence of the governor-magnet, which now provides a weight and mechanical resistance on the opposite end of the lever 63 and thus controls and determines the extent of feed of the positive carbon.

When from any cause, such as the breaking off of the carbon, as shown in Fig. 11, the lamp becomes inoperative or in an abnormal condition, the then highly-energized shunt-magnet 65 continues to pull down upon its end of the lever 63, overcoming the mechanical resistance of the governor-magnet 50 until the cut-out-contact rod and cut-out contact 60 are brought together, thus closing the cut-out circuit through the said cut-out contact 60, cut-out-contact rod 61, the coils of the governor-magnet 50, and the lead 51^a, the said coils of the governor-magnet now serving the purpose of a resistance in the cut-out circuit. It will also be noted that as the governor-magnet is now energized by the current passing through the cut-out circuit it is magnetically held in this suspended position and thereby maintains the cut-out circuit closed, while the lamp is in an abnormal condition. Should the carbons from any cause be brought together, it is evident that the governor-magnet is discharged by the opening of the cut-out circuit, and the said magnet then falls into the position shown by the dotted lines in Fig. 1.

In order to positively and mechanically lock the parts in the position shown in Fig. 11, so that the carbons may be removed or to adjust the parts of the lamp, I provide the locking device 70, consisting of a pivoted cam 71, operated manually by a handle 72, which cam when thrown down engages and holds the connecting-lever 63 and thereby locks the cut-out circuit closed.

In Fig. 14 I have shown a modified form in which the governor-magnet 50 is held in a stationary position and a weight 74 provided secured to the end of the movable core or armature 51, the said weight carrying the contact 55 and the cut-out contact 75, connected together by the conductor-strip 76, insulated from said weight 74, the other contact 78 being held on the frame of the lamp. It is evident that the action of this form is the same as before described, except that the governor-magnet is stationary and the weighted core movable.

By reference to Fig. 12 it will be observed when the lamp is in normal operation that no magnets or solenoids are in series with the arc, the current passing through the leads 56 and 59 directly to the carbons.

In Fig. 15 I have shown the type of lamp of Figs. 1 and 2 adapted to the form of lamp shown in Fig. 13.

By reference to Fig. 1 it will be observed that the main magnet or solenoid 20 is adjustably mounted on the horizontal lever 27, said

adjustment being for the purpose of equalizing or maintaining the proper equilibrium between the main magnet or solenoid 20 when acting as a mechanical resistance against the counteracting magnetic influence of the shunt magnet or solenoid 21.

When in my claims I refer to the main magnet as "adapted to move independently of the intermediate mechanism," I do not desire to be understood as stating that the lever 27 of said mechanism may not have a preliminary movement under the influence of the main magnet, as shown by the dotted lines in Fig. 1; but rather desire to be understood as referring to the movement of the main magnet on its core into the dotted position in said figure independent of said intermediate mechanism.

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

1. In an arc-lamp the combination with the main magnet or solenoid, of a shunt magnet or solenoid, an intermediate centrally-pivoted connecting-lever between the cores of the said magnets, a carbon-rod, a clutch and a clutch-lever extended from said clutch and connected to the intermediate lever, the main magnet or solenoid being adapted to move independently of the intermediate mechanism along its core into a suspended position whereby it constitutes a weight against the resisting influence of which the shunt-magnet acts in the feeding of the carbon.

2. In an arc-lamp, the combination with the main magnet or solenoid of a shunt magnet or solenoid, an intermediate pivoted lever to which the cores of the main and shunt magnets are pivoted, the said main magnet being mounted to move vertically upon its core and resting in a stationary position upon a fixed portion of the lamp when the current is cut off and means for raising said main magnet or solenoid into a suspended position whereby it constitutes a weight, against the resisting influence of which the shunt-magnet acts in the feeding of the carbons.

3. In an arc-lamp, carbon separating and releasing mechanism, an arc-establishing magnet or solenoid, in a derived circuit about the arc, adapted for independent movement, a circuit-breaker for said derived circuit operated in the movement of the arc-establishing magnet, and means for suspending the said arc-establishing magnet whereby it constitutes a mechanical resistance against which the shunt magnet or solenoid acts.

