

UNITED STATES PATENT OFFICE.

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CASTING HAVING CHROMIUM ALLOY SURFACE.

No Drawing.

Application filed September 24, 1924. Serial No. 739,502.

This invention relates to ferrous metal castings the surface portions of which are alloyed with chromium, and it particularly relates to castings of this type which are free from cracking and warping. The general type of castings referred to is that disclosed in U. S. patent to Charles B. Jacobs 1,632,704, granted June 14, 1927, entitled "Castings having chromium alloy surfaces", the present invention being in the nature of an improvement upon such castings and furnishing castings which, while embodying the general characteristics of the Jacobs castings, have the particular characteristic of being free from cracking and warping. It is the principal object of the present invention to provide castings of the character indicated.

In brief, the Jacobs invention comprises bringing the base metal during the casting into contact with chromium, this being conveniently accomplished by coating the surfaces of the green mold or cores in which the casting is made, and which correspond with the surfaces of the casting on which the alloy is required, with chromium in granular condition (15 to 40 mesh) and associated with a suitable binder, for example, sodium silicate, and baking the mold to fix the coating; wherefore the casting metal flows over and melts or dissolves the coating, giving a casting with the desired chromium alloy surface. Castings of this type have a distinct surface layer of chromium alloy, the chromium content of which is greater than 25%, with the chromium content of the base metal of the casting substantially less (for example, less than 10%), and decreasing rapidly from the surface to the interior. Jacobs proposes to use as his base metal, cast iron or cast steel.

The present invention particularly relates to adapting these castings to conditions where the temperatures to be withstood are so high as to suggest failure of the cast articles, as carburizing pots and heat treating equipment, due to cracking and warping of the base casting itself, the surface protection afforded by the ferrous chromium coating not being a protection

against interior changes in the casting caused by the effect of repeated heating and cooling, or maintenance at high temperature. According to the invention the difficulties indicated are overcome by using certain steel alloys for the base casting, rather than straight steel.

Specifically, steel alloys containing the following may be used: (1) one containing chromium 5 to 15% throughout and carbon 0.2 to 2.0%; (2) one containing chromium 5 to 15%, nickel 10 to 30%, and carbon 0.2 to 2.0%; (3) (4) either "1" or "2" with silicon in any amount up to 3%. That is to say, the base casting contains chromium 5% to 15% and carbon 0.2% to 2.0%. It may also contain nickel, preferably in the proportion of 10% to 30%. Silicon will inevitably be present as an incidental constituent, and the silicon content may be increased to as high as 3%.

These alloys when used for the base casting metal, replacing the steel otherwise used, combined with the high-chromium coating will produce an article in which not only is cracking and warping guarded against but also one which is cheaper than a solid alloy richer in nickel and chromium but is yet free from oxidation because of the non-oxidizing quality of the surface.

As a means of preventing porosity and improving the properties of the base casting of alloys it may also be desirable to add other metals such as manganese, tungsten or molybdenum, the proportions of which will not exceed 2 or 3% each, any desired one or ones of these being used with any of the above alloys.

The present procedure need introduce no changes into the general method of making the Jacobs castings.

I claim:

1. A casting containing a base metal and a distinct surface layer comprising chromium alloyed with said base metal, the chromium content of said layer being greater than 25%, the base metal of the casting containing 5 to 15% of chromium throughout.
2. A casting containing a base metal and

a distinct surface layer comprising chromium alloyed with said base metal, the chromium content of said layer being greater than 25%, the base metal of the casting containing 5 to 15% of chromium throughout and 0.2 to 2.0% of carbon.

3. A ferrous metal casting consisting of a base metal interior and a distinct surface layer of alloy comprising iron and chromium, the chromium content of the surface layer being more than 25%; the base metal consisting mainly of iron, and containing 5% to 15% chromium, 0.2% to 2% carbon and not more than 3% silicon.

4. A ferrous metal casting consisting of

a base metal interior and a distinct surface layer of alloy comprising iron and chromium, the chromium content of the surface layer being more than 25%; the base metal consisting mainly of iron, and containing 5% to 15% chromium, 0.2% to 2% carbon, not more than 3% silicon and a porosity preventing substance consisting of not more than 3% of one or more than one of the following elements; manganese, tungsten, molybdenum.

In testimony whereof I affix my signature.

WALTER M. MITCHELL.