No. 859,528. PATENTED JULY 9, 1907.

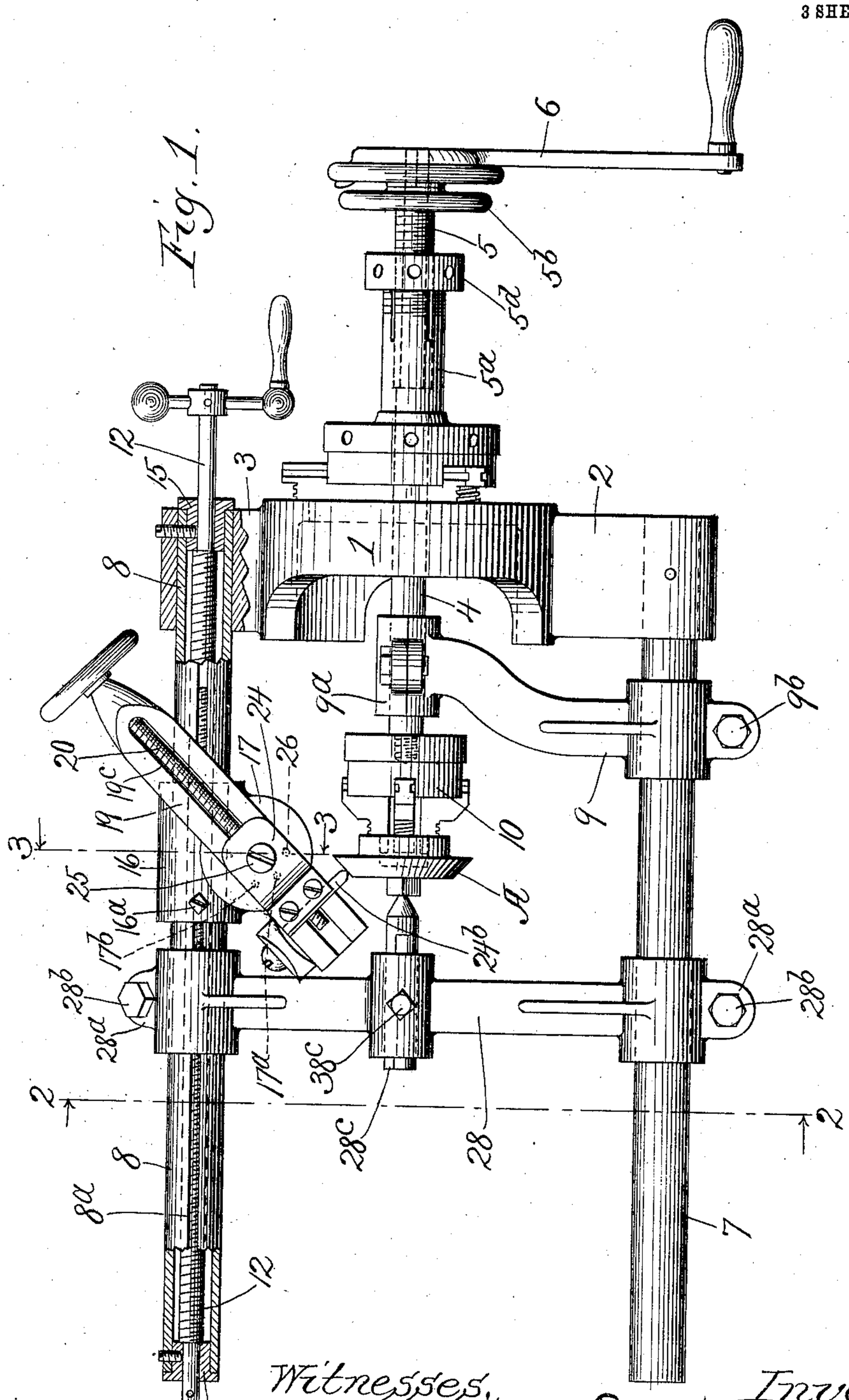
F. L. SMITH.

VALVE SEAT AND DISK TRUING MACHINE.

APPLICATION FILED SEPT. 14, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses,
Edward T. Wray.
J. S. Abbott

Inventor.
Frank L. Smith
by Burton & Burton
his Attys

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3 SHEETS—SHEET 2.

Fig. 2.

