

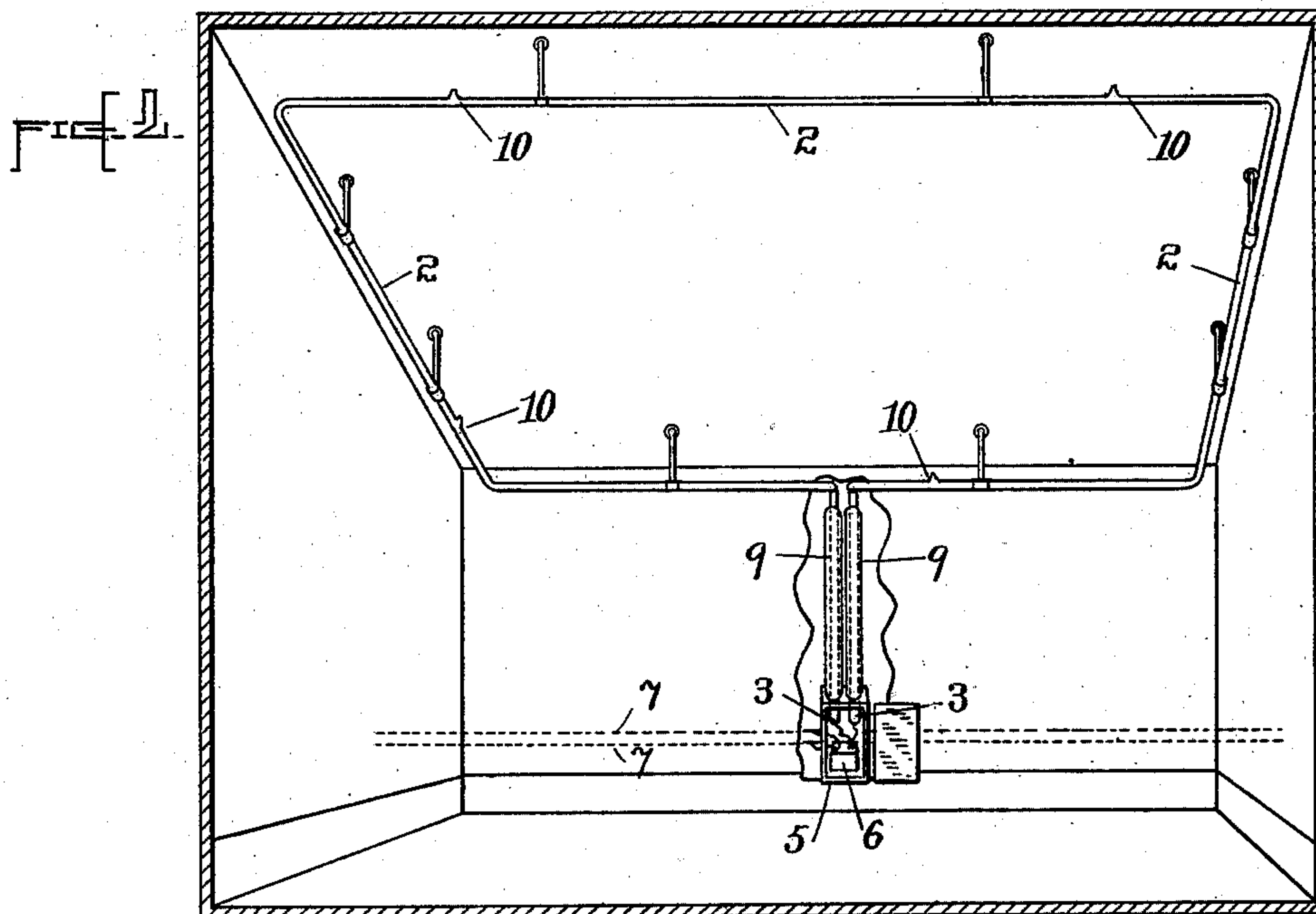
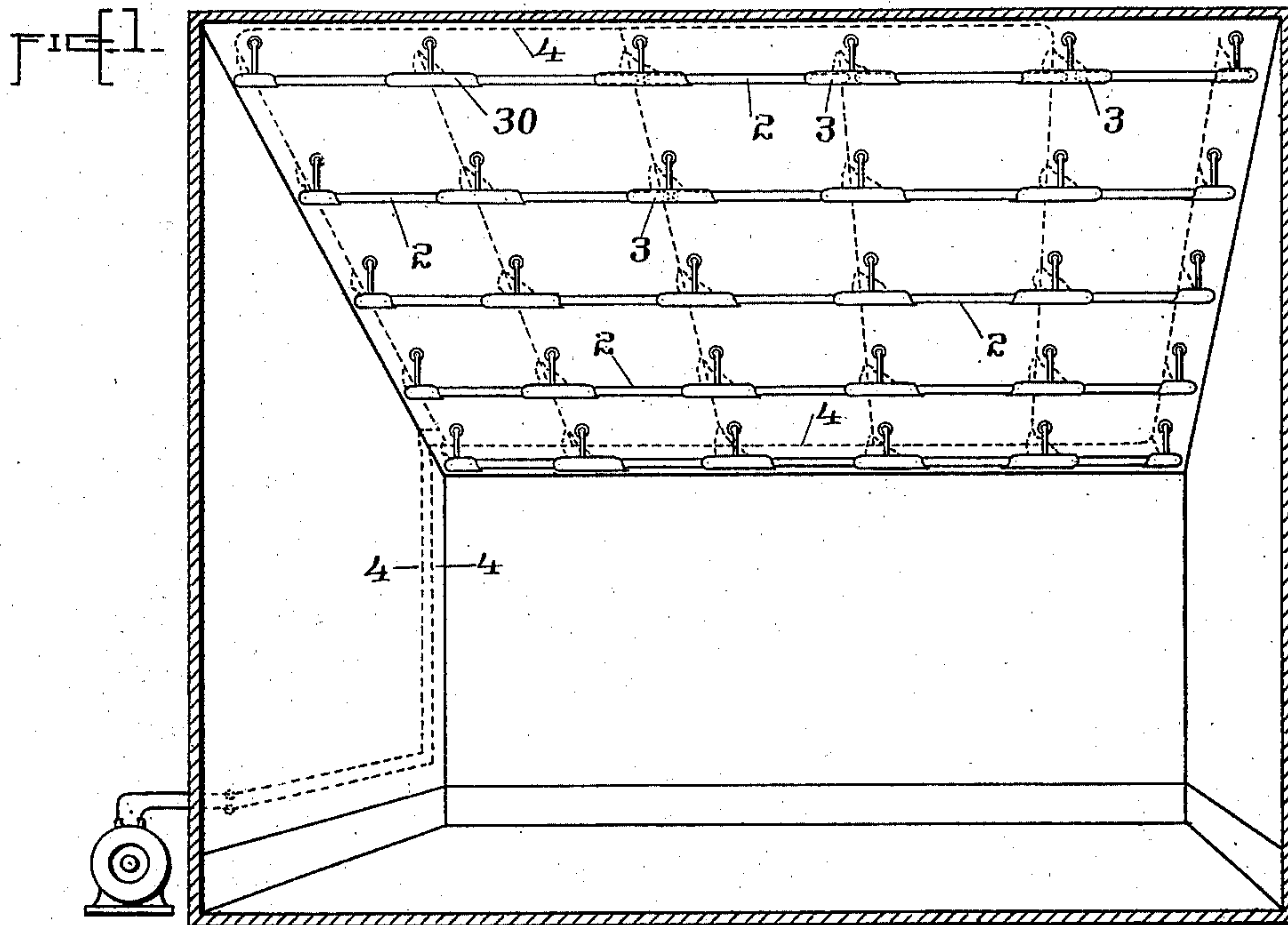
No. 702,321.

