H. D. AGNEW.

GRINDING AND POLISHING MACHINE.

APPLICATION FILED JULY 5, 1916.

1,248,051.

Patented Nov. 27, 1917.

10 SHEETS—SHEET 1.

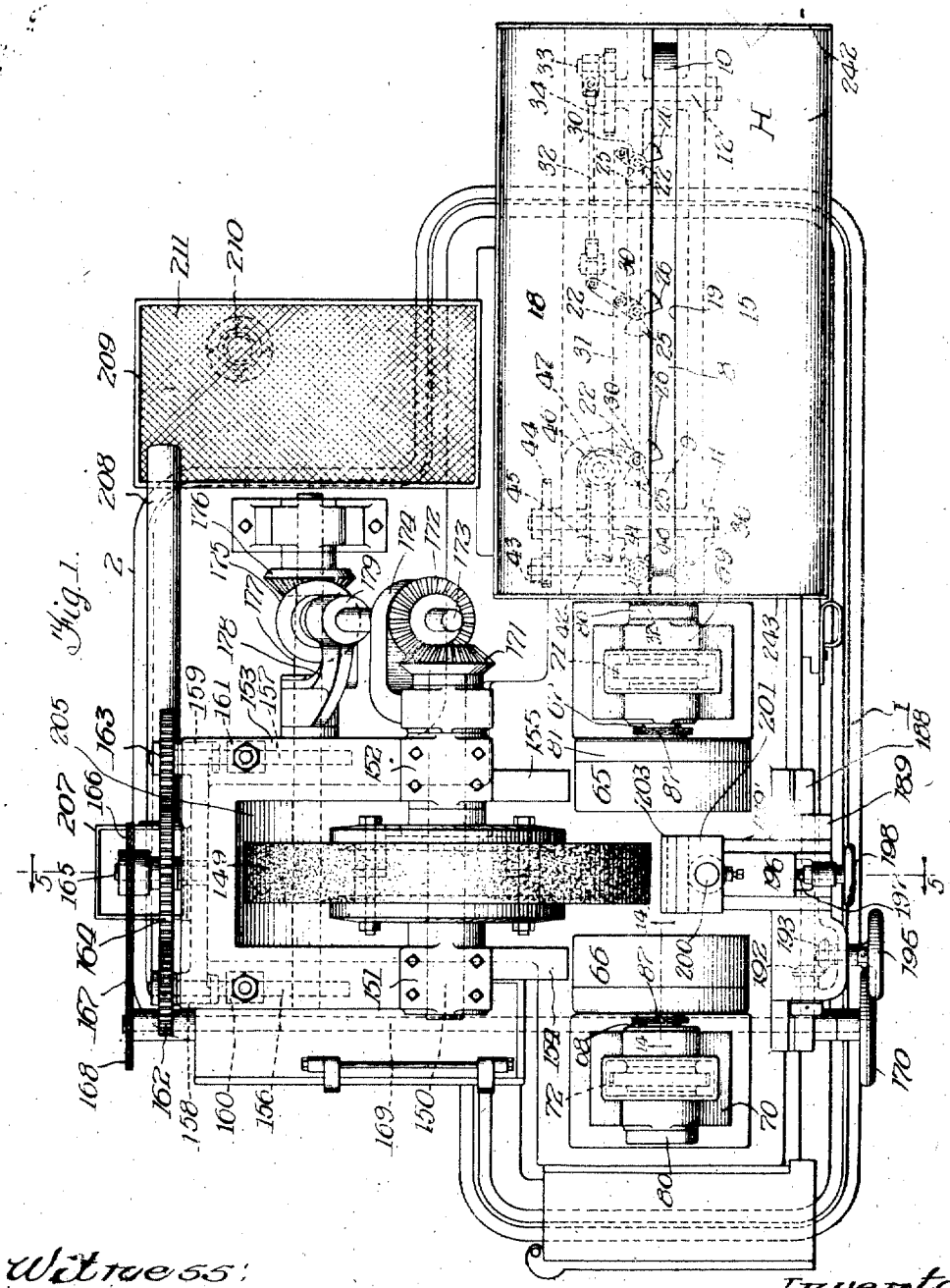

Fig. 1.

Witness:

Geo. C. Dorsey

Inventor

Henry D. Agnew

By George Capel Jones

Atty.

H. D. AGNEW.

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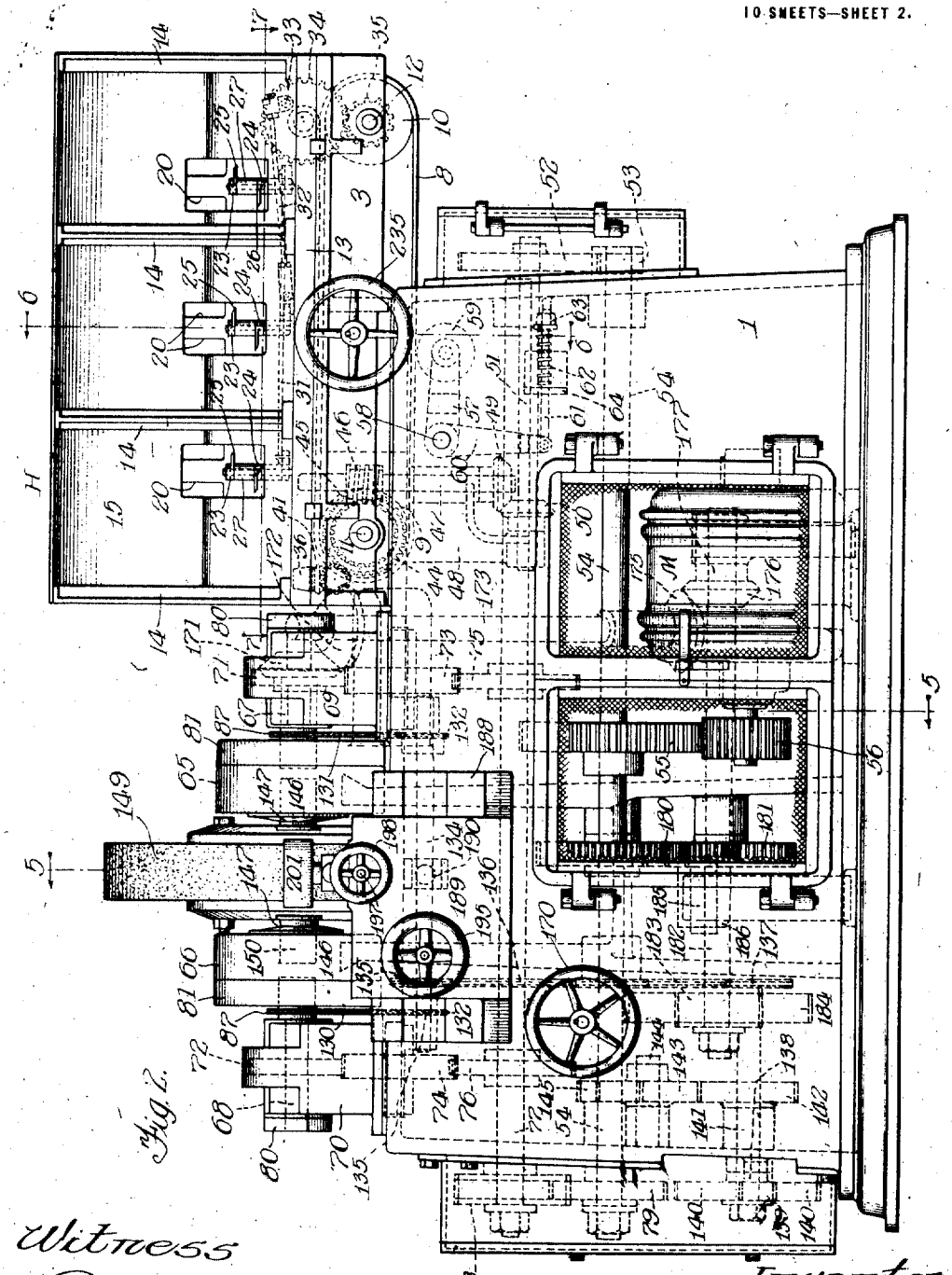

Fig. 2.

Witness

Inventor

Henry D. Agnew

By Geo. Bagnall Jones Atty.

