April 5, 1949. W. A. HARRIS, SR 2,466,233

VALVE CUTTING TOOL

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FIG. 1.

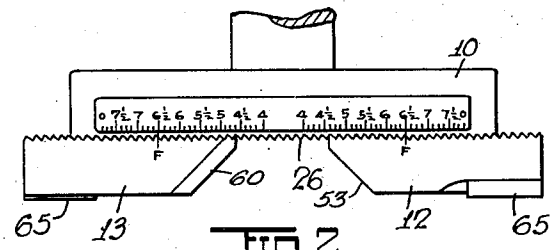


FIG. 2.

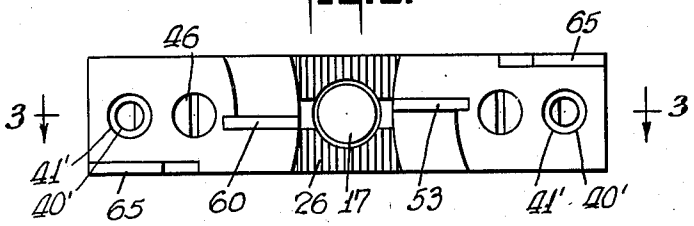


FIG. 3.

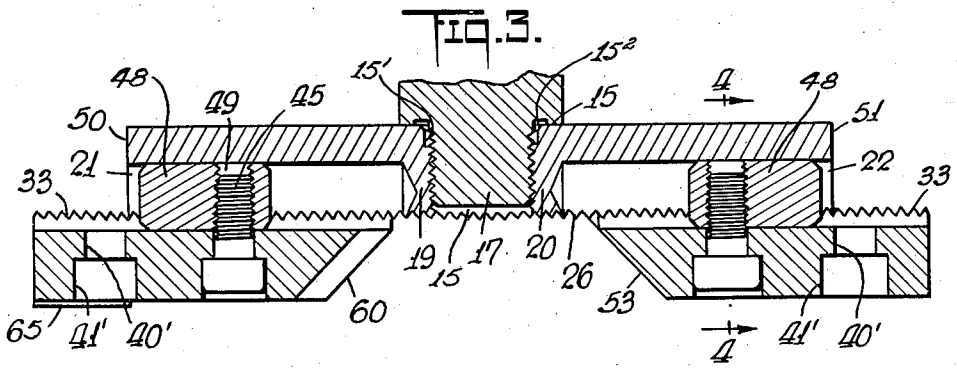


FIG. 5.

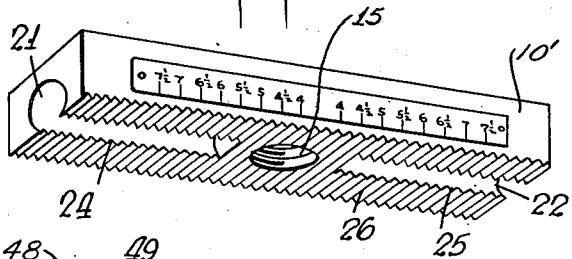
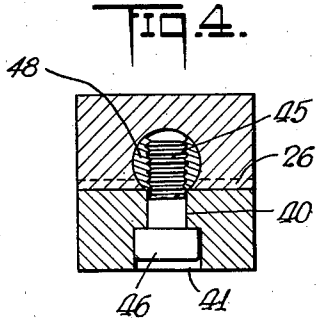


FIG. 4.



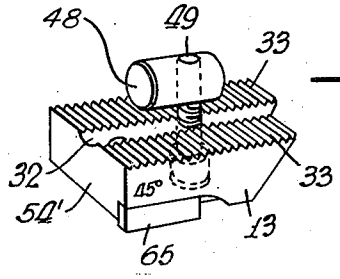


FIG. 6.

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FIG. 7.

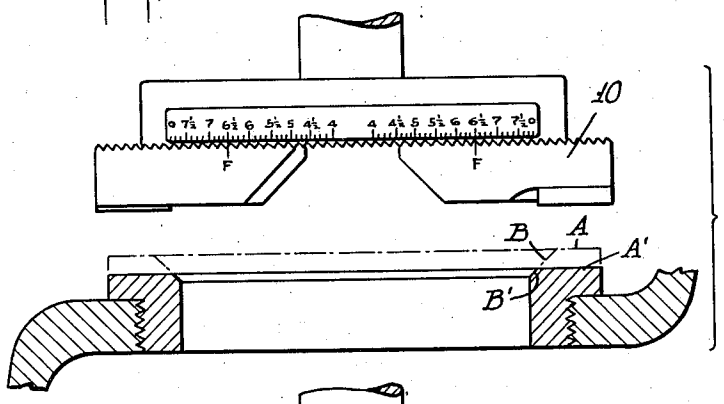


FIG. 8.

