Sept. 22, 1925. 1,554,760

T. RESTEL

CYLINDER HONE OR LAPPING TOOL

Filed June 16, 1924 2 Sheets-Sheet 1

Fig. 1.

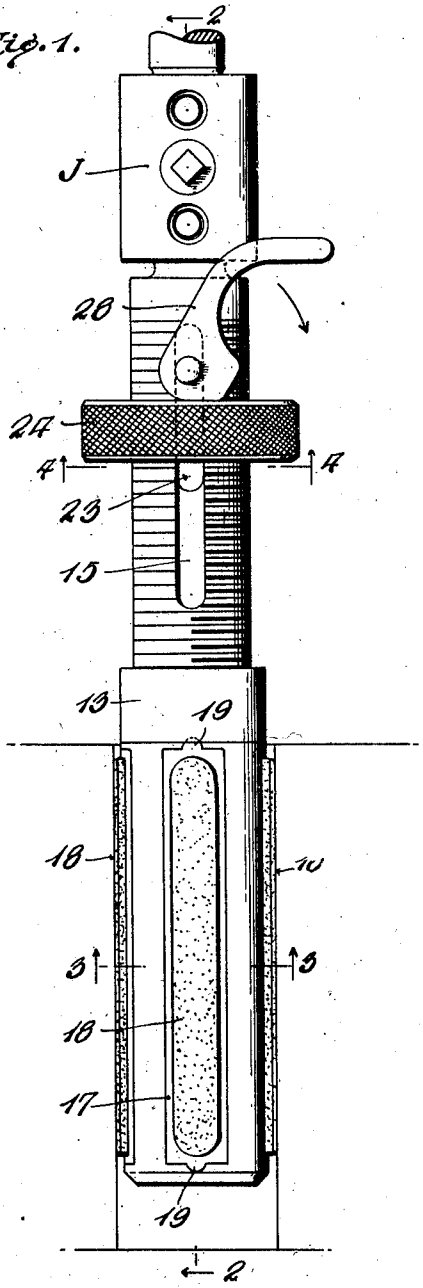
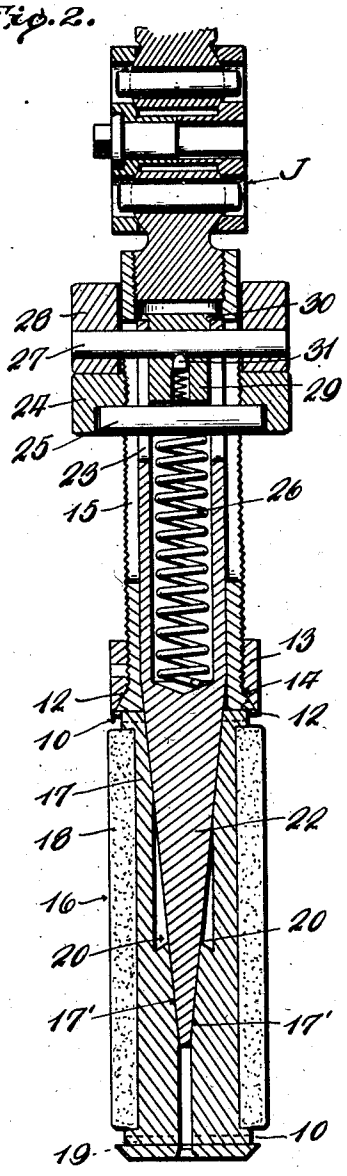


Fig. 2.



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Fig. 3.

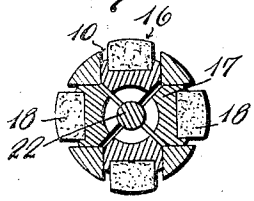


Fig. 4.

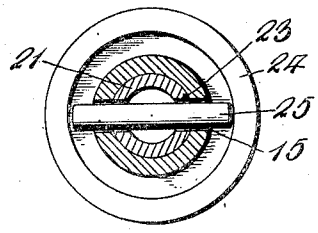


Fig. 5.

