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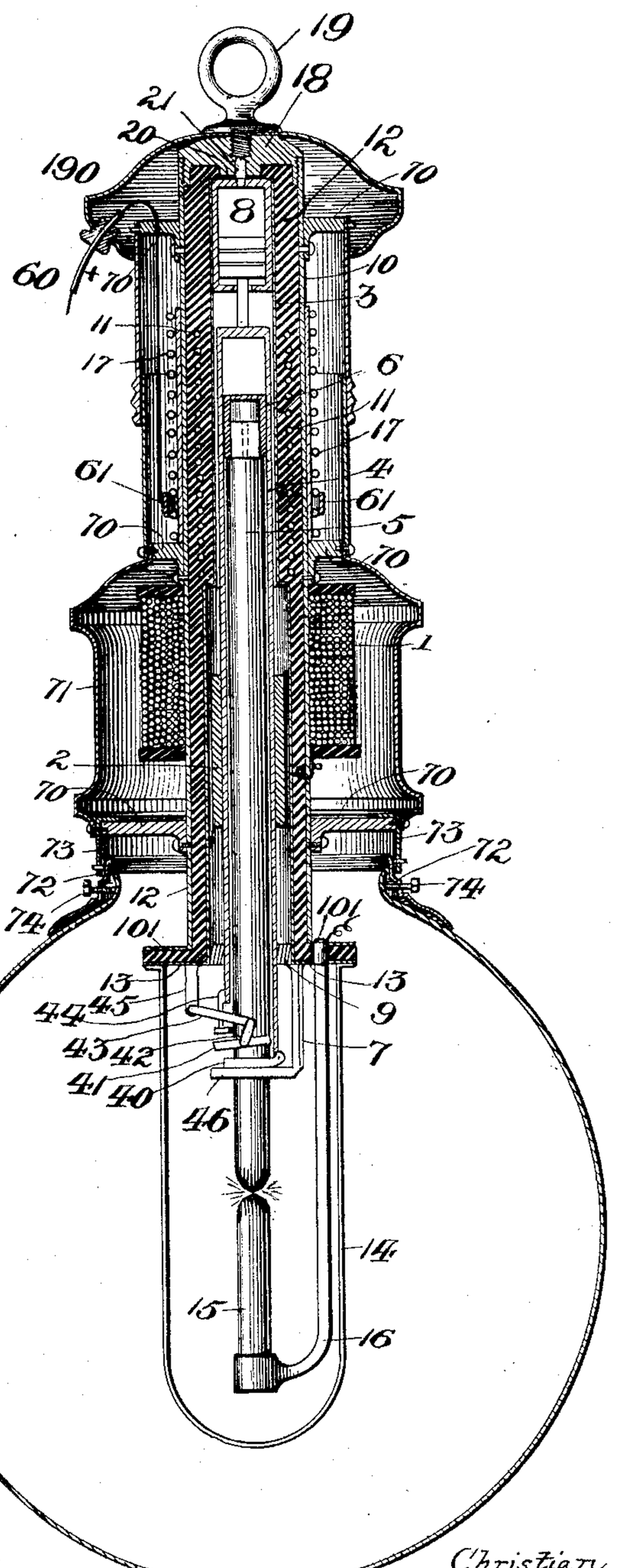
C. J. TOERRING.

ELECTRIC ARC LAMP.

(Application filed Nov. 5, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 631,055, dated August 15, 1899.

Application filed November 5, 1898. Serial No. 695,588. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN J. TOERRING, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Arc-Lamps, of which the following is a specification.

