March 21, 1939. H. C. PRESTON 2,151,528

VALVE STEM GRINDER

Filed Feb. 14, 1936 2 Sheets-Sheet 1

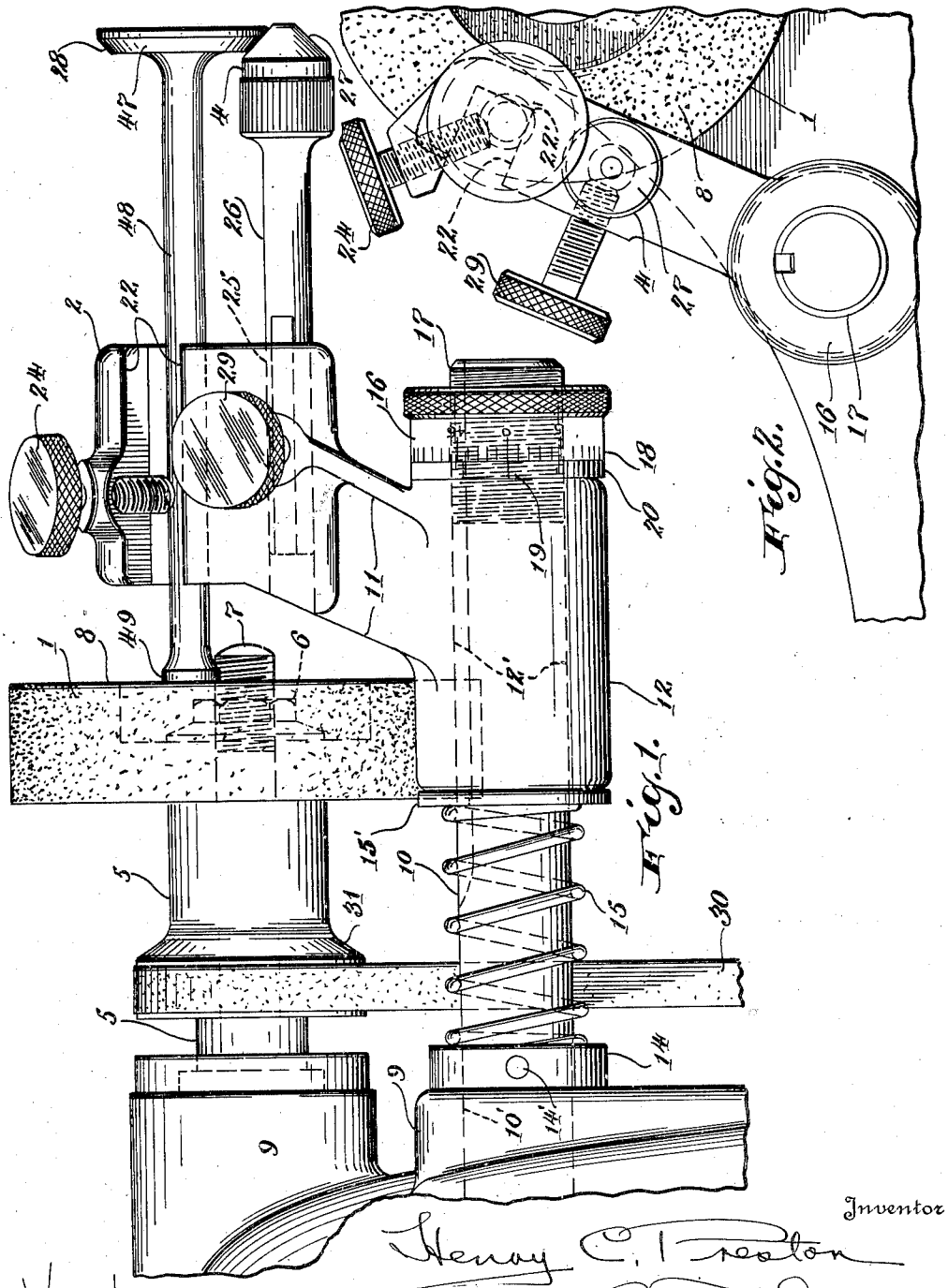


Fig. 2.

