Aug. 1, 1939. H. W. KULP 2,167,897

VALVE UNIT OR VALVE GUIDE PULLER

Filed Sept. 4, 1936

Fig. 1.

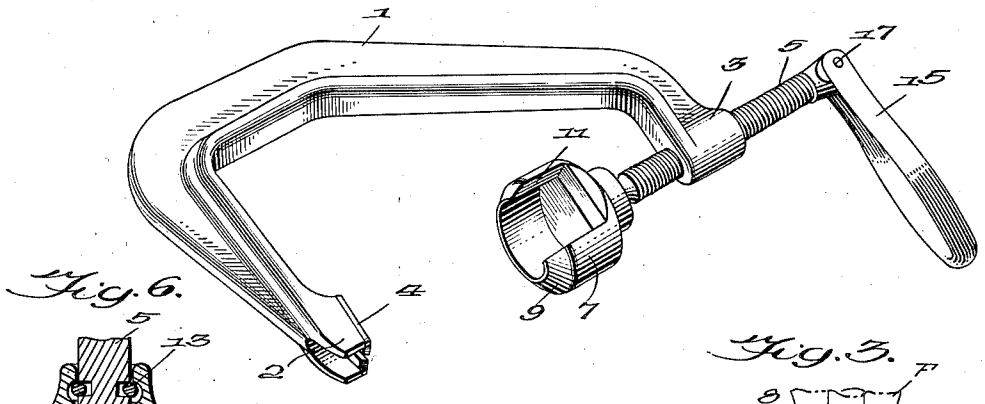


Fig. 6.

Fig. 3.

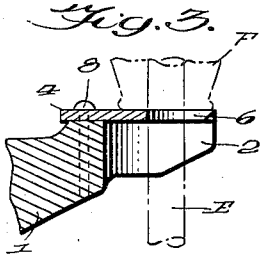


Fig. 2.

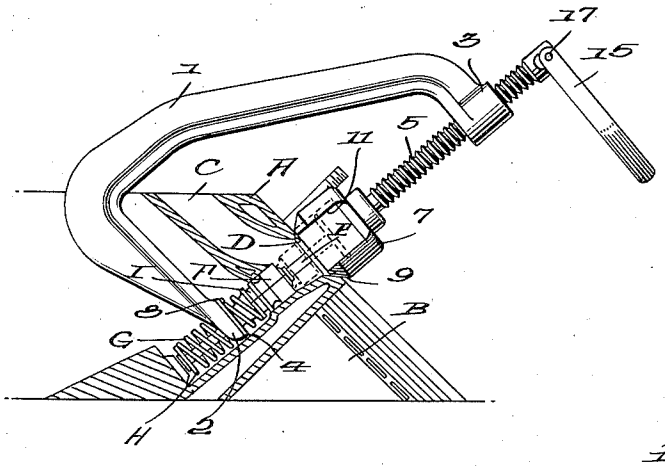
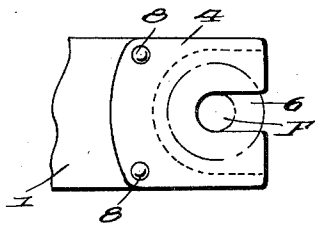


Fig. 4.



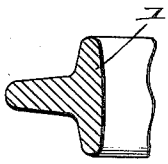


Fig. 5.

Inventor

Harry W. Kulp,

By Richard E. Babcock

Attorney

Patented Aug. 1, 1939

2,167,897

UNITED STATES PATENT OFFICE

2,167,897

VALVE UNIT OR VALVE GUIDE PULLER

Harry W. Kulp, Lancaster, Pa., assignor to K-D Manufacturing Company, Lancaster, Pa., a corporation of Pennsylvania

Application September 4, 1936, Serial No. 99,475

7 Claims. (Cl. 29—86.3)

This invention relates to valve-guide-pullers or valve unit pullers.

