July 4, 1933. B. T. STEBER 1,916,775

VALVE GRINDING MACHINE

Filed Jan. 22, 1929 4 Sheets-Sheet 1

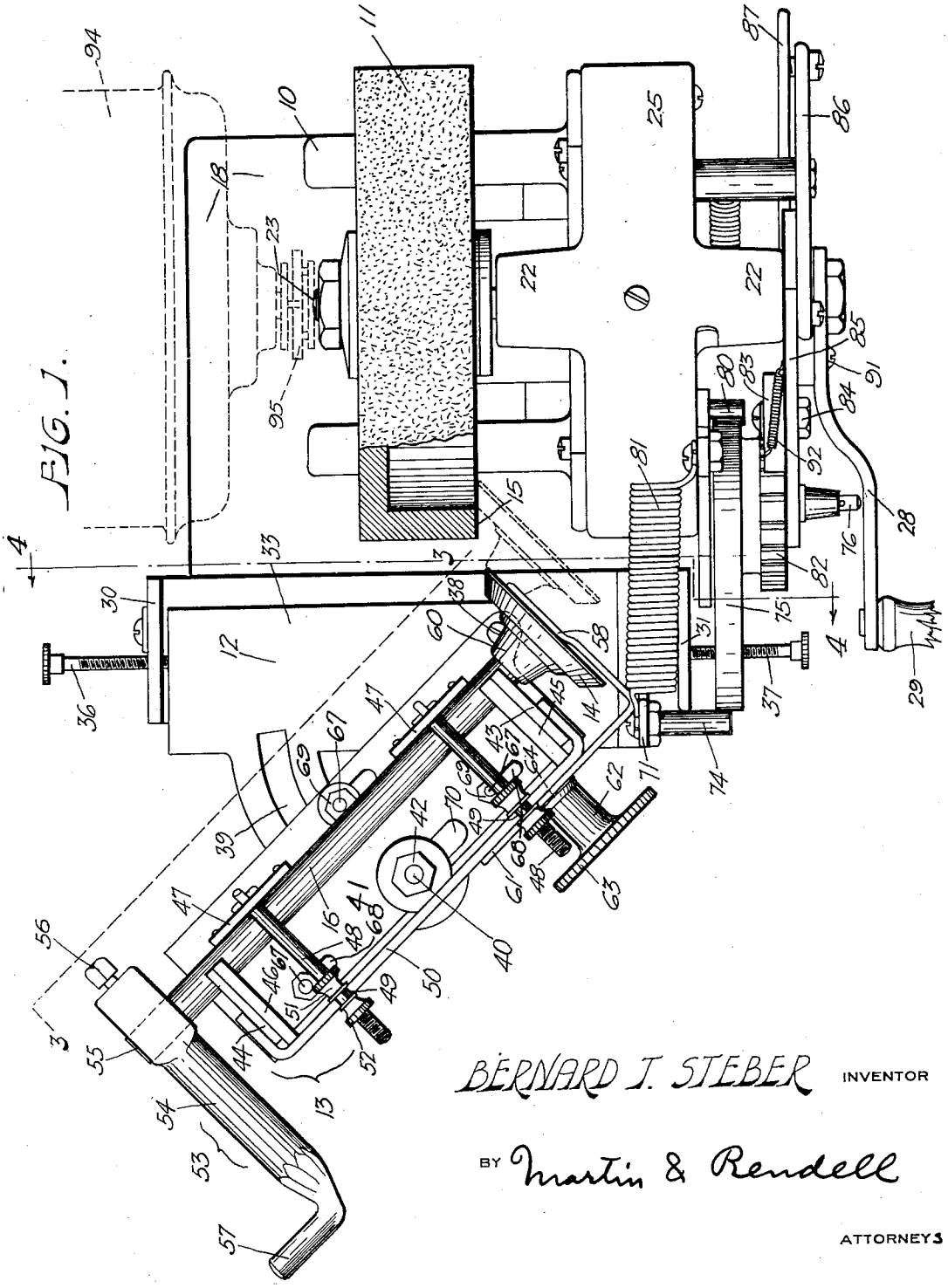


FIG. 1.