Fig. 1.

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VALVE STEM GRINDER

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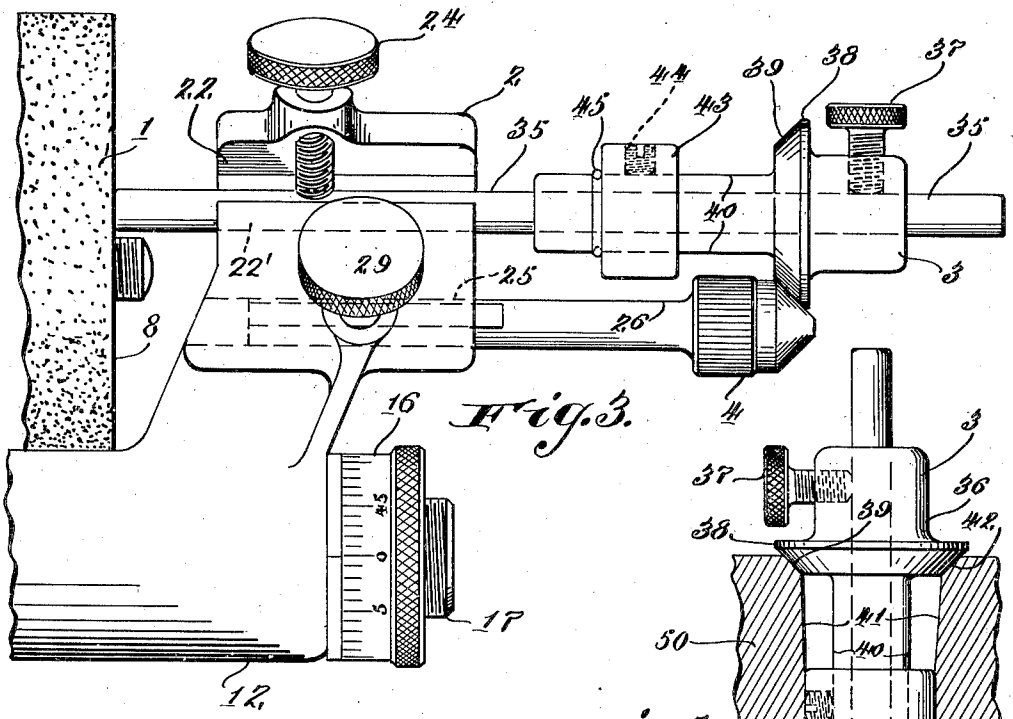


Fig. 3.

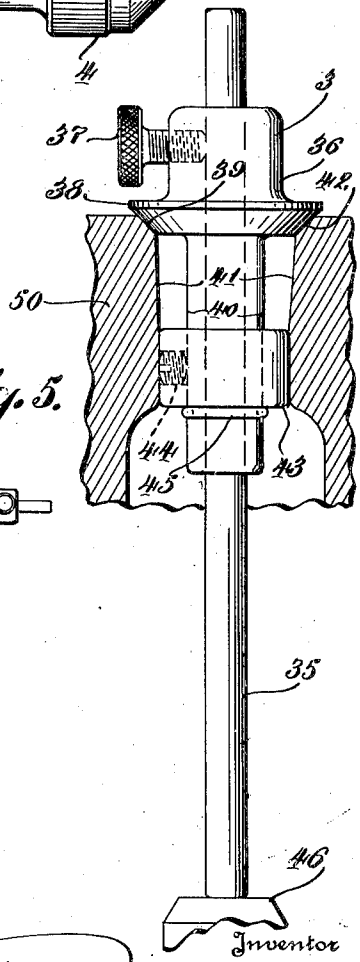


Fig. 5.