For the last several years it has been the practice of the manufacturers of several popular priced automobiles to assemble their valves, having the usual valve stem, with the valve guides applied about the valve stem, the springs applied about the valve stems and pushing upon said valve guides, and the valve retaining washers or keepers applied to the lower end of the spring and, as thus assembled to insert the valve unit in the engine block. After being thus assembled the valve guide retaining element or retainer not shown, having a bifurcated end is applied by said bifurcated end in the groove I of the split valve guide members and extends laterally to bear against the under face of the engine block and so locks the unit in the engine block against movement in the reverse direction.

In order to grind the valves or to replace them it is necessary to remove the entire valve unit in order to remove the spring and otherwise disassemble the unit. However, before one of the valves needs to be reground or replaced ordinarily it will have been used in the engine for a long period of time, quite possibly for a couple of years or more or until the automobile has been run a distance of around twenty to twenty-five or thirty thousand miles. During such long running these valve guides will have become practically frozen into the engine block due originally to their close fit and to the fact that oil and carbon deposits will have been formed and baked on and around said valve guides and over the adjacent parts and faces of the engine block. They quite commonly become so tightly stuck in the engine block that it is a matter of great difficulty to remove them, both because of the tightness of the engagement and sealing in of the guides and also because of the difficulty of access to the guides and heretofore in attempting to remove them it has quite frequently been the case that in such removal the valve guides would be so badly damaged that they could not be replaced in the engine and had to be substituted by new guides, not to mention the great loss of time in finally removing the guides.

The present invention has been developed with the above considerations in mind and has for its primary objects to provide a powerful puller for pulling or removing these valve guides or valve units by simple and certain operation; to provide a tool by which the pressure is applied directly to the lower end of the valve guide and not to some other part of the valve assembly which might be damaged otherwise; to provide a tool which shall be self-centering on the engine block as applied in use; to provide a tool in which the pull or pressure exerted by the tool shall be applied in a straight line parallel to or coincident with the common axes of the valve guide bore in the engine block, the valve guide and the valve stem, thus preventing any possible binding due to any inclination to cant or jam; to provide for the unobstructed endwise upward movement of the valve head necessary to the removal of the valve unit, without in any manner impairing the centering of the tool in proper position on the engine block; and to provide full visibility for the operator so that he may see when the pulling job of an individual valve unit has been completed.

In this application I show and describe only the preferred embodiment of my invention simply by way of illustration of the practice thereof as by law required. However, I recognize that my invention is capable of other and different embodiments, and that the various details thereof may be modified in a number of ways, all without departing from my said invention; therefore, the drawing and description herein are to be considered merely as illustrative and not as exclusive.

In the accompanying drawing:

Figure 1 is a perspective view of a tool or puller embodying my invention;

Figure 2 is a side elevation of my tool as operatively applied in the pulling or removal of a valve unit from an engine block, a portion of which is shown in cross section;

Figure 3 is a sectional detail view through the lower end of the tool or puller, the valve stem and valve guides being indicated by dotted lines to show the relation of these parts when the tool is operatively applied to pull a valve unit or valve guides;

Figure 4, a top plan view of Figure 3;

Figure 5, a cross section through the C body of the tool to illustrate its rugged construction; and

Figure 6, a fragmentary detail sectional view through the lower part of the screw 5 and the upper part of the centering and pressing shell 7 to illustrate their mode of connection.

Referring now in detail to the accompanying drawing, A, designates the engine block; B, a piston; C, an intake or exhaust port controlled by the valve E seating on valve seat D; F, the usually longitudinally divided valve stem guides such as now are commonly in use; G, the usual valve spring surrounding the lower end of valve guides and bearing with its upper end against the lower

portion of said valve guides and held to said valve stem by a valve spring retainer H applied to the lower end of the valve stem; and I, the usual annular groove to receive the unit retaining or locking means, not shown, which engages in said groove I and bears with its upper face against the lower face of the engine block to hold the assembled unit in proper operative position in the engine block.