The primary object of my invention is to produce an arc-lamp in which the temperature of the arc-inclosure is above that attained by lamps now on the market and shall be as high as possible. This I do by making the arc-inclosure of a transparent part, the heat-radiating surface of which shall be as small as possible, and of a heat-retaining part, which is composed of a non-heat-conducting structure or material. My invention in this respect is an improvement on that of my Patent No. 585,603, dated June 29, 1897; but in the present invention instead of passing the upper carbon through a closely-fitting opening in the upper part of the arc-inclosure, as was done in the lamp of said patent, which construction will necessarily permit the leakage of some air at the upper part of the inclosure, where such leakage is undesirable, I now construct the upper non-heat-conducting part of the arc-inclosure so as to completely surround and inclose the upper-carbon pencil and a portion of the lamp-operating mechanism, by which expedient I attain a construction in which there is no air leakage at the top of the inclosure, which fact, combined with the heavy mass of non-heat-conducting material comprising the upper part of the arc-inclosure, which I am enabled to use and which is preferably, though not necessarily, coextensive with the upper part of the inclosure, permits the attainment of a very high temperature of the inclosed gases. This temperature may be increased by embedding a resistance-wire in the non-heat-conducting material forming a part of the upper part of the arc-inclosure. The construction thus outlined prevents leakage of the air at the upper and lower parts of the arc-inclosure and permits a small leakage only at the joint between these parts. I have found that the attempt to make an arc-inclosure completely air-tight is false in theory, since it results disadvantageously in blackening the globe and otherwise. The feature to be aimed at is rather the highest possible temperature of the gases contained in the inclosure than its absolutely air-tight character. The ingress of a very small quantity of air at points where it will not materially interfere with the temperature of the inclosed gases I have found beneficial, the best results being obtained with a globe closed at all points except at some point between the top and bottom of the inclosure.

Another feature of my invention relates to the use of a device for conveying current to the carbon, which is in the form of a clutch and is arranged to be in immovable contact with the carbon at those moments when the feeding and current-carrying clutch is out of touch therewith, so that current may at all times be conveyed to the carbon pencil at a point near the arc, whatever be the position of the feeding-clutch.

The drawing represents a longitudinal cross-section of a lamp embodying my invention.

The upper portion of the arc-inclosure consists of a tube 3, surrounded by a heavy coating of non-heat-conducting material 12, which may in turn be protected by an outer tube or casing 10, having an extended plate 101 at the bottom. The tube 3 is air-tight at the top, being closed by the cylinder of a dash-pot 8, of ordinary construction, and at the bottom has secured to it in any convenient manner an iron plate 13. To the upper face of the cylinder of the dash-pot 8 is secured a block 18 by means of a screw 21. The outer edge of this block is threaded onto the outer tube or casing 10, as shown. A piece of non-heat-conducting material 20 may be interposed between the block 18 and the dash-pot, so as to confine all the conduction of heat from the inside tube 3 to the outside casing to the narrow path through the screw 21. Since, however, the touching metal surfaces are small, this is not strictly necessary. It is plain from this description that the upper portion of the arc-inclosure is especially adapted to prevent the escape of heat and thus to keep the temperature of the gases confined therein at a maximum. This I therefore call the "heat-retaining" portion of the arc-inclosure.

Within the tube 3 slides a tube 4, within which the carbon pencil moves, the upper end of the pencil being pushed into a split tube 6,

which constitutes its holder. The upper end of the tube 4 is attached to the piston of the dash-pot 8. Around the tube at a point corresponding to an enlargement of the tube 3 is secured an armature 2, which is within the field of force of a solenoid 1 and is actuated thereby. A metal bushing 9 surrounds the tube 4 above its lower end. This bushing tends to guide the tube and also to convey some current to it. The joint between the bushing and tube need not be air-tight, but is sufficiently close to prevent the passing of dust into the upper chamber. To an extension from the lower end of the tube 4 is linked a ring or other clutch 40, surrounding the carbon and resting on a bed or stop 46, fastened to a bracket 7, depending from the plate 13.

The negative carbon-holder 16 passes through the plates 13 and 101 and is insulated therefrom in any suitable manner.

