(No Model.)

5 Sheets—Sheet 1.

# W. HOCHHAUSEN.

## ELECTRIC ARC LAMP.

No. 453,583. Patented June 2, 1891.

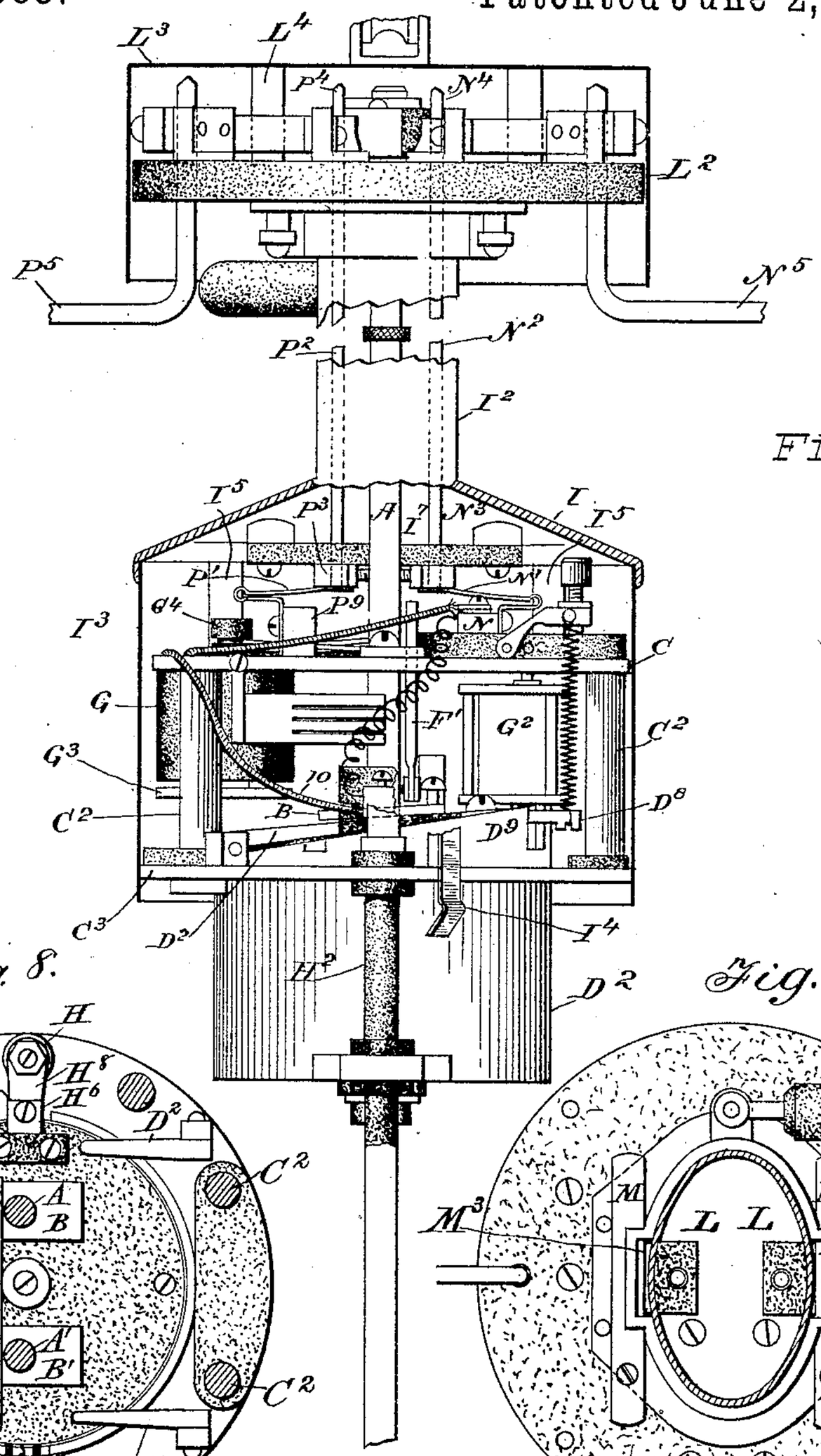



Fig. 1.

Fig. 8.

Fig. 9.

ATTEST:

J. A. Mundy

Wm. H. Capes

INVENTOR:

Wm. Hochhausen

By H. B. Townsend

Attorney

(No Model.)

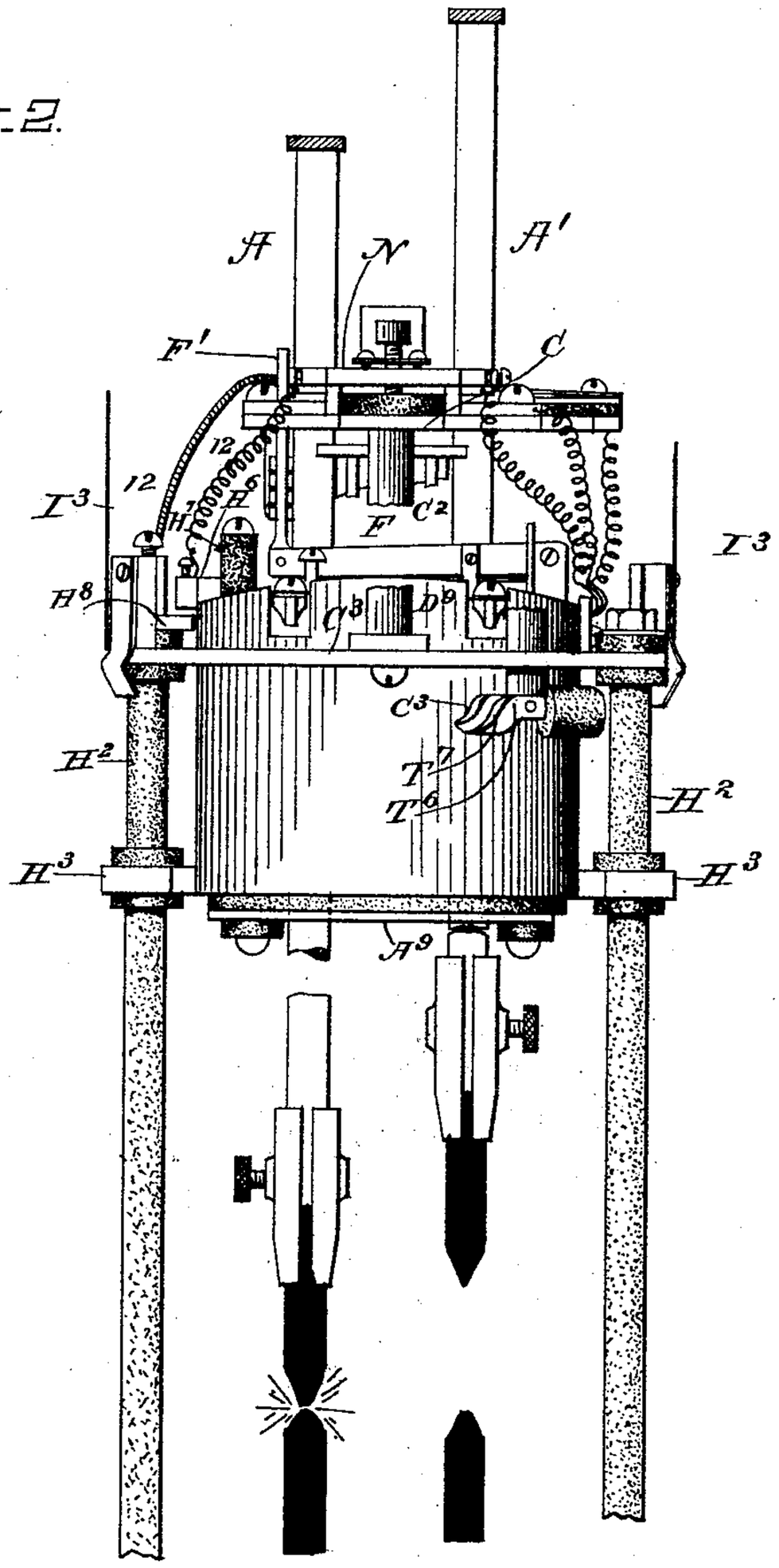
5 Sheets—Sheet 2.

