No. 887,127. PATENTED MAY 12, 1908.

V. W. RILEY & H. W. ROWING.

ELECTRIC ARC LAMP.

APPLICATION FILED MAR. 10, 1906.

3 SHEETS—SHEET 1.

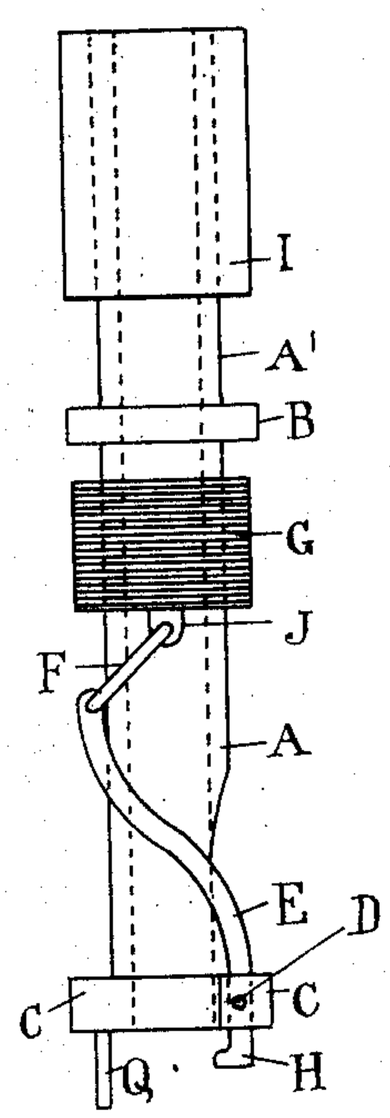

Fig. 3.

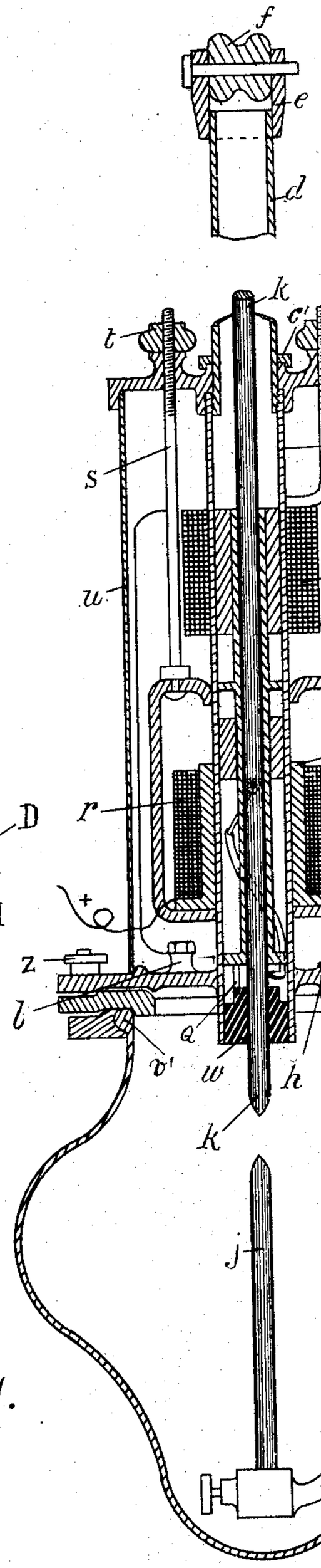

Fig. 1.

