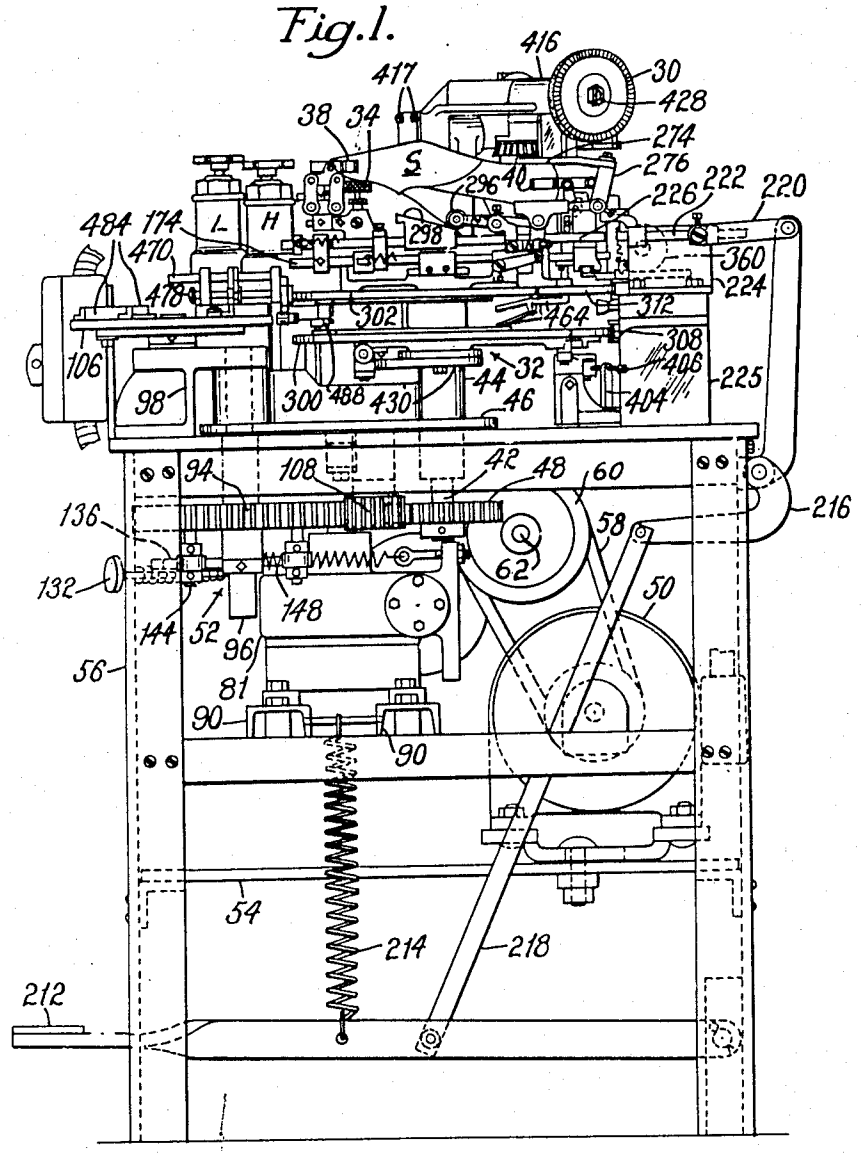
Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 1

Fig. 1.



Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACH..NES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 2

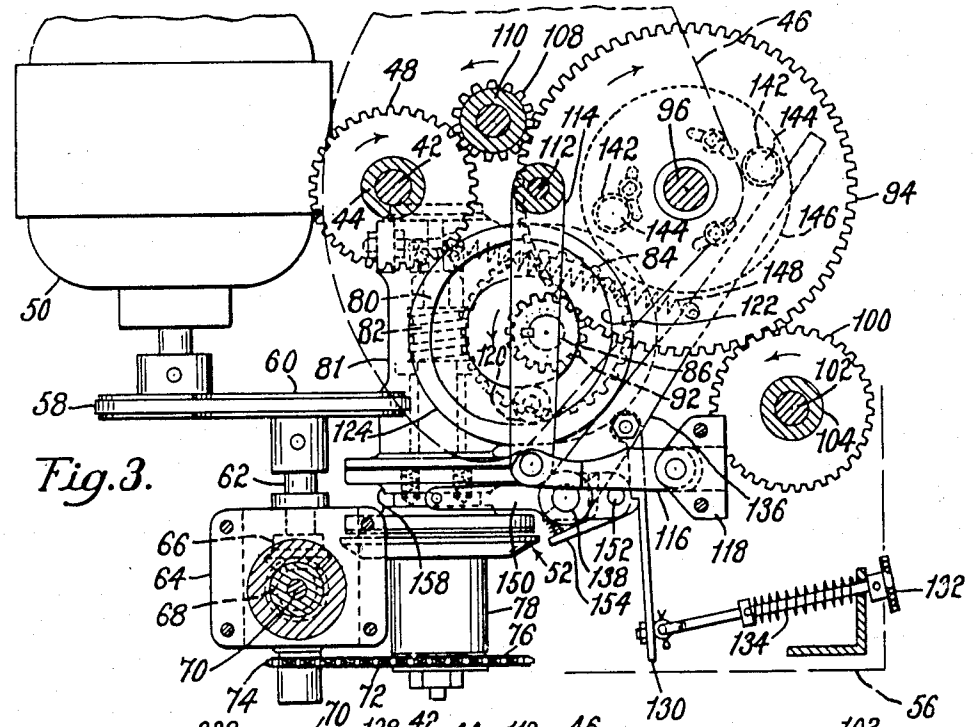


Fig. 3.

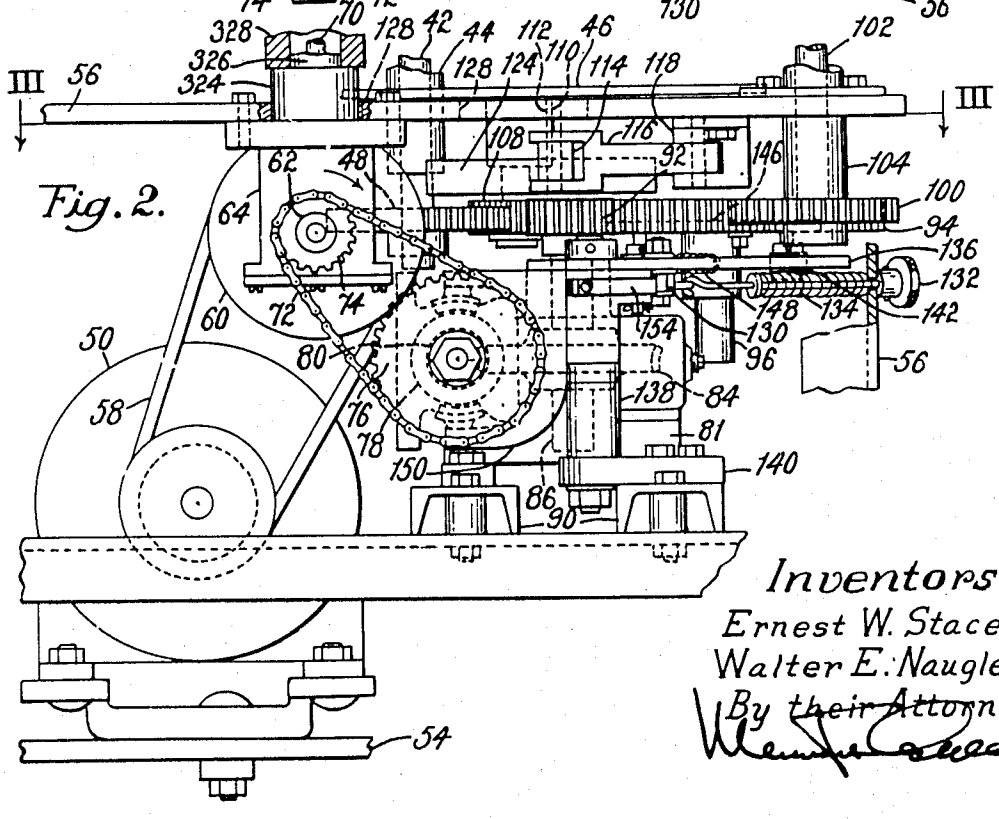


Fig. 2.

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 3

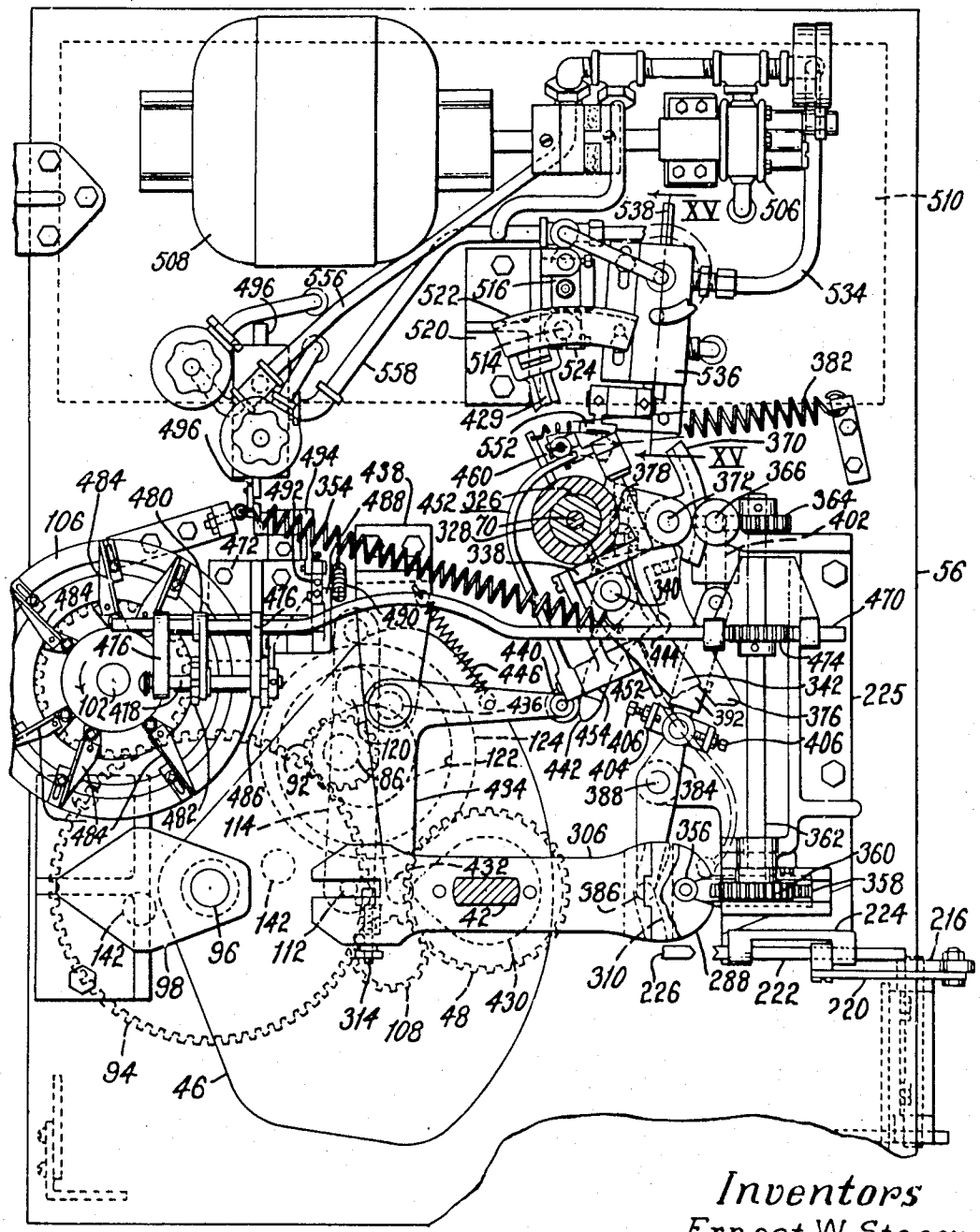


Fig. 4.