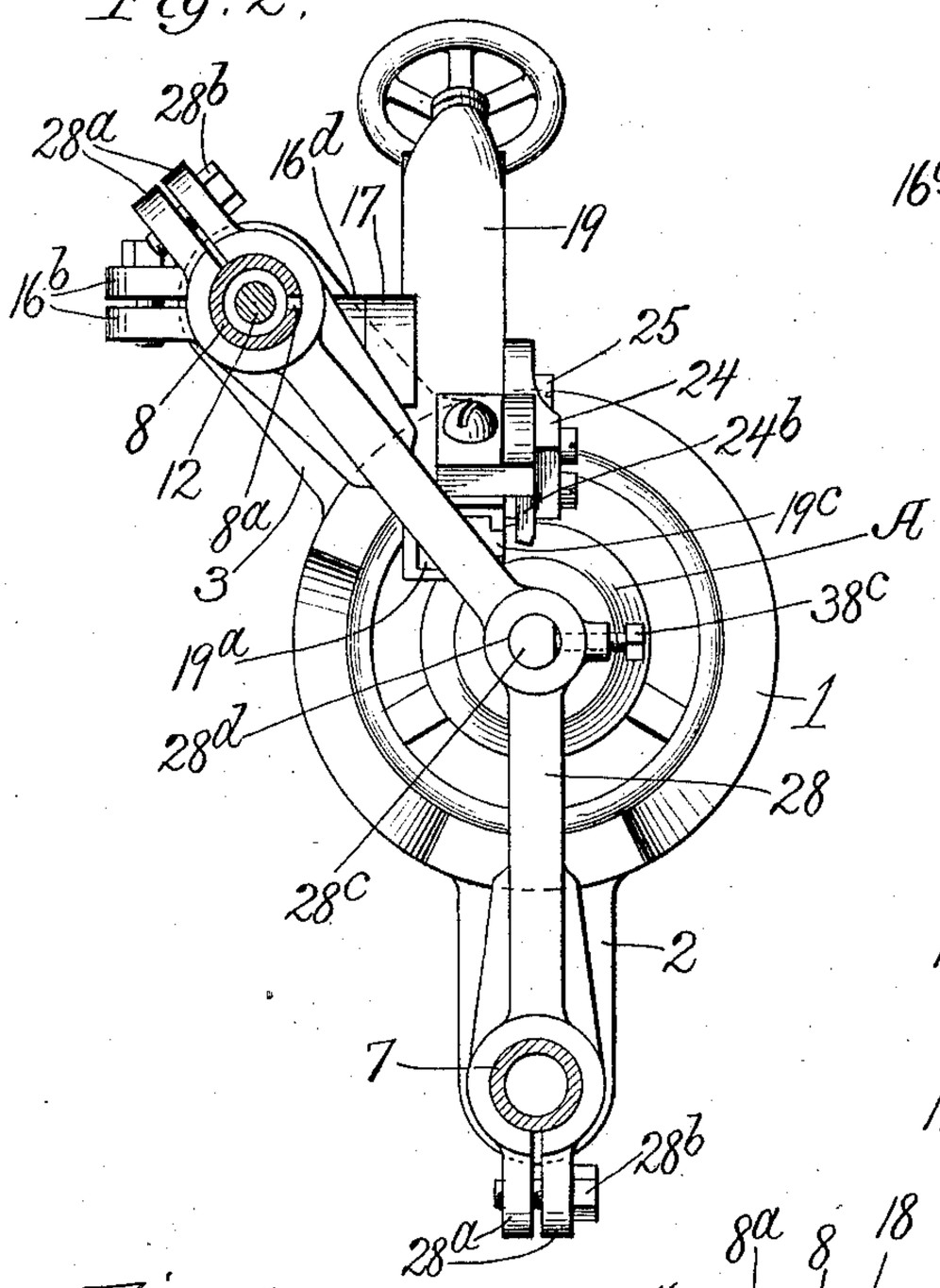


Fig. 4.

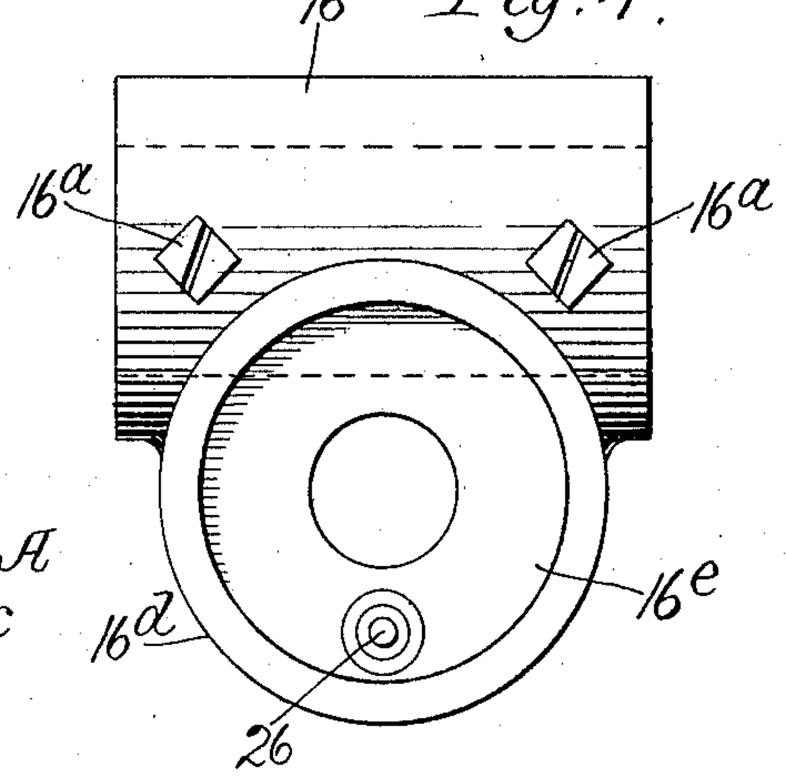


Fig. 5.

