

W. R. WHITNEY.  
 ATTACHING FILAMENTS TO LEADING-IN WIRES.  
 APPLICATION FILED JUNE 14, 1907.

1,013,914.

Patented Jan. 9, 1912.

Fig. 1.

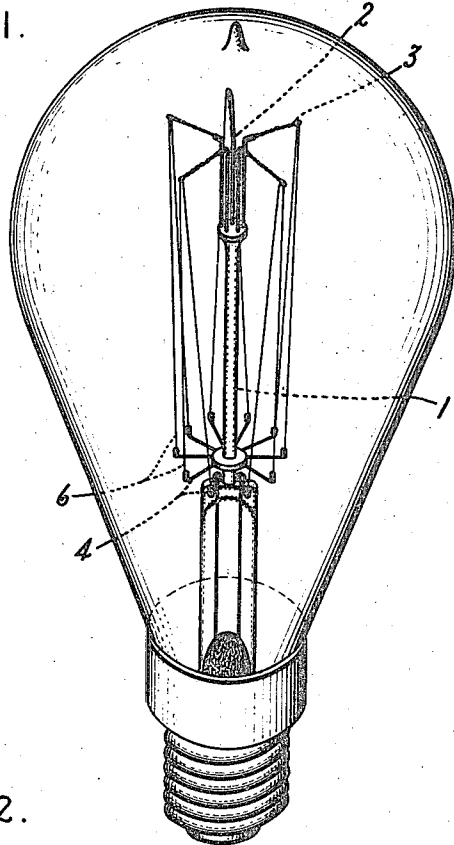


Fig. 2.

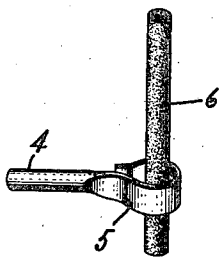


Fig. 3.

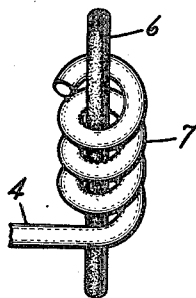
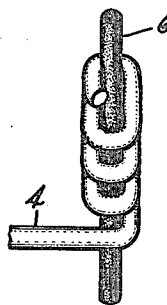


Fig. 4.



Witnesses:

*Margaret E. Wholley*  
*Adeline R. Grady*

Inventor:

Willis R. Whitney,

by *Albush, Davis*  
 Att'y.

# UNITED STATES PATENT OFFICE.

WILLIS R. WHITNEY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## ATTACHING FILAMENTS TO LEADING-IN WIRES.

1,013,914.

Specification of Letters Patent.

Patented Jan. 9, 1912.

Application filed June 14, 1907. Serial No. 378,933.

### *To all whom it may concern:*

Be it known that I, WILLIS R. WHITNEY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Attaching Filaments to Leading-in Wires, of which the following is a specification.

According to my present invention metal lamp filaments may be connected with their leading-in conductors by purely mechanical means and without the use of any foreign material which might possibly contaminate the filament or the lamp vacuum, or otherwise impair the material of the filament. The novel connections hereinafter described are produced by a new process, and although the process is applicable to lamp filaments of either tungsten or molybdenum, I have hereinafter described the process as applied to tungsten. I desire, however, that this specification shall be construed as applying also to molybdenum and that, in this relation, the two materials may be regarded as equivalents.

Tungsten filaments as ordinarily produced are brittle and quite devoid of ductility and they therefore do not lend themselves readily to manipulation and cannot be bent and twisted like filaments of more ductile material. I find, however, that when the tungsten is treated as hereinafter described, it is put in such physical condition that it can be bent and otherwise manipulated and can, while in this state, be distorted to produce a good mechanical connection with the leading-in conductor.

The accompanying drawing illustrates, in Figure 1, a lamp embodying my invention. Fig. 2 is an illustration of the connection between filament and leading-in conductors, much magnified. Figs. 3 and 4 are enlarged views of a modified connection before and after the joint is completed.

Tungsten filaments can be produced in various ways, including, among others, the processes described in British Patents Nos. 23,334 and 23,336 of 1906, and No. 15,451 of 1907. To mount tungsten filaments produced in this or any other manner in a lamp I may use the arrangement illustrated.

To mount these coherent filaments of pure tungsten in a lamp I may use the arrange-

ment illustrated in Fig. 1, in which 1 is a central pedestal of glass or other non-conducting material carrying a plurality of copper or nickel wires 2 bent to form radial arms and having sockets at their outer ends for engagement with twisted wire loops 3 of tantalum. The filaments may be supported by these tantalum loops and may be symmetrically disposed about the central pedestal 1. The leading-in conductors 4 at the base of the lamp may be of nickel or platinum and each provided at its end with a loop, spiral or similar device forming a socket for the lower end of the filament. The socket may be of the simple form shown in Fig. 2, in which the leading-in conductor 4 is merely flattened out into a hook 5 engaging with the leg 6 of the tungsten filament, or it may be of the more complex form shown in Fig. 3 in which the leading-in conductor is shaped into a helix 7.

To complete the joint between the filament and the leading-in conductor, I squeeze the joint with a heated body as between the jaws of a pair of heated pliers. I find that the heat of the pliers will soften the tungsten and render it ductile and pliant, and that by squeezing the joint I can distort the filament as illustrated in Fig. 4 and can press the platinum or nickel wire into intimate contact therewith. The pliers need not be very hot, and in fact, should preferably be at about visible redness. At such low temperatures the tungsten filament does not oxidize and is not injured by the operation. Even if the pliers be hotter and the tungsten be oxidized superficially the product is still serviceable. As soon as the joint cools, the tungsten resumes its non-ductile and brittle character. It retains permanently its distorted shape and the joint is entirely free from vaporizable material.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The method of attaching a tungsten lamp filament to a leading-in conductor which consists in pressing one about the other while the filament is heated to a temperature lower than that at which tungsten oxidizes in air.

2. The method of attaching a non-ductile lamp filament to a leading-in conductor which consists in rendering a portion of said

filament pliant by heating and then pressing the filament into intimate contact with the leading-in conductor and locking it thereto.

3. A joint between a fragile metal filament and its supply conductor comprising  
5 a spiral on said conductor pinched tight about said filament and holding it in place.

In witness whereof, I have hereunto set my hand this 12th day of June, 1907.

WILLIS R. WHITNEY.

Witnesses:

BENJAMIN B. HULL,  
HELEN ORFORD.