C. E. REED.

MACHINE FOR TURNING HEELS.

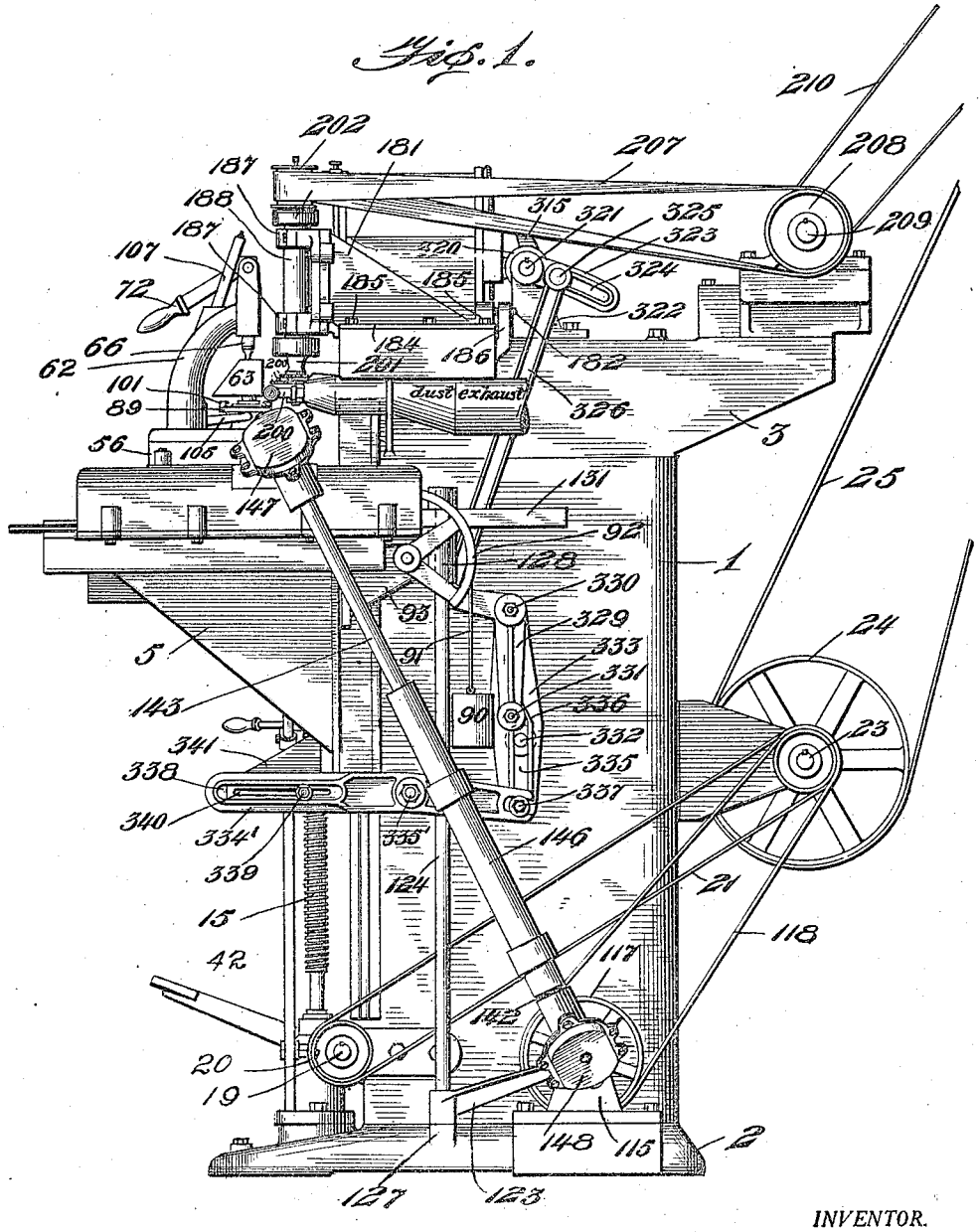
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8 SHEETS—SHEET 1.

Fig. 1.



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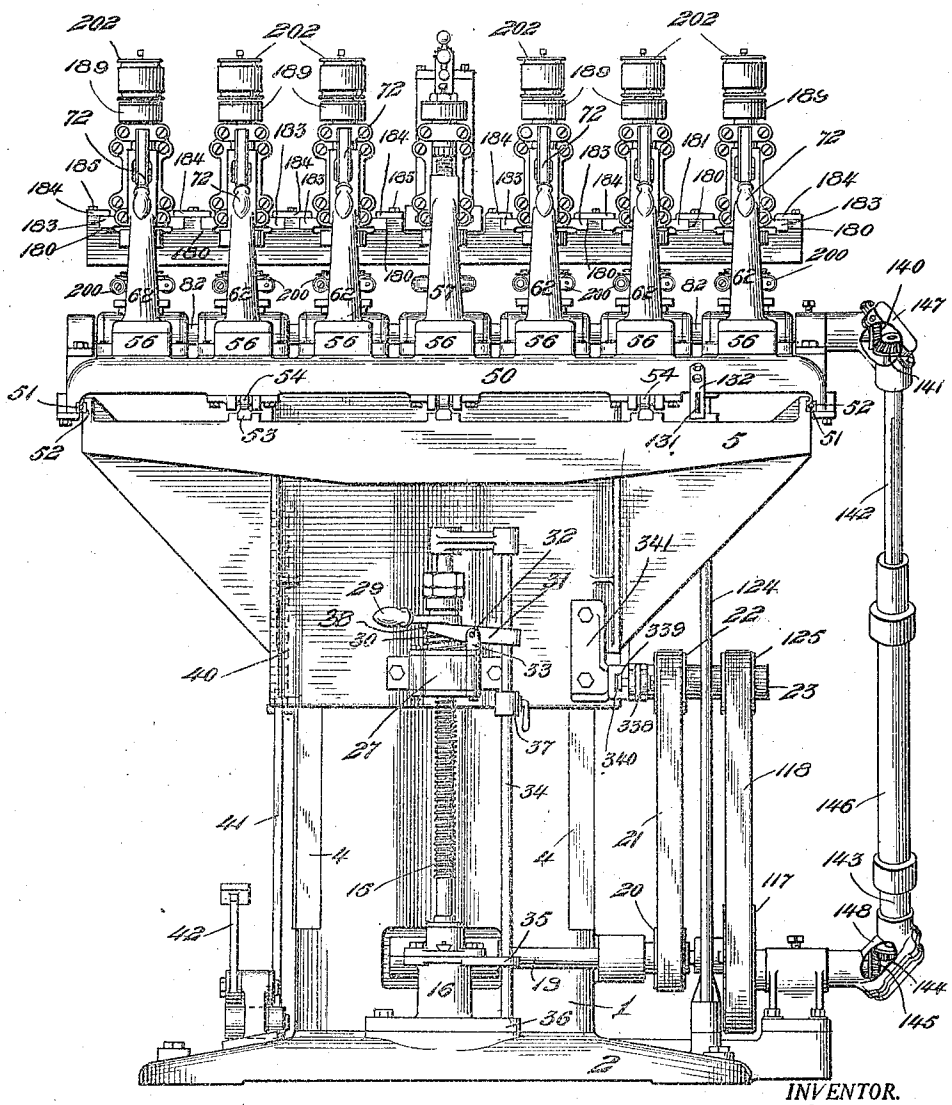
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8 SHEETS—SHEET 2.

Fig. 2.