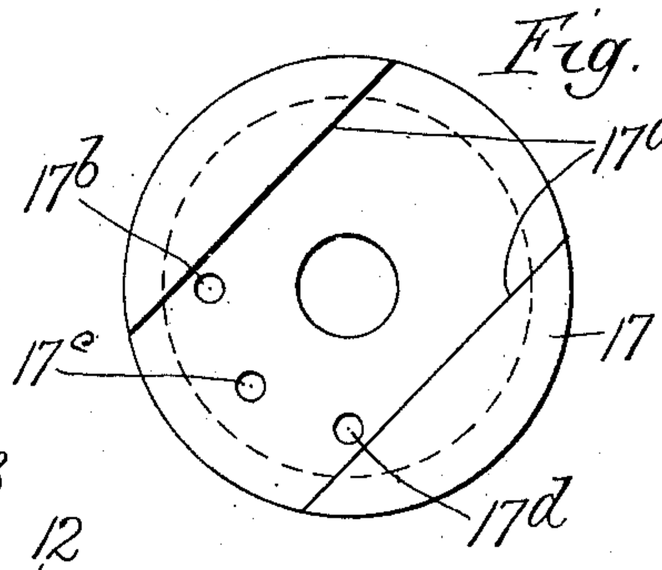
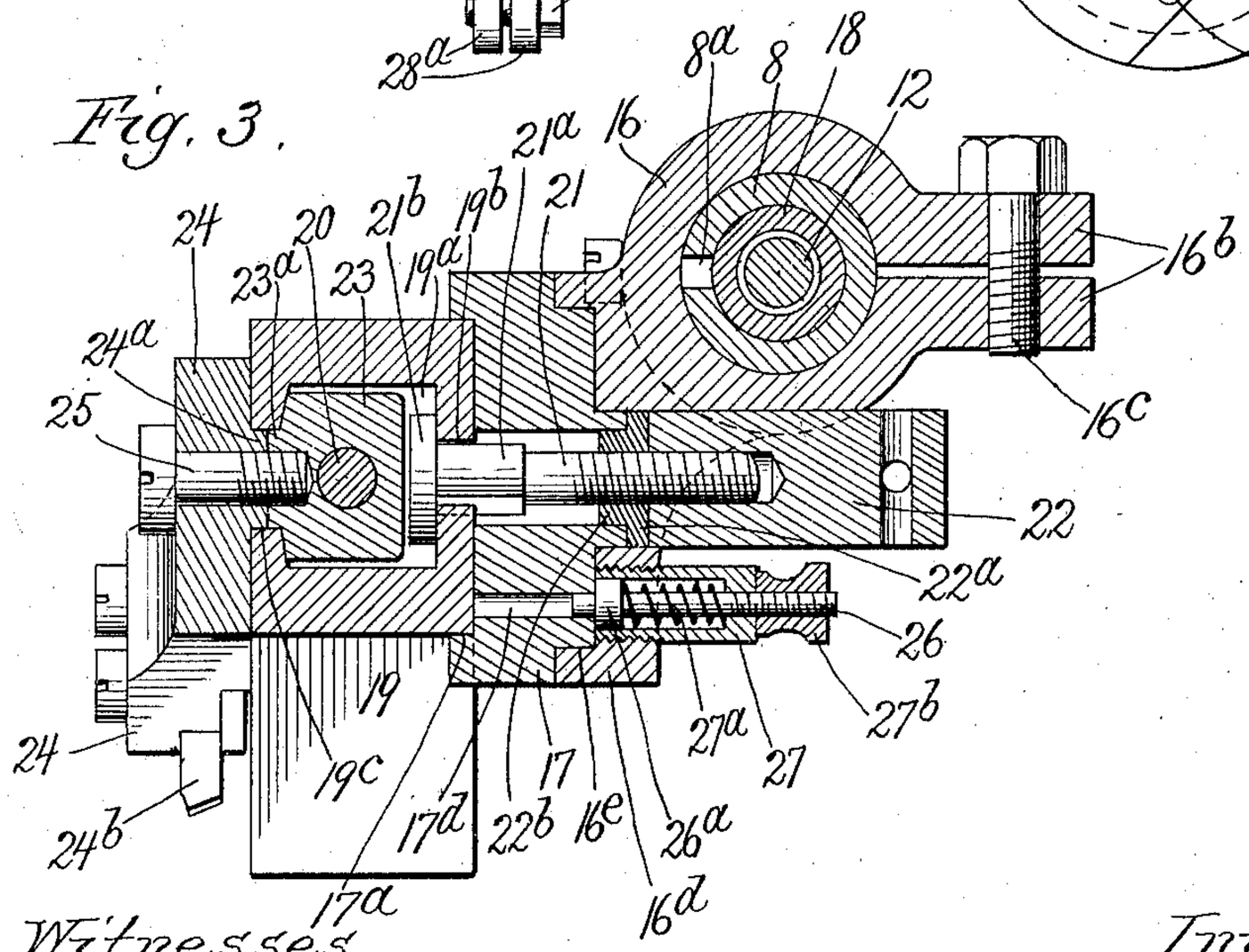


