No. 702,320. Patented June 10, 1902.

D. McF. MOORE.

ELECTRIC TUBE LAMP.

(Application filed May 7, 1902.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

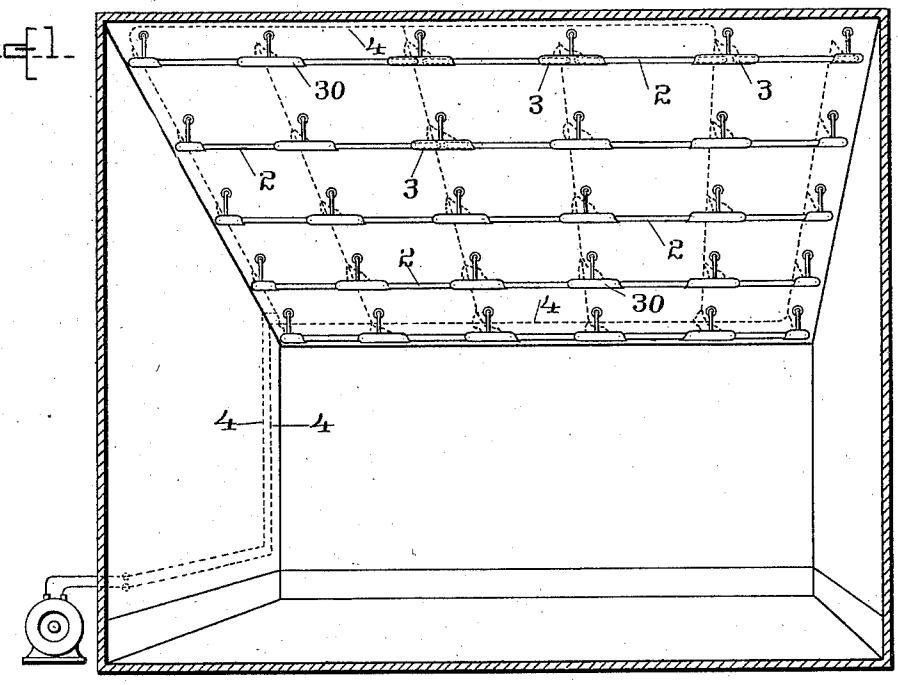

FIG. 2.

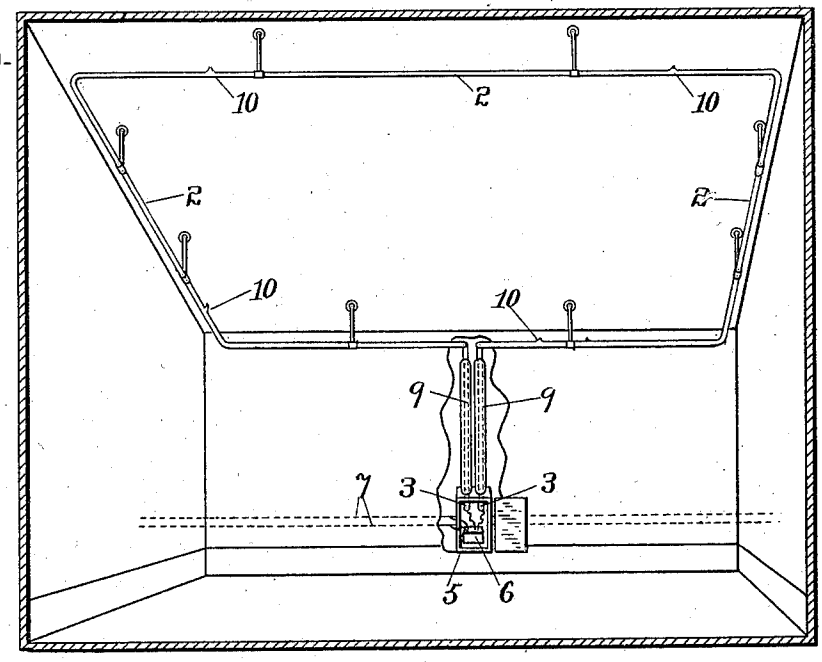

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FIG. 3.

