April 17, 1934. C. W. FLOSS 1,955,362

LAPPING TOOL

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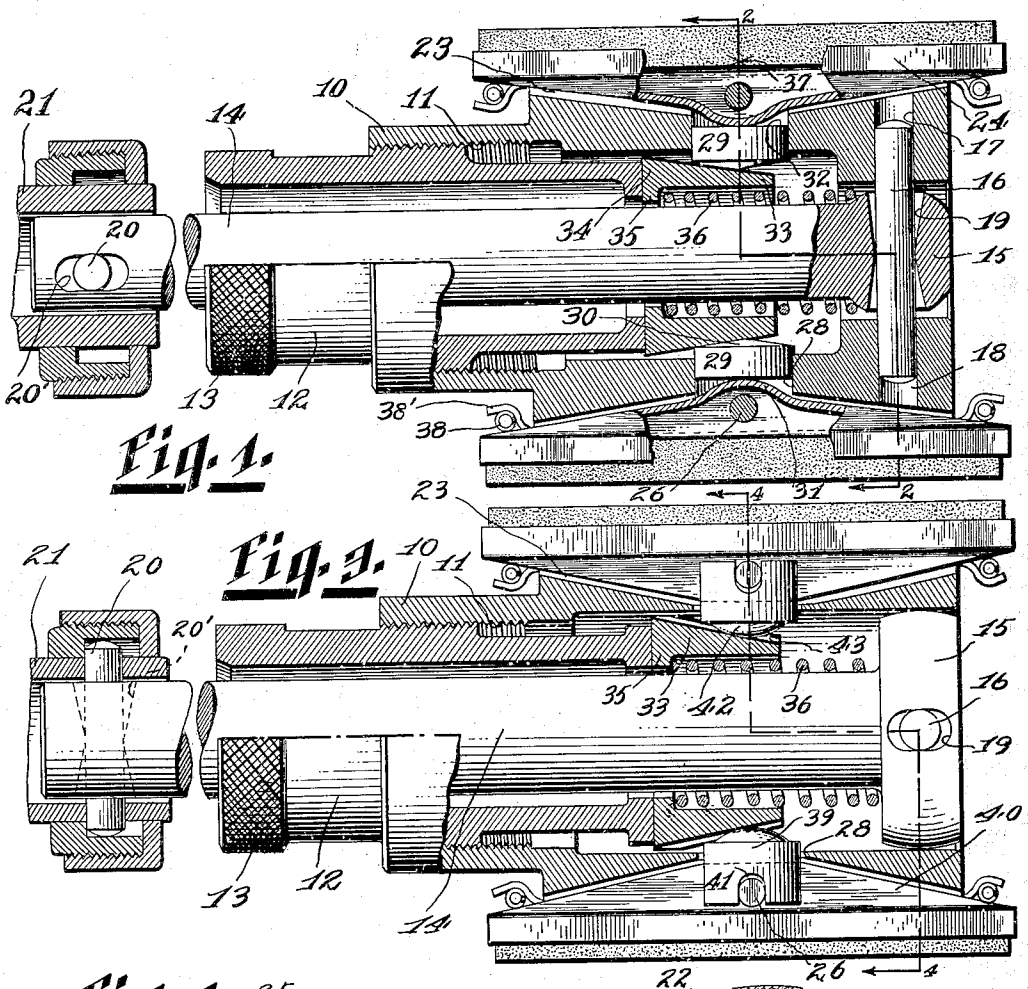


Fig. 1.

Fig. 3.

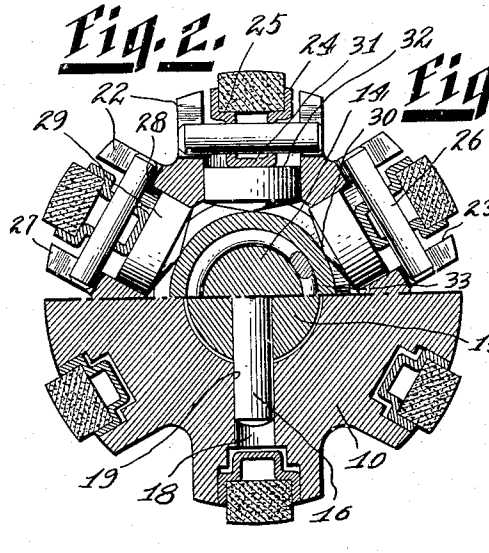


Fig. 2.

