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ANODE FOR LUMINOUS ARC LAMPS.

APPLICATION FILED SEPT. 26, 1919.

1,422,439. Patented July 11, 1922.

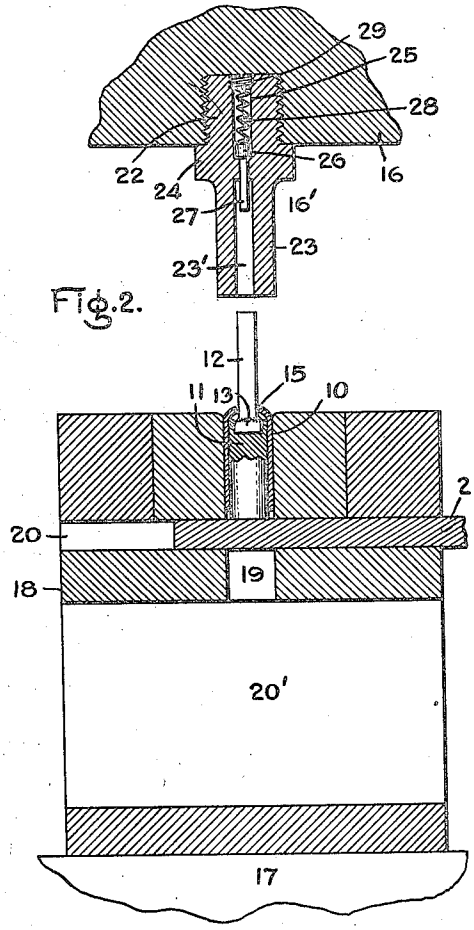


Fig.2.

Fig.3.

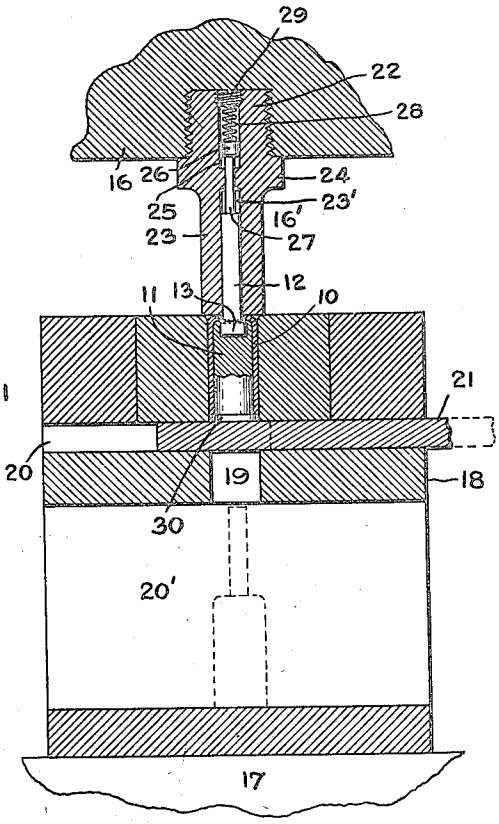


Fig.1.

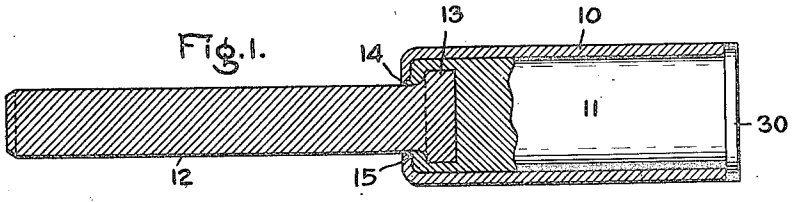
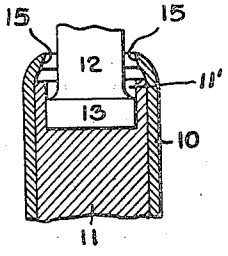


Fig.4.



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UNITED STATES PATENT OFFICE.

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ANODE FOR LUMINOUS ARC LAMPS.

1,422,439. Specification of Letters Patent. Patented July 11, 1922.

Application filed September 26, 1919. Serial No. 326,652.

To all whom it may concern:

Be it known that I, CROMWELL A. B. HALVORSON, Jr., a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Anodes for Luminous Arc Lamps, of which the following is a specification.

