Dec. 30, 1941. H. A. BERKMAN 2,268,378

MEANS FOR REMOVING VALVE GUIDES

Filed June 10, 1939

Fig. 1

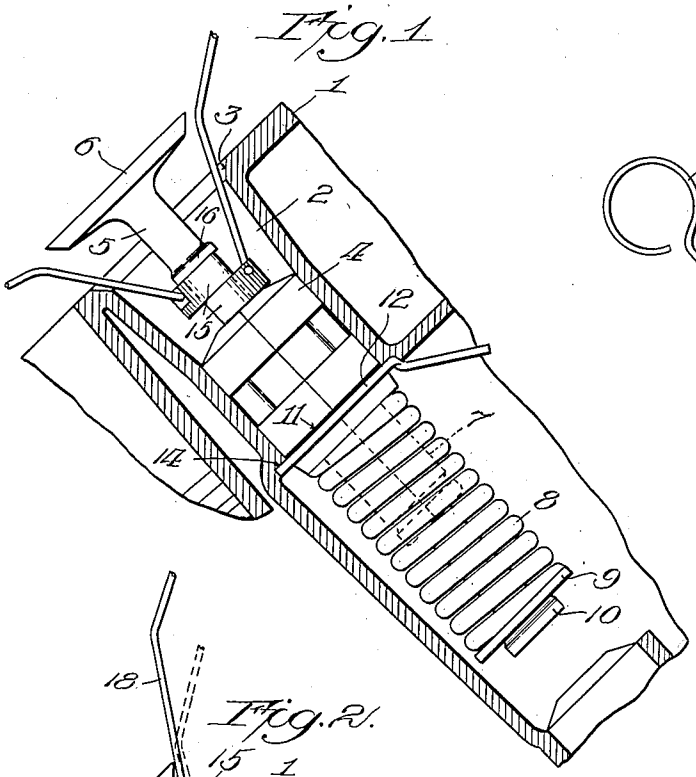


Fig. 3.

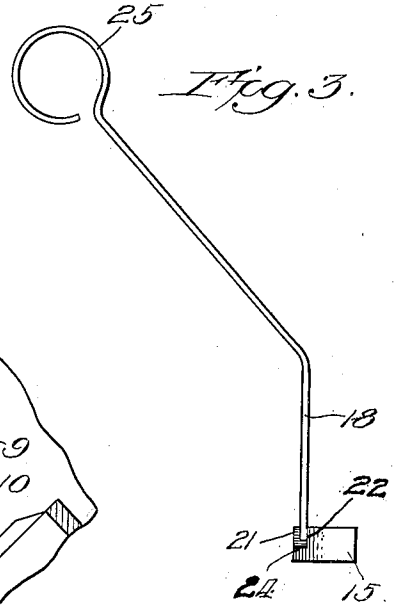


Fig. 2.

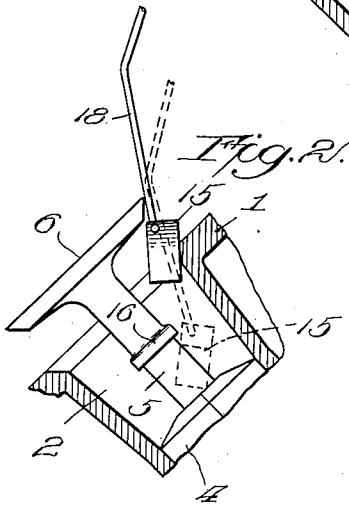
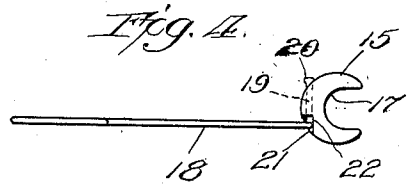


Fig. 4.



