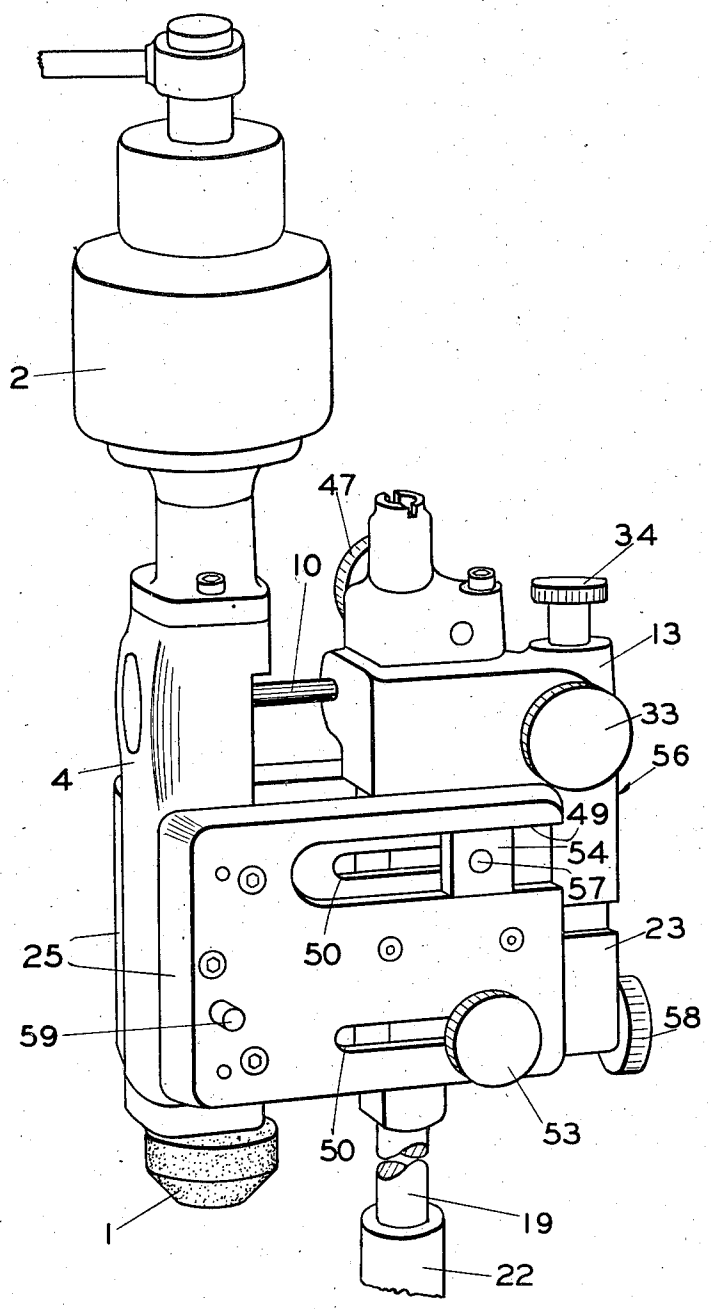
May 28, 1946. A. I. DUNN 2,400,983

VALVE SEAT GRINDER

Filed Aug. 4, 1945 4 Sheets-Sheet 1

FIG. 1



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May 28, 1946. A. I. DUNN 2,400,983