My invention has reference to an improved anode for luminous arc lamps, which are specifically known as magnetite lamps. In such lamps the cathode (negative electrode) is generally composed of a thin iron shell filled with a compacted mixture of magnetite, titanium oxide and some other ingredients, while the anode (positive electrode) is now usually made of copper in a rather heavy iron or mild steel shell. In the operation of such lamp the cathode is consumed rather promptly, although much more slowly than a carbon electrode; it furnishes the vapors which constitute the luminous arc, and is generally spoken of as the consuming electrode. The anode is not consumed by the electric action but is slowly wasted by oxidation and is spoken of as the non-consuming electrode; a comparatively short length of it lasts through several thousand hours of operation. These anodes are made of considerable cross-section, and being of short length, they become scaly and receive the powdery, condensed fumes which proceed from the cathode, throughout their whole length. As it gradually wastes, the anode must be fed or adjusted toward the cathode, and since it wastes irregularly, it must from time to time be given a partial turn about its axis. Current is supplied to the anode by a heavy clamp, and this clamp must be loosened and again tightened when the anode is adjusted, and owing to the scale and other impurities the clamp makes only poor electrical contact with the electrode in its new position unless both are scraped. The clamp-contact necessarily embraces the iron shell and the electrical connection between the latter and the copper core is impaired in course of time by oxidation creeping into the inner wall of the shell and the outer surface of the copper.

These and other imperfections of anodes for luminous arc lamps are avoided by my invention in a simple and effective manner. In accordance with this invention the anode is composed of an iron shell, a copper core and an iron stem anchored in the core in axial alignment with the same, the core being flowed by pressure in a cold condition within the shell and about the butt of the stem, in intimate, unchanging contact with both. With this construction the stem serves as the medium for carrying the current to the lamp by any suitable clamp or holder and the electrode as a whole can be adjusted to or from the cathode and can be given partial turns to compensate for side burning without the necessity of scraping either the stem or the clamp, since both are removed from the region where scales or other insulating formations can occur.

In the accompanying drawing, Fig. 1 represents an axial section, partly in elevation, of my improved anode; Fig. 2 is a vertical section, partly in elevation, of a press adapted to the manufacture of the improved anode, with the anode elements in position to be acted upon; Fig. 3 is a like view, showing the action of the press in completing the anode and discharging the same, and Fig. 4 is a detail of Fig. 2 upon a somewhat enlarged scale.

The improved anode, as most clearly shown in Fig. 1, is composed of a shell 10, of iron or mild steel, a core 11, of copper, and a stem 12, of iron, or mild steel, the stem extending axially from the shell and core; all these parts are usually cylindrical. One end of the stem is formed into an expanded cylindrical foot 13, which, together with a short length of the stem proper, is embedded in the copper core. One end of the shell 10 is partly closed as indicated at 14, but has a circular opening through which the shank of the stem projects; the shell thus assumes the form of a thimble with an opening in the top end. As shown in the drawing the edge of the opening in the top of the thimble is chamfered inwardly, as indicated at 15, but this formation, while convenient in the manufacture of the article, is not essential. The copper core material extends not only around the foot of the stem, but also behind the same, so that it fills the thimble-shell completely. As will presently appear, the core is not poured into the thimble as a casting, but is inserted as a cold solid cylindrical body and is then condensed and expanded within the same by heavy pressure until it flows not only within the main body of the shell, but also, and

particularly, around and behind the foot of the stem. This mode of making the article, which is hereinafter more fully described, gives to the anode characteristics which are peculiar to the same and upon which the special utility of the device largely depends.

The manner of making the improved anode is illustrated in Figs. 2, 3 and 4. Between the follower 16 and the platform 17 of a hydraulic or other suitable press, and resting upon the platform, is a heavy framework 18, the upper part of which has a cylindrical bore 19, traversed by a wide rectangular slot 20, in which a heavy slide 21 is fitted. The part of the bore 19, which extends above the slot 20, is designed to receive snugly the loosely and temporarily assembled elements 10, 11, 12, 13 of the anode, which, when the slide 21 is in the slot 20, rest upon the slide, as indicated in Fig. 2. Below the bore 19, the frame 18 is formed with a wide transverse slot 20′, of sufficient height to receive the finished anode (indicated in dotted lines) when the slide 21 is withdrawn from the slot 20. The temporary assemblage of the anode elements within the bore 19 is indicated in Fig. 2, and these elements are more clearly shown in Fig. 4. It will be seen that in this loose assemblage, the core 11 is formed at its upper end with a cylindrical recess for the reception of the foot 13 of the stem 12, and of a short portion of the latter. In this condition the upper end of the shell is rather wide open and is externally curved toward the stem, while internally it is boldly chamfered as indicated at 15.

