(No Model.) 3 Sheets—Sheet 1.

J. McLAUGHLIN.

ELECTRIC ARC LAMP.

No. 567,840. Patented Sept. 15, 1896.

Fig. 2

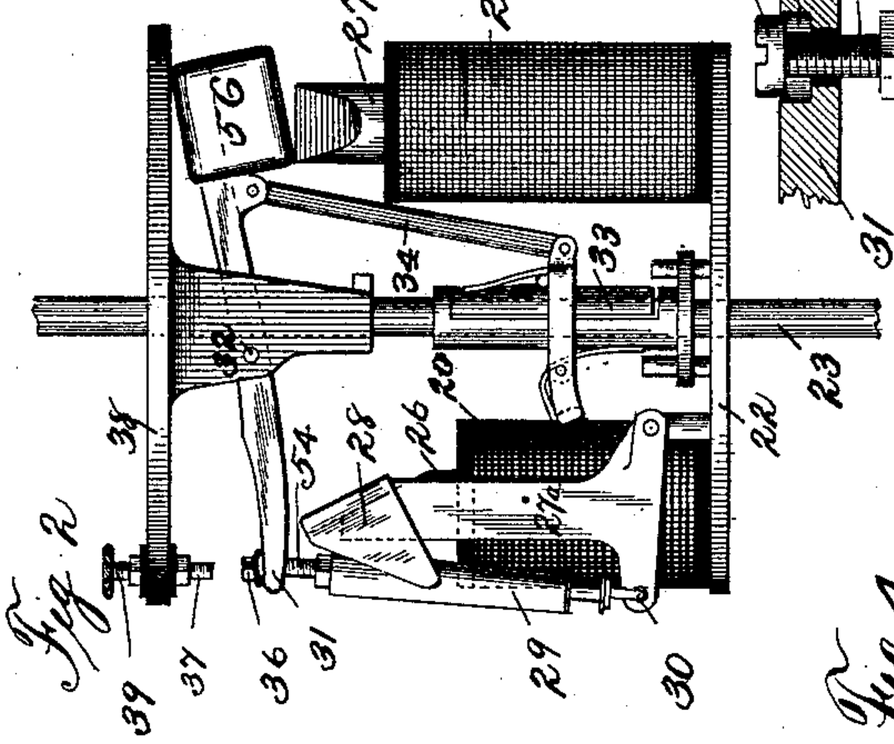


Fig. 3

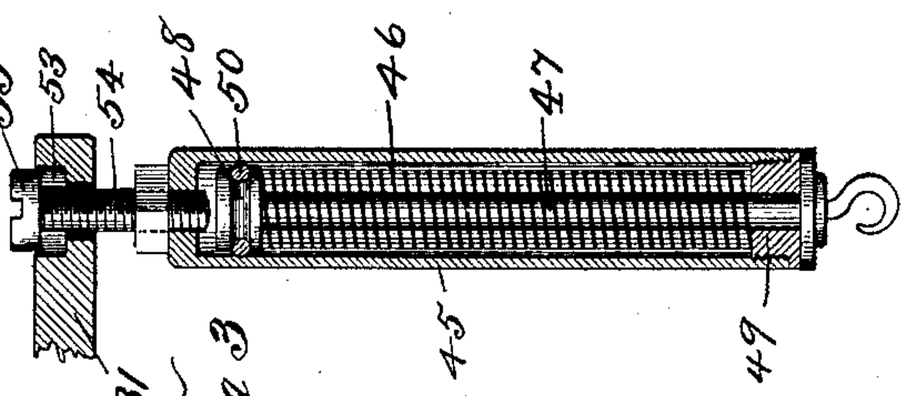


Fig. 4

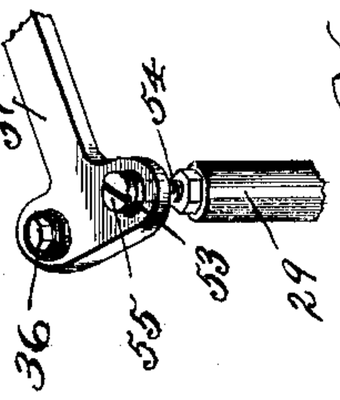


Fig. 17

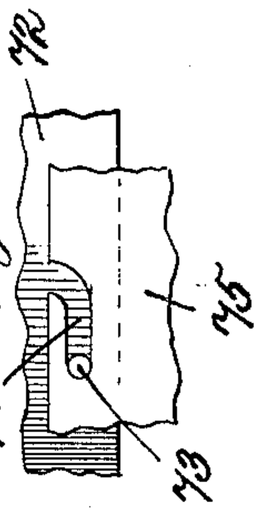
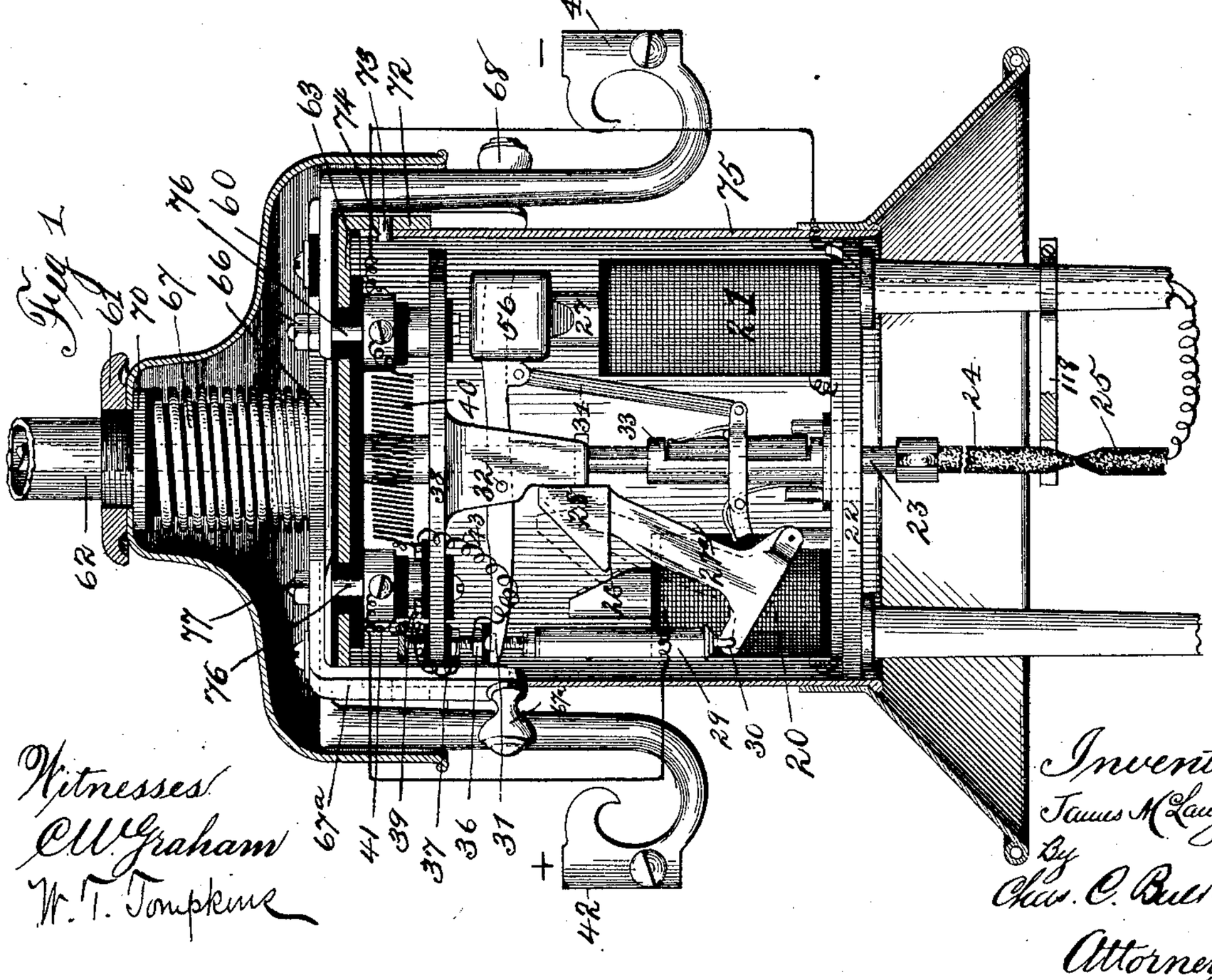


Fig. 1



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(No Model.) 3 Sheets—Sheet 2.

