July 28, 1925. 1,547,180

T. J. MURPHY

ELECTRIC LAMP

Filed June 7, 1920

FIG-1-

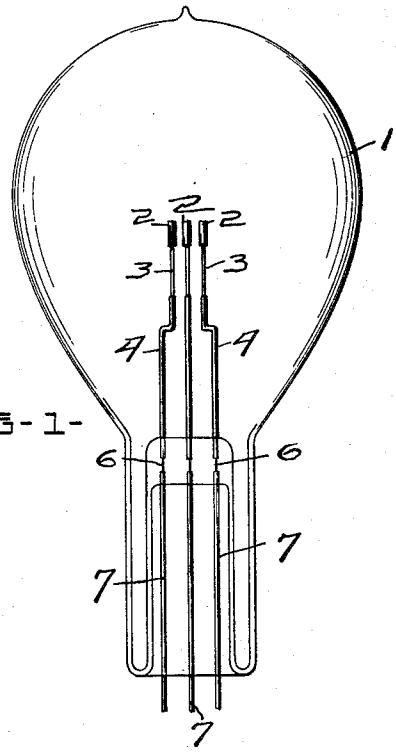


FIG-2-

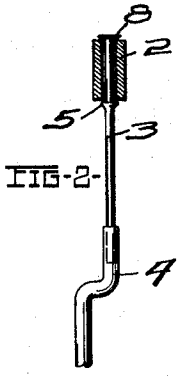
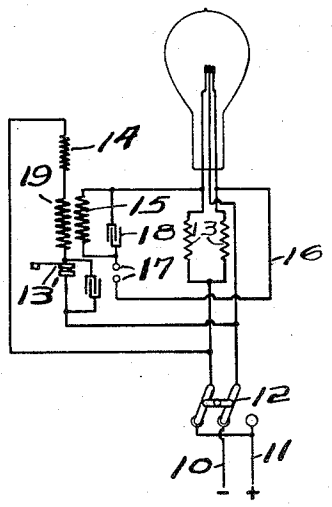


FIG-3-



INVENTOR

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by

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UNITED STATES PATENT OFFICE.

THOMAS J. MURPHY, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO JAMES P. B. DUFFY, OF ROCHESTER, NEW YORK.

ELECTRIC LAMP.

Application filed June 7, 1920. Serial No. 386,959.

To all whom it may concern:

Be it known that I, THOMAS J. MURPHY, a subject to the King of Great Britain, and a resident of New York, in the county of New York and State of New York, have made an Invention Appertaining to Electric Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention has for its object to provide a tri-electrode enclosed arc lamp. It particularly has for its object to provide a lamp having tungsten electrodes which are mounted in juxtaposition to produce efficient arcs between two of the electrodes and one of the electrodes. It also has for its object to prevent dissipation of the heat through the means supporting the electrodes and consequently to greatly increase the lighting efficiency of the lamp. The invention has for its object other advantages and features that will appear from the following description and from the drawings.

The invention may be contained in electrode lamps of different forms. To illustrate a practical application of the invention I have shown a tri-electrode tungsten lamp. The tungsten lamp selected is illustrated in the accompanying drawing.

Figure 1 of the drawing illustrates a side view of the lamp. Fig. 2 illustrates a larger view to show the manner in which the electrodes are supported. Fig. 3 illustrates diagrammatically a system to which the lamp is connected.

1 is the glass bulb of the lamp of the form well known in the art. The glass bulb may be mounted or secured in a suitable sleeve for connecting it in a lighting circuit. The bulb is preferably filled with an inert gas such as argon or nitrogen.

The tungsten electrodes 2 are supported within the bulb 1 in proximity to each other. They are formed preferably in the form of small cylinders or sleeves and are located on tungsten wires 3 which are supported in nickel tubular members 4. The wires 3 may be formed with a shoulder 5 and when the sleeves 2 are placed over the wires 3, the ends of the wires 3 may be headed as at 8 to prevent the tungsten sleeves 2 from slipping off the wires 3. The sleeves 2 are loosely mounted on the wires 3 so that they can be easily rotated around the wires 3. This loose connection prevents a dissipation of the heat by conduction through the wires 3 and the tubular members 4. Also the connection of the wires 3 with the tubular members 4 prevents in a great measure conduction of the heat as between the wires 3 and the tubular members 4. Each tubular member 4 being made in the form of a tube has a small cross sectional area of metal compared to its strength and consequently conduction of heat is decreased. The tubular members 4 are connected with suitable wires 6, having a coefficient of expansion substantially the same as that of the glass, in the manner well known in the art. The wires 6 are connected to the wires 7 that make connection with the parts of the sleeve of the lamp.