VALVE SEAT GRINDER

Filed Aug. 4, 1945 4 Sheets-Sheet 2

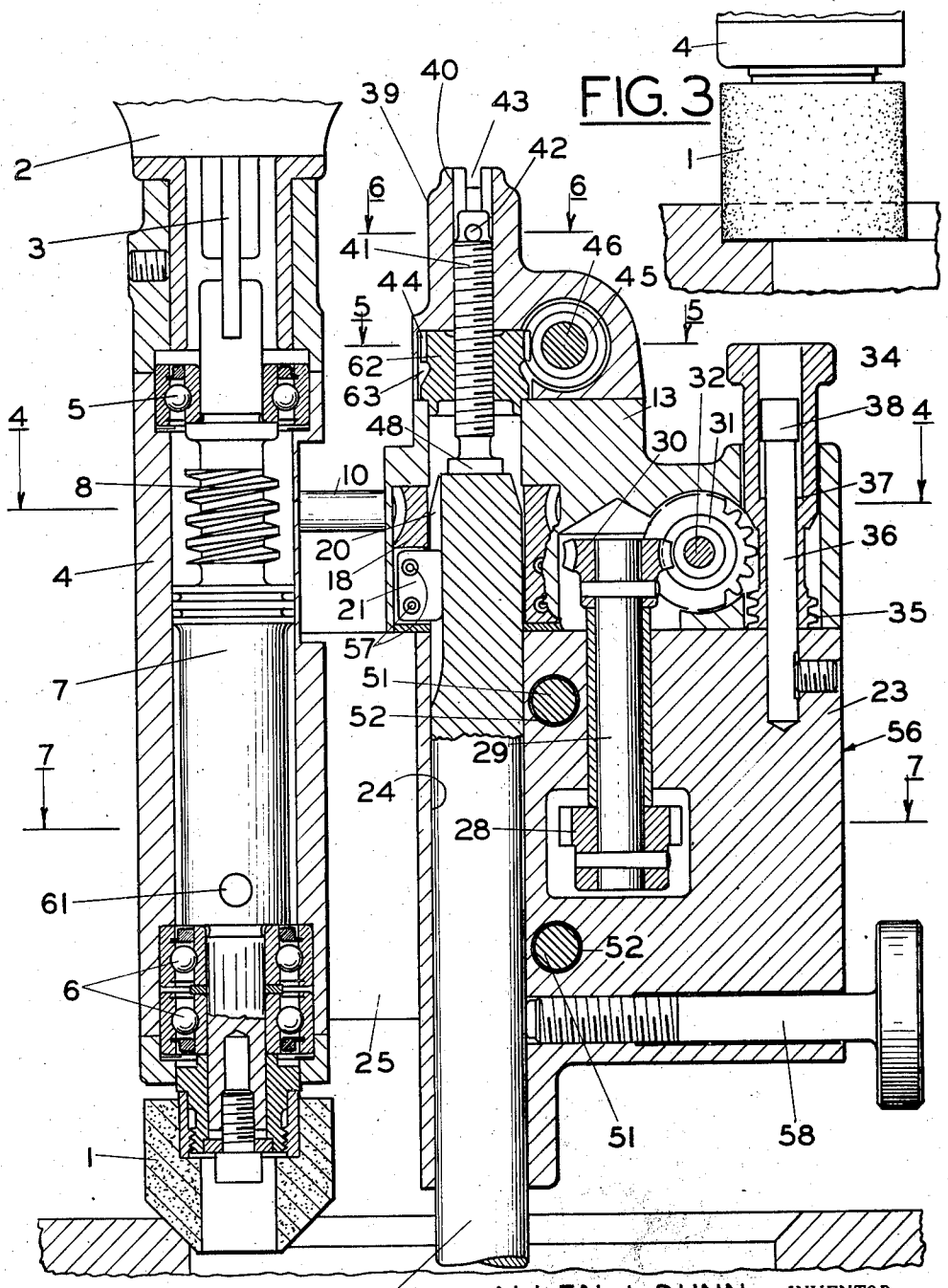


FIG. 2

FIG. 3

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May 28, 1946. A. I. DUNN 2,400,983

