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ALLOYS AND METHOD OF MAKING
THE SAMEMiner M. Austin, Waukegan, Ill., assignor to Fan-
steel Metallurgical Corporation, a corporation
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5 Claims. (Cl. 75-93)

This invention relates to alloys. It more particularly relates to workable alloys and the method of making the same.

An object of my invention is the provision and production of an alloy which is readily workable at a yellow heat and which retains its resiliency at relatively high temperatures.

Another object is the provision of and production of an alloy with a relatively fine crystalline structure and having relatively great resistance to cross breaking.

For the purpose of this specification, I will make reference particularly to tantalum alloys of nickel and iron but it will be understood that my invention is not limited to these alloys as it may include many others.

Heretofore I have made a great many attempts to produce workable alloys containing from 1% to 30% of tantalum in nickel and in iron, which alloys could be rolled into sheets or drawn into wire. In the case of nickel, I have been unable to work alloys containing more than 10% tantalum, and in the case of iron, I have been unable to work alloys containing more than 6% of tantalum. These alloys are practically unworkable either hot or cold. They have a very low cross breaking strength and the fractured surface is coarsely crystalline.

In carrying out my invention I overcome the above disadvantages by taking a molten mixture of tantalum and nickel in the proportions of from 10% to 30% of tantalum and introduce as a scavenger .1% of magnesium in the form of an alloy of 5% magnesium and 95% nickel, which scavenger completely changes the character of the alloy. The resulting alloy has its cross breaking strength many times increased. Its castings will withstand substantial bending when cold and they may be readily rolled and swaged at a yellow heat.

The same results are produced by using tantalum iron instead of tantalum nickel as the original alloy. Although I have specified 10% to 30% of tantalum, much higher percentages of tantalum may be used without the resulting alloy losing its working properties.

The employment of my invention has made possible the production of forgeable alloys of tantalum with base metals of the class of iron and nickel. Similar beneficial results are obtainable by the use of cobalt, gold or platinum in the place of iron or nickel and it is contemplated that they also may have many valuable uses. It is also possible to substitute in the scavenger for magnesium any of a variety of vigorous reducing

agents, such as aluminum, calcium, silicon or carbon with similar results.

Although I have specified .1% as the preferred amount of magnesium to be added by the scavenger, it is satisfactory to use as high as .5% and as low as .05%. If 1% or more is used, the results are not beneficial and I accordingly use in all cases less than 1% magnesium. It will be readily observed that when an original alloy of tantalum-iron or other than tantalum-nickel is used, the final alloy will contain substantially 2% of nickel as the result of adding .1% of magnesium in the form of the scavenger consisting of 95% nickel and 5% magnesium.

Although it has not been conclusively determined exactly what effect the magnesium has on the alloys to produce the beneficial effects herein set forth, it appears that the magnesium acts as a reducing agent on the tantalum oxide and produces a magnesium oxide which is less harmful. It probably acts on many other impurities and renders them harmless, which impurities otherwise make the alloy unworkable.

Workable alloys with a high content of tantalum, have many valuable uses. It has been observed, for instance, that the 20% tantalum-nickel alloy remains remarkably rigid and retains its resilience even at a red heat and may be used as a support wire in vacuum tubes. Tantalum-iron wire has very desirable electrical characteristics and finds use in grids in vacuum tubes. Also corrosion resisting qualities of tantalum-irons may be taken advantage of in numerous ways.

It is contemplated that certain variations may be made in the alloys herein specified and in the method of producing them without departing from the spirit of this invention, and I desire to avail myself of such modifications as come within the scope of the appended claims.

I claim as my invention:

1. The method of producing a workable alloy of tantalum comprising substantially ten per cent tantalum, which consists in introducing .1 per cent of magnesium in the form of an alloy of five per cent magnesium and ninety-five per cent nickel in a molten mixture of ten per cent tantalum and ninety per cent iron.

2. The method of producing a workable alloy of tantalum which consists in introducing from 0.05% to 0.5% of magnesium in the form of an alloy of 5% magnesium and 95% nickel in a molten mixture of from 10% to 30% tantalum and 90% to 70% of a metal from the group including nickel and iron.

3. The method of producing a workable alloy of tantalum which consists in introducing from 0.05% to 0.5% magnesium in the form of an alloy of 5% magnesium and 95% nickel in a molten mixture of from 10% to 30% tantalum and from 90% to 70% nickel.

4. The method of making a workable alloy of from 10% to 30% tantalum and from 90% to 70% nickel, which consists in melting a mixture of from 10% to 30% of tantalum and from 90% to 70% of nickel and adding thereto from 0.05% to 0.5% of a vigorous reducing agent in the form of an alloy of substantially 5% of such reducing agent and substantially 95% of nickel.

5. The method of making a workable alloy of from ten per cent (10%) to thirty per cent (30%) tantalum and from ninety per cent (90%) to seventy per cent (70%) nickel which consists in melting a mixture of from ten per cent (10%) to thirty per cent (30%) of tantalum and from ninety per cent (90%) to seventy per cent (70%) of nickel, and adding thereto from five one hundredths per cent (.05%) to substantially one per cent (1%) of a metallic reducing agent in the form of an alloy of substantially five per cent (5%) of such reducing agent and substantially ninety-five per cent (95%) of nickel.

MINER M. AUSTIN.