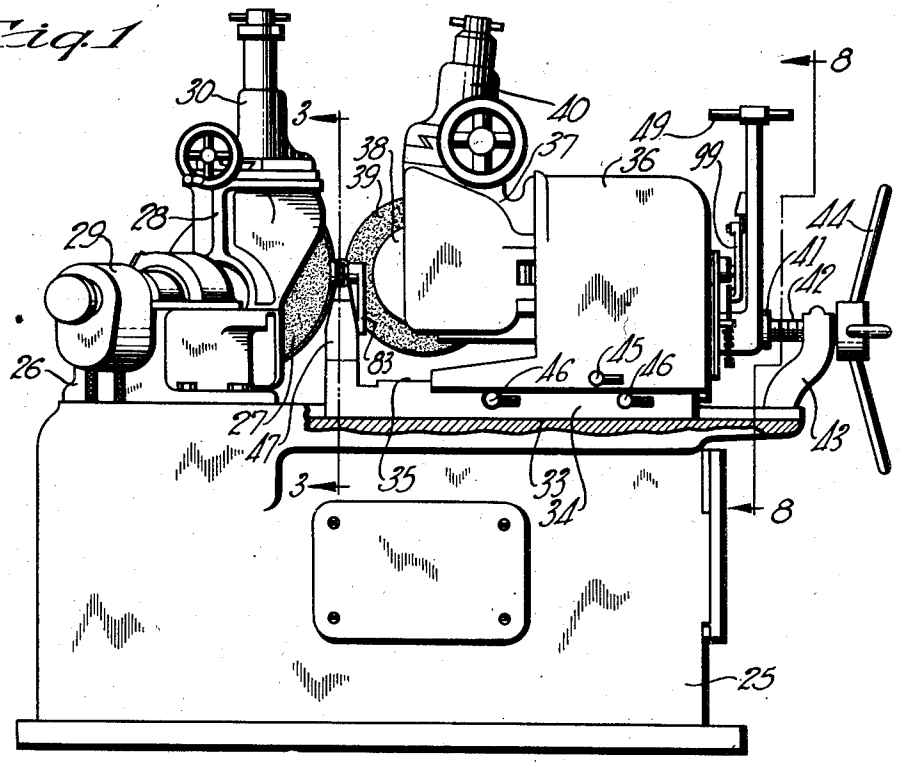
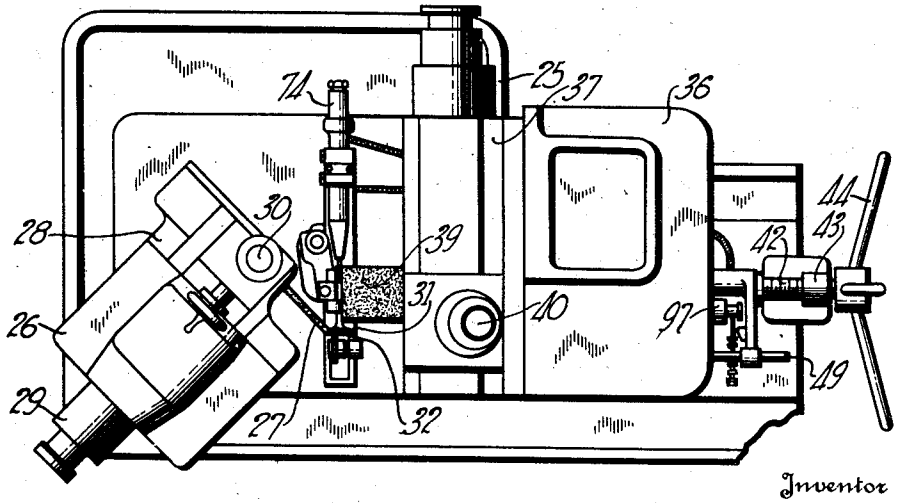
Dec. 12, 1933. F. S. HAAS ET AL 1,938,764

GRINDING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 1

Fig. 1





Inventor

FREDERICK S. HAAS

HANS FRITSCHI

Fig. 2

By Parsons

Attorney

Dec. 12, 1933. F. S. HAAS ET AL 1,938,764

GRINDING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 2

Fig. 3

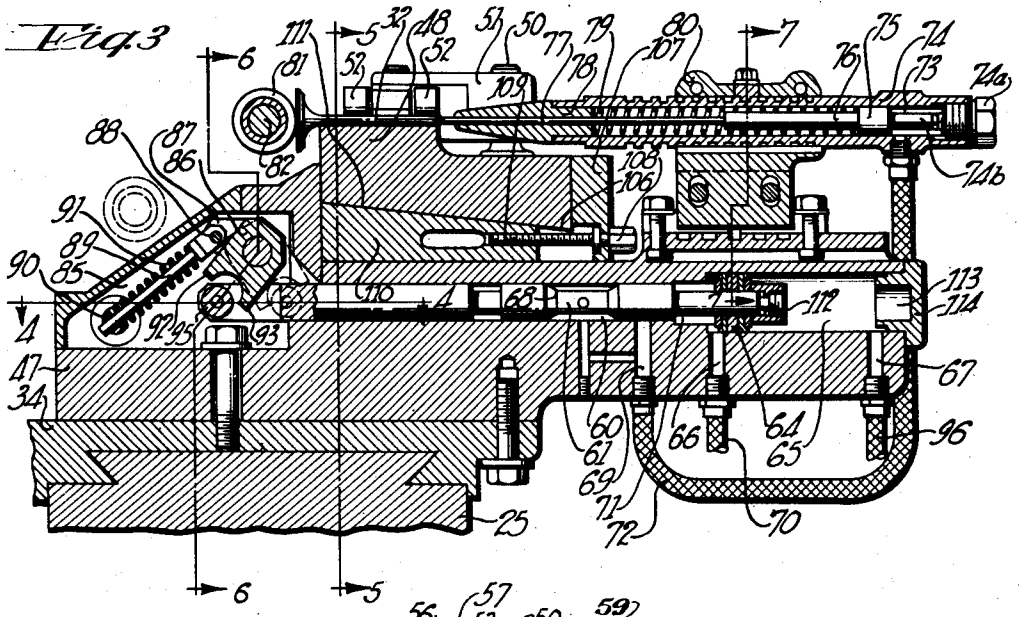


Fig. 4

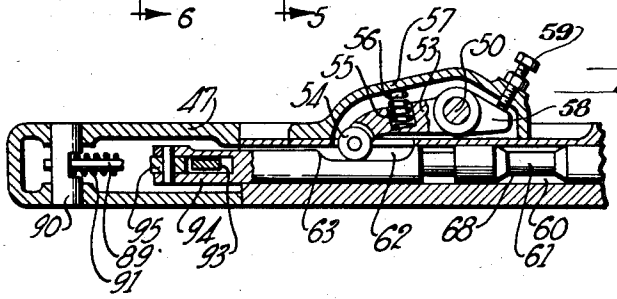


Fig. 5

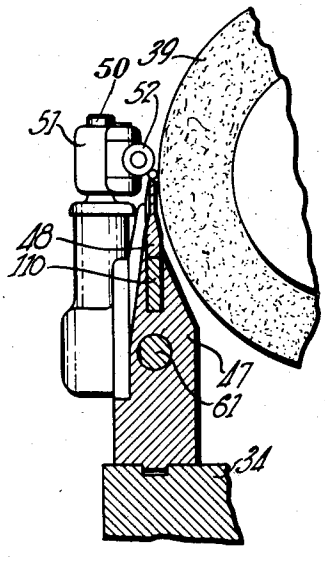


Fig. 7

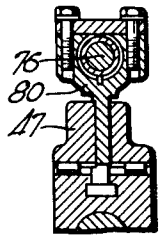
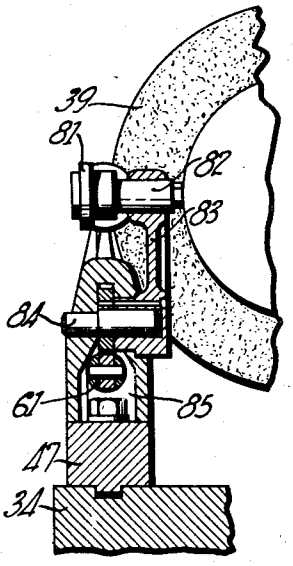


