June 24, 1930. W. L. BRYANT 1,765,787

GRINDING MACHINE

Filed Dec. 2, 1925 9 Sheets-Sheet 1

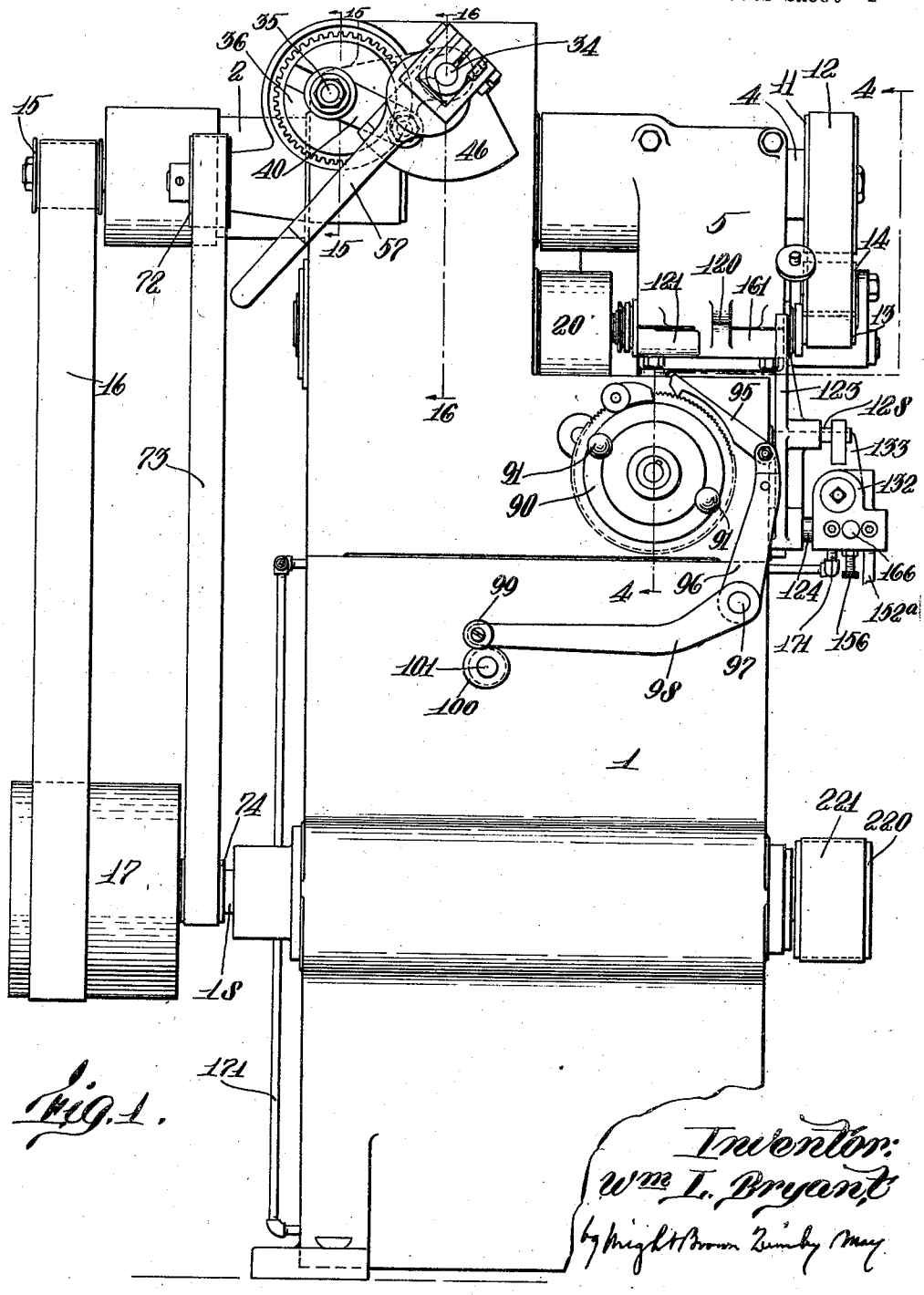

Fig. 1.

Inventor:
Wm L. Bryant
by Wright Brown Quinby & May

Atty's.

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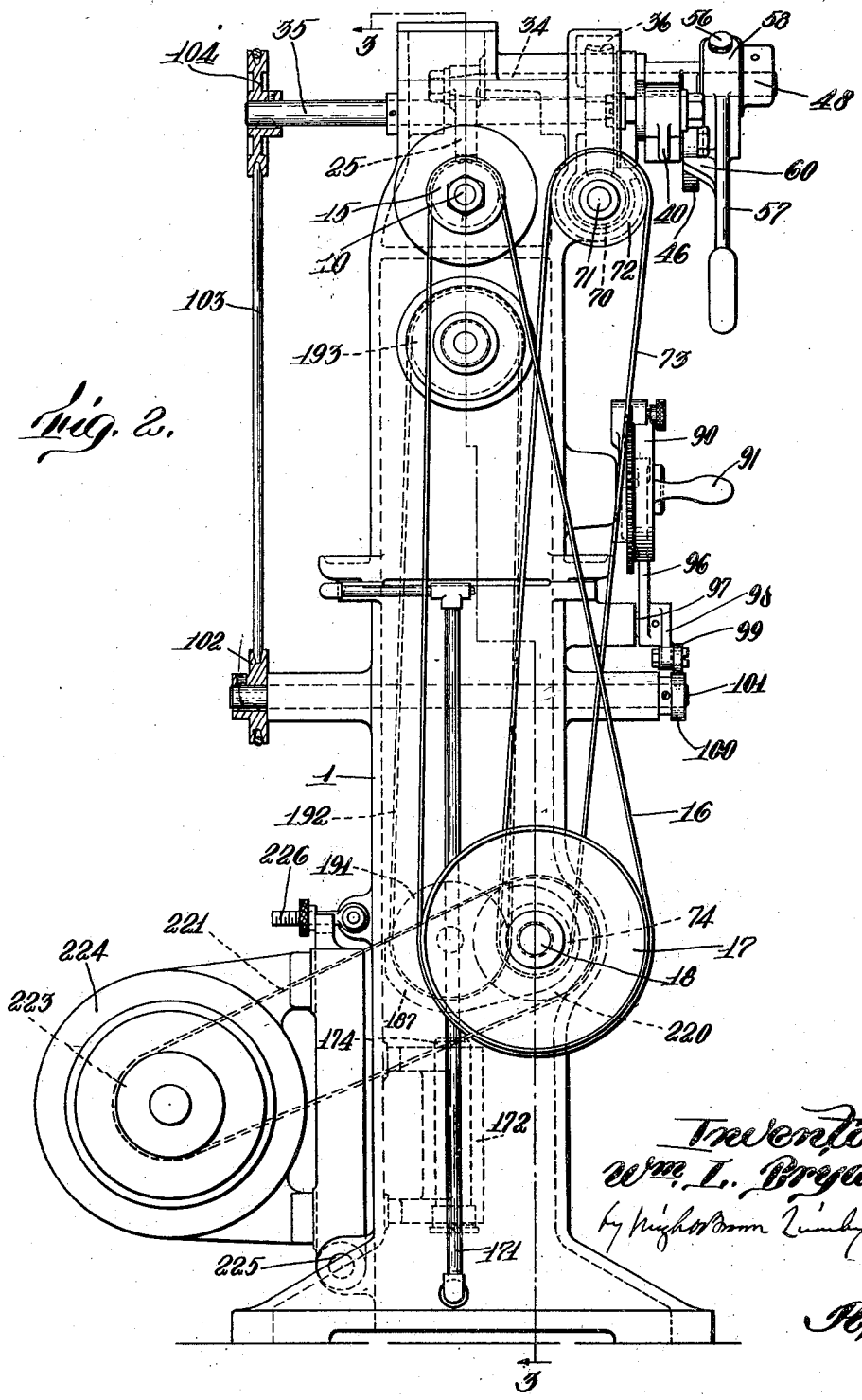

Fig. 2.

Inventor:
Wm. L. Bryant
by Wright Brown Quinby & Mary

Attys.

