

No. 769,637.

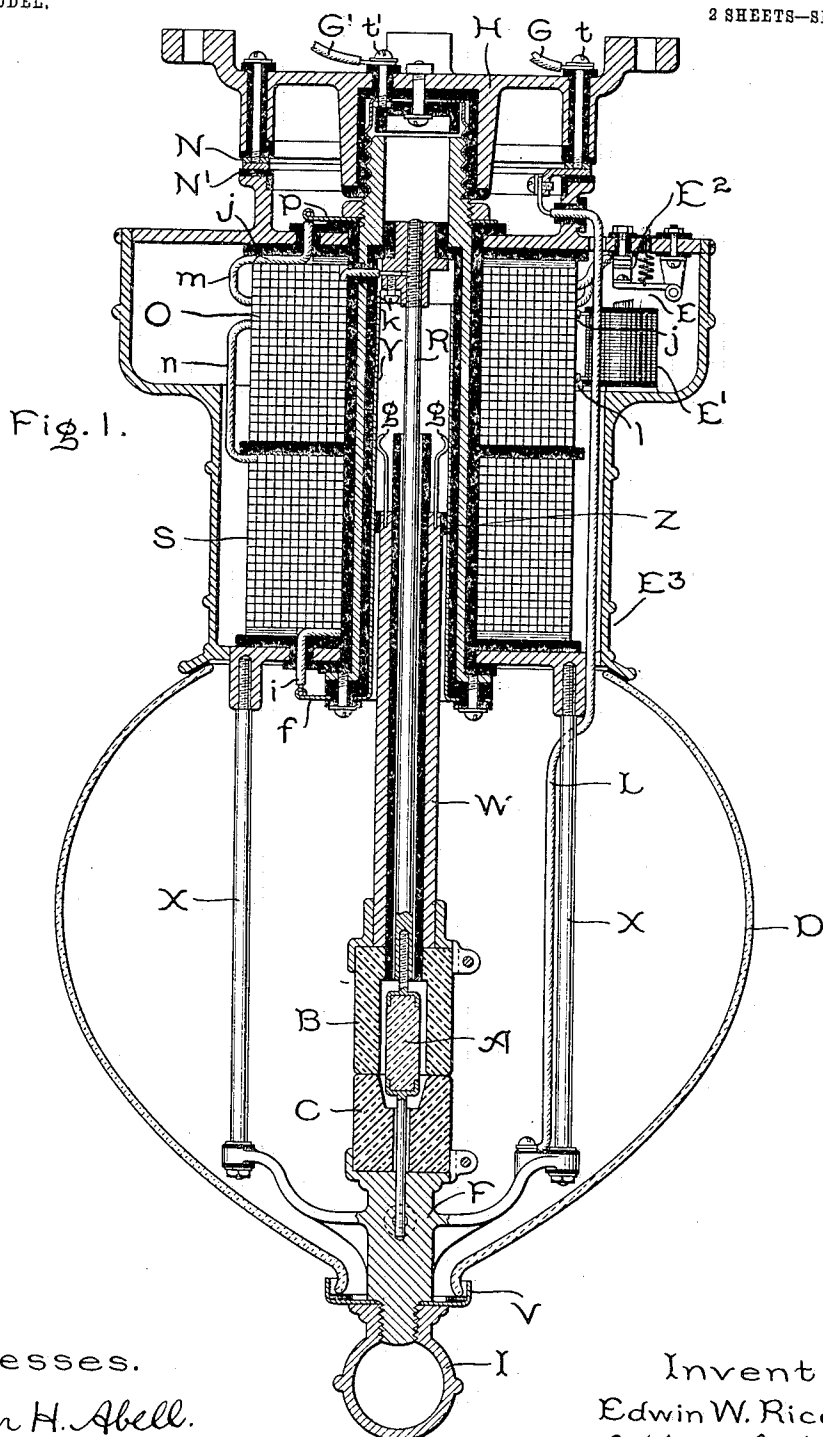
PATENTED SEPT. 6, 1904.

E. W. RICE, JR.
ELECTRIC LAMP.

APPLICATION FILED JULY 8, 1899.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses.