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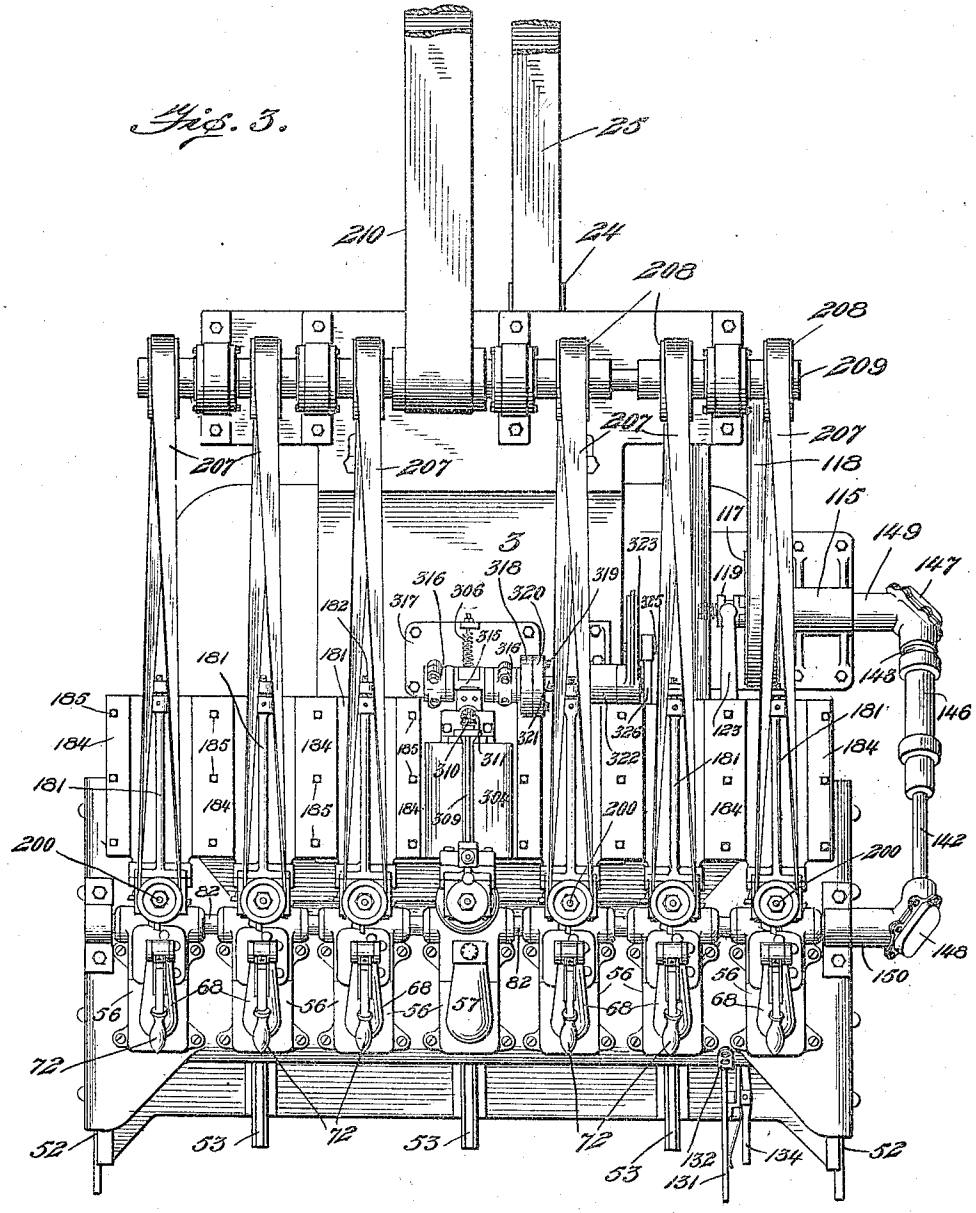
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8 SHEETS—SHEET 3.

Fig. 3.



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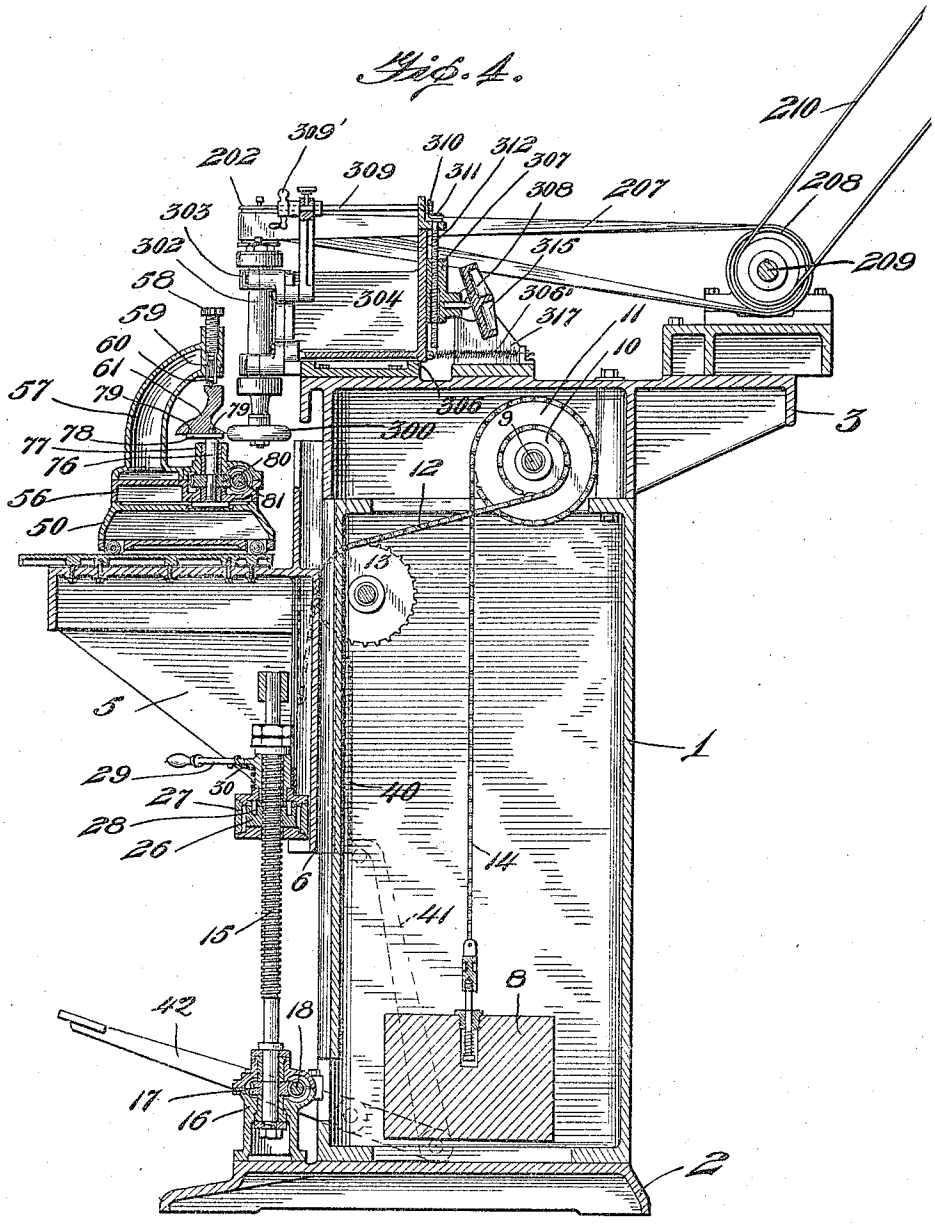
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8 SHEETS—SHEET 4.

Fig. 4.



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8 SHEETS—SHEET 5.

Fig. 6.

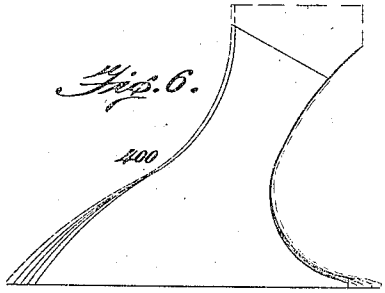
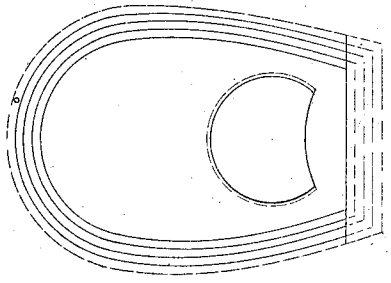


Fig. 5.

Fig. 7.