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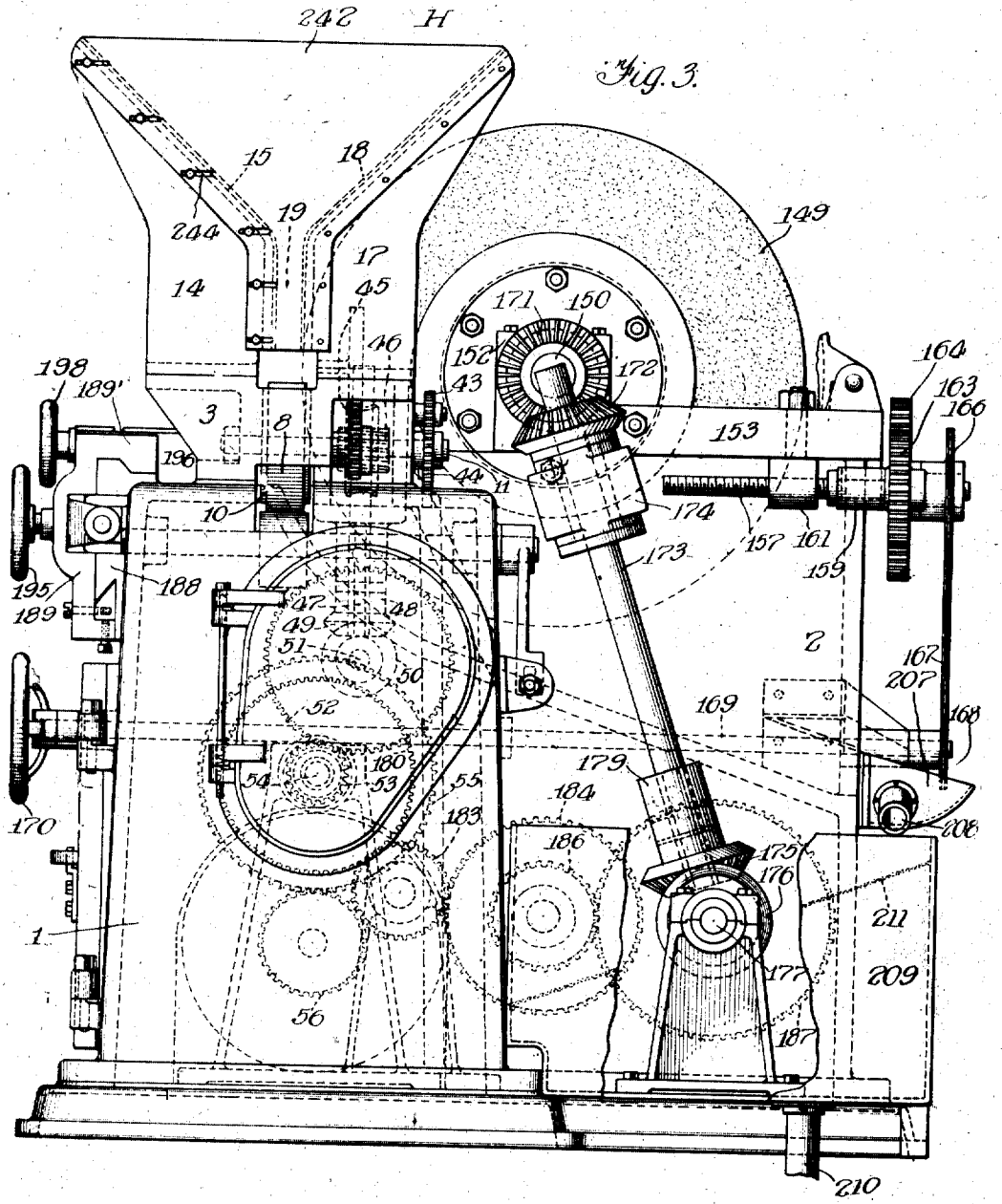

Fig. 3.

Witness

Fred. C. Dixon

Inventor

Henry D. Agnew

By George Bayard Jones

Atty.

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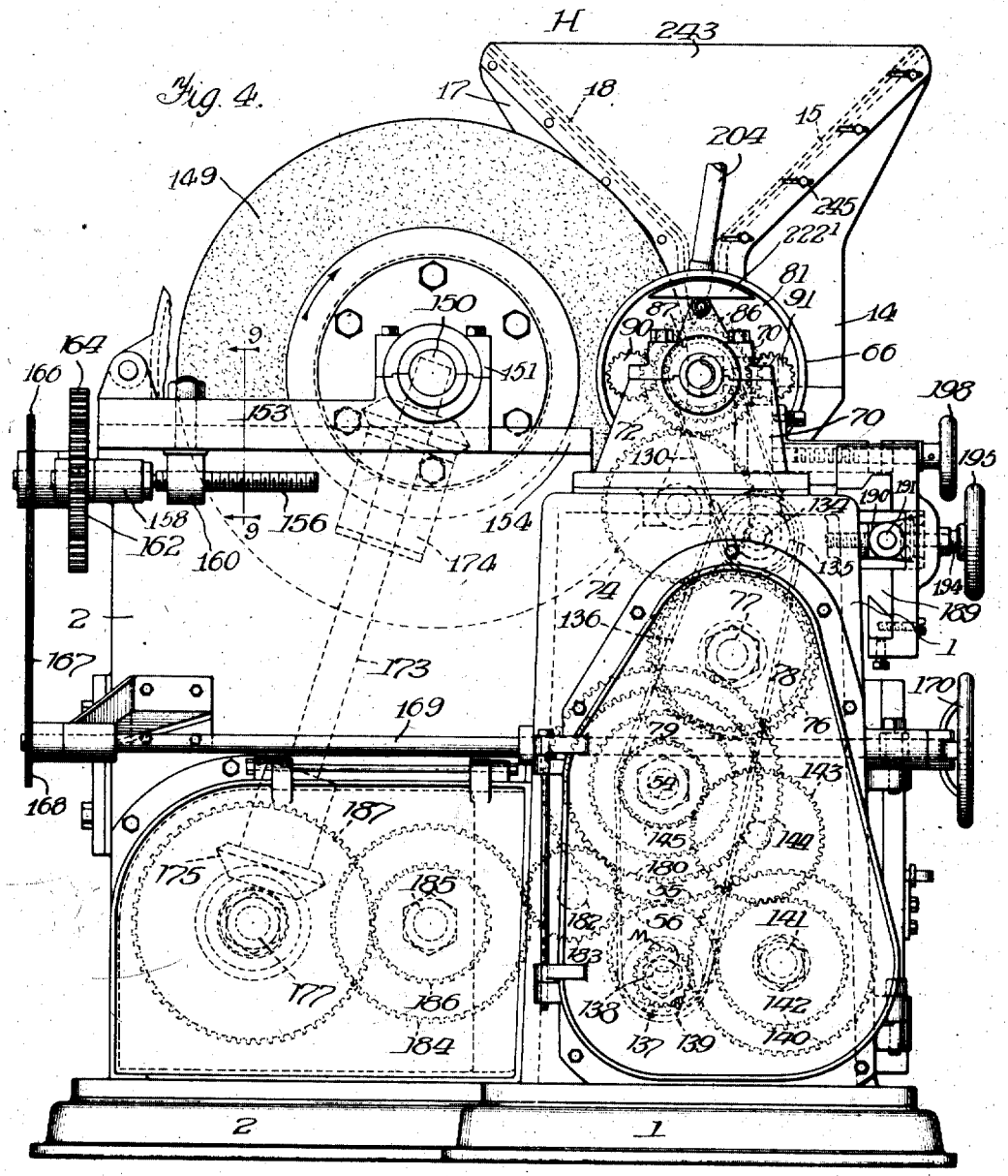
10 SHEETS—SHEET 4.

Fig. 4.



Witness

Fred C. Dawson

Inventor

Henry D. Agnew

By George Bayard Jones,

Atty.

H. D. AGNEW.

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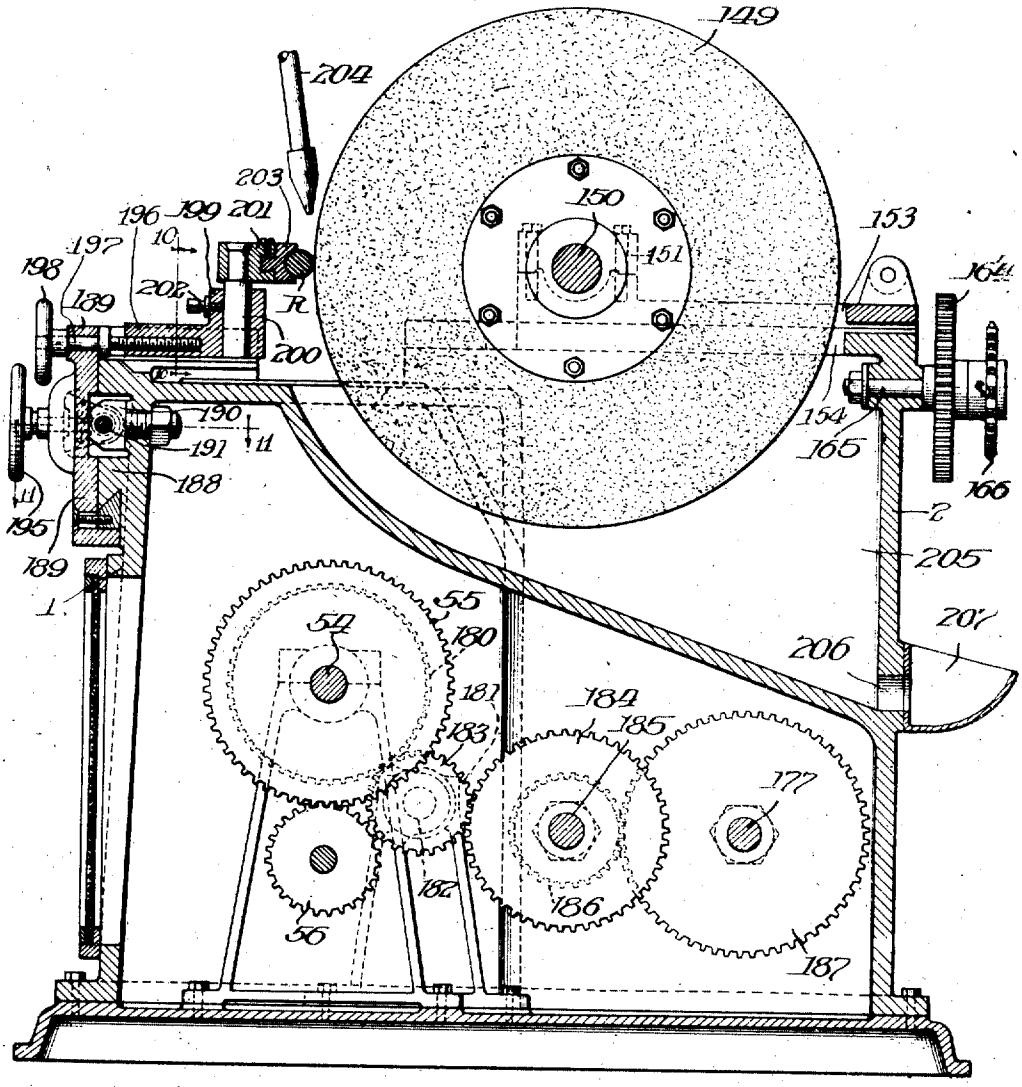
10 SHEETS—SHEET 5.

