

UNITED STATES PATENT OFFICE.

AUGUSTE J. ROSSI, OF NEW YORK, N. Y., ASSIGNOR TO TITANIUM ALLOY MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

ALLOY AND PROCESS FOR ITS PRODUCTION.

935,863.

Specification of Letters Patent.

Patented Oct. 5, 1909.

No Drawing.

Application filed March 22, 1907. Serial No. 383,959.

To all whom it may concern:

Be it known that I, AUGUSTE J. ROSSI, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Alloys and Processes for Their Production, of which the following is a specification.

My present invention relates to improvements in, and processes for producing, alloys, including those of copper with other metals, such as tin, zinc, or lead, one or more, and designated, as the case may be, brasses or bronzes.

The copper of commerce contains impurities, and it has been found that admixtures, or alloys therewith of certain metals, or elements, such as titanium, silicon, or phosphorus, produces on such copper, for casting or other purposes, certain beneficial results, for instance reduction, diminution, or even elimination of undesired compounds or gases present in its molten state, and which cause defects such as "pinholes" tending to render such castings unsound and useless. While commercial copper itself, as say in the form of castings, has been thus purified and improved, the introduction thereinto, in its remolten state, of zinc, tin, and sometimes lead therewith or other metal such as manganese to produce resulting brasses or bronzes has hitherto produced in the resulting bath a recurrence of conditions unfavorable to the copper and consequent unsoundness, if not uselessness, of the resulting brasses or bronzes. Thus for instance, into the alloy, in molten state, compounds have been imported and resulting gases developed and occluded, which owing to their maliferous effect, especially upon the copper content, have injuriously affected the alloy produced, even in cases in which the copper itself had been, as above stated, previously purified.

My tests have demonstrated that by introducing into the bath of molten copper employed in production of the brass and bronze alloys referred to, tin, lead, or zinc, themselves previously improved by alloying, or mixing, with metals, or elements, capable of also producing, as aforesaid, desired effects upon the copper, a satisfactory condition of the resulting alloy is insured, and even in higher degree than in cases in which such added metals or elements have been separately brought into the presence of the

copper previously to its reduction to molten state for the purpose of producing the brasses or bronzes referred to.

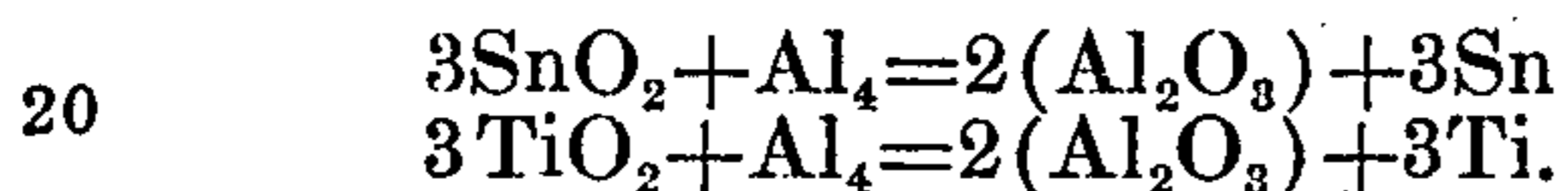
My present invention therefore comprises not only an improved process for producing alloys of copper with other metals, as brasses or bronzes, but also the production of, and process for producing, as new articles, alloys or mixtures essentially metallic, of tin, lead, and zinc, with metals, or elements, adapted not only to so improve the latter for the purpose specified, but also to so, as aforesaid, in combination therewith, control conditions in the bath composed of the desired alloy in its molten state, and thus insure a sounder and more perfect final product than has heretofore been possible.

My researches and tests have also demonstrated to my satisfaction that the metal titanium possesses, in the connection mentioned, exceptionally advantageous properties, not only due to its effect upon the copper, and such elements or compounds in the bath as are disadvantageous to the latter in the particulars mentioned, but also particularly upon the lead, tin and zinc, and such elements or compounds as may have special effects thereon under the conditions developed in the alloy bath, my particular novel combination of titanium with the said metals, tin, lead, manganese and zinc, preliminarily to their introduction into said bath, also appearing to enhance the beneficent effect of the titanium upon the alloying bath and its resulting product, as compared to the effect produced by merely introducing into such bath a previously produced alloy of copper and titanium.

In general aspects my processes for producing the alloys of tin, zinc, manganese or lead, respectively with titanium, are similar, varying in some details however as hereinafter more specifically described. As titanium exists rarely, if ever, isolated in metallic state, but only as alloyed with other metal, principally iron, or sometimes copper, and none of these alloys serve my purpose, it is necessary to derive the required titanium from its oxid.