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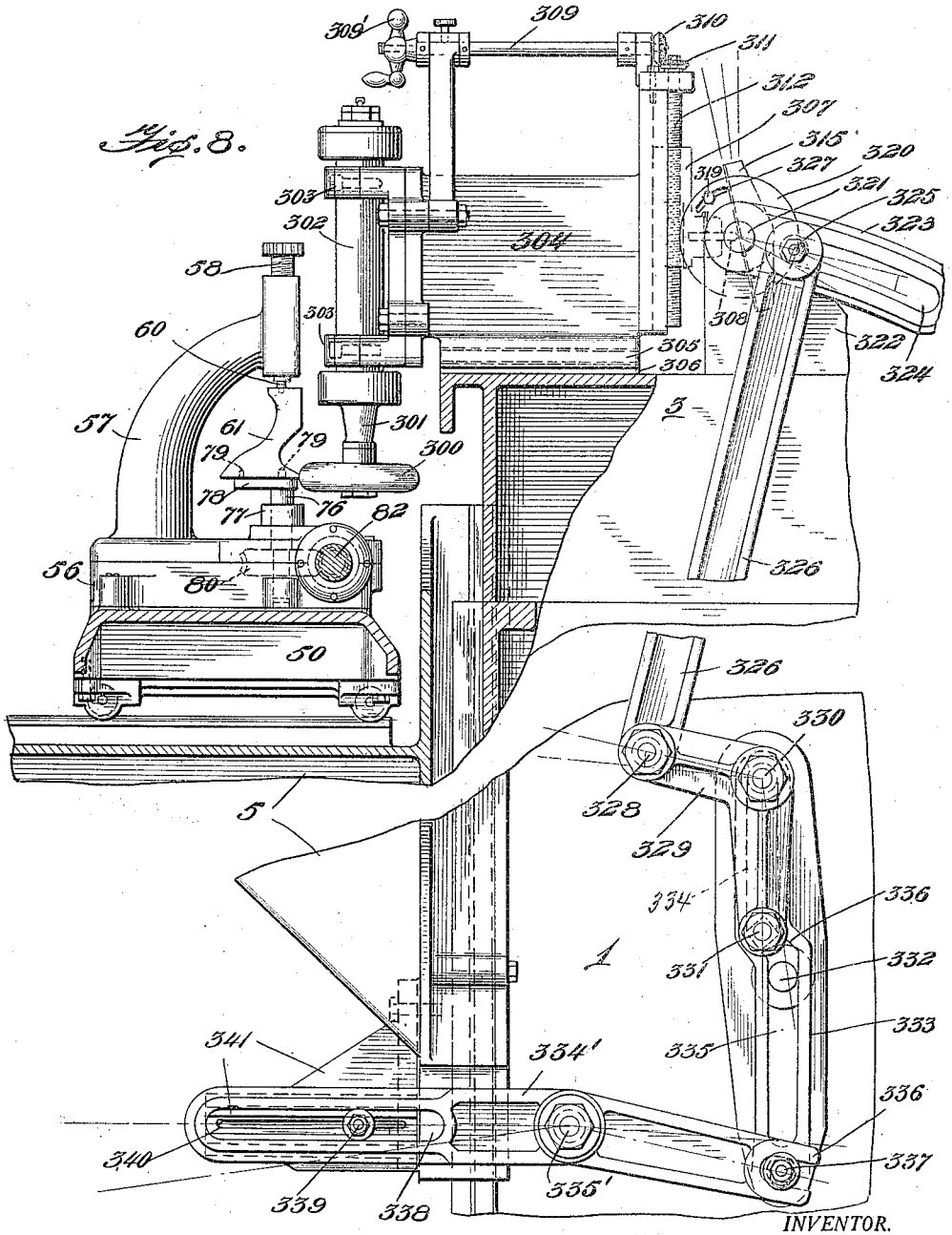
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8 SHEETS—SHEET 6.

Fig. 8.



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8 SHEETS—SHEET 7.

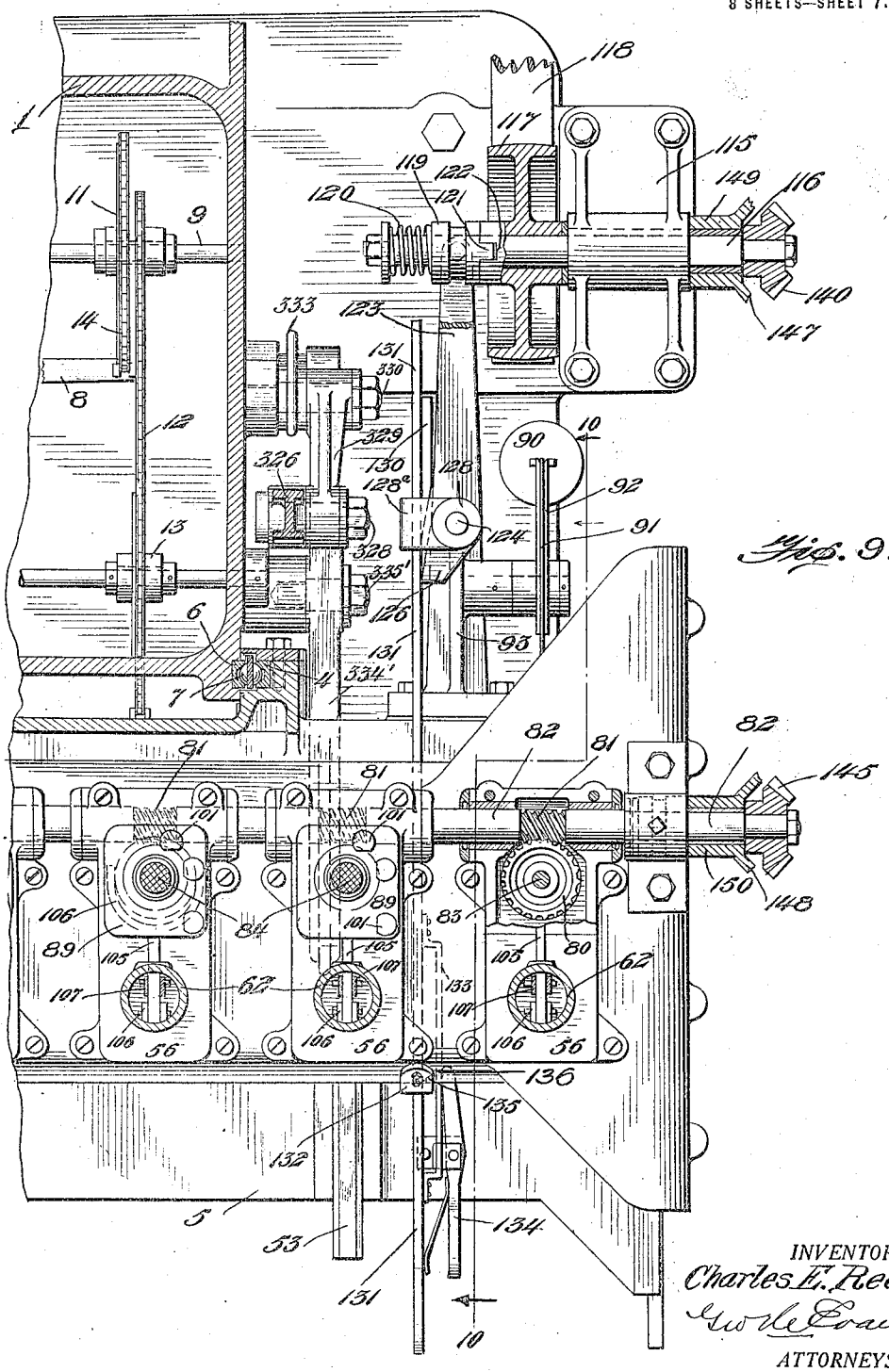


Fig. 9.

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8 SHEETS—SHEET 8.

Fig. 10.

