H. H. EATON.

GRINDING MACHINE.

APPLICATION FILED NOV. 8, 1915.

1,228,418.

Patented June 5, 1917.

2 SHEETS—SHEET 1.

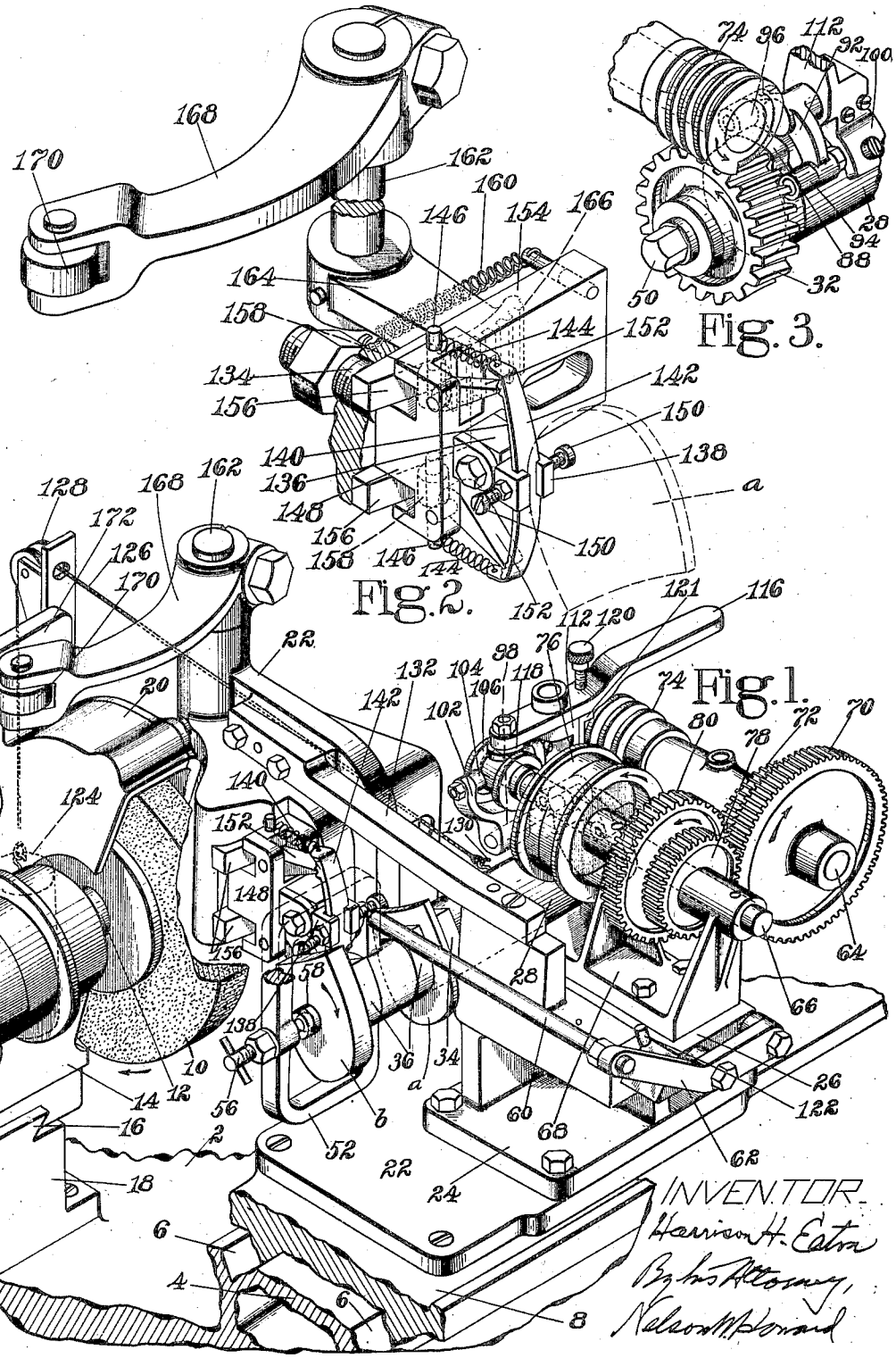

Fig. 1.

Fig. 2.

Fig. 3.