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ELECTRIC ARC LAMP.

No. 567,840. Patented Sept. 15, 1896.

Fig 6.

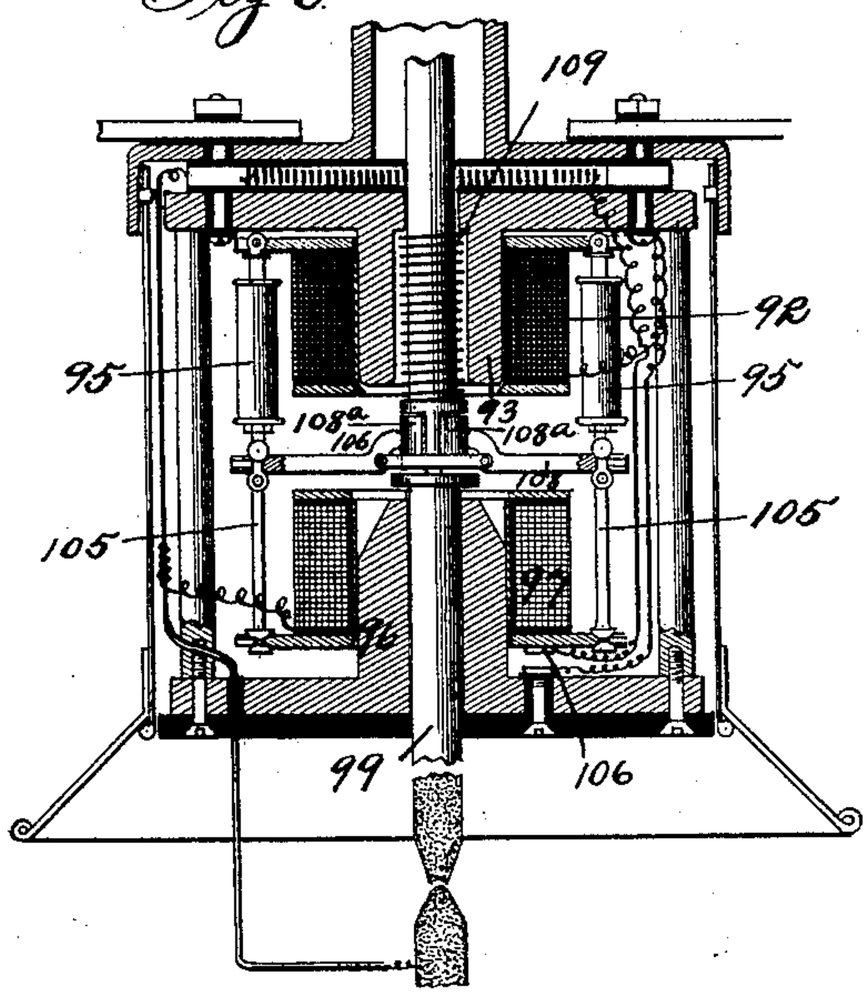


Fig 5

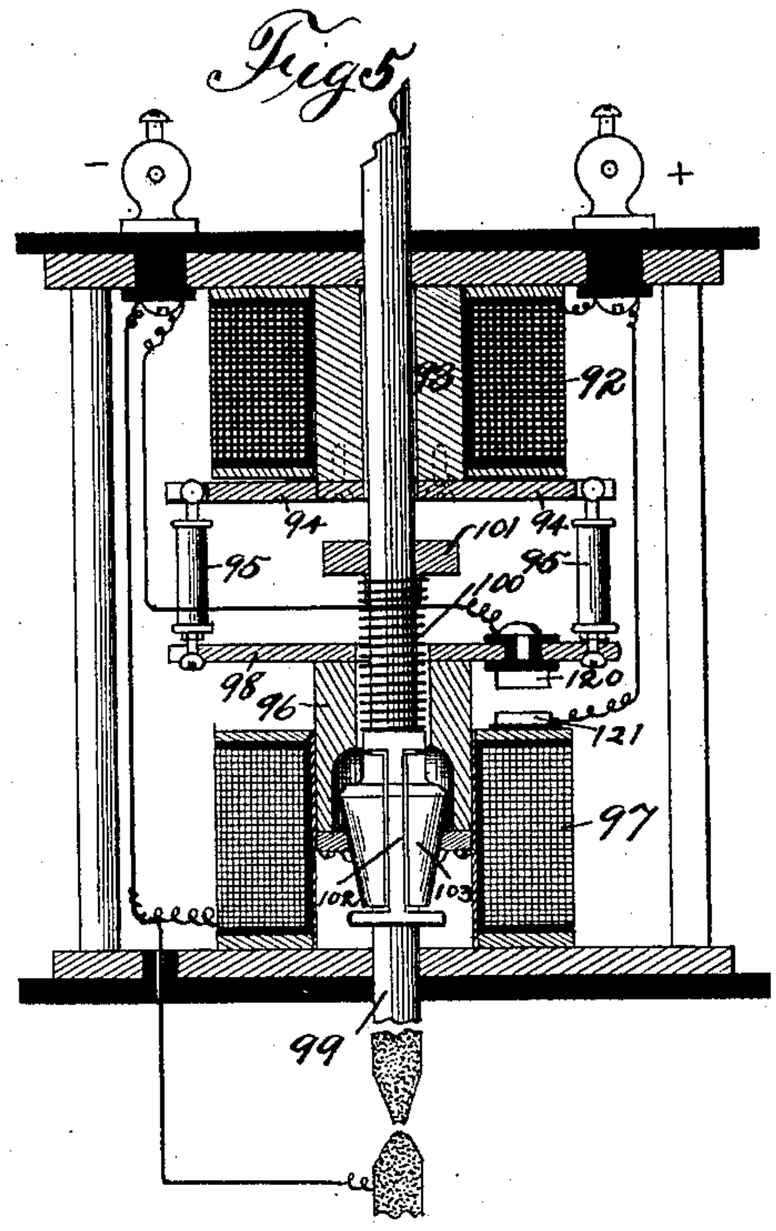


Fig 7

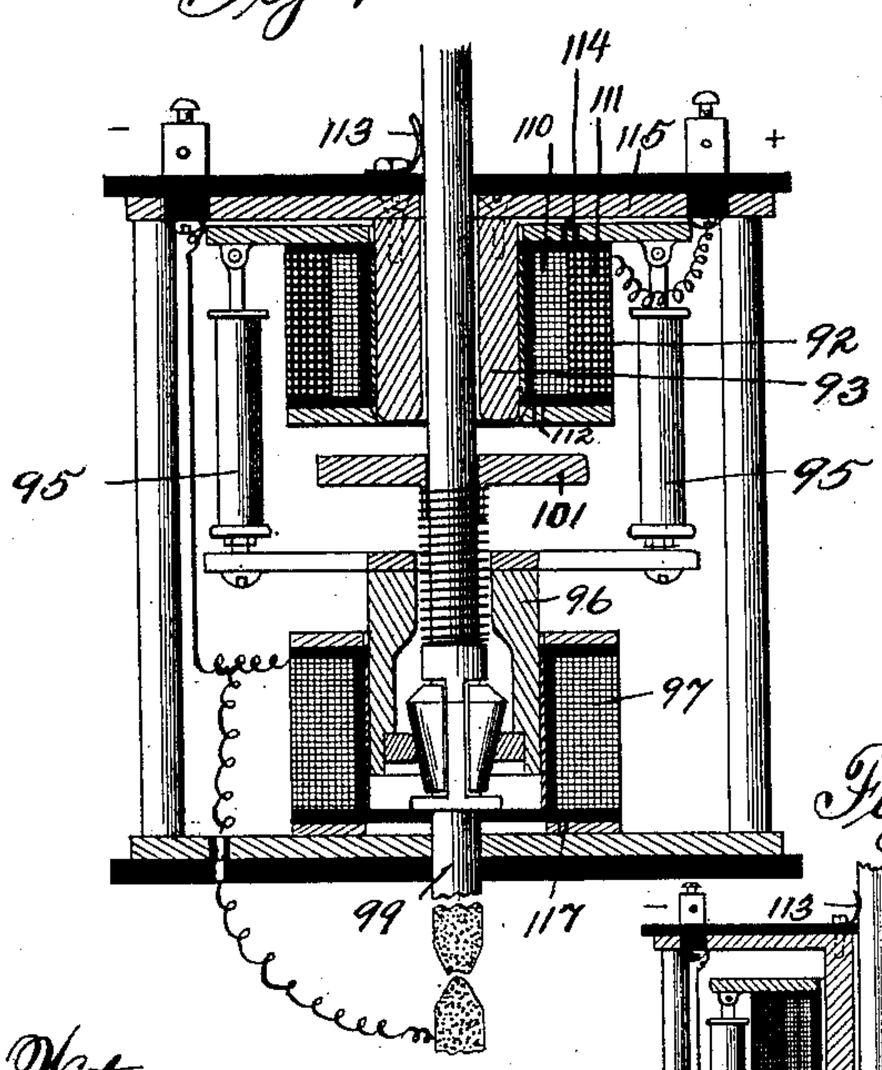


Fig 9

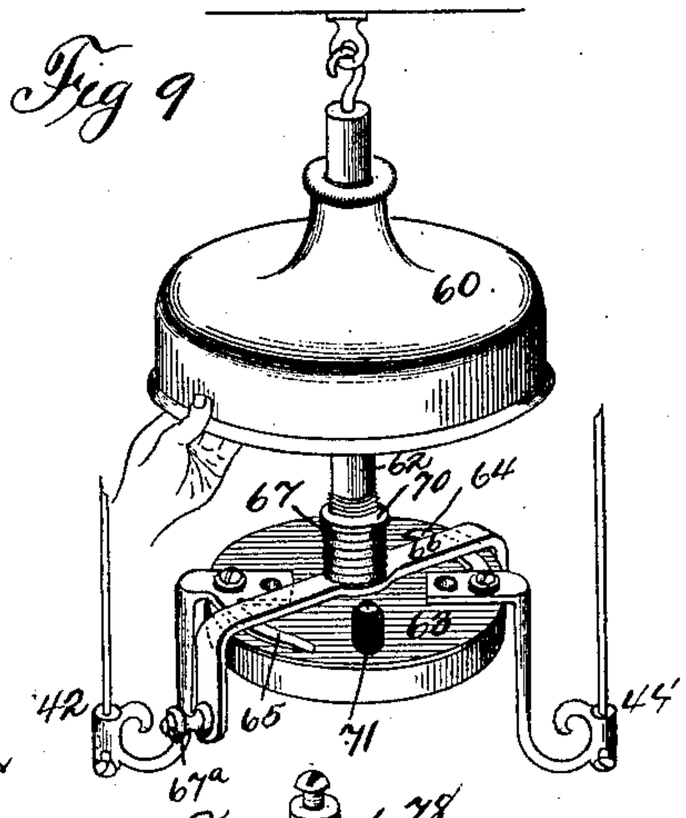


Fig 8.

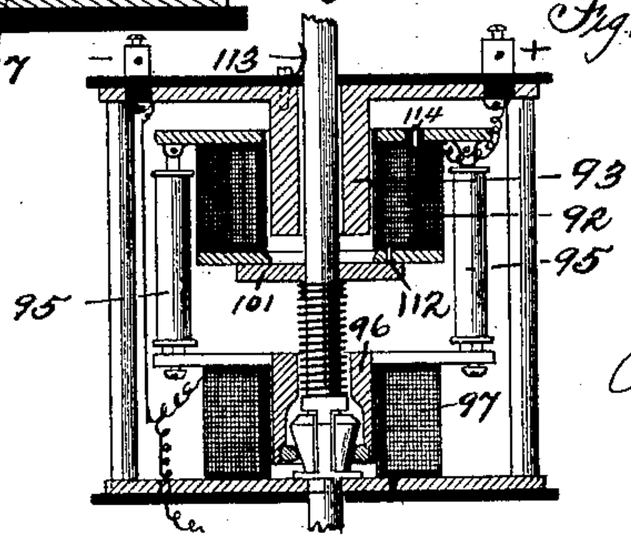
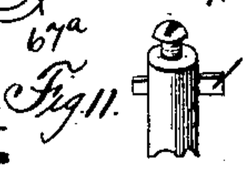


Fig 11.



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(No Model.) 3 Sheets—Sheet 3.

J. McLAUGHLIN.

ELECTRIC ARC LAMP.

No. 567,840. Patented Sept. 15, 1896.