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 4

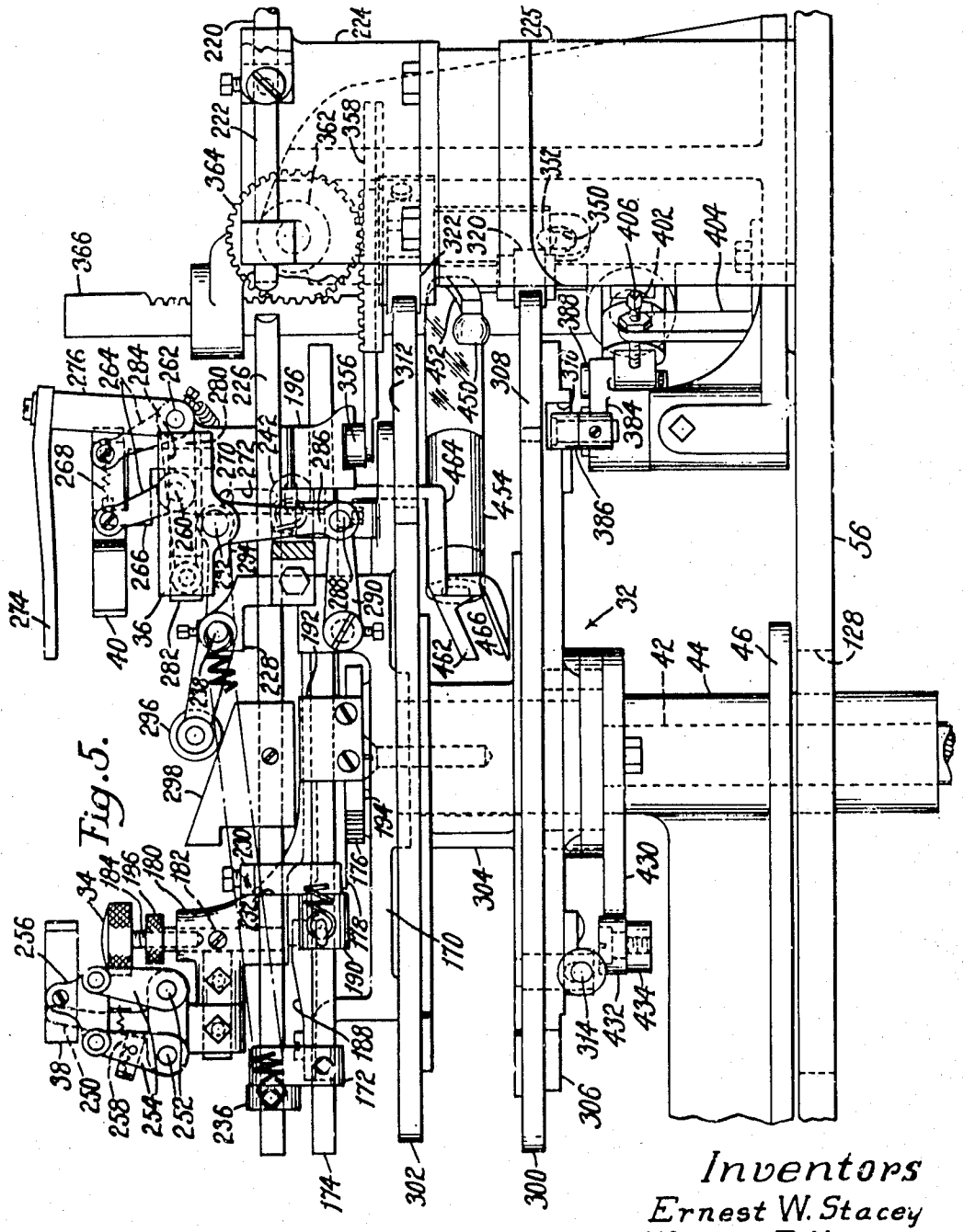


Fig. 5.

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 5

Fig. 6.

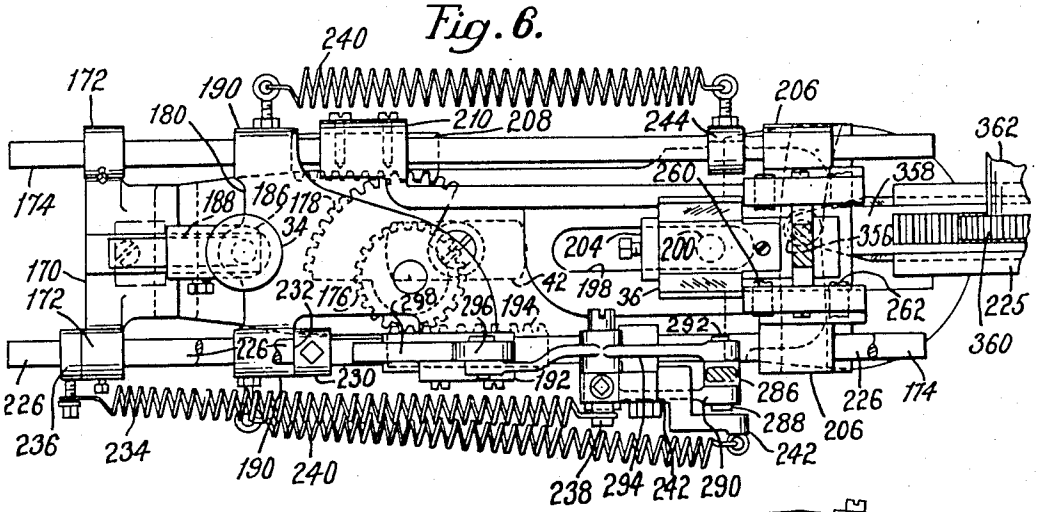
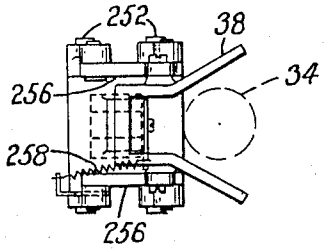


Fig. 7.



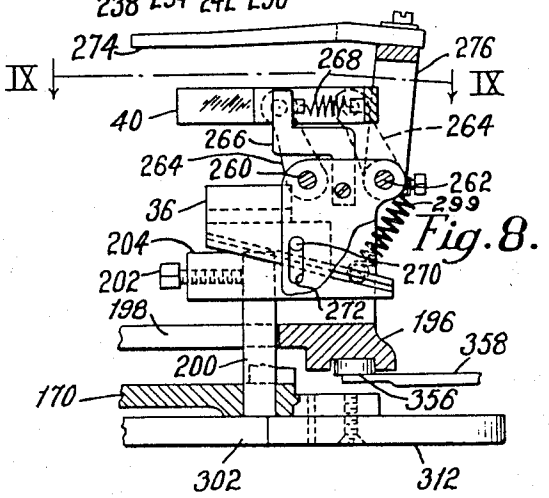


Fig. 8.

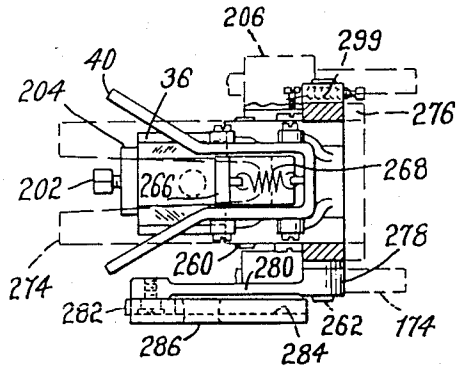


Fig. 9.

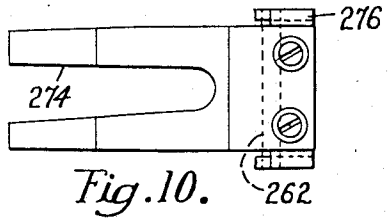


Fig. 10.

Inventors.
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 6

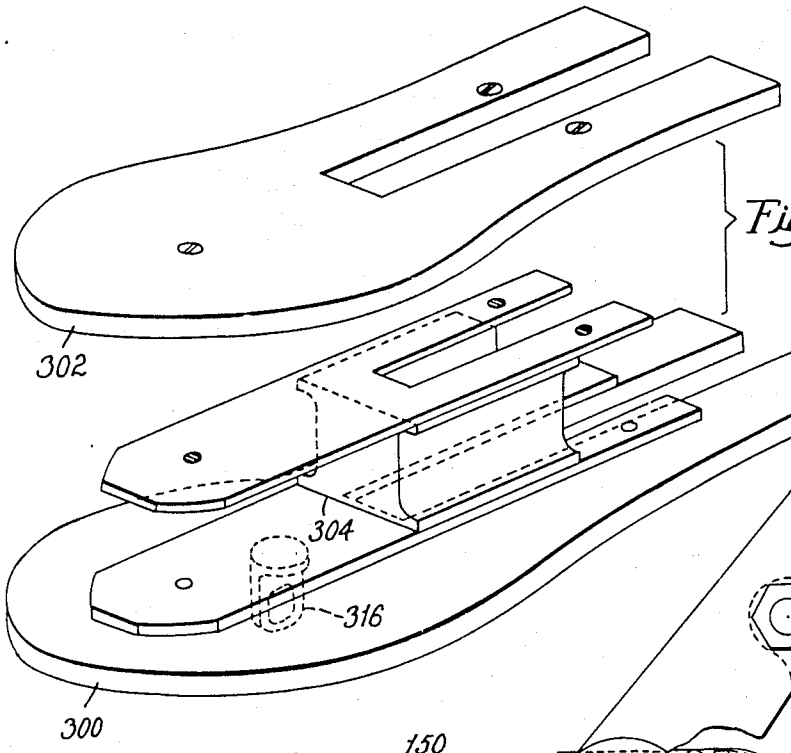


Fig. 11.

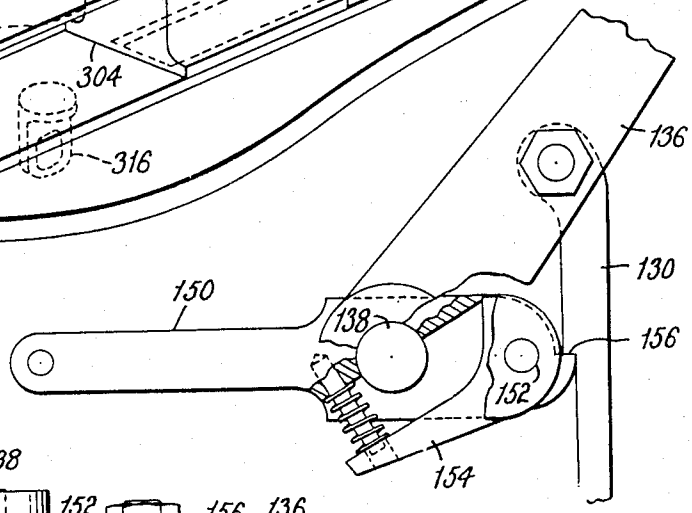


Fig. 3A.

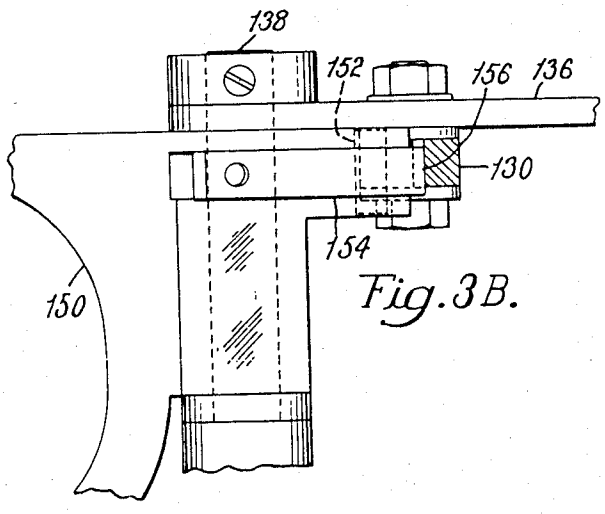


Fig. 3B.