Fig. 5.



Witness:

Inventor

Henry D. Agnew

By

H. D. AGNEW.

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10 SHEETS—SHEET 6.

Fig. 6.

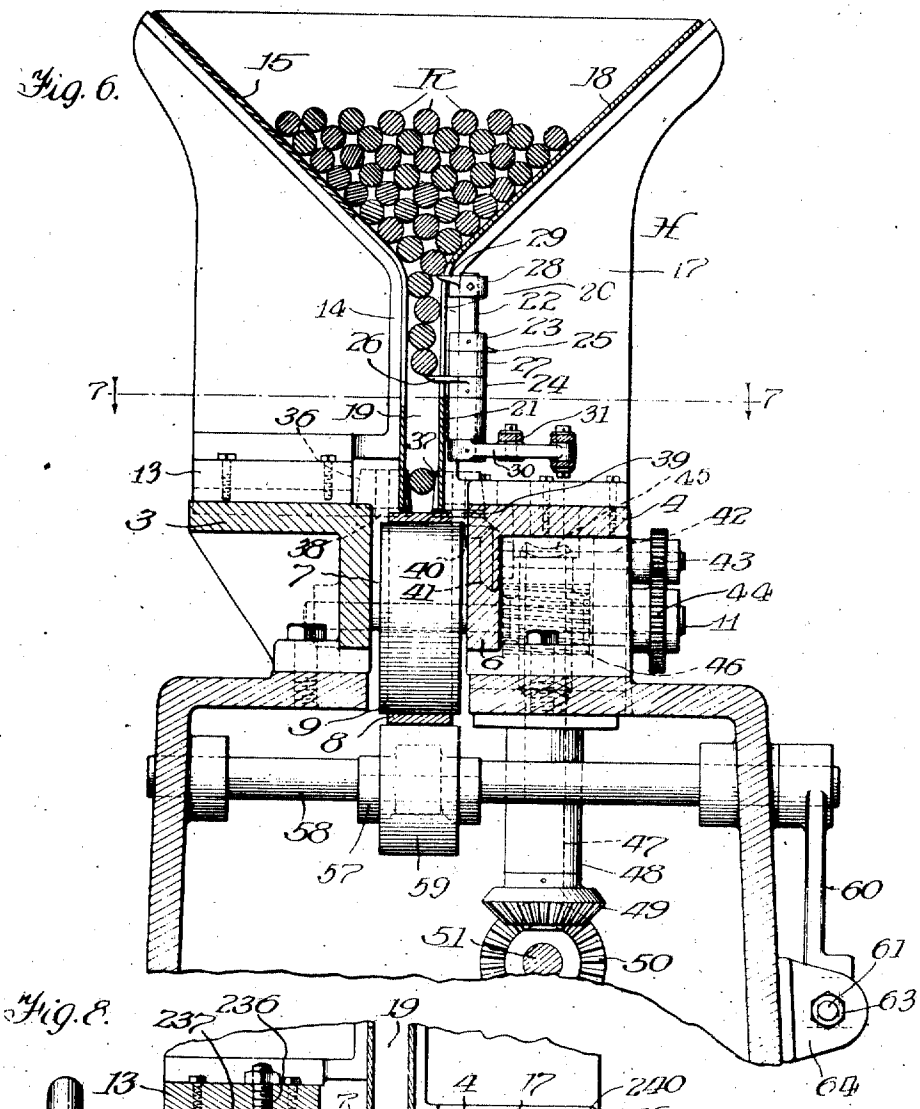
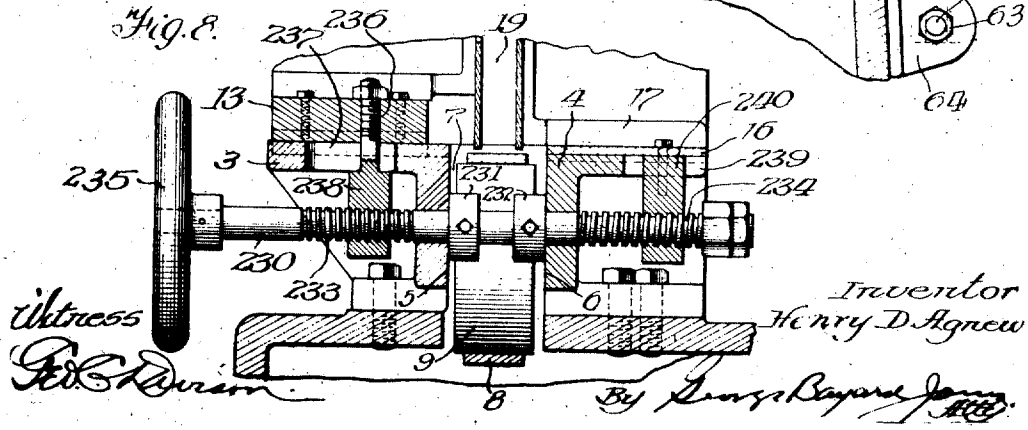


Fig. 8.



Witness

Inventor

Henry D. Agnew

By

H. D. AGNEW.

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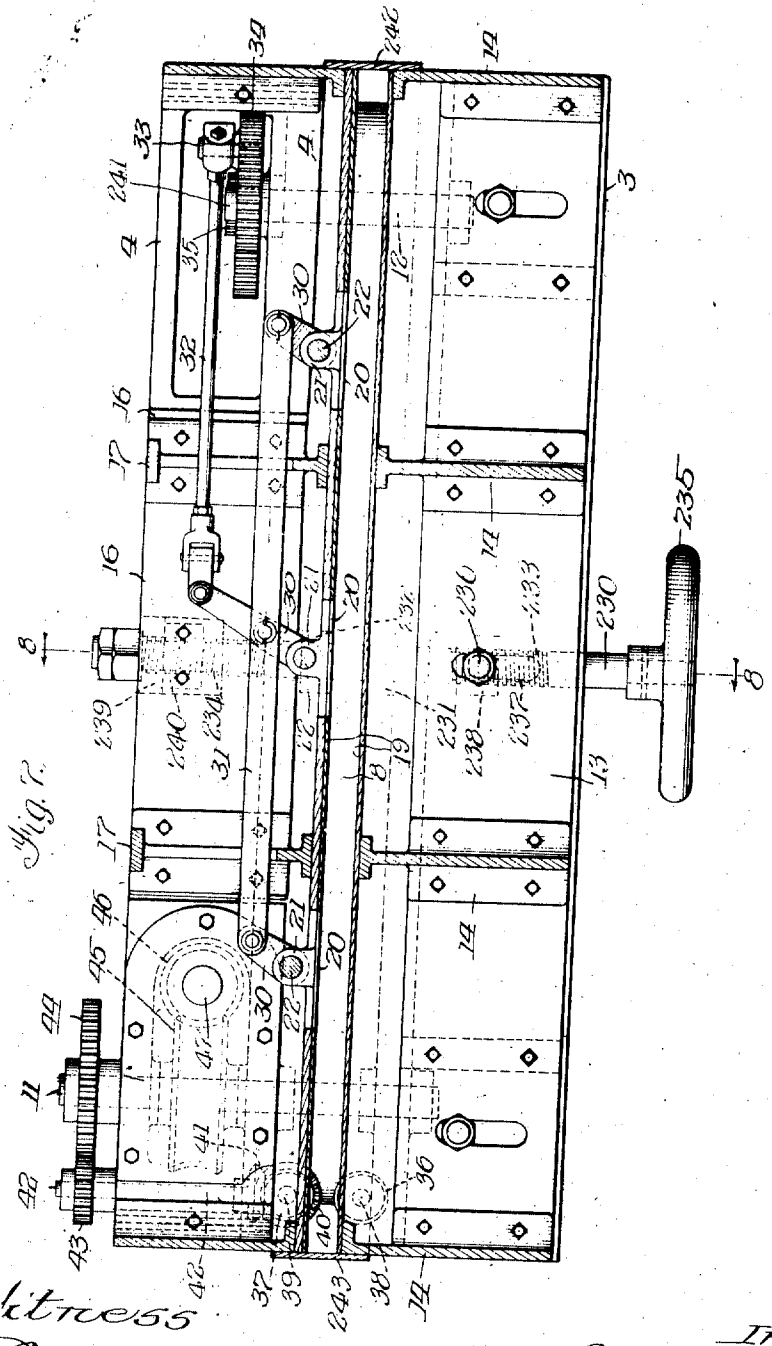

Fig. 7.

