

No. 750,414.

PATENTED JAN. 26, 1904.

H. VIERTEL.
DEVICE FOR PRODUCING ELECTRIC LIGHT.
APPLICATION FILED JUNE 1, 1903.

NO MODEL.

Fig. 1.

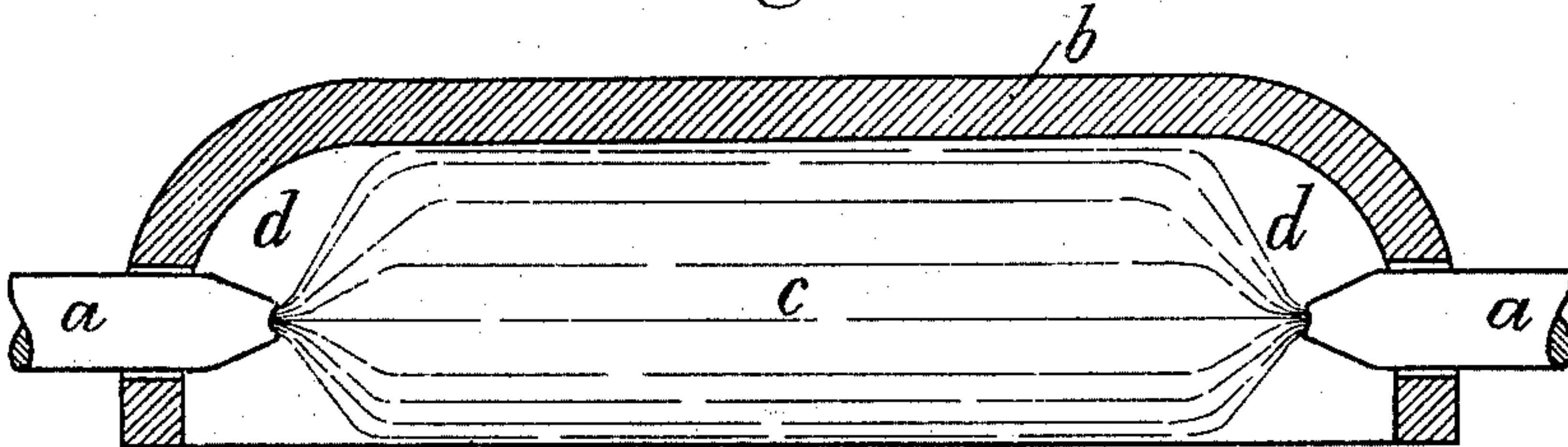


Fig. 2.