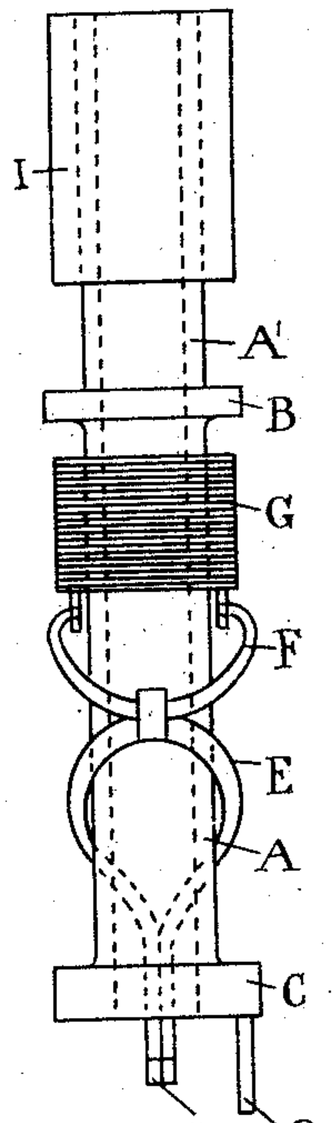

Fig. 4.

Witnesses.

Bertram Hammond Fowler.

Frederick Micah Mellor

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Victor Watson Riley

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3 SHEETS—SHEET 2

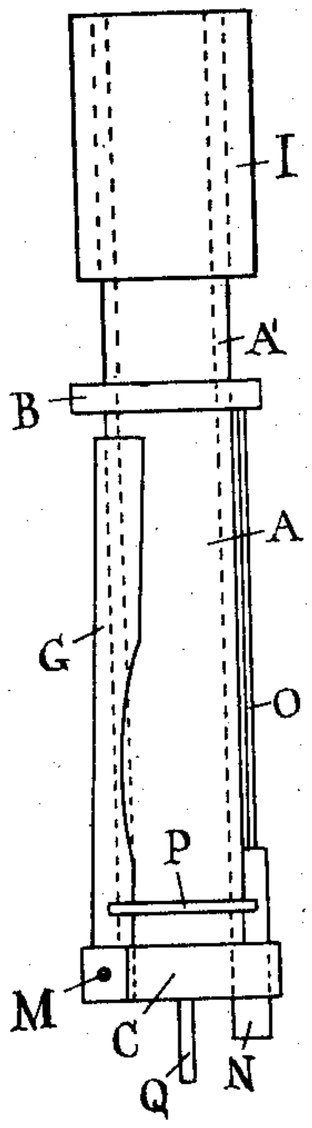

Fig. 5.

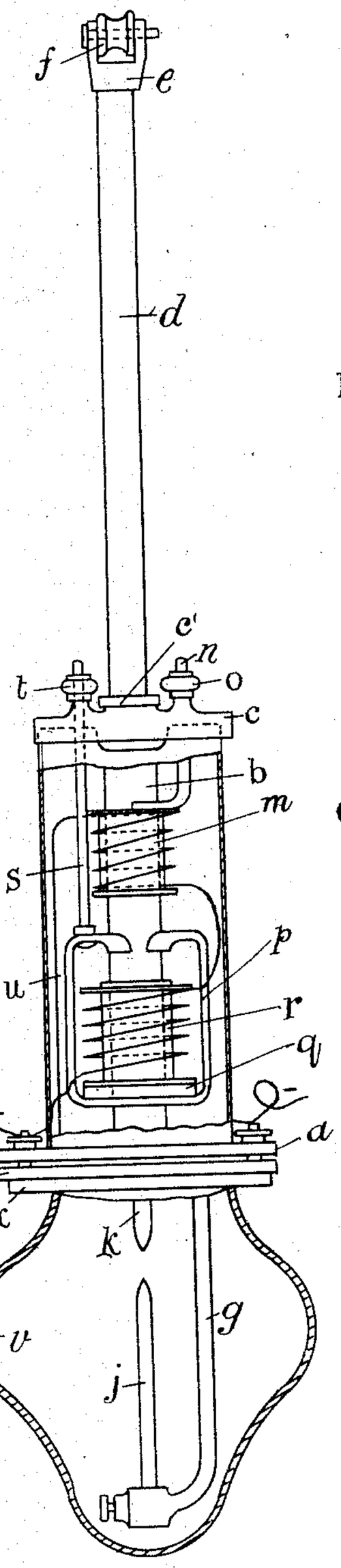

Fig. 2.

