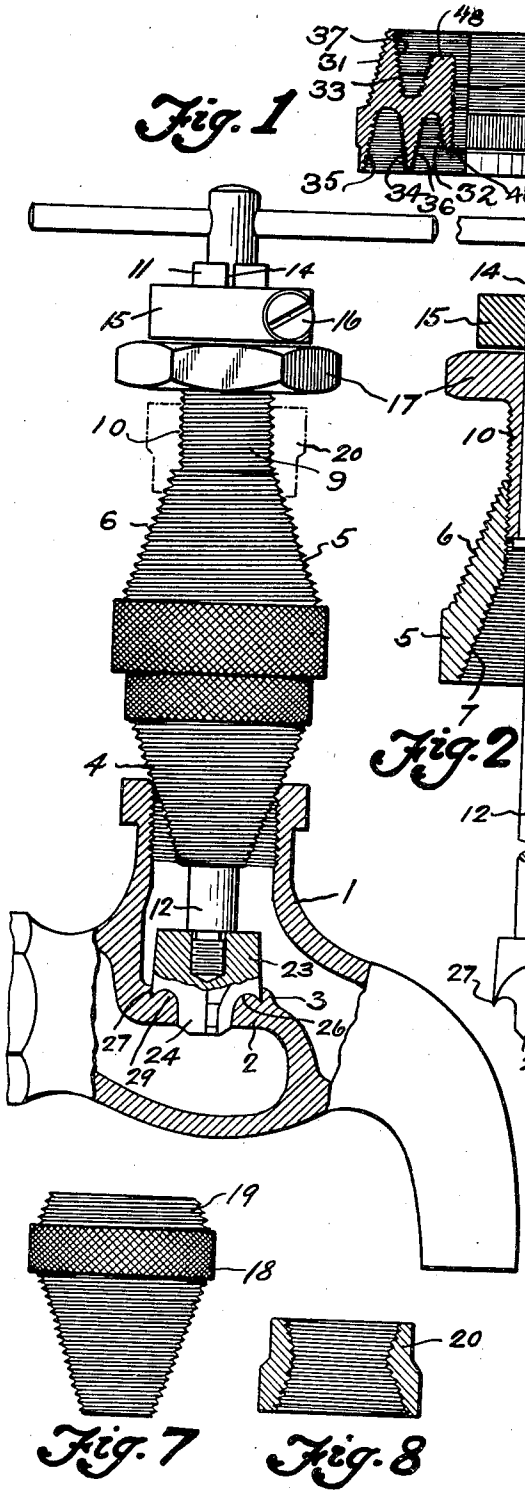
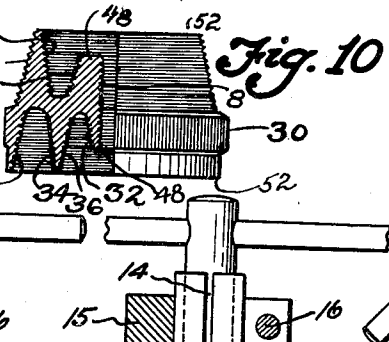
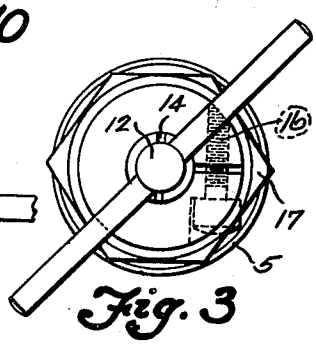
Jan. 25, 1938. R. G. HAWKER 2,106,173

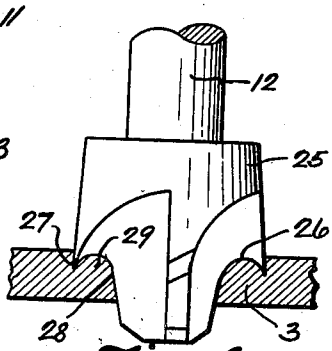
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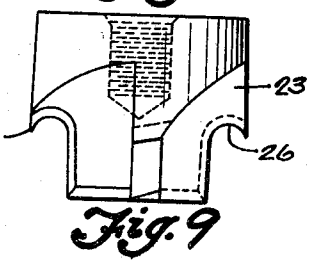
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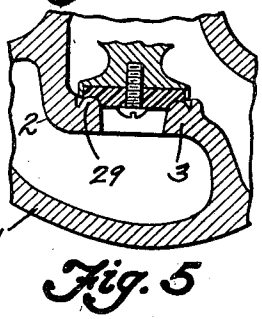