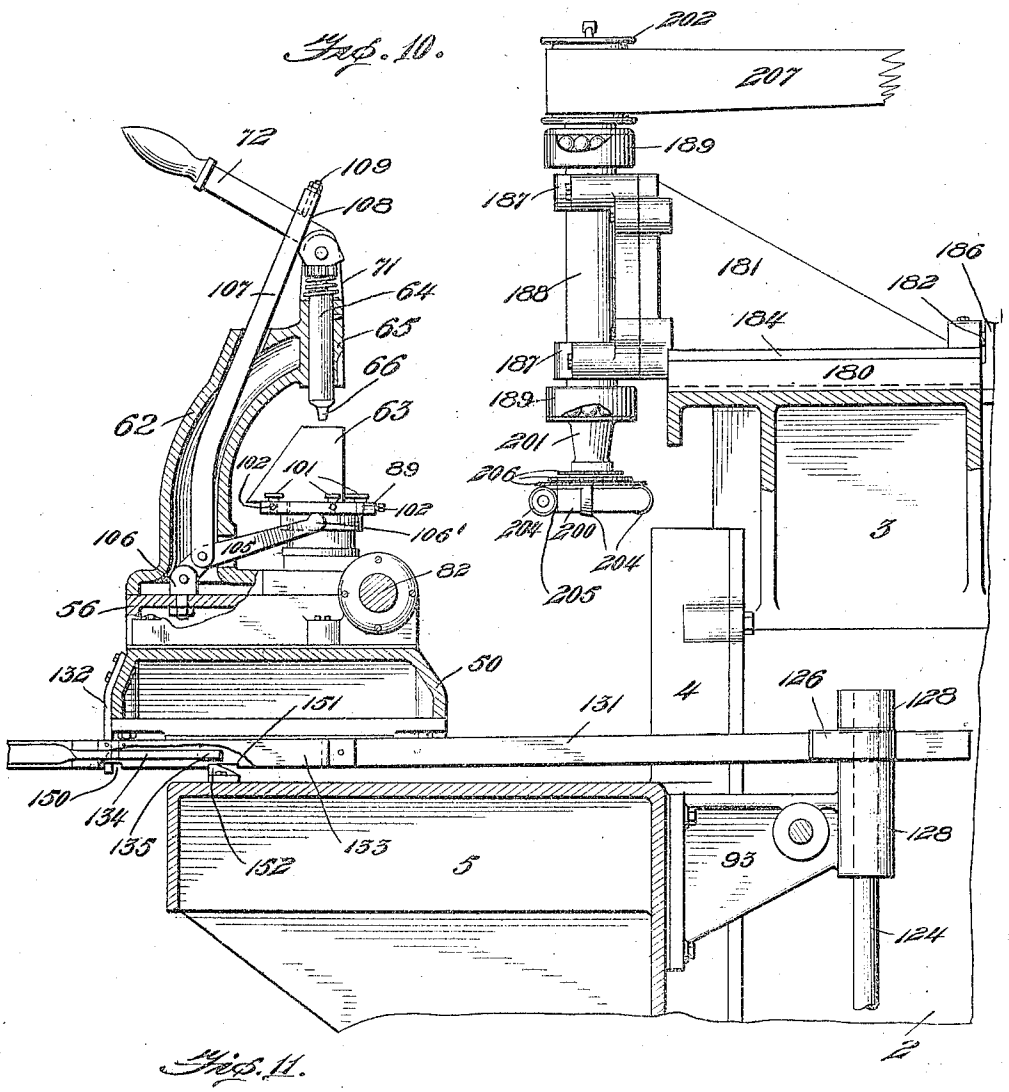


Fig. 11.

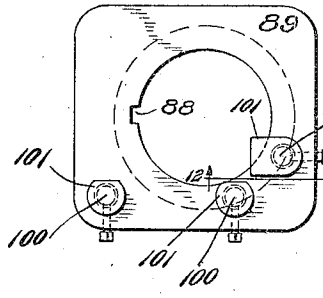
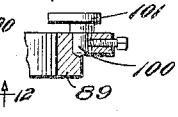


Fig. 12.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR TURNING HEELS.

1,305,007. Specification of Letters Patent. Patented May 27, 1919.

Application filed August 10, 1918. Serial No. 249,246.

To all whom it may concern:

Be it known that I, CHARLES E. REED, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Turning Heels, of which the following is a specification.

My invention relates to machines for turning wooden shoe heels and the like.

The objects of the invention are to provide a machine which will turn and grade a complete heel from the base to the tread at a single operation; to provide a machine in which a rotary pattern or model and a rotary blank holder are moved toward and from and also at right angles across an adjustable pattern engaging device and a relatively stationary rotary cutter; also to provide means for automatically adjusting the pattern or model engaging device toward and from the model or pattern; also to provide such automatically adjusting mechanism with means for operating it from a vertically movable apron on which the saddle carrying the pattern and blank holders slides toward and from the cutter and pattern engaging device; also to provide the pattern engaging device with a vertically adjustable tongue engaging a fan board automatically actuated from said vertically movable apron to move the pattern engaging device toward and from the pattern to regulate the grade given the blank by the cutter; also to provide an improved holder for the blank having guide blocks movable downwardly to a point below the upper face of said holder after the blank has been clamped in place so as to allow the cutter to engage the lowermost edge of the heel blank; also to actuate said guide blocks from the clamping lever; also to provide for the axial adjustment of the guide blocks to provide for different sizes of blanks; also to provide a machine of the character described in which there are a plurality of rotary cutters at opposite sides of the pattern engaging device, every cutter being mounted in an adjustable slide bearing so that they all may be brought at the working point into exact alinement; also to provide a highly effective operating connection between the line shaft of the rotary pattern shaft and the rotary blank holders and the drive shaft therefor at the lower end of the main frame; also to provide a novel clutch releasing mechanism actuated from the saddle carrying said pattern shaft and blank holder shafts.

These objects I attain by the construction shown in the accompanying drawings, in which:

Figure 1 is a side elevation of the right hand end of the machine with the blank brought up to the cutter.

Fig. 2 is a front elevation of the same.

Fig. 3 is a top plan view.

Fig. 4 is a central vertical section through the machine with the pattern in place and the pattern engaging wheel in position to begin work.

Fig. 5 is an enlarged sectional end elevation of the upper part of the machine showing the cutter about to begin work on the blank; the blank centering devices being lowered out of the way of the cutter.

Fig. 6 is a side elevation showing five graded sizes of heel.

Fig. 7 is a plan thereof.

Fig. 8 is an enlarged broken sectional view showing the pattern in place, the pattern wheel and fan board mechanism.

Fig. 9 is a sectional plan view of the right hand half of the machine; the telescopic shaft being omitted.

Fig. 10 is a broken sectional side elevation on line 10—10, Fig. 9, to better show the saddle drawn outwardly and a blank inserted between the positioning or centering devices and the clutch actuating latch lever holding the saddle from inward movement.

Fig. 11 is a plan of the positioning or centering plate, and

Fig. 12 is a detail section thereof on line 12—12 of Fig. 11.

The frame of the machine comprises a hollow column 1, having a base 2, and a top 3. The column 1 is provided at its front with vertical guideways 4 on which slides the apron 5, said apron having corresponding guideways 6 and balls 7 being interposed between the said guideways, as best shown in Fig. 9. The vertically sliding apron 5 is provided with a counterbalancing weight 8 connected thereto by a differential gearing comprising the shaft 9 provided with a small wheel 10 and a large wheel 11 from the former of which extends a chain or belt 12 passing over an idler 13 to the apron 5, while a similar chain or belt 14 passes around the larger wheel 11 down to the weight 8. The

feed of the apron 5 is downward and is effected by a vertical screw 15; swiveled at its lower end in a bearing 16 secured to base 2 and there provided with a worm wheel 17 actuated by a worm 18 on a horizontal shaft 19 provided with a drive pulley 20 connected by a belt 21 with a drive pulley 22 on a shaft 23 at the rear of the column 1. This shaft 23 has a drive pulley 24 driven from a source of power not shown through a belt 25.

The feed screw 15 extends through a split nut 26 mounted in a casing 27 secured to the front of the apron 5, see Figs. 1 and 4. This is a well known quick release mechanism and comprises in detail the nut 26 in two halves having cam grooves in their upper faces engaged by pins 28 depending from a plate carried by the rotating hub of a release lever 29 mounted to turn freely on the upper non-threaded end of feed screw 15. This releasing lever is provided with a torsion spring 30 which throws it to the right to separate the sections of nut 26 by the pins 28 when it is released from its retracted position by the latch 31. Latch 31 is formed of a counterweighted bar pivoted between its ends, as at 32, to a lug 33 projecting up from casing 27. The longer heavier end of latch 31 extends across a rod 34 fixedly secured to an arm in which the upper plain end of the shaft 15 turns; the lower end of the rod 34 being secured in bearings 35, 36 on bearing 16. A stop 37 is adjustably secured on rod 34 in the downward path of the weighted end of latch 31 so that when said weighted end reaches the stop 37 the latch will be rocked and its opposite end depressed out of contact with the lug 38 on the lever 29, whereupon the torsion spring will throw the lever and cause the separation of the split nut 26 and consequently the stopping of the downward feed of apron 5.

On the rear side of the apron 5 is provided a vertical rack 40 engaged by a pawl 41 mounted at the inner end of a foot lever 42 so that the operator may quickly raise the apron 5 and parts carried thereby after the apron reaches the end of its feed and the split nut 26 is released, as before described.

It will be seen from the above that the screw 15 will feed the apron 5 down the distance for which the feed is set, at which point the split nut 26 will be automatically released from the screw, whereupon the operator by pressing on the foot lever 42 may quickly raise the apron to the starting point, where the nut will be again thrown into engagement with the screw. On the upper side of the apron 5 is mounted a horizontally sliding saddle 50 which carries the pattern holder and the blank holders to be presently described. The ends of the saddle 50 overhang the ends of the apron 5, as shown in Fig. 2, and ball bearings 51 are interposed between the guideways 52 interposed between said overhanging or overlapping ends. Intermediate of these guideways are tracks 53 upon which travel rollers 54 mounted on the lower side of the saddle 50. The saddle is drawn inwardly or rearwardly by a weight 90 suspended from a chain 91 passed over a segment 92 mounted on a bracket 93 secured to the rear side of the apron 5 so that the saddle 50 is moved vertically by the apron and its feed screw 15 and inwardly by the weight 90.

