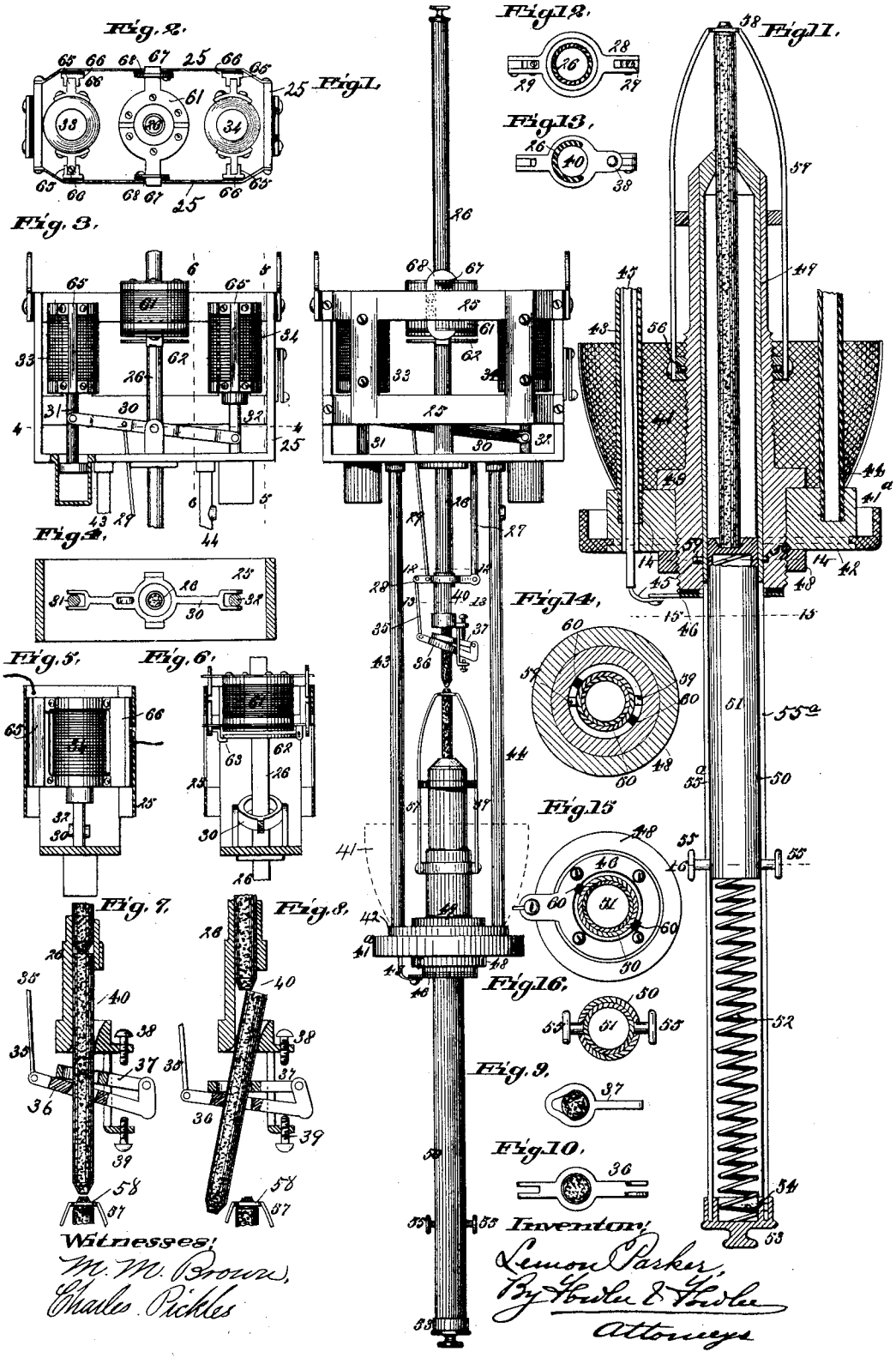
(No Model.) 2 Sheets—Sheet 1.

L. PARKER.

ELECTRIC ARC LAMP.