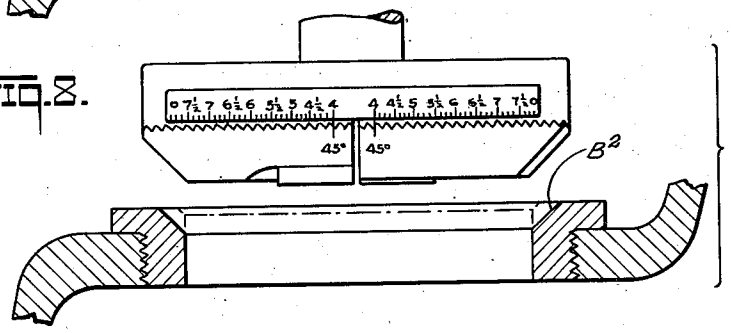


FIG. 9.

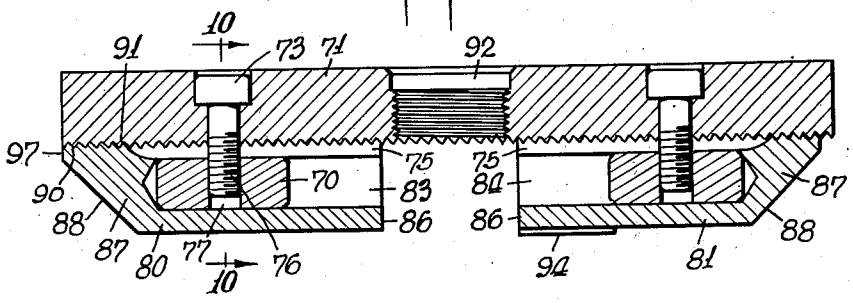
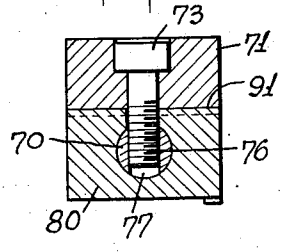


FIG. 10.



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2,466,233

VALVE CUTTING TOOL

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Application August 22, 1945, Serial No. 611,997

2 Claims. (Cl. 29—105)

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My invention relates to a cutting tool for a globe valve reseating machine, and more particularly to one having adjustable cutting blocks.

The general object of my invention is a new and improved cutting tool wherein valve reseating is made more convenient, economical and effective.

Further general objects of my invention are: an improved and simplified cutter block supporting bar; an improved cutter block; an improved arrangement whereby cutter blocks can be quickly assembled with and disassembled from the supporting bar; an improved arrangement whereby adjustment of the cutter blocks relatively to each other and to the bar is facilitated; an improved arrangement for securing the cutter blocks to the bar in any selected position of adjustment; an improved arrangement whereby the cutting blocks may be secured in reversed position; and an improved arrangement whereby the angular positions of the cutting edges with reference to the axis of rotation remains unchanged in all adjusted positions thereof.

For the attainment of these objects and such objects as may hereinafter appear or be pointed out, I have illustrated embodiments of my invention in the drawings wherein:

Fig. 1 is a side elevational view of one embodiment;

Fig. 2 is a top plan view thereof;

Fig. 3 is a section taken on line 3—3 of Fig. 2;

Fig. 4 is a section taken on line 4—4 of Fig. 3;

Figs. 5 and 6 are perspective views respectively of the base bar and of a cutter block of Fig. 1;

Figs. 7 and 8 show two manners in which the tool of Fig. 1 may be applied to the valve for the reseating operation;

Fig. 9 is a section similar to that of Fig. 3 through a second embodiment of my invention; and

Fig. 10 is a section similar to that of Fig. 4 taken on line 10—10 of Fig. 9.