Inventors
Ernest W. Stacey
Walter E Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 7

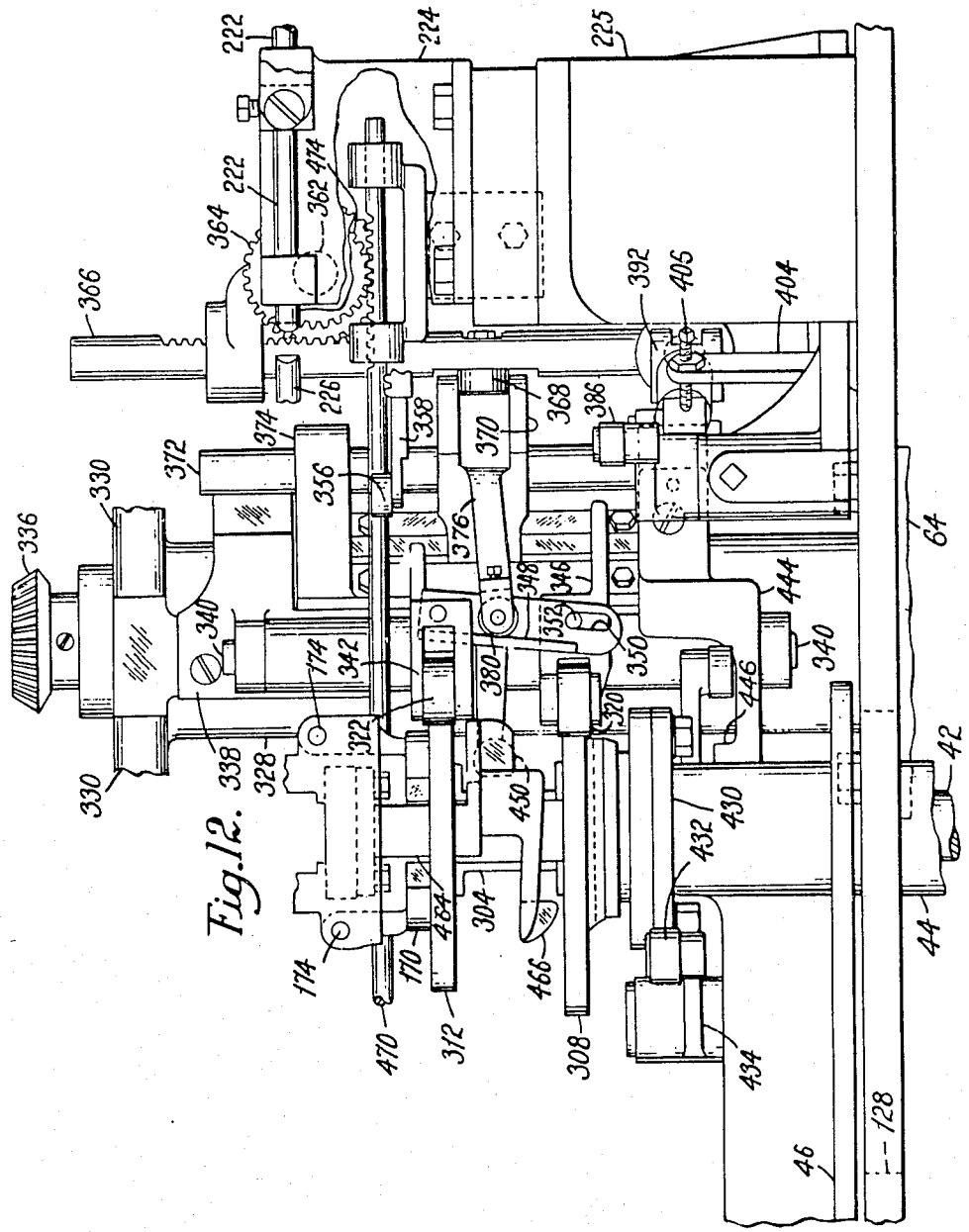


Fig. 12.

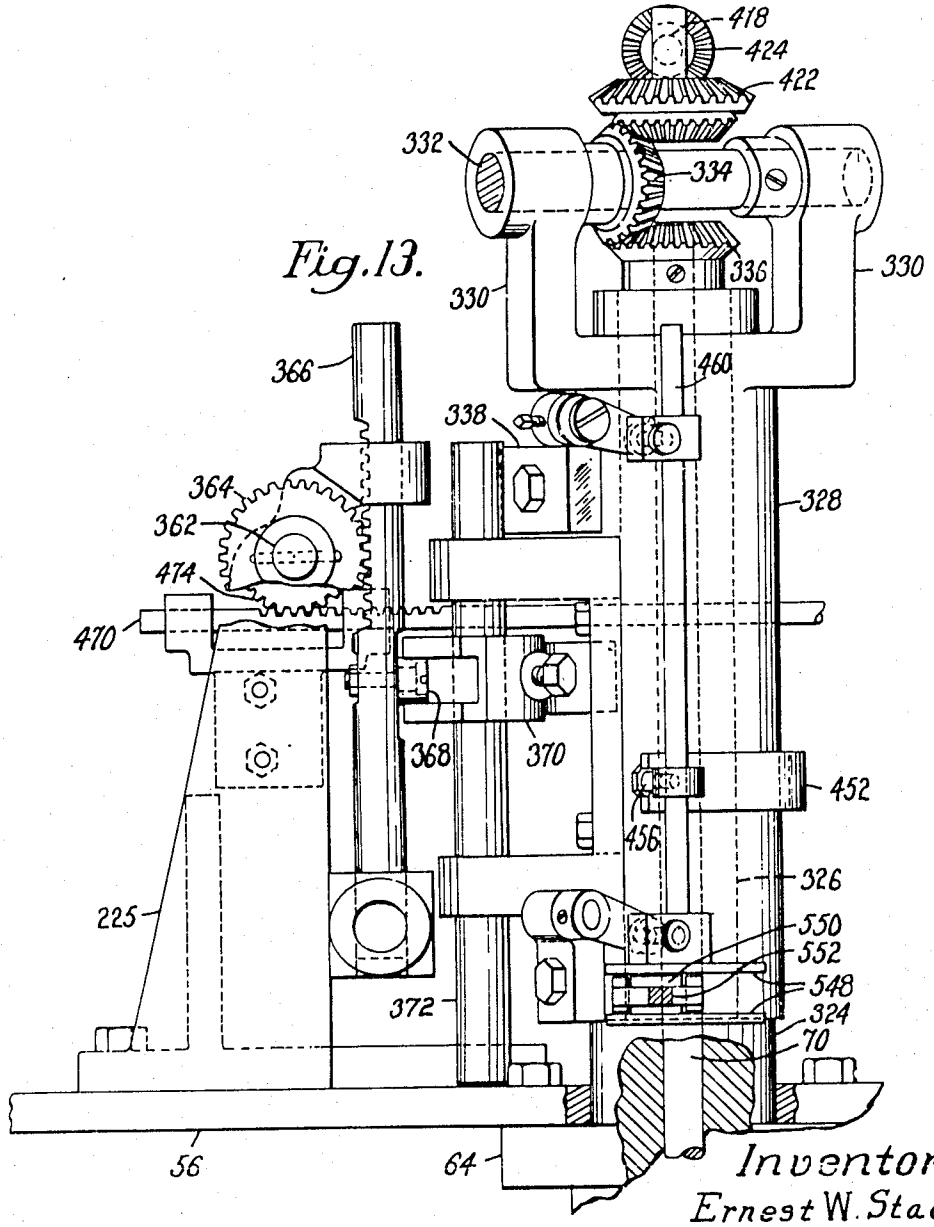
Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 8

Fig. 13.



Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 9

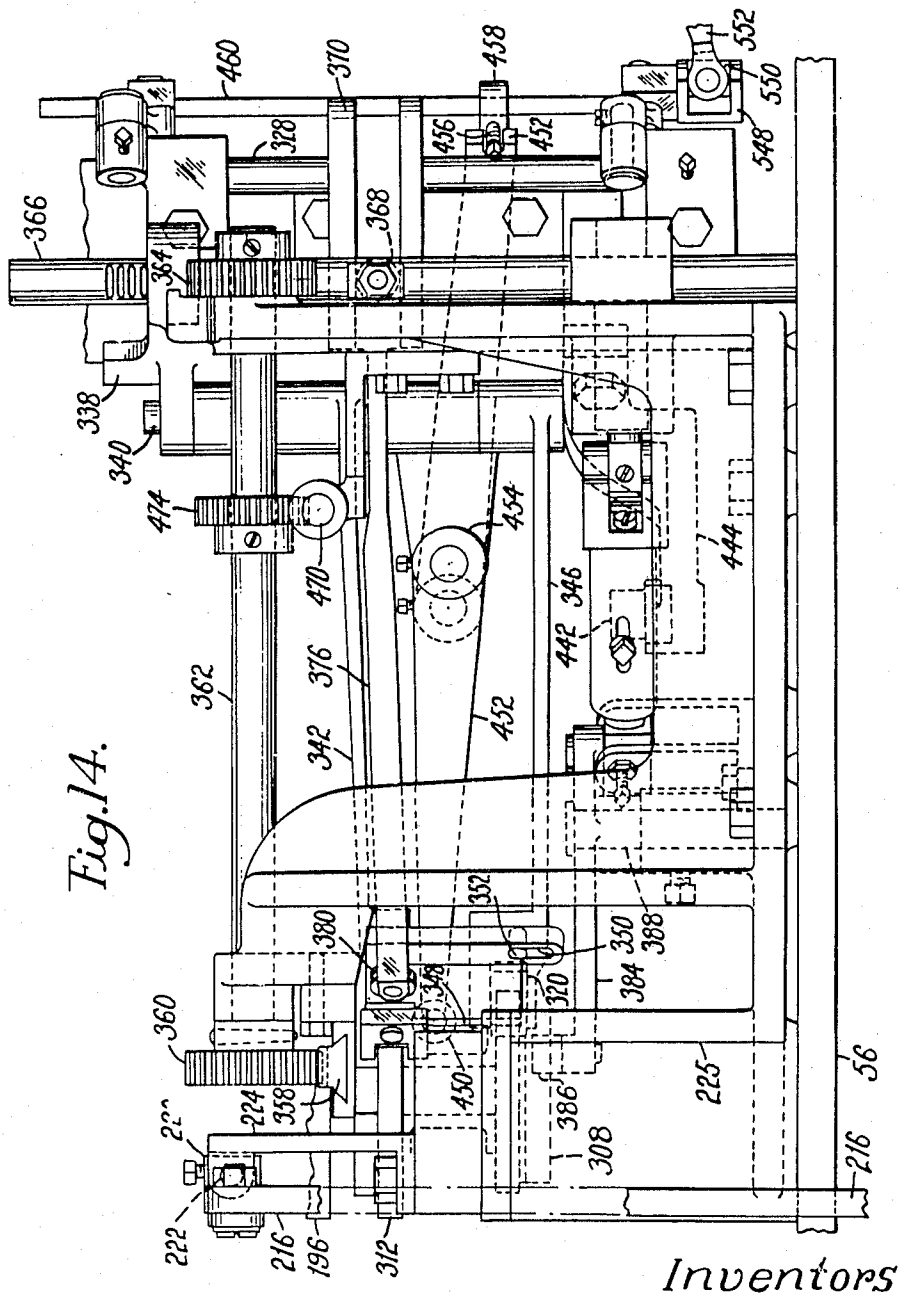


Fig. 14.

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 10

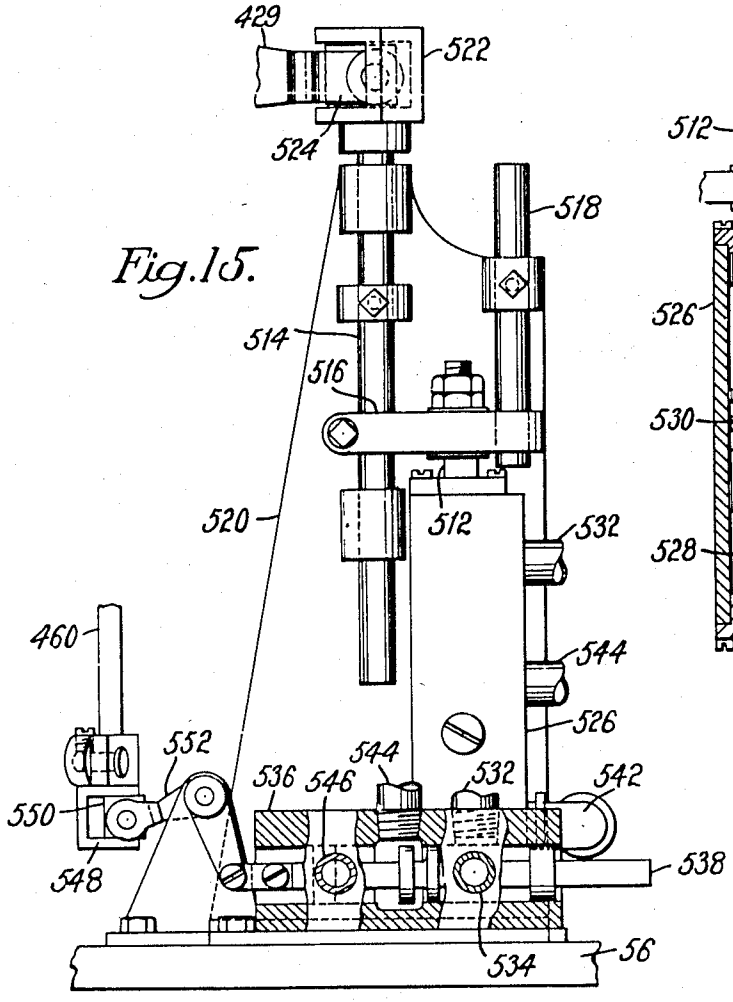


Fig. 15.

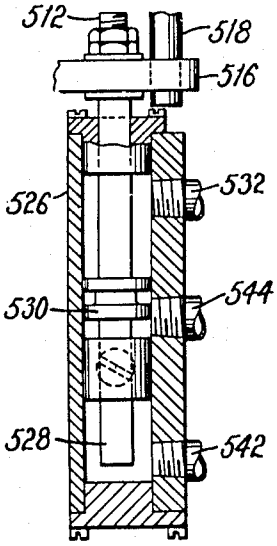


Fig. 16.

