F. O. ALBERTSON.

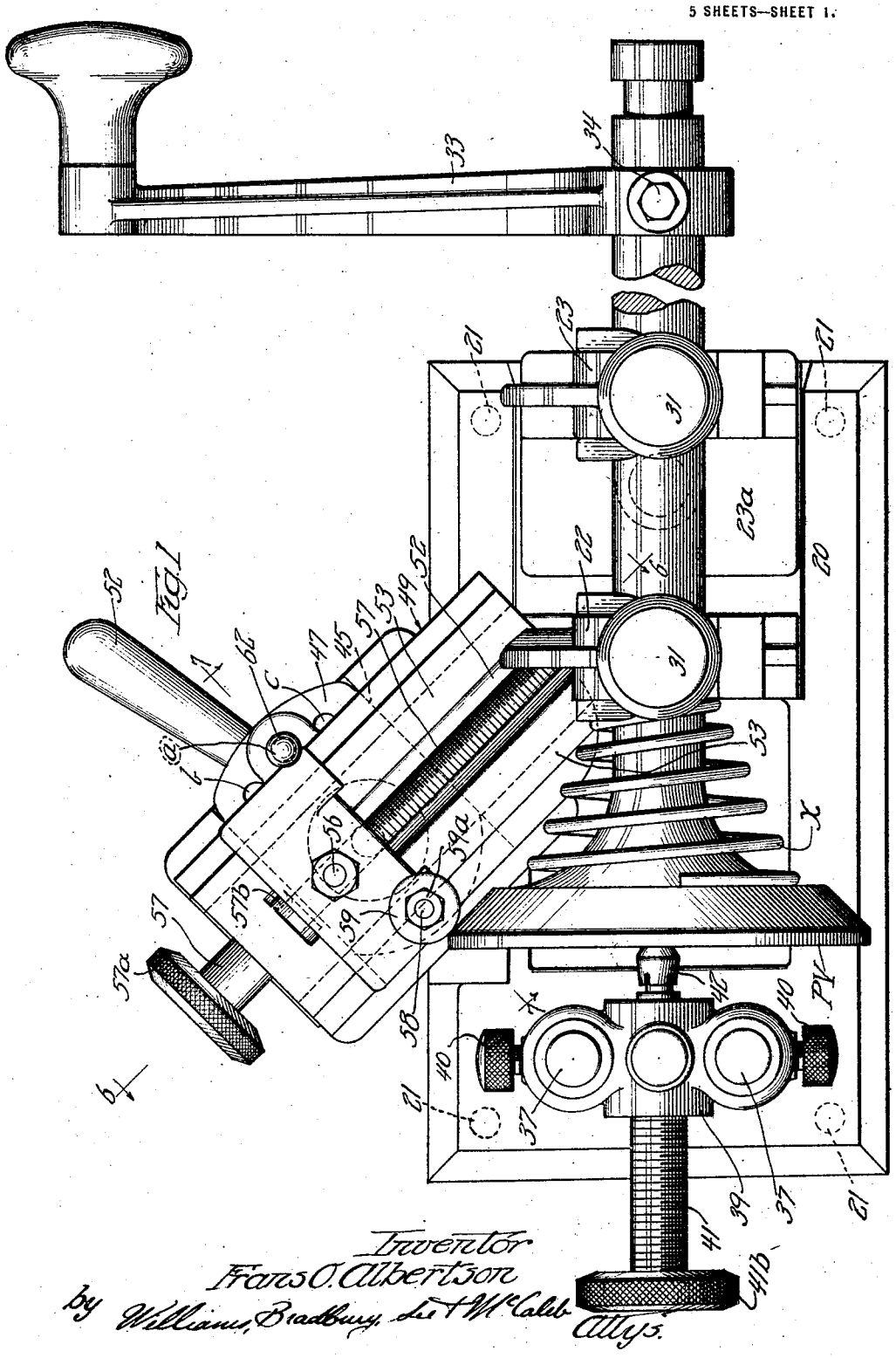
VALVE REFACING APPARATUS.

APPLICATION FILED SEPT. 7, 1920.

1,421,133.

Patented June 27, 1922.

5 SHEETS—SHEET 1.



Inventor
Frank O. Albertson
by Williams, Bradbury, Lee & McCalb
Attys.

F. O. ALBERTSON.

VALVE REFACING APPARATUS.

APPLICATION FILED SEPT. 7, 1920.

1,421,133.

Patented June 27, 1922.

