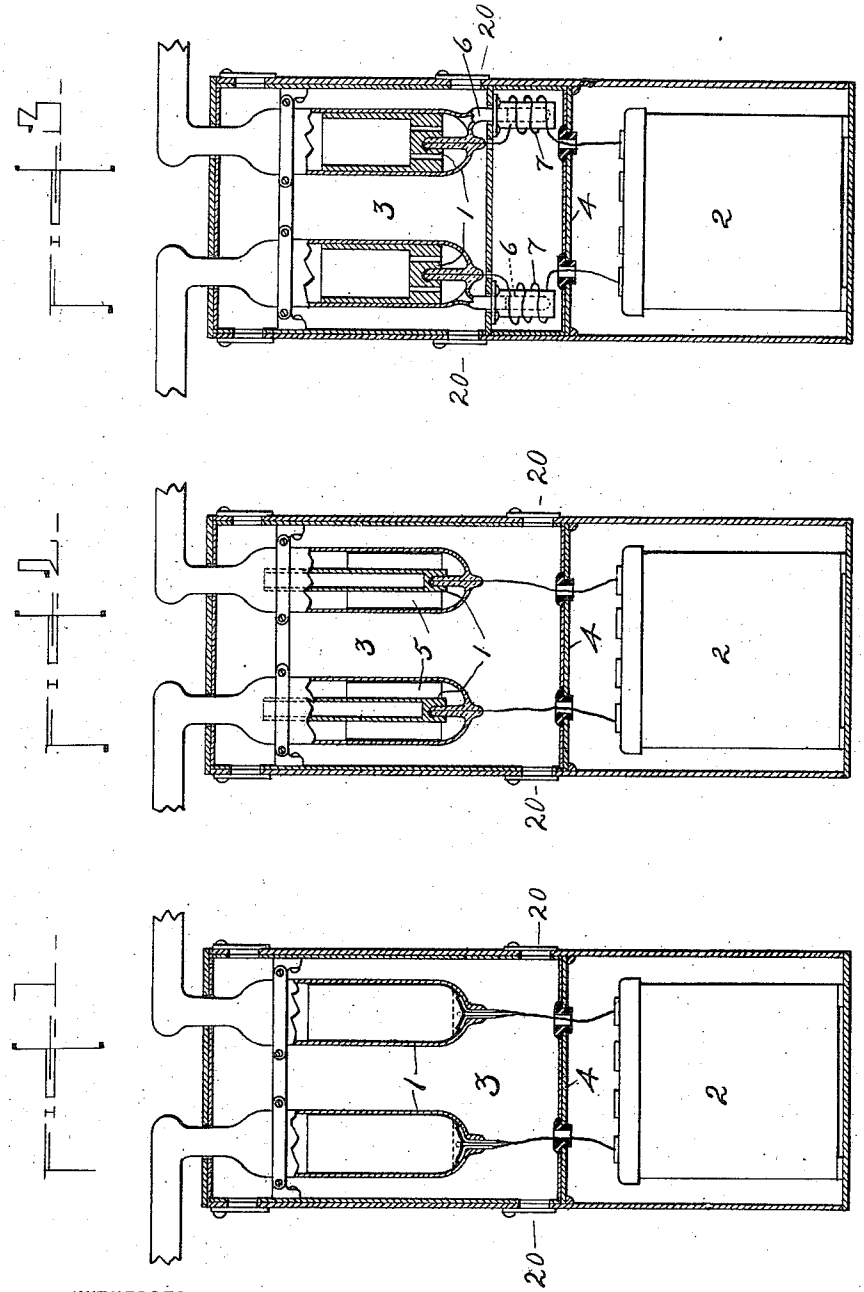
D. McF. MOORE.

VACUUM TUBE LAMP.

APPLICATION FILED NOV. 26, 1904.

986,304. **Patented Mar. 7, 1911.**



WITNESSES:

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DANIEL McFARLAN MOORE, OF NEWARK, NEW JERSEY, ASSIGNOR TO MOORE ELECTRICAL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VACUUM-TUBE LAMP.

986,304. Specification of Letters Patent. Patented Mar. 7, 1911.

Application filed November 26, 1904. Serial No. 234,340.

To all whom it may concern:

Be it known that I, DANIEL McFARLAN MOORE, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, with post-office address 52 Lawrence street, have invented certain new and useful Improvements in Vacuum-Tube Lamps, of which the following is a specification.

My present invention relates to that class of devices employed for lighting and other purposes, and comprising essentially a sealed receptacle containing a rarefied air or other gas through which electric energy is passed for the purpose of rendering the contents of the receptacle luminous, or for other purposes.

My invention, while principally intended for use in connection with vacuum tube lamps having internal electrodes, may also be used with those forms in which the energy is electrostatically transferred to the contents through exterior conducting caps or electrodes.

In some of my prior applications for patents I have described the use of some organic substance in the tube which will furnish the source of a gas of suitable nature for rendering the tube luminous or will be the agent in a catalytic operation by which the gases decomposed by the action of the electric current will be reconverted into a gas of suitable nature for use in the lamp.

My present invention relates to a method and means for causing the organic substance to evolve the required gas or gases, or, in other words, for it to act in the required manner, and consists briefly stated in heating the exterior of the tube by suitable regulable means, the source of heat being either the conserved heat of the tube itself or some independent source.