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VALVE GRINDING MACHINE

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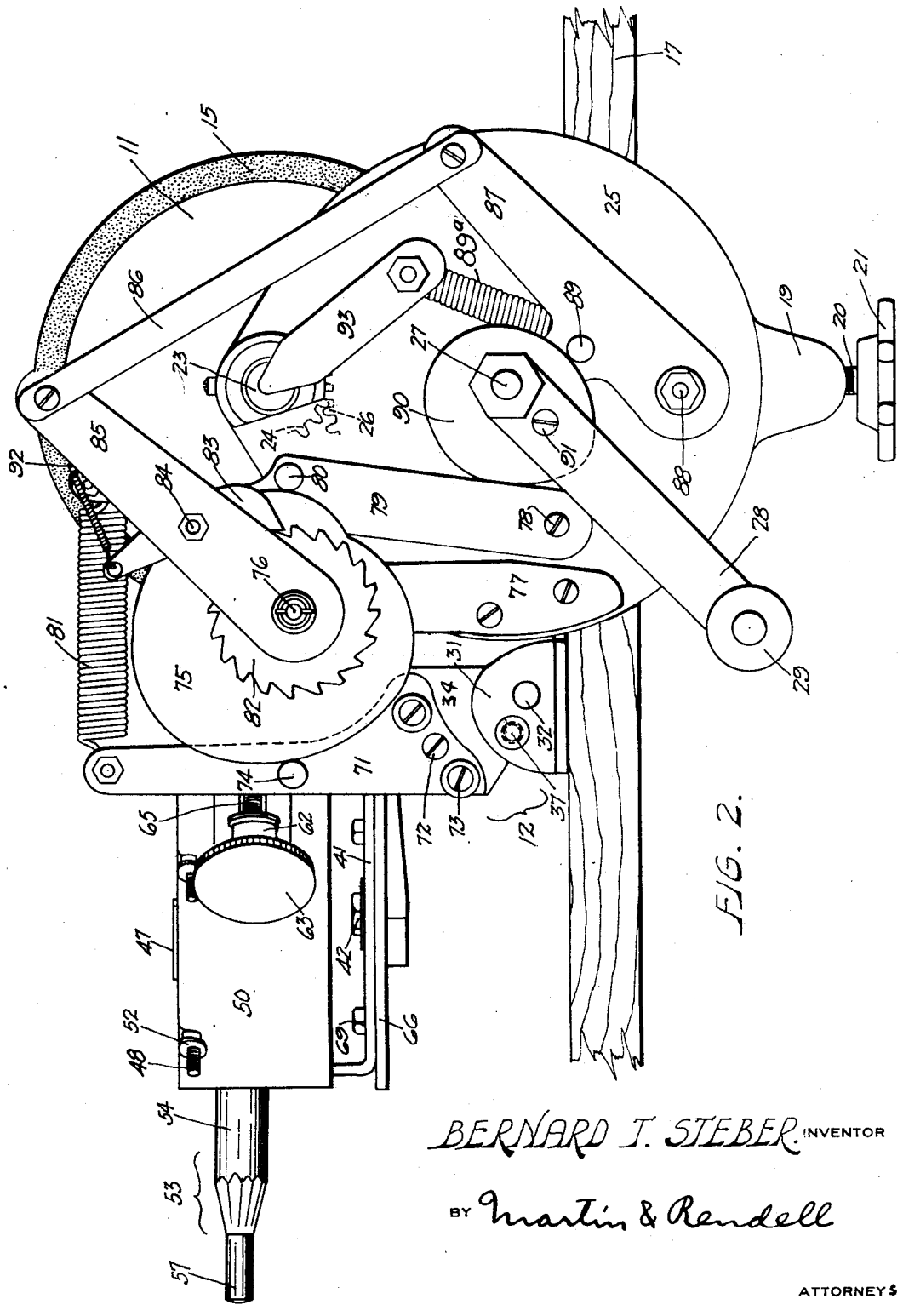


FIG. 2.

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VALVE GRINDING MACHINE

Filed Jan. 22, 1929 4 Sheets-Sheet 3

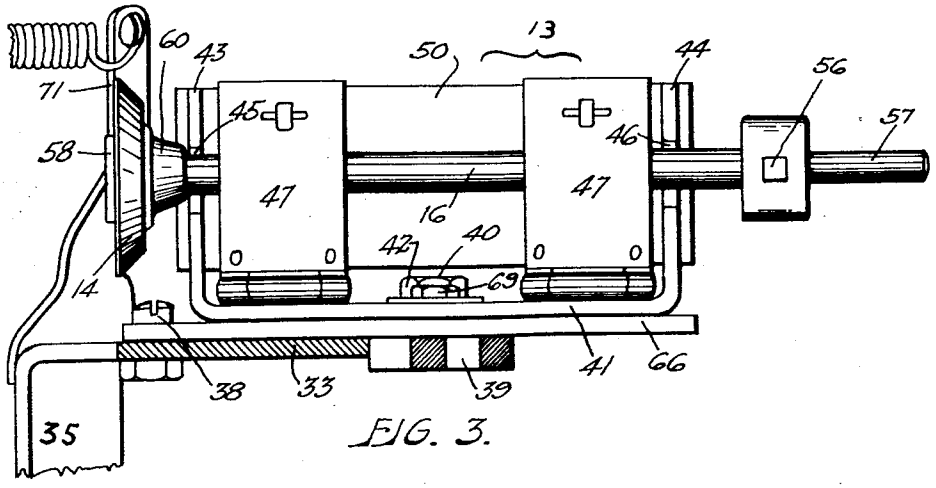


FIG. 3.

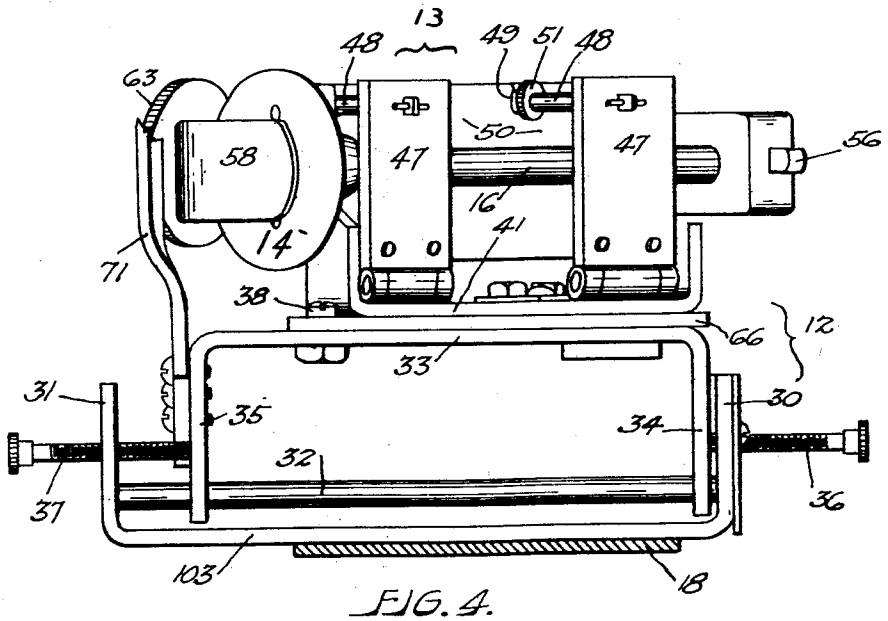


FIG. 4.