No. 477,221. Patented June 21, 1892.



Witnesses:
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Attorneys

(No Model.) 2 Sheets—Sheet 2.

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Fig. 17.

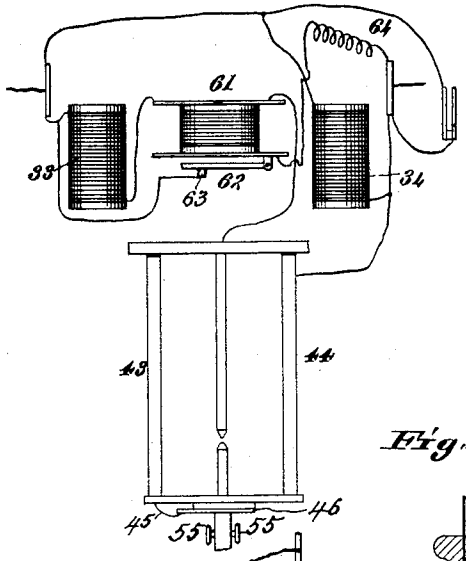


Fig. 18.

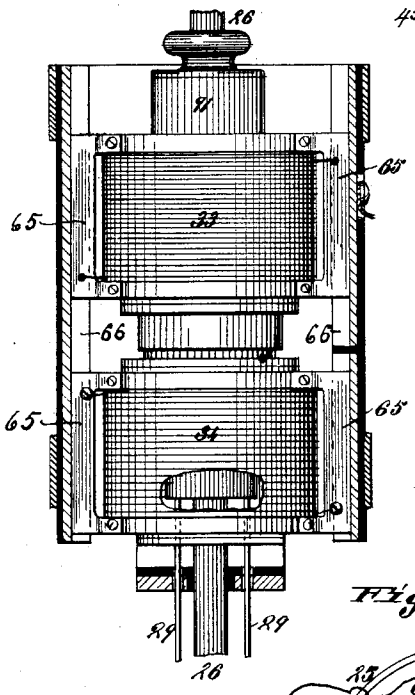


Fig. 19.

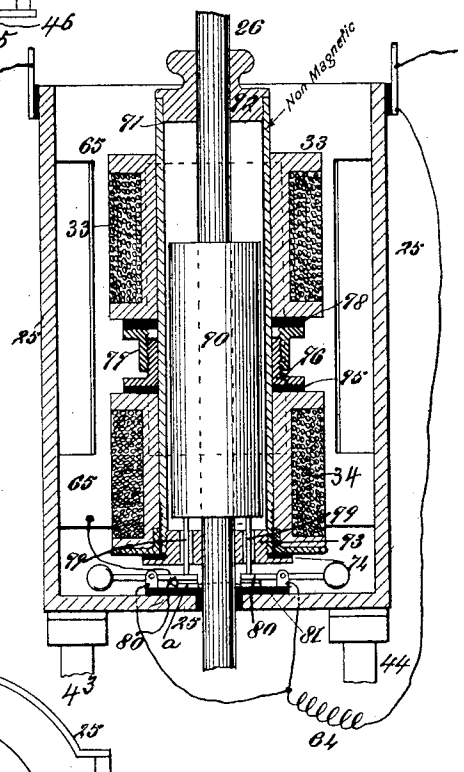
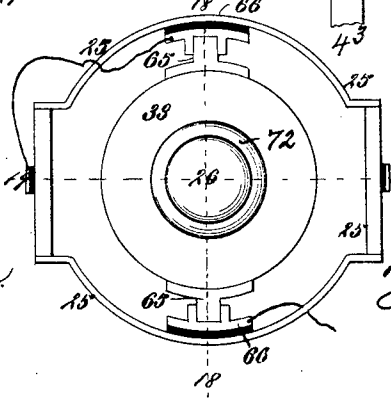


Fig. 20.



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UNITED STATES PATENT OFFICE.

LEMON PARKER, OF ST. LOUIS, MISSOURI.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 477,221, dated June 21, 1892.

Application filed July 13, 1891. Serial No. 399,316. (No model.)