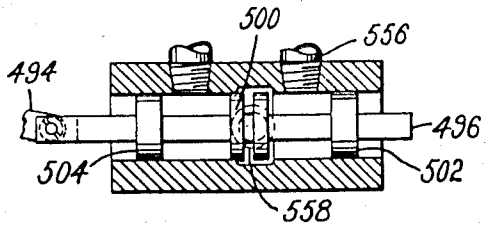


Fig. 17.

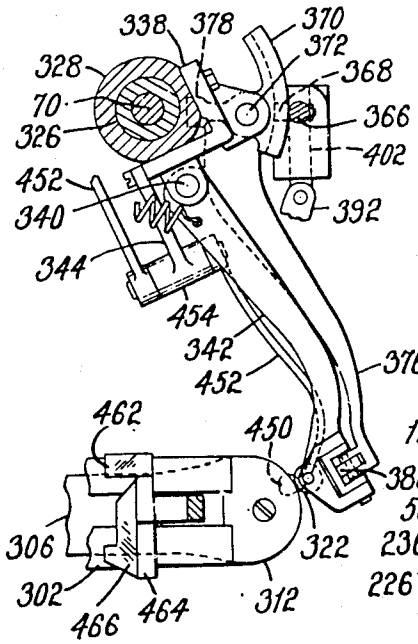
Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 11

Fig. 18.



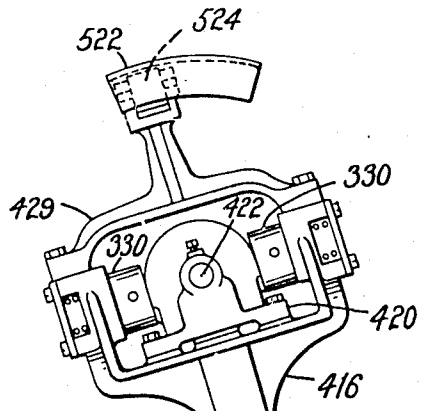
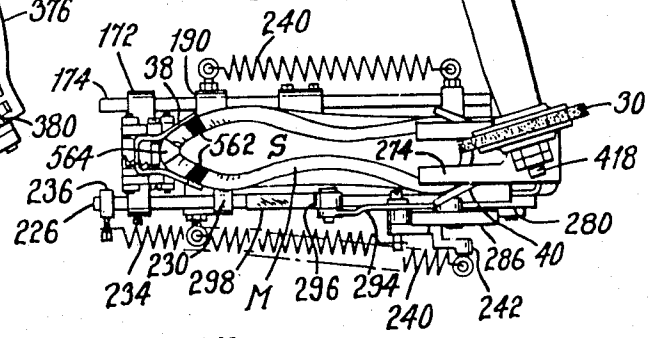


Fig. 20.



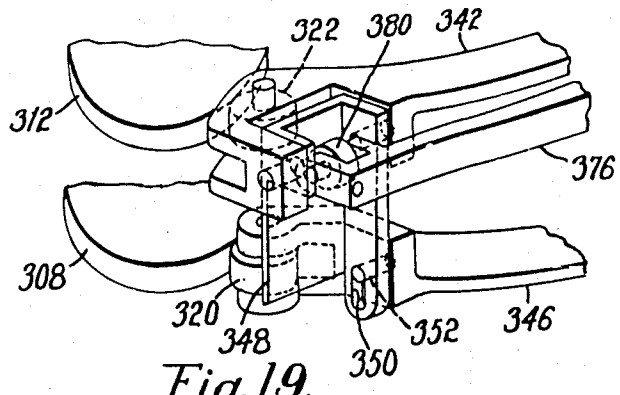


Fig. 19.

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 12

Fig. 21a

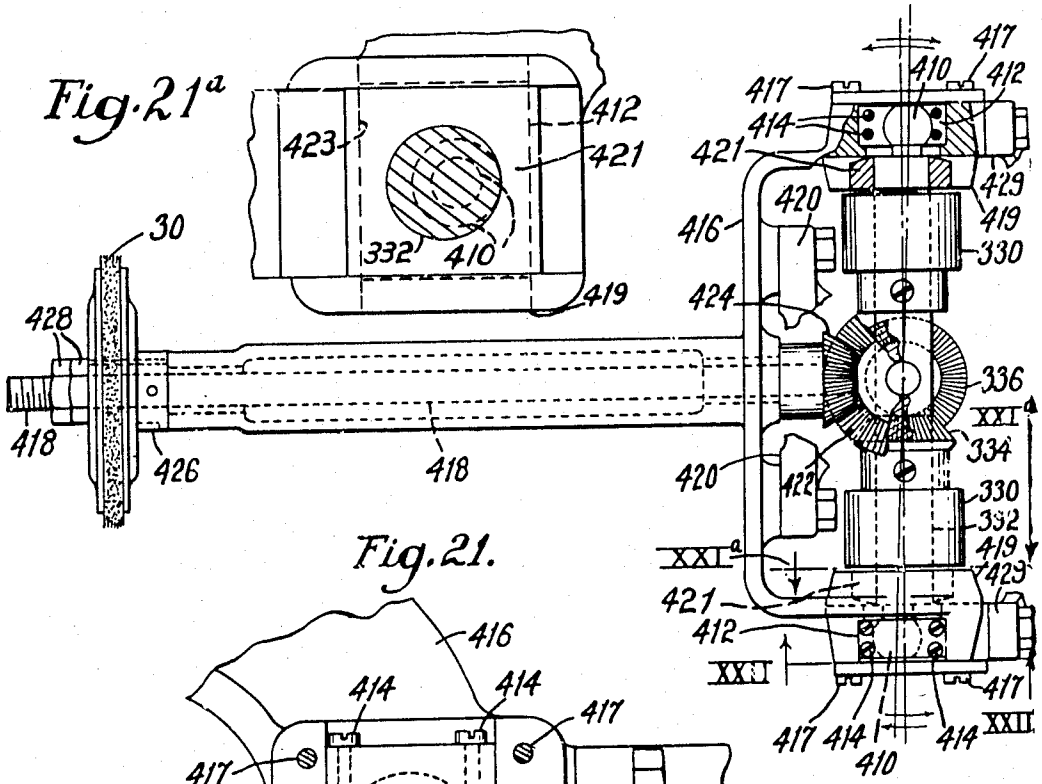


Fig. 21.

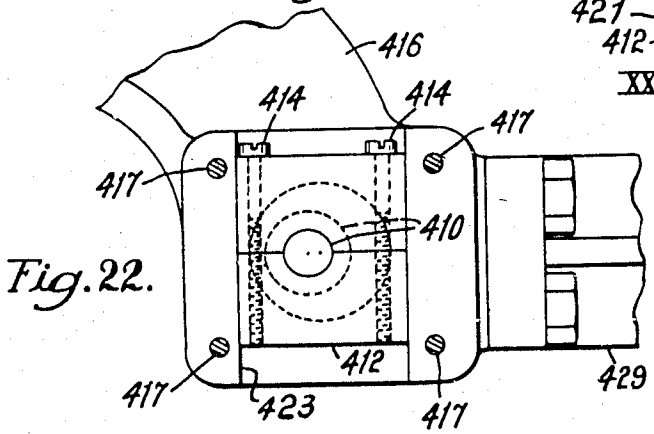


Fig. 22.

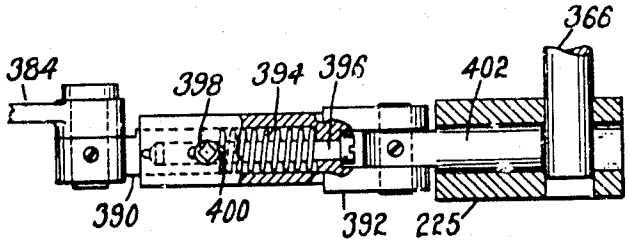


Fig. 23.

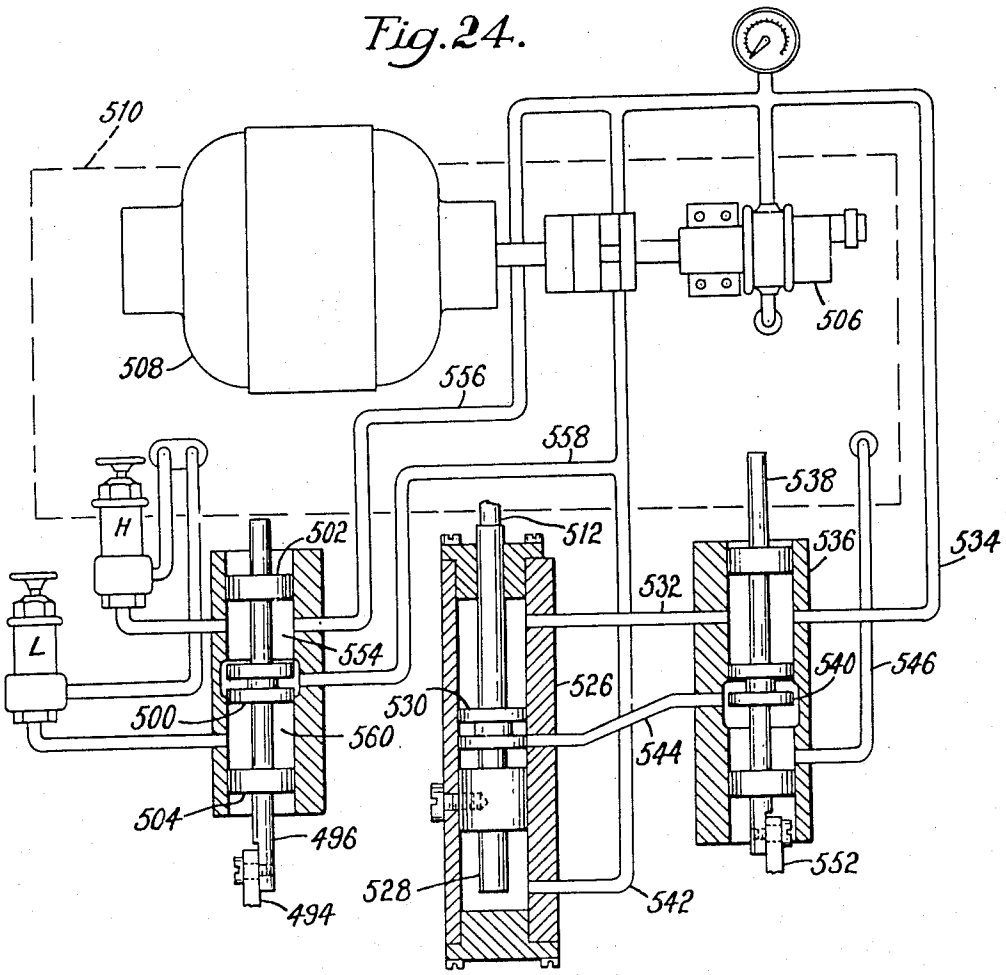
Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 13

Fig. 24.



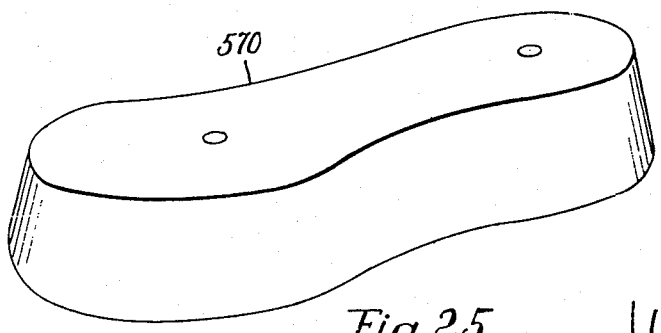


Fig. 25.