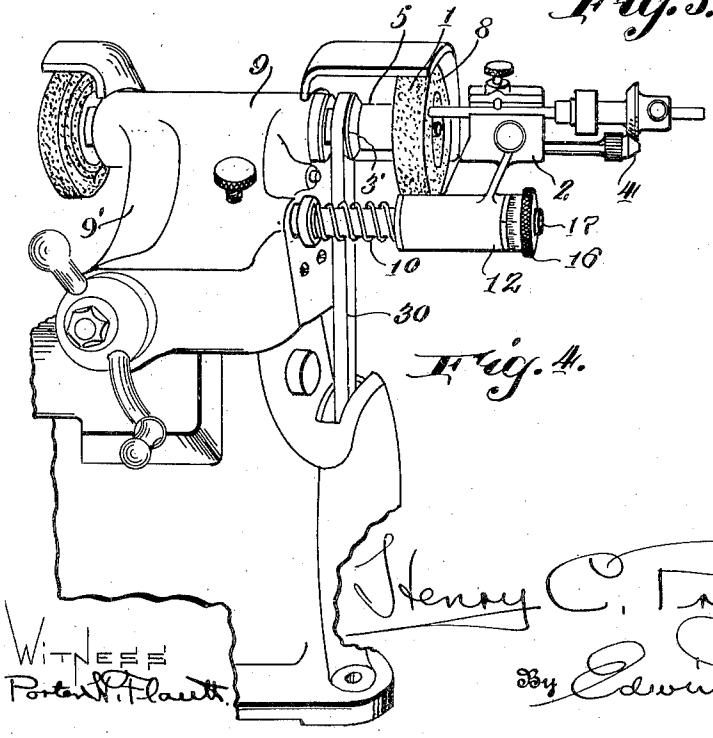


Fig. 4.

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UNITED STATES PATENT OFFICE

2,151,528

VALVE STEM GRINDER

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Application February 14, 1936, Serial No. 63,857

8 Claims. (Cl. 51—124)

The invention relates to apparatus for grinding the end surfaces of valve stems to determine their length, and for ascertaining the proper adjustment of the apparatus for each operation.

While the apparatus is capable of more general application to new work and to other types of valve, they are particularly adapted to the treatment of internal combustion motor valves, after regrinding the valve seats and resurfacing the valve.

The operation for which the grinding apparatus of the invention has been devised is a step in the repair of internal combustion motors in which no adjustment of the valve tappets is provided, making it necessary after each valve refacing and valve seat grinding job to remove some material from the lower end of the valve stem, in order to maintain, in the closed position of the valve, the proper relation between the tappet and the end of the valve stem and between the valve and its seat, so that closing of the valve at all motor temperatures is insured.

The apparatus may also be employed when for any reason it is not desirable to change the valve tappet adjustment and in the assembling of new motors, particularly of the type first above identified.

In the accompanying drawings I have illustrated an apparatus embodying the features of my invention in the preferred form.

In the drawings:

Figure 1 is a front elevation of the grinding wheel and the means for positioning and holding the valve and presenting it to the grinding wheel, for grinding the end of the valve stem.

Figure 2 is a fragmentary end elevation of the same looking from the right in Figure 1.

Figure 3 is a fragmentary view corresponding to Figure 1 illustrating the valve holding or clamping and positioning agencies in their relation to the grinding wheel and the manner of adjusting them to give the proper length of stand for a job which has been tested for this purpose in accordance with the invention.

Figure 4 shows the apparatus of Figures 1, 2 and 3 assembled for operation, in connection with a valve resurfacing machine. This arrangement may be chosen for convenience in performing successively the operation of resurfacing the valves and grinding the ends of their stems to reduce the stems to the proper length.

Figure 5 is an elevation of the valve stem gage in position in the motor, the surrounding portions of which are shown fragmentarily in sections, the upper end of this tappet being shown in elevation.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the construction shown, which is one of various feasible embodiments of the invention, comprises a grinding wheel 1, a swinging head 2, a valve stem gage construction 3 and a valve seating surface positioning abutment 4.

More particularly described, the drawings show the grinding wheel 1, which may be driven in any suitable manner, secured to the grinding wheel shaft 5 of a valve resurfacing machine by means of a nut 6 which engages a threaded shaft end 7. While the apparatus of the invention is for convenience combined with a valve resurfacer, it may also be constructed as a separate unit or in any suitable arrangement. The outer flat surface 8 of the wheel 1 in regular practice is at right angles to the shaft axis. The grinding wheel 1 is preferably removable so it can take the place of some other removable agency as a brush or buffer.