5 SHEETS—SHEET 2.

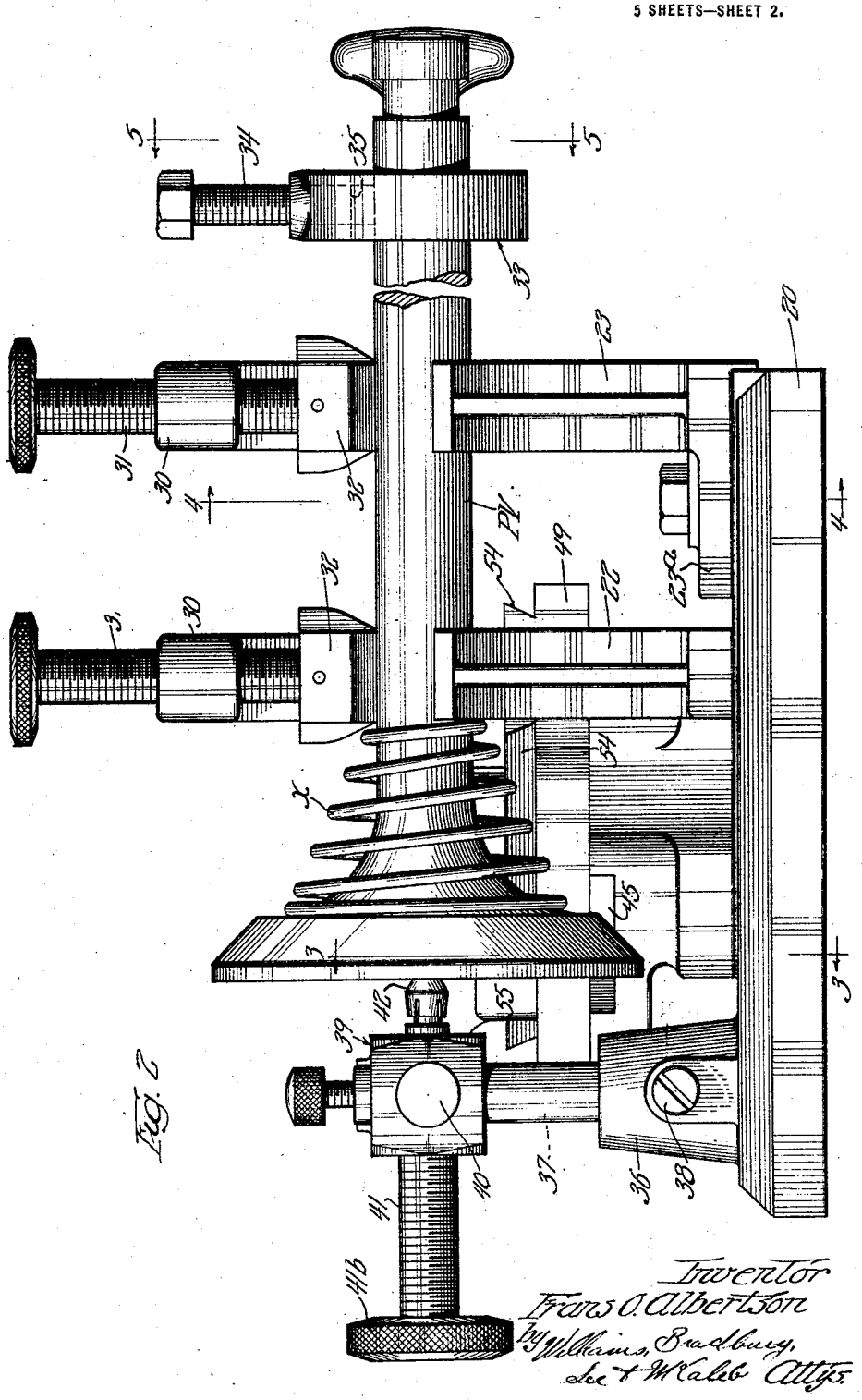


Fig. 2.

Inventor
Frank O. Albertson
by Wilkins, Bradbury,
Lee & McCabe Attys.