Arthur H. Abell.
Edward Williams, Jr.

Inventor.

Edwin W. Rice, Jr.,

by *Albert S. Davis*
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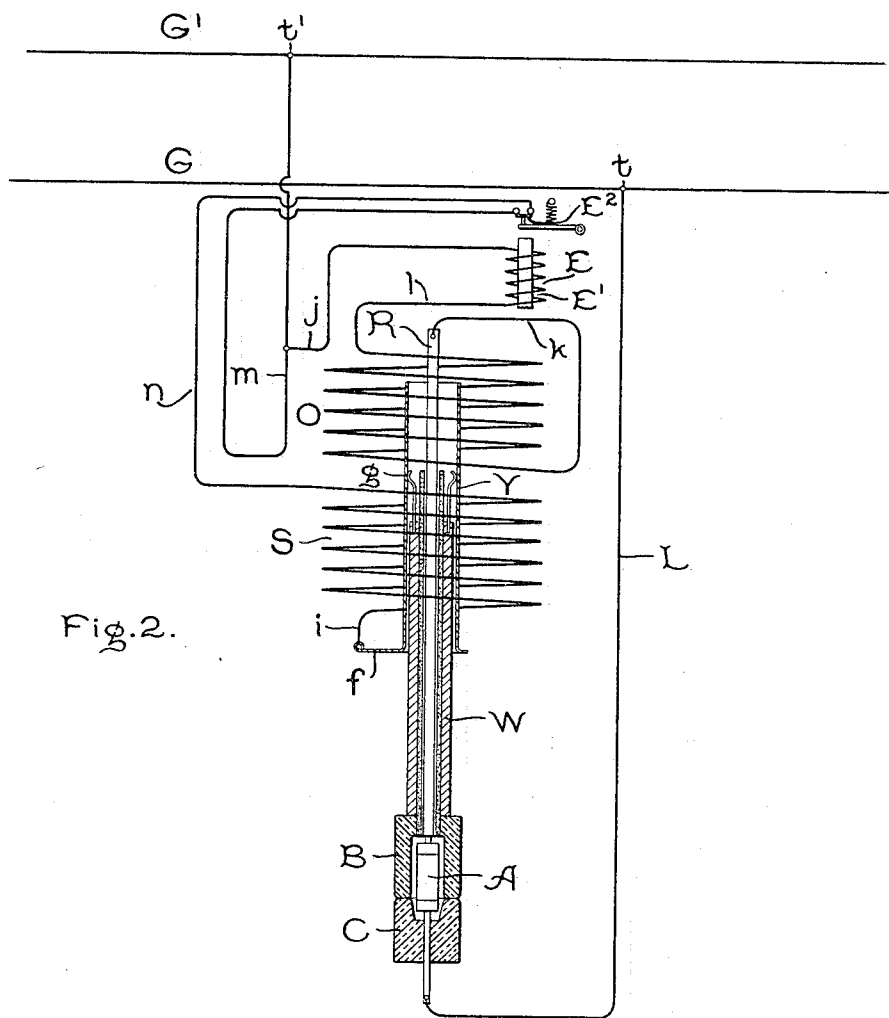


Fig. 2.

Witnesses.

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UNITED STATES PATENT OFFICE.

EDWIN W. RICE, JR., OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE
GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 769,637, dated September 6, 1904.

Application filed July 8, 1899. Serial No. 723,151. (No model.)

To all whom it may concern:

Be it known that I, EDWIN W. RICE, JR., a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification.

This invention relates to that class of electric lamps in which the luminous media are non-conductors at ordinary temperatures, but become conductive at high temperatures, and which therefore it is first necessary to raise by external means to the requisite temperature for diminishing the resistance sufficiently to permit the working current to pass through or across the same. Such media include all suitable solids or fluids in any state.

The invention consists in providing lamps of this class with means for first heating such a light-giving medium, hereinafter called a "pyro-electrolyte," and means, the operation of which is dependent upon the condition of the electrolyte, for automatically controlling the heating means.

The invention consists, further, in other features to be hereinafter described and claimed.