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 6

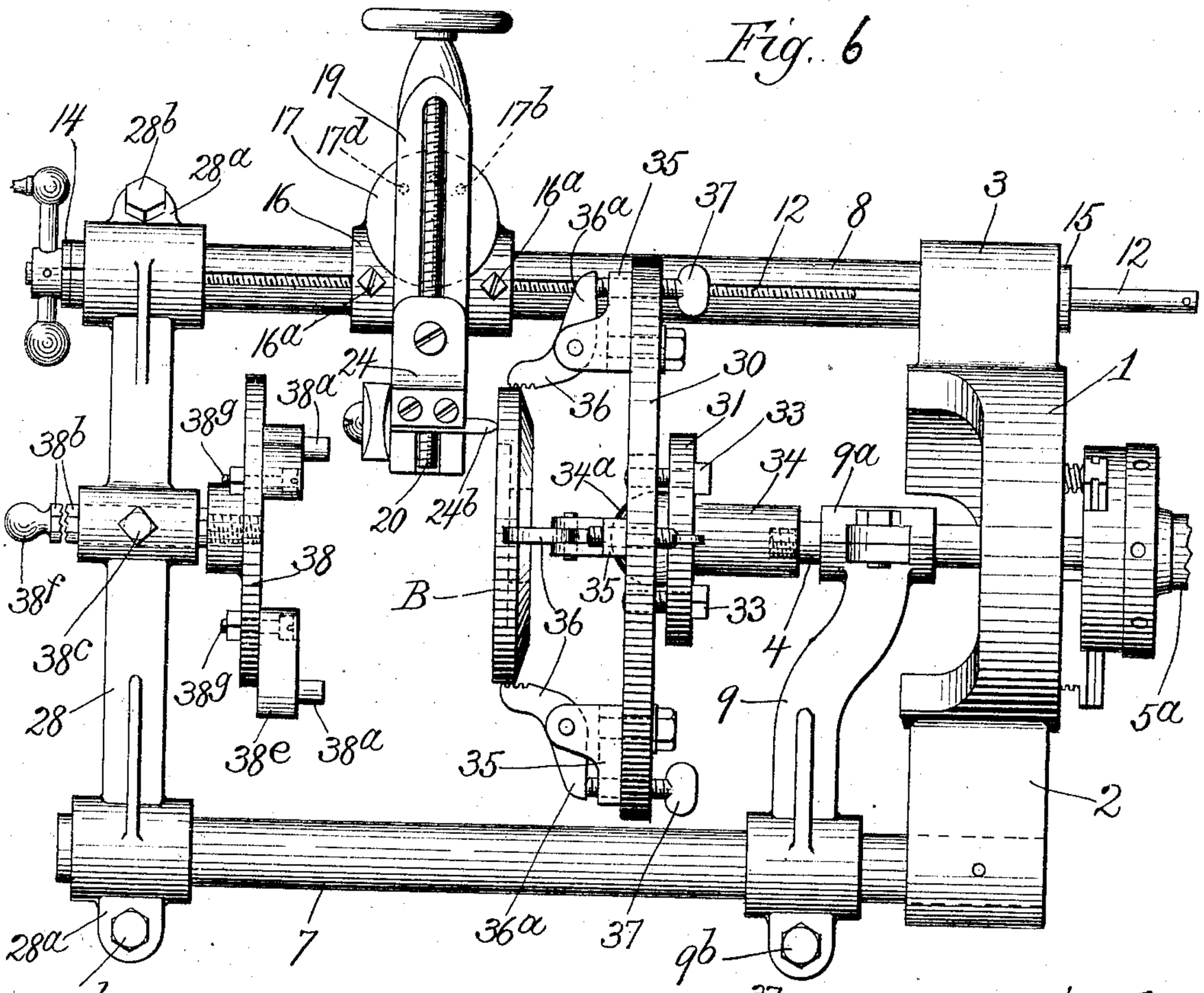


Fig. 8.