To all whom it may concern:

Be it known that I, LEMON PARKER, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Arc Lamp, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

The object of my invention is to construct an electric-arc lamp whereby when the upper carbon thereof is consumed it will be discharged from the lamp and replaced by a fresh carbon automatically.

The invention has also for its object to construct an electric-arc lamp wherein the magnet-coils may be conveniently withdrawn from the lamp and new coils readily inserted therein should any of the coils burn out or need replacing.

The invention also has other objects in view, which will be set forth hereinafter.

To carry out the objects of my invention, I have devised a special kind of clutch, which grips the upper carbon itself and has other means of co-operating therewith, whereby the first object stated may be attained.

The other features of the invention will be set forth in full, and then pointed out in the claims making a part hereof.

Figure 1 represents an elevation of an electric-arc lamp made in accordance with my invention. Fig. 2 is a plan view thereof; Fig. 3, an elevation showing the electro-magnetic solenoids and their connected parts. Fig. 4 is a horizontal section on the plane of the line 4 4 of Fig. 3. Fig. 5 is a sectional elevation showing the electro-magnetic solenoids on the plane of the line 5 5 of Fig. 3, and Fig. 6 a similar view on the plane of the line 6 6 of Fig. 3. Figs. 7 and 8 are enlarged views showing two different positions of my improved clutch for the upper carbon. Figs. 9 and 10 are detail views illustrating the two parts of the clutch. Fig. 11 is a sectional elevation of the lower carbon and mechanism co-operating therewith, on an enlarged scale. Figs. 12 and 13 are horizontal sections on the plane of the lines 12 12 and 13 13, respectively, of Fig. 1. Fig. 14 is a horizontal section on the line 14 14 of Fig. 11, and Fig. 15 a similar section on the line 15 15 of Fig. 11. Fig. 16 is still another similar section on the plane of the line 16 16 of Fig. 11. Fig. 17 is a diagrammatic view showing the circuits. Fig. 18 is an enlarged vertical sectional view on the line 18 18 of Fig. 20, showing a modified way of placing the electro-magnetic solenoids. Fig. 19 is a sectional elevation thereof on the line 19 19 of Fig. 20, and Fig. 20 is a plan thereof.

The same marks of reference indicate the same or corresponding parts throughout the several views.

25 is the frame-work of an electric-arc lamp, made of spring metal, which supports the electro-magnetic devices for controlling the upper carbon.

26 is a tubular housing or retaining-tube for containing the carbons, and is made of such internal bore that the carbons may gravitate freely therethrough.

Extending from the bottom of the casing or frame-work of the lamp, which supports the electro-magnetic devices for controlling the upper carbon, is a rod 27, and to the lower end of this rod is pivoted a lever 28, to which is articulated a rod 29, that passes upward and is pivotally affixed to an oscillating beam 30, in turn pivotally supported from the base of the frame-work 25 of the lamp. This beam 30 is pivotally affixed to the cores 31 and 32 of the main and derived circuit solenoids 33 and 34, respectively. The lever 28 is also articulated to a connecting-rod 35, which in turn is pivotally affixed to a clutch 36, the latter being pivoted by an angular extension to a second clutch or overlapping part 37, which is adapted to grip the upper carbon. The two parts of the clutch are shown in detail in Figs. 9 and 10 and play between stops 38 and 39, carried by the lower end of the hollow housing 26, in which the carbons move. When the main-circuit magnet 33 is energized above its normal value, it draws up its core 31, lifting the end of the beam 30 adjacent thereto and raising the rod 29 and the free end of the lever 28, pulling upward the connecting-rod 35 and lifting the two parts of the clutch 36 and 37, as clearly shown in Fig. 7. The two parts of the clutch

have openings through them of substantially the shape shown in Figs. 9 and 10, and when the said parts are raised, as shown in Fig. 7, the edges of the opening therein bind against the carbon and grip the same. Upon further upward movement of the connecting-rod 35 the carbon will be raised. Should the main magnet or solenoid 33 lose its excessive vitality, and should the derived-circuit magnet become energized above its normal value, the beam 30 will be tilted in the opposite direction to that shown in Figs. 1 and 3, thereby permitting the two parts of the clutch in a manner evident from the foregoing to descend to the position shown in Fig. 8. The two parts of the clutch now loosen their grip upon the carbons and allow the same to feed through the holes therein. As soon as the arc has reached its normal value the beam 30 and all the parts connected therewith resume their regular positions and the arc becomes normal.