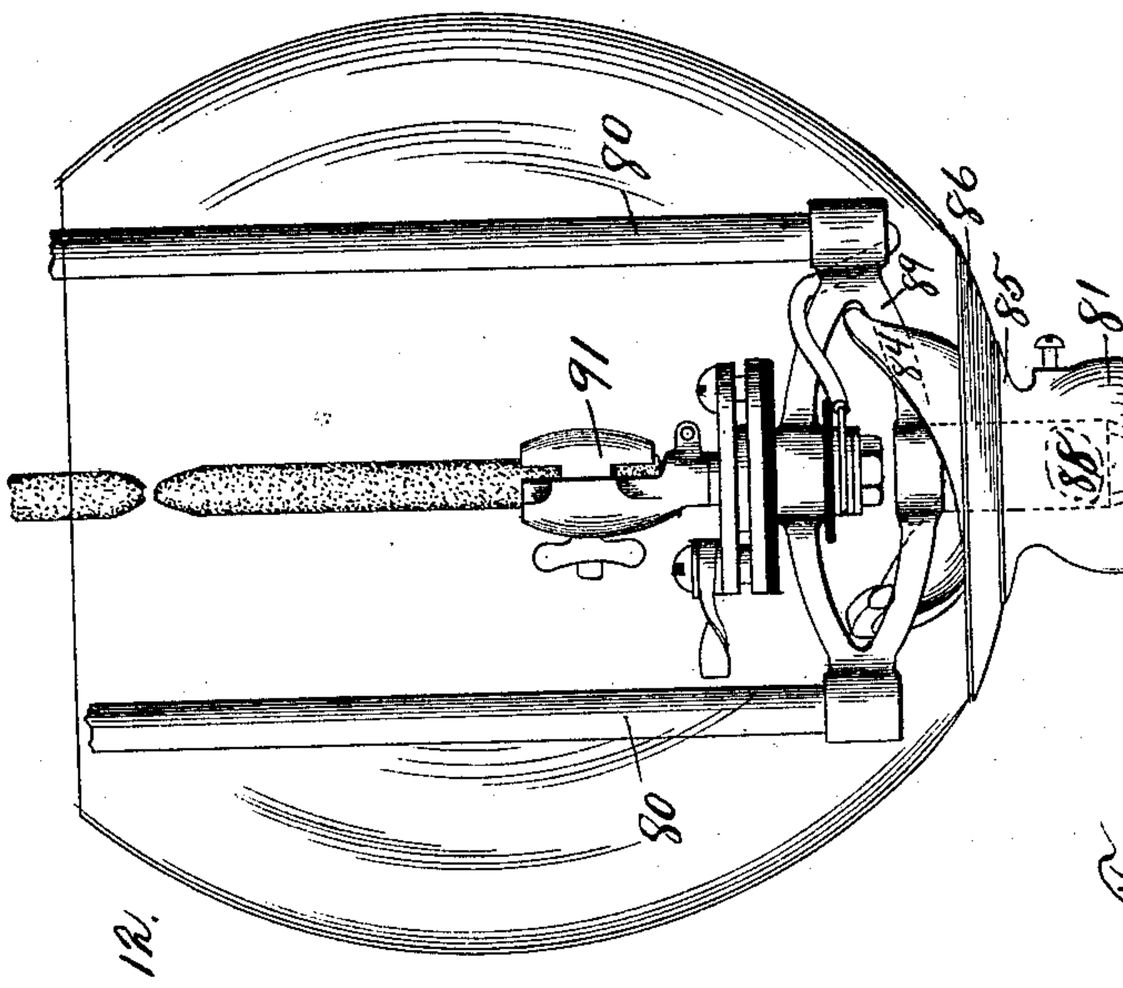

Fig. 12.