F. O. ALBERTSON.

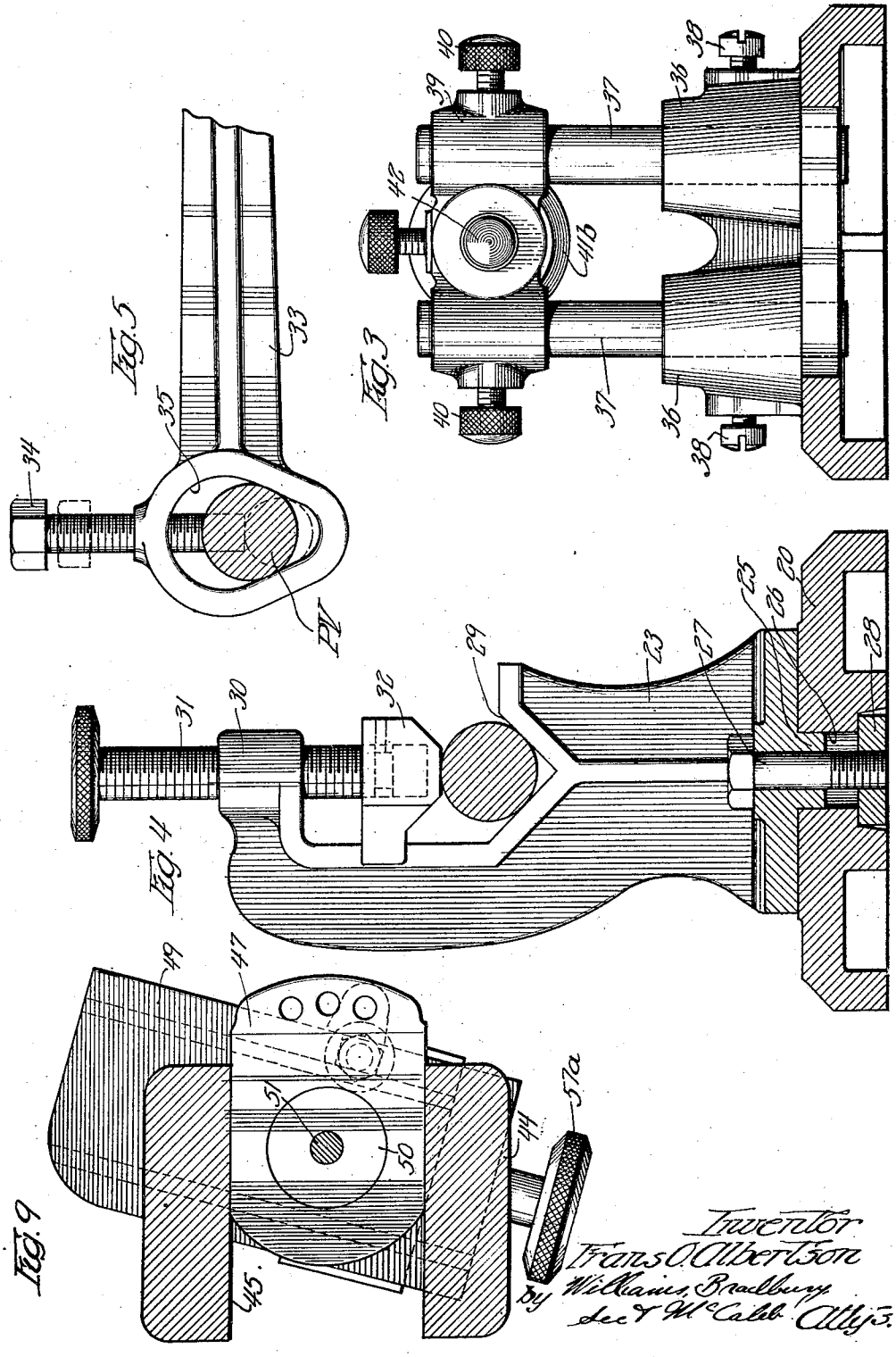
VALVE REFACING APPARATUS.

APPLICATION FILED SEPT. 7, 1920.

1,421,133.

Patented June 27, 1922.

5 SHEETS—SHEET 3.



F. O. ALBERTSON.

VALVE REFACING APPARATUS.

APPLICATION FILED SEPT. 7, 1920.