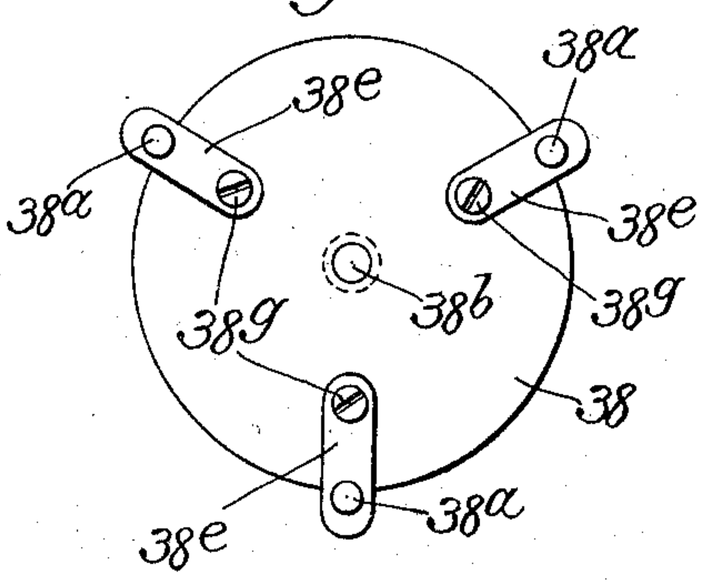
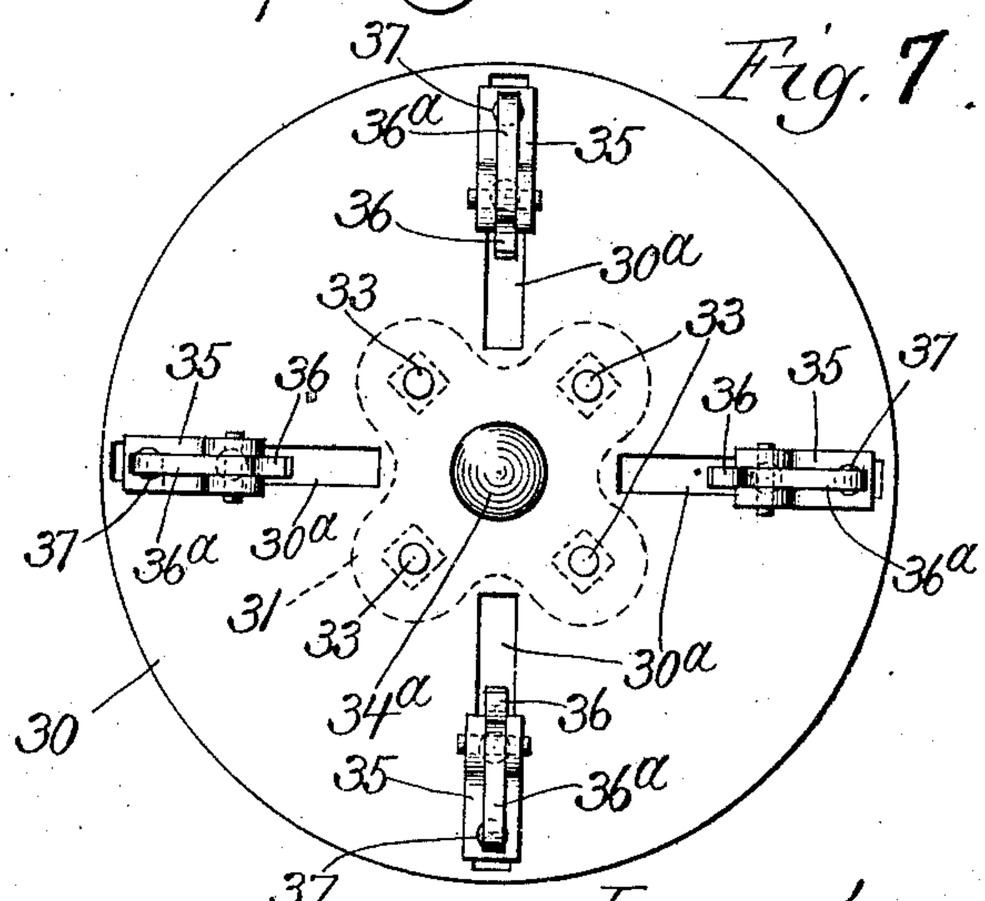


Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANK L. SMITH, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ALVA C. RICKSECKER, OF CHICAGO, ILLINOIS.

VALVE SEAT AND DISK TRUING MACHINE.

No. 859,528. Specification of Letters Patent. Patented July 9, 1907.

Application filed September 14, 1905. Serial No. 278,383.

To all whom it may concern:

Be it known that I, FRANK L. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Valve Seat and Disk Truing Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved machine of the class which may be mounted temporarily in any fixed holding means, as an ordinary bench vise, for the purpose of dressing or re-cutting and truing up valve disks and other similar articles which may be held in the machine for that purpose.

It consists of the features and elements of construction set out in the claims.

In the drawings:—Figure 1 is a side elevation of this improved machine when mounted with parts for holding the tool at rest and rotating the work broken away and shown in vertical section at the bearings of the two feeding or adjusting shafts. Fig. 2 is a section at the line 2—2 on Fig. 1. Fig. 3 is a detail section on an enlarged scale of the tool-holder at the line 3—3 on Fig. 1. Fig. 4 is a detail side elevation of the traveler of the tool-holder separated from the remainder of said tool-holder. Fig. 5 is a detail elevation of intermediate elements in the adjusting devices of the tool-holder. Fig. 6 is a side elevation showing the machine equipped for holding the tool at rest and rotating the work and mounted with devices for adjusting the work to set the surface to be operated upon by the tool in a plane at right angles to the axis of rotation. Fig. 7 is a front elevation of the work-holding chuck shown in Fig. 6. Fig. 8 is a face view or inner side elevation of the leveling device shown in Fig. 6.

The fixed frame of this machine, which is adapted to be gripped in a vise or otherwise temporarily mounted in a fixed position, comprises a head-bracket, 1, which has two lugs, 2 and 3, extending radially from the central annular portion of the bracket, preferably at a distance less than 180 degrees apart, the lug, 2, being parallel-sided and thereby adapted to be engaged in a vise or other holding means in which the machine is mounted. The central part of the bracket has a circular opening for receiving the bearings and rotating and adjusting devices pertaining to the operating shaft, 4, which, in some uses of the machine carries the tool for rotating the latter and in other modes of use carries the work to be rotated against a fixed tool. These bearings and rotating and adjusting devices are of familiar construction requiring no specific description beyond this: That the shaft, 4, is journaled and longitudinally stopped in the exteriorly threaded sleeve, 5, which is screwed into the bearing sleeve, 5^a, by means of the handle, 5^b, to advance the tool or the work which is carried at the forward end of the shaft, 4, said shaft being rotated by the handle, 6.