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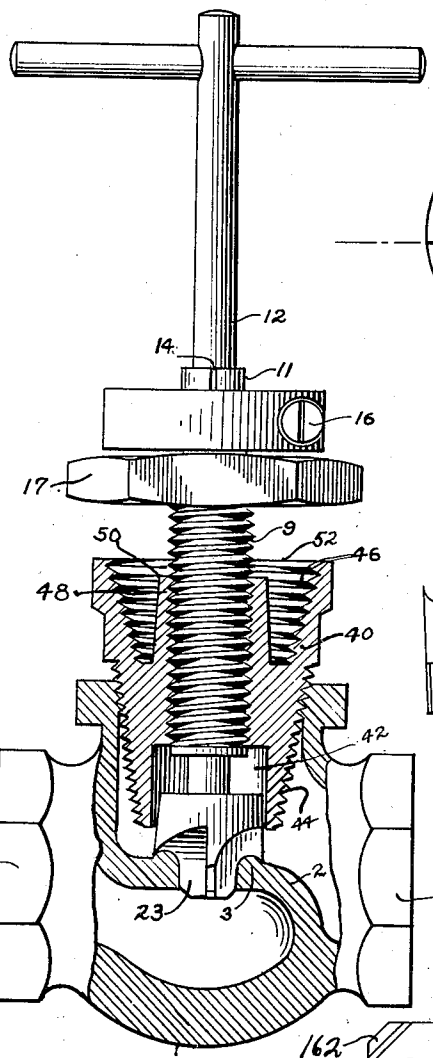


