

Jan. 12, 1932.

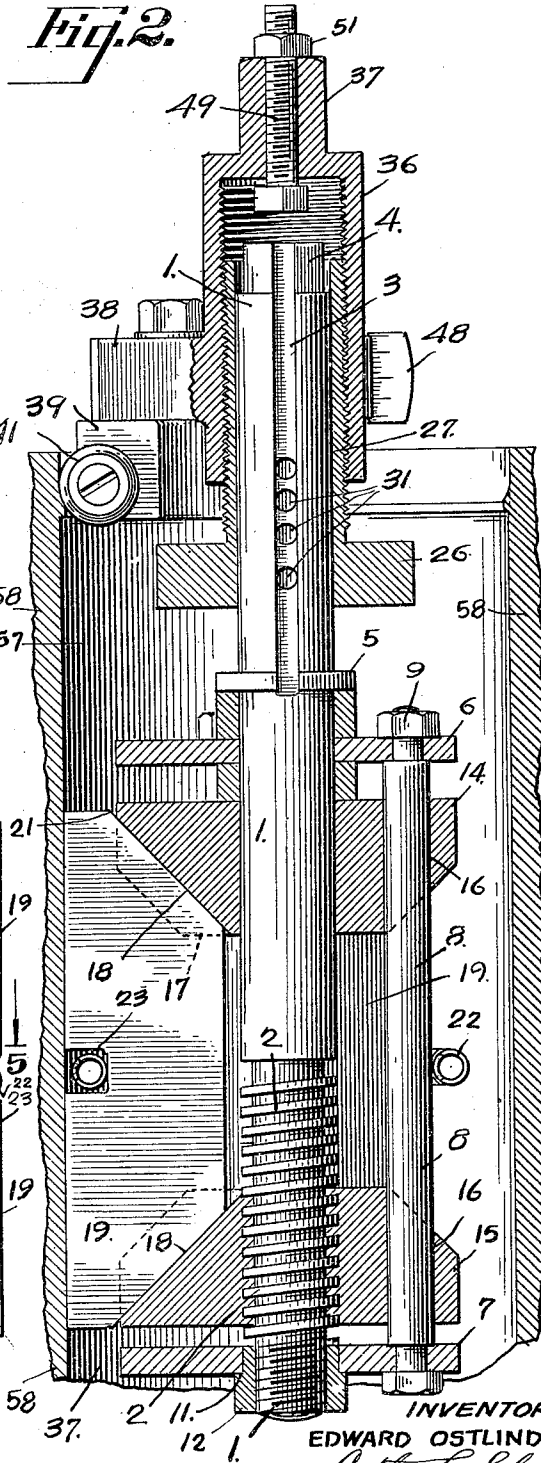
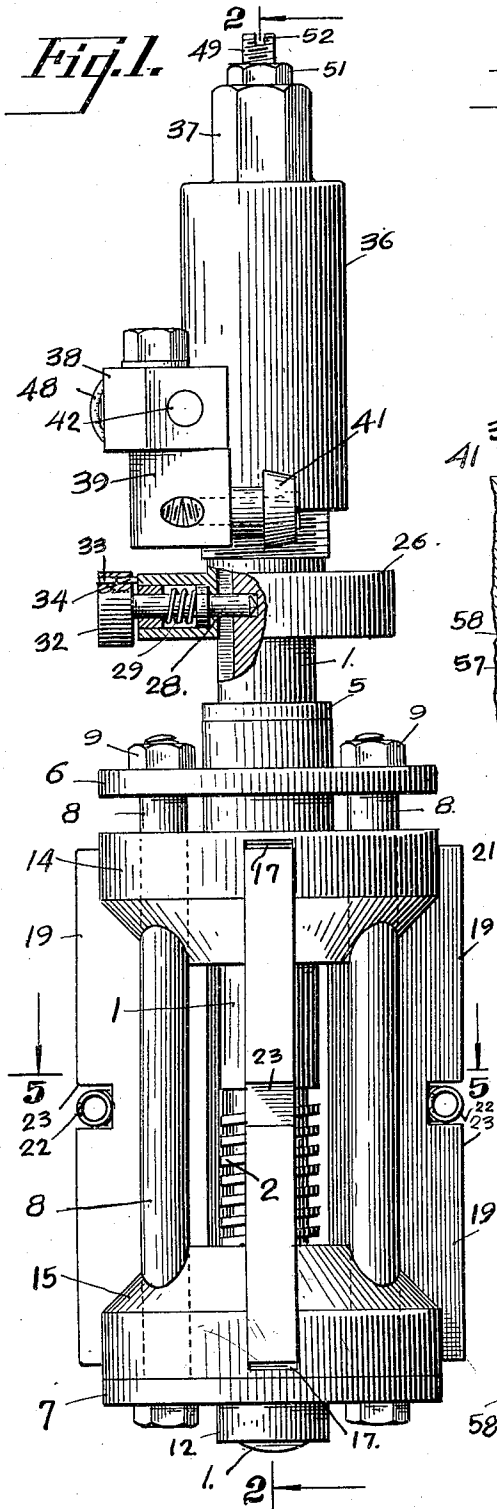
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1,840,736