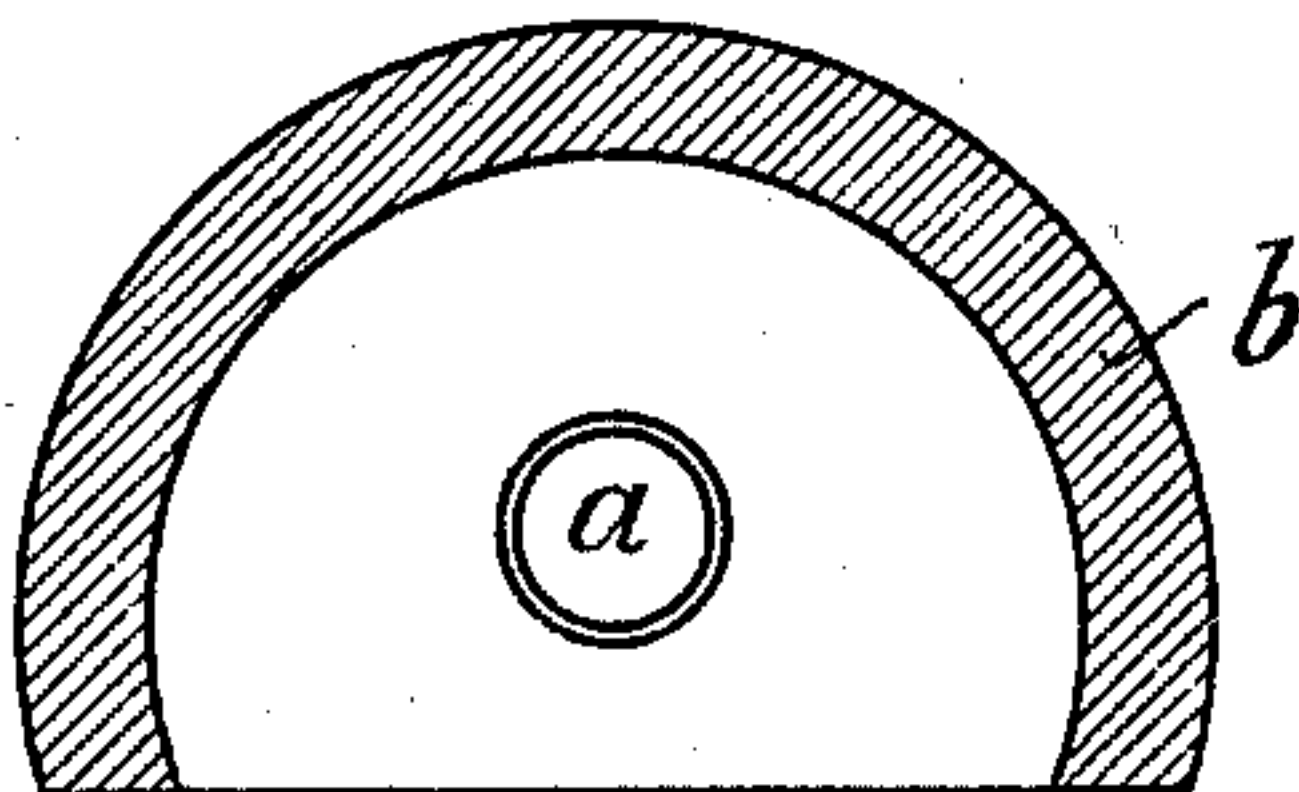


Fig. 3.