Fig 11

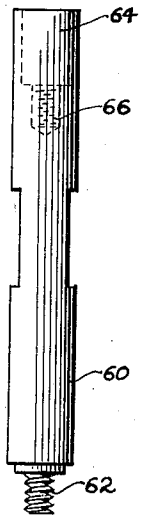


Fig 12

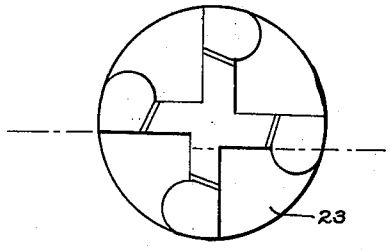


Fig 13

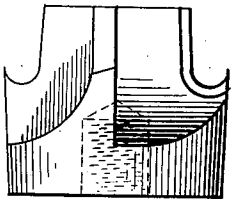


Fig 14

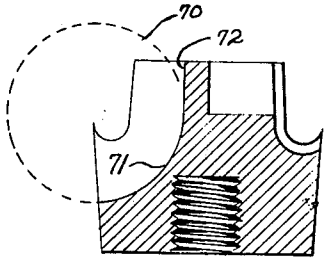


Fig 15

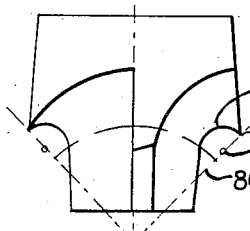


Fig 16

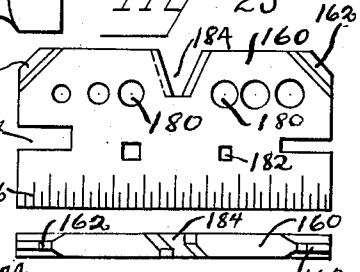


Fig 25

Fig 26

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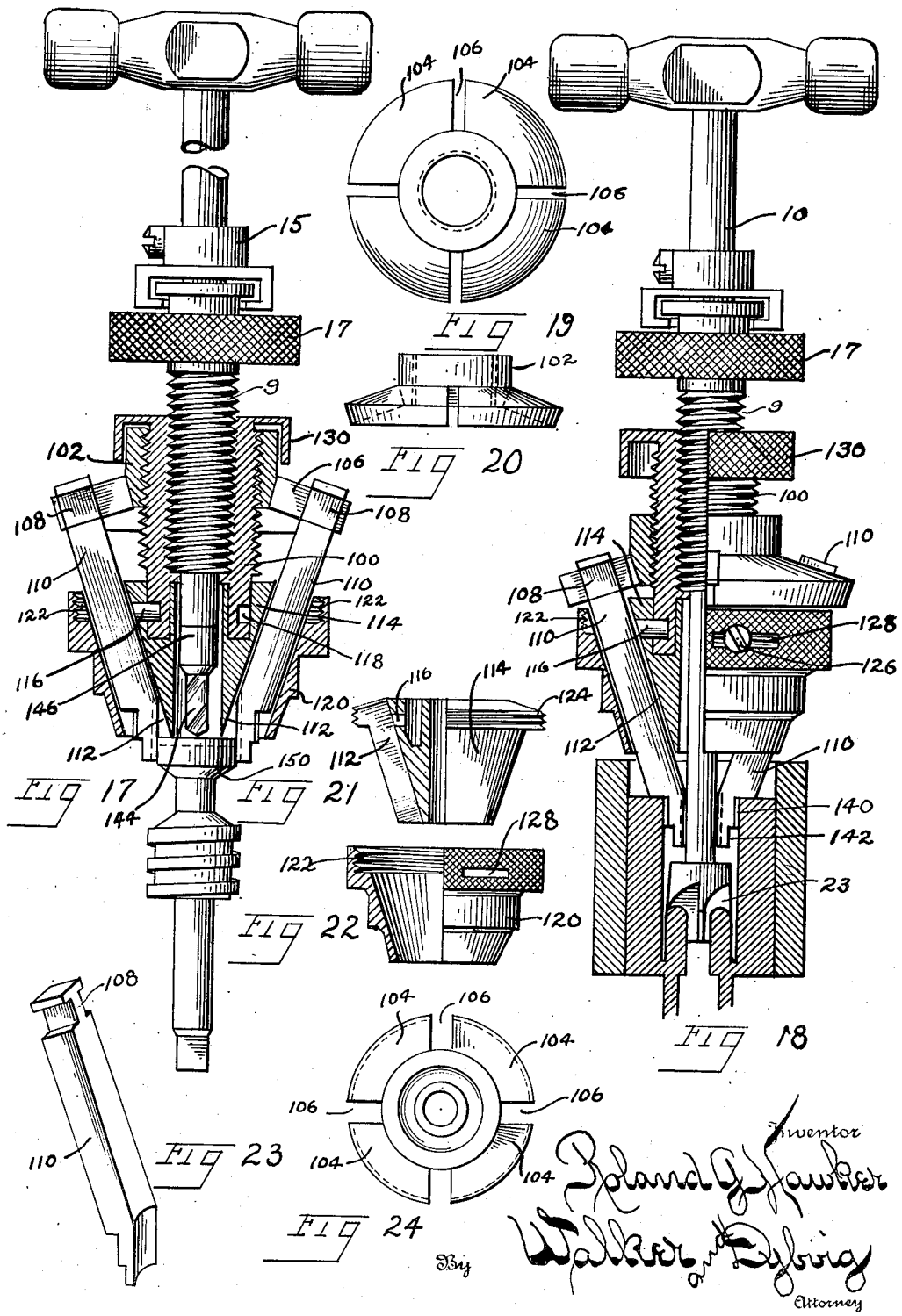


Fig 17

Fig 18

Fig 19

Fig 20

Fig 21

Fig 22

Fig 23

Fig 24

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Patented Jan. 25, 1938 2,106,173

UNITED STATES PATENT OFFICE

2,106,173

BIBB SEATING TOOL

Roland G. Hawker, Burlington, Vt.

Application September 7, 1935, Serial No. 39,589

2 Claims. (Cl. 90—12.5)

This invention relates to valve seating tools which are particularly adapted for renewing the seating surfaces of globe valves, bibb type faucets and analogous constructions. This is a continuation in part of my copending application Serial No. 692,662, filed October 7, 1933.