COUNTERBORING TOOL

Filed Dec. 13, 1930

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

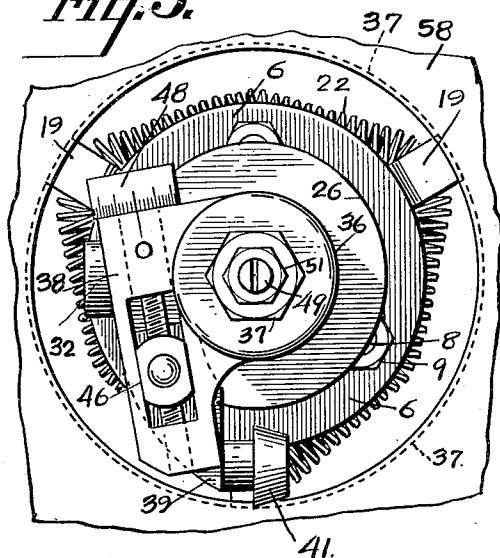


Fig. 7.

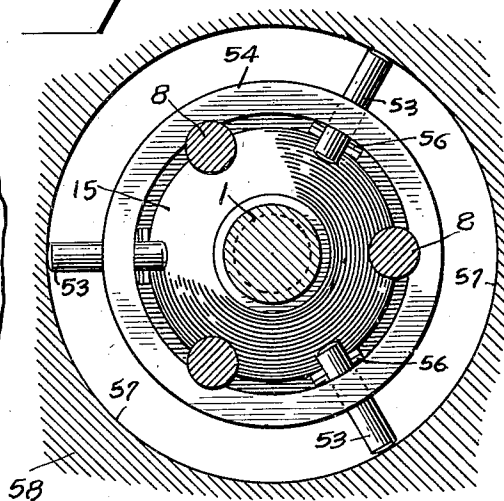


Fig. 4.

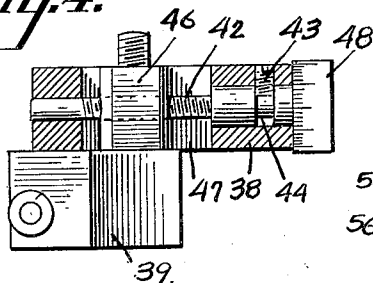


Fig. 6.

