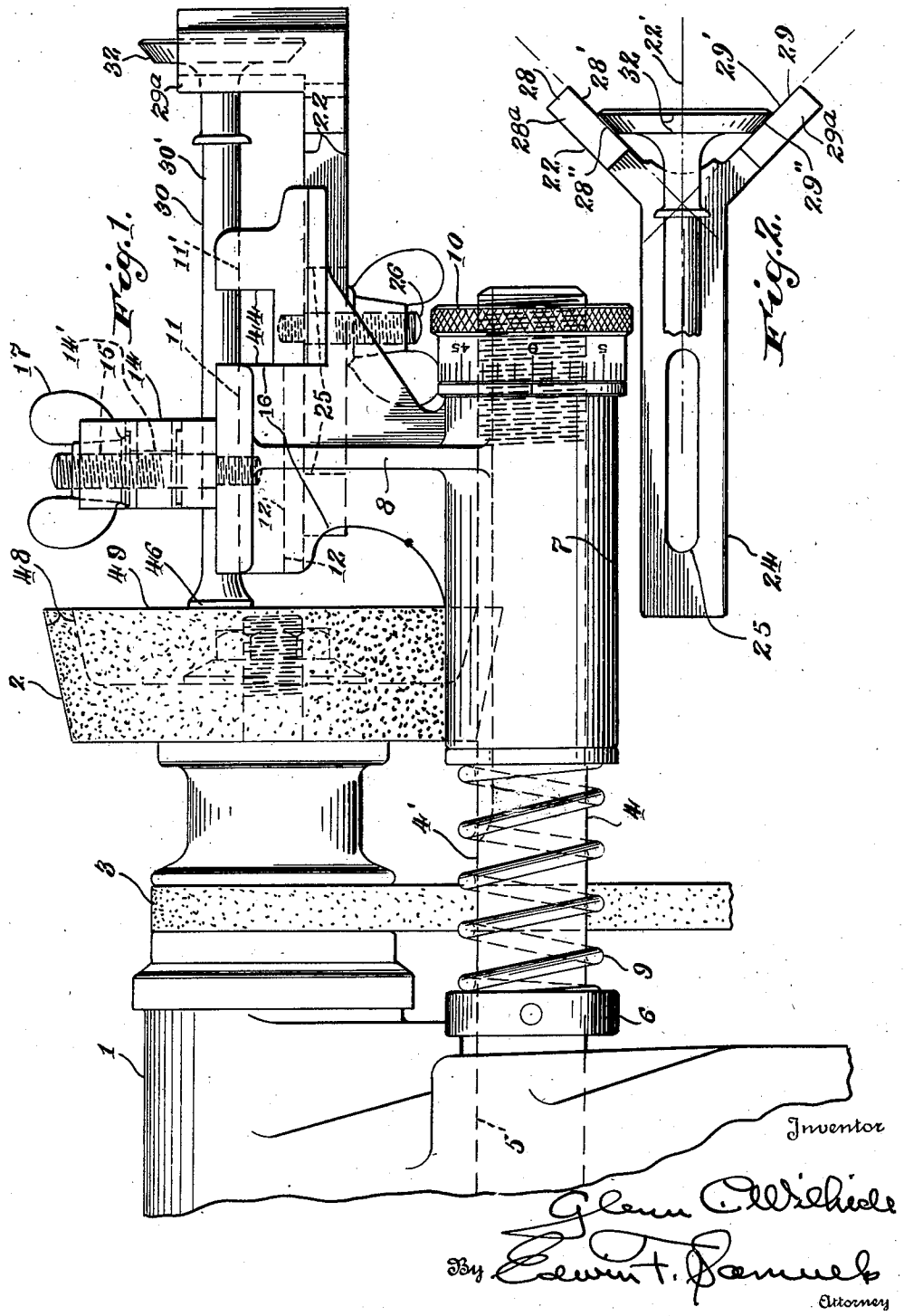
July 8, 1941. G. C. WILHIDE 2,248,262

GRINDING VALVE STEMS AND TAPPETS