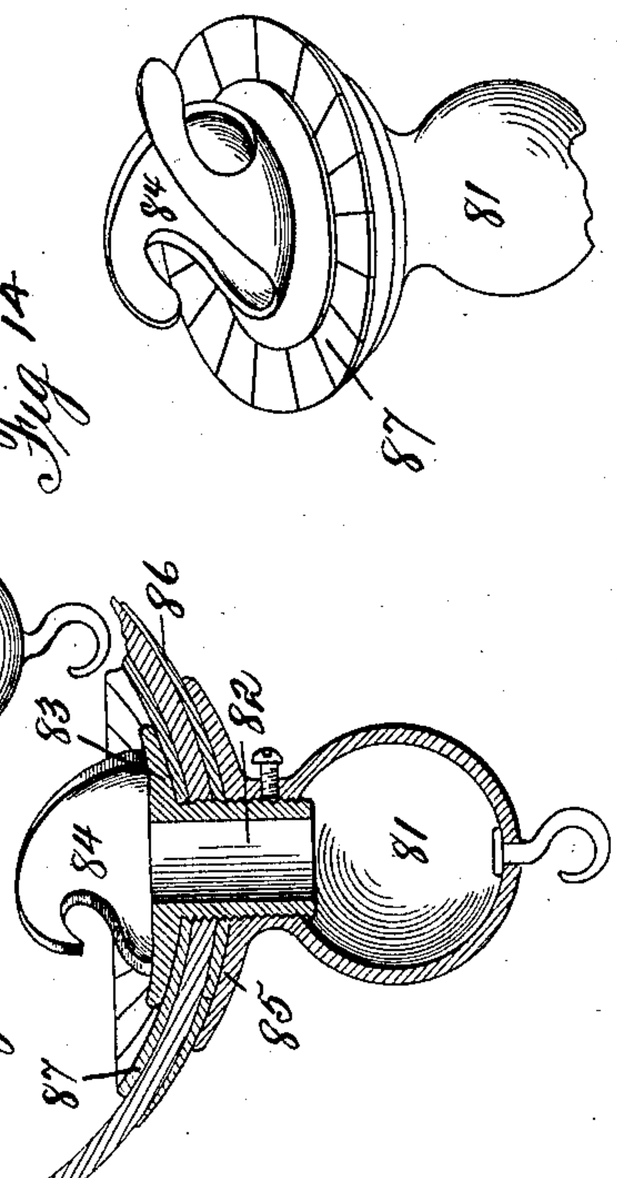

Fig. 13

Fig. 14

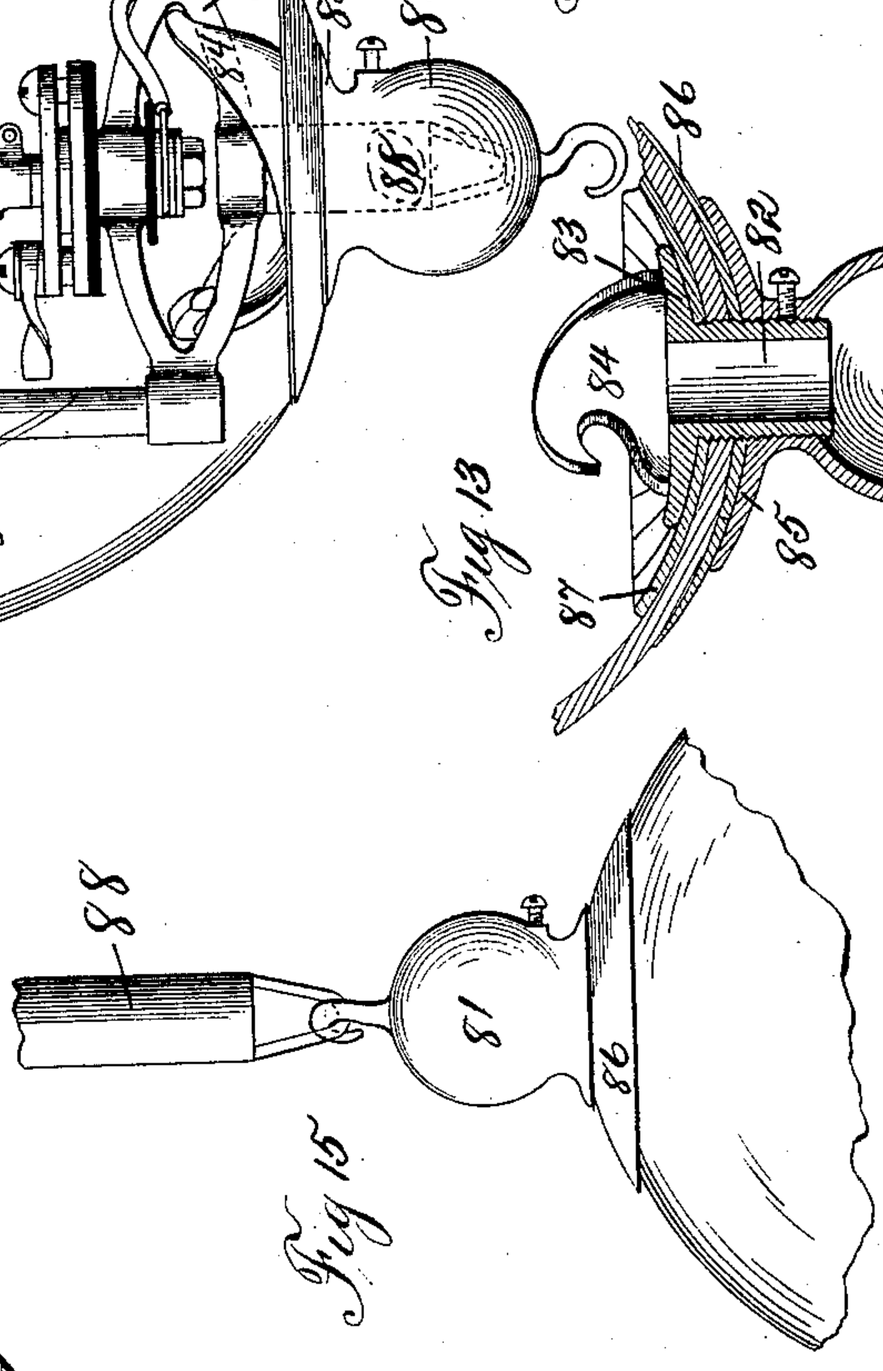

Fig 15

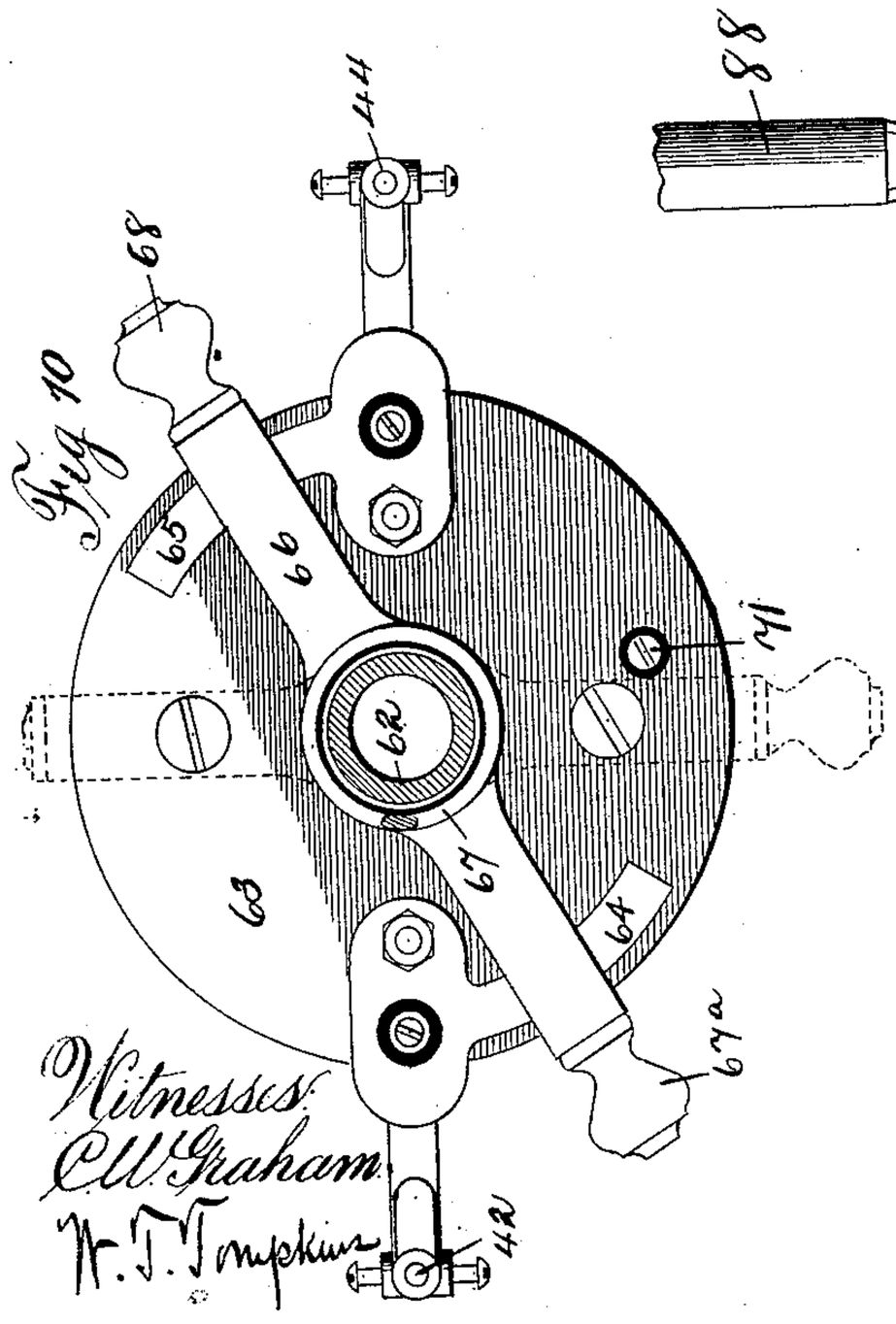

Fig 10

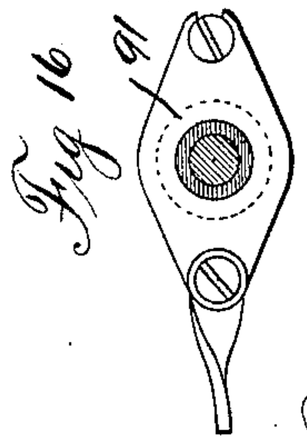

Fig 16

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UNITED STATES PATENT OFFICE.

JAMES McLAUGHLIN, OF CHICAGO, ILLINOIS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 567,840, dated September 15, 1896.

Application filed March 4, 1895. Serial No. 540,450. (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.

My invention relates to certain improvements in electric-arc lamps generally, and also to certain improvements in a type of arc-lamp which is shown and described in an application filed by me on the 15th day of May, 1893, the serial number of which is 474,298. I do not desire to be understood, however, as limiting my invention to this type of lamp only, as the features shown, described, and claimed may be adapted for application in other connections, reference being made to said application more particularly to supplement the description of the present improvements. In the application aforesaid I have shown and described carbon separating and releasing devices consisting of main and shunt magnets and a mechanical resistance which is established and maintained as a resistance by the main magnet acting upon an armature, armature-lever, or pivoted lever, thereby separating and establishing the arc, the shunt-magnet acting against the resistance to feed the carbon and maintain the proper arc interval.

My invention has several objects in view, among which may be stated the provision of means whereby the armature, armature-lever, or pivoted lever, acted upon by the main magnets, is adapted to normally assume a position, when no current is passing through the main magnet, in which the possibility of breaking the cut-out contacts is avoided. The position thus assumed by this armature, armature-lever, or pivoted lever is one in which it is approximately remote from the main magnet; and another object of my invention is to provide means by which this armature is capable of an initial positioning movement under the influence of the main magnet without performing work until within relatively close inductive proximity to the main magnet, such a quantity of current only being diverted into the main magnet as is necessary simply to accomplish this initial positioning movement, such a current strength then being diverted through the main magnet as will cause a still further movement of the armature or lever and by which the work of establishing the resistance of the mechanical resistance is accomplished, whereby the carbons are separated and the arc established.

My invention in this connection also has a further object, which consists in a particular construction, arrangement, and operation of the mechanism constituting the mechanical resistance, whereby the same is maintained in a more sensitively responsive condition.

My invention has a further object in the provision of means whereby in the separation of the carbons the full magnetic capacity of the main magnet may be concentrated upon this work and in this way wholly or partially cutting out a portion of the conductor of the main magnet to reduce the resistance in series with the arc.

