

(No Model.)

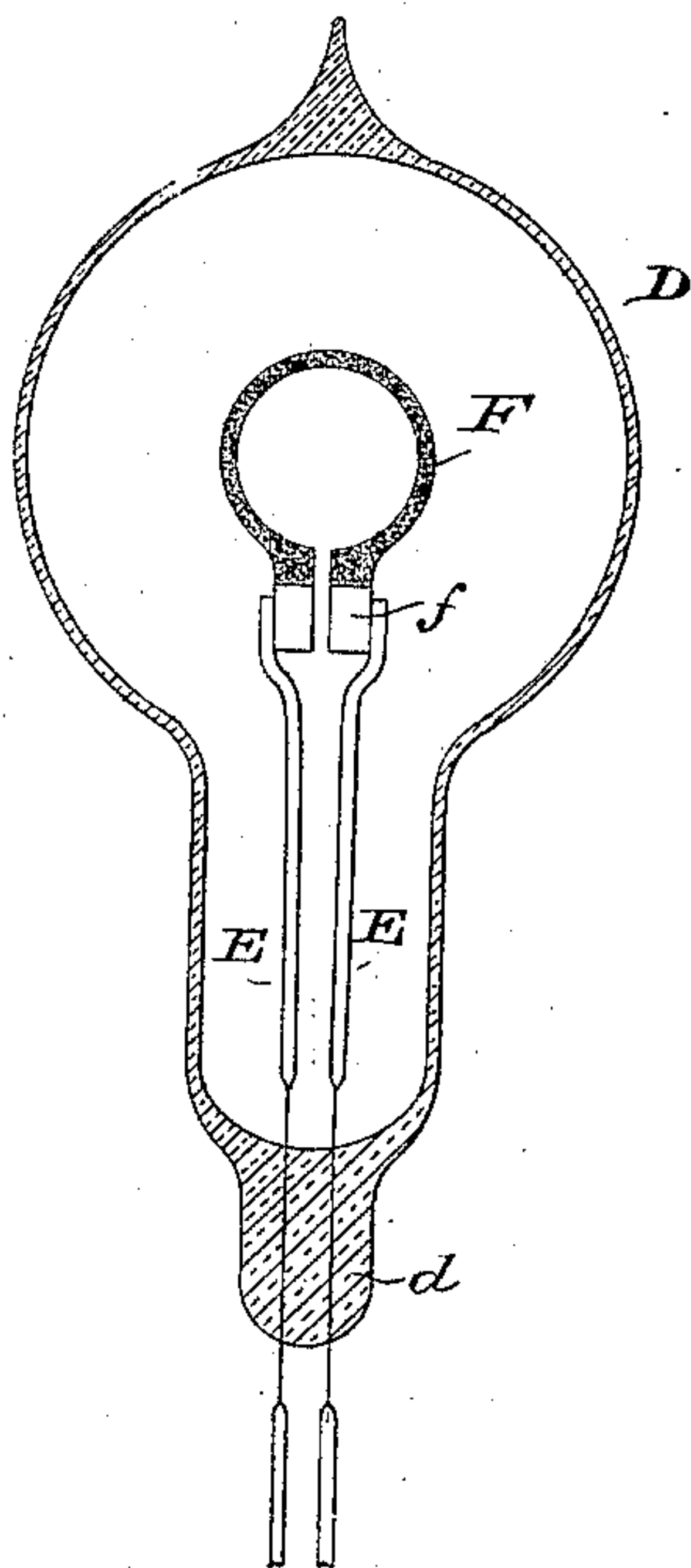
W. M. THOMAS.  
SYSTEM OF ELECTRIC LIGHTING.