The bearing sleeve, 5^a, is split and provided with a clamping nut, 5^d, for securing the threaded sleeve, 5, after it is adjusted to the desired position. The lugs, 2 and 3, afford rigid support for the two bars, 7 and 8, which project from the lugs parallel to the axis of the shaft, 4. On the lever-arm, 7, there is mounted for sliding a bracket arm, 9, which extends radially with respect to the shaft, 4, and at the inner end is provided with a journal box, 9^a, for journaling the inner end of the shaft which protrudes through the center of the bracket, 1. The bracket, 9, is split at its seat on the bar, 7, and provided with a clamping nut, 9^b, for binding it securely thereto. This bracket thus affords a bearing for the shaft, 4, which can be advanced as the shaft is advanced and which prevents the spring of the shaft which would result from causing it to protrude so far from its bearing as would otherwise frequently be necessary.

In Fig. 1 there is shown a work-holding chuck, 10, of familiar construction secured to the end of the shaft, 4, and in said chuck there is represented a tapering valve disk, A, as the work to be operated upon. When the machine is used in this manner, a tool-holder is mounted on the bar, 8. This bar is tubular and has a longitudinal slot, 8^a, and extending axially within it there is a threaded shaft, 12, reduced at the ends and journaled in the plugs, 14, 15, set into the ends of the bar, 8, for that purpose. The tool-holder comprises an exterior traveler, 16, which consists of a sleeve which is secured by screws, 16^a, extending through the slot, 8^a, to the interior nut, 18, on the shaft, 12. Preferably, the sleeve has projecting lugs, 16^b, 16^b, and is split radially through the lugs to adapt it to be clamped on to the bar, 8, by a bolt, 16^c, set through the lugs. On this traveler the tool-holding bar is pivotally mounted for swinging to carry the tool in a plane radial to the shaft, 4; and in order that when thus mounted, the lug, 2, being held vertically in a vise, the tool may stand vertical or at least not inclined toward the operator, which would prevent the point from being easily watched during working, the bar is located as already described, less than 180 degrees from the bar, 7, which projects from the lug, 2. For the purpose of so mounting the traveler, there is offset from the sleeve at the side opposite that from which the split lug, 16^b, projects, and extending in a plane at right angles to the plane of the split, an integral disk-like lug, 16^d, apertured at the center and recessed in one face concentrically with the aperture for seating and affording piv-

otal bearing to a disk, 17, which is circumferentially rabbeted to enter the said concentric recess, 16^e, of the lug, 16^d.

On the outer face of the disk, 17, there is formed a transverse channel, 17^a, and in this channel there is seated for sliding longitudinally a tool-carrying bar, 19, which has an axial chamber, 19^a, extending to one end but not to the other end of the bar, and in the end through which said chamber does not open there is journaled and longitudinally stopped a threaded shaft, 20.

The lower side of the bar, 19, has a longitudinal slot, 19^b, opening into the axial cavity; and a bolt, 21, having an enlarged portion, 21^a, reduced by flattening at the opposite sides to the width of the slot, 19^b, is inserted in the slot with its head, 21^b, in the axial chamber of the bar, 19, and said bolt extends through the central aperture of the disk-like lug, 16^d, and is provided with a long nut, 22, below the lug for clamping the disk, 17, to said lug, 16^d, and at the same time clamping the bar, 19, to the disk, 17. A washer, 22^a, is preferably interposed between the nut and the lower side of the lug, 16^d, such washer having a central boss, 22^b, for centering it and thereby centering the bolt, 21, in the central aperture of the lug, 16^d, which is made larger than the bolt to accommodate the enlarged shoulder, 21^a, of the latter. The upper side of the bar, 19, has a longitudinal slot, 19^c, and within the axial chamber there is a nut, 23, engaged by the screw shaft, 20, and having at its upper side a rib, 23^a, by which it is engaged in the slot, 19^c. On the upper side of the bar, 19, there is seated the tool-holding block, 24, which has projecting from its lower face a rib, 24^a, taking into the slot, 19^c, and a bolt, 25, set through the block and through the rib engages the nut, 23, through the rib, 23^a, thereof, and the tool-carrying block is thereby rigidly bound to the nut so as to be carried therewith longitudinally of the bar, 19, when the shaft, 20, is rotated for that purpose. It will be seen that by this means the bar, 19, is adjustable and the tool-block and the tool, 24^b, carried thereby is also movable longitudinally in the bar, and the bar is also adapted to be adjusted angularly about the pivotal connection of the disk, 17, with the disk-like lug, 16^d, and the parts may be secured in any position to which they may be adjusted, both angularly and transversely to the pivot of such angular adjustment by means of the clamping nut, 22. The purpose of this angular adjustment, it will be understood, is to adapt the tool to be propelled in the longitudinal movement caused by the screw shaft, 20, in a path corresponding to the conical slope of any disk which is to be dressed.

Since a very large number of valve disks, for dressing which the machine is designed, if sloped,—that is, if otherwise than flat,—will be sloped at an angle of 45 degrees, means are provided for setting the parts for moving the tool at such an angle and also at a right angle to the bar, 8, and the shaft, 4, as is necessary for dressing off a flat-faced disk. This means consists in mounting on the lug, 16^d, a plunger bolt, 26, in a housing, 27, secured into the lug, the bolt having a stop shoulder, 26^a between which and the head of the housing there is coiled on the bolt a spring, 27^a, for thrusting the bolt inward, and a thumb nut, 27^b, screwed on to the end of the bolt outside the housing serves to stop the inward thrust and as a handle for retracting the bolt to disengage it from an aperture or bolt socket in the disk, 17, with which it may be engaged. Said disk is provided with three such apertures or bolt sockets, 17^b, 17^c and 17^d, the first-mentioned being in a line drawn parallel to the sides of the seat in which the bar, 19, is lodged through the axis of the pivotal connection of the disk, 17, to the lug, 16^d, so that when the bolt is engaged in this middle aperture the bar, 19, extends at right angles to the bar, 8, and shaft, 4. The other two apertures are at positions 45 degrees removed from the first-mentioned ones at opposite sides thereof, so that when the bolt is engaged with either of them the bar, 19, extends in direction 45 degrees removed on one side or the other from a position at right angles to the shaft, 4, and the tool is thereby set for travel in a path corresponding to a conical face of 45-degrees slope in one direction or the other, as the case may require.