Upon reference to Fig. 1, it will be pointed out that the tool comprises essentially the bar 10 and cutter carrying blocks 12 and 13. The bar 10 (see Fig. 5) is preferably an elongated solid piece of tool steel provided preferably symmetrically centrally of its length and width with a threaded socket 15 formed vertically therethrough for receiving the reduced externally threaded end 17 of the arbor or spindle of the reseating machine. Supporting bar 10 is cylindrically bored inwardly from its end walls 50 and 51 and to opposite sides of the socket 15 as shown at 21 and 22. These bores extend longitudinally and centrally

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of the width of the bar and terminate short of the socket 15 to close their inner ends at 19 and 20, and intersect the lower surface 26 of bar 10 to provide the longitudinally extending slots or openings 24 and 25. The bores 21 and 22 and the slots 24 and 25 are in alignment longitudinally of the bar 10. Bar 10 has its lower surface 26 provided with serrations or teeth across its width to engage with the similarly serrated top surface of the cutter blocks to which reference will shortly be made.

The cutter blocks 12 and 13 are duplicates of each other and the description of one will therefore suffice also for the other. The upper surface of cutter block of Fig. 6 is shown as provided with the centrally longitudinally extending channel or groove 32 to leave the longitudinally extended and relatively elevated surface portions 33 to each side thereof. These surface portions are serrated as shown, for cooperation with the serrated lower portions 26 on the bottom surface of the bar 10 of Fig. 5 in the manner shortly to be pointed out. The groove 32 on the upper surface of the cutter block is cut on the same radius as are the bore portions 20 and 21 of the supporting bar 10 and preferably is substantially of the same width as the width of slots 24 or 25 so that when the cutter block 13 is assembled with the bar 10 with its serrated surface 33 fully engaged with the serrated surface 26 of the bar, the groove 32 and one of the bores 20 and 22 complete a cylindrical bore, the major portion of which is in the bar 10 of Fig. 5 and the minor portion of which is in the cutter block 13 of Fig. 6.

I will now describe my arrangement whereby a set of two cutter blocks 12 and 13 can be readily assembled with the bar 10 and adjusted predeterminedly longitudinally thereof and locked in that adjusted position. This arrangement comprises a round opening formed vertically and centrally of and through each cutter block so that its lower end opens through the bottom of the block and its upper end opens through the groove 32 on the upper surface of the block. The upper portion 40 of this opening is of less diameter than the lower portion 41 and is intended to receive therethrough the externally threaded shank 45 of a headed screw whose enlarged head 46 is received in the lower widened portion 41 of this opening and thus countersunk into the block. The screw is of a length so that when it is fully entered into the aforementioned opening in the cutter block, its shank 45 will project substan-

tially above and beyond the level of the top surface portions 33 of the block.

This arrangement comprises also a cylindrical pin 48 for each cutter block. Each pin is provided with a threaded opening 49 which is shown as passing diametrically therethrough, the diameter of the threaded opening being such that the shank 45 of the aforementioned screw can be threaded thereinto and to this end the external lower surface of the head 46 of the screw may be provided with means such as a cross groove (not shown) which extends diametrically thereof or a non-circular opening for engagement by a tool whereby to rotate the screw.

Fig. 6 shows the pin 48 assembled with the cutter block 13 for and preparatory to assembling that cutter block of Fig. 6 with the base bar 10 to give a relation such as that shown in Figs. 1–4, inclusive. This assembly is effected as follows: The cutter block 13 of Fig. 6 is assembled with the supporting bar 10 of Fig. 5 merely by entering its pin 48 into the open end of bore 20 and then adjusting it to a predetermined position longitudinally of the bore. In this movement of the pin along the bore, it is of course necessary that the shank 45 of its screw align with and enter the slot which extends lengthwise of the bore. In this movement, the shank 45 of the screw cooperates with slot 24 on bar 10 to maintain the approximate parallelism between the adjacent surfaces of the cutter block and the bar 10 and also holds the cutter block to a rectilinear movement longitudinally of the bar. The cutter block 13 is locked in the position to which it has been adjusted merely by rotating the screw in a direction which will cause the cutter block 13 to gradually approach bar 10 until the serrations or teeth 33 on the upper surface of the cutter bar are fully engaged with the serrations or teeth on the lower surface 26 on the bar 10. It will be observed upon viewing Fig. 4 which shows this locked relationship, that pin 48 is seated for its major part in bore 20 of bar 10 and for its minor part in groove 32 of the cutter block 13.

The other cutter block 12 is assembled with the supporting bar 10 to give the showing of Fig. 1 by entering its pin 48 into the open end of bore 21 at the extreme right in Figs. 3 and 5 and then adjusting the cutter block 12 longitudinally along the bore towards the left and to the same extent as the cutter block 13 was moved to the right and the assembly is completed by rotating its screw to lock the bar 10 and block 12 to each other.