In the housing or tube 26 may be placed any number of carbons, one above another, the lower end of one resting upon the upper end of the one below. These carbons may be inserted at the lower end of the tube 26 or from its upper end. Just above the clutch-plates 36 and 37 I cut away the tube 26 at 40, and the perforation through the lower end of said tube 26 I enlarge in the direction of the length of the clutch, as shown in Figs. 7 and 8, so that when a carbon is nearly burned out and the upper end thereof reaches the cut-away place 40 the said carbon will be tilted to one side of the vertical in the manner shown in Fig. 8 by the clutch and thrown out of alignment with the lower carbon, so as to escape the same. The carbon will then fall through the clutch into a wire netting or basket 41, surrounding the lower carbon, which is designed to be arranged in the inside of the glass globe of the lamp, (not shown,) a flange 41^a being provided for the globe to rest upon. As soon as the carbon leaves the clutch the arc will be destroyed, the circuit of the cut-out magnet will be broken, and the lamp short-circuited by the armature 62 coming against the contact 63. (See Fig. 17.) The beam 30 will therefore be tilted so as to depress the clutch-controlling parts connected therewith. Above the carbon that has escaped from the clutch is another carbon, which at once gravitates through the holes in the two parts of the clutch, which holes now register with each other in such a way as to allow such action. As soon as the fresh carbon comes against the lower carbon a strong current will pass through the main-circuit magnet 33. The clutch will thereby be operated first to grip the carbon and then to raise the same, as shown in Fig. 7, the arc being thereby established. When another carbon burns out, the same operation will be gone through with. Such a lamp may be made to burn one or more nights without trimming. The short pieces of carbon may be used therein, the lamp being independent in its run of any special length of carbons. Any means of feeding the carbons to the clutch I regard as within the spirit of my invention.

To best carry out the purpose of my invention I provide a lower carbon, which will be automatically fed, preferably by mechanical devices, as it is consumed, making the lamp what is called a "focusing" one. The lower carbon and its co-operating parts are carried by a circular base-plate 42 by hollow rods 43 and 44, depending from the lower part of the frame-work 25 of the lamp. Through the rod 43 passes a wire 45, in communication with one terminal of the circuit, the other terminal of the circuit being in metallic connection with the frame-work of the lamp. The wire 45 is connected to an annular plate 46, carefully insulated from the lower carbon and the frame-work of the lamp, the purpose of which construction will be set forth hereinafter.

Into the plate 42, which sustains the lower carbon, passes a short tube or socket-piece 47, upon the screw-threaded lower end of which is a nut 48, which holds the said socket-piece to the said plate 42, a flange 49 being formed upon said tube and bearing against the upper surface of the plate 42. Passing through the interior of the short socket-piece 47 is a tube 50, adapted to contain the lower carbon or carbons. This tube at the upper end is preferably made tapering, as shown, and has a perforation in its upper end of sufficient size only to admit the passage of the lower carbon. Within the interior of such tube, which is fixed in position, is a sliding tube 51, open at the lower end, but closed at the top, wherein it has a depression for receiving the lower end of the lower carbon. Within the tube 50 is also a spiral spring 52, bearing upon a cap 53, secured to the lower end thereof by a bayonet-joint 54. The said spiral spring rests in the hollow interior of the sliding tube 51 and bears upon the inside of the upper end thereof. Extending from the sliding tube 51 are knobs 55, which work through slots 55^a in opposite sides of the tube 50. The spiral spring 52 holds the lower carbon upward, constantly tending to press it in this direction.

