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TUNGSTEN-BASE ALLOY FOR POINTS OF GOLD NIBS

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My invention 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-group 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 disk 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 are 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 a hard metal of the same group, i. e., osmium, ruthenium, rhodium, or iridium. The percentage of the soft metal 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 hard metals of the same group, i. e., osmium, or other hard metals. 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 and a small percentage of osmium 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 millimetres, 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 kilogrammes in brittle alloys, but may be 50 kilogrammes, and more, for tenacious alloys.

Table I shows the crushing strengths of five alloys according to my invention and Table II, by way of comparison, shows the crushing strengths of four commercial alloys for the same purpose. It will appear that while the crushing strengths of my novel alloys range from 48.4 to 70 kilogrammes, those of the commercial alloys only range from 5.8 to 29.3 kilogrammes.

Table I

No.	Tungsten	Platinum	Hard metal	Cobalt	Crushing strength
	Percent	*Percent*	*Percent*	*Percent*	*Kg.*
1	65	15	Ru. 10	10	48.4
2	65	15	Os. 10	10	56.3
3	65	20	Os. 5	10	Beyond 70
4	80	8	Os. 2	10	50.9
5	80	8	Ir. 2	10	63

The examples show that in order to obtain high tenacity, the percentage of tungsten must be high; that the percentage of precious metals which may exceed 25%, should contain more soft than hard metal; that the percentage of ignoble metal should not exceed 20%; that cobalt is favorable; and that the best alloys are those which

contain osmium as the hard metal, as demonstrated by the maximum crushing strength of alloy No. 3.

If ruthenium or rhodium are added which are hard metals similar to osmium, the alloys become less tenacious and softer but still are superior to commercial alloys with respect to their crushing strength.

For crushing strengths of commercial alloys, see

Table II

No.	Tungsten	Platinum	Hard metal	Cobalt	Crushing strength
	Percent	*Percent*	*Percent*	*Percent*	*Kg.*
6	70		Os. 5	25	28.7
7	65		Os. 15, Rh. 10	10	17.6
8	65		Os. 15, Ru. 10	10	5.8
9	65	10	Os. 15	10	29.3

Comparing Nos. 2 and 9, it will appear that, by converting the percentages of soft and hard metals in an alloy of otherwise equal composition, the crushing strength becomes almost twice that of the commercial alloy.

My novel alloys have the further good property that they can be welded to the 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 osmium.

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

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 osmium, and from 8% to 20% of platinum, the amount of the platinum being greater than the amount of the osmium.

4. 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 a hard metal of the class composed of osmium, ruthenium, rhodium and iridium from the platinum group and from 8% to 20% of a soft metal of the class composed of platinum and palladium from the platinum group, the amount of the soft metal of the platinum group being greater than the amount of the hard metal of the platinum group.

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