The present tool is applicable to a wide range of sizes of valves and faucets, with which it is detachably engageable by means of a universal mounting or an adapter therefor. Such mounting forms a guide for a revoluble cutter shaft, having a cutter head of improved design, adapted to form a contoured seat of maximum size with minimum waste of material and lost space, which comprises one of the dominant features of the invention, and including manually adjustable means for positively feeding the cutter head and shaft axially independent of their rotation.

The object of the invention is to simplify the structure as well as the means and mode of operation of such devices whereby they will not only be cheap in construction, but will be more efficient and convenient in use, accurate in operation, uniform in action, easily operable and unlikely to get out of repair.

A further object of the invention is to provide an improved form of mounting for the tool and to provide positive feeding means for the cutter shaft.

A further object of the invention is to provide adapters by which the range of adaptation may be greatly extended to include valves of extreme sizes.

A further object of the invention is to provide a cutter head having peripheral clearance which will facilitate its operation and to further provide a tapered centering seat by which the cutter is more accurately located with reference to the valve seat being formed.

Another object of this invention is to provide an adapter for use with valves having shallow seats.

A further object of this invention is to provide an adapter wherein the operating tool may be retracted into the adapter when in inoperative position.

A further object of this invention is to provide an expansible and contractible adapter unit for use with various sizes and types of valves.

Another object of this invention is to provide an adapter for removing obstacles from portions of the valve fixture.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

In the accompanying drawings, wherein is shown the preferred but obviously not necessarily the only forms of embodiment of the invention, Fig. 1 is a side elevation, partly in section, of a bibb type faucet and the tool, forming the subject matter hereof, applied thereto. Fig. 2 is a vertical sectional view of the tool assembly. Fig. 3 is a top plan view. Fig. 4 is an enlarged side elevation of the cutter head, showing it applied to the diaphragm or partition of a fixture illustrated in section. Fig. 5 is a detail sectional view of the completed valve seat, showing the application of a closure valve thereto. Fig. 6 is a detail view of a modification of the mounting member for the adjusting screw. Fig. 7 is a side elevation of an adapter, by use of which the tool may be applied to fixtures of smaller size. Fig. 8 is a sectional view of a further adapter. Fig. 9 is a side elevation of a modification of the cutter head, wherein cutting edges are provided on the terminal end of the pilot portion. Fig. 10 is a view of a universal adapter with parts broken away and shown in section. Fig. 11 discloses another modification of an adapter wherein the cutting tool may be retracted into the adapter when trimming shallow seats. Fig. 12 is an extension for use with the adapter when used with extremely deep valves. Figs. 13, 14, 15 and 16 disclose various sizes and types of cutting tools. Fig. 17 discloses another modification of adapter particularly adapted for use with ball cock attachments and illustrated with a drill attachment for removing a screw or other obstructions from a portion of the valve fixture. Fig. 18 is similar to Fig. 17 showing the attachment engaging a ball cock valve. Figs. 19, 20, 21, 22, 23 and 24 show the use of parts of the adapters shown in Figs. 17 and 18, Figs. 21 and 22 having portions shown in section. Figs. 25 and 26 show a side elevation and top plan view respectively of a bibb seat removing and tightening tool.

Like parts are indicated by similar characters of reference throughout the several views.

In the accompanying drawings, 1 indicates a typical bibb type faucet embodying a diaphragm or division wall 2 having therein an opening about which is located a valve seat 3 to be formed or refinished.

The present valve seating device is detachably engageable with the screw threaded top 4 of a valve or faucet which ordinarily receives a pack-

ing gland for the valve stem. In some fixtures, the top 4 is interiorly screw threaded while in other fixtures such portion is threaded exteriorly. The present tool is universally adaptable to either exteriorly or interiorly threaded fixtures by means of a mounting cone 5 having both interior and exterior conical screw threaded surfaces 6 and 7. By reversing the position of the mounting cone 5, it may be engaged either interiorly or exteriorly of the threaded portion 4 of the fixture. The conical form of the mounting member affords a relatively wide range of adaptability, enabling such cone to be engaged at one point or another throughout its tapered form, either interiorly or exteriorly of fixtures of various sizes. Although the surfaces 6 and 7 will not conform to the threaded surfaces of the fixtures, nevertheless at a point of corresponding diameter there will be ample interengagement of the threads of the mounting cone with those of the valve or faucet to temporarily hold the cone firmly in engagement during the reseating or seat reaming operation.