# W. HOCHHAUSEN.

## ELECTRIC ARC LAMP.

No. 453,583. Patented June 2, 1891.

Fig. 2.




ATTEST:

J. A. Mundle.

Thos. H. Cafsel

INVENTOR:

Wm Hochhausen

By H. C. Townsend

Attorney

(No Model.) 5 Sheets—Sheet 3.

# W. HOCHHAUSEN.

## ELECTRIC ARC LAMP.

No. 453,583. Patented June 2, 1891.

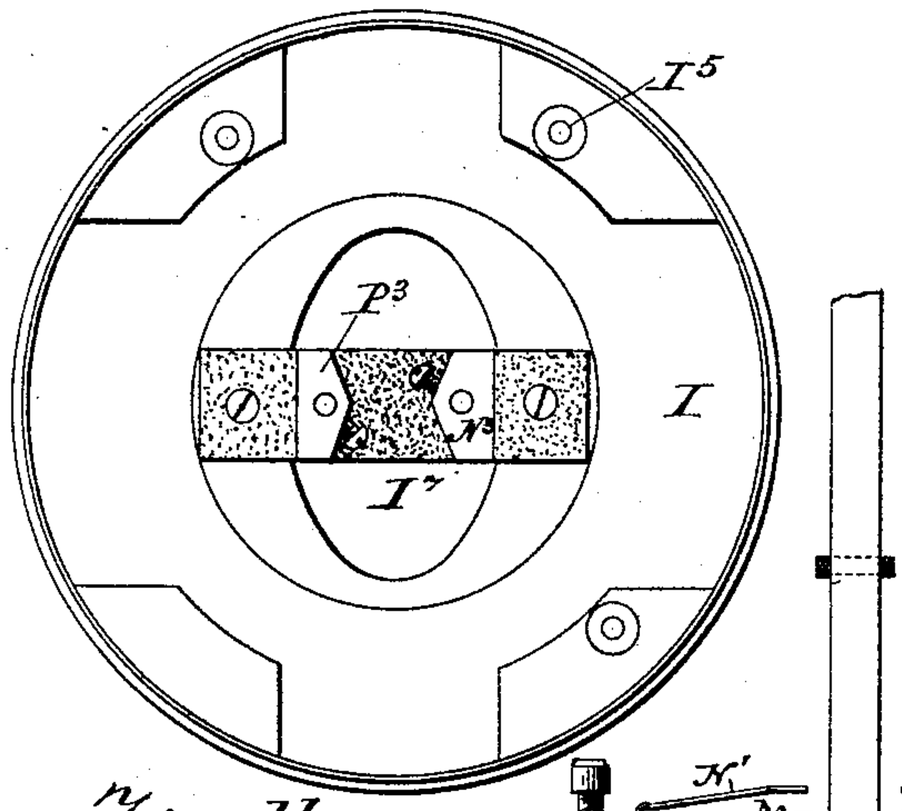



Fig. 11.

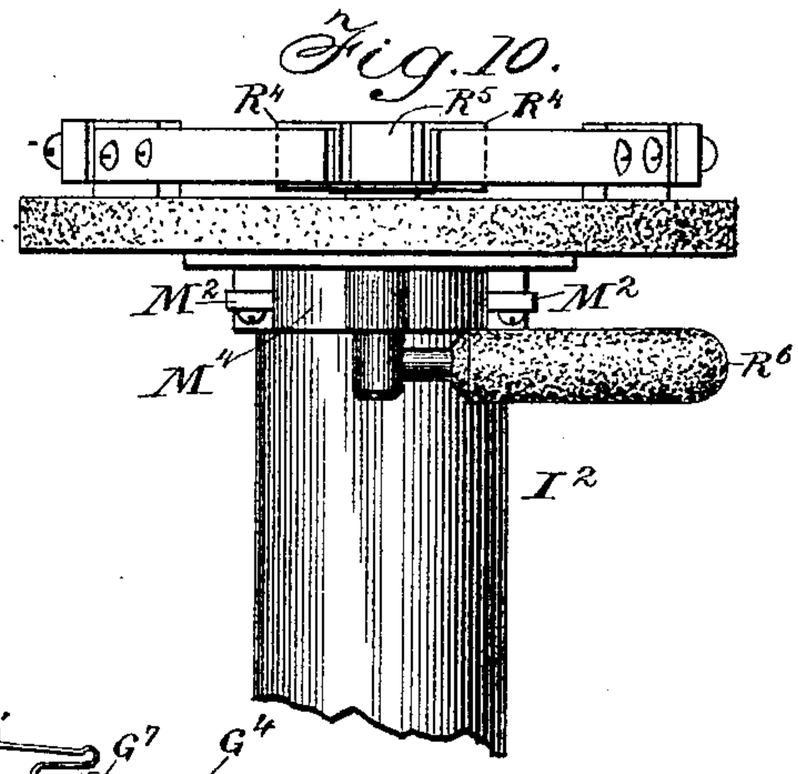



Fig. 10.

