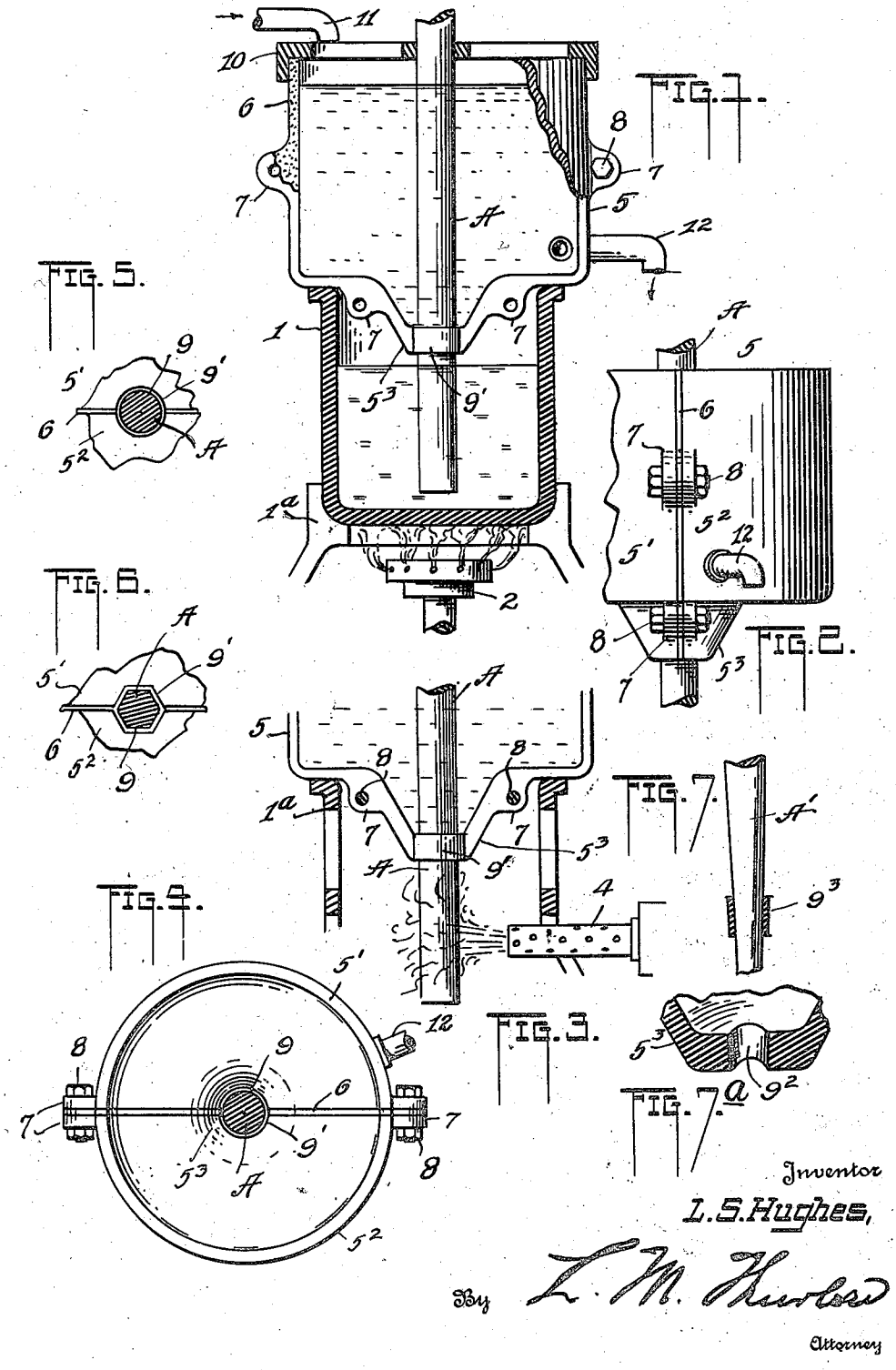
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APPARATUS FOR HEAT TREATING METAL OBJECTS

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Inventor
L. S. Hughes,
By L. M. Hurlbut
Attorney

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APPARATUS FOR HEAT-TREATING METAL OBJECTS

Lyman S. Hughes, Peoria, Ill.

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3 Claims. (Cl. 266—4)

This invention pertains to the art of treatment of metals; relating more particularly to a method of, and an apparatus for softening a portion of a steel member while providing for maintaining the hardness of the balance of that member.

The object of the invention is that when a steel shaft or like member is too hard to admit of being machined it may be reduced in hardness by heat treatment as to that portion to be machined, while the balance thereof is maintained in its original hardened condition by suitable cooling methods.