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 14

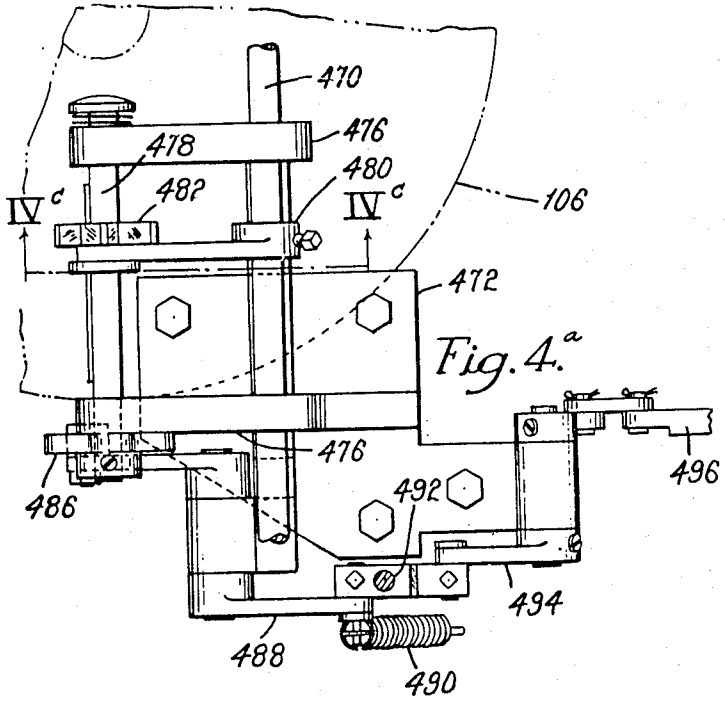


Fig. 4.a

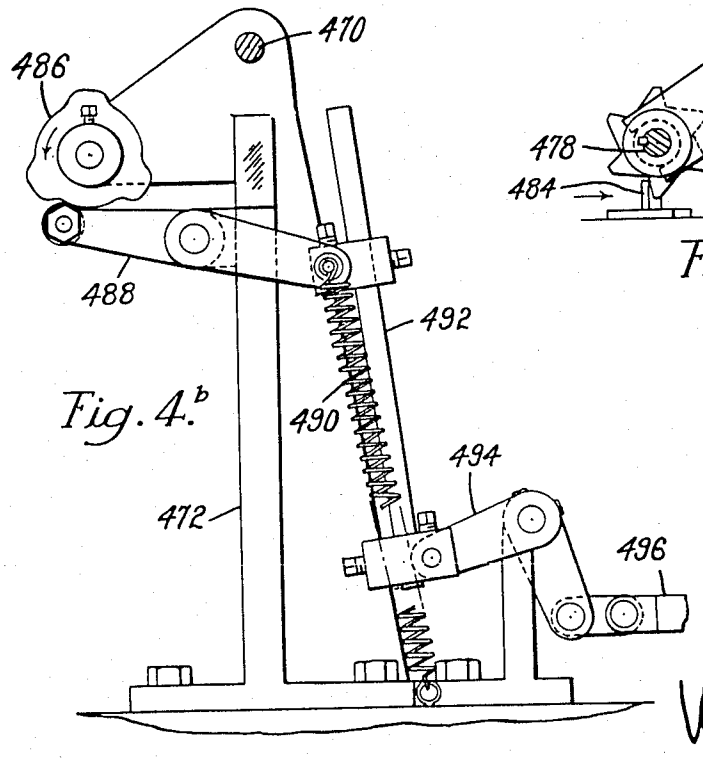


Fig. 4.b

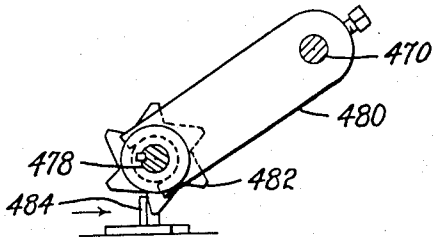


Fig. 4.c

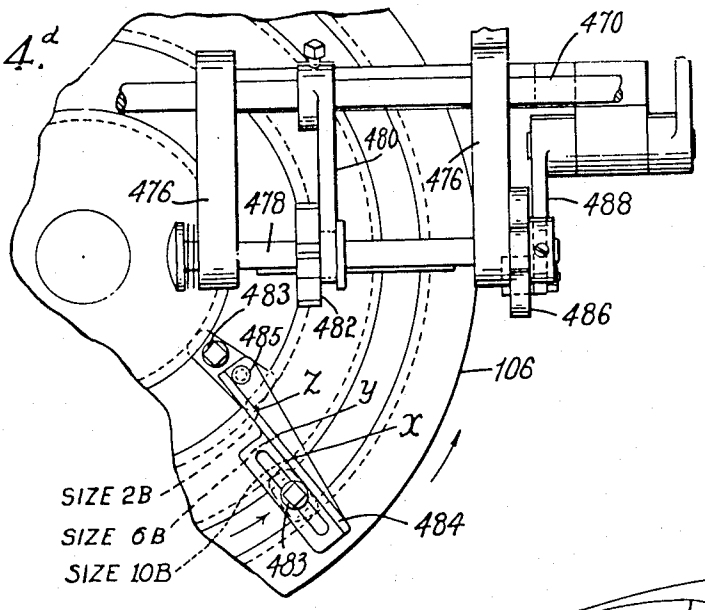
Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

Feb. 7, 1956 E. W. STACEY ET AL 2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Filed Dec. 11, 1952 15 Sheets-Sheet 15

Fig. 4.d



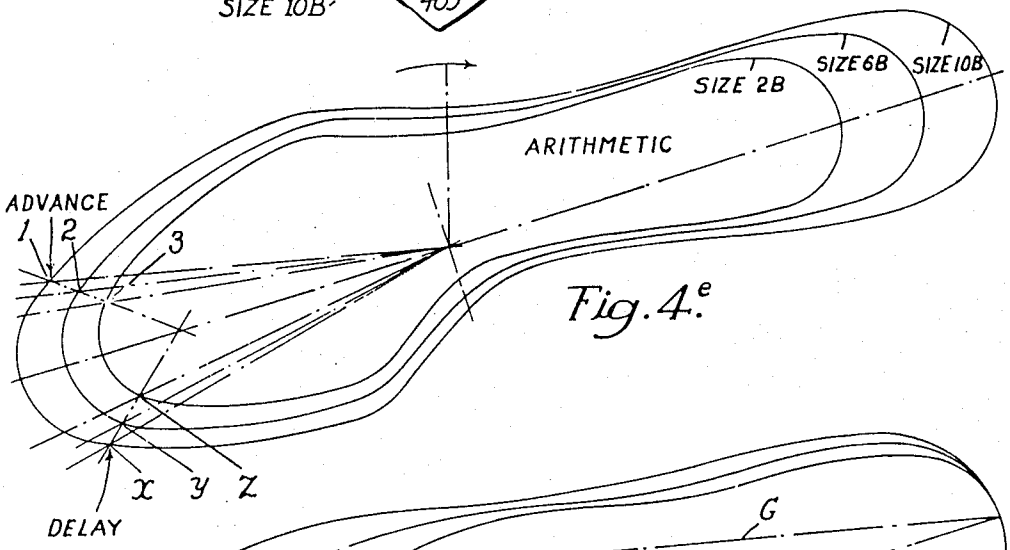


Fig. 4.e

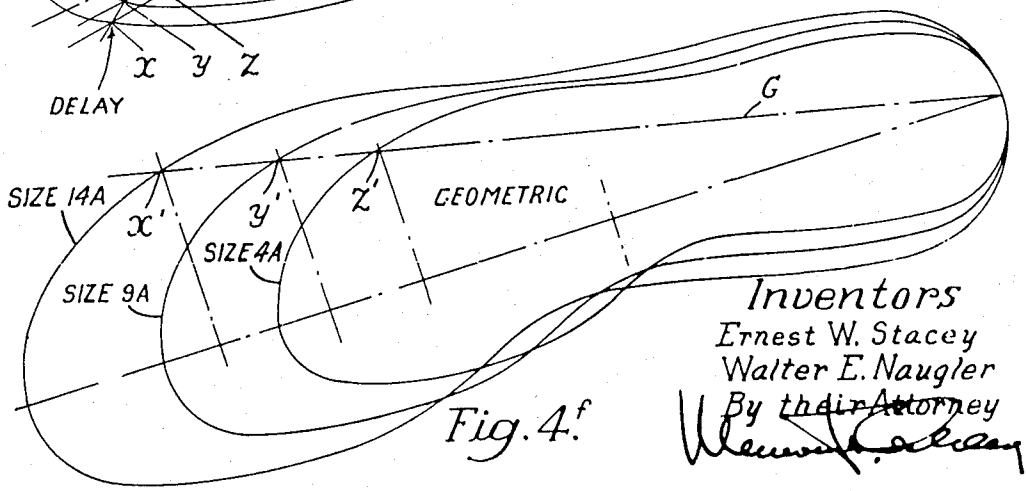


Fig. 4.f

Inventors
Ernest W. Stacey
Walter E. Naugler
By their Attorney

United States Patent Office

2,733,588

Patented Feb. 7, 1956

2,733,588

MACHINES FOR OPERATING ON SHOE BOTTOMS OR THE LIKE

Ernest W. Stacey and Walter E. Naugler, Beverly, Mass., assignors to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Application December 11, 1952, Serial No. 325,284

14 Claims. (Cl. 69—6.5)

This invention relates to machines for operating on shoe bottoms or the like and is more particularly concerned with the provision of a machine for progressively treating the overlasted marginal portion of an upper lying on a shoe bottom. By way of illustration, the invention is hereinafter described as embodied in a machine designed automatically to roughen progressively and according to pattern the overlasted margin of an upper in preparation for the attachment thereto of an outsole by means of adhesive. It will be understood that, in certain aspects, the invention is not limited in use to a roughing operation, or even necessarily to the treatment of shoe bottoms or of shoe parts but may well have a more general application as, for example, to those machines in which relative movements between a model and its follower are communicated with predetermined modifications to a tool and a work piece being treated by the tool.

In preparing a shoe bottom for cement attachment of a sole, especially where the upper is of leather, the usual practice is to roughen the marginal bottom surface of the upper by manually presenting it to the action of a rotary roughing tool such as a wire brush. The shoe is so held and manipulated by hand that successive portions of its bottom margin are fed into operative engagement with the tool, the path of roughing customarily extending along the margin from one corner of the heel breast area, around the forepart, and ending at the other corner of the heel breast area, thus omitting the heel end periphery. In view of the complex curvatures found in shoe bottom patterns and the need for a uniform degree of roughing along the margins, the operation calls for the exercise of considerable skill. Moreover, the manual process becomes more difficult and time-consuming in the case of high-quality shoes so constructed as to have marginal bottom portions which, in addition to the heel periphery, are not to be roughened. This situation arises, for example, where shoes are of open-toe-style, or have sandal-like straps that are preattached to an upper and lasted together with the upper. These straps, when of a material other than leather, might be badly shredded or otherwise damaged upon contact with the roughing tool. In analogous machines for operating on predetermined peripheral portions of other types of work with other instrumentalities than an abrading type tool (a coating wheel or an embossing tool, for instance), a similar need for automatic means for guiding and interrupting effective tool contact will be recognized.

An object of this invention therefore is to provide an improved machine, easily operated and requiring little or no skill, for uniformly and progressively treating with a tool the entire margin or selected peripheral portions of a work piece in accordance with a predetermined pattern. Another object of the invention is to provide such a machine with power means for temporarily nullifying the dictates of the pattern and hence automatically preventing the operating tool from acting effectively on one or more predetermined portions of the work piece being treated. A still further object is to control the position of an operating tool in accordance with the size of a given work piece by grading mechanism automatically actuated by a work support and having reference to a larger and a smaller model patterned after the work piece.

In pursuance of these objects and others and as a feature of the invention, the illustrative machine is provided with a tool in the form of a roughing wheel, means for supporting a shoe, and improved power means for bodily moving the wheel and shoe supporting means relatively to one another to carry the point of operation of the tool progressively about the margin of the shoe bottom, regardless of its shape or size, with substantially constant linear speed whereby an even roughing treatment may be obtained.

The required configuration of the operating path of the roughing tool being determined by the particular styles of the shoes to be treated, the illustrated machine is accompanied by two sets of patterns for each style, one set comprising the graded letter widths for the smallest size (length of shoe) to be roughened and the other set comprising the correspondingly graded letter widths for the largest size to be roughened. A single pair of these patterns, one large and one small and of the same letter width, serve jointly to control the roughing operation upon shoes of a complete range of sizes of a single style and of that letter width. Thus an effective or true path of the tool is automatically determined and controlled for a complete size range of shoes of a given style and known width by a grading device automatically adjusted by a shoe support and coacting with the smallest and largest pattern of that style and corresponding width, these two patterns being secured together and detachably mounted in the machine. Viewing this aspect of the invention more broadly, the illustrated machine features grading means which is effective, when any work piece intermediate in size between the large and small patterns then mounted in the machine, and of like style, is mounted in its support in the machine, to prescribe and control a course of marginal operation of the tool on the work appropriately corresponding to the configuration of the patterns.

In a novel arrangement in the illustrated machine, a shoe mounted on its last and with its bottom facing upward, is supported on a jack by a toe rest and a heel block and held between longitudinally separable toe and heel forks. When so jacked the shoe itself appropriately adjusts the grading means to fix the operating path of the roughing tool. By use of a conventional type of one-revolution clutch mechanism, the jack is given a single revolution during operation of the machine to carry the shoe and its pair of patterns in phase, and the jack is so mounted as to partake simultaneously of a swinging movement designed to traverse successive portions of the margin of the shoe bottom past the roughing tool with substantially constant linear speed, the tool itself having only such bodily oscillatory movement as is required to provide sufficient width to the operating path. Means is provided in the cycle of the illustrated machine for bringing the tool from an out-of-the-way position to its point of initial shoe bottom contact in the heel breast area whereat the patterns commence their control influence and for subsequently returning the tool to its original removed position at the end of an operating cycle. Also, the construction of the illustrated machine as herein disclosed includes hydraulic means both for maintaining an even but adjustable operating pressure between the roughing tool and the shoe bottom and also for interrupting and restoring operative engagement at selected intervals.