The puller comprises or consists of a preferably forged steel very rugged or husky rigid preferably C-type body 1 having a bifurcated lower end 2 and an internally screw threaded hub 3 at its upper end, the axial line of said hub 3 being in alignment with the bifurcated lower end 2, and preferably in alignment with the center or central portion of said lower end 2, or with the center of the space between its furcations.

The externally screw threaded pressure screw 5 engages with its screw threads in the threads of the hub 3 to by such engagement move endwise therethrough and carries on its lower end between the hub 3 and the bifurcated end 2 the centering shell 7 formed with an interrupted lower conical face 9 and having one side portion cut out as at 11 to permit the mechanic to see therethrough as the pulling operation progresses.

Preferably this shell 7 will be a forging or a malleable casting. A loop form strap form handle 15 may be provided and may be connected to the upper end of the screw 5 by a pivot pin such as 17 to provide an easy means of rotation of the screw 5 in any position of the tool. Of course any other means of rotation of the screw 5 might be substituted, this being a matter of no importance, so long as there is some means by which the screw 5 may be rotated.

The shell 7 will preferably be permanently connected to the end of the screw 5 in such manner as to have a universal movement at least through a limited range and a swivel arch. One construction for accomplishing this end is shown in Figure 6, wherein the end of the screw 5 is inserted in a cavity in the upper end of the shell 7, the outer or exterior face of the screw 5 being annularly grooved and the inner face of the shell 7 being similarly annularly grooved, there being a split resilient spring 13 applied in the annular groove of the screw 5, the end of which is then inserted or forced through the upper end of the cavity in the shell 7 until the split ring 13 wedges into transverse registry with groove in the shell 7 and by its resiliency spreads so as to be disposed partially in the annular groove of the screw 5 and in the annular groove of the shell 7, thus locking these two parts together with some end play permitting relative universal movement and swivel movement between them. While this construction is preferred it is not essential and any other construction or mode of connection between these two elements permitting a swivel action will suffice, considering the invention from its broadest aspects. Any construction permitting a universal movement between these two parts, plus a swivel action will suffice.

Since the body 1 with its integral hub 3 and bifurcated lower end 2 is formed from a preferably drop forging some difficulty in forming the bifurcated lower end 2 in the drop forging operation or the forging operation has been encountered. On the other hand to form the lower end 2 in the forging operation in an intermediate form simply as a solid end and thereafter to grind the material out to form the bifurcated end would involve an excessively expensive grinding operation.

In order to overcome the above difficulty and obtain economy of manufacture I have found it advisable to form the lower end 2 as a wide forked end or clearance space, just having the upper edges of the portions 2 as supporting surfaces and then to make a close fit with the valve stem and to engage the lower face of the valve stem guide bushing I provide the bifurcated plate 4 which rests upon the plane face of the previously ground upper face of the bifurcated lower end 2, and said plate is secured in position by the rivets 8 or any other suitable means of connection or manner of connection or association. This plate 4 may be a stamping from a thick plate or thick piece of sheet metal or it may be a steel forging and it may be heat treated or carborized or have such other characteristics as may be felt to be desirable.

The mode of use shall be as follows. The valve guide locking means or retainer previously above referred to, having been removed so as to permit the valve unit or valve guide to be removed from the engine block, the puller will be applied with the conical face 9 of its shell 7 seated upon the radially outer peripheral part of the seat D in the engine block of the valve E and with the upper face of the plate 4 in engagement with the lower ends of the valve guide member F and with the valve stem received in the bifurcation of the plate 4, which first straddles the valve stem E. As thus applied the pressure screw 5 will be rotated through hub 3 to force shell 7 against the engine block and to pull frame 1 with its foot 2 toward the upper end of the engine block and in so doing to force the valve guides F with it, as well as the valve E, until the guides F and valve E have moved into the positions indicated by dotted lines in Figure 2. This is a very simple operation with this tool, the leverage provided by this tool is ample to break all adhesions of oil and carbon deposits and yet at all times the thrust is uniform, continuous and in a straight line which is automatically centered with the center of the valve seat D the common axis of said seat D valve E and the guides F, so that there is no chance of damage by any sudden blow or by any misapplication of pressure in other than the proper direction.