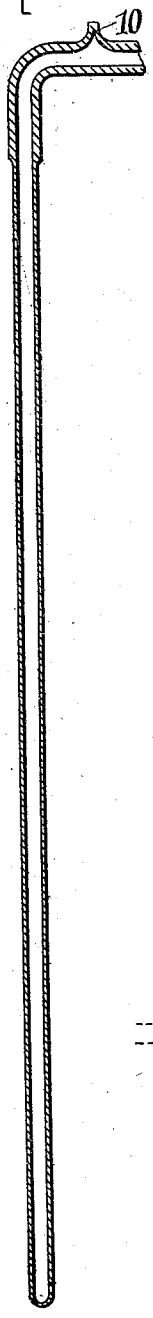

FIG. 4.

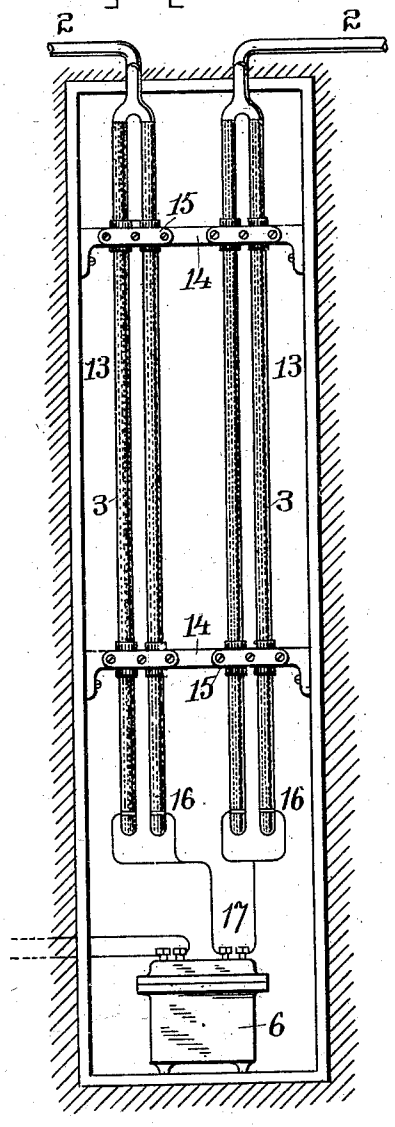

FIG. 6.

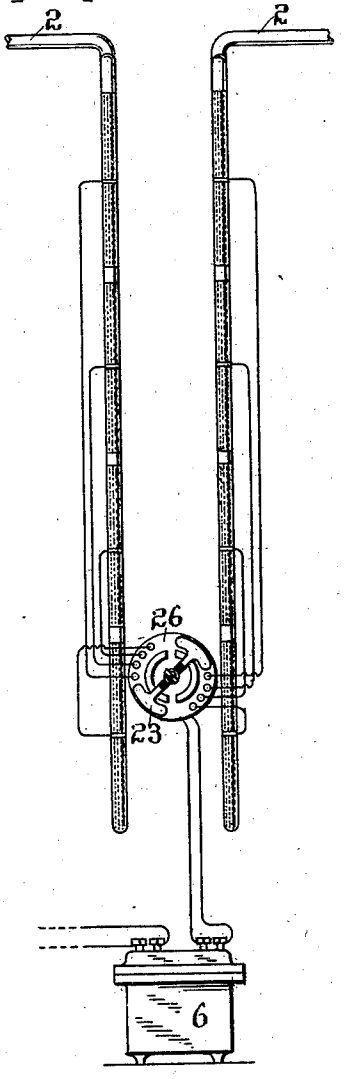

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FIG. 5.