To the upper side of the saddle is secured a series of casings 56, each provided on its upper side with an upwardly and inwardly curved hollow standard 62, seven being shown. The middle standard 57 is provided at its upper end with a vertically adjustable screw 58, carrying a sleeve 59 to the lower end of which the clamping and centering pin 60 of the model 61 is secured, as shown in Fig. 4, by turning the screw 58 the pin 60 is raised and lowered.

The six standards 62 are all provided with clamping devices for the tops of the blanks 63. This clamp device comprises a vertically sliding sleeve 64 mounted in a tubular bearing head 65 on the end of standard 62. The sleeve 64 has its bore reduced at the lower end to receive the stem 65′ of a centering or clamping pin 66, which is loosely mounted therein. The stem 65′ has an annular collar 67 engaged by a threaded nipple 68 screwed into the lower end of sleeve 64, so that the clamping pin will be free to turn and at the same time will be raised and lowered with sleeve 64. In the upper end of the sleeve 64 is a headed screw 68′ under the head 69 of which is a spring 70 which lifts the sleeve 64 and clamping pin 66 away from the blank 63. In a fork 71 at the upper end of arm 62 is pivoted the clamp actuating lever 72, the cam head of which has two cam surfaces 73, 74, as shown in Figs. 5 and 10, to engage the head of screw 68′. When the lever 72 is swung down the cam surface 73 engages the head of screw 68′ and forces the said screw, the sleeve 64 and the clamping pin 66 down upon the top of the blank. When the lever is swung up to the position shown in Fig. 10 the spring 70 lifts the screw and attached parts and forces the head of the screw against the cam surface 74 which holds the lever 72 in its raised position. In vertical alinement with the pattern clamping screw 58 is a shaft 76 mounted in bearings 77 in casing 56 and provided at its upper end with a head 78, having pins 79, to enter recesses in the lower end or base of the pattern 61. This shaft 76 is rotated by means of a worm wheel 80 engaged by one of a series of worms 81 on worm shaft 82. This worm shaft 82 is a line shaft extending through all of the cas-

ings 56, and engaging the six worm wheels 80 on the six blank-rotating shafts 83 so that all seven shafts are rotated in unison.

Every blank-rotating shaft 83 has its upper end roughened, as at 84, to afford a firm grip on the base of the blank 63, see Fig. 9. Upon the upper sides of the casings 56 are formed integral bearings 85 and provided with bushings 86 for the shafts 83. Mounted on the upper ends of these bearings 85 are secured dust collars 87 to rotate with the shafts. Upon the shouldered exteriors of the dust collars 87 are splined at 88 loose vertically movable positioning plates 89 carrying the centering or positioning studs 100 against which the lower edge of the base of the heel blanks 63 is placed to properly position them. These studs 100 have their stems mounted in apertures in the plate 89 and above the plate are formed with overhanging eccentric heads 101 so that by turning the studs to bring the heads into the desired positions different sizes of heel blanks may be positioned on the upper ends of the shafts 83. The studs 100 are held in their adjusted positions by means of the set-screws 102, as shown in Figs. 11 and 12.

To lower the plate 89, and bring the heads 101 of the studs below the plane of the upper ends 84 of the blank-rotating shafts 83, I provide the lever 105 pivoted at its outer end to the bearing 106 in the casing 56 and at its opposite end provided with a yoke 106' bearing against the under side of the said plate 89, and to this lever 105 is pivoted the lower end of a link 107 extending up through standard 62 and slotted at its upper end to receive the clamping lever, as shown at 108. It will be seen, therefore, that when the lever 72 is swung up to raise the clamp 66 it will at the same time raise the lever 105 and lift the plate 89 and its studs 100, 101 into the position shown in Fig. 10 so that a blank may be properly positioned. A downward movement of lever 72 will depress the clamping pin 66 into engagement with the blank and hold it down on the head 84 of blank-rotating shaft 83 and at the same time will depress lever 105 to lower the plate 89 and studs 100, as before described. A set-screw 109 projects through the upper end of lever 107 to nicely adjust the lifting action of lever 72 upon the link 107.

At the lower rear right hand corner of the column 1 is a bearing 115 in which is mounted a driven shaft 116 provided at its inner end with a loose pulley 117 connected by a belt 118 with a smaller pulley 125 on the shaft 23 before referred to. The pulley 117 is engaged with the shaft 116 (Fig. 9) by means of a clutch section 119 pressed toward the pulley by a spring 120 to bring the clutch tooth 121 into a recess 122 in the pulley hub. The sliding clutch member 119 is pressed away from the pulley 117 by means of an arm 123 projecting rearwardly from the lower end of a vertical rock shaft 124. The rock shaft 124 is mounted at its lower end in a step bearing 127 and at its upper end passes through a bearing sleeve 128 at the rear end of the bracket 93 carried by the apron 5. The sleeve 128 slides freely on the upper end of the rock shaft 124. Mounted to turn with and slide on the upper end of rock shaft 124 is its actuating arm 126 operated from a cam 130 on the clutch-actuating latch bar 131 sliding at its rear end in a guide 128[a] projecting from the sleeve bearing 128, see Fig. 9. This arm 126 is moved up and down on shaft 124 by sleeve 128 which is transversely slotted to receive the inner end of said arm.

This clutch-actuating latch bar 131 extends to the front of the machine between the saddle 50 and upper face of apron 5, as shown in Figs. 5 and 10, and is actuated by the horizontal movement of the saddle in both directions, as will now be described. The front end of the latch bar 131 extends through a slotted plate 132 depending from the front wall of the saddle 50 and on its outer side has an elongated strap 133, to which is pivoted a latch 134, the nose 135 of which projects through an aperture 136 in the strap so as to lie in the path of the plate 132 when the saddle 50 moves inwardly. It follows, therefore, that the saddle 50 will, through plate 132 and latch nose 135, move the latch bar 131 rearwardly and so move the cam 130 out of engagement with the clutch-actuating arm 126, which will permit spring 120 to throw clutch 119 into engagement with pulley 117 that drives the shaft 116, which in turn drives the worm shaft 82 and, through it, the blank rotating shafts 83 and the pattern or model shaft 76.

The shaft 116 has a bevel gear 140 which meshes with a gear 141 on the section 142 of a telescopic shaft, the other section 143 of which has a bevel gear 144 meshing with a bevel gear 145 on the worm shaft 82.

The two sections of the telescopic shaft slide in a splined connecting sleeve 146, see Figs. 1 and 2.

The opposite gear-carrying ends of the two shaft sections 142, 143 are mounted in angle boxes 147, 148, the horizontal sleeves 149 and 150 of which are hung loosely on the shafts 116 and 82, respectively. This connecting drive gearing for the shafts 116, 82 provides for the free horizontal and vertical movement of the saddle 50 and renders the employment of universal joints unnecessary.

By pressing on latch 134 to throw its nose 135 out of the path of the plate 132 the saddle 50 and parts carried thereby may be moved inwardly without moving the latch bar 131 and so the clutch 119 will be held away from pulley 117 so as to prevent rota-

tion, whenever desired, of the blank-rotating shafts 83 and pattern-rotating shaft 76. The latch bar 131 may afterward be thrown rearwardly by hand to allow the spring 120 to throw the clutch into action and start shafts 83, 76 to rotating.

The lower edge of the latch bar 131 is provided at its outer end with an outer recess 150 which engages the lower wall of the slotted plate 132 so that when the saddle 50 is moved outwardly the latch bar 131 will be moved outwardly and so move the cam 130 into engagement with arm 126 of rock shaft 124 and so swing arm 123 to the left and release clutch 119 from pulley 117 and thereby stop rotation of shafts 83 and 76. The lower edge of latch bar 131 is further provided at its outer end with an inner recess 151 which, when the saddle 50 is moved to its outermost position, will engage a stop lug 152 on top of apron 5, and so hold the saddle 50 against inward movement; the latch bar recess 151 at this time being in engagement with forward recess 150. This construction provides for the automatic starting of the pattern and blank-rotating mechanism as well as for their being started by hand when moved up to the pattern controlled rotary cutters 200 to be presently described.