It is to be understood of course that the furcation of the lower end 2 of the frame 1 shall be wide enough and at least of such length as to straddle the valve spring G to such degree that the said bifurcated end 2 may center itself with relation to the axis thereof.

I claim:

1. A valve unit puller comprising a rigid integral C-type steel frame formed with a bifurcated lower end and having its upper end portion formed with an internally screw threaded hub, the center of said lower end being substantially in alignment with the axis of said hub, and a bifurcated abutment plate secured against the upper face of said bifurcated end of said frame, in combination with a screw engaging in the threads of said hub, a shell, and means connecting said shell to the lower end portion of said screw for universal movement with relation thereto, said shell being formed with a downwardly presented conically beveled lower face and having a portion of its side wall cut away, said conical face being adapted to rest and center itself on the radially outer portion of a valve seat in an engine head, said bifurcated end of said

frame being adapted to straddle the usual valve spring, said bifurcated abutment plate being adapted to extend between the coils of such spring and straddle the usual valve stem and engage with its upper face portion adjacent to its furcation the lower ends of the members of the split bushing, and said shell being adapted to receive in its interior the head of the valve as the abutment plate is forced toward the shell by the operation of the screw.

2. A valve unit puller comprising an integral rigid frame formed with a bifurcated lower end and having its upper end portion formed with an internally screw threaded hub, the center of said lower end being substantially in alignment with the axis of said hub, and a bifurcated abutment plate secured against the upper face of said bifurcated end of said frame, in combination with a screw engaging in the threads of said hub, a downwardly opening shell, and means connecting said shell to the lower end portion of said screw, said shell being formed with a downwardly presented conically beveled lower face, said conical face being adapted to rest and center itself on the radially outer portion of a valve seat in an engine head.

3. A valve unit puller comprising a rigid frame formed with a bifurcated lower end and having its upper end portion formed with an internally screw threaded hub, in combination with a screw engaging in the threads of said hub, a downwardly opening shell, and means connecting said shell to the lower end portion of said screw for universal movement with relation thereto, said shell being formed with a downwardly presented conically beveled lower face.

4. A valve unit puller comprising a rigid frame formed with a bifurcated lower end and having its upper end portion formed with a hub, the center of said lower end being substantially in alignment with the axis of said hub, in combination with a rod disposed in and movable endwise through said hub, means for causing such movement, a downwardly opening shell, and means connecting said shell to the lower end portion of said rod for universal movement with relation thereto, said shell being formed with a downwardly presented conically beveled lower face.

5. A valve unit puller comprising a rigid frame formed with a bifurcated lower end and having its upper end portion formed with a hub, the center of said lower end being substantially in alignment with the axis of said hub, in combination with a rod disposed in and movable endwise through said hub, means for causing such movement, a shell, and means connecting said shell to the lower end portion of said rod, said shell being adapted to receive in its interior the head of the valve as the bifurcated lower end of the frame is forced toward the shell by the operation of said means.

6. A valve unit puller comprising a rigid frame formed with a bifurcated lower end, a shell formed with a downwardly presented conically bevelled lower face in operation extending around and receiving the valve and contacting the valve seat, and means connected to said frame for producing movement of said shell towards said bifurcated lower end.

7. A valve unit puller formed with a C-shaped frame with its lower end adapted to fit between the coils of a helical valve spring, a shell formed with a downwardly presented conically bevelled lower face in operation extending around and receiving the valve and contacting the valve seat, and means connected to said frame for causing movement of said shell towards the lower end of said frame.

HARRY W. KULP.