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H. L. BARTON

HEAT TREATMENT OF METALLIC ARTICLES

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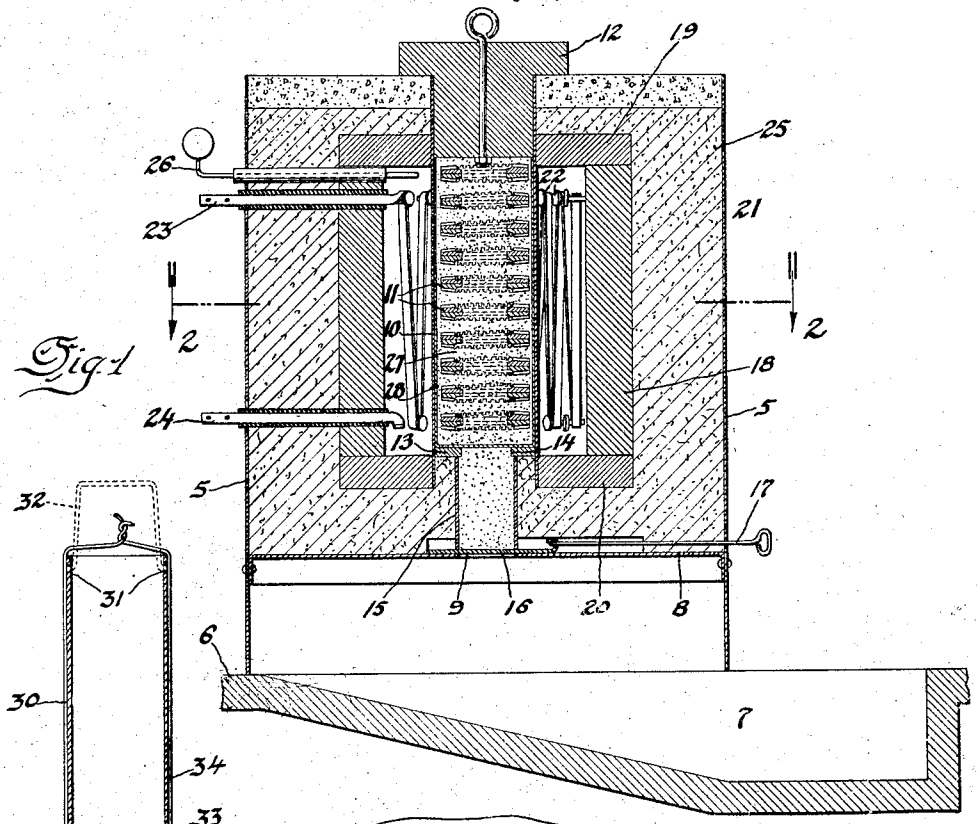


Fig. 1

Fig. 3

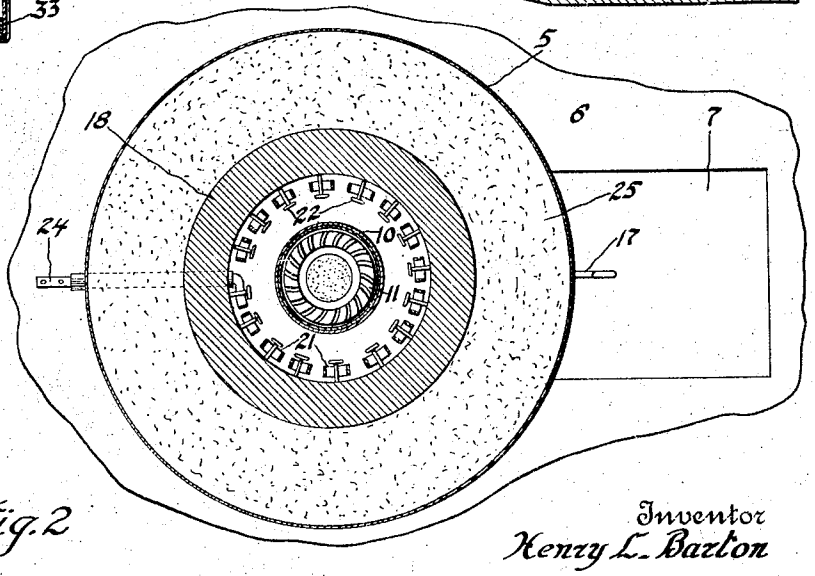


Fig. 2

Inventor
Henry L. Barton

By his Attorneys
Blackmore, Spencer & Flint

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UNITED STATES PATENT OFFICE.

HENRY L. BARTON, OF DETROIT, MICHIGAN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

HEAT TREATMENT OF METALLIC ARTICLES.

Application filed July 3, 1922. Serial No. 572,617.

