

UNITED STATES PATENT OFFICE.

LUDWIG SCHERTEL AND WILLI LÜTY, OF ESSEN-ON-THE-RUHR, GERMANY.

PROCESS OF REFINING TIN.

No Drawing. Application filed April 27, 1923, Serial No. 635,115, and in Germany April 29, 1922.

This invention relates to a process of refining metallic tin to a high degree of purity comprising the addition of certain elements which have a greater affinity for oxygen than tin or the formation heat of which per unit of oxygen is greater than that of tin and an oxidizing agent to a bath of molten tin to be purified, thereby forming an oxidic scum which contains the impurities and which may be removed from the top of the bath in any suitable manner.

The essential points of the invention under consideration are the following:

The bath of molten tin is supplied with an adequate addition of such elements, the formation heat of which per unit of oxygen is greater than that of tin, and subjected to reaction with a compound which will disengage oxygen, such as water, preferably in the form of steam, or with a gaseous mixture containing oxygen, such as air, whereby an oxidic scum is formed which, if the proportions of elements added and of oxygen introduced are regulated according to requirements, will take off the impurities from the tin bath.

The same effect can be attained by first alloying the additional elements with the tin, separately producing the oxidic scum, and then introducing this scum into the molten tin to be refined. Furthermore, the scum used may be employed repeatedly until it has been made foul by the accumulation in it of the impurities referred to.

The scum formed in this way is removed in any known manner from the tin bath after having sufficiently acted upon the latter.

In some cases, it is advantageous not to introduce the total amount of the additional element or elements initially, but to add the same by portions. Thereby it is possible not only to limit at will the purifying action with regard to the removal of an individual impurity, but also to extract one impurity from the tin leaving another therein. It is to be stated that the impurities are not necessarily taken off at the same rate and in proportion with the amounts present in the tin, but may be removed one after the other. The reaction of the additional elements, too, is by no means the same in any case since one element does not act upon quite the same impurities as another. In order to isolate one of the impurities the refining process can be carried out in such a manner that this impurity is taken off by means of a suitable

addition element, whereupon the rest of the impurities is removed by means of another element acting especially upon this residue. Another manner of carrying out the refining process consists in adding a number of differently acting elements simultaneously, for instance in an alloyed condition.

The scum removed which still contains tin is subjected to a liquation process in order to recover the tin. The additional element eventually retained in the refined tin can be removed therefrom in any known way.

In order to make the invention more clearly understood, by way of example, some results obtained when carrying out the process on a manufacturing scale, may be stated:

1. By adding sodium to molten tin containing 0.09 percent of arsenic and by forming a scum, and subsequently separating the scum, the tin was found to contain only 0.03 percent of arsenic.

2. By treating in the same manner as mentioned in Example 1 molten tin containing 0.18 percent of antimony together with arsenic, with metallic calcium the amount of these impurities was reduced to 0.07 percent.

3. By adding metallic zinc to molten tin containing 0.08 per cent of arsenic and applying the oxidizing medium, the amount of this impurity was reduced down to 0.005 percent.

4. A tin containing 0.28 percent of antimony, arsenic and copper may be refined by adding metallic aluminum and the oxidizing medium, so as to reduce the content of the impurities mentioned to 0.01 percent. From this example it is to be seen that aluminum has a special purifying effect, since copper is removed.

What we claim is:

1. A process for refining metallic tin, which comprises introducing into molten tin elements the formation heat of which per unit of oxygen is greater than that of tin, subjecting the molten mass to the action of an oxidizing agent, and removing the impurities from the molten metal by means of the resulting scum.

2. A process for refining metallic tin, which comprises introducing into molten tin an element the formation heat of which per unit of oxygen is greater than that of tin, subjecting the molten mass to the action of an oxidizing agent, and removing the impurities from the molten metal by means of the resulting scum.

3. A process for refining metallic tin, which comprises introducing into molten tin a metal the formation heat of which per unit of oxygen is greater than that of tin, subjecting the molten mass to the action of an oxidizing agent, and removing the impurities from the molten metal by means of the resulting scum.
4. A process for refining metallic tin, which comprises introducing into molten tin metals in alloy form the formation heat of which per unit of oxygen is greater than that of tin, subjecting the molten mass to the action of an oxidizing agent, and removing the impurities from the molten metal by means of the resulting scum.
5. A process for refining metallic tin, which comprises introducing into molten tin elements the formation heat of which per unit of oxygen is greater than that of tin, and producing by the addition of oxygen disengaging substances a scum which takes off the impurities from the molten metal.
6. A process for refining metallic tin, which comprises adding to the molten tin elements the formation heat of which per unit of oxygen is greater than that of tin, in the form of scum separately produced by treating such elements with oxygen disengaging substances.
7. A process for refining metallic tin, which comprises introducing into the molten tin elements the formation heat of which per unit of oxygen is greater than that of tin, producing a scum which takes off the impurities from the molten metal by the addition of oxygen disengaging substances, removing the scum and using said scum for treating other baths of molten tin.
8. A process for refining metallic tin, which comprises adding to the molten tin elements the formation heat of which per unit of oxygen is greater than that of tin, in the form of scum separately produced by treating such elements with oxygen disengaging substances, removing the scum, and using said scum for treating other baths of molten tin.
- In witness whereof we have hereunto set our hands.
- LUDWIG SCHERTEL.
WILLI LÜTY.