The above and other features of the invention, including various novel combinations of parts and details of construction will now be described in detail by reference to the accompanying drawings of an illustrative machine for roughing shoe bottoms.

In the drawings,

Fig. 1 is a view in elevation of the right side of a machine in which the invention is embodied and in which a shoe is mounted;

Fig. 2 is an enlarged view in elevation of the left side of the driving unit seen in Fig. 1;

Fig. 3 is a plan view of the driving means shown in Fig. 2, portions being shown in section taken on the line III—III of Fig. 2;

Fig. 3A is a plan view on an enlarged scale of a portion of the clutch operating mechanism seen in Fig. 3;

Fig. 3B is a view in side elevation, partly in section, of parts shown in Fig. 3A;

Fig. 4 is a plan view of certain portions of the machine shown above the main frame seen in Fig. 1, but with patterns removed and indicating means for controlling the roughing tool;

Fig. 4ª is a plan view on an enlarged scale of mechanism shown in Fig. 4 for controlling the roughing tool on corresponding portions of shoe bottoms of different sizes;

Fig. 4ᵇ is an elevation of the parts shown in Fig. 4ª;

Fig. 4ᶜ is a detail of parts shown in Fig. 4ª;

Fig. 4ᵈ is a plan of a cam arranged angularly on its holder;

Figs. 4ᵉ and 4ᶠ are, respectively, arithmetic and geometric insole patterns superimposed and illustrating corresponding peripheral points thereon;

Fig. 5 is a view in right side elevation of means for mounting a shoe and its control patterns;

Fig. 6 is a plan view of mechanism shown in Fig. 5, parts being omitted to reveal construction details;

Fig. 7 is a plan view of the toe fork and toe rest seen in Fig. 1;

Fig. 8 is a view in enlarged vertical section of the means shown in Fig. 1 for holding the heel end;

Fig. 9 is a section taken on the line IX—IX of Fig. 8;

Fig. 10 is a plan of the heel clamp shown in Fig. 8;

Fig. 11 is an exploded perspective view of a pair of patterns of one width;

Fig. 12 is a view in side elevation of a portion of the machine above the main frame and showing grading mechanism in action on patterns which have been turned about their vertical axis about 90°;

Fig. 13 is a view in left side elevation of a portion of the means for driving and locking heightwise, the roughing tool;

Fig. 14 is a view in rear elevation and on a larger scale of a portion of the machine shown in Fig. 4;

Fig. 15 is a view in rear elevation and partly in section taken on the line XV—XV of Fig. 4 showing mechanism, connecting with that shown in Fig. 12, for controlling elevation of the roughing tool;

Fig. 16 is a vertical section of a cylinder shown in Figure 15;

Fig. 17 is a detail in section of hydraulic control mechanism;

Fig. 18 is a plan view of followers operating on the heel end of a pattern;

Fig. 19 is a perspective view of the followers cooperating with the heel ends of patterns;

Fig. 20 is a plan view of the tool or brush elevating control arm and a shoe mounted in the machine;

Fig. 21 is an enlarged plan view, partly in section, of the brush head;

Fig. 21ª is a section taken on the line XXIª—XXIª in Fig. 21;

Fig. 22 is an end elevation of an eccentric yoke bearing as seen when looking in the direction of the arrows XXII—XXII in Fig. 21;

Fig. 23 is a detail, partially in section, indicating a toggle operated locking linkage shown also in Fig. 4;

Fig. 24 is a schematic diagram of the hydraulic system controlling pressure application of the tool; and

Fig. 25 is a perspective view of a master model which may be mounted in the machine as a part of an alternate form of grading mechanism.

The illustrated machine is provided with a roughing tool **30** (Figs. 1 and 21) in the form of a rotary wire brush adapted to operate progressively on the lasted margin M (Fig. 20) of an upper overlying the bottom of a shoe S. For thus treating the shoe bottom margin in preparation for the reception of sole attaching cement, the shoe S is mounted on a rotatable jack generally designated **32** (Fig. 5) and comprising a toe rest **34**, a heel rest **36**, a toe fork **38** and a heel fork **40**. The jack **32** is so moved bodily with respect to the tool **30** as to cause the point of operation of the tool automatically to traverse successive and continuous portions of the margin M, or when the tool is affected by controls hereinafter described, on only selected marginal portions of the shoe bottom. Accordingly the jack **32** (Fig. 5) is secured to an upright spindle **42** rotatable in a vertical bearing **44** formed integral with a plate-like link **46**. The function of the latter is to impose on the jack an oscillating movement in a horizontal plane in addition to its rotation about a vertical axis which rotation, as indicated in Fig. 3 by an arrow, is clockwise as seen from above.

For rotation of the jack **32** the lower end of the spindle **42** carries a gear **48** (Figs. 2 and 3) driven by power transmitted from a motor **50** (Fig. 1), through a suitable one-revolution clutch generally designated **52** (Figs. 2 and 3), and a gear train about to be described. The motor **50**, mounted on a crossbar **54** of a table-like machine frame **56**, drives, by means of a belt **58** and a pulley **60**, a stub shaft **62** having bearings in a gear box **64**, bolted to the underside of the top of the frame **56**. This stub shaft **62** carries a bevel gear **66** (Fig. 3) in mesh with a bevel gear **68** for continually rotating a vertical post **70** (Figs. 2, 3 and 13), while the motor **50** is running, the post **70** being operatively connected to the tool **30** as will be subsequently explained. By a chain **72** and sprockets **74, 76** the stub shaft **62** also drives a cross shaft **78** (Fig. 3) coupled by means of the clutch mechanism **52**, hereinafter briefly described, to a driven shaft **80**. The driven shaft **80** is rotatably mounted in a bushing carried by a housing **81** and carries a worm gear **82** meshing with a gear **84** mounted on a vertically disposed shaft **86** journaled in the housing **81**. The housing **81** is supported by a pair of channel bars **90** mounted on the machine frame. Affixed to an intermediate portion of the shaft **86** is a smaller gear **92** that meshes with a relatively large gear **94**. The latter is rotatably mounted on a vertical pivot pin **96** having bearings formed in the top of the frame **56** and a bracket **98** (Fig. 4) secured thereon. The gear **94** is, in turn, in mesh with a gear **100** affixed to a vertical shaft **102** received in a sleeve bearing **104** mounted on the machine frame. At the upper end of the shaft **102** a rotary cam folder **106** (Figs. 1 and 4) is mounted for purposes hereinafter explained. It is the pivot pin **96** on which the above-referred-to plate-like arm **46** is mounted for oscillation. An idler gear **108** rotatably mounted on a stub shaft **110** received by and secured to a hub formed on the underside of the arm **46** meshes with both the gears **94** and **48** to rotate the latter and hence the jack **32**.

For oscillating the jack **32**, the arm **46** is pivotally connected by a pin **112** (Figs. 3 and 4) to one end of a link **114** having its other end pivotally supported by a jam-preventing link **116** (Figs. 2 and 3) pivotally mounted on a bracket **118** secured to the frame **56**. A roll **120** rotatably mounted on a pin affixed to the link **114** is arranged to be received by a closed cam track **122** formed in the upper side of a cam plate **124** secured to the upper end of the shaft **86**. Accordingly, as the gear **48** is rotated to revolve the shoe-supporting means it also causes the cam track **122** to effect, via the roll **120** and the link **114**, a swinging movement of the arm **46** about the axis of the pivot shaft **96**. In order that the arm **46**

may thus oscillate horizontally, the frame 56 is provided with a slot 128 affording passageway for the bearing 44, the stub shaft 110, and the pin 112.

Any suitable type of single-revolution clutch may be employed, the conventional illustrative mechanism 52 being of the axially shiftable pin-and-collar construction and controlled by a latch 130 pivotally supported at one end and connected at its other end to a starting plunger 132 extending through the frame 56 and having mounted thereon, between the frame and a collar secured on the plunger, a compression spring 134. The pivotal support of the latch 130 is afforded by nut-and-bolt connections with a lever 136 (Figs. 2, 3, 3A and 3B) having an end fulcrumed on a vertical pin 138 fast on a bracket 140 (Fig. 2) mounted on a channel bar 90. The lever 136 extends into the path of a pair of rolls 142, 142, respectively, suspended from pins 144 affixed 180° apart in a disk 146. The latter is adjustably bolted to the hub of the gear 94. Thus, as viewed in Fig. 3, one revolution of the gear 94 will twice cause the lever 136 to be displaced clockwise about the pin 138, the lever being yieldingly urged into the path of the rolls 142, 142 by a tension spring 148 connecting it with the housing 81. A yoke 150 (Figs. 2, 3, 3A and 3B) pivotally mounted on the pin 138, carries a pin 152 for pivotally supporting a spring-pressed detent 154 having a shoulder 156 engageable with a shoulder formed on the latch 130. With the starting plunger 132 in normal position, and the shoulder on the latch 130 engaged by the shoulder 156, each clockwise displacement of the lever 136 acts through the latch 130 and the detent 154 to swing the yoke 150 clockwise. A clutch collar 158 (Fig. 3) is provided with a groove for receiving shoes carried by the yoke 150 and the latter is accordingly effective to shift the collar out of driving engagement with the shaft 78. Compression springs (Fig. 3), mounted in an end face of the shaft 80, normally act to shift the clutch collar 158 axially back into driving relation with the shaft 78 when the starting plunger 132 is retracted, the influence of such springs being stronger than the spring backing the detent 154. It will therefore be seen that, though the motor 50 may run continuously, the illustrated arrangement is such that upon retracting the plunger 132 the gear 94 will be permitted to rotate 180° to drive the jack-carrying spindle 42 one complete revolution, and toward the end of that revolution the second of the rolls 142 will displace the lever 136 to disengage the clutch mechanism and stop rotation of the jack 32.

Means are provided for accommodating different sizes and styles of shoes in bottom-up position on the jack 32. The jack comprises a horizontal base plate 170, Figs. 5 and 6, affixed to the flatted upper end of the spindle 42. Secured in bores formed in bosses 172 integral with the plate 170 is a pair of relatively fixed parallel guide rods 174, one at each side of the plate 170, extending lengthwise of the shoe S when jacked. Centrally mounted in the plate 170 is a fixed hub on which a gear 176 and a segment gear 178 integral therewith are rotatably mounted. A toe bracket 180 slidably receives a vertical sleeve 182 in which a toe rest stem 184 is threaded for heightwise adjustment. A threaded collar 186 on the stem locks the toe rest 34 and its stem 184 in adjusted position. An inclined cam 188 affixed to the plate 170 is engaged by the bottom of the sleeve 182, contact being maintained by gravity acting on the latter. The toe bracket 180 is provided with a pair of forward bearing bosses 190 for receiving the rods 174, respectively, and a rearward boss 192 for receiving one of the rods 174 and carrying a rack 194 (Fig. 6) arranged to mesh with the gear 176. A heel bracket 196 has a longitudinally extending kerf 198 (Figs. 6 and 8) through which a projection 200 of the plate 170 extends upwardly to support, by means of a setscrew 202, a cam block 204 provided with inclined grooves extending on its opposite sides, respectively. The heel rest 36, slidably mounted on the block 204, is provided with a rabbeted portion for cooperation with said cam grooves and is adapted with a V-like portion for accommodating the sides of a last heel cone. The heel bracket 196 has a pair of heelward bosses 206 for receiving the rods 174, respectively, and a toeward boss 208 for receiving one of the rods 174 and carrying a rack 210 which meshes with the segment gear 178.

The toe bracket 180 and the heel bracket 196 are slidably moved apart lengthwise of a shoe by actuation of a treadle 212 (Fig. 1) fulcrumed on the frame 56 and yieldably supported by a spring 214 depending from an upper portion of the frame. The lower end of a bell crank 216 pivotally mounted on the frame 56 is operatively connected to the treadle by a link 218 and the upper end of the crank 216 is pivotally connected to a link 220. The latter is connected to a rod 222 slidably mounted in alined bores formed in a bracket 225 bolted to and projecting upwardly from a rear bracket 225 mounted on the frame 56.

