May 16, 1933. F. O. ALBERTSON 1,909,446

VALVE GRINDING MACHINE

Filed March 28, 1932 4 Sheets-Sheet 1

Fig. 1.

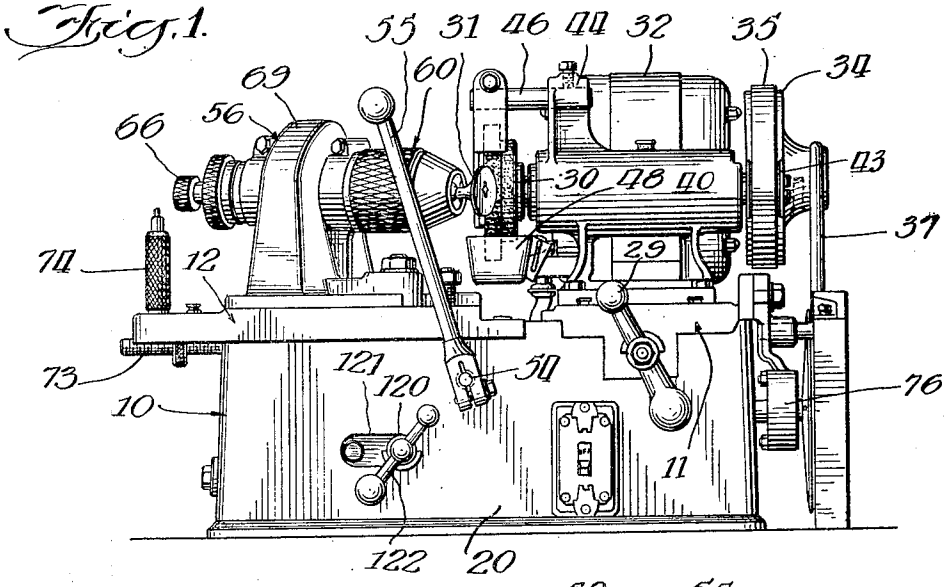
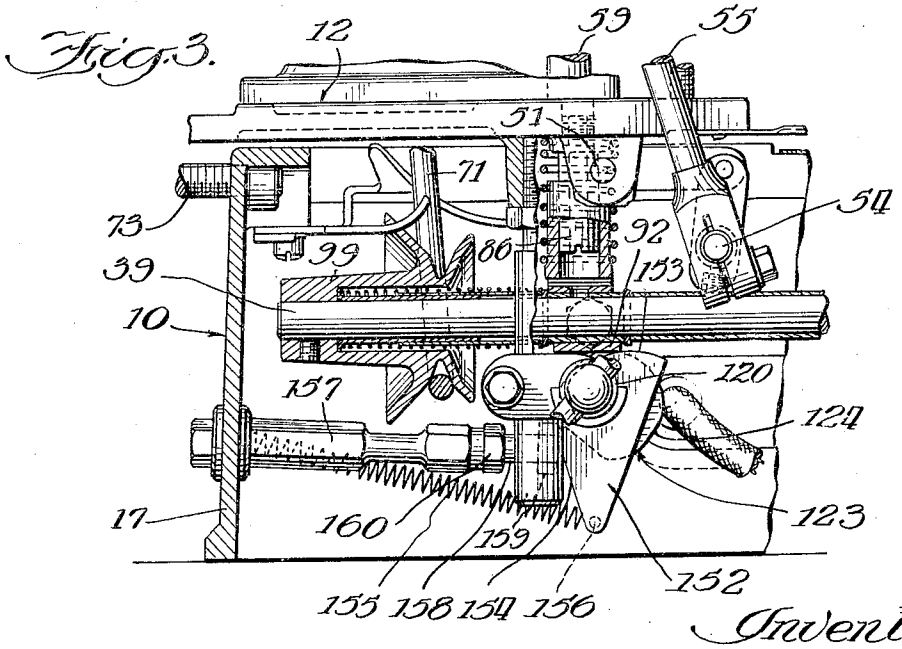


Fig. 3.



