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H. W. KULP

2,089,902

VALVE GUIDE DRIVER

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Fig. 1.

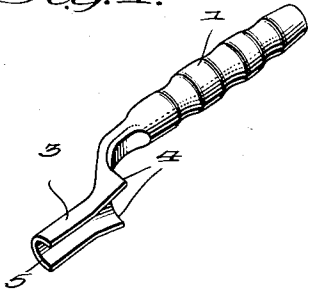


Fig. 2.

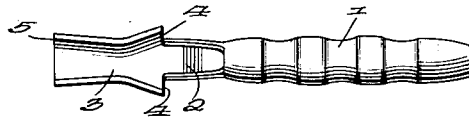


Fig. 3.

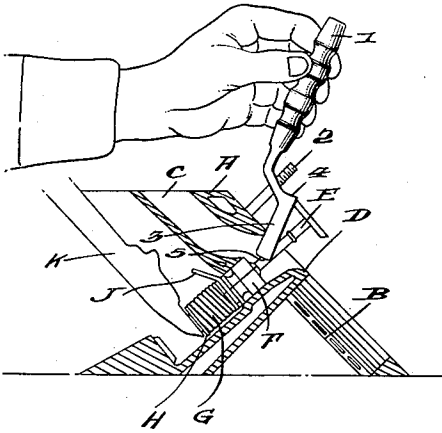


Fig. 4.

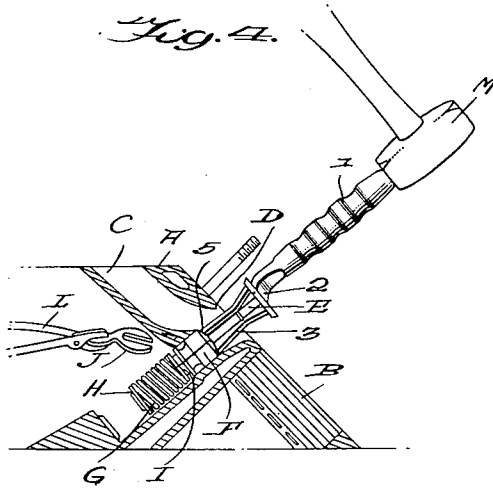


Fig. 5.

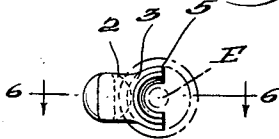
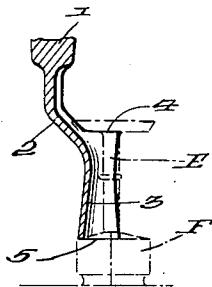


Fig. 6.



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# UNITED STATES PATENT OFFICE

2,089,902

## VALVE GUIDE DRIVER

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6 Claims. (Cl. 29—88.2)

This invention relates to valve guide or bushing drivers.

The present day automobile is quite frequently run for a total distance of anywhere from twenty to thirty thousand miles or more before the valves are ground. At least several types of internal combustion engines used in popular makes of automobiles of the present day employ a split bushing or two valve stem guide members arranged about the valve stem of each valve and disposed in the corresponding bore of the engine block and it is necessary to remove these valve stem bushings or guides before the valves can be removed for grinding. In some, the valve with its stem and with the valve bushings or guides, the valve spring and valve spring retainer applied thereto are assembled as a unit, inserted from the top of the engine block therein, and thereafter locked in place by a valve guide retainer or lock which engages in a groove in the valve guides or bushings and bears against the engine block and it is necessary to remove this guide retainer or lock before the unit can be removed. In order to remove this guide lock or retainer it is necessary to force the valve guide or bushings downward slightly in the bore of the engine block in order to free the guide or bushing lock or retainer, so that the same can be removed or pulled from place.

Due to the aforementioned long use or operation of the engine before such grinding or replacement of the valves becomes necessary such valve guides or bushings become practically frozen into the bores of the engine block by the deposit of oil and carbon and the baking thereof on surfaces of the bore and the surfaces of the bushings or guides and in order to move said bushings or guides endwise of said bore it is practically necessary to hammer them from place.

The present invention has been developed with the above considerations in mind and has for its primary objects to provide a simple sturdy strong driving tool that will stand up in use and will not be deformed or take a permanent set under repeated hammer blows; to provide a tool by which the force of the hammer blow will be directed and delivered directly to the upper ends of the guides or sleeves and will not be delivered to or against the valve head either by a direct blow or by vibration or side slanting blow; to provide a tool which will definitely and positively hold the valve head up out of the way and avoid any pressure on the head or the valve stem which might otherwise bend the valve stem or damage the valve; to provide a tool which will

hold the valve head up out of the way and prevent binding of the tool between the valve seat and the opposed face of the valve head; and to provide a tool of the character described with a laterally offset vertically upward or substantially vertically upward extending blow receiving portion.