Beyond the interior conical threaded portion 7 of the mounting cone 5, such member is provided with a straight interiorly threaded bore 8 to receive a bearing and feeding sleeve 9. This bearing member 9 is provided with a straight threaded portion 10 adjustably engageable within the threaded bore 8 of the mounting cone 5. The adjustable sleeve 9 is provided with a smooth bore which affords an extended guide bearing for a bushing sleeve 11 engageable in different positions of axial adjustment upon the cutter shaft 12.

The bushing sleeve 11 is peripherally flanged at the lower end at 13 to afford an abutment for the end of the screw threaded adjusting sleeve 9. The upper end of the tubular bushing 11 is longitudinally slotted at 14 and is engageable within a surrounding clamp collar 15 adapted to be contracted by the screw 16 into clamping engagement with the tubular bushing 11 and thereby contact the bushing 11 immovably upon the cutter shaft 12. The feed screw 9 is free for rotation about the tubular bushing 11 intermediate the terminal head or flange 13 and the clamp collar 15. To facilitate its rotary adjustment, the feed screw 9 is provided with a head 17 which may be peripherally knurled or of polygonal form. By such screw threaded adjustment within the cylindrical bore 8 of the mounting cone, the cutter shaft 12 is adjusted axially relative to the mounting cone and the faucet or valve with which the cone is interengaged independently of the rotation of such shaft.

To adapt the device to fixtures too small to receive the threaded surface 6 of the cone, which it is to be understood may be reversed in its relation to the feeding screw 9, and adapter cone 18, illustrated in Fig. 7 and which tapers to a smaller diameter suitable to enter the fixture orifice of lesser size is engageable with the mounting cone 5. The adapter 18 is of double tapered form having a short screw threaded tapered end 19 of larger diameter engageable in the large end of the interiorly screw threaded mounting cone 5, while its opposite smaller end is engageable within the fixture. There are sometimes encountered fixtures wherein the top portion 4 is exteriorly threaded, but of such short extent that the spout or other configuration of the valve or faucet design interferes with the use of the cone 5 by preventing its descent over such top into screw threaded engagement therewith. For such emergency there is preferably employed a short interiorly threaded tapered collar 20 engageable exteriorly over the fixture and within which the smaller end of either of the tapered threaded cones 5 or 18 may be inserted. For convenience the adapter collar 20 may be temporarily engaged with the mounting cone 5, as illustrated by dotted lines in Fig. 1, when not in use, thus avoiding loose parts and keeping the assembly intact for storage and transportation.

In lieu of the split clamp collar 15 for fixedly securing the bearing bushing on the shaft 12, the bushing 11 may be tapered at its split end and screw threaded to receive a clamp nut 21, as illustrated in Fig. 6. In such embodiment, the bearing bushing is preferably keyed or otherwise non-rotatively engaged with the shaft 12, but capable of longitudinal adjustment thereon.

In the formation of valve and faucet seats it has heretofore been a common practice to provide a comparatively narrow upstanding head or rib about the vent opening in the diaphragm or partition wall of the fixture and a relatively wide groove or annular recess around the bead or upstanding rib. The surrounding groove or recess performs no useful function and results merely in loss of valuable seating area and waste of material. The resulting narrow bead or rib, forming the seat for the valve head, is ordinarily of such acute form that it quickly becomes embedded in the valve head or closure which is ordinarily of rubber, fiber, or other compressible material. Such valves, having screw stems ordinarily provided with operation levers, are subject to quite heavy pressure, amounting to some hundreds of pounds when tightly closed by the ordinary user. This quickly cuts and destroys the washer or valve head and induces undue wear upon the reduced seating surface, causing leaky fixtures and necessitating frequent replacement. One of the dominant features of the present invention is the utilization of as large an area of the diaphragm or partition wall of the fixture for valve seating purposes as will be permitted by the size of the throat or opening of the fixture through which the cutter head must be introduced. To this end, a minimum amount of material is removed from the outer margin of the seating surface, reducing the surrounding recess to a mere kerf, only sufficient to permit the rounding of the seating area.