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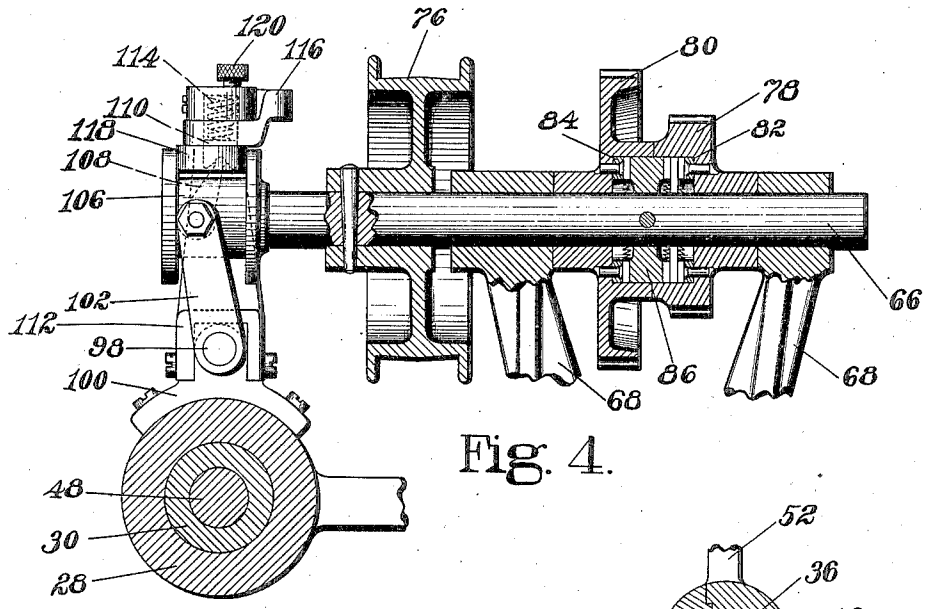

Fig. 4.

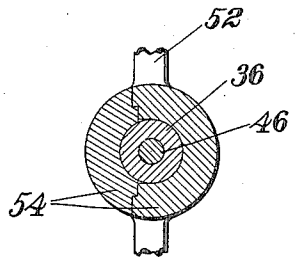

Fig. 6.

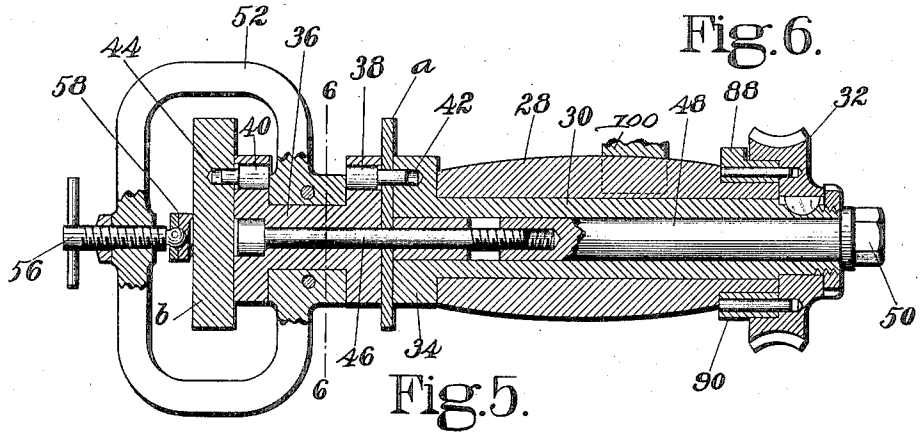

Fig. 5.

INVENTOR.

Harrison H. Eaton

By his Attorney,

Nelson W. Howard

UNITED STATES PATENT OFFICE.

HARRISON H. EATON, OF BEVERLY, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY COMPANY, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GRINDING-MACHINE.

1,228,418. Specification of Letters Patent. Patented June 5, 1917.

Application filed November 8, 1915. Serial No. 60,293.

To all whom it may concern:

Be it known that I, HARRISON H. EATON, a citizen of the United States, residing at Beverly, in the county of Essex and State of Massachusetts, have invented certain Improvements in Grinding-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to grinding machines or the like, and is herein shown as embodied in a machine for use in shaping articles in conformity to a pattern, although the utility of the invention is not necessarily restricted to this particular type of machine. In the illustrated machine the work shaping tool comprises an emery wheel for grinding the surface of the work; but it will be apparent from the following description that the invention in its broader aspects is not limited to machines which have a working tool of this particular character, since the various features of improvement are applicable to machines which perform their work by the use of tools of other types such, for example, as milling cutters.