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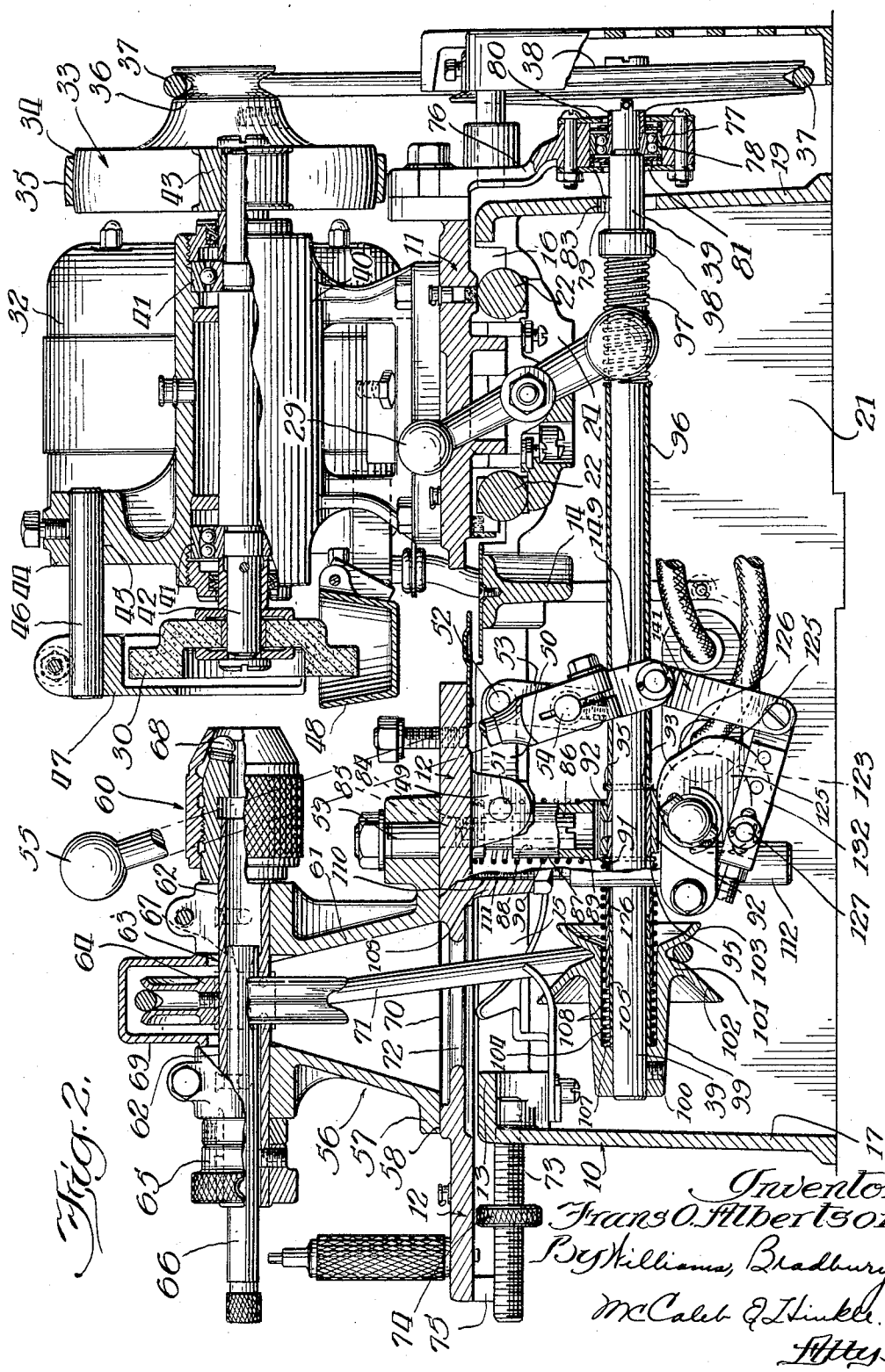


Fig. 2.

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VALVE GRINDING MACHINE

Filed March 28, 1932 4 Sheets-Sheet 3

Fig. 4.

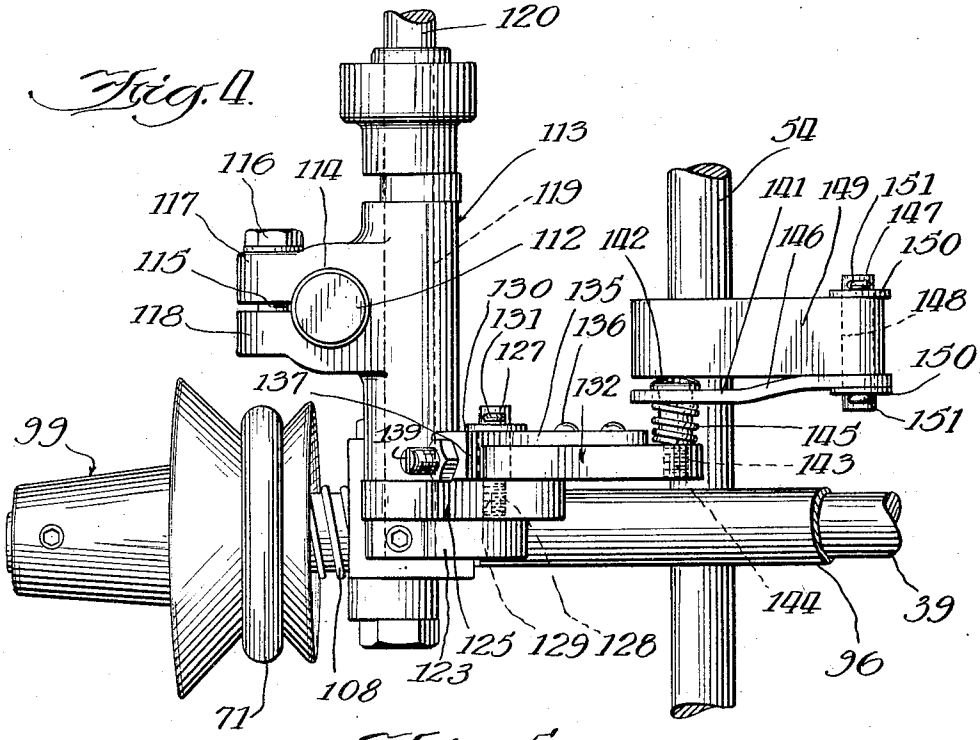
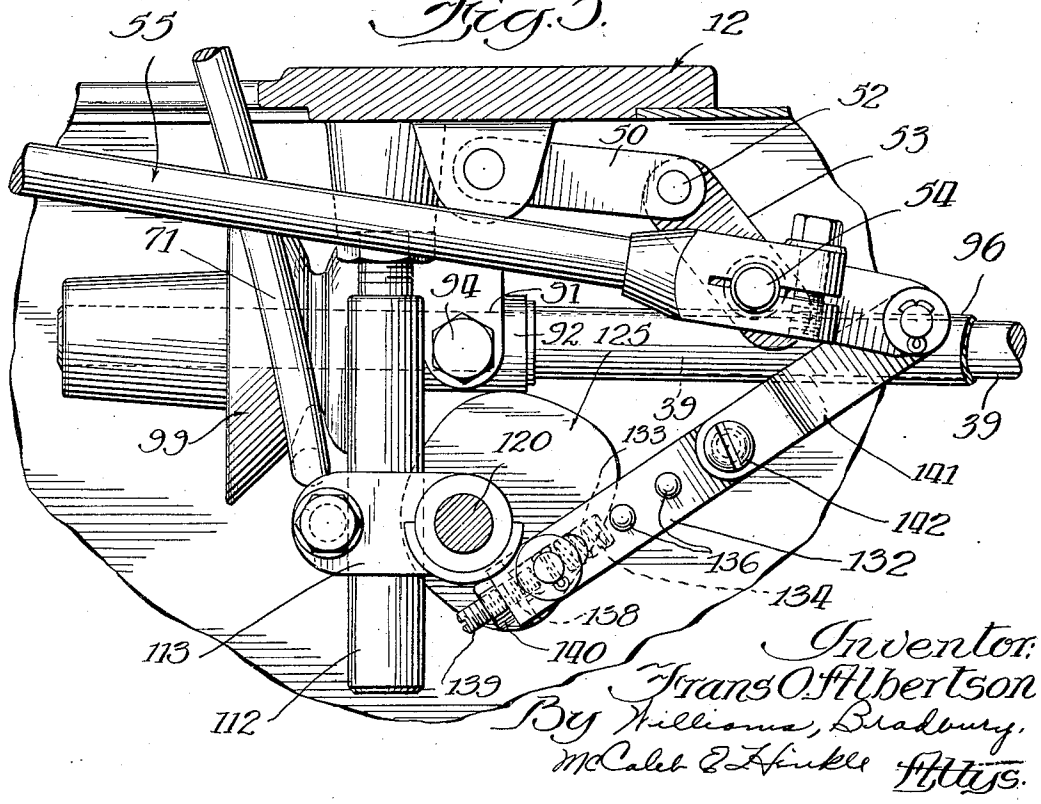