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GRINDING MACHINE

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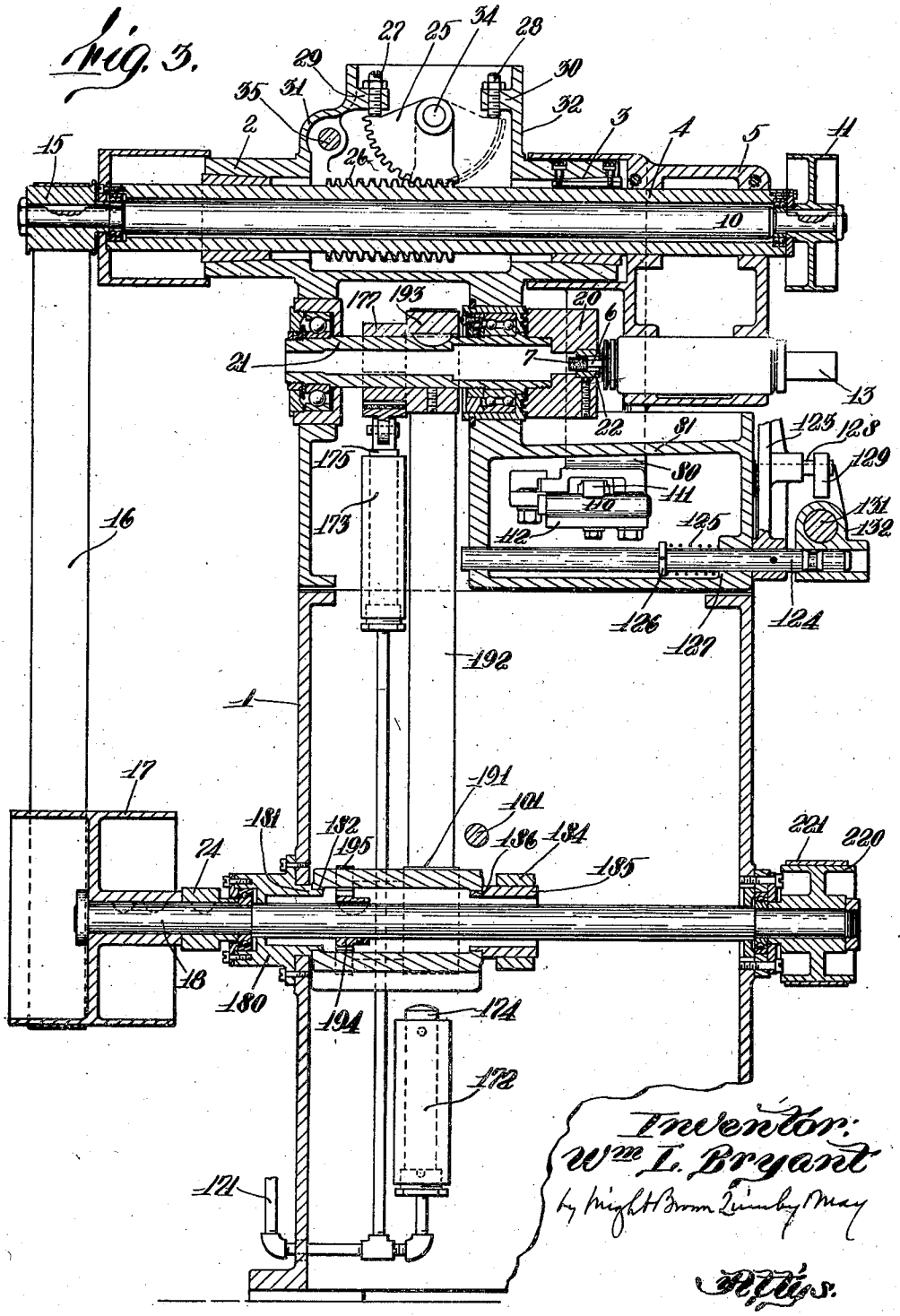
Fig. 3.



Inventor:
Wm L. Bryant
by Wright Brown Quinby & May
Attys.

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GRINDING MACHINE

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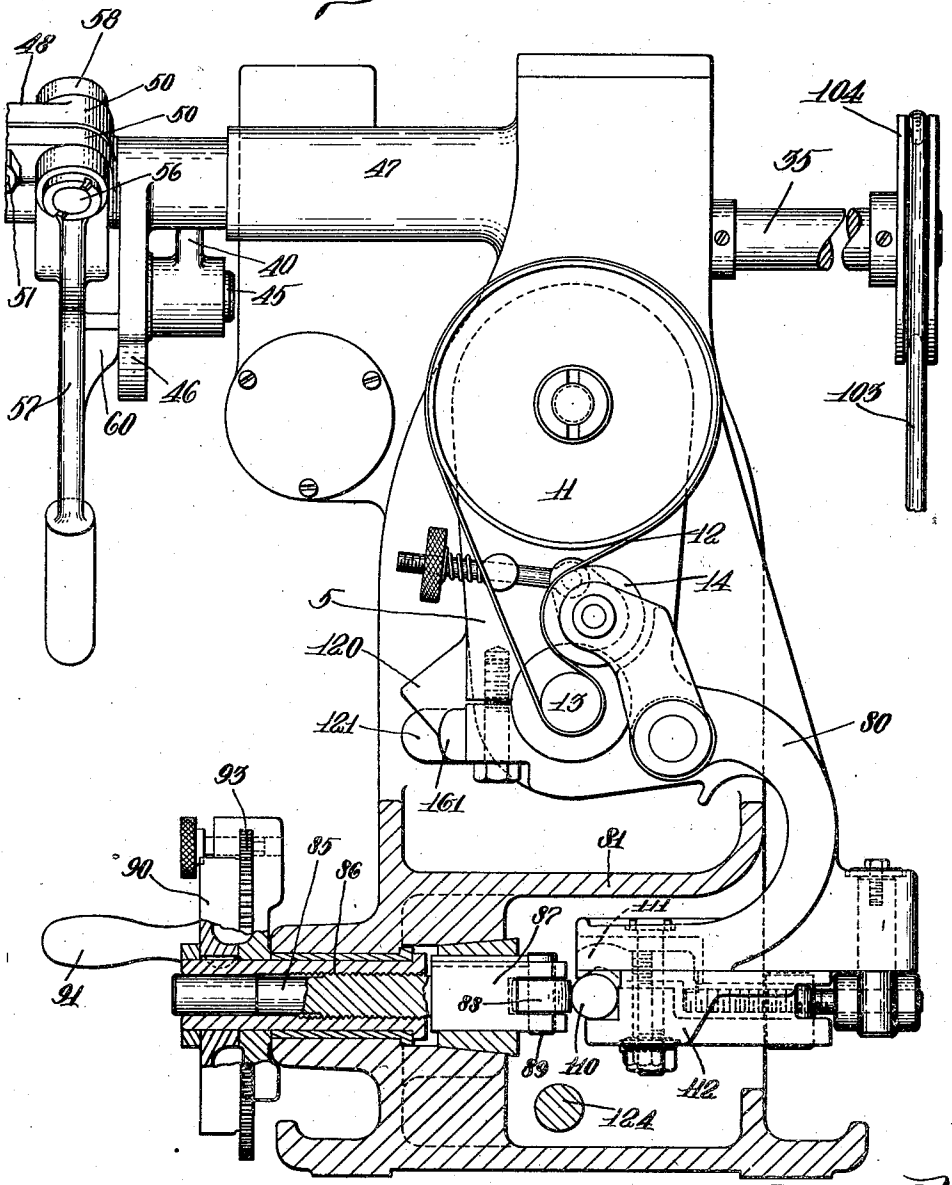
Fig. 4.



Inventor:
Wm. L. Bryant
by Wright Brown Quinby & May.
Atty's.

June 24, 1930. W. L. BRYANT 1,765,787

GRINDING MACHINE

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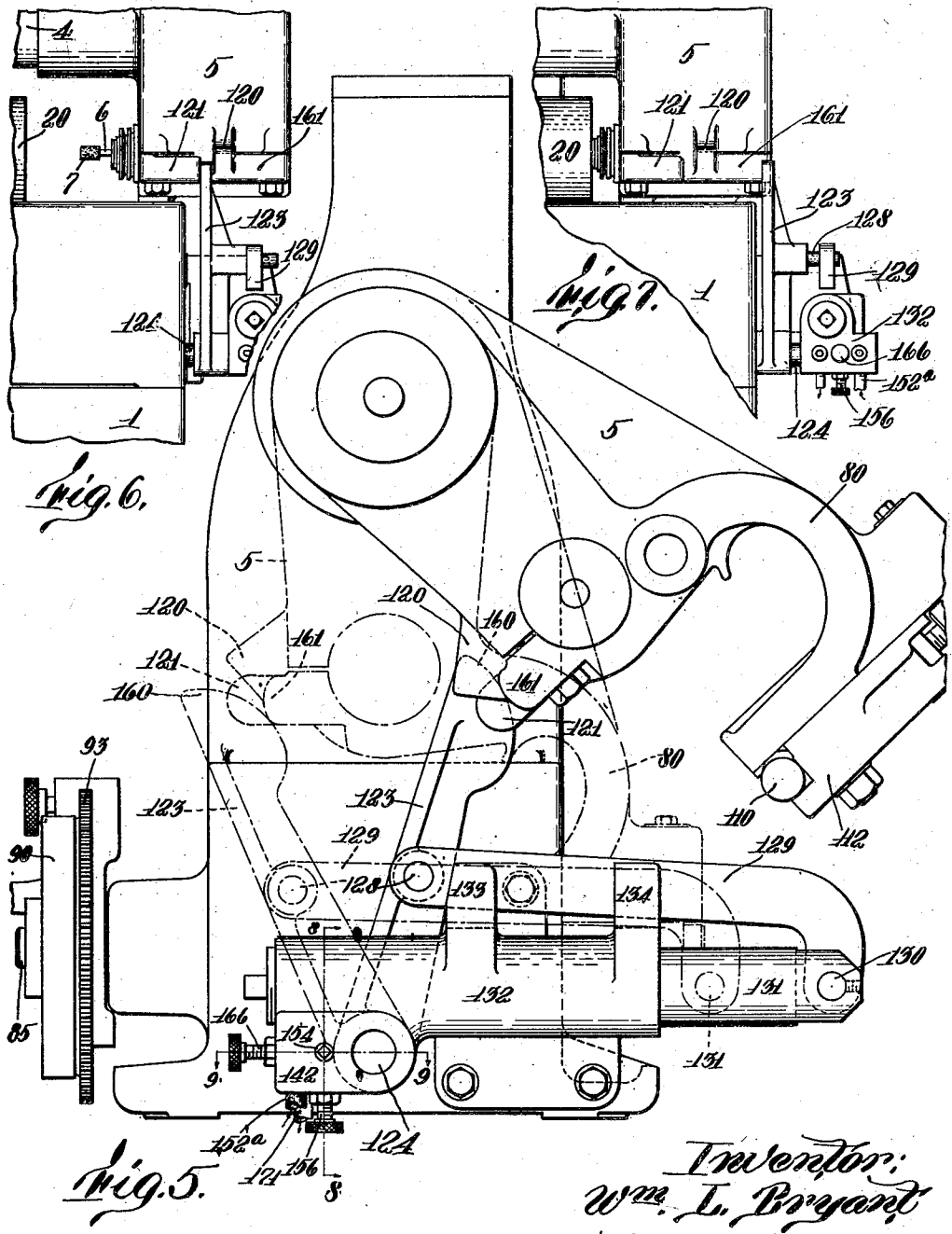