Machines of the illustrated type include a pattern-guide arranged to coöperate with the pattern to control the presentation of the work to the operating tool. In machines in which the work is shaped by engagement with the periphery of a rotary tool, this guide should, for accurate results, conform to the curve of the periphery of the tool. In order to secure such conformity it has been necessary heretofore, where tools of different diameters were in use, to provide a different pattern-guide for each size of tool; and in the event of decrease in the diameter of the tool through wear, which is comparatively rapid in an emery wheel, conformity between the curvature of the tool and that of the guide could only be approximated by substituting at intervals guides of different degrees of curvature.

It is an object of this invention to avoid the trouble and expense incident to the frequent changing of the pattern-guides in machines of the above described character, and to provide means whereby substantial conformity between the curvature of the tool and that of the guide may at all times be insured. An important feature of the invention accordingly consists in a pattern-guide of novel and improved construction which is readily adjustable to vary the curvature of its guiding face.

A further feature of the invention resides in the provision of means for adjusting the guide to conform to the varying curvature of the tool or to the different curvatures of tools of different diameters. In the illustrative machine the tool carrying shaft is adjustable to carry the tool toward or from the location of the work in order to present the periphery of the tool in effective operative relation to the work, and the mechanism for adjusting the guide is controlled by the adjustment of the tool to cause the guide to conform to the curvature of the tool when the tool is in position to operate upon the work.

A more particular object of this invention is to provide an improved machine for use in shaping the die plates for the molds employed in machines for compressing heels for boots and shoes. Such molds include die plates for engaging respectively the top and the bottom of the heel, the edge contour of each plate conforming to the outline of that part of the heel with which the plate engages. Since it is essential that at the end of the heel compressing operation these plates shall fit very closely within the dies which are used for compressing the sides of the heel, it is necessary that the plates be formed with great accuracy and precision. In the usual practice these plates are formed of soft steel and are pack hardened; and it is frequently found that during the hardening process the shape of the plates is altered. This invention provides a machine whereby the plates may be subjected to a final shaping or truing operation to conform their edges to a definite pattern; and among its various features the invention includes novel means for presenting plates of the character above described to the grinding member or like tool so as to cause the tool to operate effectively and uniformly upon all portions of the edge of the plate.

It will be apparent, however, and should be understood that although shown and described as adapted for operation upon heel compressor plates, the machine is not thus

restricted in its use, and that the several features of the invention are of general utility as applied to the production of articles of different forms and for various uses.

The above and other features of the invention, including certain details of construction and combinations of parts, will now be described with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention, and will be pointed out in the claims.

In the drawings:—

Figure 1 is a perspective view showing such portions of a machine for shaping heel compressor plates as are necessary in order to illustrate the features of the invention;

Fig. 2 is an enlarged perspective view of a portion of the machine detached;

Fig. 3 is a fragmentary view of a portion of the mechanism for driving the work rotating arbor;

Fig. 4 is a view in vertical section through a portion of the work rotating mechanism;

Fig. 5 is a view in vertical section through another portion of the work rotating mechanism, showing the means for holding the work and the pattern in fixed relation; and

Fig. 6 is a section on the line 6—6 of Fig. 5.

The operative parts of the machine are mounted upon a frame 2, the upper portion of which is seen in Fig. 1, the frame having a raised portion 4 provided with grooves 6 to serve as a guideway upon which a work supporting carriage 8 is movable longitudinally of the machine. As usual in machines of this type, suitable mechanism is provided for imparting short reciprocatory movements to the carriage 8 to cause the work to traverse the periphery of the grinding wheel from side to side so as to equalize the wear of the wheel, this means not being illustrated herein since it forms no part of the present invention. The grinding wheel 10 is carried by a power driven shaft 12 which extends longitudinally of the machine in parallel relation to the path of movement of the carriage 8. The shaft 12 is mounted in bearings on a carrier 14 which is flanged to embrace a dovetailed projection 16 on a base block 18 secured to the frame 2, this arrangement permitting movement of the carrier 14 and the grinding wheel toward or from the carriage 8 in a path at right angles to the path of movement of the carriage. The carrier 14 may be thus moved to adjust the position and hence the cutting path of the wheel 10 with reference to the work by suitable manually operated means, not shown in the drawings. Attached to the carrier 14 is a dust hood 20 which partially covers the wheel 10.