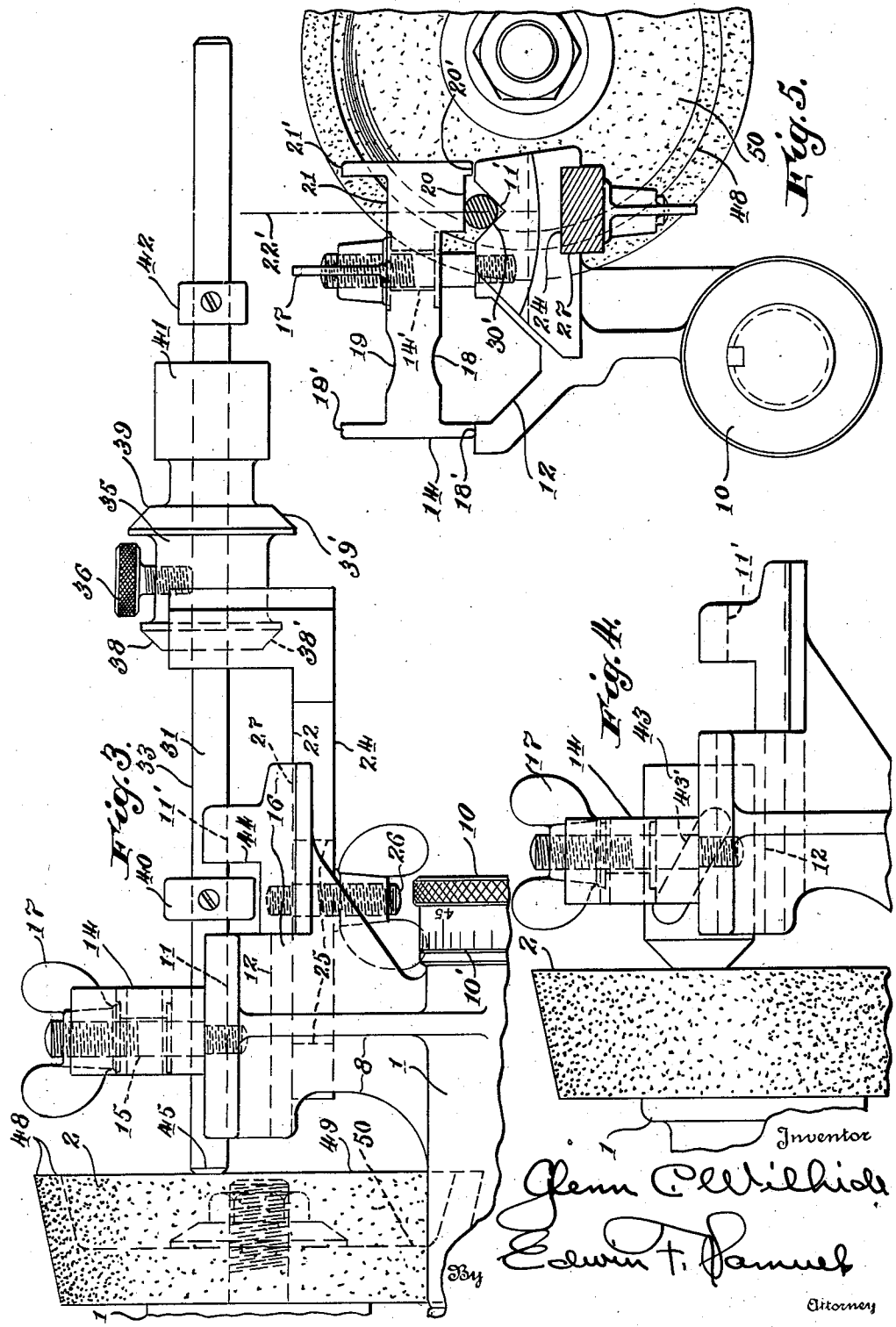
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GRINDING VALVE STEMS AND TAPPETS