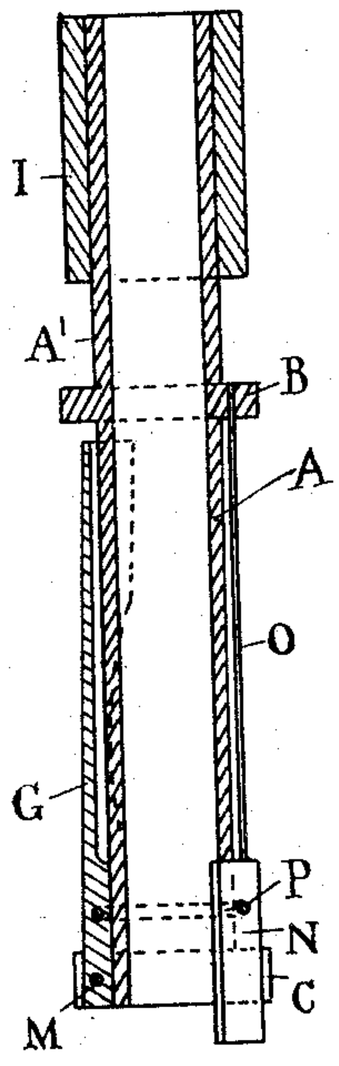

Fig. 6.

Witnesses.

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Frederick Micah Mellor

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3 SHEETS—SHEET 3.

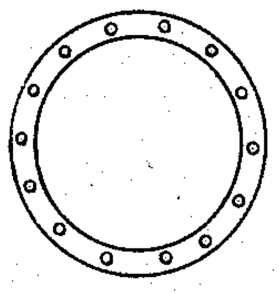

Fig. 8.

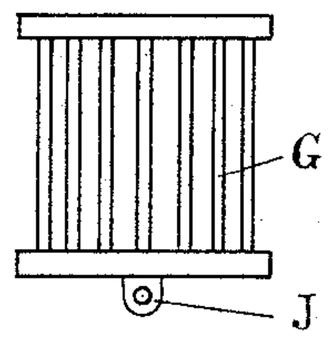

Fig. 7.

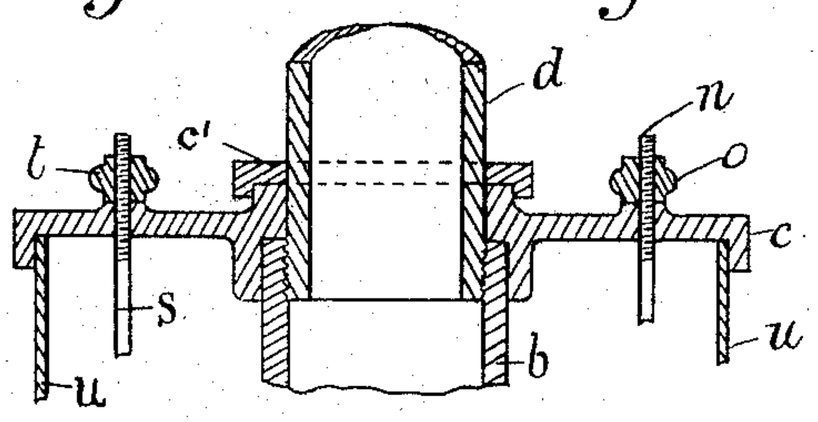

Fig. 9.