4. In an arc-lamp, an arc-establishing magnet or solenoid in a derived circuit about the arc, a shunt magnet or solenoid, intermediate mechanism between said magnets or solenoids, carbon separating and releasing mechanism and a circuit-breaker for the derived circuit aforesaid operated by the said arc-establishing magnet or solenoid.

5. In an arc-lamp, an arc-establishing magnet or solenoid, in a derived circuit about the

arc, adapted for independent movement, a shunt magnet or solenoid, intermediate mechanism between said magnets or solenoids, carbon separating and releasing mechanism, a circuit-breaker for the derived circuit operated by the arc-establishing magnet or solenoid and means for suspending the said arc-establishing magnet whereby it constitutes a mechanical resistance against which the shunt magnet or solenoid acts.

6. In an arc-lamp, an arc-establishing magnet, in a derived circuit about the arc, which is capable of a movement bodily upon its core when energized, a circuit-breaker for said derived circuit operated by the initial movement of said arc-establishing magnet, a shunt magnet or solenoid and an intermediate lever connected with the arc-establishing magnet or solenoid and the shunt magnet or solenoid together with carbon separating and releasing mechanism operated by the intermediate lever.

7. In an arc-lamp, an arc-establishing magnet or solenoid, in a derived circuit about the arc, which is capable of a movement bodily upon its core when energized, a circuit-breaker for said derived circuit operated by the initial movement of said arc-establishing magnet, a shunt magnet or solenoid and an intermediate lever connected with the arc-establishing magnet and the shunt-magnet, the former in its initial bodily movement assuming a position whereby to constitute a mechanical resistance against which the shunt-magnet acts and also breaking the derived circuit.

8. In an arc-lamp the combination of an arc-establishing magnet or solenoid in a derived circuit about the arc, which magnet is movable and adapted to close the cut-out circuit and in so doing include its coils in said cut-out circuit and a shunt magnet or solenoid connected mechanically with the arc-establishing magnet, the former raising the latter to close the cut-out circuit whereby the coils of the arc-establishing magnet provide a resistance in the cut-out circuit.

9. In an arc-lamp, a governor magnet or solenoid in a derived circuit around the arc, a shunt magnet or solenoid, carbon separating and releasing devices, connecting mechanism between said magnets or solenoids operating said carbon separating and releasing devices, a cut-out circuit and means whereby the governor-magnet, when the arc is established, is mechanically suspended constituting a weight acting in opposition to the shunt magnet or solenoid, said governor magnet or solenoid being held magnetically suspended when the lamp is in an abnormal condition to maintain the cut-out closed and constituting a resistance in the cut-out circuit.

10. In an arc-lamp a movable arc-establishing magnet or solenoid, a shunt magnet or solenoid, intermediate mechanism between the two magnets, carbon separating and releasing mechanism connected with the interme-

diating mechanism, a cut-out circuit and cut-out contacts carried by the arc-establishing magnet, said magnet being raised bodily by the shunt-magnet under abnormal conditions to establish the cut-out contacts whereby the arc-establishing magnet is energized and magnetically held suspended to maintain the cut-out contacts closed while abnormal conditions prevail.

- 10 11. In an arc-lamp, an arc-establishing magnet or solenoid, included in a derived circuit about the arc, capable of independent movement, a shunt magnet or solenoid, intermediate mechanism between said magnets, carbon separating and releasing mechanism normally holding the carbons apart, and a cut-out-contact maker carried by the arc-establishing magnet, said arc-establishing magnet being raised bodily by the shunt-magnet, under abnormal conditions, thereby causing the cut-out-contact maker to establish the cut-out circuit through the arc-establishing magnet and energizing the same causing it to be held magnetically suspended to maintain the

cut-out contact closed during prevalence of abnormal conditions and at the same time releasing the hold of the carbon separating and releasing mechanism upon the carbon whereby the same is free to move.

12. In an arc-lamp, the combination with the arc-establishing magnet or solenoid of a cut-out circuit, a demagnetizing-coil about the arc-establishing magnet or solenoid in the cut-out circuit and a shunt-magnet which in closing the cut-out circuit causes the current to pass through the demagnetizing-coils thus demagnetizing the arc-establishing magnet or solenoid and thereby preventing the opening of the cut-out circuit by the arc-establishing magnet or solenoid when the lamp is in an abnormal condition.

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

JAMES McLAUGHLIN.

Witnesses:

C. C. BULKLEY,
JEAN J. GRAHAM.