VALVE SEAT GRINDER

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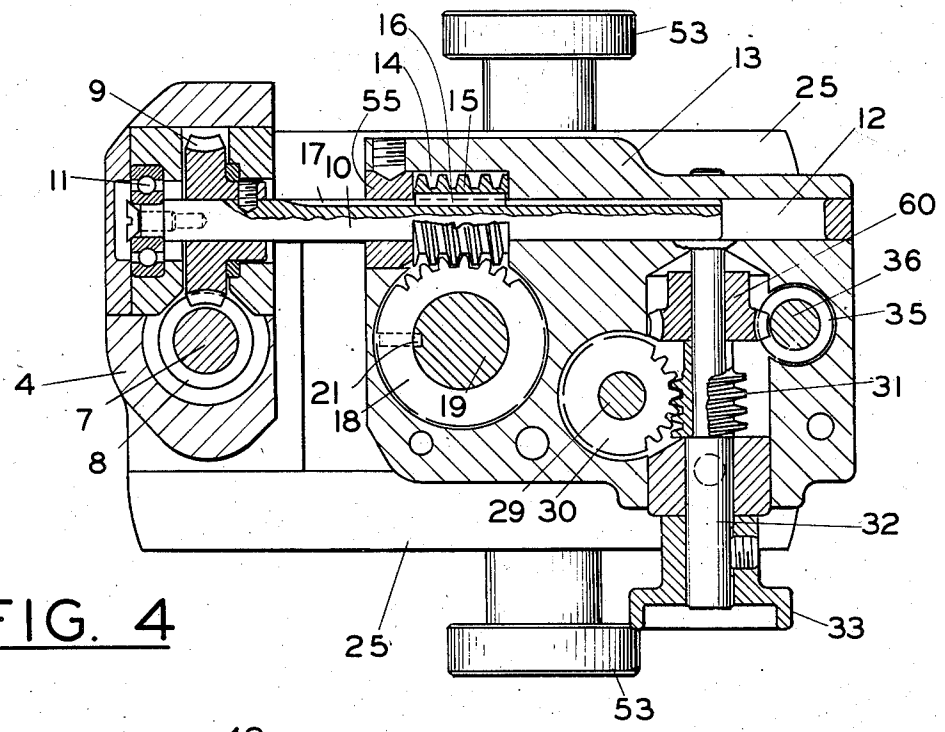


FIG. 4

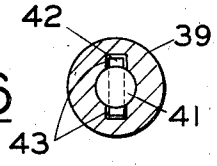


FIG. 6

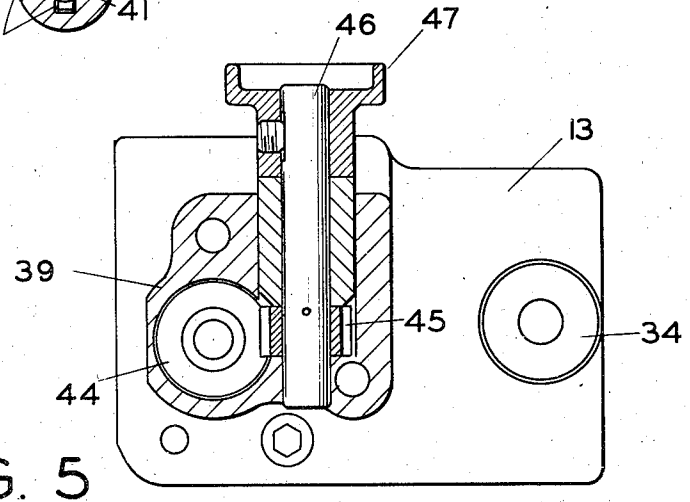


FIG. 5

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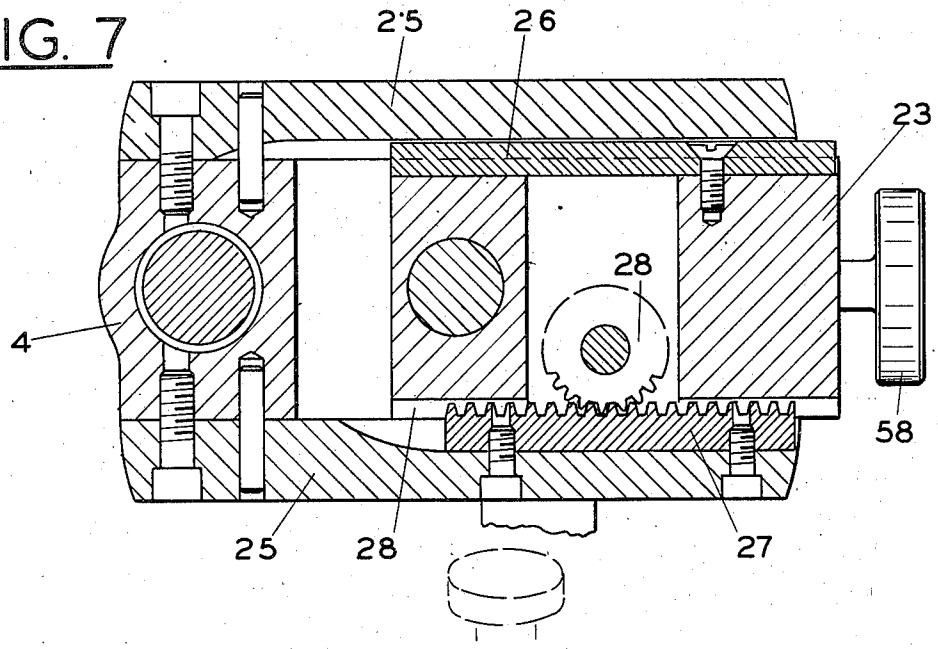
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May 28, 1946. A. I. DUNN 2,400,983

