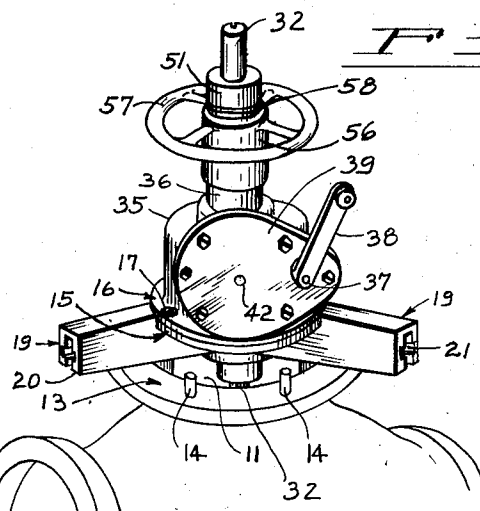
Feb. 18, 1947. P. E. WILCOX 2,416,247

VALVE SEAT GRINDER

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Fig. 1.



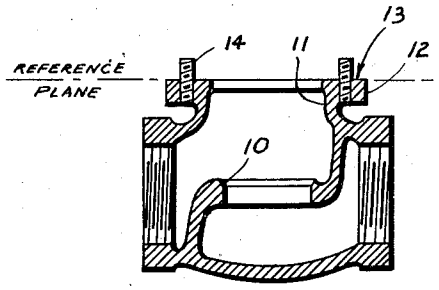


Fig. 2.

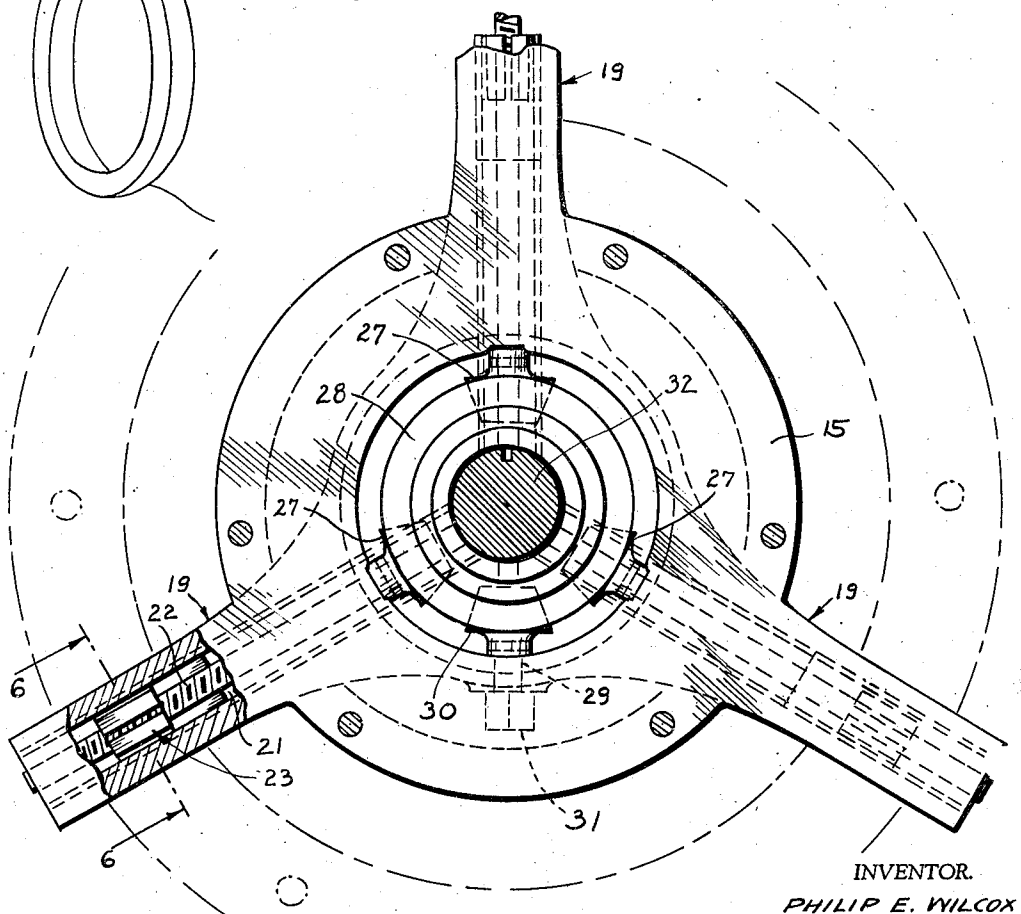


Fig. 3.