That the method may be understood and that an apparatus for practicing the method may be made known the appended drawing is provided forming part thereof.

Figure 1 is an elevation in part sections of an apparatus in one of its usable forms;

Figure 2 is a side elevation of a part thereof rotated 90° from the position thereof shown in Figure 1;

Figure 3 is an elevation of part of what is illustrated in Figure 1 showing a torch as a heating medium for the work to be performed;

Figure 4 is a plan of a receptacle shown in the preceding figures;

Figures 5 and 6 each illustrates in plan a portion of the bottom of the receptacle shown in Figure 4;

Figure 7 is an elevation of part of a member to undergo heat treatment together with a stopper portion mounted thereon to encircle it the same being shown in cross section, and

Figure 7^a illustrates in perspective a part of a receptacle bottom having a conical opening.

In machine practice where hardened steel members such as lengths of shafts, cutter stock, and the like are employed it is often necessary to machine a portion thereof in a lathe or by other means so as to fix thereon a separate necessary part, for example. Since too hard to permit machining the material must be treated to reduce it to mild workable condition to admit of changing its form by machining operations. At the same time it is quite necessary in many instances that only that portion to be thus operated upon be reduced to mildness while maintaining the balance of the stock in its original hard condition.

That the two different conditions in the same stock or member may obtain it is required that while the necessary heat is applied to the one portion thereof the balance must be kept cool in order that the purpose of a normally hard article shall not be altered.

To this end the present to be described method is employed together with an apparatus for practicing such method.

In the named drawing two different ways of heat treatment are shown as examples, though other methods of heating may be used.

In Figure 1 a pot 1 is provided suitably mounted, as on a stand 1^a, for example, within which a metal may be kept molten by means of a gas burner 2, or other type of heating unit, while in Figure 3 a blow torch 4 is illustrated applied directly to the work designated at A.

In the first three figures is represented a receptacle 5 for a suitable cooling agent, as flowing cooling water, for example. This receptacle in the present arrangement is shown above the pot 1 and suitably supported. It may consist of a single part, a part of which is shown in Figure 7^a, or as in the named three figures may be of two separable parts as 5′ and 5^2 adapted to abut, as in Figures 2 and 4, and including a gasket 6 between them of asbestos or like medium, the parts being fixed relatively through the use of perforated ears or lugs 7, and bolts 8. While the bottom of the thus provided receptacle may be flat throughout it may in some cases be depressed centrally providing the extension 5^3. In either event the bottom has an opening 9 therethrough through which the work A may be introduced so that an extremity of the latter may be depend into the molten metal, in the one case, or into a position opposite said torch 4, so as to lie in the blast of such torch.

In the present example since the receptacle 5 is above the pot 1 and since the work extends through the bottom of the former it is, of course, necessary to provide a leak-proof joint around the work to prevent water leakage. To this end a wrapping 9′ of the asbestos or of other material encircles the work and due to clamping the parts 5′ and 5^2 together upon said wrapping the desired end is acomplished. And it may be said that the opening 9 may be of any desired outline, i. e., round, hexagonal or other form to conform to the form or type of the work, as shown in Figures 4, 5 and 6 for example. Or again, should the receptacle be even of but a single part, Figure 7^a, its bottom may have an opening as 9^2, Figure 7^a, of a conical type and the work A′ may have a conical wrapping 9^3, Figure 7 to seat therein forming a perfect leak proof plug. Thus the described separable receptacle-parts are not necessarily required. In

either type, whether of two parts as 5', 5^2, or whereof but a single portion as stated, the bottom may be depressed, creating a basin at the position of the opening within the named extension 5^3.

The downwardly directed lower wall or bottom of the reservoir 5 serves to space the main portion of said bottom from the hot molten metal, or the torch flame, as the case may be, in order that the cooling medium in said receptacle can be kept as far away from the heat as possible and yet reach into the heat chamber to permit said cooling medium to reach the nearest position to the part of the work to be treated. Thus, too, the extremity of the work can be projected into the molten metal of less bulk than would be required to entirely fill the pot 1.

The work may be supported in a firm upright position in any good manner through the use of a member 10, for instance, through which said work may be introduced.

As the cooling agent, water may flow into the receptacle 5 from a supply pipe 11, its exit being through a conduit 12.

In order that various diameters of work A may be handled several receptacles 5 may be provided, each having an opening 9 of a diameter to accommodate a given piece of such work. Or, again, a single receptacle may be used having an opening 9 of a diameter great enough to take the largest diameter of work, and the latter, whatever its smaller diameter may have a wrapping 9' of an extent sufficient to provide the desired leak proof arrangement.

