L. MAUCLAIRE.

ELECTRICAL ARCING DEVICE FOR LIGHTING AND INTERRUPTION

APPLICATION FILED APR. 22, 1916.

1,323,304.

Patented Dec. 2, 1919.

2 SHEETS—SHEET 1.

Fig. 1

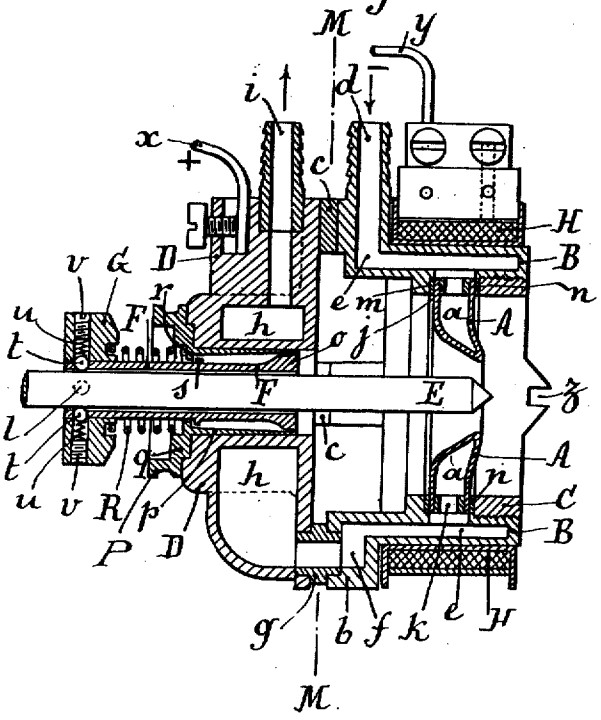

Fig. 2.