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GRINDING VALVE STEMS AND TAPPETS

Glenn C. Wilhide, Towson, Md., assignor to The Black & Decker Manufacturing Company, a corporation of Maryland

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3 Claims. (Cl. 51—124)

In the surfacing or resurfacing of internal combustion motor valves and seats, the effective length of the valve stem is increased, and it thus becomes necessary, particularly in the kind of motor having nonadjustable tappets, to shorten the stem by grinding its lower end, i. e. the end which contacts the tappet. It is also found that the upper surfaces of the tappets, and the lower or tappet ends of the valves become defaced and must be flattened and trued to give satisfactory operation of the reconditioned motor.

The present invention relates to valve stem grinding apparatus of the general class of that shown in Patent 2,151,528, filed February 14, 1936, granted March 21, 1939, and assigned to the assignee of the present application.

The object of the invention is to provide an improved apparatus for trueing the ends of internal combustion motor valve stems, and valve tappets, and for reducing the valve stems to the proper length after surfacing or resurfacing the valve and/or seat, and for trueing and grinding the ends of studs, buttons, and the like which are suited to similar treatment.

It is also of interest that the present apparatus is adapted without change to use in connection with valves of different sizes, and particularly to the grinding of the valve stems and tappets of a well known type of motor in the low priced class and of the V-8 arrangement which is equipped with tappet end valves and nonadjustable tappets, and other valves and tappets.

An important feature of the apparatus is the valve stop, or abutment which eliminates any possibility of the valve or gauge swinging to the side, or yielding upwardly in operation so that the surface produced at the end of the stem might be out of line, i. e. not at right angles to the valve axis.

The defect thus avoided would result in improper adjustment of the valve, and tend to give a variation of the valve opening as the valve rotates, and rotation is generally considered desirable, if not essential to the operation of the poppet type of internal combustion motor valve.

The invention also includes an improvement in the grinding wheel which avoids heating in the grinding or trueing of the end surfaces of valve stems and tappets, and thus avoids burning of the metal.

In the accompanying drawings, I have illustrated a valve stem and tappet grinding attachment embodying the features of the invention in the preferred form.

In the drawings:

Figure 1 is a front elevation of a refacer head and wheel, and the attachment of the invention, showing a valve in the position for grinding or trueing the end surface of its stem.

Figure 2 is a top plan view of the valve, and/or gauge stop, or abutment, for determining the position of the valve relatively to the wheel, and hence the length of the stem.

Figure 3 is an elevation similar to Figure 1, but broken away, showing the gauge in position for determining the setting of the abutment.

Figure 4 is a view taken from the same direction, of a fragmentary nature showing the position of the parts in the grinding of a valve tappet.

Figure 5 is an elevation taken from the right in Figures 1 and 3 showing a valve stem in grinding position in the carriage.

Referring to the drawings by numerals, the illustration includes a valve refacer head 1 on which is mounted a valve refacer wheel 2 driven by a belt 3 from any suitable source not illustrated.

The present machine includes the shaft 4 which is clamped in a hole 5, bored in the head 1 in exact parallelism with the axis of the grinding wheel 2, and is positioned by the collar 6. The surface 4' of the shaft 4 is finished with accuracy about its axis, and the hub 7 of the grinder carriage is also finished internally and is mounted to slide along shaft 4, and to swing about its axis. The hub 7 of the carriage or bracket 8, to be further described, has imparted to it a tendency to the right due to the spring 9 coiled about the shaft 4 between the hub 7 and the collar 6, and the carriage 8 is adjusted with accuracy along the shaft by the thumb nut 10 which is provided with a vernier 10', all in substantial accordance with the previous application above cited, the vernier and thread being to determine valve clearance, etc. The carriage 8 further comprises a plurality of seats 11 and 12 which are shown in end view in Figure 5, and in dotted lines in Figures 1 and 3. These seats are of downwardly tapering cross-section as seen in Figure 5, and as seen in Figures 1 and 3, are elongated in the direction of the axis of the wheel, and in exact parallelism thereto, the seat 12 being the shorter of the two.

