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TREATMENT OF AUSTENITIC STEELS

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1 Claim. (Cl. 148—4)

This invention relates to the treatment of austenitic steels and, more particularly, to the treatment of steels of the so-called "stainless" type which contain primarily the elements of nickel and chromium alloyed with iron.

Heretofore in the treatment of austenitic steel (such as, for example, the 18 per cent. chromium, 8 per cent. nickel metals), it has been considered necessary to heat the same to 1850 degrees Fahrenheit or higher in order to anneal it. This heat treatment was followed by a rapid air-cool and water-quench in order to retain in solution the chromium and carbon present as complex carbides. Such a heat treatment at these elevated temperatures necessitated utilization of elaborate heating equipment, thereby raising the cost. Following such a heat treatment the metal was then pickled in a hot solution of acid, such as nitric-hydrofluoric or the like, which is not only expensive, but attended by a high metal loss (such as 2½ per cent. by weight).

It is one of the objects of the invention to provide a treatment for austenitic steels of the "stainless" type which eliminates the necessity of elaborate heat treatment and its attendant high cost.

Another object is to eliminate the step of acid pickling, thereby eliminating inter-granular corrosion.

Still another object is to decrease the usual loss of metal by pickling.

These and other objects will become apparent to those skilled in the art after referring to the following specification.

According to the present invention, an 18 per cent. chromium, 8 per cent. nickel steel or any austenitic steel in the hot-rolled condition (as sheets or in coil form) is subjected to an annealing step in a standard annealing box, which, to the best knowledge and belief, has heretofore not been considered for the annealing of this type of steel. The annealing may be at any temperature, such as 1500 degrees Fahrenheit, so long as the heat is sufficient to anneal or soften the metal. This heat treatment thus avoids the high temperature (1850 degrees Fahrenheit and higher) to which such steels have heretofore been subjected. This provides a microstructure of great desirability. It further allows annealing costs to be maintained at much less than those of the methods of the prior art.

Heretofore, in order to acid pickle stainless steels of the austenitic type it was necessary to previously heat treat at a temperature high enough to get the carbides and chromium content in solution for otherwise the acid pickling would attack the more or less pure ferrite grains, thus deeply etching the surface of the steel and resulting in a surface not tolerated in this type of steel by the consumer.

The method of the invention avoids acid pickling of a steel which (by virtue of its low temperature annealing) may have its chromium and carbon (as chromium-carbides) lying at the grain boundaries. Acid pickling would attack the ferrite grains. Therefore, surface abrasion is used instead. This surface abrasion step involves the use of any suitable abradant (for example, steel shot of 60 mesh, although it is understood that other abradants such as sand and steel shot or grit of varying meshes might be used in lieu thereof).

Such a cleansing treatment results in about one-fifth of the metal loss and approximately one-fourth of cleansing costs attending the usual acid pickling, as well as avoiding undue attack of the metal when the carbides are separated from the ferrite grains.

Following the box annealing and abrading steps, the hot-rolled and abraded metal is then subjected to a cold-reducing step to reduce its thickness and/or provide it with a smooth surface.

It is to be understood that if the severity of cold-working is such as to prevent the reduction of the metal to the gauge or size desired, it may again be box annealed and thereafter abraded as many times as desired until the sufficient number of cold-reducing steps can satisfactorily bring the metal to the shape and surface desired. This is optional but, in any event, the cold-reducing step is followed by a heat treatment (preferably in a continuous manner) and a rapid air or water-cool. Such cooling positively assures placing into solution the carbides and the re-combination of the chromium with the metal. This again presents the microstructure which is resistant to corrosion.

This necessitates that the final heat treatment be in excess of 1850 degrees Fahrenheit in order to be positive as to the obtaining of such a microstructure.

While there is described several specific embodiments of the invention, it will be seen that it is not to be limited exactly thereto, since various modifications may be made without departing from the scope of the invention as defined by the following claim.

What is claimed is:

A method of treating austenitic steels of the stainless type containing chromium, nickel and

carbon, which comprises in sequence the steps of heating the steel to a temperature sufficient to anneal the same but less than approximately 1850 degrees Fahrenheit, mechanically cleaning the surface of the treated steel, working the surface of the steel to the desired size whereby it is hardened, and finally heat-treating the steel sufficiently in excess of approximately 1850 degrees Fahrenheit to assure placing at least the chromium and carbon present in solution.

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