Secured to the carriage 8, in the construction shown, is a casting 22 upon which is bolted a smaller casting 24 suitably formed to provide a slideway in which a slide 26 is movable in a path at right angles to the path of movement of the carriage 8. The slide 26 is formed at its rear end to provide a bearing 28 for a work rotating arbor 30. This arbor has keyed thereto at one end a worm gear 32 through which it receives its movement from mechanism to be subsequently described, and at its other end is formed with an enlarged head 34 to provide a seat for a pattern plate, shown at *a*. It will be understood that in the operation of the machine the pattern-plate and the work piece should be rotated in unison and maintained in fixed relation to each other. To this end the machine includes a spool 36 having in its opposite ends alined openings in which are mounted two pins 38 and 40, the pin 38 having a reduced end portion formed to extend through and fit closely in a hole in the pattern plate and in a bore 42 in the head 34, and the pin 40 having a reduced end to fit in a hole 44 in the work piece *b*, this hole being located in the same relation to the peripheral outline of the work piece as is the hole 42 in the pattern plate to the peripheral outline of the plate. The spool 36 is held in position by means of a rod 46 provided with an enlarged head for engagement in a socket in the spool and having a threaded end portion to engage in a threaded bore in the end of a rod 48 which extends centrally within the arbor 30 and has a flattened head portion 50 whereby it may be turned so as to draw the rod 46 into position to hold the spool 36 securely in place with the pattern plate *a* clamped between the spool and the head 34 on the arbor.

In order to assist in retaining the work piece *b* in position, there is provided a yoke 52 having a hub portion 54 mounted upon the central portion of the spool 36 as a bearing, the hub 54 being split, as shown in Fig. 6, to facilitate the assembling of the parts. Threaded through the yoke in line with the axis of the arbor 30 is a rod 56 having a ball-shaped end to engage in a socket formed in a box 58 which engages the work piece and turns therewith. It will be understood that the yoke 52 is not intended to turn with the work but is maintained in a stationary position through its engagement with the end of a rod 60 which projects from a bracket 62 on the plate 26. In order further to insure that the work shall be maintained in the correct relation to the pattern, the spool 36 is preferably provided with two pins such as 40 to enter two different sockets in the face of the work piece, only one such pin, however, being shown in the drawings.

The mechanism for driving the gear 32 to rotate the arbor 30 includes parallel shafts

64 and 66 mounted to rotate in bearings formed in a standard 68 which is bolted upon the slide 26. Secured to the shaft 64 at one end are a pair of spur gears 70 and 72 of different diameters, and at the other end a worm wheel 74 which is arranged to engage and drive the gear 32. Pinned to the shaft 66 is a belt pulley 76 arranged to be driven from an overhead power shaft, and mounted loosely on the shaft 66 between its two bearings in the standard 68 are a pair of spur gears 78 and 80 of different diameters arranged to engage respectively the gears 70 and 72 on the shaft 64 so as to drive the latter shaft at different rates of speed. Within recesses in the opposed faces of the gear wheels 78 and 80 are secured toothed clutch rings 82 and 84 respectively, and pinned to the shaft between these rings is a central clutch member 86 having teeth on its opposite sides to permit it to engage alternatively the teeth of the ring 82 or the teeth of the ring 84, according to the longitudinal position of the shaft 66 in its bearings, so as to make either the gear 78 or the gear 80 the driving gear. It will be understood that when power is transmitted through the gears 78, 70 to the shaft 64 the arbor 30 is driven at a slower speed than when the gears 80, 72 are the driving gears, and that when either of the gear wheels 78 or 80 is clutched to the shaft 66, the other wheel may turn idly upon the shaft at a rate of speed determined by its engagement with the corresponding gear wheel on the shaft 64.