1,421,133. **Patented June 27, 1922.**

5 SHEETS—SHEET 4.

Fig. 7

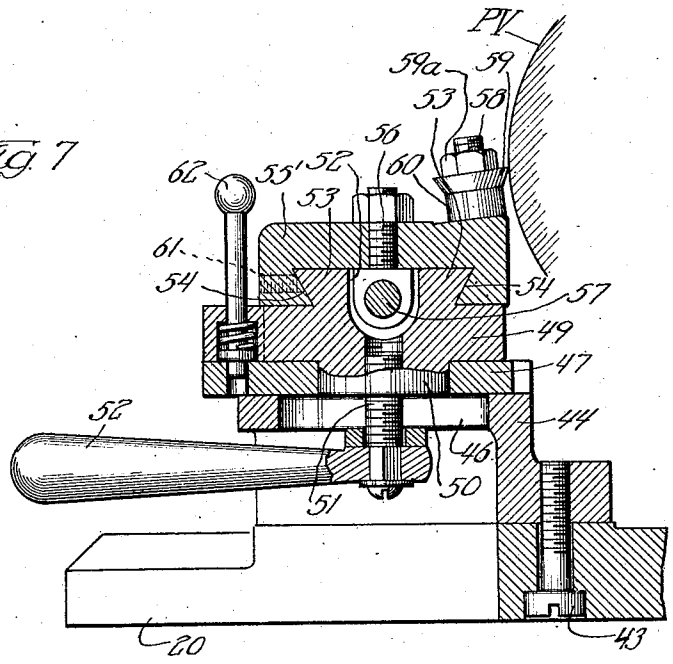
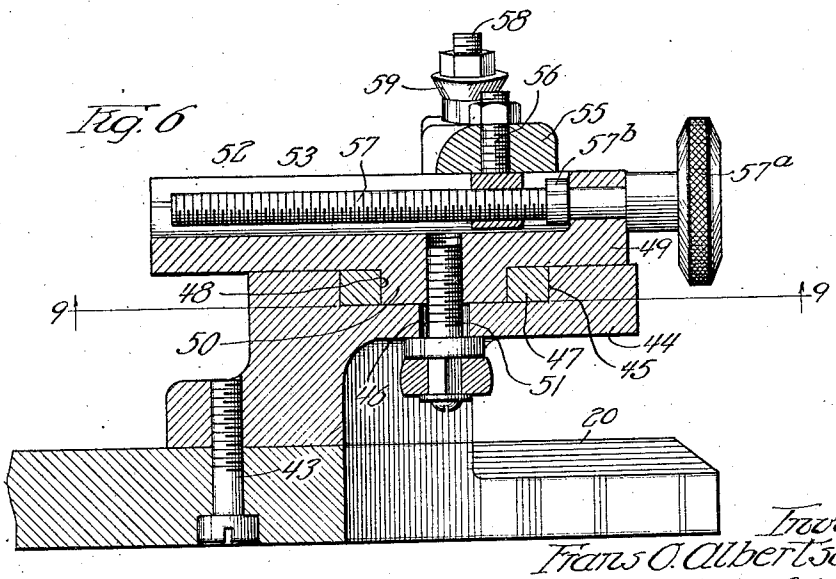


Fig. 6



Inventor
Frans O. Albertson
by Williams Bradbury, Lee & McCaleb Attys

F. O. ALBERTSON.

VALVE REFACING APPARATUS.

APPLICATION FILED SEPT. 7, 1920.

1,421,133. **Patented June 27, 1922.**

5 SHEETS—SHEET 5.

Fig. 8

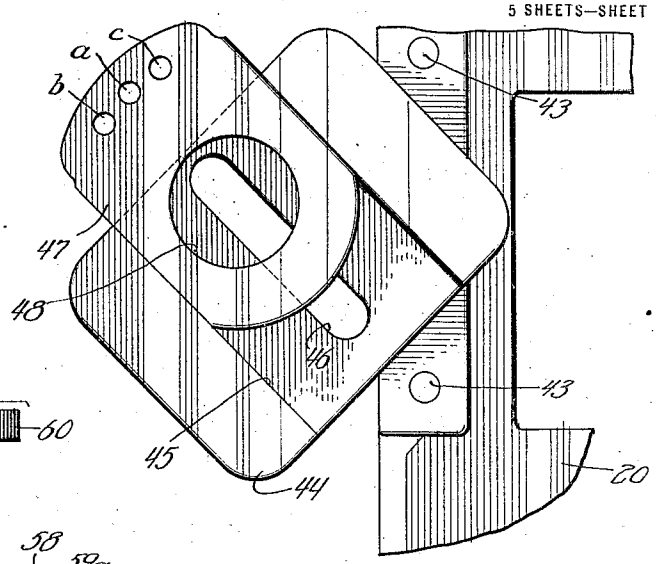


Fig. 12



Fig. 11

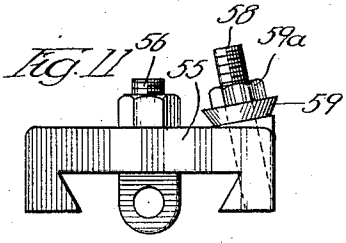


Fig. 10

Inventor.
Frans O. Albertson
by Williams, Bradbury, Lee & McCabe Attys.

UNITED STATES PATENT OFFICE.