INVENTOR.
PHILIP E. WILCOX

BY

ATTORNEY

Feb. 18, 1947. P. E. WILCOX 2,416,247

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Fig. 3.

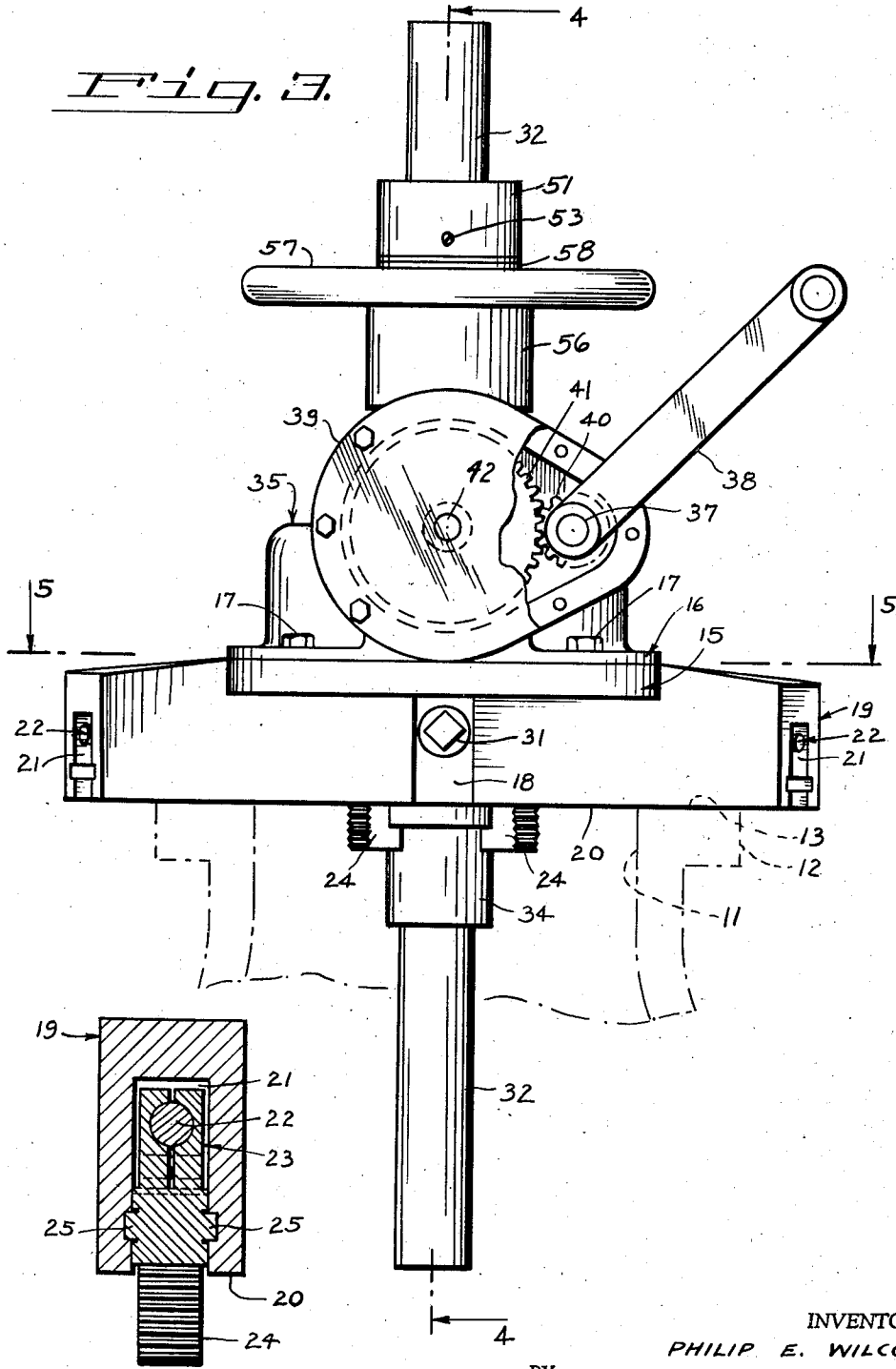


Fig. 6.

