

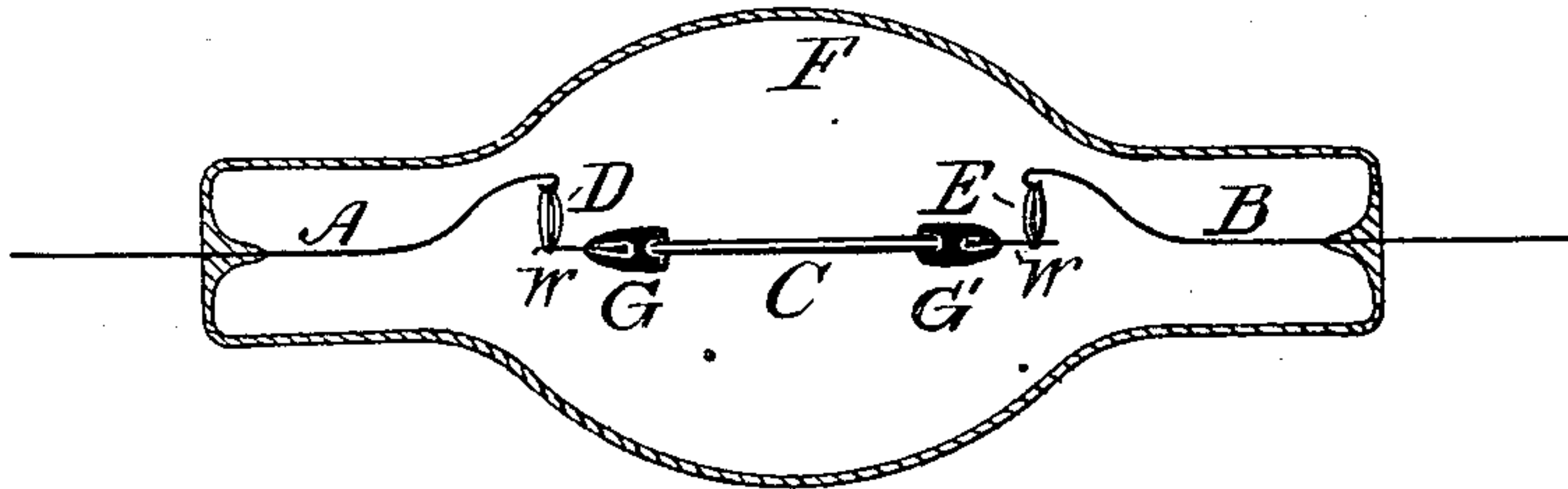
(No Model.)

A. BERNSTEIN.  
INCANDESCENT ELECTRIC LAMP.

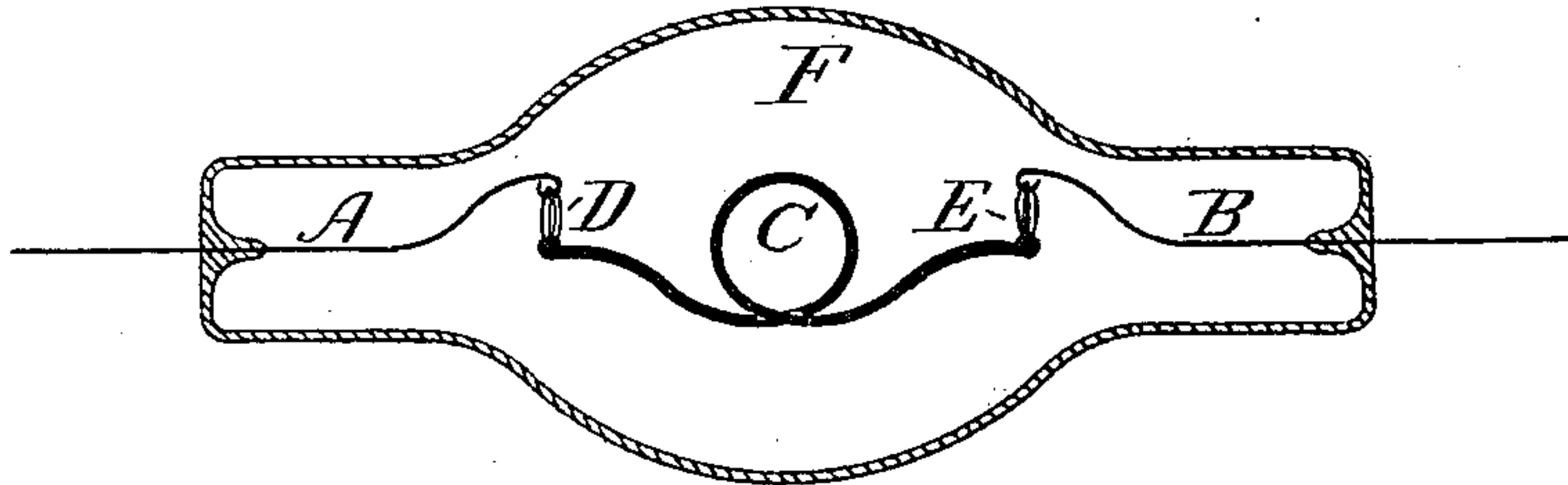
No. 273,704.