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July 4, 1933. B. T. STEBER 1,916,775

VALVE GRINDING MACHINE

Filed Jan. 22, 1929 4 Sheets-Sheet 4

FIG. 6.

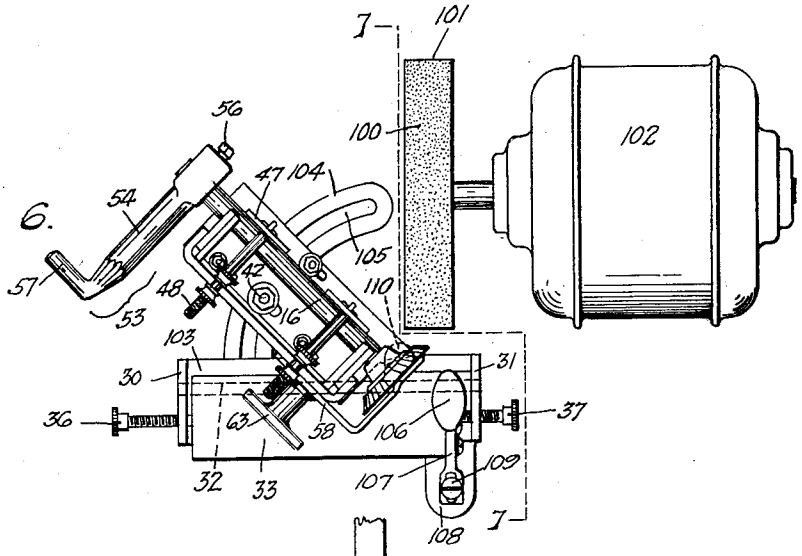


FIG. 7.

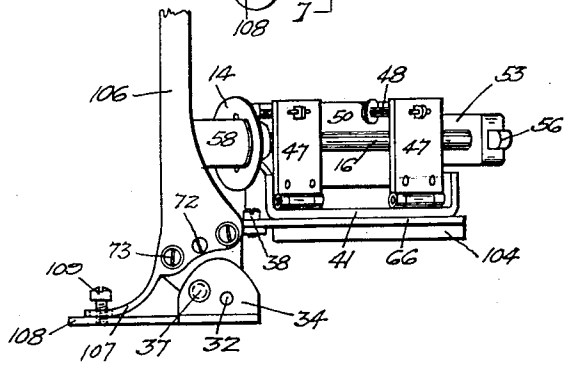
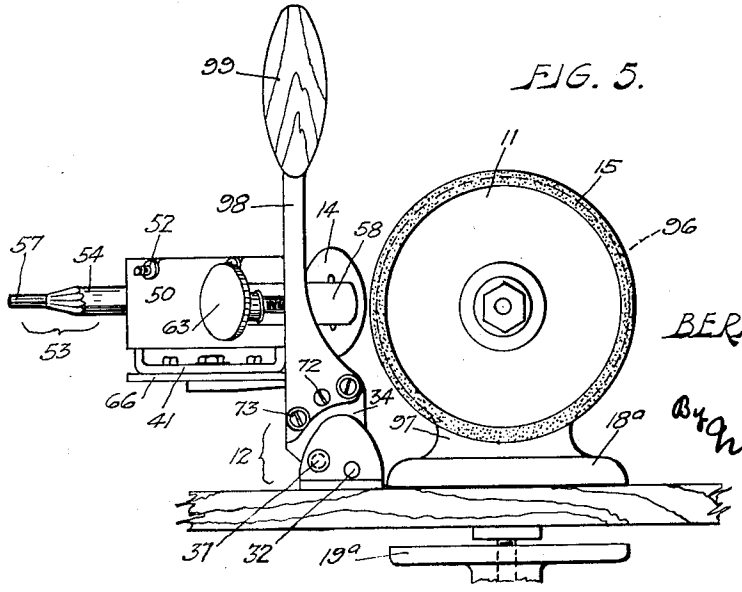


FIG. 5.



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Patented July 4, 1933 1,916,775

UNITED STATES PATENT OFFICE

BERNARD T. STEBER, OF UTICA, NEW YORK

VALVE GRINDING MACHINE

Application filed January 22, 1929. Serial No. 334,251.

This invention relates to machines for grinding valves.

The purpose of my present invention is to provide a new and improved form of machine for grinding valves and particularly to provide a machine which is especially adapted to readily and accurately grind valves especially valves such as are commonly known as poppet valves or puppet valves.