56 is a ring which fastens upon the screw-threaded exterior of the socket-piece 47, and to this ring is pivoted a bail 57, having at the upper end a ring 58 of slightly less diameter than the lower carbon. The said ring and bail tend to hold the lower carbon in fixed position with reference to the arc, and as the upper end of the lower carbon pencils wears away the said ring allows the spring 52 to feed the carbon upward. By taking hold of the knobs 55 the tube 51 may be depressed, thereby lowering the carbon and permitting the bail 57, carrying the ring 58, to be swung to one side. Upon liberating the knobs 55 the spring 52 presses the sliding tube 51 upward until the said knobs come against the upper ends of the slots 55^a, thereby permitting the lower

carbon to push upward the upper carbon and enabling the lower carbon, which is nearly consumed, to be discharged from the lamp.

To insert a new lower carbon, either the cap 53 may be taken off by suitably manipulating the bayonet-joint 54 or the spring and sliding tube withdrawn from the tube 51, whereupon, after the carbon is inserted from below into the tube 50, the aforesaid parts can be replaced. The same result may be attained by withdrawing the tube 50, carrying the aforesaid parts, and inserting the carbon into the tube 50 at its upper end, and to make the tube 50 removable it has pins 59, which may be made to register with slots 60 at each side in the interior of the lower end of the socket-piece 47. By suitably rotating the tube 50, carrying the pins 59, the said pins may be put in alignment with the said slots 60 and the tube inserted or withdrawn from the socket 47, as the case may be.

Preferably arranged about the tubular housing 26, in which the upper carbons are retained, is a cut-out magnet 61 in the circuit of the main line, as clearly shown in Fig. 17. Beneath this magnet is arranged an annular armature-plate 62, which when no current is on the lamp rests upon a contact 63, in communication with one of the terminals of the external circuit. The other end of the armature is in communication with the other terminal of the external circuit *via* a resistance-coil 64. When there is any current flowing in the cut-out magnet 61, the armature 62 is raised from the contact-stop 63, and thus the short circuit by way of the armature and said contact-stop is broken. When the arc becomes abnormally long, as by some derangement of or hitch in the apparatus, no current passes through the cut-out magnet, it all passing through the derived circuit. Consequently the armature 62 drops upon the contact-stop 63, establishing a short circuit, and cuts the lamp out. The resistance-coil 64 is employed for the reason that if the short circuit had no appreciable resistance and was established no part of such current would pass through the cut-out magnet, so as to break the short circuit when the carbons came together; but all of the current would continue to pass over the cut-out circuit. By interposing a resistance in the cut-out circuit sufficient of the current is diverted through the cut-out magnet when the carbons come together to energize the cut-out magnet, so as to lift the armature 62 from its contact-stop and break the cut-out circuit.

I also provide my lamp with another cut-out, which acts, when the lower carbon is substantially consumed, to prevent the upper carbon from descending upon the ring 58 and mechanism of the lower carbon and burning it out when the lower carbon is consumed past a certain point—that is, to a point where it will be fed upward no longer—and to effect this purpose I design to have the knobs 55 carried by the tube 51, which is in electrical communication with the frame of the lamp, and consequently one of the terminals of the external circuit comes against the ring 46 when the lower carbon is nearly consumed, thereby short-circuiting the lamp in an evident manner, it being remembered that the ring 46 is in electrical communication with the other terminal of the external circuit in the manner indicated in the foregoing.

Another feature of my invention relates to the removability of the magnets which control the mechanism. The main and derived circuit coils are wound upon wooden or other insulating bobbins having tongues 65 extending from each side and suitably secured thereto. These tongues take into grooved plates 66, secured to the spring frame-work of the lamp. From the foregoing description it will be understood that the cores of these magnets pass freely through the interior thereof, being constructed on the solenoid principle. It will be seen, therefore, that the coils of the magnets, should they need repairing, as in the case of becoming burned out, may be entirely removed as a whole at once and replaced by new ones similarly constructed, which I design to have on hand for the purpose. The plates 66 of each magnet are each connected, respectively, to opposite poles of the circuit, and the ends of the coils of each magnet are connected to the respective tongues, so that when the magnets are inserted in the grooved keeper-plates the said coils are put in electrical communication with the circuit by the mere act of inserting the coil in its place and held in contact therewith by the opening of the frame-work. The cut-out magnet I construct slightly different from the other magnets. It has arms 67 extending from each side thereof, which are adapted to take under angle-pieces 68, carried by the frame 25 of the lamp, when the said cut-out magnet is placed over the tubular housing 26 and appropriately rotated. The said angle-irons, with the arms, make in effect a bayonet-joint. The angle-iron of the cut-out magnet and the arms of such magnet are also in electrical communication with the respective poles of the circuit, so that when the said magnet is inserted in the lamp electrical communication with the apparatus is made by the mere insertion of such magnet in its place.

