

(No Model.)

2 Sheets--Sheet 1.

J. W. SWAN.  
Electric Lamp.

No. 233,445.

Patented Oct. 19, 1880.

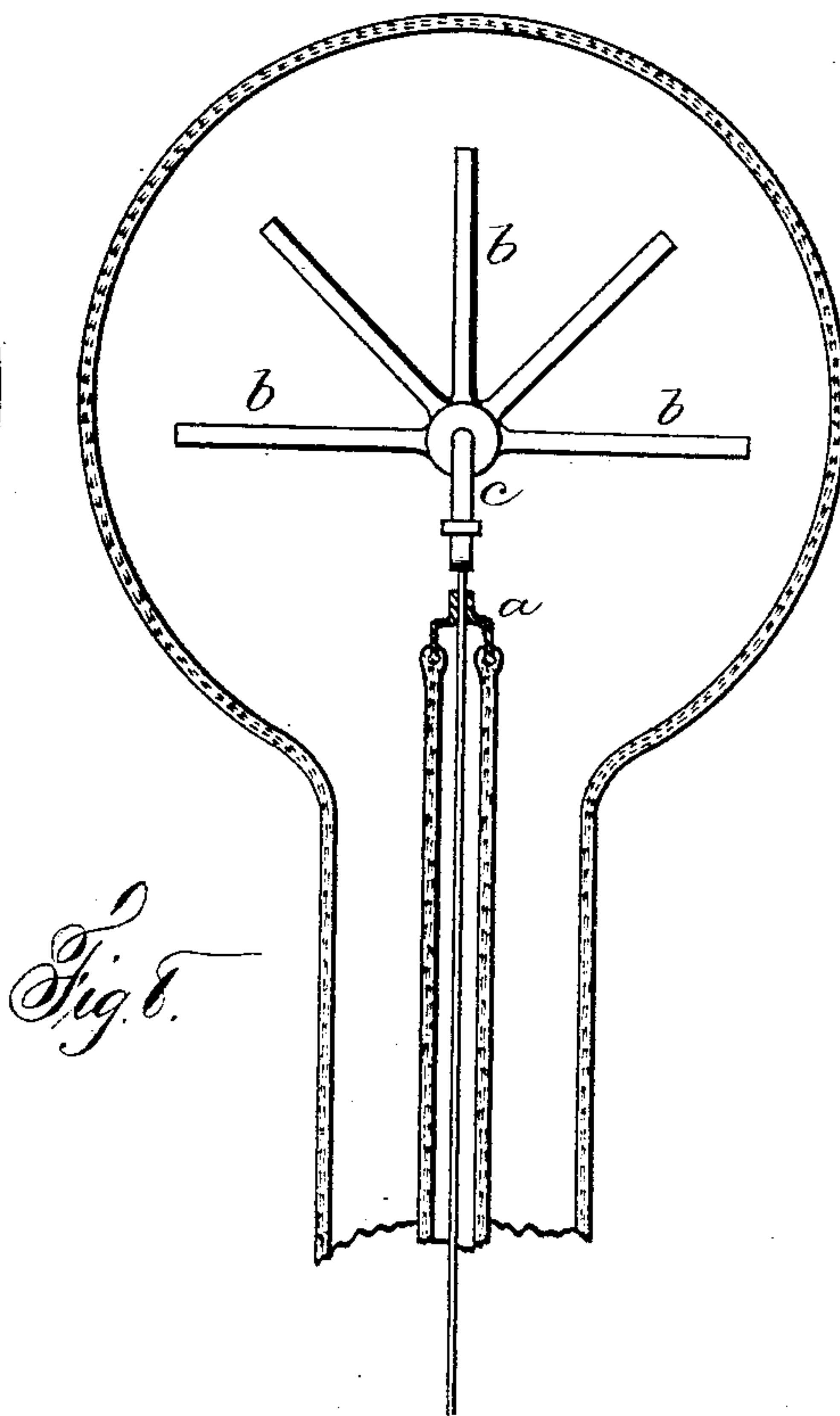
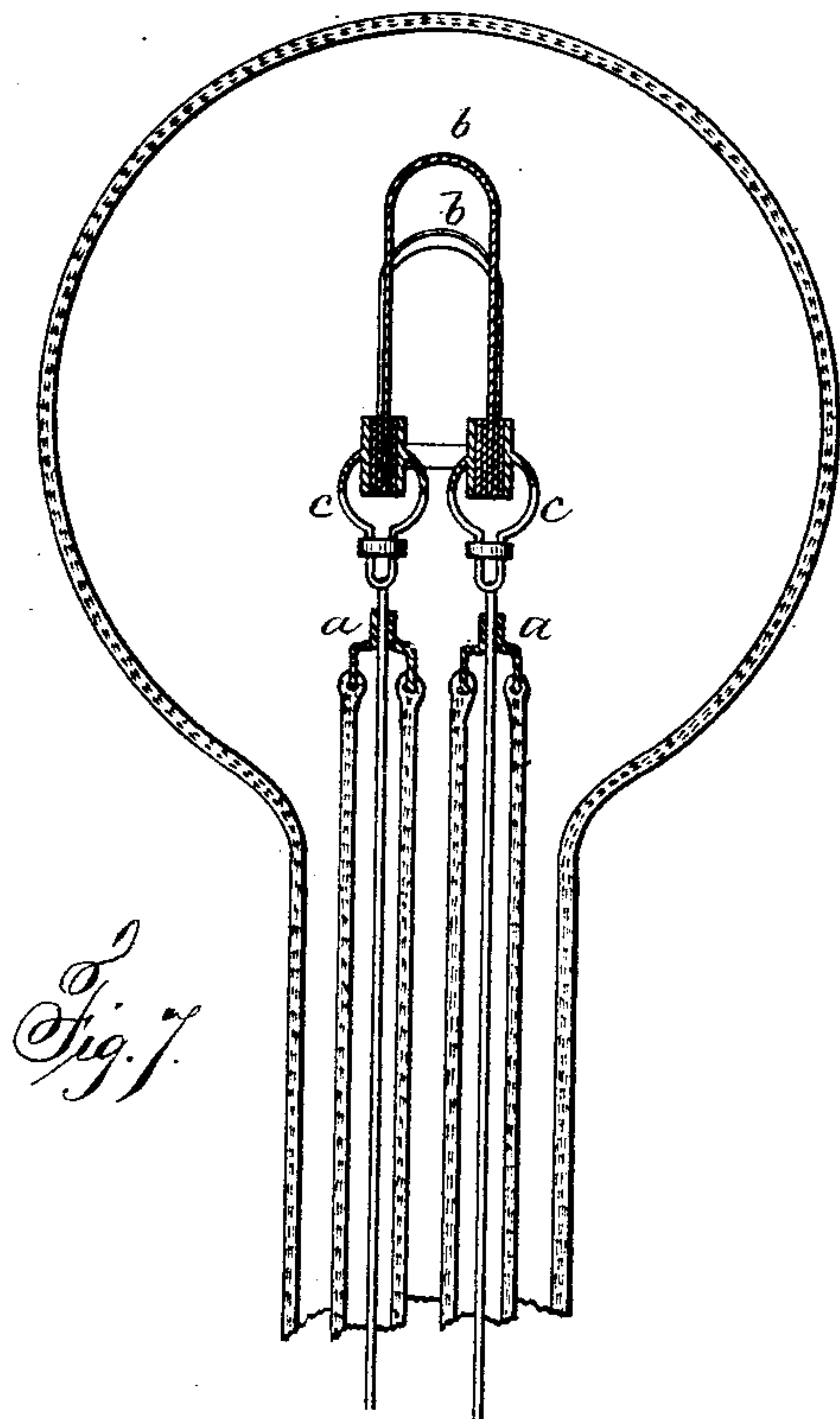