Inventor:
Wm. L. Bryant
by Wright Brown Quinby & May
Attys.

June 24, 1930. W. L. BRYANT 1,765,787

GRINDING MACHINE

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Fig. 8.

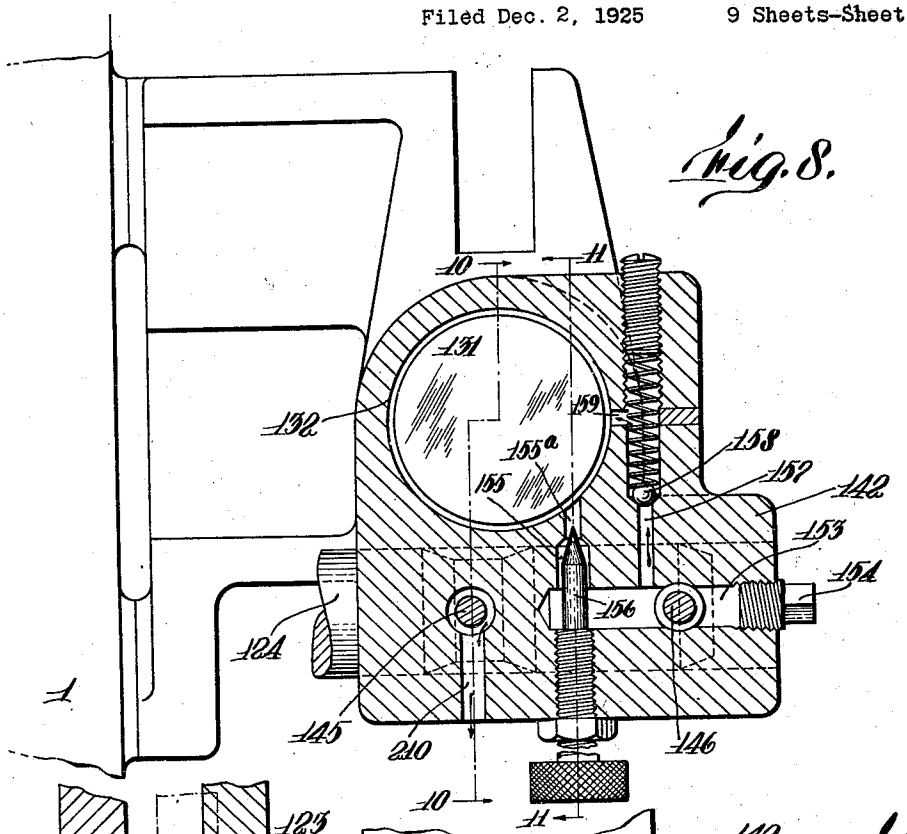
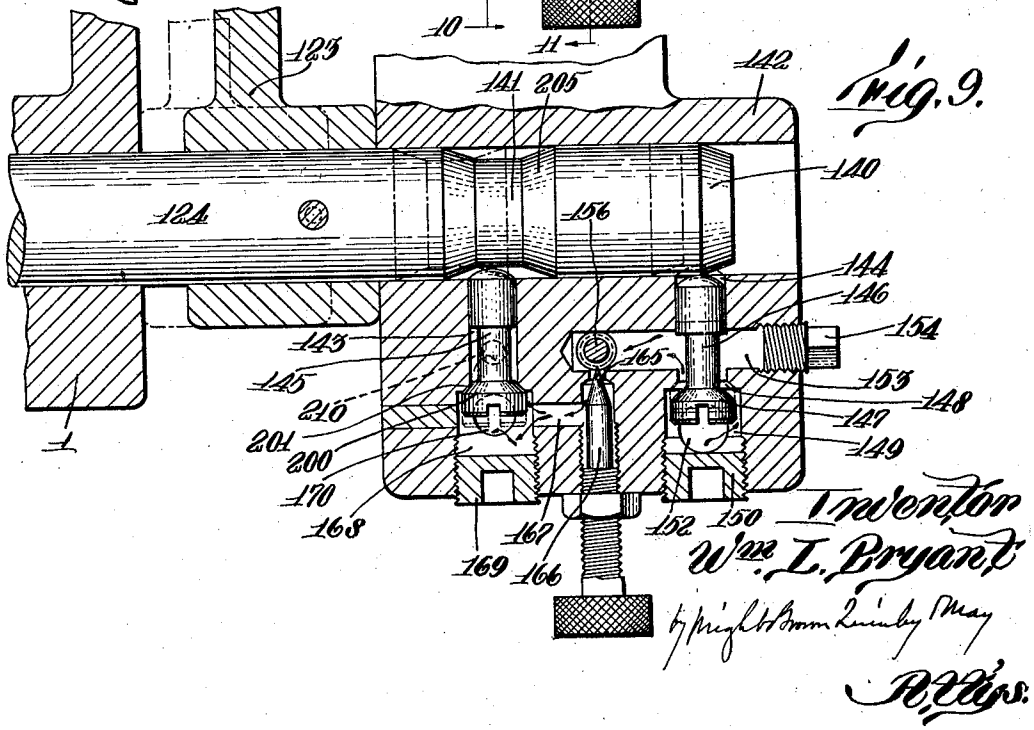


Fig. 9.



Inventor
Wm. L. Bryant
by Wright Brown Quinby & May
Attys.

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Fig. 10.

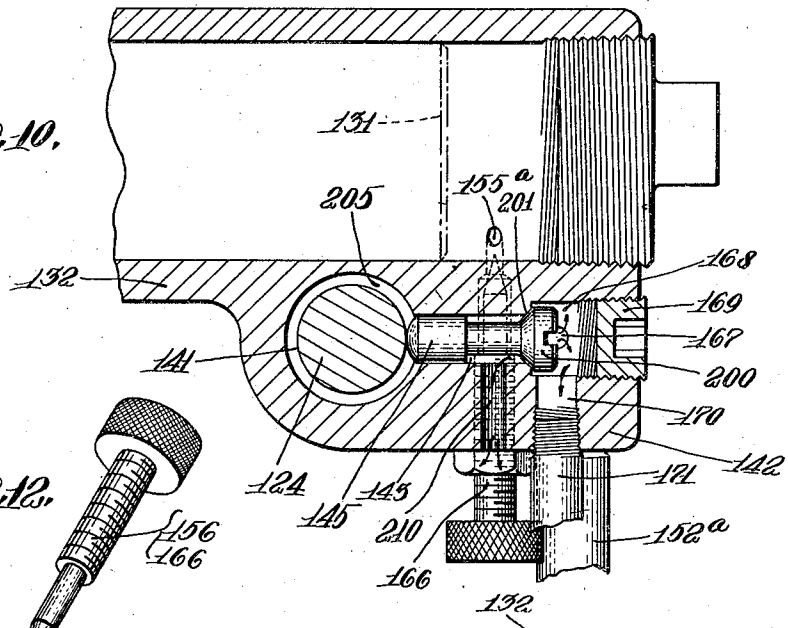


Fig. 12.

Fig. 11.

