Patented Oct. 20, 1942 2,299,114

UNITED STATES PATENT OFFICE

2,299,114

ALLOY

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No Drawing. Application December 19, 1941, Serial No. 423,601

5 Claims. (Cl. 75—172)

This invention relates to alloys and is concerned in particular with precious metal alloys.

It is one object of our invention to provide an alloy having the color and general appearance of platinum and having a high degree of resistance to corrosion and oxidation. It is another object of our invention to provide an alloy of the type described, which shall have great hardness and tensile strength combined with great ductility.

In our Patent No. 2,189,571, granted February 6, 1940, we have described alloys of 20% to 60% platinum, 10% to 40% palladium, 10% to 50% silver, and 1% to 25% gold. Such alloys are resistant to corrosion and oxidation and have high tensile strength and hardness, and possess sufficient ductility so that they can be easily worked mechanically into suitable shapes. In the continuation of our research of quaternary alloys of platinum, palladium, silver, and gold, in the search for alloys of great tensile strength and hardness combined with high ductility, we have found that a surprisingly advantageous alloy can be produced outside the range of our aforesaid patent by decreasing the content of silver to less than 10% and, likewise, varying the proportional contents of the other three constituents.

The following table illustrates some of the properties of our new alloys:

Composition, per cent				Ultimate T. S.	Proportional limit	Elongation
Pt	Pd	Au	Ag			
				Lbs./sq. in.	*Lbs./sq. in.*	*Per cent*
50	22	20	8	165,000	148,000	12
50	26	20	4	181,500	151,000	14.5
50	28	20	2	148,000	132,000	12

It will be noted that one prime distinction between our new alloys and those of our Patent No. 2,189,571 is the lower silver content. In properties, our new alloys are, likewise, distinguished from our previous alloys in that the tensile strength is considerably increased without a corresponding decrease in elongation, i. e. ductility, and that on the contrary there appears a tendency toward an increase in ductility combined with an increase in tensile strength. An alloy of 60% platinum, 20% palladium, 10% gold, and 10% silver, representing in its silver content the lower limit of our previous alloy, has a tensile strength of only 139,000 lbs. per sq. in., and a proportional limit of 123,000 lbs. per sq. in. combined with an elongation of 12%. On the other hand, our new alloys are, likewise, distinguished in properties from ternary alloys of platinum, palladium, and gold, i. e. alloys without silver, in that they have considerably greater tensile strength; an alloy, for instance, of 50% platinum, 30% palladium, and 20% gold, has a tensile strength of only 116,000 lbs. per sq. in., and a proportional limit of 80,000 lbs. per sq. in. with an elongation of 13%.

The alloys according to this invention contain from 40% to 60% platinum, from 20% to 40% palladium, from 10% to 30% gold, and 1% to less than 10% silver. The dividing line of 10% silver between our previous alloys and our new alloys is critical in combination with a higher minimum content of platinum, palladium and gold, as compared with our previous alloys, in order to obtain the greatly increased tensile strength combined with high or even higher ductility. Likewise, alloys containing less than 1% silver do not appear to possess the properties characteristic of the quaternary alloys here involved, but possess on the contrary the general properties of the comparable ternary alloys. It will be noted that, in the alloys of the table above given, there is obtained a definite peak in the alloy of 50% platinum, 26% palladium, 20% gold and 4% silver, with the tensile strength tapering off with an increase of silver as well as with a decrease of silver. In the triangle thus formed, with the alloy containing 4% silver at the peak, the preferred range of our new alloys would contain on the one slope a minimum of 2% silver and on the other slope a comparable maximum of 9% silver. The alloy of 8% silver on the one slope would correspond to an alloy of 2.75% silver on the other slope. Likewise, the preferred range of such alloys should contain a minimum of about 60% platinum and gold combined, as well as a minimum of about 61% platinum and palladium combined.

The alloys according to this invention have a high melting point. The alloys specified in the above table, for instance, all have a melting point in excess of 2732° F. The hardness of our new alloys, likewise, is in excess of that of other quaternary alloys as is also their resistance to corrosion and oxidation. The alloys are completely resistant to acids, such as hydrochloric acid, nitric acid, sulphuric acid, etc. The new alloys also retain their hardness at elevated temperatures as their softening point is extremely high.

The alloys according to this invention are suitable for many uses and are particularly suitable for the manufacture of dental appliances subject to corrosive or the like influences, such as den-

tures, orthodontia wires, clasps, etc. The alloys are, likewise, suitable for jewelry and the like purposes.

What we claim is:

1. An alloy of 40% to 60% platinum, 20% to 40% palladium, 10% to 30% gold, and 2% to 9% silver.

2. An alloy of 40% to 60% platinum, 20% to 40% palladium, 10% to 30% gold, and 2% to 9% silver, wherein the combined content of platinum and gold is not less than about 60% and the combined content of platinum and palladium is not less than about 61%.

3. An alloy of platinum, palladium, gold and silver composed of 40% to 60% platinum, 20% to 40% palladium, 10% to 30% gold, and about 4% silver.

4. An alloy of about 50% platinum, about 26% palladium, about 20% gold, and about 4% silver.

5. An alloy of platinum, palladium, gold and silver composed of about 50% platinum, about 20% gold, from 22% to 28% palladium, and from 2.75% to 8% silver.

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