To all whom it may concern:

Be it known that I, HENRY L. BARTON, a citizen of the United States of America, and a resident of the city of Detroit, county of Wayne, and State of Michigan, have invented certain new and useful Improvements in the Heat Treatment of Metallic Articles, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

The invention relates to means for subjecting metallic articles such as gears to a heat treatment in the presence of a substance designed to affect the characteristics of the metal, such, for example, as a carbonizing material.

The principal object of the invention is to reduce the time and labor heretofore required in the operation of carbonizing and the subsequent treatment of the carbonized articles. To this end the invention contemplates the utilization of a continuously heated preferably electric furnace, the preparation of charges therefor in receptacles designed merely to facilitate the placing of the charge in the furnace after which the receptacle may be in part or wholly removed or destroyed, the discharge of the carbonizing compound from the furnace after the necessary time of treatment has elapsed, and the retention of the treated articles within the heated zone of the furnace until the convenience of the operator and the temperature of the articles permit the usual operation of quenching to be performed whereupon the articles may be removed from the furnace and immediately quenched without requiring reheating.

In the accompanying drawings illustrating apparatus in which the invention may be embodied, Fig. 1 is a vertical sectional view of a carbonizing furnace showing a charge in position therein.

Fig. 2 is a horizontal section on line 2—2 of Fig. 1.

Fig. 3 is a sectional elevation of a charging receptacle which may be utilized in connection with the invention.

Referring to the drawings, 5 indicates the exterior shell or casing of a furnace, which casing may be cylindrical, as shown, and is supported upon a suitable floor or base 6 provided with a pit 7 extending under the furnace and adapted to receive material discharged from the interior. A bottom casing member 8 is supported upon the shell 5 at some distance above the floor to permit free discharge of the furnace contents through an aperture 9 in the center of the base.

Centrally positioned in the furnace is the tubular lining 10 which is preferably of some heat-conducting material such, for example, as nichrome, highly resistant to change under the conditions to which it is subjected in use. The treating chamber constituted by the space within the lining will be preferably of a cross sectional form and area appropriate to the articles to be treated and is shown as adapted to receive ring gears 11. The lining is of uniform internal dimensions from top to bottom and extends through the top of the furnace to permit access to the treating chamber to charge the furnace or remove the treated articles. A removable cover 12 of refractory material serves to close the upper end of the treating chamber.

At the bottom of the treating chamber is an annular base plate 13 forming in part the floor of the chamber and adapted to support the gears 11. The central aperture 14 in this plate communicates with the interior of a tube 15 which provides a chute or discharge passage leading to the aperture 9 in the casing member 8. A gate or damper 16 is arranged to slide across the end of tube 15 and a suitable operating device, as a rod 17, extends from the damper to an exterior point convenient for manual actuation.

Surrounding the lining 10 is a space enclosed by suitable refractory side walls 18 and top and bottom walls 19, 20, constituting a heating chamber. Electrical resistance elements 21 are supported in any usual or convenient manner within the heating chamber as by posts 22 on the side walls 18. The resistance elements which may be, as shown, in the form of a continuous ribbon, are provided with terminals 23, 24, adapted to be connected to a source of electricity. Suitable heat insulating material 25, such, for example, as silocel, is disposed between the outer casing elements and the refractory walls 18, 19, 20. A temperature indicating device 26 may be arranged to disclose the

temperature conditions in the heating chamber.

In carrying out the operation of carbonizing articles such as ring gears in accordance with the invention, the gears are arranged in pairs, back to back, as shown in Fig. 1, if it be desired to carbonize chiefly the toothed portions, and packed in suitable carbonizing material 27 in a receptacle 28 of such size and shape that it will fit closely within the lining 10 and may completely fill the treating chamber of the furnace. The receptacle may be of material such as paper, which will be itself consumed or reduced to carbon and volatile products during the heating of the charge, and therefore will not interfere in any way with the progress of the carbonizing operation. In charging the furnace the discharge passage in the tube 15 will first be filled, preferably with material of the same character as the material 27. A carton 28 which has been previously filled with properly arranged gears and carbonizing material is then lowered into the treating chamber to a position in which it rests upon the base plate 14 and the material in the discharge passage or chute. The cover 12 is now placed in position to close the upper end of the treating chamber. The parts being then as shown in Figs. 1 and 2, the heating operation may proceed until the desired temperature has been reached and maintained for the required period.

At the completion of the carbonizing treatment the damper 16 is operated to permit the discharge of the carbonizing material through the chute 15 into the pit 7. Inasmuch as the bottom of the carton 28 will have been burned or carbonized during the treatment of the gears it will offer no obstruction to the fall of the carbonizing material from the treating chamber and only such small quantity of the material as is retained between the gears will remain in the treating chamber. The cover 12 may now be removed if desired and the gears withdrawn singly or otherwise.

