Oct. 20, 1931. F. W. ROEBBEL ET AL 1,828,074

METHOD AND TOOL FOR LAPPING OR HONING

Filed March 24, 1928 2 Sheets-Sheet 1

Fig. 1.

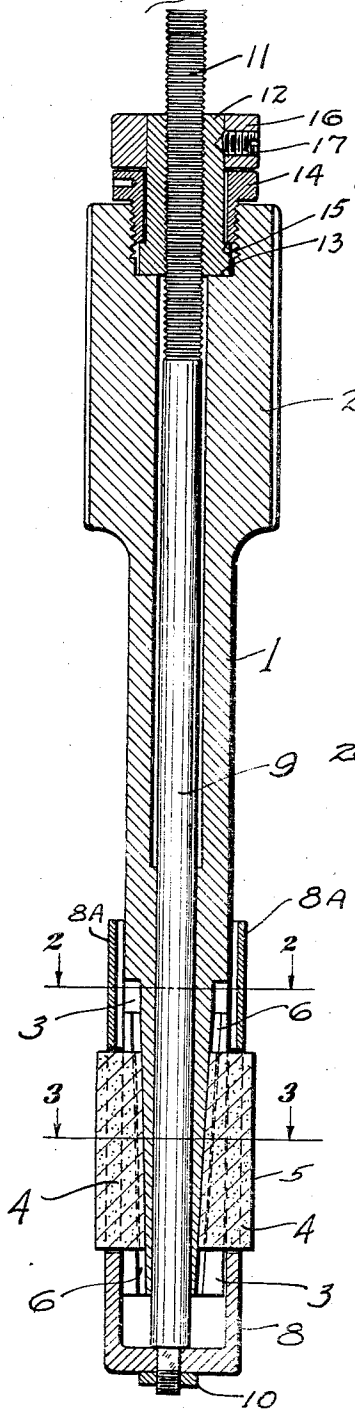


Fig. 2.

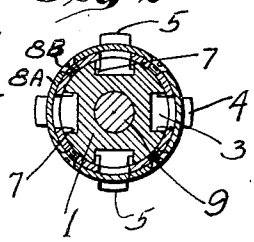


Fig. 3.

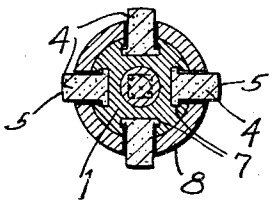


Fig. 5.

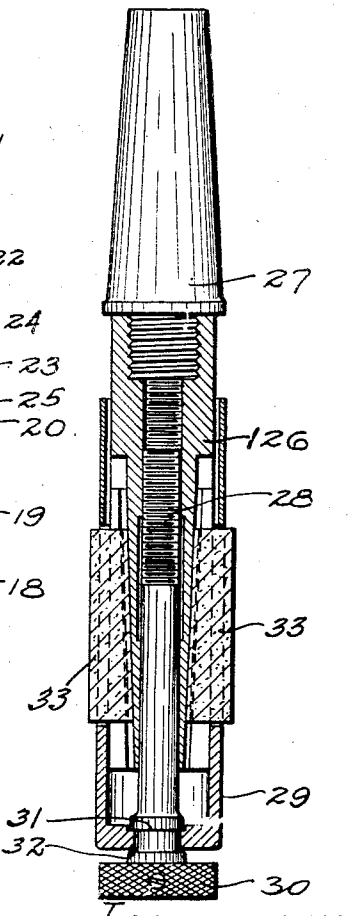
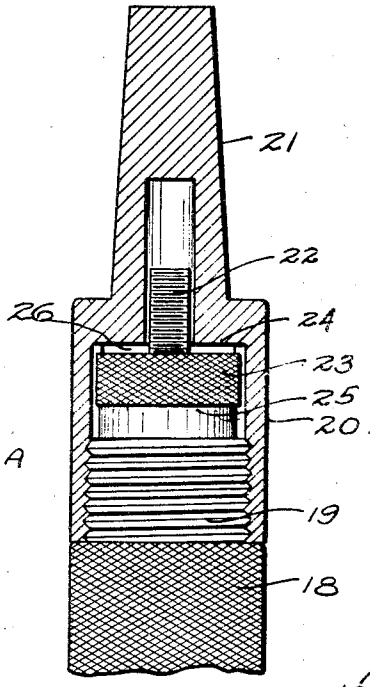


Fig. 4.



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Fig. 6.

