P. C. HEWITT.

ELECTRIC LIGHTING.

APPLICATION FILED APR. 5, 1900. RENEWED APR. 15, 1908.

900,733. Patented Oct. 13, 1908.

Fig. 1

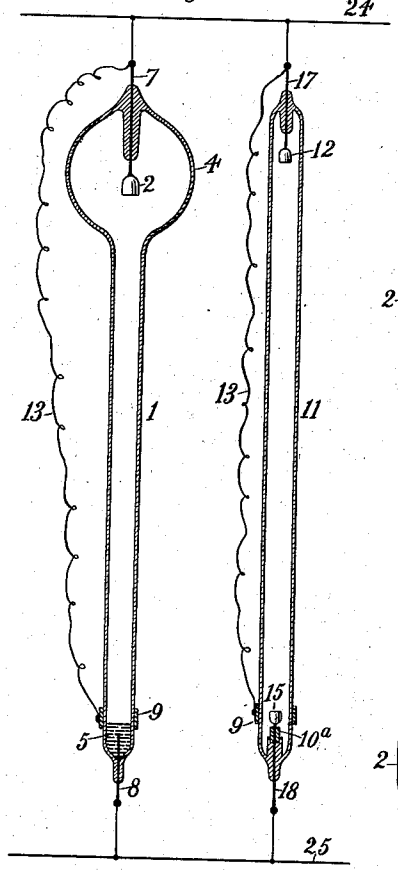


Fig. 2

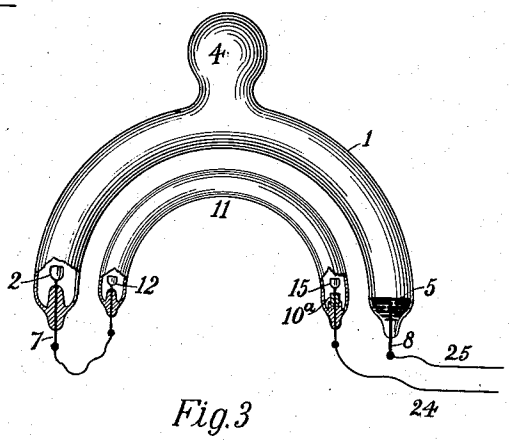


Fig. 3

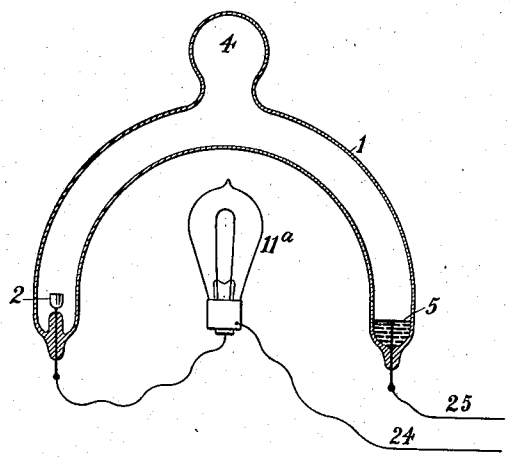
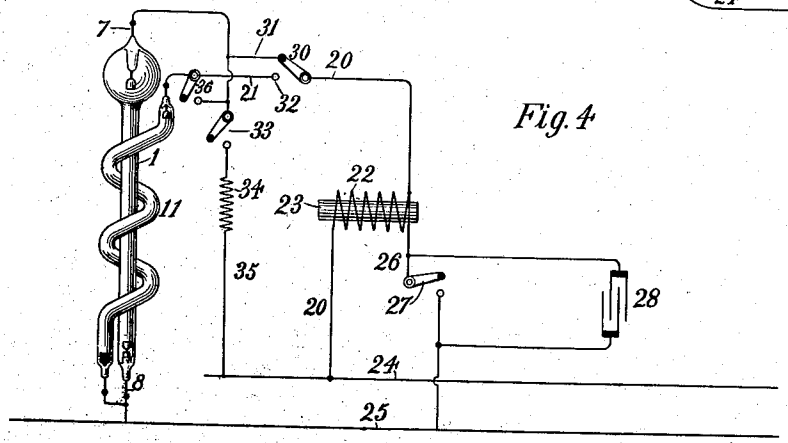


Fig. 4



Witnesses:

Raphael Netter

W. H. Capel.

Inventor

Peter Cooper Hewitt.

by Charles A. Terry. Atty

UNITED STATES PATENT OFFICE.

PETER COOPER HEWITT, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO COOPER HEWITT ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC LIGHTING.

No. 900,733. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed April 5, 1900, Serial No. 11,608. Renewed April 15, 1908. Serial No. 427,207.