Fig. 6



Inventor

FREDERICK S. HAAS

HANS FRITSCHI

By H. K. Parsons

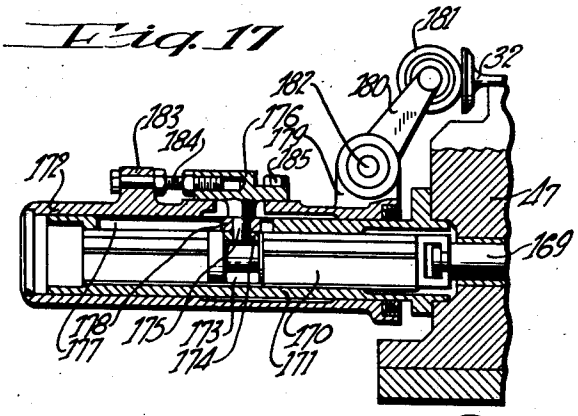
Attorney

Dec. 12, 1933. F. S. HAAS ET AL 1,938,764

GRINDING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 3

Fig. 17



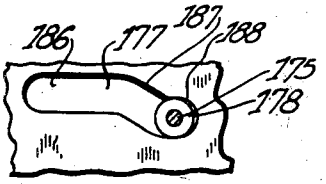
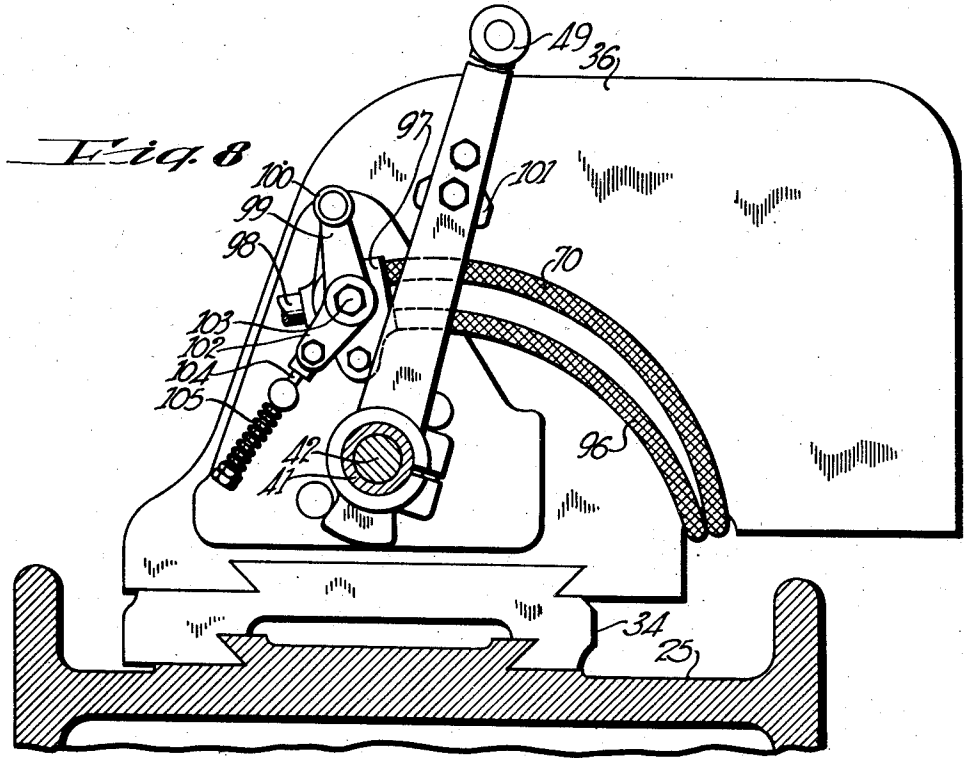