VALVE SEAT GRINDER

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FIG. 7



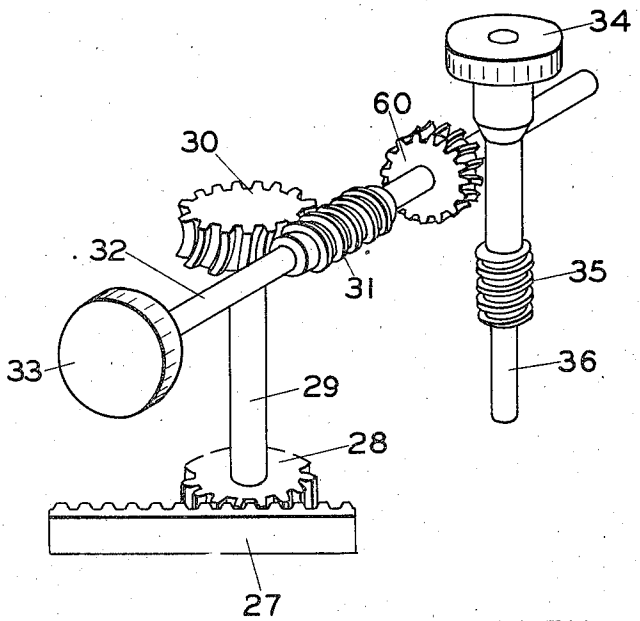


FIG. 8

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Patented May 28, 1946 2,400,983

UNITED STATES PATENT OFFICE

2,400,983

VALVE SEAT GRINDER

Allen I. Dunn, Los Angeles, Calif., assignor to Thompson Products, Inc., Cleveland, Ohio, a corporation of Ohio

Application August 4, 1945, Serial No. 608,901

11 Claims. (Cl. 51—241)

This invention relates to grinders of the type used for grinding a valve seat or seat insert while it is in place in an internal combustion engine. The purpose of grinding the seat in place is to eliminate any misalignment between the valve and the seat. Unless the conical face on the valve fits with substantially perfect mating engagement with the corresponding face on the valve seat, leaking will occur and as a result the service life of the valve or seat, or both, will be only a fraction of what it should be. In large engines, particularly, the accumulated tolerances on the various parts which align the valve with the valve seat are such that considerable eccentricity can occur.

It is therefore the principal object of my invention to provide a grinder tool for valve seats and seat inserts of poppet type valves, which tool will accommodate a large range of sizes and yet has adequate rigidity to perform accurate work.

Another object of my invention is to provide a valve seat grinder having provision for lateral feed and accurate control thereof, whereby the abrasive wheel may be fed laterally to grind a valve seat or a counterbore for a seat insert. Another object is to provide a grinder tool of this type which combines the features of rigidity and accurately controlled lateral feed with the advantages of compactness, light weight, and ease of portability. Another object is to provide an improved feed mechanism for accurately regulating the axial feed of the abrasive tool.

A further object of my invention is to provide a valve seat grinder of the type where the abrasive wheel contacts only a very small portion of the work at any given instant and is automatically progressed around a circular path, together with provision for axial feed and lateral feed which may be accurately and independently regulated by manual controls while the device is in operation.

Other objects and advantages will appear hereinafter.

In the drawings, Figure 1 is a general perspective view of a preferred form of device embodying my invention. Figure 2 is a longitudinal section of the device. Figure 3 is a fragmentary detail illustrating the grinding of a counterbore. Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 2. Figures 5, 6, and 7 are section views taken on lines 5—5, 6—6, and 7—7, respectively, of Figure 2. Figure 8 is a diagrammatic sketch of the gear train employed for lateral feed.