INVENTOR.
PHILIP E. WILCOX

BY

ATTORNEY

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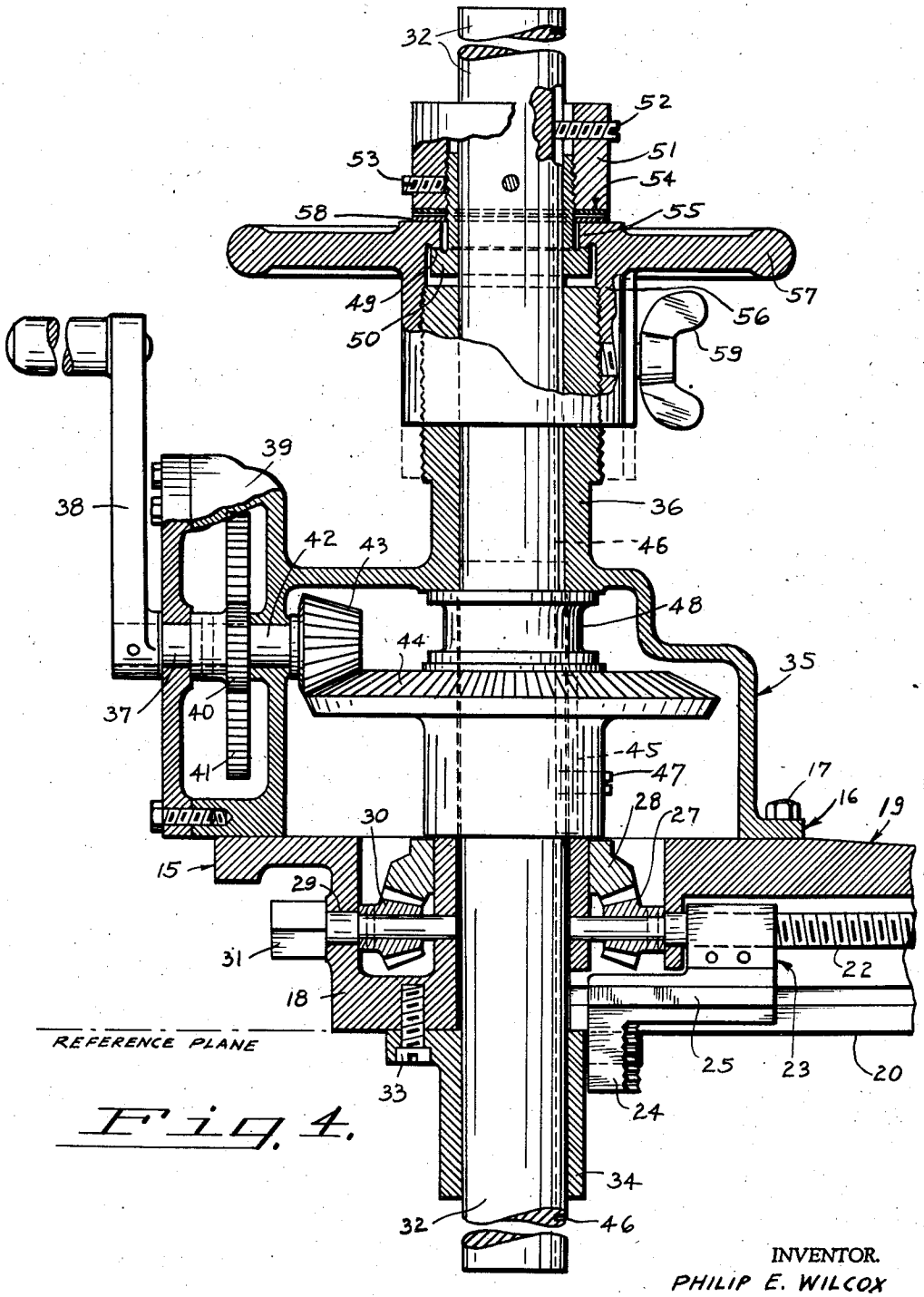


Fig. 4.