2 Sheets—Sheet 1.

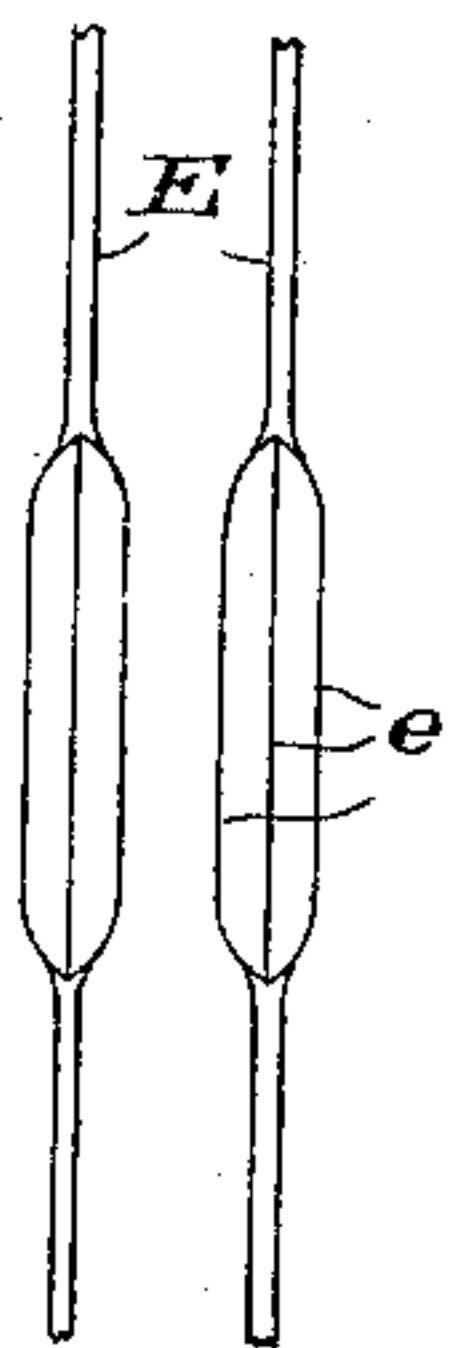
No. 319,347.

Patented June 2, 1885.

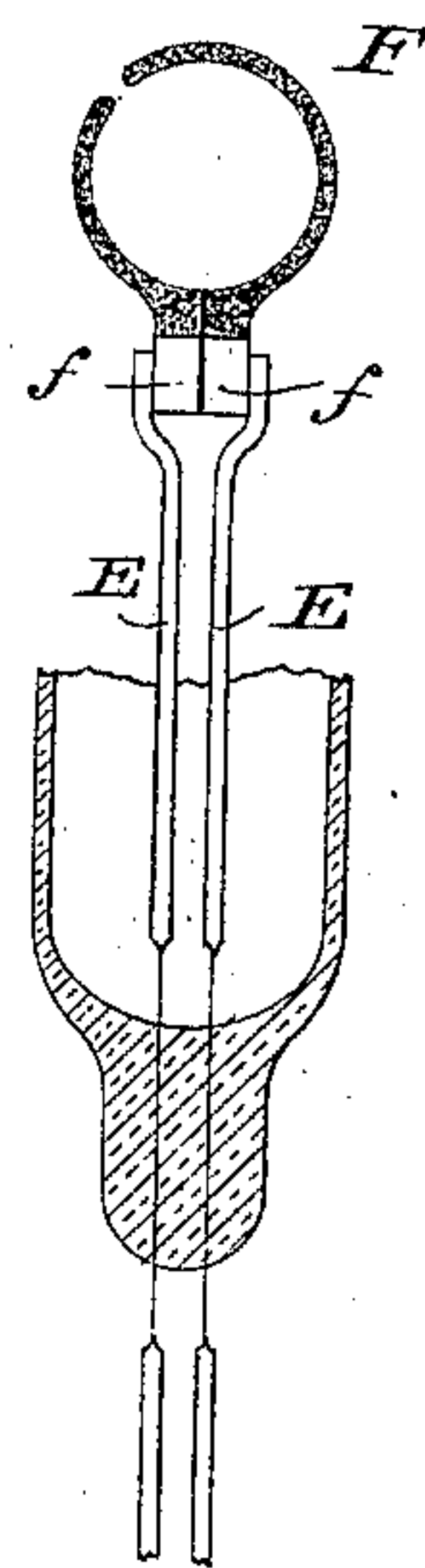
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



WITNESSES

*Wm A. Skinkle.*  
*Ch. C. Newman.*

INVENTOR

*William M. Thomas.*

By his Attorneys

*Baldwin, Hopkins & Pyle*

(No Model.)