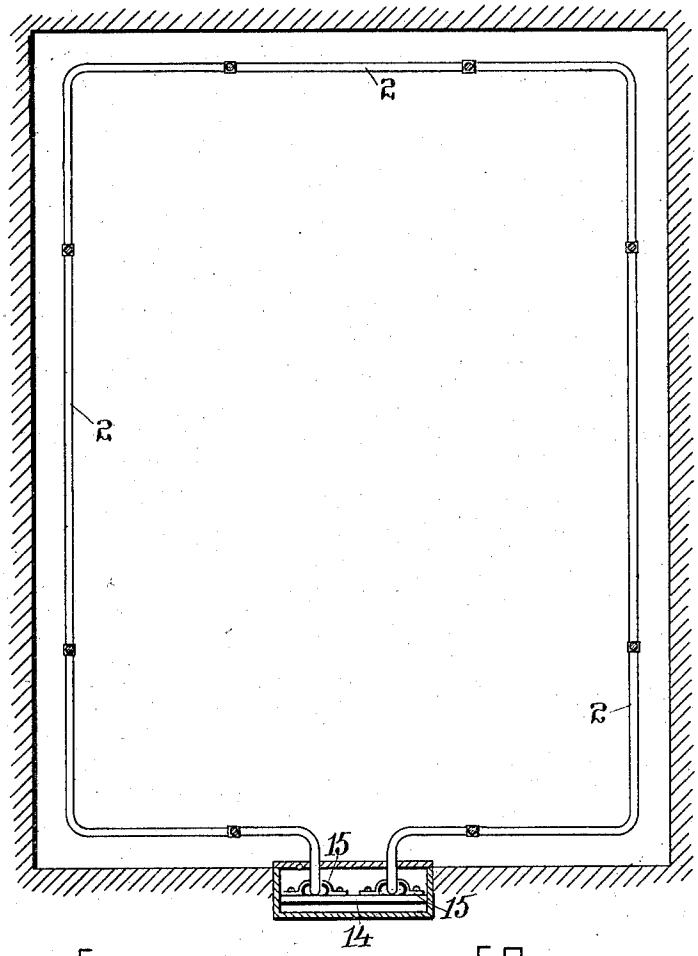


FIG. 9.

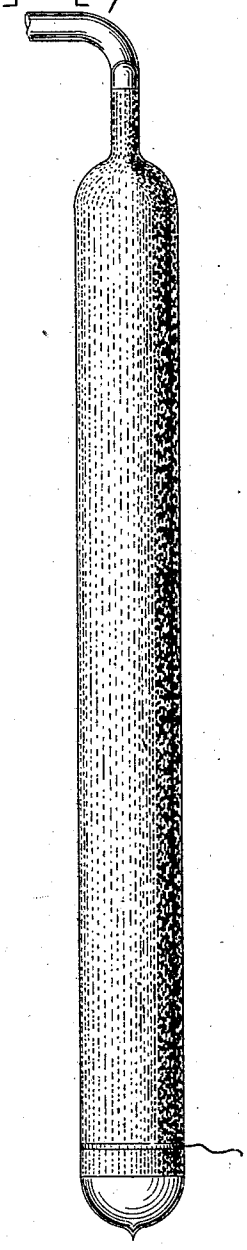


FIG. 7.

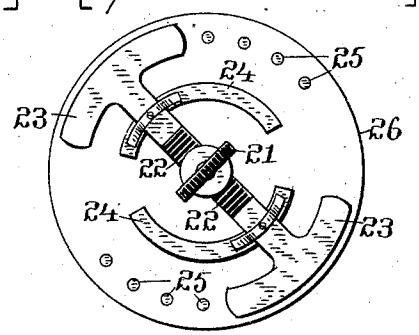
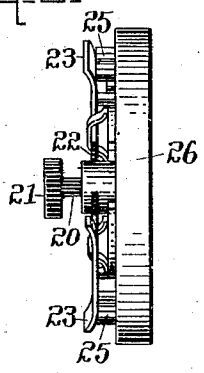


FIG. 8.



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UNITED STATES PATENT OFFICE.

DANIEL McFARLAN MOORE, OF NEWARK, NEW JERSEY.

ELECTRIC-TUBE LAMP.