INVENTOR.
PHILIP E. WILCOX

BY

ATTORNEY

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UNITED STATES PATENT OFFICE

2,416,247

VALVE-SEAT GRINDER

Philip E. Wilcox, New York, N. Y., assignor to The Leavitt Machine Company, Orange, Mass., a corporation of Massachusetts

Application June 3, 1944, Serial No. 538,647

2 Claims. (Cl. 51—241)

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My present invention relates generally to grinding apparatus, and has particular reference to an improved instrument for grinding valve-seats.

A general object of the invention is to provide certain improvements in the known type of apparatus which is employed to grind or re-grind a valve-seat positioned in the interior of a valve body. Illustrative of the kind of valve-seat for whose grinding the present instrument is primarily intended is the valve-seat of a conventional globe valve. Accordingly, I have herein illustrated and shall hereinafter describe a grinding apparatus suitable for grinding such a valve-seat, although it will be understood that certain phases of the invention may be of wider applicability and are not necessarily restricted in their utility to the grinding of globe valve valve-seats.

Among the problems inevitably involved in grinding an interior valve-seat of the character mentioned is the necessity for accurately positioning and firmly supporting the grinding instrument in proper predetermined relation to the valve-seat, and in maintaining such accuracy and support throughout the grinding operation. Usually the grinding instrumentality is mounted or formed on the end of a work-shaft journaled in a suitable housing for both rotational and axial movements. For proper grinding it is imperative that the shaft be not only centered or aligned in predetermined manner with respect to the valve-seat but that it be "true" in rotation, and it is also of great importance that the shaft remain "true" and centered during the progress of the grinding procedure. The centering or alignment of the shaft is usually accomplished by means of an adjustable chuck adapted to engage the neck of the valve body either exteriorly or interiorly.

In accordance with my present invention, a structure is provided by means of which these necessary accurate relationships can be more readily achieved and sustained, whereby the grinding operation may be performed with greater ease and speed, and whereby the results achieved are uniformly reliable, accurate, and true. More particularly, the present improved array and arrangement of parts are of such a character that the journaling of the workshaft is in accurately fitted positional relation to the housing, and the firm and accurate support of the housing upon a single fixed reference surface formed on the valve body (usually a finished flat exterior surface on the valve body neck through which the valve stem normally extends), may remain entirely unaffected and undisturbed by

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the chuck adjustments and by the axial adjustments of the workshaft. This is achieved by a design of the parts whereby the means for controlling the axial movements of the shaft is independent of the journaled fit of the shaft in the housing, and whereby the chuck engagement with the valve body is similarly divorced from the means controlling the accurate seating of the housing in firmly supported relation to the valve body.

In general, the improved structure is one which lends itself readily to precision manufacture and operation, which functions smoothly and efficiently under varied conditions and over long periods of use, which is relatively inexpensive to manufacture and easy to use, and which is of mechanically sound and staunch character.

I achieve these general objects and desirable advantages, and such other objects and advantages as may hereinafter appear or be pointed out, in the manner illustratively exemplified in the accompanying drawings, in which:

Figure 1 is a perspective view of a grinding apparatus of the present improved type shown in operative relation to a conventional globe valve;

Figure 2 is a longitudinal cross-sectional view through the valve body, illustrating certain known relationships of parts;

Figure 3 is a longitudinal view of the main parts of the grinding instrument by itself, with a portion broken away to reveal certain interior mechanism;

Figure 4 is a cross-sectional view, on an enlarged scale, taken substantially along the line 4—4 of Figure 3;

Figure 5 is a plan view of the lower section of the apparatus, taken substantially along the line 5—5 of Figure 3, with certain parts broken away to reveal interior structure; and

Figure 6 is a fragmentary cross-sectional view taken substantially along the line 6—6 of Figure 5.

The embodiment of the invention which I have herein chosen to illustrate is intended to find support upon a globe valve body and to grind or re-grind the interior valve-seat. After the valve and valve-stem, and associated parts, of a globe valve have been removed, the body presents an appearance substantially as shown in Figure 2. The valve-seat 10 is disposed in the interior of the body, beneath a neck 11, the latter having a flange 12 with an accurately-finished flat exterior surface 13. Carried by the flange 12 are a series of circumferentially-spaced studs 14 by

means of which the stuffing-box and the valve-stem are held in place.