Fig. 5.



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VALVE GRINDING MACHINE

Filed March 28, 1932 4 Sheets-Sheet 4

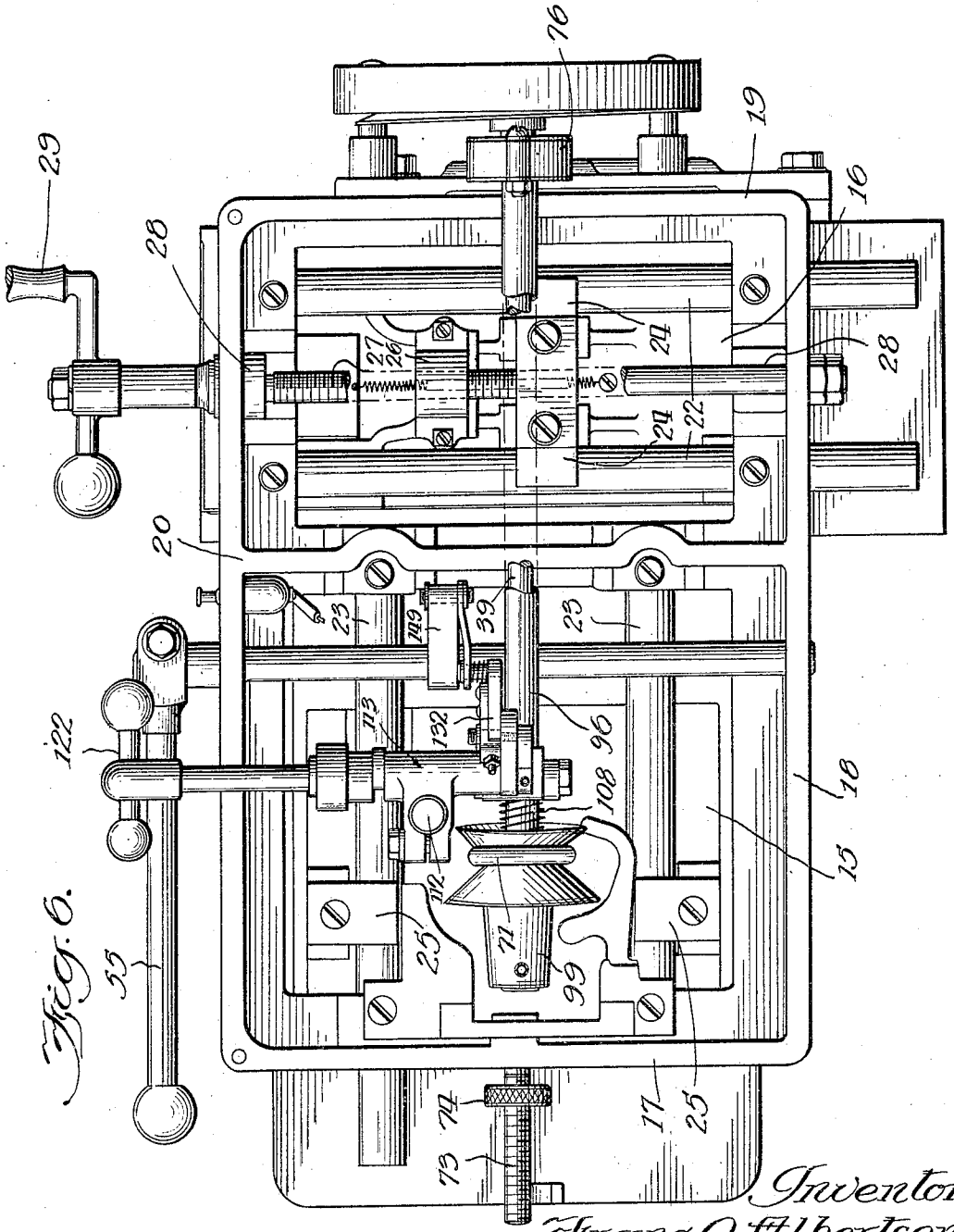


Fig. 6.

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UNITED STATES PATENT OFFICE

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VALVE GRINDING MACHINE

Application filed March 28, 1932. Serial No. 601,513.

