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VALVE SEAT INSERT TOOL

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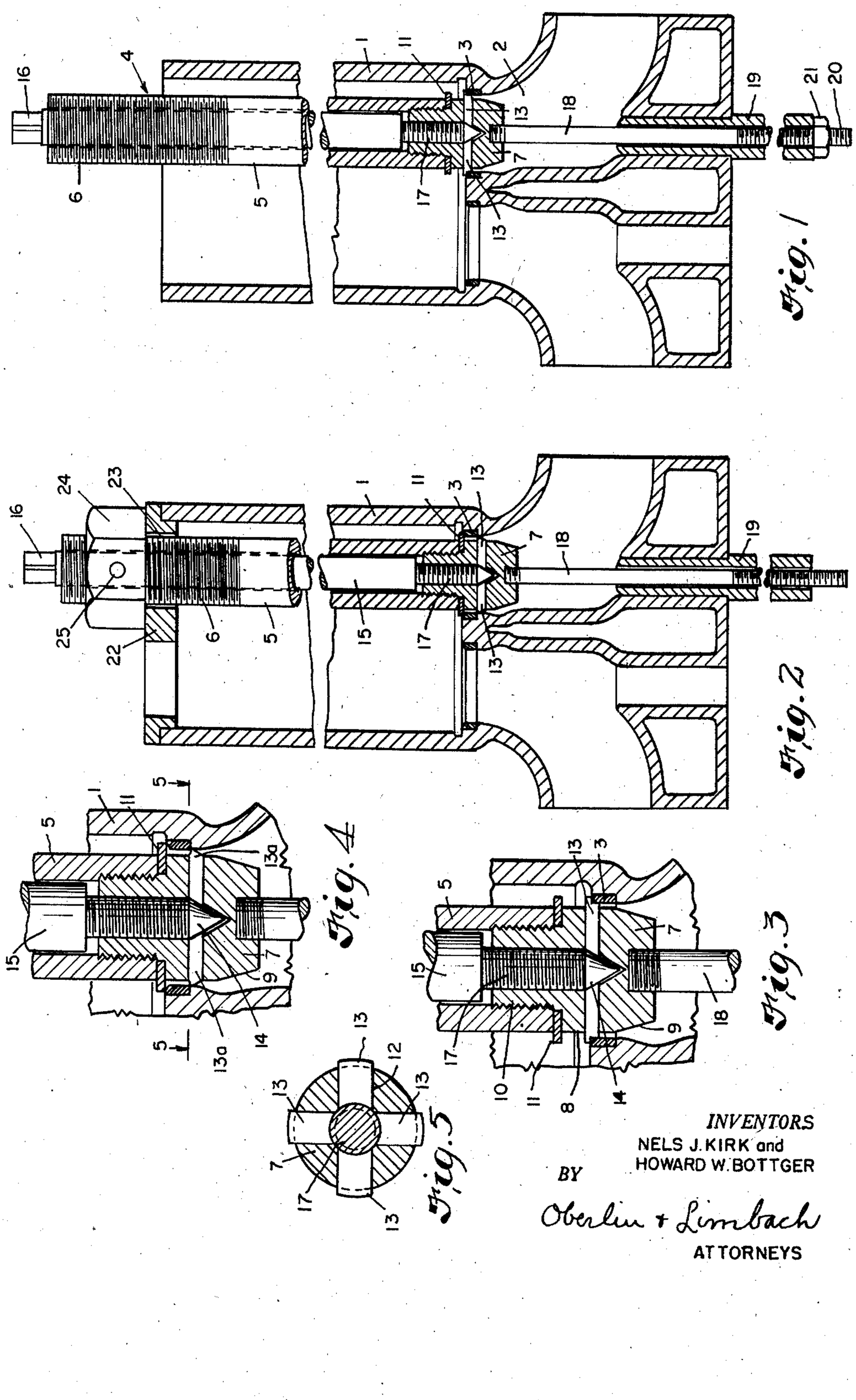

Fig. 1

Fig. 2

Fig. 4

Fig. 3

Fig. 5

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VALVE SEAT INSERT TOOL

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1 Claim. (Cl. 29—263)

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This invention relates as indicated to valve seat insert tools and more particularly to a tool useful for the purpose of removing, inserting, or replacing annular valve seat inserts such as are commonly employed around the valve ports of internal comubustion engines.

Inserts of the type referred to are usually made of a hard material such as Stellite and are held in place by friction. A convenient way of securing the necessary frictional engagement between the insert and the engine block is to supercool the insert prior to moving it into place whereupon its expansion on reaching the temperature of the engine block forces it against the confining portions of the engine block holding it securely in place.

