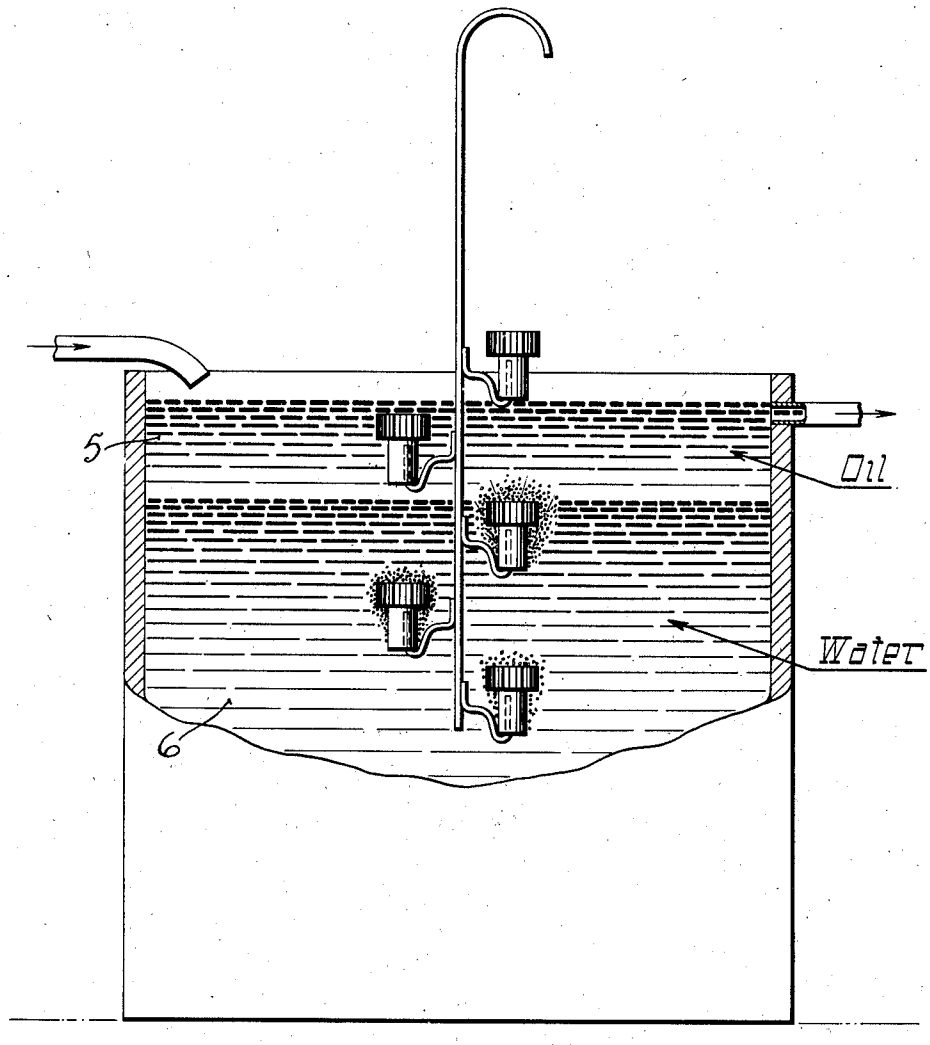
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QUENCHING BATH AND METHOD OF QUENCHING METAL

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QUENCHING BATH AND METHOD OF QUENCHING METAL

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This invention relates to the art of heat treating and refers particularly to the quenching of metal which has been heat treated for case hardening.

In ordinary cyanide case hardening, the part to be treated usually is carburized in any conventional manner as by dipping it into a bath of molten potassium cyanide. After being carburized, it is quenched either by being dipped directly in water or oil or by allowing it to cool. In the latter instance reheating and further treatment in any approved manner follows.

If the part is immersed in water, it is subjected to severe shock and strain which very often results in distortion and warping. The use of oil for the quenching bath avoids this sudden and severe shock but has the disadvantage of causing a spotty uneven thickness of the case or hardened surface layer. In addition, the oil immersion leaves cyanide adhering to the finished work which must be removed in a caustic soda bath.

Bearing these and other objections in mind, it is an object of the present invention to provide an improved manner of quenching heated metal, particularly for the purpose of case hardening, which obviates the disadvantages of past practices and which results in a better finished product.

With the above and other objects in view which will appear as the description proceeds, this invention resides in a new and novel quenching bath and manner of using the same, as more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention conducted in accordance with the best mode so far devised for the practical application of the principles thereof and in which the single figure is a view illustrating the quenching bath of this invention and showing its manner of use.