Current passes into the lamp through the conductor 60, down to a sliding conducting-ring 61, thence through the resistance-wire 17, coiled on the outside of the tube 10, to the resisting-wire 11, embedded in the insulation 12, thence into the solenoid 1, and to the inner tube 3, from which it passes, by way of the bushing 9 and the clutches, to the positive carbon, thence to the negative carbon, and out of the lamp in a manner not necessary to show. The action of starting the arc and of feeding the upper carbon by means of movements conveyed to the tube 4 through the armature 2 and thence to the ring-clutch 40 is well understood and need not be further described.

The lower portion of the arc-inclosure 14, which is of transparent material, is made, as will be seen, with as small a heat-radiating surface as possible. Its upper edge abuts against the plate 13, the joint between the globe 14 and the plate 13 constituting the only place where air may possibly leak into the globe. As before stated, it is necessary for a little air to leak into the arc-inclosure, and the point here selected I have found best adapted for the purpose, especially when the inclosure is completely air-tight at all other points. I also provide an outer protecting and ornamental casing, which carries the outer globe at its lower end. This need not be further described than to say that brackets 70 are secured to the tube or casing 10, on which the sections of the outer casing 71 are mounted. A ring 72, carried by a canopy 73 and carrying screws 74, serves to hold the outer globe in place. The top of the outer globe, it will be noticed, is above the top of the inner inclosure 14. The hood 190 is held in place by the screw-plug 19.

I may now describe the current-feeding clutch devices which I employ. When the current is fed to the lower end of the carbon pencil through the feeding-clutch, it is plain that at the moment when the carbon is slipping through the clutch or when the clutch is moving with relation to the carbon preparatory to taking hold to strike the arc considerable arcing must result from this relative motion of the clutching-surface, which is at the same time a current-carrying surface, and the carbon. To obviate this difficulty, I employ a second current-carrying device so constructed as to have an immovable contact with the carbon at all times when the contacting surface of the feeding-clutch is moving with reference to the carbon.

To the plate 13, which is charged with current during the operation of the lamp, I secure a bracket 45, carrying a lever 43, to which is secured a link 42, on which is pivoted a current carrying or feeding plate 41. A stop 44 is carried by the tube 4 and acts upon the lever 43. The feed-plate 41 has an extension to the left, as shown, for the purpose of normally giving the plate a tilt and securing an instantaneous grip at the proper time. The operation of these devices is as follows: The armature 2 raises one end of the clutch 40 until it has firmly gripped the carbon. The stop 44 has also been raised during this time, but does not come in contact with the lever 43 until the ring-clutch 40 has obtained its grip. In consequence during this period current is conveyed to the carbon by the part 41, which has no movement relative to the carbon during this time, and therefore causes no arcing. The tube 4 is now drawn still farther up, striking the arc. The clutch 40 has a tight grip of the carbon, and therefore the plate 41 may now be moved with relation thereto without causing arcing. This is done by the stop 62. On account of the leverage the plate 41 is raised to a greater extent than the clutch 40. When, therefore, the arc grows too long, and the tube 4 falls, allowing the clutch 40 to be disengaged from the carbon by action of the clutch-plate 46 and the carbon to feed the current carrying a feeding plate 41, has a distance downward through which it may move without moving relatively to the carbon, to make up for the amount of carbon consumed—that is, for the amount of feed. Thus at all points of the carbon-feed arcing is prevented.

What I claim is—

1. An arc-inclosure having a light-transmitting portion and a heat-retaining portion of non-heat-conducting material or structure shaped to inclose the top of the upper electrode, substantially as described.

2. An arc-inclosure having a light-transmitting portion closed at the bottom and a heat-retaining portion closed substantially air-tight at the top and shaped to inclose the carbon pencil, the joint between these portions permitting the passage of a minute quantity of air, substantially as described.

3. An arc-inclosure having a light-transmitting portion, practically air-tight at the bottom and a heat-retaining portion of non-heat-conducting material closed at the top and shaped to inclose the top of the upper carbon pencil, substantially as described.