Fig. 1.



Fig. 2.



Fig. 3.

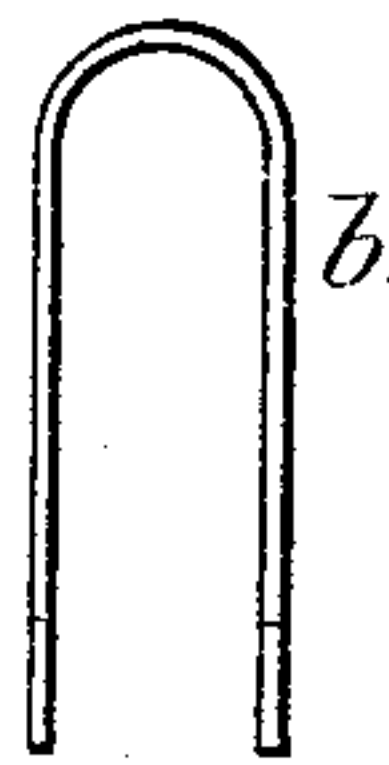
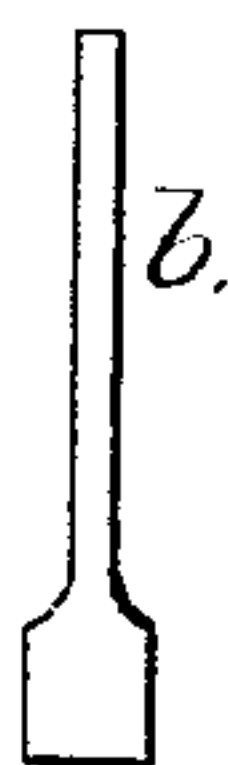


Fig. 4.



Witnesses  
Harold Serrell  
Chas. H. Smith

Inventor  
Joseph Wilson Swan  
Lemuel W. Serrell

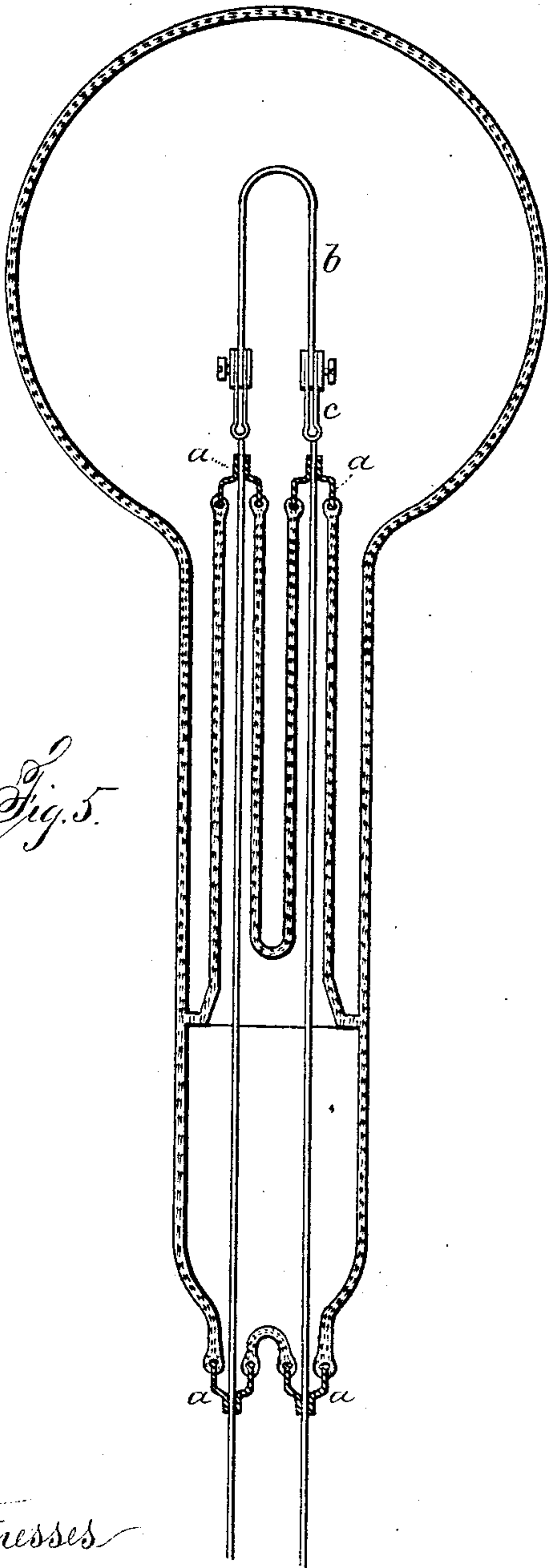
(No Model.)

