W. H. BUNTING.

METHOD FOR BROACHING BUSHINGS.

APPLICATION FILED SEPT. 11, 1917.

1,318,538. Patented Oct. 14, 1919.

Fig. 1.

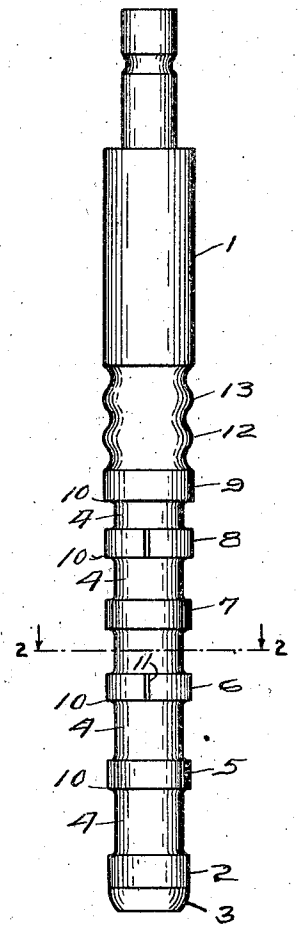


Fig. 2.

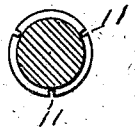
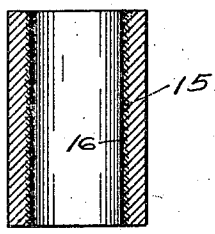


Fig. 3.



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METHOD FOR BROACHING BUSHINGS.

1,318,538. Specification of Letters Patent. Patented Oct. 14, 1919.

Application filed September 11, 1917. Serial No. 190,733.

To all whom it may concern:

Be it known that I, WILLIAM H. BUNTING, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Method for Broaching Bushings; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to means and processes for forming bearings or bushings having compacted surfaces from rough castings.

The object of the invention is to produce a bearing having a compacted surface from a rough casting by a single stroke of a tool.

In the processes used heretofore by others in the formation of bushings, particularly bronze bearings, the bushing is first reamed or bored internally. It may also be turned externally. Commonly the bearing receives a finishing reaming operation or the bushing is broached by a tool having sharp cutting teeth to produce a finishing polish. The object of the preliminary reaming or boring is to remove the hard crusted surface formed in the casting. The crusted surface or layer of the bushing while in the rough varies in its brittleness and in its hardness and varies as to its depth, and is exceedingly irregular and rough. Also the diameter of each bushing may vary at different points in the length and the diameter of bushings of substantially the same size will vary. By my invention is provided a means and a process whereby each bushing may be formed from the rough casting by a single operation of the means whereby many operations and manipulations heretofore used by others are entirely done away with to the saving of great expense in the manufacture of bearings. Also by my invention not only is a finished bushing polished but also the bearing surface is compacted and hardened which gives long life to the bushing.

I have shown in the drawing the means for forming the bushing which in many respects may be varied by those skilled in the art and yet such modified structures may still contain my invention.

Figure 1 of the drawing is a side view of the broaching tool that I have selected to illustrate an embodiment of the invention. Fig. 2 is a sectional view taken on the line 2—2 indicated in Fig. 1. Fig. 3 is an illustration of a section of a finished bushing, the compacted layer that supports the bearing surface being indicated in a conventional way.

The tool 1 may be secured in any suitable way to a reciprocatory plunger or may be placed intermediate a plunger and a bushing, the bushing being located on a bolster plate or bed of the press and thus forced through the bushing by the pressure of the plunger or the tool 1 may be secured to the bolster plate or bed of the press and a bushing may be pushed over the tool. If the tool is secured to the plunger or to the bolster plate, a suitable stripper plate may be secured to a member other than the one to which the tool is secured, for the removal of the bushing from the tool after the bushing is operated upon by the tool.

The tool is provided with a pilot 2, preferably having a rounded nose, 3, which operates to center the bushing with respect to the tool. Moreover the rounded nose 3 of the pilot operates to break down to a great extent any blisters or minute points that may be formed on the surface of the rough casting.