Witness

F. C. Dorion

Inventor

Henry D. Agnew

By George Bagard Jones Atty

H. D. AGNEW.

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10 SHEETS—SHEET 8.

Fig. 9.

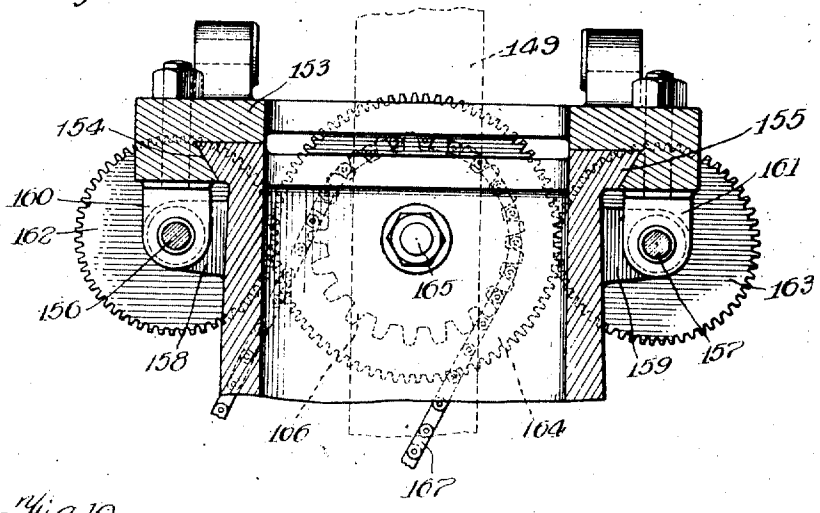
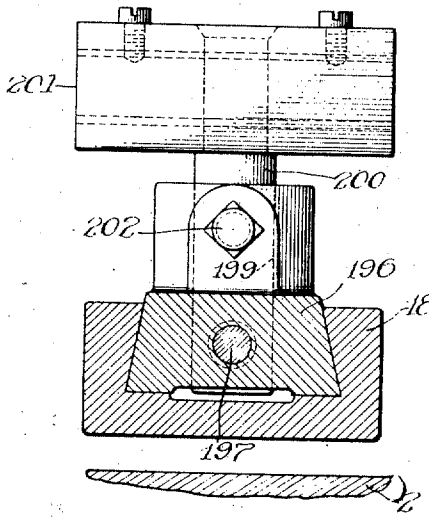


Fig. 10.



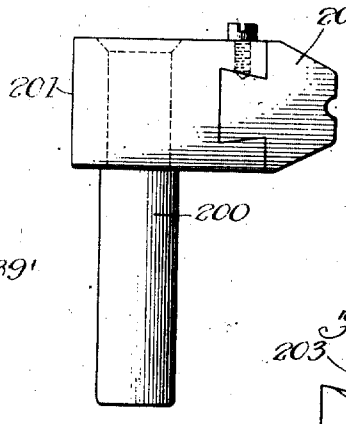


Fig. 12.

Fig. 13.

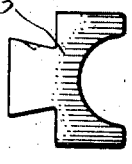
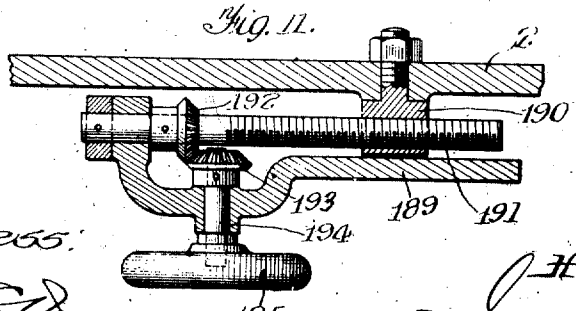


Fig. 11.



Witness:

Inventor

Henry D. Agnew

By George Ogard Jones Atty.

H. D. AGNEW.

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10 SHEETS—SHEET 9.

Fig. 15.

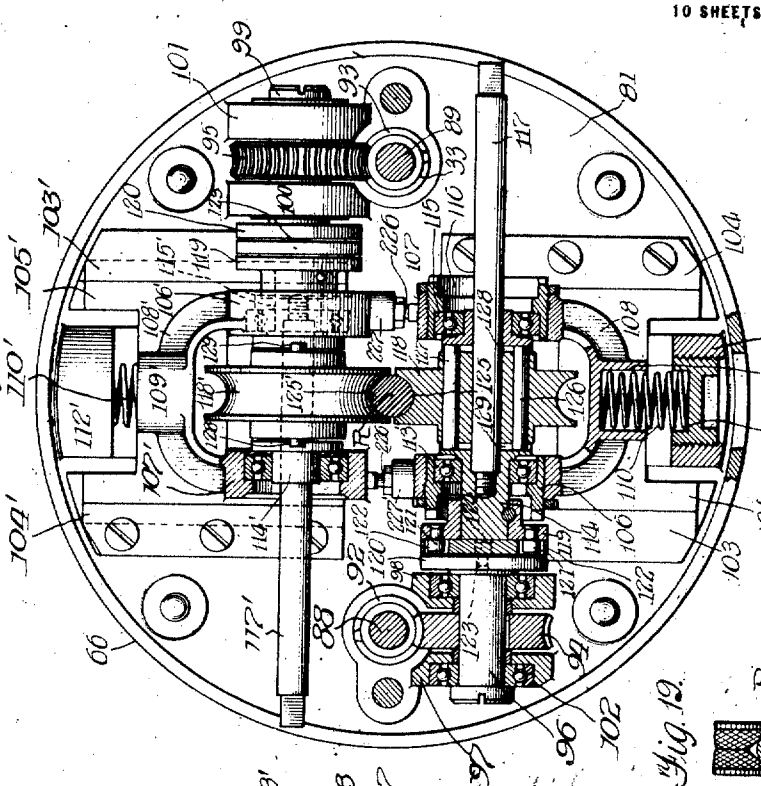


Fig. 12.

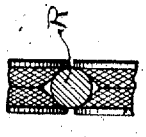
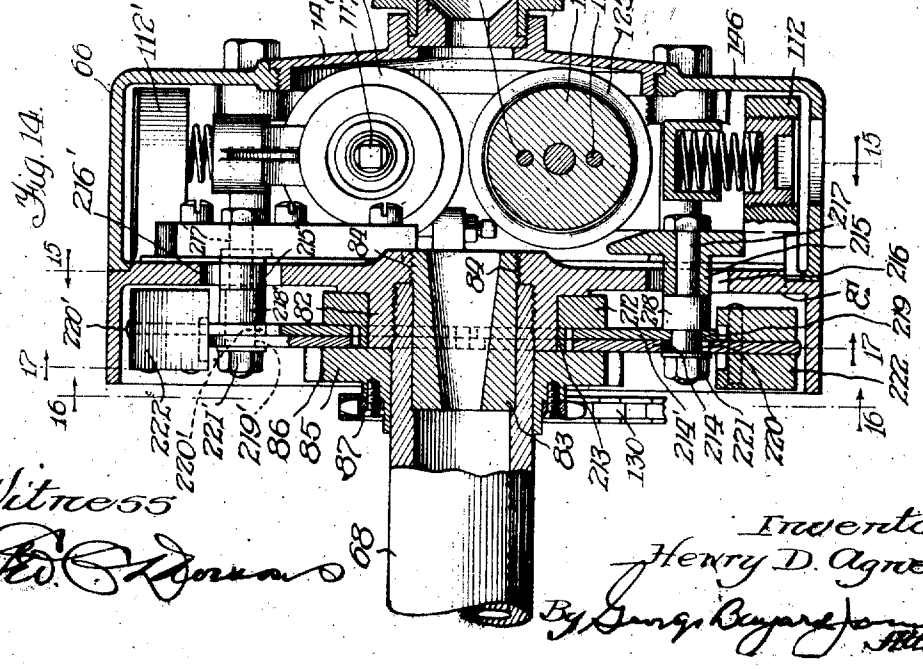


Fig. 14.



Witness

Inventor

Henry D. Agnew

By George Bryan & Co.

Attys

H. D. AGNEW.

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APPLICATION FILED JULY 5, 1916.

1,248,051. Patented Nov. 27, 1917.

10 SHEETS—SHEET 10.

Fig. 17.

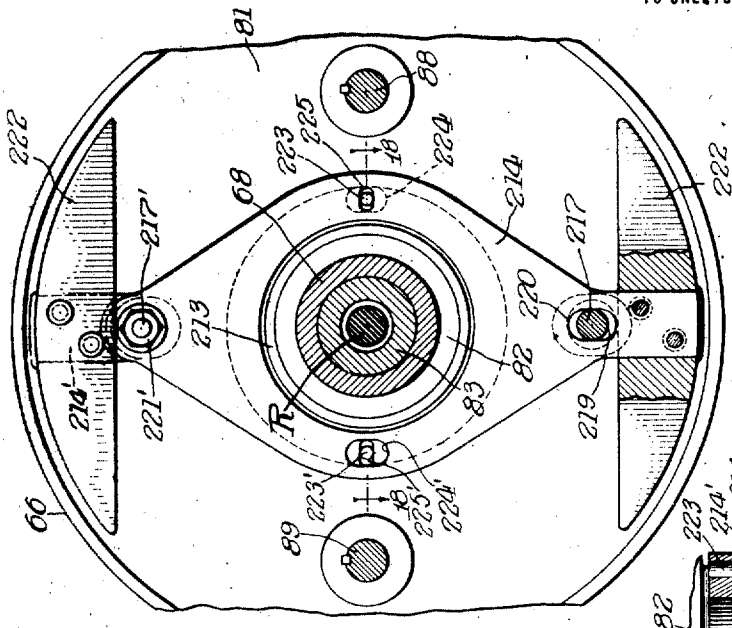


Fig. 18.

