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COPPER-BASE ALLOY

Donald K. Crampton, Marion, and Henry L. Burghoff, Waterbury, Conn., assignors to Chase Brass & Copper Co. Incorporated, Waterbury, Conn., a corporation

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4 Claims. (Cl. 75—159)

This invention relates to improvements in age-hardenable copper-base alloys.

One object of this invention is to produce improved age-hardenable copper-base alloys having high tensile strength in the age-hardened condition.

Other objects of this invention will appear from the present disclosure.

We have found that advantageous age-hardenable copper-base alloys can be made when the alloys contain nickel in the range from 2.9% to 8.1%, arsenic in the range from 1.7% to 5.2%. and copper at least 81%, with or without one or more additional elements in such amounts as do not seriously impair the characteristic properties of the alloy, that is, in such amounts as do not essentially change the nature of the alloy, and such expressions as "the balance substantially all copper," etc., are intended to cover alloys including such amounts of additional elements. Such additional elements may consist of impurities or purposely-added elements to impart secondary properties to the alloy without seriously impairing the primary characteristic properties of the alloy, or such elements may be added for the purpose of lowering the cost of the alloy.

Other advantageous age-hardenable copper-base alloys which can be wrought, can contain nickel from 3.1% to 6%, arsenic from 2.3% to 3.8%, and copper at least 81%.

Other advantageous age-hardenable copper-base alloys can contain nickel from 4.3% to 5.7%, arsenic from 2.6% to 3.4%, and copper at least 83%.

The total of the nickel and arsenic will advantageously be from 6.2% to 13% of the alloy, and more advantageously from 6.7% to 11.2% of the alloy.

Advantageous age-hardenable alloys can be made by adding up to 14% of zinc to any of the foregoing alloys.

If any lead is to be present in the alloy, it should not exceed 5%, and if the alloy is to be wrought, the lead content should not exceed 2.5% to avoid deleterious effects. If any of the following elements are to be present in the alloy, the amount should not be higher than indicated as follows to avoid deleterious effects: aluminum ½%, antimony 0.1%, bismuth .03%, cadmium ½%, chromium 0.2%, iron 0.3%, magnesium 0.1%, phosphorus 0.1%, selenium 1%, silicon 0.2%, silver 5%, tellurium 1%, tin 1½%, titanium 0.1%, zirconium 0.25%.

In addition to the fact that age-hardenable alloys, in accordance with the present invention, are characterized by high tensile strength and high hardness in the age-hardened condition, the electrical conductivity and thermal conductivity of the alloys are also improved by the age-hardening treatment.

In accomplishing the age-hardening treatment, the solution treatment or step may be accomplished by heating the alloys above 1200° F., but below the melting point of the alloy being treated, and quenching or otherwise suitably rapidly cooling the alloy. The age-hardening can then be accomplished by re-heating or aging at some temperature between 500° F. and 1100° F., for a suitable time, which can be in the range of from one-half hour to twenty-four hours, depending on the temperature used, but preferably for not longer than eight hours.

The nickel and arsenic age-hardening material or constituent can also be employed in copper-base alloys in conjunction with other age-hardening materials or constituents.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

We claim:

1. An age-hardening copper-base alloy comprising: age-hardening amounts of nickel and arsenic, the nickel being from 2.9% to 8.1% and the arsenic being from 1.7% to 5.2%; and copper at least 81%.

2. An age-hardenable copper-base alloy comprising: age-hardening amounts of nickel and arsenic, the nickel being from 3.1% to 6% and the arsenic being from 2.3% to 3.8%; and copper at least 81%.

3. An age-hardenable copper-base alloy comprising: age-hardening amounts of nickel and arsenic, the nickel being from 4.3% to 5.7% and the arsenic being from 2.6% to 3.4%; and copper at least 83%.

4. An age-hardened copper-base alloy comprising: age-hardening amounts of nickel and arsenic, the nickel being from 2.9% to 8.1% and the arsenic being from 1.7% to 5.2%, and the total of the nickel and arsenic being at least 6.2%; and copper at least 81%.

DONALD K. CRAMPTON.
HENRY L. BURGHOFF.