SPECIFICATION forming part of Letters Patent No. 702,320, dated June 10, 1902.

Original application filed December 18, 1901, Serial No. 86,358. Divided and this application filed May 7, 1902. Serial No. 106,321. (No model.)

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, have invented certain new and useful Improvements in Electric-Tube Lamps, of which the following is a specification.

My invention relates to certain improvements in electric lamps of the class wherein the light is produced by means of electric energy supplied to the terminals of the gaseous body or column contained in a sealed translucent receptacle.

The invention is of special utility for lamps used in the system of illumination described in my application for patent filed December 18, 1901, No. 86,358, in which I have set forth the features or improvements herein claimed and of which application my present application constitutes a division.

In my prior application I set forth a system of illumination wherein the luminous tube or gaseous column is distributed over areas, spaces, or rooms to be lighted, and the terminals of said tube are brought to the source of energy in contradistinction to previous systems employed by me wherein the energy-supplying wires are distributed and the energy supplied to a number of tubes or units of comparatively short length, and I shall in the present specification describe my present invention as carried out in the system described and claimed in my aforesaid prior application.

My present invention may be carried out with any form of lamp comprising, essentially, a translucent receptacle and energy-supplying electrodes at the terminals or near the terminals of the luminous column, and one feature of my present invention consists in dividing the energy-supplying terminals into sections insulated from one another and combining therewith suitable devices whereby any number of said sections may be connected up to the energy-supplying source for the purpose of varying the luminosity of the gaseous column.

Another part of my invention relates to a means for cutting down the consumption of energy in that particular form of lamp wherein the energy is supplied through conducting terminals or electrodes applied to the exterior of the receptacle and transferring their energy to the gaseous contents by an electrostatic action. This part of my invention consists, substantially, in making the translucent tube or receptacle with an end section having walls of reduced thickness beneath said conducting terminals or electrodes.

My invention also consists in giving to the end portion of the translucent tube or receptacle an enlarged superficial area for the application or transfer of electric energy to the contents of the tube, as will be more particularly hereinafter set forth.

In the accompanying drawings, Figure 1 illustrates in skeleton perspective a system of lighting heretofore employed by me, while Fig. 2 illustrates the improved system to which my present invention is especially applicable, although in some of its features it is also applicable to tubes employed in a system such as shown in Fig. 1. Fig. 3 is a longitudinal section of one end of the improved construction of tube. Fig. 4 is a vertical section through the wall or wall-box at one end of the apartment and shows a modification in the construction of tube hereinafter more fully described. Fig. 5 is a plan of a tube as disposed and supported in a room in the manner indicated in Fig. 4. Fig. 6 represents the disposition of the parts at or near the terminals of the tube in elevation and shows also the provision of a sectional cap or electrode. Fig. 7 is an end view, and Fig. 8 a side elevation, of a switch adapted for use with said sectional cap. Fig. 9 represents a modification in the form of the tube at its ends.

Referring to Fig. 1, the area to be lighted is shown as illuminated by means of twenty-five tubes, the visible or illuminating portion of each of which is indicated by the numeral 2, while 3 indicates the conducting caps or terminals, (shown in dotted lines,) which with lamps of the particular kind heretofore invented by me are applied to the exterior of the tube at the ends thereof and furnish to the gaseous contents electric energy for causing the same to emit luminous radiations. The said tubes are supplied with energy by means of distributing-wires 4, which extend

over the area to be lighted, and are connected through suitable fixtures 30 with the conducting caps or electrodes at the terminals of said tubes.

As will be obvious, in this system there are a large number of terminal fixtures and of individual lighting devices, each of which has a number of terminal electrodes consuming electrical energy in the work of transferring energy to the gaseous contents to be rendered luminous. Moreover, in such a system a large portion of the total gaseous column is inclosed in the conducting cap or electrode, so that its luminosity is obscured and is not available for any useful purpose.

