Oct. 4, 1955 R. G. HAWKER 2,719,461

BIBB SEAT FORMING TOOL

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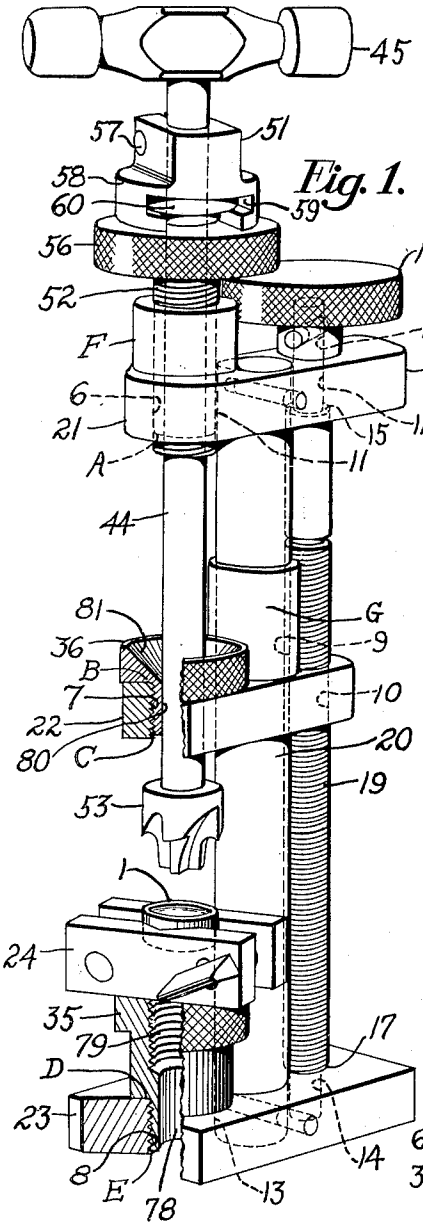


Fig. 1.

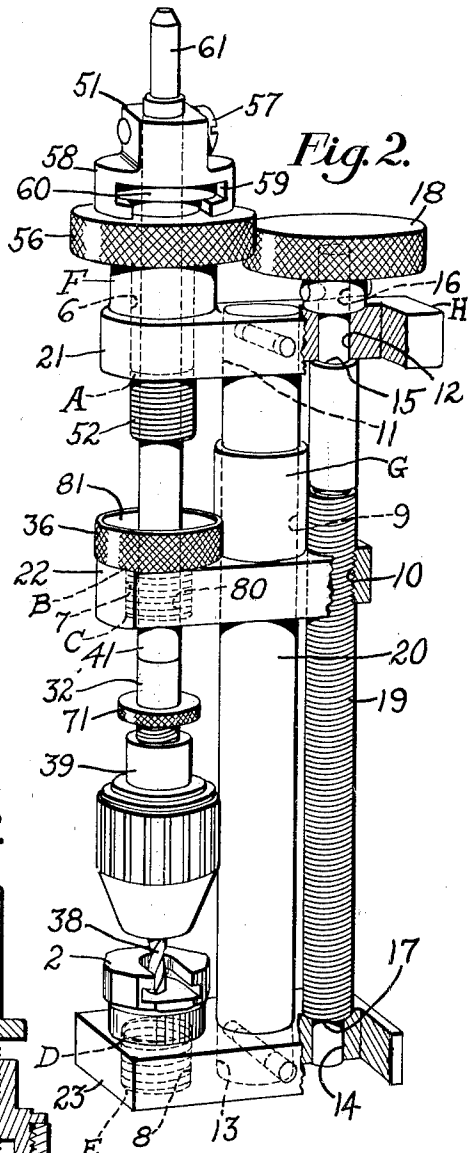


Fig. 2.

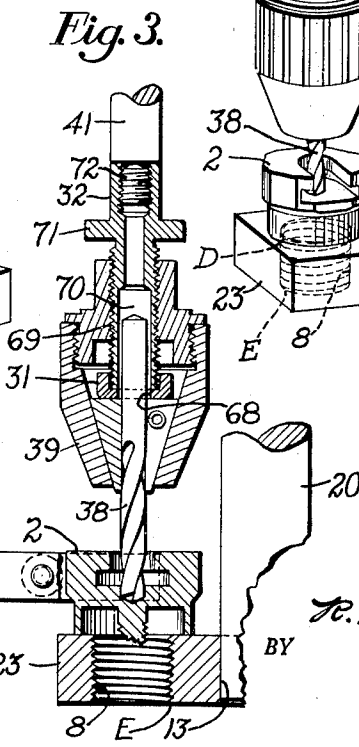


Fig. 3.

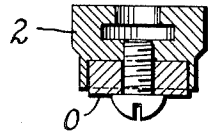


Fig. 4.

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Fig. 5.

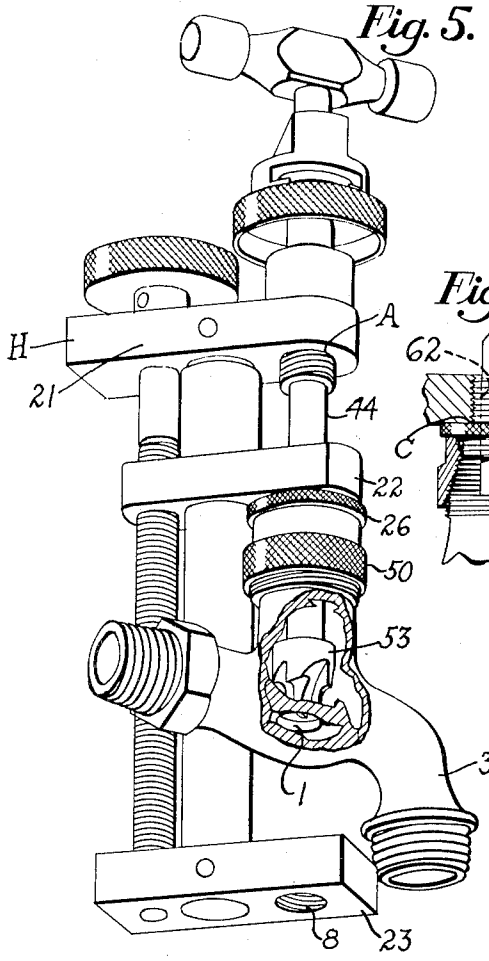


Fig. 6.

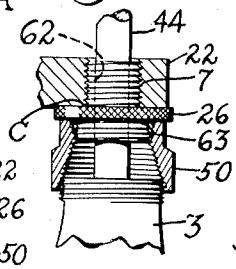


Fig. 7.

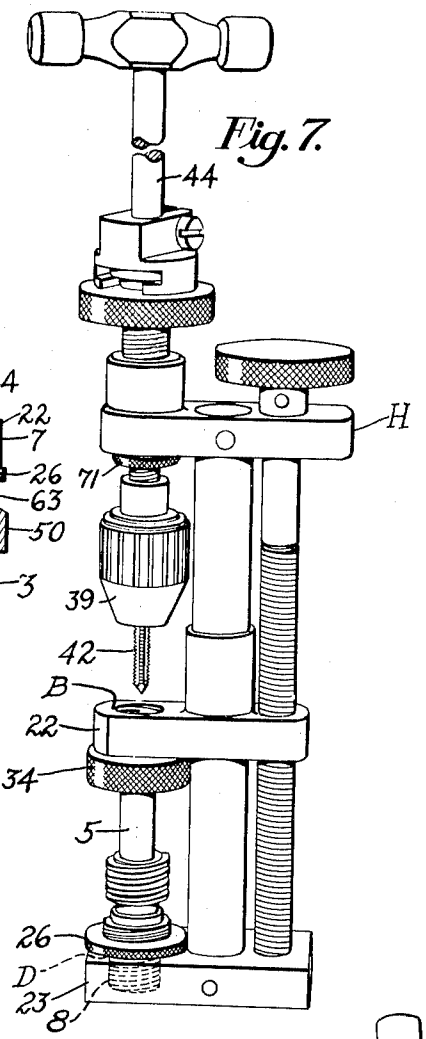


Fig. 8.

