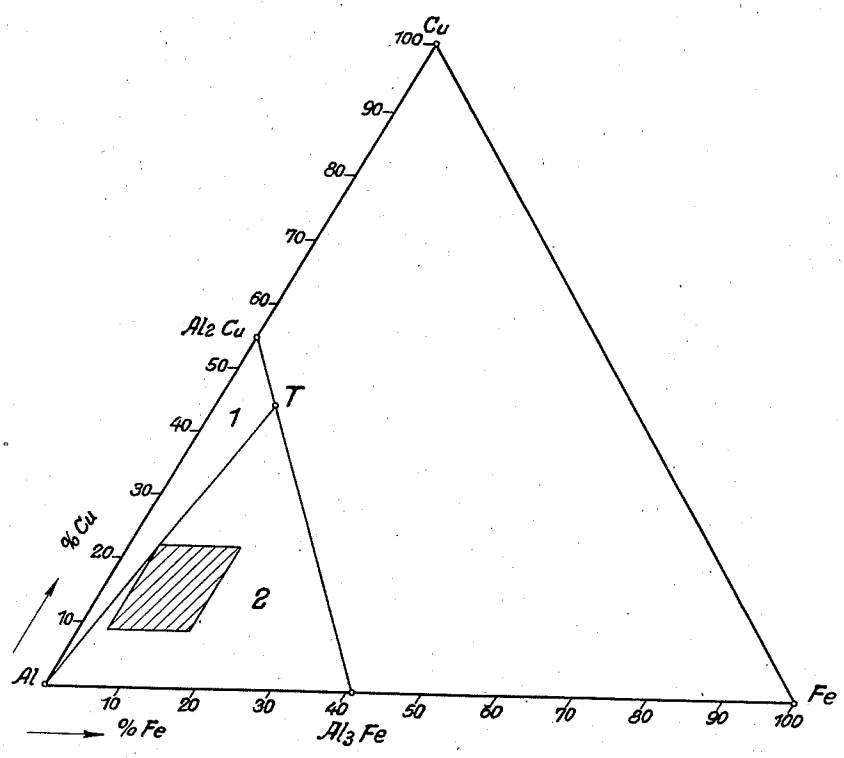
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ALUMINIUM ALLOY AND ARTICLE MADE THEREFROM

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ALUMINIUM ALLOY AND ARTICLE MADE THEREFROM

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4 Claims. (Cl. 75—139)

Our invention relates to aluminium alloys containing copper and iron and to articles made from such alloys. It has for its object to provide an alloy of the kind described which is particularly suitable for use in machine parts or bearings supporting rotatory or oscillatory parts of machinery and for other purposes.

Aluminium alloys containing copper and iron have already been used in the manufacture of bushings, sleeves, guides, pistons and other parts of machinery subject to sliding motion. The compositions of these alloys are illustrated by the accompanying drawing which shows the compositions of alloys containing aluminium, copper and iron by means of the conventional triangular diagram, in which the alloy composition represented by any given point on the diagram may be determined by drawing lines through said point parallel to two of the three sides of the triangle, which are divided up into percentages, as shown in the drawing. The two points at which these parallel lines intersect the two sides of the triangle, determine in a well known manner the percentages of two components, while the percentage of the third component results as balance to 100. The compositions of the alloys of the prior art are comprised within the triangle 1 forming part of the diagram shown in the drawing affixed to this specification and forming part thereof, this triangle being confined between the points Al, Al_2Cu and T of the diagram.

In contradistinction to these alloys the alloys bounded by the triangle 2, which may be assumed theoretically to consist of primary Al_3Fe, of secondary peritecticum (i. e. a ternary compound T between Al_2Cu and Al_3Fe) and of a tertiarily separated ground mass, rich in aluminium with mixed crystals of Al and with eutectic Al_3Fe, with the only exception of alloys containing a very low percentage (up to about 8 per cent) Cu and (up to about 4 per cent) Fe, were hitherto regarded as practically useless.