Fig. 18

Fig. 8



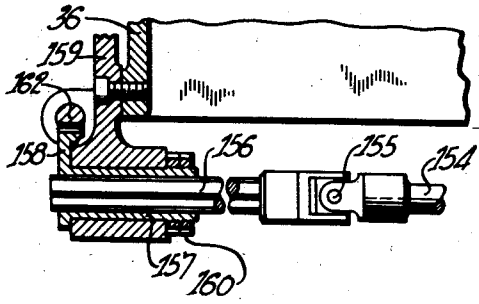


Fig. 16

Inventor

FREDERICK S. HAAS

HANS FRITSCHI

By H K Parsons

Attorney

Dec. 12, 1933. F. S. HAAS ET AL 1,938,764

GRINDING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 4

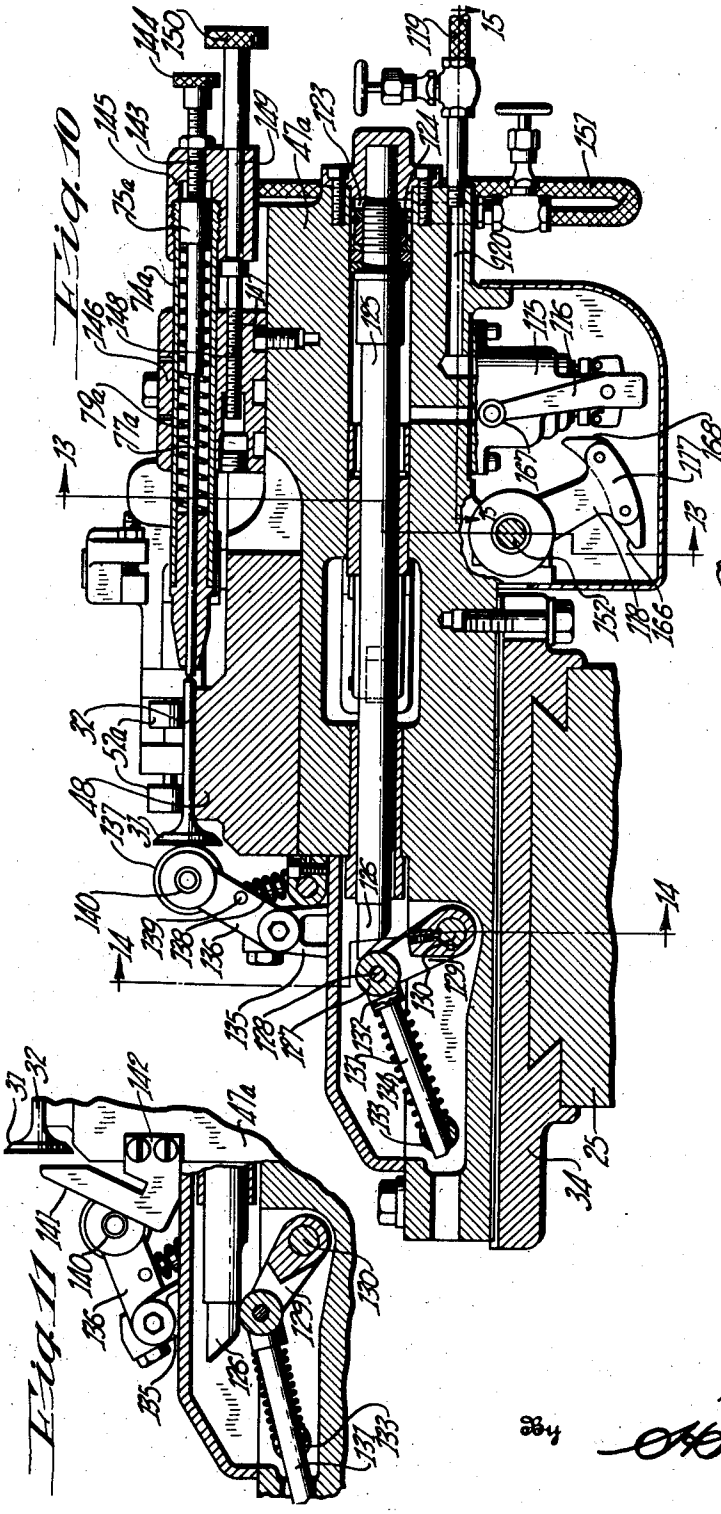


Fig. 10

Fig. 11

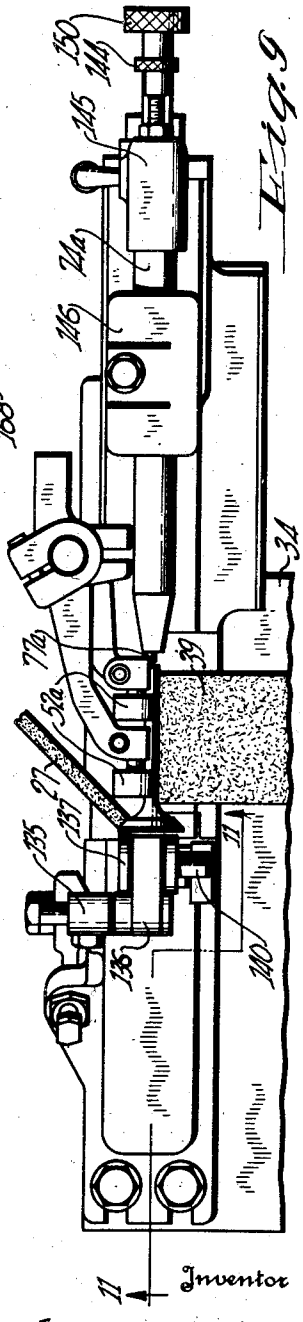


Fig. 9

Inventor

FREDERICK S. HAAS

HANS FRITSCHI

By H. K. Parsons

Attorney

Dec. 12, 1933. F. S. HAAS ET AL 1,938,764

GRINDING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 5

Fig. 15

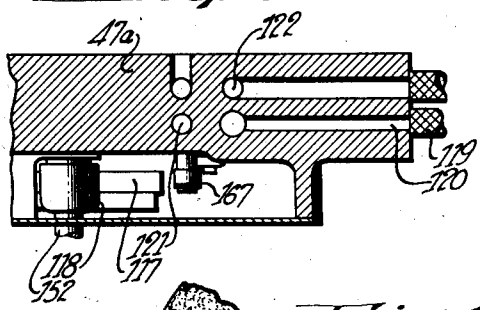


Fig. 13

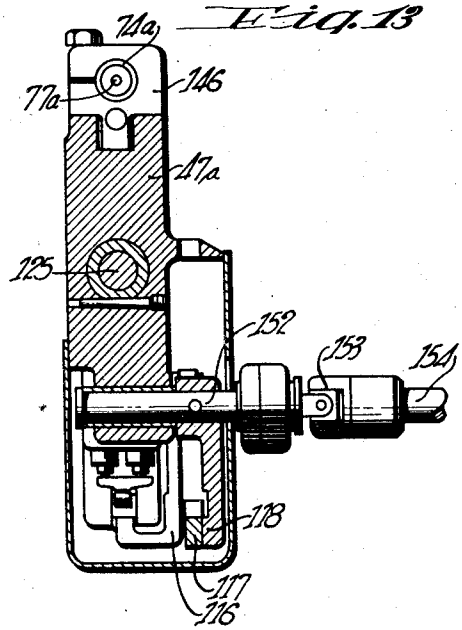
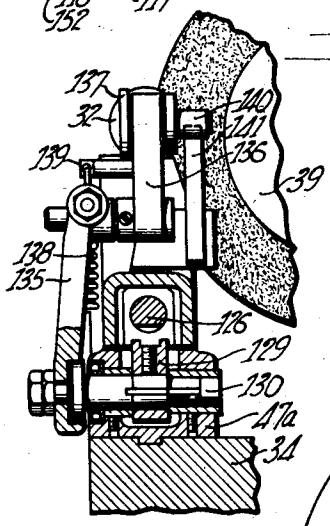


Fig. 14



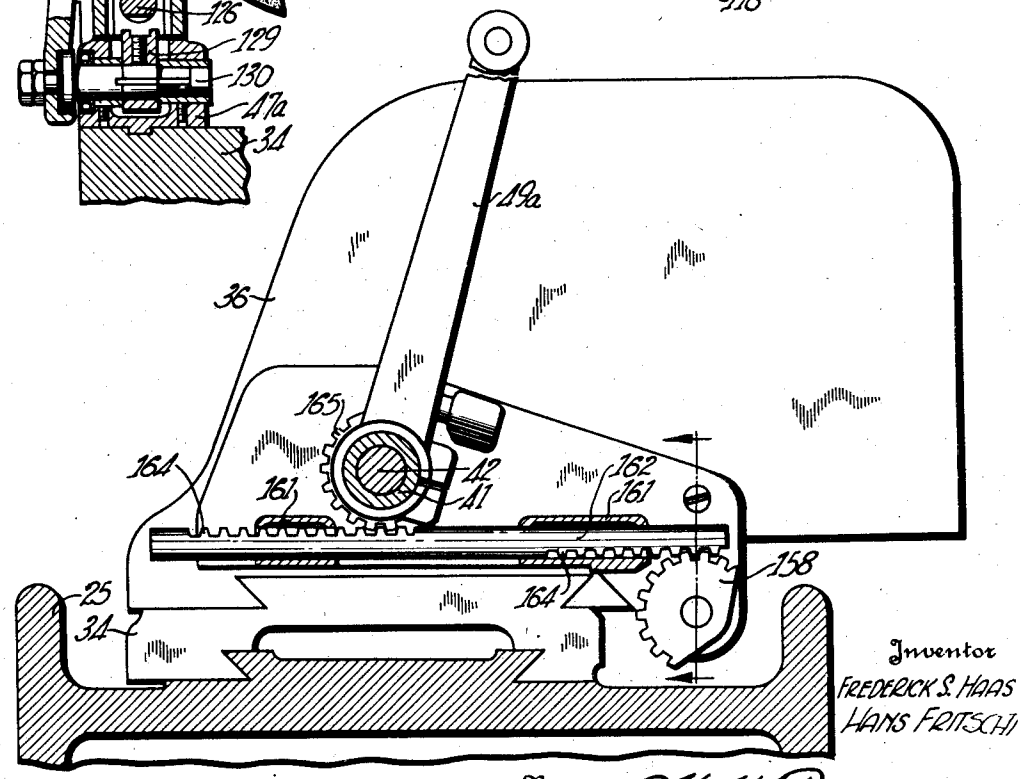


Fig. 12

Inventor
FREDERICK S. HAAS
HANS FRITSCHI

By O'K Parsons

Attorney

Patented Dec. 12, 1933 1,938,764

UNITED STATES PATENT OFFICE

1,938,764

GRINDING MACHINE

Frederick S. Haas and Hans Fritschi, Cincinnati, Ohio, assignors to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application April 2, 1931. Serial No. 527,250

27 Claims. (Cl. 51—103)

This invention relates to improvements in grinding machines and especially to improvements in centerless grinder structures.