4. An arc-inclosure having a light-transmitting portion and a heat-retaining portion closed substantially air-tight at the top and shaped to inclose the carbon pencil, and means for permitting the ingress of a minute quantity of air located between the top and bottom of the inclosure, substantially as described.

5. An arc-inclosure having a light-transmitting portion, and a heat-retaining portion of non-heat-conducting material, shaped to inclose the top of a carbon-carrying tube moving therein, substantially as described.

6. An arc-inclosure having a light-transmitting portion, and a heat-retaining portion closed air-tight at the top and consisting of a tube and a coating of non-heat-conducting material, substantially as described.

7. An arc-inclosure having a light-transmitting portion and a heat-retaining portion consisting of a cylinder of non-heat-conducting material, a dash-pot at the top thereof, a carbon-carrying tube therein and a carbon-feeding device carried by the tube, substantially as described.

8. An arc-inclosure composed of a light-transmitting portion and a heat-retaining portion having a current-carrying resistance-wire, substantially as described.

9. An arc-inclosure having a light-transmitting portion and a heat-retaining portion of non-heat-conducting material having a resistance-wire embedded therein, substantially as described.

10. An arc-inclosure having a heat-retaining portion closed substantially air-tight at the top and ending in a base-plate and a light-transmitting portion closed substantially air-tight at the bottom and abutting against the base-plate to make a leak-joint, substantially as described.

11. An arc-inclosure having a light-transmitting portion and a heat-retaining portion of non-heat-conducting structure or material shaped to include a carbon-carrying tube, said tube, and a carbon-feeding device carried by the tube and actuated by a coil outside the inclosure, substantially as described.

12. An arc-inclosure consisting of a cylinder of non-heat-conducting material, a solenoid surrounding the cylinder, a carbon-carrying tube moving within the cylinder, an armature and feeding devices on the tube and a light-transmitting inclosure for the arc, substantially as described.

13. An arc-inclosure composed of a substantially cylindrical metal tube closed air-tight at the top and a coating of non-heat-conducting material surrounding the tube in a manner to offer no substantial path for the conduction of heat from the inside to the outside of the inclosure.

14. An arc-inclosure consisting of a light-transmitting portion with a small heat-radiating surface, and a heat-retaining portion of non-heat-conducting structure or material shaped to inclose the top of the carbon pencil and to prevent the passage of heat from the inside both by conduction and radiation, substantially as described.

15. An arc-inclosure consisting of a light-transmitting portion and a heat-retaining portion composed of two substantially disconnected tubes and a layer of non-heat-conducting material between them, substantially as described.

16. The combination of a carbon-feeding device, a current-carrying device and intermediate mechanism arranged to maintain an immovable relative contact of the current-carrying device with the carbon when the feeding device is changing its hold, substantially as described.

17. The combination of a carbon-feeding device, a current-carrying device and mechanism arranged to give an immovable relative contact between the current-carrying device and the carbon when the feeding device is preparing to strike the arc, substantially as described.

18. The combination of a carbon-feeding device, a movable current-carrying device and a stop timed to change the point of contact of the same with the carbon after the feeding device has taken its grip, substantially as described.

19. The combination of a carbon-feeding device, a movable current-carrying device and motion-multiplying mechanism causing a contact of the same with the carbon at a point sufficiently high to make up for the motion of the feed, substantially as described.

20. The combination of a clutch, a current-feeding device mounted from a lever and a stop moving with the clutch and timed to act on the lever after the clutch has gripped, substantially as described.

21. The combination of the electrodes of an electric-arc lamp and an arc-inclosing envelop therefor, said envelop being made in two readily-separable parts air-tight except for the joint between the parts, the upper part shaped to inclose the electrode, the joint between said parts being located between the top and bottom of said envelop, said joint adapted to allow the admission of a limited amount of air to the interior of the envelop, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHRISTIAN J. TOERRING.

Witnesses:
HELENE KUNZE,
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