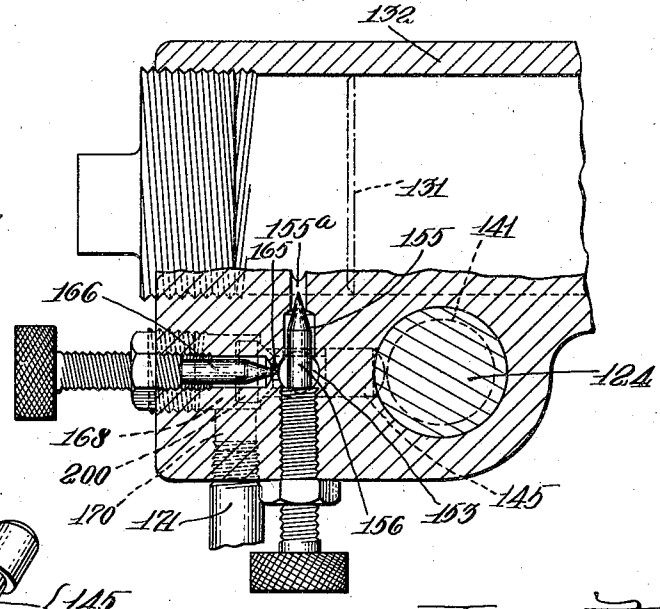
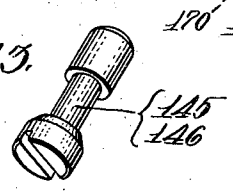


Fig. 13.



Inventor:
Wm. L. Bryant,
by Wright Brown Quinby & Mary
Attys.

June 24, 1930. W. L. BRYANT 1,765,787

GRINDING MACHINE

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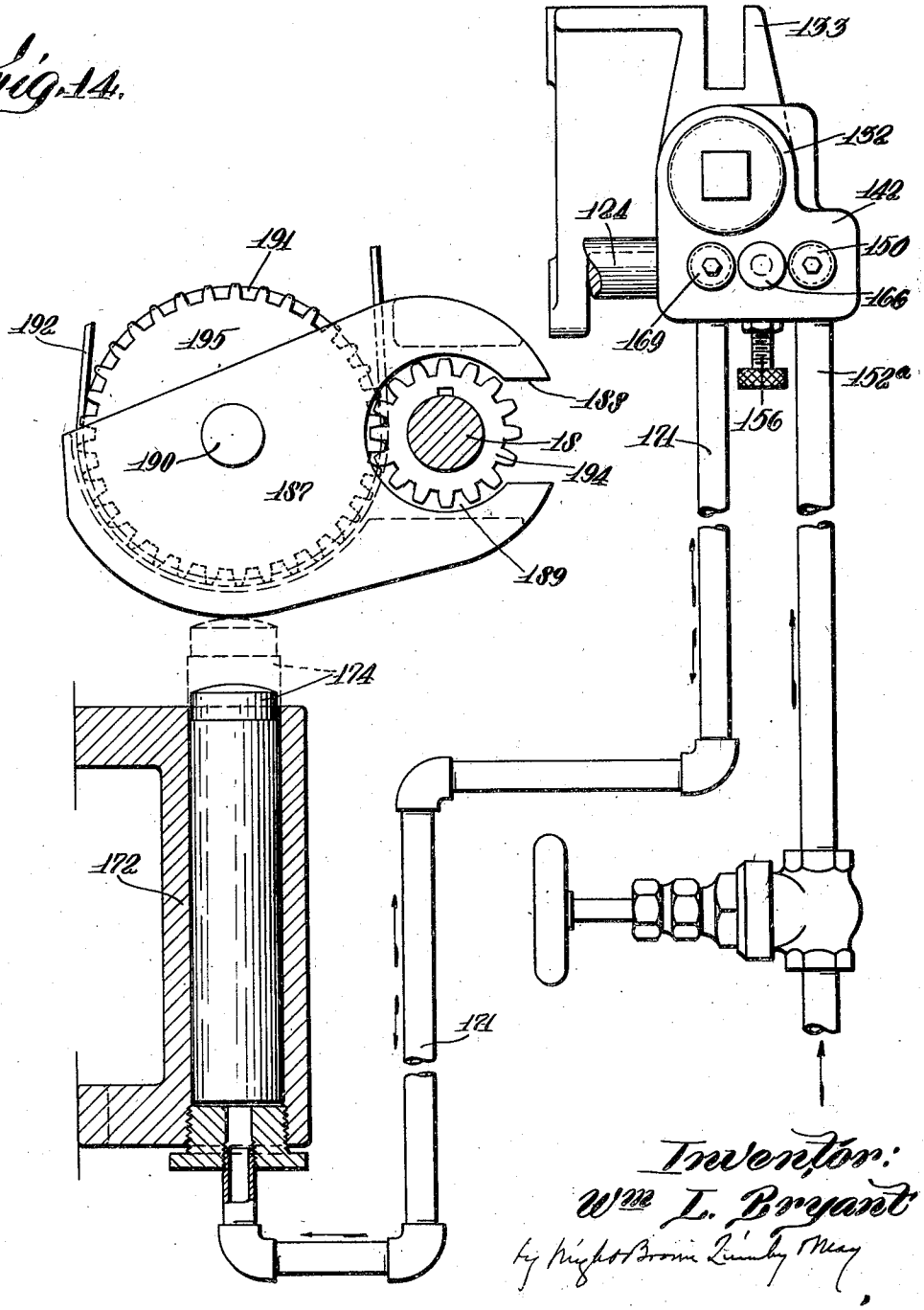
Fig. 14.



Inventor:
Wm L. Bryant
by Wright Brown Quinby & May
Attys.

June 24, 1930. W. L. BRYANT 1,765,787

GRINDING MACHINE

Filed Dec. 2, 1925 9 Sheets-Sheet 9

Fig. 15.

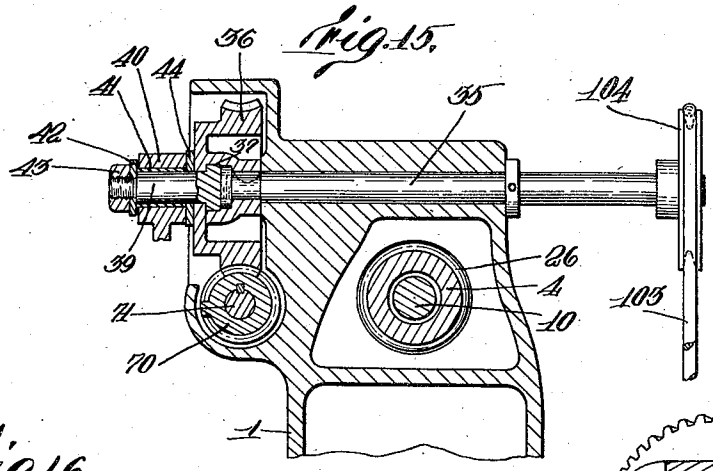


Fig. 16.

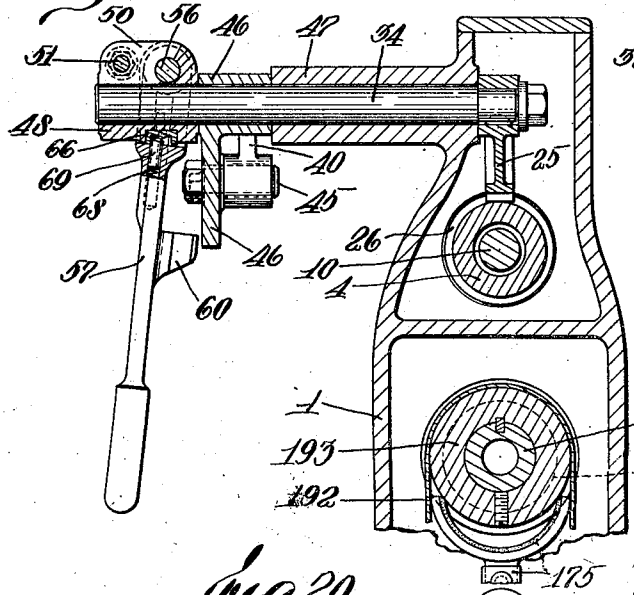


Fig. 17.

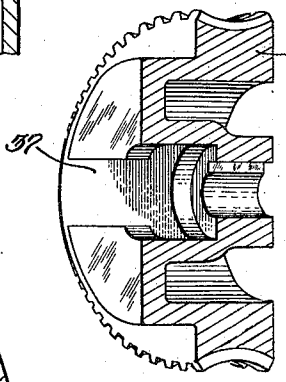
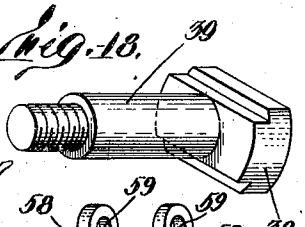


Fig. 18.



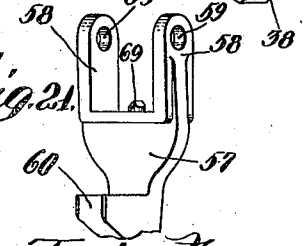


Fig. 20.

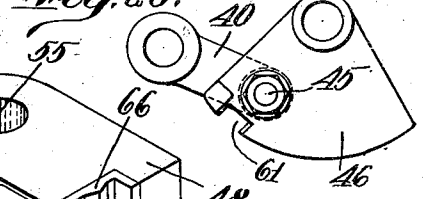


Fig. 19.

