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MEANS FOR BROACHING BUSHINGS.

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1,318,489. Patented Oct. 14, 1919.

Fig. 3.

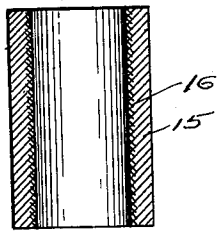


Fig. 1.

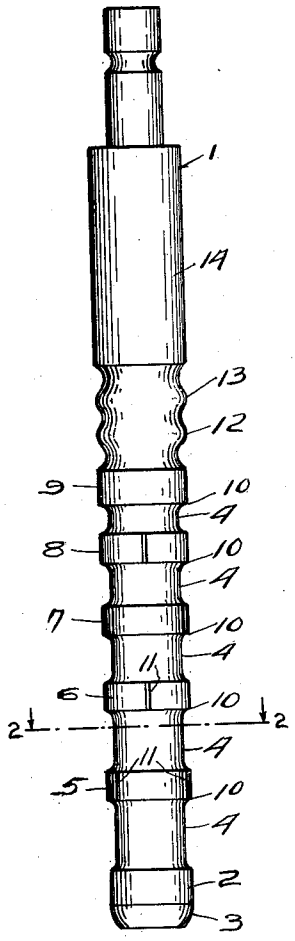
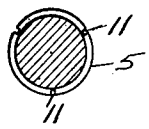


Fig. 2.



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MEANS FOR BROACHING BUSHINGS.

1,318,489. Specification of Letters Patent. Patented Oct. 14, 1919.

Application filed August 20, 1917. Serial No. 187,205.

To all whom it may concern:

Be it known that I, AUGUSTUS F. DONALDSON, 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 Means 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 for forming bushings having compacted surfaces. It particularly has for its object to provide a tool that may be secured to a plunger or to the bolster plate of the press and wherein the tool, in the one case, is pushed through the bushing or in the other case, the bushing is pushed over the tool, and wherein in either case, the bushing may be stripped from the tool.

By my invention is thus provided a means whereby bushings may be suitably fed to a broaching machine and the plunger may be continuously operated to drive the broach through the bushings or the bushings over the broach and upon the return movements of the plunger, the bushings may be stripped from the broach.

In the embodiment of my invention, a broach is provided with a shank that is of a size such that it will receive the bushing and maintain the diameter sufficiently great against the spring of the metal that will assure the action of the operative parts of the tool that are located in proximity to the shank. If the tool is provided with beads for compressing and compacting the surface of the bearing, the shank is made of a diameter such that upon the return movement of the bushing relative to the broach, the shank will maintain the bushing in alinement with the beads and prevent wabbling of the bushing relative to the broach and yet the shank is of a diameter that is not too great to prevent the action of the bead adjoining the shank either when the bushing first passes over the shank or while the bushing is being removed from the shank.

I have shown in the drawing a broach embodying my invention which however may be varied by those skilled in the art and yet such modified structures may still contain my invention.

Figure 1 of the drawings 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 indicted 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 is secured in any suitable way to a reciprocating plunger and the bushings in the rough are placed upon a suitable plate or machine bed and the tool is forced through the bushing and withdrawn from the bushing in the reciprocatory movements of the tool, the bushing being held between the machine bed or plate and a suitable stripper plate for removing the bushing on the return movement of the tool from 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.

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 continu-

ity of the cutting edges being broken by the channels, the chips formed by the cutting edges instead of being complete circles, are broken up into thirds and will thus drop 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, and the character of the metal contained in the bushings. Also the number of cutting ridges may be varied.

For a one inch tool, the first cutting lip may be about .04 of an inch larger than the pilot. The succeeding ridge 6, I find preferable, to increase by about .02 of an inch larger than the preceding cutting ridge, while the succeeding cutting ridges 7 and 8 increase by about .01 of an inch, while the cutting ridge 9 and the compacting beads 12 and 13 increase successively by about .002 of an inch. The size of the bushing when finished, that is, when the tool has completed its reciprocatory movement through the bushing, will be about the size of the lip or cutting ridge 9 which in the particular instance selected is 1 inch, but the bushing except for the spring of the metal is slightly under the 1 inch diameter. The broaching movement on through the bushing brings the beads 12 and 13 into operation which may be .002 and .004 of an inch larger than the cutting lip 9 to act on the bushing which kneads and compresses the surfaces of the bushings and then the broach moves so as to slip the shank 14 within the bushing. The shank 14 is considerably over the size of the completed bushings and they are held in this stretched position by the shank so that when the stripper plate pulls the bushings from the shank, they may again pass over the beads 12 and 13 on the return movement of the broach and again be kneaded by the operation of the beads. This double kneading and stretching of the bushing brings it substantially to size and so that on the return stroke the ridge 9 does not materially act upon the surface of the bushing. The diameter of the other ridges being smaller than the finished size of the bushing, they readily pass through the bushings.

The size of the shank 14 is preferably slightly smaller than the bead 13. It may be of a size between the diameters of the two beads 12 and 13. This will make the diameter of the shank about .003 of an inch larger than the rigde 9.

The shank 14 is thus made of a size that will permit the action of the last compacting bead, both when the shank receives the bushing and when the bushing leaves the shank and yet it is of a size such that the bushing will be held secure from lateral movement during the time that the beads operate upon the bushing. If the shank is too small in diameter, the compacting beads will produce slight irregularities in the surface of the bushing by reason of the irregularity of the hardness of the metal and the crowding of the portion thereof by the beads on the return movement of the plunger and the lack of rigidity of the bushing.

The tool produces a hard smooth, true cylindrical bearing surface in the bushing 15 that is supported by a compacted layer 16 as shown conventionally in Fig. 3.

I claim:

1. A broach for forming bushings and having a bead for kneading the surfaces of the bushings, and a shank for receiving the bushing, the bead being located adjacent to the shank and the diameter of the shank being slightly smaller than the maximum diameter of the bead.

2. A broach having compacting beads and a shank, the diameter of the compacting beads being greater than the diameter of the finished bushing, the diameter of the shank being intermediate the diameter of the larger compacting bead and the diameter of the finished bushing.

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

AUGUSTUS F. DONALDSON.