

UNITED STATES PATENT OFFICE.

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ALLOY OF LITHIUM AND ALUMINUM.

No Drawing. Application filed June 28, 1920, Serial No. 392,494, and in Germany February 15, 1919.

This invention is based on the discovery that the addition of lithium, even in very small quantities, exerts a favorable influence upon the aluminum.

5 These lithium aluminum alloys can be mechanically worked, as by drawing, rolling, forging, welding, etc., into a great variety of articles capable of structural use such as plates, wires, rods, tubes, girders, etc.

10 Aluminum, as is well known, can be made capable of hardening like steel by suitable alloying additions. The number of the materials which come under consideration for this purpose is, however, extremely limited.

15 Exhaustive experiments have now shown that lithium-aluminum alloys, but also all their multiplex varieties as for example

20 Li-Al-Cu ,
 Li-Al-Cu-Zn ,
 Li-Al-Cu-Zn-Mn etc.

possess in particularly high degree the capability of being improved or ennobled by heat; but even when not improved by heat they show considerably greater technological qualities than alloys without an addition of lithium.

30 In the alloys the lithium can also be substituted, partly or completely, by additional materials as barium and strontium.

The improvement or ennobling takes place in such a way that the alloys are heated to temperatures above 100°C . and slowly cooled, or are chilled in a suitable fluid or in a current of air. This improvement or ennobling is independent of any heating that may have been required incident to the mechanical working or shaping of the alloys.

40 This process can, if necessary, be repeated as often as desired; the heating may also be effected either within an indifferent sort of gas or in a vacuum or in a salt bath.

In further explanation of our invention, we desire to state that in the mechanical working of these alloys, as in drawing wire, rolling sheets and the like operations, it is found that after a certain amount of reduction, the metal becomes too hard and must then be annealed to soften it sufficiently to permit further working. This annealing operation, which is well known and commonly practiced in drawing wire or rolling metal, is not to be confused with the ennobling heat-treatment, which is applied to

the articles after they are otherwise finished. 55

The alloys may contain up to 40% lithium, but preferably a much smaller amount, less than 6%, is used.

An important feature of the invention is the fact that very small additions of lithium have a favorable influence upon the aluminum and the alloys above described. The amount of lithium added need not exceed 0.5%. 60

I am aware of the patent to Pacz, No. 1,387,900, patented Aug. 16, 1921, which describes an alloy of aluminum and silicon, containing 8% or more of silicon. My alloy contains no silicon except perhaps that small amount which sometimes occurs as an impurity in commercially pure aluminum. My alloy is therefore substantially free from silicon. 70

Aluminum-lithium alloys have been proposed for chemical purposes, for example, it has been suggested to prepare alloys of calcium, barium, strontium or lithium with aluminum by the electrolytic treatment of fused calcium chloride in the presence of molten aluminum, and to use such alloys in steel casting for the purpose of forming stable compounds at high temperatures with the carbonic oxide, hydrogen and nitrogen, which are evolved during the casting process and which otherwise result in the production of bubbles in the steel. The lithium in this connection plays only a purely chemical rôle and the only reason why it is alloyed with aluminum is that pure lithium is high in price and difficult to obtain. Furthermore, in such alloys the percentage of lithium is relatively high, so that the alloy would be unsuitable for structural purposes. 85

I claim:

1. As a new article of manufacture, a structural element formed of an aluminum base alloy substantially free from silicon and containing an appreciable amount of lithium up to 40 percent thereof. 95

2. An aluminum base alloy for structural purposes substantially free from silicon and containing an appreciable amount of lithium up to 6 percent thereof. 100

3. A structural element formed of an aluminum base alloy substantially free from silicon and containing an appreciable amount of lithium up to 6 percent thereof. 105

4. A structural element as claimed in

claim 3 which has been heat-treated by heating it above 100° C. and then cooling it.

5 5. A structural element as claimed in claim 3 which has been heat-treated by heating it above 100° C. and then slowly cooling it.

10 6. A method of treating aluminum which is substantially free from silicon to render it suitable for structural purposes, comprising adding lithium to the aluminum and heat treating the alloy.

15 7. A method of treating aluminum which is substantially free from silicon to render it suitable for structural purposes, comprising adding lithium to the aluminum and heat treating the article made from the alloy by heating it above 100° C. and cooling it.

20 8. A method of treating aluminum which is substantially free from silicon to render it suitable for structural purposes, comprising

ing adding not more than six percent of lithium to the aluminum and heat treating the alloy.

9. The method of improving the quality 25 of structural elements made from alloys consisting predominantly of aluminum substantially free from silicon and containing lithium which consists in heat treating such elements by cooling them from temperatures 30 above 100° C.

10. The method of improving the quality of structural elements made from alloys consisting predominantly of aluminum substantially free from silicon and containing 35 lithium which consists in heat treating such elements by slowly cooling them from temperatures above 100° C.

In testimony whereof we have affixed our signatures.

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