The system as shown has other advantages in respect to the large number of fixtures necessary, which add to the cost, and also in the fact that the voltage for exciting the tubes is distributed through the room or apartment to be illuminated, which is objectionable, particularly with high voltages, on account of fire risks and for other reasons, as well understood in the art of electric lighting.

In Fig. 2 the system claimed in my prior application, No. 86,358, is shown. In this system I take advantage of the fact discovered by me and set out in my application for patent, No. 86,357, filed December 18, 1901, that an increase of the length of the visible luminous column in a lamp wherein the illumination is produced by exciting through electric energy the gaseous contents of the tube gives a practically corresponding increase in the efficiency of the lamp, or, in other words, secures a very greatly increased total illuminating capacity for practically the same total expenditure of electrical energy. Fig. 2 shows in skeleton an apartment or interior illuminated by such a tube extending around the sides thereof and terminating at 5 in a suitable wall pocket or box, where it is provided with conducting caps or terminals of sufficient size to supply the requisite amount of energy required for giving a density of light of the desired amount and where it is in direct connection with the source of energy-supply. A source of energy-supply is shown as consisting of the secondary of a suitable static transformer 6, the primary of which is supplied from mains 7, which may be street-mains extending from a suitable power-house and there connected with a source of alternating currents.

By means of the transformer a voltage of any desired amount may be obtained for the excitation of the tubes, such voltage being dependent upon the density of illumination required for each unit of length of the tube, the size of the conducting-caps, the nature of the gaseous contents, and other factors.

Ordinarily it is desirable to construct the transformer so as to give at the terminal of the secondary a higher voltage than that on the main 7. It is also desirable to select for the system mains 7 7 having the highest frequency used commercially. My invention, however, does not concern itself especially with frequencies nor with voltages on the mains supplying the energy, since, as more fully set forth in my application, No. 86,359, filed December 18, 1901, I have found that, using what would ordinarily be termed "very moderate voltages" at the terminals of the tube 2, a very great length of gaseous column may be rendered luminous and that such lengths of luminous tube may be used as will permit large areas to be illuminated, while the source of energy connected to the terminals thereof may be isolated or confined within the protecting-space of a wall-pocket or other device.

The tube may be built up in place in sections of glass tubing joined together end to end by air-tight joints of any desired kind. Suitable hooks or supports which may be of simple construction and of limited cross-sectional area, as indicated at 8, could be used to support the tube. The terminal caps 3 of the tube are located in a box or receptacle 5, where they are attached to the terminals of the secondary of a transformer.

The manner in which the ends of the tube may be disposed in the wall pocket or box is better illustrated in Fig. 4. The interior of said box is lined, preferably, with a slate lining 13 or other good fireproof insulating material, and upon the back plate are mounted suitable brackets 14, provided with clamps 15 to clamp and support the end or ends of the luminous tube. The conducting cap or terminal on the tube may be of any desired conducting material, preferably a composition of graphite or carbon, which may be applied as a paste and allowed to harden, after which metal conducting-rings to make connection therewith may be applied, as indicated at 16. Direct connection with these conducting-rings of metal is made from the terminals 17 of the transformer 6, as shown. Where the tube is of very considerable length, I construct it so that it shall have an enlarged area in cross-section or an enlarged superficial area at its ends where the conducting-caps are applied. This permits the luminous portion of the tube to be made of any desired size and length, while the non-luminous portions may be shortened up. By thus giving a larger cross-sectional area to the end of the tube I provide a larger surface for the application of the conducting-cap, which should be large with a long tube in order to permit the proper amount of energy to be transferred to and from the gaseous contents. The enlarged cross-sectional area may be obtained by attaching to each end of the luminous portion of the tube two or more branches each provided with the conducting envelop or cap, or, if desired, the bore of the tube may be enlarged, as shown in Fig. 9, where the cap is applied.