My invention has for other objects the provision of different kinds of means whereby the mechanical resistance device is actuated to form the arc and also to feed the carbon, and also has in view the provision of improved types of clutch mechanism, together with what may be termed the "lamp-trimmings," an improved switch for the lamp, and also an improved globe-holder therefor.

My invention has certain other objects in view; and it consists in certain features, arrangements, and constructions hereinafter to be particularly described, reference being now had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved type of lamp, the switch being in a closed position. Fig. 2 is a detail view showing the position assumed by the parts after the carbons have been separated and the current is passing through the main magnet. Fig. 3 is a detail perspective view of the connection between the mechanical resistance device and the horizontal pivoted intermediate lever. Fig. 4 is an enlarged detail sectional view of the mechanical resistance device and the connection aforesaid. Fig. 5 is a sectional view and side elevation showing a type of lamp in which the cores of the magnets, both main and shunt, are movable, the main magnet of the lamp having its movable core acting to establish the mechanical resistance and the

arc. Fig. 6 is a like view showing the magnet-coils, both main and shunt, movable. Fig. 7 is a like view showing a movable main-magnet coil and a movable core for the shunt-magnet, this view also illustrating the manner in which a portion of the main-magnet coil is cut out after the arc is established. Fig. 8 is a view similar to Fig. 7, showing the position assumed by the main-magnet coils and shunt-core when the current is not passing through the carbons. Fig. 9 is a view showing a removable and replaceable cover or cap, and also showing the lamp-switch in perspective. Fig. 10 is a detail view in section showing means for detachably holding the lamp to the top plate. Fig. 11 is a plan view of the switch. Fig. 12 is a view of the lower portion of a lamp, showing the globe held in position by means of my improved globe-holder. Fig. 13 is a detail view in section of my improved globe-holder. Fig. 14 is a perspective view of the same. Fig. 15 is a view showing the means by which the globe may be suspended while renewing the carbons in the lamp. Fig. 16 is a detail view of a device for alining the lower carbon.

Referring first to Figs. 1 to 4, inclusive, I will proceed to a description of the construction of the lamp, having reference to certain features of improvements by which the arc interval is established and maintained.

The main magnet of the lamp is designated at 20, and the shunt-magnet at 21, which two magnets are held in a suitable manner upon the base-plate 22 of the lamp.

The carbon-rod or carbon-holder rod at 23 is mounted vertically, as usual, and carries the upper movable carbon 24, which is in contact with the lower carbon when no current is in the main magnet and carbons.

The cores of the main magnet 20 and the shunt-magnet 21 are respectively designated at 26 and 27, and the main magnet 20 acts upon a pivoted armature-lever 27^a, carrying the armature 28. A mechanical resistance device 29, consisting of a spring, to be described, is secured at 30 to the lower end of the armature-lever 27 and also to the horizontal connecting-lever 31, which is pivoted at 32. The clutch 33, of a peculiar construction to be described, is operatively connected with the lever 31 by means of the linking-rod 34. The lever 31 carries at that end to which the resistance device 29 is attached a contact-point 36 of the cut-out, the other contact-point, 37, of which is secured on the top plate 38 of the lamp and is adjustable by means of the thumb-screw 39. (Shown more clearly in Fig. 2.) A resistance 40 is employed, the purpose of which will be particularly pointed out, a lead 41, Fig. 1, connecting the contact-point 37 with the binding-post 42 and a lead 43 also connecting the contact-point 36 with the resistance 40, which latter is connected with the binding-post 44, so that the course of the current when the cut-out is closed and the switch, to be described, is open is through the resistance 40 from one binding-post to the other, and also through the main magnet and carbons, as about to be described.

The mechanical resistance device (designated generally at 29) consists of the cylindrical casing 45, Fig. 4, and the spring 46, wound about the pull-bar 47, which latter is secured to the movable head 48, and the spring 46 is disposed between the stationary head 49 and the movable head 48, the pull-bar 47 passing loosely through the former, and therefore when the armature 28 and the armature-lever 27^a are attracted by the main magnet 20 the rod 47 is pulled downward by the armature-lever 27^a, thus compressing the spring 46 between the movable head 48 and the stationary head 49. The movable head 48 is fitted closely within the cylinder 45 and carries a packing-ring 50, whereby an air-cushion is established in the space between said head 48 and the upper end of the cylinder 45, which air-cushion provides a dash-pot serving to regulate and steady the movement of the parts.

In order that a good cut-out contact may be preserved intact and undisturbed when no current is passing through the carbons, I have provided an arrangement whereby the armature 28 and armature-lever 27^a are caused to assume such a position away from the main magnets that the lower end of the armature-lever 27^a cannot exert a pull upon the mechanical resistance device to in turn pull down upon the intermediate lever 31, carrying the cut-out contact 36. In fact, the tendency of the armature-lever 27^a is to move in such a direction as to release the mechanical resistance device.

The armature 28 being so remote from the main-magnet core 27, it is evident that an excessive current strength would be required to pull the armature 28 into a keeper position upon said core 27 were it necessary to at once establish or commence the establishment of the tension of the spring 46, and in order to avoid the necessity of using such a current I first permit the armature 28 to have a preliminary movement without any action upon the spring 46 until the armature 28 is brought into relatively close inductive proximity to the core of the main magnet, and then in the continued movement of the armature into its keeper position the tension of the spring is established, and also the arc.

Referring to Figs. 1 to 4, inclusive, it will be observed that the end portion of the lever 31 is recessed or socketed at 53, Fig. 4, and a connecting-screw 54 passes loosely through the end of the lever 31, the head 55 of this screw being adapted to seat itself within the socket 53, and is adjustably secured to the upper end of the cylinder 45. By this arrangement it is evident that when the armature-lever 27^a is in the position shown in Fig. 1 the relationship between the lever 31 and

the connecting-screw 54 is as shown in Fig. 4, and therefore when the main magnet 20 is energized the said lever 27ª is permitted a movement, without acting upon the spring 46, into the position shown by the dotted lines in Fig. 1. This preliminary movement is effected by means of the lost motion between the connecting-screw 54 and the end of the lever 31. A minimum of current strength is sufficient to energize the main magnet, whereby the lever 27ª executes its preliminary movement, and when the armature 28, after said preliminary movement, assumes a position in relatively close proximity to the cores 26 of the main magnet the lost motion between the connecting-screw 54 and the end of the lever 31 is then taken up by the engagement of the head 55 in the socket 53, and in the continued movement of the armature 28 into its keeper position the tension of the spring is established as the spring is compressed by the downward pull of the rod 47.

When the contacts 36 and 37 are together, the cut-out circuit is closed and the arc is broken, the carbons being together. Under these circumstances the course of the current is through the resistance 40 in the cut-out circuit from one binding-post to the other, and also through the main magnet 20, the carbon-rod 23, and carbons 24 and 25 from one binding-post to the other, the current dividing in proportion to the resistance of each circuit. That portion of the current passing through the main magnet and carbons energizes the said magnet, causing the armature 28 and its lever 27ª to be attracted thereby and to execute the described preliminary movement into the position shown by the dotted lines in Fig. 1. By this movement the head 55 of the screw 54 engages the lever 31 within the socket 53, and by the combined movement of these parts into this position, together with the pull of the armature-lever 27ª, the contacts of the cut-out circuits are weakened, thereby increasing the resistance of the cut-out circuit, whereby more current is diverted through the main magnet and carbon circuit, and as the armature 28 is now within close inductive proximity to the cores 26 the main magnet is capable of pulling said armature into a keeper position on said cores and at the same time by the movement of the lever 27 establish and maintain established the tension of the spring 46, this movement completely separating the cut-out contacts 36 and 37, so that there remains only one course, except through the shunt, for the current—namely, through the main magnets and carbons and arc interval, which interval is also established by the armature 28 and its lever 27ª moving into a keeper position as the end of the lever 31 with which the mechanical resistance device 29 is connected is pulled down, elevating that arm of the lever 31 carrying the weighted shunt-magnet armature 56 and pulling upward upon the linking-bar 34 and causing the clutch 33 to engage the carbon-rod 23 and lift said rod, together with the carbon 24, and thereby establish the arc interval.