Seated in a recess 10' in the machine frame or casing 9 parallel to the shaft 5 is an arbor 10 on which the swinging head 2 oscillates. For this purpose the head 2 is formed on the end of an arm 11 and on the opposite end of the arm 11 there is a boss 12 containing bearing 12', which is free to slide on the arbor 10 in the direction of its length and to oscillate about the axis of said arbor. Between the bearing boss 12 and a collar 14, which encircles the arbor 10 and is pinned thereto at 14', a spring 15 is coiled about the arbor bearing at one end against the collar 14 and at the other end against a washer 15' which encircles the shaft and rests against the bearing boss 12.

The bearing boss 12 with its arm 11 and the swinging head 2 are held in position against the pressure of spring 15 in any suitable manner but preferably by a nut 16 which engages a fine thread 17 on the arbor 10 near its outer end. The periphery of the nut as shown is marked with graduations 18 which read in connection with a corresponding zero mark or vernier 19 on a washer 20 keyed to the arbor. The nut 16 is referred to herein as a micrometer nut.

The swinging head 2 is grooved at 22 in parallel relation with the shaft 5 and arbor 10 and a set screw 24 is threaded through the head 2, at the upper side of the groove, entering the groove, which is shown as of rectangular cross section, on the diagonal.

The head 2 is also bored at 25 parallel to groove 22 and shaft 5, and in this bore 25 the stem 26 of the inclined abutment 4 is slidably mounted. It will be noted that both groove 22 and hole 25 are seats having guiding surfaces parallel to the axis of wheel 1. While the abutment 4 is shown as having a conical end 27, this is mainly for convenience of manufacture, but it is at least desirable that this abutment bear the same angle of inclination as the valve seating surface 28. The abutment 4 is held in any

desired position of adjustment by means of a set screw 29. The heads of set screws 24 and 29 and micrometer nut 16 are preferably knurled as shown, and shaft 5 is driven by a belt 30, engaging pulley 31 on said shaft, the belt being driven from any suitable source of power as an electric motor not shown which drives the valve refacer 9'.

Referring to Figure 5, the setting of abutment 4 to give the proper length of valve stem for any particular valve and seat is determined by means of a rod or gage stem 35 and sleeve 36 slidably mounted on the stem. The stem is shown as round, and any member which is adjustable along the stem and adapted to support a dummy valve may be substituted for the sleeve. In the form shown the sleeve 36 is secured in adjusted position on the stem 35 by a set screw 37 and is provided with a dummy valve head 38 having a valve head seating surface 39 of the same angle as that of the valve being treated and adapted to contact the valve seat surface 42 which is ground to the same angle as valve head surface 39 and valve seating surface 28. The guide portion 40 of the sleeve 36 is adapted to enter into the valve stem guide opening 41 of the motor casting 50 till the valve head surface 39 contacts seat 42. The guide portion 40 may be provided with a bushing 43 which fits the opening 41 and is secured by means of a set screw 44. Spring ring 45 prevents the bushing 43 from dropping down into the motor in case it should become loosened.

In the operation of reducing a valve stem to the proper length, after resurfacing the valve and grinding the seat, the shaft of the engine or internal combustion motor is turned till the tappet 46, Figure 5, of the valve being treated, is in its lowermost position. This may be most easily ascertained by means of the gage stem or rod 35 which is guided by the sleeve 36 which is first inserted through the valve seat 42 into the valve guide opening 41 as just described with the seating surface 39 of valve head 38 in contact with the valve seat surface 42 and the guide portion centered and aligned with the valve seat axis. To this end it may either fit the valve stem guide opening 41 or be bushed to fit it, or it may be otherwise centered and aligned. The thumb screw 37 being loosened so that the rod or gage stem 35 is free to move up and down, the bottom position of tappet 46 is easily ascertained by the position of the stem. With the parts in this position, the gage stem 35 resting on tappet 46 in its lowermost position, seat surface 39 resting on seat surface 42 and guide portion 40 centered and aligned with the axis of the valve seat, the screw 37 is tightened and the entire valve stem gage construction 3 as assembled with the screw 37 still tightened is withdrawn from the position illustrated in Figure 5 and transferred to the swinging head 2 as shown in Figure 3. In this second position the gage stem 35 rests in the longitudinal corner 22' of groove 22 with its axis parallel to the axis of shaft 5 and substantially intersecting the line of the axis of clamping screw 24, what was formerly the lower end of rod or gage stem 35 bearing against the flat radial surface 8 of grinding wheel 1. With the parts in this position as illustrated in Figure 3 the screw 24 is tightened.