The machine shown is intended particularly for use in shaping the top or bottom plates of the molds of heel compressing machines. The illustrated work piece *b* is accordingly similar in shape to a heel lift, having a slightly concave end face corresponding to the breast of the heel and a convex surface extending around its edge from one breast corner to the other. It will be apparent that as the plate *b* is turned with its edge in contact with the grinding wheel 10, the wheel will engage at one time a greater extent of the surface of the plate when the concave breast face is presented for treatment than when the wheel is operating upon other portions of the edge. It is desirable, therefore, in order that all portions may be ground sufficiently to conform to the pattern, that when the breast is presented for treatment the wheel 10 remain longer in engagement with the surface upon which it is operating than when other portions of the edge are in engagement with the wheel. To this end the work rotating mechanism includes means for changing automatically the speed of rotation of the arbor 30 as the plate *b* is turned with either of its breast corners in engagement with the wheel, so as to establish a slower rate of movement of the work while the breast face is presented for treatment, and to reëstablish the original speed after the treatment of the breast face. This control is effected by means of a cam 88 formed on a sleeve 90 which is mounted to rotate on the end of the bearing member 28 and is pinned to the gear 32 so as to cause the cam to rotate in predetermined relation to the breast faces of the work piece and the pattern plate. Mounted adjacent to the path of the cam 88 is a rocker member 92 having oppositely extending arms which carry rolls 94 and 96 respectively in position to be engaged by the cam, the member 92 being fast on a spindle 98 which is mounted to turn in a bearing in a bracket 100 secured to the member 28 and has secured to its opposite end a yoke 102 provided with rolls 104 positioned between the opposed end flanges of a spool 106 fast on the shaft 66. As the cam 88 engages one of the rolls 94 or 96 it will swing the member 92, and through the spindle 98 and the yoke 102 will cause the shaft 66 to move endwise in one direction or the other and shift the position of the clutch member 86.

In order to assist in shifting the clutch and to maintain the member 86 in engagement with the member 82 or the member 84, the yoke 102 has pivoted thereto at the axis of one of the rolls 104, a dog 108 the end of which is seated in a recess in a plunger 110 which is mounted in a socket in a casting 112 secured to the bracket 100 and is pressed downwardly by a spring 114. The spring pressed dog 108 thus acts as a lever to hold the yoke 102 in either position to which it is shifted by the cam 88 and thus to insure the effective engagement of the teeth of the clutch. When it is desired to stop the rotation of the arbor 30 the clutch member 86 may be moved into central or neutral position by means of a handle 116 pivoted on the casting 112 and provided with a roll 118 between the flanges of the spool 106. A stop screw 120 threaded through the handle for engagement in a bore in a lug 121 secured to the casting 112 may be used to retain the handle in its central position.

As the parts of the machine are illustrated in Fig. 1, the work piece *b* is not in engagement with the grinding wheel, since the slide 26 is held in retracted position by means of a pin 122 inserted in a socket in the slide and engaging a portion of the casting 24 adjacent to the slideway. This is the position of the parts when the work piece and the pattern are to be assembled and secured in proper relation or when the piece *b* is to be removed and another piece substituted. When it is desired to begin the grinding operation, the pin 122 is removed and the slide 26 and the work rotating mechanism carried thereby are drawn rearwardly to cause the work to engage the grinding wheel and the pattern *a* to engage a guide to be subse-

quently described. This movement of the slide is effected by means of a weight 124 on a cord 126 which runs over a pulley 128 and is connected to a hook 130 on the member 28, and during the grinding operation this weight acts to maintain the work and the pattern in coöperative relation to the wheel and the guide respectively.

The guiding means for the pattern *a* is mounted upon a portion of the casting 22 which extends upwardly and rearwardly behind the casting 24 and the mechanism which is supported thereby. To render the extension of the casting 22 more rigid a bar 132 is provided, connecting this extension with a portion of the casting 24. Secured to the casting 22 by means of a bolt 134 is a bracket 136 to the forward end of which is secured a flanged holder 138 for the pattern guide with which the pattern *a* engages during the rotation of the work piece to control the position of the work with reference to the wheel 10. This guide comprises a resilient steel bar 140 upon the front or guiding face of which, in the construction shown, is mounted a thin flexible wear plate 142, maintained in conformity with the contour of the member 140 by springs 144 attached to its ends and to pins 146 projecting from a block 148 slidably mounted on the bracket 136. Screws 150 in the holder 138 serve to secure the bar 140 in central position on the holder. It will be readily understood that, for the best results, the pattern guide should present a guiding face conforming as nearly as possible to the curvature of the periphery of the wheel 10. To this end the bar 140, and the plate 142 as well, are made resilient, as above stated, and means is provided for securing and maintaining an accurate conformity between the curvature of the guide and that of the wheel. The bar 140 is so formed that it tends to assume a curvature of a considerably smaller radius than that of the wheel, and behind it is arranged mechanism for adjusting its curvature in opposition to its normal resilient tendency. This mechanism comprises dogs 152 pivoted to the slidable block 148 and having their forward ends seated in recesses at the ends of the bar 140. The pressure of the bar 140 upon the dogs 152 thus tends to slide the block 148 rearwardly on the bracket 136 toward the casting 22. Movement of the block 148 in the opposite direction to adjust the curvature of the guide is effected through a slide 154 movable in a suitable slideway in the casting 22 and having projections 156 at its forward end formed to engage in recesses in the block 148, the projections 156 being wedge-shaped for engagement with rolls 158 on the block 148 so that the position of the block, and consequently the degree of curvature of the guide 140, depend upon the position of the slide 154. A spring 160 attached at its opposite ends respectively to the slide 154 and to the casting 22 tends to move the slide inward, the force of this spring being strong enough to overcome the resiliency of the bar 140. The position of the slide is adjusted and controlled by mechanism which includes an upright spindle 162 mounted to turn in a bearing in the casting 22, an arm 164 secured to the lower end of the spindle and having teeth 166 formed for engagement with similar teeth on the back of the slide 154, and an arm 168 secured to the upper end of the spindle and provided with a roll 170 for engagement with a plate 172 formed preferably as a part of the casting 20.