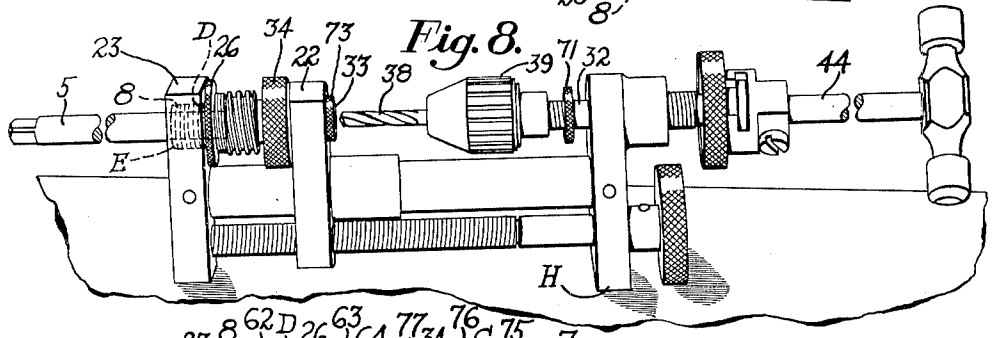
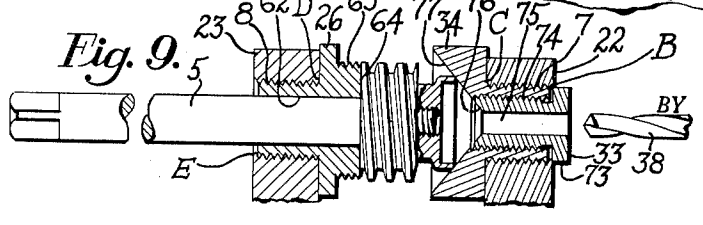


Fig. 9.



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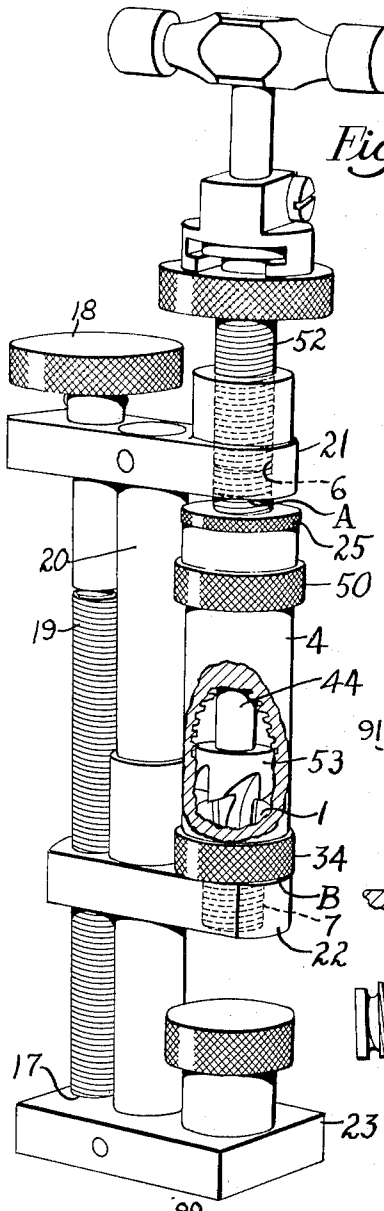


Fig. 10.

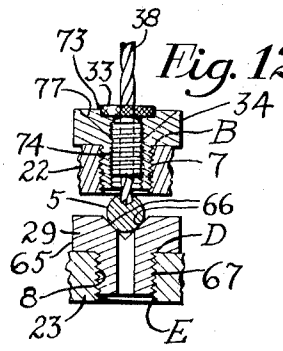


Fig. 12.

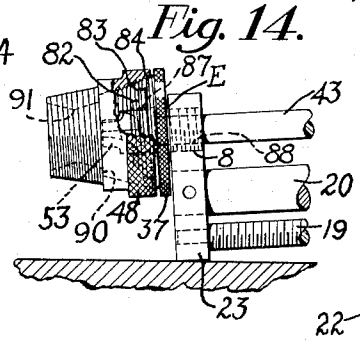


Fig. 14.

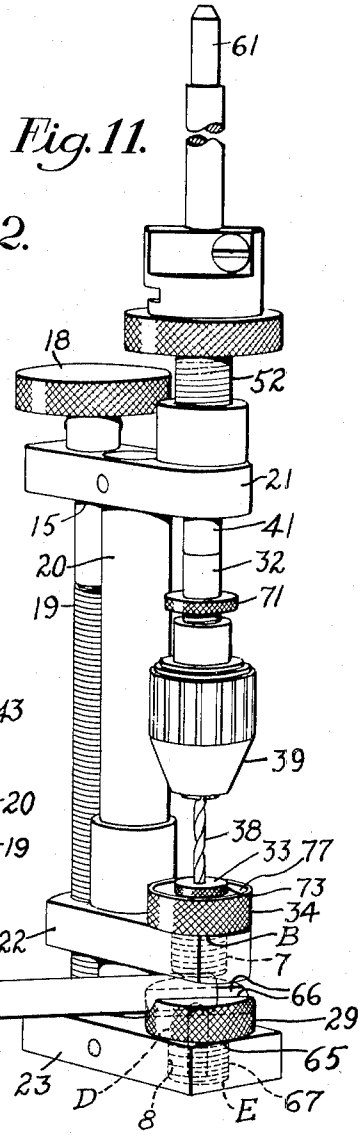


Fig. 11.

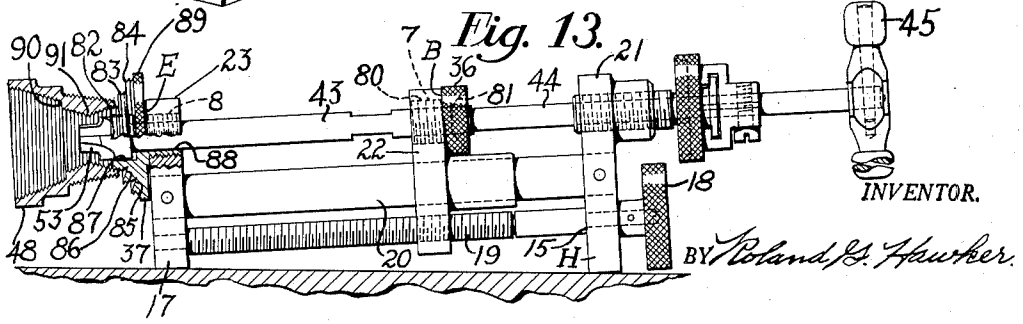


Fig. 13.

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BY Roland S. Hawker.