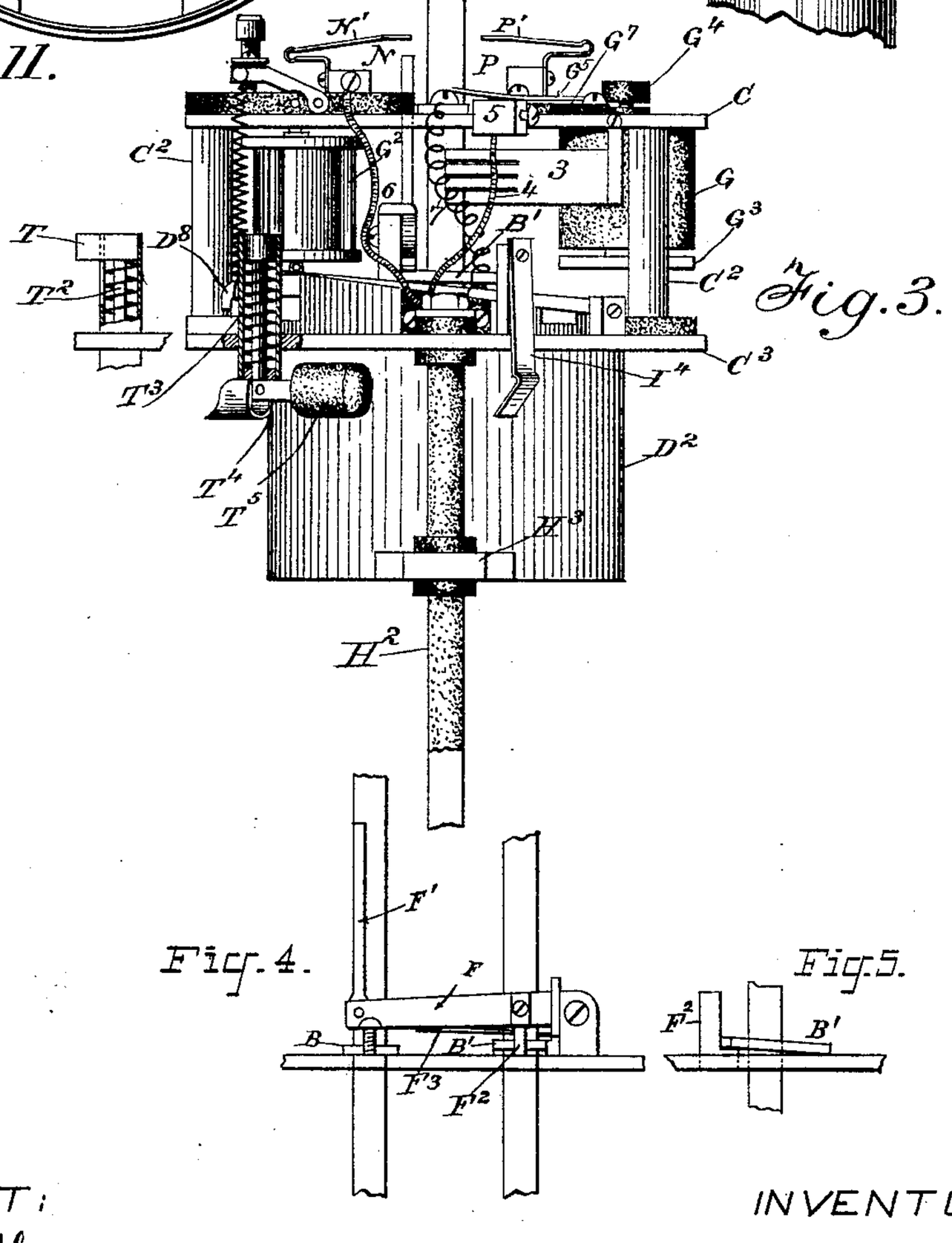



Fig. 3.




Fig. 4.




Fig. 5.

ATTEST:

A. Hurdle

Jno. N. Hazel

INVENTOR:

Wm Hochhausen

By H. C. Townsend

Attorney

(No Model.) 5 Sheets—Sheet 4.

# W. HOCHHAUSEN.

## ELECTRIC ARC LAMP.

No. 453,583. Patented June 2, 1891.

Fig. 6.

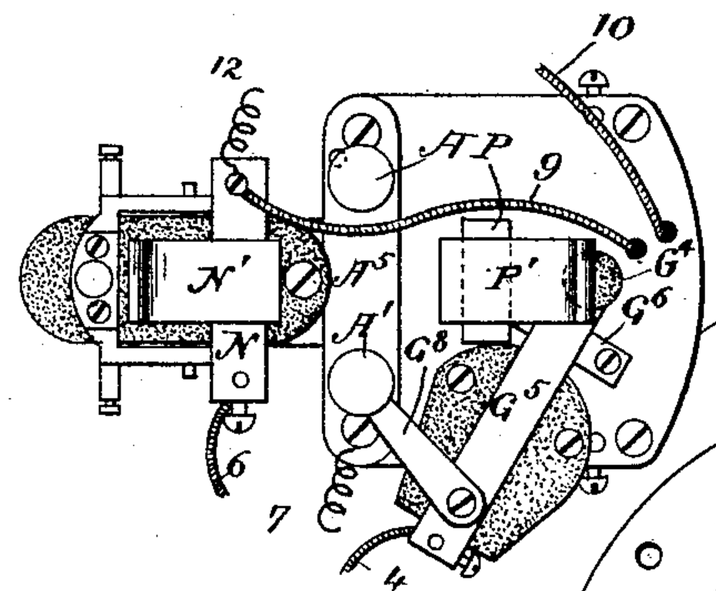



Fig. 12.

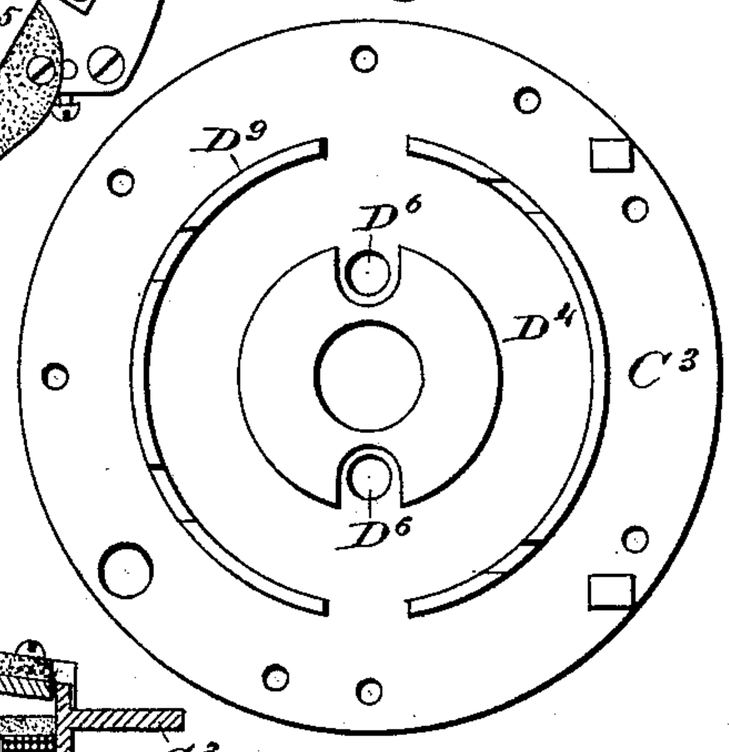



Fig. 7.

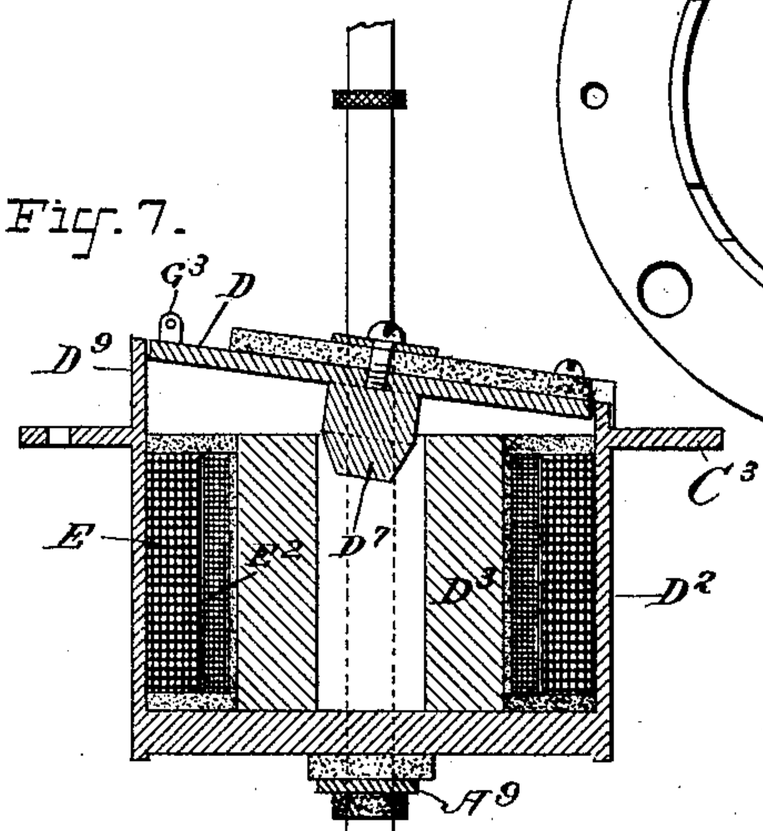



Fig. 13.

Fig. 14.