When the elements of the anode are thus assembled the lower part of the core projects below the shell as is clearly seen in Fig. 2; this has a certain significance, which will appear further on.

From the main body of the follower 16, projects downwardly the removable actuating follower 16′; it is preferably screwed into the body 16, as shown, and is in general outline cylindrical, with an upper portion 22, a lower portion 23 and an intermediate enlarged portion 24. The upper portion of the actuating follower has an axial bore 25 which receives the head 26 of a pin 27 and a pressure spring 28, the upper end of which abuts against a screw plug 29, while its lower end bears upon the head 26 of pin 27. The lower portion of the actuating follower has an axial bore 23′ of such diameter as to receive and guide the stem 12, in the course of the making of a finished anode, indicated in Fig. 3. Between the two axial bores 23′ and 25 is an intermediate axial channel through which the pin 27 projects into the bore 23′.

When the slide 21 is in position within the slot 20, and the elements of the anode have been assembled and rest upon the slide, the followers 16, 16′ are caused to descend the bore 23′ receives the stem 12, the upper end of which comes in contact with the lower end of pin 27, which is now gradually raised against the action of spring 28, whereby the foot 13 of the stem is held at the bottom of the recess 11′. As the follower continues to descend the lower face of the actuating follower 23 bears upon the upper edge of the shell 10, and depresses the same, while at the same time the material of the core 11 is compressed within the shell and flows into intimate and forcible contact with the same, the wall of the recess 11′ folding over and flowing around the neck between the stem and its foot, until this foot and neck become anchored in the core material. At the same time the lower end of the core is gradually flattened into a rivet head 30, against the lower edge of the shell, as shown in Figs. 1 and 3. By this process the shell assumes the thimble form, with the stem projecting from the same. The slide 21 is now withdrawn from the slot 20, whereby the finished anode is allowed to drop through the bore 19 into the space of the slot 20′, from whence it is removed in any suitable manner.

While the apparatus for making the improved anode, and the process of making the anode have here been minutely described, it should be understood that while this apparatus and process have yielded excellent results, they may be modified in many ways without departing from my invention, which is centered in the improved anode. The intimate contact of the core material with the shell and the anchoring of the stem within the core material by flowing the latter in a cold state by suitable heavy pressure, is the principal and characteristic feature of my invention. The formation of the recess 11′ for the reception of the foot of the stem, while convenient, is not absolutely necessary; nor is the formation of the rivet head 30 essential. In fact, this rivet head is soon consumed, but the great pressure by which it is formed so intimately joins the core material with the shell, that these two become cold-welded, and no slag or fumes can creep in or be formed or deposited between them.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A positive electrode for luminous arc lamps, composed of an iron shell, a stem axially extending through the shell, and a copper core cold compacted in the shell and anchoring the stem.

2. A positive electrode for luminous arc lamps, composed of an iron shell, an iron stem axially extending through the shell, an anchor-foot formed on the stem located within the shell, and a copper core cold compacted in the shell and around the anchor-foot.

3. A positive electrode for luminous arc

lamps, composed of an iron shell, an iron stem axially extending through the shell, an anchor-foot formed on the stem located within the shell, and a copper core filling the shell and cold welded to the inner wall of the same and to the foot of the stem.

4. A positive electrode for luminous arc lamps, composed of an iron thimble shell, a stem axially extending from the shell through the thimble end of the same, and a copper core cold compacted in the shell and anchoring the stem.

5. A positive electrode for luminous arc lamps, composed of an iron thimble shell, an iron stem axially extending from the shell through the thimble end, an anchor-foot formed on the stem located within the shell, and a copper core cold compacted in the shell and around the anchor-foot.

6. A positive electrode for luminous arc lamps, composed of an iron thimble shell, an iron stem axially extending from the shell through the thimble end, an anchor-foot formed on the stem located within the shell, and a copper core filling the shell and cold welded to the inner part of the same and to the foot of the stem.

In witness whereof, I have hereunto set my hand this 23rd day of September, 1919.

CROMWELL A. B. HALVORSON, Jr.