United States Patent Office 2,719,461 Patented Oct. 4, 1955

2,719,461

BIBB SEAT FORMING TOOL

Roland G. Hawker, Kingfield, Maine

Application February 13, 1950, Serial No. 143,854

9 Claims. (Cl. 90—12.5)

These inventions relate to improvements in tools for performing valve seat forming operations, particularly to improvements in the methods of performing valve seat forming, reforming, replacement, resurfacing, refinishing and renewing operations in bibbs, faucets and valves of various sizes, types and analogous constructions and on interchangeable replacement valve seats and in interchangeable replacement valve seat units and also for performing various drilling and thread cutting operations in bibb, faucet and valve closure parts.

The objectives for which these inventions have been developed are, to provide a tool with the necessary interchangeable adapters, associated adapters, attachments including tools and accessories for constituting and providing the necessary different tools required, for performing all of the different operations required.

An object of these inventions is, that they are to be used in conjunction with and to form a part of and to cooperate in their operation with my following inventions, disclosed in Patents No. 1,993,479, March 5, 1935; No. 2,018,554, October 22, 1935; No. 2,106,173, January 25, 1938; No. 2,144,244, January 17, 1939; No. 2,209,021, July 23, 1940; No. 2,276,771, March 17, 1942.

Further objects of these inventions are to provide new methods for improved use and operation of my "Bibb Seat Forming Tool" of reference as "Valve Seating Apparatus" in my Patent No. 1,993,479 and as "Bibb Seating Tool" in my Patent No. 2,209,021 and as "Flush Valve Seat Forming Tool" in my Patent No. 2,276,771, comprising an operating mechanism for several different tools to be used in combination with and in cooperation in operation with the different new features of construction, methods and means provided by a fundamental frame including interchangeable adapters, associated adapters, attachments, tools, cutters and accessories as illustrated in the drawings in Figs. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, and 14.

Another object of these inventions is to provide a fundamental frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable supporting and clamping member slidably mounted on the spacer between the head and the base members, means for mounting purposes in equal, spaced, parallel relation, longitudinally concentric from above and from below the head and base members and the adjustable supporting and clamping member, an adjustable supporting and clamping mechanism supported by the head and the base members, for operating the adjustable supporting and clamping member between the head and the base members in parallel relation with the head and the base members.

Other objects of these inventions are to provide an adjustable supporting and clamping member adjustable between the head and base members of a fundamental frame, for supporting an operating shaft through a bearing at any predetermined location selected along an operating shaft within the limits of the fundamental frame,

for supporting the operating shaft when performing operations with a cutting tool operated by the operating shaft at any predetermined location selected between the adjustable supporting and clamping member and the base member within the limits of the fundamental frame, as illustrated in Figs. 1, 2 and 5, and for providing an adjustable clamping means along an operating shaft for performing clamping operations at any predetermined location selected between the adjustable supporting and clamping member and the base member within the limits of the fundamental frame as illustrated in Fig. 5, and for providing an adjustable supporting means along an operating shaft, for supporting an internal tapered screw-threaded centering and mounting means in accurate central correlation with an operating shaft, for performing centering and mounting operations at any predetermined location selected between the adjustable supporting and clamping member and the base member within the limits of the fundamental frame, as illustrated in Figs. 5 and 6, and for providing an adjustable supporting means, for supporting an internal tapered centering means, for performing centering operations at any predetermined location selected between the adjustable supporting and clamping member and the base member within the limits of the fundamental frame, as illustrated in Figs. 7, 8 and 9, and for providing an adjustable clamping means, for performing clamping operations at any predetermined location selected between the adjustable supporting and clamping member and the base member within the limits of the fundamental frame, as illustrated in Figs. 7, 8, 9, 11 and 12, and for providing an adjustable supporting means, for supporting cutting tools such as drills through a sleeve, for performing operations with the cutting tool or drill supported through a sleeve at any predetermined location selected between the adjustable supporting and clamping member and the base member within the limits of the fundamental frame, as illustrated in Figs. 8, 9, 11 and 12, and for providing an adjustable supporting means, for supporting an internal tapered centering means, for performing centering operations at any predetermined location selected between the adjustable supporting and clamping member and the head member within the limits of the fundamental frame, as illustrated in Fig. 10, and for providing an adjustable clamping means, for performing clamping operations, at any predetermined location selected between the adjustable supporting and clamping member and the head member within the limits of the fundamental frame, as illustrated in Fig. 10, and for providing an adjustable supporting means, for supporting an operating shaft through a bearing at any predetermined location selected along an operating shaft between the head and base members within the limits of the fundamental frame, for supporting the operating shaft when performing operations with a cutting tool operated by the operating shaft at any predetermined location selected below the base member of the fundamental frame, as illustrated in Fig. 13.

Another object of these inventions is to provide interchangeable bearing adapters, for providing improved operation of the operating shaft in feeding operation longitudinally and in revolving operation axially by supporting the operating shaft close to where the operation is to be performed by the cutting tool operated by the operating shaft, (for example) to be mounted in the means provided from below the head member for supporting the operating shaft when performing operations below the head member or between the head member and the adjustable supporting and clamping member, as illustrated in Fig. 10, and to be mounted in the means provided from above or from below the adjustable supporting and clamping member for adjustable bearing support of the operat-

ing shaft close to where the operation is to be performed from below the adjustable supporting and clamping member or between the adjustable supporting and clamping member and the base member and for additional bearing support of the operating shaft when performing operations below the base member, as illustrated in Figs. 1, 2, 5, 6 and 13, and to be mounted in the means provided from above or from below the base member for supporting the operating shaft when performing operations from below the base member, as illustrated in Figs. 13 and 14.

Another object of these inventions is to provide improved new methods for mounting adapters having internal or external tapered screw-threaded centering and mounting means, by securely mounting the adapters with the internal and the external tapered screw-threaded centering and mounting means maintained in accurate central correlation with the operating shaft in revolving operation axially and in feeding operation longitudinally, as illustrated in Figs. 5, 6, 10, 13 and 14. Parts No. **48** and **50**, (for example) previously associated adapters comprising internal or external tapered screw-threaded centering and mounting means were mounted for operation on feeding screws or on associated adapters mounted on feeding screws, as illustrated in my Patents No. 1,993,479 in Figs. 1, 3 and 4, Patent No. 2,018,554 in Figs. 1 and 2, Patent No. 2,106,173 in Fig. 11, Patent No. 2,276,771 in Figs. 1 and 13, ordinary screw-threaded operating tolerance particularly when accentuated by wear especially caused from metal chips and borings which jam and damage the feeding screw prevents maintaining the operating shaft in accurate central correlation with the internal or external tapered screw-threaded centering and mounting means.

Another object of these inventions is to provide new methods for improved operation and use of my internal tapered screw-threaded centering and mounting adapter, illustrated in my Patent No. 2,018,554 and No. 2,106,173 in Fig. 8. Paret No. **50** illustrated in Figs. 5, 6 and 10.

Another object of these inventions is to provide new methods for improved operation and use of my operating shaft extension for extending the lengths of operating shafts, illustrated in my Patent No. 2,106,173 in Fig. 12, by providing adjustable and stationary bearing support of my operating shaft extension in feeding operation longitudinally and in revolving operation axially, part No. **43** illustrated in Figs. 13 and 14.

Another object of these inventions is to provide operating shafts for operation either by manual or by electric power, parts No. **41** and **44**, part No. **41** for electric power illustrated in Figs. 2 and 11 and part No. **44** for manual power illustrated in Figs. 1, 5, 7, 8, 10 and 13.