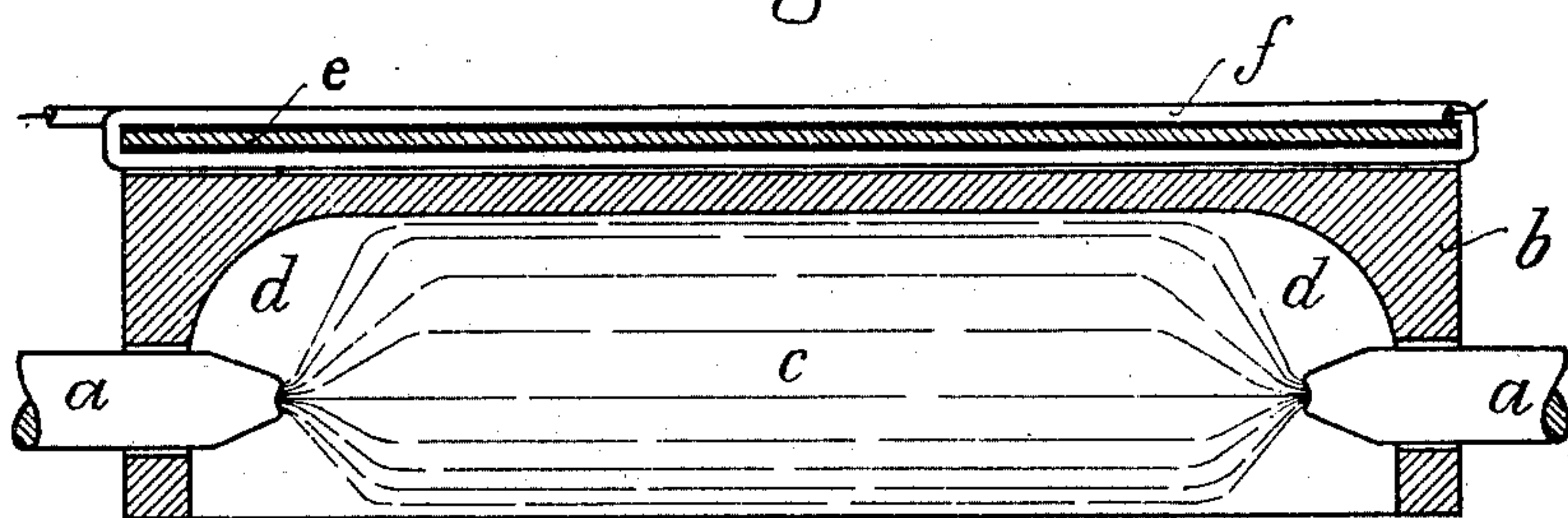
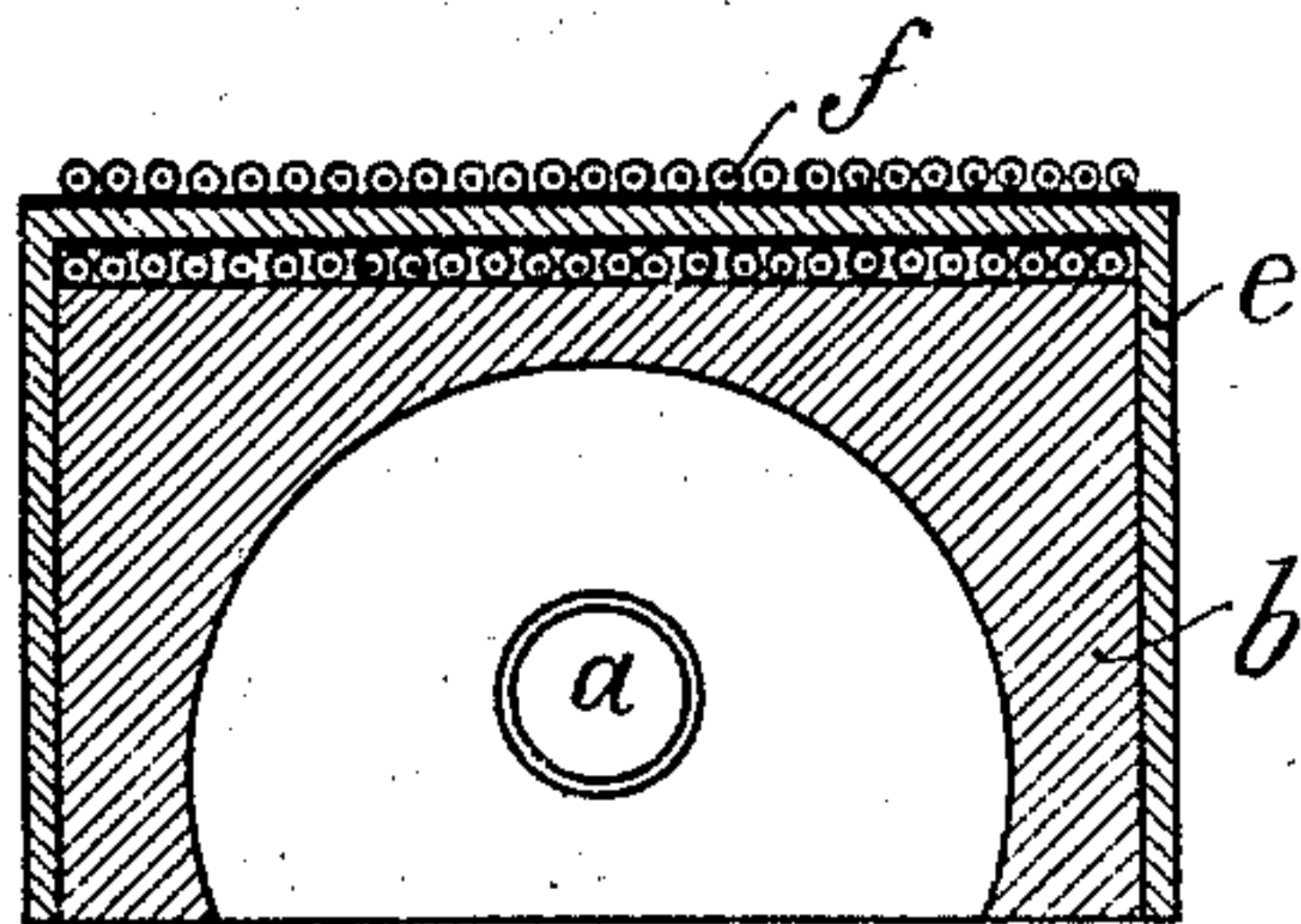


Fig. 4.



Witnesses:
A. T. Gony
M. F. Keating

Inventor:
Hermann Viertel
By his Attorney
Charles J. Kintner

UNITED STATES PATENT OFFICE.

HERMANN VIERTEL, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO
GEBRÜDER SIEMENS & CO., OF CHARLOTTENBURG, NEAR BERLIN,
GERMANY.

