To all whom it may concern:

Be it known that we, GEORGES MICHAUD and EUGENE DELASSON, both citizens of the Republic of France, residing at 60 Rue Arsenne Chereau, Montreuil, Seine, in the Republic of France, have invented a certain new and useful Improvement In Processes for Electractically Refining Tin, of which the following is a specification.

The invention which forms the object of this application for patent and which relates to the electrolytic recuperation and refining of tin applicable to any conducting material containing tin or serving to support tin, based essentially upon the composition of the electrolyte upon the arrangement rendering it possible by continuous circulation to insure a permanent condition of saturation to the said electrolyte and also upon the composition of the electrodes.

This process based upon the electrolysis of a composite tin salt renders it possible to obtain regularly 2.22 grs. of chemically pure tin per amper hour and this in a far more economical manner than with the arrangements ordinarily employed.

Composition of the electrolyte.—The composition of the electrolyte is as follows: protochlorid of tin, to which magnesium chlorid and boric acid are added. The protochlorid of tin dissolved in water is acidulated with sulfuric acid until the precipitate of hydrate is completely dissolved; at this moment 1% of magnesium chlorid and 1% of boric acid are added to the liquor.

Formation of the anodes.—The anodes are constituted either by the tin to be refined merely poured in granular form into the water or by any other conducting material serving as support for the tin.

Formation of the cathodes.—The cathodes are formed by fixed copper plates arranged on edge and upon the upper edges of which the deposit of pure tin is formed in non-adhesive crystalline arborescences. These copper plates may be replaced by any other arrangement presenting but a small surface in contact with the electrolyte.

In order to avoid any solution of foreign metals in the electrolyte which would result in producing an impure metal the latter must be continuously saturated. This saturation is obtained in a trough containing tin waste of any kind in which the electrolyte circulates coming from the electrolysis tank. This circulation is produced by a pump which returns the liquor to the electrolysis tank from which it arrived in an acid state. In passing over the waste it has dissolved the tin and again becomes saturated.

The homogeneity of the electrolyte is obtained not only by the circulation of the liquid but also by the agitation produced by the movement of the collectors which operate in the electrolysis tank for the purpose of collecting the pure tin produced.

Figs. 1 and 2 illustrate diagrammatically in elevation and in plan respectively a form of electrolyzer for the treatment of the granulated tin. Fig. 3 illustrates a modification of this apparatus. Fig. 4 illustrates a form of apparatus utilized for the treatment of conducting material serving as a support for the tin.

Figs. 1 and 2: a is the electrolysis vessel of insulating material containing the electrolyte. b is a wicker basket lined with felt containing the tin to be refined (the anode). c and e are cathode plates of copper embedded in an insulating body and upon the upper edge of which the refined tin is deposited. d is the tank for the reception of the granulated tin. Waste of any kind in which the electrolyte circulates coming from the electrolysis tank. This circulation is produced by a pump which returns the liquor to the electrolysis tank from which it arrived in an acid state. In passing over the waste it has dissolved the tin and again becomes saturated.

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the pure tin. \( e \) is the copper block by means of which the current is brought into contact with the tin to be refined. \( f \) is the positive conductor. \( g \) is the negative conductor. \( a \) are collectors mounted upon an endless chain \( b' \) serving to force the refined tin as it is produced into the vessel \( d \).

Fig. 4 is an apparatus for the treatment of any conducting material serving as support for the tin (tinned iron waste for example). \( a \) is the electrolysis tank. \( b' \) is the material from which the tin is to be removed forming the anode. \( b^2 \) is an endless chain which conducts the material from which the tin is to be removed and which carries the collectors. \( c \) are the cathode plates upon which the pure tin is deposited. \( d \) is the tank receiving the pure tin. \( e' \) are flexible strips through which the current enters; these strips may vary in number. \( f \) are the positive conductors. \( g \) is the negative conductor. \( h \) are collectors mounted on the chain \( b^2 \). \( i \) is the small endless chain conveyor which receives the material deprived of its tin from the chain \( b^2 \) and discharges it into the tank \( k \).

No means are shown for circulating the electrolyte over tin waste in Figs. 3 and 4, but it will be understood that means similar to that shown in Fig. 2, or other means, will be employed for this purpose.

What we claim and desire to secure by Letters Patent of the United States is:

1. A process of refining tin by electrolysis which consists in passing an electric current from an anode of impure tin to a cathode through an electrolyte of high conductivity composed of protochlorid of tin 100 kilograms, sulfuric acid 10 kgs., magnesium chloride 1 kg., boric acid 1 kg., and the requisite quantity of distilled water in order that the solution should mark 20º Baumé.

2. A process of refining tin by electrolysis which consists in passing an electric current from an anode of impure tin through an electrolyte of high conductivity composed of protochlorid of tin 100 kilograms, sulfuric acid 10 kgs., magnesium chloride 1 kg., boric acid 1 kg., and the requisite quantity of distilled water in order that the solution should mark 20º Baumé, to a cathode with active surface equal to 2% of the active surface of the anode, and collecting automatically and continuously the refined tin deposited on the cathode.

3. A process of refining tin by electrolysis which consists in passing an electric current from an anode of impure tin through an electrolyte of high conductivity composed of protochlorid of tin 100 kilograms, sulfuric acid 10 kgs., magnesium chloride 1 kg., boric acid 1 kg., and the requisite quantity of distilled water in order that the solution should mark 20º Baumé, to a cathode with active surface equal to 2% of the active surface of the anode, collecting automatically and continuously the refined tin deposited on the cathode, the saturation of the electrolyte being maintained constant by a continuous circulation of the said electrolyte through a saturation tank containing waste tin.

In testimony whereof we affix our signatures in presence of two witnesses.

GEORGES MICHAUD.
EUGÈNE DELASSON.

Witnesses:
HANNON C. COXE,
VICTOR MATRAY.