It will be understood that the pin 48 of either cutter block can be entered into either bore and that the pins can be entered into the selected bores to present the cutter blocks in either of two relative and reversed positions which are 180° apart in the horizontal plane and that both cutter blocks are adjusted to the same distance from the vertical plane centrally transversely across the cutter bar 10. This adjustment will vary with the size of the valve to be reseated and the accurate predetermination of adjustment of each cutter block to the same relative positions, is facilitated in the manner shortly to be set forth. The serrations on the engaging surfaces 26 and 33 of the cutter blocks 12 and 13 comprise symmetrically formed parallel teeth which extend across the width of these surfaces and whose sides are angled at 45° each. As a result, a complete locking engagement is effected regardless of the manner in which the cutter blocks are assembled with the supporting bar.

Fig. 7 shows the same adjusted relationship of the cutter blocks 12 and 13 as does Fig. 1. The cutter blocks are shown in spaced apart relation with their innermost ends at equal distances from the center of the supporting bar 10 lengthwise thereof, and this relationship can be predetermined and controlled as follows. Fig. 5 shows index markings on one side 10' of bar 10 closely adjacent to the plane of engagement between the bar and the cutter blocks. This index, which is a linear one, is marked for the size of the valve seat which is to be ground or cut. The indexing is duplicated and symmetrically positioned to opposite sides of the central plane vertically across the width of the cutter bar 10. The predetermination of the adjusted position of the cutter blocks is effected merely by matching their innermost ends to the same number on their respective indices.

The cutter blocks can be adjusted longitudinally of the bar 10 to an extreme outward position wherein the screws reach the end walls 50 and 51 of the bar 10 and begin to clear slots 24 and 25. It will be observed that the pin 48 of each cutter block can be reversed without reversing the block and that the openings 49 diametrically through the pins are shown in Figs. 3 and 6 as to one side of the plane diametrically centrally of the pins. As a result the pins 48 can be said to have a longer end and a shorter end with reference to that plane and can be reversed to present the cutter end outermost. This reversibility of the pins 48 relative to their cutter blocks presents the advantage that when the blocks are extended considerably, the pins can be reversed from their position of Figs. 3 and 6 so that the long ends are inside the bars, whereas when the blocks are not so extended, the pins can take their positions of these figures.

Cutter blocks 12 and 13 are each defined by end faces 53 and 60, being inclined at an angle which is shown as 45° in Fig. 1. The cutting tip or edge is provided on this inclined face of each cutter block so that the cutting edge is also presented at an angle of approximately 45° to the horizontal. Upon viewing Fig. 2 it will be observed that these cutting edges of the two blocks 12 and 13 are closely adjacent to the vertical plane longitudinally centrally through the bar 10.

The cutter blocks 12 and 13 are also each provided at the bottom thereof and closely adjacent to one of the side walls of said block with the elongated flat or horizontal cutting tips or edges 65. This pair of horizontal cutting edges 65 are shown as positioned on the diagonally opposite corners of the bottom face of the cutter block and supporting bar assembly.

The reseating of the angular seat of a globe valve increases the large diameter of that seat. Figs. 7 and 8 are intended to show how this reseating can be effected so that the original dimensions of this angular seat are restored by first cutting down the top surface of the valve shown in Fig. 7.

The dotted lines to which reference characters A and B are applied in Fig. 7 are intended to show respectively the annular top surface and the angular seat at the top of a globe valve which requires reseating. The angularity of this seat is illustrated in the drawings as 45° consistent with the showing of the angularity of the cutting tips 60 in Fig. 1. The cutter blocks 12 and 13 are shown in Fig. 7 as adjusted to approximately their position of Fig. 1 as called for by the size

valve chosen for illustration in Fig. 7. In the illustrated position of the cutter bars, the pair of cutting edges **65** which are positioned horizontally to cut the top flat annular surface A, are presented in operative position for that purpose, whereas the other set of cutting edges **60** are inactive. When the tool is brought against the flat top surface A of the valve and rotated, that surface will be ground down, for example, to the level A' and the original height of the angled seat, as shown in dotted lines at B, will be reduced to that shown in full lines in Fig. 7 at B'.

The cutter bars **12** and **13** are then reversed to their position of Fig. 8 to render cutter tips **65** inactive and bring the 45° angled cutter edges **60** into operative relation to the angled seat of the valve whose height has been reduced by the first operation. The tool is then lowered to engage the angled seat portion B' of reduced height and rotated to cut down the angled seat to the level shown at B^2 in Fig. 8 thus restoring to the flat top surface and to the 45° angular seat, the original relations and dimensions which these parts had before the reseating operation was started. The reseating of the angular seat after the flat cutting is effected insures a tight fit by eliminating any burrs that may be left by the flat cutters.