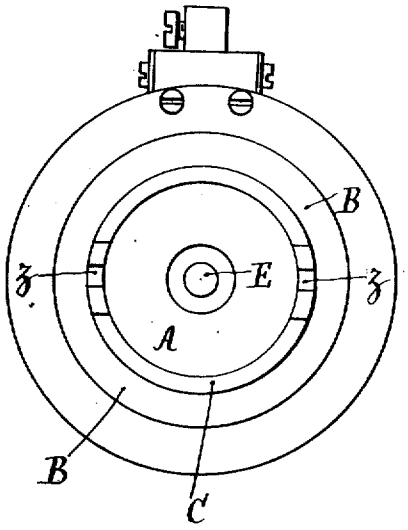

Fig. 3

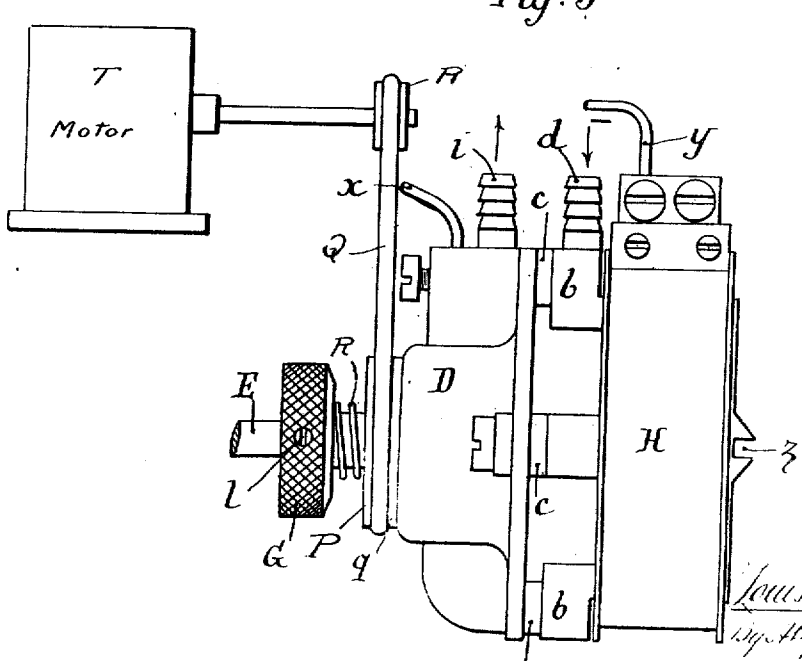

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Fig. 4

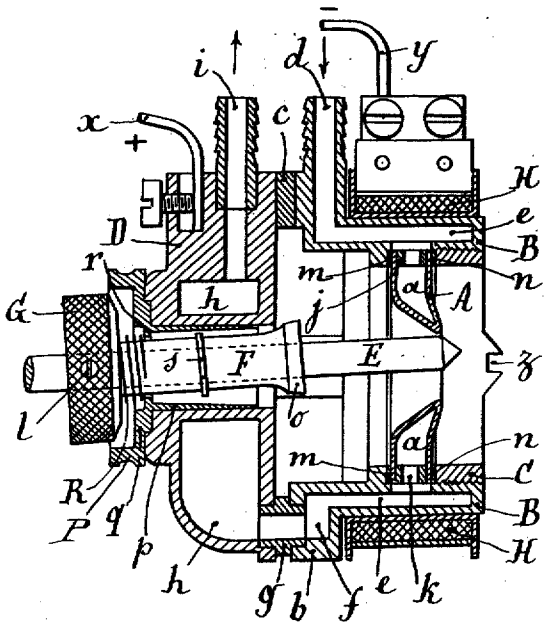

Fig. 5

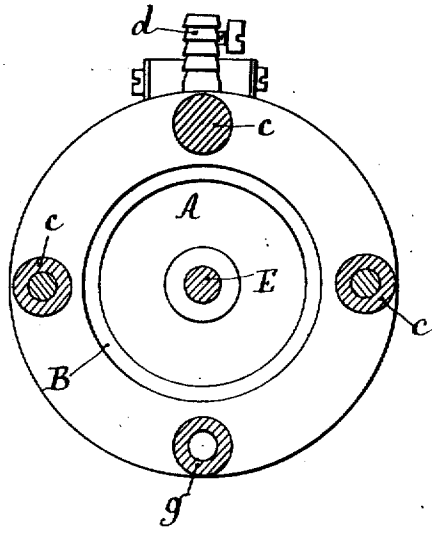

Fig. 6

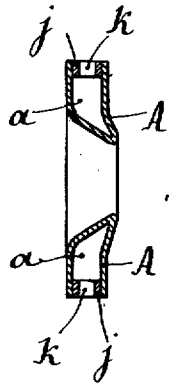

Fig. 7

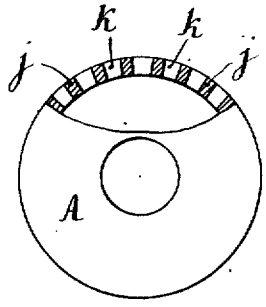

Fig. 8.

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UNITED STATES PATENT OFFICE.

LOUIS MAUCLAIRE, OF PARIS, FRANCE.

ELECTRICAL ARCING DEVICE FOR LIGHTING AND INTERRUPTION.

1,323,304. Specification of Letters Patent. Patented Dec. 2, 1919.

Application filed April 22, 1916. Serial No. 93,020.

To all whom it may concern:

Be it known that I, LOUIS MAUCLAIRE, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Electrical Arcing Devices for Lighting and Interruption, of which the following is a specification.

This invention has for its subject an arc lamp wherein the arc which passes between the two electrodes is a rotary arc of constant length, because one of the electrodes is a disk having a central opening, at the center of which is disposed the rod of carbon which constitutes the other electrode. Various advantages result from the rotation of the arc which passes between the two electrodes: deposits of carbon cannot form at any one point of the central circle of the disk electrode because the arc does not stop at any one point but always continues to turn. As the arc does not stop it can be said that its illuminating action extends uniformly over the whole of the circular area of the opening formed in the disk electrode. The point of incandescence of the end of the carbon rod is not always at the same place, as the arc is not localized, and the consequence of this is that the brightness of the crater at the extremity of the carbon electrode is kept constant, so rendering the light which is emitted absolutely constant and regular. The central electrode which is usually formed of a rod of carbon although it may be of other suitable conducting material, is moved forward progressively in proportion as it is used up, while the other electrode which is a disk of material that is a good conductor of electricity preferably of metal such as copper, is relatively fixed. The end of the electrode formed of the carbon rod is normally maintained at the center of the central opening of the disk electrode. It is only during the starting of the arc that the carbon rod is displaced out of its central position and is brought into contact with some point around the circular opening of the metallic electrode in order to close the circuit: when the arc has been formed the central carbon electrode is drawn back from the point of contact with the metallic electrode, and then it takes its place at the center of the circular electrode where it remains so that the luminous point of the arc is always kept constantly centered at the same place. The electric arc which passes between the annular metallic disk and the central rod of carbon will turn so to say about the central point solely on account of the fact that the end of the carbon is at the center of the metallic electrode: but special means are provided as hereinafter set forth in order to insure the rotation of the electric arc around the end of the central rod, and to accentuate this rotation.