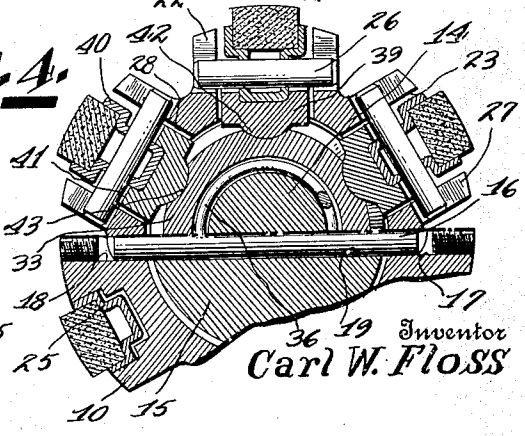


Fig. 4.

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LAPPING TOOL

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17 Claims. (Cl. 51—184.3)

This invention relates to a lapping tool, and particularly to a portable device of this character which may be employed for lapping or grinding engine cylinders.

The invention has as one of its primary objects to provide a tool of the above type arranged to have a universal driving connection with the forward end of its driving shank. This arrangement makes possible eliminating the necessity, otherwise present, of aligning the cylinder with the drive shaft, and renders possible the production of a commercially satisfactory construction which can be cheaply and durably manufactured, assembled and installed.

A further advantageous feature of this invention resides in the pivotal mounting of the stone carriers upon the device, together with the particular adjusting means for the stone holders, slidably mounted in the shell. This arrangement permits the abrading elements to lie at an angle to the axis of the tool so that the latter will fit into a bore having a slight taper. Moreover by reason of the foregoing construction uneven wear of the stones will be automatically compensated for.

Other advantages and novel features of construction which contribute materially to the mechanical efficiency of the apparatus and also add materially to its commercial value and acceptability, and structural features of the invention, will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a vertical sectional view through a lapping tool constructed in accordance with my invention;

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1 and looking in the direction of the arrows;

Figure 3 is a view similar to Figure 1 showing a modified form of the invention; and

Figure 4 is a sectional view taken substantially on the line 4—4 of Figure 3 and looking in the direction of the arrows.

Referring now particularly to the drawing, throughout which like reference characters indicate similiar parts, it will be noted that the frame of the device consists in a tubular shell or frame 10 internally threaded at one end thereof as indicated at 11 for receiving the tubular adjusting member 12 having the knurled gripping portion 13 at the rear end thereof whereby the member may be positively fed longitudinally of the tubular shell 10. Extending through the member 12 in spaced relation to the inner walls thereof is a driving shank 14 terminating at the forward end in an enlarged partly spherical portion 15, the diameter of the enlarged portion being substantially the same as the interior diameter of the shell so that the spherical portion has a rolling or universal engagement with the interior wall of the shell. To furnish driving connection between the shell and enlarged portion 15, I provide a pin 16, journaled in the apertures 17 and 18 formed in the shell, and extending through a bore 19 formed in the enlarged portion 15. As clearly shown in Figure 1 the bore 19 is tapered to a corresponding degree in opposite directions from the mediar line of the shank to the periphery of the partly spherical portion 15. With the foregoing arrangement it will be immediately apparent that the shank 14, while capable of limited lateral or rocking movement about the pin 16 relatively to the shell 10, will be prevented from axial displacement longitudinally of the shell. For driving the shank 14 I provide a pin 20 extending through a bore 20' formed in the shank adjacent the rear end thereof and journaled in the tubular driving member 21. The bore 20' preferably extends through the shank at right angles to the bore 19 and is tapered in a corresponding manner, this arrangement permitting lateral movement of the shank relatively to the driving member as well as to the shell. Thus from the foregoing it will be apparent that inasmuch as the shank is universally connected at the forward end to the shell 10 and is capable of lateral movement with respect thereto, and inasmuch as the rear end of the shank is in effect universally connected to the driving member by means of the pivot pin 20 extending at right angles to the driving pin 16, any misalignment between the driving member 21 and shank 14 with respect to the cylinder bore will thereby be compensated for.

The shell 10 is provided with a series of radial projections 22 having recesses 23 therein for receiving the stone holders 24 which are substantially channel-shape in cross section and provided with shoulders 25 constituting seats for the stones.

Extending transversely of and secured to the stone holders at the center thereof are the pins 26 which as shown project outwardly from opposite sides of the stone holders and engage in the elongated slots 27 formed in the projections 22 of the shell. The shell 10 is further formed with a series of radially spaced apertures 28 for slidably receiving the blocks 29 which as shown are provided each with a conical inner face 30. Project-