The abrasive grinding wheel 1 is driven from an electric or air motor 2 through a suitable driving connection 3. A bearing housing assembly, generally designated 4, contains axially spaced bearings 5 and 6 for the high-speed shaft 7. Formed integrally on this shaft 7 is a worm 8 which drives a worm wheel 9 contained within the bearing housing assembly 4. The gear 9 is fixed on a shaft 10 having one end mounted in the bearing 11 and the other end received within a recess 12 formed in the shell 13. A counterbore 14 is provided in the shell 13 to receive a worm gear 15 and closure plug 55. The worm gear 15 has a key 16 arranged to slide in a long keyway 17 provided in the shaft 10. Meshing with the worm gear 15 is the worm wheel 18 encircling a pilot 19.

The upper end of the pilot 19 is provided with a keyway 20 to receive a key 21 mounted within the gear 18. The pilot 19 is removably supported in a valve guide 22 in a manner well understood in the art. The pilot 19 acts as a support and locating device for maintaining the entire grinder mechanism in the proper position with respect to the valve guide 22. The shell 13 is mounted on and secured to the block 23 which has a vertical aperture 24 to receive the pilot 19. This block 23 is received between opposed parallel side arms 25 which, in turn, are rigidly attached to the bearing housing 4. This construction permits the grinder shaft 7 to be moved radially away from the pilot 19 to adjust the device to grind valve seats of different diameters, as well as to provide a transverse feed during the grinding operation. One of the side arms 25 is provided with a keyway for the reception of a key 26 carried by the block 23, and the other side arm 25 carries a gear rack 27 which is received within a slot 28 in the block 23. The key 26 and rack 27, together with the sliding fit between the block and side arms 25, act as a guide means or ways for guiding the sliding movement between the block and bearing housing 4, and for maintaining alignment without appreciable deflection. Each of the side arms 25 is provided with a wide groove 49 and two narrow slots 50 which are parallel to the key 26 and the rack 27. A pair of through-bolts 51 extend through holes 52 drilled in the block 23 and through narrow slots 50 and each is provided with a knob 53 on one end. The other end of each through-bolt 51 is threaded to receive a square nut 54 which is arranged to slide in one of the wide grooves 49. With this arrangement, turning of the knobs 53 on opposite sides of the block 23 acts to clamp the block 23 more rigidly between the side arms 25. The frictional force developed between the block 23 and the side arms

25 by this clamping means is not so great as to prevent lateral feed, however.

The lateral feed of the bearing housing 4 with respect to the block 23 is effected by means of a pinion gear 28 which meshes with the rack 27. This pinion 28 is secured on a countershaft 29 rotatably mounted in the block 23 and extending upwardly into the shell 13. A worm wheel 30 is secured to the upper end of the shaft 29 and is arranged to mesh with a worm 31 fixed on the lay shaft 32. The lay shaft 32 is rotatably mounted in the shell 13 and carries a knurled knob 33 at one end. From this description, it will be understood that by turning the knob 33 that the gear train consisting of shaft 32, gears 31 and 30 and shaft 29 is set in motion to rotate the pinion 28 with respect to the rack 27. This knob 33 provides a relatively coarse adjustment. A finer adjustment is available through the knob 34 which is adapted to turn the worm 35 and is mounted for rotation on the stationary post 36. The knob 34 can be lifted manually until the shoulder 37 strikes the nut 38 on the upper end of the post 36. This lifting action brings the worm 35 into mesh with the worm wheel 60 which is fixed on the shaft 32. When the fine adjustment is no longer required, the gear 35 is allowed to drop out of mesh with the worm wheel 31 and thereby make available the coarse feed by means of the knob 33.

A cap member 39 is secured on the shell 13 and has a smooth bore recess 40 for reception of the screw 41. The upper end of the screw 41 carries a transverse pin 42 adapted to travel in opposed slots 43 formed in the wall of the smooth bore recess 40. A nut 62 is received within a counterbore 63 in the cap member 39 and is provided with a gear 44 adapted to mesh with the gear 45. The gear 45 is secured on a feed shaft 46 rotatably mounted in the cap member 39 and provided with a feed knob 47. The lower end of the screw 41 carries a bearing pad 48 adapted to form a rotary contact with the upper end of the pilot 19. The entire grinder device is fed axially of the pilot by gravity when the nut 62 is turned with respect to the screw 41.