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MEANS FOR REMOVING VALVE GUIDES

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5 Claims. (Cl. 29—86.3)

In a common type of automobile engine the intake and exhaust valves for the cylinders seat downwardly upon portions of the engine block lying beside the cylinders, and have valve stems extending down through long guides or bushings positioned at a substantial distance below the valves when the latter are closed; the bushings having downward extensions arranged within the coil springs by means of which the valves are closed. In order to remove the valves it is necessary to remove the bushings along with the valves; this being done by lifting the entire valve unit, including the bushing and the valve spring, out of the engine block. When such a valve unit is installed, it is secured, against being so lifted, by means of a key in the form of a flat washer having a section removed at one side to permit the washer to be slipped laterally upon a neck portion of reduced diameter on the bushing. This key is normally seated within a recess in the lower face of that portion of the engine block through which the valve extends, and cannot be removed without first forcing the bushing down. In service, these bushings are subjected to such severe conditions that they become frozen to the surrounding metal of the engine blocks, so that considerable force is needed to drive the bushings down. These guides or bushings are provided with downwardly extending portions which fit into the valve springs. Although these downwardly-extending neck portions are in some cases provided with grooves or projections intended to be engaged by a tool thrust between consecutive coils of the corresponding valve springs, the coils of the springs are so close together as to make it almost impossible to insert between a tool strong enough to pull a valve bushing down.

The object of the present invention is to produce a simple and novel means whereby a valve guide or bushing may be quickly and easily driven downwardly far enough to permit the removal of the key that holds it against upward movement.

The valve stems, in the units under consideration, are provided with annular ribs or collars formed integral therewith and located far enough below the valves to engage with the top of the guides or bushings after the parts of the units have been assembled and while the springs still remain expanded to a greater degree than after assembly of units in the engine blocks. In accordance with my invention, I provide little blocks that may be placed on top of a valve guide or bushing below and in engagement with the rib or collar on the valve stem, and thus shore the valve up after the valve spring has been compressed and the valve raised. After this has been done, a proper blow delivered on top of the valve will drive the guide or bushing down far enough to permit the key to be removed and the entire unit to be forced upwardly out of the engine block by means of a suitable tool exerting a lever action against the lower end of the bushing. The reason why shoring must be interposed between the top of the guide or bushing and the overlying collar on the valve stem is to provide a sufficient clearance between the valve and its seat to permit the valve to be driven down while its stem is acting as a punch or drift against the top of the guide or bushing.

It is desirable that the valve be held quite high above its seat before a bushing-loosening blow is struck. However, since the valve face and the valve seat are frusto-conical surfaces, the gap through which an instrument or tool may be inserted into the space below the valve, after the valve has been raised, is not as great as it would be if the valve seat and the valve face were flat surfaces at right angles to the axis of the valve stem. Consequently, to provide shoring whose height equals the lift of the valve, it is necessary that a plurality of shoring blocks be employed in each instance, one resting upon the other. In other words, by employing two blocks, if each is a little less than one-half as thick as the distance between the under side of the collar on the valve stem and the top of the guide or bushing, I am able quite easily to insert one block and then the other. Obviously, the blocks may be made thin enough so that more than two will be required. Also, the blocks need not be alike so far as thickness goes. However, for practical purposes, it is more convenient to employ blocks that are duplicates of each other, so that only one type of block need be made.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawing, wherein:

Figure 1 is a section taken through an engine block having therein a valve in connection with which my invention may be employed, the valve being shown raised, securing in its raised position by a pair of shoring blocks; Fig. 2 is a view

similar to Fig. 1, showing only a fragment of the valve and a smaller fragment of the engine block, and illustrating the manner of applying one of the shoring elements; Fig. 3 is a side elevation of one of the shoring elements with its higher handle; and Fig. 4 is a top plan view of the device shown in Fig. 3.