Above the pilot 2 a plurality of channels is cut in the tool leaving ridges which are formed into cutting lips and compacting beads. The channels 4 are of widths sufficient to permit of the gathering of the metal that is removed by the cutting ridges or teeth, that form the chip clearance and permit the unencumbered action of the teeth, the chips being gathered in the channel in advance of each tooth as the tool moves through the bushing. The cutting ridges 5, 6, 7, 8 and 9 are provided with cutting edges 10. The edges are practically square except for a very slight angle or inclination that the top of the ridges make with the axis of the tool, the inclination being formed from the edges of the ridges toward the upper end of the tool that is away from the pilot of the tool. This forms a slight tool clearance for the cutting edges of the ridges.

The ridges 5, 6, 7 and 8 are also provided with channels 11 that are cut longitudinally with respect to the tool and are staggered

with respect to consecutive ridges and so that the channels of one ridge will preferably follow and precede between the lines of movement of the channels of the adjoining or leading and following ridges. The continuity of the cutting edges being broken by the channels, the chips formed by the cutting edges instead of being complete rings are broken up into thirds and are thus dropped off from the tool when the cutting edges have passed through the bushing. Otherwise, considerable work will be occasioned in the removal of the circular or substantially circular chips from the tool. The ridge 9 being without a channel gives a finishing cut to the bushing and thus leaves no protruding or roughened portions on the surface of the bushing.

The diameters of the ridges increase slightly step by step, such increment varying according to the diameter of the tool, the character of the metal contained in the bushing. Also the number of cutting ridges may be varied. Whatever may be the size of the bushing, the diameter of the first cutting ridge must exceed the diameter of the pilot, where the pilot fits the bushing, by an amount which will warrant the maintenance of the cutting edge of the ridge immediately following the pilot beneath the scale of the bushing. The increment of the edge of this ridge will vary according to the diameter of the bushing for the reason that the larger the diameter of the bushing the greater will be the variation of the diameter produced in the casting of the bushings. A 1 inch tool for forming 1 inch bronze bushings should have in its first cutting ridge an increment of about .035 over the pilot, yet tools for forming bushings having larger diameters should have an increment of .04 or even .05 where the pilots snugly fit the rough castings of the bushing, in order that the first cutting ridge may get below the rough layer and maintain its position in the cutting operation. This also maintains the axial alinement of the bushing with the tool. On account of the lack of homogeneity of the crust-like surface formed on the bushing in the casting thereof, the tool, unless the first cutting ridge above the pilot is of a diameter sufficiently great to dig below the crust-like formation and keep below the crust-like layer, will cut the bushing exceedingly irregular. Moreover if the first cutting ridge breaks through the surface, that is, if the first cutting ridge does not maintain its position below the scale or crust-like surface in the broaching operation, the scale will grind off the edge of the ridge very quickly so that the tool can be used in comparatively few operations. This will necessitate resharpening of the ridge which tends to reduce its diameter and thus the tool is quickly brought to a stage of uselessness for broaching bushings while in the rough. The increased size of the first cutting ridge or lip 5 over the diameter of the pilot may be varied also according to the compositions of which the article to be broached is formed.

The succeeding ridges 6, 7, 8 and 9 increase successively in diameter by small amounts, whereby the bushings will receive the finishing cuts before the kneading or compacting operation is performed by the beads. The tool may also be provided with compacting beads 12 and 13 which have diameters that may be .002 and .004 respectively larger than the cutting ridge 9 whereby the bushing will be kneaded and compacted as the tool is moved through the bushing. The supporting layer 16 of the bearing surface of each bushing 15 will thus be compacted and hardened.

I claim:

1. A process of forming bushings from rough castings which consists in broach cutting the rough castings to beneath the crust like surface of the rough casting so as to remove the crust of the casting by a single cutting ridge.

2. The method of producing bearings having compacted bearing surfaces from rough cast bushings which consists in removing the crust of the casting by a single cutting ridge and compressing successively small contiguous areas of the surface of the bushings after the crust is removed.

3. The method of producing bushings having compacted surfaces which consists in broaching the interior surface and compacting the surfaces by successively compressing and releasing small contiguous circular areas of the surface in succession.

4. The method of producing bushings having compacted surfaces which consists in broach cutting the surfaces and compacting the surfaces by compressing and releasing successively small contiguous circular areas of the surface in succession.

In testimony whereof, I have hereunto signed my name to this specification.

WILLIAM H. BUNTING.