My processes for producing my said novel alloys of titanium with tin, zinc, manganese, or lead, are as follows: Taking first the alloy of titanium with tin, this I produce by charging into a graphite crucible, or other container properly adapted, tin, titanous acid,

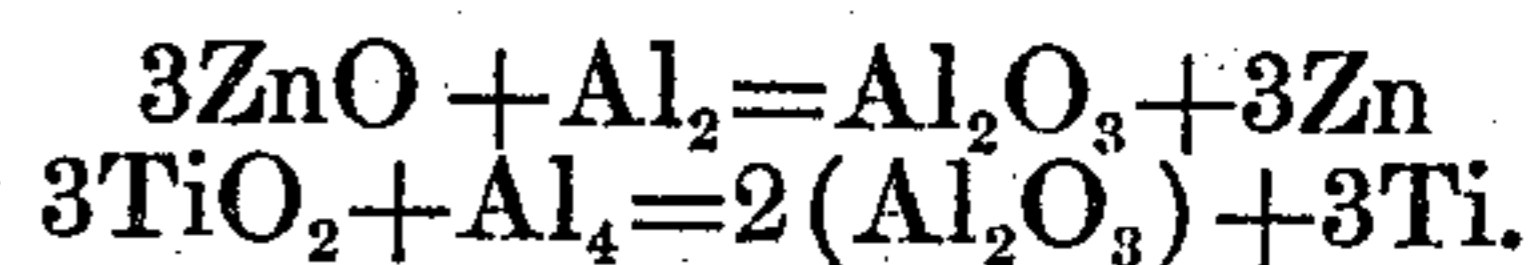
and preferably an oxid of tin, also such an amount of aluminum (preferably in shots or the like so as to melt more rapidly) as is chemically sufficient to decompose the
 5 oxid of titanium and also the oxid of tin and reduce their respective titanium and tin contents to their metallic states. This mixture is then heated, as by a coke fire, in a wind furnace, or otherwise, to a temperature
 10 sufficiently high to insure the melting of the metallic elements of the charge, and the taking place of the reactions above noted. The molten product, on being withdrawn and cooled will be found to be an alloy of tin
 15 and titanium, the percentage of the latter being proportional to the amount of titanitic acid and aluminum charged, the reactions being as per the following formula, viz:



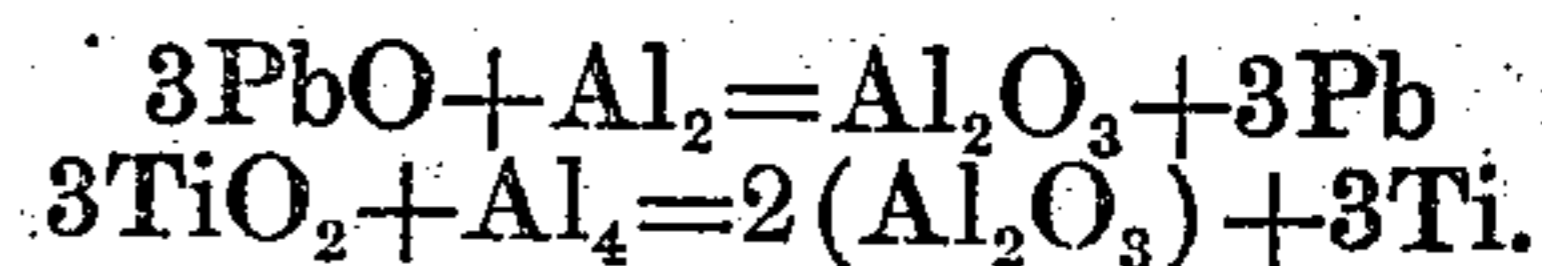
While, in this instance, the presence of an oxid of tin is not absolutely essential, it nevertheless promotes considerably the reactions
 25 desired in the charge, and accelerates its fusion into a homogeneous metallic alloy, the heat of formation of the stannic acid being so small as to leave available a large excess of heat due exothermally to the combination of its oxygen with part of the
 30 aluminum of the bath. In this manner I have obtained an alloy of tin with titanium containing seven to eight per centum of titanium and more. In operating this
 35 process any of the now well known forms of so called "electric furnaces" may be employed, in which case the addition of stannic acid, while still advisable, is not as necessary as with other furnaces, since extra
 40 heat, if required, may be derived from the current. The proportions of the ingredients used in the charge will be varied according to the percentage of the respective metals desired in the alloy according to the
 45 formulas above given and as experience and test in each case will readily demonstrate to those skilled in the metallurgical art. I have also found it advantageous, though not always essential, to add to the charge some
 50 fusible slag, such as broken glass, or a mixture of the latter with an ordinary iron blast furnace slag, comprising silica, alumina, lime and magnesia, or a silicate of alumina and lime, in such proper proportions as can
 55 readily be determined in each case as to insure such slags floating on the top of the charge, thus constituting, as it were, a blanket for the latter, and thus protecting the other aforesaid ingredients of the charge
 60 from oxidation at the surface by contact with the atmosphere.