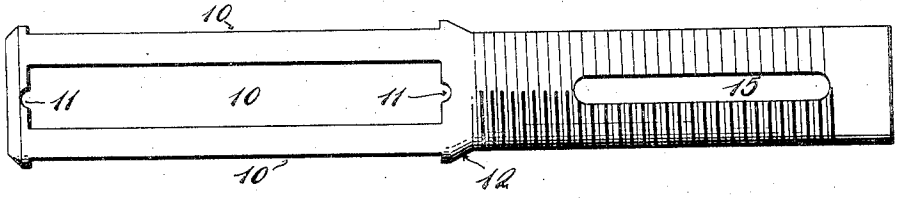


Fig. 6.

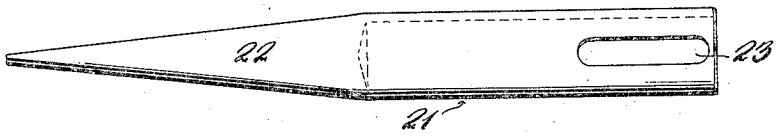
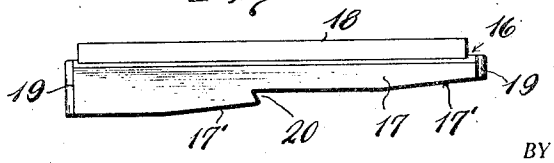


Fig. 7.



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UNITED STATES PATENT OFFICE.

THEODORE RESTEL, OF CLEVELAND, OHIO.

CYLINDER HONE OR LAPPING TOOL.

Application filed June 16, 1924. Serial No. 720,394.

To all whom it may concern:

Be it known that I, THEODORE RESTEL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Cylinder Hones or Lapping Tools, of which the following is a specification.

This invention relates to improvements in cylinder hones or lapping tools of the type embodied in my co-pending application Serial Number 696,206 filed March 1, 1924, and has for an object to provide means whereby small bore cylinders may be accurately honed, this being practically impossible with the present tools available and due to the impractibility of making up a small tool in accordance with the disclosure in the above identified application, a new and differently constructed hone is absolutely essential.

Another object is to provide a hone of this character wherein a set of radially movable cutters is adjustable by means of a single mandrel or cone member, which may be readily adjusted to permit honing of cylinders varying slightly in diameter.

It is likewise an object to provide a hone of this nature wherein the cutters or honing members each carry a pair of spaced alined inclined faces engageable with a single mandrel or expanding member for radially adjusting the cutters.

Other objects will be in part obvious and in part pointed out hereinafter.

In order that the invention and its mode of construction and functioning may be readily understood I have in the accompanying drawings and the following specification and claims based thereon set out the preferred embodiment of the cylinder hone.

In these drawings.

Figure 1 is a side elevation of the hone;

Figure 2 is a vertical sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is a transverse sectional view taken substantially on the line 3—3 of Figure 1;

Figure 4 is a transverse sectional view taken substantially on the line 4—4 of Figure 1;

Figure 5 is a detail view of the slotted stock with the cutters removed;

Figure 6 is a detail view of the mandrel and

Figure 7 is an elevation of one cutter.

In the accompanying drawings, throughout which similar reference characters designate similar parts, the hone is shown as including broadly, a slotted stock mounting a set of radially adjustable cutters or honing members which are movable under influence of an axially adjustable mandrel or cone expanding member, this mandrel being moved through rotation of a nut at one end of the hone. A control cam lever is arranged at one end to allow for additional expansion of the hone after it is positioned within a cylinder, thereby snugly engaging the cutters with the face to be honed.

This slotted stock which carries the several parts making up the hone comprises an elongated cylindrical body, approximately one-half of whose length is reduced in diameter and threaded for reasons which are apparent.

Obviously, the number of cutters or honing members may be varied, but for the purpose of this application I have shown four, which are arranged in circumferentially spaced radial slots 10 opening into the hollow interior of the stock. Opposed end walls of these slots 10 are provided with radially extending grooves or channels 11 designed to engage portions of the cutter carriers as will be hereinafter described. An annular inclined face 12 is formed at the juncture of the threaded portion of the stock and the cutter mounting portion for the purpose of limiting the axial adjustment of a locking collar or ring 13 over the adjacent ends of the cutter carriers. This locking collar or ring 13 is threaded upon the diametrically reduced portion of the stock and has an inclined or beveled end 14 engageable with the annular inclined face 12 and with the inner ends of the cutter carriers as stated.