The structure herein shown to illustrate the invention consists of the pyro-electrolyte adapted to form part of an electric circuit, of contact-points adapted to cause the formation of an arc in proximity to the electrolyte, and suitable connections and solenoid-coils adapted to rupture the arc automatically and dependent for their operation upon the condition of the electrolyte.

The operation of a lamp of this class, which embodies the essential elements of my invention, can be readily understood by reference to the accompanying drawings, Figure 1 of which is a sectional view of one form of a lamp in which many changes may be made without departing beyond the scope of my invention. Fig. 2 is a diagram of the electrical circuits and coils, including a section of the operating parts.

The line-wires G and G' are connected to the terminals *t* and *t'*, and current will flow through the conductor L to conducting-frame F and thence to the contact-points C and B,

which inclose the electrolyte A, which is now a non-conductor. As these contacts are in contact before the lamp is lighted, the current will flow up through B and will continue upward through the conducting-support W, through the contact-springs *g* carried thereby, thence to the conducting-cylinder Y, through conducting-plate *f*, to wire *i*, thence through the starting-coil S, and then by the wire *n* to the circuit-breaker E, wire *m*, and terminal *t'* to complete the circuit. The starting-coil S being thus energized will cause its core or contact-support W to be drawn up farther with a dash-pot action within the cylindrical conductor Y, which is separated from the coil S by the insulation Z, and thus an arc will be formed between the contacts B and C. The circuit-breaker E has its coil E' in the electrolyte-circuit and its spring-contact E² in the arc-circuit, and it may readily be adapted to be also operated manually. The arc thus formed will heat the pyro-electrolyte A, causing it to become a conductor, and the following circuit through it will be established: from the terminal *t*, through L and F, electrolyte A, its support R, wire *k*, coil O, wire *l*, through the coil of the circuit-breaker, wire *j*, and terminal *t'*. The coil O will now assume the office of maintaining the core W and its contact B in their elevated position, the coil S being deenergized after the circuit-breaker E, actuated by a predetermined current through the electrolyte, has opened the arc-circuit. The coil O may also be adapted to raise the core W sufficiently high within it to elongate and rupture the arc before the circuit-breaker is actuated. Should the electrolyte-circuit be broken, the circuit-breaker coil and the coil O will be deenergized, the contact B will engage with the contact C, the arc-circuit be closed through the spring-contact E², and the arc be once more established and maintained until the electrolyte-circuit may become operative.

As shown in Fig. 1, H is the lamp-holder, to which the line-wires are connected at the terminals *t* and *t'*, shown as screws, securing a circular contact-plate N. The holder has also a screw-threaded recess adapted to

receive a correspondingly-threaded projection of the lamp. The lamp is also provided with a circular contact-plate N', adapted to engage with the plate N when the lamp is screwed into the holder. The lamp-wires are connected with the plate N' in any suitable manner. The collar Z is mounted on the upper part of the support W in order to provide a small friction-surface and to serve as a piston for the dash-pot action instead of the entire surface of the support, and this collar may be made of any suitable material other than the insulating fiber shown.

The upper part of the lamp may be protected by a suitable cover E³, having supports X for the frame F, to which they are secured and from which they are properly insulated. A glass globe D, open at both ends, is held up against the cover E³ by a support V, held in place adjoining the frame F by a nut I, screwed upon a depending portion of the frame. I do not limit myself to an inclosed lamp, however, as for some substances it is better that the light-giving body be not inclosed.

No substantial departure from the invention need be made in applying the same to a lamp which has other than a solid pyro-electrolyte, but one which, nevertheless, it is necessary to heat before the electric current will pass through it. The character of the terminals of the circuit leading to such a medium, the distance between them, and the magnitude of the medium are independent of the invention, and the same may be adapted to any electric lamp which essentially is started by the application of heat.