An object of the present invention is the provision of improved means for centering, clamping, rotating, releasing and ejecting headed articles, such as mushroom type valves or the like, relative to the throat of a centerless grinding machine.

Another object of the invention is the provision of improved power controlled clamping, positioning and ejecting mechanism for automatically sequentially performing a series of movements of the work piece.

A further object of the invention is the provision of an improved hydraulically or pneumatically controlled mechanism for accomplishing the above objects which mechanism requires a minimum of time and effort on the part of the operator other than tripping an easily operable valve.

These and other objects are attained by the means described herein and disclosed in the accompanying drawings forming a part thereof, and it is to be understood that any modifications may be made in the exact structural details there shown and described, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

In the drawings:

Figure 1 is a front elevational view of a centerless grinder embodying the principles of this invention.

Figure 2 is a top plan view of the machine shown in Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 1.

Figure 4 is a sectional view taken on line 4—4 of Figure 3.

Figure 5 is a view partly in elevation and partly in section as seen from line 5—5 Figure 3.

Figure 6 is a sectional view taken on line 6—6 of Figure 3.

Figure 7 is a sectional view taken on line 7—7 of Figure 3.

Figure 8 is a view partly in elevation and partly in section as seen from line 8—8 of Figure 1.

Figure 9 is a top plan view of the throat of a centerless grinder showing a modified supporting and ejecting mechanism therein.

Figure 10 is a sectional view taken substantially along the longitudinal center of the mechanism shown in Figure 9, certain parts of the figure being illustrated in elevation.

Figure 11 is a sectional view on line 11—11 of Figure 9 showing certain parts of Figure 10 in a different operative position.

Figure 12 is a view similar to Figure 8 illustrating a modified operating mechanism for the fixture shown in Figures 9 and 10.

Figure 13 is a sectional view taken on line 13—13 of Figure 10.

Figure 14 is a view partly in section and partly in elevation as seen from line 14—14 of Figure 10.

Figure 15 is a sectional view on line 15—15 of Figure 10.

Figure 16 is a sectional view on line 16—16 of Figure 12.

Figure 17 is a modified structure for operating the end pressure roll, shown in the figure partly in section and partly in elevation.

Figure 18 is a developed view of the operating cam mechanism employed with the structure shown in Figure 17.

Throughout the several views of the drawings similar reference characters are employed to denote the same or similar parts.

The machine in general comprises a bed 25 having projecting therefrom at one end a pedestal 26 for the grinding wheel spindle, to which is rigidly secured the grinding wheel 27. The pedestal 26 has formed integral therewith or secured thereto a housing 28 forming a guard for the grinding wheel 27. A reciprocating mechanism 29 is carried by the pedestal 26 for effecting a slight axial movement of the grinding wheel 27 and its spindle. The housing or guard 28 supports a truing attachment 30 for trimming down or truing the active face of the grinding wheel 27. By reference to Figure 2 of the drawings, it will be noted that the pedestal 26 and parts supported thereby extend at an angle to the general longitudinal axis of the machine so that a plane faced grinding wheel may be employed for forming a tapered or angularly related part on the work. In other words, the pedestal 26 bears a relation of substantially 45 degrees to the axis of the bed and will satisfactorily form the seat 31 on the valve 32 at a working angle of 45 degrees.

The bed 25 is further provided on its upper surface with ways 33 for a slide 34, which, in turn, is provided with ways 35 for a second upper slide 36. A housing 37 is carried by the slide 36 and supports the regulating wheel spindle 38, to which the regulating wheel 39 is secured for movement therewith. The regulating wheel housing 37 is adapted to be adjusted in a vertical plane about a suitable horizontal axis to produce a feed thrust on the work 32 by the reg-

ulating wheel 39, and this housing 37 supports a truing mechanism 40 for effecting the proper operative face on the wheel 39.

The upper slide 36 has oscillatably journaled therein a nut 41 having threaded engagement with an adjusting screw 42 rotatably journaled in a bracket 43 carried by the bed 25. A hand or pilot wheel 44 is secured to the screw exteriorly of the bracket 43 for effecting rotation of the screw and an adjustment of the slide 36. In order to effect an adjustment of the lower slide 34 through the screw 42, there is provided a clamp 45 for securing the slides 34 and 36 to one another, while for adjusting the upper slide relative to the lower slide additional clamps 46 are provided whereby the said lower slide may be made fast to the bed 25. This adjustment of the slides by the hand or pilot wheel 44 is generally employed for the purpose of initial set up and to provide the desired grinding throat between the operative faces of the grinding and regulating wheels.

Subtending the grinding throat and supported on the inner end of the slide 34 is a work rest bracket or block 47 having adjustably secured therein a work rest blade 48, see Figure 3. The work piece 22 is peripherally supported by the work rest blade 48 in engagement with the regulating wheel 39 which effects and controls the rotation thereof. In order to effect a stock removal from the work piece the parts carried by the upper and lower slides 34 and 36 are actuated toward the grinding wheel, for which purpose an in-feed lever 49 is provided, being secured to for oscillating out the nut 41.

As was noted above, the device is intended primarily for the formation of an extended or overhanging portion of a work piece, such as a mushroom type valve. For the purpose of holding the stem of the valve in engagement with the work rest blade 48 and regulating wheel 39 there is oscillatably journaled in the bracket or block 47 a shaft 50 having secured to its upper end an arm 51 rotatably supporting rollers 52 which engage the said stem of the valve. Secured to the shaft 50 at its other end is a second arm 53 having secured at one end thereof a roller 54 and having formed intermediate its ends a pocket 55 for a spring 56 which abuts on one end with the arm 53 and on the other end with the wall 57 of the bracket 47. A tail 58 extends from the other end of the arm 53 for engagement with adjustable stop 59 to limit the movement of the arm 53 under the influence of the spring 56 only if the stem of the valve is below normal size. From this it will be seen that the rollers 52 yieldably force the stem of the valve 32 into engagement with the work rest blade and regulating wheel.

In order to free the work of the rollers 52 there is slidably mounted in a bore 60 in the bracket 47 a valve rod 61 being formed adjacent the roller 54 with a relieved cam portion 62 thereby providing a cam 63 for engagement with the roller 54 when the valve rod 61 is moved to the right, as seen in Figures 3 and 4, thereby to oscillate the arm 53 and disengage rollers 52 from the work. In order to actuate the said valve rod it is provided on its rear end with a piston 64 slidable in cylinder 65 which has ports 66 and 67 at opposite ends thereof. The valve rod 61 is further provided intermediate the cam portion 62 and piston 64 with a cannelure 68 constituting a valve for connecting port 66 with a port 69. With the parts as shown in Figure 3, hydraulic pressure, preferably air, is introduced into the cylinder 65 ahead of the piston 64, by way of port 66 and conduit 70 connected therewith, for retracting the piston 64. This movement continues until the cannelure uncovers the enlarged portion 71 at the end of the cylinder 65 whereby hydraulic pressure passes into the port 69 to and through a conduit 72. At this time the rollers 52 are free of the valve 32.