To all whom it may concern:

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Lighting, of which the following is a specification.

My invention relates to improvements in electric lighting apparatus in which electric energy is employed for producing light through the agency of vapors and gases.

In another application filed by me April 5, 1900 Serial Number 11,605, I have described a form of vapor or gas electric lamp in which a good conducting path is formed for currents of moderate potential and which is capable of regulating within itself the current flowing, so that it is suited for general use upon commercial circuits. One of the materials sometimes employed for the light-emitting medium in the lamp referred to is mercury vapor. The spectrum of mercury is deficient in red rays, and for some classes of lighting an abundance of red rays is desirable.

My present invention aims to combine with a lamp having a vapor or gas yielding a spectrum lacking certain rays, another lamp which will produce the rays not produced by the first.

For convenience of description, it will be assumed that a lamp is employed in which the main portion of the light is produced by mercury vapors and that it is desired to supplement it with a spectrum having a sufficient abundance of red rays. I accomplish this result by combining or associating with the mercury vapor, a vapor or gas such, for instance, as nitrogen, helium or argon which also is to be acted upon by the electric current so as to produce red rays in addition to such other rays as are contained in its spectrum, thereby supplying the deficiency of the mercury spectrum. This may be accomplished in various ways. For instance, the nitrogen may be included in a lamp structure similar to that employing the mercury and located in such proximity thereto as to produce the desired resultant effect. Another way of accomplishing the desired result is to combine with such a lamp as the mercury vapor lamp an ordinary form of incandescent lamp connected in series or parallel therewith but so located as to have its rays mingle with those of the mercury lamp. I desire to have it understood, however, that the invention is not restricted to combining the lamp giving the supplemental rays with a vapor lamp having mercury as the light-emitting substance but generally combining with any form of vapor lamp, such as referred to in my application Serial Number 11,605, a supplemental light-emitting body yielding the desired additional rays.

In this application specific claims are not made to the combination of a vapor lamp with the ordinary form of incandescent lamp as that forms the subject of another application.

In the accompanying drawings; Figure 1, illustrates one form of my invention; Figs. 2, 3 and 4, illustrate modifications.

Referring to Fig. 1, a tube 1, is shown as containing two electrodes, 2 and 5. The electrode 2, is here shown as consisting of a solid body which is conducting under proper conditions and contained within an enlargement 4, at the upper end of the tube. The electrode 5, consists in this instance of a body of mercury. Leading-in wires 7 and 8, respectively, connect with the two electrodes through the walls of the glass. Adjacent to or in proper relation with the tube 1, there is a second tube 11, likewise provided with electrodes 12 and 15. The electrode 12, may be similar to the electrode 2, and suspended by a leading-in wire 17. The electrode 15, consists of any suitable conducting substance connected with a leading-in wire 18, which may be protected by a porcelain sleeve 10^a, or in some other suitable way. Within the tube 11, is contained a quantity of vapor or gas, such, for instance, as nitrogen capable of yielding under the proper conditions a spectrum including a quantity of red rays.

To render the lamps suitable for general use upon commercial circuits, it is desirable that they should receive currents under the influence of moderate electro-motive forces and possess within themselves the capacity of self-regulation with respect to the amount of current received. I have found that lamps may be made which will conduct current at low potentials and within requisite limits proportional to the electro-motive force applied in such manner as to be self-regulating and highly efficient. The general plan of manufacture is to thoroughly cleanse the tubes or receptacles by alkalies and

proper acids, then exhaust them, by passing electric currents through them during the process of exhaustion. The lamp is further treated by properly heating the electrodes and creating such chemical reactions therein as would be liable to take place in use and drawing off the impurities and deleterious materials and subjecting the lamps while in the process of manufacture to the class of currents with which they are to be operated and introducing within the tubes the proper amount of vapor or light-emitting materials. In the present application claims are not made upon the method of constructing the lamps and, therefore, it will not be necessary to enter more in detail into the method of construction and manufacture.

The lamp containing mercury emits an intense white light and is highly efficient. The lamp containing nitrogen, for instance, yields red rays; other substances also yield red rays, for instance potassium, lithium, hydrogen, etc. The two lamps may be placed upon the same circuit and either in series or parallel, as may be desired under given conditions, and by being properly lo cated with reference to each other, the resultant effect is a brilliant light containing all of the desired rays.

Instead of placing the lamps as shown in Fig. 1, the tubes may be curved as shown in Fig. 2, one being placed within the arc of the other. The chamber 4, shown in Fig. 1, is not always required but is frequently desirable, particularly in connection with lamps using mercury as a cooling and impurity containing chamber. In Fig. 2, I have shown this chamber 4, as being located at the top of the bend of the tube 1. It is usually desirable that it should be out of the vapor path.

