Nov. 1, 1927. 1,647,133

W. A. JENNINGS

CYLINDER HONING TOOL

Original Filed March 10, 1924

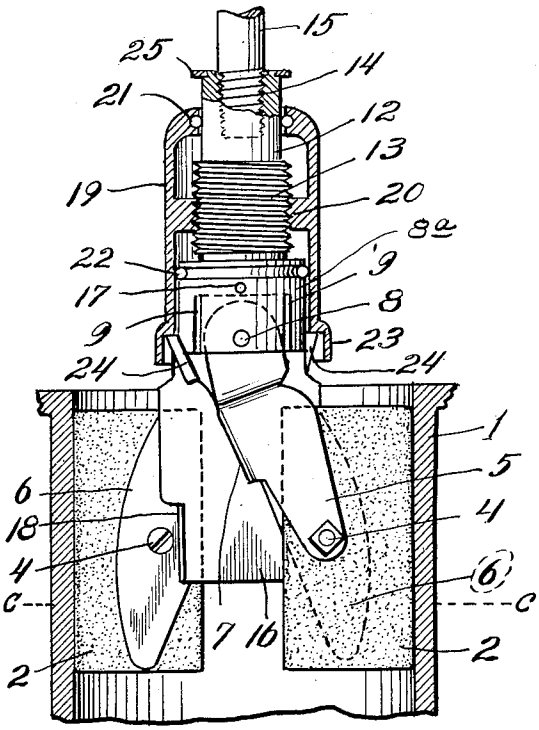

Fig. 1

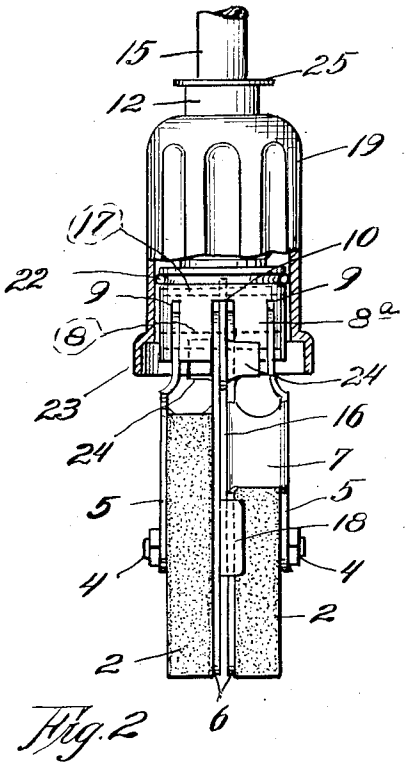

Fig. 2

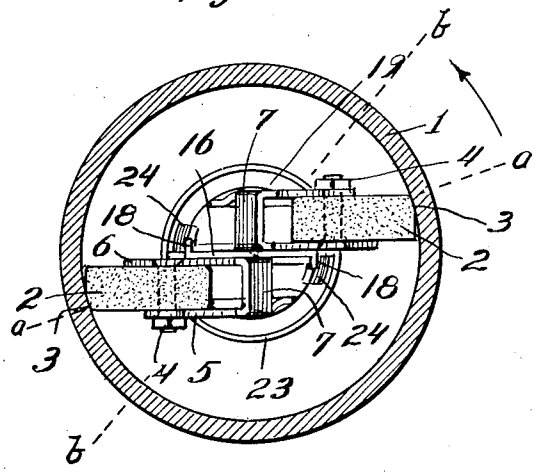

Fig. 3

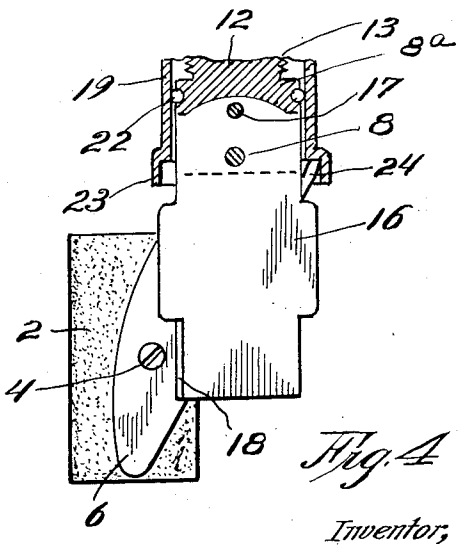

Fig. 4

Witness:

R. C. Hamilton

Inventor,

William A. Jennings,

By Thorpe Gerard,

Attys.

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UNITED STATES PATENT OFFICE.