Another object of these inventions is to provide means for supporting the fundamental frame when placed in approximately a horizontal position with all operating parts of the tool free for operation as illustrated in Figs. 8 and 13.

Another object of these inventions is to provide improved new methods and improved new tools illustrated in Figs. 1, 5, 10 and 13, for improved operation and use of the various sizes and types of my valve seat forming tools illustrated in my Patent No. 1,993,479 in Figs. 5 and 6, Patent No. 2,018,554 in Figs. 4 and 9, Patent No. 2,106,173 in Figs. 4, 9, 13, 14, 15 and 16, Patent No. 2,144,244 in Figs. 2 and 3, and Patent No. 2,209,021 in Fig. 2, for the purpose of more accurately, efficiently and successfully restoring pitted, worn, disintegrated or otherwise unsatisfactory valve seats either to a new condition or to produce a new finely finished valve seat of superior form and quality better suited for lasting service. Part No. **53**, illustrated in Figs. 1, 5, 10, 13 and 14.

Another object of these inventions is to provide improved new methods for producing more accurately, efficiently and successfully my patented valve seat illustrated in my Patent No. 2,144,244 in Figs. 1, 2, 3 and 4. Part No. **1** illustrated in Figs. 1, 5 and 10.

Another object of these inventions is to provide an attachment for performing operations with drills and taps to be mounted on the mounting means provided on the operating shaft as illustrated in Figs. 2, 7, 8 and 11, comprising a drill chuck for chucking drills or taps of various types and sizes within the full range of the requirements and further comprising improved methods and means for operating the drill chuck by providing a knurled hand wheel on the adjusting screw and for operating the drills and taps by providing means for retracting the drill or the tap up through the drill chuck a sufficient distance so that the exposed portion of the drill or tap extending beyond the drill chuck may be limited to the length of the drill or tap required for performing the operation, for the purpose of providing more accurate centering of the drill or tap in operation and to overcome a large percentage of the breaking of drills and taps particularly in very small sizes, illustrated in detail in Fig. 3, and also shown in Figs. 2, 7, 8 and 11.

Another object of these inventions is to provide an interchangeable bearing adapter in combination with an internal centering means, for universal centering purposes, tapering from the largest internal periphery in towards the central axis to and longitudinally concentric with the bearing, providing means for maintaining the internal centering means in accurate central correlation with an operating shaft supported through the bearing in revolving operation axially and in feeding operation longitudinally, comprising an interchangeable bearing and internal centering adapter, part No. **36** illustrated in Figs. 1 and 2.

Another object of these inventions is to provide a V-block type clamp, for locating interchangeable valve seats in clamped position. Part No. **24** illustrated in Fig. 1.

Another object of these inventions is to provide an interchangeable bearing adapter in combination with an internal mounting means extending in from the top of this adapter a substantial distance to and longitudinally concentric with the bearing, for mounting associated adapters and having a flat top surface on the top of this adapter positioned in central transverse relation with the bearing providing an elevated table, comprising an interchangeable bearing internal mounting and table adapter, part No. **35** illustrated in Fig. 1.

Another object of these inventions is to provide an interchangeable bearing adapter in combination with an external mounting means longitudinally concentric with the bearing, for mounting associated adapters and having a flat top surface on the top of this adapter positioned in central transverse relation with the bearing, providing a stop and a rest, a further object is to provide sleeve-type bearings through this adapter in various different sizes, for centering purposes, comprising an interchangeable bearing external mounting and centering adapter, parts No. **25** and **26** which are the same except for size, illustrated in Figs. 5, 6, 7, 8, 9 and 10.

Another object of these inventions is to provide an associated adapter providing internal tapered screw-threaded centering and mounting means tapered in towards the central axis from one end, for mounting this adapter and tapered in towards the central axis from the other end, for mounting bibbs, faucets and valves, comprising an associated internal centering and mounting adapter, part No. **50** illustrated in Figs. 5, 6 and 10.

Another object of these inventions is to provide an interchangeable adapter providing an internal mounting means located through the center of this adapter, for mounting associated adapters from either end of this adapter, in combination with an internal centering means, for universal centering purposes, tapering from the largest internal periphery in towards the central axis to and longitudinally concentric with the internal mounting means, comprising an interchangeable internal mounting and internal centering adapter, part No. **34** illustrated in Figs. 7, 8, 9, 10, 11 and 12.

Another object of these inventions is to provide an as-

sociated adapter providing a tool supporting and centering means comprising a sleeve of the diameter required located through the center of this adapter, for supporting and centering tools such as drills, in combination with an internal centering means, for universal centering purposes, tapering from the largest internal periphery in towards the central axis to and longitudinally concentric with the sleeve, comprising an associated internal centering and tool supporting adapter, part No. **33** illustrated in Figs. 8, 9, 11 and 12.

Another object of these inventions is to provide an interchangeable adapter providing a V-block centering means positioned in central transverse relation with the longitudinal axis of the adapter, for centering purposes, comprising an interchangeable V-block centering adapter, part No. **29** illustrated in Figs. 11 and 12.

Another object of these inventions is to provide an interchangeable bearing adapter in combination with multiple external mounting means of different sizes longitudinally concentric with the bearing, for mounting associated adapters and having an internal tube-like sleeve extending a substantial distance in from the top of this adapter for retracting cutting tools up into comprising an interchangeable bearing and multiple external mounting adapter, part No. **37** illustrated in Figs. 13 and 14.

Another object of these inventions is to provide an associated reversible adapter providing internal tapered screw-threaded centering and mounting means tapered from each end in towards the central axis, for mounting this adapter from either end and also for mounting bibbs, faucets and valves from either end, and providing a large enough central opening, for retracting cutting tools up through this adapter, and providing an external tapered screw-threaded centering and mounting means extending from the small end of this adapter out from the central axis of this adapter a substantial distance, for mounting bibbs, faucets and valves, comprising an associated reversible internal and external centering and mounting adapter, part No. **48** illustrated in Figs. 13 and 14.

Another object of these inventions is to provide another method of mounting my "Bibb Seat Forming Tool" on the head member of the fundamental frame, which is to include the reversible internal and external tapered screw-threaded mounting adapter, illustrated in my Patent No. 1,993,479 in Figs. 1 and 4, to be mounted in threaded engagement on a threaded mounting means to be provided on top of the head member surrounding a hole through the head member large enough for providing means for using the internal tapered screw-threaded mounting means in the adapter for a centering and clamping means in cooperation with the operation of the adjustable supporting and clamping member and also for providing means for retracting the drill chuck up through the head member into the internal tapered screw-threaded mounting means of the adapter a substantial distance.

Another object of these inventions is to provide new improved combinations of different means and methods, constituting a tool comprising practical construction in simplified form easily and conveniently operated and adaptable to change, for quickly producing the various different tools required through the application and combination of various interchangeable adapters, associated adapters, attachments, cutters' tools and accessories peculiarly adapted for use in performing the various different operations required accurately, efficiently and successfully, comprising a plurality of new and useful developments, constituting distinct complete departures from former practice.

These are the predominating purposes and features characteristic to these inventions, with the above primary and other incidental objectives in view as will more fully appear in the specifications, these inventions intended to be protected by Letters Patent consist of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described or illustrated in the detailed specifications, the

drawings and the claims. Figures 1–14 of the drawings illustrate some of the preferred forms of embodiment of these inventions but obviously not all of the preferred forms of embodiment of these inventions.