In the modification shown in Figs. 18, 19, and 20 I arrange the main and derived circuit magnets around the carbon-retaining tube, the axes of the said tube and magnets being coincident. The cutting out of the lamp in this instance depends upon the differential action of the magnets, and the cut-out magnet is dispensed with. In the said modified structure 70 is the core of the solenoid or main and derived circuit magnets and slides freely up and down upon the carbon-retaining tube 26. This core is located inside of a short tube or cylinder 71, of non-magnetic metal, about which are arranged the main and derived cir-

cuit magnets 33 and 34. The tube is closed at the top by a plug 72. The casing or frame 25 of the modified structure is made of curved and straight sides, as shown in Fig. 20. The bobbins are wound upon a suitable base of wood or other insulating material and are provided with guide-tongues 65, of conducting material, the same taking into suitable grooved metallic plates 66, insulated from the frame of the lamp, substantially as hereinbefore described. The terminals of the coils of these magnets are connected, respectively, to the guide-tongues 65. The magnets are thus removably held to the lamp, as before described. The lower end of the tube or cylinder 71 is closed by a flanged plug 73, and this sustains an insulating-ring 74, which the coil 34 rests upon and is supported by. Upon the top of the magnet 34 rests an insulating-washer 75, upon which bears a flanged collar 76, screwed to another flanged collar 77, carrying an insulating-washer 78, upon which rests the upper coil or magnet 33.

From the lower end of the core 70 are two pins 79, diametrically opposite, which are adapted to come against suitably-weighted levers 80, sustained by the bottom of the frame or casing 25 and insulated therefrom by a ring 81 of insulating material. This ring carries a metallic ring *a*, connected to one terminal of the main line, the weighted levers 80 being connected with the other terminal of the circuit through the resistance-coil 64, as clearly indicated in Figs. 17 and 19. When no current is flowing over the line, the pins 79 rest upon the levers 80 and force said levers in contact with the insulated ring *a*. The lamp is thereby cut out of circuit. When a current begins to flow through the line, a portion of it is diverted by the resistance-coil 64 through the main magnet 33, as previously described, whereupon the core 70 is drawn up and the short circuit broken. Extending from the lower end of this core 70 and through the plug 74 are rods 29, diametrically opposite, as shown, arranged at ninety degrees from the pins 79. These rods pass downward to the lever 28, that controls the clutch, the same as set out in the foregoing. When the core 70 rises, it draws up the rods 29 and lifts the clutch and carbon in a manner explained in the foregoing. The reason for using two pins 79 and two rods 29 for the lamp in this instance is in order to balance the core 70 and keep it in an upright position. Were only one used, the core would tend to be drawn out of the vertical and bind in its movements against the tubes 26 and 71.

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

1. The combination, in an electric-arc lamp, of a stationary retaining-tube firmly and immovably fastened to the frame of the lamp, a vertical column of carbons therein placed end to end and feeding freely downward through said tube by gravity independent of feeding devices, and a clutch for gripping the lowest carbon and regulating the arc, substantially as described.

2. In an electric-arc lamp, a stationary carbon-retaining tube for supplying the carbons, having a cut-away place at one side at its lower end, a clutch for gripping the carbon itself to govern the arc, and electro-magnetic devices controlling said clutch, whereby when a carbon is nearly consumed it will automatically be discharged from the carbon-retaining tube and clutch and a fresh carbon automatically supplied thereto.