ing inwardly from the stone holders at the longitudinal centers thereof are the partly cylindrical convexed portions 31 arranged to engage the substantially flat outer surfaces 32 of the blocks 29. The conical inner surfaces 30 of the blocks engage or rest upon the frusto-conical tubular cam member 33 slidably mounted within the shell 10 adjacent the adjusting member 12 and provided with an inwardly extending annular shoulder 34 at the rear end thereof constituting an abutment 35 for the rear end of the coil spring 36 which surrounds the shank 14 adjacent the forward end thereof and engages the enlarged portion 15 of the shank. The coil spring operates to hold the frusto-conical member in contact with the adjusting member 12, so that when this latter member is fed longitudinally of the shell, by turning the same, it will impart longitudinal movement to the frusto-conical cam member 33 against the tension of the spring 36, and owing to the particular connection between the cam 33 and stone holders 24, as heretofore pointed out, the stone holders will be moved radially outwardly. To provide a more efficient construction, and to prevent the stone holders 24 from rocking about the pins 26 after the tool has been adjusted to a predetermined diameter, the convexed portions 31 are struck from the axes 37 which as shown are positioned radially outwardly from the axes of the pins 26 and in parallel alignment therewith. Such arrangement allows free movement of the stone holders about the pins until pressure is exerted on them radially, such as takes place when the tool is adjusted inside the cylinder. The stone holders are then held rigid owing to the fact that the cylindrical surfaces 31 of the stone holders 24 are developed from the axes 37, which as heretofore pointed out are spaced a substantial distance outwardly from the axes of the pins 26, and accordingly the stone shoes are in effect pivoted about the centers 37 and are not capable of pivotal movement about the pins 26. In other words, when the tool is in use, the spherical portions 31 are not permitted to rock about the flat surfaces 32 of the blocks. Thus it will be noted that when pressure is exerted upon the stones, the diameter to which the tool is adjusted remains fixed, irrespective of the condition of the cylinder bore.

Tension members, preferably in the form of annular coil springs 38, are arranged to engage the tongues 38' formed on the opposite ends of the stone holders 24, to normally draw these stone holders radially inwardly, thereby holding the convexed surfaces 31 formed on the members 28 in positive engagement with the cam 33.

In operation, the tool will be inserted in an engine cylinder, and the shank, which is connected to a suitable source of power is rotated, whereupon the effective grinding surfaces of the stones engage the cylinder wall for grinding or lapping the same. As the grinding or lapping operation proceeds, the diameter of the grinding tool may be readily increased by merely rotating the member 12 relatively to the shell 10. Such rotative adjustment of the member 12 causes the tubular cam member 33 to move longitudinally, and owing to the connection between the member 33 and stone holders 24, the latter together with the stones will simultaneously move outwardly a uniform distance. It should be noted that with the foregoing arrangement an outward pressure will be exerted equally on all of the stones at the longitudinal centers of the stone holders. This uniform outward movement of the stone holders will be equally resisted by the tension members 38. Furthermore, the arrangement of the parts is such that an absolutely rigid structure is presented, as there is an unyielding wedging connection between the frusto-conical member 33 and stone holders, and of course an unyielding connection between the stone holders and grinding stones.

In the modified form of the invention illustrated in Figures 3 and 4 I provide a slightly different form of stone holder. As shown in the aforesaid figures I provide a block 39 rigidly secured to the stone holders 40 at the longitudinal centers thereof, and slotted as at 41 for receiving the projecting ends of the pins 26. The blocks 39 project through the apertures 28 in the shell 10, and each has a partly spherical inner face 42 engageable in the circumferentially spaced grooves 43 formed in the frusto-conical tubular member 33. The partly spherical face 42 is so developed with respect to the center of the pins 26 that rocking movement of tne convexed face 42 relative to the frusto-conical member is prevented when the tool is adjusted to a predetermined diameter within the cylinder bore.

What I claim as my invention:

1. In a lapping tool, a shank, a rotatable tubular frame receiving a portion of said shank and secured to and adjacent the end thereof but capable of lateral movements with respect thereto, and a stone holder pivotally connected intermediate the ends thereof to said frame.

2. In a lapping tool, a tubular frame, stone holders mounted upon said frame for radial adjustment, a shank extending through said frame having an enlargement upon one end thereof engageable with the inner walls of said tubular frame for effecting a universal movement of the latter about the shank, and a driving connection between the enlargement and the forward end of the frame.

3. In a lapping tool, a shank, a tubular frame universally mounted upon the forward end of said shank but in driving engagement therewith and having a series of spaced apertures therein, a cam member surrounding said shank in spaced relation thereto within said tubular member, a plurality of blocks movably mounted within said apertures and engageable with the cam member, and a plurality of stone holders rigidly secured to the blocks.

4. In a lapping tool, a tubular frame having a series of radially movable blocks therein, stone holders mounted in said frame and rigidly carrying the blocks, a cam engageable with the blocks, an adjusting member threadingly engaging the tubular frame and engageable with the cam to move the same longitudinally of the tubular frame for moving said blocks radially to adjust the stone holders, and a driving shank extending freely through and spaced from the adjusting member and cam and connected to the frame adjacent the forward end thereof for rotating the same in a manner permitting limited universal movement between them.