FRANS O. ALBERTSON, OF SIOUX CITY, IOWA, ASSIGNOR TO ALBERTSON & COMPANY, OF SIOUX CITY, IOWA, A CORPORATION OF IOWA.

VALVE-REFACING APPARATUS.

1,421,133. Specification of Letters Patent. Patented June 27, 1922.

Application filed September 7, 1920. Serial No. 408,430.

To all whom it may concern:

Be it known that I, FRANS O. ALBERTSON, a citizen of the United States, residing at Sioux City, in the county of Woodbury and State of Iowa, have invented a certain new and useful Improvement in Valve-Refacing Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to an apparatus intended for use in refacing internal combustion engines puppet valves. Among its principal objects, my present invention contemplates the provision of—

1st. A valve refacing apparatus that readily may be adapted for use in refacing the beveled surface of any valve regardless of the size of the valve and regardless of the inclination of its beveled surface.

2nd. A valve refacing apparatus which comprises a cutting element which by minute angular shifts may from time to time be caused to present an infinite number of fresh effective cutting edges.

3rd. An apparatus of the class mentioned which may be operated manually and by a single operator.

4th. A valve refacing apparatus wherein the devices for feeding the valve head to be refaced against the cutting tool, although capable of adjustment prior to the use of the apparatus in refacing valves of various sizes, need not necessarily be adjusted with any great degree of precision.

These and other objects of the valve refacing apparatus of my invention will more fully appear from the detailed description to follow, wherein reference is made to the accompanying drawings, in which—

Figure 1 is a top plan view of the apparatus of my invention, showing a puppet valve of large size placed in the apparatus ready for the refacing operation;

Figure 2 is a side elevational view of the same;

Figure 3 is a vertical sectional view taken on line 3—3 of Figure 2;

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 2;

Figure 5 is a fragmentary sectional view taken on the line 5—5 of Figure 2;

Figure 6 is a vertical sectional view taken on line 6—6 of Figure 1;

Figure 7 is a vertical sectional view taken on line 7—7 of Figure 1;

Figure 8 is a fragmentary top plan view of the bracket and reciprocating plate, whereon the cutter head carrier is mounted, the cutter head carrier and parts carried thereby being removed;

Figure 9 is a view taken on line 9—9 of Figure 6, looking in the direction indicated by the arrows.

Figure 10 is a fragmentary vertical sectional view illustrating a valve of very small size in the refacing apparatus;

Figure 11 is an end view of the cutter head, illustrating the disposition of the cutting tool when a valve of the type shown in Figure 10 is being refaced; and

Figure 12 illustrates the several interchangeable collars which are preferably provided so that the cutting tool may be variably spaced from the cutter head.

Similar characters of reference refer to similar parts throughout the several views.

The apparatus comprises a base plate 20 which is preferably rectangular in shape, so that if desired it may be clamped between the jaws of a vise. However, the base may be permanently secured to a work bench, in which case I employ screws as indicated by dotted lines, at 21—21 in Figure 1.

Rising from the base casting 20 are the two standards 22 and 23. Standard 22 is rigidly attached to base 20 by a plurality of machine screws 24. Standard 23 is provided with a foot 23^a which is provided on its under side with a rib 25. The rib 25 slidably engages in a slot 26 in the base casting 20. Standard 23 may be retained at any desired position along the slot 26 by means of the screw 27 and its co-operating nut 28. This arrangement permits me to vary the spacing of the standards 22 and 23, this being very desirable in an apparatus which is intended for use in refacing puppet valves of all styles and sizes. Each of the standards 22 and 23 is pro-

vided with a substantially V-shaped seat 29 and with a portion 30 overhanging the seat. Each of the overhanging portions 30 carries a screw 31. Each screw is provided at its lower end with a shoe 32 which is preferably conformed to embrace its associated standard and is guided thereby in its vertical movement. The shoes are, of course, so attached to the screws 31 that the screws are capable of rotary movement independently of the shoes. The two V-shaped seats 29—29 constitute a cradle for the stem of the puppet valve to be refaced. In Figures 1, 2 and 7 I have illustrated a puppet valve of large size at PV and it will be noted that the beveled portion of the head of this particular valve is cut at an angle of 45° to the axis of the valve stem. After a valve is placed in the cradle afforded by the V-shaped seats 29, the screws 31 are turned down to press the shoes 32 lightly against the valve stem, it being the purpose of the shoes to retain the valve stem in the V-shaped seats without interfering with free rotation of the stem in the seats. Rotation of the valve is accomplished by a crank 33 which is so conformed that it may be applied to the stem of any valve and be temporarily rigidly clamped thereto by a set screw 34. The eye of the crank, indicated at 35 in Figure 5, is so shaped that the set screw may most effectively secure the crank to the stem of any one of a large variety of puppet valves. In Figure 5 the dotted lines indicate the position in the crank eye assumed by a valve stem considerably less in diameter than the stem of valve PV, and also indicate the position of the set screw 34 when the latter is caused to clamp the said smaller diameter valve stem in position.