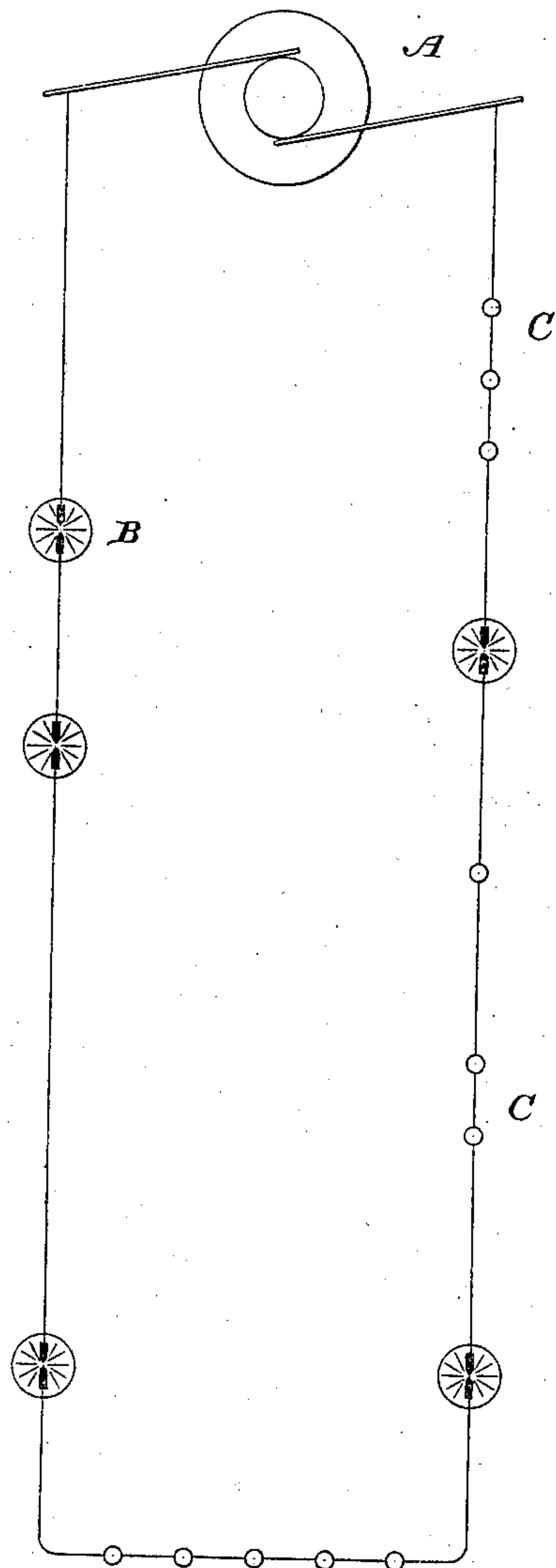
W. M. THOMAS.  
SYSTEM OF ELECTRIC LIGHTING.

2 Sheets—Sheet 2.

No. 319,347.

Patented June 2, 1885.

Fig. 4.



WITNESSES

*Wm A. Skink*  
*Chas. C. Newman.*

INVENTOR

*William M. Thomas.*

By his Attorneys

*Caldwell, Hopkins & Peck*



# UNITED STATES PATENT OFFICE.

WILLIAM M. THOMAS, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR OF ONE-HALF TO THE GRAND RAPIDS ELECTRIC LIGHT AND POWER COMPANY, OF SAME PLACE.

## SYSTEM OF ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 319,347, dated June 2, 1885.

Application filed April 9, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. THOMAS, of Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Electric Lighting, of which the following is a specification.

The object of my invention is to provide a new method or organization by which incandescent and arc lights may be burned in series in a generator-circuit; and as collateral to this primary purpose the invention contemplates certain improvements in devices for automatically cutting each of said incandescent lamps out of circuit should the lamp fail or become ruptured.

In the accompanying drawings, Figure 1 is a transverse section through one of my improved lamps. Fig. 2 is a detail view showing the division of the wires where they pass through the base of the globe or bulb of the lamp. Fig. 3 is a sectional view showing the lamp cut out of circuit, and Fig. 4 is a diagram illustrating arc and incandescent lights connected in series in a generator-circuit.

