

UNITED STATES PATENT OFFICE.

RUDOLF LANGHANS, OF BERLIN, GERMANY.

ELECTROLYTIC PROCESS OF CONVERTING HYDROXIDS OF EARTH AND EARTH ALKALI METALS INTO
INDISSOLUBLE ORGANIC OR INORGANIC SALTS, &c.

SPECIFICATION forming part of Letters Patent No. 571,533, dated November 17, 1896.

Application filed March 28, 1896. Serial No. 585,240. (No specimens.)

To all whom it may concern:

Be it known that I, RUDOLF LANGHANS, a subject of the Emperor of Austria-Hungary, residing at Berlin, Kingdom of Prussia, Germany, have invented a new and useful Process of Electrolytically Converting Hydroxids of Earth and Earth Alkali Metals into Indissoluble Organic or Inorganic Salts Capable of being Reduced into Oxids by Calcination; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the conversion of the hydroxids of the earth metals into indissoluble organic or inorganic salts reducible by heat into oxids, the term "earth metals" including as equivalents the earth metals proper as well as the earth alkali metals; and it has for its object more particularly the conversion of such hydroxid or hydroxids when electrolytically deposited on electroconductive foundations for use as incandescent bodies in gas-lighting.

In another application filed by me, Serial No. 569,346, I have fully described the process of electrolytically depositing the hydroxid or hydroxids of the earth and earth alkali metal or metals on electroconductive foundations, said process consisting, broadly, in dissolving a hydrate of an earth oxid in an aqueous but not quite concentrated solution of a neutral earth salt and electrolyzing said prepared solution by a current of high density, the electroconductive foundation to be coated forming the negative electrode. After the foundation is coated it is carefully dried and calcined, the coating being very adhesive and cohesive.

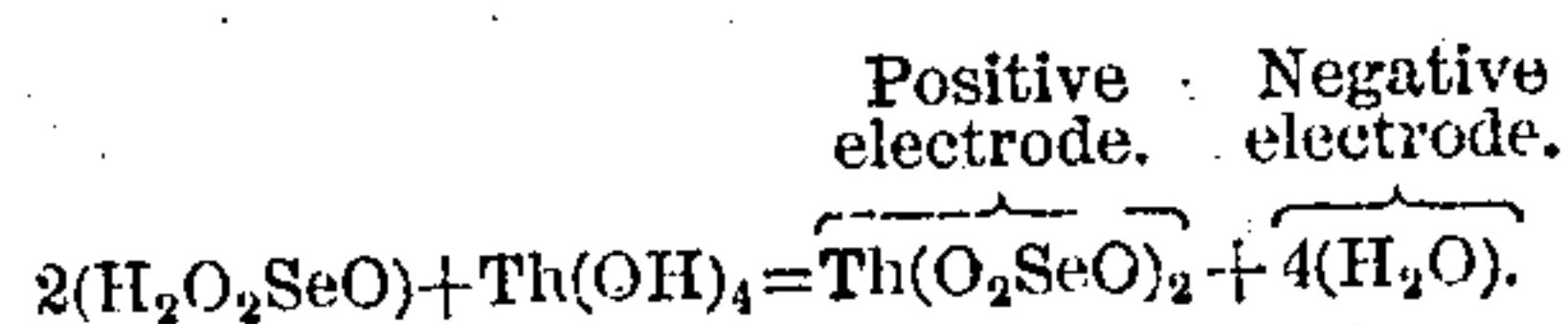
In my said application referred to I also described the means for rendering the coatings more porous by chemical treatment prior to calcination. In said chemical treatment the coated body is dipped into an aqueous solution of selenious, tartaric, oxalic, and other-named acids, or of appropriate salts of the same.

