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ALLOYS

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This invention relates to alloys and particularly to an alloy of copper and rare earth elements having unique and surprising properties and advantages in metallurgical applications.

Alloys of rare earth with ferrous and related metals are old and well known and have been used for a great variety of purposes. The addition of the rare earth elements to such materials has, however, been an ever present problem. Many types of rare earth addition materials have been proposed with varying degrees of success. The most generally used addition alloy for incorporating the rare earth elements into matrix metals such as iron has been the mixed rare earth alloy commonly called mischmetal and consisting of between about 40 to 60% cerium, about 20 to 35% lanthanum and the balance a mixture of the scarcer rare earth elements such as praseodymium and neodymium. Mischmetal melts at approximately 1450° F. and requires some time in order to obtain satisfactory dispersion in a steel bath.

We have discovered a new alloy which may be used as an additive alloy in metallurgical purposes and which has further surprising utility as a brazing alloy.

The alloy of this invention may fall within the following broad range:

Copper	About 8% to about 20%.
Mischmetal	Balance.

Preferably, however, the alloy of this invention is limited to the range of—

Copper	About 13% to about 17%.
Mischmetal	Balance.

In a preferred specific composition the alloy will be made up of—

Copper	About 15%.
Mischmetal	Balance.

An alloy made according to this invention will melt in the range of about 700° F. to 800° F. as compared with melting temperatures of about 1450° F. for mischmetal and about 2000° F. for copper.

Preferably the alloy of this invention is cast into small pellets weighing approximately 1 ounce apiece. In this form the alloy can be added to rapidly cooling masses of metal such as steel at the time of teeming into ingots.

This rapidly melting, low temperature rare earth alloy permits rare earth additions to be made to a great variety of molten metals with unusually small losses. For example the improved workability obtained by an addition of two pounds per ton of standard mischmetal added to grade 310 steel can be obtained with the addition of one pound per ton or less of the present alloy. This surprising increase in effectiveness of our present alloy appears to be the result of its low melting temperature and its ability to disperse rapidly in molten metals thereby preventing high volatilization losses.

The alloy of this invention has great utility as a brazing alloy since it melts at a temperature several hundred degrees below the lowest melting temperature of ordinary brazing alloys or "silver solders" but has approximately twice their tensile and shear strengths. Presently used brazing materials which include copper require temperatures in excess of 2100° F. for proper use. Copper-zinc base brazing alloys generally require temperatures in excess of 1800° F. Neither of these well known brazing alloys is satisfactory for joining steel which has been heat-treated and tempered to give high tensile strengths because of the high temperature required to make the joint. The alloy of our invention, on the other hand, may be used in making such joints without any deleterious effect on the tempered steel and with the production of a joint which is actually higher in tensile and shear strength than one made by conventional brazing alloys and this despite the fact that the steels being joined have been tempered to give tensile strengths of 150,000 p.s.i. or higher. In such brazing or joining applications the preferred alloys are those falling with the limited range of—

Copper	13% to 17%.
Mischmetal	Balance.

In the alloy of this invention any of the rare earths alone or in combinations differing from mischmetal may be substituted for the mischmetal without detracting from the effectiveness of the alloy. For example cerium or lanthanum may be substituted alone or in combination for mischmetal in the alloys of this invention.

While we have illustrated and described certain preferred embodiments of our invention it will be understood that it may be otherwise embodied within the scope of the following claims.

We claim:

1. An article comprising two or more metallic members and the solidified product of a fused alloy consisting essentially of about 8 to 20% copper and the balance mischmetal, the fused adjacent surfaces of the members being joined by said fused alloy.

2. An article comprising two or more metallic members and the solidified product of a fused alloy consisting essentially of about 13 to 17% copper and the balance mischmetal, the fused adjacent surfaces of the members being joined by said fused alloy.

3. An article comprising two or more metallic members and the solidified product of a fused alloy consisting essentially of about 15% copper and the balance mischmetal, the fused adjacent surfaces of the members being joined by said fused alloy.

4. A method of brazing metal members comprising the steps of heating the metal members to be brazed, applying thereto a pool of molten alloy of about 8 to 20% copper and the balance mischmetal, heating to fuse the pool of molten alloy and an adjacent surface of the member to be brazed and cooling to form the completed brazed member.

5. A method of brazing metal members comprising the steps of heating the metal members to be brazed, applying thereto a pool of molten alloy of about 13 to 17% copper and the balance mischmetal. heating to fuse the pool of molten alloy and an adjacent surface of the member to be brazed and cooling to form the completed brazed member.

6. A method of brazing metal members comprising the steps of heating the metal members to be brazed, applying thereto a pool of molten alloy of about 15% copper and the balance mischmetal, heating to fuse the pool of molten alloy and an adjacent surface of the member to be brazed and cooling to form the completed brazed member.

7. An article comprising a metallic member and the

solidified product of a fused alloy consisting essentially of about 8 to 20% copper and the balance mischmetal, said alloy being joined with the fused adjacent surface of the metallic member.

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