Referring to the drawing, 1 represents a fragment of an engine block having a bore or passage 2 extending through the same from top to bottom; the bore terminating at its upper end in a frusto-conical valve seat 3. Arranged in the lower part of the bore or passage 2 is the usual guide or bushing 4 through which extends the stem 5 of a poppet valve 6. The bushing or guide has a part 7 of reduced diameter extending downwardly therefrom. Surrounding the stem 7 and that part of the valve stem projecting below the lower end of the latter, is a strong compression spring 8; the spring bearing at its upper end against the bottom face of the guide or bushing proper, and resting at its lower end upon a key 9 overlying an enlargement 10 on the lower end of the valve stem. The body portion of the guide or bushing is provided with a peripheral annular groove 11 that lies within the lower end of the bore or passage 2 when the guide or bushing is in its normal position of use. Engaged in the groove 11 is a key 12 which is normally seated in a counter-sunk portion or recess 14 in the under side of the part 1 of the engine block. The key 12 can be removed only by shifting it laterally relatively to the guide or bushing and, therefore, while the bushing is in its normal position with the key seated in the recess 14, the key cannot be withdrawn; but the bushing must be driven down far enough to bring the key clear of the recess 14, in order to permit the bushing to be freed from the key.

All of the parts which I have described are old and well known and form no part of the present invention; the present invention having to do only with means to facilitate the driving down of the valve stem guide or bushing when it is desired to withdraw the key 12. This means comprises at least two little blocks which may roughly be said to be crescent shaped. In the drawing I have shown the blocks as being duplicates of each other, for simplicity of manufacture and use and, for the sake of brevity, shall confine the detailed description to this embodiment, although the blocks may be made thinner so that more of them will be required to produce a stack of a given height, and although the blocks need not all be of the same thicknesses, so far as the principle of the invention is concerned.

In Figs. 1 and 2 the valve is shown as having been raised by any usual or suitable means; the raising of valves being a common expedient. While the valve is held in its raised position, two blocks 15 are inserted through the upper end of the bore or passage 2, between the valve and its seat, and are placed one on top of the other, with the lower block resting upon the guide or bushing. Each block has a thickness preferably a little less than one-half the maximum lift of the valve, so that they may be easily placed one upon the other below an annular rib or collar 16 forming part of and surrounding the valve stem above the guide or bushing; this rib or collar being intended to rest upon the bushing or guide before the valve unit is placed in position in the engine block, and being intended to lie a short distance above the top of the guide or bushing after the valve unit has been placed in the engine block and the valve is closed. The important characteristics of these blocks are that they are small enough to be inserted between the valve and its seat, but sufficiently small that they can be manipulated into their working positions relatively to the valve stem, and have extending through one side edge a deep notch 17 that will permit each block partially to embrace the valve stem. I have found that a more or less crescent shape is quite satisfactory; the concave contour comprising two parallel flat faces extending inwardly from the outer edge and spaced apart from each other a distance slightly greater than the diameter of the valve stem, together with a semi-cylindrical face into which the inner ends of the two flat faces or edges merge. This permits each block to engage the valve stem over one-half of the periphery of the latter and to have horn-like parts projecting completely past the stem on opposite sides of the latter.

Each block is provided with a long slender handle 18 which may conveniently be formed from a piece of stiff wire. One end of the wire is bent laterally, as indicated at 19, and is inserted in a hole drilled through the block parallel with the top and bottom faces and at right angles to the central axis of the notch, thus forming a hinge pin about which the block may rock. Preferably the parts are so constructed as to produce enough friction in the hinge joint to cause the block to stand in any angular position, in spite of the action of gravity, into which it may be brought. This may be accomplished by providing the hinge pin element with a slight lengthwise bend so that it must be straightened to enter the passage in the block and, by tending to resume its bent shape, create a pressure against the surrounding portions of the block. Another way of creating the desired frictional resistance is to upset the free end of the hinge pin, as indicated at 20, in a manner to cause a slight binding action.

It is desirable to limit the swinging movement of the block between a position in which it stands at right angles to the adjacent portion of the handle and a position in which the planes of its top and bottom faces are approximately parallel with the adjacent portion of the handle. This is conveniently accomplished by cutting away a small portion of the block adjacent to the handle end of the hinge pin, as indicated at 21, to provide a vertical shoulder 22 that serves as a stop for swinging movements in one direction, and a horizontal shoulder 24 which limits swinging movement in the opposite direction.

The handle is preferably bent through an acute angle at a point about as far distant from the block 15 as the distance between the top of the valve 6 and the guide or bushing when the valve is raised, as shown in Figs. 1 and 2. Also, the free end of the handle may conveniently be bent into a ring 25 or other shape that permits the tool to be easily held and steadied while applying the same.