The stem 26 of the inclined abutment 4 is free to slide in the head 2, the thumb screw 29 being loosened for this purpose. The inclined abutment is therefore easily moved to the left of the valve head 38 so as not to interfere with the proper location of the valve stem gage assembly 3. When the latter has been clamped as above stated by tightening the screw 24 with the end of gage stem 35 in contact with grinding wheel 1 and parallel to the shaft 5, the inclined abutment 4 is moved to the right till its inclined surface 27 is in close contact with the valve head seating surface 39. Then the screw 29 is tightened with the parts in this position.

Then the screw 24 is loosened and the valve stem gage assembly 3 is removed from the swinging head 2. The head 2 is next swung about the arbor 10 out of alignment with the grinding wheel 1 and the valve 47 having been refaced as to seating surface 28 is clamped in the head 2 in place of gage assembly 3 this being the valve from the seat 42 to which the valve stem gage was applied after the seat had been ground. To properly locate the valve 47, its stem 48 is placed in the corner 22' of the groove 22 with the seating surface 28 of the valve in close contact with the inclined surface 27 of the abutment 4 adjusted and clamped as above described. The screw 24 is then tightened clamping the valve 47 in the position described in which the axis of the valve 47 and stem 48 is parallel to and with the axis of the grinding wheel 1. By grinding the valve stem in this position the stem would be just long enough to engage the tappet 46 in its lowest position, with the valve seated, and with the parts all remaining at one temperature throughout the process. To provide for seating at other temperatures, particularly when the motor is at normal running temperature or at a higher temperature, a slight clearance must be provided at the normal atmosphere temperature at which the grinding is done. The micrometer nut 16 and screw thread 17 are provided for this purpose, and the setting of the apparatus for the grinding step is completed by turning the nut 16 to the right sufficiently to move the bearing boss 12 to the left to the amount of the desired clearance which is ordinarily about .008''.

To complete the operation, the grinding wheel 1 being in rotation, the head 2 is swung about the arbor 10 away from the observer in Figures 3 and 4, and the operation of the grinding wheel removes the end portion of the valve stem up to the plane of the wheel face 8, which may be defined as the radially disposed side surface of the wheel. This reduces the valve to the right length to cause the valve to open at the right time and to permit full and complete contact at the time of closing at any and all running temperatures.

The operation briefly stated consists in employing the gage to determine the relation between the valve seat and the tappet in its bottom position and clamping the gage in the head 2 to determine the position of abutment 4. The valve is then clamped in the seat or groove 22 in place of the gage, its position being determined by the abutment and the seat. Then its lower end is ground to the right length.

I have thus described specifically and in detail the apparatus of my invention in the preferred form in order that the method of constructing, applying, operating and using the invention may be fully understood, however, the specific terms herein are used descriptively 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 grinding wheel and means for rotating the same of a head mounted to swing in a plane at right angles to the grinding wheel axis, across the face of the wheel, the head having a seat for a valve stem and a seat for the shank of an abutment, both said seats having guiding surfaces for the said stem and shank, parallel to the axis of said wheel, whereby the said stem and shank are guided and supported in parallelism with said axis, clamping means for each said seat and an abutment having a surface adapted to engage the seating surface of a valve, the stem of which is clamped in said valve stem seat, the abutment having a shank adapted to slide and be clamped in the second said seat.