The reduced threaded portion of the stock is provided intermediate its ends with a pair of diametrically opposed longitudinal slots 15 which receive cross-pins whose functions will be hereinafter apparent. A double universal joint J is connected to the end of the threaded portion of the stock as shown in Figure 2 of the drawings. The structure of this joint J is similar to that in my application herein referred to.

Each honing member or cutter 16 includes a metal carrier 17 in the form of a bar cupped or channeled to receive a car-

borundum or other abrasive element 18. Guide members or ribs 19 are integrally formed upon the ends of the carriers 17 and are designed to snugly and slidably fit within channels or grooves 11 in the hone receiving slots as previously stated. The aforementioned locking collar or ring 13 takes over the adjacent or inner ribs 19 and consequently prevents accidental displacement of the carriers 17.

The inner face of each carborundum carrier 17 is thickened at one end and is beveled longitudinally from a point near the outer end of the thickened portion to the opposite end. Obviously this bevel 17′ is curved transversely to conform to the curvature of the mandrel or expansion cone member. The portions 17′ of each carborundum carrier 17 which contact with the mandrel are spaced apart longitudinally through cutting out a section of the metal and providing an undercut shoulder 20. This undercut shoulder is formed to receive a collar which in turn is engaged by the expansion cone so the cutters may be forced against the end of the stock to retain the carborundum faces in position for dressing. Ordinarily there is no ring engaging the undercut shoulders.

A mandrel or expansion cone member 21 is formed from a length of metal which is tapered from a point substantially midway its length to one end, thus forming the cone 22 which engages the bevels of the cutter carriers 17. The cone shaped portion is of substantially the same length as the beveled part of the hone carrier 17 and consequently there is assured equal adjustment of both ends of the hone, and the necessary rigidity.

This mandrel is hollow from the juncture of the cone shaped part and the body portion, to its other end and is provided with a pair of diametrically opposed longitudinal slots 23 as shown, and for purposes which will be apparent. This mandrel or expansion cone member 21 is movable axially to adjust the cutter, through rotation of an adjusting ring or collar 24 arranged upon the threaded portion of the clotted stock. A cross-pin 25 has its ends covered by the collar 24 which is substantially L-shaped in cross-section and is at all times snugly engaged with the cross-pin. This cross-pin 25 extends through the slots formed in the mandrel and threaded portion of the slotted stock. A coil expansion spring 26 is arranged in the hollow portion of the mandrel and serves as a connection between the cross-pin and mandrel for purposes of adjustment, it being apparent in Figure 2 that rotation of the ring or collar 24 will move the mandrel longitudinally and consequently radially move the cutters. This means allows the operator to vary the diameter so it may be inserted into a cylinder to be honed.

Obviously in order to hone a cylinder the cutter must be expanded after being positioned within the cylinder and must, after the honing, be contracted for removal without scarring the cylinder wall. This is accomplished through arranging a second cross-pin 27 in the same slots with the first cross-pin and mounting a cam lever 28 thereon. This cam lever 28 engages the inner face of the adjusting ring or collar 24, while the cross-pin carried thereby, mounts between its ends a metal block 29, snugly fitting in the end of the hollow mandrel body. This block 29 is provided with an annular flange 30 which engages the end of the mandrel body as shown in Figure 2. A spring actuated plunger or ball 31 is arranged in this block 29 and is seatable in a recess formed in the second cross-pin so as to retain the cam lever in either of its adjusted positions.

When a cylinder is to be honed with this tool, the adjusting nut is rotated until the cutters are radially adjusted to a point whereat they may be inserted into the cylinder freely. During this operation the cam lever is positioned to compress the spring and space the first cross-pin from the block fitted in the end of the mandrel. When the hone is properly positioned in the cylinder, the lever is tripped and the coil spring is allowed to expand and consequently moves the cutters into snug engagement with the cylinder wall. The honing having been completed, the lever is again moved to contract the cutters and the hone is removed from the cylinder. Ordinarily this operation is long and tedious as compared with the above stated operation.

As pointed out in my application herein referred to, the provision of a double universal joint, rather than a single universal joint or a rigid connection to a drive shaft, eliminates entirely the tendency of the hone to slap and inaccurately finish the cylinder.

Manifestly certain minor changes in the details of construction may be resorted to and such changes as fall within the scope of the appended claims, I consider within the spirit of my invention.