The conduit 72 terminates in a piston chamber 73 formed in cylindrical housing or cylinder 74 which encloses a piston 75 having extending therefrom a rod 76 and a plunger 77. The housing 74 has secured in its one end a guide sleeve 78 for guiding the plunger 77 and the inner shoulder of the sleeve 78 forms one abutment for a spring 79 abutting on its other end with the piston 75. A suitable bracket 80 secures the housing 74 in adjusted position to the main bracket or housing 47. By reference to Figure 3 it will be noted that the plunger 77 forms an abutment for the work 32 and limits its axial movement relative to the work rest blade 48 and subsequently is employed for ejecting the work from the throat after the rollers 52 have been freed therefrom. A plug 74*a* forms a closure for the cylinder 74 against which the piston extension 74*b* contacts to limit the rearward movement of the piston 75 under the influence of spring 79. By this construction a positive stop is provided for the work and insures the proper distance between the seat portion 31 of the valve and the end of its stem.

In order to hold the work against the plunger 77 there is provided an end roller 81 rotatably journaled on a stud or shaft 82 carried by one end of an oscillating arm 83 secured to for movement with a second stud 84. This stud 84 is journaled in the walls of the housing or bracket 47 and extends through a chamber 85 formed in the said housing or bracket 47. An actuator 86 is secured to the stud 84 interiorly of the chamber 85 and the said actuator has a lug 87 formed thereon to which is pivoted, as at 88, one end of a pin 89. The other end of the pin 89 is slidably mounted in a swiveled guide member 90 and a spring 91 surrounding the pin 89 abutting on one end with the guide member 90 and on the other end with the head of the pin and the said spring tends to oscillate the actuator and stud 84 in a clockwise direction, as seen in Figure 3, for holding the end pressure roller 81 against the work 32 for yieldably holding said work against the abutment plunger 77. The end of the actuator 86 is formed to provide arms 92 and 93, one of which is received in the bifurcated end 94 of the valve rod 61. A pin 95 connects the fingers of the bifurcated end 94 and engages the arm 93 of the actuator for oscillating the said actuator and stud 84 in a counter clockwise direction upon movement of the valve rod 61 to the right, as seen in Figure 3, for removing the end roller 81 from the path of movement of the work or valve 32.

The cycle of operation of the parts thus far described is: hydraulic or pneumatic pressure entering through conduit 70 actuates the piston 64 to the right, as seen in Figure 3, for first removing the end roller 81 from the path of movement of the work 32, next freeing the rollers 52 from the work and finally forcibly actuating the piston 75 and ejector plunger 77 to the left for ejecting the work piece from the grinding throat. The spent hydraulic medium behind the piston 64

is discharged through port 67 and a conduit 96 connected therewith.

The conduits 70 and 96 are connected to a suitable valve 97 mounted on the rear wall of the housing or upper slide 36 and the said valve is additionally provided with an in-take conduit 98 extending to a suitable or desirable hydraulic source. An arm 99 is pivotally carried by the valve for actuating same and the said arm is provided with a roller 100 adapted to be engaged by the operating dog or pawl 101 carried by the in-feed handle 49. A tang 102 extends from the valve stem 103 and carries a spring pin 104 for spring 105 which is compressed as the valve is opened through the movement of the arm 99 whereby the valve is immediately closed upon release of the roller 100 by the dog or pawl 101. The cycle of movement above described relative to the release and ejection of the work, occurs at the end of the grinding operation and as the grinding throat is being enlarged to its widest dimension. In other words, the handle 49 is actuated from the position shown in Figure 8 through substantially ninety degrees in a counter clockwise direction to effect the feed of the work and grinding wheel and is then returned to widen the throat and permit a replacement of the work therein. Therefore, near the return movement of the handle 49 and when the work is fully disassociated from the grinding wheel the roller 100 is engaged by the pawl or dog 101 for actuating the arm 99 and connecting the in-take pressure of conduit 98 with the conduit 70. Since the valve 97 is immediately closed and the pressure removed from behind the piston 75, the spring 79 in the tubular housing 74 will immediately return the said piston 75 to its normal position after the expulsion of the finished work 32 but the piston 64 will remain in its rearmost position. After the new work piece has been placed on the work rest blade 48 and before contact of work and grinding wheel the handle 49 is again actuated in a counter clockwise direction which will again open the valve 97 by actuating the arm 99 in the other direction and connect the pressure source of conduit 98 with the conduit 96 for shifting the piston 64 to the left, as seen in Figure 3, for forcing the new work or valve inwardly against the plunger 77 and engage the valve stem by the rollers 52.

In order to vertically adjust the work rest blade 48 to take care of different sizes of work pieces the bracket or block 47 is provided with a way 106 terminating in a wall 107 of the bracket 47. Rotatably journaled in said wall 107 is an adjusting screw 108 having its threaded end 109 received by a wedge shaped block 110 contacting with an oppositely inclined under surface 111 of the work rest blade 48. From this it will be seen that rotation of the screw 108 to shift the wedge to the right, as seen in Figure 3, raises the work rest blade 48 through the interengagement of the face 111 of the blade and the inclined face of the wedge block, while rotation of the screw 108 in the opposite direction will cause a separation of said inclined faces so that the blade 48 may be forced down into the way 106.

To avoid undue forceful bumping of the piston 64 with the ends of the cylinder 65 the said cylinder is provided at its inner end with the reduced portion 71 acting as a trap for the hydraulic medium ahead of the said piston when it is actuated to the left, as seen in Figure 3, to cushion the stopping of the piston movement in this direction. The piston itself is provided with a reduced extension 112 for entering a socket portion 113 formed in the end cap 114 which closes the right hand end of the cylinder 65. The said piston extension 112 and socket 113 cooperate with one another in forming a dash pot structure for cushioning the shock at the end of the piston stroke to the right.

The modified structure shown in Figures 9 to 16 inclusive, will now be described. This structure comprises a bracket or work rest member 47*a* for supporting the work rest blade 48. This structure does not contain a sliding valve as a part of its mechanism but includes a separate hydraulic or pneumatic valve for connecting the pressure line with various ports. Accordingly, the bracket or housing member has bolted thereto a valve 115 including a pivotally mounted handle 116 to be operated by the double cam shaped finger 117 carried by arm 118 by means to be described later. Hydraulic pressure, preferably air, is introduced to the valve 115 from a suitable source through the conduit 119 and port 120 passing from the valve 115 through suitable ports 121 and 122 to opposite ends of a cylinder 123 formed in the housing 47*a*. The cylinder 123 contains double ended piston 124 which has extending from it a rod 125 terminating in a tapered nose 126. The tapered end 126 engages a roller 127 rotatably mounted on pin 128 joining the fingers of fork 129 secured to for movement with shaft 130. A pin 131 having a clevis 132 at its one end is pivotally mounted by means of the clevis to the pin 128 and the other end of the pin 131 extends through guide 133. A spring 134 surrounds the pin 131 and abuts on opposite ends with the guide 133 and clevis 132. Exteriorly of the housing 47*a* the shaft 130 has secured to it for movement therewith an arm 135 having pivotally secured to its upper end a second arm 136 which rotatably supports end pressure roller 137. A spring 138 has one end secured to pin 139 carried by the arm 136 and its other end secured to the housing 47*a*. The shaft of end pressure roller 137 has journaled on it a cam roller 140 for engaging the cam face 141 of cam 142 secured to the housing 47*a* by any suitable or desirable means. The cam 142 determines the contact of the end pressure roller 137 with the end of the work piece and causes the said roller to approach and engage the said end of the work by a wiping action rather than a direct slap as would be the case should the said arm merely oscillate about a point remote from the engagement of the roller with the work.