2. The combination with a grinding wheel and means for rotating the same of a head mounted to swing in a plane at right angles to the grinding wheel axis, across the face of the wheel, the head having a seat for a valve stem and a seat for the shank of an abutment, both said seats having guiding surfaces for the said stem and shank, parallel to the axis of said wheel, whereby the said stem and shank are guided and supported in parallelism with said axis, clamping means for each said seat and an abutment having a surface adapted to engage the seating surface of a valve, the stem of which is clamped in said valve stem seat, the abutment having a shank adapted to slide and be clamped in the second said seat, and the same being adapted for use with a separate detached gauge which is clamped in the said swinging head in place of the valve to determine the position of the said abutment in accordance with the relation of the tappet in bottom position to the valve seat and means providing for the movement of the head toward the wheel to determine the valve stem clearance.

3. The combination with a grinding wheel and means for rotating the same of a head mounted to swing in a plane at right angles to the grinding wheel axis, across the face of the wheel, the head having a seat for a valve stem and a seat for an abutment, both said seats having guiding surfaces for the said stem and abutment, parallel to the axis of said wheel whereby the said stem and abutment are guided and supported in parallelism with said axis, clamping means for each said seat and an abutment having a surface adapted to engage the seating surface of a valve, the stem of which is clamped in said valve stem seat, the abutment being adapted to slide and be clamped in relation to the second said seat, the same being adapted for use with a gauge which is inserted in said head in place of the valve stem to determine the setting of said abutment in correspondence with the distance from the valve seat to the tappet and means providing for the adjustment of the head toward and from the grinding plane.

4. The combination with a grinding wheel and means for rotating the same of a head mounted to swing in a plane at right angles to the grinding wheel axis, across the face of the wheel, the head having a seat for a valve stem and a seat for an abutment, both said seats having guiding surfaces for the said stem and abutment, parallel to the axis of said wheel whereby the said stem and abutment are guided and supported in parallelism with said axis, clamping means for each said seat and an abutment having an outside surface inclined to engage the seating surface of a valve, the stem of which is clamped in said valve stem seat, the abutment being adapted to slide and to be clamped in relation to the second said seat, the same being adapted for use with a gauge which is set in accordance with the relation between a tappet in its bottom position and the corresponding valve seat and is inserted in said head in place of the valve stem to determine the setting of said abutment the head having a shaft about which said swing takes place, and means providing for adjustment of the head along said shaft to determine the valve stem clearance.

5. The combination with a grinding member and means for moving the same to provide a grinding plane, of a head mounted to move in parallelism with said grinding plane across said grinding plane, the head having a seat for a valve stem and a seat for the shank of an abutment both said seats having guiding means for said stem and shank at right angles to said grinding plane, clamping means for each said seat and an abutment having a surface adapted to engage the seating surface of a valve the stem of which rests in said valve stem seat the abutment having a shank adapted to slide and be clamped in the second seat.

6. The combination with a grinding member and means for moving the same to provide a grinding plane, of a head mounted to move in parallelism with said grinding plane across said grinding plane, the head having a seat for a valve stem and a seat for the shank of an abutment both said seats having guiding means for said stem and shank at right angles to said grinding plane, clamping means for each said seat and an abutment having an inclined surface adapted to engage the seating surface of a valve, the stem of which is in said valve stem seat, the abutment having a shank adapted to slide and be clamped in the second seat, and means for adjusting said head toward and from said grinding plane to determine the clearance of the valve being ground.

7. The combination with a grinding member and means for moving the same to provide a grinding plane, of a head mounted to move in parallelism with said grinding plane across said grinding plane, the head having a seat for a valve stem and a seat for the shank of an abutment, both said seats having guiding means for said stem and shank at right angles to said grinding plane, clamping means for said seats and an abutment having a conical surface adapted to engage the seating surface of a valve having its stem in said valve stem seat the abutment having a shank adapted to slide and be clamped in the second seat.

8. The combination with a grinding member and means for moving the same to provide a grinding plane of a head having a shaft substantially at right angles to said plane upon which the head is mounted to swing across said grinding plane, a micrometer screw for moving said head along said shaft toward said grinding plane said head having a seat for a valve stem and a seat for the shank of an abutment both said seats having guiding means for said stem and said shank at right angles to said grinding plane, clamping means for said seats and an abutment having a surface adapted to engage the seating surface of a valve the stem of which is clamped in said valve stem seat the abutment having a shank adapted to slide and be clamped in the second said seat.

HENRY C. PRESTON.