By virtue of the nature of a globe valve, it is through the neck 11 that a grinding tool must be projected in order to engage with the valve-seat for grinding purposes. Accordingly, the grinding apparatus is necessarily designed to co-operate with this neck to bring the tool into proper grinding relation to the valve-seat. The surface 13, being accurately parallel to the plane of the valve-seat, affords a convenient reference surface by means of which the desired positioning of the tool may be achieved, and the valve-seat being accurately aligned, axially, with the neck 11, the latter serves as a convenient means for centering the tool. Because of the importance of these relationships to the proper functioning of the grinding apparatus, and the fact that the precision characteristics of the present improved apparatus depend upon the surface 13 as a fixed guide, the plane of this surface has been specifically designated in Figure 2, as well as in Figure 4, as the "reference plane."

Referring now to Figures 3, 4, and 5, it will be observed that the housing of the present apparatus is composed (for the sake of convenience in manufacture) of two main sections, a lower section and an upper section. By means of abutting disc-like or flange portions 15 and 16, these sections are held together by suitable bolts or studs 17 or equivalent fasteners.

The lower section of the housing has a central hub-like portion 18 (Figure 4) from which three radial supporting arms 19 extend. These arms are preferably arranged at substantially 120° intervals, and each of them has an accurately-finished bottom surface 20 (see Figure 6), these surfaces being accurately aligned in a single plane so as to afford a firm and stable three-point support upon the reference surface 13, as indicated in Figure 1. The spaced arrangement of the arms 19 permits the desired supporting contact to be established in the regions between the studs 14. The bottom surfaces 20 need not be of any unusual widths, and the arms 19 may be of any desired lengths, preferably so chosen that the apparatus may be selectively employed with any of a series of valve bodies of different sizes.

Each of the arms 19 has a longitudinal bore or cavity 21, and a longitudinal slot aligned with the bore and opening onto the surface 20. In Figure 6, the cavity 21 is shown of substantially rectangular cross-sectional configuration, but it may have any other suitable or desired shape. It accommodates a worm-shaft 22 upon which a chuck element 23 is mounted, the latter having a body portion within the confines of the arm 19 and a gripping portion of "dog" 24 which projects out of the slot. The body portion has an interiorly-formed worm thread adapted to engage with the worm-shaft 22, and if desired this portion of the chuck element may be made of split construction, as shown. The opposed walls of the slot in the arm 19, are preferably provided with grooves or guide-ways adapted to receive suitable ribs 25 formed on the chuck element so as to facilitate the longitudinal movements of the chuck element.

As will be obvious, the rotative movements of each worm-shaft 22 cause the corresponding chuck element to move longitudinally. These movements of the three chuck elements are preferably coordinated, and may be controlled by gear mechanism of the character shown. It will be observed that the inner end of each worm-shaft carries a beveled gear 27 journaled in the hub portion 18 of the housing. These gears mesh with a common beveled gear 28 concentrically mounted with respect to this hub portion. A control shaft 29, carrying at its inner end a beveled gear 30 meshing with the gear 28, and suitably shaped on its outer end (as at 31) to receive an actuating tool or the like, brings about simultaneous and coordinated rotations of the worm-shaft 22 thereby causing simultaneous radial movements of the gripping portions or "dogs" 24.

In the embodiment illustrated herein, these gripping portions are of a character which engage the interior of the neck of the globe valve body, but if desired they may be provided in a form which engages the neck exteriorly. Of primary importance is the fact that the parts are so designed and assembled that the movements of the chuck elements have no effect upon the firm seating of the grinding apparatus upon the valve body. This advantage is illustrated most clearly in Figures 4 and 6 wherein it will be observed that each finished surface 20 is below the level of the corresponding chuck element, except for the gripping portion 24, and the latter presents only a lateral surface or surfaces whose sole function is to engage the neck of the valve body, radially, for centering purposes. Accordingly, the apparatus may be rested upon the valve body with the surfaces 20 in contact with the reference surface 13, thus affording an accurate three-point support, and this firm relationship remains unimpaired and undisturbed by adjustments of the chuck elements. Conversely, these chuck elements may be freely adjusted and moved, by actuation of the part 31, to bring about the desired centering of the apparatus relative to the valve body neck, without affecting the accuracy or rigidity of the apparatus in relation to the reference surface 13.