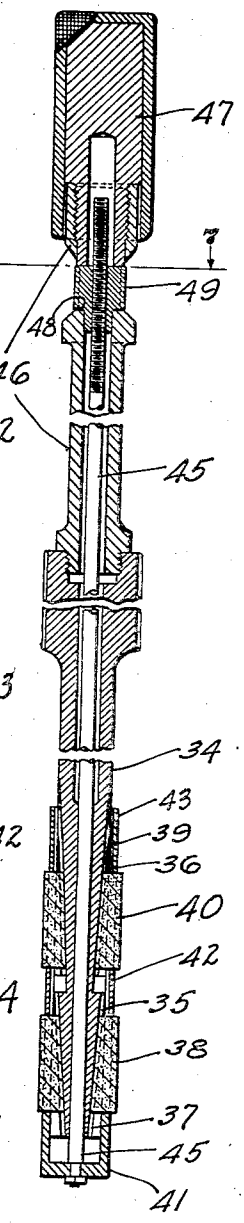


Fig. 7.

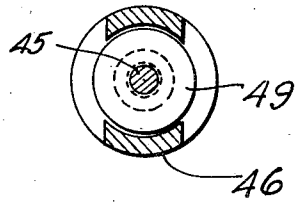


Fig. 9.



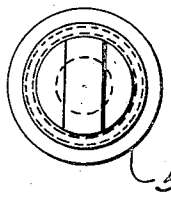
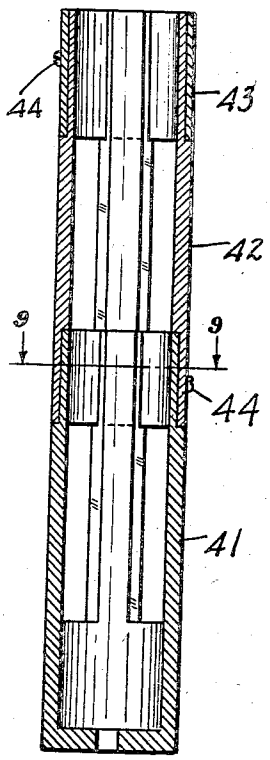


Fig. 10.

Fig. 8.



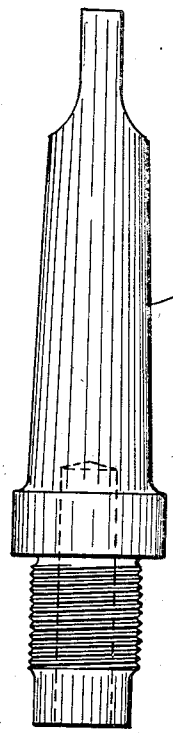


Fig. 11.

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UNITED STATES PATENT OFFICE

FREDERICK W. ROEBBEL AND HARRY E. ROGERS, OF ST. LOUIS, MISSOURI

METHOD AND TOOL FOR LAPPING OR HONING

Application filed March 24, 1928. Serial No. 264,520.

Our invention relates to metal working and consists in a novel method and apparatus for lapping or honing operations and particularly adapted for use in working the interior faces of hollow cylinders. Instances of the use of our invention are the finishing of engine cylinders and the barrels of pneumatic hammers.

It has been customary to finish the surfaces of the type referred to by charging a lapping material of fixed diameter, approximating the interior diameter of the surface to be finished, and inserting the tool lengthwise into the cylinder and then rotating the cylinder and the tool relative to each other, Some times emery cloth is wrapped around a mandrel to form a tool for the purpose desired. In either instance the end of the cylinder where the tool is inserted is enlarged and, where emery cloth is used as described, it is impossible to maintain the desired form of the tool and any irregularities in the contour of the work will be followed by the tool and a true cylinder will not be produced.

The main object of our invention is to effect a lapping or honing operation which will overcome the above-mentioned disadvantages and, briefly, we attain this object by first inserting the tool into the work with the working elements of the tool spaced from the surface to be finished, and then moving the working elements into contact with the surface.

Another object of our invention is to provide for adjustment of the working elements of the tool during its assembly with the work and, preferably, while the tool and work are being rotated relatively to each other, without interfering with the operation of the tool.

The accompanying drawings illustrate our tool, and the use of the same, as described below, will explain the method which we believe to be novel in doing work of this kind. In these drawings—

Figure 1 is a longitudinal section through a selected embodiment of our tool.

Figures 2 and 3 are transverse sections taken on the lines 2—2 and 3—3 of Figure 1.

Figure 4 is a modification of the upper end of the tool showing its application to a drill chuck socket or the like.

Figure 5 illustrates another modification of our tool.

Figure 6 is a longitudinal section through another form of our invention.