WILLIAM A. JENNINGS, OF RAYTOWN, MISSOURI.

CYLINDER-HONING TOOL.

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This invention relates to cylinder honing tools and has for one of its objects to produce a honing device by which the honing elements may be caused to exert any desired unyielding pressure on the interior cylinder wall for the finishing or polishing thereof.

Another object is to provide a tool of the character mentioned in which the honing elements will automatically adapt themselves for full length contact, to the wall of the cylinder and apply pressure with a wiping action on the wall.

A further object is to provide an abutment or bearing surface as a brace against lateral yielding movement of the honing elements, and thus minimize twisting or turning strains on the honing element supports.

With the objects named in view, the invention consists in certain novel and useful features of construction and organization of parts as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawing, in which:—

Figure 1 is a central section taken through the sleeve element of a tool embodying the invention and through a cylinder, the position of the parts of the tool appearing as under actual operating conditions.

Figure 2 is an edge view of the tool with the sleeve partly broken away to disclose parts otherwise hidden.

Figure 3 is an inverted plan view of the device as shown in Figure 1.

Figure 4 is a vertical section taken through part of the device to more clearly disclose the bearing movement for the hone carriers.

In the said drawing, where like reference characters identify corresponding parts in all of the Figures, 1 represents an engine cylinder, and 2 a pair of similar hones in edgewise contact at diametrically opposite points at 3, with the internal wall of the cylinder. Each of said hones is composed of any suitable material and they are each pivoted on a bolt 4 in similar hone holders, comprising a pair of parallel arms 5 and 6 rigidly connected together by a cross piece 7. The arms 6 are somewhat longer than the arms 5, and form resistance or bearing surfaces for the hones, as will hereinafter appear, it being noted that the heads of the bolts 4 are countersunk in the arms 6 so that there shall be no projecting edges. It will be evident that each hone is thus free to pivotally accommodate itself to the angle of the cylinder wall, around its respective pivot bolt 4.

The upper ends of the arms 5 and 6 are pivotally mounted on a pin 8 carried by a head 8^a, the separate holders, however, being adapted for movement in opposite directions. The arms 5 engage slots 9 spaced apart in the head at equal distances from its axis, and parallel to a larger central slot 10, within which both arms 6 engage the slot 10. Fitted within the slot 10 and between the arms 6 of the pair of holders, is an abutment or brace plate 16, extending downwardly between the holders and secured rigidly in position within the slot 10 of the head 8^a, by engagement with the pin 8 and also with an auxiliary pin 17 secured in the head in vertical alinement with but above the first-mentioned pin (see Figure 4). It will also be noted that the plate 16 is formed on its lower opposite side edges with oppositely extending stop flanges 18 to prevent the hones from swinging inwardly beyond a predetermined distance.

The drive member or head 8^a, has a shank 12 of reduced diameter, which is threaded throughout a part of its length as at 13. The upper end of the drive member is formed with a threaded socket 14 for engagement with the extremity of a rotating drive shaft 15, operated through any suitable source of power.

In order that the holders and, therefore, the hones may be positively swung outwardly on the pivot pin 8, as hereinafter explained, and caused to apply any desired pressure on the cylinder wall, a clamp sleeve 19 is provided, which is formed with an internal circumferentially-threaded flange 20 in engagement with the threads 13 of the drive member, the arrangement being such that downward adjustment of the sleeve applies pressure for imparting outward or separating swinging movement to the holders, and to facilitate this adjustment, ball-bearings 21 and 22 are provided to reduce friction between the shank and the clamp sleeve. The lower end of the clamp sleeve, which is enlarged as at 23, engages the upper

edges of flanges 24 formed on and near the upper ends of the arms 6 and extending at right angles thereto, that is toward their respective arms 5, so that they shall not interfere with the plate 16.