When the tube terminates in separate tubes, as shown in Fig. 5, those which are connected with the same end of the tube are attached

to the same terminals of the transformer, as clearly shown. In order to permit the luminosity of the tube to be varied at will, I make the conducting-caps in sections of any desired number, as indicated in Fig. 6, said sections being insulated from one another and connected, respectively, with contacts of a suitable switch, whereby any number of said sections may be connected at will to the transformer or other source of energy to permit the total area of cap to be varied, thereby varying the amount of energy to and from the gaseous column. Any form of switch may be used for this purpose. In Figs. 7 and 8 I show a form of switch wherein the shaft 20, carrying a button 21, is provided with two arms of insulating material 22, to which in turn are attached conducting plates or brushes 23, each adapted to ride at the same time upon a continuous conducting-plate 24, connected to one terminal of the transformer or other source of energy, and also upon or over a series of contacts 25, connected, respectively, to different sections of the sectional cap. The contacts 25 are mounted upon suitable base-plates 26. By turning the shaft 20 the number of contacts 25 joined to the feed-plates 24 may be varied at pleasure to vary the luminosity.

Under those circumstances where it may be desirable to locate the box or receptacle 5 at some distance from those portions of the tube which are capable of giving useful illumination the tube may be protected for some distance by a casing 9, Fig. 2, of any suitable character, extending from the box to the points where the tube enters the space to be lighted.

Instead of using a casing 9 the portion of the tube extending from the terminals of the transformer to those portions which are intended for illumination might be made of conducting material, in which case said tube itself would be the conducting cap or terminal of the gas-column to be rendered luminous.

When the tube contains a gas or vapor whose tension requires to be artificially modified, or, in other words, a gas which may need to have a particular degree of rarefaction or gaseous tension, it may be provided at some portion of its length convenient of access with a nipple, such as indicated at 10, for the application of a proper exhaust-pump; also, if desirable, such nipples may be located at other points for the use of an exhaust-pump or for the introduction of desired materials into the tubes. One of these is shown in detail in Fig. 3.

In a lamp of the construction wherein the energy is supplied by exterior caps or terminals the major portion of the consumption of energy takes place in the transfer of energy from the cap through the sealing glass wall of the contents. It is, however, desirable for obvious reasons to use glass tubing of considerable thickness for those portions of the tube which are exposed.

In order to eliminate as far as possible the waste of energy at the caps, I propose to construct the tubes, as indicated in the longitudinal section, Fig. 3, with a thickness of wall as small as possible at those points where the caps are applied and at which points the tube is protected against damage, and for the other portions or those which are to inclose the actual light-radiating column I use a greater thickness.

In the foregoing description I have assumed that the lamp is one wherein the gaseous column is excited to luminosity by energy supplied through exterior caps or conductors, this being the form which it is preferable to employ, inasmuch as no interior pieces of metal exist which are liable in use to give off occluded gases and to thus interfere with the proper operation of the lamp. It will be obvious, however, that that feature of my invention which consists in the use of the sectional electrode is not confined to a lamp wherein said electrode is exterior to the receptacle containing the gaseous column.

What I claim as my invention is—

1. An electric lamp consisting of a translucent tube or receptacle containing a rarefied gas or vapor and having conducting caps or terminals applied to a portion of the receptacle whose walls are of reduced thickness.

2. In an electric-lighting system, an electric lamp consisting of a translucent tube or receptacle containing a rarefied gas or vapor and provided with a sectional conducting cap or terminal the sections of which are insulated from one another, as and for the purpose described.

3. An electric lamp consisting essentially of a translucent tube or receptacle containing a rarefied gas or vapor and having an end portion of enlarged superficial area for the application or transfer of electric energy to the contents of said tube.

4. An electric lamp consisting of a translucent tube or receptacle containing a rarefied gas or vapor and terminating in branches each provided with a conducting-cap, as and for the purpose described.

5. In an electric-lighting system, an electric lamp consisting of a translucent tube or receptacle containing a rarefied gas or vapor and provided with a sectional conducting cap or terminal, in combination with means for varying a number of said terminals in action.

Signed at New York, in the county of New York and State of New York, this 6th day of May, A. D. 1902.

DANIEL McFARLAN MOORE.

Witnesses:
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E. L. LAWLER.