

UNITED STATES PATENT OFFICE.

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ALLOY.

SPECIFICATION forming part of Letters Patent No. 684,707, dated October 15, 1901.

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To all whom it may concern:

Be it known that I, ERNST MURMANN, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Alloys; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Castings of aluminium-magnesium alloys, as is known, could heretofore only be obtained free from faults, such as porosity, by fulfilling special conditions, such as rapid removal of the heat, which render the working more difficult in practice. In addition to this the employment even of masses of aluminium magnesium free from faults, manufactured under such conditions of working, is almost precluded for heavy castings by reason of the comparatively high market price of the magnesium.

This invention relates to a process which permits the production of alloys of the kind in question free from pores, while obviating the special expedients (such as rapid cooling or pressure) heretofore necessary, and at the same time insures the applicability, from an economical standpoint, of such alloys for making heavy castings. According to the present invention this is effected by adding zinc to the aluminium-magnesium alloy—that is to say, by partially replacing the magnesium in the said alloy by zinc.

In carrying the improved process into practice it is advantageous to make the alloy in the atomic proportions of its constituents, these proportional quantities themselves being capable of variation in accordance with the physical properties—such as hardness, specific gravity, and so on—which the alloy is to have. The following specifications may serve as examples of the quantitative composition of these alloys.

For obtaining an alloy of the highest degree of resistance the proportions of the ingredients will be one hundred parts, by weight, of aluminium, four parts, by weight, of magnesium, and five parts, by weight, of zinc. This corresponds to an atomic proportion of forty-eight aluminium, two magne-

sium, and one zinc. This alloy corresponds to the ordinary cast brass.

More tenacious and at the same time somewhat softer alloys are obtained by the following proportions of ingredients: one hundred parts, by weight, of aluminium, four parts, by weight, of magnesium, and three parts, by weight, of zinc; or one hundred parts, by weight, of aluminium, three parts, by weight, of magnesium, and four parts, by weight, of zinc; or one hundred parts, by weight, of aluminium, two parts, by weight, of magnesium, and five parts, by weight, of zinc.

An alloy of one hundred parts, by weight, of aluminium; eight parts, by weight, of magnesium, and five parts, by weight, of zinc corresponds more or less to red brass.

An alloy consisting of one hundred parts, by weight, of aluminium; two parts, by weight, of magnesium, and five parts, by weight, of zinc will already be capable to be worked very well with a file, which with pure magnesium alloys can be obtained in the same degree only at a proportion of one hundred parts, by weight, of aluminium and six parts, by weight, of magnesium and after an application of mechanical pressure or rapid cooling. From this circumstance it is obvious that the important advantage is obtained that by the partial replacement of the magnesium in the alloys in question by zinc, according to the present invention, this process enables to obtain a material which is eminently suitable for mechanical working and in which much smaller quantities of magnesium are employed than heretofore (ten to thirty parts, by weight, of magnesium to one hundred parts, by weight, of aluminium) and at the same time to avoid the technical difficulties (such as rapid cooling or pressure) which have heretofore been connected with the manufacture of alloys containing a small percentage of magnesium.

The addition of zinc to be made in accordance with this invention can vary in alloys of one hundred parts, by weight, of aluminium and one to ten parts, by weight, of magnesium within the limits of one to twenty parts, by weight.

The prevention or reduction of porosity by the partial replacement of the magnesium by zinc finds its explanation in the circumstance

that the formation of pores in the castings is mainly due to the presence of the magnesium. If, therefore, the last-mentioned substance be partially replaced by zinc by reason of the reduction of the amount of magnesium contained in the alloy thus obtained the danger of formation of pores is correspondingly reduced, so that larger pieces fairly free from pores can be cast in sand without any difficulty. The pores which are still formed, though in smaller number than heretofore, appear principally in the surface of the casting. In addition to this the tenacity of an alloy of this kind containing zinc, and which has been allowed to set slowly in the sand-mold, is substantially higher than that of the pure aluminium-magnesium alloy as heretofore made under rapid cooling, so that both thick and thin castings will possess the same degree of resistance per unit of surface.

The alloys containing zinc here considered, having one to three parts, by weight, of magnesium and five to one parts, by weight, of zinc, can be rolled and drawn, while those containing one to ten parts, by weight, of magnesium and twenty to one parts, by weight, of zinc permit good or even excellent working

with the file and other tools and in this respect correspond to the pure magnesium-aluminium alloys having eight to twenty parts, by weight, of magnesium to one hundred parts, by weight, of aluminium.

Beyond the indicated proportions the alloys become harder and more brittle. An alloy, for example, of one hundred parts, by weight, of aluminium; fifteen parts, by weight, of magnesium, and twenty parts, by weight, of zinc is very brittle and scratches red brass.

I claim—

1. An alloy consisting of aluminium, magnesium and zinc, substantially as and for the purpose set forth.

2. An alloy consisting of one hundred parts of aluminium, from one to ten parts of magnesium and from one to twenty parts of zinc by weight, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

ERNST MURMANN.

Witnesses:

C. B. HURST,
ALVESTO S. HOGUE.