As pointed out hereinbefore, where a piece of metal is to be case hardened, it is first subjected to a carburizing heat treatment which impregnates the piece with carbon to a depth depending upon the duration of the carburizing treatment. This carburizing treatment is conveniently effected by immersing the piece in a bath of molten potassium cyanide; and if the part to be case hardened also requires brazing, the brazing and the carburizing may be effected in a single operation as described in Patent No. 2,197,039, issued to Oscar F. Gottlieb, April 16, 1940.

It is the quenching of the part after the carburizing treatment with which the present invention is concerned. The quenching bath as disclosed in the drawing consists of a body of oil 5 floated on a body of water 6. Any conventional quenching oil may be used, but a water soluble oil of course will not do as the respective quenching characteristics of the oil and water must now be impaired.

The depth of the oil bath is determined by the size of the pieces to be handled and must be such that the surface of the oil will contact the part and close in over it as it is lowered into the bath.

Any suitable means of immersing the pieces may be employed, as for instance, the rack shown in the drawing.

As the parts are immersed they naturally first contact the oil which effects an initial quenching without entailing the severe shock and strain of a water immersion. Then as the parts are lowered into the water, the explosive effect resulting from the spontaneous steam formation blows the cyanide particles off the surface of the piece, and thus insures uniform case thickness.

The explosive effect resulting from the contact of the hot metal with the water also blows the liquid away and if the oil bath were of insufficient depth an open crater would be formed so that the oil would not contact the upper parts of the piece as it is lowered. It is this condition which determines the depth of the oil bath.

Quenching in the manner described achieves the desired results of a surface free from adhering cyanide and a uniform case thickness without danger of distortion or warping; but the part, upon withdrawal from this quenching bath, would have the usual bluish-black color which characterizes cyanide hardened metal.

It has been found, though, that the addition of a slight amount of sodium hydroxide, as for instance 2 per cent by weight, to the water bath brings about an action which results in a smooth cadmium colored surface having great resistance to rusting.

It is not definitely understood how the addition of sodium hydroxide to the water bath effects this result, but it is believed that the sodium hydroxide has an etching effect on the surface which so thoroughly cleanses the same that the natural clear white color of the metal

is restored. This complete cleansing of the surface would render it highly active so that direct exposure to air would produce extreme oxidation. However, before it reaches the air it must pass through the layer of oil.

In doing so the highly active surface apparently "drinks in" the oil. This would protect the surface from oxidation and thus more or less "fix" the clear white color.

In any event, the results are not only entirely satisfactory, but highly desirable in that the cadmium plating or other plating heretofore necessary to protect cyanide hardened metal against rusting is obviated, and in addition the part is given a neat, well appearing surface finish.

While the description thus far fully describes the method employed, it is desired to point out that in production the original character and depth of the oil bath is maintained at the desired level in any suitable manner as by continuously drawing off the oil from the surface and pumping it back after cooling, cleaning and replenishing if necessary.

From the foregoing description taken in connection with the accompanying drawing, it will be readily apparent that this invention has numerous advantages over past methods of quenching metal for case hardening.

To reiterate, distortion and warping is eliminated; uniform case thickness is assured; the heretofore necessary time consuming step of separately cleansing the part as by a caustic soda bath is obviated; and likewise the need for cadmium plating or other similar expedient for protection against rusting is obviated.

What I claim as my invention is:

1. The herein described method of quenching carburized metal to effect case hardening which comprises: passing it through a body of oil floated on water containing substantially no more than two per cent sodium hydroxide directly into the water; and withdrawing it from the sodium hydroxide solution back through the oil.

2. A quenching bath comprising: a body of oil floated on a body of water containing traces of sodium hydroxide in solution.

3. A quenching bath comprising: a body of oil floated on a body of water containing sodium hydroxide in the amount of approximately two per cent (by weight) of the water.

4. A quenching bath for quenching carborized metal parts comprising: a body of oil floated on a dilute sodium hydroxide solution.

5. The hereindescribed method of quenching carburized metal to effect case hardening which comprises: passing it through a body of oil floated on water containing substantially no more than two percent sodium hydroxide directly into the water; withdrawing it from the sodium hydroxide solution back through the oil; and recurrently drawing off the oil from the surface of the water for cooling and cleaning thereof while simultaneously replacing such oil with cooled and cleaned oil.

6. The hereindescribed method of quenching a heated metal piece which comprises: passing the heated metal piece through a body of oil floated on water into the water with the oil having a depth such that the oil completely closes over the metal piece before the piece reaches the water, and with the water containing in solution substantially no more than two percent sodium hydroxide.

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