A. G. E. HULTGREN.

METHOD OF HARDENING SOLIDS OF REVOLUTION.

APPLICATION FILED JUNE 26, 1917.

1,309,137.

Patented July 8, 1919.

Fig. 1.

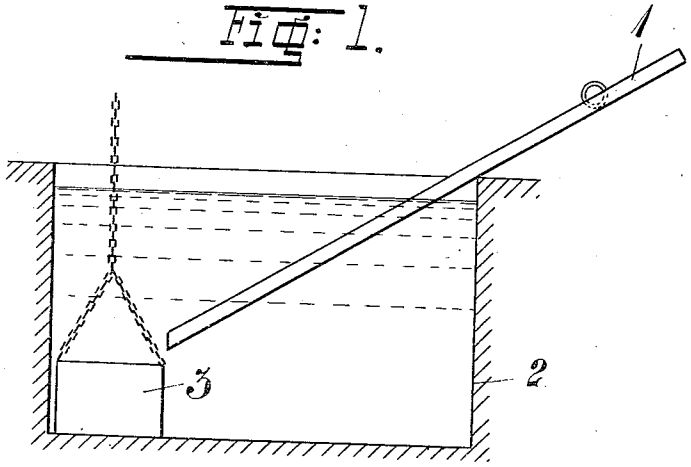
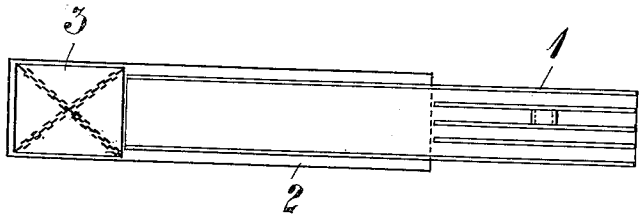


Fig. 2.



Inventor

Axel Gustaf Emanuel Hultgren

By Attys

Fraser, Turk & Myers

UNITED STATES PATENT OFFICE.

AXEL GUSTAF EMANUEL HULTGREN, OF GOTTENBORG, SWEDEN, ASSIGNOR TO AKTIEBOLAGET SVENSKA KULLAGERFABRIKEN, OF GOTTENBORG, SWEDEN, A CORPORATION OF SWEDEN.

METHOD OF HARDENING SOLIDS OF REVOLUTION.

1,309,137. Specification of Letters Patent. Patented July 8, 1919.

Application filed June 26, 1917. Serial No. 177,071.

To all whom it may concern:

Be it known that I, AXEL GUSTAF EMANUEL HULTGREN, a citizen of the Kingdom of Sweden, residing at Gottenborg, Sweden, have invented new and useful Improved Methods of Hardening Solids of Revolution, of which the following is a specification.

On hardening bodies in general a deformation of the body to a greater or smaller extent occurs caused by an uneven cooling of the body. Said uneven cooling arises essentially on the following grounds, viz., (1) that the various parts of the body when immersed into the hardening liquid do not simultaneously come into contact with the liquid and (2) that during the following cooling operation—which always takes place by moving the body and the hardening liquid in relation to each other—the cooling of the body will be stronger on that part of the surface where on account of the movements and the shape of the body the circulation of the liquid in relation to the body will be most intense and on account thereof the vapors will be most rapidly removed from the surface of the body. Said deformation is especially perceptible and inconvenient on hardening ring-shaped bodies having a comparatively small cross-sectional area in relation to the diameter, as, for instance, the rings of ball and roller bearings.

The object of this invention is to prevent the said inconveniences connected with the hardening of bodies having the form of solids of revolution, especially the bearing rings of ball and roller bearings. For this purpose the invention consists in causing the body to be hardened to rotate, before it is introduced into the hardening liquid, and thereupon introducing the body into said liquid in such manner that it will rotate therein, and also advance bodily in a direction forming an angle with the axis of revolution of the body.

The speed of rotation of the bodies to be hardened depends upon the size of the body, and the rotation may, obviously, be effected in different manners and by different means.

The accompanying drawing illustrates a device adapted for performing the method in question. Figure 1 is in part a side-view and in part a vertical section of said device, and Fig. 2 is a plan-view thereof.

The device consists, substantially, of an inclined track or channel 1 supporting the bodies or rings to be hardened, the lower end of which track or channel extends below the surface of the hardening liquid contained in a receptacle 2. The length of the portion of the track 1 located above the hardening liquid depends upon the speed which is to be imparted to the bodies passing down said track. The said portion may, as is shown in Fig. 2, be divided into any number of grooves or slots separated from each other. Placed at the lower end of the track in the receptacle 2 is a basket 3 or the like collecting the hardened bodies, said basket being preferably adapted to be raised out of the hardening liquid. The distance passed by the bodies in said liquid during the rotation should, preferably, be of such length that the bodies are cooled sufficiently, when reaching the collecting device.

Obviously, the track or channel need not necessarily extend below the surface of the hardening liquid, because the rotating movement is imparted to the bodies before reaching said surface. The shape of the track shown in the drawing is, however, to be preferred, if the bodies, when hardened, are collected within a rather limited space, as for instance in the basket shown. Of course, the track need not be straight-lined, as is shown in the drawing, any suitably curved form of the track being applicable.

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

1. A method of hardening bodies having the form of solids of revolution, consisting in imparting a spinning movement to the body and introducing it, while spinning, into a body of hardening liquid.

2. A method of hardening rings of ball and roller bearings, consisting in causing the body to be hardened to roll along an incline into the hardening liquid.

3. A method of hardening bodies having the form of solids of revolution, consisting in imparting a spinning movement to the body by causing it to roll along an incline, and introducing it, while spinning, into a body of hardening liquid toward which said incline extends, whereby the body will rotate within the hardening liquid and also advance bodily in a direction forming an angle with the axis of revolution of the body.

In testimony whereof I have signed my name.

AXEL GUSTAF EMANUEL HULTGREN.