Referring now to the construction and arrangement by which the mechanism of the lamp is inclosed, and also to the form of switch designated and shown in Figs. 1 to 10, I provide a hood or cap 60, adapted to inclose the top portion of the lamp mechanism, and which is held in position by means of the washer 61, which washer is screw threaded upon the hollow casing 62, within which the carbon-rod 23 travels. What may be termed a "cover-plate" 63 has secured to and depending from it the binding-posts 42 and 44 on either side, the switch contact-strips, Fig. 10, (designated at 64 and 65,) being also mounted upon said top plate 63, and the switch 66 is so held by means of the spring 67, Fig. 1, as to be moved into and out of contact with the contact-strips 64 and 65 on either side of the lamp by the depending handles 67ª and 68 to open or close the switch, as may be desired, the spring 67 being interposed between the fixed shoulder 70 and the top of the switch 66, a stop 71, Fig. 1, serving to limit the throw of the switch in opening. On the inner portion of the rim 72 of the cover-plate 63 are the studs 73, adapted to engage with the angular slots 74 in the upper rim of the inclosing shell 75 to form a bayonet-joint connection between the cover-plate 63 and the inclosing shell 75, whereby the latter may be readily detached and withdrawn in order to obtain access to the lamp mechanism, and also readily attached in place.

In order that the lamp proper may be removed from the cover-plate 63, I provide the connecting-studs 76, secured to the top portion of the lamp-frame, which studs are passed through holes in the cover-plate 63 and then held in place by means of the nuts 77, or these studs 76 may be held in position by means of pins 78, passed through the studs 76 and engaging the upper side of the cover-plate 63.

Figs. 10 to 13, inclusive, show a form of globe-holder adapted to hold the globe in such a manner as that it may be readily attached to or detached from the connecting-bars between the lower ends of the side rods 80 of the lamp. This globe-holder consists of a head 81, which is screw-threaded to a shank 82, which shank is connected with the base-plate of the grasping-hooks 84. Disposed and held upon the shank 82 between the base 83 and the concave flange 85 of the handle or head 81 are the globe-holding plates 86 and 87, the latter being fluted. The grasping-hooks 84 are bent spirally in opposite directions, and when the globe-holder is inserted in position by slipping the hollow shank 82 over the projecting lug 88, extended from the lamp-frame, and giving to the globe-holder a partial turn, the grasping-hooks 84

engage each the lower one of the two connecting-bars 89, as designated in Fig. 10 by the dotted and full lines.

In Fig. 12 I have shown a device for alining the lower-carbon holder 91 and thereby alining the lower carbon.

In Figs. 5 to 8, inclusive, I have shown differing types of lamp operating upon the same general principle as heretofore described—namely, an establishment of the counteracting influence of a mechanical resistance device by the main magnet to separate and establish the arc and a shunt-magnet operating against but coöperating with the mechanical resistance device to maintain a normal arc interval. In Fig. 5, for instance, I have shown a main magnet 92, operating upon a movable core 93, constituting the armature, which core 93 carries arms 94, to which the mechanical resistance devices 95 are attached at one end, which mechanical resistance devices are similar to those previously described. In this instance also the core 96, constituting the armature of the shunt, is also movable, and the shunt is designated at 97. The core 96 carries the arms 98, to which the other ends of the mechanical resistance devices 95 are attached, the carbon-rod 99 passing through the cores 93 and 96 and is surrounded by a coil-spring 100, this spring being held in position by means of the intermediate member or cross-bar 101 and the stop 102. In this type I have also shown a varying form of clutch consisting of the wedge-shaped grasping members 103, which are partly disposed within the hollowed end portion of the core 96, so that when the latter is pulled upward it engages the wedge-shaped grasping member 103 and thereby causes the same to grip the carbon-rod.

In Fig. 6 I have shown a lamp similar to that shown in Fig. 5, except that in this instance both the core 93 of the main magnet 92 and the core 96 of the shunt-magnet 97 are stationary and the magnets being movable relative to the fixed cores. In this type of lamp the mechanical resistance devices 95 are each connected by the connecting-bars 105 with the shunt-magnet 97, and also with the main magnet 92, so that when no current is passing through the arc both of the magnets are in a relatively lower position than as shown, the shunt-magnet 97 establishing the cut-out connection at 106 and the main magnet 92 being away from its core. When, now, the current passes through the main magnet 92, the said magnet is energized and attracted by the core 93, and in its upward movement, through the medium of the mechanical resistance devices 95 and the connecting-bars 105, the shunt-magnet 97 is raised at the same time that the arc is established. The shunt-magnet when energized is attracted by its core 96 and pulled downward thereby against the influence of the mechanical resistance devices, the resistance of which has been established by the main magnet 92, and the carbon-rod 99 is thereby fed downward. I have in this view also shown another type of clutch, (designated at 106,) consisting of the clamping members 107 and the pivoted clutch-levers 108, connected to the mechanical resistance device 95 and also bearing against the clutch members 108^a, a spring 109 serving to keep the parts in position.

In Figs. 7 and 8 I have shown a type of lamp having a stationary shunt-magnet 97 and a movable core 96. In this instance the main magnet 92 is movable and its core 93 stationary, the main magnet 92 being connected with the movable shunt-core 96 by means of the mechanical resistance devices 95. In this instance I have shown the main magnet 92 wound with a conductor composed of two sizes of wire, (designated, respectively, at 110 and 111,) the two sizes of wire being connected in series and wound in the usual manner on an insulated metal spool. As shown at 112, the inside end of the wire is connected to the metal spool, which is in electrical connection with the carbon-rod through the metal parts of the lamp and the contact-spring 113. At the place where the two sizes of wire join, a terminal 114 is connected to each of the wires of different size, and this terminal projects through an insulated hole in the metal spool. The terminal 114 is thus adapted to make contact with the top plate 115 when and while the mechanical resistance devices and arc interval are being established. My object in this arrangement is to provide means by which the maximum attractive force is utilized in the main magnet to establish the influence of the mechanical resistance devices and the arc interval by means of the combined energy exerted by the fine-wire coils and the coarse-wire coils, and then, when this result is accomplished, to reduce the current passing through the fine-wire coils before the same can become injured by overheating. The fine-wire coils are thus relieved automatically by the terminal 114 coming into contact with the top plate 115, whereby two paths for the current are provided from the coarse-wire magnet into the metal portions of the lamp in contact with the carbon-rod, one of said paths being through the permanent connection at 112 and the other through the contact 114. When no current is passing through the main magnet and the arc, the carbons being together and the parts in position shown in Fig. 8, the carbon-rod is free to move in either direction to permit a renewal of the carbons. The current passes from the positive binding-post through both sizes of wire on the main magnet and into the metal spool, with which it is connected at 112, and by the use of this fine wire a powerful magnet is provided to pull the movable core 93 into the position shown in Fig. 7, and in this movement to establish the counteracting influence of the mechanical resistance devices and lift the core of the shunt-magnet, thereby clamping

the clutch on the carbon-rod and lifting the same and its carbon a predetermined distance and also at the same time establishing the contact at 114.