It is customary to apply to the carbonized articles a heat treatment comprising reheating the articles to a certain temperature, approximately 1700° F. in the case of gears, and then quenching. The temperature at which the gears are quenched is below that at which the carbonizing operation is carried out, but it has not been possible, employing the ordinary carbonizing pots and the usual method of manipulation, to remove the pots from the furnace and unpack the gears quickly enough to prevent cooling below the quenching temperature. Reheating has, therefore, been necessary. In accordance with the invention herein described, however, the gears are, so to speak, automatically unpacked while still remaining in the furnace, and may be kept at any desired temperature indefinitely. It is, therefore, possible to transfer them from the carbonizing furnace directly to the quenching bath, either immediately or at the convenience of the operator should it be inconvenient to proceed at once with the quenching operation. The reheating operation with its attendant expenditure of time, labor, and heat may, therefore, be eliminated. Furthermore, the furnace described permits close regulation of the temperature of the contents and, therefore, enables the gears to be brought accurately to the quenching temperature.

It will be understood that means other than that above described may be employed whereby the charges may be prepared at the convenience of the workmen and inserted into the furnace with very little loss of time. The walls of the charging receptacles may, if desired, be of material adapted to remain in the furnace during the carbonizing operation without being consumed, suitable provision being made to enable the spent carbonizing material to be dumped when the operation is completed, as, for example, by the use of a destructible bottom piece.

In Fig. 3 is shown a receptacle which may be utilized in the manner just described or the wall portion of which may be withdrawn after the charge has been placed in the treating chamber. As shown the receptacle comprises a tubular portion 30, open at both ends, and provided adjacent to the upper end with holes 31 adapted to receive a bail or like handling device 32. A bottom 33 which may be of fibrous material carbonizable at the working temperature of the furnace is placed in the lower end of the tubular section 30 and may be retained by releasable means such as the wire band 34. When the loaded receptacle has been placed in the furnace the bottom section may be released from the side wall and the latter withdrawn leaving the charge in place in the treating chamber.

Various other changes may be made in details of construction and operation without departing from the spirit and scope of the invention and therefore, I do not wish to be limited to the specific features herein described except as required by the language of the appended claims in view of the prior art.

I claim:

1. The method of carbonizing and heat treating comprising the charging of the articles to be treated together with carbonizing material into a furnace, subjecting them to a temperature suitable for carbonizing, discharging the carbonizing material and reducing the temperature while retaining the articles in the furnace, and quenching the articles directly upon removal from this furnace.

2. The method of carbonizing comprising the packing of the articles to be treated together with carbonizing material into receptacles of a size adapted to substantially fill the carbonizing furnace, charging the furnace with said receptacles, applying heat suitable for carbonizing and discharging the carbonizing material while retaining the articles in the furnace.

3. The method of carbonizing comprising placing articles to be carbonized together with carbonizing material in a furnace, applying heat suitable for carbonizing, and discharging said material from the furnace while retaining the articles therein.

4. The method of carbonizing comprising packing the articles to be carbonized together with carbonizing material in receptacles destructible in the furnace during the carbonizing operation, placing said filled receptacles in a furnace and applying heat suitable for carbonizing, then discharging the carbonizing material and reducing the temperature of the articles to a point suitable for quenching before their removal from the furnace.

5. Apparatus comprising a furnace having a treating chamber, means for supporting within said chamber articles to be treated and carbonizing material, and means for discharging said material while retaining the articles within the furnace.

6. Apparatus comprising a furnace having a treating chamber and a chute leading from said chamber, means for supporting in said chamber articles to be carbonized and carbonizing material and a gate controlling flow through said chute, said parts adapted to prevent discharge of said articles from said chamber while permitting discharge of said material.

7. Carbonizing apparatus comprising a furnace having a tubular treating chamber, and a receptacle having a bottom of material destructible by heat at the carbonizing temperature for containing the articles and carbonizing material, said receptacle adapted to fit within said chamber, and an exit whereby the carbonizing material in said chamber may be discharged by gravity, means being provided for retaining the articles within the furnace during the discharge of said material.

8. In a furnace, a tubular heating chamber having an upper charging opening and a lower discharging opening, means for controlling discharge through said lower opening, and a support surrounding said lower opening adapted to retain ring-shaped articles in the chamber.

9. In a furnace, a vertically arranged tubular heating chamber, electrical heating elements arranged in proximity to said chamber, a discharge orifice in the center of the base of said chamber, an annular support being provided around the orifice, and a gate for controlling exit through said orifice.

In testimony whereof I affix my signature.

HENRY L. BARTON.