Upon the lower end of the stem or shaft 12 is detachably mounted a cutter head 23, interchangeable with other like cutter heads of different diameters. The cutter head 23 is provided with a terminal pilot portion 24 of reduced diameter and a larger portion 25, fluted to form a succession of radial cutting edges, indented at 26 to agree with the contour on the seating surface to be produced. The outer periphery of the enlarged body portion 25 is upwardly tapered to provide ample clearance and the dependent outer extremities 27 of the radial indented cutting edges 26 are brought to comparatively narrow sharp definition. This enables the indention 26 to be relatively wide to produce an ample wide seating surface and minimizes the removal of material from the surrounding annular recess or groove by which the contoured seat is defined. The cutting edges, within the indention 26, are rearwardly beveled relative to the direction of rotation at 28 as are also the marginal dependent narrow cutting edges 27. This rearward bevel, indicated at 28 in Fig. 4 affords the necessary clearance to produce a smooth uniform surface upon the rounded bead or rib 3

formed in the diaphragm or partition wall of the fixture.

While the cutter head **25** has been illustrated as being fluted to form a succession of four radial cutters, it is to be understood that it may be formed with a greater or lesser number. It is to be noted, however, that these cutting edges, pertaining to the formation of the seat **3**, are all terminal or axial relative to the cutter head and that peripheral cutting edges are not formed upon this portion of the cutter.

The terminal or pilot portion **24** of the cutter is longitudinally tapered, but in reverse direction to the taper of the body **25**. The taper of both portions is relatively slight.

The pilot portion is provided with cutting edges both at its end and longitudinally of its flutes. The diameter of the pilot portion is slightly greater than that of the water-way opening in the diaphragm or partition of the fixture to be reseated. Consequently the reduced portion **24** of the cutter acts as a reamer to slightly enlarge the opening whereby the pilot portion is made to accurately fit the opening. By thus making the water-way opening exactly correspond to the size of the pilot, the cutter head will automatically center itself relative to the seat to be formed. The tapered form of such reduced pilot portion reams the hole slightly conical so that the cutter has at all times a tight wedging fit in the opening which continues to be slightly enlarged as the seat is formed by the continued rotation of the cutter, thus maintaining such tight centering fit. The engagement of the pilot portion in the valve hole has heretofore been employed for centering seat cutting tools, but the continued rotation of the pilot portion during the formation of the seat tended to enlarge the hole to greater size than the pilot, leaving the tool loose to wobble therein. The taper upon the present pilot portion **24**, by continuing the formation of the tapered opening as the seating operation proceeds obviates any lost motion, and insures accurate formation of the seating surface.

By the present device, the seat produced is the largest possible within the limit of the throat of the fixture through which the cutter must be introduced, and utilizes the maximum amount of material for contact area. The body of the cutter employed is preferably the largest that will pass through the throat of the fixture. The prefered shape of the seat is that of a rounded annulus, the height of the bead or rib being less than its width, whereby advantage is taken of all the material possible for pressure resistance.

While the preferred form of seat comprises an annular convex seat **29**, it is to be understood that by varying the contour of the cutting edge **26** of the cutter, concave, bevel, flat or other shapes of seats may be produced.

In Fig. 9 there is shown a modification wherein the terminal of the pilot portion of the cutter is provided with radial cutting edges, thus affording an end mill for surfacing flat areas. While for illustrative purposes the sides of the pilot portion in Fig. 9 are shown straight, these may if desired be tapered.

In Fig. 10 there is shown a modified form of adapter or mounting **30** of universal character for use in lieu of the mounting members **4**, **5** and **20**. The universal mounting **30** comprises multiple interior and exterior tapered screw threaded surfaces of different diameters for engagement with fixtures of different sizes, all combined into a single compact unit. It is to be noted that the unit includes a large exterior threaded conical surface **31** and a small like surface **32** and two such external tapered surfaces **33** and **34** of intermediate sizes. Likewise it embodies the larger interior conical tapered surface **35** and small interiorly threaded tapered surface **36** and a like surface **37** of intermediate size. There is thus afforded a wide range of adaptability. The adapted is further provided with a central threaded bore **8** for reception of the threaded feeding sleeve **9** in the manner shown in Figs. 1 and 2. This universal mounting or adapter device as illustrated in Fig. 10 is the preferable construction for use of a service man who encounters fixtures of various forms and many different sizes.

