

UNITED STATES PATENT OFFICE.

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

METHOD OF TREATING ALUMINUM.

1,019,531.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, AUGUSTE J. ROSSI, a citizen of the United States, and a resident of Niagara Falls, in the county of Niagara and State of New York, have invented a certain new and useful Method of Treating Aluminum, of which the following is a specification.

My present invention relates to the treatment of aluminum as hereinafter described and in the improved products resulting from such treatment.

Aluminum as heretofore industrially produced contains, to its detriment for many purposes, notwithstanding its own affinity for oxygen and its compounds, certain foreign substances or gases, or both, dissolved or occluded therein, among which may be mentioned, as particularly deleterious, carbon and nitrogen, of which, notwithstanding its high reductive properties, aluminum appears unable to cleanse itself. The presence of such impurities impairs, according to their respective resulting effects in the metal, desired physical properties such as strength, hardness, resistance to abrasion, etc., and it becomes therefore desirable, in many cases, that such impurities should if possible be eliminated as far as may be.

The object of my present invention comprises such elimination from aluminum of its characteristic impurities and, as thereto germane, the production of methods of treatment and resulting products utilizable in the accomplishment of said object.

I have discovered that the aluminum of commerce may be purified of undesired carbon contents, and at the same time its nitrogen content entirely eliminated, by bringing titanium, under proper conditions, into the presence of the molten metal, and my present invention, in its broadest aspect, consists accordingly in the utilization of titanium for the purpose and under the conditions specified. The titanium may be so furnished to the aluminum either by reduction of the oxid of titanium in presence only of the molten aluminum, or by adding to latter only an alloy of titanium and aluminum, the results, as regards purification, being the same in either case.

My said invention may be practiced as follows. In all instances I produce and maintain as preliminary a bath of the mol-

ten aluminum to be treated. To this bath I then add only a quantity of oxid of titanium proportioned to yield, on reduction thereof by the aluminum, sufficient titanium to chemically combine with all impurities, including particularly the nitrogen present, thus forming nitrids of titanium. The temperature of the whole is then raised sufficiently to insure the desired reaction between the aluminum and the oxygen of the titanium oxid, thus supplying the elemental titanium which in the absence of other constituents except aluminum and its said impurities promptly combines chemically as aforesaid with said impurities, including also the nitrogen present to form the required nitrids. These nitrids in turn combine chemically with carbon present to form cyanonitrids of titanium which, with the alumina formed at expense of the oxygen of the titanium oxid, and compounds of titanium with constituents of said impurities, rise as a sort of slag to the surface of the bath thus freeing the latter proportionately of its carbon content as well as of other impurities. The aforesaid reactions having been accomplished, the resulting molten aluminum product is tapped out and allowed to cool in accordance with usual metallurgical practice, and, sufficient titanium oxid having been added and temperature and time afforded for the aforesaid reactions, should be found free of nitrogen and purified of undesired carbon, as well as all other impurities.

An alloy of aluminum and titanium may be employed in lieu of titanium oxid in the practice of my said method, in which case said alloy is added to the molten aluminum in quantity sufficient to impart enough titanium to combine as aforesaid with all undesired elements and compounds, *i. e.* impurities present, and particularly with nitrogen to thereby eliminate carbon also, and leave in the resulting product traces or not to exceed one one-half of one per cent. of titanium. The aluminum product treated as aforesaid is characterized by greater density, hardness and strength than the aluminum before its aforesaid treatment by my method.

In all cases in which precision is of importance, the nitrogen and carbon contents of the aluminum to be treated should first

be determined as will be understood by those skilled in the metallurgical art, and the proportions of titanium oxid or of alloy of titanium thereto calculated in order to insure the aforesaid resulting product.

I am aware that molten aluminum has heretofore been utilized for the purpose of reducing titanium oxid and do not wish to be understood as claiming such use of aluminum as my present invention, which differs therefrom in that such prior utilizations of aluminum have involved entire destruction of all the aluminum present, this being in such cases used exclusively as a reducer, and the purpose being to secure a resulting product as far as possible completely freed from aluminum, whereas the ultimate purpose and effect of my present invention comprise purification broadly and specifically elimination of nitrogen from the resulting aluminum product and removal therefrom of carbon as well as titanium.

I am also aware that it has been stated that an alloy of titanium and aluminum containing from one-half of one to ten per centum of titanium can be produced in a bath containing not only aluminum and oxid of titanium but also fluorids of metals more electro-positive than aluminum, etc., but neither is this my present invention which, by dispensing with the presence of such fluorids and other agents, enables the titanium present to act alone as hereinbefore described as a complete purifier of the aluminum, and this during a single heat,

whereby is attained my novel product, as is impossible by said prior procedures.

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

1. The method of treating aluminum containing impurities including nitrogen and carbon, which consists in bringing said aluminum into molten state, incorporating therewith titanium, and then imparting to and maintaining in the resulting bath a temperature at which said titanium can combine chemically with said nitrogen and carbon, the said titanium being proportioned to secure a resulting aluminum product containing less than one-half of one per centum of titanium.

2. The method of treating aluminum containing impurities including nitrogen and carbon, which consists in bringing said aluminum into molten state, adding thereto titanium oxid proportioned to satisfy chemical affinities of all said impurities for titanium, raising the temperature of the resulting bath to one at which aluminum reduces said oxid, and then maintaining said temperature until resulting metallic titanium has combined chemically with said impurities including said nitrogen and carbon to secure a resulting aluminum product containing less than one-half of one per centum of titanium.

AUGUSTE J. ROSSI.

Witnesses:

WALTER D. EDMONDS,
PHILIP C. PECK.