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TUNGSTEN-BASE ALLOY

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3 Claims. (Cl. 75—176)

This application is divided out from my copending application Serial No. 105 filed January 2, 1935, and relates to alloys for the points of gold nibs.

Many alloys for the purpose specified have already become known. There are tungsten-base alloys whose balance is made up by metals of the platinum group. There are other alloys with a base of platinum-groups metals, and up to 10% tungsten, with a small percentage of nickel or the like. Lastly, there are alloys with iron, copper, or nickel as the base, with a small percentage of two metals of the platinum group, and of tungsten.

The many alloys of these types which have become known, are hard and sufficiently acid-proof, so that they do not wear rapidly, and are not attacked by ink. However, they are so brittle that it is difficult to split the nibs, and this operation must be performed by means of a very thin and rapidly rotating disc of copper moistened with a paste of emery. This is obviously an undesired complication which ought to be eliminated.

It is an object of my invention to provide an alloy for the points of gold nibs which is as hard and acid-proof as the aforesaid known alloys, but at the same time possesses a high degree of tenacity so that nibs having points of my novel alloy can be split simply by means of a blade or shearing device.

To this end, I compound my novel alloy of tungsten as the base to which is added a metal of the iron group, i. e., iron, nickel, or cobalt, a soft metal of the platinum group, i. e., platinum or palladium, and ruthenium, which is a hard metal of the same group. The percentage of platinum or palladium should be higher than that of the hard metal.

I have found that the composition of an alloy which can be cut by the aforesaid cutting or shearing means, must fulfill certain conditions. The base of the alloy is tungsten, at the rate of 65 to 80% of the alloy. However, up to 20% of the tungsten may be replaced by molybdenum, or tantalum, or by carbides of these metals. To this base I add metals of the iron group, i. e., iron, nickel, or cobalt, at the rate of 5 to 20%. Iron and nickel are less efficient than cobalt, so that cobalt is normally preferred.

The novel feature of my alloys is that their content of precious metals consists for the major part, preferably at the rate of 8 to 20%, of soft metals of the platinum group, i. e., platinum or palladium, and for the minor part, preferably at the rate of 2 to 10% of ruthenium. Ruthenium is particularly suitable as a constituent of my alloys, but rhodium and iridium may also be used.

My alloys may be prepared uniformly in any suitable manner, for instance, in electric arc or high frequency induction furnaces, preferably with inserted crucibles.

Heretofore, the soft metals of the platinum group, i. e., platinum and palladium, were not added at comparatively high percentages, as the alloys for the points of nibs became too soft. However, I have established the surprising fact that by adding platinum or palladium and a small percentage of ruthenium to a base of tungsten with iron, nickel, or cobalt, alloys are obtained whose hardness is equal to that of alloys consisting principally of the said hard metals, but whose tenacity is very much superior to that of the aforesaid alloys, and my novel alloys can therefore be cut.

The tenacity of alloys is ascertained by placing a particle of the alloy whose diameter may be 1.3 millimeters, between a pair of jaws, and compressing it until it is crushed. The crushing strength is determined by the tenacity, and not by the hardness, of the alloy under test. It amounts to only a few kilograms in brittle alloys, but may be 50 kilograms, and more, for tenacious alloys.

As preferred examples of my preferred alloys, I give the following:

Example I.—Tungsten 65%; cobalt 10%; platinum 20%; and ruthenium 5%.

Example II.—Tungsten 65%; palladium 15%; cobalt 10%; and ruthenium 10%.

Example III.—Tungsten 65%; platinum 15%; cobalt 10%; and ruthenium 10%.

Example IV.—Tungsten 80%; platinum 8%; cobalt 10%; and ruthenium 2%.

My improved alloys have crushing strengths between around 50 and 70 kilograms, whereas the crushing strengths of several known commercial alloys vary between 6 and 30 kilograms.

To obtain my high tenacity the percentage of tungsten must be high and the percentage of precious metals may exceed 25 and the amount of platinum or palladium should exceed that of the ruthenium. The percentage of ignoble metals should not exceed 20. As the metal of the iron group, I prefer to employ cobalt and as the soft metal of the platinum group, platinum is preferred. My ruthenium alloys are second only to the osmium alloys in tenacity and are remarkably superior to known commercial alloys with respect to their crushing strength.

My novel alloys have the good property that

they can be welded to gold nibs on account of their content of cobalt, while, as known, pure tungsten and many alloys of tungsten, molybdenum, and metals of the platinum group, cannot be welded directly to gold nibs.

I claim:

1. An alloy for points of gold nibs consisting of 65% of tungsten, 10% of cobalt, 20% of platinum, and 5% of ruthenium.

2. An alloy for points of gold nibs consisting of 80% of tungsten, 10% of cobalt, 8% of platinum, and 2% of ruthenium.

3. An alloy for points of gold nibs consisting of from 65% to 80% of tungsten, from 5% to 20% of a metal of the iron group, from 2% to 10% of ruthenium, and from 8% to 20% of platinum, the amount of the platinum being greater than the amount of the ruthenium.

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