DEVICE FOR PRODUCING ELECTRIC LIGHT.

SPECIFICATION forming part of Letters Patent No. 750,414, dated January 26, 1904.

Application filed June 1, 1903. Serial No. 159,715. (No model.)

To all whom it may concern:

Be it known that I, HERMANN VIERTEL, engineer, a subject of the German Emperor, residing at 17 Goethestrasse, Charlottenburg, near Berlin, in the German Empire, have invented a certain new and useful Improvement in Devices for Producing Electric Light, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in devices for producing electric light in which the light-emitting medium consists mainly of vapors rendered highly incandescent by the passage of an electric current through them. The invention differs herein from common arc-lamps in which the light is generally emitted exclusively from the incandescent carbon points and from arc-lamps with carbon pencils containing an addition of metallic salts, in which a great portion of the emitted light emanates also from the incandescent crater-surfaces of the electrodes.

The principle my present invention is based upon consists in heating as great a quantity of vapor as possible by the passage of an electric current and in raising the temperature of the incandescent vapors, so as to obtain as perfect a transformation as possible of electric energy into light-rays. In the experiments heretofore carried out with vapor-lamps mainly such substances were used as evaporate at relatively low temperatures, so that, for instance, the incandescent vapors could be inclosed within closed vessels with transparent walls—as, for instance, within cooled glass vessels. In order to realize a gain in the radiation of light, very high temperatures must be applied, and this, again, presupposes the use of evaporating substances, but at a correspondingly high temperature.

To carry out my invention, it is essential to inclose the very voluminous vapor masses so as to give to them the shape of a conductor of a more or less uniform cross-section, to maintain this shape of conductor, if possible, during the whole time of the combustion without any disturbing motion of the vapor masses,

and at the same time to permit the free escape of the produced light. To fulfil these requirements according to my present invention, I employ a hollow body or chamber of refractory material, preferably in the shape of a tube or chamber wholly closed except at its bottom. Within this hollow body or inverted chamber are evaporated the substances the vapors of which are to be rendered incandescent. Said vapors are kept incandescent by the electrodes entering said chamber at its longitudinal ends. The hollow space must be shaped so that the vapors fill it as perfectly as possible, so as to avoid noxious whirling movements thereof. It is an essential feature of my invention that the axis of the hollow space or chamber be horizontal or that the margin of the opening at the bottom of the chamber lies in a horizontal plane in order to prevent the cold air from entering the hollow space from the lower parts and to prevent the heated air from escaping at the upper parts, as the air circulation caused thereby would entail a disturbing motion of the vapor masses.

By the present arrangement it is rendered possible to maintain very large vapor quantities in an incandescent state and to obtain an extremely steady and uniform light without using any sensitive regulating devices.

My present invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section; Fig. 2, a cross-section thereof, and Figs. 3 and 4 a modification.

Referring now to the drawings, *b* indicates a vapor-inclosing chamber with an opening at its bottom, so that its lower margin lies in a horizontal plane. *a a* are the electrodes, and *c* the incandescent vapor mass. The latter fills completely the hollow space or chamber, so as to leave but small spaces *d*, filled with air or vapors of lower temperature, which, however, owing to their slight volume relatively to the volume of the whole vapor mass will not cause any noxious whirling movements in the vapor mass.

I prefer to use carbon pencils as electrodes, as they combine high conductivity for heat

with a very high point of evaporation. If pure carbon electrodes are used, a space filled with carbon vapors in the shape of a very large arch of light is obtained, which, however, emanates
 5 itself a great portion of the produced light. A gain in the radiation of light is more especially realized if vapors of other substances which have a very high temperature of volatilization are produced, said substances being preferably
 10 added to the electrodes—for instance, as central cores of carbon rods. The quantity of such substances which will render the arc luminous may be limited to a few per cent., as the parts once evaporated rest for a long time as incan-
 15 descent vapors within the chamber, a substitution being only necessary for those slight quantities of vapor which are being condensed on the relatively cooler walls or which escape into the surrounding atmosphere. Owing to
 20 the extremely high difference in the temperatures of the vapors inclosed within the hollow spaces and of the surrounding air, respectively, to the difference in the specific weights of the inclosed vapors and of the surrounding air, a
 25 very strong aerodynamic upward motion of the incandescent vapors takes place. As by this arrangement the escape of vapors from the hollow spaces is entirely prevented, the behavior of the gases contained in the chamber is the
 30 same as if they were perfectly shut off from the surrounding air. The electrodes are preferably made to enter the chamber horizontally, so that their axes nearly coincide with the horizontal axis of the hollow space. The con-
 35 sumption of the electrodes is very slight.