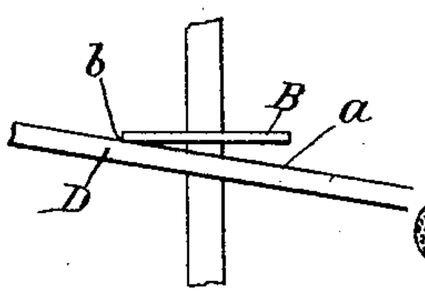
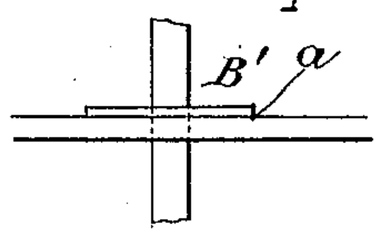
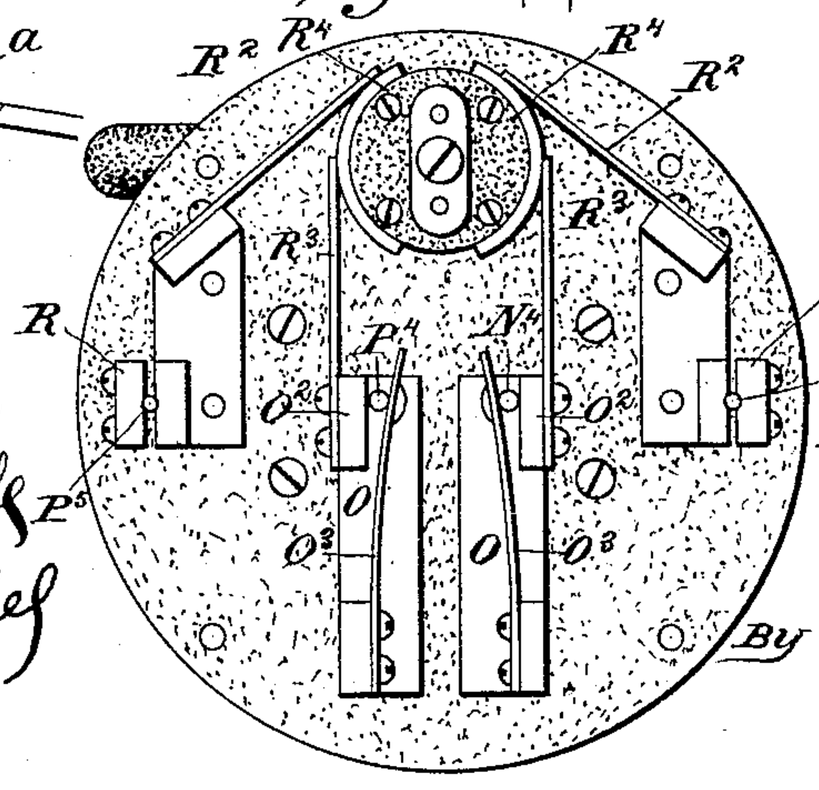



Fig. 15.




ATTEST:

J. A. Mudge

Wm. A. Cafes

INVENTOR:

Wm Hochhausen

By H. B. Townsend

Attorney

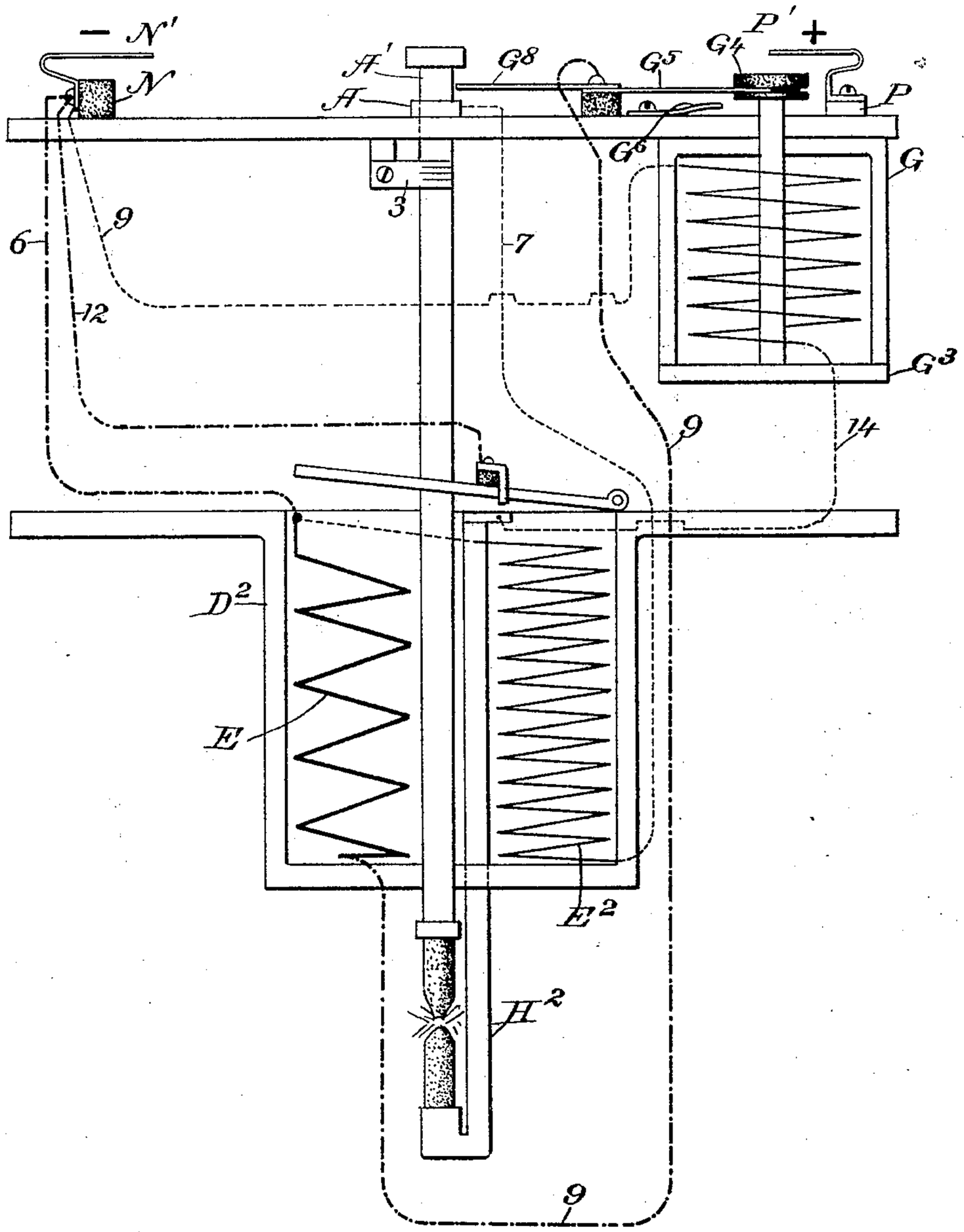
(No Model.) 5 Sheets—Sheet 5.

# W. HOCHHAUSEN.

## ELECTRIC ARC LAMP.

No. 453,583. Patented June 2, 1891.

Fig. 6ª




ATTEST:
J. Mundle
T. F. Coursey

INVENTOR:
Wm Hochhausen
By H. B. Townsend
Attorney

# UNITED STATES PATENT OFFICE.

WILLIAM HOCHHAUSEN, OF BROOKLYN, ASSIGNOR TO THE EXCELSIOR ELECTRIC COMPANY, OF NEW YORK, N. Y.

## ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 453,583, dated June 2, 1891.

Application filed May 28, 1890. Serial No. 353,423. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HOCHHAUSEN, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Electric-Arc Lamps, of which the following is a specification.

My invention relates to the construction of electric-arc lamps and the devices for suspending the same, and involves, among other things, improvements in the feed-regulating appliances, the transfer mechanism for double-carbon lamps, the construction of the feed-regulating magnet, and other details designed to simplify and cheapen the general construction and to insure durability and efficiency in operation.

My invention consists in pivoting the transfer-lever of a double-carbon lamp upon a support carried by the armature-lever instead of upon a fixed support.

My invention consists, also, in other details of construction and combinations of parts more particularly hereinafter described, and then specified in the claims.