Figs. 1, 2, 5, 7, 8, 10, 11 and 13 disclose different tools produced through the combination of interchangeable adapters, associated adapters, attachments, cutters' tools and accessories.

Fig. 3 is a detailed sectional view of a drilling attachment.

Fig. 4 is a detailed sectional view of a valve coupling, screw and disc.

Fig. 6 is a detailed sectional view of an interchangeable bearing centering and external mounting adapter, part No. **26** and of an associated internal centering and mounting adapter, part No. **50**.

Fig. 9 is a detailed sectional view of an interchangeable bearing centering and external mounting adapter, part No. **26**, an associated tool supporting and centering adapter, part No. **33** and an interchangeable internal centering and mounting adapter, part No. **34**.

Fig. 12 is a detailed sectional view of an interchangeable V-block centering adapter, part No. **29**, an associated tool supporting and centering adapter, part No. **33** and an interchangeable internal centering and mounting adapter, part No. **34**.

Fig. 14 is a detailed view of an interchangeable bearing and multiple external mounting adapter, part No. **37** and an associated reversible internal and external centering and mounting adapter, part No. **48**.

The different tools disclosed in Figs. 1, 2, 5, 7, 8, 10, 11 and 13 each comprises a fundamental frame having a head **21** and a base **23** members held in spaced, parallel relation by an interposed, rigid, spacer **20** in a reamed hole **11** by a tapered pin through the head member **21** and in a reamed hole **13** by a tapered pin through the base member **23**, an adjustable supporting and clamping member **22** slidably mounted on the spacer **20** between the head member **21** and the base member **23** through a reamed hole **9**, a flange G on top of the adjustable supporting and clamping member **22** for providing extended longitudinal support of the adjustable supporting and clamping member **22** through extending the length of the reamed hole **9**, an extended portion H on one end of the head member **21** for supporting a tool when placed and operated in a horizontal position, a flange F on top of the head member **21** for providing extended length and support of a mounting means **6**, means for mounting purposes in equal, spaced, parallel relation from the spacer **20** in alignment longitudinally and concentric through the head member **21** at **6**, through the adjustable supporting and clamping member **22** at **7** and through the base member **23** at **8**, the mounting means at **6** from A and at **7** from B and from C and at **8** from D and from E are provided for mounting interchangeable adapters and the mounting means at **6** through the head member **21** is also provided for mounting a feeding screw **52** of an operating mechanism from the top of the flange F, an adjustable supporting and clamping mechanism comprising an adjusting screw **19** in screw-threaded engagement through a screw-threaded hole **10** in the adjustable supporting and clamping member **22**, a reduced portion along each end of the adjusting screw **19** providing for bearing support of the adjusting screw **19** in revolving operation axially through a bearing **12** in the head member **21** and through a bearing **14** in the base member **23**, a shoulder **15** along one end of the adjusting screw **19** and a shoulder **17** along the other end of the adjusting screw **19** provides end thrust bearing support against the head member **21** at **15** and against the base member **23** at **17**, a knurled adjusting wheel **18** mounted on the top end of the adjusting screw **19** in a hole **16** and securely pinned, operating the knurled adjusting wheel **18** in a clockwise direction moves the adjustable supporting and clamping

member 22 on the adjusting screw 19 and on the spacer 20 longitudinally down to the top of the base member 23 and reversing the direction of operating the knurled adjusting wheel 18 moves the adjustable supporting and clamping member 22 on the adjusting screw 19 and on the spacer 20 longitudinally up under the head member 21, an operating mechanism comprising a feeding screw 52 mounted from the top of the flange F on the head member 21 in the mounting means 6, a knurled operating wheel 56 for operating the feeding screw 52, a sleeve through the feeding screw 52 longitudinally concentric, an operating shaft either 41 or 44 mounted through the sleeve in the feeding screw 52, for longitudinal and free rotative movement, a handle 45 on one end of the operating shaft 44 for manual operation of the operating shaft 44, a shank 61 on one end of the operating shaft 41 for electric operation of the operating shaft 41, a mounting means on the opposite ends of the operating shafts 41 and 44 for mounting purposes, a knurled operating wheel 56 on the feeding screw 52 below an annular groove, the annular groove undercut below an end thrust collar 60 on top of the feeding screw 52, the end thrust collar 60 engaged in an open chamber 59 in the bottom section 58 of an abutment collar 51, a horse shoe form below the open chamber 59 engaged in the annular groove below the end thrust collar 60, providing end thrust bearings above and below the end thrust collar 60 on the feeding screw 52 against corresponding end thrust bearings in the open chamber 59 in the bottom section 58 of the abutment collar 51 for supporting the feeding screw 52 in feeding operation longitudinally forward and reverse, a reamed hole longitudinally concentric through the top section of the abutment collar 51, a slit extending through half of the abutment collar 51 longitudinally central, a clamping screw 57 located transversely with relation to the slit and freely inserted through a part of the abutment collar 51 on one side of the slit and in screw-threaded engagement in a part of the abutment collar 51 on the opposite side of the slit, providing an adjustable clamping means for clamping the abutment collar 51 onto the operating shaft either 41 or 44 by turning the clamping screw 57 in a clockwise direction, providing means for restricting longitudinal movement of the operating shaft either 41 or 44 relative to the sleeve and means selectively operable to permit unrestricted longitudinal adjustment of the operating shaft either 41 or 44 relative to the sleeve, for adjusting the operating shaft either 41 or 44 to any predetermined location selected within the limits of the fundamental frame and to any predetermined location selected beyond the base member 23 of the fundamental frame and means for then connecting the operating shaft either 41 or 44 to the operating mechanism for feeding operation by clamping the abutment collar 51 onto the operating shaft either 41 or 44 with the clamping screw 57, for performing operations with a cutting tool carried and supported by the operating shaft either 41 or 44, by operating the operating shaft 41 in revolving operation with an electric motor or by operating the operating shaft 44 in revolving operation by hand and by operating the operating shaft either 41 or 44 in feeding operation by operating the knurled operating wheel 56 in a clockwise direction for feeding the operating shaft either 41 or 44 longitudinally down and by reversing the direction of operating the knurled operating wheel 56 for feeding the operating shaft either 41 or 44 longitudinally up.

Fig. 1 discloses the special operating features and the application of the interchangeable adapters, tools and accessories required for producing a tool especially adapted for performing valve seat forming operations on an interchangeable valve seat 1 held in a clamp 24 located on the table of an interchangeable bearing 78, internal mounting 79 and table adapter part No. 35 mounted in 8 in the base 23 from D, an operating shaft 44 operable by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and operable in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable bearing 80 and internal centering 81 adapter part No. 36 mounted in 7 in the adjustable supporting and clamping member 22 from B providing bearing 80 support of the operating shaft 44 through the bearing 80 operable along the operating shaft 44 to any predetermined location selected between the head 21 and the base 23 for supporting the operating shaft 44 in the bearing 80 in revolving operation axially and in feeding operation longitudinally close to the location selected for performing the valve seat forming operation on the interchangeable valve seat 1 which may be at any predetermined location selected between below the adjustable supporting and clamping member 22 and the base member 23 within the limits of the fundamental frame with the valve seat forming cutter 53 mounted on the operating shaft 44.

