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PALLADIUM NICKEL RUTHENIUM ALLOY

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mund Cohn, New York, N. Y.No Drawing. Application October 29, 1937,
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This invention relates to alloys and, more particularly, relates to palladium alloys having physical characteristics superior to previously known palladium alloys and comparable to white gold or platinum. The alloys of my invention are suitable for jewelry, watch-cases, optical frames, dentures and other articles of manufacture.

Palladium is a soft white noble metal of the platinum group. It is lighter in weight and lower in cost than platinum. The natural softness of palladium, like platinum, renders it unsuitable as a metal for certain articles of manufacture. In my United States Patent No. 2,074,996 of March 23, 1937, I have disclosed a new manner of hardening palladium by the use of nickel, thus forming a palladium nickel alloy. Nickel is comparatively cheap and has substantially the same color as palladium. I have produced by the proper proportioning of the nickel content a hard palladium alloy having approximately the white appearance of palladium and being resistant to oxidation and discoloration. The relatively high fusion point of the palladium nickel alloy of my present invention together with the white appearance and the workability of the metal renders it widely useful. The elasticity and springiness of the alloy make it suitable for optical frames and other uses.

Although this palladium nickel alloy possesses the many desirable properties listed above, it is deficient with respect to certain vital characteristics.

The color of the palladium nickel alloy, although fairly satisfactory, is still far enough below the optimum to make improvement desirable. This deficiency is particularly notable when it is used as a setting for diamonds or other precious stones. Its reflectivity and its color do not set off precious stones to the best advantage. The color and reflectivity of the metal which makes up the setting of a stone is of great importance in the jewelry arts since different metals can set off the same stones to create entirely different appearances.

I have found that an alloy of palladium, nickel and ruthenium in proportions such as will be explained in detail hereinafter produces a metal with a color that is superior for jewelry settings to the palladium nickel alloy above referred to. Its reflectivity and its color are such that a diamond or other precious stone is set off to the greatest advantage and presents an enhanced beauty.

I have further found that this alloy has superior qualities of hardness, workability and duc-

tility. These characteristics are of great importance in metals of this nature, which are to be used in the jewelry art for settings, watch cases, optical frames, and for dentures and other articles of manufacture.

I have further found that I may produce a palladium cobalt ruthenium alloy with the superior characteristics indicated above for a palladium nickel ruthenium alloy.

It is the object of my invention to provide a novel alloy of palladium.

Another object of my invention is to provide a novel palladium alloy with superior reflectivity and color.

It is another object of my invention to provide a novel palladium alloy with properties of greater hardness, workability and ductility.

Another object of my invention is to provide a novel alloy of palladium, nickel and ruthenium.

Another object of my invention is to provide a novel alloy suitable for the jewelry arts comprising palladium and non-precious metals and ruthenium.

Other objects of my invention will be evident from the following description.

I produce the alloy with the superior properties above indicated by alloying ninety to ninety-eight per cent (90-98%) of palladium with one per cent (1%) to nine per cent (9%) of ruthenium and nine per cent (9%) to one per cent (1%) of nickel.

I have found that if greater percentages of nickel and ruthenium are used in comparison to the palladium, the alloy obtained is not as desirable as the alloy of the above-indicated percentages. The specific alloy which I have found produces the best results comprises ninety-two per cent (92%) palladium, five per cent (5%) nickel and three per cent (3%) ruthenium.

The combination of nickel and ruthenium produces a new and unexpected color in the alloy. The color of this new alloy is preeminently desirable for enhancing the beauty of precious stones set therein.

The alloy is cold rolled to suitable shape in a manner well-known in the art and is annealed by heating to a temperature of 800° to 1000° centigrade and permitted to cool slowly under atmospheric conditions. To prevent the formation of oxide coatings on the palladium alloy I water quench the alloy.

Since it is desirable to prevent the formation of nickel oxide I add a small quantity of flux when the alloy is first prepared from its elemen-

tary constituents. This is important inasmuch as nickel oxide inclines the alloy to be brittle.

I have also found that these palladium alloys may be melted in an atmosphere of hydrogen without using flux. The reducing agent hydrogen prevents the formation of the undesirable nickel oxide. This process is applicable both to palladium nickel alloys and to the alloys of my present invention.

- 10 In place of the nickel of the above-indicated alloy I may employ cobalt. Thus I may form a measurably superior palladium alloy comprising ninety to ninety-eight per cent (90-98%) palladium, one per cent (1%) to nine per cent (9%)
- 15 cobalt, and nine per cent (9%) to one per cent (1%) ruthenium. Specifically, I prefer an alloy of ninety-one per cent (91%) palladium, five per cent (5%) cobalt and four per cent (4%) ruthenium.

- 20 I have also found that I can produce a very satisfactory alloy of palladium containing palladium 90%-97%, cobalt 1 to 8%, nickel 1 to 8% and ruthenium 1 to 8%. The specific alloy which I have found produces the best results comprises
- 25 90% palladium, 3% nickel, 3% cobalt and 4% ruthenium.

The palladium nickel ruthenium alloy and the

palladium cobalt ruthenium alloy have the general appearance of palladium but with a greatly enhanced reflectivity and a color especially well-adapted to set off precious stones. These alloys have further desirable properties of hardness, 5 workability and ductility. Thus they may be employed both generally in the jewelry arts, as dentures and for many other purposes with specifically superior results.

They have a high fusing point together with 10 a desirable malleability and workability which makes their use in the arts well-adapted to manufacturing processes and produces a springiness and elasticity of value in the ultimate products.

I claim:

1. An alloy comprising palladium, nickel and ruthenium in substantially the proportion of 15 ninety per cent (90%) to ninety-eight per cent (98%) palladium, one per cent (1%) to nine per cent (9%) nickel, and nine per cent (9%) to one per cent (1%) ruthenium.

2. An alloy comprising substantially ninety-two per cent (92%) palladium, five per cent (5%) 25 nickel, and three per cent (3%) ruthenium.

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