In the accompanying drawings, Figure 1 is a general side elevation of apparatus embodying my invention, the cover-plate of the lamp being shown in vertical section and the lamp-horn and conductors broken away in two for the purpose of making the figure compact. Fig. 2 is a side elevation of the working parts of the lamp, taken on a line at right angles to Fig. 1. Fig. 3 is a side elevation of the working parts of a lamp, taken from the side opposite Fig. 1. Fig. 4 shows in side elevation the transfer-lever. Fig. 5 is an edge view of a part of the same. Fig. 6 is a plan of the upper portion of the frame within the lamp-casing. Fig. 7 is a vertical section through the regulating-magnet of the lamp. Fig. 8 is a plan of the armature, the clutches, and the transfer-lever, the connecting-posts of the lamp and casing being shown in section. Fig. 9 is an inverted plan view of the hanger-board. Fig. 10 is a side elevation of the working parts of the hanger-board. Fig. 11 is an inverted plan view of the cover-plate for the working parts of the lamp. Fig. 12 is a plan of the core and casing of the lamp-magnet. Fig. 13 is a plan view of the working parts supported on the hanger-board. Figs. 14 and 15 show the clutches of the lamp in two positions, respectively. Fig. 6ª is a diagram illustrating the circuits and connections of the lamp.

A A′ indicate the two upper-carbon carriers of a double-carbon lamp.

A is the fixed acting rod or carrier, and A′ the rod or carrier which is released when the first burning carbon has been consumed and its carrier A has fed down to a predetermined point through the intervention of the tripping devices hereinafter described.

B B′ indicate, respectively, the feed clamps or clutches which engage with the carbon rods or carriers A A′. These clamps or clutches are shown herein as consisting of the ordinary ring clamp or clutch that binds the rod and prevents it from feeding when said clutch or clamp is tilted, but allows said rod to feed when the clutch is lowered, so that one edge or side of it comes into contact with a releasing stop or surface that causes the clutch to move toward a horizontal position.

Heretofore it has been usual to allow the clamp or clutch to engage with a fixed releasing floor or surface, so that at the time of feeding a part of the weight of the carbon rod and other devices sustained by the armature-lever will be removed from such lever and an increased attractive power will be required on the part of the magnet in order to still further lower the clutch and cause a feed to take place. In my invention both the clutch and releasing floor or surface therefor are sustained by the armature of the feed-regulating magnet at all times, so that there will not be any difference in the weight sustained by the magnet at any time during the operation of the lamp.

In the present case I have shown clutches B B′ as sustained wholly on the upper surface of an armature D, the part of such armature or plate where the edge *a* of the clutch engages constituting the releasing floor or surface. The armature D consists of a plate or disk of iron, from which projects arms $D^2$, pivoted on a flange $C^3$ of iron, extending from and preferably formed in one piece with an

iron casing D′², which surrounds the coils of the feed-regulating magnet and protects the same from the weather, while at the same time carrying the magnetism from the lower end of the core D³ of such magnet around the outside of the coils up to the armature, thus increasing the attractive effect. The casing D′² of iron extends across the lower side of the coils, and the core D³ is attached to the horizontal portion of the casing or is preferably cast in one piece with such casing, thus producing an iron shell having an annular cavity, such as indicated at D⁴, Fig. 12, which receives the lamp-magnet coils. The core D³ of the magnet has two vertical passages or perforations D⁶, through which extend the carbon rods or carriers. Armature-plate D may carry a piece of iron D⁷, forming a short core-piece, extending part way into a central opening in the fixed core D³. This piece D⁷ gives increased attractive effect or pull upon the plate or lever sustaining the clutches and rods or carriers. Arms D⁸ extend from the plate D for attachment of retracting or lifting springs, as indicated in Figs. 1 and 3. The iron piece D⁷ is fastened to the top of the armature-plate D by a screw, as indicated in Fig. 7. The screw also holds in place on said armature a plate of insulating material, as indicated, upon which the clutches B B′ rest and by which they are insulated from the magnet-core. The shell or casing D′² extends up above the flange or extension C⁸, as shown more clearly in Fig. 7, and rises on the side opposite the pivoted side of D to a higher point than on the side near the pivot C, thus bringing the magnetism up to the edge of the armature-plate D when the same is lifted or tilted upward to its fullest extent. This vertical extension B⁹ is cut away, as shown in Figs. 1 and 2, for the passage of the arms D⁸. The coils of the regulating-magnet may be main or derived circuit coils, or both; or, as in the present instance, one set of coils, as the coarse-wire coil E, may be simply the starting-coil, operated as hereinafter described, while the other coil E² may be the usual fine-wire coil in a derived circuit around the arc. As is obvious, the lamp-magnet might have coils connected into circuit in any other way as found convenient or desirable. The top side of the coil is covered in by insulating material, preferably made water-proof.

F is the trip-lever through which the first burning carbon releases the second burning carbon carried by the rod A′. The lever F is pivoted upon the armature of the lamp-magnet, as clearly shown, and has a pin or rod F′, rising vertically from it into position to be engaged by a button on the end of the carbon rod or carrier A when the latter has fed down to the point where its carbon is nearly consumed. The tripping-lever F′ carries, as indicated more clearly in Figs. 4 and 5, a hanger F², the end of which is bent inward beneath the clutch B′, so that while the trip-lever is held by its spring F³ in a raised position the clutch B′ will be tilted, so as to lock the carbon rod A′ and prevent it from feeding down even, though the armature lever or plate D may be pulled down to such an extent as to free the clutch B. When, however, the first carbon rod A feeds down so as to engage the pin F′, its weight depresses the lever F and allows the clutch B′ to drop down to such an extent as to feed the rod A′, which thereupon moves down and brings its carbon into contact with the opposite carbon. The first rod A is left suspended or sustained by the pin F′ and transfer-lever F, which latter is held down by the weight of A in position so as not to interfere with the movements of the clutch B′ in regulating the feed of the rod A′. Inasmuch as the transfer-lever is also sustained by the armature D, it will be observed that the weight of the rod A will also be sustained by said armature-lever at all times, and there will therefore be no change in the weight upon the armature-lever produced by or in the transfer.

Fig. 14 shows the position of the clutch when the rods A A′ are held from feeding. The armature-lever D is shown tilted upward to its fullest extent, and the clutch is sustained on one edge and is also tilted, so as to fully lock on the rod. As the armature-lever is drawn down when the arc increases in length, it gradually approaches a horizontal position, until finally the clutch assumes the position indicated in Fig. 15, or a nearly horizontal position, after which a very slight further movement will allow the feed to take place. In the whole operation it will be seen that the weight of the carbon rod or carrier is sustained entirely by the armature, and there can therefore be at no time any irregularity of operation, owing to the fact that, as in previous constructions, a part of the weight of the rod is necessarily sustained by a fixed support at or just before the time of feeding.

By reference to Figs. 14 and 15 it will be seen that the clutch is normally sustained from a point *b* on the armature-lever D, and that as the latter descends the surface of the lever between *b* and the pivotal point of support operates as the releasing-floor, which causes the clutch to assume or approach a nearly horizontal position as the lever descends. This movable releasing-floor, considering the same as distinct from the point or portion *b* of the lever, at which the clutch is normally sustained, obviously moves at a lesser rate than the point *b* when the lever D descends, so that finally the clutch *b* catches up and is released. The simplest way of obtaining this differential movement of the releasing-floor and the normal point of suspension or support of the clutch is to pivot the supporting plate or surface which sustains the clutch in such manner that the releasing-floor shall be nearer the fulcrum than the normal point of attachment or connection with said clutch. I do not limit myself, how-

ever, to such construction, and include as my invention any combination wherein the releasing-floor is sustained by the armature-lever but moves at a lesser rate than the part by which the clutch is normally sustained when locked on the carbon-carrier.