2 Sheets--Sheet 2.

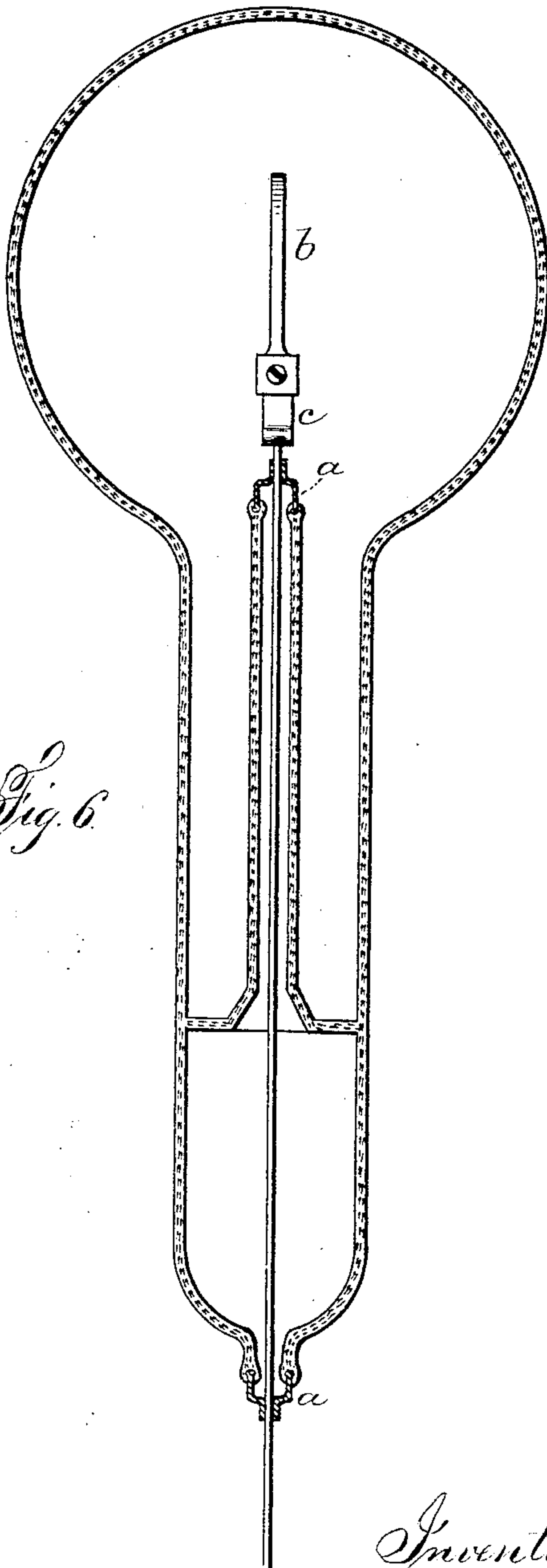
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*Fig. 5.*



*Fig. 6.*

*Witnesses*

*Harold Serrell*  
*Charles Smith*

*Inventor*

*per Joseph Wilson Swan*  
*Lemuel W. Serrell atty*



# UNITED STATES PATENT OFFICE.

JOSEPH W. SWAN, OF NEWCASTLE-UPON-TYNE, ENGLAND.

## ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 233,445, dated October 19, 1880.

Application filed April 12, 1880. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH WILSON SWAN, chemist, of Newcastle-upon-Tyne, England, have invented an Improvement in Electric Lamps, of which the following is a specification.

My invention relates to that kind of electric lamp in which light is produced by the incandescence of a continuous conductor of carbon inclosed in an exhausted glass bulb, and provides means for increasing the durability of the said kind of lamp.

The first part of my invention has for its object to prevent the cracking and leakage of the glass bulb or inclosing-vessel in consequence of the heating and cooling of the conducting-wires, which, when simply sealed into the glass globe, cause it to crack and leak at or near the junction of the wires and glass.

