Aug. 9, 1932. I. IYTAKA 1,870,732

ANTICORROSIVE ALUMINIUM LIGHT ALLOY

Filed Jan. 12, 1931 2 Sheets-Sheet 1

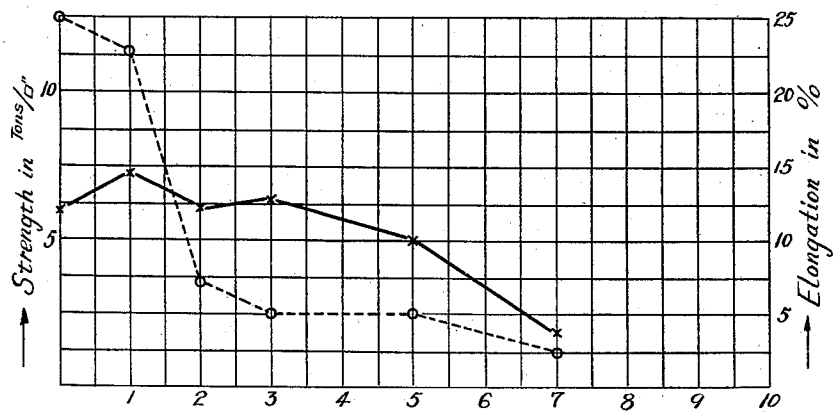


Fig. 1.

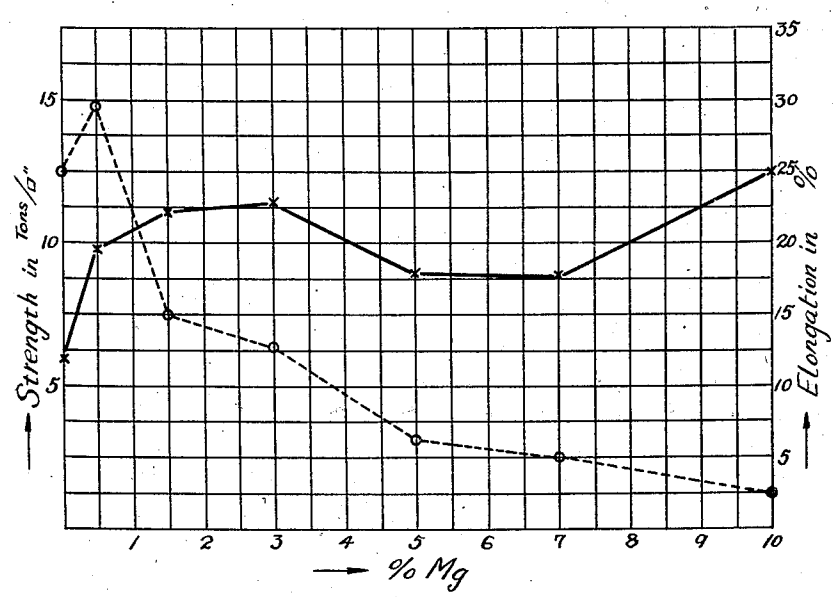


Fig. 2.

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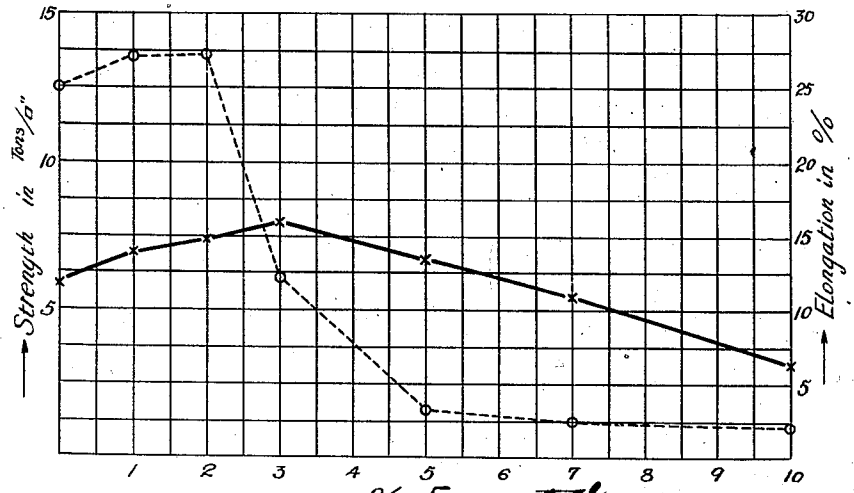


Fig. 3.

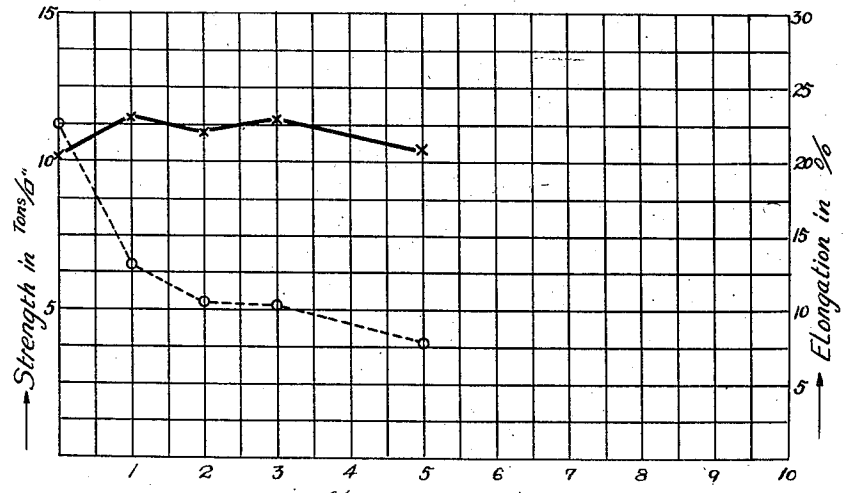


Fig. 4.