Supported upon the flange $C^3$ is a frame composed of the plate C and posts $C^2$, which are preferably insulated from the plate $C^3$. The plate C is of conducting material and sustains various parts of the lamp, to be presently mentioned more particularly, among them a magnet G, which controls the circuit of the starting-coil E, and a dash-pot $G^2$, the piston of which is connected at point $G'^3$ with the armature D. The armature of the magnet G consists of a plate $G^3$ at the bottom of the coil, which plate is suspended from a rod passing upward through the coil G and terminating in a button $G^4$ of insulating material having a notch or recess in its side, in which engages the spring $G^5$, forming a switch-spring, which is included in the circuit of the starting-coil E. The spring $G^5$ tends to come into contact with a contact or electrode $G^6$, that is fastened upon the conducting-plate C and is in electrical connection therewith. The switch-spring $G^5$ is sustained on a block of insulating material $G^7$, carried by the plate C. Extending also from the plate $G^5$ and in electrical connection therewith is a spring $G^8$, the free end of which is in position to be struck by the button of the rod A', carrying the second burning carbon, and to be depressed thereby into connection with the plate C or with the plate sustained thereby and in contact therewith, thus cutting out the lamp, as will be presently described.

P N are blocks or pieces of conducting material sustained on the plate C and having fastened to them, respectively, springs P' N', which lie in a horizontal position and form, respectively, electrodes constituting the terminals of the lamp-circuit proper. The block P is fastened to and is in electrical connection with the plate C, but the block N is insulated therefrom. The plate C, as will be obvious, forms one electrode or terminal of the lamp-circuit, the block P being in electrical connection therewith. When spring $G^5$ is down against the contact $G^6$, which is the condition when the lamp is out of action, the spring $G^5$ is in electrical connection with plate C. There is also a connection from plate C to the carbon rods or carriers by the usual springs, one of which is indicated at 3, and which bear against the sides of the carbon rods or carriers, and by contact of the rods or carriers in their guide frames or plates.

The connections of the coils and magnets are made as follows: Wire 4 is connected by binding-block 5 to the plate $G^5$ and forms one terminal of the coarse-wire coil E. The opposite terminal of said coil (indicated by the numeral 6) connects to block N. When the armature $G^3$ is raised by the attraction of magnet G, the button $G^4$ lifts the spring $G^5$ and breaks the circuit of said coil. The fine-wire coil $E^2$ is in the derived circuit, one terminal of such coil being connected by a wire 7 to the conducting-plates C by being clamped upon the guide-plate $A^5$, which guides the rods A A' and is of conducting material and fastened directly upon the plate C. The other terminal of the fine-wire coil connects to the circuit of the coarse-wire coil $E^2$ at the side thereof which joins to wire 6, so that the derived-circuit coil is always in a circuit formed from P through C, 7, 6, and terminal N. The coils of magnets G have one terminal connected by wire 9 with block N, and the other terminal 10 clamped at H upon the upper end of one of the said rods $H^2$ of the lamp, which, after the usual fashion, are in electrical connection with the lower carbon and form a part of the circuit for the current passing through the electric arc. Therefore so long as the lamp is burning the coils G will be in circuit and the armature $G^3$ raised; but when the lamp is out of operation the armature $G^3$ will fall back. The side rods $H^2$ are preferably covered with insulating material and are fastened at their upper end to the flange $C^3$ and are braced or held in brackets or lugs $H^3$, projecting from the casing $D^2$ of the magnet-coils at or near the bottom of said casing. A flexible connection 12 also runs from block N to a contact-block $H^6$, which is fastened to a block of insulating material $H^7$, sustained upon the top of the armature-lever D, and is adapted to make contact with a plate or block $H^8$, which projects from the upper end of one of the said rods of the lamp, as indicated in Figs. 2 and 8. When the armature is lowered sufficiently by the pull of the derived-circuit magnet-coils to bring the contacts $H^8$ and $H^6$ together, the current will be shunted from the magnet-coils G, which will thereupon lose its power and allow the spring $G^5$ to come into connection with the plate C, thus closing the circuit through the coarse-wire coil by way of 5 and wire 4, which circuit, being of low resistance, forms substantially a low resistance cut-out for the lamp. This contact of the blocks $H^6$ $H^8$ will obviously occur if the arc becomes abnormally long and pulls the armature-lever D down sufficiently far. This will obviously occur when the second of the two carbons has been consumed.

To insure the formation of a cut-out circuit, I provide also the spring $G^8$, which, when the rod A' has descended to its full extent, will be brought by said rod into contact with plate $A^5$ and C, thus forming the connection from the terminal P to the block 5, and by way of wire 4, through the low-resistance coil, to the opposite terminal N. Should, therefore, the contacts $H^6$ $H^8$ or the device controlled thereby fail to establish a cut-out circuit, the same will be established by the spring $G^8$.

The cover-plate of the lamp is indicated at

I, and is preferably cast in one piece with the horn $I^2$, in which the carbon rods A A′ are housed at their upper ends. The parts $I^2$ I are also preferably of iron, and the lamp proper is sustained from them by means of the posts $I^5$, which may be cast in one piece with the cover I and extend down to the flange $C^3$, to which they are fastened by screws or other devices. On removal of such screws the lamp may be taken away, leaving the hood or cover I and the horn $I^2$, with other parts supported thereby, in place. The cylindrical casing $I^3$, which protects the working parts above the regulating-magnet, is sustained in place by springs $I^4$, supported by the flange $C^3$.

Passing down through the horn are conductors $P^2$ $N^2$, which terminate within the hood or cover I in electrodes or terminals $P^3$ $N^3$, which register with and are adapted to bear upon the spring-electrodes P′ N′, so as to make connection therewith when the lamp is in place beneath the cover I. The electrodes $P^3$ $N^3$ may be either the bared ends of the conductors or wires $P^2$ $N^2$ or may be blocks of conducting material, as indicated in Fig. 11, which are fastened upon a cross-piece $I^7$ of insulating material, secured to the under side of the cover-plate I and passing across from one side to the other of the plate in line with the lamp-horn. Suitable clamping-screws may be provided in said blocks for clamping the wires or conductors $P^2$ $N^2$ in place. At or near the upper end of the horn or tube $I^2$ the conductors $N^2$ $P^2$ are properly fastened or secured in insulating-blocks L; but their free upper ends, extending above the lamp-horn and indicated at $P^4$ $N^4$, form electrodes or terminals adapted for connection with spring electrodes or terminals in the hanger-board.

$L^2$ is a plate, formed, preferably, of soapstone, slate, or similar non-combustible insulating material, upon which the parts of the hanger-board are sustained, and which also carries the devices for attachment of the line-wires $P^5$ $N^5$.

$L^3$ is a cover for the hanger-board, which cover has its top and sides made continuous or of a single piece of material, preferably so as to be effectually water-tight, and has its sides extending down over the edge of the plate $L^2$ to form a drip-flange, which will effectually exclude moisture. Posts $L^4$ extend down from the top of the cover $L^3$ and rest upon the plate $L^2$, to which they are secured by screws passing up from beneath. Upon the lower side of the plate $L^2$ is a socket M, adapted to receive the upper end of the lamp-horn $I^2$.

$M^2$ indicates locking bars or levers pivoted on the outside of said socket and adapted to to lock beneath projections $M^3$ on the outside of the lamp-horn, near the upper end thereof, so as to hold the parts securely.