Referring to the modification disclosed in Fig. 11, the adapter **40** is provided with a cylindrical recess **42** extending into the tapered end of the adapter so that the adapter may be used in connection with a shallow valve, the cutter **23** extending into the recess **42**. The adapter **40** in addition to the external threads **44**, is provided with the internal threads **46**. The sleeve **48** terminates at **50** below the surface **52**, as viewed in Fig. 11. The tubular sleeve **48** being shorter than the threaded portion **46**, also allows the tool **23** to be used with a shallow valve when the internal threads **46** engage the valve. In that respect the adapter shown in Fig. 11 is quite similar to that shown in Fig. 10, in that in Fig. 10 the surface **50** is within the surface **52**.

In Fig. 12 an extension **60** terminating in a reduced threaded portion **62** and provided with a cylindrical recess **64** terminating in a reduced portion **66** provided with threads, may be used to extend the length of the shank **12**, whereby the tool may be used in extremely deep valves. The end of the shank **12** snugly fits within the recess **64** and threadily engages the recess **66**. The tool **26** is adapted to engage the threads of the reduced portion **62**. Flattened sides **63** permit the use of a wrench to turn the extension **60**.

Referring to Figs. 13, 14 and 15, the method of producing the cutter **23** has been illustrated. A grinding or an abrading wheel, shown by the dotted line **70**, cylindrical in shape, is used to grind the face of the cutter and to remove the material between the cutters. It is to be noted that the arcuate surface **71** terminates in a flat surface **72**.

In Fig. 16 another modification of a cutter has been shown which will be hereinafter referred to as a 45° angle cutter. If a line is passed from the point **74** of the cutter through the center **76** of the arcuate cutting edge **78**, this line **80** forms a 45° angle with the axis **82** about which the cutter rotates. By providing the 45° angle cutter the chances of the lip or point **74** of the cutters found at the end of the arcuate or cutting edges penetrating the diaphragm is greatly reduced, thus better utilizing the material of the valve. In addition thereto the 45° angle cutter provides a more direct water way so as to eliminate whistling or rumbling. When the washers become worn the chances of chatter or hammering caused from the water under high pressure passing in and out around the narrow crevices at high speed is greatly minimized and in most cases completely eliminated. When the narrow crevices are produced by the cutter shown in Fig. 1 a loose spindle and a flexible washer will cause undesirable noise, especially where the water pressure is high. This is very annoying. The 45° angle

cutter shown in Fig. 16 eliminates this annoyance.

Referring to the modification disclosed in Figs. 17 to 24, inclusive, another adapter has been shown which may be used in connection with ball cock valves. These valves have presented a problem of long standing without anyone ever producing a reseating tool that has been acceptable to the public. The valve seat is oftentimes obscurely positioned. In addition thereto the surrounding fixtures cannot be engaged successfully by the valve adapters now on the market. These surrounding fixtures vary in contour. Practically no two makes have the same surroundings. That being the case it is essential to produce an adapter universal in its adaptation both internally and externally engageable.

This adapter may be used with the clamp 11, stem 12 and the tubular sleeve 9, each of which has already been described. This adapter is provided with an expansible and contractible means for either internally or externally engaging portions of the valve fixture. Upon the threaded sleeve 9 is mounted a tubular member 100 internally and externally threaded, the internal threads engaging the threads of the sleeve 9. The external threads engage a threaded member 102 provided with flaring sectors 104 separated by angularly disposed notches 106 receiving reduced portions 108 of members 110 normally seated in slots 112 found in member 114, rotatably mounted on the lower end of the tubular sleeve 100 as shown in Fig. 17 and held in position by a suitable key 116, having its inner end seated in a peripheral channel 118. Members 110 are held in the slots 112 by a member 120 having a conical inner surface and held in position by the threads 122 engaging the threads 124 on member 114.