Fig. 21.

Inventor:
Wm L. Bryant,
by Wright Brown Quinby & May
Attys.

Patented June 24, 1930 1,765,787

UNITED STATES PATENT OFFICE

WILLIAM L. BRYANT, OF SPRINGFIELD, VERMONT

GRINDING MACHINE

Application filed December 2, 1925. Serial No. 72,692.

This invention relates to grinding machines more especially of that general type disclosed in my Patent No. 1,051,483, granted January 28, 1913, in which the grinding wheel is swingingly mounted, being fixed to or integral with a rock shaft which is axially reciprocable. In that patent the grinding mechanism is shown as carried by the rock shaft between a pair of supporting bearings.

According to the present invention the grinding mechanism is positioned at one side of both bearings. By making this change the floor space required for the machine has been reduced nearly one-half and a stiffer construction has been effected. Thus more machines may be placed in a given floor area and it is possible to operate these machines with a high degree of accuracy with less effort, thus giving a higher production rate for each machine.

The machine controls have also been reduced to one, which is positioned at the left of the machine so that the operator has his right hand free for other purposes, thus facilitating inspection and gaging of the work as it approaches its desired dimensions.

The grinding mechanism supporting rock shaft has also been made hollow in the present construction and the counter shaft for this grinding mechanism has been journaled therein, thus rendering the machine more compact and avoiding the necessity of an overhead shaft in order to drive the grinding mechanism. The machine may thus be made self-contained so that it can be set up wherever desired without reference to shaft arrangements in the shop.

For a more complete understanding of this invention, together with further objects and advantageous constructions, reference may be had to the accompanying drawings in which

Figure 1 is a front elevation of the machine.

Figure 2 is a left end elevation thereof.

Figure 3 is a vertical section on line 3—3 of Figure 2.

Figure 4 is a section on line 4—4 of Figure 1.

Figure 5 is a right end elevation of the upper portion of the machine.

Figures 6 and 7 are detail front elevations of the air valve and actuating mechanism, the actuating mechanism being shown in different positions in the two figures.

Figures 8 and 9 are detail sections on lines 8—8, and 9—9, respectively, of Figure 5.

Figures 10 and 11 are detail sections on lines 10—10 and 11—11, respectively, of Figure 8.

Figures 12 and 13 are perspective views of valve elements.

Figure 14 is a somewhat diagrammatic elevation showing the air valve and certain air actuated parts controlled thereby.

Figures 15 and 16 are detail sections on lines 15—15 and 16—16, respectively, of Figure 1.

Figure 17 is a sectional perspective of a worm gear shown in Figure 15.

Figure 18 is a perspective of an adjusting slide engageable with the worm gear shown in Figures 1 and 17.

Figures 19 to 21 are detail views of certain parts shown assembled in Figure 1, 2, 4 and 16.

This machine as shown best in Figures 1 and 3, comprises a standard 1 having at its upper end a pair of spaced bearing portions 2 and 3 in which is journaled and axially slidable a sleeved rock shaft 4. Outwardly of the bearings 2 and 3 this rock shaft 4 has fixed thereto an arm 5 and at the free end of this arm and arranged in parallel relation to the rock shaft 4 is a rotary shaft 6 having a grinding wheel or tool 7 on its inner end. Journaled axially within the rock shaft 4 is a countershaft 10 which extends through the rock shaft and has fixed thereto on its forward end a belt pulley 11 over which extends a belt 12 (see Figures 1 and 4) which passes about a drive pulley 13 fixed to the shaft 6 on the outer face of the arm 5. The belt 12 may be caused to wrap around a substantial arc of the pulley 13 by an adjustable spring tension device 14. At the opposite end of the counter shaft 10 is carried a belt pulley 15 over which passes a belt 16 which also engages over a long pulley 17 fixed to a power shaft 18 journaled in the lower portion of

the standard 1 in substantially parallel relation to the counter shaft 10.

Against the forward face of the standard 1 beneath the rock shaft 4 is rotatably mounted a work holder 20, as shown in Figure 3 this work holder being carried at the outer end of a shaft 21 journaled in the standard. This work holder 20 is formed as a chuck to engage the work shown at 22 so that it may be operated upon by the tool 7. In order to effect traversing movement between the tool and the work, the rock shaft 4 carrying the arm 5 is reciprocable axially and in order to effect feed of the tool relative to the work the arm 5 is adapted to be swung by rocking the rock shaft about its axis. The reciprocating means for the rock shaft which thus effects traverse of the tool is effected by means of a segment gear 25, the teeth of which mesh with annular rack teeth 26 formed on a portion of the rock shaft 4 between the bearings 2 and 3. Stops which may comprise screws 27 and 28 shown as threaded through lugs 29 and 30 extending inwardly from upright walls 31 and 32 at the upper end of the standard may be employed to limit the extent of rocking movement permitted to segment gear 25 thus to limit the amplitude of reciprocation of the rock shaft 4 and thus limit the traverse of the tool.

Provision is made by which this segment gear 25 is rocked by power during the normal operation of the machine. For this purpose the segment gear is fixed to a rock shaft 34. Journaled in the upper end of the standard 1 parallel to the rock shaft 34 is a shaft 35. This shaft 35 has fixed thereto a worm wheel 36 which as shown more particularly in Figure 17, is provided with a radially extending undercut guide portion 37 in which rides a correspondingly shaped slide block 38 (see Figure 18), this slide block being provided with a crank pin 39. This crank pin has journaled thereon one end of an arm 40, as shown best in Figures 1 and 15, this arm as shown bearing on a bushing 41 on the crank pin 39 and being retained in position thereon by means of a washer 42 and nut 43. This nut and washer also serve to press the bushing against the wear piece 44 engaging the outer face of the worm wheel 36 so as to clamp the block 38 in any adjusted position within its guideway 37. The opposite end of the arm 40 is pivotally connected as at 45 to a rock arm formed as a sector 46 which is journaled on the shaft 34 and which bears against the end of a journal post 47 extending laterally from the standard 1 as shown best in Figure 16. Outwardly of this sector 46 a block 48 is fixed to the shaft 34. As shown best in Figure 19 this block 48 has a hole 49 therethrough through which the shaft 34 passes and it is split at one side of this hole to form the jaws 50 which may be brought together to clamp the block firmly to the shaft 34 as by means of the screw 51.

This block 48 is provided also with a perforation 55 at right angles to the hole 49 to receive the pivot 56 which forms the fulcrum of a hand lever member 57. As shown in Figure 21 this lever 57 has a forked upper end, the jaws 58 of which straddle the block 48, the pivot 56 passing through perforations 59 in the upper ends of these jaws. An intermediate portion of the length of this lever 57 is provided with a laterally extending lug 60 which may be engaged in a notch 61 in the edge of the sector 46 when the lower end of the lever is swung inwardly toward the machine standard. When this is done the sector 46 is operatively connected to the rock shaft 34 so that as this sector is rocked by the link 40, rocking motion is imparted to the rock shaft 34, and the segment gear 25, effecting axial reciprocation of the sleeved rock shaft 4. If the lever 57, however, be swung outwardly to disengage the lug 60 from the notch 61, as shown in Figure 16, rocking motion of the segment 46 is idle, imparting no rocking motion to the shaft 34. When the lever is thus swung outwardly, it may be swung by hand about the axis of shaft 34 to effect rocking motion of the shaft 34 and thus effect traverse of the rock shaft 4 and consequent traverse of the tool.

The lever 57 may be held yieldingly in either of its two rocked poistions. For this purpose the block 48 is shown as provided with a notch 65 in its lower edge within which is fitted a channel shaped wear piece 66 having its base formed with a central projecting rib 67. The lever 57 is provided with a recess 68 at its upper end within which is positioned an outwardly spring pressed plunger or pin 69 which engages at its upper end against the base of this channel 67. As swinging of the lever 57 causes this plunger or pin 69 to ride over the central rib 67 of the wear piece, it is evident that the lever will tend to remain in either of its rocked positions, but may be moved forcibly from one to the other, the pin 69 first retracting against the tension of its spring and then springing outward again during this motion.

The power means for effecting traverse of the tool includes mechanism for imparting rotation to the worm wheel 36. As shown best in Figures 2 and 15 this comprises a worm 70 fixed to a shaft 71. This shaft is journaled in suitable portions of the standard beneath the worm wheel 36 and at one end has fixed thereto a belt wheel 72 over which passes a belt 73 which also passes over a belt pulley 74 carried by the power shaft 18.