The present invention relates to valve grinding machines and is particularly concerned with improvements in valve grinding machines of the type covered by my prior United States Letters Patent No. 1,722,880 granted July 30, 1929.

One of the objects of the invention is the provision of an improved valve grinding machine which has an improved form of drive mechanism between the tool holder and the motor.

Another object of the invention is the provision of an improved machine of the class described having an automatic stop mechanism for stopping the rotation of the tool holding chuck when the carriage is withdrawn to a predetermined point.

Another object of the invention is the provision of an improved clutch mechanism for driving the work holding chuck, by means of which the rotation of the chuck may readily be stopped at any time with a hand operated lever and by means of which the chuck is automatically stopped from rotation when the carriage which supports the chuck is withdrawn to a predetermined point.

Another object of the invention is the provision of an improved mechanism whereby only a very slight movement on the part of the carriage is adapted to move the interengaging parts of the drive mechanism out of engagement with each other so that the rotation of the chuck stops quite quickly at a predetermined point and the actuation of the stop mechanism does not require much range of movement of the carriage.

Another object of the invention is the provision of an improved valve grinding machine, the construction of which includes a multiplicity of improvements of various parts, all of which contribute to the efficiency, maintenance and operative characteristics of the machine, so that the present machine may be manufactured at a lower cost than the devices of the prior art.

Another object of the invention is the provision of an improved commercial form of construction of the device disclosed in the prior patent mentioned above.

Referring to the drawings, of which there are four sheets,

Fig. 1 is a front elevational view of a valve grinding machine constructed according to the present invention;

Fig. 2 is a longitudinal vertical sectional view with some of the mechanism in elevation, showing the details of construction of the operative parts of the valve grinder, and in particular the mechanism which is adapted to stop the rotation of the chuck and valve when the carriage reaches a predetermined point;

Fig. 3 is a fragmentary vertical sectional view of a modified mechanism, taken on a vertical longitudinal plane;

Fig. 4 is a full size fragmentary bottom plan view of another modified form of automatic cam mechanism;

Fig. 5 is a full size fragmentary elevational view of the automatic cam mechanism of Fig. 4 for stopping the rotation of the chuck; and

Fig. 6 is a bottom plan view of the complete machine, as shown in Fig. 2.

The valve grinding machines to which the present invention relates preferably comprise a base 10, a transversely movable carriage 11, and a longitudinally movable carriage 12.

The base 10 may comprise a cast metal member formed with a top 13 having a transversely extending frame member 14 and provided with apertures 15 and 16 on both sides of said transverse frame member. The base has a plurality of substantially rectangular depending walls 17 to 20, forming a support for the tool and providing a chamber 21 for enclosing the mechanism of the valve grinder. The base 10 is provided with transversely extending guides 22 fixedly secured on the base and extending across the aperture 16 and with the longitudinally extending guides 23 fixedly secured upon the base and extending longitudinally across the aperture 15. The guides preferably comprise cylindrical steel rods upon which the carriages 11 and 12 rest, and the carriages are provided with lower guide members 24, 25 supported by the carriage and engaging be-

neath the rods 22, 23 to slidably support the carriages on the guides.

The motor carriage 11 is provided with a threaded member 26 for engaging a threaded shaft 27, both ends of which are rotatably mounted in bearings 28 carried by the frame. The rotation of the shaft 27 by means of the crank 29 thus causes the motor carriage to move transversely to the base 10 and feeds the grinding wheel 30 toward the valve 31 or other work piece.

The motor carriage 11 fixedly supports the electric motor 32, which is provided with a drive pulley 33 having an outer curved surface 34 for receiving a flat belt 35. Pulley 33 is also provided with a grooved formation 36 for receiving the round belt 37 which transmits power to the enlarged pulley 38 carried by a drive shaft 39 underneath the top of the base.

The motor carriage 11 also fixedly supports a standard 40 which is provided with bearings 41 for rotatably supporting the grinding wheel shaft 42. The grinding wheel shaft 42 carries a pulley 43 at one end and a grinding wheel 30 at the other end. The standard 40 is also provided with an upwardly extending lug 44 having a transverse bore 45 for adjustably supporting a stub shaft 46 which carries a grinding wheel guard 47. The carriage may also support a receptacle 48 for catching the grindings.

The work supporting carriage 12 is slidably supported for longitudinal movement on the guides 23 and it may be provided with a downwardly extending lug 49 which is pivotally connected to a link 50 by means of a pin 51. The link 50 is pivotally connected by a pin or rivet 52 to a second link 53, which is fixedly mounted on a shaft 54 carried by the base 10. The shaft 54 may be rotated by means of the hand lever 55. When the shaft 54 is rotated in counterclockwise direction in Fig. 1 or Fig. 2, the bell-crank arm 53 causes the link 50 to move toward the left, moving with it the carriage 12, which slides upon the guides 23.

The work supporting head 56 is mounted upon the carriage 12 to move with the carriage 12 so as to cause the valve to reciprocate across the face of the grinding wheel 30, and the work supporting head 56 must also be supported for pivotal adjustment on the carriage 12 so as to provide for valves having valve surfaces of different angularity.

For instance, with a forty-five degree valve seat, the valve stem should be disposed at an angle of forty-five degrees to the axis of the grinding wheel shaft 42, and valves having surfaces of different angularity should be disposed accordingly.

The work supporting head 56 is thus preferably provided with a flat base 57 which is adapted to slide on the flat top 58 of the carriage 12. The base 57 is pivotally supported on the stud 59 which is carried by carriage 12, and preferably located adjacent the work supporting end of the chuck 60 so as to accomplish a maximum angular adjustment at the working end of the chuck. The work supporting head 56 is preferably provided with an upwardly extending frusto-conical casing 61, which may be formed with a pair of transversely extending bores 62 at the top. The bores 62 form bearings for the work supporting shaft 63 which is provided with a driven pulley 64.