In operation, the pilot 19 is first seated in the valve guide 22 in the customary manner, with the upper end of the pilot 19 projecting for approximately the proper distance with respect to the upper end of the guide 22. The grinder device is then lowered into position on the pilot 19 so that the pilot enters the aperture 24 in the block portion of the body member 56. The term "body member 56" is here used to designate the assembly consisting of the block 23, shell 13, and cap member 39. The upper end of the pilot 19 extends through the worm wheel 18 and contacts the bearing pad 48 formed on the lower end of the screw 40. If the key 21 in the worm wheel 18 does not happen to be oriented correctly to enter the pilot keyway 20, the key 21 will merely be moved outwardly in its slot against the confining action of the circular retaining springs 57. These springs 57 will automatically effect engagement of the key 21 and keyway 20 when the gear 18 is subsequently rotated. The springs 57 serve a further purpose in preventing the key 21 from falling out through the aperture 24 when the grinder device is withdrawn from the pilot 19.

When the body member 56 is in place on the pilot 19, the axial feed knob 47 and lateral coarse feed knob 33 are manually turned to bring the abrasive wheel 1 into position with respect to the work. The work may comprise the conical face of a valve seat as shown in Figure 2 or the cylindrical or plane surfaces of a counterbore as shown in Figure 3. The motor 2 is then started, revolving the shaft 7 and abrasive wheel at high speed. Rotation of the shaft 7, and hence the gear train 8, 9, 10, and 14, causes the abrasive wheel to be advanced progressively around the work surface while it is spinning on its own axis. The abrasive wheel 1 may be fed into the work either by the lateral fine feed knob 34 or the axial feed knob 47, or both.

When it is desired to dress the abrasive wheel 1, the grinder device is lifted sufficiently to disengage the key 21 from the pilot keyway 20, and is held in raised position by means of the set screw 58. The motor 2 may then be used to rotate the abrasive wheel 1 without causing the entire device to rotate around the pilot 19. A dressing tool, not shown, of any desired type may then be brought into contact with the abrasive wheel 1.

A pin 59 carried in an aperture formed in the bearing housing 4 and one of the side arms 25 can be thrust into a detent 61 in the shaft 7 to prevent rotation of the shaft 7 and hence facilitate removal and replacement of the abrasive wheel 1. The pin 59 is normally maintained in an inoperative position by a spring, not shown.

While I have shown only a preferred form of my invention, it should be understood that various changes or modifications may be made without departing from the spirit of the invention.

I claim:

1. In a device of the class described for grinding a work surface concentric with a valve stem guide, the combination of a body member, pilot means for rotatably supporting the body member coaxially of the valve stem guide, a carriage member comprising a bearing housing portion and a pair of opposed parallel side arms extending therefrom, said body member having a portion thereof received in slidable relation between said opposed parallel side arms, transverse feed means for effecting relative movement between the body member and the carriage member transverse the pilot axis, said feed means including a rack associated with one of said side arms and a pinion mounted on said body member, axially spaced bearings in said bearing housing portion of the carriage member, a shaft rotatably mounted in said bearings and adapted to drive an abrasive tool, and power means for rotating the shaft.

2. In a device of the class described for grinding a work surface concentric with a valve stem guide, the combination of a body member, pilot means for rotatably supporting the body member coaxially of the valve stem guide, a carriage member comprising a bearing housing portion and a pair of opposed parallel side arms extending therefrom, said body member having a portion thereof received between said opposed parallel side arms, guide means interposed between said body portion and one of said side arms and adapted to permit relative movement between the body member and the carriage member transverse to the pilot axis, transverse feed means for effecting such relative movement, axially spaced bearings in said bearing housing portion of the carriage member, a shaft rotatably mounted in said bearings and adapted to drive an abrasive tool, and power means for rotating the shaft.

3. In a device of the class described for grinding a work surface concentric with a valve stem guide, the combination of a body member, pilot means for rotatably supporting the body mem-

ber coaxially of the valve stem guide, a carriage member comprising a bearing housing portion and a pair of opposed parallel side arms extending therefrom, said body member having a portion thereof received in slidable relation between said opposed parallel side arms to permit movement between the body member and the carriage member in a direction radial to the pilot axis, feed means for effecting such relative movement, said feed means including a stationary element secured to the carriage member and a movable element rotatably mounted on the body member, a shaft rotatably mounted in said bearing housing and adapted to drive an abrasive tool, and power means for rotating the shaft.