A shifting rod 226 (Fig. 5), alined endwise with the rod 222 and adapted to receive an adjacent end of the latter, is movable endwise through a bore formed in an upright arm 228 integral with the plate 170 and through a bore in the toeward boss 172. On being urged forwardly by depression of the treadle 212, the shifting rod 226 carries forwardly a block 230 affixed thereon and abutting a shoulder 232 of the toe bracket 180. As a consequence, that bracket is moved forward with its rack 194 which acts through gears 176 and 178 and the rack 210 to move the heel bracket 196 rearwardly to a corresponding extent, thereby permitting insertion of a last with its shoe in the jack 32. Such rearward movement of the bracket 196 also serves other functions to be later explained. Lengthwise separation of the two brackets 180, 196 is yieldingly resisted, a tension spring 234 being connected to a stop collar 236 secured to the shifting rod 226 and a fulcrum pin 238 affixed to the arm 228, and two additional tension springs 240, 240 being respectively connected between opposite bosses 190 of the toe bracket 180 and opposite extensions 242, 244 of the plate 170.

For abutting the toe end of the shoe to hold it clamped the toe bracket 180 carries an upright toe abutment arm 250 and the latter has a pair of transversely extending pivot pins 252 (Figs. 5 and 7) the opposite ends of which pivotally support parallel links 254 respectively extending upward to support a pair of parallel couplings 256 between which the toe fork 38 is mounted. A tension spring 258 extends forwardly from the arm 259 to connect with one of the links 254 to urge the fork into clamping relation with a jacked shoe.

For abutting the heel end of the shoe to hold it clamped in cooperation with the toe fork 38 the heel fork 40 and associated parts are mounted as shown in Figs. 5, 6, 8 and 9. The heel bracket 196 (Fig. 8) supports a pair of transverse pivot pins 260, 262 the opposite ends of which pivotally support parallel links 264 for mounting at their upper ends the heel fork 40. A heel abutment arm 266 secured to the bracket 196 is connected to one end of a tension spring 268 having its other end connected to the rear of the heel fork 40, the spring 268 thus yieldingly urging the heel fork forwardly and thus coacting with the toe fork 38 to centralize a shoe with respect to the axis of the spindle 42. To permit the rest 36, and hence the heel bottoms, to be suitably adjusted heightwise for various shoe sizes, a pin 270 (Figs. 5 and 8) fixed in a transversely extending bore formed in said rest extends through a pair of vertical slots 272 in the bracket.

Means is also provided for automatically clamping the heel end of the jacked shoe against the rest 36. A hold-down clamp 274 (Figs. 5 and 7) is secured to an upright arm 276 of a bell-crank lever 278 pivotally supported by the pin 262. A forwardly extending arm 280 (Fig. 9) of the bell crank lever 278 supports a square cam

follower 282 adapted to ride in a cam slide 284 formed in the upper end of a lever 286. The lower end of the latter is pivotally connected to a pivot pin 288 mounted in one end of a link 290 (Fig. 5) which is pivotally secured at its other end to the arm 228. The lever 286 is fulcrumed on a pin 292 mounted in one end of a bell-crank lever 294 which itself is pivotally supported by the arm 228 and is actuated by a cam roll 296 mounted at the other end of said lever. This roll 296 engages and is moved heightwise by an inclined cam 298 affixed to the shifting rod 226. It will be noted that the parallelogram of linkage, including the link 290 and the lever 286, as controlled by the bell-crank lever 294, appropriately positions the cam slide 284 heightwise, thus adjusting the holddown 274 to operative position for any size shoe which may be jacked. A tension spring 299 connecting the heel bracket 196 with the lever 278 acts through the follower 282 to hold the roll 296 in contact with the cam 298.

For determining the operating path of the tool 30 in roughing a shoe S having a bottom of a particular size and of a particular letter width, a pair of horizontally disposed heelless bottom patterns 300 and 302 (Figs. 5 and 11), the largest and smallest to be operated on of that width and corresponding style, respectively, is detachably mounted with their faces in spaced relation on a flat portion of the spindle 42 and beneath the plate 170. The patterns 300, 302 are joined by a U-shaped web 304 for receiving the flat portion of the spindle. A base 306 on which the pattern assembly is supported is integral with the spindle and comprises a heel end 308 complementing the lower pattern 300 and having a V-shaped cam groove 310 for a purpose later to be described. A heel-end piece 312, complementing the upper pattern 302, is fixedly secured to the plate 170. A spring-pressed detent 314 (Figs. 4 and 5), mounted in the base 306, normally projects into a hole formed in a projection 316 (Fig. 11) of the pattern assembly to lock the latter in operative position. From the structure described it will be understood that one pair of such patterns 300, 302 is used when operating on right shoes of a given width and another pair of patterns would be substituted if left shoes, or shoes of a different style and width, were to be treated. It will subsequently be more readily appreciated that without any great alteration of the illustrated machine, arrangement could be made for operating on either rights or lefts by simply inverting the patterns of a single set to convert the machine from right shoe roughing to left shoe roughing, and vice versa.

For operation on the bottom of the shoe S (Fig. 20) jacked in the machine, automatically acting grading mechanism cooperating with the shoe-supporting means 32 in general and the patterns 300, 302 in particular is provided to suitably influence the operating path of the tool 30. The patterns 300, 302 are, in effect, rotary cams against the respective peripheries of which rolls 320, 322 (Figs. 5, 12, 18 and 19) are arranged for progressive engagement. A point of contact between the roll 320 and the pattern 300 peripherally corresponds in phase with the point of contact between the roll 322 and the pattern 302, and the two points of contact thus establish a movable gradient. The tool-driving post 70 (Figs. 2, 4, 13 and 18) extends upwardly through a spacer portion 324 of the gear box 64 and a vertical sleeve bearing 326 resting thereon. Rotatably mounted on the bearing 326 is a sleeve 328 formed at its upper end, for a purpose later explained, with arms 330, 330, respectively, providing alined bearings for a countershaft 332 carrying a bevel gear 334 that is in mesh with a bevel gear 336 fast on the upper end of the post 70. Secured to the sleeve 328 is an angular bracket 338 (Figs. 4, 13 and 18) provided with bosses for receiving a vertical pin 340 affording a fulcrum for one end of an arm 342 having at its other end a forked portion for rotatably mounting the roll 322. Also pivotally mounted on the pin 340 is an arm 346 for rotatably carrying the roll 320. As best seen in Figs. 12, 14 and 19, the arm 342 pivotally supports a grading plate 348 having a slot 350 for receiving a pin 352 fixed in the arm 346. Thus the arrangement is such that when the contact points of the rolls 320, 322 on the patterns 300, 302 are in exact vertical alinement, the plate 348 is exactly vertical but remains free to assume the same variable inclination as may be imposed by the rolls 320, 322 in traversing the rotating-oscillating peripheries of the patterns 300, 302, respectively. For yieldingly urging operative contact between the roll 322 and the pattern 302 a tension spring 354 (Fig. 4) connects the arm 342 with a bracket affixed to the frame 56, and means later described similarly act on the roll 320 to urge it into contact with the pattern 300. As will hereinafter become apparent, the plate 348 affords no (zero) grading when exactly vertical but, when inclined from the vertical, the degree of grading or displacement to be transmitted to the tool 30 from the plate 348 at any instant is dependent upon both the extent of the plate inclination and the particular point of reference on the plate, considered heightwise, from which grading is taken. In other words, for any gradient, i. e., considering the plate 348 to have a particular inclination at any given point in the cycle of the machine, the magnification in operating path from the small pattern 302 and/or the diminution from the large pattern 300 to be transmitted to the tool 30 is proportional to the position heightwise of a point of reference on the plate. Accordingly, means is provided for translating or converting the size of the shoe S into a heightwise measurement on the plate 348. For this purpose the heel bracket 196 (Fig. 5) has in its bottom a transverse cam groove for accommodating a roll 356 mounted on one end of a rack 358. The latter is arranged to extend lengthwise of the shoe S when in its starting position and is slidable in a guideway formed in the bracket 225. A gear 360 in mesh with the rack 358 is fixedly mounted on one end of a shaft 362 rotatably mounted in bearings formed in the bracket 225. Fast on the other end of the shaft 362 is a gear 364 (Figs. 13 and 14) meshing with a vertical rack 366 which is slidably mounted in alined bores formed in the bracket 225. A roll 368 is secured to the rack 366 and is arranged to be received by a horizontal slide 370 concentric with the axis of the post 70 and mounted on a pin 372 (Figs. 4 and 12) for vertical movement thereon. The pin 372 is carried by lugs 374 secured to the sleeve 328. Integral with the slide 370 is a grading arm 376 one end of which is disposed to slide in a vertical guideway 378 (Figs. 4 and 18) formed in the sleeve 328 and the other end of which is forked to support a roll 380 (Figs. 12, 14, 18 and 19) engageable with the grading plate 348. The point of contact between the roll 380 and the plate 348 provides the heightwise "point of reference" above mentioned. A tension spring 382 (Fig. 4) connecting a projection of the sleeve 328 with the frame 56 urges the roll 380 yieldingly into contact with the plate 348. It will be noted that the grading is thus a consequence of the arm 376 acting to rotate the tool-carrying sleeve 328 on its bearing 326 an extent dependent on the height of the roll 380 as determined automatically by the shoe-supporting means 32 engaging the shoe S.

It will be understood that an alternative grading means, in lieu of the two patterns 300, 302 and the plate 348, might well employ a single master model 570 such as is illustrated in Fig. 25. This model 570 would, in effect, extend to fill the space between the patterns 300, 302 and constitute a model having a conical edge face and comprising the peripheral contours of a graded series of shoe bottoms of the same style and letter width but different sizes. In such an arrangement the roll 380 would progressively contact the conical surface of this master model 570 to determine the "point of reference" and thereby appropriately influence the grading movement of the tool 30 about its vertical axis.

For locking the roll 380 heightwise when positioned as

just explained, automatic means are actuated near the start of the machine cycle. One end of a bell-crank lever 384 (Fig. 4) carries a roll 385 engageable with the walls of the cam groove 310 when at the starting position. The lever 384 is part of a toggle and is fulcrumed on a stud 388 fixed in the bracket 225, the other end of the lever 384 having a pivot pin connection with an arm 390 (Fig. 23). The arm 390 has a portion bored endwise that is received in the tubular end of an arm 392. A compression spring 394 is seated in the arm 392 and abuts an end of the arm 390. For uniting the arms 390, 392 as, in effect, a single compressive link a screw 396 extends axially through the spring 394 and is engaged by a clamping bolt 398 extending through a slot 400 formed longitudinally of the arm 392. The arm 392 is pivotally connected at one end to a pin 402 slidably mounted in a bearing formed in the bracket 225. The pin 402 is arranged, when the toggle is straightened upon interaction of the roll 386 and the groove 310, to engage the rack 366 and thus clamp it against heightwise movement. The effect of the spring 394 is to cushion the the clamping according to the adjustment of the bolt 398 in its slot 400. The grading roll 380 is thereby fixed heightwise, but not laterally of the patterns 300, 302, until the operating cycle is concluded. The shape of the cam groove 310 is such that, upon reentry of the roll 386 at the close of the cycle, the toggle is broken and the rack 366 is free to be readjusted vertically, if need be, for the next roughing operation. Threaded into opposite sides of a bracket 404 secured to the frame 56 are a pair of stop screws 406, 406 for limiting displacement of the knee of the toggle on either side of dead center.

During the operating cycle the variable grading displacements transmitted by the arm 376 to the sleeve 328 are further transmitted by the countershaft 332 to the tool 30 but, by means now to be explained, an additional motion is imposed on the tool to move its work-engaging contact back and forth horizontally and transverse to its axis of rotation and so provide a roughing path of adequate width that avoids excessive abrasion along a single line on the shoe bottom. Referring to Fig. 21, opposite ends of the countershaft 332 are formed to provide ball-like eccentrics 410, 410 having their respective centers equally offset on opposite sides of the axis of the shaft 332. The halves of a bearing block 412 (Fig. 22), in which each of the eccentrics is nested, are secured together by screws 414 and each block 412 is mounted in an end portion of a yoke 416, a tubular portion of which affords a sleeve bearing for a shaft 418. These end portions of the yoke 416 are each formed with a vertical slideway 423 and are respectively secured by screws 417 to spacers 419 each of which is adapted to receive a hardened slide block 421 mounted on an end of the countershaft 332. Lateral displacement of the tool 30 is effected by the lateral displacement of the eccentrics 410 acting on the block 412 and the yoke 416. Vertical displacements of the eccentrics 410 merely represent lost motion as each block 412 slides heightwise in its slideway 423 without thus moving the block 412 or the yoke 416. In order to prevent binding, the outer faces of the slide blocks 421 are rounded and their inner faces, together with those of the spacers 419, are normally separated from the outer end faces of the yoke arms 330, 330. A bracket 420 bolted to the yoke 416 covers drive gears adjacent to the top of the post 70 and provides a bearing for a double bevel gear 422 (Fig. 13) coaxial with said post. The gear 422 is driven by the gear 334 and transmits rotation to the shaft 418 by means of a gear 424 fixed on one end thereof. The roughing tool 30 is fixedly mounted on the other end of the shaft 418, the tool being held against axial movement in one direction by a collar 426 pinned to the shaft and against movement in the other direction by locknuts 428 threaded on the shaft 418. It should be noted that throughout an operating cycle the shaft 418 is disposed so as to carry the tool 30 in a plane extending substantially at right angles to the path of successive marginal portions to be roughened. A yoke 429 (Figs. 15, 20 and 21), bolted to the yoke 416, is actuated hydraulically, as later explained, to swing the tool 30 heightwise about the countershaft 332 as turning axis.