The shaft 63 supports the chuck 60 at one end, and at the other end it supports a head or thrust bearing 65 adapted to be used in rotating the shaft by hand. The work shaft 63 is preferably hollow and provided with a slidably adjustable valve stem aligner 66 having a gradually tapered frusto-conical surface 67 for engaging the end of a valve stem, the stem being held adjacent the valve by means of the jaws 68 of chuck 60.

The casing 61 may be provided with a cover 69 at the top, of substantially cylindrical shape, for enclosing the pulley 64, and it is provided with a circular opening 70 at the bottom for passing the round belt 71 which engages pulley 64.

The base 12 is provided with an arcuate opening 72 which is formed on an arc with the center of the stud 59 as a radius so as to pass the belt 71 and permit the movement of the work supporting head 56 pivotally on the stud 59 through a predetermined range of positions.

The base may also support a longitudinally extending stop bolt 73 provided with an adjustable nut 74 for engaging the stop lug 75 which depends from the carriage 12. The nut 74 may be adjusted so that it determines the range of movement of the carriage toward the grinding wheel and so that it prevents the carriage from moving longitudinally of the base past the grinding wheel.

The motor 32 in valve grinding machines of this type preferably drives the grinding wheel and rotates the valve supporting chuck so that the valve 31 will be ground about its complete periphery automatically, and the grinding may proceed uniformly without removing too much from any side of the valve. Therefore, the machine is provided with an operative mechanical connection between the motor 32 and the work supporting shaft 63. This connection preferably takes the form shown in Fig. 2 in which the base 10 supports an extensible shaft 39.

At one end the base 10 is provided with a downwardly extending bracket 76 which is provided with a transverse bore 77 for supporting self-aligning ball bearings 78. The bearings 78 are enclosed by means of cover plates 79 and 80 carried by brackets 76 at each end of bore 77, and the cover plates 79 and 80 are provided with the enlarged aper-

tures 81 so as to permit a limited amount of pivotal movement of the shaft 39.

The shaft 39 carries a grooved pulley 38 which is engaged by the belt 37 driven by the motor pulley 33. The side wall 19 of the base is also provided with an enlarged aperture 83 to permit pivotal movement of the shaft 39 about the center of the self-aligning ball bearings 78. The carriage 12 is provided with a downwardly extending threaded bore 84 which fixedly supports the threaded upper end 85 of a cylindrical guide stud 86. The guide stud 86 slidably supports a tubular member 87 which is provided with a complementary bore 88 and with an outer annular shoulder 89 forming a seat for a spring 90.

The tubular member 87 is provided with a lower forked end 91 for pivotally supporting a bearing block 92 which is provided with a transversely extending bearing sleeve 93. Block 92 is pivotally mounted on the forked ends 91 by means of the pivot bolts 94, thus making provision for the pivoting of the block 92 about a horizontal axis. The bearing 93 slidably engages the drive shaft 39 and is provided with a washer 95 at each end.

In order to take up the backlash in the shaft 39 and to urge it toward the right in Fig. 2, the shaft 39 is provided with a sleeve or tube 96, one end of which engages washer 95, and the other end of which forms a seat for the helical compression spring 97. The other end of compression spring 97 engages a collar 98 which is fixedly secured to shaft 39. Spring 97 reacts against the bearing 93 through the sleeve 96 and constantly maintains an axial thrust on the shaft 39 toward the right.

The spring 90 engages the lower side of carriage 12 and constantly urges the tubular member 87 downward so as to maintain the belt 71 under proper tension, but the spring 90 may be compressed when the left end of shaft 39 is raised so as to cause the belt 71 to slip in the pulley 99, as shown in Fig 5.

This upward movement of the left end of shaft 39 is permitted by the provision of a self-aligning ball bearing 78 at the right end and by the pivotal mounting of the block 92 in the forked end 91 of the tubular member 87.

The pulley 99 is fixedly mounted on shaft 39 by means of a set screw 100, and the pulley is preferably formed with the customary groove 101 and with outwardly spreading annular guide flanges 102, 103. The flanges 102, 103 assure the re-engagement of the belt 71 with the groove 101 of the pulley after it has been loosened or permitted to slip, as shown in Fig. 5, and the flanges also guide the belt into the groove of the pulley, although the groove may not be in alignment with the groove of pulley 64.

The pulley 99 is also provided with a counterbore 104 surrounding the shaft 39, and the counterbore 104 may receive a pair of telescoping metal sleeves 105, 106. Sleeve 105 is provided with an annular outwardly extending flange 107 providing a seat for one end of spring 108. The other end of spring 108 engages the left washer 95.

Since stud 86 is mounted on carriage 12, stud 86, sleeve 87, block 92 and bearing 93 move longitudinally of the frame or base 10 and of the shaft 39 when the carriage is moved. When the carriage is moved to the left, in Fig. 2, spring 108 is compressed and spring 97 expands, and when the carriage is moved to the right, in Fig. 2, spring 97 is compressed and spring 108 expands. Both these springs are under an initial compression which is sufficient so that in either of the extreme positions of the carriage both springs are still under compression, thus constantly urging the shaft 39 in one axial direction.

The carriage 12 is also provided with a downwardly extending lug 109 which is provided with a threaded bore 110 for receiving the threaded end 111 of a supporting stud 112. The stud 112 carries a transversely extending bearing bracket 113 which may be provided with a cylindrical bore 114 and a slot 115. A screw bolt 116 extending through the end 117 and threaded into the end 118 clamps the bracket 113 on the supporting stud 112.

The bearing bracket 113 is provided with a transversely extending bore 119 forming a bearing for a cam shaft 120. The forward end of the cam shaft 120 projects through a slot 121 in the front wall 20 of the base 10, a slot being necessary on account of the fact that the shaft 120, bracket 113, and stud 112 move with the carriage 12. The forward end of the shaft 120 is preferably provided with a lever 122 or a crank for use in rotating the shaft by hand when it is desired to start or stop the rotation of the work shaft 63.