In using the multiple tools, after the valve has been raised, as shown, one of the blocks, as indicated in full lines in Fig. 2, is slipped down into the bore 2 while swung down so as to form, in effect, a downward extension of the handle. When the block reaches the position indicated in dotted lines in Fig. 2, wherein the horns rest upon the guide or bushing, one on each side of the valve stem, a slight downward push on the handle

causes the block to swing toward the other limit of its movement so as to lay itself flat upon the top of the guide or bushing in the manner of the lower of the two blocks in Fig. 1. After the handle has been manipulated to push the block laterally until the cylindrical inner end of the notch fits closely about the valve stem, it is held there and the second block is inserted from a somewhat different position angularly of the axis of the valve stem; the second block coming to rest upon the first one instead of directly on top of the guide or bushing. When the upward pressure on the valve stem, by means of which the valve was held raised, is released, the valve moves down until the collar 16 is drawn tightly against the upper block 15 by the action of the valve spring. The handles of the shoring tools may now be released and the guide or bushing be driven down through a blow or blows struck directly or indirectly upon the center of the upper side of the valve; it being sufficient to drive the guide or bushing down only far enough to permit the key 12 to be withdrawn.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. A tool for use in removing a valve stem guide or bushing fitted in an internal combustion engine block below the valve seat for a downwardly seating valve, comprising a small flat-faced block having a uniform thickness less than one-half the maximum lift of the valve and provided in a side edge with a notch to receive and partially surround the valve stem when the block is lowered past the lifted valve to the top of the guide or bushing and is shifted laterally toward the stem, and a long slender handle hinged to the block adjacent to the edge opposite that in which the notch is located.

2. A tool for use in removing a valve stem guide or bushing fitted in an internal combustion engine block below the valve seat for a downwardly seating valve, comprising a small flat-faced block having a uniform thickness less than one-half the maximum lift of the valve and provided in a side edge with a notch to receive and partially surround the valve stem when the block is lowered past the lifted valve to the top of the guide or bushing and is shifted laterally toward the stem, a long slender handle hinged to the block at the edge opposite that in which the notch is located, and said block having shoulders to engage the handle and limit the relative angular movements between the block and handle.

3. A tool for use in removing a valve stem guide or bushing fitted in an internal combustion engine block below the valve seat for a downwardly seating valve, comprising a small flat-faced block having a uniform thickness less than one-half the maximum lift of the valve and provided in a side edge with a notch to receive and partially surround the valve stem when the block is lowered past the lifted valve to the top of the guide or bushing and is shifted laterally toward the stem, a long, slender handle hinged to the block at the edge opposite that in which the notch is located, and shoulders on said block to engage with the handle and limit the swinging movement of the block to movements between a position in which the block stands at about a right angle to the handle and a position in which the block forms a downward extension of the handle.

4. A tool for use in removing a valve stem guide or bushing fitted in an internal combustion engine block below the valve seat for a downwardly seating valve, comprising a small crescent-shaped flat-faced block having a uniform thickness less than one-half the maximum lift of the valve and adapted to partially surround the valve stem when the block is lowered past the lifted valve to the top of the guide or bushing and is shifted laterally toward the stem, and a long slender handle hinged to the convex edge of the block at about the middle of that edge for swinging movements about an axis transverse to the handle and parallel to the upper and lower faces of the block.

5. A tool for use in removing a valve stem guide or bushing fitted in an internal combustion engine block below the valve seat for a downwardly seating valve, comprising a small flat-faced block having a uniform thickness less than one-half the maximum lift of the valve and provided in a side edge with a notch to receive and partially surround the valve stem when the block is lowered past the lifted valve to the top of the guide or bushing and is shifted laterally toward the stem, said block having a hole drilled through the same near the edge opposite that containing the notch and parallel with the upper and lower faces of the block, a wire handle having one end bent laterally and extending through said hole in the block, and said block having a section cut away at the handle end of said hole to provide shoulders to engage the handle and limit the relative angular movements between the block and handle.

HERBERT A. BERKMAN.