On the upper side of the plate $L^2$ are spring contacts or electrodes adapted to receive the electrodes $P^4$ $N^4$, and composed, essentially, of plates O O, having blocks or contacts $O^2$ $O^2$, between which and the springs $O^3$, sustained by O and pressing toward $O^2$, the terminals $P^4$ $N^4$ are adapted to pass. The plates O O are perforated and the plate $L^2$ is similarly perforated at the proper points to permit the terminals $P^4$ $N^5$ to pass up through when the lamp-horn is inserted in the socket and fastened in place. At their lower edge, where the electrodes $P^4$ $N^4$ enter, the springs $O^3$ $O^3$ are bent or inclined, so as to permit easy entrance of the electrodes $P^4$ $N^4$. The main-line wires $P^5$ $N^5$ also pass up through openings in the plate $L^2$ and are clamped by suitable clamping devices sustained on the upper side of the plate $L^2$, as indicated at R R, Fig. 13. The conducting-plates sustaining the clamps R also sustain springs $R^2$ $R^2$, and the conducting-plates O O or the blocks $O^2$ $O^2$, as indicated, sustain similar conducting-springs $R^3$ $R^3$. These springs $R^2$ $R^2$ $R^3$ $R^3$ are the contact-springs of a cut-out switch, the movable part of which is located on the upper side of the plate $L^2$ within the casing, and consists, essentially, of the two semicircular conducting-plates $R^4$ $R^4$, passing to the edge of a block $R^5$, of insulating material, that is secured to a spindle which extends down through the plate $L^2$, for attachment of an operating-handle $R^6$, extending out beneath the edge of the trip-flange for the casing.

When the parts are in the position shown in Fig. 13, the line-circuit is obviously complete to the electrodes $P^4$ $N^4$, and from the same through the lamp. When, however, the cut-out switch is turned ninety degrees, so as to permit the two springs $R^2$ to rest on one plate $R^4$, it is obvious that the current will be cut off from the lamp and circuit formed directly from $P^5$ to $N^5$ independently of the springs $R^3$ $R^3$, which will now rest upon the insulating-spaces or upon the same plate $R^4$, which will not be in electrical connection with either of the springs $R^2$.

Guides or bearings for the two carbon rods or carriers are indicated at $A^5$ $A^9$. The first of these $A^5$ is of conducting material and is supported on top of the plate C on the upper part of the frame carried by the flange $C^3$. The lower guide plate or bearing $A^9$ is secured to the bottom of the casing $D^2$ for the regulator-magnet, but is insulated therefrom by suitable interposed insulating material, as shown.

For the purpose of holding down the armature-lever and freeing the clutches, so as to permit the carbon-carriers to be moved freely up and down in cleaning or recarboning the lamp, I provide a catch T, adapted to engage with the edge of the armature-lever carried by the spring-seated rod $T^2$, working in a tube $T^3$ on the flange $C^3$. To the lower end of this rod is pivoted a lever $T^4$, having a handle $T^5$, and having its end opposite the handle recessed, so as to receive the rod $T^2$ when the lever $T^4$ is returned to vertical position. The edge of the lever at $T^6$ rubs upon

the lower end of the tube $T^3$ when the lever is turned, and thereby draws down the rod $T^2$. When the lever reaches vertical position, it is held in such position, with the squared end $T^7$ thereof resting against the lower end of the tube $T^3$.

What I claim as my invention is—

1. The combination, in an electric-arc lamp, of a perforated plate of iron constituting the armature of a magnet and mounted and sustained upon fixed pivotal bearings to one side of the vertical line in which the carbon feeds, a ring-clutch sustained loosely on said armature and having an opening coincident with the perforation in the armature, and an electro-magnet beneath said armature for drawing the same down to effect a release of the clutch.

2. In an electric-arc lamp, the combination, with the regulator-magnet, of a pivoted lever mounted over said magnet on suitable pivots and constituting the armature-lever of the magnet, and a ring-clutch loosely sustained on top of said lever and having a movable releasing-floor connected to and moving with the lever, which sustains it but at a lesser rate as the clutch is lowered by the pull of the magnet toward position to release.

3. In an electric-arc lamp, the combination, substantially as described, of a pivoted lever or plate, a regulating electro-magnet tending to swing the lever downward, and a ring-clutch sustained on top of said lever and having its point of connection with the lever, where it is normally sustained thereby in position to engage and hold the carbon, and its releasing point or floor carried also by said lever, located at different distances from the pivotal point of support of the lever, the releasing-point being nearer the fulcrum or pivot, so as to move at a slower rate than the point by which the clutch is normally sustained.

4. In an electric-arc lamp, the combination, with the regulator-magnet through which the carbon-carrier passes vertically, of an armature mounted over said magnet on suitable pivots and a ring-clutch loosely sustained on top of said armature, so as to be capable of tilting upon it, as and for the purpose described.

5. In an electric-arc lamp, the combination, with the regulator-magnet through which the carbon-carrier passes vertically, of an armature perforated, as described, and mounted on a fulcrum at one side of the carrier, and a tilting ring-clutch resting on bearings on top of said plate in engagement with the carbon-carrier and adapted to tilt independently of the armature.

6. The combination, in an electric-arc lamp, of a regulator-magnet through the axis of whose coil the carbon-carrier plays vertically, a disk or plate armature perforated and sustained upon a fulcrum to one side of the carbon-carrier, and a ring-clutch resting on bearings upon the top of said plate-armature.

7. In an electric-arc lamp, a regulating-magnet depending below the casing, and the plate or support sustaining the working parts of the lamp, in combination with an iron waterproof jacket for said magnet, forming a magnetic extension from the lower end or pole thereof to the opposite end, where it is in close proximity to the armature of the magnet, as and for the purpose described.

8. In an electric-arc lamp, a regulator-magnet having a core perforated for the passage of the carbon rod or carrier, in combination with an exterior protective iron shell connected with the core at one end and extended around over the coils to form a weather protection therefor up to the opposite end of the magnet, in combination with a plate-armature pivoted in the field of the core and having its edges in close proximity to the upper end of said shell, so that the shell and plate may serve to carry the magnetism from the one pole around to the opposite pole of the magnet, as and for the purpose described.

9. In an electric-arc lamp, the combination, with the regulator-magnet coils, of a cast-iron shell having a perforated core cast in one piece with it and open at its top end only to permit the coils to be inserted, a carbon-carrier passing axially through the core, and a clutch-supporting armature sustained upon the shell and over the coils, as and for the purpose described.

10. A magnet-core and shell for the regulating-magnet of an arc lamp, consisting of a central iron core-piece having one or more longitudinal perforations, an exterior cylindrical portion, and a connecting part over the portion of the coil exposed to the weather, in combination with a flange near the top of the shell and an armature and feed-regulating mechanism sustained by said flange over the magnet, as and for the purpose described.

11. The magnet having a disk or plate armature sustained over the same by pivots located at one side and provided with an exterior iron casing extended longitudinally at the side opposite the pivots to a level above the same, as and for the purpose described.

12. A regulator-magnet having an iron casing upon its exterior provided with a laterally-extending flange or plate near its top integral with said casing and forming the base-plate or support which carries the working parts of the lamp, in combination with a casing sustained on said flange, and lamp side rods attached to and depending from the same, as and for the purpose described.

13. In an electric-arc lamp, the combination, with a regulator-magnet having its axis vertically disposed and provided with a vertical passage for the carbon rod or carrier, of an exterior iron protective case forming a carrier of magnetism from the lower end of the magnet to the upper end thereof, a flange formed on such case, a perforated pivoted armature pivoted in supports on said flange and having its edges in close proximity to the upper edge

of the iron protective case, and lamp side rods also sustained by and depending from said flange.

14. The combination, in an electric-arc lamp, of a regulator-magnet through which the carbon-carrier passes vertically, an iron casing for the magnet-coils, forming a carrier of magnetism from one end to the other thereof, as well as a weather-protective case, a lateral flange or plate extending from the casing between its ends, a frame sustained thereby over the magnet, guides or bearings for the carbon-carrier, supported, respectively, on said frame and at the lower end of the iron casing, and a perforated pivoted armature carried by the flange and having its edges in close proximity to the edges of the iron casing, as and for the purpose described.

15. In a double-carbon lamp, a trip or transfer lever supported on the feed-regulating and carbon-sustaining lever, as and for the purpose described.