The circular disk electrode is hollow and water or other cooling fluid is caused to circulate through it in order to prevent this electrode from attaining a high temperature.

The lamp may be regulated by hand, the carbon electrode being advanced in proportion as it is used up: as an alternative method a regulator may be disposed at the back of the apparatus in order to effect automatically the advancement of the central carbon electrode as it is used up.

In the accompanying drawings:

Figure 1 is a longitudinal section of the rotary arc lamp having a constantly centered luminous point and embodying this invention.

Fig. 2 is a front elevation from the side of the electrodes.

Fig. 3 is a side elevation.

Fig. 4 is a view similar to Fig. 1 illustrating the central rod of carbon or positive electrode in an operative position.

Fig. 5 is a transverse section on the line M M of Fig. 1, and

Figs. 6 and 7 are respectively a diametric section and a front elevation partly broken away of the circular disk electrode which constitutes the negative electrode.

Fig. 8 is a view in cross-section of the non-combustible electrode with a sinuous edge.

Referring now to the drawings which illustrate by way of example one practical construction according to the invention, but it is to be understood that the invention is not limited to the precise construction as hereinafter set forth. In this construction the disk electrode A, which may be of metal such as copper or of other good electrical conducting material, carbon and so forth, consists of an annular chamber, *a* the front wall of which may be pressed forward slightly toward its inner circumference while the rear wall is pressed forward to a much greater extent so as to meet the front wall at an acute angle. The central aperture in the

disk electrode A is therefore conical in form expanding from the annular ridge at the front toward the rear in this case. The disk electrode is inserted and held within a ring-shaped casing B being clamped within the same against a shoulder by means of an internal nut C and with washers *m*, *n*, of lead, rubber or other suitable material at each side of the disk electrode A where it is clamped in place. The internal nut C is screwed up by means of a key engaging in notches *z*, at its end or internally therein, or in any other suitable way. The ring-shaped member B surrounding the disk electrode A is hollow and formed with passage-ways for admitting the cooling liquid and allowing it to flow out. The hollow space in the ring-member B communicates with the interior *a* of the disk electrode A around the circumference thereof, the disk electrode A having thin walls, between which at its outer circumference is inserted a ring *j* of reinforcing material perforated radially with holes *k* which open on the one side into the interior of the disk electrode A and on the other side into the hollow space of its supporting ring member B (see Figs. 6 and 7).

The ring member B surrounding the disk electrode A has a number of projecting pieces or blocks *b* around the back thereof, by means of which it is secured to a support or base D at the rear, for example by screws passing through a flange in the base D and into the projecting blocks *b* on the ring member. Insulating distance pieces or washers *c* may be interposed between the projecting pieces *b* of the ring member B and the base. These projections insure that there is a large open space between the ring member and the base through which the air can circulate.

The upper and lower projections or blocks *b* on the ring member B are made hollow and communicate with the hollow interior of the said member in order to provide for the circulation of the cooling liquid. This liquid, for example, may enter through a socket or nipple *d* in the upper projection, flowing through the passage *e* into the interior of the ring member B, circulating through the annular hollow space *a* of the disk electrode A and flowing out through the passage *f* in the lower projection or block at the back of the ring member. It flows out through a joint member *g* of insulating material into a hollow space *h* in the base D or back portion of the lamp, flowing out of the same ultimately through a socket or nipple *i* at the top. Pipes may be connected in any suitable way to the inflow and outflow nipples *d* and *i* for maintaining the circulation of the liquid.

The positive electrode E of carbon or the like, is in the form of a rod held in a sleeve F rigidly attached to or forming part of a milled head G adapted to be manipulated by hand. A screw *l* passing into the milled head G may secure it to the sleeve F. The front end *o* of the sleeve F is expanded in the form of a collar which may be slightly coned so that when drawn back it will fit in a correspondingly coned guiding tube *p* projecting inward into an aperture at the center of the hollow base D of the lamp, and secured to or forming part of a disk *q* which is engaged against the back of the base D. A spring R arranged between an internal flange *r* at the back of the guiding tube *p* or its supporting disk *q* and the front of the milled head G on the sleeve F tends to draw back the sleeve F causing its slightly conical collar *o* to center itself in the correspondingly slightly coned guiding tube *p*. The backward movement of the sleeve F is limited by means of an annular projection or collar *s* on it of less diameter than the interior of the guiding tube, and which comes against the flange *r* at the back of the tube *p* in the limiting position.