The devices employed for obtaining the object described are caps *a*, of platinum, attached to the bulb at the places where the conducting-wires enter it. Each cap is attached to the bulb by means of the fusion of the glass around the rim of the cap. The conducting-wires pass through or into the caps, and the junction of the wires and caps is secured airtight by soldering, or, where the wire does not pass through the cap, but into it, soldering is not essential. A firm contact of the conducting-wires with the interior of the caps is in that case sufficient. The forms of cap I prefer to use are shown in the annexed drawings, Figures 1 and 2.

Fig. 1 shows a section, through its axis, of the kind of cap, *a*, I use when the wire passes through it, and is soldered into it. Fig. 2 shows a section, through its axis, of the kind of cap, *a*, I use when the wire only enters the inside of the cap, but does not pass through it.

The size and figure of the cap *a* may be varied to some extent without detriment to the object in view, and I therefore do not limit myself strictly to the exact size and form indicated by the drawings.

The second part of my invention has for its object to prevent the rupture of the carbon within the exhausted glass bulb, as the results of its unequal contraction.

I have found that when the carbon em-

ployed within the lamp is formed of a horseshoe-shaped plate, produced by cutting out the horseshoe-shaped piece from a sheet of card-board, and afterward carbonizing it by heat, the horseshoe-shaped carbon-plate so produced is liable to become distorted and ultimately to break in consequence of the unequal contraction caused by the unequal heating of the inner and outer portions of the arch during the use of the lamp.

The defect above described I remedy by forming the carbon to be made incandescent of a strip of card-board, paper, or parchment-paper, *b*, bent into the form of an arch, hoop, or loop, the front view, Fig. 3, of such an arch, hoop, or loop showing its section or thickness, and the side view, Fig. 4, its width.

Where the paper is cut out in the shape of a horseshoe or an arch the measurement at the inner side of the arch is less than that around the outer side of the arch; hence the inner portion offers less resistance to the current than the outside, and becomes the most highly heated.

In my improvement the straight strip offers a uniform resistance to the current, and this resistance is the same and the temperature uniform when the strip of paper is bent to the required form. The strip of card-board, paper, or parchment-paper *b*, bent as aforesaid, I subject to a white heat in a closed vessel of a suitable material, such as fire-clay containing powdered charcoal or other suitable air-excluding powder. I mount one or more of the curved carbon strips, formed as above described, within a glass bulb by clipping the ends of the said curved carbon strips between forceps *c*, of platinum, or an alloy of platinum and iridium, attached to the conducting-wires, which pass through or into the caps, as before described.

The carbon arch and the caps are shown in position in a lamp in Figs. 5 and 6, in which Fig. 5 is a front view, and Fig. 6 a side view, of the carbon, the glass bulb being shown in section.

I guard against the destruction of a lamp in consequence of the accidental rupture of the carbon within it by employing two or more pieces of carbon, *b*, in each lamp.

The multiple carbon arches I clip together by their ends by means of platinum forceps *c*,

before mentioned. I spread out the arches in the manner indicated in Figs. 7 and 8, in which Fig. 7 is a front view, and Fig. 8 a side view, of the carbons as arranged in a lamp, the glass bulb being shown in section.

The third part of my invention has for its object the prevention of the evolution of gas occluded by the conducting-wires within the lamps and the prevention of leakage through the platinum caps; and these objects I accomplish by coating the conducting wires and caps with glass or enamel.

The parchment-paper, which I prefer to use, produces a much stronger and more elastic carbon than the paper or bristol-board heretofore employed, and offers a more uniform resistance to the current.

I claim as my invention—

1. The combination, with an electric lamp,

of platinum caps in the glass where the conductors are applied, substantially as specified. 20

2. In an incandescent electric lamp, a carbon formed from a straight strip of card-board, paper, or parchment-paper, and bent to the form of an arch, hoop, or loop, and carbonized by heat while in a bent condition, substantially as set forth. 25

3. A carbon for an electric lamp made of the carbonized parchment-paper.

4. In an electric lamp, the internal wires and caps coated with glass or enamel. 30

Signed by me this 15th day of March, A. D. 1880.

JOSEPH WILSON SWAN.

Witnesses:

EVAN R. JONES,

ROBERT ROWELL,

*Both of No. 6 Grey street.*