Formed integral with the base casting 20 and disposed at the end thereof opposite the standard 23 are the bosses 36, each of which is provided with a vertical bore in which is adjustably mounted a rod or post 37. Posts 37 are securely held in position in their respective bosses 36 by set screws 38—38. It is the purpose of the posts 37—37 to constitute guides for a vertically adjustable cross head 39 which may be retained in any desired position with respect to the posts by set screws 40—40.

The cross head 39 is provided with a horizontal screw-threaded bore with which co-operates the feed screw 41, the end of which nearest the standards is in the form of a ball 41^a, as is perhaps most clearly shown in Figure 10. Carried by the ball is a hollow cone-shaped member 42 having slots therein, so that the metal between the slots may be turned down over the ball to retain the cone-shaped member on the feed screw. The cone-shaped member, by reason of the fact that it is capable of substantially universal movement with respect to the feed screw, permits the latter to be employed for feeding any valve head against the cutting tool without the necessity for precisely adjusting the cross head 39 prior to the refacing of such valve. The feed screw 41 is preferably provided with a comparatively large milled head, as indicated at 41^b.

I will now describe the cutting tool and the means for supporting, adjusting and operating the same. Projecting laterally from the base casting and secured thereto by a plurality of screws 43—43 is a bracket 44, which is provided in its upper surface with a comparatively wide and parallel-sided groove or guideway 45, the sides of which are inclined at an angle of 45° to the axis of a valve stem carried by standards 22 and 23. Also formed in the bracket 44 is an elongated slot 46. Slidably mounted in the guideway 45 is a plate 47 which is provided with a comparatively large central aperture 48 and at one end with three small apertures, *a*, *b*, *c*, the centers of which small apertures are disposed in the circumference of a circle concentric with the center of the aperture 48; the purpose of the small apertures *a*, *b*, *c* to presently appear. It will be noted that the upper surface of plate 47 is substantially flush with the upper surfaces of the bracket 44. Resting upon the upper surfaces of the plate 47 and bracket 44 is the cutter head carrier 49, which, on its under face, is provided with a cylindrical boss 50 which fits snugly and rotatably in the aperture 48 of slidable plate 47. The cutter head carrier is thus mounted for movement around an axis that may be shifted to various points in a straight line at an angle of 45° to the axis of the stem of the valve to be refaced. A screw 51 extends freely through the slot 46 in the bracket 44 and co-operates with the central screw-threaded bore in the boss 50. The screw 51 is conveniently provided with a squared lower end to which is applied an operating handle 52, a washer 53 being conveniently disposed around the screw 51 and between handle 52 and bracket 44.

It will readily be seen that by tightening the screw 51 by means of handle 52 the cutter head carrier may be tightly clamped to the bracket 44 and plate 47. Tightening of the screw also serves fixedly to hold the plate 47 in the guideway 45.

The cutter head carrier is provided with a longitudinal groove 52, the sides of which are bounded by ribs 53—53 having undercut surfaces 54—54 so that the cutter head indicated at 55 may have sliding dove-tail attachment to the cutter head carrier 49, as is most clearly illustrated in Figure 7. The cutter head carries a bolt 56, the head of which depends into the slot 52, and is provided with a threaded bore which co-op-

erates with the cutter feed screw 57. The cutter feed screw 57 bears at one end in the cutter carrier 49 (Figure 6) and is provided with the milled head 57ª. The cutter feed screw is also provided with a collar 57ᵇ which permits relative rotary movement between the screw and the cutter head carrier, but prevents relative longitudinal movement between these parts.

Carried by the head 55 is a threaded stud 58, the axis of which is slightly inclined from the vertical. Disposed upon this stud is the cutting tool 59, which is in the form of a centrally apertured tool steel disc having a beveled cutting edge. That surface of the head 55 from which the stud 58 projects is conformed to lie at right angles to the axis of the stud and interposed between this surface and the cutting tool 59 is a spacing collar 60. I find that in operating upon valves of various sizes it is desirable to vary the height of the cutting edge. As a simple means for effecting this adjustment I provide a plurality of variously sized and interchangeable collars, the set of the interchangeable collars being shown in Figure 12. The cutting tool 59 is held rigidly in position by a nut 59ª.