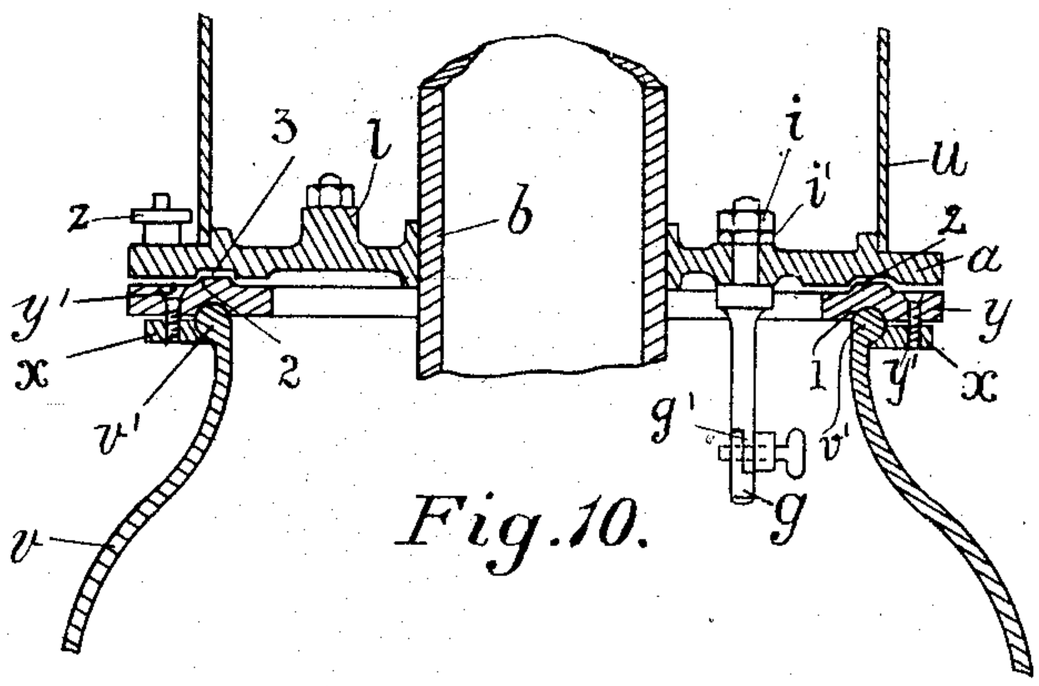

Fig. 10.

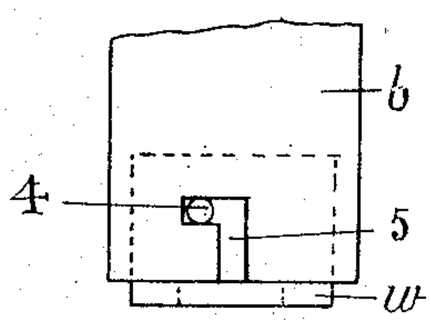

Fig. 11.

Witnesses.

Bertram Hammond Fowler.

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UNITED STATES PATENT OFFICE.

VICTOR WATSON RILEY AND HERBERT WILLIAM ROWING, OF LONDON, ENGLAND.

ELECTRIC-ARC LAMP.

No. 887,127. Specification of Letters Patent. Patented May 12, 1908.

Application filed March 10, 1906. Serial No. 305,322.

To all whom it may concern:

Be it known that we, VICTOR WATSON RILEY and HERBERT WILLIAM ROWING, subjects of the King of Great Britain, and residents of No. 7 St. George street E., in the county of London, England, have invented new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

This invention relates to the feeding mechanism of electric arc lamps of the type in which the upper carbon is fed by gravity to the lower carbon and the separating of the carbons to strike the arc is effected by means of a clutch operated by a solenoid or solenoids the said clutch also permitting the carbons to come together as the arc lengthens and the pull of the solenoid or solenoids on the armature or armatures decreases.

Now according to this invention we cause the upper carbon to pass through a short length of tubing or cylinder composed of brass or other non-magnetic metal of high conductivity, such tubing or cylinder being provided with flanges or guide plates thereon the said flanges or guide plates respectively sliding freely in or on a suitable guide or guides also of similar material. The said guide or guides is or are in current connection with the positive lead or terminal and the current is collected from said guide or guides by means of said flanges or guide plates and transmitted to the upper carbon. The said guide or guides may be of any suitable construction and may form the main structure of the lamp and for example may be secured to the base or globe plate or holder thereof.

The short length of tubing or cylinder is provided with a soft iron armature operating a gripper the armature being actuated by the influence of a solenoid. The upper carbon is gripped and together with the short length of tubing or cylinder and its attached mechanism (which together are hereinafter called the "clutch") rises to strike the arc, the grip being released as the arc lengthens and the lamp feeds sufficiently to regulate the arc to normal conditions when the armature is again pulled on and the carbon is once more held firmly.

