

UNITED STATES PATENT OFFICE.

CHARLES VICKERS, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO THE TITANIUM ALLOY MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

ALLOYS OR COMPOUNDS FOR IMPROVING COPPER AND ITS ALLOYS.

1,151,744.

Specification of Letters Patent.

Patented Aug. 31, 1915.

No Drawing. Original application filed December 17, 1912, Serial No. 737,206. Divided and this application filed January 8, 1913. Serial No. 740,790.

To all whom it may concern:

Be it known that I, CHARLES VICKERS, a subject of the King of Great Britain, and a resident of Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Alloys or Compounds for Improving Copper and Its Alloys, of which the following is a specification.

My present invention relates to means for purifying, and thus improving, copper and its alloys including brasses and bronzes.

My present application for patent is a division of my pending application, Serial Number 737,206, filed December 17, 1912.

The objects of my invention comprise elimination, more perfectly, and economically, than heretofore, of deleterious substances and gases which, incidental to, or produced in, molten copper, impair the strength, appearance, or other desired qualities of therefrom derived final products including, in particular, castings.

Copper, and copper-containing castings, for example, have heretofore, in reliance upon addition of titanium as a purifier, been greatly improved in strength, and in other desired integral qualities, by adding thereto, while molten, alloys of copper and titanium, now known as "cupro-titanium," such, for example, as produced by the method described in reissued Letters Patent of the United States, No. 12,764, granted to Auguste J. Rossi, March 17, 1908. But such castings, so treated, have hitherto been unfortunately characterized by specks, or other blemishes, on or near the surface which render them unavailable commercially in the important field of "finished" castings, *i. e.* such as are required, by conventional standards, to possess turned or otherwise polished surfaces. This has limited the field of titanium-purified copper-containing castings to those in which the blemishes referred to can be concealed by paint or other coatings. It is my present opinion that said undesirable specks and blemishes may be attributed in part, if not entirely, to the infusibility, at its then temperature and environment, of the titanic acid formed in the molten copper so treated, by combination of therein-contained oxygen, or oxygen compounds, with titanium. Molten copper

differs in important respects from the ferrometals now so perfectly purified by aid of titanium. For example its melting point is very much lower. Moreover molten copper contains, in suspension, comparatively none of the basic slags combinable with titanic acid as fluxes to increase fluidity and insure complete rising out of the metal. In such bath of molten copper therefore much of the aforesaid titanic acid appears to remain unfused, and uncombined, in the form of disseminated flakes which notwithstanding they tend to rise toward, appear unable to emerge completely above, the surface, thus, I believe, contributing to the undesired specks and blemishes in the resulting castings as above referred to. My researches and experiments have now demonstrated that if with the titanium so added for purification as aforesaid there be also added magnesium the bath of molten metal so treated will be more perfectly purified, the said flakes disappearing in resulting slags which latter emerge completely to supernatant position whence they are readily separable from the underlying purified molten metal, the surfaces of the resulting castings being substantially free from the aforesaid undesired specks and blemishes.

It will be observed that my present invention comprises addition of titanium and magnesium to the bath of copper, or copper-containing, metal. I believe that in said bath the titanium combines with undesired elements present, for example oxygen and its compounds to form titanic acid, and that the resulting compounds of magnesium combine therewith in forming slags so fusible as to insure their elimination from the bath.

Owing to the comparative difficulty and expense of producing isolated elemental titanium and of its introduction into the bath as such, also the corresponding difficulty of producing and using an alloy consisting of titanium and magnesium, also the comparative inconvenience and ineffectiveness of adding isolated magnesium to the bath, I preliminarily produce, for purification of copper, or its alloys, an alloy comprising copper, titanium and magnesium. The respective proportions of titanium and copper in such alloy will be such as determined to be best suited to the particular

type of copper, or its alloys, to be treated as disclosed by the ascertained nature and amount of its impurities. In ordinary cases a content of say five (5) per cent. of titanium to ninety-three (93) per cent. of copper is usually satisfactory, to which I add about two (2) per cent. of magnesium, though more magnesium than this might be, though unpreferably, employed, in many cases, without serious detriment other than needless expense, or the imparting of too low specific gravity to my new alloy.

I prefer to produce my alloy by following the procedure described in said Rossi's re-issued Patent No. 12,764 to near its conclusion, *i. e.* to the stage when the resulting copper-titanium alloy is ready to be tapped. I then add to the bath the desired proportion of magnesium which alloys with the copper and titanium, or I remelt the alloy produced by said method and then add thereto said magnesium. Or my said alloy containing magnesium may be produced in any other convenient manner.

To the molten copper, or its alloys, to be purified, thus including brasses, bronzes, etc., I add my said novel alloy in such quantity and of such percentage of titanium as called for, as aforesaid, by the particular metal under treatment, the usual rule being to thus incorporate into the bath at least

sufficient titanium to satisfy chemical affinity therefor of all undesired elements and compounds present, though, for special purposes, the amount of titanium may be increased so as to retain metallic titanium in the final product. After said addition of my alloy the temperature is maintained and the bath allowed to stand during an interval sufficient for completion of the desired reactions and emergence therefrom of the resulting slags or compounds. This is usually not less than about ten minutes, after which they are separated from the bath in any convenient manner, as by tapping out the underlying molten metal and casting it as desired. The resulting castings will be found dense, and as otherwise improved by titanium, and also having surfaces much more perfect than though titanium had been employed without addition of magnesium.

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

1. As a new article the ternary alloy of copper, titanium and magnesium.
2. As a new article an alloy comprising copper, less titanium than copper, and less magnesium than titanium.

CHARLES VICKERS.

Witnesses:

ALBERT GOODROE,
F. BEHMER.