It will be understood that the cutter head 55 and the cutting tool 59 may be moved longitudinally of the carrier 49 by turning the cutter feed screw 57. If desired, the head 55 may be provided with a plurality of small set screws (one of which is shown at 61 in Figure 7), it being the purpose of these set screws to bear lightly against one of the ribs 53 to regulate the force that must be applied to screw 57 to reciprocate the cutter head. In other words, the screws 61 serve to steady the operation of the cutter head.

Referring now to Figure 7, it will be seen that the cutter head carrier 49 is provided with a spring-pressed plunger 62, the lower end of which is adapted to engage in any one of the apertures *a*, *b*, or *c*, of the reciprocating plate 47. When plunger 62 engages in aperture *a*, operation of the screw 57 moves the cutter head 55 and the cutting tool 59 in a line at an angle of 45° to the axis of a valve carried by standards 22 and 23. When the plunger engages in aperture *b*, the cutting angle is 60°, and when the plunger engages in aperture *c*, the small angle is 30° Practically all puppet valves in use at the present time have their beveled surfaces cut at angles of 30°, 45° or 60°.

Now let us assume that a valve of the type shown at PV in Figures 1, 2 and 7 is to be refaced. The valve is placed, as shown in Figures 1 and 2, with the stem thereof resting in the V-shaped seats of the standards 22 and 23, and the screws 31—31 are turned down so that the shoes 32 bear lightly against the valve stem and hold the latter in the seats without, however, interfering with comparatively free movement of the stem, both longitudinal and rotatable. Prior to placing the valve upon the standards, a coiled spring X is placed around that portion of the valve stem nearest the head. The vertically adjustable head 39 is now adjusted so that the axis of the feed screw 41 is brought as closely into coincidence with the axis of the valve stem as can be accomplished without any considerable difficulty. The conical element 42 is now caused to engage in the usual depression or center punch mark in the valve head. An approximate adjustment of the head 39 is sufficient, since the universal movement of the element 42 serves to compensate for any small misalignment of the valve stem and feed screw. The crank 33 is now applied to the valve stem. The lever 42 is now turned to loosen the screw 51. Since the head of the valve PV is provided with a 45° bevel, the plunger 62 of the cutter head carrier 49 is caused to engage in aperture *a* of the reciprocating plate 47. Engagement of this plunger in aperture *a* insures that the feed screw is disposed at an angle of 45° to the axis of the valve. Plate 47 is now moved in guideway 45 until the cutting tool is brought to a point immediately adjacent the beveled surface of the valve, as shown in Figure 1. The operator now moves lever 52 to tighten the screw 51, thereby tightly clamping reciprocating plate 47 and the cutter head carrier 49 to the bracket 44. The operator now determines the depth of the cut which he is going to make in the beveled surface of the valve by suitable adjustment of the feed screw 41. He is now ready to reface the valve. He grasps the handle 33 with one hand and rotates the valve stem, using the other hand to manipulate the cutter feed screw 57 to cause the cutting tool 59 to move across the beveled surface of the valve, as the same is rotated. If the first cut taken in the beveled surface of the valve head is not sufficient properly to reface the same, a further cut or cuts may be taken by properly adjusting the feed screw 41 and then rotating the valve and manipulating the cutter feed screw 57 in the manner described.

Figure 10, which shows a puppet valve of very small size in the apparatus, illustrates the adaptability of the apparatus of my invention in so far as concerns the matter of refacing puppet valves of all styles and sizes. When this particular size of valve is being refaced, the cutting tool 50 may rest directly upon the cutter head as shown in Figure 11. The refacing of the style of valve shown in Figure 10 is accomplished in exactly the manner hereinbefore described, except that in this case the plunger 62 of the cutter head carrier 49 is caused to engage in the aperture *c* of the reciprocating plate 57, so that operation of the cutter feed

screw 57 will cause the cutter head and the cutting tool 59 to reciprocate in a line at an angle of 30° to the axis of the valve. The particular valve shown in Figure 10, of course, is provided with a 30° bevel.

Valve refacing tools heretofore provided have, so far as I am aware, been universally provided with cutting tools having rectilinear cutting edges. I have found that the refacing of an engine puppet valve will very quickly turn or dull the edge of any cutting tool. Since the edge of my cutting tool 59 is circular rather than rectilinear, and since but an infinitely small portion of the cutting edge engages the valve at any one time, I find that a cutting tool of the type herein shown and described will last almost indefinitely, because the operator, when any portion of the cutting edge ceases to function properly, need only make a minute angular shift of the cutting tool upon its supporting stud to bring a fresh and sharp portion of the cutting edge into cutting relation with the valve.