The shaft 120 fixedly supports a cam 123, shown in Fig. 2, and adapted to be rotated by manipulating the lever 122. The cam 123 has a constantly increasing radius and is adapted to engage the lower side of block 92 so that when the shaft 120 is rotated, cam 123 raises the block 92 and with it shaft 39 and pulley 99. This moves the pulley from the position shown in Fig. 2 to the position shown in Fig. 5 where the shaft 39 and pulley 99 may rotate freely without driving the belt 71.

It will thus be observed that the rotation of the work shaft 63 and chuck 60 may be stopped at any time by rotating shaft 120 by means of lever 122 by hand, in the embodiment of Fig. 2. In the embodiments of Figs. 4 and 5 this hand actuated cam 123 is omitted, as these embodiments represent alternative forms of the invention.

In the embodiment of Fig. 3, the hand actuated cam 123 is likewise fixedly mounted for rotation with the shaft 120, and in that

embodiment the cam 123 is provided with a flat surface 124 which forms a suitable supporting surface for the block 92 so that the cam 123 will stay in its uppermost position, supporting the shaft in that position after the hand is removed from lever 122.

Referring again to Fig. 2, the shaft 120 may also support for free rotation on shaft 120 an automatic cam 125 which is adapted to move the shaft 39 and pulley 99 upward whenever the carriage 12 reaches a predetermined position. Cam 125 also increases in radius from the left to the right in Fig. 2 and may be provided with a flat, stable supporting surface 126 to aid in holding the cam in the supporting position. The cam is also provided with a laterally projecting stud 127 having a reduced threaded end 128 which is fixedly secured in a complementary bore 129 in the cam. Stud 127 is provided with a washer 130 and a cotter-pin 131, the washer slidably engaging the side of a link 132 which is pivotally mounted on stud 127. A toggle link 132 is provided with an axially extending slot 133 for receiving helical compression spring 134. One side of slot 133 is closed by engagement of the slot with the side of cam 125, while the opposite side of the slot may be closed by a bracket 135 which is secured to the toggle link 132 by rivets or screw bolts 136.

Bracket 135 is provided with a laterally extending end 137 which extends across the end of slot 133 and is provided with a threaded bore 138 for receiving a spring adjustment screw 139. The end of the adjustment screw 139 bears on the trunnion or stud 127, while the opposite side of the trunnion engages the coil spring 134.

The position of the trunnion in the slot 133 may be adjusted by adjusting the screw 139 which is secured in place by a lock nut 140. The spring also aids in breaking the toggle which is formed of the links 132 and 141 pivoted together by means of the screw bolt 142. The link 132 is provided with a threaded bore 143 which is adapted to receive the reduced threaded end 144 of screw bolt 142. A spring 145 is compressed between the side of link 132 and the side of link 141. This enables the support of the link 141 at a point spaced from the link 132 so as to prevent interference between the parts carried by link 141 and the parts carried by link 132. Link 141 is preferably offset at 146 by an amount equal to the thickness of the head of bolt 142 so that the opposite end of link 141 may be pivotally supported upon a stub shaft 147 which extends through a bore 148 in the bellcrank arm 149. The stub shaft 147 is provided with washers 150 and cotter-pin 151 for holding these parts in position.

The bellcrank arm 149 comprises a block which is fixedly secured on shaft 54 so that the block 149 rotates with the shaft 54. Shaft 54 supports the upwardly extending lever 55 which is utilized in moving the carriage 12 back and forth longitudinally of the base 10. When the lever 55 is moved to the left in Fig. 1 or Fig. 2, the arm 149 moves in a counterclockwise direction, drawing with it the link 141. This causes the link 132 to move in a counterclockwise direction, but it exerts no pull on the trunnion 127 nor upon cam 125 until the toggle has become straightened, as shown in Fig. 5.

The carriage 12 is thus provided with a predetermined range movement throughout which the movement of the lever 55 will have no effect upon the cam 125. At the end of this range of movement toward the left, the toggle links 132, 141 will straighten out as shown in Fig. 5, and a pull will be exerted upon the trunnion 127, which will rotate cam 125 counterclockwise in Fig. 1 or 5. Cam 125 will then engage block 92 and raise the block 92, shaft 39 and pulley 99 from the position of Fig. 2 to that of Fig. 5. The rotation of the work shaft 63 and chuck 60 will automatically cease when the carriage 12 is moved to the outermost limit of its range of movement. By means of the mechanism described, the rotation of the valve is automatically stopped when the valve is withdrawn completely to the left, but the present mechanism is adapted to move the shaft 39 upward quickly, and therefore it does not utilize much of the range of movement of the carriage 12. Most of the range of movement of the carriage 12 is still available for manipulation of the valve longitudinally of the base in the grinding of the valve, and the valve may be withdrawn from engagement with the grinding wheel without necessarily stopping the rotation of the valve. It preferably requires a still farther movement of the work carriage to the left after the valve has become disengaged from the grinding wheel to effect a complete stoppage of the rotation of the valve.

The weight of the lever 55 and the proportions of the parts are preferably such that when the lever is moved to the position of Fig. 5 the carriage will remain in that position until the lever 55 is again lifted by hand, but, if necessary, the carriage may be retained in that position by the provision of a flat surface 126 on the cam 125. It will be observed that in Fig. 2 the cam 123 may still be actuated by means of the hand lever 122 to stop the rotation of the chuck at any time, as the operation of the cam 125 is independent of the cam 123.

The spring 134 aids in breaking the toggle 132, 131 from the position of Fig. 5, and the toggle preferably does not pass the dead center position shown in Fig. 5, since it would otherwise tend to move in the wrong direction.