In the accompanying drawing:

Figure 1 represents a perspective view of a tool embodying my invention;

Figure 2 represents a front elevation thereof;

Figure 3, a fragmentary sectional view of an engine block with a valve unit disposed therein and with its lower end portion raised by a suitable prying tool, with a side elevation of a tool embodying my invention being inserted therein;

Figure 4, a view similar to Figure 3, only the tool embodying my invention being shown in front elevation in its final applied position being struck by a hammer, the valve unit or bushings or guides thereof having been hammered downward slightly and the bushing or guide keeper or lock J having been removed by means of the pliers L, thus freeing the valve unit for removal through the top of the engine block;

Figure 5, a bottom elevation of the tool, a valve with its stem being indicated by dotted lines; and

Figure 6, a sectional view on the line 6—6 of Figure 5.

While in the accompanying drawing the tool has been used or illustrated in association with an engine wherein the valve unit is inserted and removed from the top of the engine block as a unit, it may equally well be used with other types of engines wherein the valve assemblage is not removable as a unit but wherein it is necessary to remove the separate valve stem bushings or guides incident to the removal or replacement of the valves, the valve bushings or guides in the latter incident being driven downward until they are completely removed from their bore.

Referring now in detail to the accompanying drawing, A designates the engine block; B, the piston or a piston; C, an exhaust or intake port; D, the valve seat; E, the valve having the bushings or guides F fitted about the same and receiving the usual valve spring G which bears with its upper end against the valve bushings or guides and with its lower end against the spring retainer or keeper H which is applied to the lower end of the valve stem, said valve stem bushings or guides F being formed with an annular groove I in which engages the forked end of the bushing or guide retainer or lock J which in turn is adapted to bear with its upper face of its lateral exten-

sion against the lower face of the upper portion of the engine block A, and which is shown in Figure 4 as having been pulled from place by the pliers L, and M designates any suitable hammer which may be used for hammering on the upper end of the shank or body of the drive tool or device, to drive or hammer the bushings or guides F downward in their bore to permit the withdrawal of the lock or keeper J or completely downward for their full distance to remove them from their bore completely where the bushings or guides F are movable in a downward direction as against being removable with and as part of the valve unit by an upward movement, that is from the top of the engine block.

The driving tool of the present invention comprises as essential portions a handling and driving shank 1, a valve stem surrounding or straddling bushing driving body 3 and outwardly and upwardly inclined laterally projecting portion 2 serving to connect the handling and driving portion 1 and the body and bushing or guide driving portion 3. Preferably all of the above portions of the tool will be integral with each other and preferably the tool will be formed as a single piece of forged steel, preferably a drop forging. However, it is not essential that the portion 2 shall be integral with the body 3, or that the portion 2 shall be integral with the shank 1, nor is it essential that it shall be of forged steel or of any other forged metal, but it may be of any suitable material having characteristics suitable to the purpose for which the tool is intended.

Preferably the portion 2 will extend as a continuation of the lower end of the impact receiving and handling shank 1 from the lower end thereof and will merge with and connect to the upper portion of the body 3, but while such construction is preferred it is not essential. Preferably the outwardly and upwardly inclined upper face of the portion 2 will be concave or arcuate in cross section to permit the portion 2 to approach as nearly as possible to the vertical without contacting the opposed face of the head of the valve E when the latter is held raised by the tool, but while such form of the upper face of the portion 2 is preferred for the reason stated, it is not essential so long as the tool be so formed that the upper face of the portion 2 does not interfere with the proper positioning of the valve or exert any pressure on the valve or valve stem tending to bend the latter in the operative position of the driving tool.

The body 3 of the tool is of U-shape in cross section or grooved so as to extend well beyond the center of the valve stem of the valve E on each side thereof as applied in operative position and is of such size as to fit within the valve guide 4 and is provided with a lower driving end edge or surface 5 extending perpendicularly to the axis of the body 3. The upper end of the body 3 is provided with two wings having upper edge faces 4 extending perpendicular to the axis of the body 3 and parallel to the driving face 5. Said upper edge faces 4 are spaced apart a distance less than the diameter of the lower face of the valve head and in the operative position of the tool engage the lower face of said head when the driving edge 5 of the tool is in flat engagement with the upper faces or ends of the two members of the divided or split bushings F to support said valve in raised position against the opposition of the valve spring G. As stated, the upper face

of the inclined portion 2 will be so formed and located as not to be engaged by any portion of the head of the valve E when the same is held raised by engagement with the upper faces of the supporting edges 4 and therefore the action of the spring will be exerted in a straight line without any part or surface bearing on any part of the valve or valve bushings or guides having any tendency to bend the valve stem or deflect it sidewise.