4. In a device for grinding a valve seat concentric with a valve stem guide, the combination of a pilot adapted to be received in the valve stem guide, a body member rotatably mounted on the pilot, feed means for moving the body member coaxially of the pilot including an element slidably but non-rotatably supported on the body member coaxially of the pilot, a feed shaft rotatably supported by the body member on an axis contained in a plane normal to the pilot axis, and drive means whereby the feed shaft may advance the said element with respect to the body member.

5. In a device for grinding a valve seat concentric with a valve stem guide, the combination of a pilot adapted to be received in the valve stem guide, a body member rotatably mounted on the pilot, feed means for moving the body member coaxially of the pilot including an externally threaded screw slidably and non-rotatably mounted on the body member coaxially of the pilot, a nut rotatably mounted on the body member and encircling the screw, a gear on the nut, a feed shaft rotatably supported by the body member on an axis contained in a plane normal to the pilot axis, and a gear on the feed shaft meshing with the gear on the nut.

6. In a device of the class described, the combination of a pilot positioned coaxially of a valve stem guide, a carriage member having a bearing housing portion and a pair of opposed parallel side arms extending therefrom, a body member having a block portion received in a slidable relation between said opposed parallel side arms, a pilot-receiving opening in said block portion intermediate the side arms and offset from the geometrical center of the block portion in a direction toward the bearing housing portion of the carriage member, transverse feed means for effecting relative movement between the carriage member and the body member including a stationary feed element secured to the carriage member, and a manually operable gear train on the body member having a rotary feed element adapted to engage the stationary feed element.

7. In a device of the class described, the combination of a pilot positioned coaxially of a valve stem guide, a carriage member having a bearing housing portion and a pair of opposed parallel side arms extending therefrom, a body member having a portion received in slidable relation between said opposed parallel side arms, transverse feed means for effecting relative movement between the carriage member and the body member including a stationary feed element secured to the carriage member, a manually operable gear train on the body member having a rotary feed element adapted to engage the stationary feed element, and a pilot-receiving opening in the body member between the opposed parallel side arms and positioned intermediate the location of the gear train and the bearing housing portion of the carriage member.

8. In a device of the class described for grinding a work surface concentric with a valve stem guide, the combination of a body member, a pilot for rotatably supporting the body member coaxially of the valve stem guide, a carriage member slidably mounted on the body member for movement transverse to the pilot axis, an abrasive tool rotatably mounted on the carriage member, feed means for effecting said transverse movement including a stationary element secured to the carriage member and a movable element on the body member adapted to engage the stationary element, dual means carried on the body member for turning the movable element, and gravity-actuated means for rendering one of said dual means normally inoperable.

9. In a device of the class described, the combination of a body member mounted for rotation about a certain axis, a carriage member slidably mounted on the body member for movement transverse to said axis, feed means for effecting said transverse movement including a rack secured to the carriage member and a pinion meshing therewith, a countershaft rotatably mounted on the body member and having a power transmission element and said pinion secured thereto, dual means carried on the body member for driving the power transmission element, and gravity actuated means for rendering one of said dual means normally inoperable.

10. In a device of the class described for grinding a work surface concentric with a valve stem guide, the combination of a body member, a pilot for rotatably supporting the body member coaxially of the valve stem guide, a carriage member comprising a bearing housing portion and a pair of opposed parallel side arms extending therefrom, said body member having a block portion thereof received in slidable relation between said opposed parallel side arms, axially spaced bearings in said housing portion, a shaft rotatably mounted in said bearings and adapted to drive an abrasive tool, a first gear element on the shaft intermediate said spaced bearings, a second gear element non-rotatably associated with the pilot, and power transmission means including a shaft whereby rotation of the first gear causes the body member to turn about the second gear.

11. In a device of the class described, the combination of a body member mounted for rotation about a certain axis, a carriage member comprising a bearing housing portion and a pair of opposed parallel side arms extending therefrom, said body member having a block portion thereof received in slidable relation between said opposed parallel side arms, means including a transverse element extending through said block portion adapted to adjustably clamp the block portion between said opposed parallel side arms, feed means for effecting relative movement between the body member and the carriage member, and a shaft rotatably mounted in said bearing housing and adapted to drive an abrasive tool.

ALLEN I. DUNN.