Patented June 10, 1902.

D. McF. MOORE.  
ELECTRIC TUBE LIGHTING.

(Application filed May 7, 1902.)

(No Model.)



Witnesses:

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# UNITED STATES PATENT OFFICE.

DANIEL MCFARLAN MOORE, OF NEWARK, NEW JERSEY.

## ELECTRIC-TUBE LIGHTING.

SPECIFICATION forming part of Letters Patent No. 702,321, dated June 10, 1902.

Original application filed December 18, 1901, Serial No. 86,358. Divided and this application filed May 7, 1902. Serial No. 106,322. (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  
5 and State of New Jersey, have invented certain new and useful Improvements in Electric-Tube Lighting, of which the following is a specification.

My present invention relates to the novel  
10 system of electric lighting described in my prior application, Serial No. 86,358, filed December 18, 1901, and having for its object the avoidance of electric conductors for distributing the electrical energy to the lamps or  
15 light-giving portions of the system, and to thereby permit the illumination of buildings and contained areas without the presence of conducting wires or circuits of copper distributed through the building or the rooms  
20 thereof.

In my prior application I have described a system in which a translucent tube containing a gaseous luminous column or body and provided with proper energy-supplying terminals is distributed or run over the areas,  
25 spaces, or rooms to be lighted, the terminals of said tube being brought to the source of energy outside of said areas or spaces or in a location where the said terminals may be suitably protected against danger of contact or  
30 accidental interference, said tube containing a gas which is of such character or degree of rarefaction that by the application of electric energy or current to the terminals of the tube it will be rendered luminous by the transfer  
35 of the energy from one terminal or electrode to the other.