The side pressure rolls 52*a*, for holding the work against the work rest blade and regulating wheel, in this modification are similar to those above described being operated toward and from the work by the cut away cam portions 62 and 63 formed on rod 125 similar to that shown on the valve rod 61.

The end stop and plunger ejecting mechanism is slightly different in that an adjustable stop in the nature of an adjusting screw 143 having a knurled operating head 144 is provided, it being threadedly received in a bracket 145 in which the end of the tubular housing 74 is secured. The end stop plunger 77*a* terminates in a piston 75*a* and has the spring 79*a* surrounding same. The bracket 146 which secures the housing 74 to the bracket or block 47*a* is provided with a threaded perforation 147 receiving the threaded end 148 of an adjusting screw 149 journaled in a depending portion of the bracket 145. A knurled knob 150 is secured to the end of the adjusting screw 149. A conduit 151 connects the end of the

cylinder containing the piston 75*a* with the right hand end of the cylinder 123 so that as soon as pressure is introduced to the end of the cylinder 123 it is simultaneously introduced in the cylinder of piston 75*a*. However, the piston 75*a* is not actuated until after the piston rod 125 has been actuated because the side pressure rollers 52*a* hold the work against movement until they are released from the work by the said piston rod 125.

The arm 118 for actuating the valve 115 is secured to a short shaft 152, see Figure 13, connected by a universal joint 153 to one end of a rod 154. The rod 154 extends from the grinding throat along the rear wall of the machine to the end thereof at the right, as seen in Figures 1 and 2, where it is connected by a second universal joint 155 to a splined shaft 156, see Figure 16. The splined shaft 156 is mounted in a sleeve member 157 for rotative movement with the sleeve member but the said sleeve member has axial movement relative to the splined shaft 156. The sleeve member 157 has secured to it or formed integral therewith a segmental gear 158 and is journaled in a bracket 159 secured to the upper slide 36. Lock nuts 160 are secured to the sleeve on the other end thereof to prevent inadvertent displacement of the sleeve and bracket 159. Bearing bosses 161 are carried by the bracket 159 through which is axially slidable a rack shaft 162 having rack teeth 163 thereon for engagement with the segmental gear 158, as well as rack teeth 164 for engagement with the teeth of a segmental gear 165 associated with the operating handle 49*a*. The handle 49*a* is in all other respects similar to the handle 49 and effects a shifting of the upper and lower slides in a similar manner.

With the parts shown in Figures 9 and 10 the handle 49*a* of Figure 12 is in a horizontal position with the arm 118 in a position to dispose the cam plate 117 below the valve handle 116 so that at the completion of the grinding operation the handle 49*a* is raised upwardly for raising the arm 118 from the position shown in Figure 10. This movement of the arm 118 in a counter clockwise direction causes cam face 168 to engage the roller 167 on the arm 116 for connecting the hydraulic pressure of line 119 through the valve 115 with the right hand ends of cylinders containing the pistons 124 and 75*a*. The piston 124 immediately moves toward the left, as seen in Figure 10, but the piston 75*a* remains stationary. The piston 124 carries with it the rod 125 and continues to move until the nose 126 has, through the roller 127, actuated the parts 129, 131, 135, 136 and 137 to the position shown in Figure 11. At this time the end pressure roll 137 is out of the path of movement of the work 32. Continued movement of the rod 125 then moves the side or lateral pressure rolls 52*a* from the work whereupon the pressure behind the piston 75*a* actuates same to the left and ejects a work piece from the grinding throat. At this time the cam face 166 has passed from the roller 167 whereupon the pressure is cut-off from the left hand ends of the cylinders so that the spring 79*a* may expand and return piston 75 to the normal end of its stroke against the adjustable abutment 143. The grinding throat is now enlarged to the limit of its movement with the handle 49*a* in the position shown in Figure 12 and a new unfinished work piece is mounted in the grinding throat. The handle 49*a* is now actuated in a counter clockwise direction to feed the new unfinished work relative to the grinding wheel whereupon the cam face 166 on the cam plate 117 engages the roller 167 of the arm 116 for oscillating said arm in the opposite direction and connecting the pressure in conduit 119 with the forward face of piston 124 to retract the rod 120 and permit the expansion of spring 134 whereupon the roller is yieldably shifted up the cam face 141 to engagement with the end of the work.

The modification shown in Figures 17 and 18 is similar in all respects except for the action of the end pressure roller. In this connection either the valve piston rod 61 or the piston rod 125, indicated in Figure 17 by the numeral 169, may be secured to the sliding bar 170. This bar is slidably mounted in a sleeve 171 secured in any desirable manner to the end of the housing or bracket 47 or 47*a* and forms a bearing for a second sleeve 172. The sliding bar 170 has formed therein a circular groove 173 receiving a roller 174 carried by a stud 175 depending from an adjustable bracket 176 adjustably secured to the sleeve 172. The intermediate or bearing sleeve 171 is provided with a cam slot 177, see Figure 18, in which is mounted a roller 178 also journaled on the stud 175. The outer sleeve 172 is provided at its forward end with an ear 179 to which is secured an arm 180 carrying the end pressure roll 181. This arm 180 is adapted to be secured in any desirable angular position about the axis of stud 182, which connects the ear 179 and arm 180, so as to dispose the roller 181 in the proper position for engaging the end of the work. An upstanding lug 183 is further provided on sleeve 172 in which is journaled the adjusting screw 184, the threaded end of which screw is received in the bracket 176 whereby said bracket may be adjusted relative to the sleeve 172. Clamp bolts or screws 185 are provided to lock the bracket 176 in adjusted positions.

The operation of the modified structure shown in Figures 17 and 18 is as follows: the rod 169 is moved to the left carrying with it the slide bar 170 which, through the connection of the groove 173, roller 174 and bracket 176, moves the outer sleeve 172. The movement of the outer sleeve 172 carries with it the intermediate roller 178 moving in the cam slot 177. This cam slot 177, as seen in Figure 18, is formed first with a straight guide portion 186, an angularly disposed portion 187 and a second straight guide portion 188. Therefore, as the sleeve 172 and parts carried thereby are moved, they travel first, rearwardly, then laterally and rearwardly, and finally again rearwardly to dispose the end pressure roll away from the end of the work and to one side of its path of travel so that the work may be readily ejected from the grinding throat.

What is claimed is:

1. In a centerless grinder for grinding headed articles the combination of a grinding wheel for operation on the head of the article, a regulating wheel for frictional engagement with the article to effect and control its rotation, power controlled means for holding the article in frictional contact with the regulating wheel, power controlled means for positioning the article relative to the regulating wheel, and means for ejecting the article from operative association with the regulating wheel.

2. In a centerless grinder for grinding headed articles the combination of a grinding wheel for operation on the head of the article, a work rest

blade for peripherally supporting the article with the head thereof operatively associated with the grinding wheel, a regulating wheel adjacent the blade for frictional engagement with the article to effect and control its rotation, and power controlled means for holding the article against the blade and regulating wheel to determine the axis of rotation for determining the axial position of the article relative to the blade and regulating wheel, and for ejecting the article from the blade.

3. In a centerless grinder for grinding headed articles the combination of a grinding wheel for operation on the head of the article, a work rest blade for peripherally supporting the article with the head thereof operatively associated with the grinding wheel, a regulating wheel adjacent the blade for frictional engagement with the article to effect and control its rotation, power controlled means for sequentially positioning the article as respects the blade and wheels, determine the axis of rotation of the article and eject same from the blade, and means for effecting a relative feeding and retracting movement between the grinding wheel and the power controlled means and for initiating the cyclic operation of the power controlled means.