Fig. 2 discloses the special operating features and the application of the interchangeable adapter, drilling attachment, tools and accessories required for producing a tool especially adapted for performing drilling operations and thread cutting operations with a tap in a valve coupling 2 located on the base 23 and illustrated in detail in Figs. 3 and 4, an operating shaft 41 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable bearing 80 and internal centering 81 adapter part No. 36 mounted in 7 in the adjustable supporting and clamping member 22 from B, providing bearing 80 support of the operating shaft 41 through the bearing 80 operable along the operating shaft 41 to any predetermined location selected between the head 21 and the base 23 for supporting the operating shaft 41 in the bearing 80 in revolving operation axially and in feeding operation longitudinally close to the location selected for performing the drilling operation on the valve seat coupling 2 which may be at any predetermined location selected between below the adjustable supporting and clamping member 22 and the base 23 within the limits of the fundamental frame with the drill 38 securely mounted in the drill chuck 39 by operating the knurled operating wheel 71 on the adjusting screw 32 mounted in 72 onto the operating shaft 41.

Fig. 3 discloses the special operating features of the drilling attachment mounted on the operating shaft 41 in the internal screw-threads 72 in the adjusting adapter 32, a knurled operating wheel 71 has been provided on the adjusting adapter 32 for adjusting the external screw-threads 69 on the adjusting adapter 32 in the internal screw-threads in the drill chuck 39, operating the knurled operating wheel 71 in a clockwise direction moves the end of the adjusting adapter 32 against the disc 31 and the disc 31 against the jaws of the drill chuck 39 until the jaws of the drill chuck 39 are closed or clamped against the drill 38 longitudinally concentric, reversing the direction of operating the knurled operating wheel 71 releases the pressure of the end of the adjusting adapter 32 against the disc 31 and the pressure of the disc 31 against the jaws of the drill chuck 39 for the purpose of releasing the drill 38, a hole 68 has been provided centrally located through the disc 31 of a diameter equivalent to the maximum diameter of the drill 38 the jaws of the drill chuck 39 are made to clamp, for retracting the shank end of the drill 38 up through the hole 68, a hole 70 has been provided in the adjusting adapter 32 centrally located and extending a substantial depth in from one end of a diameter equivalent to the maximum diameter of the drill 38 the jaws of the drill chuck 39

are made to clamp, for retracting the shank end of the drill 38 up into the hole 70 far enough to leave only the required amount of the cutting end of the drill 38 exposed and extending below the drill chuck 39 for performing the drilling operation with the drill 38, for increasing the resistance of a small drill 38 or other cutting tool extending beyond the end of the drill chuck 39 against breaking, bending or leading off under cutting pressure and also to provide more available working space within the limits of the fundamental frame between the head 21 and the base 23.

Fig. 5 discloses the special operating features and the application of the interchangeable adapter, associated adapter and tools required for producing a tool especially adapted for performing valve seat forming operations on a valve seat 1 in a faucet 3 mounted in an internal tapered screw-threaded centering and mounting means illustrated in detail in Fig. 6, an operating shaft 44 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable bearing 62 and external mounting 63 adapter part No. 26 mounted in 7 in the adjustable supporting and clamping member 22 from C, an associated internal centering and mounting adapter part No. 50 mounted on the external mounting means 63, providing bearing 62 support of the operating shaft 44 through the bearing 62 operable along the operating shaft 44 to any predetermined location selected between the head 21 and the base 23 for supporting the operating shaft 44 in the bearing 62 in accurate central correlation with the internal tapered screw-threaded centering and mounting means in the associated internal centering and mounting adapter part No. 50 in revolving operation axially and in feeding operation longitudinally close to the location selected for performing the valve seat forming operation on the valve seat 1 in the faucet 3 mounted in the internal tapered screw-threaded centering and mounting means in the associated internal centering and mounting adapter part No. 50, which may be performed at any predetermined location selected between below the adjustable supporting and clamping member 22 and the base 23 within the limits of the fundamental frame with the valve seat forming tool cutter 53 mounted on the operating shaft 44, and providing a clamping means between the adjustable supporting and clamping member 22 and the base 23 operable within the limits of the fundamental frame, for clamping the faucet 3 between the associated internal centering and mounting adapter part No. 50 and the base 23, providing a bearing means, a centering and mounting means and a clamping means along an operating shaft operable to any predetermined location selected between the head 21 and the base 23 within the limits of the fundamental frame, for the purpose of performing operations between the adjustable supporting and clamping member 22 and the base 23 from any predetermined location selected within the limits of the fundamental frame.

Fig. 7 discloses the special operating features and the application of the interchangeable adapters, associated adapter, drilling attachment, tools and accessories required for producing a tool especially adapted for performing drilling operations with a drill and thread cutting operations with a tap in a short valve stem 5 located between the adjustable supporting and clamping member 22 and the base 23, an operating shaft 44 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable bearing 62 and external mounting 63 adapter part No. 26, illustrated in detail in Fig. 9, mounted in 8 in the base 23 from D, an interchangeable internal mounting and internal centering 77 adapter part No. 34 illustrated in detail in Fig. 9, mounted in 7 in the adjustable supporting and clamping member 22 from C, providing an internal mounting and internal centering 77 means adjustably operable to predetermined location selected between below the head 21 and the base 23, and providing an adjustable centering 77 and clamping means operable for performing clamping operations between the adjustable supporting and clamping member 22 and the base 23 within the limits of the fundamental frame, a short valve stem 5 located in clamped position between the internal centering means 77 in the adapter part No. 34 and the flat top surface 64 on the adapter part No. 26, an associated internal centering 76 and tool supporting 75 adapter part No. 33, illustrated in detail in Fig. 9, has been removed from the internal mounting means in the adapter part No. 34 at B after performing the drilling operation in the valve stem 5 and the operating shaft 44 has been disengaged from controlled operation by the operating mechanism, for performing a thread cutting operation in the drilled hole in the valve stem 5 with a tap 42 securely clamped in the drill chuck 39 by operating the knurled operating wheel 71 in a clockwise direction on the adjusting adapter part No. 32, illustrated in detail in Fig. 3, mounted in 72 onto the operating shaft 44.

Fig. 8 discloses the special operating features and the application of the interchangeable adapters, associated adapter, drilling attachment, tools and accessories required for producing a tool especially adapted for performing drilling operations with a drill and thread cutting operations with a tap in a long valve stem 5 located below the adjustable supporting and clamping member 22 and extending beyond the base 23, consequently, provision has been made by including an extended portion H on the head 21, for operating this tool in approximately a horizontal position, an operating shaft 44 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable bearing 62 and external mounting 63 adapter part No. 26, having a sleeve type bearing 62 of substantially the same size as the valve stem 5, for providing a sleeve type centering means 62 longitudinally concentric with the operating shaft, illustrated in detail in Fig. 9, mounted in 8 in the base 23 from D, an interchangeable internal mounting and internal centering 77 adapted part No. 34, illustrated in detail in Fig. 9, mounted in 7 in the adjustable supporting and clamping member 22 from C, providing an internal mounting and internal centering 77 means adjustably operable to any predetermined location selected between below the head 21 and the base 23, and providing an adjustable centering 77 and clamping means operable for performing centering 77 and clamping operations between the adjustable supporting and clamping member 22 and the base 23 within the limits of the fundamental frame, an associated internal centering 76 and tool supporting 75 adapter part No. 33 having a knurled portion 73 on the largest external periphery and an external mounting means 74, illustrated in detail in Fig. 9, mounted in the internal mounting means in the adapter No. 34 from B, providing an internal sleeve tool supporting means of substantially the same size as the tool, operably adjustable to any predetermined location selected between below the head 21 and the base 23 for supporting and centering the tool in performing operations at any predetermined location selected between below the adjustable supporting and clamping member 22 and the base 23 within the

limits of the fundamental frame, a long valve stem 5 located in clamped position with one end of the valve stem 5 in the internal centering means 77 in the adapter part No. 34 and with an enlarged portion on the valve stem 5 on the flat top surface 64 of the adapter part No. 26 and with the long end of the valve stem 5 supported through the sleeve type bearing 62 in the adapter No. 26 and extending out beyond the base 23 longitudinally concentric with the operating shaft 44, for performing a drilling operation in the end of the valve stem 5 with a drill 38 securely clamped in the drill chuck 39 by operating the knurled operating wheel 71 in a clockwise direction on the adjusting adapter 32, illustrated in detail in Fig. 3, mounted in 72 onto the operating shaft 44.