My present invention relates to the practical installation of said system, and my present application is a division of my application  
40 filed December 18, 1901, Serial No. 86,358.

While my present invention is applicable to said system as carried out with a translucent receptacle and energy-supplying electrodes at the terminals of the luminous column of any desired kind or manner of application, I prefer to use electrodes whose terminals consist of conducting caps or sheets applied to the exterior of the tube and transferring their energy by electrostatic action to the contents of the tube itself.  
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In the accompanying drawings, Figure 1 illustrates in skeleton perspective a system of lighting heretofore employed by me and shows a room or space of considerable area  
55 illuminated by a number of lighting-tubes. Fig. 2 illustrates in skeleton my improved system of illumination to which my present invention is applicable.

Referring to Fig. 1, the area to be lighted  
60 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  
65 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.  
70 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  
75 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  
80 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  
90 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  
95 well understood in the art of electric lighting.

In my improved system I take advantage of the fact that an increase of the length of the visible luminous column in a lamp wherein the illumination is produced by exciting  
100 through electric energy the gaseous contents of a 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.

5 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. The source of energy-supply is here shown as 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.

In installing the light-giving device lengths of glass tubing of such dimensions longitudinally as will permit the same to be readily handled are joined together end to end, by fusing or otherwise, in the position which the illuminating-tube is to occupy when installed. In other words, said tube is built up, installed, and distributed through the spaces to be illuminated in much the same manner as a distributing-wire would be installed for the purpose of supplying the tubes of Fig. 1, the only difference being that on account of the size, fragility, and want of flexibility in the glass tube it is necessary to construct it in sections and *in situ*. A flexible translucent tube of such construction that could be coiled and strung in position throughout the spaces to be illuminated would serve fully the purpose of my invention; but for present commercial practice it is best to use rigid lengths of tube and to fuse them together end to end. They may, however, be joined end to end in other ways.

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. They afford means whereby also the contents of the tube may be renewed as desired or the desired tension of vapor within the same reestablished in case it should depart from the normal or critical density or tension best suited for the production of light. After the

installation of the tube in the manner described the materials to be introduced into the tube and from which the gaseous column is produced are injected at the nipples 10 at various points. A suitable exhaust-pump is then applied to one end of the tube and the materials caused to distribute themselves by the suction thereof, or in some cases I may proceed by exhausting the tube and then injecting the material, which will automatically distribute itself throughout the same by the suction.

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 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. My invention, however, is not confined to this class of lamp, and the system may evidently be realized with lamps having other kinds of terminals.

By my improved system of lighting I am enabled to dispense with the use of distributing-wiring through buildings or rooms, to install the light at much less cost than by the present incandescent system, to dispense with the use of armored piping or conduit and junction boxes or moldings, fixtures, porcelain fuse cut-outs, flexible cords, sockets, and other lighting appliances now used for incandescent house-lighting. Moreover, as compared with the system before used by me, wherein tubes of, say, seven to eight feet in length are employed, at least forty per cent. less tubing is required, owing to the fact that a great total length of conducting-caps or other metals or parts obscuring the illuminating-column is dispensed with. For example, if a given illumination in a room emanates from twenty-five tubes the electricity is transferred to and from the gas at fifty places, while if one long tube is used it is transferred at only two places. The absence of caps and fixtures is also of advantage from artistic standpoint, because it permits a practically unbroken or continuous line of light around the area to be lighted, thus realizing the object sought for in electric illumination—namely, a perfect diffusion of light.

What I claim as my invention is—

1. The herein-described improvement in electric-tube lighting, consisting in installing a translucent tube and then introducing into the same while in place the gaseous agent which is to be rendered luminous and then



exhausting the tube to secure the desired rarefaction of its contents.

2. The herein-described improvement in treating a translucent tube designed to contain a luminous gas rendered luminous by electric currents, consisting in introducing the desired chemicals at different points along the tube and exhausting at the end to secure a thorough and uniform distribution of the chemical, as and for the purpose described.

3. The herein-described improvement in electric-tube lighting, consisting in installing a translucent tube, exhausting the tube and then introducing into the same the material from which the gaseous agent is evolved.

4. The herein-described improvement in electric-tube lighting, consisting in first installing a translucent tube, then exhausting the tube, and finally admitting the gaseous agent.

5. The herein-described improvement in electric-tube lighting, consisting in building

up a length of tubing in sections with air-tight joints and distributed over the areas to be lighted the end sections of said tube being provided with suitable conducting-terminals, and after the building up of said tube in place, suitably exhausting or treating the same so that the gaseous contents may be rendered luminous by the application of electrical energy to the caps or terminals.

6. The herein-described improvement in electric-tube lighting, consisting in first installing a translucent tube in sections connected by air-tight joints and finally exhausting the tube in place, as and for the purpose set forth.

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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