UNITED STATES PATENT OFFICE.

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METHOD OF TREATING LIGHT-METAL ALLOYS.

1,374,968. Specification of Letters Patent. Patented Apr. 19, 1921.

No Drawing. Application filed January 21, 1920. Serial No. 353,097.

To all whom it may concern:

Be it known that I, WILLIAM R. VEAZEY, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Methods of Treating Light-Metal Alloys, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention, relating, as indicated, to the treatment of light metal alloys, has more particular regard to the treatment of alloys which consist principally, or entirely, of magnesium and aluminum, wherein such magnesium is the predominant metal. It is known that alloys of magnesium and aluminum, wherein such first mentioned metal constitutes 80 per cent. and upward of the total, possess valuable characteristics when in the form of cast articles, but, so far as I am aware, it has never been heretofore found practical to forge or otherwise similarly work an alloy of this constitution. I have now discovered, however, that by bringing such an alloy to a proper temperature before thus forging or similarly working the same, its tensile strength may be greatly increased and other desirable qualities imparted thereto.

Having regard to the accomplishment of the foregoing and related ends, the invention, then, consists of the steps hereinafter fully described and particularly pointed out in the claims, the following description setting forth but one of the several ways in which the principle of the invention may be used.

As previously indicated, the present improved method relates particularly to the working of magnesium-aluminum alloys, wherein the first mentioned metal largely predominates. As a specific example of an alloy of this type, which has been found eminently satisfactory for castings, the following composition may be given, viz. 91.5 per cent. of magnesium and 8.5 per cent. of aluminum. This alloy cannot be forged at all in the cold, although it readily lends itself to ordinary machine operations, such as turning, boring and polishing. In endeavoring to find a temperature at which such alloy may be successfully forged, I have discovered that even a temperature as high as 450° F. is too low, the alloy shattering like glass, while at temperatures much in excess of 800° F., and thence upwardly to the point of fusion of the alloy, any attempt to forge or similarly handle the alloy likewise results in shattering the same into granular form, much as sugar cake would be crushed by hammer blows.

I have discovered, in other words, that for satisfactorily working an alloy of the particular composition cited above, either between swages or in forging dies, the alloy should be raised to a temperature of approximately 600° F., and preferably such swages or dies should be maintained at approximately the same temperature. As indicating the range within which such alloy may be worked with satisfactory results, I should state that 100° above and below the preferred temperature just indicated constitute the limits, *i*, *e*. such satisfactory working temperature lies between 500° and 700° F. This range of temperature, furthermore, would appear to apply to any light metal alloy within the general class comprising from 80 per cent. upward of magnesium .

The result of forging such alloy under the temperature conditions stated is to produce a much more finely grained structure; also to render the alloy more brittle. However, the tensile strength is very considerably increased, and the brittleness may be partially overcome by subsequent heat treatment or annealing, without materially reducing the tensile strength thus secured. As a result of my improved method of treating such light metal alloys, the latter are rendered adaptable for use in a great variety of ways for which such alloy is not suitable in the form of castings, whether sand cast or die cast and whether such castings be subsequently heat treated or not. Thus, for example, connecting rods for internal combustion engines, and other machine parts, where lightness combined with great tensile strength is a desirable achievement, may be made.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the method herein disclosed, provided

the step or steps stated by any of the following claims or the equivalent of such stated step or steps be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. The method of treating a light metal alloy in which magnesium is the predominant constituent, which consists in heating the same to a temperature of from 500° to 700° F., and then forging or similarly working the same.

2. The method of treating a light metal alloy in which magnesium is the predominant constituent, which consists in heating the same to a temperature of from 500° to 700° F., and then forging the same with swages or dies heated to approximately the same temperature.

3. The method of treating a magnesium-aluminum alloy in which the magnesium constitutes at least 80% of the total, which consists in heating the same to a temperature of from 500° to 700° F., and then forging or similarly working the same.

4. The method of treating a magnesium-aluminum alloy in which the magnesium constitutes at least 80% of the total, which consists in heating the same to a temperature of from 500° to 700° F., and then forging or similarly working the same with swages or dies heated to approximately the same temperature.

5. The method of treating a magnesium-aluminum alloy in which the magnesium constitutes at least 80% of the total, which consists in heating the same to approximately 600° F., and then forging or similarly working the same.

6. The method of treating an alloy consisting of approximately 91.5% magnesium and 8.5% aluminum, which consists in heating the same to approximately 600° F., and then forging or similarly working the same.

7. The method of treating an alloy consisting of approximately 91.5% magnesium and 8.5% aluminum, which consists in heating the same to approximately 600° F., and then forging the same with swages or dies heated to approximately the same temperature.

Signed by me this 19th day of January, 1920.

WILLIAM R. VEAZEY.