Fig. 10 discloses the special operating features and the application of the interchangeable adapters, associated adapter, tools and accessories required for producing a tool especially adapted for performing valve seat forming operations on a valve seat 1 in an interchangeable valve seat unit 4 located between the head 21 and the adjustable supporting and clamping member 22, an operating shaft 44 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable bearing and external mounting adapter part No. 25 mounted in 6 in the head 21 from A (this adapter part No. 25 is the same except for size as the adapted part No. 26 illustrated in detail in Fig. 6), an associated internal centering and mounting adapted part No. 50, illustrated in detail in Fig. 6, mounted on the external mounting means 63 on the adapted part No. 25, the operating shaft 44 is supported through the bearing 62 in revolving operation axially and in feeding operation longitudinally in accurate central correlation with the internal tapered screw-threaded centering and mounting means in the associated adapter part No. 50, illustrated in detail in Fig. 6, an interchangeable internal mounting and internal centering adapter part No. 34, illustrated in detail in Figs. 9 and 12, mounted in 7 in the adjustable supporting and clamping member 22 from B, providing an internal mounting and internal centering 77 means adjustably operable to any predetermined location selected between from above the base 23 to up under the head 21 within the limits of the fundamental frame, and providing an adjustable centering 77 and clamping means operable for performing centering 77 and clamping operations between the adjustable supporting and clamping member 22 and the head 21 within the limits of the fundamental frame, an interchangeable valve seat unit 4 containing in one end a valve seat 1, this end of this interchangeable valve seat unit 4 is located in the internal centering means 77 in the adapter part No. 34 in clamped position with the other end of this interchangeable valve seat unit 4 located in the internal tapered screw-threaded centering and mounting means in the adapter part No. 50, for performing a valve seat forming operation on the valve seat 1 with the valve seat forming tool cutter 53 mounted on the operating shaft 44.

Fig. 11 discloses the special operating features and the application of the interchangeable adapters, associated adapter, drilling attachment, tools and accessories required for producing a tool especially adapted for performing drilling operations with a drill and thread cutting operations with a tap in a valve stem 5 in central transverse relation with the operating shaft 41 at any location selected along the valve stem 5 with the valve stem 5 located in clamp position between the adjustable supporting and clamping member 22 and the base 23 in central transverse relation with the operating shaft 41, an operating shaft 41 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected between the head 21 and the base 23 and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected between the head 21 and the base 23, an interchangeable V-block form 66 centering adapter part No. 29 mounted by the mounting means 67 in 8 in the base 23 from D, by turning the knurled periphery 65 in a clockwise direction, illustrated in detail in Fig. 12, an interchangeable internal mounting and internal centering 77 adapter part No. 34 mounted in 7 in the adjustable supporting and clamping member 22 from B, providing an internal mounting and internal centering 77 means adjustably operable to any predetermined location selected between above the base 23 to up under the head 21 and providing an adjustable clamping means operable for performing clamping operations between the adjustable supporting and clamping member 22 and the base 23 at any predetermined location selected within the limits of the fundamental frame, an associated internal centering 76, illustrated in detail in Fig. 9 and tool supporting 75 adapter part No. 33 having a knurled portion 73 on the largest external periphery and an external mounting means 74, illustrated in detail in Fig. 12, mounted in the internal mounting means in the adapter part No. 34 from the internal centering means 77, providing an internal sleeve type tool supporting means 75 of substantially the same size as the tool 38, operably adjustable to any predetermined location selected between below the head 21 and the base 23, for supporting and centering the tool 38 in performing operations at any predetermined location selected between below the adjustable supporting and clamping member 22 and the base 23 within the limits of the fundamental frame, a valve stem 5 located in clamped position between the V-block form centering means 66 in the adapter part No. 29 and the adjustable supporting and clamping member 22, for performing the drilling operation in the valve stem 5 with the drill 38 securely clamped in the drill chuck 39 by operating the knurled operating wheel 71 in a clockwise direction on the adjusting adapter 32, illustrated in detail in Fig. 3, mounted in 72 onto the operating shaft 41.

Fig. 13 discloses the special operating features and the application of the interchangeable adapters, associated adapter, operating shaft extension, tools and accessories required for producing a tool especially adapted for performing valve seat forming operations on valve seats located in bibbs, faucets and valves mounted in internal tapered screw-threaded centering and mounting means or mounted on external tapered screw-threaded centering and mounting means from below the base member 23 of the fundamental frame, consequently, provision has been made by including an extended portion H on the head member 21, for supporting this tool for operation in approximately a horizontal position, an operating shaft 44 controlled in operation by an operating mechanism in revolving operation axially in either direction from any predetermined location selected below the base 23 of the fundamental frame and controlled in feeding operation longitudinally forward or reverse from any predetermined location selected below the base 23 of the fundamental frame, an operating shaft extension part No. 41 mounted on the operating shaft 44, for extending the length of the operating shaft 44, an interchangeable bearing 80 and internal centering 81 adapter part No. 36, illustrated in detail in Fig. 1, mounted in 7 in the adjustable supporting and clamping member 22 from B providing bearing 80 support of the operating shaft 43 through the bearing 80 operable along the operating shaft 43 to any predetermined location selected between below the head 21 and above the base 23 within the limits of the fundamental frame, for supporting the operating shaft 43 in the bearing 80 in revolving operation axially and in feeding operation longitudinally, an interchangeable bearing 88 and multiple external mounting 82, 83 and 84 adapter part No. 37 is mounted in 8 in the base 23 from E by turning the knurled portion on the largest external periphery in a clockwise direction, providing bearing 88 support of the