It will be seen that by adjusting the position of the slide block 38 in its guideway in the worm wheel 36 the amplitude of motion imparted to the sector 46 by the link 40 may be adjusted to determine the length of and to

define limits to the traversing stroke imparted by the power mechanism, but it will also be noted that when the lug 60 is disconnected from the sector 46 the length of traverse which may be imparted by swinging the lever 57 by hand is not so limited, but is limited only by the stops 27 and 28 which are beyond the normal operating limits imposed by the adjustment of the block 38. This additional traversing movement which may be imparted to the tool by manipulation of the lever 57 not only may be availed of to remove the tool from operative relation to the work in its path of reciprocation, but according to this invention it is also availed of to effect the stopping of the rotation of the work and also to swing the rock shaft to an extent sufficient to remove the tool from in front of the work so that the work may then be freely removed from the work holder without being interfered with in any way by the tool. By this means the machine controls have been reduced to a single lever by the motion of which the power traverse may be started or stopped and, when stopped, the rotation of the work may be stopped, and the tool removed from in front of the work beyond its feed limits.

The feed of the tool is effected by rocking the arm 5 so as to move the tool laterally of its traversing movement. In order that this may be done the arm 5 is provided with an arched extension 80 which passes around one edge of and beneath a pan 81 positioned beneath the work holder 20 and the main portion of the arm 5 in which the tool shaft is journaled and beneath this pan it normally contacts with a feed mechanism being so biased by the weight of the arm and parts carried thereby. This feed mechanism may be of any suitable type, but as herein shown comprises a screw 85 threaded in a nut 86 journaled in a portion of the standard 1 as shown best in Figure 4. This screw 85 is permitted an axial movement, but is held from rotation, and carries on its inner end a head 87 which is forked to receive between the forked portions a roller 88 having a journal pin 89. The nut 86 has keyed thereto a feed wheel 90 which may be provided with handles 91 by which it may be turned. The wheel 90 is provided with teeth 93 thereon. Turning motion of the wheel 90 may be effected by means shown in Figures 1 and 2 in which the teeth 93 are engaged by a ratchet member 95 carried at the upper end of a rocker arm 96 rockable about the pivot shaft 97 with an arm 98. The free end of this arm 98 carries a roller 99 which bears on a cam 100 fixed to a shaft 101. This shaft 101 extends through the standard 1 and at its opposite end has fixed thereto a belt pulley 102 over which passes a belt 103 which passes over a belt pulley 104 fixed to the shaft 35 on which is also fixed the worm wheel 36. At each rotation of the shaft 101 the cam 100 effects a rocking motion of the arm 98 which in turn causes a step by step turning movement of the wheel 90 which thus effects a progressive intermittent inward movement of the screw 86. In order that the arm 80 may bear accurately against the roller 88 and yet be permitted to traverse, a removable adjustable wear piece to engage the roller 88 has been provided. This comprises a cylindrical bar 110 (Figure 4) positioned between clamping jaws 111 and 112, the jaw 111 being integral with the extension 80, provision being made in the well known manner for anguarly adjusting this bar 110 in order to insure proper feed positioning of the tool through its traverse.

The arm 5 opposite to its extension 80 is provided with a pair of outwardly extending lugs 120 and 121, as shown best in Figures 1, 6 and 7. When the lever 57 has been so thrown as to disengage the sector 46 it may be swung to rock the shaft 34 and effect an outward traverse of the tool sufficiently to bring the lug 121 against the upper end of a lever 123, continued traversing motion of the arm thereupon moving the lever 123 bodily into the position shown in Figure 6. This lever 123 is fixed to a rock shaft 124 so that this shaft is moved axially as the lever is moved bodily in this direction. This shaft 124 extends within the standard 1, as shown best in Figure 3, and it is normally pressed inwardly by means of a spring 125 surrounding it and bearing between a collar 126 fixed thereto and a shoulder 127 on the standard. This lever 123 is also provided with a guide pin 128 which is slidable through the end of an arm 129. This arm 129, as shown best in Figure 5, is pivoted at 130 to the outer end of a plunger 131 which is slidable within an air cylinder 132 and the arm 129 is guided against motion axially of the guide pin 128 by means of upstanding arms 133 and 134 on the cylinder 132 back of which the arm 129 passes. The rock shaft 124 has its outer end formed as a valve actuating member for certain fluid pressure motors to be later described. As shown best in Figure 9 it has at its end a conical portion 140 and inwardly from this end a portion of reduced diameter at 141. This end portion of the rock shaft slides and rocks through an extension 142 of the air cylinder 132. The extension 142 has a pair of perforations 143 and 144 arranged transversely of the axis of the rock shaft 124 and within these perforations are slidable valve plungers 145 and 146 each constructed as shown detached in Figure 13 having rounded heads which engage against the outer face of the rock shaft 124. The valve plunger 146 has formed thereon a valve 147 which may seat against a valve seat 148 in a passage 149. The outer end of this passage 149 is normally closed off by means of a threaded plug 150 and in communication

with this passage is a port 152 through which fluid under pressure may be supplied as from a pipe 152a. Above the valve seat 148 is a chamber 153, the outer end of which is normally closed by a threaded plug 154. This chamber 153 communicates through a port 155 normally partly closed by a needle valve 156 with a passage 155a leading to the interior of the cylinder 132 behind the plunger piston 131 so that as the shaft 124 is moved to the right as by the impingement of the lug 120 against the lever 123, the valve 147 is opened permitting air to pass by this valve and past the needle valve 156 into the cylinder 132. It also passes into this cylinder by a less restricted passage through a port 157 past a spring seated ball check valve 158 and through a port 159. When the valve 146 is opened to cause the air cylinders to be operated in this manner the plunger 145 engages within the reduced portion 141 of the actuating rock shaft 124 so that the valve 200 carried thereby is forced against its seat 201 by the pressure of the air within the chamber 168. This forces the plunger 131 outwardly which acts through the arm 129 to swing the lever 123 into the position shown in full lines in Figure 5. Its upper end which is formed with a curved engagement face 160, engaging a lug 161 on the arm 5 rocks this arm about the axis of the rock shaft 4 into the inoperative position shown in Figure 5 in full lines where the tool shaft 6 is laterally considerably removed from alinement with the axis of the work holder 20. When in this position the upper end of the lever 123 passes between the lugs 120 and 121 so that the lug 120 extending outwardly of the upper end of the lever 123 prevents the arm 5 from being traversed in the opposite direction sufficently to bring the tool to the work. Simultaneously with this action the air passes from the chamber 153 through a port 165 past a needle valve 166 through a passage 167 communicating with a chamber 168 having its outer end closed as by means of a threaded plug 169 and out through a port 170 with which communicates a pipe 171. This pipe leads to a pair of fluid pressure cylinders 172 and 173 shown in Figure 3. The air cylinder 172 is so arranged that when air is admitted back of its plunger 174 driving connections from the driver shaft 18 to rotate the work holder are interrupted and the cylinder 173 is so arranged that when its plunger 175 is pushed upwardly it bears against a friction wheel 177 fixed to the shaft 21 to stop the rotation of this shaft. The needle valves 156 and 166 are similar in construction and are shown in detail in Figure 12.

The mechanism for rendering inoperative the rotating driving connections between the power shaft 18 and the work holder are as follows: Referring to Figure 3 it will be seen that the shaft 18 is journaled at one end in a bearing block 180 fixed to one face of the standard 1 and that this block 180 has a hub portion 181 extending inwardly of the standard wall and having a portion 182 of reduced diameter thereon. Spaced from this reduced portion is a bearing ring 184 fixed to the standard 1 and axially slidable through this ring is a sleeve 185 having at its inner end a reduced circular portion 186. Journaled on the reduced portions 182 and 186 is a stirrup member 187, shown in end elevation in Figure 14. This stirrup member has a longitudinal slot 188 therein so that it may be placed laterally over the shaft 18 with its end portions arcuately formed as at 189 to bear on the reduced portions 182 and 186 so as to be rockably supported thereon. By moving the sleeve 185 axially to space the bearing portion 186 from the bearing portion 182 this member 187 may be placed in position over the shaft and the bearing portion 182 and the sleeve 185 may then be moved axially toward the portion 182 to bring the bearing portion 186 into bearing relation with the corresponding end of the member 187. Thus this member may be inserted or removed without requiring the removal of the shaft 18. This member 187 carries therein a shaft 190 on which is fixed a belt pulley 191 over which passes a belt 192 which also passes about a pulley 193 keyed to the work holder rotating shaft 21. The member 187 being free to rotate about the axis of the power shaft 18 as a center acts by its unsupported weight to tension the belt 192 by reason of its eccentric pivotal mounting on the shaft 18. Driving connections are employed between the shafts 18 and the shaft 190 comprising intermeshing gears 194 and 195 fixed to these shafts, respectively.

The plunger 174 of the power cylinder 172 is positioned beneath the member 187 in substantial vertical alinement with the axis of the shaft 190 and when fluid under pressure is supplied to this cylinder and the plunger raised, the member 187 is engaged by this plunger and is rocked upwardly about the axis of the shaft 18 and the tension on the belt 192 released so as to release the operative driving connections between the power shaft and the work holder rotating shaft. At the same time that this is done the cylinder 173 is also supplied with fluid under pressure and its plunger is brought up against the brake wheel 17, so that the rotation of the work holder is stopped.