Our investigation of alloys of this type containing about 9 to 22 per cent Cu and about 4 to 15 per cent Fe, the rest being Al, with a view to their suitability as a material for sliding bearings etc. has now shown that they possess surprisingly favorable properties in this respect, being capable of withstanding, without seizing, a very high specific strain, which is a multiple of that shown by the customary bearing metals.

We believe these surprising properties to be explainable by the assumption that the diffusion phenomena which are checked by the solidification of the cast alloy, form a hindrance to the formation of the secondary peritectic, while favoring the formation of a ternary eutectic of Al_2Cu, T and mixed crystals of Al. As ascertained by running tests, this ternary eutectic appears to be capable of retaining the oil film in such manner that it is not broken even under high specific pressures on the bearing.

The characteristic feature of the new material is the content of primary crystals of Al_3Fe forming hard bearing crystals and of ternary eutectic in a ground mass of mixed crystals rich in aluminium.

The region, shown in the drawing by hatching, which encloses the alloys according to this invention, which contain, besides aluminium, ranging from about 63 to 88 per cent, from 9 to 22 per cent Cu and from 4 to 15 per cent Fe, lies in the field marked 2 of the diagram, which is confined between the points Al, Al_3Fe (59% Al+41% Fe) and T (being the ternary compound containing about 48% Al, 44% Cu and 8% Fe).

We have found an alloy containing about 15 per cent Cu and about 6 per cent Fe to be particularly suitable for sliding bearings.

An alloy containing about 10 per cent Cu and about 5 per cent Fe, while being very suitable for the same purpose, is somewhat softer than the alloy mentioned in the first place.

An alloy containing about 20 per cent Cu and about 5 per cent Fe was found to be somewhat harder than the first named alloy.

An alloy containing about 10 per cent Cu and about 7 per cent Fe is superior to the first named alloy as to running properties, but presents slight difficulties in casting.

An alloy containing about 10 per cent Cu and 12 per cent Fe has still better running properties.

Obviously the requirements will be different in each individual case, bearings running under high specific load requiring as a rule slightly harder metals, while on the other hand the properties of the shafts or spindles supported in the bearings (whether formed with soft or hardened surfaces, whether being rigid or subject to certain changes of form in operation) require different bearing metals. Therefore one alloy may be the best for one purpose, while being less suitable for others.

The process of solidification of the cast metal which considerably influences the structure, may be varied in a well known manner by a more or less intensive abduction of heat, for instance by chill casting, to yield the structure most suitable for the purpose in view.

The term "aluminium" used in the specification

and in the following claims is intended to include not only pure aluminium, but also a metal containing the impurities of commercial aluminium or small amounts of other impurities.

Various changes may be made in the details disclosed in the foregoing specification without departing from the invention or sacrificing the advantages thereof.

In the claims affixed to this specification no selection of any particular modification of the invention is intended to the exclusion of other modifications thereof and the right to subsequently make claim in the present application to any modification not covered by these claims is expressly reserved.

We claim:—

1. An aluminium alloy consisting of from 9 to 22 per cent Cu and from 4 to 15 per cent Fe, with a balance aluminium; said alloy being characterized by its content of hard primary crystals of Al_3Fe in a ground mass of mixed crystals rich in aluminium.

2. An aluminium alloy consisting of about 15 per cent Cu and 6 per cent Fe, with a balance aluminium; said alloy being characterized by its content of hard primary crystals of Al_3Fe in a ground mass of mixed crystals rich in aluminium.

3. A machine part subject to sliding friction constructed from a chill-cast alloy consisting of about 10 per cent of copper and 5 per cent of iron with a balance aluminium.

4. A machine part subject to sliding friction constructed from a chill-cast alloy consisting of about 10 per cent of copper and 12 per cent of iron with a balance aluminium.

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