3. An electric-arc lamp having a clutch for gripping the carbon itself, consisting of two plates 36 and 37, perforated, as set forth, and pivoted together by an angular extension, and electro-magnetic devices controlling the free end of the lower plate and thereby the upper plate to move it in opposite directions longitudinally of its length to grip and free the carbon as the free end of the lower plate is raised and lowered.

4. An electric-arc lamp having a clutch for gripping the carbon itself, consisting of two suitably-perforated plates, one overlying and articulated to the other, electro-magnetic devices for controlling one of said plates and thereby the other plate, and adjustable stops between which said plates are adapted to play.

5. The combination, in an electric-arc lamp, with a fixed tubular carbon-retaining tube having a cut-away place therein at the side and lower end and perforated at its lower end in the manner set forth, of a clutch consisting of two perforated plates through which the carbon is adapted to pass, and electro-magnetic devices for controlling said clutch, whereby when a carbon is nearly consumed it will be thrown out of alignment with the lower carbon and discharged from the clutch and carbon-retaining tube and a new one automatically supplied.

6. In an electric-arc lamp, the combination of a mechanically-impelled carbon, a shiftable bail engaging the end of the carbon and normally restraining said carbon from further movement, whereby when the bail is shifted the said mechanically-impelled carbon will be discharged automatically by the impelling means.

7. As a means of controlling mechanically-impelled carbons, the combination of a suitable retaining-tube for such carbons, a suitably-impelled sliding tube arranged within the interior of the first-mentioned tube and bearing against the lower end of the carbon, and a shiftable device or bail for holding the carbon in the position in which it is placed, whereby upon the sliding tube being depressed the said shiftable device may be shifted aside and the carbon discharged from the retaining-tube.

8. As a means of controlling mechanically-impelled carbons, the combination of a suitable retaining-tube for such carbons, a suitably-impelled sliding tube arranged within

the interior of the first-mentioned tube and bearing against the lower end of the carbon, knobs upon the said sliding tube projecting through slots in the first-mentioned tube, and a shiftable device or bail for holding the carbon in the position in which it is placed, whereby upon the knobs being depressed the said shiftable device may be swung to one side and the carbon discharged from the retaining-tube.

9. An electro-magnetic mechanism having the ends of the coils in electrical communication, respectively, with suitable members secured thereto and separable as a whole from spring-actuated retaining devices in electrical communication with the respective terminals of the apparatus, whereby the coils may be readily removed and inserted and electrical communication with the apparatus is established and broken, respectively, by inserting and removing the said coils.

10. An electric-arc lamp having suitable electro-magnets, the coils of which are made removable as a whole by extension-arms carried thereby engaging with suitable spring-actuated retaining means upon the lamp.

11. An electro-magnetic mechanism having the ends of the coils in electrical communication, respectively, with suitable members secured thereto and insulated therefrom, and a spring-casing therefor with which the said members make contact and complete the electric circuit of the coils, substantially as and for the purpose set forth.

12. The combination, in an electric-arc lamp, of a carbon-retaining tube through which the carbons may gravitate freely, electro-magnetic devices for feeding the carbons in said retaining-tube and regulating the arc, the axes of the magnets whereof are arranged coincident with the axis of the retaining-tube, suitable members extending from said magnets and insulated therefrom, with which members the terminals of the coils of the magnets are respectively connected, and a casing carrying suitable corresponding members connected with the respective terminals of the circuit and with which the aforesaid members carried by the magnets engage.

13. The combination, in an electric-arc lamp, of a stationary retaining-tube, a vertical column of carbons resting end to end one upon another and loosely inclosed by said tube, a hollow core surrounding said carbon-retaining tube, main and derived circuit coils controlling said core and encircling the same, a clutch for gripping the lowermost of said column of carbons and regulating the arc, and suitable actuating devices between the core and the said clutch.

In testimony whereof I have hereunto set my hand and affixed my seal, this 10th day of July, 1891, in the presence of two subscribing witnesses.

LEMON PARKER. [L. S.]

Witnesses:
A. C. FOWLER,
J. F. WESTON.