Our invention is illustrated by the accompanying drawings in which:—

Figure 1 represents longitudinal section of an electric arc lamp of the inclosed type constructed according to this invention. Fig. 2 represents elevation of same partly in section. Fig. 3 is elevation of "clutch." Fig. 4 is elevation of same at right angles to Fig. 3. Fig. 5 is elevation of modified form of "clutch." Fig. 6 is section of same. Fig. 7 is elevation of one form of clutch armature hereinafter referred to. Fig. 8 is plan of same. Fig. 9 is a sectional illustration of method of retaining casing of lamp in position, the parts unnecessary for such illustration being omitted. Fig. 10 is a sectional illustration of the method of attaching globe to the lamp, the parts unnecessary for such illustration being omitted. Fig. 11 shows method of securing insulating plug hereinafter referred to in the lamp.

The same letters denote the same parts in all the figures.

a is the base plate of the lamp of brass or other suitable non-magnetic metal of high conductivity.

b is a tube either formed integral with the base *a* or made of similar material and secured thereto by screwing, brazing or otherwise and in good electrical contact therewith.

c is the top or outside cover of lamp.

d is a tube by which the lamp may be suspended and by which the upper carbon may be protected. The said tube may be screwed into the tube *b*.

e is a forked cap to carry insulator for suspending lamp screwed or otherwise secured to the tube *d*.

f is the insulator above referred to.

g is the lower carbon holder which is secured in the base *a* but is insulated therefrom by the bushing *h* or any other suitable means. The carbon holder *g* is connected to the — lead by the binding nuts *i*, *i'*.

j is the lower carbon.

k is the upper carbon.

l is a terminal formed in one with or otherwise secured to the base *a* to receive the + wire from the upper solenoid *m*.

m is a solenoid surrounding the tube *b* and supported from the cover *c* by means of the screw *n* and adjusting nut *o* by means of which nut the solenoid *m* can be moved up and down the tube *b* with the object of adjusting such solenoid to the desired position.

p is a soft iron magnet frame preferably having the top turned inwards and partly surrounding the tube *b* to the lower portion

of which frame is secured a flanged soft iron cylinder *q* which forms the core of the solenoid *r*.

The frame *p* is suspended from the cover *c* by the screw *s* and the adjusting nut *t* to enable the said frame and its solenoid to be moved towards or away from the solenoid *m* and to be adjusted to any desired position.

The solenoids *r* and *m* are as shown in series with the + lead the current passing from said lead through the coils of the lower solenoid thence through the coils of the upper solenoid back to the terminal *l* then through the structure of the lamp and through the "clutch" to the upper carbon.

u is a casing of any suitable material to cover in the mechanism.

c' is a ring or flange fixed on the tube *d* by means of which the cover *c* which is bored to accurately fit the tube *d* but not fixed thereto is caused to clamp the casing *u* to the plate *a* by screwing the tube *d* into the tube *b* when the ring *c'* would be pressed into contact with the cover *c* and by this means the casing *u* would be clamped between the cover *c* and plate *a*.

v is the lamp globe.

The "clutch" shown by Figs. 3 and 4 and which is equally applicable to continuous as alternating currents consists of a brass or other non-magnetic metal casting A which is bored to receive and inure perfect freedom of movement of the upper carbon *k* therein, the said casting having flanges B. C thereon which are turned to fit the tube *b* and slide easily therein. To the bottom flange C in a slot formed therein is pivoted at D a lever E which passes round the body of the casting A and is connected by a link loop or bail F to a soft iron ring or collar G which slides freely on the said body A between the flanges thereof and forms the armature for the solenoid *r*. The above-mentioned lever and the link, loop or bail are composed of any suitable metal.