On the forward side of top 3 of column 1 is provided a series of transverse guideways 180, in which is mounted a series of brackets 181 provided at their rear ends with swiveled adjusting screws 182, and along their lower sides with guides 183, fitting accurately in the guideways 180 and held rigidly in their adjusted positions by the overlying clamping plates 184 provided with securing screws 185. The swiveled adjusting screws 182 pass through threaded apertures in the lugs 186 projecting up from the table top 3. There are six of these cutter brackets, three at each side of the middle of the top, one opposite every blank holder. On the front vertical face of every bracket 181 are provided upper and lower bearings 187 in which are clamped the vertical sleeves 188 having ball races 189 carrying ball bearings 190 in which are mounted the six rotary shafts 201 carrying at their lower ends the cutter heads 200 and at their upper ends provided with high speed pulleys 202. By adjusting the brackets 181 and the sleeves 188 the cutters may be exactly adjusted with respect to each other and to the blank holders. The circular cutters 204 are cup-shaped and are pivoted at their centers in radial recesses 205 in the cutter heads 200 and are not pattern-shaped as in prior heel cutting machines. Superposed on the cutter heads 200 are circular roughing out saws 206. These cutter heads and their cup-shaped cutters and roughing out saws are not of my invention. The pulleys 202 are constantly rotated by belts 207 from larger pulleys 208 on a line shaft 209, which in turn is connected by a belt 210 to the same shaft, not shown, to which belt 25 is belted.

The working edges of all of the cutters are adjusted to the same horizontal line and all of the cutters must lie in the same horizontal plane so that when set for operation they will be presented to the blanks, as shown in Figs. 1 and 5. Furthermore, the cutters lie in the same horizontal plane with the pattern-controlled wheel 300, see Fig. 2, the relation of which to the pattern 61 is clearly shown in Figs. 4 and 8. This pattern controlled wheel 300 is on the lower end of a vertical shaft 301 mounted in a ball bearing sleeve 302 carried in bearings 303 on the front face of a horizontally sliding carriage 304 provided at its lower edges with ways 305 engaging guides 306 on top of table 3 and provided with a retracting spring 306′ tending to constantly withdraw the carriage and pattern-controlled wheel 300 away from the pattern. On the rear side of the carriage 304 is a vertically adjustable block 307 carrying a rearwardly projecting tongue 308; the block being adjusted up and down by means of a manually operated shaft 309 having a bevel gear 310 at its rear end meshing with a bevel gear 311 on the upper end of an adjusting screw 312 engaging a threaded aperture in block 307. By rotating shaft 309 by means of its hand wheel or crank 309′, tongue 308 may be adjusted from a central position on the fan board 315 to any desired position above or below its center or horizontal pivot line.

This fan board 315 is provided with trunnions at its opposite sides journaled in bearings 316 on a bracket 317 fixed to the top 3. To the right hand trunnion, Fig. 3, is fixed a disk 318, to which is adjustably secured by bolts 319 a second disk 320 at the inner end of a short rock shaft 321 mounted in a bearing 322 on top 3. To the outer end of rock shaft 321 is fixed a rearwardly extending actuating arm 323 provided with a curved slot 324 in which is adjustably mounted a pivot bolt 325 on which pivots the upper end of a link 326. By means of the bolts 319 and the slots 327 through which they pass, the desired permanent angle of the fan board 315 may be adjusted. The lower end of the link 326 is pivoted by bolt 328 to the forwardly extending arm of a bell crank lever 329 pivoted at its angle by a pivot bolt 330 to the side of column 1. The lower end of the depending arm of the bell crank lever 329 is provided with an actuating stud or bolt 331. Upon the bolt 330 and a lower stud 332 on column 1 slides a vertically disposed sliding link 333 provided with a longitudinal slot the upper portion 334 of which is offset from the lower portion 335; the two portions of the slot being con-

nected by a short inclined slot 336. When the squared portion of the actuating stud 331 lies within either portion 334 or 335 of the slot no movement will be imparted to the bell crank lever 329 and so none will be transmitted through link 326 and arm 323 to the fan board 315, but when the sliding link 333 is moved to bring the inclined slot 336 into operation its walls will engage stud 331 and rock the bell crank lever 329 and the fan board 315. Motion is imparted to the slide 333 by means of a horizontal lever 334′ pivoted between its ends, as at 335′ to column 1 and having a forked rear end 336′ engaging a pivot stud 337 on the lower end of said slide 333. The longer outer end of the lever 334′ is provided with a longitudinal slot 338 in which works a stud bolt 339 adjustably secured at its inner end in the slot 340 of a bracket 341 projecting outwardly from the vertically movable apron 5. It follows, therefore, that the throw of lever 334′ may be regulated by adjusting the stud 339 in or out along slot 340 in bracket 341, see Figs. 1 and 8. By this fan board mechanism 308, 315 and the links and levers connecting the fan board 315 with the vertically movable apron I am enabled to produce graded sizes of heels, as shown in Figs. 6 and 7. The tongue 308 is shown, see Fig. 8, engaging the center of the fan board 315 so that, no matter how the fan board may be rocked, no change in the position of the pattern wheel 300 with respect to the pattern 61 will take place and no change of the wheel 300 with respect to the working line of the several rotary cutters 200 will take place, but the pattern 61 will move downwardly across the wheel 300 and the blanks will likewise move downwardly across the fixed horizontal plane of rotation of the cutters 200 and so duplicate the pattern. In order to give the desired "grade" for different sizes of heels, the tongue 308 will be adjusted above or below the horizontal axis 321 of the fan board 315, and then when the fan board is rocked from a vertical to an inclined plane, as shown in Fig. 8, the carriage 304 will be given a forward or rearward movement, according to whether the tongue 308 is above or below the fan board axis, and so the carriage 304 will carry the model wheel outwardly or inwardly toward the pattern 61 and so move the rotating blanks farther away from the rotating cutters 200 or permit them to move closer to the cutters and so produce larger or smaller sizes of heels. Obviously, therefore, the grade given by the cutters may be made to fade away or vanish at any desired point, according to the amount of inclination given the fan board and the length of time such inclination of the fan board is allowed to continue. This will depend upon the adjustment of the stud 339 which regulates the throw of lever 334. When the stud 325 is in the position shown in Fig. 8, the fan board 315 will always be moved back to a vertical position, regardless of the position of stud 339 in the slot 338 of lever 334.

To hold the fan board 315 at any desired angle while its actuating slide 333 travels in a straight line between the permanent angle given by adjusting screw 319 and the normal vertical position for the purpose of giving the grade to the heel from the end of the vanishing point 400, see Fig. 6, to the tread, the actuating stud 325 is moved outwardly in slot 324 from the position shown in Fig. 8. Thus the fan board will always set at an incline and so operate the tongue 308, which will have been properly adjusted above or below the fan board axis, according to whether the grade is to be added or taken away above the vanishing point 400, Fig. 6. The outside broken line above point 400 shows the extreme outer grade, but it will be understood that the space between the dotted and full lines is to be proportionately divided and continued from the corresponding dotted lines below point 400.

By my improved construction six heels may be formed at one operation and these heels may be made exact reproductions of the model and of any desired size. Furthermore, by means of the fan board mechanism, above described, the grade above the vanishing point 400 of the heel can be made in any proportional part of the grade at the base of the heel. A brief description of the operation of the machine is as follows, the parts being in the position shown in Fig. 10, where the apron 5 is in its uppermost position and the saddle 50 in its outermost position: A blank 63 is in position within the studs of the positioning plate 89 ready to be clamped. The lever 72 will now be depressed and the blank clamped in place on the rotary shaft; the positioning plate 89 being depressed at the same time below the level of the upper end of shaft 83. The saddle 50 and the clamped pattern and blanks carried thereby will now be moved toward the pattern-controlled wheel of the rotating cutters 200, so that the parts will now be in the positions shown in Figs. 4 and 5, whereupon the latch bar 131 will have permitted the pulley 117 to be clutched to its operating shaft and thereby impart motion to the worm shaft 82 and the blank-carrying shafts 83. At the same time the vertical feed screw 15 will have imparted downward movement to the apron 5 and consequently to the saddle 50 and the parts carried thereby.

The downward movement of the saddle 50 will carry the pattern along the face of the pattern wheel 300 and also carry the blanks in like manner across the working faces of the cutters 200 so that as the saddle is moved in and out in accordance with the action of

the pattern on the pattern wheel 300 the series of rotating blanks will in passing down across the rotating cutters receive the contour of the pattern. This operation will go on until the latch 31 engages the stop 37 and releases the lever 29, which in turn separates the divided nut and renders the feed screw inoperative. At the same time the saddle 50 will have reached its innermost position and the blanks formed into complete heels conforming exactly to the pattern.