Cooperating with these seats, is a clamp bar 14 which is secured in overlying clamping relation to the seats 11 and 12 as shown in Figures 1 and 5, by means of a bolt 15 which is seated in the swinging head 16 of the carriage 8, and extends

through a suitable opening shown in the form of a vertical notch or groove in clamping bar 14. The same being indicated by reference character 14', the wing nut 17 forces the clamping bar 14 down against the work.

It is of advantage that the clamping bar 14 as shown in Figure 5, has arcuate seats or notches 18 and 19 shown as of different radii, in its top and lower surfaces on one side of the screw 15, and feet 18' and 19' at the end edges side of said notches. On the other side of the screw 15 it has a clamping surface 20 and a short foot 20', and opposite the surface 20 it has a flat surface 21, and a foot 21'. The bar can be turned end for end, or it can be turned upside down to bring the notches of different sizes or the presser feet 20 and 21 into cooperation with the seats 11 and 12 to clamp work of different diameters to the carriage to be presented in proper grinding relation to the stone.

An important feature of the invention resides in the valve and gauge stop or abutment 22 shown in plan in Figure 2 and side elevation in Figure 3. This abutment or stop consists of an elongated shank 24 slotted at 25 to be engaged by a screw 26 shown extending downwardly from the bottom of the head 16 of the carriage 8 in Figure 3. The shank 24 slides in the guiding seat 27 shown in end elevation in Figure 5.

This abutment or stop 22, as seen in plan view Figure 2, is in the form of a Y, having two converging arms 28 and 29 at its end at the right in Figure 2, which is in the operative position, remote from the grinding wheel 2. The Y arms 28 and 29, as shown in elevation in Figures 1 and 3, are of considerable extent in a direction at right angles to the diameter of the valve or gauge which diameter connects the tangent points 28'' and 29'', i. e. they extend upwardly to and beyond the horizontal plane of the center of the valve, or axis of the valve 30, as seen in Figure 1, said valve being clamped in the seat 11 for grinding, and likewise above the horizontal plane of the axis of the gauge 31 when similarly clamped. It is also of importance that the inner surfaces 28' and 29' of the Y-arms 28 and 29, are related to each other, and to the axis of the valve in accordance with the angle of the seating surface 32 of the valve to be treated. It is, of course, important that the seat or guide 27 is parallel to the axis of the wheel, as is likewise the stem 30' of valve 30 and the stem 33 of gauge 31 when clamped in grinding and gauging position respectively as shown in Figures 1 and 3, and it is of importance that the abutment, or stop 22 when adjusted toward and from the wheel 2 maintains its gauge or positioning surfaces 28', 29', in the exact angular relation to the wheel axis, and valve and gauge axis described for any and all adjustments. The abutment 22 has the advantage that it engages the valve at opposite tangent points or elements so that there is no tendency to lateral or upward deflection, and being limited to engagement at two opposite tangent points, there is little chance for inaccuracy due to grit and dirt particles. Further, the gauge is suited to any size of valve of substantially the same angle as the abutment on account of its lateral extent, and the vertical extent of the flat surfaces adapts the gauge to treatment of valves having stems of a variety of diameters. The valve stem grinding operation is a process requiring extreme accuracy and it is the purpose of this apparatus to meet this requirement to better advantage than any apparatus hitherto before provided. To this end the abutment 22 has its shank 24 integral with the upright members 28—*a* and 29—*a* on which the valve contacting surfaces 28' and 29' are formed and this shank, while it is adjustable in the direction of the wheel axis, is rigidly related to the seat 11, 11', which seat is an integral part of the carriage. To provide for the adjustment, the abutment shank 24 is elongated in the direction of the grinding wheel axis and this shank fits closely in the guiding seat or way 27.