Further purposes of the invention are to provide a machine of the class described which is simple and economical in construction, easily operated, compact in size and moderate in weight, readily adapted to be operated by hand or by power with a minimum of power in either case and further a machine which is adapted to be easily set to grind valves of different sizes or valves where the face to be ground may be at an angle of ninety degrees to the axis of the valve or where said face is at a different angle such as the common bevel faced valve; and further to provide a machine having a new and improved form of advancing the valve towards and withdrawing it from the grinding face by means of a swinging cradle which allows the valve carried thereby to be swung forwardly past or over the grinding face and transversely of said grinding face and then back past the grinding face, that is transversely thereof again which swingng motion carrying the valve transversely of the grinding face causes an accurate and even grinding of the valve with a minimum of power consumption; a further purpose is to provide in a machine of the form disclosed simple means to rotate the valve while it is being ground and also to provide means to adjust the position of the valve relative to the plane of the grinding wheel face so that the machine may be adapted to use with a large variety of kinds and sizes of valves and also readily adjusted, successively if need be, to positions to grind as much or as little from the valve as required.

Further purposes are to provide in a machine of the sort described means for so swinging the cradle past the abrasive wheel which means may be operated by hand where separate power is used to drive the abrasive wheel or may be operated by the same means as actuates the abrasive wheel when that is hand operated so that in a hand operated machine the operator's two hands can effect the three movements necessary to properly operate the machine; I further provide in certain forms of the machine co-operative connection between the means for driving the abrasive wheel and the means for advancing and withdrawing the valve past the wheel so that these two movements may be effected from one hand-moved member or from one motor or driven member.

Fig. 1 is a plan view of a valve grinding machine embodying this invention with the parts shown in the position they occupy when the valve is out of engagement with the grinding wheel.

Fig. 2 is a front elevation of the machine that is looking directly at the end of the shaft 23 carrying the small cam wheel.

Fig. 3 is a vertical sectional view on line 3—3 of Fig. 1 looking in the direction indicated by the arrow.

Fig. 4 is a vertical sectional view on line 4—4 of Fig. 1.

Fig. 5 is a front elevation of a modified form of the invention.

Fig. 6 is a plan view of another form of the invention and Fig. 7 is a sectional view on line 7—7 of Fig. 6.

Referring to the drawings in a more particular description and first to the form shown in Figs. 1 to 4 it will be seen that the machine comprises a frame 10 and an abrasive wheel 11 revolubly mounted thereon, a cradle 12 swingingly mounted upon the frame so as to swing the valve holder generally denoted by the reference numeral 13 and the valve 14 carried thereby so that the face of the valve to be ground may be carried forward into engagement with and past the abrasive wheel and then back past said wheel and so out of engagement with the grinding face 15 of the abrasive wheel. Means hereinafter described in detail are provided to automatically or independently thus swing the valve holder and the valve carried thereby towards and away from the grinding wheel that is past and re-past the grinding wheel as the grinding

wheel is rotated. Independent means are provided for meanwhile rotating the valve 14 by rotating the valve spindle 16 by means of which the valve is rotatably held in the valve holder 13.

The frame 10 of the machine is adapted to be readily but removably secured to the edge of a bench or solid table 17 as by the bed plate portion 18 of the frame resting against the top of said bench and being held thereto by a depending bracket 19 and clamping screw 20 having hand wheel 21. In the upstanding portion of the frame are bearings 22—22 carrying the shaft 23 upon which to the rear of the frame and over the bed plate portion 18 is mounted the said grinding wheel 11. Upon the grinding wheel shaft 23 is provided a small gear 24 meshing within the casing 25 with the large gear wheel 26 mounted on shaft 27 carried in said casing and frame. When the machine is to be hand operated it will be provided as shown in full lines in Figs. 1 and 2 with an operating crank 28 secured to said shaft 27 and provided with handle 29 so that rotation of the large gear wheel 26 by hand will impart the necessary rapid motion to the small gear wheel 24 and therethrough to the abrasive wheel 11. As the machine is shown in the drawings and will be herein described the grinding wheel 11 is mounted upon a horizontal axis and the cradle 12 is likewise mounted upon a horizontal axis and this is the preferred and convenient arrangement and setting of the machine, but it will be understood that the machine may be bodily set up in other positions upon the bench or other fixed member. Upon the frame of the machine are provided two upstanding ears 30 and 31 spaced apart and having mounted therein the opposite ends of the shaft 32 upon which is rockingly or swingingly carried the cradle 12 as particularly shown in Figs. 1 and 4. The shaft 32 is parallel with the axis of the cup-shaped grinding wheel and spaced therefrom and spaced therebelow far enough so that the valve spindle 16 carried in the valve holder 13 will preferably be about on the same horizontal plane as the axis of the grinding wheel.

The cradle 12 comprises a platform 33 from which depend two spaced ears 34 and 35 which are mounted upon the shaft 32 as by said ears having holes to fit said shaft. The cradle 12 is adjustable longitudinally of the shaft 32 by means of oppositely disposed adjusting screws 36 and 37, said screw 36 being mounted in the ear 30 and extending inwardly into contact with the ear 34 on the cradle and said screw 37 projecting through upstanding ear 31 on the frame inwardly against the depending ear 35 on the cradle. By loosening one of these set screws and tightening up the other the cradle may obviously be adjusted to the desired extent relative to the shaft 32 which adjustment will as particularly seen in Fig. 1 effect an adjustment of the face of the valve 14 towards or from the vertical plane of the grinding face 15 of the grinding wheel so as to grind more or less deeply as desired.