Valve seat inserts of this type are usually machined whenever replacing becomes necessary since the usual hand-lapping operation does not provide the desirably accurate finish which is necessary for best operation of the engine and which can be secured by the grinding operation. Such grinding operation, however, wears down the valve seat insert at a much more rapid rate than the hand-lapping operation, resulting in the necessity for more frequent replacement of the inserts. When it becomes necessary to replace an insert, the task of removing the old insert is a major one because of the extremely tight frictional fit between the insert and the engine block as above described. Also when replacing or installing a new insert, it is essential that the same be moved firmly to its seat so that upon subsequent expansion, due to the insert becoming warmed, it will be in proper position.

It is a principal object of our invention to provide means by which the operations above described may be quickly and easily performed.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claim, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a broken sectional view showing the tool of our invention being employed for the purpose of installing a new valve seat insert;

Fig. 2 shows the use of the same tool for the purpose of removing a previously installed insert;

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Fig. 3 is an enlarged sectional view of a portion of Fig. 1, showing more particularly the manner in which the tool engages the valve seat insert;

Fig. 4 is an enlarged sectional view similar to Fig. 3 but showing a portion of Fig. 2; and

Fig. 5 is a transverse sectional view of the structure illustrated in Fig. 4 taken on a plane substantially indicated by the line 5—5.

Referring now more particularly to the drawing and more especially to Fig. 1, there is here illustrated a conventional engine block generally indicated at 1, which may be for example the engine block of a Waukesha C. F. R. Octane Rating Engine, and which in the opening leading to one of the ports 2 is provided with a replaceable insert 3 with which the poppet valve not shown is adapted to engage.

The tool generally indicated at 4 and which comprises our invention, and which is designed for the purpose of installing and replacing valve seat inserts such as 3, comprises a body portion generally indicated at 5 which is cylindrical in form and externally threaded as at 6 at one end thereof. Threadably secured in the opposite end of the body 5 is a chuck member generally indicated at 7, the construction of which is illustrated somewhat more clearly in Fig. 3.

The chuck member 7 as thus illustrated in Fig. 3 comprises a substantially cylindrical body portion 8 tapered slightly at its forward end 9, and having an exteriorly threaded reduced portion 10 by which the chuck is threadably engaged in the lower end of the main body member 5.

A preferably flat annulus 11 is positioned between the chuck and body member 5 and by the same held rigidly with respect to the body 5 so as to provide a radially extending flange hereinafter for convenience referred to as the gauge depth ring.

The chuck 7 is provided with radially extending slots 12 in which are slidably mounted jaws 13. The inner ends of the jaws 13 are chamfered so as to provide a cam surface engaged by the tapered lower end 14 of a chuck adjusting screw 15 which extends upwardly through the body 5 and which at its upper end 16 is provided with a flat-faced terminus for engagement by a common type of wrench. The interior of the chuck 7 is threaded to receive the threaded end 17 of the adjusting screw 15 so that, as the adjusting screw 15 is moved downwardly upon clockwise rotation thereof, the pointed end 14 will engage the inner ends of the jaws 13 and force the same radially outwardly.

In the normal operation of our improved tool

it requires the use of one type of jaw when installing a valve seat insert, and a slightly different type of jaw when removing a valve seat insert. The type of jaw used in installing the insert is, as indicated in Fig. 3, provided at its outer end with an angular shoulder whereby the cylindrical face on the outer end of the jaws engages the inner periphery of the annular insert and the radial face of such jaw ends engages one of the radial faces of the annular insert so that the latter may be forceably moved downwardly as the tool is forced downwardly in the manner presently to be explained.

Threadably engaged in the lower end of the chuck **7** is a rod **18**. The rod **18** is preferably arranged coaxially with the main body **5** of the tool, and of such an outside diameter as to be snugly embraced by the valve stem guide **19** of the engine block. The first function of the rod **18** is to guide the tool to insure proper seating of the valve seat insert as the same is moved to its proper place. The second function of the rod **18** is to force the insert to its seat. This latter function is accomplished by having the end of the rod **18** threaded as at **20**, and by threading a nut **21** thereon into engagement with the lower end of the valve stem guide, such action serving to move the entire tool with its clamped valve seat insert downwardly until the insert is in proper position.