In the operation of the machine, after the pattern *a* and the work *b* have been secured in position as shown in Figs. 1 and 5, the pin 122 is removed, whereupon the weight 124 draws the slide 26 rearwardly to cause the pattern *a* to engage the wear plate 142 of the guide and thus position the work for the grinding operation. The wheel 10 may then be adjusted, through movement of the carrier 14 upon the slideway 16, to bring it into position for effective engagement with the work. As the wheel is moved forwardly toward the work, the plate 172, through engagement with the roll 170 on the arm 168, will cause the spindle 162 to turn in a direction to effect a movement of the slide 154 toward the right, Fig. 2, thus slightly withdrawing the wedges 156 and permitting the bar 140 to force the slide 148 rearwardly so that the bar may assume a curvature of shorter radius. As previously stated the parts are so constructed and arranged that when the wheel 10 is in position for effective engagement with the work the radius of curvature of the guide is of substantially the same length as the radius of the wheel, or in other words the center of curvature of the guide is substantially coincident with the axis of the wheel. As the pattern is moved in engagement with the guide the work will thus be presented accurately in engagement with the corresponding portion of the wheel so as to cause the work to be shaped in exact conformity to the size and shape of the pattern. The spring 160 retains the guide controlling mechanism in adjusted position, maintaining the roll 170 in engagement with the plate 172. As the carriage 8 moves back and forth to cause the work piece to traverse the periphery of the wheel from side to side, the pattern guide and the mechanism for controlling the shape of the guide move with it, since they are mounted upon the casting 22 which is secured to the carriage, and the roll 170 moves along the plate 172 without any tendency to swing the arm 168.

The direction of rotation of the different elements are indicated by the arrows. As

the parts are positioned in the drawings, the side of the plate *b* beyond the corner of the breast edge is in position to be presented to the grinding wheel upon the removal of the retaining pin 122, and consequently the clutch is thrown to cause the arbor 30 to be driven at the higher speed. It will be understood that when the plate *b* has been turned sufficiently far in the direction indicated to bring the corner of its breast surface into engagement with the wheel, the cam 88 by engagement with the roll 94 will cause the clutch to be thrown so that the work will be driven at the slower speed while the wheel 10 is operating upon the concave breast surface; and that when the other breast corner has come into engagement with the wheel the clutch will be thrown again into the higher speed by engagement of the cam 88 with the roll 96.

It will be readily apparent that the purpose of the plate 142 is to prevent wear of the bar 140 which constitutes the principal portion of the pattern-guide, the object being to provide a wear member which may be renewed more readily and at less expense than the resilient bar. It should be understood, therefore, that except as fulfilling this object the plate 142 is not to be regarded as an essential element of the combination; and since various means may be adopted for preventing wear of the surface of the bar 140, it should be understood that the invention, in its broader aspects, is not limited to a wear member of the form and construction illustrated, nor in other respects is the invention in its broader aspects to be regarded as limited to the details of construction of the mechanism shown and described.

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

1. In a machine for shaping articles in conformity to a pattern, the combination with a tool for operating upon the work, of a pattern-guide arranged to coöperate with the pattern to control the position of the work presented to the tool and having a guiding face conformable substantially to the contour of the working face of the tool, the guide being constructed and arranged so that the contour of its face may be adjusted to correspond to variations in the contour of the working face of the tool.

