Patented Sept. 2, 1947

2,426,773

UNITED STATES PATENT OFFICE

2,426,773

TEMPERING PROCESS FOR STEEL OBJECTS

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No Drawing. Application February 13, 1942, Serial No. 430,716

2 Claims. (Cl. 148—15)

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The present invention relates to metallurgy and more especially to a salt bath for heat treating of metals, and bright tempering and de-scaling of steel parts within the range of temperatures of from substantially 500° to 900° F.

Steel parts are usually hardened before being tempered and frequently the hardening operation on steel parts produces an oxide which is not desirable in the finished product, such as, for example, punches and dies. In other cases, where little or no oxide is produced in a hardening operation, oxide on the parts may be produced during the tempering operation.

In tempering of steel parts, a substantial range of temperature control is desirable. Different temperatures in tempering are sometimes influenced by the character of the article being treated and sometimes by the character of the steel being tempered; and at other times the tempering temperature is determined by a combination of the two preceding factors. It therefore follows that a tempering salt bath to be satisfactory should be of such nature that it can be controlled to produce the desired temperature, without disintegration of the bath, and without the chemicals of the bath acting to change the metallurgical characteristics of the metal being treated.

The present invention is a salt bath for use in bright tempering and de-scaling and wherein oxides on the metal before it is introduced into the bath are removed and oxides are prevented from forming while the articles are being heat treated in this bath.

A simple bath for the lower range of temperatures from substantially 500° F. to substantially 900° F. may comprise from 40% to 60% sodium hydroxide, from 35% to 50% potassium hydroxide, and from 3% to 20% of sodium cyanide. Preferably, the bath for this temperature range comprises 50% sodium hydroxide, 45% potassium hydroxide and 5% sodium cyanide.

The salt bath comprising the present invention is not intended to change the characteristics of the metal in the objects being treated but is intended to hold the metallurgical constituents in the same proportions in which they are introduced into the bath; therefore the sodium cyanide content is not intended as a case hardening or a nitriding ingredient but is of such amounts in the bath as to react with the other salts to reduce the oxides present on the work or prevent formation of oxides, for the given temperature range, without essentially carburizing or decarburizing the work which is being treated.

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In certain alloy steels, such as molybdenum steel, the parts treated are often surface coated with borax, aluminum paint, lacquers or other agents intended to prevent decarburization or oxidizing during the heat treatment of such steels. Such surface coatings are easily removed by quenching into this salt bath. These coatings would not be removed by quenching by the ordinary practice. The present bath will remove oxides from any type of steel providing the film of oxide is not in great excess. However, in order to obtain the most satisfactory results from the present salt bath, it is desirable that the parts shall be bright or unoxidized before they are introduced into the bath.

The tempering of steels usually occurs after the articles have been hardened. Such hardened articles are often too brittle for the particular type of work in which the article is intended to be employed. The article, therefore, is "tempered" usually by raising its temperature and permitting the article to cool, usually by quenching in some cooling medium or by cooling in air. The purpose of the tempering, therefore, is to decrease the brittleness and to increase the tensile strength. If all the hardness could be retained, while the strength of the metal is being increased, the condition would be extremely desirable. In order to approach this desired end, it is necessary to maintain a close temperature control.

The present bath is one wherein temperature control may be readily maintained without fuming of the bath materials and wherein exactly the right temperatures for the type of steel, or character of work being done by the parts treated, may be maintained within a close range and thereby the maximum amount of hardness of the work is retained.

In the making of the bath herein specified, the salts designated are melted together in the proportionate ranges given and are then permitted to cool or the salts may be mechanically mixed without melting. Articles to be treated are introduced into the melted salt bath and are retained therein, usually, until all parts of the work are brought to the temperature of the bath. The work is then removed and cooled either by quenching in a suitable quenching bath or is air cooled, as the case may be.

Except as a matter of economy, the length of time the work remains in the bath, after the work has become uniformly heated throughout, is immaterial, because no part of the work can ever become hotter than the temperature of the bath. This absolutely overcomes any danger of over-

heating or burning the work, providing of course, that the temperature of the bath is correct.

The bath is not substantially exhausted by use, except for mechanical depletion due to some of the bath adhering to the work when the work is removed from the melting pot. This loss of the bath is made up by simply adding additional chunks of bath material to the mass in the melting pot.

What I claim is:

1. The process of bright tempering a steel object without distortion of its structure or impairment of its steel surface, which comprises: immersing said steel object in a molten salt bath the operating temperature of which falls within the range 500° F. to 900° F., and the composition of which comprises 40% to 60% sodium hydroxide, 35% to 50% potassium hydroxide, and 3% to 20% sodium cyanide, the sodium cyanide component being of an amount within said stated composition range such, at the operating temperature of the bath, as to effect neither carburizing nor decarburizing of the steel of the object, maintaining said object in said molten salt bath until same has been brought to substantially the operating temperature of said bath, and thereafter removing said steel object from said bath and cooling same.

2. The process of bright tempering a steel object without distortion of its structure or impairment of its steel surface, which comprises: immersing said steel object in a molten salt bath the operating temperature of which falls within the range 500° F. to 900° F., and the composition

of which comprises 50% sodium hydroxide, 45% potassium hydroxide, and 5% sodium cyanide, the sodium cyanide component being of an amount, at the operating temperature of the bath, as to effect neither carburizing nor decarburizing of the steel of the object, maintaining said object in said molten salt bath until same has been brought to substantially the operating temperature of said bath, and thereafter removing said steel object from said bath and cooling same.

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