In operation the drive shaft 15 is rotated, and when it is desired to expand the hones, the operator lightly grasps the clamp sleeve 19 to prevent it from rotating as rapidly as the shaft. This will bring about the downward movement of the sleeve through the action of the interengaged threads 13 and 20, and the downward pressure applied by the sleeve on the flanges 24, will cause the holders to swing outwardly in opposite directions and press the hones against the cylinder wall, the hones pivotally operating, if necessary, on their pivots 4, to assume positions parallel to the wall. As this result is accomplished, the sleeve is released. It is essential that the sleeve shall be lightly or yieldingly held, as referred to, so that the hones, or either of them, if standing at an angle to the axis of the cylinder, may, upon contact with the cylinder, swing on pivotal points or point 4, to parallel relation for contact for their full length, if fully within the cylinder, on the wall thereof. It will be noticed that the hones are offset with respect to and at opposite sides of a plane bisecting the cylinder between them, that is to say, the hones are so relatively arranged that their outer edges occupy radial planes *a*—*a* back, with respect to the direction of rotation, of the radial plane *b*—*b* their inner edges, and hence, under the resistance of the wall, apply lateral pressure against the interposed brace plate 16. It has been found that this lateral or reactionary pressure is in excess of the edgewise outer pressure applied by the hones on the wall, the excess being so pronounced that if the hones are swung outward too quickly and forcefully into contact with the wall, the lateral pressure of the hones on the plate 16 in excess of the edgewise pressure develops so rapidly that the hones are unable to assume the required parallel relation for proper service, and if they fail to assume such position, the cylinder is liable to be scored horizontally by the projecting corners of the hones. In actual use the pressure of the hones on the cylinder can be increased to such a degree as to arrest the operation of the driving member.

The fact that the lateral pressure creates a resistance so quickly as to lock the hones, is apparent when the hones depend within a cylinder for less than half their length and are brought into contact in parallel relation to the cylinder wall as they retain their parallel relation and perform their polishing function efficiently, although they are applying edgewise pressure on the wall at points wholly below their pivotal points 4. In Figure 1, the rotation of the parts just mentioned is indicated, if it be assumed that the top of the cylinder occupies the position indicated by the dotted line *c*—*c* which would leave the hones when above said line, exposed and functionless as far as polishing action is concerned.

In order to prevent the accidental unscrewing of the clamp sleeve 19 from the upper end of the drive member, the upper extremity of the latter is provided with a removable guard ring 25, it being apparent that the threaded flange 20 of the sleeve will prevent such unscrewing movement in a downward direction through abutment with the head 8^a.

It is believed that the description and operation of the device has been sufficiently set forth and that no recapitulation is necessary. It is obvious from a consideration of the construction, that the clamp sleeve 19 may be caused to expand the holders from time to time to take up wear on the hones within the limit of its downward movement.

From the above description it is apparent that I have produced a construction of the character described which possesses all of the features of advantage set forth as desirable, and while I have illustrated what I now regard as the preferred form of construction, I desire to be understood as reserving the right to make all such changes or modifications as may fairly fall within the scope of the appended claims.

I claim:

1. In a device of the character described, the combination with a rotatable driving head, of a pair of holders pivoted in said head for swinging movement in opposite directions, hones carried by said holders, a sleeve cooperating with said head to swing the holders outwardly, and means interposed between the hones and offering resistance to lateral pressure applied on said hone holders by the hones when in operation.

2. In a device of the character described, the combination with a rotatable driving head, of a pair of holders pivoted in said head for swinging movement in opposite directions, hones carried by said holders, a sleeve cooperating with the head to swing the holders simultaneously outward, and a plate depending from the head between said holders and offering resistance to lateral pressure applied by the holders when the hones are performing a polishing function.

3. In a device of the character described, the combination with a rotatable driving head, of a plate projecting from and disposed in the plane of the axis of the head, a pair of holders pivoted to the head and disposed at opposite sides and in frictional engagement with said plate, and a hone pivoted to each holder for swinging edgewise with the respective holders in planes parallel to said plate and adapted in practical opera-

tion to apply lateral pressure, through the holders, onto the said plate, in opposite directions.

4. In a device of the character described, the combination with a rotatable driving head, of a plate projecting from and disposed in the plane of the axis of the head, a pair of holders pivoted to the head and disposed at opposite sides and in frictional engagement with said plate, a hone pivoted to each holder for swinging edgewise with the respective holders in planes parallel to said plate and adapted in practical operation to apply lateral pressure, through the holders, onto the said plate, in opposite directions; said plate having flanges to limit the reverse swinging movement of the holders respectively.

5. In a device of the character described, the combination with a rotatable driving head, of a pair of hones pivoted in said head for swinging movement in opposite directions, and a sleeve carried by and rotating with said head and effecting oppositely expanding swinging movement of said hones when said sleeve is held against rotation.

6. In a device of the character described, the combination of a rotatable drive shaft, a driving head on said shaft, a pair of hones pivoted in said head for swinging movement and having flanges projecting beyond the head, a sleeve having threaded engagement with the drive shaft and enclosing the head at its lower end and through contact with the hone flanges effecting oppositely expanding swinging movement of said hones when said sleeve is held against rotation.

In witness whereof I hereunto affix my signature.

WILLIAM A. JENNINGS.