The foregoing operation of installing the insert is generally accomplished in the following procedural manner:

First, the tool before being installed in the engine as illustrated in Fig. 1 has the valve seat insert **3** clamped thereon. Second, the assembly is then, and before installation in the engine, supercooled so as to shrink the valve seat insert. The supercooled assembly is then inserted in the engine block and the valve seat insert moved to its proper place by the procedure previously described, whereupon the valve seat insert is permitted to come to room temperature, expanding the same and moving it into tight engagement with its seat.

The procedure in removing a previously installed valve seat insert by the use of the tool of our invention is as follows:

The nut **21** is removed from the rod **18** and not used during this operation. A buttress plate **22** is placed over the upper end of the engine head, which plate is provided with an opening **23** in axial alignment with the valve stem insert to be removed. A nut **24** is loosely threaded on the thread end **6** of the body **5**. The tool is then inserted through the opening **23** with the rod **18** extending through the valve seat guide **19** until the gauge depth ring **11** rests on the upper end of the valve seat insert **3**. The nut **24** is then threaded downwardly until it lightly engages the plate **22**. The screw **15** is then rotated in a direction to drive the same downwardly and force the jaws **13***a* outwardly into engagement with the lower edge of the valve seat insert in the manner most clearly illustrated in Fig. 4.

The outer ends of the jaws **13***a* used when employing the tool to remove a previously installed insert are provided with sharp edges so as to be more readily forced into the space between the lower edge of the valve seat insert and the adjacent portion of the engine head.

After the jaws have thus been forced into place, the nut **24** is then tightened down, raising the entire assembly and moving the insert **3** from its seat.

There may be instances where, for one reason or another, due to variation in the sizes of the parts or otherwise, the sharp outer ends of the jaws **13***a* do not coincide with or cannot readily enter the space between the insert and the engine block. When such a condition is encountered, then a set screw not shown may be threaded in the opening **25** in the nut **24** to lock the nut **24** against rotation relatively to the body **5**. The jaws are then forced outwardly against the valve seat insert or the space between the same and the engine block, and the entire assembly rotated by the application of a wrench to the nut **24**, and the jaws used as a cutting tool for the purpose of forming a groove.

By progressively tightening the screw **15** and continuing rotation of the entire assembly, a groove of sufficient depth may be cut so that there will be a sufficient depth of engagement between the jaws **13***a* and the valve seat insert to enable the latter to be removed by the procedure previously outlined.

When it becomes necessary to perform a cutting operation as last explained, then for such operation a special set of jaws made of a hard cutting material may be employed in place of the usual jaws. After the cutting operation is completed, then the cutting jaws may be replaced by other jaws of substantially the same shape but of greater strength so as not to be broken during the subsequent operation of removing the valve stem insert.

It will be observed that the chuck **7** is separable from the lower end of the body **5**, thus making possible the use of various sizes of chucks in a single tool. This may become necessary in working with inserts of different axial dimensions. In other words, when removing an insert of a given axial dimension, the operator will select a chuck in which the axial dimension of the distance between the shoulder on the chuck holding the gauge depth ring and the slot holding the jaws correspond substantially to the axial dimension of the valve seat insert to be removed.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in the following claim or the equivalent of such be employed.

We, therefore, particularly point out and distinctly claim as our invention:

In a device for the removal of annular valve seat inserts from internal combustion engines, the combination of an elongated tubular member externally threaded at one end and internally threaded at the other end, a chuck threaded into the last named end of said tubular member, said chuck provided with radially extending jaw receiving openings and a communicating axially extending threaded opening, jaws movably mounted in said radially extending openings, a rod arranged coaxially in said tubular member, said rod at one end projecting from the externally threaded end of said tubular member and at its other end threaded into said axially extending opening and provided with a coniform point adapted to engage the inner ends of said jaws, an annular abutment member removably secured between said chuck and the adjacent end of said tubular member, extending radially outwardly of the outer surface of such member and having an outer diameter greater than the inner diameter of the annular valve seat insert to be removed, whereby said abutment member when resting on such insert fixes the extent to which said chuck

enters such insert, and a nut on the externally threaded end of said tubular member.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
869,861	Alspaugh	Oct. 29, 1907
1,126,612	Wright	Jan. 26, 1915
1,246,415	Gerrish	Nov. 13, 1917
2,037,199	Randall	Apr. 14, 1936
2,282,629	White et al.	May 12, 1942
2,292,739	Bradbury	Aug. 11, 1942
2,310,639	Johnson, Jr.	Feb. 9, 1943

FOREIGN PATENTS

Number	Country	Date
367,139	Great Britain	Feb. 18, 1932