

UNITED STATES PATENT OFFICE.

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APPARATUS FOR CASEHARDENING SMALL OBJECTS.

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To all whom it may concern:

Be it known that I, GEORGES ANTONY HENRI MÉKER, a citizen of the Republic of France, residing at Courbevoie, Seine, France, have invented certain new and useful Improvements in Apparatus for Case-hardening Small Objects, of which the following is a specification.

The object of my invention is to provide a cementation furnace so designed as to enable an absolutely uniform case-hardening of small objects to be obtained.

Cementation in fixed boxes does not permit the uniform carburizing of small objects to be effected because those nearest the walls of the box become heated to cementation temperature before those in the center. The only certain remedy consists in imparting a continuous motion to the objects and to the carburizing agent during the operation.

My present invention does, however, ensure the result sought for by providing a furnace of the rotary-type where the objects are put into a specially shaped basket or box which is inserted in a tube and rotated therewith, while permitting the temperature prevailing in the center of the box to be measured.

In order to make my invention more clearly understood I have illustrated an embodiment thereof in and by drawings appended hereto and wherein:

Figure 1 is a vertical longitudinal section of the furnace.

Figure 2 is a detail sectional view of the cementation box with its operating handle.

Figure 3 is an end view of the same.

Figure 4 is a section on line 4—4 of Figure 2.

Figure 5 is a section of the outer tube taken on line 5—5 of Figure 1.

In all the figures the same reference letters denote the same parts.

Referring to the drawings A is the metal tube driven by a wheel B actuated in its turn by a worm C. But the means by which the metal tube is rotated may be any. Tube A rests on two sets of two rollers *d* and *d'*. The central part of the tube is disposed within and heated by a refractory furnace E, comprising a burner F if the furnace is a gas one, or any other source of heat. The tube has a partition G cast in one piece with it and is filled between this partition and

the driving wheel B with refractory heat-insulating material.

The cementation basket or box H is shown in detail in Figure 2. It is protected against exterior radiation by a removable plug H' made of some refractory substance: asbestos or such like. Box H is, for instance, in the shape of a cylinder, the inner end of which carries a handle *h*.

Box H is cut away at its upper part to form an opening *i* (Figure 4), in order to permit the loading and unloading of material. Duct *h'* bored through handle *h* of the box affords a passage for a pyrometer.

In order to rigidly connect the box with tube A during rotation thereof, the said box is provided at diametrically-opposite points with two longitudinal ribs or beads I, while tube A has hollow grooves J registering therewith.

As will be apparent this device, once set and kept in position by a suitable stop, constitutes a rotary closed box.

I have only to stop the tube in a predetermined position in order to withdraw the box, thereby withdrawing at the same time all the objects treated therein. I can then tilt them at once into the tempering tank, reload the box while hot and put it back into the furnace again.

Under such conditions I obtain a uniform case-hardening of all the objects contained in the box for, contrary to what is the case with all hitherto known devices, all the objects are equally exposed to heat action and can immediately after cementation be pitched at one throw into the tempering tank.

Having now particularly ascertained and described the nature of my said invention as well as the manner in which the same is to be performed, I declare that what I claim is:

1. Apparatus for case-hardening small objects, comprising a furnace having a heating chamber; a metal tube extending axially through said chamber and having its central portion disposed within the same, said tube being open at one end and constituting, with the furnace, a pair of companion elements, one of which is adapted to be positively rotated; mechanism for driving said rotatable element; a removable cementation basket for containing the objects to be treated adapted to be inserted into and withdrawn from the tube through the open end thereof; and

means for positioning said basket in the said central portion of the tube.

2. Apparatus for case-hardening small objects, comprising a furnace having an internal heating chamber; a metal tube extending through and beyond said chamber and provided with an internal stop which is located within the confines of the portion of the tube disposed in the chamber, said tube being open at the end remote from said partition and constituting, with the furnace, a pair of companion elements, one of which is adapted to be positively rotated; mechanism for driving said rotatable element; and a removable cementation basket for containing the objects to be treated adapted to be inserted through the open end of the tube into engagement with said stop to position it within the aforesaid portion of the tube disposed within the chamber.

3. Apparatus for case-hardening small objects, comprising a furnace having an internal heating chamber; a metal tube extending through and beyond said chamber and provided with an internal stop which is located within the confines of the portion of the tube disposed in the chamber, said tube being open at the end remote from said partition and constituting, with the furnace, a pair of companion elements, one of which is adapted to be positively rotated; mechanism for driving said rotatable element; a removable cementation basket for containing the objects to be treated adapted to be inserted through the open end of the tube into engagement with said stop to position it within the aforesaid portion of the tube disposed within said chamber; and a removable plug fitted in the open end of the tube.

4. Apparatus for case-hardening small objects, comprising a furnace having a heating chamber; a rotatable metal tube extending axially through said chamber and having its central portion disposed within the same said tube having an open end; mechanism for rotating said tube relatively to the furnace and its chamber; a removable cementation basket for containing the objects to be treated adapted to be inserted

into and withdrawn from the tube through the open end thereof; means for positioning the basket within the said central portion of the tube; and means for connecting the basket to the tube to rotate therewith.

5. Apparatus according to claim 4, in which the connecting means between the tube and basket comprises at least one interfitting rib-and-groove joint.

6. Apparatus according to claim 4, in which the positioning means comprises an internal stop situated within the central portion of the tube and against which the inner end of the basket abuts.

7. Apparatus for case-hardening small objects, comprising a furnace having a heating chamber; a rotatable metal tube extending axially through said chamber and having its central portion disposed within the same; mechanism for rotating said tube relatively to the furnace and its chamber; a cementation basket for containing the objects to be treated adapted to be inserted into and withdrawn from the central portion of the tube through one end thereof; means for connecting the basket to the tube to rotate therewith; and heat-insulating material fitting in the tube at opposite sides of the basket, the material at one side constituting a plug which is removable from the tube to enable the insertion and withdrawal of the basket.

8. Apparatus for case-hardening small objects, comprising a furnace having a heating chamber; a tubular supporting element extending axially therethrough and having an open end; a cementation basket for containing the objects to be treated adapted to be inserted into and withdrawn from said element through its open end; means for effecting a relative rotary movement between the furnace and the basket; and an elongated handle on said basket extending outward therefrom through said open end and having an axial bore which opens into the basket to receive a pyrometer.

In testimony whereof I affix my signature.

GEORGES ANTONY HENRI MÉKER.