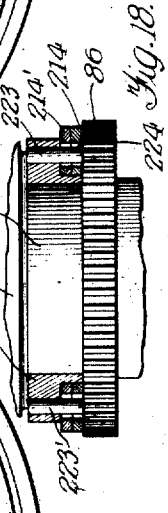
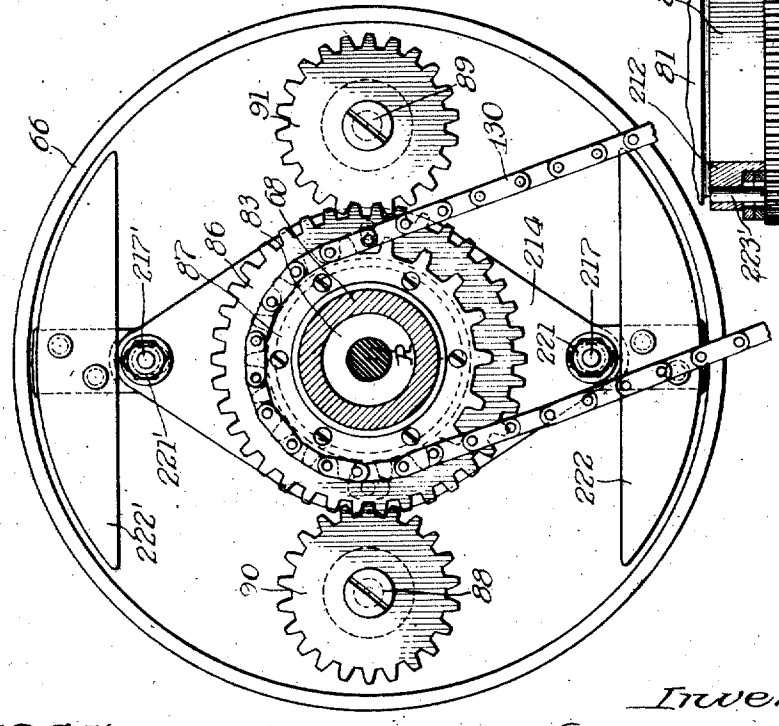


Fig. 16.



Witness:

Inventor

Henry D. Agnew

By George Bayard Jones Atty

UNITED STATES PATENT OFFICE.

HENRY D. AGNEW, OF OAK PARK, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

GRINDING AND POLISHING MACHINE.

1,248,051. Specification of Letters Patent. Patented Nov. 27, 1917.

Application filed July 5, 1916. Serial No. 107,590.

To all whom it may concern:

Be it known that I, HENRY D. AGNEW, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grinding and Polishing Machines, of which the following is a full, clear, concise, and exact description.

This invention relates to a machine for grinding and polishing rods or tubes of material such as hard rubber, fiber, or the like.

In the electrical art, particularly telephony, the various manually operated switch mechanisms are provided with actuating handles or buttons which are usually of hard rubber, and a great number of insulating bushings, thimbles, disks, washers, etc., are utilized. Such insulating parts can readily be cut from hard rubber rods or tubes and then readily turned down to exact shape when necessary. Some of these insulating devices, particularly the handles or buttons for circuit controlling mechanisms, should be ground down and polished in order to provide smooth surfaces for the fingers. The object of my invention is therefore to produce an efficient machine for rapidly grinding and polishing the outer cylindrical surfaces of rods or tubes from which the insulating devices are cut.

Generally speaking, the machine is constructed with a hopper to receive the charge of rods or tubes, from which hopper the rods or tubes are fed one by one into chucks which rapidly rotate the rods or tubes around their longitudinal axes adjacent a rapidly revolving grind-stone which engages the rods and tubes, the chucks being provided with feed mechanism for advancing the rods longitudinally past the stone during axial rotation thereof, the rods or tubes being delivered from the chucks with their cylindrical surfaces smoothed and polished, the finished rods being then cut transversely to produce the sleeves, disks, washers or the like, or to produce blanks which are turned down to form the handles or buttons for manually operated circuit devices.

Provision is also made for adjusting the hopper, the chucks, and the grind-stone for the treatment of rods or tubes of different diameters.

A machine embodying the various features of the invention is represented on the accompanying drawings in which—

Figure 1 is a plan view of the machine,

Fig. 2 is a front elevational view thereof,

Fig. 3 is a side view looking from the right,

Fig. 4 is a side view looking from the left,

Fig. 5 is a sectional view on plane 5—5, Figs. 1 and 2,

Fig. 6 is an enlarged sectional view on plane 6—6, Fig. 2,

Fig. 7 is a plan view on plane 7—7, Figs. 2 and 6,

Fig. 8 is a sectional view on plane 8—8, Fig. 7,

Fig. 9 is an enlarged sectional view on plane 9—9, Fig. 4,

Fig. 10 is an enlarged sectional view on plane 10—10, Fig. 5,

Fig. 11 is an enlarged sectional view on plane 11—11, Fig. 5,

Fig. 12 is a side view of the supporting head and stem shown in Fig. 10,

Fig. 13 is a side elevational view of a modified form of guide block,

Fig. 14 is an enlarged sectional view on plane 14—14, Fig. 1,

Fig. 15 is a sectional view on plane 15—15, Fig. 14,

Fig. 16 is a sectional view on plane 16—16, Fig. 14,

Fig. 17 is a sectional view on plane 17—17, Fig. 14,

Fig. 18 is a sectional view on plane 18—18, Fig. 17, and

Fig. 19 shows feed rollers with triangular grooves.

The supporting frame for the machine comprises the front section 1 on which the chute and chuck members are mounted, and the section 2 on which the grindstone is mounted. On the frame section 1 at the right end thereof the hopper structure H is mounted. Beams 3 and 4 of right-angular cross-section are mounted in parallelism on top of the frame part 1 at the right end thereof with their vertical sides 5 and 6 separated to provide the space 7 for a belt

8 which is carried by pulleys 9 and 10 on shafts 11 and 12 respectively, which are journaled in the beam sides 5 and 6. On the horizontal flange of the beam 3 is mounted a plate 13 which supports a row of brackets 14 to which the one side 15 of the hopper H is secured. The horizontal flange of the beam 4 carries a plate 16 on which is mounted a row of brackets 17 for supporting the other side wall 18 of the hopper. The upper sections of the hopper sides deflect outwardly but the lower sections are parallel and separated to leave the vertical passageway 19 for the tubes or rods R to be treated. The upper limb of the belt runs along directly below the passageway 19 to receive the rods and to convey them one at a time to chuck mechanism which will be described later.

In order to feed the rods one at a time to the belt escapement mechanism is provided. The side wall 18 of the hopper has a row of openings 20 and below each opening is a bearing sleeve 21 for journaling a vertical shaft 22. Secured to each shaft are upper and lower collars 23 and 24 from which extend respectively the escapement blades 25 and 26, the collars being separated by a spacer sleeve 27 on the shaft. At the upper end of each shaft is a collar 28 having an agitating wing 29. Crank arms 30 secured to the lower ends of the respective shafts extend parallelly outwardly and pivot to a bar 31. As shown, the middle crank arm 30 is extended beyond its pivotal connection with the bar 31 and has pivotal connection with one end of a connecting rod 32, the other end of the rod being pivoted to the crank pin 33 on a gear 34 which meshes with a pinion 35 on the belt pulley shaft 12. As this shaft turns, the gear 34 will be rotated and the middle crank arm will be rocked, such rocking movement being transmitted to the other crank arms by the bar 31. The angular spacing of the escapement blades on the shaft collars and the angle of rock is such that the blades 25 and 26 will alternately enter through the openings 20, the lower blades being swung alternately below and away from the lowermost rod and the upper blades being alternately swung away from and below the next rod, such operation restricting the rods to drop one by one to the bottom of the passageway 19 to the conveyer belt. The wings 29 at the upper ends of the shafts are alternately swung into and out of the openings 20 to agitate the rods and to prevent packing or jamming thereof.

At the inner end of the passageway 19 adjacent the lower end thereof are the feed rollers 36 and 37 whose surfaces are conical in order to readily receive between them the inner ends of the rods, as clearly shown in Fig. 6. The feed roller 36 is pivoted on shaft 38 supported on the rear hopper section, while the other roller 37 is secured to shaft 39 supported on the front hopper section. At its lower end this shaft carries a bevel gear 40 which meshes with the bevel gear 41 on shaft 42 which at its rear end has secured a gear 43. This gear meshes with the gear 44 mounted on the rear end of the belt pulley shaft 11, this shaft mounting also a worm wheel 45. The driving worm 46 for the worm wheel is mounted on vertical shaft 47 which is journaled in the bracket structure 48. The lower end of the shaft carries the bevel gear 49 which meshes with the gear 50 secured on the inner end of counter shaft 51, this shaft being journaled in the bracket structure 48 and in the outer wall of supporting frame section 1, the outer end of the shaft carrying a gear 52 which is engaged by the pinion 53 on the outer end of the main shaft 54. This main shaft carries the gear 55 driven by the pinion 56 on the shaft of electric motor M mounted within the frame section 1. Rotation of shaft 11 results in propulsion of the belt 8, operation of the escapement mechanism and drive of the feed rollers 36 and 37, these rollers coöperating with the belt to shift the rods longitudinally toward the left into the chuck mechanism in which they are rapidly rotated in front of a grinding stone. In order to keep the belt tight I have shown belt tightener mechanism. As best shown in Figs. 2 and 6, the arm 57 mounted on the shaft 58 journals at its front end the roller 59, and depending from the shaft at the rear end thereof is the arm 60 engaged by the pull bar 61 which is encircled by a spring 62 abutting between the nut 63 on the rod and the bracket 64, the arrangement being such that the roller 59 is held pressed against the lower leg of the belt.