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

1. The combination in an electric lamp, with a pyro-electrolyte adapted to form part of an electric circuit, of means for establishing a voltaic arc in proximity to said electrolyte when the latter is non-conducting, means for automatically opening the arc-circuit at a point other than the arc when the pyro-electrolyte shall have become conducting, and means for preventing the formation of an arc while the pyro-electrolyte is taking current.
2. The combination in an electric lamp, with a pyro-electrolyte, electrical connections therefor, arcing points in proximity to said electrolyte, electrical connections therefor, means for separating said arcing points, and means for opening the arc-circuit at a point other than the arc.
3. The combination in an electric lamp, with a pyro-electrolyte, electrical connections therefor, arcing points in proximity to said electrolyte, electrical connections therefor, means for separating said arcing points, and means whereby a predetermined current in the pyro-electrolyte will open the arc-circuit at a point other than the arc.
4. The combination with a pyro-electrolyte

adapted to be connected in an electric circuit, of arcing points between which an arc is to be established in proximity to the pyro-electrolyte for heating the same, a coil in series with the arcing points and adapted to separate said points, to establish an arc, and a second coil adapted to maintain the points in their separated position.

5. The combination in an electric lamp, with a pyro-electrolyte adapted to form part of an electric circuit, of means for establishing a voltaic arc in proximity to said electrolyte, a circuit-breaker dependent for its operation upon the condition of the electrolyte, for breaking the arc-circuit at a point other than the arc when the pyro-electrolyte shall have become conducting, and a magnet-coil for preventing the formation of an arc while current is flowing through the pyro-electrolyte.

6. In an electric lamp, the combination of a pyro-electrolyte adapted to be connected in an electric circuit, electrodes for establishing a voltaic arc in the vicinity of said pyro-electrolyte, and means dependent upon current in said pyro-electrolyte for holding said electrodes separated.

7. The combination in an electric lamp, with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing electrodes in proximity to said pyro-electrolyte for heating the same to conductance, a coil for drawing an arc between said electrodes, a coil in series with the pyro-electrolyte, and means whereby the completion of the circuit through the latter by the heated electrolyte will rupture the arc.

8. The combination in an electric lamp, with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing points in proximity thereto, means for separating said points to form an arc, and a coil in the circuit closed by the heated electrolyte adapted to further separate said contact-points thus rupturing the arc.

9. The combination in an electric lamp, with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing points in proximity thereto, means for separating said points to form an arc, and a coil in the circuit closed by the heated electrolyte adapted to open the circuit through the arc at a point other than the arc.

10. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing electrodes adapted to have established between them a voltaic arc to inclose said electrolyte, separate circuits for said pyro-electrolyte and said electrodes, and a series coil for drawing the arc in the circuit of said pyro-electrolyte.

11. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing electrodes adapted to have established between them a voltaic arc to inclose said electrolyte, a series coil for starting the arc, a circuit-breaker for the arc-circuit and

connected in the circuit of the electrolyte, and a coil in the pyro-electrolyte circuit for holding the arcing electrodes separated.

12. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, and a heater therefor, one inclosed by the other, each forming a part of one of two separate electric circuits, the heater consisting of arcing electrodes, a coil in series with the electrodes for drawing the arc, and means for automatically opening the circuit of the arc when the electrolyte has become conductive by heating.

13. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing points in proximity thereto for heating the pyro-electrolyte to conductance, a movable support carrying one arcing point, a fixed support carrying the other arcing point and to which said pyro-electrolyte is secured, and a magnet-coil adapted to control said movable support.

14. The combination with a pyro-electrolyte adapted to be connected in an electric circuit and mounted in a stationary conducting-support of an arcing contact mounted in said support, a second contact mounted in a movable conducting-support, and a series coil for automatically moving said movable support to start the heating-arc.

15. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, of a stationary arcing electrode, a movable arcing electrode, a coil in series with said electrodes for moving one of them to draw an arc for heating the pyro-electrolyte to conductance, and a coil in series with said pyro-electrolyte for automatically moving said electrode to extinguish the arc.

16. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing points for heating the same to conductance and connected in parallel therewith, a coil in series with the arcing points for starting an arc, and a coil in series with the electrolyte.