2. In a machine for shaping articles in conformity to a pattern, the combination with relatively adjustable work shaping and work holding devices, of means for controlling the relative position of said devices during the presentation of the work to the shaping device including a pattern-guide adjustable to vary the contour of its guiding face, and means controlled by the relative adjustment of said devices for varying the contour of said face of the guide.

3. In a machine for shaping articles in conformity to a pattern, the combination with a work holding device, of a rotary tool adjustably movable toward and from said device, means for controlling the position of said device during the presentation of the work to the tool including a pattern-guide adjustable to different degrees of curvature, and means for varying the curvature of said guide in proportion to the extent of said adjusting movement of the tool.

4. In a machine for shaping articles in conformity to a pattern, the combination with a work holding device, of a rotary tool having a curved periphery for engagement with the work and adjustably movable toward said device to compensate for decrease in the diameter of the tool through wear, a pattern-guide arranged to present a curved face conformable substantially to the peripheral curve of the tool, said guide being adjustable to different degrees of curvature, and automatic means for adjusting the guide in proportion to said adjusting movement of the tool to cause the curvature of the guide to conform to the varying curvature of the tool.

5. In a machine for shaping articles in conformity to a pattern, the combination with work holding means, of a shaft upon which may be mounted rotary tools of different diameters, said shaft being adjustable laterally to bring the curved periphery of a tool mounted thereon into engagement with the work, a pattern-guide adjustable to different degrees of curvature and adapted to present a guiding face conformable substantially to the peripheral curve of the tool, and means for adjusting the curvature of said guide in accordance with the distance of the tool shaft from the work.

6. A machine for shaping articles in conformity to a pattern having, in combination, a grinding member and a work holding device relatively adjustable to vary the distance between them, a pattern-guide arranged to coöperate with the pattern to control the relative positions of said member and device during the grinding operation, said guide being adjustable to vary the contour of its guiding face, and means for causing the guide to present a contour conformable substantially to the contour of the working surface of the grinding member when said member and the work holding device are in predetermined positions of relative adjustment.

7. A machine for shaping articles in conformity to a pattern having, in combination, a pattern-guide adjustable to different degrees of curvature, a rotary tool having a curved periphery for engagement with the work and adjustable transversely of its axis to bring it into position to operate upon the work, and adjusting means for said guide

arranged to be operated by said adjusting movement of the tool, said means being constructed and arranged to cause the guide to present a curved guiding face conformable substantially to the peripheral curve of the tool when the tool is in a predetermined position of adjustment.

8. A machine for shaping articles in conformity to a pattern having, in combination, a pattern-guide adjustable to different degrees of curvature, a rotary tool having a curved periphery for engagement with the work and adjustable transversely of its axis to bring it into position to operate upon the work, and means for maintaining the curvature of said guide on a radius corresponding in length substantially to the radius of the tool.

9. In a machine for shaping articles in conformity to a pattern, the combination with work holding means, of a pattern-guide adjustable to different degrees of curvature, a rotary tool mounted for adjustment to bring its peripheral surface into engagement with the work, and means for adjusting the curvature of said guide in accordance with the distance between the work and the axis of rotation of the tool.

10. In a machine for shaping articles in conformity to a pattern, the combination with work holding means, of a pattern-guide adjustable to different degrees of curvature, a rotary tool adjustable toward and from the work in a path transverse to the axis of rotation of the tool, and adjusting means for said guide constructed and arranged to maintain the center of curvature of the guide substantially coincident with the axis of rotation of the tool.

11. A machine for shaping articles in conformity to a pattern having, in combination, a pattern-guide adjustable to different degrees of curvature, a tool adjustable to bring it into position to operate upon the work, a member movable in unison with said adjusting movement of the tool, an oscillatory spindle having an arm projecting therefrom into the path of movement of said member and connections between said spindle and the guide constructed and arranged to effect adjustment of the guide in accordance with the turning movement of the spindle.

12. A machine for shaping articles in conformity to a pattern having, in combination, means for holding the work and the pattern in spaced relation for rotation about a common axis, a rotatable tool adjustable to present its peripheral surface in engagement with the work, a guide having a curved face in position to be engaged by the pattern, said guide being adjustable to different degrees of curvature, and connections between the adjustable tool and the guide constructed and arranged to cause the curvature of the face of the guide to conform to the peripheral curve of the tool when the tool is in a predetermined position of adjustment with reference to the work.