In the progress of my researches I have dis-

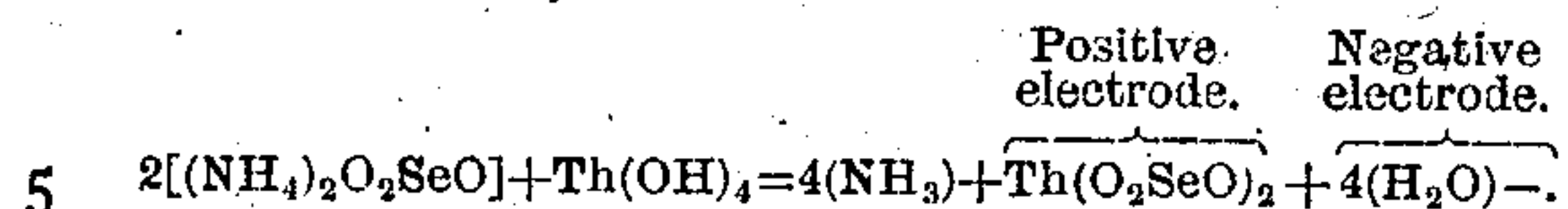
covered an electrolytical method of converting the said hydroxid or hydroxids deposited electrolytically on the electroconductive foundation into indissoluble salt or salts, organic or inorganic, which can be reduced into oxid or oxids by the application of heat. This discovery is highly important because it is in some respects more advantageous than the chemical treatment, inasmuch as the transformation is brought about more quickly and in a more perfect manner than by chemical reactions.

To effect the conversion electrolytically in accordance with my present invention, I proceed as follows: The body or foundation coated with the hydrated oxid or oxids is removed from the first bath described in my application referred to, and is connected with the positive pole of a weak source of electricity and placed as the positive electrode in an aqueous solution of the selected acid, for instance, selenious acid, tartaric, oxalic, formic, tannic, or carbonic acid, and the passage of the weak current immediately transforms the hydrated oxid or oxids into the corresponding indissoluble salt or salts. Instead of said acids certain salts of the same may be used, in which case the acid radicle is likewise separated out at the positive electrode, while the basic radicle separates out at the negative electrode. From this it results that the basic radicle of the salt used must be such as not to alter the bath. Such salts are, for instance, the ammonia salts of said acids, as also the salts which they form with the amines and analogous compounds. These salts being merely equivalents as to effect of the acids, the term "acid" is intended to include the said salts also. The current density required to effect this electrolytic transformation is about 0.02 ampere per square centimeter of coated surface.

For instance, if an aqueous solution of selenious acid is to be used to transform a coating of thorium hydroxid into thorium selenite the reaction is as follows:



When an aqueous solution of selenite of ammonia is used, the reaction is as follows:



The hydrated oxid or oxids having been thus converted into the corresponding indissoluble salt or salts electrolytically the coated body is disconnected from the source of electricity, removed from the said solution, and then by calcination the said salt or salts are reduced into oxid or oxids.

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

1. The herein-described process of electrolytically transforming into salt the hydroxid of earth metal deposited upon electroconductive foundations, which consists in placing such coated foundation as an anode in an electrolyte which consists in an aqueous solution of an acid or its specified equivalent capable of converting the hydroxid coating into a salt which is indissoluble in the bath, but reducible to oxid by the action of heat, and electrolyzing by a current of low density.

2. The herein-described process of electro-

lytically transforming into salt the hydroxid of earth metal deposited upon electroconductive foundations, which consists in placing such coated foundation as an anode in an electrolyte which consists of an aqueous solution of selenious acid or its described equivalent, and subjecting the said solution to the action of a current of low density.

3. The herein-described process of electrolytically transforming the hydroxid of an earth metal deposited by electrolysis as coatings upon electroconductive foundations into salt by the action of an electric current of low density on an aqueous solution of an acid or its described equivalent capable of converting the hydroxid into a salt that is indissoluble in the bath and reducible to oxid by heat, into which solution the coated foundation is placed as an anode, and thereafter reducing the salt to oxid by calcination.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

RUDOLF LANGHANS.

Witnesses:

W. HAUPT,

CHARLES H. DAY.