The carbon electrode E is carried forward when the milled head G is pushed forward for lighting the lamp, in consequence of the pressure exerted on the carbon rod by two little balls *t* working in grooves or slots in the milled head G and in the tube F therein, and pressed inwardly by means of springs *u* held by screws *v* inserted from the outside. The rear end of the carbon rod E is pressed forward through the sleeve F and between the spring-pressed balls *t* in order to feed or advance it in the sleeve F as its end is used up in the burning of the lamp, but otherwise the friction due to the balls *t* is sufficient to prevent the carbon rod E from being displaced in its supporting sleeve.

In starting the lamp the milled head G is pressed inward moving forward the sleeve F and the electrode E held therein: the collar *o* on the end of the sleeve passes out of the guiding tube *p* and out of the opening at the center of the base D of the lamp, and as the sleeve F is then no longer guided it cants toward one side or another, thus bringing the carbon rod E into contact with the inner circumference of the disk electrode A at one point thereof. The electric circuit is thus closed, the current flowing through a lead *x* secured to the base D of the lamp, through the sleeve F and the carbon rod E, the disk electrode A with which the rod E is momentarily in contact, the ring member B surrounding the disk electrode A and a terminal to which a conductor *y* is connected, mounted on the ring member B. As soon as the arc has been struck the milled head may be released, whereupon the spring R presses it with its sleeve F backwardly, and the collar *o* on the sleeve then centers the latter in the guiding tube *p* so that the carbon electrode E returns to a central position

within the disk electrode A. The arc then passes between the end of the rod E and the inner edge of the disk electrode A the latter forming the negative terminal.

It has been explained in the introduction to this specification that the electric arc which has been formed will turn around the point or end of the carbon electrode E being maintained between this and the inner edge of the disk electrode A. This turning of the electric arc around the central point must not be a matter of any uncertainty however, on the contrary it must be absolutely insured. A continuous and constant rotation of the electric arc is desired, and in order to insure this the ring member B is wound with a coil H comprising several turns of large-section wire. This coil H is fed by the same current which is supplied through the terminals to the arc and the coil H may be in series with the arc. If the lamp is to work with a current of 15 amperes it may be sufficient for the coil H to have 7 and 8 turns of wire of large cross-section. The number of turns may be varied however according to the desired rapidity of rotation of the arc.

As has been stated already, the coil H which is disposed around the ring member concentrically with the disk electrode A and with the central carbon electrode E has the effect of insuring the rotation of the electric arc in one direction. If the direction of flow of the current through the coil is reversed, the direction of rotation of the arc is reversed also. Means may be provided for changing over the connections of the terminals of the coil for this purpose.

An alternative or additional method of insuring the rotation of the arc is to cause the central electrode E to turn by mechanical means, as indicated in Fig. 3 by pulley P, belt Q, pulley R′, and motor T, as for instance by an electric motor or by any other motor, by a spring or otherwise. The two methods of causing relative rotation of the arc may be combined, and for example the central electrode E may be turned mechanically in one direction, while the electric arc is caused to turn in the reverse direction by the action of a magnetic field developed by the current in the surrounding coil H. The electric arc may thus be given a movement in relation to the central electrode E which has a relative speed corresponding with the sum of the actual movement of rotation of the arc and of the mechanical rotation of the carbon electrode.

The lamp which may have a rotating electric arc as hereinbefore described, may be utilized for the projection of light or for the production of electric oscillations for wireless telegraphy, and telephony, or to provide high frequency currents, without utilizing the light but only the variations of the current.

In order to cool the disk electrode water may be used or any other suitable liquid, particularly petroleum which is a good insulator and which wets very effectively the surface of copper, thus giving excellent contact with this metal. Instead of using such a liquid however, air or other gas under pressure may be employed for cooling purposes.

The inner edge of the disk electrode may have a wavy or sinuous contour, which would have the effect of augmenting the action hereinbefore described. Fig. 8 shows such an electrode.

Claims:

1. An arc lighting device comprising an annular non-combustible electrode and a second combustible electrode within the space of said annular electrode, a magnet coil adapted to produce a magnetic force for rotating the arc between said electrodes, and mechanical means for producing rotation of an electrode.

2. An arc lighting device comprising an annular non-combustible electrode and a second combustible electrode within the space of said annular electrode, and means for supporting said second electrode, said support comprising a tapered holder and a tapered socket piece within which said tapered holder is adapted to fit, said holder being displaceable longitudinally in the socket piece, thereby permitting tilting of said electrode on its axis to approach the annular electrode and strike the arc.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

LOUIS MAUCLAIRE.

Witnesses:

CHAS. P. PRESSLY,

RENÉ BARDY.