The ring or collar G, especially for alternating currents, is preferably built up of thin soft iron stampings as shown (riveted or otherwise fastened together) to avoid eddy currents or it may be formed of pieces of soft iron wire arranged vertically the ends of which being riveted or otherwise secured to a top and bottom ring of non-magnetic metal as shown by Figs. 7 and 8. The lower end of the lever E forms a gripper H which is actuated by the armature G when the solenoid *r* is energized and the upper carbon is thus gripped. The armature G is provided with ears J to receive the coupling link, loop or bail F.

I is a soft iron hollow cylindrical core which may be built up as before described. This core is secured in any suitable manner to the "clutch" extension piece A'. The said extension piece is preferably formed in one with the casting A and is bored correspondingly therewith but any suitable means for attaching the core I to the "clutch" may be employed. The core I forms the core for the solenoid *m*.

For convenience of manufacture the flange B is made separate from the casting A and brazed screwed or otherwise attached thereto after the armature G has been placed thereon or for the same reason the flange B may be cast with the extension piece A' and connected to the "clutch" as before described.

The action of the lamp is as follows:—When no current passes through the lamp the upper carbon rests upon the lower carbon and is supported thereby but as soon as the current is switched on the solenoid *r* is energized and the armature G attracted upwards. The upward movement of the armature G being connected with the lever E causes the upper end of the lever E and the gripper H to move upwards and the upper carbon is gripped and the motion of the armature G relative to the "clutch" is arrested. The attraction of the solenoid *r* being still maintained on the armature G raises the "clutch" and with it the upper carbon thus striking the arc. The lamp continuing in operation as time proceeds the arc lengthens and the attraction (by the core *q* set up by the solenoid *r*) of the armature G diminishes, the grip on the upper carbon is lessened and such carbon descends until the arc is shortened when the attraction by the core *q* of the marature G is thereby increased and the gripper again grips the upper carbon and holds it in the position to produce the required or normal arc and so on the feeding being effected without sensible flickering of the light.

w is a plug perforated vertically through its center and serving to guide the upper carbon and to allow of the insertion and withdrawal of the "clutch." Said plug is made of, or bushed with, suitable incombustible insulating material to insure the continuity of the current being interrupted when the upper carbon is finally released from the "clutch" owing to such carbon burning short, and to guard against the possibility of an arc being formed between the clutch and the disengaged carbon which on being disengaged drops upon the lower carbon and is supported thereon by the plug. The said plug may be held removably in place in the tube *b* by means of pins 4 in the plug and bayonet slots 5 in the tube (as shown by Fig. 11) or by any suitable means Q is a peg of non-magnetic metal secured to the flange C of the "clutch" and arranged to rest on the insulating plug *w* when the "clutch" is in its lower position. The object of the peg Q is to prevent the gripper from coming in contact with the plug *w* thereby insuring perfect freedom of movement of the gripper at the moment when the current is switched on. The said peg

also insures the upper carbon being left clear of the "clutch" when finally burned short and becoming detached therefrom thus preventing the formation of an arc between the lower portion of the "clutch" and the upper portion of the detached lower carbon inasmuch as when the upper carbon becomes burned so short as to descend below the gripper which no longer can act on the carbon such carbon drops on to the lower carbon (as before stated) and clear of the "clutch" which cannot descend on to what remains of the upper carbon by reason of the peg supporting it.

If the lamp is of the inclosed type the globe v, is formed with the usual projecting rim or flange v', round the top thereof which rim or flange is secured by means of a ring x made in halves to the joint ring y by means of screws y' the ring y being secured to the plate a by studs and nuts z. The globe flange is embedded in a recess 1 formed between the joint ring y and ring x the recess being filled with asbestos plaster or other suitable material to make a permanent joint. On the joint ring y is formed a projection 2 which fits into a channel 3 on the lamp base a in which is placed a packing ring of asbestos or other suitable material thus making a reliable air-tight joint which can be broken and remade with ease without risk of breaking the globe owing to the joint strain not coming on the globe.