Patented Mar. 13, 1883.

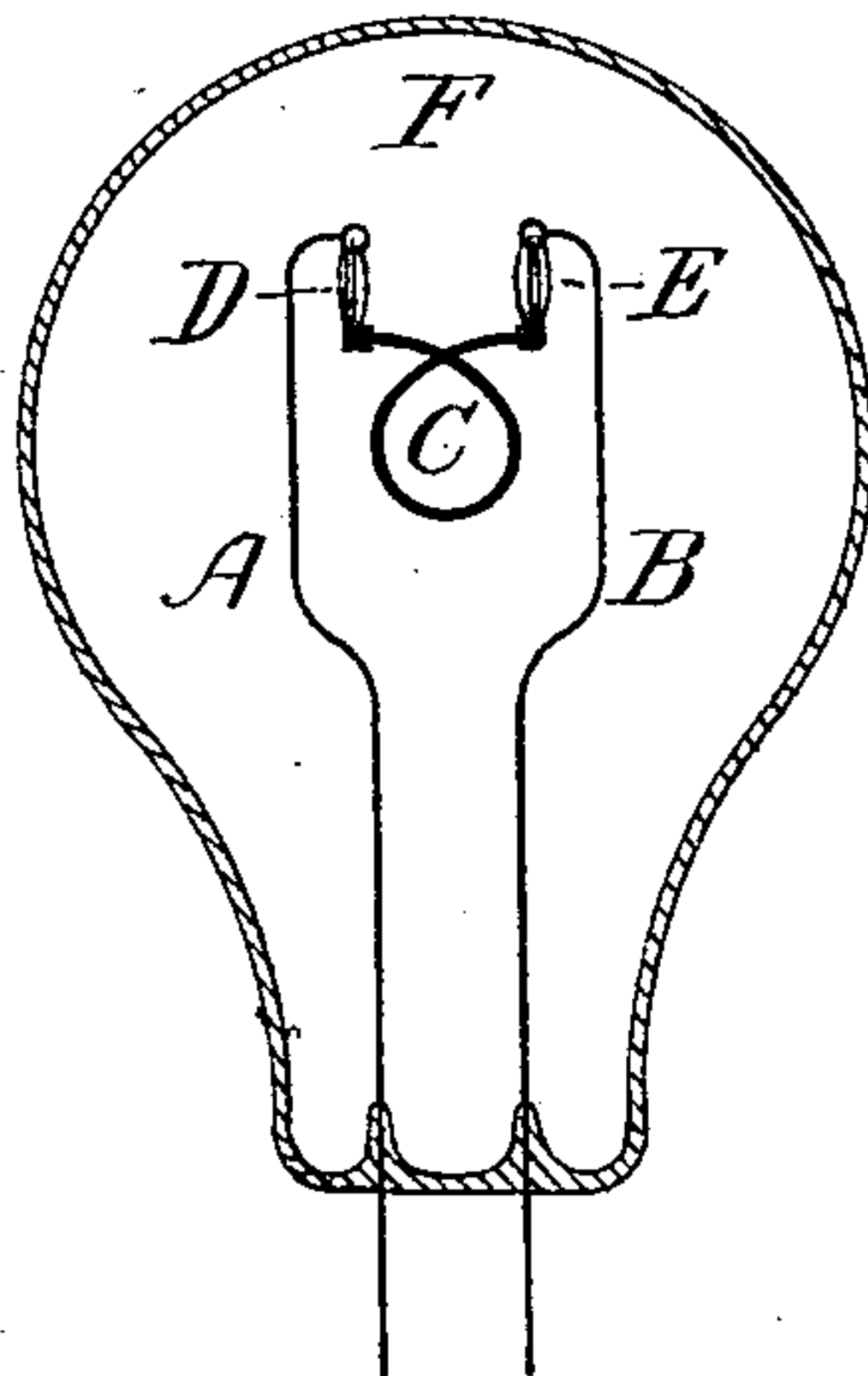
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses:  
Geo. Willis Pierce.  
J. H. Cheever.

Inventor:  
Alex Bernstein  
by his attorney  
Thos D Lockwood

# UNITED STATES PATENT OFFICE.

ALEX BERNSTEIN, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE BERNSTEIN ELECTRIC LIGHT MANUFACTURING COMPANY, OF SAME PLACE.

## INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 273,704, dated March 13, 1883.

Application filed January 4, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, ALEX BERNSTEIN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Incandescent Electric Lamps, of which the following is a specification.

My invention relates to improvements in incandescent electric lamps; and its object is a special construction of such lamps whereby the different expansions and contractions which necessarily occur in them are prevented from exercising any detrimental effect on the carbon or other light-giving conductor.

To this end my invention consists in attaching the said light-giving conductor, which is preferably made of carbon, to the leading-in wires in such a way as to allow free and full play in every direction, it thus being enabled to respond to any change, whether of extension or contraction, however slight.

In incandescent lamps as heretofore manufactured the attachments of the carbon filaments are subject to serious disadvantage from their liability of disruption, arising from irregular expansion and contraction, and from this cause many of the lamps have not the durability that might reasonably be expected. These unequal expansions usually occur when the lamps are first lighted or when they are extinguished. They are also liable to occur when there is a sudden increase or diminution in the amount of electricity passing in the circuit, however such irregularity may be caused. The carbon strips, being held rigidly at one or both ends by the supporting-wires, tend to expand on cooling and to contract on being heated, and unless there is some means of allowing for this expansion and contraction the light-giving conductor is in great danger of being fractured. By my method of constructing incandescent lamps the difficulty arising from unequal expansion is entirely obviated.

Referring to the drawings which form a part of this specification, in which similar letters are used to designate corresponding parts, Figure 1 represents a lamp in which a hollow cylindrical carbon is employed, as described in Letters Patent issued to me on the 30th day of January, 1883. Figs. 2 and 3 represent lamps in which thin carbon strips or filaments are employed as the light-giving part.

In lamps as heretofore made the carbon has been either rigidly attached to both leading-in wires or attached rigidly to one wire and flexibly to the other; but in the construction which I describe herein the connection between the carbon and the conducting-wires is made by suspending the carbon from the said leading-in wires by means of flexible supports, each consisting of a number of fine wires attached at their lower ends to the light-giving conductor.

In the lamp shown in Fig. 1, (which may be made in the form of the well-known incandescent lamp patented in England November 4, 1845, by Edward A. King, and popularly designated as the "Starr-King lamp," when used for submarine illumination as described in the said specification of King, or which may be constructed in any desired form,) F is the glass inclosing-bulb, which, as usual, is, before sealing, exhausted of its air. A and B are the conducting or leading-in wires for conveying the electricity to and from the light-giving conductor, and C is the said light-giving conductor, which is suspended from the two conducting-wires by means of two flexible conductors, D and E, which are placed at its ends, and which are composed of a large number of small wires.

In Fig. 1 the light-giving conductor is a hollow cylinder of carbon provided at each end with and resting in solid carbon blocks G, which, by means of short wires W, connect with the flexible conductors, the blocks G, as well as the light-giving part C, being suspended by the flexible conductors from the leading-wires A B. In Figs. 2 and 3 the same construction is shown as applied to a carbon strip or filament, which may be of any desired shape. These wires are flexible, and the number used is large enough to admit of a free passage of the electric current—i. e., their combined resistance shall not be greater than the resistance of the same length of one of the conducting-wires A. These fine wires, being very flexible, readily admit of any elongation or contraction of the carbon filament due to any cause.

The glass bulb and conducting-wires may expand, while the light-giving carbon may contract, or vice versa, without bringing any strain whatsoever upon the carbon.

I do not, of course, limit myself to the use of



flexible wires as a mode of suspension, since it is evident that a metallic chain would subserve the same purpose, and

I claim—

5 1. In incandescent electric lamps, a light-giving conductor suspended from the leading-in or conducting wires inside the bulb by means of two flexible conductors interposed in the circuit between the said leading-in or conduct-  
10 ing wires and the light-giving conductor, as described.

2. In an incandescent electric lamp, a light-giving conductor consisting of a hollow cylindrical carbon suspended from the leading-in  
15 wires by means of flexible conductors, the said flexible conductors being entirely within the bulb and each formed of a number of smaller wires maintained separate from one another and united on one side with the light-giving  
20 body and on the other side with the leading-

in wires, in the manner and for the purpose described.

3. In an incandescent electric lamp, the combination, with a hollow carbon cylinder, an exhausted glass bulb or globe, and solid leading  
25 conducting-wires extending through the glass into the interior of the said globe, of two flexible conductors, each consisting of a number of small wires or metallic fibers, whereby the  
30 light-giving conductor is suspended within the globe from the leading-in wires, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 30th day of December, 35  
1882.

ALEX BERNSTEIN.

Witnesses:

J. H. CHEEVER,

GEO. WILLIS PIERCE.