Referring to Fig. 3, this is a modification in which the shaft 120 is provided with another cam 152 which rotates freely on the shaft 120. Cam 152 is provided with the camming surface 153 of constantly increasing radius and with a stop engaging surface 154. A tension spring 155 has one end hooked about a stud 156 carried by the lower point of cam 152 and the other end is secured to the base 10.

Cam 152, being carried by shaft 120, may be located directly beneath block 92 in such position as to raise the block when cam 152 is rotated in a counterclockwise direction. The spring 155, however, tends to maintain cam 152 in such a position that the cam surface 153 is constantly in engagement with the block 92, but the tension of the spring is not sufficient to raise the block 92.

The base 10 is preferably provided with a stop member 157 which may comprise of a stud or post fixedly supported upon the side wall 17 and projecting toward the stop surface 154 of cam 152. The post 157 is provided with a threaded bore for receiving the threaded end of a bolt 158, the head 159 of which engages stop surface 154 of the cam. The bolt 158 is retained in predetermined position by means of a lock nut 160. The bolt 158 is so adjusted that when the carriage is in the position of Fig. 2 or Fig. 1, the stop surface 154 engages the head of bolt 159, but the radius of the camming surface 153, which is then in engagement with the block 92, is not such as to lift the block 92, or it may be out of engagement with the block 92.

As the carriage 12 moves to the left in Fig. 3, the cam 152 and shaft 120 move with the carriage, and consequently stop surface 154 on the cam 152 is brought into engagement with the head 159. As the carriage continues to move, the cam 152 is caused to rotate in a counterclockwise direction by the head 159, and the camming surface 153 of increasing radius is brought into engagement with the block 92. As the carriage moves toward the end of its range of movement, camming surface 153 slidably engages block 92 and raises the block so that the shaft 39 and pulley 99 are raised to the position of Fig. 5. The result of the operation of this mechanism is substantially the same as that previously described in that the belt 71 slips so that the shaft 39 and pulley 99 rotate without driving the belt 71 or the chuck 60.

The operation of the various parts of the valve grinding machine has been described with reference to the description of the structure involved. The operation of the complete machine is as follows:

The motor 32 drives the grinding wheel 30 by means of the pulleys 33, 43 and belt 35, and the motor may be moved back and forth transversely of the base 10 by means of the crank 29. The motor also drives the shaft 39 through the belt 37 and pulley 38, and the drive shaft 39 drives pulley 99, belt 71, pulley 64, work shaft 63 and chuck 60, which supports a valve 31.

The carriage 12 may be pivotally adjusted on the stud 59 for any valve angularity, the work head being secured in place by the nut on stud 59. The carriage 12 may be moved back and forth longitudinally of the base 10 by means of lever 55, thereby causing the edge of the valve to traverse the grinding wheel while the valve is being rotated by means of the chuck.

The chuck must be stopped when it is desired to remove the valve, and for this purpose the carriage 12 may be withdrawn to the left limit of its range of movement, when the automatic cam mechanism will disconnect the belt 71 from pulley 99 in such manner that the belt slips and the rotation of the chuck is stopped. The chuck is thus automatically stopped as soon as each valve is finished and the carriage is moved completely to the left.

This eliminates the necessity for a separate manual operation of the lever 122 and saves the time of the operator, although the lever 122 is available to stop rotation of the chuck at any time.

It will thus be observed that I have invented an improved automatic stop mechanism whereby the movement of the carriage is adapted to stop the rotation of the work holding chuck in machines of the class described. The present stop mechanism does not require much of the range of movement of the carriage to effect an actuation of the mechanism for stopping the rotation of the chuck, and therefore the useful range of movement of the carriage is not limited in any way by the mechanism. The time of the operator is saved by eliminating unnecessary manual operations, and the value of the machine is greatly enhanced by the addition of the automatic stopping mechanism.

The present machine also includes an improved drive shaft arrangement which is more efficient than the devices of the prior art and which permits the whole or partial slippage of the drive belt for the work holding chuck so that the chuck may be driven at a slow rate of speed, if desired.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent of the United States, is:

1. In a valve grinding machine, the com-

bination of a supporting base with a motor driven grinding wheel carried by said base, a work supporting head having a chuck rotatably mounted in said head and adapted to support a valve, said work supporting head being carried by a carriage for reciprocation with respect to said grinding wheel, means carried by said base for driving said chuck from said electric motor, clutch means interposed in said latter driving means, and means automatically actuated by movement of said work supporting carriage to a predetermined position for actuating said clutch means.

2. An automatic stop mechanism for the carriage of a valve grinding machine, comprising a drive shaft having a pulley and a belt, a work supporting carriage, a base for movably supporting said carriage and for supporting said drive shaft, and means for automatically moving said drive shaft into a position where said belt will slip in said pulley when said carriage reaches a predetermined position, comprising a transverse shaft carried by said support, a cam carried by said shaft and having a camming surface of increasing radius and a stop member carried by said support and engaged by said cam, said cam being carried by said carriage, whereby said cam is rotated by engagement with said stop member when said carriage is moved to said predetermined position.

3. In a valve grinding machine, the combination of a supporting base with means for driving a valve grinder carried by said base, a drive shaft carried by said base, a self-aligning universal bearing supporting one end of said drive shaft on said base, a carriage movably mounted on said base, a bearing carried by said carriage and pivotally mounted on said carriage said bearing supporting the other end of said shaft, and means for lifting said bearing and causing said shaft to pivot about said universal joint to effect a disconnection of said shaft with a driven member.