While only a slight downward movement of the bushings or guides F is necessary to permit the removal of the guide keeper or lock J in the construction illustrated, where the guides or bushings F are to be removed by continued downward movement the length of movement of such bushings will be considerably greater than that indicated and accordingly the body 3 will be made of sufficient length to permit the tool to be used in this manner to drive the bushings or guides F a considerable length downward in their respective bores and to such extent that they will drop from their bores or may be easily removed therefrom by a slight pull by hand, before the under or lower face of the inclined portion 2 of the tool engages against the valve seat D of the engine block.

To use the tool in the operation of forcing the bushings downward in their respective bores, as the first operation the lower end of the spring together with the valve stem and spring keeper will be forced upward or lifted by a suitable prying tool or lever K to raise the head of the valve E well above the head of the engine block to permit the easy insertion of the lower end of the body 3 in the valve port with the lower end of the body 3 near the bushings or guides F, as illustrated in Figure 3. Thereafter the tool will be moved bodily endwise toward bushings or guides F until the lower end 5 rests thereon and until the wings or upper edges 4 clear the under face of the head of the valve and thereafter the tool will be moved to true vertical position with its lower edge 5 squarely in engagement with the upper face of the bushings or guides F, when the pressure on the lower end of the valve unit will be released, permitting the spring G to force the valve E downward endwise until the under or lower face of its head rests squarely on the upper or supporting edges 4 of said upper wing portion. Thus arranged several sharp blows will be delivered by the hammer M to the upper end of the shank 1 until the guides or bushings F are driven downward to the desired point, or repeated hammer blows will be delivered if it is necessary to drive the bushings or guides F completely from their bore, all depending on the type and construction of the valve assembly of the engine being serviced.

I claim:

1. A valve bushing driver comprising a handling and driving shank and an integral, inclined, laterally extending, portion depending from said shank, in combination with a body portion integral with said inclined portion and longitudinally grooved to embrace a valve stem and being of slightly less diameter than the bushing to be driven, said body being formed with a bushing engaging face extending perpendicularly to the axis of said body and valve head engaging and supporting faces extending perpendicularly to the axis of said body and adapted to engage the lower face of a valve head on opposite sides of the valve stem, and said inclined portion being so formed and disposed as to be out of contact with

the valve head when the latter is in engagement with said valve head supporting faces.

2. A valve bushing driver comprising a handling and driving shank and an integral, laterally extending, portion depending from said shank, in combination with a body portion connected with said inclined portion and longitudinally grooved to embrace a valve stem and being formed with a bushing engaging end face and valve head engaging and supporting faces extending perpendicularly to the axis of said body and adapted to engage the lower face of a valve head on opposite sides of the valve stem, and said inclined portion being so formed and disposed as to be out of contact with the valve head when the latter is in engagement with said valve head supporting faces.

3. A valve bushing driver comprising a handling and driving shank and an inclined, laterally extending, portion depending from said shank, in combination with a body portion connected with said inclined portion and longitudinally grooved to embrace a valve stem and being formed with a bushing engaging end face and a valve head engaging and supporting face extending perpendicularly to the axis of said body and adapted to engage the lower face of a valve head, said inclined portion being so formed and disposed as to be out of contact with the valve head when the latter is in engagement with said valve head supporting faces.

4. A valve bushing driver comprising a handling and driving shank and an inclined, laterally extending, portion depending from said shank, in

combination with a body portion connected with said inclined portion and longitudinally grooved to embrace a valve stem and being formed with a bushing engaging face and a valve head engaging and supporting face adapted to engage the lower face of a valve head, and said inclined portion being so formed and disposed as to be out of contact with the valve head when the latter is in engagement with said valve head supporting faces.

5. A valve bushing driver comprising a handling and driving shank and an inclined, laterally extending, portion depending from said shank, in combination with a body portion depending from said inclined portion and longitudinally grooved to embrace a valve stem and being formed with a bushing engaging end face and a valve head engaging and supporting means comprising two opposed portions substantially in a single plane adapted to engage the lower face of a valve head on diametrically opposite sides of the valve stem and radially inwardly from the conical face of the valve head.

6. A valve bushing driver comprising a handling and driving shank and an inclined, laterally extending portion depending from said shank and relatively immovable therewith, in combination with a body portion depending from said inclined portion and longitudinally grooved to embrace a valve stem and being formed with a bushing engaging end face and a valve head engaging and supporting face.

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