The valve holder generally denoted by the numeral 13 is adjustably mounted upon the cradle 12 so as to swivel or pivot upon the pivot screw 38 connecting the valve holder and the cradle at the forward end of the valve holder and near the edge of the cradle towards the grinding wheel. The platform 33 of the cradle is provided with an integral or securely fixed extension on its side away from the grinding wheel and through the platform and particularly this extension thereof is provided with an arc-shaped slot 39 having its center at the axis of the screw 38. A screw 40 extends through the arc slot 39 in the platform 33 of the cradle and through a hole or slot 70 in the floor 41 of the valve holder and receives a nut 42 whereby the valve holder may be set at desired angle relative to the cradle. The range of such adjustment will preferably be from a position such as shown in Fig. 1 where the axis of the valve stem 16 is about at an angle of 45° with the vertical plane of the shaft 32 carrying the cradle to a position where the axis of the said spindle will be parallel to the said shaft. When the parts are set to the position as shown in Fig. 1 the machine is adapted to grind or re-surface valves having a bevel face such as shown on the valve 14 in Figs. 1 to 4.

When the valve holder is loosened from the position shown in Fig. 1 and swung substantially over the platform of the cradle so as to have the spindle 16 parallel with the cradle shaft the machine will be adapted to grind a valve having a face at right angles to the axis of the spindle of the valve. This description of the work which may be done with the machine at the different positions suggested is simply illustrative of the extreme adaptability of the machine for the general work of grinding or re-surfacing poppet valves and similar articles and is not intended to limit the scope of the invention as hereinafter claimed.

At the opposite ends of the cradle and upstanding from the floor 41 of the cradle are two ends 43 and 44 respectively provided with V-shaped bearings 45 and 46 respectively. Into these V-shaped bearings is placed the spindle 16 of the valve to be ground with said valve 14 beyond or forward of the front end 43 and front bearing 45. The spindle 16 is rotatably but readily removably mounted or held against said V-shaped bearings by two spaced swinging leaves 47 hingedly or pivotally mounted at their lower ends upon the valve holder floor 41 and bearing intermediate their length against the spindle and provided above the line of the spindle with

swingingly mounted rods 48 reaching over the spindle and having their forward ends screw-threaded and dropped into slots 49 provided in the front plate 50 extending vertically of the valve holder from its front and rear ends 43 and 44. On the outer or screw-threaded ends of each of said rods are mounted two spaced knurled-edged nuts 51 and 52 inside and outside respectively of the front plate 50. By loosening the outer nuts the rods may be lifted from the slots 49 and the hinged leaves 47 swung back away from the spindle allowing the spindel to be removed from the holder. Upon another valve spindle being placed in the V-shaped bearings of the holder the hinged leaves are again swung into engagement with the spindle and the outer set of nuts tightened against the front plate. Adjustment of the inner nuts on the rods 48 determines the extent to which the leaves may be drawn against the valve spindle so as to allow the spindle to be held loosely enough to be readily rotated but at the same time tight enough to allow of the work being done very accurately. It will be understood that the specific form of bearing for the spindle and the specific form of means for readily and removably mounting and holding the spindle of the valve in the valve holder are simply illustrative of means for so revolubly but removably mounting the valve spindle in the valve holder and are not limitations of my invention.

As very simple but effective means for rotating the valve in its holder I provide and attach to the rear or projecting end of the spindle 16 a removable dog 53 like a lathe dog having in one end of the shank 54 thereof an eye 55 large enough to receive any valve spindle. The dog is removably but securely held to the spindle by headed set screw 56. The outer end of the shank of the dog is bent at right angles away from the valve holder forming a handle 57 adapted to be grasped and turned by the left hand of the operator whereby all parts of the face of the valve are successively brought into engagement with the grinding face of the abrasive wheel. When a valve has been sufficiently re-surfaced the dog is removed from the spindle of that valve and placed upon the spindle of the next valve to be ground or placed with the machine ready for any subsequent operation.

The valve is held from longitudinal movement in the valve holder by the flat or top head of the valve being engaged by an arm 58 which is preferably set or so spaced as to hold the lower or opposite face 59 of the valve hub 60 against the outer or forward side of the outer end or block 43 near the V-shaped bearing 45. The arm 58 is a part of a strong L-shaped bracket the other part or base 61 of which is at right angles thereto and adjustably secured to the outer or forward side of the front plate 50 of the valve holder. The base 61 may be conveniently held in adjustable relation to the front plate 50 by means of a short post 62 enlarged at its forward end to form a hand wheel 63 preferably having a knurled edge. At its inner end the post 62 is reduced in diameter and such reduced diametered part 64 is screw-threaded to engage the screw-threaded hole in the front plate 50 of the valve holder through a longitudinally extending slot 65 provided in the base 61 of said bracket. The shoulder at the inner end of post 62 is thus brought into holding engagement with the base 61. This bracket may be adjusted so as to locate the holding arm 58 thereof at a proper distance from the opposing outer face of the end 43 of the valve holder to adapt the machine for use with various sizes or forms of valves.

Under some circumstances it is an advantage to have a supplemental or further means for adjusting the face of the valve to be ground relative to the plane of the grinding wheel in addition to the means already described for adjusting the cradle longitudinally of its shaft. Such additional or supplemental adjusting means I preferably provide in the form of a bed plate 66, normally fixedly secured to the bottom of the floor 41 of the valve holder 13. This bed plate accordingly forms the real bottom of the valve holder and rests directly upon the platform 33 of the cradle. This bed plate is the part of the valve holder which is directly swiveled or pivoted to the cradle by the swivel or pivot pin or screw 38 already described. This bed plate 66 is preferably of about the same width as the floor 41 of the holder but a little longer especially at the forward inner corner to provide for the said pivot screw 38. The floor 41 is adjustable longitudinally of the bed plate 66 and these parts are held in desired adjusted position longitudinally of each other as by means of short screw-threaded posts 67 upstanding from the bed plate through elongated slots 68 in the floor and engaged above the floor by nuts 69. To accommodate this longitudinal adjustment between the main part of the holder and its bed plate the hole in the floor 41 through which passes the screw 40 coming up through the arc-shaped slot 39 in the platform 33 of the cradle is made as a slot 70. When this adjustment of the upper part of the valve holder 13 relative to its bed plate 66 is to be made it will be understood that the nut 42 on said screw 40 has to be loosened. After such longitudinal adjustment is effected the nut and screw 40 are again tightened so as to hold the valve holder 13 bodily at its desired angle relative to the cradle 12.