Owing to the fact that with regard to the great length of the column of vapor slight alteration in the length of the electrodes, respec-
 40 tively, in the length of the conductor formed by the vapor between the carbon points have no material influence upon the pressure and intensity of the current, lamps as described may be run with fixed electrodes during a very long time interval without any trouble. The
 45 required regulating mechanism may be a very simple one. With an arrangement according to my present invention I can with ease and certainty maintain a vapor column about six
 50 inches long and about one and three-fourths inches in diameter in incandescent state by using arc-lamp electrodes containing, for instance, a low percentage of fluoric spar in the central core. To obtain such an arc-shaped
 55 vapor-body, a pressure of from one hundred and twenty to one hundred and fifty volts at the terminals of the electrodes is required. It is thus possible to run single lamps on high-tension circuits, in which case relatively very small resistances only are necessary.

60 I have discovered that the effect produced by the arrangement hereinbefore described may be materially increased if a magnetic field is applied to act on the vapor arc. I prefer to use a magnetic field which is nearly homo-
 65 geneous all along the tubular body and the

lines of force of which are perpendicular to the axis of said body. An arrangement for producing such a field as applied to the device is shown in Figs. 3 and 4 of the drawings. It consists of a sheet-iron case *e*, surrounding the
 70 outer sides of the hollow body *b* and provided at its upper part with windings *f*, excited by the main current.

Having thus described my invention, what I claim, and desire to secure by Letters Patent
 75 of the United States, is—

1. In a device for producing light by means of conducting light-emitting vapors kept incandescent by the passage of an electric current through them, the combination with a
 80 closed tubular horizontal hollow body or chamber of refractory material having an opening at its bottom, of electrodes projecting into said hollow body or chamber, the latter having a greater length than diameter, as and for
 85 the purpose set forth.

2. In a device for producing light by means of conducting light-emitting vapors kept incandescent by the passage of an electric current through them, the combination with a
 90 closed tubular horizontal hollow body or chamber of refractory material, having an opening at its bottom, of electrodes arranged horizontally or nearly horizontally and projecting into said hollow body or chamber, the latter
 95 having a greater length than diameter, as and for the purpose set forth.

3. In a device for producing light by means of conducting light-emitting vapors kept incandescent by the passage of an electric current through them, the combination with a
 100 closed tubular horizontal hollow body or chamber of refractory material having an opening at its bottom, of electrodes containing substances which will produce at high temperatures highly-luminous vapors, and projecting
 105 into said hollow body or chamber, the latter having a greater length than diameter, as and for the purpose set forth.

4. In a device for producing light by means of conducting light-emitting vapors kept incandescent by the passage of an electric current through them, the combination with a
 110 closed tubular horizontal hollow body or chamber of refractory material having an opening at its bottom, of electrodes arranged horizontally or nearly horizontally containing substances which will produce at high temperatures highly-luminous vapors, and projecting
 115 into said hollow body or chamber, the latter having a greater length than diameter as and for the purpose set forth.

5. In a device for producing light by means of conducting light-emitting vapors kept incandescent by the passage of an electric current through them, the combination with a
 120 closed tubular horizontal hollow body or chamber of refractory material having an opening at its bottom, of electrodes projecting into said hollow body or chamber, the latter hav-
 130

ing a greater length than diameter, and of a magnetic field to act on the arc, as and for the purpose set forth.

5 6. In a device for producing light by means of conducting light-emitting vapors kept incandescent by the passage of an electric current through them, the combination with a closed tubular horizontal hollow body or chamber of refractory material having an opening
10 at its bottom, of electrodes projecting into said hollow body or chamber, the latter hav-

ing a greater length than diameter, and of a magnetic field to act on the arc, consisting of a sheet-iron case covering the hollow body and provided with windings excited by the
15 main current.

In witness whereof I hereunto subscribe my name this 20th day of May, A. D. 1903.

HERMANN VIERTEL.

Witnesses:

ALVIS GOBANZ,
HENRY HASPER.