

UNITED STATES PATENT OFFICE.

JOHN W. LANGLEY, OF EDGEWOODVILLE, ASSIGNOR OF ONE-HALF TO HUNT
& CLAPP, OF PITTSBURG, PENNSYLVANIA.

ALLOY.

SPECIFICATION forming part of Letters Patent No. 451,406, dated April 28, 1891.

Original application filed September 20, 1890, Serial No. 365,658. Divided and this application filed December 31, 1890. Serial No. 376,388. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN W. LANGLEY, of Edgewoodville, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Alloys, of which the following is a full, clear, and exact description.

My invention relates to an improvement on the aluminium alloys described and claimed by me in a prior patent application, Serial No. 365,658, filed on September 20, 1890. That application is based upon a discovery that aluminium when alloyed with titanium, especially in certain proportions, gives a new product, which, in addition to the many useful properties of aluminium, which render it capable of varied application in the arts, possesses other beneficial properties in which aluminium is deficient. Thus, although pure aluminium is somewhat soft and only slightly elastic, even after hammering or rolling, I find that if it be alloyed with ten per cent. of titanium or less a product is obtained intrinsically harder than aluminium, approximately as incorrodible, and capable of acquiring by hammering or rolling a degree of elasticity and hardness comparable to spring-brass. The alloy is fusible at a temperature below the melting-point of steel, and its fusing-point and specific gravity increase with the proportion of titanium which it contains. When the proportion of titanium is less than five per cent., the alloy is nearly as malleable as pure aluminium, and its malleability decreases and its hardness increases as the proportion of titanium in the alloy is increased. The best material for commercial uses, where elasticity combined with easy malleability are required, is an alloy containing titanium from one-half of one per cent. (more or less) to two per cent.

My present invention consists in a new alloy or compound made by adding chromium to my said alloy of aluminium and titanium. The chromium addition is of advantage in increasing the stiffness of the alloy. It is preferable that the chromium content should be less than fifteen per cent., preferably less than five per cent. As the chromium is increased

there is a corresponding increase of hardness. The difference between the alloy of aluminium and titanium and the alloy of aluminium, titanium, and chromium is that the chromium confers greater rigidity than the titanium; but if more than five per cent. of chromium is used there is a greater loss of ductility.

My improved alloy may be made by simple fusion together of its several metallic components or by fusion of one of their metallic constituents with an alloy of the other two; but I prefer to use the following mode of manufacture: I make by fusion a bath of fluorides of aluminium and sodium, or of fluoride of sodium, or of fluoride of aluminium, sodium, and calcium, or, generally, a fluoride or fluorides of a metal or metals more electro-positive than aluminium. I may add to these fluorides chlorides of the alkalis or alkaline earths; but these are unnecessary. Cryolite of commerce may be used as the fluoride constituent of the bath; but, although I do not exclude its use from the scope of the broad claim of this application, it is in some respects disadvantageous, because of its iron, which in the alloying process hereinafter described is reduced and by mingling with the alloy impairs its quality. For this reason I prefer to employ the above-mentioned fluorides in as pure a state as possible. Either before or after the fusion of this fluoride bath I add to it reducible oxides or salts of titanium and chromium, preferably titanite oxide and oxide of chromium, and after thorough admixture of these substances I introduce the aluminium. A reaction between the aluminium and said oxide or salt at once takes place, the oxide or salt is reduced, its oxygen or acid radical combines with a part of the aluminium, and the freed metallic bases immediately alloy with the remainder of the aluminium. In practice I prefer to use as the fluoride bath fluorides of aluminium and sodium, which may be employed in amount ranging from one hundred to four hundred per cent. of the weight of the aluminium intended to be added. This bath I melt in a carbon crucible and add thereto the oxide or salt of the metal to be alloyed. When the whole mass is in-

corporated and as nearly fluid as possible, I
charge metallic aluminium into the crucible,
the relative proportions of the aluminium and
oxide or salt being such that the percentage
5 of oxide or salt shall be about twice the per-
centage in which its metallic base is desired
to be present in the alloy. Immediately on the
introduction of the aluminium the reaction
above noted takes place between the alumin-
10 ium and the oxide or salt and is accom-
panied by a rapid elevation of temperature
of the bath. After waiting until further re-
action ceases, which is indicated by cessation
of rise of the temperature, the contents of the
15 crucible are poured into a suitable receptacle,
and after cooling somewhat the melted fluo-
ride can be separated as a supernatant slag
from the metallic alloy at the bottom of the
vessel. The alloy is then collected, and is
20 preferably remelted to cleanse it thoroughly

from slag and otherwise to improve its prop-
erties.

The oxides or salts of titanium and chro-
mium and their alloying with the aluminium
should be conducted in a non-silicious crucible, 25
(preferably a carbon crucible,) since, if the
vessel be silicious in its composition, a con-
siderable portion of silicon will be alloyed
with the aluminium, titanium, and chromium,
producing a compound of inferior quality. 30

I claim—

As a new article of manufacture, an alloy
containing aluminium, titanium, and chro-
mium, substantially as described.

In testimony whereof I have hereunto set my 35
hand this 26th day of December, A. D. 1890.

JOHN W. LANGLEY.

Witnesses:

H. L. GILL,

THOMAS W. BAKEWELL.