The operator will now pull saddle 50 outwardly to the position shown in Fig. 10, which will cause latch bar 131 to move outwardly and throw clutch 119 out of engagement with pulley 117 and so stop rotation of the worm shaft 82 and the shafts 83. Levers 72 will now be swung up to release the heels so that the operator may readily remove them and insert a new set of blanks.

To change the size of heel produced it is only necessary to turn the shaft 309 to raise or lower the tongue 308 as before described, so as to set the pattern wheel closer to or farther from the pattern 61. These sizes of the heel are shown in Figs. 5 and 6 and the several sizes merge or vanish at 400. Grade may be added above and below this point 400 by giving the fan board a permanent angle by adjusting bolt 319 and then moving pivot bolt 325 outwardly in slot 324 of fan board lever 323.

While I have shown and described six pattern shafts and six cutters, the number may be varied to suit, and so also there are many changes which may be made without departing from the spirit of my invention. Furthermore, articles other than wooden heels may be produced by this machine without making any radical changes in its construction.

In conclusion, I would add that great difficulty has been experienced in turning irregular articles, such as shoe lasts, true to shape and size, owing to the fact that the pattern and blanks are commonly carried by a swinging frame pivoted at its upper end, which frame will, when the blanks are presented to the cutters, be skewed out at its lower free end and so cause the production of uneven work.

This is true also of a rocker-supported sliding frame. To overcome these objections I have made the apron 5 to overlap the sides of the column 1 and there provided the vertical raceways 6 containing the ball bearings 7 so that the apron is held to slide in a true vertical line without any chance of its being moved or forced outwardly. It has a very free and easy movement, however. Furthermore, the saddle 50 is in like manner held to a true horizontal movement by its end edges overhanging the ends of the apron top, as shown in Fig. 2, and connected thereto by the V-raceways containing the ball bearings. This construction prevents all accidental deflection of the blanks when brought up to the cutters.

What I claim is:

1. The combination with a rotary cutter in fixed bearings, of a rotary blank holder movable toward and across the working edge of the cutter and parallel to its axis, a pattern mechanism controlling the normal movement of the blank toward and from the rotary cutter and supplemental pattern controlling devices operating by the movement of said holders parallel to the cutter axis for imparting other than said normal control to the blank; whereby additional material may be added to the blank at certain portions thereof or removed therefrom, as may be desired.

2. The combination with a support movable in two planes at right angles to each other, operating means therefor, a rotary pattern holder and a rotating blank holder mounted thereon, and means for rotating them in unison, of a pattern engaging member and a rotating cutter toward which the support is constantly pressed as it is fed across its edge, a carriage for the pattern engaging member sliding transversely of the cutter axis and controlling means operated by the movement of said support for automatically shifting the said sliding carriage at a predetermined time toward or from the pattern holder.

3. The combination with a stand or column, a sliding apron thereon, means for operating the apron, a saddle on the apron movable transversely to the movement of the apron, means for moving the saddle constantly toward the cutter, a pattern rotating shaft mounted on the saddle, a parallel blank rotating shaft alongside the first named shaft, and means for rotating the shafts in unison, of a slide on the stand or column movable at a right angle to the shaft, a pattern engaging device carried thereby, a rotary cutter on the slide opposite the blank holder, and a fan board mechanism controlling the said movable slide and actuated from the movable apron in the movement of the latter.

4. The combination with vertically and inwardly movable pattern holding and blank holding shafts and means for rotating them in unison, of a horizontally movable slide provided with a pattern engaging device and with a rotating horizontal cutter toward which the said pattern holding and blank holding shafts are constantly pressed, a tongue adjustable vertically on the said slide, a fan board engaging said tongue and mounted at its ends to rock vertically, and an actuating mechanism for said fan board operated upon movement of said pattern and blank holding shafts longitudinally of their axes.

5. In a machine of the character described, the combination with a pattern engaging device and its slide, of a tongue vertically adjustable on the slide, a fan board engaging the tongue and having a horizontal axis, means for permanently changing the angle of the fan board on its axis, an operating arm projecting from the fan board axis, an operating link adjustable at its upper end along said arm, a bell crank lever to one arm of which the lower end of said link is connected, a vertically movable sliding link having a longitudinally extending slot off-set between its ends and there connected by an inclined slot, a stud extending from the other arm of said bell crank lever into the slot of the sliding link to rock the bell crank lever when the said stud enters the inclined slot, and a horizontal lever for actuating the sliding link from a movable element of the machine.

6. The combination with vertically and inwardly movable pattern holding and blank holding shafts, and means for rotating them in unison, of a rotary horizontal cutter opposite the blank holder, a horizontal slide alongside thereof and provided with a pattern engaging device, a tongue adjustable vertically on the said slide, a fan board engaging said tongue to control the slide, said fan board being adjustable on its horizontal axis to obtain a permanent angle, an operating arm connected to said axis, an actuating member for said arm adjustable thereon toward and from the fan board, and means for actuating said operating arm to rock the fan board at predetermined intervals, said last-named means being operated upon movement of said pattern and blank holding shafts longitudinally of their axes.

7. The combination with a stand or column, a vertically sliding apron thereon, means for feeding the apron downwardly, a horizontally sliding saddle on the upper side of the apron, means for imparting a constant inward movement to the saddle, a vertical pattern rotating shaft and a vertical blank rotating shaft mounted on the said saddle and having holders at their upper ends for the pattern and blank respectively, of a horizontal carriage on the top of the column and provided with a pattern engaging device, a rotary horizontal cutter mounted on top of the column opposite the blank holder, a tongue adjustable vertically on the rear of the said carriage, a rocking fan board engaging said tongue and provided with a horizontal axis journaled on the top of the column, an operating arm extending rearwardly from the fan board axis, an operating link adjustable at its upper end along the said operating arm, a bell crank lever to one end of which the lower end of said link is connected, a vertically sliding link mounted on the side of the column and having a longitudinal slot offset between its ends and there connected by an inclined slot, a stud extending from the lower end of the bell crank lever into said slot for operation by the sliding link, a horizontally adjustable stud on the lower part of the vertically movable apron, and a lever pivoted between its ends to the column, pivotally engaging with its rear end the lower end of said sliding link and having a longitudinal slot in its outer member engaging the stud on the apron.

8. The combination with a stand or column, a series of horizontal rotary cutters thereon, and a pattern engaging device at the middle of the series of cutters, of a vertically movable apron on the column, means for feeding the apron slowly down, means for releasing the feed at a predetermined point, means for quickly raising the apron, a horizontally movable saddle on top of the apron, means for moving the saddle constantly inward, a line shaft mounted on the saddle, vertical shafts geared at their lower ends to the line shaft; the middle one of said shafts being a pattern rotating shaft and the others blank rotating shafts, a driving mechanism for said line shaft, means for rendering the driving mechanism operative when the saddle is initially moved inward to bring the pattern engaging device up to the pattern and the blanks up to the cutters, and means for throwing said driving mechanism out of action when the saddle is drawn outwardly.

9. In a machine of the character described, the combination of a vertically and horizontally movable saddle provided with a line shaft and with rotary pattern and blank rotating shafts geared thereto, means for giving a constant inward movement to the saddle, a driving mechanism for the said line shaft having a clutch device, and a clutch actuating bar operatively connected with the saddle to connect the clutch when the saddle is moved inwardly and to be moved outwardly by the saddle when it is moved outwardly and thereby disconnect the clutch.

10. In a machine of the character described, the combination of a vertically and horizontally movable saddle provided with a line shaft and with vertical pattern and blank rotating shafts geared thereto, means for giving a constant inward movement to the saddle, a driving mechanism for the line shaft including a clutch, and a clutch actuating latch bar having a latch for separably connecting it with the saddle for inward movement therewith or to permit the independent movement of the saddle; the inward simultaneous movement of the saddle and latch bar serving to connect the clutch and the outward movement of the latch bar by the saddle serving to disconnect the clutch.

11. In a machine of the character de-

scribed, the combination of a vertically and horizontally movable saddle provided with a line shaft and with vertical pattern and blank rotating shafts geared thereto, means for giving a constant inward movement to the saddle, a driving mechanism for the line shaft including a clutch, a clutch and actuating latch bar having a latch for separably connecting it with the saddle for inward movement therewith or to permit the independent movement of the saddle; the inward simultaneous movement of the saddle and latch bar serving to connect the clutch and the outward movement of the latch bar by the saddle serving to disconnect the clutch, and means for locking the latch bar and saddle against inward movement.

