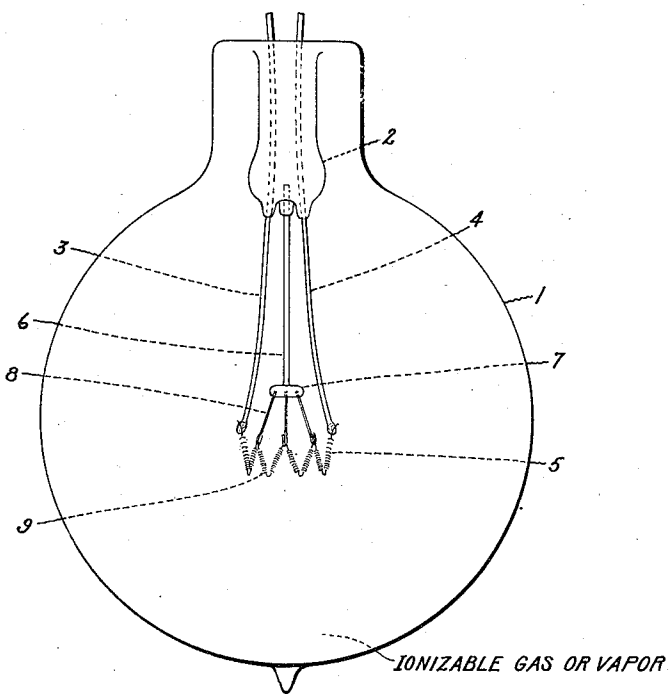
Oct. 12 , 1926. 1,603,087

G. M. J. MACKAY

ELECTRIC DISCHARGE DEVICE

Filed Oct. 1, 1920

Fig. 1.



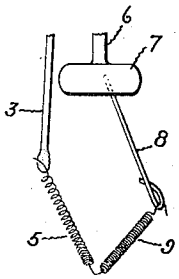


Fig. 2.

Inventor:
George M.J. Mackay,
by Albert G. Davis
His Attorney.

Patented Oct. 12, 1926. 1,603,087

UNITED STATES PATENT OFFICE.

GEORGE M. J. MACKAY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC DISCHARGE DEVICE.

Application filed October 1, 1920. Serial No. 414,099.

The present invention relates to electric devices and particularly to lamps provided with a conductor operating at incandescence and so arranged that an electric discharge passes between sections of the electric conductor. Such a lamp is described in my prior application Serial No. 354,195, filed Jan. 26, 1920.

It has been found that in the operation of a lamp of this type with direct current, a wasting away occurs at the cathode end of the filament. I have found that this loss of metal is not due to cathodic sputtering, but appears to be due to excessively high temperature of the cathode end. This section of the filament carries what may be termed two electric currents, namely, a current passing through the filament and a current passing from one section of the filament to another, as will be hereinafter more fully explained. When the filament is heated by alternating current, both terminals tend to waste away as they alternately act as cathode.

In accordance with my present invention, I have provided a device in which the filament is arranged to carry both an electron or discharge current and a resistance heating current without local disintegration.

In the accompanying drawing, Fig. 1 illustrates a lamp embodying my invention; and Fig. 2 is a detail view of one section of the filament shown in Fig. 1.

The lamp shown in Fig. 1 consists of a sealed bulb 1 into the stem 2 of which are sealed the current supply conductors 3, 4. A spiral filament 5 is conductively joined at its end to the conductors 3, 4. A support 6 embedded in the stem 2 bears at its extremity a button 7 into which are sealed hooks 8 serving as intermediate support for the filament 5. The bulb contains an ionizable vapor, for example, a quantity of alkali metal such as sodium, or a suitable gas, for example, neon at a pressure of about ten microns, which is too low to carry away heat to an appreciable extent. My invention is not limited in application to a device in which a gas or vapor takes part in the conduction of current. The benefits of my invention may be obtained in a device in which an electron discharge occurs between parts of a conductor independently of gas ionization.

The filament 5, which has a substantially uniform cross section, consists of a plurality of sections arranged in zigzag form. As will appear more clearly in Fig. 2, the spiral is opened adjacent the terminals, the pitch of the spiral gradually decreasing from a nearly straight section adjacent the lead 3 to a closely wound spiral adjacent the short link 9 connecting adjacent sections of the filament.

At the operating temperature, say, at 2200° C. a current passes through the gaseous filling in the bulb between parts of the filament having sufficient difference of potential to produce a discharge resulting in luminosity.

During one current wave the current passes from the negative end of the filament, say, the end adjacent the lead wire 3 to the more positive portions of the filament as well as the lead wire 4. The parts most remote from the negative end receive the greatest part of the discharge current due to the greater potential difference. In other words the discharge passes from a given surface at the cathode end of the filament to other more positive parts in proportion to their potential difference. In the case of the alternating current device illustrated this action is reversed each half wave. In consequence the outermost filament sections carry more current and operate at a higher temperature than the intermediate part of the filament. As the current through the gas gradually decreases to points more remote from the leads, only the heating current passes through the intermediate parts of the filament. By a proper adjustment of pitch as described, the filament will operate at a uniform temperature, the greater heating near the terminals being offset by a greater heat dissipating capacity. Therefore, as a result of my invention, the length of life of the device is increased.

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

1. An electric device comprising an envelope, a material therein having at the operating temperature of said device a gaseous pressure sufficiently high to be capable of carrying an appreciable current by ionization but too low to convey heat to a substantial degree, and a filamentary conductor operating at incandescence mounted in said envelope, and current-conveying terminals therefor, said conductor having a substan-

tially uniform cross-section and being arranged to have a greater heat dissipating capacity adjacent the negative terminal than at an intermediate portion.

2. The combination of an enclosed envelope, a quantity of sodium therein, a conductor operating at incandescence in said envelope, said conductor having in part at least the form of a spiral with a pitch progressively decreasing from the negative terminal towards a more positive part of the same.

3. An electric lamp comprising an envelope, a quantity of material therein having at the operating temperature of the lamp a pressure of the order of magnitude of about ten microns of mercury, a coiled conductor therein which is capable of operating at incandescence, and electric terminal conductors therefor, the coils of said conductor adjacent the negative terminal being spaced farther apart to cause the heat dissipating capacity of said coils to be greater than an adjoining portion of said conductor.

In witness whereof, I have hereunto set my hand this 30th day of September, 1920.

GEORGE M. J. MACKAY.