

Jan. 2, 1945.

J. A. ANDERSON

2,366,467

TOOL FOR REMOVING VALVE SEATS, BUSHINGS, OR THE LIKE

Filed Dec. 31, 1943

Fig. 1.

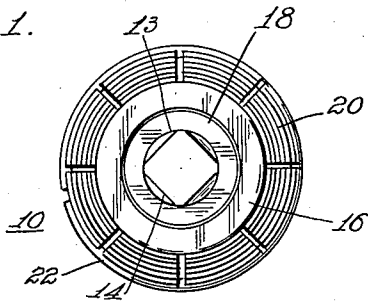


Fig. 2.

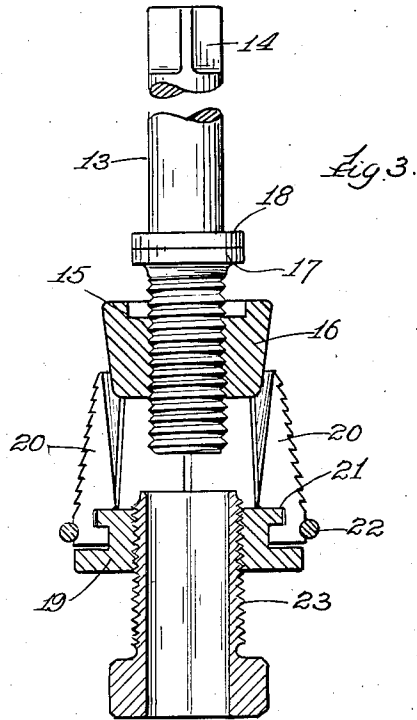
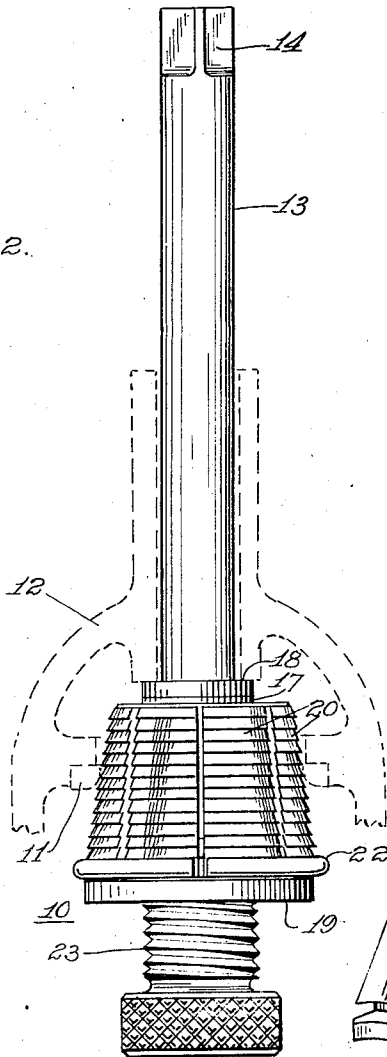


Fig. 3.

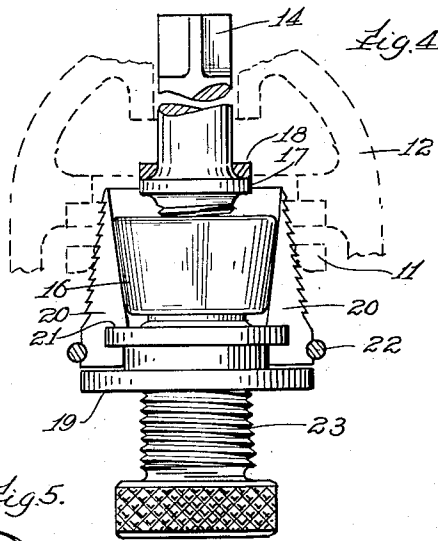


Fig. 4.

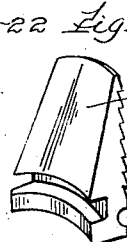


Fig. 5.

Inventor
John A. Anderson,
by Stebbins, Blank & Webb
Attorneys

UNITED STATES PATENT OFFICE

2,366,467

TOOL FOR REMOVING VALVE SEATS, BUSHINGS, OR THE LIKE

John A. Anderson, Pittsburgh, Pa.

Application December 31, 1943, Serial No. 516,372

8 Claims. (Cl. 29-265)

This invention relates to a tool of the type generally known as bushing pullers or extractors. In particular, it relates to a device for removing the valve-seat inserts used in internal-combustion engines.