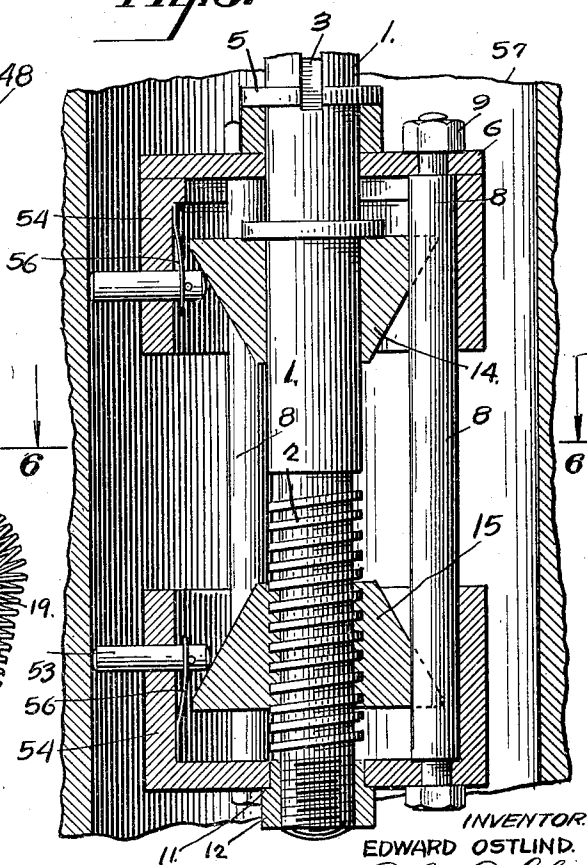
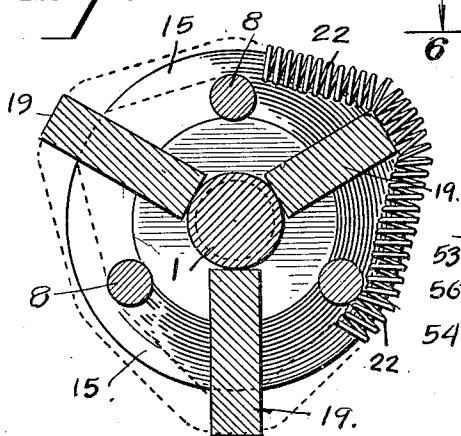


Fig. 5.



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COUNTERBORING TOOL

Application filed December 13, 1930. Serial No. 502,103.

My invention relates to improvements in tools for counter-boring the cylinders of internal combustion engines and the like, wherein a shaft is rigidly clamped within a cylinder bore of an engine in coaxial relation to the bore, the shaft being provided with an adjustably mounted cutter head having a cutter to counter-bore the cylinder.

The cylinders of internal combustion engines are subject to wear by the constant movement of the pistons and piston rings therein. This wear results in producing a slight shoulder within the cylinder at the uppermost end of the piston stroke and in the plane of the uppermost point reached by the top of the uppermost piston ring. It is common to compensate for the wear upon the piston rings and cylinders by inserting new rings upon the pistons, the new rings being usually made slightly oversize. When such rings are inserted, the new rings strike the shoulders worn by the previous rings, frequently causing an annoying knock in the engine and seriously impairing the efficiency of the rings and of the engine. This is sometimes corrected by reborring the cylinders to a uniform oversize and then installing oversize pistons and rings. This means of correction, however, is costly and unless the reborring is done with extreme care and accuracy, frequently fails to accomplish its purpose and injures, rather than improves, the engine.

My present invention is, therefore, directed to an improved tool whereby the unworn shoulder at the top of an engine cylinder bore may be easily and accurately removed.

Another object is to provide an improved counter-boring tool which may be easily and accurately adjusted to counter-bore any desired amount at the top of an engine cylinder.

A further object is to provide an improved tool which will facilitate the mounting and centering of a cutter relative to a cylinder bore to be counter-bored.

Another object is to provide an improved tool wherein the cutter carrying shaft is rigidly clamped within, and in co-axial relation to the cylinder bore, and which will facilitate the operation of a cutter within the upper end of said bore.

A further object is to provide an improved tool of the character described having simple and improved means for mounting and adjusting a cutter-head and for operating said cutter head to counter-bore the end of a cylinder bore.

