

UNITED STATES PATENT OFFICE.

WILLY SAULMANN, OF BERLIN, GERMANY.

PRODUCTION OF INCANDESCENT MANTLES.

SPECIFICATION forming part of Letters Patent No. 640,326, dated January 2, 1900.

Application filed February 23, 1897. Serial No. 624,712. (No specimens.)

To all whom it may concern:

Be it known that I, WILLY SAULMANN, doctor of chemistry, a subject of the King of Prussia, German Emperor, residing at Berlin, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in the Production of Incandescent Mantles, of which the following is a full, clear, and exact description, and for which I have obtained patents in France, No. 257,601, dated October 15, 1896; in Belgium, No. 122,156, dated June 26, 1896, and in England, No. 14,448, dated June 30, 1896.

Hitherto incandescent mantles have been produced by impregnating a vegetable fabric with a solution of nitrates of thorium and cerium, $\text{Th}(\text{NO}_3)_4$ and $\text{Ce}(\text{NO}_3)_4$, said fabric having been thoroughly cleaned before it was carbonized. This treatment produces a molecular mixture of thorium and cerium oxids which when heated to white heat produces a very brilliant light; but mantles constructed or produced according to this method have the disadvantage of being very fragile, the pulverous oxids not imparting to the structure sufficient strength. The consequence is that the mantles soon become deformed in use and are also subject to a loss of the pulverous oxid, which deteriorates the illuminating power of the mantle.

The object of the present invention is to obviate these disadvantages and to produce a stronger and more durable mantle without, however, decreasing the illuminating power of the same.

After a number of experiments I have found that the illuminating power of the mantle is not due solely to the presence of thorium oxid and cerium oxid, but that the presence of cerium in any of its combinations is sufficient to impart to the thorium oxid the power of illuminating which it has not received from nature. Thus if cerium silicate is mixed with the nitrate of thorium and the fabric impregnated and oxidized it will when glowed give a very bright light, whereas when the fabric is impregnated with nitrate of thorium alone hardly any illuminating power is noticeable. Moreover, the cerium silicate does not decompose in the white heat, for the ashes show no signs of cerium oxid. Hence it follows that the presence of a cerium silicate is suf-

ficient to impart illuminating power to the thorium nitrate. The employment of silicate of cerium is, however, not advantageous, because it will merely be suspended in the nitrate-of-thorium solution and prevent attainment of perfect homogeneity of the substances, which is necessary to produce a good mantle. Apart from this it is impossible to deposit the silicate properly on the fabric, because the silicic acid contained therein possesses alkaline properties which it is important to avoid in the mantles. It is therefore necessary to employ fireproof-cerium compounds which are soluble and which can be deposited on the fabric direct. The compounds which will fulfil these conditions are those which contain triatomic elements, and in the present case particularly arsenic, boron, antimony, and chromium.

If, for instance, a solution of nitrate of cerium is mixed with a solution of arsenic acid, the solution will remain clear, but if heated or vaporized cerium arseniate appears in the form of a white crystalline precipitation.

The manufacture of incandescent mantles with arsenic is carried out in the following manner: The mantle is first impregnated with a solution of nitrate of thorium, then treated with a solution of arsenic acid and nitrate of cerium, after which it is dried in order to separate out the insoluble cerium arseniate. The combustible fabric or foundation is then burned out and a consistent body of thorium oxid and cerium arseniate obtained.

For the purposes of the present description cerium arseniate with nitrate of thorium are employed; but a compound of cerium with antimony or with boron or with chromium may be used instead of the cerium arseniate. The basic compounds of arseniate, borate, &c., may also be employed in the same manner. The mantles will not, however, be quite so strong as is the case if cerium arseniate is employed. The cerium may also be replaced by similar compounds of other suitable incandescing rare metals or combinations thereof with the aforesaid triatomic elements.

Mantles produced by the present process are very durable and strong, because the arseniate, borate, &c., contained in them in crystalline form imparts to them much more strength than does the amorphous pulverous

oxid. For this reason the illuminating power of the mantles is more enduring than that of the ordinary mantles.

I claim as my invention—

- 5 The process substantially as herein described, of producing incandescent bodies for illuminating purposes, consisting in impregnating a combustible substance with a solution of thorium salt, and also with a solution
10 of a compound of cerium or equivalent incandescing rare earth with a triatomic element

such as arsenic, boron, antimony, chromium, and then burning out the combustible substance.

In testimony whereof I have signed this 15 specification in the presence of two subscribing witnesses.

WILLY SAULMANN.

Witnesses:

H. SCHLOSS,
BRUNO ROBRA.