4. In a centerless grinder for grinding headed articles the combination of a grinding wheel for operation on the head of the article, a work rest blade for peripherally supporting the article with the head thereof operatively associated with the grinding wheel, a regulating wheel adjacent the blade for frictional engagement with the article to effect and control its rotation, power controlled means for sequentially positioning the article as respects the blade and wheels, determine the axis of rotation of the article and eject same from the blade, and means for effecting a relative feeding and retracting movement between the grinding wheel and the power controlled means and for initiating the cyclic operation of the power controlled means, said means including a manually actuable lever.

5. In a grinding machine the combination with a bed, of a pair of opposed grinding and regulating wheels carried thereby and forming a grinding throat therebetween, a work rest blade within said grinding throat, a work rest blade block adjustably supporting the blade, means for holding the work against the blade and regulating wheel, means for axially urging the work relative to the blade, and hydraulically actuable means for rendering the holding means and axially urging means inoperative.

6. In a grinding machine the combination with a bed, of a pair of opposed grinding and regulating wheels carried thereby and forming a grinding throat therebetween, a work rest blade within said grinding throat, a work rest blade block adjustably supporting the blade, means for holding the work against the blade and regulating wheel, means for axially urging the work relative to the blade, hydraulically actuable means for rendering the holding and axially urging means inoperative, means limiting the axial movement of the work relative to the blade, and hydraulically actuable means for ejecting the work from the blade.

7. In a work centering, rotating and ejecting mechanism the combination of a supporting block, a work rest blade carried by the block, means adjacent the block for engagement with a work piece peripherally supported by the blade to effect its rotation, an end pressure roll for terminally engaging the work for axially shifting same relative to the work rest blade, an abutment limiting the axial movement of the work relative to the blade, a pair of pistons carried by the block, and hydraulic means for shifting the pistons for sequentially releasing the work from the end pressure roll and actuating the abutment to eject the work from the work rest blade.

8. In a work centering rotating and ejecting mechanism the combination of a supporting block, a work rest blade carried by the block, means adjacent the block for engagement with a work piece peripherally supported by the blade to effect its rotation, an end pressure roll for terminally engaging the work for axially shifting same relative to the work rest blade, an abutment limiting the axial movement of the work relative to the blade, a pair of pistons carried by the block, and hydraulic means for shifting the pistons for sequentially releasing the work from the end pressure roll and actuating the abutment to eject the work from the work rest blade, one of said pistons including a valve for connecting the hydraulic pressure source with the remaining piston at a definite point in its cycle of movement.

9. In a work centering, rotating and ejecting mechanism the combination of a supporting block, a work rest blade carried by said block for peripheral engagement with the work piece, means adjacent the block for frictional engagement with the work to effect its rotation, lateral pressure means cooperating with the work rest blade and friction driving means to determine the axis of rotation of the work, axial pressure means for urging the work relative to the work rest blade, an ejector and abutment pin for limiting the axial movement of the work relative to the blade, a pair of pistons carried by the block, an hydraulic pressure source for actuating the pistons, one of said pistons rendering the lateral and the axial pressure means inoperative and the other piston actuating the ejector and abutment pin to eject the work piece from the work rest blade, and means carried by one of said pistons for connecting the pressure source with the other piston to effect synchronized actuation of the parts.

10. In a work centering, rotating and ejecting mechanism the combination of a supporting block, a work rest blade carried by the block for peripheral engagement with the work, means adjacent the block for frictional engagement with the work to effect its rotation thereby, lateral pressure means for laterally shifting the work piece into engagement with the friction driving means to determine the axis of rotation of the work, axial pressure means for axially shifting the work relative to the block, an hydraulically actuable piston carried by the block, cam portions on the piston for rendering the axially urging means and the lateral pressure means inoperative, and hydraulic means for ejecting the work from the block.

11. In a centerless grinder the combination of a pair of opposed grinding and regulating wheels forming a grinding throat therebetween, a work supporting, centering and ejecting mechanism within the grinding throat cooperating with the regulating wheel and comprising a work supporting block, a work rest blade carried by the block, side pressure means carried by the block for urging the work laterally of the work rest blade into engagement with the regulating wheel and determining the axis of rotation of the work, end pressure means for axially urging the work relative to the work rest blade, an abutment and

ejector pin for limiting the axial movement of the work relative to the blade, a hydraulically actuable piston carried by the block, a source of hydraulic pressure, means feeding the work and grinding wheel relative to one another, and means operable by said work feeding means for connecting the hydraulic source with the piston to render the side and end pressure means inoperable.

12. In a mechanism of the class described for effecting axial movement of a work piece the combination of a work rest blade for the work, a support for the blade, an end pressure roll engaging the terminus of the work for shifting same axially of the blade, a pivotally mounted arm for the roll, yielding means for actuating the arm about its pivot, cam means for determining the engagement between the roll and work, and power means for actuating the arm against the yielding resistance of its operating means.

13. In a mechanism of the class described for effecting axial movement of a work piece the combination of a work rest blade for the work, a support for the blade, an end pressure roll engaging the terminus of the work for shifting same axially of the blade, a pivotally mounted arm for the roll, yielding means for actuating the arm about its pivot, cam means for determining the engagement between the roll and work, power means for actuating the arm against the yielding resistance of its operating means, said means comprising a hydraulically actuable piston, and a cam on said piston cooperating with the arm to actuate same.

14. In a mechanism of the class described the combination of a work rest blade, a support for the blade, means adjacent the support for frictional engagement with a work piece on the blade to effect the rotation thereof, an arm pivotally supported by the support, lateral pressure rolls carried by the arm for laterally shifting the work relative to the blade into engagement with the friction driving means, yielding means for actuating said arm, and hydraulically actuable means for reversely shifting said arm against the yielding resistance of its actuating means to release the work from the work rest blade and friction driving means.

15. In a mechanism of the class described the combination of a work rest blade, a support for the blade, means adjacent the support for frictional engagement with a work piece on the blade to effect the rotation thereof, an arm pivotally supported by the support, lateral pressure rolls carried by the arm for laterally shifting the work relative to the blade into engagement with the friction driving means, yielding means for actuating said arm, hydraulically actuable means for reversely shifting said arm against the yielding resistance of its actuating means to release the work from the work rest blade and friction driving means, said means including a hydraulically actuable piston, a cam thereon, and a roller on the arm for engagement with the cam.

16. In a mechanism of the class described the combination of a work rest blade, a support for the blade, means adjacent the support for frictional engagement with a work piece on the blade to effect the rotation thereof, an arm pivotally supported by the support, lateral pressure rolls carried by the arm for laterally shifting the work relative to the blade into engagement with the friction driving means, yielding means for actuating said arm, hydraulically actuable means for reversely shifting said arm against the yielding resistance of its actuating means to release the work from the work rest blade and friction driving means, said means including a hydraulically actuable piston, a cam thereon, and a roller on the arm for engagement with the cam, and means for ejecting the work from the work rest blade.

17. In a device of the class described the combination of a work supporting bracket, a work rest blade on said bracket for supporting a work piece, means for urging the work axially of the blade including a yieldably actuated pressure roller, an arm carrying the roller, a crank supporting the arm, yielding means for actuating the crank, means for limiting the axial movement of the work relative to the blade, hydraulically actuable means for retracting the crank and pressure roll against the yielding action thereof, and additional hydraulic means for actuating the work movement limiting means for ejecting the work from the work rest blade.