A further object is to provide a simple and compact reborring tool which is hand operated and which may be efficiently operated without dismounting the cylinder block.

A still further object is to provide an improved device of the character described embodying improved features of construction and arrangement affording simplicity, economy, and efficiency in manufacture and in operation.

I accomplish these and other objects by means of the improved device disclosed in the drawings forming a part of the present application wherein like characters of reference are used to designate similar parts throughout the specification and drawings, and in which:—

Fig. 1 is a side elevation of my improved counter-boring tool, parts being broken away and shown in section;

Fig. 2 is a vertical section of the tool as applied to rebores a cylinder, the section being taken upon the line 2—2 of Fig. 1 in the direction indicated;

Fig. 3 is a plan view of the tool as shown in Fig. 1;

Fig. 4 is a sectional detail of the cutter mounting and adjusting means;

Fig. 5 is a broken transverse sectional view taken upon the line 5—5 of Fig. 1 in the direction indicated;

Fig. 6 is a broken vertical sectional view showing a modified form of the mechanism for clamping the tool within a cylinder bore; and

Fig. 7 is a transverse sectional view taken upon the line 7—7 of Fig. 6 in the direction indicated.

Referring to the drawings, the numeral 1 is used to designate in general a shaft member having a threaded portion 2 and provided with a key-way 3 longitudinally disposed at one end of the shaft member. The shaft 1 is provided with a squared end 4 to receive a

wrench or other tool by which the shaft may be rotated.

A pair of flange members 6 and 7 are rotatably mounted upon the shaft. The flange member 6 seats against a collar 5 carried by the shaft, and the members 6 and 7 are held rigidly in spaced relation by means of a plurality of spacing rods 8 having reduced ends extending through the flange members and tapped to receive nuts 9. The flange member 7 is engaged by a shoulder 11 formed upon a bushing 12 threaded or otherwise secured upon the threaded end of the shaft to form a bearing for the shaft and to retain the flange members in assembled relation upon the shaft.

A pair of wedge members 14 and 15 are mounted upon the shaft between the flange members 6 and 7. The members 14 and 15 are apertured, as at 16, to slidably engage the spacing rods 8, said rods serving as guides and operating to prevent rotation of the wedge members relative to the shaft 1. The wedge member 15 is internally threaded to engage the threads of the threaded shaft portion 2 whereby rotation of the shaft within the wedge member operates to impart axial movement to the wedge member along the shaft. The wedge members 14 and 15 are provided with a plurality of matching recesses 17 having the backs of the recesses machined to form wedge faces 18.

A plurality of clamping members 19 are mounted in engagement with the recesses 17, said members 19 having angularly disposed faces 21 seating against the wedge faces 18. A spring 22 having its ends joined to form a continuous loop extends around the members 19 and is received within notches 23 formed in the edges thereof. The members 19 are symmetrically disposed around the shaft and the faces 21 and 18 are so arranged that an axial movement of the member 16 toward the member 14 will force the clamping members 19 radially outwardly from the axis of the shaft 1.

A cutter-head mounting member designated in general by the numeral 26 is removably and adjustably mounted upon the end of the shaft having the key-way 3. The member 26 consists of a flange-like body having a threaded extension 27 axially bored to form a neat fit upon the shaft 1, the member 26 being assembled upon the shaft 1 with the extension 27 extending away from the clamping mechanism hereinabove described.

A key 28 is slidably mounted upon the member 26. The key 28 is normally moved inwardly to an operative position by a spring 29, the inner end of the key member being movable to engage the key-way 3 to prevent rotation of the member 26 upon the shaft 1, and also being arranged to engage any of a plurality of recesses 31 formed in spaced relation within the back of the key-way to pre-

vent longitudinal movement of the member 26 along the shaft. The key member 28 is provided with a head 32 having an aperture 33 therein to receive a pin 34 carried by the member 26 when the key is in operative position, the head being outwardly movable past the pin 34 and being arranged to be turned with the aperture 33 out of alinement with the pin whereby the key may be held outwardly in an inoperative position when desired.