It is the customary practice to use differently sized supporting bars for different ranges of valve seat sizes. The arrangement thus far described is convenient and economical in that it provides a means for cutting a wide range of valve seats and angles with a relatively small number of bars and assemblies. This is indicated by the fact that with this type of construction, only five bars with ten pairs of cutter blocks (two pairs for each bar) are needed for practically all the valve seat sizes and angles that are found in valves ranging from 2" to 12", whereas the same range formerly required more than 65 solid cutters.

It will be observed that the supporting bar has its upper surface clear of all projections or protuberances and that the socket **15** does not therefore require a raised hub to enable the spindle to clear projections or protuberances. It will also be observed that the bores **21** and **22** which extend approximately to the maximum length permitted by the presence of the central socket **15** can be employed for their full length in adjusting the pins **48** because there are no elements which project downwardly from the bar to limit the effective length of the bore for purposes of cutter block adjustment. The length of the bar can therefore be reduced to provide merely for the diameter of the central socket, the length of the bore to each side thereof and the thickness of the wall which separates bores **21** and **22** from socket **15**.

Because the bar **10** has neither a hub or other projection extending upwardly from its upper surface, it can be made of regular cold rolled stock which requires only machining, whereas a hub necessitates that the bar be cast.

It will further be observed that my device comprises essentially only the supporting bar **10** characterized as above and the solid cutter blocks **12** and **13** and that merely a single screw is required to secure a cutter block in any of its adjusted positions.

The bores **21** and **22** are preferably drilled and reamed and the pins **48** are formed from round stock that is ground to proper diameter. The use of cylindrically ground pins and cylindrically bored channels cooperating therewith, possesses advantages which will be readily understood, not only in the preliminary assembling of the parts and adjusting the cutter blocks but also in the locking operation because the cylindrical surface will more readily permit the cutter blocks and the supporting arm **10** to adjust themselves so as to permit the teeth on the surfaces **26** and **33** to fully interengage.

Upon reference to Fig. 3, it will be observed that I show a second and alternative opening through each cutter block for the reception of the screw, also centrally of its width but to one side of the already described opening. I have applied the reference characters **40'** and **41'** to two portions of this opening. The headed screws can be entered into the alternative opening **40'–41'** and the cylindrical pin **48** engaged by the screw in that position thereof. This allows of a further variation in range of adjustment of the cutter blocks which may be preferred for certain size machines. The central socket opening **15** preferably has its upper portion **15'** enlarged and unthreaded and its uppermost portion 15^2 bevelled, to guide the arbor into its engagement with the threads which begin immediately therebelow.

Where the arbor or spindle of the tool is of relatively large diameter and requires a correspondingly larger socket opening, I find it of advantage to machine the supporting arm **10** sufficiently wider however only at its middle so as to permit of the larger socket without, however, correspondingly increasing the all over width of the arm. This holds the arm to a minimum weight and size. This has not been shown in the drawings, but it will be understood by anybody skilled in the art.

The use of a cylindrical pin for each cutter block presents advantages over a single pin for both, in that as herein disclosed the cutter blocks can be adjusted to proper engagement more readily and accurately and the cylindrical pins do not have to be driven through both faces of the cutters as would be the case where a single cylindrical pin is employed. As a result the cutting edges can be centered on the outer surfaces of the cutting block so that their radial adjustment will be not only longitudinal of the cutter but radially longitudinal of the cutter so that the angular relation of the cutters to each other is maintained constant. Another advantage of the illustrated arrangement is that while the cylindrical bores must be sufficiently long to permit the required adjustment of the cutter blocks, cylindrical pins can be relatively short.

In the embodiments of Figs. 1 to 8, the cylindrical pins are carried by the cutter blocks and are adjustable therewith longitudinally of the supporting bar **10**. The embodiment of these figures can therefore be characterized as the adjustable pin type. I will now describe the alternative embodiment of Figs. 9 and 10 wherein the cylindrical pins are not adjustable with the cutter blocks and which therefore can be characterized as the fixed pin type. Upon referring to Figs. 9 and 10, it will be observed that the cylindrical pins **70** are each carried by the supporting bar **71** by means such as a headed screw which is engaged through an opening which is provided vertically through the bar **71**, with the head **73** of the screw seated in the upper enlarged end of the opening in countersunk relation to the bar. The threaded shank **76** of each of the two screws extends outwardly beyond the lower surface of the bar **10** for a sufficient distance so that it can be threaded into an opening **77** extending diametrically

through a cylindrical pin 70. Both screws are free to rotate in the bar 71 and when rotated each will raise or lower its pin 70.