18. In a device of the class described the combination of a work supporting bracket, a work rest blade on said bracket for supporting a work piece, means for urging the work axially of the blade including a yieldably actuated pressure roller, an arm carrying the roller, a crank supporting the arm, yielding means for actuating the crank, means for limiting the axial movement of the work relative to the blade, hydraulically actuable means for retracting the crank and pressure roll against the yielding action thereof, additional hydraulic means for actuating the work movement limiting means for ejecting the work from the work rest blade, and means for synchronizing the operation of the last mentioned means.

19. In a grinding machine of the class described for grinding a headed terminal portion of a work piece the combination of a grinding wheel for operation on said headed terminal portion, a work rest blade for supporting the work piece while in contact with the grinding wheel, a regulating wheel adjacent the work rest blade having frictional engagement with the work piece for controlling the rotation thereof, means terminally engaging the work to limit its axial movement relative to the blade, a support for the axial movement limiting means, and power actuated means for shifting said axial movement limiting means relative to its support to eject the work piece from the work rest blade

20. In a work supporting and ejecting mechanism for use with centerless grinders the combination of a work rest blade, a block supporting the blade, a limit stop for positioning the work relative to the blade, a cylindrical guide enclosing the stop, a bracket supporting the guide and adjustably secured to the work rest block, and means for adjusting the cylindrical guide relative to the bracket.

21. In a work supporting and ejecting mechanism for use with centerless grinders the combination of a work rest blade, a block supporting the blade, a limit stop for positioning the work relative to the blade, a cylindrical guide enclosing the stop, a bracket supporting the guide and adjustably secured to the work rest block, means for adjusting the cylindrical guide relative to the bracket, a hydraulic medium connectible with the cylindrical guide for projecting the stop relative thereto to eject the work piece from the blade, a valve operable in one direction for connecting the hydraulic medium with the cylindrical guide to actuate relative thereto and operable in the other direction for effecting the retraction of the stop, and means adjustably determining the nor-

mal position of the stop relative to the cylindrical guide.

22. In a grinding machine of the class described the combination of a work rest blade adapted to properly support the body portion of a work piece, said work piece having a portion overhanging the work rest blade and adapted to be ground, a grinding wheel disposed on one side of the work rest blade for grinding the overhanging portion of the work, a regulating wheel on the other side of the work rest blade for frictional engagement with the body portion of the work to effect and control its rotation, lateral means engaging the work and holding same in contact with the work rest blade and regulating wheel, means terminally engaging the work to position it relative to the work rest blade including a stop, a cylindrical guide for the stop, a hydraulic medium adapted to be connected with the cylindrical guide for projecting said stop therethrough to eject the work from the blade, a valve controlling the flow of the medium, an oscillatable arm for actuating the valve in opposite directions for connecting the medium with the guide and disconnecting it therefrom, means for actuating the grinding and regulating wheels toward and from one another to effect a stock removal from the work, and means operatively connecting the oscillatory arm with said actuating means for oscillating said arm in timed sequence with the actuating means.

23. In a grinding machine of the class described the combination of a work rest blade adapted to properly support the body portion of a work piece, said work piece having a portion overhanging the work rest blade and adapted to be ground, a grinding wheel disposed on one side of the work rest blade for grinding the overhanging portion of the work, a regulating wheel on the other side of the work rest blade for frictional engagement with the body portion of the work to effect and control its rotation, lateral means engaging the work and holding same in contact with the work rest blade and regulating wheel, means terminally engaging the work to position it relative to the work rest blade including a stop, a cylindrical guide for the stop, a hydraulic medium adapted to be connected with the cylindrical guide for projecting said stop therethrough to eject the work from the blade, a valve controlling the flow of the medium, an oscillatable arm for actuating the valve in opposite directions for connecting the medium with the guide and disconnecting it therefrom, means for actuating the grinding and regulating wheels toward and from one another to effect a stock removal from the work, and means operatively connecting the oscillatory arm with said actuating means for oscillating said arm in timed sequence with the actuating means, said actuating means including a manually oscillatory lever, a rack bar operatively associated with the lever for movement therewith, and means operatively connecting the rack bar and oscillatory arm.

24. In a grinding machine for grinding a headed terminal portion of a work piece the combination of a work rest blade, a grinding wheel disposed on one side of the work rest blade for operation on the terminal portion of the work, a regulating wheel on the other side of the blade for frictional engagement with the body portion of the work to effect and control its rotation, lateral means for engagement with the work to hold same in contact with the work rest blade and regulating wheel, means terminally engaging the work and shifting it relative to the blade, comprising a jointed oscillatory arm, yielding means for oscillating the arm in one direction, yielding means tending to fold the arm at its joint, a cam for limiting and controlling the folding of the arm, and power actuated means for oscillating the arm in the other direction operable against the yielding oscillatory means.

25. In a grinding machine for grinding a headed terminal portion of a work piece the combination of a work rest blade, a grinding wheel disposed on one side of the work rest blade for operation on the terminal portion of the work, a regulating wheel on the other side of the blade for frictional engagement with the body portion of the work to effect and control its rotation, lateral means for engagement with the work to hold same in contact with the work rest blade and regulating wheel, means terminally engaging the work and shifting it relative to the blade, comprising a jointed oscillatory arm, yielding means for oscillating the arm in one direction, yielding means tending to fold the arm at its joint, a cam for limiting and controlling the folding of the arm, and power actuated means for oscillating the arm in the other direction operable against the yielding oscillatory means, said power operating means comprising a piston, a hydraulic medium connectible with the piston for actuating same, and a valve controlling the flow of the hydraulic medium.

26. In a grinding machine for grinding a headed terminal portion of a work piece the combination of a work rest blade, a grinding wheel disposed on one side of the work rest blade for operation on the terminal portion of the work, a regulating wheel on the other side of the blade for frictional engagement with the body portion of the work to effect and control its rotation, lateral means for engagement with the work to hold same in contact with the work rest blade and regulating wheel, means terminally engaging the work and shifting it relative to the blade, comprising a jointed oscillatory arm, yielding means for oscillating the arm in one direction, yielding means tending to fold the arm at its joint, a cam for limiting and controlling the folding of the arm, and power actuated means for oscillating the arm in the other direction operable against the yielding oscillatory means, said power operating means comprising a piston, a hydraulic medium connectible with the piston for actuating same, a valve controlling the flow of the hydraulic medium, means limiting the movement of the work relative to the blade including a stop, power means for actuating the stop in a direction to eject the work from the blade including the hydraulic medium, and an interlock between the stop and piston whereby they are actuated in sequential order to first remove the axial urging means and subsequently eject the work from the blade.

27. In a grinding machine for grinding a headed terminal portion of a work piece the combination of a work rest blade, a grinding wheel disposed on one side of the work rest blade for operation on the terminal portion of the work, a regulating wheel on the other side of the blade for frictional engagement with the body portion of the work to effect and control its rotation, lateral means for engagement with the work to hold same in contact with the work rest blade and regulating wheel, means terminally engaging the work and shifting it relative to the blade, comprising a jointed oscillatory arm, yielding means for oscillating the arm in one direction, yielding

means tending to fold the arm at its joint, a cam for limiting and controlling the folding of the arm, power actuated means for oscillating the arm in the other direction operable against the yielding oscillatory means, said power operating means comprising a piston, a hydraulic medium connectible with the piston for actuating same, a valve controlling the flow of the hydraulic medium, means for limiting the movement of the work relative to the blade, including a stop, power means for actuating the stop in a direction to eject the work from the blade including the hydraulic medium, an interlock between the stop and piston whereby they are actuated in sequential order to first remove the axial urging means and subsequently eject the work from the blade, and a connection between the lateral work holding means and the piston whereby said holding means is rendered inoperative prior to the ejection of the work.

FREDERICK S. HAAS.
HANS FRITSCHI.