4. In a valve grinding machine, the combination of a supporting base with means for driving a valve grinder carried by said base, a drive shaft carried by said base, a self-aligning universal bearing supporting one end of said drive shaft in said base, a carriage movably mounted on said base, a bearing carried by said carriage and pivotally mounted on said carriage, said bearing supporting the other end of said shaft, a guide stud carried by said carriage, a guide slidably mounted on said stud and supporting said latter bearing, a pulley carried by said shaft, and a belt engaging said pulley, said bearing being adapted to be moved with said guide on said guide stud, and said shaft being pivoted on said universal joint to move said pulley out of engagement with said belt.

5. In a valve seat grinder, the combination of a supporting base with means for driving said valve seat grinder, a drive shaft carried by said base and having one end operatively connected to said means and the other end carrying a pulley, a bearing carried by one end of said base for said drive shaft, a carriage movably mounted on said base for supporting the work, a bearing carried by said carriage to support the other end of said drive shaft, and resilient means carried by said shaft on each side of said latter bearing for urging said shaft axially into engagement with its bearings to take up backlash, said resilient means on opposite sides of said latter bearing being alternately compressed when said carriage moves in one direction or the other with respect to said shaft.

6. In a valve seat grinding machine, the combination of a supporting base with a work supporting carriage movably carried by said base, a chuck carried by said carriage, a drive shaft carried by said base, a pulley carried by the chuck, and a pulley carried by the drive shaft, a belt connecting said pulleys, manually actuated means for moving the carriage back and forth on the base, and means actuated by said manually actuated means for moving said drive shaft to cause said belt to slip with respect to one of said pulleys when said carriage reaches a predetermined position.

7. In an automatic stop mechanism for valve grinding mechanisms, the combination of a supporting base with a carriage movably mounted on said base, a drive shaft for driving the valve grinding mechanism, a pulley carried by said drive shaft, and a belt actuated by said pulley, a transverse shaft carried by said base, a hand lever carried by said shaft, a pair of links connecting a crank arm carried by said shaft, and a link connecting the end of said arms and said carriage, whereby said carriage may be reciprocated by said hand lever, a second transverse shaft carried by said carriage, a cam carried by said second transverse shaft, and lost motion mechanism between said cam and said hand lever, whereby said cam is actuated to move said drive shaft and disconnect said pulley from said belt when said carriage reaches one end of its range of movement.

8. In an automatic stop mechanism for valve grinding mechanisms, the combination of a supporting base with a carriage movably mounted on said base, a drive shaft for driving the valve grinding mechanism, a pulley carried by said drive shaft, and a belt actuated by said pulley, a transverse shaft carried by said base, a hand lever carried by said shaft, a pair of links connecting a crank arm carried by said shaft, and a link connecting the end of said arm and said carriage, whereby said carriage may be reciprocated by said hand lever, a second transverse shaft carried by said carriage, a cam carried by said second

transverse shaft, and lost motion mechanism between said cam and said hand lever, whereby said cam is actuated to move said drive shaft and disconnect said pulley from said belt when said carriage reaches one end of its range of movement, said lost motion mechanism comprising a pair of toggle links having their ends pivoted together, the other end of one link being pivotally mounted on said cam, and the other end of the other link being pivotally mounted on a crank arm carried by said first-mentioned transverse shaft.

9. In an automatic stop mechanism for valve grinding mechanisms, the combination of a supporting base with a carriage movably mounted on said base, a drive shaft for driving the valve grinding mechanism, a pulley carried by said drive shaft, and a belt actuated by said pulley, a transverse shaft carried by said base, a hand lever carried by said shaft, a pair of links connecting a crank arm carried by said shaft, a link connecting the end of said arm and said carriage, whereby said carriage may be reciprocated by said hand lever, a second transverse shaft carried by said carriage, a cam carried by said second transverse shaft, said cam being mounted for free rotation, a stop member carried by said supporting base and located to engage a stop engaging surface on said cam, whereby said cam is rotated when the carriage moves to the end of its range of movement and said cam moves said drive shaft pulley out of engagement with said belt.

10. In an automatic stop mechanism for valve grinding mechanisms, the combination of a supporting base with a carriage movably mounted on said base, a drive shaft for driving the valve grinding mechanism, a pulley carried by said drive shaft, a belt actuated by said pulley, a transverse shaft carried by said base, a hand lever carried by said shaft, a pair of links connecting a crank arm carried by said shaft, a link connecting the end of said arm and said carriage, whereby said carriage may be reciprocated by said hand lever, a second transverse shaft carried by said carriage, a cam carried by said second transverse shaft, said cam being mounted for free rotation, a stop member carried by said supporting base and located to engage a stop engaging surface on said cam, whereby said cam is rotated when the carriage moves to the end of its range of movement and said cam moves said drive shaft pulley out of engagement with said belt, and resilient means for urging said stop engaging surface of said cam into engagement with said stop.

11. In an automatic stop mechanism for the work supporting chuck of a valve grinding machine, the combination of a drive shaft with the work supporting chuck driven by said shaft and clutch means interposed between said shaft and chuck, a movable carriage supporitng said chuck, manual means for moving said carriage, and camming means carried by said carriage and adapted to actuate said clutch means when said carriage reaches a predetermined position.

12. In an automatic stop mechanism for the work supporting chuck of a valve grinding machine, the combination of a drive shaft with the work supporting chuck driven by said shaft and clutch means interposed between said shaft and chuck, a movable carriage supporting said chuck, manual means for moving said carriage, a cam rotatably mounted on said carriage, a stud carried by said cam, a toggle link having a slot for receiving said stud, said slot having an adjustable member engaging one side of said stud, and a spring in said slot engaging the other side, a second toggle lever pivotally connected to the first, and a bell-crank arm carried by said manually actuated means, whereby said cam is rotated when the carriage reaches the end of its range of movement and said cam actuates said clutch means to stop rotation of said chuck.

In witness whereof, I hereunto subscribe my name this 24 day of March, 1932.

FRANS O. ALBERTSON.