(No Model.)

J. W. PACKARD.

INCANDESCENT ELECTRIC LAMP.

No. 417,789. Patented Dec. 24, 1889.

Fig. 1.

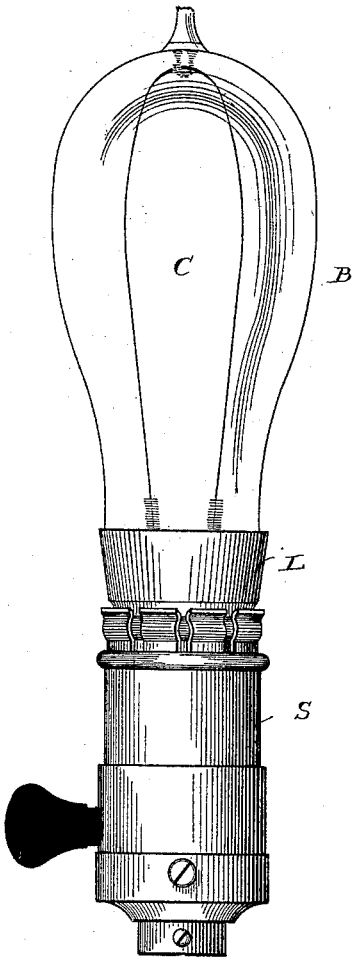
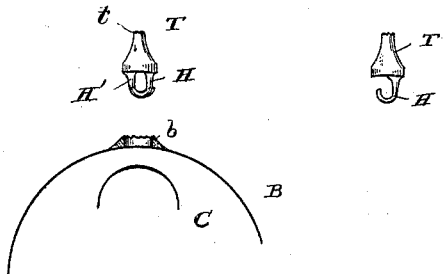


Fig. 2.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES WARD PACKARD, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTINGHOUSE ELECTRIC COMPANY, OF PITTSBURG, PENNSYLVANIA.

INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 417,789, dated December 24, 1889.

Application filed September 7, 1889. Serial No. 323,312. (No model.)

To all whom it may concern:

Be it known that I, JAMES WARD PACKARD, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in High-Resistance Incandescent Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in the improved construction of incandescent electric lamps for high-resistance circuits, hereinafter to be described and claimed.

In the drawings, Figure 1 shows a complete lamp constructed in accordance with my invention. Fig. 2 shows details illustrating said construction.

When it is desired to run incandescent lamps upon or in connection with a high-resistance circuit, it is necessary that the internal resistance of the lamp shall be considerable in order to equal that of the external circuit. To attain this desired resistance, it is customary to make the carbon filament of the lamp of greater length than is the case with ordinary incandescent lamps. While the length of the filament is thus increased, it is still necessary, in order to have it of the desired resistance, that the cross-section of the filament shall not be increased. The result of this co-existence of requirements is a long slender filament which is scarcely able to sustain its own weight, and is therefore liable to break in the handling of the lamp as well as under the jars and shocks to which it is subjected while in use by the turning of the cut-out key, &c. In order to prevent such breakage, it has been attempted heretofore to support the carbon filament at one or more points in the loop by suitable hooks or other projections from the glass bulb inclosing the same. The difficulties met with in these attempts have been that owing to the incandescence of the carbon filament the said hooks or projections were apt to be melted away if made of glass, while if made of platinum or some other refractory substance they would cut through the filament itself, which has been softened by being raised to an incandescent state.

It is the object of my invention to overcome this complication of difficulties by making the carbon filament of greater cross-section at the point or points at which it is to be supported than at other points, and also to provide a convenient method of affixing said supports to the lamp-bulb. The effect of making that portion of the filament at which it is to be supported of greater cross-section is to reduce its resistance, and consequently prevent its being raised to a condition of incandescence, whereby the disadvantages above set out are obviated.

Referring to the drawings, S represents a lamp-socket, and L a lamp of ordinary construction in its general features, except that the bulb B is made longer than is usually the case.

C is the long carbon filament, which at the extremity of the loop has a portion *c* of greater cross-section than that of the rest of the filament.

In constructing the lamp-bulb an opening *b* is left at its end, into which the end of a tube T may be inserted and fused into place. In the end of the tube T is a hook H, or a pair of hooks H H′, which may be of glass, platinum, or any suitable material. The hook or hooks engage the filament C and support it at the point *c*, as shown in Fig. 1. After the air has been exhausted from the lamp through the portion of tube T the lamp-bulb may be closed by sealing the outer end *t* of said tubular portion.

The advantages of my construction of lamp are obvious. The supporting-hooks can be readily put in place and engagement with the carbon at the point where support is most needed and is most effective when supplied.

The carbon filament, being dull and comparatively cool at that point, does not tend to heat and melt the supporting-hooks, nor is it easily cut into by the said hooks or hook, while combined with this is the additional advantage of the greater mechanical strength conferred by this increase of cross-section, and the diminished liability of the filaments

being severed by mechanical abrasion at that point.

I am aware that heretofore filaments have been supported at different portions of their length by one or more forms of apparatus in which the said filaments were tightly clasped, and that in some cases that portion of the filament which was so clasped has been enlarged; but the advantages resulting from the use of my invention are, that the filament is loosely held in the supporting-hooks, so that it may expand and contract and to a certain extent change its shape under the influences of varying temperatures, and still the making of said filament of greater cross-section at and for a short distance on either side from its point of support prevents the destruction of the filament and also of the supporting-hook, as would otherwise be the case.

Having therefore described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an incandescent electric lamp, a lamp-bulb which has one or more supporting-hooks for the carbon filament, a filament which rests loosely in said supporting-hooks, and which has a greater cross-section at the point of support and for a short distance on either side than it has throughout other portions of its loop, substantially as described.

2. In an incandescent electric lamp, the combination of the main bulb, together with the tubular portion or tip inserted and sealed in the end of the bulb, the inner end of said tubular portion being open, and one or more hooks on the inner end of said tubular portion, substantially as described.

3. In an incandescent electric lamp, the combination of the main bulb, the tubular portion or tip inserted and sealed in the end of the bulb, the inner end of said tubular portion being open, and one or more hooks on the inner end of said tubular portion, together with a carbon filament which rests loosely in said supporting-hooks, and which has a greater cross-section at the point of support and for a short distance on either side of said point than it has throughout other portions of its loop, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES WARD PACKARD.

Witnesses:
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