

UNITED STATES PATENT OFFICE.

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PROCESS FOR MAKING ANODES OF SOLID MANGANESE PEROXID.

1,296,188.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, MAX HUTH, a German citizen, and residing at Berlin-Charlottenburg, Germany, have invented certain new and useful Improvements in Processes for Making Anodes of Solid Manganese Peroxid, of which the following is a specification.

My invention relates to anodes which are made from solid peroxid of manganese and consists in brief in an improvement of the process described in my U. S. Patent No. 935109, dated September 28, 1909, in which either pure nitrate of manganese or crystalline peroxid of manganese is brought into forms with the addition of nitrate of manganese and thereupon heated in order to change the nitrate of manganese into peroxid of manganese. When using plates of normal strength, the conductivity of anodes which are made according to the above mentioned patent, will not be sufficient for high currents, and it is the object of my present invention to obtain an increase of the conductivity of the anodes, which is relatively dependent upon the strength of the material, by subsequently treating the anode by a precipitation of peroxid of manganese.

According to my present invention, the process of making anodes, therefore, is carried out in such a manner, that at the first decomposition of the material, which is brought into the form, the pure nitrate of manganese or crystalline peroxid of manganese with an admixture of nitrate of manganese will form a main layer of peroxid of manganese. The material added will then again be decomposed into peroxid of manganese, which however will not deposit as an additional layer upon said former layer, but which seems to enter into the pores of the same, thereby increasing the density thereof. The main layer of peroxid of manganese will therefore be so to say impregnated by the subsequent decomposition without, however, causing the thickness of the anode to increase in proportion to the quantity of material which is introduced.

This impregnating process now may either be carried out according to the aforementioned patent in two manners which are different from each other. In the first place the peroxid of manganese which is formed

by the decomposition of nitrate of manganese may be made to cool off in the form and thereupon new material may be added which is again decomposed by being heated. Also during the decomposition of the material which is first brought into the form the proper quantities of nitrate of manganese may be continuously added and thus the process of manufacture may be rendered uninterrupted. The number and duration of the several working phases, as well as the quantity of the material to be added is dependent upon the quality of the desired product.

As thus the quantity of the first decomposed material will determine the strength of the anode, and as the quantities of the material thereupon added will essentially only influence the conductivity of the product, a smaller cross section will be required for the same current by reason of the increased conductivity. This will result in a great saving of material. Since however the greater density of the anodes will prevent formation of gas in the inside of the anodes and therewith the phenomena of polarization and a loosening of the structure, the anodes will also obtain a greater mechanical strength and a greater life-time.

According to my invention instead of the crystalline peroxid of manganese also natural manganese dioxid may be employed as original material. For this purpose natural manganese dioxid is made to small pieces and rendered free from impurities by treatment with sulfuric acid or another acid which does not decompose peroxid of manganese. The powder of manganese dioxid which is thus gained is thereupon well washed out, dried and wetted with a solution of nitrate of manganese and thereupon pressed into the desired form. The remaining steps of the process for making electrodes according to my present invention are in accordance with those described in the aforementioned U. S. patent.

By the pressing process the material will become of such a strength, that it will entirely retain its form when being subsequently heated for decomposing the nitrate of manganese. This impregnation of the peroxid of manganese with nitrate of manganese and the subsequent decomposition of the same may now be repeated a number

of times until the electrode possesses the sufficient density and conductivity. In order to obtain a good conductivity for the current it is preferable to add the material employed for this purpose, for instance carbon or the like, into the form. Thus the electrode together with the connecting piece for the terminal will consist of one integral piece which is entirely made by the pressing process.

Anodes made according to the aforescribed process are free from injurious impurities and possess a good conductivity for the current, the same as those which are made by pressing the artificial peroxid of manganese together with nitrate of manganese.

Having thus described my invention I claim as new and desire to secure by Letters Patent of the United States:—

1. A process for enhardening and increasing the density and conductivity of anodes made from peroxid of manganese or from a compound of manganese convertible by heat into peroxid of manganese which consists in subsequently treating the anode by a precipitation of peroxid of manganese.

2. A process for enhardening and increasing the density and conductivity of anodes made from peroxid of manganese or from a compound of manganese convertible by heat into peroxid of manganese, which consists in forming the main body of the anode by a first layer of peroxid of manganese and repeatedly treating such layer with nitrate of manganese while applying heat thereto.

3. A process for enhardening and increasing the density and conductivity of anodes made from peroxid of manganese or from a compound of manganese, convertible by heat into peroxid of manganese, which consists in forming the main body of the anode by a

first layer of peroxid of manganese and repeatedly heating and treating such layer with nitrate of manganese.

4. A process for enhardening and increasing the density and conductivity of anodes made from peroxid of manganese or from a compound of manganese convertible by heat into peroxid of manganese, which consists in repeatedly treating such material with nitrate of manganese and in applying heat thereto, said nitrate of manganese being continuously introduced during heating.

5. A process for enhardening and increasing the density and conductivity of anodes made from natural peroxid of manganese, which consists in repeatedly heating and cooling the same and continuously introducing nitrate of manganese during heating.

6. A process for enhardening and increasing the density and conductivity of anodes made from peroxid of manganese or from a compound of manganese convertible by heat into peroxid of manganese, which consists in forming the main body of the anode by a first layer of peroxid of manganese, repeatedly treating such layer with nitrate of manganese and in applying heat thereto, said nitrate of manganese being repeatedly introduced after cooling.

7. A process for enhardening and increasing the density and conductivity of anodes made from natural peroxid of manganese, which consists in heating and cooling the material in succession and introducing nitrate of manganese after cooling.

In testimony whereof I affix my signature in presence of two witnesses.

MAX HUTH.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.