12. In a machine of the character described, the combination with a column or stand, a vertically movable apron on the front side thereof, means for feeding the apron downward, means for automatically releasing the apron feed, means for quickly raising the apron, a saddle on top of the pattern, means for giving the saddle a constant inward movement, a line shaft on the saddle, a central vertical pattern rotating shaft and a plurality of blank rotating shafts all geared at their lower ends to said line shaft, a driven shaft at the lower end of the column, gear boxes hung on the line shaft and driven shaft, a telescopic shaft with its opposite ends mounted in said gear boxes and there geared to the line shaft and driven shaft respectively, a clutch on the driven shaft, a vertical rock shaft having a clutch actuating arm at its lower end engaging said clutch and provided at its upper end with an operating arm, and a clutch actuating bar having a cam to engage said upper operating arm, and means for operating the clutch actuating bar from the saddle to connect the clutch when the saddle is moved inwardly and to disconnect the clutch when the saddle is moved outwardly.

13. The combination with a vertically and horizontally movable support, a rotary pattern holder, and a rotary blank rotating shaft mounted on said support, means for rotating said pattern holder and blank rotating shaft in unison, of a relatively fixed horizontally rotating cutter opposed to the blank holder, a carriage adjustable toward and from the pattern holder and provided with a pattern engaging device, a manually operated shaft on the upper part of the carriage, a vertically extending feed screw geared at its upper end to the rear end of said shaft, a traveling block engaged by the screw for vertical adjustment thereby, a tongue projecting rearwardly from said block, a vertically rocking fan board journaled horizontally in rear of said carriage, and provided at one end with a disk, a shaft provided with a disk abutting the first named disk, an adjusting bolt connecting said disks, a slotted arm projecting rearwardly from the latter shaft, an adjustable stud in said slot, a bell crank lever, a link pivotally connecting said bell crank lever and adjustable stud, a vertically movable slide having a longitudinal slot offset between its ends; said slot having an inclined connecting slot, a stud working in said slots and pivotally connected to the other arm of said bell crank lever, a vertically rocking lever connected at its rear end to the lower end of said slotted slide and connected at its outer end for operation with a part giving vertical movement to the vertically and horizontally movable support.

14. In a machine of the character described, the combination with a column or support, a pattern engaging device and a rotary cutter mounted in fixed bearings thereon, of a vertically sliding apron on the front of the column, overlapping guiding portions between the column and the apron to hold the latter to a true vertical movement and ball bearings mounted between said overlapping portions, a horizontally movable pattern and blank carrying saddle on the upper face of the apron, overlapping connections between the ends of the saddle and the apron, and ball bearings interposed between said overlapping surfaces.

15. In a machine of the character described, the combination with a column and the model wheel and fixedly mounted rotating cutter, a vertically movable apron provided with side flanges overlapping the sides of the column, vertically opposed raceways between said overlapped surfaces and ball bearings within the raceways, of a horizontally sliding pattern and blank carrying saddle mounted on the upper surface of the apron and having depending flanges at its ends overhanging the ends of the apron, horizontally extending opposed raceways between said overlapping surfaces and ball bearings within the raceways.

16. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

17. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and adjustable means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

18. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating automatically in the relative movement of said holding means and said pattern-follower and work-cutting device, to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

19. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and adjustable means automatically operating in the relative movement of said holding means and said pattern-follower and work-cutting device, to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

20. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing movement of said holding means in a direction lengthwise of the work, to produce a feeding of the pattern and work to said follower and work-cutting device, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

21. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing movement of said holding means in a direction lengthwise of the work, to produce a feeding of the pattern and work to said follower and work-cutting device, and adjustable means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

22. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing movement of said holding means in a direction lengthwise of the work, to produce a feeding of the pattern and work to said follower and work-cutting device, and means operated automatically by said holding means in its movement in a direction lengthwise of the work, to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

23. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing movement of said holding means in a direction lengthwise of

the work, to produce a feeding of the pattern and work to said follower and work-cutting device, and adjustable means operated automatically by said holding means in its movement in a direction lengthwise of the work, to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

24. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work, said last-named means being adjustable to vary the amount of grade in the direction of the width of the work.

25. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work, said last-named means being adjustable to vary the degree of taper of the grade lengthwise of the work.

26. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work, said last-named means being adjustable to vary the point on the work at which the machine ceases to progressively grade the work.

27. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work, said last-named means being adjustable to vary the amount of grade in the direction of the width of the work and to vary the degree of taper of the grade lengthwise of the work.

28. In a machine of the character described, the combination of pattern and work-holding means and a pattern-follower and a work-cutting device, coöperating, respectively, therewith, means whereby said work-cutting device is caused to cut the work peripherally responsive to the relative movement of said pattern and follower, means for producing relative movement of the said work-holding means and said pattern-follower and work-cutting device lengthwise of the work and pattern to produce a feed action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work, said last-named means being adjustable to vary the amount of grade in the direction of the width of the work, the degree of taper of the grade lengthwise of the work, and the point on the work at which the machine ceases to progressively grade the work.

29. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatively supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, means for effecting relative movement

lengthwise of the pattern and work, between said pattern-supporting means and said work-supporting means and said follower and cutting device, to produce a feeding action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a taperng grade in the direction of the length of the work.

30. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, and toward which the pattern and work are yieldingly constantly pressed, means effecting relative movement lengthwise of the pattern and work between said pattern-supporting means and said work-supporting means and said follower and cutting device, to produce a feeding action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

31. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, and toward which the pattern and work are yieldingly constantly pressed, means for effecting the movement of said pattern-supporting means and said work-supporting means in a direction lengthwise of the pattern and work, to produce a feeding action, and means operating to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

32. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, means for effecting relative movement, lengthwise of the pattern and work, between said pattern-supporting means and said work-supporting means and said follower and cutting device to produce a feeding action, and means operating automatically in the relative movement of said holding means and said follower and work-cutting device, to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

33. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, means for effecting relative movement, lengthwise of the pattern and work, between said pattern-supporting means and said work-supporting means and said follower and cutting device to produce a feeding action, and means operating automatically by engagement with that part of the machine which moves lengthwise of the work and pattern to effect the feeding action referred to, to cause the work-cutting device to cut the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

34. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, said pattern-follower and said work-cutting device being relatively movable toward and from the pattern and work, means for effecting relative movement lengthwise of the pattern and work, between said pattern-supporting means and said work-supporting means and said follower and cutting device, to produce a feeding action, and means for shifting the movable one of said follower and cutting device relative to each other during the said feeding action, for cutting the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work.

35. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device coöperating with the pattern and work, respectively, said pattern-follower and said work-cutting device being relatively movable toward and from the pattern and work, means for effecting relative movement lengthwise of the pattern and work, between said pattern-supporting means and said work-supporting means and said follower and cutting device, to produce a feeding action, and means for shifting the movable one of said follower and cutting device relative to each other during the said feeding action, for cutting the work to progressively varying thicknesses relative to the pattern in a di-

rection lengthwise of the work to produce a tapering grade in the direction of the length of the work comprising a tiltable fan-board, means for forcing against said fan-board the one of said follower and cutting device which is movable relative to the other, and means for rocking said fan-board during the said feeding action.

36. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and a work-cutting device coöperating with the pattern and work, respectively, said pattern-follower and said work-cutting device being relatively movable toward and from the pattern and work, means for effecting relative movement lengthwise of the pattern and work, between said pattern supporting means and said work-supporting means and said follower and cutting device, to produce a feeding action, and means for shifting the movable one of said follower and cutting device relative to each other during the said feeding action, for cutting the work to progressively varying thicknesses relative to the pattern in a direction lengthwise of the work to produce a tapering grade in the direction of the length of the work comprising a tiltable fan-board, means for forcing against said fan-board the one of said follower and cutting device which is movable relative to the other, and means, operated by the one of the elements which in moving effects the said feeding action, for rocking said fan-board during said feeding action.

37. In a machine of the character set forth, the combination of means for rotatably supporting a pattern and means for rotatably supporting the work, a pattern-follower and a work-cutting device toward and away from which said pattern-holding means and said work-holding means are movable, means for yieldingly forcing said pattern-holding means and said work-holding means toward said pattern-follower and cutting-device, said follower and cutting device being relatively movable toward and away from said pattern-holding means and said work-holding means, means for causing said pattern-holding means and said work-holding means to move lengthwise of the pattern and work to produce a feeding action, a fan-board against which the relatively movable one of said follower and cutting-device is constantly pressed, and means operated by the movement of said pattern-holding means and said work-holding means in the feeding movement stated, to gradually tilt said fan-board during the said feeding action, for producing a tapering grade in the direction of the length of the work.

In testimony whereof I affix my signature.

CHARLES E. REED.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."