The cutter blocks 80 and 81 are each bored cylindrically as shown at 83 and 84 to freely receive pins 70, the bores being located however entirely within the cutter blocks and extending longitudinally centrally thereof. These bores are open at one end through the vertical end faces 86 of the cutter blocks and their other ends terminate short of and are closed by the end walls 87 whose outer face is inclined as shown at 88. The cutter blocks are each provided with longitudinally extending vertical slots 75 each of a width slightly greater than the width of the shanks 76 of the screw with which it cooperates and of a length to be at least co-terminous with the bore. Each slot 75 is open through the top surface of its cutter block and intersects the bore of that block for the full width of the slot.

The embodiment of Figs. 9 and 10 may conform structurally to the characteristics of the embodiments of Figs. 1 to 8, except as to the differences already pointed out and the further differences now to be pointed out. For example, the engaging surfaces of bar 71 and cutter blocks 80 and 81 are toothed (see 90 and 91), the bar 71 has counterbored socket 92 provided centrally thereof, the cutter blocks are provided with cutting edges 94 for grinding the flat surfaces, all substantially as set forth in the embodiment of Figs. 1 to 8, inclusive.

The cutter blocks of the alternative embodiment are each assembled with the bar by aligning the open end of its bore 83 or 84 with a pin 70 and its slot 75 with shank 76 of the cooperating headed screw and then moving the cutter block inwardly along its cylindrical pin which is fixed to supporting bar 71. This requires that pin 70 be spaced below the bottom of bar 71 sufficiently to prevent interference with the adjustment of the cutter block, by teeth 90 and 91. This clearance can be provided by rotating the appropriate screw. Otherwise the preliminary assembling of the cutter blocks and their adjustment to the same predetermining positions is as set forth in the embodiment of Figs. 1 to 8.

It will however be observed that this alternative embodiment differs from the first described embodiment in that the bores 83 and 84 are below the top of the surface of the cutter blocks and terminate short of the inclined end faces thereof. In both embodiments the angular cutting tips of the two cutter blocks are approximately in radial alignment with each other and the center of the socket 15 and maintain that relation in all adjusted positions of the cutter blocks.

The details of construction herein set forth are intended merely for purposes of disclosure of specific applications of my invention, and are given in compliance with the requirements of the statutes. They are not intended as limitative unless called for in the claims. So also the 45° angularity of the cutter tips 60 is intended as merely illustrative, reference having already been made to the fact that sets of cutter blocks will provide for differing range in sizes and also for other angularities in the valve seat.

What I claim as new and desire to secure by Letters Patent is:

1. In a device for cutting the tapered seats of globe valves, in combination, a mounting bar of prismatic shape having a central tapped socket for attachment, the said mounting bar being machined from bar stock, the underside of the mounting bar presenting a plurality of transversely directed, equidistanced serrations, a pair of cutter carriers, likewise machined from bar stock, the upper surfaces thereof presenting a plurality of transverse serrations fitting said serrations of the mounting bar, said mounting bar having a pair of cylindrical bores extending inwardly from each end thereof, the center of said cylinders being distanced from the underside of the bar somewhat less than the radius of the cylinder, so that a pair of longitudinal slots are formed in said underside of the mounting bar, a pair of cylindrical plugs slidable in said bores and inserted therein from the said ends thereof, having a tapped hole through the diameter thereof, the said cutter carriers having a hole with an enlarged opening at the underside of the carriers, headed screws inserted in said holes with their heads received in said enlarged openings thereof, the ends of said screws clearing in the said longitudinal slots in the underside of the mounting bar and threaded into said tapped holes of the cylindrical plugs.

2. The device according to claim 1 wherein one end of said pair of cutter carriers are beveled and provided with cutting edges, and wherein the underside of said carriers are provided with cutting edges close to the other ends thereof, said pair of carriers being selectively positioned in underlying relation to the mounting bar with their said beveled cutting edges facing one another and with their said underside cutting edges distally disposed for cutting the planar surface of said globe valve seat, and said pair of carriers being then positioned with their said beveled cutting edges distally disposed for cutting the tapered sides of said valve seat.

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