The gauge 31 is of interest in that it is adapted by merely reversing it end for end to use in the treatment of valves of two different sizes. The gauge 31 includes a rod 33 of approximately twice the overall length of the valve to be treated, being permissibly of more than twice this length. This rod which is to advantage substantially the diameter of the stem of the valve to be treated carries slidably mounted thereon a valve head member 35 which is secured in adjusted position on the stem by means of a thumb screw 36, or in any suitable manner. This valve head member 35 is provided with two oppositely disposed valve head shapes or dummies 38 and 39, provided with oppositely disposed tapered surfaces 38' and 39' of the angle of the valves to be treated. The gauge 31 is also shown as provided with different size collars 40, 41, and 42, to suit the different size holes for the valve guides in the engine block. The valve shapes 38 and 39, as shown in Figure 3, are adapted to fit in the seats of the 60 and 85 horsepower motor of the V type suggested. Valve shape 39' also fits the valve seat of a four cylinder motor of the same make and the bow or elbow 41 fits in the valve guide hole of this motor. The purpose of the collars is to hold the gauge in upright position in place of the valve so that it will give the exact measurement between the seat surface and the operative surface of the valve tappet, i. e. the upper surface of the valve tappet, in its lower position, i. e. the seated position of the valve. Figure 3 shows the gauge in final adjustment to the gauging position for a valve of the 60 horsepower V-type motor for grinding the end of the valve stem, the abutment 22 being clamped. The carriage is then swung out of line with the stem and the valve is placed in seat 11 in place of the gauge.

Figure 1 shows the tappet end valve 30 in grinding position, and Figure 4 shows a valve tappet clamped in grinding position in the seat 12, the valve 30 described being in the seat 11, see Figure 5. Figures 1 and 3 show a notch 44 in the head 16 of the grinder carriage 8 to accommodate the collars 40—42, the collar 41 being shown as integral with the valve shaped gauge member 35.

In the operation of the gauge 31, the valve and spring, and valve guide being removed from the engine casting, the gauge is inserted in place of the valve, and the proper collar 40—42 in place of the valve guide. The valve member 35 is then moved down until the surface 38' or 39', whichever is being used, depending upon the size of the valve being treated, engages the valve seat. The screw 36 is then tightened, clamping the valve member 35 in position, whereby the gauge is seated in place of the valve. The gauge 31 is then removed from the valve seat, and placed in the seat 11 in the carriage 8, and being slid along the same until its end 45, corresponding to the tappet end of the valve, is in contact with the wheel 2. It is then clamped in position and the abutment 22 is set with its abutment surfaces 28' and 29' in contact with the seating surface

36' of the gauge. The gauge 31 is then unclamped by releasing the thumb nut 17 which has been tightened in the first instance to clamp it, and a valve 30 is clamped in its place, the carriage having been swung out of alignment with the wheel so that the end of the valve stem 30' does not contact the wheel. It is of importance that the seating surface 32 of the valve be in close contact with the abutment surfaces 28' and 29', of the stop or abutment 22 before clamping. When the valve has been clamped by means of the block 14 the screw 17 being tightened for this purpose, the nut 10 is turned sufficiently to provide the desired clearance, and the carriage is swung to move the tappet end 26 of the valve across the surface 48 of the stone 2.

In clamping the valve stem in seat 11, 11', the latter being to the right of notch 44, the presser foot 20 of the clamping bar 14 bears on the valve stem holding it in the groove or seat 11, 11'. It is of interest that the valves for the different sizes of motors have stems of different diameters which are clamped in this way. This does not, however, interfere with the accuracy of adjustment, and/or grinding because of the arrangement of abutment surfaces 28' and 29' whereby they intersect on a line parallel to the grinding plane 49 and in the center upright plane of seat 11. This is the plane in which the axis of the valve stem moves up and down, as its diameter changes, i. e. as valve stems of different diameters are clamped in the seat.