Figure 7 is a transverse section taken on line 7—7 of Figure 6.

Figure 8 is an enlarged vertical section through the body of the tool and taken on a plane extending between the working elements.

Figure 9 is a transverse section taken on the line 9—9 of Figure 8.

Figure 10 is a top view and Figure 11 is a side elevation of a shank used to adapt the device shown in Figure 6.

In the simple form of our invention, shown in Figures 1, 2, and 3, the body of the tool is indicated at 1 and consists of a hollow shaft, the upper end of which forms a handle 2 for manually manipulating the tool. The other end of the tool is provided with longitudinally extending grooves 3 in its periphery and the bottoms of these grooves are inclined from the axis of the body. Lapping elements 4 are slidably mounted in grooves 3 and are wedge-shaped as indicated so that when assembled with the body, as shown, the outer or working faces 5 of the elements are parallel with the axis of the tool. Preferably, the sides of grooves 3 are provided with lateral recesses 6 and the sides of elements 4 have corresponding projections 7 fitting in recesses 6 and serving to prevent outward movement of elements 4 except as such movement may be provided by movement of the elements lengthwise of the grooves.

A sleeve 8 fits over body 1 and is provided with suitable slots for receiving the outer portions of elements 4. A ring 8—A is fastened to the end of sleeve 8 by means of screws 8—B so as to position the elements 4 in the slots in sleeve 8 and prevent displacement of the elements longitudinally of the sleeve. By moving sleeve 8 lengthwise of the body of the tool, elements 4 will also be moved lengthwise and will be moved away from or towards the axis of the tool to any desired extent.

We show means for moving sleeve 8 and for holding it in desired position comprising a rod 9 having a square shouldered end with a nut 10 for engaging the end of sleeve 8. The opposite end 11 of rod 9 is threaded into a nut or bushing 12 and the body of the tool is provided with a thrust bearing 13 for engaging one end of nut 12. A bushing 14 provides a thrust bearing 15 for an upwardly facing shoulder on nut 12. At collar 16, secured to nut 12 by a set screw 17, facilitates rotation of the nut and its assembly with the associated elements.

It is obvious that rotation of the collar 16 and nut 12 will feed rod 9 lengthwise of the body of the tool thereby adjusting the working elements 4 to and from the axis of the tool.

By adjusting elements 4 near the lower end of the tool, the working surfaces 5 of elements 4 will be nearest to the tool axis and the same may be inserted in a cylinder of substantially larger diameter without contact between the working elements and the surface of the cylinder. The adjusting nut may then be turned to draw rod 9 inwardly of the body of the tool and move elements 4 outwardly until their working surfaces 5 contact with the interior surfaces of the cylinder. The cylinder, or other work, and the tool may then be rotated and reciprocated relatively to each other to complete the lapping or honing operation.

It will be understood that the elements 4 may consist of pieces of oil stone or other abrasive material suitable for honing purposes or may consist of lapping elements of iron, brass, lead or other material having a working suface charged with emery or other abrasive.

It will be noted that the position of the working elements may be controlled at a remote point and that their position may be varied during the operation of the tool. In other words, it is unnecessary to remove the tool from the work or to interrupt the relative rotation of the tool and the work in order to expand the working surface of the tool.

The tool just described is particularly adapted for use in hand operation and in the modification illustrated in Figure 4, I show the upper end 18 of the tool provided with a shouldered and threaded portion 19 adapted to be screwed into a socket 20 having a shank 21 which may be inserted in the chuck or socket of a drill press or other suitable machine tool. The rod 22 corresponds to rod 9 and the nut 23 corresponds to the nut 12—16. The sides of the socket are slotted, as indicated at 26, to permit access to the nut 23.

In some operations it may be desirable to adjust the working elements from the end of the tool which is inserted in the cylinder to be operated on, and a tool suitable for such use is indicated in Figure 5, in which the body 126 of the tool is threaded on to a shank 27 and the rod 28 is threaded into the body of the tool. The lower end of the rod projects beyond the sleeve 29 and carries a knob 30 whereby the rod may be rotated. Shoulders 31 and 32 on the rod and knob 30, respectively provide thrust bearings for the sleeve 29 which will be slid along the body of the tool to adjust the working elements 33 similarly to the adjustment provided in the form of our tool illustrated in Figure 1.

In the form of our invention illustrated in Figures 6 to 9, the tool body 34 is provided with two sets of grooves 35 and 36 having inclined bottoms and disposed longitudinally of the tool. The recesses 37 in the side of the groove 35 extend to the lower end of the body and permit the insertion of the working elements 38 from below. The corresponding recesses 39 in grooves 36 extend upwardly to permit the insertion of working elements 40.