The precision characteristics of the apparatus are assured by mounting the work-shaft in the housing in a "trued" unalterable relation to the surfaces 20, usually at an accurate 90° to the plane of these surfaces. The journaling of the work-shaft is shown most clearly in Figure 4.

One bearing portion for the work-shaft 32 is secured, as at 33, to the hub portion 18 of the lower housing section, and assumes the form of a depending sleeve 34 which may be of any desired or suitable length. A second bearing portion, well spaced from the sleeve 34, is formed on the upper housing section. This latter section has an enlarged part 35 to accommodate certain mechanism presently to be described, and an upwardly extending sleeve 36 which serves as the bearing portion referred to. The bearing sleeves 34 and 36, being rigidly and immovably associated with the housing as fixed parts thereof, define an absolutely true work-shaft axis which may be accurately arranged at a fixed predetermined angularity (preferably 90° as shown) to the surfaces 20, hence to the reference surface 13. During manufacture, the shaft 32 is preferably "lapped" into accurately journaled relationship to these bearings.

The rotational movements of the work-shaft 32 may be controlled in any desired usual manner, but I prefer the improved arrangement shown whereby a drive shaft 37, disposed at right angles to the axis of the work-shaft 32, may be manually rotated by means of a crank-handle 38 or may be mechanically or electrically driven in any other suitable fashion. The drive shaft 37 is journaled in the housing portion 39 and carries a gear 40 which meshes with the larger

gear 41. The latter gear is mounted on a shaft 42 (see Figure 4) which carries the beveled gear 43, the latter meshing with and driving the larger beveled gear 44. The gear 44 is concentrically mounted with respect to the work-shaft 32 and is splined to the latter by means of a key 45 fitting into the key-way 46 in the shaft 32. A set-screw 47 may be provided to fasten the key 45 to the hub of the gear 44. A suitable spacer or washer element 48 may be positioned as shown.

The disposition of the crank-handle 38 in a laterally accessible position serves to facilitate the application of a driving force, either manual or otherwise, for rotating the work-shaft. Moreover, by virtue of the improved arrangement, the actuation of the drive shaft 37 is caused to be positionally remote from and fully independent of the means for controlling axial movements of the work-shaft. The true rotation of the work-shaft on its axis, and in predetermined positional relation to the reference surface 13 and the valve-seat which is being ground, is thus more readily effected and sustained.

Equally independent of the accurately journaled relation of the work-shaft to the housing is the novel means which I have provided for controlling the axial advancements and retractive movements of the work-shaft. To achieve the desired result, I provide a rearwardly-directed shoulder on the work-shaft, accurately disposed in a plane perpendicular to the work-shaft axis. This shoulder is designated by the reference numeral 49 (Figure 4) and is preferably formed on the flange of a sleeve element 50 secured to the work-shaft above the bearing portion 36. The sleeve element 50 is held in position by a collar 51 with which it engages in screw-threaded relation, the collar 51 being secured to the shaft 32 by means of a set-screw 52 which enters the key-way 46 and binds frictionally or otherwise against the bottom wall of the key-way. The parts 50 and 51 may be positionally adjusted relative to each other during the assembly of the apparatus when it is manufactured, or at any subsequent time when such adjustment is desirable, but normally these parts are firmly secured together by means of the set-screw or screws 53.

The lower edge of the collar 51 defines a rearwardly-directed annular shoulder 54 arranged in opposed relation to the shoulder 49. Between the shoulders 49 and 54 is an annular flange 55 carried by the adjusting element 56. This element is in screw-threaded relation to the bearing portion 36, and is herein shown provided with a manually-controllable wheel 57 by means of which the flange 55 may be caused to advance or retire in a longitudinal direction relative to the work-shaft axis. When it advances it presses against the shoulder 49 and thus imparts a longitudinal or axial advancing movement to the work-shaft 32. A compression spring 58, interposed between the flange 55 and the shoulder 54, urges the shoulder 49 constantly against the flange 55.

Between periods of adjustment of the element 56 relative to the bearing portion 36, a set-screw or wing-nut 59 (mounted in the element 56) may be tightened so as to bear against the portion 36 and thereby lock the parts in any selected relationship.