The parts being in this position it is then possible for the operator by swinging the handle 57 slightly in the opposite direction to effect a slight return traverse of the arm 5, the lug 120 engaging the lever 123 and moving it axially of the rock shaft 124 until this lever is brought up against the frame of the machine as shown in Figure 7 and in dotted lines in Figure 9, this traversing action of

the shaft 124 being aided by the spring 125. When this occurs the valve 147 is permitted to close against its seat, the tapered portion 140 of the shaft 124 riding off the end of the plunger 146 and at the same time the inclined portion 205 of the shaft 124 engages the end of the plunger 145 thus unseating the valve 200, permitting the air to pass from the passage 168 to the exhaust port 210. This permits exhaust of fluid pressure from the cylinders 172 and 173 withdrawing the braking effect from the shaft 21 and permitting reestablishment of driving connections between this shaft and the power shaft 18 by reason of the downward rocking of the member 187 which acts to tension the belt 192. Likewise the fluid pressure is permitted to exhaust from the cylinder 132 but since the check valve 158 prevents exhaust through the passages 159 and 157, such exhaust must take place entirely through the port 155[a] past the needle valve 156 and also through the port 165 past the needle valve 166 into the chamber 168. Thus the exhaust from the cylinder 132 is much retarded so that the return of the plunger 131 to its inward position is relatively slow and the return of the arm 5 to its position where the bar 110 impinges on the roller 88 is made gentle so that no damaging shock is imparted to the feed mechanism when the parts finally come into contact. When the arm 5 has been returned to its position in effective relation to the feed mechanism the lug 120 is so angularly disposed relative to the lever 123, as shown in dotted lines in Figure 5, that it offers no obstruction to completing the return traverse of the tool to bring it into operative alinement or relation to the work. By effecting this return traverse to the point where the lug 60 may be brought into engagement within the notch 61, the mechanism is then connected for power traverse of the tool.

The power shaft 18 may be driven in any suitable manner but as herein shown it is provided with a belt pulley 220 over which passes a belt 221, which, as best shown in Figure 2, passes about a drive pulley 223 to a motor 224 having its base pivoted at 225 to the standard 1 near its base and held up in proper relation thereto by the pivoted clamping screw 226.

Having thus described an embodiment of this invention it should be evident to those skilled in the art that various changes and modifications may be made therein without departing from its spirit or scope as defined by the appended claims.

I claim:

1. A machine of the class described comprising a pair of spaced bearings, a sleeved rock shaft journaled in said bearings, an arm fixed to said rock shaft outwardly of one of said bearings, a rotary shaft journaled in said arm, a tool actuated by said rotary shaft, a counter shaft journaled in said rock shaft, and driving connections between said counter and rotary shafts.

2. A machine of the class described comprising a pair of spaced bearings, a sleeved rock shaft journaled in said bearings, an arm fixed to said rock shaft outwardly of said bearings, a rotary shaft journaled in said arm in substantially parallel relation to said rock shaft, a rotary tool fixed to said rotary shaft, a counter shaft journaled in said rock shaft, and driving connections between said counter and rotary shafts beyond one end of said rock shaft.

3. A machine of the class described comprising a standard, a pair of spaced bearings carried by said standard, a sleeved rock shaft journaled in said bearings and extending on opposite sides thereof, an arm fixed to one end of said rock shaft beyond said bearings, a rotary shaft journaled in said arm, a tool fixed to the inner end of said rotary shaft, a counter shaft extending axially through said rock shaft, driving connections from one end of said counter shafts to said rotary shaft, a rotary work holder carried by said standard to hold work in operative relation to said tool, a drive shaft, and driving connections from said drive shaft to said counter shaft and to said work holder.

4. In a machine of the class described, a tool, power means, a rock arm connected to be rocked by said power means, a rock shaft operatively connected to said tool, and a hand lever carried by said rock shaft and movable into and out of operative engagement with said arm.

5. In a machine of the class described, a tool, power means, operative connections between said tool and power means comprising a rock member, an element rockable to actuate said tool, and a lever pivoted to said rock element and swingable into and out of engagement with said rock member, whereby when said lever is in such engagement said power means actuates said tool, said lever being hand actuable when out of such engagement to actuate said tool.

6. In a machine of the class described, a tool, power means, operative connections between said tool and power means comprising a rock member, an element rockable to actuate said tool, a lever pivoted to said rock element and swingable into and out of engagement with said rock member, whereby when said lever is in such engagement said power means actuates said tool, said lever being hand actuable when out of such engagement to actuate said tool, and means tending to retain said lever in either of its rocked positions.

7. In a machine of the class described, a tool, power means, and operative connections between said power means and tool comprising a pair of rock members, one of said mem-

bers connected to be rocked by said power means and the other member rockable to actuate said tool, and means for operatively connecting and disconnecting said members.

8. In a machine of the class described, a tool, power means, and operative connections between said power means and tool comprising a pair of rock members, one of said members connected to be rocked by said power means and the other member rockable to actuate said tool, and a lever pivoted to one of said members and swingable into and out of engagement with the other of said members, whereby said power means may be operatively connected or disconnected from said tool.

9. In a machine of the class described, a tool, power means for traversing said tool, and an operator controlled member actuable to operatively connect and disconnect said tool and power means and also actuable when said power means is disconnected to traverse said tool.

10. In a machine of the class described, a tool, power means, and operative connections between said means and tool acting to move said tool, said connections including a hand lever movable to disconnect said means and tool and actuable by hand when so moved to move said tool.

11. In a machine of the class described, a tool, power means for reciprocating said tool, and an operator-actuable member actuable to operatively connect and disconnect said power means and tool and operable when said power means is disconnected to reciprocate said tool.

12. In a machine of the class described, a tool, power means for reciprocating said tool between limits, and operator-actuable means for operatively connecting and disconnecting said power means and tool and operable when said power means is disconnected to reciprocate said tool and beyond one of said limits, and means acting when said tool has been moved beyond said one limit for moving said tool laterally.

13. In a machine of the class described, a tool, means for reciprocating said tool, and means acting on movement of said tool in its reciprocation beyond a predetermined limit to move said tool laterally of its reciprocation.

14. In a machine of the class described, a reciprocatory and rotary tool, a power shaft, connections from said shaft for rotating said tool, and connections from said shaft for reciprocating said tool between limits, said reciprocating connections including an operator-controlled member actuable to operatively associate or disassociate said shaft and tool, said member being actuable when in disassociating position to reciprocate said tool.

15. A machine of the class described comprising an axially movable rock shaft, an arm carried by said shaft, a tool carried by said arm, power means for reciprocating said rock shaft to effect traversing movements of said tool within prescribed limits, means actuable by the operator to operatively disconnect or connect said power means and rock shaft, and also actuable to reciprocate said rock shaft independently of said power means when said power means is operatively disconnected and beyond one of said limits, and means acting when said shaft is moved beyond said one limit to rock said shaft and swing said tool away from the work.

16. A machine of the class described comprising a reciprocable rock shaft, an arm carried by said rock shaft, a rotary shaft journaled in said arm, a tool carried by said rotary shaft, a power shaft, driving connections between said power shaft and rotary shaft, means actuated by said power shaft for reciprocating said rock shaft between limits, said means comprising a member actuable by the operator to render operative or inoperative said reciprocating means, said member being actuable when said reciprocating means is inoperative to reciprocate said shaft and beyond one of said limits, and means acting when said shaft is moved beyond said one limit to rock said rock shaft.

17. In a machine of the class described, a reciprocatory tool, a rotary work holder, means for rotating said holder, means for reciprocating said tool, and fluid pressure means acting when said tool is reciprocated beyond a predetermined normal limit for rendering inoperative said work holder rotating means.

18. In a machine of the class described, a reciprocatory tool, a rotary work holder, means for rotating said holder, means for reciprocating said tool, and fluid pressure means acting when said tool is reciprocated beyond a predetermined normal limit for rendering inoperative said work holder rotating means and for stopping its rotation.

19. In a machine of the class described, a movable tool, a rotatable work holder, means for rotating said holder, means for moving said tool, and fluid pressure means actuated on an abnormal movement of said tool for rendering inoperative said rotating means.

20. In a machine of the class described, a movable tool, a rotatable work holder, means for rotating said holder, means for moving said tool, and fluid pressure means actuated on an abnormal movement of said tool for rendering inoperative said rotating means and for stopping the rotation of said holder.

21. In a machine of the class described, a movable tool, a rotatable work holder, means for rotating said holder, means for moving said tool, and fluid pressure means actuated on an abnormal movement of said tool for rendering inoperative said rotating means

and for moving said tool from its working position.

22. In a machine of the class described, a reciprocable tool, means for moving said tool between normal limits of reciprocation, means actuable to move said tool beyond one of said limits, and means acting when said tool is moved beyond said one limit to move said tool out of the path of its reciprocation.

23. In a machine of the class described, a reciprocable tool, means for moving said tool between normal limits of reciprocation, means actuable to move said tool beyond one of said limits, means acting when said tool is moved beyond said one limit to move said tool out of the path of its reciprocation, and means preventing operative reciprocation of said tool when it is out of such path.

