

April 29, 1941.

C. ANSELMI

2,240,202

COPPER ALLOY

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Fig. 1.

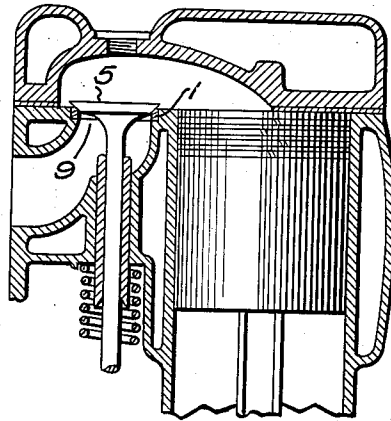


Fig. 2.

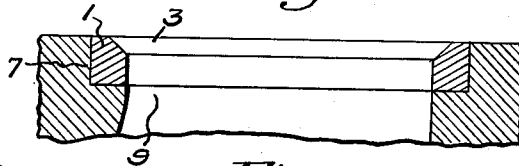
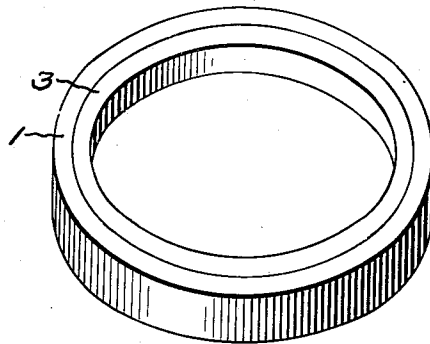


Fig. 3.



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COPPER ALLOY

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Application July 25, 1939, Serial No. 286,377

3 Claims. (Cl. 75-159)

My invention relates to alloys particularly useful in situations where the article made of the same is subjected to severe wear, corrosive action and stress under high temperature conditions, being particularly, but not exclusively, suitable as a material for fabricating valve seats for the exhaust valves of internal combustion engines.

The invention however will be best understood from the accompanying drawing and following description, the scope of the invention being more particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is a vertical section of a fragment of an internal combustion engine;

Fig. 2 is a diametrical vertical section of the valve port and seat according to Fig. 1 on an enlarged scale; and

Fig. 3 is a perspective of the valve seat member according to Figs. 1 and 2.

No claim is made for the particular shape of the valve seat member shown in the drawing. It may, for example, be made in the form of the ring 1 shown in the drawing, this ring having the tapered valve seating surface 3 for cooperation with the puppet valve 5. The ring so constructed may be secured in place by pressing it into the complementary annular recess 7 about the upper edge portion of the valve port 9.

The alloy according to the invention is predominantly copper, and contains requisite amounts of aluminum, nickel and iron to give it the desired properties. Generally speaking, the aluminum in combination with the nickel imparts to the alloy great strength and resistance to corrosion, while the iron in combination with the nickel and aluminum imparts toughness and improves the grain structure and wear resisting properties, the iron in such combination imparting such hardness to the alloy as makes it suitable for use as a valve seat or for analogous use under high temperature conditions but without making the alloy brittle or deleteriously reducing its resistance to corrosion. It has been found that by adding to copper these three metals within rather fairly critical ranges the resulting alloy will have the properties mentioned, and further that it may be hot worked without fracture markedly to refine its grain and give it a structure which, as compared to the cast alloy and to other alloys, is very fine and dense, such structure rendering it susceptible of taking a high finish and particularly suitable for use in situations where it is to make a tight fit with another part as is the case with a valve seating surface.

The above properties adapting the alloy for

use in the situations mentioned will be secured with, approximately, 8 to 11% aluminum, 0.5 to 1.5% nickel, and 0.1 to 0.7% iron provided the amount of nickel is at least twice the amount of iron. A particularly useful alloy according to the invention consists of, approximately, 9 to 10% aluminum, 1% nickel, and 0.25% iron.

The above alloys after being cast may be preliminarily hot worked by extrusion or other hot working, followed by hot pressing or forging, for refining their grain and securing a fine dense structure. The hot forging or pressing operation may involve making the blank for the ring-shaped valve seat member, which blank may be finished by a machining operation to secure a smooth surface suitable for a valve seat. The valve seat so constructed is highly resistant to the corrosive and pitting effects of the high temperature exhaust gases of an internal combustion engine, and markedly resists fracture and wear tended to be caused by the hammering of the valve on such seat.

Small amounts of manganese, say up to 1%, but preferably not over 0.5%, may be added to the alloy to insure against any deleterious effects of sulphur, which is particularly objectionable with an alloy containing nickel. Small amounts of other metals also may be added for imparting additional properties to the alloy or for modifying those hereinbefore mentioned, or may exist as impurities, so long as they do not materially eliminate the valuable properties obtained by the combination of copper, aluminum, nickel and iron, and in this sense the alloy according to the invention consists essentially of that combination within the ranges and proportions above mentioned.

I claim:

1. An alloy consisting essentially of, approximately, aluminum 8 to 11%, nickel 0.5 to 1.5%, iron 0.1 to 0.7%, copper balance, the amount of nickel being at least twice the amount of iron.

2. An alloy consisting essentially of, approximately, aluminum 9 to 10%, nickel 1%, iron 0.25%, copper balance.

3. A worked copper base alloy containing relatively small amounts of aluminum, nickel and iron characterized by a markedly finer grain structure than cast alloy of the same composition, the aluminum, nickel, iron and copper being approximately within the following proportions: aluminum 8 to 11%, nickel 0.5 to 1.5%, iron 0.1 to 0.7%, with the balance copper and the amount of nickel at least twice the amount of iron.

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