The traveler, 16, may be introduced on to the bar, 8, either end first, so that the disk lug 16^e, may stand offset either inwardly or outwardly from the bar, 8. In the former position, as seen in Fig. 1, the device is adapted to hold the tool in position for operating on the smaller disk without danger of springing, because the pivot and clamping bolt, 21, is thereby brought close to the work and tool. But when it is desired to operate upon a large disk or at a correspondingly great distance from the axis of the shaft, 4, the traveler may be reversed in position on the bar, 8, so as to cause the disks and pivotal mounting and clamping of the bar, 23, to be offset outwardly from the bar, 8, so that the tool adjusted for working over a face of as large diameter as can be revolved between the bars, 7 and 8, shall stand as close to the pivotal clamping bolt as with the traveler mounted in the other position shown in Fig. 1 for operating on a smaller disk. Such reversed position of the traveler, 16, and corresponding position of the tool is shown in Fig. 6, wherein the tool-carrying bar, 19, is shown set for dressing a flat disk.

A center bearing head, 28, is provided mounted for sliding on the bars, 7 and 8, and having split lugs, 28^a, clamped by bolts, 28^b, for securing the head at any adjusted position on the bars. A center-point spindle, 28^c, may be employed set through the center-bearing aperture, 28^d, and engaged with the center of the work for further steadying it.

When the work to be operated upon is such as shown in Fig. 1—a valve disk having the surface which is to be dressed concentric about a threaded portion, either socket or stem, of the disk—by which the latter is adapted to be held by the chuck, no provision is necessary for either centering or squaring the work for the action of the tool, but when this is not the case it is necessary to provide means for holding the work which will permit it to be thus centered and squared,—that is, set with the surface to be dressed in proper relation to the axis of rotation. There is shown in Fig. 6 a form of work-holder adapted for this purpose. It consists of a plate, 30, having a ball-and-socket joint connection with its stem or spindle, 34, by which it is attached to the shaft, 4. The ball-and-socket joint may be formed as seen in Fig. 1,—by a clamping plate, 31, secured to the plate, 30,

each of said plates having part of the socket and embracing the ball, 34ª, at the end of the stem, 34. The plate, 30, has radial slots, 30ª, in which there are mounted for movement radial with respect to the shaft supports or fulcrum bearings, 35, for gripping jaws, 36, said jaws having each a tail, 36ª, against which the adjusting or clamping screws, 37, set through the supports, 35, impinge to force the gripping faces of the jaws into binding engagement with the work represented by a valve disk, B. Before the tool-holder of the same form as shown in Fig. 1 is advanced into position for operating on the work, a leveling or squaring device consisting of a disk, 38, having three (or more) projecting pins, 38ª, mounted so as to be movable in and out over its face and having a spindle, 38ᵇ, fitted to the center bearing head, 28, is mounted in the latter, and by advancing it to the face of the disk, B, while the latter is lightly grasped in the jaws of the chuck, said disk may be approximately leveled or set in proper relation to the axis; and the jaws being then tightened to grip the disk firmly, the ball-and-socket joint of the work-holder to its stem, 34, being relaxed by slacking the bolts, 33, which clamp the plates, 30 and 31, on to the ball, 34ª, the leveling device, 38, being forced up firmly against the face of the disk, B, the latter will be adjusted to exact position by the movement of the entire work-holder about the ball-and-socket joint, and the bolt, 38ᶜ, provided in the bearing of the spindle, 38ª, being then set tight to hold the leveling device in position to which it has been forced having its pins, 38ª, firmly bearing against the disk, the nuts, 33, may be tightened clamping the work-holder rigidly at the ball-and-socket joint. Thereupon the bolt, 38ᶜ, being slackened, the leveling device may be withdrawn and the tool-holder operated to bring the tool into working position, as seen in Fig. 6.

A convenient construction of the leveling device in respect to the mounting of the pins, 38ª, is that shown in which said pins are formed as projections from the face of short lever arms, 38ᵉ, near the end, said arms being pivoted near the other end to the face of the disk by bolts, 38ᵍ, which may be clamped tight to secure the arms and hold the pins in any position to which they may be adjusted by swinging the arms about their said pivot bolts. It is not necessary for the ordinary purpose of leveling a valve disk that the pins, 38ª, should be offset exactly at the same distance from the center, though this may be done if desired to facilitate centering the disk as nearly as it is necessary to do so.

I claim:—

1. In a machine for the purpose indicated, in combination with a head bracket adapted to be held in a vise, bearings carried by such bracket for a rotatable shaft; a shaft journaled in said bearings, said bracket having a rigid arm parallel with the shaft, and an arm having a bearing for the shaft mounted for sliding on said rigid arm, and means for making it rigid therewith.