The rods are fed one at a time into the chuck mechanism and are fed slowly through the chuck mechanism and during transit therethrough are rapidly rotated while they are being ground. Chucks 65 and 66 are mounted on the inner ends of hollow shafts 67 and 68 respectively, these shafts being journaled in bearing frames 69 and 70 mounted on the frame structure 1, as clearly shown in Figs. 1 and 2. The shafts carry respectively the gears 71 and 72 which mesh with intermediate gears 73 and 74 driven by the gears 75 and 76 on the counter shaft 77, a gear 78 on this shaft meshing with the gear 79 on the main shaft 54 whose driving gear 55 meshes with the motor pinion 56. The shafts being hollow and coincident with the path of the rods delivered from the chute, the rods enter shaft 67 and then pass through the chucks 65 and 66 and then

through shaft 68 from which they are delivered, the entrance end of the shaft 67 being preferably provided with a beveled entrance thimble 80. The two chucks are of substantially identical construction and in Figs. 14 to 18 the construction of chuck 66 is shown. The main supporting disk 81 of the chuck has the internally threaded flange 82 extending therefrom concentric with its center and receiving the threaded inner end of the hollow shaft 68, a thimble 83 extending into the shaft end and having threaded engagement in the central opening 84 of the disk 81, the thimble having a conical bore for guiding rods into the shaft 68. Journaled on the shaft 68 is a hub 85 which at its inner end supports the gear 86 and which at its outer end supports the sprocket wheel 87. At diametrically opposite sides of the gear 86 the shafts 88 and 89 are journaled in the disk 81 and carry respectively gears 90 and 91 which mesh with the gear 86. At their inner ends the shafts support worms 92 and 93 which mesh with worm wheels 94 and 95 respectively. The worm wheel 94 is secured on shaft 96 which is journaled in the brackets 97 and 98 extending inwardly from the disk 81. Likewise, worm wheel 95 is mounted on the shaft 99 journaled in brackets 100 and 101 extending inwardly from the disk, ball bearings 102 being preferably provided to reduce friction. The axes of the shafts are parallel and at equal distances to one side of the center of the disk 81. Secured to the inner face of disk 81 and extending at right angles with the axis of shaft 96 are the guide blocks 103 and 104 in which the plate 105 is slidable radially on the disk and from the inner end of the plate at the sides thereof bearing frames 106 and 107 extend at right angles and are connected by a yoke 108. Centrally of this yoke is the pocket 109 extending radially outwardly for receiving a compression spring 110, the other end of the spring resting in the pocket of a plug 111 having threaded engagement with the annular shelf 112 extending inwardly from the disk 81. The spring by acting against the yoke tends to force the plate 105 radially inwardly and the bearing frames thereon. In frame 106 is a ball bearing 113 which receives the hub 114, while in frame 107 is the ball bearing 115 which receives the hub 116. A shaft 117 extends centrally through the hub 116 and at its inner end has threaded engagement with the hub 114, and between the hubs the shaft supports the feed roller 118. The inner end of hub 114 carries a coupling head 119 and the adjacent end of shaft 96 carries a coupling head 120, the coupling head 119 having coupling pins 121 for engaging in the holes 122 of the coupling head 120 and the coupling head 120 having coupling pins 123 for engaging in the holes 124 of the coupling head 119. With this arrangement the rotation of shaft 96 is transmitted to the hubs and to shaft 117.

Diametrically opposite the guide blocks 103 and 104 are similar guide blocks 103′ and 104′ for a plate 105′ which carries the bearing frames 106′ and 107′ connected by a yoke 108′, a spring 110′ tending to force the plate with the bearings radially inwardly. The bearing frames journal the hubs 114′ and 115′ which receive the shaft 117′, the arrangement being exactly the same as in connection with the shaft 117, the shaft 117′ being connected with the shaft 99 by the coupling heads 119 and 120. Between the bearing frames the shaft 117′ journals the feed roller 118′, this feed roller being in the same radial plane as the roller 118 and the rollers having the peripheral grooves 125 and 125′ respectively which, in Fig. 15, are of semi-circular cross-section, the opposed grooves coöperating to receive and engage with the cylindrical sides of the rods R traveling therebetween. The semi-circular grooves of the rollers in the first chuck through which the rod is fed, are knurled to insure a firm grip on said rod. The corresponding grooves in the roller in the second chuck are smooth to avoid marring the smooth surface of said rods after they have been ground accurately to the desired diameter. In order that the rollers may be renewed or in order that other rollers may be substituted to provide different shape or different size passageway therebetween for the rods, the hub of each roller has pins 126 and 127 extending therethrough beyond the sides thereof for engaging in cross slots 128 and 129 in the inner faces of hubs 114 and 155 respectively. To remove a roller its supporting shaft is unscrewed at its inner end from the hub and the shaft is then withdrawn whereupon the rollers can be slid from between the hubs. To re-insert a roller its pin ends are first slid into the cross slots of the hub and then the shaft is inserted and screwed into place. To enable the shafts to be readily screwed or unscrewed the outer ends thereof are polygonal as shown to receive a wrench or other tool.

The sprocket wheels 87 associated with the chucks 65 and 66 are connected by chains 130 and 131 with sprocket wheels 132 and 133 on the shaft 134, a drive wheel 135 on this shaft being connected by a chain 136 with the sprocket wheel 137 on shaft 138, a gear pinion 139 on this shaft being driven by the gear 140 on shaft 141, this shaft having the gear wheel 142 driven by the gear wheel 143 on shaft 144, this gear meshing with the gear 145 on shaft 54 on which is the driving gear 55 connected with

the motor pinion 56. The chucks are thus rapidly rotated around their axes to axially rotate the rods passing therethrough, and at the same time the guide rollers are slowly rotated to longitudinally propel the rods through the chucks. To protect the rod guiding and propelling mechanism in the chuck a cover 146 is provided therefor, the cover having the removable central plate 147 which has the centrally located thimble 148 for guiding the rods passing through the chuck.

During travel of the rods from chuck 65 to chuck 66 they are held in engagement with a grind-stone 149. This grind-stone is mounted on shaft 150 journaled in bearing boxes 151 and 152 at the front ends of a U-shaped frame 153. This frame is slidable on guide-ways 154 and 155 extending at right angles with the chuck axes.

In order to shift the frame 153 to adjust the grind-stone with reference to the rods the following mechanism is provided. Screw shafts 156 and 157 are journaled at their outer ends in lugs 158 and 159 extending from the machine frame, the threaded ends of the screws engaging in blocks 160 and 161 respectively depending from the frame 153. Secured to the outer ends of the screw shafts are gears 162 and 163 which mesh with a driving gear 164 on the stub shaft 165 extending rearwardly from the machine frame, a sprocket wheel 166 being secured to the gear wheel and connected by chain 167 with the sprocket wheel 168 on shaft 169 which extends forwardly to the front of the machine and there terminates in hand wheel 170. By turning wheel 170 the frame 153 can be shifted transversely of the machine to adjust the grind-stone with reference to rods passing between the chucks.

The grind-stone shaft 150 carries at its end a double gear 171 which meshes with the bevel gear 172 on the shaft 173 which is journaled in bearing frame 174 which will adapt it to swing about the grind-stone shaft axis (see Figs. 1 and 4). The shaft is also free to shift longitudinally with reference to the gear 172. At its lower end the shaft carries a bevel gear 175 which meshes with the gear 176 on the shaft 177 which shaft is suitably journaled on the machine frame. A bearing frame 178 which is pivoted concentric with shaft 177 has the bearing sleeve 179 for the shaft 173, and the gears 175 and 176 are maintained in mesh during swing of the shaft 173 as the grind-stone structure is adjusted transversely on the machine. The driving train for the shaft 177 is as follows: motor pinion 56, gear 55, shaft 54, gear 180, gear 181, shaft 182, gear 183, gear 184, shaft 185, gear 186, and gear 187.