Where the work may have a flange or other extending part, as an enlargement, for example, extending therefrom somewhere along its length, and it is desired to reduce the work to mildness close up to such flange it is clear that a receptacle having a flat bottom is desirable for the reason that the flange may lie thereon close to the heat source and that the entire portion of the work below the flange may therefore be wholly heat treated. This, of course, would not be permitted by the depressed central extension 5^3 where the mentioned flange might be too large in diameter to enter such extension.

When, however, the work may by chance have enlargement or flange that would enter the comparatively narrow space of said extension 5^3 but too large to pass through the opening 9 of the latter the full length below such flange could still be treated.

The advantage of the extension 5^3 is a distinct one, however, as compared with a flat bottom receptacle since having a smaller area of metal exposed to the heat is kept low in temperature by the cooling agent and the heat of the molten metal or outer heat source could be maintained at any determined point. That is to say, higher temperature for quicker softening purposes could be employed with a given cooling medium due to a smaller metal exposure at said extension than with the greater spread of metal of the flat bottom type of receptacle.

While the drawing shows that the work is held upright and the extremity thereof to be heat-treated depends from the receptacle 5 it is possible to reverse that position or even to operate upon the work while held horizontally. However, the preferred manner is as shown and described for mechanical reasons as well as obviating certain disadvantages that might arise from the employment of the alternate positions mentioned.

Clearly, the means of heating, as well as the means of maintaining a relatively cool condition of the work may be other than those described.

In providing such an apparatus, or its equivalent, any bar member may be reduced to mildness on a part thereof suitable for machining operations while the balance thereof may retain its hardness, due to the cooling agent, for the purposes originally intended.

An advantage in the structure is that it is simple and of relatively light weight and rendering it readily portable when required at any given job.

I claim:

1. Apparatus for heat treating a hardened steel shaft-like member for softening an extremity thereof while maintaining hardness of the balance thereof, including a cooling chamber for holding a cooling medium and having provision for continuous movement of the medium therethrough, said chamber having spaced opposite walls with aligned openings in said opposite walls, one of said walls projecting outwardly in a direction away from the other wall, said outward projection beginning at a point removed from the lateral edge of said wall and at the region immediately adjacent the opening therein and extending with reduced cross-sectional area which is less than the area of the cooling chamber, whereby the bulk of the cooling medium is located distant from the heat of the heating chamber while yet the cooling medium follows the work toward the heat, and said opening being located at the extreme outer end of said projecting portion, said aligned openings being adapted to receive a shaft of material to be heat treated and have said shaft extend therethrough to a point exteriorly of said chamber, a heating chamber adjacent said cooling chamber and into which said projecting wall extends, and heating means associated with said heating chamber for heating the end of said shaft projecting into said heating chamber.

2. Apparatus for heat treating a hardened steel shaft-like member for softening an extremity thereof while maintaining hardness of the balance thereof, including a cooling chamber for holding a cooling medium and having provision for continuous movement of the medium therethrough, said chamber having spaced opposite walls with aligned openings in said opposite walls, one of said walls projecting outwardly in a direction away from the other wall, said outward projection beginning at a point removed from the lateral edge of said wall and at the region immediately adjacent the opening therein and extending as a tapered wall with progressively smaller cross-sectional area which is less than the area of the main portion of the cooling chamber, whereby the bulk of the cooling medium is located distant from the heat of the heating chamber while yet the cooling medium follows the work toward the heat, and said opening being located at the extreme outer end of said projecting portion, said aligned openings being adapted to receive a shaft of material to be heat treated and have said shaft extend therethrough to a point exteriorly of said chamber, a heating chamber adjacent said cooling chamber and into which said projecting wall extends, and heating means associated with said heating chamber for heating the end of said shaft projecting into said heating chamber.

3. Apparatus for heat treating a hardened steel shaft-like member for softening an extrem-

ity thereof while maintaining hardness of the balance thereof, including a cooling chamber for holding a cooling medium and having provision for continuous movement of the medium therethrough, said chamber having spaced opposite walls with aligned openings in said opposite walls, one wall projecting with a tapered contour outwardly in a direction away from the other wall beginning at the region immediately adjacent the opening therein, the area of the tapered wall being less than the area of the main portion of the cooling chamber, and said opening being located at the extreme outer end of said projecting portion, said aligned openings being adapted to receive a shaft of material to be heat treated and have said shaft extend therethrough to a point exteriorly of said chamber, and said apparatus including a second chamber associated with said first mentioned chamber for holding a molten heating medium and into which that end of the shaft-like member to be heated is adapted to project whereby the advance end of the projecting portion and the opening therein are positioned within the confines of said second chamber.

LYMAN S. HUGHES.