In the machine shown in Figs. 1 to 4 means are provided for automatically swinging the cradle so as to move the valve face transverse-

ly of the grinding face of the wheel as the grinding wheel is rotated and this is done by means co-operatively connecting said cradle with the means for rotating said abrasive wheel. In the said machine as shown in full lines the grinding wheel is driven through two meshed gear wheels the larger one of which is rotated by hand by the operator grasping the handle 29 on the crank 28. The means for so automatically swinging the cradle and therewith the valve by means co-operatively connected to the means for driving the abrasive wheel, will now be described.

The cradle 12 has securely but adjustably secured to the outside of its forward ear 35 an upstanding arm 71. A convenient form of such adjustable connection is by means of a center screw 72 connecting said arm and ear and one or more side screws 73 passing through slots in the arm into screw-threaded holes in said ear. This arm 71 extends upwardly considerably past the top of the valve in the holder and intermediate its length the arm is provided with a forwardly projecting pin 74. This pin engages the left hand periphery of a double involute cam disk 75 mounted upon stub shaft 76 projecting forwardly from an upstanding branch 77 of the frame. This branch of the frame may be conveniently formed as a strong strap secured to the front of the casing 25 enclosing the large and small gears 26 and 24 already mentioned. To the left of the bottom of the said frame member 77 there is pivotally secured to the casing 25 as by pivot screw 78 a lever 79 having a forwardly projecting pin 80 which engages the right hand side of the periphery of the cam disk 75 about opposite the shaft 76. The said lever 79 is mounted in the same vertical plane as the frame branch member 77 so that the lever 79 passes upwardly just to the rear of the cam disk 75 as the parts are seen in Fig. 2. The lever 79 extends above the said pin 80 and preferably to a point above the cam disk 75 and at its upper end has attached thereto the right hand end of contractile spring 81 the other left hand end of which is attached to the upper end of arm 71 projecting up from the cradle.

It will now be seen that as the cam disk 75 is rotated the cam face thereof will press pin 80 to the right hand side as seen in Fig. 2 and thereby the lever 79 towards the right. This movement towards the right of lever 79 will be communicated through spring 81 to cause a substantially similar movement in arm 71 fixed upon the cradle 12 carrying the valve holder 13 and thereby swing the valve transversely across the grinding face 15 of the abrasive wheel 11 until the high spot of said cam wheel is opposite the cam pin 80 when the valve will preferably be just past the inner edge of the grinding face 15, that is towards the center of the grinding wheel as illustrated in dotted lines in Fig. 1. The higher face of said cam disk will gradually pass from opposite the pin 80 past the pin 74 on arm 71 thereby in an obvious manner moving the pin 71 to the left as the parts are seen in Fig. 2 and re-tracting the cradle and carrying the face 14 of the valve back past the grinding face of the grinding wheel until the parts again come to the position shown in full lines in Fig. 1. This re-tractive movement it will be noted is a positive one due to the positive connection of the periphery of the cam disk 75 with the cam pin 74 on the arm 71 rigidly attached to the cradle. On the other hand the forward or advancing movement of the cradle is preferably as shown in the construction illustrated a spring tensioned or yieldingly tensioned movement due to the cam disk 75 engaging the cam pin 80 on lever 79 which motion is transmitted through the spring 81 to cause a yielding drawing during the advancing movement of the cradle. This yielding advancing movement allows the cradle to hang back a little to take the grinding upon the valve in a slower advance in case a valve has been set or the machine adjusted so as to have the face 14 of the valve too far past the plane of the grinding face 15 of the grinding wheel. If the excess of cut is small the machine in one or two movements will equalize the grinding upon the valve. If the excess of cut is too great the operator can at once manually withdraw the cradle and valve holder bodily by grasping the valve holder and pulling it to the left against the tension of the spring 81. The operator can then operate the machine until the lever 79 is moved to the left whereupon the operator's hand can be released from the valve holder and with the parts of the machine in the position shown in Figs. 1 and 2 the valve or more particularly the valve holder or the cradle can be more accurately adjusted so as not to require too much to be ground off of the valve at its first engagement with the grinding wheel. In various other conditions also it is an advantage to be able to manually swing the carriage back so as to disengage the valve from the wheel without having to stop to move the parts of the machine to produce this movement.