It is further evident that with this improved arrangement the full power of the magnet is concentrated upon the work of separating the carbons and that when this result is accomplished the major portion of the resistance of the main magnet is cut out.

Although I have shown a coarse and fine wire, it is evident that the same result may be accomplished by a continuous conductor wound upon the main magnet of the same cross-section throughout.

It will be observed that it is not my purpose to regulate the arc interval by increasing or decreasing automatically the strength of a single magnet, which single magnet moves the carbon in both directions, as this result has been heretofore accomplished; but on the contrary I provide a main magnet having a continuous conductor wound thereon with an intermediate contact, which when established cuts out a portion of the conductor to reduce the resistance in series with the arc. I still employ a shunt-magnet in order to feed the carbon. By a "movable part of the main magnet" I desire to be understood as including any movable part of the lamp mechanism acted upon by the main magnet. When the arc interval becomes abnormal, such a quantity of current then traverses the shunt-magnet 97, passing from the metal parts of the lamp through the connection 117, as energizes the shunt-magnet, which then acts upon its core to release the clutch against the counteracting influence of the mechanical resistance devices and thus permit a feed of the carbon-rod.

In Fig 1 I have shown a stop 118, which is connected to the frame of the lamp and extended into the plane of the downward movement of the carbon-rod. When the upper carbon has fed downward a predetermined distance, the carbon-rod is engaged by the stop, which, withholding the carbon, cuts out the lamp. This stop 118 is capable of adjustment, so that the lamp may be automatically cut out at any predetermined desired time.

Referring again to the means by which a maximum effect is concentrated momentarily in the main magnet to establish the arc and the resistance of the mechanical resistance device and then relieving said magnet when this result is accomplished, it is evident that the main magnet may also be wound with two conductors separate from each other, which are joined into a single conductor, and the current therefor in effect traverses first the two conductors and then the single conductor, and the combined effect of all of the conductors is therefore initially concentrated in the main magnet. When the desired operations are performed, the two conductors contact at 114, and thus the flow of current in the single conductor is relieved.

In Figs. 5 and 6 I have shown the cut-out contacts 120 and 121, the contact 120 being operated, as shown, by a movable part of the shunt-magnet 97 in Fig. 5, which movable part is the core 96, and in Fig. 6 I have shown the cut-out contact 106 carried by the movable winding-coils of the shunt 97.

In one of my claims I have set forth and claimed the manner of establishing the mechanical resistance device, consisting, as specified therein, of movable coils on the main magnet and a movable core on the shunt-magnet; but it is readily evident that this arrangement may be transposed to movable coils on the shunt-magnet and a movable core for the main magnet without departing from my invention.

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

1. In an electric-arc lamp, a main magnet, a mechanical resistance device, an armature for said main magnet, a pivoted lever acting to establish the counteracting influence of the mechanical resistance device, a shunt-magnet, intermediate mechanism between said shunt-magnet and the mechanical resistance device and a loose joint between the pivoted lever and the intermediate mechanism whereby the said lever may assume a position relatively remote from the main magnet and brought by said magnet into relatively close proximity thereto before establishing the said counteracting influence of the mechanical resistance device.

2. In an electric-arc lamp, a main magnet, an armature acted upon by said main magnet and held against the same as a keeper when the current is passing through the arc, a pivoted lever acted upon by said armature, a mechanical resistance device the counteracting influence of which is established by the pivoted lever, a shunt-magnet, intermediate mechanism between said shunt-magnet and the mechanical resistance device and a loose joint between the pivoted lever and the intermediate mechanism whereby the said lever may assume a position relatively remote from the main magnet and brought by said main magnet into relatively close proximity thereto before establishing the said counteracting influence of the mechanical resistance device.

3. In an electric-arc lamp, a main magnet, a mechanical resistance device, an armature for said main magnet, a pivoted lever acting to establish the counteracting influence of the mechanical resistance device, a shunt-magnet, intermediate mechanism between said shunt-magnet and the mechanical resistance device, a cut-out circuit, a cut-out contact carried by said intermediate mechanism and a loose joint between the pivoted lever and the intermediate mechanism whereby the said lever may assume a position rela-

tively remote from the main magnet and have imparted thereto a preliminary movement before establishing the said counteracting influence of the mechanical resistance device.

4. In an electric-arc lamp a combined dash-pot and mechanical resistance device consisting of a spring, and an inclosing casing therefor, a plunger moving within said casing and a pull-rod connected with said plunger which pull-rod is also connected with a movable part of the lamp at a point on the exterior of the casing, the spring being interposed between the plunger and the end of the casing and the pull-rod extending through said frame.

5. In an electric-arc lamp, the combination with the carbons of a main magnet having movable coils therefor, a mechanical resistance device acted upon by the movable coils of the main magnet to establish its counteracting influence and thereby form the arc and a shunt-magnet having a movable core acting against the counteracting influence of the mechanical resistance device.

6. In an electric-arc lamp a main magnet or solenoid having conductors of different resistance, a mechanical resistance device the counteracting influence of which is established by said main magnet, a shunt-magnet operating against the influence of the mechanical resistance device and means whereby the flow of current in that portion of the conductor upon the main magnet of greater resistance is reduced or cut out when the counteracting influence of the mechanical resistance device is established.

7. In an electric-arc lamp, a main magnet or solenoid, a continuous conductor wound thereon, a contact or contacts connected with said continuous conductor at a point or points intermediate of its length and a supplemental circuit or circuits to the arc adapted to be established by said contact or contacts and maintained so when the arc interval is normal, said contact or contacts being established by a movable part of the main magnet, together with a shunt-magnet or solenoid and connected mechanism for feeding the carbon whereby in the separation of the carbons said supplemental circuit or circuits is established and a portion of said continuous conductor wholly or partially cut out.

8. In an electric-arc lamp the combination with the frame thereof consisting of the connecting-bars of an upper cross-bar extended between the frame-bars, a carbon-holder mounted on said cross-bar, a lower cross-bar between the connecting frame-bars, an extension depending from said lower cross-bar and a globe-holder having grasping members engaging the lower cross-bar, said extension serving to guide the globe-holder when it is being attached in a secured position on the lamp-frame.

9. In an arc-lamp the combination of a switch mounted upon the top plate having manually-operated arms depending therefrom each side of the switch below the top plate, binding-posts held depending from said top plate and a hood disposed over the top plate and providing an annular slot between the hood and the top plate within which the supports for the binding-posts extend and within which the switch-handles travel.

10. In an electric-arc lamp a main magnet therefor which is wound with a plurality of conductors providing separate paths for the current whereby the combined effect of the different conductors is concentrated in the main magnet to establish the influence of the mechanical resistance device and the arc interval and means for automatically reducing or cutting out one or more conductors when the result aforesaid has been accomplished.

11. In an electric-arc lamp the combination of a main magnet a mechanical resistance device the influence of which is established by a movable coil of the main magnet acting thereon a shunt-magnet operating against the influence of the mechanical resistance device by a movable core of said shunt-magnet and a cut-out operated by the movable core of the shunt-magnet when the current is passing through the arc.

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

JAMES McLAUGHLIN.

Witnesses:

C. C. BULKLEY,

T. M. FOOTE.