It will be observed that the bearing portion 36 is threaded on its exterior surface. As a result, the accurately "lapped" fit between it and the work-shaft 32 remains entirely unaffected by rotative adjustments of the element 56. This fact, coupled with the accurate transverse disposition of the shoulder 49 relative to the shaft 32, assures precision functioning of the apparatus at all times.

The operative interposition of the spring 58 between the shaft 32 and the adjusting element 56 assures continued and proper frictional engagement at all times between the adjusting element 56 and the shaft, and eliminates any vibration or looseness which might otherwise impair the accuracy of the grinding procedure. This arrangement of parts achieves two further advantages. One is that the physical weight of the work-shaft and its associated parts is always transmitted through the spring 58 to the element 56 and thus to the housing, with no danger at any time that this weight may fall improperly upon the valve-seat and cause possible injury to the latter, or that the weight of the shaft and the parts it carries may in any way impair the accurate fit between the work-shaft and its bearings. The other advantage lies in the ability to bring about a retractive movement of the work-shaft by mere adjustment of the element 56 (causing the flange 55 to bear upwardly against the shoulder 54), without any necessity for disturbing the accurately centered and aligned relationship between the surfaces 13 and 20.

It will thus be seen that the present improved apparatus is of unusual efficiency and reliability, capable of performing micrometrically accurate grinding and regrinding operations, or operations of analogous character, with ease and precision. These advantages are achieved by means of a structure which is relatively simple in its mechanical constituents, relatively inexpensive to manufacture, easy to use, and of rugged and durable character.

Obviously, many of the details herein described and illustrated may be modified by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. Accordingly, unless otherwise specifically alluded to in the claims, these details are intended to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In an instrument for grinding a valve seat in the interior of a valve body having a neck and a flat reference surface in fixed positional relationship to the valve seat, a housing provided with a bearing portion, a work shaft accurately journaled in said bearing portion for rotational and axial movements, means fixedly carried by the housing for supporting the latter on said reference surface with the shaft axis accurately at a predetermined angle to said surface whereby the operative end of said work shaft may be brought through said neck into accurate positional relation to said valve seat, said means comprising three radial arms having outer surfaces affording a three-point support upon said reference surface, said arms being arranged at approximately 120° intervals, and complementary chuck elements carried by said arms and provided with dogs adapted to engage radially with said neck, and means for mounting each chuck element in one of said arms for longitudinal movement therein, each arm having a longitudinal bore therein and an aligned longitudinal slot in its outer face, each chuck element being mounted within said bore so that only the dog thereof projects outwardly through said slot, whereby longi-

tudinal movements of said chuck elements may be effected independently of the accurate support of the housing upon said reference surface.

2. In an instrument for grinding a valve seat in the interior of a valve body having an upstanding neck terminating at its top in a flat exterior surface which is accurately finished to serve as a single surface of reference on the valve body, a housing having its bottom portion composed of radially extending arms, the bottom surfaces of which are accurately ground into the same plane to serve as a single surface of reference on the valve top whereby when the housing is seated on the valve body, the former will always be uniformly related to the latter in all angular positions of the housing, said housing being provided with a bearing surface, a work shaft extending downwardly from and beyond the housing for entry into the interior of the valve body when said housing is seated on said surface of reference, said work shaft being accurately journaled in said bearing portion for rotational and axial movements, whereby said surfaces of reference will always position and maintain the shaft accurately to the valve seat in that position to which it has been adjusted in its bearing and chuck means carried by said arms and depending below the bottom surfaces thereof for affixing

the housing to the valve body after it has been seated thereon, said chuck means being adjustable radially along said arms to an inner position wherein when said housing is seated on said valve body said chuck means can be entered into the neck of the valve top and then expanded to engage the inner surface of the valve neck wall without disturbing the seating of the housing on the valve body.

PHILIP E. WILCOX.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,654,219	Houser	Dec. 27, 1927
1,676,414	Romano et al.	July 10, 1928
1,693,767	Smith	Dec. 4, 1928
1,713,316	Yertson	May 14, 1929
210,433	Phelan	Dec. 3, 1878
513,392	Hall	Jan. 23, 1894

FOREIGN PATENTS

Number	Country	Date
266,008	Germany	Oct. 17, 1913