I claim:

1. A cylinder hone comprising a hollow stock having a set of longitudinal slots extending from one end to a point substantially midway the length of the stock, said stock being externally threaded beyond the cutter receiving slots, a set of cutters arranged in the slots, beveled faces formed upon the inner side of the cutters, an expansion cone member engaging the beveled portions of the cutters, a hollow extension carried by the cone member, said extension and threaded portion of the stock having alined opposed slots, an adjusting ring arranged upon the threaded portion of the stock, and devices in the hollow extension and opposed

slots between the ring and cone member to axially move the cone with rotation of said ring.

2. A cylinder hone comprising a hollow stock having a set of longitudinal slots extending from one end to a point substantially midway the length of the stock, said stock being externally threaded beyond the cutter receiving slots, a set of cutters arranged in the slots, beveled faces formed upon the inner side of the cutters, an expansion cone member engaging the beveled portions of the cutters, a hollow extension carried by the cone member, said extension and threaded portion of the stock having alined opposed slots, an adjusting ring arranged upon the threaded portion of the stock, a cross-pin extending through the slots, and a coil expansion spring engaging the cross-pin, and the base of the cone member, said ring being rotatable to move the cross-pin longitudinally and adjust the cutters.

3. A cylinder hone comprising a hollow stock having a set of longitudinal slots extending from one end to a point substantially midway the length of the stock, said stock being externally threaded beyond the cutter receiving slots, a set of cutters arranged in the slots, beveled faces formed upon the inner side of the cutters, an expansion cone member engaging the beveled portions of the cutters, a hollow extension carried by the cone member, said extension and threaded portion of the stock having alined opposed slots, spring means for exially moving the cone member to radially adjust the cutters for positioning the hone in a cylinder, a cross-pin in the slots bearing against the spring and a cam lever mechanism for expanding the cutters into contact with a cylinder wall.

4. A cylinder hone comprising a hollow stock having a set of longitudinal slots extending from one end to a point substantially midway the length of the stock, said stock being externally threaded beyond the cutter receiving slots, a set of cutters arranged in the slots, beveled faces formed upon the inner side of the cutters, an expansion cone member engaging the beveled portions of the cutters, a hollow extension carried by the cone member, said extension and threaded portion of the stock having alined opposed slots, an adjusting ring arranged upon the threaded portion of the stock, an expansion coil spring in the hollow extension, a cross-pin in the opposed slots bearing against the spring, and a cam lever acting upon the adjusting ring and operable to expand the cutters into contact with the face of a cylinder to be honed.

5. A cylinder hone comprising a hollow stock having a set of longitudinal slots extending from one end to a point substantially midway the length of the stock, said stock being externally threaded beyond the cutter receiving slots, a set of cutters arranged in the slots, beveled faces formed upon the inner side of the cutters, an expansion cone member engaging the beveled portions of the cutters, a hollow extension carried by the cone member, said extension and threaded portion of the stock having alined opposed slots, an adjusting ring arranged upon the threaded portion of the stock, a cross-pin extending through the slots, a coil expansion spring engaging the cross-pin, and the cone member, said ring being rotatable to move the cross-pin longitudinally and adjust the cutters, a second cross-pin arranged in the slots and connected to said extension for longitudinal movement therewith, a cam carried by the second cross-pin and engageable with the adjusting ring whereby to permit quick expansion of the cutters after being positioned within a cylinder to be honed.

6. A cylinder hone comprising a hollow stock, radially movable cutters, an expansion cone in the stock, telescopically arranged hollow extensions on the stock and cone, means for preventing relative rotary movement of the extensions, while permitting relative axial movement, a coil expansion spring carried by the cone to move it axially in the stock to vary the cutter adjustment, and adjusting rings engaging said means to vary the spring tension.

7. A cylinder hone comprising a hollow stock, a set of radially adjustable removable cutters carried by the stock, an expansion cone arranged in the stock, inter-engaging beveled faces formed on the cone member and cutters, an externally threaded hollow extension on the stock, a hollow extension carried by the cone member and arranged in the hollow stock extension, a cross-pin arranged to prevent relative rotary movement of the extensions, a spring arranged in the cone member in engagement with the cross-pin to move the cone axially and expand the cutters, and means for shifting the pin longitudinally.

In testimony whereof, I affix my signature.

THEODORE RESTEL.