16. The combination, with the carbon-carriers and their clutches sustained wholly by the magnet, of the transfer-lever also sustained by said magnet.

17. The combination, in an electric-arc lamp, of two carbon-carriers, the ring-clutches therefor sustained on a vertically-movable armature-plate, and a transfer-lever engaging with one of said clutches and provided with a spring for normally holding the clutch in engagement with its carbon-carrier, as and for the purpose described.

18. The combination, in a double-carbon lamp, of a vertical regulator-magnet through which the two carbon-carriers are fed, an armature-plate sustained over said magnet and provided with perforations through which the carbon-carriers pass, clutches supported on the top of said plate and engaging, respectively, with said carriers, and a transfer-lever also pivoted on said plate and connected with one of said clutches, as and for the purpose described.

19. The combination, in an electric-arc lamp, of a feed-regulating magnet, two carbon-carriers passing vertically through said magnet, an armature-lever sustained over the magnet and cut away to form openings for the passage of the carbon-carrier, feed-regulating devices sustained on top of said armature, and a trip or transfer lever also sustained by said armature-lever, as and for the purpose described.

20. The combination, in an electric-arc lamp, of a feed-regulating magnet having an exterior casing of iron provided with a flange, lamp mechanism sustained on said flange over the magnet, a lamp-horn and top plate cast in one piece, and posts uniting said top plate and flange, as and for the purpose described.

21. The combination, in an electric-arc lamp, of the lamp-magnet having the laterally-extending flange projecting from its iron casing, a frame sustained on such flange and carrying electrodes to which the working parts of the lamp are connected, a lamp-horn and cover-plate united together, means for uniting said cover-plate and flange, and electrodes covered by the cover-plate and horn and adapted to engage with the electrodes within the lamp when the parts are secured together, as and for the purpose described.

22. In an electric-arc lamp, the combination of the cover-plate and horn, a lamp-frame carrying the working parts of the lamp and detachable therefrom, and electrodes sustained by the lamp and by the cover-plate or horn, respectively, and adapted to register with one another, said electrodes forming, respectively, the terminals of the line and of the lamp mechanism, as and for the purpose described.

23. An electric-arc lamp having a cover-plate and horn formed of iron cast in one piece and provided with posts extending down for attachment of the base carrying the working parts of the lamp.

24. In an electric-arc lamp, leading wires or conductors housed within the lamp-horn and terminating at the top and bottom of the horn, respectively, in contacts or electrodes adapted to engage, respectively, with contacts within the lamp-casing and with contacts or electrodes on the hanger-board.

25. The combination, in an electric-arc lamp, of the lamp-horn, the conductors within the same, clamps for fastening said conductors at the lower end of the horn or chimney, spring-electrodes carried by the lamp-frame and in position to be engaged by the lower ends of such conductors, clamping devices at the top of the horn for holding such conductors at the opposite end, and a hanger-board provided with spring-electrodes adapted to receive the bared upper ends of said conductors.

26. In an electric-arc lamp, the combination, with the vertical lamp-magnet having an exterior casing of iron provided with a flange cast in one piece therewith, of a lamp-horn, cover-plate, and vertically-depending posts all cast in one piece, said posts being adapted to connect the cover-plate and flange, as and for the purpose described.

27. The combination, with the lamp-magnet and its exterior casing provided with a laterally-extending flange at or near the top of the casing, of the depending side rods carrying the lower-carbon holder and bolted to said flange, and the lugs or projections at or near the bottom of the magnet-case and through which said side rods pass.

28. The combination of the lamp-magnet having an exterior iron casing provided with a flange, as described, of a frame sustained on such flange, spring plates or electrodes having horizontal spring-terminals sustained on such frame, a lamp chimney or horn extending upward from the cover-plate and containing conductors which terminate within the cover in electrodes or terminals adapted to

engage with the spring-electrodes carried by the frame, and means for detachably fastening the flange and cover-plate together.

29. The combination, in an electric-arc lamp, of the vertical lamp-magnet provided with the exterior iron casing and flange, magnet-coils within such casing connected, respectively, into a derived circuit around the arc and into a starting circuit or branch, and a switch mechanism controlling such starting-circuit and sustained by a frame supported on the flange.

30. The combination, in an electric-arc lamp, of a magnet having a starting-coil and provided with an iron casing and flange, of a magnet supported on a frame sustained by the flange, a movable core for said magnet-coils, an iron plate at the lower end of the core, and a switch in the starting-circuit sustained above the magnet and operated by said core.

31. The combination, with the regulating-magnet for an arc lamp, of an iron protective casing surrounding the coils thereof, a flange near the upper end of the casing forming the bottom plate of the lamp, a casing for the working parts of the lamp sustained by said flange, a cover-plate, and posts uniting the same to the flange.

32. The combination, with the lamp hanger-board having spring-electrodes and means for connecting the same with the line-terminals, of wires or conductors housed within the lamp-horn and adapted to engage with the electrodes on the hanger-board when the horn is locked to the board.

33. In a hanger-board for electric-arc lamps, a disk or plate of slate or similar non-combustible insulator having on its bottom surface a socket adapted to receive the lamp-horn, means for locking the horn in position, conductors passing down through the lamp-horn and terminating at the upper end thereof, openings in the hanger-board plate, located within the socket in position to receive the bared ends of such conductors, and spring-electrodes on the opposite side of the plate for engagement by such conductors when the horn is locked in position.

34. The combination, with a hanger-board plate of insulating material, of a metallic socket on its lower side adapted to receive the upper end of the lamp-horn, spring-electrodes on the opposite side of the plate, adapted to be engaged by conductors passing down through the horn when the horn is locked in position, a cut-out switch located on the upper side of the hanger-board plate, and a vertical spindle carrying said switch and provided below the plate with an operating-handle.

35. The combination, in a hanger-board for electric lamps, of a plate of slate or similar insulator, an unbroken casing covering the parts on the top side of said plate and extending down over the edge to form a drip-flange, a rotary cut-out switch located within said casing, a spindle or rock-shaft extending vertically through the plate, and the laterally-extending handle below the plate connected to said spindle.

36. The combination, substantially as described, of an electric-arc lamp having contact terminals or electrodes forming the terminals of the lamp-circuits, a lamp-horn sustaining the electrodes adapted to engage with those in the lamp and connected with the hanger-board, means for detachably fastening or sustaining the lamp from the horn, a cut-out switch located on the hanger-board, and means for connecting the line-wires to blocks or plates on the hanger-board.

37. A hanger-board for electric-arc lamps, comprising a disk or plate of non-combustible insulator, a socket on the lower side thereof adapted to receive the lamp-horn, line or binding posts on the upper side of the plate, located in position to register with vertical openings, through which the line-wires may be passed from beneath, spring-contacts connected with said posts and forming terminals of a cut-out switch, spring sockets or electrodes located over the socket for the lamp-horn and adapted to be engaged by conductors carried by the horn, and spring-contacts connected with said sockets or electrodes and forming other terminals of the cut-out switch.

38. In a hanger-board for electric lamps, spring-contact sockets sustained on suitable conducting plates or blocks fastened to the top of an insulating-plate, and contact-springs extending from such blocks or plates and forming terminals of a cut-out switch, located also on the plate.

39. The combination, substantially as described, of the slate-base, the spring contacts or electrodes adapted to be engaged by conductors leading down to the lamp, a pair of contact-springs sustained, respectively, in electrical connection with the said sockets, another pair of contact-plates connected to binding posts or blocks upon the top side of the insulating-plate and adapted to form line-terminals, and a rotary insulating-disk mounted on a vertical spindle running down through the plate and carrying two conducting-arcs, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 22d day of May, A. D. 1890.

WILLIAM HOCHHAUSEN.

Witnesses:

WM. H. CAPEL,

HUGO KOELKER.