As there is some distance between the chucks, provision is made for preventing flexure of the rods and for holding them straight and against the grind-stone while they are being rotated by the chucks and propelled thereby. At the front of the machine a guide block 188 is provided on which the frame 189 is mounted to slide laterally parallel with the grind-stone axis. Journaled in the end of the frame 189 and threaded through a block 190 secured to the machine frame is the screw shaft 191 which carries a bevel gear 192 meshing with the gear 193 on the shaft 194 which terminates at the front end of the machine in the hand wheel 195. When the hand wheel is turned the frame 189 is shifted laterally. The top 189′ of the frame 189 overhangs the machine frame in front of the grind-stone and shiftable on the frame top at right angles with the grind-stone axis is the carriage 196, the carriage base having dove-tailed connection with the frame top, as clearly shown in Fig. 10. A screw shaft 197 is journaled in the front end of the frame 189 and threads into the carriage, as clearly shown in Fig. 5, a hand wheel 198 enabling the screw shaft to be readily turned. The inner end of the carriage has the vertical socket 199 for receiving the stem 200 of the tool supporting head 201, a set screw 202 serving to secure the stem into position with the socket. As shown in Fig. 5, the guide tool, 203 is secured in the head 201 and has the semi-cylindrical guide groove for engaging with the rod R to hold it against the grind-stone while it is being turned and propelled. The tools are interchangeable and have dovetailed connection with the head, as clearly shown. When rods or tubes of different diameters are treated corresponding tools are inserted in the head. By means of the hand wheel 198 adjustment can readily be made of the tool with reference to the grind-stone. Above the tool a water discharge nozzle 204 is provided for directing water to the grind-stone. The grindings are carried with the water into a receptacle 205 formed below the grind-stone and the water with the grindings particles therein flows through openings 206 into a trough 207 from which it runs through spout 208 into a receptacle 209 which is connected with the sewer by pipe 210. A strainer 211 is interposed between the spout 208 and receptacle 209 for retaining the grindings particles in order to prevent wastage. Where the tubes and rods are of rubber the grindings particles, when thus collected, can be re-dissolved and utilized.

As the grind-stone may wear unequally it must occasionally be trued up and to accomplish this a truing tool can be inserted in the head 201 in place of the guide tools and then by manipulating the hand wheels 195 and 198 the truing tool can be adjusted with

reference to the grind-stone during the operation.

Referring again to the chuck mechanism which rapidly rotates the rods axially during the grinding operation, the plates 105 and 105′ which support the bearing frames for the feed rollers will tend to be moved radially outwardly by centrifugal force against the action of the springs 110 and 110′, the faster the chucks rotate the greater will be the tendency for such outward movement. This will, of course, vary the pressure of the guide rollers on the rods and will interfere with proper support and feed of the rods. Provision is therefore made to counteract such centrifugal force and to keep the feed rollers centered and their pressure against the rods equalized and uniform. Referring to Figs. 14 to 18, in each chuck the hub 82 on the disk 81 journals a collar 212 which has the reduced section 213 which abuts against the inner face of gear 85. Equalizer plates 214 and 214′ have central openings for receiving the outer sections 213, these openings being of the same width as the diameter of said sections but being of slightly larger diameter longitudinally in order that they may move longitudinally on the collar. Extending outwardly from the back of the plate 105 is a lug 215, this lug projecting through the enlarged opening 216 in the disk 81 and extending therethrough is the bolt 217 which clamps the lug between the bolt head and a collar 218. The outer end of the bolt extends through an opening 219 in the equalizer plate 214, this opening being of the same diameter as the bolt. The bolt head also extends through a longitudinally elongated opening 220 in the plate 214′, a nut 221 receiving the threaded end of the bolt to hold the plates together against the collar 218. Likewise, the plate 105′ has the bolt 217′ extending therefrom through the lug 215′ which passes through the opening 216′ in the disk 81, the outer end of the bolt passing through the elongated opening 220′ in equalizer plate 214 and through the opening 219′ in equalizer plate 214, the opening being of the same diameter as the bolt, the nut 221′ receiving the bolt end. The equalizer plate 214 which is secured at one end to the bolt 217 extending from plate 205 has secured to its opposite end a weight 222, and the equalizer plate 214′ which is secured by bolt 217′ to plate 205′ has secured at its opposite end the bolt 222′. When the chuck is rotated these weights tend to move radially outwardly by centrifugal force sufficiently to counteract any tendency of the bearing frame supporting plates 105 and 105′ to move outwardly. Extending outwardly from the collar 212 are the diametrically opposite pins 223 and 223′, the pin 223 extending through the longitudinally elongated and widened slot 224 in equalizer plate 214 and through the transversely elongated slot 225 in the equalizer plate 214. The pin 223′ extends through the transversely elongated slot 225′ and equalizer plate 214′ and through the longitudinally and transversely extended slot 224′ in equalizer plate 214. With this arrangement any movement by centrifugal force in diametrically opposite directions will be equalized and in order to keep the passageway between the feed rollers 118 and 118′ centralized and coincident with the axis of the chuck through which the rods R pass. In other words, one of the weights cannot move radially outwardly a greater distance than the other, for any outward movement of either weight will effect rotation of the collar 212 by the coöperation of the corresponding supporting plate and transverse slot with the pin therethrough, and thus coöperation of the opposite pin with the transverse slot of the other plate will cause equal outward movement of such other plate and its weight. The arrangement is therefore such that any outward movement of the bearing frame supporting plates 105 and 105′ by centrifugal force will be counteracted by the weighted equalizer plates, and the pressure of the feed rollers against the rods traveling therethrough will be constant and uniform and the rods passing between the feed rollers will be held in axial alinement with the chuck axes, the result being that the rods will be ground off and finished with a true cylindrical surface and uniform diameter.

In order to prevent strain on the various bearings for the shafts 117 and 117′ and 96 and 96′ the holes in coupling heads 119 and 120 and 119′ and 120′ are of larger diameter than the coupling pins received thereby. In order to limit the displacement of the feed roller supporting bearing structures when there is no rod within the feed rollers, adjustable abutment screws 226 and 226′ are provided in lugs 227 and 227′ extending inwardly from the disk 81, the heads of these screws abutting respectively against the inner ends of the plates 105 and 105′ when a rod leaves the feed rollers in order to prevent the feed rollers from coming into contact.

When the rods are fed from the hopper they are more or less rough and of varying diameters and the grooves in the feed rollers of chuck 65 are therefore preferably triangular as shown in Fig. 19. The feed rollers in chuck 66 are of substantially semicircular cross-section as shown in Figs. 14 and 15 to receive the finished rods and deliver them to the exterior of the machine.

Reference has been made to the adaptability of the machine for grinding rods or

tubes of different diameters. As has been shown, the grind-stone can be shifted bodily as different diameter rods or tubes are run through the machine. In the chucks the feed rollers are changed to correspond with the diameter of the stock treated. The hopper structure H is also adjustable that it may efficiently feed rods or tubes of different diameters. The adjusting mechanism for the hopper is best shown in Figs. 2, 3, 7 and 8. The plates 13 and 16 for supporting the respective hopper halves 15 and 18 are slidable transversely on the beams 3 and 4 respectively in order that the width of passageway 19 may be varied. Extending transversely of the beams 3 and 4 and journaled in the vertical limbs thereof is a screw shaft 230, this shaft being locked against longitudinal movement by collars 231 and 232. The shaft below the tops of the beams 3 and 4 has left and right thread sections 233 and 234 and the front end of the shaft is provided with a hand wheel 235. A stud 236 extends downwardly from the plate 13 through the slot 237 in beam 3 and at its lower ends supports the block 238 which threadedly receives the screw threading 233. Extending downwardly from the plate 16 through slot 239 in beam 4 is the block 240 which threadedly receives the threads 234 of the screw shaft. When the screw shaft is turned the plates and the hopper structures thereon are shifted toward or away from each other to adjust the width of passageway 19 to the discharge belt 8. To maintain meshing engagement between the gear 41 and the gear 40 on the shaft supporting feed roller 37, the gear 41 is splined on the shaft 42 to be shifted longitudinally thereon when the hopper halves are separated or brought together. Provision is also made for permitting longitudinal shift along the gear 35 of the gear 34 which controls the operation of the escapement mechanism mounted on one of the hopper sides. The gear 34 is mounted on a stub shaft 241 which extends from the hopper structure side. As the hopper sides are adjusted the gear 34 will then shift along the gear 35 which will remain in mesh therewith. When the hopper is adjusted for a rod or tube of different diameter, the escapement blade supporting collars 23 and 24 and the spacing collar 27 are changed, depending upon the size of the rod whose flow and escape is to be controlled.

The ends of the hopper are preferably closed, end plates 242 and 243 being shown, these plates being rigidly secured along one edge to one of the hopper sides and the other edges of the plates having pin and slot connection 244 and 245, such connection permitting adjustment of the hopper sides toward and away from each other.

All adjustment and regulation of the machine can be accomplished by the operator while standing at the front of the machine, the hand wheels for the various adjusting mechanisms and trains being all at the front of the machine and readily accessible.

What is claimed is:

1. In a machine for grinding and finishing rods or tubes, the combination of a hopper, means for feeding rods or tubes from the hopper one at a time, chucks for receiving the rods or tubes from the hopper, feed mechanism within said chucks adapted to yieldingly clamp said rods to shift them axially therethrough, means for rapidly rotating said chucks and said feed mechanism with the rods passing therethrough, means within each of said chucks for neutralizing the centrifugal force tending to overcome the clamping engagement of said feed mechanism with said rods whereby said clamping engagement is maintained uniform, and a grinding member engaging with said rods or tubes during their passage through said chucks.

2. In a machine for grinding cylindrical rods, the combination of a supporting bearing, a hollow shaft journaled in said bearing, a chuck secured to the shaft end axially thereof, radially extending guideways on said chuck at opposite sides of its center, plates shiftable radially in said guideways to be moved toward and away from each other, a feed roller journaled on each plate, said feed rollers being in a common diametral plane and having grooves forming a passageway therebetween at the chuck axis, means for feeding rods through said hollow shaft and said passageway, yielding means tending to force said plates radially inwardly whereby said rollers will exert clamping action on rods passing therebetween, means for rotating said rollers to propel rods axially through the chuck, means for rotating said shaft and chuck, and grinding mechanism operating on said rods during propulsion and rotation thereof.