operating shaft 43 through the bearing 88, for supporting the operating shaft 43 in the bearing 88 longitudinally concentric with the multiple external mounting means 82, 83 and 84 in revolving operation axially and in feeding operation longitudinally, an annular groove 85 is tapered down and in towards center from the largest external screw-threaded mounting means 84 to below and beneath the intermediate external screw-threaded mounting means 83 and another annular groove 86 is tapered down and in towards center from the intermediate external screw-threaded mounting means 83 to below and beneath the small external screw-threaded mounting means 82, this provides clearance for a thread run-out below the external screw-threaded mounting means 83 and 82, clearance for a thread run-out is also provided below the external screw-threaded mounting means 84, these tapered annular grooves 85 and 86 are also tapered down and in towards center to make this adapter part No. 37 more compact, the internal centering and mounting adapter part No. 50, illustrated in detail in Fig. 6, may be mounted on the external mounting means on this adapter part No. 37, a hole 87 is of sufficient depth and large enough in diameter to provide a tube-like sleeve longitudinally concentric with the bearing 88, for retracting a substantial part of the valve seat forming tool cutter 53 up into, an associated reversible internal and external centering and mounting adapter part No. 48 mounted on the external mounting means on the adapter part No. 37 from either end of this reversible adapter part No. 48, as illustrated in detail in Fig. 13 at 82 and as illustrated in detail in Fig. 14 at 84, providing internal tapered screw-threaded centering and mounting means from either end of this reversible adapter part No. 48, for mounting this reversible adapter part No. 48 on the adapter part No. 37 and providing internal tapered screw-threaded centering and mounting means from either end of this reversible adapter part No. 48 in accurate central correlation with the operating shaft 43, for mounting bibbs, faucets and valves of various sizes from either end of this reversible adapter part No. 48, the internal tapered screw-threaded centering and mounting means at one end is offset by a shoulder 90, and providing an external tapered screw-threaded centering and mounting means from one end of this reversible adapter part No. 48 in accurate central correlation with the operating shaft 43, for mounting bibbs, faucets and valves of various sizes, and providing a central hole 91 through this reversible adapter part No. 48 large enough for retracting the valve seat forming tool cutter 53 up through, for providing available working space for operation of the valve seat forming tool cutter 53, for performing valve seat forming operations on valve seats located in bibbs, faucets and valves mounted in the internal tapered screw-threaded centering and mounting means or on the external tapered screw-threaded centering and mounting means of this reversible adapter part No. 48 with the valve seat forming tool cutter 53.

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

Having thus described my invention, I claim:

1. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means associated with the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced, parallel relation with the spacer, for operating the tool supporting by the operating shaft at a predetermined location between the head member and the adjustable arm for performing operations with the tool supported by the operating shaft between the head member and the adjustable arm, a sleeve engageably mounted in the head member from under the head member concentric with the operating shaft, comprising additional support for the operating shaft in the head member, for maintaining the operating shaft concentric in rotation axially and in movement longitudinally under heavy cutting pressure in performing operations with the tool supported by the operating shaft between the head member and the adjustable arm.

2. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means associated with the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced, parallel relation with the spacer, for operating the tool supported by the operating shaft at a predetermined location between the head member and the adjustable arm, for performing operations with the tool supported by the operating shaft between the head member and the adjustable arm, an adapter engageably mounted under the head member provided with a central opening to receive the operating shaft, an internal threaded sleeve-like form tapering from one end down to a central opening, comprising a universal centering means, engageably mounted on the adapter longitudinally concentric with the operating shaft.

3. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an adjusting screw supported in bearings axially and longitudinally in the head and the base members in spaced, parallel relation with the spacer and having a knurled hand wheel securely mounted on one end extending above the head member, and mounted in and operable with the adjustable member from the head member to the base member, and supporting an arm on the adjustable member extending crosswise from the spacer out over the base member and under the head member in parallel relation with the head and the base members, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means associated with the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced, parallel relation with the spacer, for operating the tool supported by the operating shaft at a predetermined location between the head member and the adjustable arm, for performing operations with the tool supported by the operating shaft between the head member and the adjustable arm.

4. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an arm on the adjustable member extending transversely from the spacer out over the base member and under the head member, and means for maintaining the arm in parallel relation with the head and the base members, and means for operating the arm from down

on top of the base member to up under the head member, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means associated with the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced, parallel relation with the spacer, for operating the tool supported by the operating shaft at a predetermined location between the head member and the adjustable arm for performing operations with the tool supported by the operating shaft between the head member and the adjustable arm, an adapter engageably mounted under the head member provided with a central opening to receive the operating shaft and provided with a mounting means surrounding the central opening for engageably mounting other adapters, an internal threaded sleeve-like form tapering from one end down to a central opening, comprising a universal centering means, engageably mounted on the adapter longitudinally concentric with the operating shaft.

5. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an arm on the adjustable member extending transversely from the spacer out over the base member and under the head member, and means for maintaining the arm in parallel relation with the head and the base members, and means for operating the arm from down on top of the base member to up under the head member, in combination with a valve tool having a tool supporting and operating shaft, a sleeve in which the shaft is mounted for longitudinal and free rotative movement, means for restricting longitudinal movement of the shaft relative to the sleeve, said last named means being selectively operable to permit unrestricted longitudinal adjustment of the shaft relative to the sleeve, and means associated with the sleeve for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced, parallel relation with the spacer, an internal threaded sleeve-like form tapering from one end down to a central opening, comprising a universal centering means engageably mounted under the head member longitudinally concentric with the operating shaft, for locating one end of valve closure parts concentric with the operating shaft, and in cooperation with the operation of the adjustable arm against the other end of the valve closure part, for locating valve closure parts in clamped position between the universal centering means and the adjustable arm.

6. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an arm on the adjustable member extending transversely from the spacer out over the base member and under the head member, and means for maintaining the arm in parallel relation with the head and the base members, and means for operating the arm from down on top of the base member to up under the head member, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means associated with the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced, parallel relation with the spacer, an internal threaded sleeve-like form tapering from one end down to a central opening, comprising a universal centering means engageably mounted under the head member longitudinally concentric with the operating shaft, an internal circular form tapering from one end down to center, comprising a universal centering means, engageably mounted on top of the adjustable arm longitudinally concentric with the universal centering means mounted under the head member.

7. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an arm on the adjustable member extending transversely from the spacer out over the base member and under the head member, and means for maintaining the arm in parallel relation with the head and the base members, and means for operating the arm from down on top of the base member to up under the head member, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means carried by the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced parallel relation with the spacer, for operating the tool supported by the operating shaft at a predetermined location between the head member and the base member, a universal centering adapter engageably mounted under the head member longitudinally concentric with the operating shaft, another universal centering adapter engageably mounted on top of the arm longitudinally concentric with the universal centering adapter mounted under the head member and in cooperation with the operation of the adjustable member comprising an adjustable centering and an adjustable clamping means, longitudinally concentric with the operating shaft, for performing operations between the universal centering adapters from above the base member to up under the head member.

8. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an arm on the adjustable member extending transversely from the spacer out over the base member and under the head member, and means for maintaining the arm in parallel relation with the head and the base members, and means for operating the arm from down on top of the base member to up under the head member, in combination with a valve tool having a tool supporting and operating shaft, a member associated with the shaft and with respect to which the shaft and tool are rotatable and longitudinally adjustable, and means carried by the member for engageably mounting and supporting the valve tool in the head member in operative position with respect to the frame with the operating shaft in spaced parallel relation with the spacer, for operating the tool supported by the operating shaft at a predetermined location between the head member and the base member, a mounting means in the head member, through the arm and through the base member, in spaced, parallel relation with the spacer longitudinally concentric with the operating shaft, for engageably mounting universal centering adapters, bearing adapters and other adapters used for clamping, supporting and centering purposes.

9. In a valve resurfacing tool, a supporting frame comprising head and base members held in spaced, parallel relation by an interposed, rigid, spacer, an adjustable member slidably mounted on the spacer between the head and the base members, an arm on the adjustable member extending transversely from the spacer out over the base member and under the head member, and means for maintaining the arm in parallel relation with the head and the base members, and means for operating the arm from down on top of the base member to up under the head member, comprising a clamping means

between the arm operated by the adjustable member and the head member.

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