By the improved method forming the subject of my present application the chemical in the tube may be brought to a higher degree of temperature as its quality is impaired through use and the evolution of gas and the action of such material thus be made uniform at different stages of the life of the lamp thus securing uniform action and constant life.

In describing my invention I will assume that the same is applied to an internal electrode lamp such as shown in my prior Patent, No. 749,998, and that the organic substance or other gas evolving or converting substance is embodied in the lamp in the shape of a coating as in said patent but as a part of a mixture of conducting material and chemical as in my application for patent filed of even date herewith. In that application one of the chemicals described is rosolic acid and is mixed with graphite but it will be understood that my invention is useful in other cases.

In the accompanying drawings Figure 1 shows in vertical section a piece of apparatus by which my invention may be practiced. Figs. 2 and 3 illustrate modifications.

The terminals of the tube are indicated at 1, while 2 indicates a transformer supplying energy thereto. The terminals are inclosed in a suitable casing or heat preserving envelop 3, which may be made by interposing a diaphragm 4 in the protection casing of my Patent No. 702315 between the transformer and the tube ends. Said casing is provided with suitable lining forming a non conductor of heat so that the heat from the terminals of the lamp while in use may be conserved and accumulated around the same for use in bringing up the temperature of the contents of all that portion of the tube surrounding the electrode proper.

At the top and bottom of the inclosure are suitable openings and dampers or regulators 20 which may be opened to create a draft and carry away the heat or be closed to permit the heat to accumulate and bring up the temperature. In use the lamp is started and run with such dampers open and hence, the terminals and contents are at the minimum temperature and it may be run at such temperature for some time but finally, as the contained chemical deteriorates, or its outer layers become inactive, the lamp will flicker out. This may be prevented, however, by raising the temperature of the chemical which may be readily done by regulating the dampers and in this manner a tube, which, if run continuously in the open air would last but several hours, may be made to run for several hundred hours.

Another modification of the method of applying this invention is shown in Fig. 2, in which the chemical placed within the tube for the purpose of furnishing the gaseous conductor is not a part of the coating, or electrode proper, as shown in Fig. 1,

but is placed upon the walls of the tube in a position entirely insulated and isolated from the electrode proper, which in this case consists of a pencil of graphite supported upon the glass stud containing the leading-in wires. The chemical as shown is placed opposite the rear portion of the electrode purposely because a good light giving tube consists essentially of a thoroughly ionized gas, and when the gaseous vapors are given off by the chemical coating or powder (5) they receive their first and principal ionization while passing through the annular space around the electrode.

Another method of practicing this invention is shown in Fig. 3, wherein the chemical is shown in a tube (6) extending from the main electrode tube and heated by means of an electric heater in the form of a hollow cylinder to which is applied an electric heating coil. Main electrode (1) has its bottom perforated so that when the vapors pass from the chemical it is necessary for all of them to pass through the electrode and then be ionized before entering the light column proper. A further advantage is gained in that the portion of the main tube covering the electrodes proper (1—1) can be kept cool, comparatively speaking, that is, its temperature can remain constant. The natural tendency of most heretofore properly constructed internal electrode tubes has been to have the vacuum gradually get higher, that is, less pressure within the vacuum and, assuming constant voltage, its total watts gradually increase until a certain maximum is reached, which is generally coincident with the maximum efficiency for the given gas, shortly after which the tube refuses to take any watts at all. This difficulty is shown overcome in Fig. 3, by placing the heater or heating coil (7) in series with the tube circuit so that as the watts naturally tend to increase the heat will also increase, thereby furnishing more gases or vapors, preventing the vacuum from getting too high or may be simply heating the chemical until it is in a proper condition to reunite with the gases that have once been ionized and then neutralized by collision.

The device termed "rheostat" herein shown is simply a heating coil which, as shown, is placed in the direct working circuit of the tube and so that when the vacuum rises, thereby lowering the resistance between the electrodes and thus causing more energy to flow on the working circuit, the said heating coil will carry more energy and will heat the chemical so that more gas will be furnished to the tube and the vacuum will fall, thereby increasing the resistance and producing less action of the heater. The heater coil, therefore, operates, as will be seen, as a means for regulating the action of the means employed for furnishing the gas to the tube. This combination of devices is also shown in my application filed of even date herewith No. 234,339, but is claimed herein. This part of my invention is not limited to any particular regulating device for causing the flow of energy in a direct working circuit of the tube to operate upon the means for furnishing the gas and in such manner that more gas will be furnished when the resistance of the tube is lowered and more energy thereby flow in the regulating device, as the gist of this part of my invention consists in using some device in the direct working circuit which will respond to or be operated by the flow of current thereon and will act in the proper way to cause additional gas to be furnished to the tube when more current flows through said regulating device and through the space between the main electrodes of the tube.

What I claim as my invention is:

1. An internal electrode vacuum tube containing a gas evolving organic substance and provided with a heat conserving envelop.

2. An internal electrode vacuum tube containing a gas evolving organic substance and provided with a heat conserving envelop and means for regulating the heat.

3. An internal electrode vacuum tube having its terminals only incased and means for regulating the flow of air around the terminals.

4. A vacuum tube containing a gas evolving organic substance combined with a heating envelop surrounding the terminals and means for regulating the internal temperature of the envelop.

Signed at New York in the county of New York and State of New York this 23d day of November A. D. 1904.

DANIEL McFARLAN MOORE.

Witnesses:

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