As convenient but simple illustrative means for automatically causing the swinging of the cradle in the necessary slow movement by operative connection to the more rapidly rotated hand operated shaft 27, I provide the following mechanism: A ratchet wheel 82 is mounted upon shaft 76 just forward of the cam disk 75 and secured to said cam disk so that rotation of the ratchet wheel 82 will cause rotation of the disk 75. A step by step movement is given to the ratchet wheel 82 and thereby to the cam disk 75 in

a clockwise direction by means of a pawl 83 engaging at its lower end the pointed teeth of the ratchet wheel and pivoted intermediate its length on pin 84 secured to lever 85 which has its lower end loosely mounted upon the said shaft 76 forward of the ratchet wheel 82. A back and forth movement is given to the pawl 83 by the outer end of the said lever 85 being swung back and forth by a link 86 pivotally connected to the upper end of said arm 85. The other and lower end of said link 86 is in turn pivotally connected to the free end of the lever 87 which has its lower end pivotally mounted on a short stub shaft 88 projecting forwardly from the casing 25. The lever 87 is provided intermediate its length with a cam pin 89 which is engaged by the periphery of a cam wheel 90 mounted on shaft 27 and rotating therewith as by said cam wheel being fastened to the crank 28 carrying the handle 29 as by screw 91 passing through said crank into the said cam wheel. Cam pin 89 is yieldingly pressed against cam wheel 90 at all positions of the cam wheel by a coiled spring 89ª stretched between lever 89 and an adjacent projection provided on the casing 25. It will now be seen that each revolution of the shaft 27 will move the high spot of the cam wheel 90 past the cam pin 89 and thereby impart a swinging motion to the lever 87 which is communicated through link 86 back to lever 85 causing advancement of the ratchet wheel one or two notches according to the number of teeth upon the ratchet wheel and the extent of motion of the lever 85. As the machine is illustrated, each swinging motion of the arm 85 advances the ratchet wheel 82 one notch. With twenty teeth upon the ratchet wheel 82 it will be seen that twenty revolutions of the shaft 27 are required to move the cam disk 75 one complete revolution thereby causing one complete travel of the cradle namely an advance movement and a retracting movement. It will be obvious that the ratio of movement between the shaft 27 and the cradle may be varied but the ratio suggested is found to be practicable. A small spring 92 attached to the free upper end of the pivot pawl 83 has its upper end attached to the lever 85 so as to yieldingly hold the lower end of said pawl in engagement with the teeth of the ratchet wheel 82. The frictional grasping of the cam disk 75 between the two cam pins 74 and 80 due to the spring 81 is sufficient to hold the cam disk from moving backward when the pawl 83 is being swung backward by lever 85.

In order to aid in securing greater accuracy in grinding the valves I provide means for constantly keeping the abrasive wheel as far from the face of the valve to be ground as allowed by the bearings carrying the shaft 23 of said grinding wheel. As convenient means for doing this I provide the machine with a spring-tensioned arm 93 having its free end bear upon the forward end of the shaft 23 and its other end supported in suitable manner at the front of the casing 25. Preferably, this spring tensioned arm may be of the type of a flat leaf spring. Pressure of this spring is enough to prevent any longitudinal movement or longitudinal vibration of the grinding wheel. Further description of said spring-tensioned device is not necessary here as this part of the device forms the subject-matter of a separate pending application heretofore made by me.

In dotted lines on Fig. 1 there is shown a part of an electric motor 94 which by a flexible joint such as 95 may be connected to the shaft 23. In this modification of course the handle 29 and hand-operating crank may be removed as the power motor 94 will directly drive at the required high speed the abrasive wheel 11 and the power will be transferred in reverse direction through the small gear wheel 24 to the large gear wheel 26 to cause through cam wheel 90 the required slow movement of the cam disk 75 by the co-operative connections already described between said cam disk 75 and the cam wheel 90.

The modification of my invention shown in Fig. 5 consists in entirely eliminating any operative connection between the means for rotating the abrasive wheel and the valve carrier and cradle and in providing separate manually operated means for directly swinging the cradle. In this construction a cup-shaped abrasive wheel 11 having a vertically arranged grinding face 15 as already described is utilized and this abrasive wheel is rotated by power as by a motor 96. The abrasive wheel 15 is carried by suitable bearings provided on a frame 97 which is shown as adapted to be detachably secured to the edge of a bench or table as by having its bed plate 18ª held to the bench by a screw-threaded clamp extending through a depending bracket 19ª. The cradle 12 has its platform rockingly mounted relative to the bed plate 18 as by the depending ears of said platform 33 being mounted on shaft 32 secured above said bed plate. The cradle 12 and the valve holder is then constructed and used exactly as heretofore described with regard to the form shown in Figs. 1 to 4 except that in place of the short arm 71 a longer arm 98 is secured to the outside of the forward ear 34 of the cradle 12 and this arm projects considerably above the valve holder carried by the cradle and is at its upper end provided with a handle 99. By manually swinging this arm 98 by the operator's right hand upon the handle 99 the cradle and therewith the valve holder and the valve thereon may be swung upon the axis of the cradle shaft 32 so as to advance the face 14 of the valve to be ground towards and straight across the vertical grinding face 15 of the abrasive wheel and then back again by

a reverse or backward movement of the said hand-operated arm 98. It will be understood of course that during this direct swinging or reciprocation of the cradle by movement of the lever 98 the operator will be rotating the valve at the desired speed by turning the dog 53 attached to the spindle of the valve. The cradle and therewith the valve will be thus swung backward and forward as many times as needed to bring the valve to the proper condition. If after a series of such engagements of the valve with the abrasive wheel there are still dull or unground spots upon the face of the valve, the cradle will be moved longitudinally of its shaft 32 by advancing the set screw 36 as already described. The valve will be removed from the valve holder in the same manner as already described and the valve holder may be adjusted on the cradle to grind the valve at the desired angle.