The electrodes 2 are located in a row and their axes extend preferably parallel to the axis of the bulb of the lamp. The middle electrode is connected to one side of the source of current supply while the end electrodes are connected to the other side of the source of current supply. In starting, the middle electrode is connected with the negative side of the circuit where the lamp is connected to a source of direct current and the end electrodes are connected to the positive side of the source of direct current supply. It has been found that arcs may then be easily formed between the end electrodes and the center electrode. The current, during the starting of the lamp, is very small in quantity, but by making the central electrode negative the heating effect of the arc on the negative electrode will be greatly increased. Before the arcs will maintain themselves the negative electrode must be brought to approximately 2800° Fahr. By forming the double arcs to this electrode, this can be readily done with the small amount of superimposed vibratory high tension current. Once the arcs are established the current may be reversed and so as to connect the center electrode with the positive side of the source of direct current supply and the end electrodes with the negative side and thereby increase the source of light in the center electrode. This will concentrate the major portion of the light in one electrode, namely, the center electrode, which will be

exceedingly advantageous when the lamp is used in picture projecting apparatus since the light will originate substantially at the single point and thus produce better focusing results on the screens.

In Figure 3 is shown diagrammatically a system for operating the lamp. The main supply wires 10 and 11 connect through a reversing switch and through the resistance coils 13 with the electrodes of the lamp. The arcs between the electrodes, however, are established by producing high voltage of alternately or interrupted currents in the circuit of the electrodes, in order to break down the resistance between the electrodes. This is done in the manner well known in the art by producing a spark between the electrode which will heat the electrodes locally and at the same time afford a means for the passage of the low voltage current supplied by the main lines 10 and 11. A Ruhmkorff coil is connected to the lines 10 and 11 through its vibrator 13'. This being in a shunt circuit is provided with a resistance coil 14. The secondary 15 of the Ruhmkorff coil is connected to the outside electrodes. A gap is located in the circuit 16 of the coil 15 between the electrodes 17. A condenser 18 is connected across the ends of the coil 15 to produce in conjunction with the circuit breaker or vibrator 14, a higher vibratory rate or high frequency of oscillation in the current in the manner well known in the art that will produce high tension sparks across the electrodes of the lamp. The high tension current produced at the break of the primary 19 is multiplied in its intensity by the coil 15 and it breaks across the gap between the electrodes 17 and between the electrodes 2 of the lamp and inasmuch as the electrodes of the lamp are connected to the main lines 10 and 11 through the reversing switch 12, the arcs from the current supplied through the lines 10 and 11 will immediately be established on the arcs or sparks produced by the high tension current. The coils 13 are merely resistance coils and although they are located across the gap between the two outside electrodes 2, yet because of the nature of the oscillatory current produced by the transformer coil 15, the condenser 18 located across the terminals of the coil 15 and the spark gap 17, there will be a potential across the arc gap, in accordance with well known facts, which will break it down and permit the lamp to start.

The arcs will thus be divided as between the center electrode and the two outer electrodes. It has been found that the arcs will be established easier by connecting the center electrode with the negative side of the source of direct current supply than if the center electrode is connected with the positive side. After the arcs have been established the current through the electrodes may be reversed which will concentrate the more intense light which is produced at the positive terminals. This will then make the single electrode the positive terminal and will concentrate the intense light on the one terminal which has many advantages particularly in connection with moving pictures and microscopic projection.

I claim:—

1. In an electric lamp, three tungsten sleeves, three supporting wires loosely connected to the sleeves, and means for supporting the wires in the lamps.

2. In a tri-electrode lamp, three tungsten sleeves located in parallel relation to each other, tungsten wires for supporting the sleeves, the sleeves loosely connected to the wires and so as to permit free rotation of the sleeves with respect to the wires.

3. The process of operating an arc lamp having more than two electrodes, at least two of the electrodes located farther apart than they are to a third electrode, which consists in connecting at least two of the electrodes with one terminal of a source of direct current supply, and the said one electrode with the other terminal of the source of supply, and making the last named electrode the negative electrode, and forming high tension sparks between the last named electrode and the said at least two of the electrodes, and reversing the current so as to make the said last named one electrode the positive electrode.

In testimony whereof I have hereunto signed my name to this specification.

THOMAS J. MURPHY.