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UNITED STATES PATENT OFFICE

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ANTICORROSIVE ALUMINIUM LIGHT ALLOY

Application filed January 12, 1931. Serial No. 508,217.

The present invention relates to an alloy the principal constituent of which is aluminum.

According to the invention the alloy contains chormium, magnesium, and iron in the proportions of 0.5 to 5.0 per cent., 0.5 to 7.0 per cent., and 0.3 to 4.0 per cent. respectively, and the remainder of aluminum, the latter being allowed to contain small quantities of impurities. In fact, the limitation of the quantities of these constituents of the alloy as mentioned is the essential feature of the invention.

The invention has for its main object to improve known light alloys and thereby to completely eliminate their deficiencies or drawbacks of being corrosive against sea water and poor in mechanical strength, and thus to obtain an alloy which, besides being very anticorrosive to sea water, has more excellent mechanical properties than those in the known alloys of this kind.

The new alloy of the invention is also easily cast accompanying almost no casting hives nor cracks. It can be easily rolled for making plates, wires, pipes and the like, and also be safely forged to manufacture various kinds of articles of complicated nature. It may be said to be at the stage of almost perfection in the anticorrosive property to sea water.

The accompanying drawings are for helping the understanding of the invention, in which Figs. 1, 2 and 3 are curve diagrams illustrating the effect of respectively chromium, magnesium and iron upon strength or elongation of aluminum; Fig. 4 shows the similar curve diagram when both magnesium and iron are alloyed with aluminum.

The new alloy may be manufactured as follows:—

Chromium and iron are not used in form of pure metal as their melting points are too high, and are preferably taken in the form of an aluminum primary alloy preparatory prepared and containing about 25 per cent. of combined quantity of chromium and iron. In the first step, aluminum is melted, and then the said primary alloy is added thereto, and after thoroughly fused, the crucible containing the fused mixture is taken out of the hearth. To this mixture is added magnesium while vigorously stirring by iron bar, and after removing sediments there is obtained a final product which can be easily cast in a known manner.

The addition of chromium of 0.5 per cent. or above materially increases the resistance to the corrosive action of sea water. And it is obvious from Fig. 1 that the addition of chromium increases at the same time the mechanical strength. It is, however, seen from the same figure that the addition of chromium in excess affects the reduction of strength, and particularly of elongation. From these reasons, according to the invention, the limit of chromium is taken from 0.5 to 5.0 per cent.

The purpose of alloying magnesium is similar to that of chromium. Fig. 2 shows the effect of this metal when alloyed with aluminum and by the same reasons, the limits of the quantity of magnesium is taken in the range of 0.5 to 7.0 per cent.

It is further found that chromium is more advantageously used in combination with magnesium, although both are used for the same purpose. That is to say, the sole use of chromium over 2.5 per cent. results in rendering the fracture surface of an alloy very bad, while the use of chromium in combination with magnesium, even at the proportions of 2.0 per cent. of the former, and of 1.5 per cent. of the latter, amounting in all to 3.5 per cent., does not result in making the said surface bad. Besides, the two metals, being used in more increased quantity than in the case of either of them being used alone, tends to increase the strength of alloy. It is for this reason that chromium or magnesium is not used alone, but used in combination in order not only to make more complete the anticorrosive property of the alloy, but also to materially improve the mechanical properties of the same.

According to the invention, the addition of iron increases the strength of aluminum, as seen from Fig. 3. But the amount of addition of iron must be below 40 per cent., because, if this extent is passed, it is found

the fracture surface of the alloy becomes bad. Hence the limits of iron is taken from 0.3 to 4.0 per cent. Here it is found that the addition of iron to such extent never affects the anticorrosive property of the alloy. It is also found that, as seen from Fig. 4, iron is more effective in increasing mechanical strength when it is used together with magnesium than if used alone. In other words, the addition of iron up to 5 per cent. to the alloy containing 1.0 per cent. of magnesium increases the strength thereof, while, when this limit is passed, the strength is reduced. Moreover, although the addition of 5 per cent. of iron, becomes the cause of making the fracture surface bad, this defect is eliminated in the presence of 1.0 per cent. of magnesium. Therefore the combined use of magnesium and iron to the extents serves not only to increase mechanical strength, but also to improve the nature of fracture surface.

The alloy of the invention has a specific gravity of about 2.73, which indicates its being very light.

The uses of the alloy are found in various directions, say, for the manufacture of pipes, plates, wires, bars, and so forth, and due to its great strength it may most advantageously be used for constructing aeroplanes and automobiles and also their fittings. The alloy finds its uses almost in all directions of castings. It may be said, however, that the alloy may, above all, most conveniently be used for material in regard to ships and hydroplanes in view of its unequalized anticorrosive property.

Claim:

An alloy containing 0.5 to 5.0 per cent. of chromium, 0.5 to 7.0 per cent. of magnesium, 0.3 to 4.0 per cent of iron and the remainder of aluminum with its impurities.

In testimony whereof I affix my signature.

ITYRO IYTAKA.