

UNITED STATES PATENT OFFICE.

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COMPOSITION OF MATTER FOR ALLOYS.

No Drawing. Original application filed November 15, 1924, Serial No. 750,132. Divided and this application filed May 22, 1925. Serial No. 32,182.

The alloy herein set forth is a division of the patent application filed by these inventors under the date of Nov. 15, 1924, in the United States Patent Office, under the Series Number 750,132, and according to a division required therein.

Our invention relates to a composition of metals and elements suitable for making a non-oxidizing, heat resisting alloy, and having special properties for making it immune from the effects of highly oxidizing flames.

The object of our invention is to produce an alloy suitable for making high speed valve castings, and which will instantly fuse to the surface of inserted steel parts yet solidify before melting or changing the steel.

Another object is to produce an alloy having special properties for resisting any molecular change in the metal even when subjected to heat approaching the melting point of the alloy.

A further object is to produce a non-oxidizing alloy that will not scale or pit under highly oxidizing conditions.

A further object is to produce an alloy that may also be rolled into sheets or drawn into bars without destroying or changing the structure of the alloy.

The special purpose for which this alloy was originally designed was for manufacturing valve castings for high speed engines, and where they are subjected to high heat temperatures and highly oxidizing conditions, yet the alloy is equally as well adapted to any casting of similar nature or placed under similar conditions, and while we describe its use and application to an engine valve, we include and intend to include therein the application of this alloy to any casting, or use, subjected to similar operating conditions.

It is the general practice, or commonly known, that in the manufacturing of certain types of valves for high speed gas engines, where high temperatures and oxidizing conditions prevail, the valve is made of a two piece construction, using a turned steel valve stem and casting an alloy valve cap thereon, extending the alloy over sections exposed to the heat and oxidizing elements, the special construction greatly reducing the cost of manufacturing of the machine parts. The

metal in the valves subjected to these conditions, ordinarily will fail because of scaling, pitting or warping, and are annealed under the constant high temperature of the burning gas, causing the valve to jam and leak, becoming useless. Because of the severity of the engine shocks when operating under high speed, the two piece valves must fuse the two metals together into a solid piece. This requires an alloy of an extremely high melting point which will insure instant fusing with the surface of steel parts inserted therein within the mold, yet solidify quickly before destroying or changing the inclosed steel part. Our alloy is especially adapted to meet all of these conditions as are required for valve castings, and for other castings where used under high heat temperatures and subjected to a highly oxidizing flame, and possess a non-oxidizing and heat resisting properties even to nearly the melting point of the metal.

In preparing our alloy we use the following elements; nickel, chromium, manganese, iron, silicon and tungsten. The preferred proportions used for producing an alloy of the highest heat resisting properties, are as follows given in percentage by weight:

	Per cent.
Nickel -----	56
Chromium -----	8
Manganese -----	7
Iron -----	26
Silicon -----	2
Tungsten -----	1

This alloy has a melting point between 3000 and 4000 degrees Fahrenheit, and will fuse to the surface of steel parts instantly upon contact therewith, solidifying before changing or distorting the inclosed steel section.

The silicon and manganese combining to form a non-oxidizing property, preventing the scaling or pitting of the metal under highly oxidizing conditions.

While the foregoing sets forth the preferred proportions it is obvious that a variation of these proportions between certain limits may be made, producing different grades of alloy, without departing from our invention. Very good results are obtained by varying the proportions of the elements

between the following limiting proportions given in percentage by weight:

	Per cent.	
Nickel from-----	50	to 60
Chromium from-----	5	to 10
Manganese from-----	2	to 12
Iron from-----	15	to 35
Silicon from-----	$\frac{1}{2}$	to 4
Tungsten from-----	$\frac{1}{2}$	to 3

10 As the proportions of any one or more of the above elements are varied, it is obvious the grade, and the resulting resisting properties of the alloy will also be varied accordingly, and may be predetermined as desired for any particular grade, depending upon the requirements in the place in which it is to be used.

It is known, and has been determined by these inventors, that nickel and cobalt having very similar properties and belonging to the same group (and being the only metals of the nickel group herein referred to or included), that the substitution of the cobalt in the place of the nickel will produce an alloy of the same properties, the results being almost identical. We, therefore, claim the right to substitute the cobalt in the place of the nickel throughout this patent, and without departing from our invention.

Very good results have been obtained by substituting aluminum in the above formula for the metal tungsten for the hardening agency, although the resulting alloy does not possess as high heat resisting and non-oxidizing properties yet will produce a very good commercial casting.

Having fully described our composition for an alloy, what we claim as our invention and desire to secure by Letters Patent is:—

1. A non-oxidizing, heat resisting alloy

adapted for fusing with cast-in steel parts, comprising nickel 56 percent, chromium 8 percent, manganese 7 percent, iron 26 percent, silicon 2 percent, tungsten 1 percent.

2. An alloy having high non-oxidizing and heat resisting properties, comprising 56 percent of metals from the nickel group, 8 percent of chromium, 7 percent of manganese, 26 percent iron, 2 percent silicon, and 1 percent tungsten.

3. A non-oxidizing alloy comprising for from 50 to 60 percent nickel, from 5 to 10 percent chromium, from 2 to 12 percent manganese, from 15 to 35 percent iron, from $\frac{1}{2}$ to 4 percent silicon, from $\frac{1}{2}$ to 2 percent tungsten.

4. A non-oxidizable, heat resisting alloy adapted for making combination castings of alloy and cast-in steel parts, comprising nickel 56 percent, chromium 9 percent, manganese 7 percent, iron 26 percent, and silicon 2 percent.

5. An alloy having high non-oxidizing and heat resisting properties, adapted for making castings having steel cast-in parts, comprising nickel 56 percent, chromium 9 percent, manganese 9 percent, and iron 26 percent.

6. An alloy comprising nickel 56 percent, chromium 8 percent, manganese 9 percent, iron 26 percent, and tungsten 1 percent.

7. A non-oxidizing, heat resisting alloy adapted for casting metal parts in combination with steel parts, comprising metal of the nickel group 56 percent, chromium 9 percent, manganese 9 percent, and iron 26 percent.

In witness whereof we sign this specification.

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