To produce my new alloy of zinc and titanium, the same process as above described may be followed, with the exception that, in
 65 this charge zinc is substituted for tin and

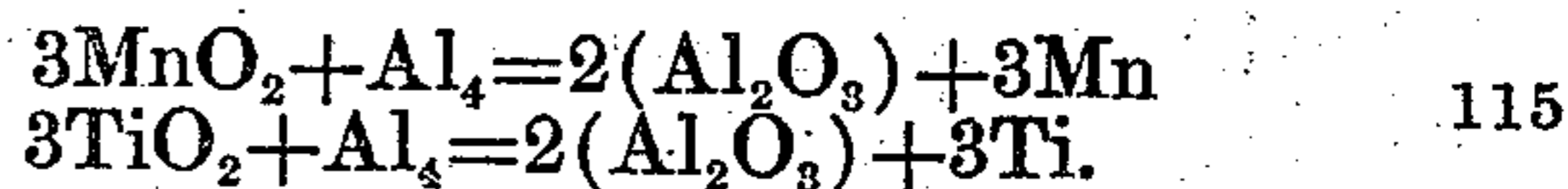
an oxid of zinc for an oxid of tin. In this manner I have produced alloys of zinc and titanium containing from six to ten per centum of the latter. In producing this alloy however it will prove substantially essential for industrially economical results, to utilize the slag blanket above described, owing to the otherwise rapid and excessive oxidation of the molten zinc by contact with the atmosphere under the high temperatures
 75 required, thus avoiding an important loss of that metal. It will also be noted in the instance last mentioned, owing to the stability of the oxid of zinc and the affinity of that metal for oxygen, that when protected from the atmosphere by the aforesaid slag blanket, the zinc present in the charge will assist in reducing, in part, the titanitic acid. In this instance, as in the case of my alloy of tin and titanium, the proportions of
 85 the various ingredients of the charge must be varied in each case according to the respective qualities of the ingredients as experience will demonstrate and the respective proportions of the metals desired in the
 90 resulting alloy. The formulas for calculation in this instance being:



To produce my new alloy of lead and titanium, the same process as aforesaid may be followed except that for the tin or zinc in the charge, lead must be substituted, and an oxid of lead for the oxid of tin or zinc.
 100 In this instance also proportions of ingredients of the charge will depend upon the special conditions of each case and resulting products desired. For instance, if litharge is used (PbO), the formulas for calculation
 105 will be:



To produce my new alloy of manganese
 110 and titanium the process will be the same as aforesaid, the formulas for calculation being:



Substantially the same process may be employed to produce, for the purposes aforesaid, alloys, or mixtures essentially metallic, of tin, zinc, or lead, with silicon, phosphorus,
 120 or any other purifier or seasoner desirable to be used in the treatment of copper; it is enough to substitute for the oxid of titanium an oxid of one of the elements thus to be mixed or alloyed, using as before molten
 125 aluminum as a reducer of these oxids.

Having thus preliminarily prepared my novel alloys of tin, lead or zinc with titanium, they may then be utilized in the application of my improved process for alloy-
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ing copper with those metals as follows, viz: The copper, either preliminarily purified or not, together with the said alloys, one or more as may be required according as brass or bronze is desired, are brought into each other's presence in such proportions as may be preferred according to the practice of the art and the class of resulting product sought, within a crucible, furnace, or other container, and there subjected to a temperature sufficient to bring them, in each other's presence, to molten state, the temperature being maintained and other treatment accorded as is usual and well known in the art of producing such alloys until a thorough and homogeneous mixture and association of the respective ingredients of the charge has been effected. On cooling, the molten product will be found to be an alloy of copper with the particular metal or metals desired, as tin, lead, manganese or zinc, and containing also some titanium or other purifying metal or element employed, and possessed of exceptionally superior qualities.

It will be understood that the introduction of the titanium may be effected by mixing it with the other metals as hereinbefore specified, in which case the said preliminary production of an alloy is, though preferable, not essential, it being sufficient to mix the titanium with the other metals during production of the final resulting alloy thereof with copper.

I do not, in this specification, make any claim to the aforesaid use, in these connections, of a molten slag blanket overlying the charge, because this is reserved for another application for patent.

Having thus described my invention, what

I claim as new and desire to secure by Letters Patent is the following, viz:

1. The process of producing alloys of copper with other metal which consists in first producing an alloy of such other metal with titanium, next mixing said last mentioned alloy with copper, and then reducing the mixture to molten state.

2. The process of producing alloys of copper with other metal which consists in first making an alloy of the copper with titanium, next producing an alloy of such other metal with titanium, next bringing said two last mentioned alloys together and reducing them, in each other's presence, to molten state.

3. The process of producing alloys of copper with other metal which consists in mixing metals together with some titanium.

4. The process of producing alloys of copper with other metal which consists in melting said copper together with other metals containing some titanium.

5. As a new article of manufacture an alloy of copper with metal and including some titanium.

6. As a new article of manufacture an alloy of copper with other metals and including some titanium.

7. As a new article of manufacture an alloy of copper with tin and zinc and including some titanium.

8. As a new article of manufacture an alloy comprising copper and zinc and including some titanium.

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Witnesses:

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