In the maintenance of internal-combustion engines subjected to severe service, it is necessary to remove the valve-seat inserts when they have become worn, burned or pitted. The removal of the inserts, however, has been attended with such difficulty that it has been the practice in servicing airplane engines to replace the entire cylinder with a new one having an insert fitted therein.

I have invented a novel form of puller or extractor particularly suited for the removal of valve-seat inserts but also applicable to the extraction of other forms of rings, sleeves or the like positioned in a housing. In a preferred embodiment, my invention comprises a tapered plug adapted to be positioned within the ring or sleeve to be extracted. A screw shaft threaded into the plug extends outwardly of the housing in which the insert or bushing is positioned and has a thrust bearing engaging the housing. A plurality of exteriorly toothed segmental wedges mounted on a common support are adapted to be thrust between the plug and the interior of the valve seat or bushing. The mounting means for the wedges, conveniently a thimble, has a screw threaded therethrough adapted to be engaged by the plug to limit the movement of the latter relative to the wedges. After engagement of the screw by the plug on initial rotation of the screw shaft, the wedges having been forced into firm biting engagement with the insert or bushing, are forced axially of the screw shaft on further rotation thereof and thereby exert a powerful thrust on the insert or bushing tending to remove it from the cylinder or other housing.

Further details, novel features and advantages of the invention may be readily understood from the following detailed description which refers to the accompanying drawing illustrating the preferred embodiment. In the drawing,

Figure 1 is a plan view of the tool;

Figure 2 is a side elevation showing the tool in position to remove a valve-seat insert;

Figure 3 is an axial section with the parts in extended relation;

Figure 4 is an elevation with parts in section along an axial plane, showing all the parts in collapsed relation after the insert has been removed; and

Figure 5 is a perspective view of one of the wedges.

Referring in detail to the drawing, my valve-seat extractor indicated generally at 10 is well adapted for the removal of a valve-seat insert 11 from an engine cylinder 12 or other housing in which it may be positioned. The tool 10 comprises a screw shaft 13 squared at one end to receive a wrench, as indicated at 14. The other end of the shaft is threaded as at 15 and is provided with a tapered plug 16. The shaft has a shoulder 17 adjacent the threaded end and a thrust bearing washer 18 resting on the shoulder is adapted to engage the interior of the housing 12, as shown in Figure 2.

A thimble or sleeve-nut 19 is provided with a plurality of exteriorly toothed segmental wedges 20 assembled thereon adapted to be telescoped on the plug 16. The thimble has a shoulder 21 and the lower ends of the segments are slotted to accommodate it. A spring ring 22 holds the segments in assembled relation on the thimble but permits slight radial movement of the segments. The thimble is tapped to receive a hollow screw 23. The inside diameter of the screw 23 is large enough to accommodate the end of shaft 13 so that the end of the screw 23 may be brought to bear against the plug 16.

In using the tool, the shaft 13 is inserted through the inner end of the cylinder or housing 12 so that the squared end 14 passes outwardly through the extension for the accommodation of the valve-stem bushing (not shown). When the shaft 13 has been positioned as shown in Figure 2, the plug 16 should lie within the insert 11 and may be turned one way or the other, if necessary, to bring it to the proper position. With the screw shaft and plug in place, the wedges 20 assembled with the thimble 19 are thrust forcibly into the space between the plug and the insert. The screw 23 is preferably first retracted to about the position shown in Figure 3. It will be apparent that the wedges will be spread by the plug 16 so that their toothed exteriors have initial engagement at least, with the valve seat 11. The screw 23 is then turned up until it is spaced a short distance from the plug. The proper relation may be obtained by turning the screw until it bears on the plug and then backing it up a turn or so. It will be understood that when the screw 23 is turned up, it receives the threaded end of the screw shaft 13 interiorly.

With the parts in the relation described, i. e., as shown in Figure 2, the shaft 13 is turned by any suitable means in such direction as to force the plug 16 downwardly. The reaction of the thrust on the plug is sustained by the bearing

washer 18 on the shoulder 17 of the shaft. The initial downward movement of the plug 16 forces the wedges 20 into positive biting engagement with the insert 11. The initial engagement of the wedges with the insert holds them against rotation or axial movement while the initial advance of the plug firmly sets the teeth of the wedges into the insert. If screw 23 has been properly positioned, the plug 16 will engage the end of the screw by the time the plug has descended far enough to set the teeth of the wedges into the insert. Thereafter, continued rotation of the shaft 13 applies thrust directly from the plug 16 to the screw 23 and thence to the wedges 20. When this thrust builds up to the required value, the insert 11 is pulled out of the housing 12 whereupon the entire tool with the insert thereon may be withdrawn, as shown in Figure 4. It will be understood that the plug 16 is held against rotation at all times by the frictional engagement thereof by the interior surfaces of the wedges 20.