2. In a machine for the purpose indicated, in combination with a head bracket, bearings carried thereby for a rotatable shaft; a shaft journaled in said bearings; two arms rigid with said bracket extending parallel with the shaft; an arm having a bearing for the shaft mounted on one of said parallel arms and adjustable longitudinally thereon, and a tool carrier mounted and adjustable longitudinally on the other of said parallel arms.

3. In a machine for the purpose indicated, in combination with a head bracket, bearings carried thereby for a rotatable shaft; a shaft journaled therein; two arms rigid with said bracket less than 180 degrees apart about the shaft axis and extending parallel therewith; an arm having a bearing for the shaft mounted on one of said parallel arms and adjustable longitudinally thereon, and a tool carrier mounted and adjustable longitudinally on the other of said parallel arms.

4. In a machine for the purpose indicated, in combination, a head bracket; bearings carried thereby for a rotatable shaft; a shaft journaled in such bearings; two arms rigid with said bracket and extending parallel with the shaft; a center head mounted for sliding on the two parallel arms and having a spindle bearing axially in line with the shaft bearing, said shaft being adapted to carry a work holder, and a tool holder mounted and longitudinally adjustable on one of said parallel arms.

5. In a machine for the purpose indicated, in combination, a head bracket; a bearing carried thereby for a rotatable shaft; two arms rigid with said bracket parallel with the shaft bearing; a shaft bearing bracket arm mounted for longitudinal adjustment on one of said parallel arms; a tool carrier mounted for longitudinal adjustment on the other of them and a center head mounted for longitudinal adjustment on both the arms.

6. In a machine for the purpose indicated, in combination, a head bracket and bearings carried thereby for a rotatable shaft, said bracket having two rigid arms parallel with the axis of the shaft bearing; a center head which connects said arms and is longitudinally adjustable thereon, a shaft in said bearings adapted to carry a work holder for rotating the work; a tool carrier mounted on one of said parallel arms and means for moving it longitudinally thereof at will, said carrier comprising an element to which the tool is mounted, which is movable transversely with respect to said arm for advancing the tool toward and from the axis of the rotatable shaft.

7. In a machine for the purpose indicated, in combination with means for holding and rotating the work; a rigid bar parallel with the axis of rotation; a traveler mounted on said bar comprising a sleeve having a flange offset therefrom at one side and a tool-carrying bar mounted on said flange, said traveler adapted to be reversed in position endwise on the bar to cause the flange to offset either inwardly or outwardly from the latter.

8. In a machine for the purpose indicated, in combination with means for holding and rotating the work; a rigid bar parallel with the axis of rotation; a traveler mounted on said bar comprising a sleeve having a flange offset therefrom at one side and a tool-carrying bar pivotally mounted on said flange, said traveler adapted to be reversed in position endwise on the bar to cause the flange to offset either inwardly or outwardly from the latter.

9. In a machine for the purpose indicated, in combination with means for holding and rotating the work; a rigid bar parallel with the axis of rotation; a traveler mounted on said bar comprising a sleeve having a flange offset therefrom at one side and a tool-carrying bar mounted on said flange with capacity for pivotal and longitudinal adjustment, said traveler adapted to be reversed in position endwise on the bar to cause the flange to offset either inwardly or outwardly from the latter.

10. In a machine for the purpose indicated, in combination with means for holding and rotating the work, a rigid bar parallel with the axis of rotation; a traveler mounted on said bar comprising a sleeve having a flange offset therefrom at one side; a disk pivoted to said flange adjustable about its pivot and provided with means for securing it in adjusted position; a tool-carrying bar mounted transversely across the face of the disk and longitudinally adjustable thereacross, and means for securing it in adjusted position.

11. In a machine for the purpose indicated, in combination with a head bracket and a rotatable shaft journaled therein adapted to carry a work holder for rotating the work, an arm rigid with said bracket parallel to the shaft; a traveler comprising a sleeve mounted on said arm and means for moving it longitudinally and securing it thereon, said traveler consisting of a sleeve having a disk flange offset therefrom; a second disk centrally pivoted to said

disk flange; a bolt taking through the centers of the two disks and provided with means for clamping them together; a tool-carrying bar mounted transversely across the face of the disk and longitudinally movable thereacross, said bar being axially chambered and slotted on the side which is seated in the disk, said bolt through the center of the disk being engaged in the slot for clamping the bar to the disk when the disks are clamped together by the bolt; a tool-holding block mounted with capacity for longitudinal movement on the bar; a threaded shaft extending longitudinally through the axial chamber of the bar, and a traveling nut thereon rigidly connected with the tool-holding block for moving the latter by the rotation of the threaded shaft.

12. In a machine for the purpose indicated, in combination with a head bracket having shaft bearings, a shaft journaled in said bearings adapted to carry a work-holder; two arms rigid with the bracket parallel to the shaft; a center head mounted on the two arms having a central bearing; a leveling device having a spindle and mounted thereby in the center head and adapted to be advanced against the face of the work to be operated upon and to be withdrawn therefrom.

In testimony whereof, I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 6th day of September, 1905.

FRANK L. SMITH.

In the presence of—
L. M. SMITH,
J. S. ABBOTT.