In Fig. 3, I have shown a modification in which the form of mercury tube shown in Fig. 2 is employed, whereas, tube 11, is replaced by an incandescent electric lamp 11^a, of the ordinary type which is capable of yielding red and other rays. These two lamps are shown as being connected in series but they may be connected in parallel if desired. In the operation of this class of vapor lamps, it is sometimes desirable that a steadying resistance be connected in series with the vapor lamps and in such instances the incandescent lamp connected as in Fig. 3, well serves this purpose.

For the purpose of starting lamps of this character it is usually desirable to employ an initial higher potential for producing within the lamp such a condition on the part of the vapor as will cause it to receive currents of the potential with which it is designed to be operated. To accomplish this any convenient arrangement of circuits may be employed and in Fig. 4, I have illustrated one organization of such circuits in connection with a different arrangement of lamps. In this instance the lamp 11, is in the form of a spiral surrounding the lamp 1. These lamps are connected across the main circuit conductors 24, 25, by conductors 20, 21. In the conductor 20, there is included the coil 22, of a suitable spark-coil or reactive device, the core of which is represented at 23. A conductor 26, including a switch 27, leads from one terminal of the coil 22, to the main conductor 25, the arrangement being such that the coil 22, may be placed in closed shunt across the circuit 24, 25. A suitable condenser 28, of any desired form is connected in shunt around the switch 27. When the switch is closed an electric current is passed through the coil 22, and upon breaking the conductor 26, a high difference of pot ntial is established at the terminals of the lamp, and the result of this is to create such a condition on the part of the vapor columns as to cause the current from the conductors 24 and 25, to flow easily through the lamp and operate it. A separate starting device may be provided for each lamp if desired. The two lamps may be connected in series if desired.

It is frequently desirable to relieve the lamps from static charge during the application of the starting current by means of a conducting band surrounding the lamp near one electrode and connected by a conductor with the leading-in wire at the other terminal of the lamp. I have found that by placing a conductor such, for instance, as a band 9, of foil or other suitable material, near the electrode 5, and connecting it by a conductor 13, with the leading-in wire 7, the starting currents are more effective. Where two separate lamp structures are employed, a similar device will be used with each lamp.

As the starting device is liable to operate upon only one lamp at a time it may be desirable to use some such arrangement of circuits as indicated in Fig. 4, in which a switch 30, is introduced into the conductor 20. This switch may be connected with either of two contact points 31 and 32, connected respectively with the two lamps 1 and 11. When in contact with the point 31, the starting device is applied to the lamp 1, and when that lamp has been started a switch 33, may close its connections through a conductor 35, including a resistance 34 to the main line 24. By moving the switch 30, into contact with a point 32, the line 20, is connected with the lamp 11, which may then be started. A switch 36, may be used to place the lamp 11, in connection with the conductor 35.

In a divisional application, Serial Number 105,723, filed by me May 3, 1902, claims are made upon certain of the features described herein. In another divisional application filed January 18, 1908, Serial Number 411,384 claims are made upon other features of the system described herein.

The invention claimed is:—

1. The combination with a gas or vapor lamp, consisting of a chamber containing a vapor of comparatively low electric resistance and adapted to pass an electric current of definite voltage and be made luminous thereby to produce light, said vapor or gas yielding a spectrum deficient in certain rays, of a similar lamp having a vapor or gas path yielding a spectrum containing rays of the character in which the spectrum of the first named lamp is deficient, one of said lamps partially surrounding the other, whereby a resulting light containing the rays of both spectra is produced.

2. The combination with a plurality of vapor electrical devices, each requiring a starting current of higher potential than that upon which it is to be operated, of a reactance device, and means for impressing upon the vapor devices successively high potential currents derived from the reactance device.

3. The combination with a plurality of vapor electrical devices, each requiring a starting current of higher potential than that upon which it is to be operated, of a common reactance device, and means for impressing upon the vapor devices successively high potential currents derived from the reactance device.

4. The combination with a plurality of vapor electrical devices, each requiring a starting current of higher potential than that upon which it is to be operated, of a reactance device, means for impressing upon the vapor devices successively high potential currents derived from the reactance device, and means whereby the reactance device can be cut-out of the circuit of one or all of the vapor devices.

Signed at New York in the county of New York and State of New York this twenty-third day of March A. D. 1900.

PETER COOPER HEWITT.

Witnesses:
WM. H. CAPEL,
CHARLES B. HILL.