3. In a machine for grinding rods, the combination of a chuck, bearing frames mounted on the chuck at opposite sides of its center and shiftable radially, feed rollers journaled in said bearing frames in a diametral plane and having peripheral grooves for forming an axial passageway for rods to be ground, yielding means tending to force said bearing frames toward each other to effect clamping engagement of the rods by said rollers, means for rotating said rollers to propel rods longitudinally, means for rotating said chuck to axially rotate the rods during propulsion thereof, means within said chuck for counteracting centrifugal force acting on said bearing frames, and grinding mechanism for

engaging with said rods during propulsion and rotation thereof.

4. In a grinding machine for rods, the combination of two chucks, diametrally opposed bearing frames in each chuck, a feed roller journaled in each bearing frame, said rollers being in a common diametral plane and having peripheral grooves forming a passageway at the axis of the chuck, means for rotating said feed rollers to cause axial propulsion of rods through said chucks and the feed roller passageways, springs acting on said guide frames tending to shift them toward each other and causing said feed rollers to clamp the rods to effect propulsion thereof, means for rapidly rotating said chucks in synchronism whereby said rods are axially rotated during propulsion thereof, means in each chuck for neutralizing the centrifugal force tending to shift said bearing frames apart whereby the clamping engagement of the feed rollers will be maintained uniform, a grind-stone engaging the rods during their passage from one chuck to the other, and means for rotating said grind-stone in a direction opposite to that of the rotation of the rods.

5. In a machine for finishing rods, the combination of a chuck, means for feeding rods one at a time axially into said chuck, bearing frames at diametrically opposite sides of said chuck and shiftable radially, feed rollers on said frames having peripheral grooves coöperating to form an axial passageway between them to receive the rods, springs acting on said bearing frames tending to force them radially inwardly to cause the rollers to exert clamping action on the rods, means for rotating said rollers to propel the rods, means for axially rotating said chuck, centrifugal means within said chuck acting on said bearing frames during rotation of the chuck to counteract the centrifugal force tending to shift such frames outwardly, a grind-stone adjacent the chuck outlet for operating on said rods, and an adjustable abutment for holding said rods in alinement and against said grind-stone.

6. In a machine for finishing rods, the combination of a chuck, means for feeding rods one at a time axially into said chuck, bearing frames at diametrically opposite sides of said chuck and shiftable radially, feed rollers on said frames having peripheral grooves coöperating to form an axial passageway between them to receive the rods, springs acting on said bearing frames tending to force them radially inwardly to cause the rollers to exert clamping action on the rods, means for rotating said rollers to propel the rods, means for axially rotating said chuck, plates extending diametrally in said chuck, each plate being secured at one end to one of said bearing frames, and having a weight at its other end, said plate being adapted to shift longitudinally, means for causing said plates to rotate with the chuck, said plates and weight responding to centrifugal force to counteract the centrifugal force tending to shift the bearing frames outwardly whereby the pressure of the feed rollers against the chucks will be maintained uniform, and a grind-stone adjacent the chuck outlet for operating on said rods as they pass from the chuck.

7. In a machine for finishing rods, the combination of a chuck, means for feeding rods one at a time axially into said chuck, bearing frames at diametrically opposite sides of said chuck and shiftable radially, feed rollers on said frames having peripheral grooves coöperating to form an axial passageway between them to receive the rods, springs acting on said bearing frames tending to force them radially inwardly to cause the rollers to exert clamping action on the rods, means for rotating said rollers to propel the rods, means for axially rotating said chuck, plates extending diametrally in said chuck, each plate being secured at one end to one of said bearing frames and having a weight at its other end, said plate being adapted to shift longitudinally, means for causing said plates to rotate with the chuck, said plates and weight responding to centrifugal force to counteract the centrifugal force tending to shift the bearing frames outwardly whereby the pressure of the feed rollers against the chucks will be maintained uniform, means interconnecting said plates for translating the longitudinal movement of one plate into corresponding longitudinal movement of the other plates whereby the passageway between said feed rollers will be maintained central with reference to the chuck axis, and a grind-stone adjacent the chuck outlet for operating on the rods.

8. In a machine of the class described, the combination with two parallel supporting beams having a passageway therebetween, a hopper structure comprising side sections mounted on the respective beams and spaced apart to leave a discharge passageway for rods or tubes, means for effecting relative shift of said hopper side sections on said beams to vary the width of said discharge passageway, and a belt traveling below the discharge passageway outlet to receive the rods or tubes.

9. In a machine of the class described, the combination of supporting frame sections having a belt run-way therebetween, a hopper structure comprising hopper side sections mounted on the respective frame sections and separated at their lower ends to leave a discharge passageway for rods or

tubes, means for shifting said hopper side sections to adjust the width of said discharge passageway, a belt traveling in said run-way below the discharge passageway to engage with the rods or tubes to shift them longitudinally along the bottom of said discharge passageway and out of the passageway at one end thereof.

10. In a machine of the class described, the combination of supporting frame sections having a belt run-way therebetween, a hopper structure comprising hopper side sections mounted on the respective frame sections and separated at their lower ends to leave a discharge passageway for rods or tubes, means for shifting said hopper side sections to adjust the width of said discharge passageway, a belt traveling in said run-way below the end of the discharge passageway, escapement mechanism for feeding rods or tubes through the discharge passageway one at a time, feed rollers for receiving one end of the rods and for propelling said rods longitudinally along the bottom of the discharge passageway and away therefrom, said belt receiving and engaging with the other end of said rods to assist in shifting said rods from the discharge passageway.

11. In a machine of the class described, the combination of a hopper structure comprising two hopper side sections separated by a discharge passageway, means for adjusting said side sections to vary the width of said discharge passageway, escapement mechanism for feeding rods or tubes one at a time to the bottom of said discharge passageway, feed rollers journaled on said side sections and projecting into said discharge passageway to receive the rods or tubes, and means for rotating said rollers to effect lengthwise propulsion of said rods out of the discharge passageway.

12. In a machine of the class described, the combination of a hopper having spaced sides forming a discharge passageway, escapement mechanism for controlling the escape of rods or tubes one by one to the bottom of said passageway, a belt traveling below said passageway, feed rollers at the bottom of said passageway near one side thereof for receiving one end of the rods, said belt receiving the other ends of said rods and coöperating with said feed rollers to shift the rods longitudinally out of the passageway, rotary supporting mechanism for receiving the rods, and grinding mechanism for acting on said rods when in said rotary supporting mechanism.

13. In a machine of the class described, the combination of a hopper structure having a vertical discharge passageway through which horizontally disposed rods or tubes may pass, escapement mechanism for controlling the one at a time passage of rods or tubes toward the bottom of said passageway, feed rollers at the bottom of said passageway at one side thereof and projecting thereinto to receive one end of the rods between them, means for rotating said rollers to propel the rods axially, chuck mechanism for receiving the rods from said passageway, means for axially rotating said chuck mechanism to rotate the rods axially, means in the chuck mechanism for axially propelling the rods therethrough, and grinding mechanism acting on said rods during such rotation propulsion by the chuck mechanism.

14. In a machine of the class described, the combination of a hopper structure comprising two side walls having a narrow discharge pasageway therebetween for rods or tubes, means for adjusting said sides to change the width of said passageway, escapement mechanism mounted on one of said sides to control the one at a time travel of said rods to the bottom of said passageway, means in the bottom of said passageway for shifting the rods axially therefrom, two chucks arranged in axial alinement with the discharged rods, propulsion mechanism in said chucks for receiving the rods one at a time and propelling them axially therethrough, means for rotating said chucks to rotate the rods during their passage therethrough, and a grind-stone positioned to operate on the rods as they pass from one chuck to the other.

15. In a machine of the class described, the combination of a hopper for receiving rods or tubes in horizontal position, a discharge passageway leading downwardly from said hopper, a plurality of upright shafts adjacent one side of said passageway having escapement arms thereon for projecting into said passageway to control the one at a time passage of rods or tubes to the bottom of said passageway when said shafts are rotated, means for simultaneously rotating said shafts, means at the bottom of said passageway for propelling the rods axially through one side of the passageway, a chuck positioned axially to receive the discharged rods, means in said chuck propelling the rods axially therethrough, means for rotating said chuck to rotate the rods during propulsion therethrough, and a grind-stone for operating on the rods as they pass from the chuck.

16. In a machine for grinding rods or tubes, the combination of hopper mechanism for feeding rods lengthwise one at a time, a chuck, a plurality of feed wheels in said chuck having opposed peripheral faces forming a passageway for receiving the rods, means for rotating said wheels to propel the rods axially through said chuck, means for rotating said chuck to rotate the rods during propulsion therethrough, and grinding mech-

anism for operating on the rods as they pass from said chuck.

17. In a machine of the class described, the combination of feeding means for feeding rods or tubes lengthwise one at a time, a chuck, radially shiftable bearing frames in said chuck, feed rollers journaled in said bearing frames with their peripheral faces opposed to form an axial passageway for the rods, means for rotating said chuck, means within the chuck controlled by centrifugal force to cause the feed rollers to exert uniform pressure against the rods, means for rotating the feed rollers to propel the rods axially, means for maintaining said rollers in position to hold said rod in axial position during propulsion and rotation thereof, and grinding mechanism for acting on the rods as they come from the chuck.

In witness whereof, I have hereunto subscribed my name this 28th day of June, 1916.

HENRY D. AGNEW.