The modified form of "clutch" shown by Figs. 5 and 6 is intended for use, preferably with continuous currents. In this case the armature G (made of thin soft iron) is so shaped from its upper portion down to about half its length so as to extend over about half of the circumference of the "clutch" body such armature gradually diminishing downwards or tapering until its end in section is approximately square. The said armature is pivoted at M in a slot in the flange C. The grip block N is fastened to the lower end of a piece of fine wire O the other or upper end of which wire is fixed in the flange B said grip block being guided by a slot in the flange C.

P is a link which passes through holes in the armature and grip block as shown causing the movement of the armature to be transmitted to the grip block.

The wire O operates as a spring to increase sensitiveness in the release of the carbon by the grip block. As soon as the current is switched on the solenoid r is energized and the armature is attracted or pulled outwards thus drawing the grip block inwards causing the carbon to be pressed against the opposite side of the bore of the "clutch" body and to be held firmly. Further outward movement of the armature being in this way arrested it is pulled upward carrying with it the "clutch" and carbon thus striking the arc. On the arc lengthening the carbon feeds and the arc becomes normal as before described. In the case of either form of clutch the gripping face of the gripper or grip block may be of any suitable shape or formed in any suitable manner the object being to insure an instantaneous grip or an instantaneous release of the upper carbon.

By removing the plug w the "clutch" is quickly removed from the lamp for inspection or repairs or for substituting the one form of "clutch" for the other.

The upper carbon is inserted in the lamp without removing the plug the carbon being simply pushed up through the plug and "clutch" the lower carbon holder being perfectly insulated from the base a and preferably jointed at a convenient part thereof as shown at g' or otherwise constructed as to be moved away in any suitable way from the normal position to facilitate the placing of the upper carbon in position.

To prevent waste the bottom carbon is made preferably of such length that it will be entirely consumed by the time the upper carbon has been burned clear of the "clutch" and is resting in the insulating plug. The remaining portion of the upper carbon will then be of such length as to be suitable for use in the lower carbon holder.

The flanges or guide plates with which the "clutch" is provided are so designed that the surfaces in contact with the tubular or other guide or guides shall be such as to be of sufficient area to convey current from such guide or guides to the "clutch" without heating and the length of the "clutch" is such that the bore inclosing the carbon shall provide ample surface for conveying the current to the carbon also without heating up.

Our "clutch" may be utilized to advantage in certain cases in connection with already known lamps of the "clutch" type and where one or a series of carbon holders is or are employed suitable mechanism as will be clearly understood to be operated by the "clutch" and through which mechanism the necessary movement of the carbon or carbons is transmitted being provided wherever requisite in such cases.

In some cases when employing our "clutch" to feeding mechanism for certain known lamps that portion above the upper flange or guide plate may be omitted if necessary.

Lamps constructed according to this invention may be arranged for use either in series or in parallel.

We claim:

1. In an electric arc lamp the combination of a non-magnetic metal tube or cylinder through which the upper carbon passes, said tube or cylinder having current collecting flanges at each end thereof, with a gripping device pivoted to the lower flange thereof,

an armature sliding on the outside of said tube or cylinder and link work connecting said armature to the gripper as specified.

2. In an electric arc lamp the combination of a non-magnetic metal tube or cylinder through which the upper carbon passes, said tube or cylinder having current collecting flanges at each end thereof, with a gripping device pivoted to the lower flange thereof, an armature sliding on the outside of said tube or cylinder, linkwork connecting said armature to the gripper and a soft iron core secured to the upper flange of said tube or cylinder as specified for the purpose stated.

3. In an electric arc lamp, the combination of a metal tube forming a portion of the main structure of the lamp, an insulating plug in the bottom of the said tube, a non-magnetic metal tube or cylinder having current collecting flanges at each end thereof and a magnetically operated gripping device for the upper carbon, as shown, secured to the said tube or cylinder, the said tube or cylinder and gripping device sliding in the said lamp tube, and a peg secured in and projecting below the lower flange of the said tube or cylinder, the said peg resting on said insulating plug when the upper carbon is burned out as specified for the purpose stated.

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Witnesses:
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H. D. JAMESON.