24. In a machine of the class described, a reciprocatory tool movable laterally of its direction of reciprocation, a rotary work holder, means for rotating said work holder, means for reciprocating said tool, and means acting on movement of said tool in its reciprocation beyond a predetermined limit to render inoperative said rotating means and to move said tool laterally away from said work holder.

25. In a machine of the class described, a reciprocatory tool movable laterally of its direction of reciprocation, a rotary work holder, a power shaft, means actuated by said power shaft for rotating said holder, means actuated by said power shaft for reciprocating said tool, said reciprocating means including a member actuable by the operator to render operative or inoperative said reciprocating means, said member also being operative to effect a lateral movement of said tool.

26. In a machine of the class described, a reciprocatory tool movable laterally of its direction of reciprocation, a rotary work holder, a power shaft, means actuated by said power shaft for rotating said holder, means actuated by said power shaft for reciprocating said tool, said reciprocating means including a member actuable by the operator to render operative or inoperative said reciprocating means, and a brake for stopping the rotation of said work holder, said member also being operative to effect a lateral movement of said tool and to actuate said brake.

27. In a machine of the class described, a reciprocable tool, a rotary work holder, a power shaft, connections from said shaft for rotating said work holder, connections from said shaft for reciprocating said tool between limits, and reciprocation connections including an operator-controlled member actuable to associate or disassociate said shaft and tool, said member being actuable when in its disassociating position to reciprocate said tool beyond one of said limits, and means acting automatically when said tool is moved beyond said limit to render inoperative said reciprocating connections.

28. In a machine of the class described, a reciprocable tool, a rotary work holder, a power shaft, connections from said shaft for rotating said work holder, connections from said shaft for reciprocating said tool between limits, said reciprocation connections including an operator-controlled member actuable to associate or disassociate said shaft and tool, said member being actuable when in its disassociating position to reciprocate said tool beyond one of said limits, and means acting automatically when said tool is moved beyond said limit to render inoperative said reciprocating and rotary connections.

29. In a machine of the class described, a reciprocable tool, a rotary work holder, a power shaft, connections from said shaft for rotating said work holder, connections from said shaft for reciprocating said tool between limits, said reciprocation connections including an operator controlled member actuable to associate or disassociate said shaft and tool, said member being actuable when in its disassociating position to reciprocate said tool beyond one of said limits, and means acting automatically when said tool is moved beyond said limit to render inoperative said reciprocating connections and to apply a braking force to stop the rotation of said work holder.

30. A machine of the class described comprising a pair of spaced bearings, a sleeved rock shaft journaled in and slidable in said bearings, a counter shaft journaled axially within said rock shaft and movable axially therewith, an arm carried at one end of said rock shaft beyond said bearings, a rotary shaft journaled in said arm, a tool carried on the inner end of said rotary shaft, driving connections between the outer end of said rotary shaft and said counter shaft outwardly of said arm, a power shaft, means including a lever for effecting reciprocation of said rock shaft between limits to cause working traverses of said tool, said lever being operator-actuable to render inoperative said effecting means and also actuable to reciprocate said rock shaft and beyond one of said limits, means for rocking said rock shaft to effect feed of said tool, and means acting when said rock shaft is moved beyond said one limit to rock said rock shaft to move said tool beyond the limits of its feed to remove it from operative alinement with the work.

31. A machine of the class described comprising a pair of spaced bearings, a sleeved rock shaft journaled in and slidable in said bearings, a counter shaft journaled axially within said rock shaft and movable axially therewith, an arm carried at one end of said rock shaft beyond said bearings, a rotary shaft journaled in said arm, a tool carried on the inner end of said rotary shaft, driving

connections between the outer end of said rotary shaft and said counter shaft outwardly of said arm, a power shaft, means including a lever for effecting reciprocation of said rock shaft between limits to cause working traverses of said tool, said lever being operator-actuable to render inoperative said effecting means and also actuable to reciprocate said rock shaft and beyond one of said limits, means for rocking said rock shaft to effect feed of said tool, means acting when said rock shaft is moved beyond said one limit to rock said rock shaft to move said tool beyond the limits of its feed to remove it from operative alinement with the work, and means for preventing operative reciprocation of said rock shaft while said tool remains out of operative alinement.

32. A machine of the class described comprising a tool holder, a tool carried by said holder, means normally in contact with said holder and movable to effect feed movements of said tool, and power means actuable to move said holder out of contact with said feeding means to an inoperative position.

33. A machine of the class described comprising a swingable tool holder, a feed mechanism against which said tool holder normally engages by its weight and actuable to swing said holder upwardly, and means actuable to swing said tool holder out of contact with said feed mechanism, and actuable to permit the retarded return of said holder into such contact.

34. A machine of the class described comprising a movable tool holder, a feed mechanism against which said tool holder is biased to contact, and means comprising a fluid pressure motor actuable to remove said holder from said mechanism, said motor having a restricted exhaust to cause return of said holder into contacting relation to be gently effected.

35. In a machine of the class described, a rotatable work holder, a tool movable substantially parallel to the axis of rotation of said work holder to effect working pressures of the tool on work carried by said holder, means for moving said tool laterally of its traversing movement to feed it relative to the work, means to rotate said work holder, and means actuable to move said tool laterally beyond its feeding range when at the end of its stroke when in operative relation to the work, and to stop the rotation of said tool holder.

36. In a machine of the class described, a rotatable work holder, a tool movable substantially parallel to the axis of rotation of said work holder to effect working pressures of the tool on work carried by said holder, means for moving said tool laterally of its traversing movement to feed it relative to the work, means to rotate said work holder, fluid pressure means actuable to stop the rotation of said work holder and to move said tool laterally beyond said feeding range, and a valve for controlling said fluid pressure means, said valve being automatically actuated on traversing movement of said tool beyond a predetermined point out of operative relation to the work.

37. In a machine of the class described, a rotatable work holder, a tool for acting on work carried by said holder, and a single member actuable by the operator to stop the rotation of said work holder and to cause removal of the tool from work carried thereby.

38. In a machine of the class described, a rotatable work holder, a tool arranged to traverse work carried by said holder, an operator-actuable member for effecting traverse of said tool, and means acting automatically on traverse of said tool to a predetermined point out of operative relation to the work to stop the rotation of said work holder and to move said tool laterally of its direction of traverse away from the work.

39. In a machine of the class described, a rotatable work holder, a tool for acting on work carried by said holder, and power means for rotating said work and for actuating said tool, said machine including a single member actuable by the operator to stop said actuation of said tool, to cause removal of said tool from the work and to stop the rotation of said tool holder.

40. In a machine of the class described, a rotatable work holder, a tool for acting on work carried by said holder, and power means for rotating said work and for actuating said tool, said machine including a single member actuable by the operator to stop said actuation of said tool, to cause removal of said tool from the work, and to stop the rotation of said tool holder, and to cause return of the tool, rotation of the work, and power actuation of said tool.

41. A machine of the class described comprising a bearing, a sleeved rock shaft journaled in said bearing, an arm carried by one end portion of said shaft at one side of said bearing, a rotary shaft journaled in said arm, a tool carried by said rotary shaft, a counter shaft journaled in said rock shaft, and driving connections between said counter and rotary shafts.

42. A machine of the class described comprising a bearing, a reciprocable rock shaft journaled in said bearing, an arm carried by one end portion of said shaft at one side of said bearing, a tool carried by said arm, means for supporting work, means for reciprocating said shaft to effect operative traverse of the work by said tool, and means for rocking said shaft to effect feed and retractive movements to said tool.

43. A machine of the class described comprising a pair of spaced bearings, a rock shaft mounted for axial movement in said bearings,

an arm carried by said rock shaft outwardly of one of said bearings for movement with said rock shaft, a tool carried by said arm, and means for supporting work in position to be operated on by said tool.

44. A machine of the class described comprising a pair of spaced bearings, a sleeved rock shaft journaled in said bearings and axially reciprocable therein, an arm fixed to said rock shaft, a rotary shaft journaled in said arm, a rotary tool carried by said rotary shaft, a counter shaft journaled in said rock shaft, and driving connections between said counter shaft and said rotary shaft.

45. A machine of the class described comprising a pair of spaced bearings, a rock shaft journaled in said bearings, an arm rockable with said shaft and movable lengthwise of the axis of said shaft, a tool carried by said arm, a counter shaft journaled in said rock shaft, and driving connections between said counter shaft and said tool.

46. A machine of the class described comprising an arm, a pair of fixed bearings for supporting said arm for pivotal movement and movement lengthwise of its pivotal axis, a tool carried by said arm, a counter shaft coaxial with said pivotal axis, and driving connections from said counter shaft to said tool.

47. A machine of the class described comprising a bearing, an arm supported by said bearing for rocking and axial movement relative to said bearing, a tool carried by said arm, a counter shaft journaled coaxilly with said bearing, and driving connections from said counter shaft to said tool.

In testimony whereof I have affixed my signature.

WILLIAM L. BRYANT.