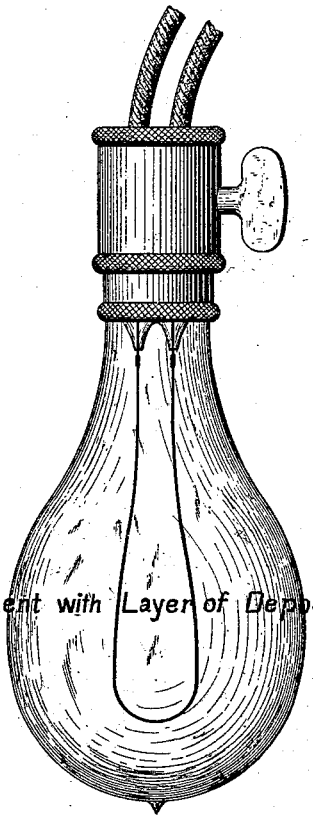
(No Model.)

J. W. AYLSWORTH.

INCANDESCING ELECTRICAL CONDUCTOR.

No. 553,328. Patented Jan. 21, 1896.



Carbon Filament with Layer of Deposited Niobium

ATTEST.
J. Henry Kaiser.
D. R. Cahill

INVENTOR.
Jonas Walter Aylsworth
By Charles J. Kintner
Atty

UNITED STATES PATENT OFFICE.

JONAS WALTER AYLSWORTH, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF TO CONVERSE D. MARSH, OF NEW YORK, N. Y.

INCANDESCING ELECTRICAL CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 553,328, dated January 21, 1896.

Application filed July 27, 1894. Renewed August 8, 1895. Serial No. 558,686. (No specimens.)

To all whom it may concern:

Be it known that I, JONAS WALTER AYLSWORTH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have made a new and useful Invention in Incandescing Electrical Conductors, of which the following is a specification.

My invention relates especially to improvements in electrical conductors which are used in connection with incandescent electric lamps; and it has for its object the production of such an electrical conductor as will give large efficiency in illuminating capacity and possess greater life than results from well-known forms of carbon and other incandescing filaments or conductors now in general use.

My invention consists in the construction or use of conductors or filaments for electric lamps from the metal niobium or from any compound of the metal niobium and any equivalent metal known in the art of metallurgy to be closely allied therewith, such as tantalum. Metals of the character of niobium and tantalum are well known by metallurgists to be of a very refractory nature and for this reason they have not heretofore been converted into such coherent form or condition as to render them capable of general use in the arts where ordinary well-known easily-fusible and ductile metals are used. It has for this reason been heretofore impossible to use such metals as electrical conductors. I have discovered that these metals are possessed of especially desirable qualities in the art of electrical illumination, such as having increased life, greater illuminating capacity under the usual voltage and current quantities, and increased resistance for an increase of temperature due to the heating of the conductor by the current, and I therefore construct filaments or conductors of the desired current-carrying capacity of such metals.

The drawing accompanying this specification illustrates an incandescent electric lamp of well-known form provided with a filament or conductor constructed in accordance with my invention.

I take an ore of niobium, such as the mineral known as "columbite," and treat it by well-known chemical means for separating the oxides of such metals and obtain in this manner niobium oxide, and in like manner equivalent oxides are obtained—that is to say, oxides of such metals as belong to or are closely allied to the same group as is niobium. After the oxide is thus separated from the substance I then convert it into a volatile halogen compound by the well-known application of mixing such oxides with charcoal and heating to a high degree of temperature in a current of a dry halogen gas, such as chlorine or bromine. The vapor of the volatile compound thus obtained is then mixed with the vapor of a reducing-gas with which it is capable of combining, such as hydrogen. This mixed vapor is then allowed to come into contact, in a suitable receptacle, with a highly-heated filament base or support of suitable nature and upon which the metallic substance, as niobium, will then be deposited. To illustrate, a filament of carbon or a filament of any substance which will form a core-base or support for the metal to be deposited upon is highly heated electrically or otherwise in the presence of the mixed vapors and the metal is deposited thereon. The reaction which takes place when hydrogen gas and a halogen compound of niobium are used is as follows: The hydrogen combines under the influence of high heat with the halogen component and deposits the metal on the base or support and simultaneously liberates a volatile compound of hydrogen and the halogen element. It is not absolutely necessary that the interior core or support shall be of carbon, as any conducting-base may be used which will withstand sufficient temperature to effect the deposit of the metal—as, for instance, platinum or a filament of non-conducting material having a conducting-surface.

I do not limit myself to any special method or means of heating the mixed vapors which contain the metal that is to be deposited and also the base or filament upon which the deposit is made, as they may be obviously heated by any well-known application of extraneous heat or by the agency of electricity, or in such manner and ways as are well known to those skilled in the art of metal working; nor do I limit myself to any special degree of

temperature in the depositing of the metallic substance upon the filamentary base or support, it being only necessary to heat the material to such temperature of temperatures as will vaporize the halogen compound and form the deposit. Where a carbon or other electrical conducting-base is used, I prefer to heat such filament or conductor to such an incandescence as it will maintain without rupture and to heat the halogen compound until the vapors are generated.

I make no claim in the present application to the art of working or producing niobium or equivalent highly-refractory metals known to metallurgists by the process herein referred to, as this constitutes the subject-matter of a separate application filed of even date herewith, and is only referred to here in order to enable those skilled in the structure of incandescing conductors to manufacture and use the same.

My claims in the present application are directed to incandescing conductors of niobium and equivalent refractory metals or the compounds of such metals when used in the arts.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An electrical conductor formed of the so-called elementary substance "niobium" deposited upon a conducting base or support such as carbon.

2. An incandescing electrical conductor formed of the so-called elementary substance "niobium" deposited upon a conducting base or support.

3. An incandescing electrical conductor having a suitable core, base or support covered with the elementary substance niobium.

4. An incandescing conductor formed of the union of the so-called elementary substance "niobium" and a core, base or support upon which the elementary substance is deposited.

In testimony whereof I have hereunto subscribed my name this 13th day of July, 1894.

JONAS WALTER AYLSWORTH.

Witnesses:
C. J. KINTNER,
M. M. ROBINSON.