In constructing my improved incandescent lamps I proportion the sectional area and length of the incandescent substance so that it will be of such a resistance as to be rendered properly incandescent when the volume of current required for the arc lamps passes through the circuit. The incandescent material or carbon in my improved lamps is many times heavier and stronger than that used in a lamp of an ordinary multiple-arc circuit. In the ordinary multiple-arc system of incandescent lighting the size of the conductor has to be increased in proportion to the number of lamps. In a series connection, however, the electric energy is utilized as tension in contradistinction to quantity as employed in the multiple-arc system. By constructing the lamps for series connection, therefore, of carbon many times heavier than the ordinary incandescent carbon, and giving them a resistance which will permit the passage of the proper current as required for the arc lamps, I am enabled to employ a number of such incandescent lamps connected in series with arc

lights, as represented in the diagram view Fig. 4, in which A is the generator, B the arc lights, and C the incandescent lights. The incandescent lamps are represented in Figs. 1 and 3, which indicate about the size of carbon which would be used in an ordinary Brush arc light of, say, two thousand candle-power. Of course, however, each incandescent light will have to be tested for resistance, as is customary in the manufacture of lamps for a multiple-arc system.

Owing to the character of the current which flows in the conductors leading to and from the carbon of the lamp and the temperature developed at the lamp, it is necessary to provide some means for preventing the expansion of said conductors injuring the sealing of the lamp where they pass through the base of the bulb D. For this purpose I divide each conductor E E into several branches where it passes through the base *d* of the globe. The effect of the expansion of the conductors is therefore diffused or distributed, and the integrity of the lamp is not liable to be impaired. I do not, however, claim this as my invention.

Wherever electric lights are connected in series it is necessary that each lamp, or each group of lamps, should be provided with a suitable cut-out or short-circuiting device to maintain the continuity of the main circuit when any one of the lamps is burned out or otherwise caused to break the circuit. Many of such devices have been devised for the ordinary two-point or arc-light lamps, and it is therefore unnecessary to describe such devices here.

The improved cut-out which I use in connection with my series incandescent lamps is shown in Figs. 1 and 3.

The ends *f* of the incandescent substance or carbon F are electroplated, or *f* may be metal sockets, in which the ends of the carbon are seated. The electroplated ends *f* of the carbon are attached to and supported by the conductors E E, which are constructed of such material or so tempered that they normally press the ends *f* toward each other. If, therefore, the carbon of the lamp should be burned



out or ruptured, as indicated in Fig. 3, the conductors E E will immediately throw the electroplated ends of the carbon or the cups *ff* into contact, so that the carbon will be cut out and the continuity of the circuit maintained.

Incandescent lamps such as I have now described may be burned in series with ordinary arc lamps in the manner illustrated in the diagram, and such incandescent lamps may be individually cut in and out by suitable devices, as is common.

I am aware that incandescent lamps have heretofore been made with carbons of relatively large cross-section—that is, with carbons of a cross-section many times greater than the well-known ordinary incandescent lamps in general use; and I do not therefore make any claim to such subject-matter.

I am also aware of the patent of Holcombe, No. 269,417, which shows an arc lamp having converging plate-carbons, with cut-out contacts to short-circuit the carbons when the carbon-holders have been allowed by the burn-

ing away of the carbons to approach within a given distance of each other, and I do not claim such subject-matter.

I claim as my invention—

1. The combination of an electric generator or source of electric energy, an electric circuit, suitably equipped arc lights placed in series in said circuit, incandescent lamps also placed in said circuit in series with the arc lights, and an automatic cut-out for each incandescent lamp which short-circuits the carbon or incandescent substance when it is ruptured.

2. The combination, substantially as set forth, of the continuous section or loop of carbon or incandescent substance, the cut-out springs which tend to press the ends or sockets *f* of the carbon loop toward each other, and the conductors.

In testimony whereof I have hereunto subscribed my name.

WILLIAM M. THOMAS.

Witnesses:

WM. H. POWERS,  
WILLIAM E. COX.