

UNITED STATES PATENT OFFICE.

ALEXANDER JUST AND FRANZ HANAMAN, OF BUDAPEST, AUSTRIA-HUNGARY; ASSIGNORS TO EGYESÜLT IZZÓLAMPÁ ÉS VILLAMOSSÁGI RÉSZVÉNY TÁRSASÁG, OF UJ-PEST, AUSTRIA-HUNGARY.

PROCESS FOR MANUFACTURE OF INCANDESCENT BODIES FOR ELECTRIC LAMPS.

No. 855,060.

Specification of Letters Patent.

Patented May 28, 1907.

Original application filed July 6, 1905, Serial No. 268,523. Divided and this application filed January 5, 1907. Serial No. 350,924.

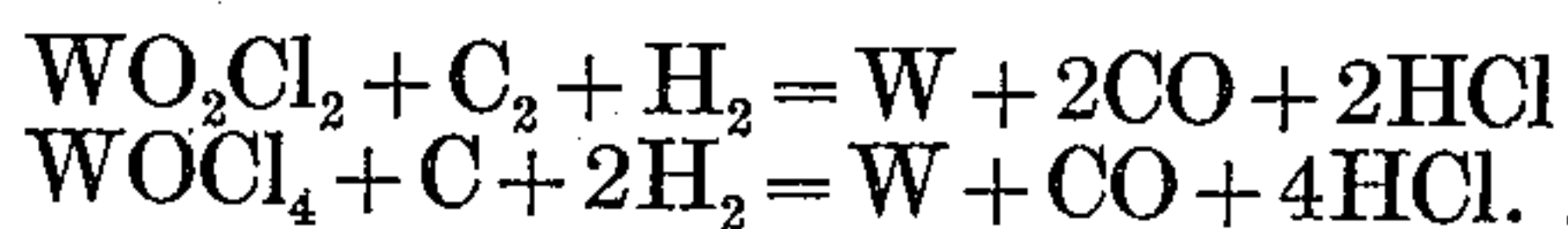
To all whom it may concern:

Be it known that we, ALEXANDER JUST, chemist, and FRANZ HANAMAN, chemical engineer, both subjects of the Emperor of Austria and residing at Budapest, Desewffy utca 3, in the Empire of Austria-Hungary, have jointly invented a certain new and useful Process for Manufacture of Incandescent Bodies for Electric Lamps, of which the following is a specification.

The present invention constitutes the first division of our application for U. S. Letters Patent for manufacture of incandescent electric lamps, filed July 6, 1905, Serial Number 268,523, and has for its object the manufacture of filaments of pure tungsten by means of a process which is based upon the substitution of the carbon contained in a filament by tungsten.

It has become known to convert carbon filaments into tungsten filaments by means of a process which consists in heating carbon filaments by means of an electric current in an atmosphere of oxychlorids of tungsten, in the presence of hydrogen, whereby the carbon of the filament becomes substituted by tungsten. Now, the experience has proved that if the said process is carried out in the described way, viz. with use of a carbon filament, as a starting body, it is not possible to obtain pure tungsten bodies, because of the fact that the inner core of the carbon filament remains uninfluenced by the reactions going on on the exterior only of the filament, or with other words, the reaction is not homogeneous throughout the whole section of the carbon core, with the result that, while the exterior part of the core becomes entirely converted into tungsten, the inner part either undergoes alterations to a slight degree only or remains wholly unaltered. This fact constitutes a very important drawback, because in case of subjecting such an imperfect body to an intense heat, such body becomes easily deteriorated. Overmore in order to obtain thereby such imperfect filaments, considerable time is required, the duration of which injuriously affects the economy of the manufacture. According to the present invention the said process is started with bodies consisting of a mixture of tungsten and carbon, or of a mixture of some tungsten compound

or compounds and carbon, whereby firstly it has become possible to obtain finally pure tungsten filaments and secondly the duration of manufacture is considerably decreased and the manufacture itself facilitated. In order to produce such filaments consisting of a mixture of tungsten and carbon, finely divided tungsten or some tungsten compound, which is readily reduced by carbon to a metal, such as tungsten oxid, tungstic acid, tungsten sulfid or the like is mixed with an organic binding medium, such as solution of cellulose in chlorid of zinc, collodion, coal tar, coal pitch or the like, the filaments being then formed by pressure in the usual manner, and thereupon (after a proceeding denitration in case of applying collodion) these filaments are carbonized. As regards the quantity of the tungsten compound employed in this mixture the proportions should be determined in such a manner that in the finished filaments sufficient carbon is always present to impart the requisite strength to them, as it is the carbon alone that imparts to such a filament the necessary strength for withstanding the subsequent treatment. Thus for example, efficient filaments are obtained, if from 2 to 10 g. tungstic acid are added to a solution of 10 g. cellulose in 260 g. chlorid of zinc of the specific weight 1.83, this mixture being then formed into filaments and carbonized in absence of air. The said filaments which consist of carbon and tungsten in accordance with the present process are submitted to the following further treatment: The filaments are submitted to an electric current in an atmosphere of vapor of the oxyhalogen compounds of tungsten (such as tungsten oxychlorids) WO_2Cl_2 , $WOCl_4$ in the presence of a little free hydrogen. When the filament incandesces, the reactions indicated by the following equations take place:



As will be seen, in this reaction the carbon still contained in the filament is replaced by tungsten.

What we claim as our invention and desire to secure by Letters Patent is:

1. The method of making incandescing

bodies for electric lamps which consists in producing the said body from a mixture of carbon and tungsten and replacing the carbon totally by tungsten, substantially as described.

5
2. The method of making incandescing bodies for electric lamps which consists in heating a mixture of carbon and tungsten to a red heat in the vapor of oxyhalogen compound of tungsten by an electric current in
10 the presence of hydrogen to cause the carbon

to be replaced totally by tungsten, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of
15 two subscribing witnesses.

ALEXANDER JUST.
FRANZ HANAMAN.

Witnesses:

TOIBORS HAJOS,
CHARLES E. WALKER.