A cutter-head designated in general by the numeral 36 is internally threaded to engage the threaded extension 27 of the mounting member. The cutter-head comprises a hollow cylindrical body closed at one end and provided with a squared extension 37 to receive a wrench or other tool by which the head may be turned upon the threaded mounting member. The cutter-head 36 is provided with a laterally disposed cutter arm 38 upon which is adjustably mounted a cutter carrier 39. A cutter 41 is mounted upon the carrier 39, the cutting edge of the cutter 41 being disposed substantially opposite to the axis of the shaft 1 and head 36. The carrier is adjustable along the arm 38 by means of an adjusting screw 42 secured against longitudinal movement within the arm by means of a member 43 engaging an annular groove 44 formed in the screw member. The screw 42 engages an extension 46 carried by the carrier 39 and extending upwardly into a slot 47 extending longitudinally of the arm 38. A calibrated head 48 is carried by the screw whereby the screw may be turned to adjust the position of the carrier and the cutter whereby the cutter 41 may be set to cut along a circular path of desired radius.

The closed end of the carrier-head is drilled and tapped to receive a stop-screw 49 threaded therethrough. The head of the screw 49 is disposed upon the inner side of the closed end, and the screw extends outwardly past the end of the squared extension 37. A jamb-nut 51 is threaded onto the outwardly extending end of the screw 49, and a slot 52 is formed in the end of the screw whereby the screw may be adjusted to position the inner end of the screw at a desired position to limit the movement of the carrier head as hereinafter more fully explained.

In Figures 6 and 7 I have illustrated a modified form of the clamping means. In this construction, pins 53 are slidably mounted in the walls of cup shaped mounting members 54 carried by the shaft 1. The pins are symmetrically disposed about the shaft 1 and are normally moved inwardly by springs 56. The wedge members 14 and 15 are arranged to engage the inner ends of the pins 53, and as said members 14 and 15 are moved toward each other the pins are forced

outwardly equally to rigidly engage the surrounding wall of a cylinder-bore and to hold the shaft 1 accurately alined in coaxial relation to said bore.

5 In operation, my improved counter-boring tool is set up and operated as follows: The shaft 1 and clamping means carried thereby is inserted downwardly into the desired cylinder bore 57 of a cylinder block 58 to a proper depth. The shaft 1 is then rotated to impart axial movement to the wedge member 15, whereby the clamping members are forced outwardly into contact with the walls of the cylinder bore, a wrench or other suitable tool being applied to obtain a proper tightening of the clamping members against the cylinder wall to rigidly clamp the device to the cylinder block with the shaft 1 extending axially upwardly from the top of the cylinder bore. In the clamping mechanism shown in Figs. 1 and 2, a rotation of the shaft 1 in a clockwise direction causes the wedge member 15 to be moved upwardly along the threaded portion 2 of the shaft 1. 15 As the member 15 is moved upwardly, the wedge faces 18 and 21 cause the several members 19 to be pressed radially outwardly equally upon all sides of the shaft, thereby accurately centering the shaft within the cylinder bore and effectually clamping the shaft in operative position.

In the modified structure shown in Figs. 6 and 7, the clockwise rotation of the shaft first moves the wedge member 15 upwardly until the pins 53 engaged thereby are pressed outwardly to engage the walls of the cylinder. As the pins are forced into clamping engagement with the cylinder wall, the shaft 1 feeds downwardly through the member 15, thereby causing the wedge block 14 to be forced downwardly to displace the pins 53 engaged thereby to their clamping positions. The pins are displaced radially equally in all directions, thereby accurately centering the shaft within the cylinder bore, and clamping the shaft in operative position.