When the tool with the insert thereon has been removed, the assembled wedges 20 may be removed from the plug 16 by turning up the screw 23. The wedges are thereby permitted to collapse, freeing the insert 11. The assembled wedges 20 with the thimble 19 together constitute a tapered expansible gripper adapted to have biting engagement with the interior of the insert 11.

It will be apparent from the foregoing description that my invention provides a simple yet highly effective tool for extracting valve-seat inserts, other types of rings or bushings positioned with a tight fit within a cylinder, bearing or other housing. By the aid of the tool, the removal of rings, bushings or the like may be performed rapidly and without difficulty. In fact, the operation is so simple that it may easily be performed by unskilled labor. The tool is inexpensive to manufacture and requires no maintenance in use. The economy obtainable by the use of the tool in servicing airplane engines as compared with the prior practice of replacing the entire cylinder, is readily apparent.

Although I have illustrated and described but a preferred embodiment, the invention may be modified as to the construction or arrangement of the parts without deviating from the fundamental principle thereof or the scope of the appended claims:

I claim:

1. A device for pulling valve seats or the like comprising a thimble, an expansible, tapered gripper adapted to be inserted in a valve seat, said gripper including toothed segmental wedges movable radially on said thimble, an expander plug adapted to engage said wedges interiorly, a screw shaft threaded into said plug having means engaging a fixed abutment, and a screw threaded into said thimble adapted to be engaged by said plug.

2. A device for removing valve seats or the like from a housing comprising a screw shaft insertible through the seat having a shoulder adapted to engage the housing, a tapered plug threaded on said shaft so as to be disposed within said seat, a plurality of exteriorly toothed segmental wedges adapted to be inserted between said plug and seat and effective to firmly engage the seat on advance of said plug and eventually to displace

the seat from the housing, and means limiting movement of the plug relative to the wedges on rotation of said shaft.

3. Apparatus for removing valve seats or bushings from housings comprising a tapered pusher plug disposed within said seat, a screw shaft adapted to be threaded into said plug and extend outwardly of the housing, a thrust bearing on said shaft engaging the housing, segmental exteriorly toothed wedges adapted to be driven between said plug and seat, common mounting means for said wedges, and means limiting movement of the plug relative to the wedges on rotation of said shaft.

4. Apparatus for removing valve seats or bushings from housings comprising a tapered pusher plug disposed within said seat, a screw shaft adapted to be threaded into said plug and extend outwardly of the housing, a thrust bearing on said shaft engaging the housing, segmental exteriorly toothed wedges adapted to be driven between said plug and seat, common mounting means for said wedges, means limiting movement of the plug relative to the wedges on rotation of said shaft, said means comprising a screw on said mounting means adapted to be engaged by said plug, whereby to push said seat out of the housing.

5. Apparatus for exerting a thrust on a ring or sleeve positioned in a housing comprising a tapered plug adapted to be disposed within the ring or sleeve, a screw shaft having a thrust bearing on the housing threaded into said plug, a plurality of exteriorly toothed segmental wedges adapted to be thrust between said plug and the ring or sleeve and forced outwardly and axially by advance of said plug, and means for limiting advance of the plug relative to said wedges.

6. A device for pulling valve seats or the like comprising a screw shaft adapted to be inserted through a valve seat and having means engaging a fixed abutment, a sleeve having a plurality of exteriorly toothed segmental wedges thereon adapted to be telescoped over said shaft, an expander plug threaded on said shaft adapted to engage said wedges interiorly, and a screw threaded into said sleeve adapted to be engaged by said plug.

7. A device for pulling valve seats or the like comprising a screw shaft adapted to be inserted through a valve seat and having means engaging a fixed abutment, an expander plug threaded on said shaft, an assembly of segmental wedges toothed exteriorly, adapted to be inserted between said plug and valve seat, a nut mounting said wedges for radial movement and a screw threaded in said nut adapted to be engaged by said plug to force the wedges axially along the shaft after the plug has expanded the wedges into binding engagement with the seat.

8. A device for pulling valve seats or the like comprising a screw shaft adapted to be inserted through a valve seat and having means engaging a fixed abutment, an expander plug threaded on said shaft, segmental wedges toothed exteriorly, a carrier on which said wedges are assembled whereby they are adapted to be inserted between said plug and valve seat, said carrier mounting said wedges for radial movement, and a screw threaded into said carrier adapted to be engaged by said plug when advanced by rotation of the screw shaft.

JOHN A. ANDERSON.