17. The combination with a pyro-electrolyte adapted to form part of an electric circuit, of means for establishing an arc in proximity to said electrolyte, a circuit-breaker adapted to be actuated to open the arc-circuit by current flowing in the electrolyte-circuit, and a coil in series with the electrolyte for preventing the formation of an arc after the arc-circuit is opened.

18. The combination with a fixed pyro-electrolytic illuminant adapted to be connected in an electric circuit, of arcing points which inclose said illuminant and are adapted to bring the same to conductance, a movable conducting-support for one of said points, a collar mounted on the upper portion thereof, a hollow conductor adapted to receive said support, said collar being adapted to fit the interior of said conductor, and a spring-contact

carried by said support and adapted to have contact with the interior of said hollow conductor.

19. The combination with a fixed pyro-electrolytic illuminant adapted to be connected in an electric circuit, of arcing points inclosing said illuminant and adapted to bring the same to conductivity, a movable contact-support for one of said points, a collar mounted on the upper portion thereof, a hollow conductor adapted to receive said support, said collar being adapted to fit the interior of said hollow conductor, means for electrically connecting said support and conductor, and a series coil for moving said support to separate said points and start the arc.

20. The combination with a pyro-electrolyte adapted to be connected in an electric circuit, of a stationary conducting-support therefor, arcing points in proximity to said electrolyte for heating the same to conductance, a movable support for one arcing point, which support incloses a support of the electrolyte, and means for automatically moving the movable support so as to maintain electrical connection with the moving arcing point and slowly enough to draw an arc.

21. The combination with a conducting-frame, an arcing contact and a pyro-electrolyte mounted thereon and adapted to be connected in an electric circuit, a second arcing contact, the arcing contacts being adapted to heat the pyro-electrolyte to conductance, a movable support for the second arcing contact, and circuit connections for said electrolyte and for said movable support.

22. The combination in an electric lamp, with a pyro-electrolyte adapted to be connected in an electric circuit, of arcing contacts adapted to inclose the pyro-electrolyte when the lamp is not in operation, and to be moved to disclose said electrolyte when the current is turned on, a coil adapted to move one contact to establish an arc to inclose the pyro-electrolyte to heat the same to conductance and to move that contact so that the pyro-electrolyte is disclosed, and a second coil adapted to extinguish the arc automatically when the electrolyte is sufficiently heated.

23. The combination with an electric circuit having a pyro-electrolyte connected therein, of a parallel circuit including arcing points which are in proximity to said electrolyte, means for moving one of said points to draw an arc for heating the pyro-electrolyte, a circuit-breaker for the arcing circuit, which is operated by current flowing in the circuit of the electrolyte, and means for holding the arcing points apart after the arc-circuit has been opened, and while current is flowing through the pyro-electrolyte.

24. The combination with a pyro-electrolytic illuminant, of arcing points arranged to initially heat the same, and a magnet-coil in series with the illuminant which separates

the arcing points to stop the arcing while current flows through the illuminant.

25. The combination with a pyro-electrolytic illuminant adapted to be connected in an electric circuit, of a heater therefor, one enclosed by the other, the heater consisting of arcing electrodes which are adapted to be connected in an electric circuit, a coil in series with the electrodes for drawing an arc to heat the illuminant, and a coil in series with the illuminant for opening the circuit of the arc when the illuminant has become conductive.

26. The combination in an electric lamp, with a pyro-electrolyte adapted to be connected in an electric circuit, of means for establishing an arc to heat the electrolyte, and for maintaining the arc until the electrolyte shall have become conducting, and means actuated by current flowing in the electrolyte, for extinguishing the arc.

27. In an electric-lighting apparatus, the combination of electrodes between which may be established an arc, a body of high refractory material in close proximity thereto which is brought to a high temperature by the heat of the arc-circuit, connections by which said refractory body after heating is supplied with current, and means for widely separating the electrodes after the refractory material has been sufficiently heated to carry a current so as to remove the said electrodes from the light-giving area of the incandescent refractory body so as to permit it to give free illumination.

In witness whereof I have hereunto set my hand this 6th day of July, 1899.

EDWIN W. RICE, JR.

Witnesses:

BENJAMIN B. HULL,
MABEL E. JACOBSON.