When the shaft 1 has been clamped in its operative position, the mounting member 26 is moved onto the upper end of the shaft 1 and set in a desired adjusted position. In adjusting the member 26, the key member 28 is moved outwardly to its inoperative position and the member 26 is lowered to the desired position relative to the top of the cylinder bore 57, as shown in Figs. 1 and 2 of the drawings, the key being then released to operative position engaging a recess 31 whereby the member will be held against rotation or longitudinal movement.

60 The cutter-head 36 is then screwed onto the threaded extension 27. The cutter 41 is adjusted by means of the screw 42 to cut the desired depth of cut from the cylinder wall, and the stop-screw 49 is adjusted so that the head will engage the upper end of the shaft 1

and limit the downward movement of the carrier when the cutter has been advanced a desired distance into the top of the cylinder. Thus, assume that the cylinder wear has left a shoulder of a depth of five one-thousands of an inch which extends from the top of the cylinder downwardly for one half-inch to the end of the piston ring travel. The cutter is set to make a cut of a depth equal to the depth of the shoulder, and the stop screw is adjusted so that the downward movement of the cutter-head will be stopped when the cutter has been made for a distance of one half inch along the cylinder wall.

The cutter-head 36 is then rotated by means of a wrench or other suitable tool applied upon the squared extension 37, the threaded engagement with the mounting member extension 27 causing the head to be fed downwardly to make the required cut. At the end of the cut, the key member 28 is moved outwardly to its inoperative position, and the cutter head is given a few turns to smooth off and finish the cut, the mounting member and the head being rotated together without advancing the cutter relative to the cylinder bore.

The above operation is repeated for the several cylinders of an engine, thereby accurately removing the shoulder resulting from wear and obtaining a true and uniform bore without the labor and expense of dismounting the cylinder block. After the initial adjustment to one cylinder, the tool may be removed and reset in connection with succeeding cylinders of the same size with very little time or labor. The clamping means affords a wide range of adjustment so that the device may be readily adjusted to cylinders of various diameter, and the length of the shaft 1 and key-way 3 is sufficient to meet the requirement of substantially any depth of cylinder.

Specific details of construction and arrangement as herein illustrated and described are, of course, subject to modification in a great many ways without departing from the spirit of my invention. I therefore do not wish to be restricted to the specific details of the disclosure herein contained, but desire to avail myself of all modifications which may fall within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A counter-boring tool comprising a shaft having a key-way longitudinally disposed along one end thereof and having a plurality of spaced recesses in the back of the key-way; means mounted upon the other end of the shaft and expandible within a cylinder bore to rigidly support the shaft in coaxial relation to the bore; a cutter-head mounting member mounted upon the shaft and provided with a securing member engaging the key-way to hold the member against rotation

relative to the shaft and also engaging a desired recess to secure the member against longitudinal movement along the shaft, said securing member being movable to disengage the key-way and recess to release the mounting member for free longitudinal and rotative movement when desired; a cutter-head detachably mounted upon the mounting member and having threaded engagement therewith to feed the head axially relative to the shaft; and a cutter mounted upon the head and movable thereby to counter-bore the adjacent end of the cylinder bore.

2. A counter-boring tool comprising a shaft having a key-way longitudinally disposed along one end thereof and having a plurality of spaced recesses in the back of the key-way; means mounted upon the other end of the shaft and expandible within a cylinder bore to rigidly support the shaft in coaxial relation to the bore; a cutter-head mounting member mounted upon the shaft and provided with a securing member engaging the key-way to hold the member against rotation relative to the shaft and also engaging a desired recess to secure the member against longitudinal movement along the shaft, said securing member being movable to disengage the key-way and recess to release the mounting member for free longitudinal and rotative movement when desired; a cutter-head detachably mounted upon the mounting member and having threaded engagement therewith to feed the head axially relative to the shaft; a cutter mounted upon the head and movable thereby to counter-bore the adjacent end of the cylinder bore; and means to limit the inward axial movement of the cutter-head relative to the cylinder bore.

In witness whereof I hereunto set my signature.

EDWARD OSTLIND.