Now referring to Fig. 18, the screw 126 threadily engaging a suitable aperture in member 114 is seated in the slot 128 in member 120 which permits the locking of members 114 and 126 in any adjusted position. Member 120 is preferably tightened sufficiently so as to permit free movement of member 110; but prevents excessive movement thereof so as to accurately center the cutter with respect to the valve fixture.

Operation of adapter

By turning the tubular sleeve 100 by means of the knurled flanged portion 130 and with it the tool and the tubular sleeve 9 relative to members 114 and 126 and the parts carried thereby, member 102 may be raised or lowered with respect to the sleeve 100. As member 102 is raised the jaw members 110 are raised upwardly, and causes the reduced portions 108 to move outwardly thereby expanding the lower ends of members 110. When moved upwardly from the lower position, member 102 causes the exterior jaw gripping surface 140 or 142 to engage the fixture as shown in Fig. 18. After the tool has been properly centered and the fixture firmly engaged by the jaws 110, the seat may be trimmed by rotating the stem 12 and advancing the feed screw 17. After the valve seat has been trimmed, member 130 is rotated so as to cause member 102 to move downwardly and disengage the fixture.

Again referring to Fig. 17, instead of a bibb seating tool being shown, a drill 144 provided with an enlarged shank 146 receiving the threaded end of the stem 12 may be used for removing screws and other foreign obstacles from portions of the valve fixture. In the modification disclosed in Fig. 17 the periphery of the stem 150 has been engaged by the inner portion of the clamping member 110, so as to permit the removal of a screw in the end thereof. Likewise members 110 may be used to engage the outside of the valve fixture especially when the valve fixture terminates in a pipe-like tube.

From the foregoing it is apparent that the valve adapter shown in Figs. 17 and 18 may be used to firmly engage a number of various types of valve fixtures much the same as a chuck in a lathe may be used to engage a great number of various shaped bodies.

In order to facilitate the removal and tightening of the bibb seating tool, a suitable wrench has been provided which includes a flat plate-like member 160 having the tapered bevel corners 162 which may be used as screw drivers, the notches 164, the graduations or rule 166, the diameter gauges 180, the square openings 182 and a V-shaped notch 184 arranged to straddle the flanges of the cutter to turn the same.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In a valve seating tool, a contoured cutter head, a smooth revoluble stem therefor, a reversible mounting cone interiorly and exteriorly screw threaded for engagement with the valve member operated upon, said cone being provided with a screw threaded central bore, an externally threaded feeding sleeve threadedly engaging said bore, and interengaging means between the sleeve and the stem, said interengaging means including a bushing sleeve surrounding the stem and upon which the feeding sleeve is revoluble, a peripheral enlargement at one end of said bushing sleeve with which the feeding sleeve has thrust engagement, and a clamp collar at the opposite end of the bushing sleeve by which the bushing sleeve is immovably engageable with the stem in different positions of axial adjustment, said mounting member having a tube-like sleeve centrally located and shorter than the maximum depth of the screw-threaded portion to provide clearance for retracting at least a portion of the contoured cutter within the mounting member.

2. In a valve seating tool, a contoured cutter head, a smooth revoluble stem therefor, a reversible mounting cone interiorly and exteriorly screw threaded for engagement with the valve member operated upon, said cone being provided with a screw threaded central bore, an externally threaded feeding sleeve threadedly engaging said bore, and interengaging means between the sleeve and the stem, said interengaging means including a bushing sleeve surrounding the stem and upon

which the feeding sleeve is revoluble, a peripheral enlargement at one end of said bushing sleeve with which the feeding sleeve has thrust engagement, and a clamp collar at the opposite end of the bushing sleeve by which the bushing sleeve is immovably engageable with the stem in different positions of axial adjustment, said mounting member having concentric tapered grooves in its opposite faces, the inner walls of the grooves being screw-threaded, and having a tube-like sleeve centrally located and shorter than the maximum depth of the screw-threaded portion to provide clearance for retracting at least a portion of the contoured cutter within the mounting member.

ROLAND G. HAWKER.

CERTIFICATE OF CORRECTION.

Patent No. 2,106,173. January 25, 1938.

ROLAND G. HAWKER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 42, for the word "contact" read contract; page 3, second column, line 10, for "adapted" read adapter; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of April, A. D. 1938.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)