

UNITED STATES PATENT OFFICE.

MARCEL WUILLOT, OF BRUSSELS, BELGIUM.

ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 633,060, dated September 12, 1899.

Application filed February 21, 1894. Serial No. 501,043. (No specimens.)

To all whom it may concern:

Be it known that I, MARCEL WUILLOT, engineer, a subject of the King of Belgium, residing at Brussels, in the Kingdom of Belgium, have invented certain new and useful Improvements in or Relating to Electrodes, (for which patents have been obtained in Belgium, dated January 24, 1894, number of certificate 82,419; in Great Britain, dated 5 January 29, 1894, No. 1,903; in Germany, dated January 30, number of certificate 39,735, and in France, dated January 31, number of certificate 222,790,) of which the following is a specification.

15 The invention consists of a new method of forming electrodes for accumulators, and this is characterized by the electrodes being submitted to the action of electrolysis of an alkaline bath instead of an acid-bath, this substitution having the effect of greatly accelerating the formation of the Planté electrodes and of entirely preventing their rapid disintegration when they are made after the Faure type.

25 The formation of the Planté plates in the sulfuric-acid bath is slow. The nitric-acid pickling which has been proposed with a view to accelerate the process as far as possible produces only a structural change. It was intended to promote the formation of spongy lead and oxidation. The addition by mechanical means of active substances, which, however, are submitted with difficulty to transformation of the kind, was a primary 35 improvement effected by Faure; but the electrodes formed in this manner have still the disadvantage of becoming disintegrated after a comparatively short period of use, owing to the injurious action inevitable with and inseparable from all acid-baths. It is thus the 40 reaction of the acid-bath which renders difficult all chemical transformation of lead plates in the Planté process preliminary to the electrical action, whereas there is no difficulty in the way of a suitable chemical transformation of the lead if one utilizes immediately the action of electrolysis of an alkaline instead of an acid-bath. In connection 45 with this an extremely favorable chemical modification of the lead can be effected by transforming it either superficially and to a variable depth or entirely in one mass into

carbonate of lead and by then immersing this latter as electrodes in an alkaline bath, where- 55 in the second chemical change is brought about. On issuing from this second transformation the regenerated metallic lead on the positive plate has regained a texture approximately as close and consistent as that of the primitive lead itself, while at the same 60 time its initial capacity of polarization has been considerably augmented. The electrodes obtained by this method of treatment, which takes some hours, are absolutely fixed and stable and of great durability. 65

In detail the process of manufacturing these electrodes is as follows: The lead is subjected to the action of carbon dioxide, whereby it is converted superficially or, if desired, entirely into carbonate of lead, commonly known as 70 "white lead," whereof the nature and quality will depend upon the process adapted for the transformation. The electrodes thus chemically modified at the surface are immersed in an alkaline bath—*e. g.*, a five per cent. ammoniacal solution—so that they may there- 75 in, as in a suitable medium, undergo the actions of electrolysis. When they have remained for a few hours only exposed to electrolytic action, a complete reconversion has 80 taken place in the carbonate of lead. At the negative pole it has been transformed into spongy lead, while the result at the positive pole has been a hard and uniformly-wrinkled skin of oxid, whereof the confused but bril- 85 liant crystals defy the finger-nails and impart to the transformed metal a closeness and consistency approximate to the primitive lead and the fixity and stability of precipitated lead, and in this manner the electrodes are 90 rendered proof against all deterioration.

The alkaline bath exercises an analogous chemical modification upon electrodes made of salts of lead produced artificially or mechanically, as in the Faure process—that is 95 to say, the respective transformation of the salts at the anode and at the cathode are effected to the entire exclusion of all sulfur compounds, whereby the resulting active material is proof against all disintegration or 100 deformation—in other words, allowing a formation which is of absolute fixity and stability and of great durability. Subordinately, the beneficial effects of the alkaline bath re-

sult in like advantage with any electrodes of lead salts, artificially or otherwise obtained, in the sense that the said bath plays with respect to them the part of a true desulfurizing agent. Hence all existing electrodes of this kind may be very easily corrected or improved by the new process either when first made or after having been in use. In consequence of the stability and fixity secured for such electrodes by means of the alkaline bath they may be used without detriment as plates for accumulators and for charge and discharge in the acid-bath, which has no deteriorating action whatever on their surface by reason of the immunity conferred on them in such a bath.

Having thus described my invention, what I claim is—

The process for the manufacture of electrodes of accumulators which consists in transforming the surface of the plates into carbonate of lead, then placing the plates in an ammoniacal solution, and passing a current of electricity from one plate to the other, thereby converting the carbonate at the anode into peroxid of lead and at the cathode into spongy lead.

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Witnesses:

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