13. In a machine of the class described, the combination with a tool having a curved working surface, of means for controlling the position of work presented to the tool comprising a guide member adapted to present a guiding face of substantially the same contour as the work engaging surface of said tool, said member being adjustable to vary the contour of its guiding face.

14. In a machine of the class described, the combination with a tool having a curved working surface, of means for controlling the position of work presented to the tool comprising a flexible guide member, and means for determining the shape of said member to cause it to present a guiding face conformable substantially to the curve of the working surface of the tool.

15. A machine for shaping articles in conformity to a pattern having, in combination, a carrier, a tool mounted thereon, said carrier being adjustable to vary the cutting path of the tool with relation to the work, a pattern guide having a relatively fixed and a relatively movable portion, and means governed by the adjustment of said carrier for adjusting the movable portion of said pattern guide to make the contour of the same conform to the cutting path of the tool.

16. In a machine of the class described, a pattern-guide comprising a resilient member tending to present normally a curved guiding face of relatively short radius, and adjusting means arranged to act in opposition to said normal resiliency of the guide to cause said guiding face to present a curve of longer radius.

17. In a machine of the class described, a pattern-guide comprising a resilient curved bar, means for supporting said bar between its ends, and adjusting means arranged to engage the end portions of the bar, said supporting means and adjusting means being relatively movable to vary the degree of curvature of the bar.

18. In a machine of the class described, a pattern-guide comprising a resilient curved bar, a bracket arranged to support said bar between its ends, a slide movable on the bracket toward and from the bar and having means for engaging the end portions of the bar, and means for moving the slide to adjust the degree of curvature of the bar.

19. In a machine of the class described, a pattern-guide comprising a resilient curved bar, a bracket arranged to support said bar between its ends, an adjusting slide movable on the bracket toward and from the bar and having means for engaging the end portions of the bar, and a wedge-shaped member at the rear of the slide for determining the position of the slide.

20. In a machine of the class described, a pattern-guide comprising a resilient curved bar, a bracket arranged to support said bar between its ends, an adjusting slide movable on the bracket toward and from the bar, connections between the end portions of the bar and the slide whereby the slide is forced in one direction by the resiliency of the bar, and means movable at the rear of the slide in a path transverse to the path of movement of the slide for forcing the slide in the opposite direction.

21. In a machine of the class described, a pattern-guide comprising a bar adjustable to different degrees of curvature, and a wear member upon the guiding face of said bar, said member being constructed and arranged to prevent contact of the pattern with said guiding face while permitting the pattern to follow the curve of said face for all degrees of curvature within the range of adjustment of the bar.

22. In a machine of the class described, a pattern-guide comprising a bar adjustable to different degrees of curvature, a wear member upon the guiding face of said bar comprising a plate of relatively thin resilient material, and means for conforming said plate to the curve of the guiding face of the bar for all degrees of curvature of said face within the range of adjustment of the bar.

23. In a machine of the class described, the combination with an operating tool of means for rotating a work piece in engagement with the tool, and means for changing the speed of rotation of the work piece at a predetermined point in the cycle of operations.

24. In a machine for shaping the surface of a work piece which presents convex and concave portions, the combination with an operating tool, of means for rotating the work piece in engagement with the tool, and automatic means for causing the work piece to rotate at a decreased speed during the period of engagement of the concave portion of its surface with the tool and for increasing the speed of rotation thereof after the tool has operated upon said concave portion.

25. In a machine for shaping the edges of heel compressor plates, the combination with an operating tool, of means for rotating a plate in engagement with the tool, and means for automatically changing the speed of rotation of said plate at two points in the cycle of operations to cause the plate to be rotated at a decreased speed while its breast portion is presented to the tool and at a relatively greater speed while other portions are so presented.

26. In a machine of the class described, a work rotating arbor, means for driving the arbor at different speeds, and means rotatable with the arbor for changing the speed of rotation thereof at predetermined points in the cycle of operations.

27. In a machine of the class described, a work rotating arbor, a power shaft, operating connections between said shaft and arbor comprising a two-speed gearing, a clutch for controlling said gearing to cause the arbor to be driven at different speeds, and means operated by the rotation of the arbor for controlling said clutch.

In testimony whereof I have signed my name to this specification.

HARRISON H. EATON.