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

1. An apparatus for refacing puppet valves comprising a base, means carried by the base adapted to support the stem of a valve to be refaced, a member carried with the base and provided with a guideway, a plate mounted in said guideway for rectilinear movement toward and away from the head of the valve to be refaced, an aperture in said plate, a cutter head carrier mounted on the plate and having a boss journaled in said aperture, means for retaining the cutter head carrier in any one of a plurality of angular positions with respect to said plate, a cutter head mounted on the cutter head carrier for reciprocating movement relatively thereto, a cutting tool fixed on the cutter head, an operating screw carried by the cutter head carrier and co-operating with the cutter head to reciprocate the latter, and means for rotating the valve.

2. An apparatus for refacing valves comprising a base, means carried by the base constituting a cradle for the stem of a valve to be refaced, a bracket carried by the base, said bracket provided with a guideway, a plate mounted in the guideway for reciprocation toward and away from the head of the valve to be refaced, a cutter head carrier mounted on said plate for rotary movement thereon, a cutter head mounted on said carrier for reciprocating movement relatively thereto, means for retaining the cutter head carrier in any one of a plurality of angular positions with respect to said plate, so that the angle between the line of movement of the cutter head and the valve axis will correspond to the inclination of the valve head bevel, a cutting tool fixed on the cutter head, means for rotating the valve, and means for reciprocating the cutter head relatively to the cutter head carrier.

3. An apparatus for refacing puppet valves comprising a base, a pair of standards rising from the base, aligned V-shaped grooves in said standards constituting a cradle for the stem of a valve to be refaced, a cutting tool disposed adjacent the head of a valve carried by the standards, a pair of posts rising from the base, a vertically adjustable cross head guided by said posts, a feed screw carried by said cross head and disposed with its axis substantialy parallel to a straight line passing through the apices of said V-shaped grooves, and means for retaining said cross head at any desired position on said posts.

4. An apparatus for refacing puppet valves comprising a base, means carried by the base constituting a cradle for the stem of a valve to be refaced, a cutting tool disposed adjacent the head of a valve carried in said cradle, a vertically adjustable head carrying a feed screw disposed substantially parallel to the axis of the valve and in a vertical plane substantially coincident with the vertical plane including the axis of the valve, means carried by the base for guiding said head, and means for retaining the head in any one of a plurality of vertical adjustments.

5. An apparatus for refacing puppet valves comprising a base, means carried by the base constituting a cradle for the stem of a valve to be refaced, a cutting tool disposed adjacent the head of a valve carried in said cradle, an adjustable head carrying a feed screw, said feed screw being located adjacent the head of the valve carried by the cradle and having its axis substantially parallel with the valve axis, means carried by the base for guiding said head, and a pointed valve head engaging member mounted upon the end of the feed screw and within certain limits having substantially universal movement with respect to the feed screw.

6. An apparatus for refacing puppet valves comprising a base, means carried by the base constituting a cradle for the stem of a valve to be refaced, a cutting tool disposed adjacent the head of a valve carried in said cradle, an adjustable head carrying a feed screw, said feed screw being located adjacent the head of the valve carried by the cradle and having its axis substantially parallel with the valve axis, means carried by the base for guiding said head, a ball formed upon that end of the feed screw nearest the valve head, and a hollow cone-shaped member fitted upon said ball for universal movement with respect to the feed screw.

7. An apparatus for refacing puppet valves comprising a base, means carried by

the base constituting a cradle for the stem of a valve to be refaced, a cutting tool disposed adjacent the head of a valve carried in said cradle, a feed screw located adjacent the head of the valve carried by said cradle, said feed screw having its axis substantially parallel with the valve axis, and a pointed valve head engaging member located upon the end of the feed screw and within certain limits having universal movement with respect to the feed screw.

8. An apparatus for refacing puppet valves comprising a base, means carried by the base constituting a cradle for the stem of a valve to tbe refaced, a cutting tool disposed adjacent the head of a valve carried in said cradle, a feed screw located adjacent the head of the valve carried by said cradle, said feed screw having its axis substantially parallel with the valve axis, a ball formed upon that end of the feed screw nearest the valve head, and a hollow cone-shaped valve head engaging member fitted upon said ball for universal movement within certain limits with respect to the feed screw.

In witness whereof, I hereunto subscribe my name this 2 day of September, 1920.

FRANS O. ALBERTSON.

Witnesses:
B. V. DUMAN,
H. A. JACOBSEN.