5. In a lapping tool, a shank, a tubular frame positioned upon the shank, stone holders arranged upon said frame each rigidly carrying a block portion substantially at its longitudinal center, said block portions projecting into the frame, a cam member slidably arranged in said frame and engageable with the block portions, an adjusting member engageable with the cam member for moving the same longitudinally to adjust the stone holders radially, and yieldable

means engageable with the cam member to hold the same in engagement with the adjusting member.

6. In a lapping tool, a shank, a tubular frame mounted upon the shank at the forward end thereof, a pin journaled in said frame and extending through a double tapered slot formed in the forward end of said shank, and means for driving the shank to rotate said tubular frame including a member connected to the rear end of said shank by means of a pin extending at right angles to the pin aforesaid.

7. In a lapping tool, the combination with a driving member, of a shank universally connected to said driving member, and a tubular stone carrying frame universally connected to said shank adjacent the forward end thereof.

8. In a lapping tool, the combination with a shank, of a stone carrying frame, and a universal connection between the forward end of said frame and shank.

9. In a lapping tool, a tubular frame having a plurality of radially spaced apertures therein, stone holders carried by the frame, a thrust transmitting member slidable and rockable in each aperture, and rigidly secured to a stone holder, and lateral projections carried by the stone holders intermediate the ends thereof projecting through said thrust transmitting members to enable rocking movement of the stone holders relatively to the frame.

10. In a lapping tool, a shank, a tubular frame having a driving connection with said shank, a member slidably mounted within said frame, and a stone holder trunnioned in said member.

11. In a lapping tool, a shank, a frame having a driving connection with said shank and having an aperture in one wall thereof, a member slidably mounted within said aperture and a stone holder having laterally projecting portions by means of which it is pivoted upon said slidable member, said member being radially adjustable to effect a corresponding adjustment of said stone holder.

12. In a grinding device, a head having a longitudinal bore, a series of abrading members carried by the head and radially adjustable relatively thereto, a control element in the bore arranged for adjustment of the abrading members, and a single element interposed between each abrading member and the control element and rigidly secured to the abrading member, through the medium of which an adjustment of the control element varies the position of the abrading member relatively to the axis of the tool.

13. In a lapping tool, a shank, a tubular frame mounted upon said shank having spaced apertures therein adjacent the longitudinal center thereof, stone holders positioned upon said frame, portions rigidly carried by and at substantially the longitudinal center thereof projecting inwardly through the apertures in the frame, and means for adjusting said stone holders radially including a member within the frame engaging the inwardly projecting portions of each stone holder.

14. In a lapping tool, a tubular frame, a plurality of abrading member holders mounted upon said frame, a partly spherical inwardly projecting portion carried by and at substantially the longitudinal center of each holder, each projecting through an aperture in said frame, a tapered cam member slidably arranged in said frame and engageable with the partly spherical portions, and means for moving the cam to adjust the holders radially.

15. In a lapping tool, a shank, a frame having driving connection with said shank, a stone holder pivotally mounted upon said frame and having a rounded portion spaced from the pivot, said rounded surface being developed about a center spaced from the pivotal connection, and an adjusting member also carried by the frame and having an inclined cam surface engaging the rounded portion carried by the stone holder for radially moving the same, whereby resistance to outward movement of the stone holder tends to prevent its rocking about the pivot by reason of the engagement of said rounded surface with the cam.

16. In a grinding tool, a frame having a longitudinal aperture therein, and a connecting radial aperture through its side wall, a stone holder pivotally carried by the frame for rocking movement about a transverse axis, a thrust transmitting portion rigidly carried by the stone holder and projecting inwardly therefrom into the radial aperture, said projecting thrust portion having a curved end, the curvature of which is unconcentric with respect to the axis of the stone holder, and a member against which the curved surface of the thrust transmitting member is adapted to seat when the device is in use, whereby radial pressure between them tends to lock the stone holder against pivotal movement.

17. In a grinding tool, a frame having an aperture therein, a stone holder pivotally carried by and projecting outwardly from the frame, a thrust transmitting member also carried by the stone holder and projecting inwardly therefrom into the frame, said projecting thrust member terminating in a curved end, and a member against which the curved end of the thrust transmitting member is adapted to seat when the device is in use, the center of curvature of the end of the thrust member being spaced from the pivotal axis of the stone holder, whereby upon inward pressure against the stone holder and consequent forcing of the thrust member against its seat, the stone holder is locked against rocking movement by the eccentricity of the end of the thrust member with respect to the axis of the stone holder.

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