Other valve parts, and pins, studs, etc., requiring trueing and flattening of their ends may be ground in this way. The machine shown is also equipped for the trueing or grinding of valve tappets 43 by using seat 12 as shown in Figure 4, and these tappets are of different diameters to which the radii of arcuate notches 18 and 19 in clamping bar 14 may correspond.

Another feature of novelty is that the stone 2 in the improved form has a narrow circular grinding surface 48, preferably of flat radial contour, as seen in Figures 1 and 5 which gives a relatively limited contact with the valve stem, and prevents heating, and consequent burning and deterioration of the metal surfaces being treated. Inside the peripheral area 48 the axial end 49 of the wheel is dished or concave to a greater or less degree as shown at 50.

The edge portion or grinding surface of the stone, as illustrated in the drawings is approximately the average width or diameter of a valve stem and provides not only for satisfactory grinding but for cooling of the stone and the valve stem by the currents of air carried by the frictional action of the inner and outer substantially cylindrical surfaces of the wheel or stone.

This arrangement is particularly desirable in the grinding and trueing of valve stems and tappets and the like where a flat grinding plane is essential and the expedient of grinding on the flat end surface of the wheel must almost necessarily be adopted. Also the fact that the valve stem is stationary in grinding, is a contributing element to the objectionable heating which takes place with the old type of wheel, and is avoided by the improved construction.

I have thus described a grinder construction and a grinding operation in accordance with my invention, and, as examples of the same, the description being specific and in detail in order that the manner of construction applying, operating, and using the invention may be fully understood; however, the specific terms herein are used in a description rather than in a limiting sense, the scope of the invention being defined in the claims.

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

1. The combination with a grinder having a wheel with a substantially flat grinding plane, and a carriage mounted to move on a path parallel to said plane and having a valve stem seat extending in a direction normal to said plane and adapted to hold a valve stem disposed normally to said plane the said carriage having a second seat parallel to said first seat and of greater diameter and adapted to receive a valve tappet in grinding position as to said wheel and a transverse clamping bar extending across both seats intermediately of their lengths and a clamping screw for said bar between said seats.

2. A valve stem grinder having a grinding wheel with a substantially flat grinding plane and a carriage movable in a direction parallel with said plane, said carriage having an integral elongated valve stem seat with downwardly converging valve stem supporting surfaces said seat extending at right angles to said plane, and a valve abutment comprising an elongated shank, the carriage having an integral guideway therefor, said shank being adjustably mounted in said guideway and clamping means therefor, the shank and the adjustment thereof being parallel to said seat, said abutment having upright portions integral with said shank and at the end thereof remote from the wheel with flat upright abutment surfaces formed thereon and converging at an angle equal to the angle of the seating surfaces of the valves to be treated, the planes of said converging surfaces intersecting on a line which is parallel to the grinding plane and extends vertically through the center line of said seat, said surfaces being of extended vertical and horizontal length, providing for the grinding of the stems of valves with heads and stems of a wide variation as to their diameter.

3. In a valve seat grinding apparatus a valve abutment which as seen in top plan is of Y shaped form and is in a single integral piece, said valve abutment having an elongated flat sided finished shank, adapted to fit closely and to slide in a flat sided guideway and having at its bifurcated end two rigid integral upright converging members extending up from the respective bifurcations of the Y, said members having two opposed, plain, flat abutment surfaces elongated vertically and horizontally and converging at an angle equal to the angle of the seating surface of the valve to be treated, the planes of said converging surfaces intersecting on a vertical line, said converging surfaces providing for the positioning of valves of different sizes having heads and stems of widely different diameters.

GLENN C. WILHIDE.