

UNITED STATES PATENT OFFICE.

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ALLOY.

No Drawing. Application filed December 9, 1920. Serial No. 429,543.

To all whom it may concern:

Be it known that I, PIERRE GIRIN, a citizen of the Republic of France, residing at 84 Rue de Lille, Paris, Seine, France, engineer, have invented new and useful Improvements in Alloys, which is fully set forth in the following specification.

This invention relates to a modification of or an improvement in that described in my application filed Dec. 9, 1918, Serial No. 265,986, and has for object improvements in the alloy described in that application, primarily with a view to adapting the said alloy to particular conditions of the manufacture on a large scale in a metallurgical apparatus such as the Martin furnace. To this end the invention increases the content in manganese from 1 per cent to 5 per cent and lowers the content of chromium from 10 to 8 per cent.

Further, the content of tungsten and of molybdenum may be diminished without injury to the main qualities of the alloy. In fact, small additions of these accessory constituents already bring about an improvement in the particular properties of these alloys in resisting corrosion.

It has been found that the alloy made as described in the aforesaid application, or as described in the present specification, may be used for the manufacture of various mechanical parts such as turbine blades, valves, the parts of cocks, etc.

The alloy forming the subject matter of the present invention contains essentially iron, a high content of nickel, chromium, manganese and carbon. It may include accessorially tungsten, molybdenum, cobalt, vanadium and titanium. It is easy to obtain in large quantities and capable of being cast, forged, rolled, drawn and worked.

The typical alloy comprises besides the iron:

	Per cent.
Nickel	25 to 40
Chromium	8 to 15
Manganese	0.5 to 5
Carbon	0.3 to 1

If necessary, as improving the mechanical properties, but by way of accessories:

	Per cent.
Cobalt	0 to 10
Tungsten	0.5 to 5
Molybdenum	0.2 to 3
Vanadium	0.2 to 1
Titanium	0.1 to 0.2

Example of composition: Ni:28, Cr:14, Mn:1.5, C:0.5, iron: the rest.

The maximum content for manganese and minimum for chromium are carried respectively to 5 per cent and 8 per cent in order to agree with the necessities of the preparation, the yields and the nature of the materials added in using the Martin furnace.

The presence of manganese is indispensable to ensure the perfect homogeneity of the metal as well as a satisfactory capacity for being forged.

Certain modifications of composition may be made without introducing important modifications of quality. Thus one may add from 0.5 to 5 per cent of tungsten, or 0.2 to 3 per cent of molybdenum, or even use these two bodies in simultaneous addition; it may be 0.2 to 5 per cent in toto.

This extension of the content in tungsten and molybdenum indicated in the aforesaid application is due to new experience which has proved the efficiency of these metals even in small proportion in affording the alloys resistance to corrosion.

The properties may be further improved and the manufacture facilitated by adding to the alloy defined above it may be 0.2 to 1 per cent of vanadium, it may be 0.1 to 0.2 per cent titanium, or 0.1 to 1 per cent of a mixture of vanadium and titanium. Cobalt from 0 to 10 per cent may also be added with a view of improving the mechanical strength of the alloy. The contents of additional elements indicated are at the cost of the content of iron.

According to the content of nickel adopted the variation of dilation obtained will be from 8×10^{-6} to 17×10^{-6} and it will consequently be possible to realize those of steel, 11×10^{-6} , of bronze, 17×10^{-6} , or even of glass, 8×10^{-6} .

The alloys made in accordance with the aforesaid application or those made in ac-

cordance with the present disclosure, are useful for the construction of steam turbine blades and all other mechanical parts which have to work in superheated steam, saturated steam dried or moist, such as valves, seats of valves, parts of steam cocks, nozzles, elements of distributors, internal combustion engine valves, needle injection valves of internal combustion engines, and parts which have to work in hot gases or atmospheres dry or damp.

By the expression "metal of the chromium group" as used in the claims, I intend to cover either chromium alone or chromium with one or more of the other metals of the chromium group.

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. An alloy of the character described containing nickel 25 to 40 per cent, metal of the chromium group appreciably in excess of 8 and not more than 15 per cent, manganese 0.5 to 5 per cent, carbon 0.3 to 1 per cent and the remainder iron.

2. An alloy of the character described containing nickel 25 to 40 per cent, metal of the chromium group appreciably in excess of 8

and not more than 15 per cent, manganese 0.5 to 5 per cent, carbon 0.3 to 1 per cent, tungsten 0.5 to 5 per cent, molybdenum 0.2 to 3 per cent and the remainder iron.

3. An alloy of the character described containing nickel 25 to 40 per cent, metal of the chromium group appreciably in excess of 8 and not more than 15 per cent, manganese 0.5 to 5 per cent, carbon 0.3 to 1 per cent, tungsten metal 0.2 to 5 per cent and the remainder iron.

4. An alloy of the character described containing nickel 25 to 40 per cent, metal of the chromium group appreciably in excess of 8 and not more than 15 per cent, manganese 0.5 to 5 per cent, carbon 0.3 to 1 per cent, molybdenum 0.2 to 3 per cent and the remainder iron.

5. An alloy of the character described containing nickel 25 to 40 per cent, metal of the chromium group appreciably in excess of 8 and not more than 15 per cent, manganese 0.5 to 5 per cent, carbon 0.3 to 1 per cent, tungsten metal 0.2 to 5 per cent, vanadium 0.1 to 1 per cent and the remainder iron.

In testimony whereof I have signed this specification.

PIERRE GIRIN.