In Figs. 6 and 7 is shown a still further modified form of my invention. A valve holder as already described and a cradle substantially as heretofore described are utilized but the parts are so arranged and combined that the swinging of the valve by swinging or rocking movement of the cradle and the valve holder instead of advancing the face of the valve to be ground transversely across the grinding face of the wheel, advances the said face of the valve to be ground towards the abrasive wheel by movement in the plane of the abrasive wheel.

Fig. 6 is a plan view of a machine embodying this invention and Fig. 7 is a vertical sectional view thereof on line 7—7 of Fig. 6. In this form of the invention an abrasive wheel 100 of the common thin disk type is used providing a grinding face at its external periphery 101 and this abrasive wheel is mounted in suitable bearings and driven by power as by a motor 102. The valve holder in this form is constructed preferably exactly as already described so as to removably carry therein a valve by means of its spindle with the valve rotated by a dog attached to the extended end of the spindle.

The cradle as a whole will be mounted so that its shaft 32 will be parallel to the axis of the abrasive wheel 100 and with the platform 33 of the cradle fixed in relation to the frame work carrying said abrasive wheel as by the platform 33 of the cradle being rigidly secured to the bed plate 18 of the frame carrying the abrasive wheel. The base 103 of the cradle is constructed as already described with reference to other forms of the device so as to provide upstanding ears 30 and 31 carrying the cradle shaft 32 upon which is rockingly supported the movable part of the cradle as by the ears 34 and 35 depending from the cradle platform 33 being mounted upon said cradle shaft 32. From the platform 33 there projects forwardly towards the axis of the abrasive wheel 100 and to the left of the abrasive wheel as the parts are seen in Fig. 6 an extension 104 having an arc-shaped slot 105. Upon the platform of the cradle is mounted a valve holder of the same form as already described in detail, with said valve holder having its bed plate 66 pivotally mounted upon the platform 33 of the cradle as upon pivot screw 110 located towards the right hand end of the cradle as the parts are seen in Fig. 6. With this swiveling connection between the valve holder and the cradle the valve holder may be moved from the position shown in Fig. 6 nearer to or farther from the plane of the abrasive wheel if the bevel face of the valve is to be ground to a different angle or the valve holder may be swung so that the valve spindle will be parallel with the plane of the abrasive wheel so that the device may be used to grind valves having a seat parallel with the plane of the disk of the valve. In this form of the invention the cradle and therewith the valve holder and valve thereon will be swung towards and upon the grinding face of the wheel by means of the hand lever 106 projecting upwardly from the right hand end of the cradle. Conveniently, this lever 106 will be secured to the right hand ear 35 of the cradle. Means will be provided to stop the swinging movement of the valve toward the abrasive wheel at the desired point and this stop mechanism will be adjustable so as to allow for limiting very accurately and by very small steps the extent to which the valve may be pushed towards the grinding face. Such adjustable stop mechanism may conveniently be formed by the hand lever 106 having a rigid ear 107 projecting over the rigid part 108 of the machine immediately below the bottom of said lever 106 with the ear 107 provided with a slot through which extends the shank of a cap screw 109, the lower end of which is in screw-threaded adjustable engagement with the member 108 while the head of the cap screw engages the upper part of the ear 107. By loosening the said cap screw the lever 106 may be moved farther towards the right as seen in Fig. 7 which will result in carrying the face of the valve to be ground farther towards the grinding face 101 of the abrasive wheel.

What I claim as new and desire to secure by Letters Patent is:

1. In a machine for grinding valves, a frame, an abrasive wheel rotatable on said frame, a drive shaft, means operated by said drive shaft for rotating said wheel, a cradle mounted to oscillate on said frame about an axis parallel to the axis of rotation of said wheel, a valve holder adjustable on said cradle, a stub shaft on said frame, a double involute cam mounted to rotate on said stub shaft, a post fixed to one end of said cradle and having a pin extending laterally therefrom in sliding contact with the edge of said

cam, a lever pivoted at one end to said frame and having a pin extending laterally therefrom in sliding contact with the edge of said cam, said post and lever being arranged so that the pins thereon contact with the edge of said cam at substantially diametrically opposite points, a spring connecting the free ends of said post and lever to hold said pins in yielding contact with the edge of said cam, a ratchet fixed to said cam, a first link having one end pivoted to said stub shaft, a pawl pivoted to said link and cooperating with said ratchet to rotate said cam, a second link pivoted at one end to said frame, a third link pivoted at its opposite ends to the free ends of said first and second links, a cam fixed to the drive shaft, a pin on the third link in constant yielding contact with the edge of the drive shaft cam, and means for rotating said drive shaft.

2. In a machine for grinding valves, a frame, an abrasive wheel rotatable on said frame, a drive shaft, means operated by said drive shaft for rotating said wheel, a cradle mounted to oscillate on said frame about an axis parallel to the axis of rotation of said wheel, a valve holder adjustable on said cradle, a stub shaft on said frame, a double involute cam mounted to rotate on said stub shaft, a post fixed to one end of said cradle and having a pin extending laterally therefrom in sliding contact with the edge of said cam, a lever pivoted at one end to said frame and having a pin extending laterally therefrom in sliding contact with the edge of said cam, said post and lever being arranged so that the pins thereon contact with the edge of said cam at substantially diametrically opposite points, a spring connecting the free ends of said post and lever to hold said pins in yielding contact with the edge of said cam, and mechanism connecting the drive shaft to said cam to rotate the cam at a rate of rotation lower than that of the drive shaft.

In witness whereof I have affixed my signature, this 12th day of January, 1929.

BERNARD T. STEBER.