The sleeve for positioning and adjusting the working elements is a composite member and comprises a lower portion 41, which engages the lower ends of working elements 38; an intermediate section 42 which engages the upper ends of working elements 38 and the lower ends of working elements 40; and an upper section 43 which engages the upper ends of working elements 40. These sections are attached to each other by means of suitable screws 44 and may be moved as a unit by the rod 45.

In order to adapt the tool to be used in a long barrel or like article, the body 34 is provided with a hollow extension 46 through which rod 45 may extend and the upper end of this extension 46 is adapted to receive a handle member 47. The lower end of member 47 cooperates with an upwardly facing shoulder 48 on member 46 to form opposed thrust bearings for the nut 49, rotation of which feeds the rod 45 upwardly or downwardly in the tool and thereby controls the adjustment of the working elements 38 and 40 radially of the tool.

If desired, member 47 may be removed and the shank element 50 shown in Figures 10 and 11 may be substituted whereby the tool may be inserted in a machine chuck or socket.

While the details of the structure described differ from the structures in Figures 1 to 5, the principle of operation is the same and it is obvious that various other modifications in the details of our invention may be made without departing from the spirit thereof, and we contemplate the exclusive use of any modifications of our novel method and tool which come within the scope of our claims.

We claim:

1. In a tool of the class described, a body, a groove in the side of said body, the bottom of said groove being inclined from the axis of said body, a lapping or honing element

mounted in said groove and slidable lengthwise and projecting beyond the periphery of said body, a sleeve fitting over said body and having a slot for receiving said element, and means connected to said sleeve for moving said element lengthwise of said groove while the lapping or honing operation is being performed.

2. In a tool of the class described, a body, a groove in the side of said body, the bottom of said groove being inclined from the axis of said body, a lapping or honing element mounted in said groove and slidable lengthwise thereof and projecting beyond the periphery of said body, a sleeve fitting over said body and having a slot for receiving said element, and a rod extending through said body and connected to said sleeve for moving the latter and said element along said body.

3. In a tool of the class described, a body, a groove in the side of said body, the bottom of said groove being inclined from the axis of said body, a lapping or honing element mounted in said groove and slidable lengthwise thereof and projecting beyond the periphery of said body, a sleeve fitting over said body and having a slot for receiving said element, and means for adjusting and holding said sleeve at different points lengthwise of said body.

4. In a tool of the class described, a body, a groove in the side of said body, the bottom of said groove being inclined from the axis of said body, a lapping or honing element mounted in said groove and slidable lengthwise thereof and projecting beyond the periphery of said body, a sleeve fitting over said body and having a slot for receiving said element, a rod extending through said element, a nut on said rod, and a thrust bearing on said body engaging said nut whereby rotation of the latter will move said rod, sleeve and element lengthwise of said body.

5. In a tool of the class described, a body, a plurality of identical alined lapping or honing elements separately mounted on said body at points spaced longitudinally thereof and facing outwardly of the body, and a single device for simultaneously adjusting said elements to the same extent from a remote point to vary the distance between their working faces and the axis of said body and to hold said working faces parallel to the axis of said body.

6. In a tool of the class described, a body, a lapping or honing element mounted on said body near one end thereof and facing outwardly of the body, a sleeve fitting over said body and having a slot for receiving said element, a rod extending through said body and connected to said sleeve for moving the latter and said element along said body, a holding member applied at the other end of said body, means near said other end including a nut on said rod for adjusting said element to vary the distance between its working face and the axis of said body, and means on the inner end of said holding member for retaining said nut.

7. In a tool of the class described, a body having a longitudinally extending groove with an inclined bottom, a second longitudinally extending groove spaced from said first mentioned groove and alined therewith longitudinally of said body and having a bottom inclined parallel to the bottom of said first mentioned groove, identical working elements slidably mounted in said grooves, and means for simultaneously adjusting said elements along said grooves.

8. In a tool of the class described, a body having a longitudinally extending groove with an open end directed towards one end of the body and having an inclined bottom, a second longitudinally extending groove with an open end directed towards the other end of the body and spaced from and alined with said first mentioned groove longitudinally of said body, identical working elements slidable into said grooves from the ends thereof, and a single device for holding said members in desired position in said grooves.

In testimony whereof we hereunto affix our signatures this 20th day of March, 1928.

FREDERICK W. ROEBBEL.
HARRY E. ROGERS.