When the jacked shoe is in its starting position, as shown in Fig. 1, the tool 30 is in a position removed from the shoe bottom. Upon commencing a cycle of operation, means to be described are automatically actuated for swinging the tool over the shoe and for lowering the tool into operative engagement with the heel-breast area of the shoe bottom. These means also act toward the end of the cycle, i. e., when the opposite corner of the heel-breast area is reached, to raise the tool 30 and then return it to the removed position. Bolted to a flange formed on the bearing 44 is a cam 430 (Figs. 4, 5 and 12) that is engaged by a roll 432 mounted in one end of a bell-crank lever 443. This lever is pivotally mounted on a fulcrum pin 436 supported by a bracket 438 that is affixed to the top of the frame 56. The other end of the bell-crank 434 carries a roll 440 arranged to cooperate with a cam-shaped end 442 of an arm 444 (Fig. 14) bolted to the angular bracket 338. A tension spring 446 (Fig. 4) connected between the bracket 438 and the bell-crank lever 434 maintains the roll 432 in engagement with the cam periphery of the cam 430, the single throw in the latter being effective initially, as best visualized in Fig. 4, to permit the spring 382 to maintain contact between the cam end 442 and the roll 440 as the tool 30 is thus swung clockwise (as viewed from above) over the shoe bottom. At the close of the cycle, the throw of the cam 430 causes the roll 440 to return the tool 30 to inoperative position by moving the cam end 442 against the tension of the spring 382.

When over the heel-breast area the tool 30 is automatically lowered into operative engagement with the shoe bottom by hydraulic pressure mechanism, subsequently described, which is controlled by a cam follower 450 (Figs. 5, 12, 14 and 18) that is mounted on one end of a bell-crank lever 452. The latter is pivotally mounted in a bearing bracket 454 secured to the bracket 338 and has a curved arm that is forked to receive a screw 456 (Fig. 14) mounted in a collar 458 fast on a control rod 460 (Figs. 4, 13, 14, 15 and 24) hereinafter further mentioned. The lever 452 is actuated to move the rod 460 upward (thereby to lower the tool 30) on lowering of the follower 450 by its engagement with a cam surface 462 (Figs. 5 and 18) formed on an arm 464 bolted to the heel bracket 196, as shown in Fig. 12. A cam surface 466 of the arm 464 is arranged to engage the follower 450 to move it upwardly at the close of the operating cycle thereby to lower the control rod 460 and raise the tool 30 from the shoe.

Additional means are provided for automatically controlling the above-referred-to hydraulic mechanism at selected times in a cycle, thus effecting or interrupting roughing by the tool 30 on predetermined portions of the shoe bottom. Referring to Figs. 4, 4a, 4b, 4c and 4d, a horizontal rod 470 is slidably mounted in bores formed in the bracket 225 and in a bracket 472. One end of the rod 470 has teeth for meshing with a gear 474 fast on the shaft 362 and the other end supports a pair of arms 476 journaled to rotatably support a pin 478. Splined on the pin 478, but rotatably carried by an arm 480 fixed to the rod 470, is a cam wheel 482 (Fig. 4c) that is provided with six spaced projections arranged to be engaged, respectively, by a series of similar cams 484 radially and detachably mounted on the rotary holder 106. Each cam 484 may be adjustably clamped to the holder 106 to engage a projection on the wheel 482 after any desired degree of rotation of the holder 106, as will now be discussed.

As noted in Figs. 4 and 4d, each cam 484 is hinged and clamped on the holder 106 either coincident with a true radius thereof or angularly inclined to a radius,

clamping bolts 483 extending through the holder and the cam 484 on opposite sides of its hinge pin 485. The purpose of the angularity of a cam 484 relatively to a radius of the holder is to advance or retard its engagement with the wheel 482 in order to advance or retard the timing of vertical operating movements of the tool 30 as required with respect to different sizes of shoes. It will be recognized that non-angularity of the cams 484 results in actuation of the wheel 482, and hence of the tool 30, without that variance in timing necessary to assure that corresponding portions of the shoe bottoms will be treated (or untreated) similarly. Tool actuations at heel and toe extremities, for example, would be accurately assured for all sizes by a radially disposed cam 484, but the other corresponding points on shoe bottom patterns of different sizes are not readily determined with accuracy unless geometric grading (as disclosed, for example, in United States Letters Patent No. 1,948,547, issued February 27, 1934, upon an application filed in the name of L. E. Topham) be employed in lieu of the more prevalent arithmetic grading system. Peripheral points x' and y' (Fig. 4^f) corresponding to a point z' of geometrically graded bottom patterns may be located, for example, by simply drawing a straight line G from the heel end extremity through the known point z' when the patterns have a line connecting their extremities superimposed and the heel end extremities are superimposed. It will be seen upon inspection of Fig. 4^f that, the holder rotating counterclockwise as the jack rotates clockwise when viewed from above, the cam 484 should engage the wheel 482 later for the point y' than for the point x', and still later for the point z' than for the point y'. Therefore, to cause the tool 30 to move vertically at each of these three corresponding points, the cam 484 should be at such an angle to a radius of the holder 106 as to produce the required relative "delays" in actuation of the wheel 482. Corresponding points on the shoe bottoms of arithmetically graded shoes, for example x, y and z in Fig. 4^e, may, for practical purposes, be selected by eye and usually the location of straps is so determined. Considering Fig. 4^e, it may be seen that the angularity of the cam 484 must be such that it engages the wheel 482 sooner for the point z than for the point y, and sooner for the point y than for the point x. This "delay" for the points y and x is obtained by the angular adjustment of the cam 484, as shown in Fig. 4^d. Other corresponding points, such as 1, 2 and 3 in Fig. 4^e may require "advance," i. e., a reverse inclination of the cam 484 to the radius. For any sets of peripheral points substantially corresponding on a shoe bottom it is found that "delay" or "advance" appropriate in amount may be determined by making an initial trial run with the straight line cam 484 being angularly adjusted as found necessary.

As the heel bracket 196 is positioned upon jacking of the shoe S the rod 470 is shifted endwise by the shaft 362 and the gear 474 so that, for different sizes of the same style and width, the engagements between the respective cams 484 and the shifted wheel 482 automatically occur at the corresponding and appropriate instants during traverse of a shoe bottom for changing the hydraulic pressure controlling the roughing tool 30. Each such engagement rotates a three-armed cam wheel 486 (Figs. 4^a, 4^b) affixed on the pin 478, and each arm of the wheel 486 is arranged to engage one end of a bell-crank lever 488 fulcrumed on the bracket 472. The lever 488 is accordingly pivoted against the resistance of a return spring 490 connecting the other end of the lever 488 with the bracket 472. The spring 490 is not permitted by the wheel 486 to return the lever 488 so that it again extends between adjacent arms of the wheel 486 until the next succeeding cam 484 engages the wheel 482. This second engagement (and subsequent alternate engagements) moves an arm of the wheel 486 entirely past the adjacent end of the lever 488 so that the latter, under the influence of the spring 490, can reverse its control action on hydraulic mechanism about to be described. The lever 488 is connected by a link 492 to one end of a bell-crank lever 494 also fulcrumed on the bracket 472 and the other end of the lever 494 is pivotally connected to a reciprocable valve rod 496 (Figs. 4, 17 and 24) having an operating spool 500 and cylindrical plugs 502 and 504 formed integrally thereon.

The primary function of the hydraulic system shown in Fig. 4, and schematically in Fig. 24, is to exert or diminish operative roughing pressure of the tool 30, the automatic control being exercised via the rod 460 at the beginning and end of the cycle and, if desired, by the adjustably spaced cams 484 acting at selected intermediate points in the cycle. The system comprises a pump 506 mounted on the frame 56 and a motor 508 for driving the pump to circulate fluid, preferably oil, under pressure from a sump 510 mounted beneath the top of the frame, through conduits, to actuate a brush elevating or depressing piston rod 512 (Figs. 15 and 24), and then to return the fluid to said sump. Vertical displacement of the rod 512 moves a slide bar 514 (Fig. 15) vertically, the rod carrying a cross arm 516 clamped to the bar and guided by a rod 518 fixed to a bracket 520 mounted on the machine frame. The upper end of the bar 514 is provided with an arcuate slideway 522 for accommodating a block 524 pivotally mounted on an end of the yoke 429. Thus, upward movement of the rod 512 causes the joined yokes 429 and 416 to swing the tool 30 downwardly, and vice versa, at any radial position required by the sleeve 328.

In Figs. 15 and 24 the hydraulic system is shown having the plunger portion of the rod 512 relatively retracted in its chamber 526 so that the tool 30 is then in raised, inoperative position. In this state of things, the rod 512 which has its plunger end 528 serving as a piston of reduced diameter and carries a spool 530, is moved and held downwardly by effective pressure acting on the upper side of the spool 530 and transmitted through pipes 532, 534 and a chamber of a valve housing 536. The latter houses a reciprocable plunger 538 movable by the control rod 460 and carrying an operating spool 540. This spool 540 is then so positioned in the housing 536 that fluid being delivered to the chamber 526 by a pipe 542 acts only on the reduced plunger end 528 and fluid being delivered by the pipe 532 is permitted by the spool 530 to exhaust and escape via drain pipes 544, 546 to the sump 510. When, at the start of a cycle, the cam 462 and the follower 450 cause the rod 460 to be raised together with an arcuate slideway 548 mounted thereon, a block 550 accommodated by the slideway 548 acts through a bell-crank lever 552 to retract the plunger 538 and thereby causes the spool 540 to block off the drain pipe 546. Accordingly, though pressure is then still being exerted against the upper side of the spool 530, a differential or cumulative pressure acts to raise the rod 512 and lower the tool 30, such pressure being derived from fluid delivered from the pipe 542 and effective against the plunger end 528, as well as fluid now permitted by the spool 540 to flow through the pipe 544 for application to the underside of the spool 530. It will be understood that at the close of a cycle the cam 466 acts in a similar but reverse manner to return the plunger 538, reopen the drain pipe 546, and consequently again raise the tool 30 from the shoe bottom.

At any intermediate point, or points, in the roughing cycle the spool 540, having plugged off the pipe 546 and opened the pipe 544 as just explained, operative pressure of the tool 30 may be quickly diminished to ineffectiveness and promptly restored by the aforementioned predeterminedly timed engagements of the cams 484 and the wheel 482. The reciprocable valve rod 496 need only thus be shifted a small amount, as may be noted in Fig. 24, to cause the operating spool 500 to close a valve chamber 554 connecting with a high pressure valve designated H and a pipe 556 leading to

the pump 506, and simultaneously to open a valve chamber 560. As above noted, the next succeeding engagement of one of the cams 484 with the wheel 482 permits adequate return shifting of the rod 496 by means of the spring 490 so that the spool 500 may again open the chamber 554 for connection, via pipe 558, with the pipe 542, and again close the chamber 560 having connection with a low-pressure valve designated L. Both valves H and L are connected with the sump 510 and are individually adjustable by hand wheels to vary the high (operative) and the low, or non-operative, pressure of the system, as desired to secure the best results on different types of upper material to be roughened. Greater differentials in the pressure quicken the responsiveness of the tool 30. Thus, upon closure of the valve chamber 560, as shown in Fig. 24, high pressure is effectively transmitted to the plunger end 528 via the pipe 542 to raise the rod 512 and lower the tool 30, the pressure conducted by the pipes 532 and 544 to opposite sides of the spool 530 being equal and hence of no effect. Upon opening of the chamber 560 and closure of the valve chamber 554 balancing pressures again act on opposite sides of the spool 530 and only a reduced or adjusted low pressure effectively acts on the plunger 528. The tool 30 is thereby permitted to continue in light contact with the shoe bottom, or a strap 562 (Fig. 20) for example, and the roughing pressure will not again be restored until the next succeeding engagement of a cam 484 with the wheel 482. Accordingly, certain spaces between adjacent cams 484 correspond with predetermined portions of the shoe-bottom margin to be roughened, and alternate sectors of the cam holder 106 between said spaces correspond with portions of the margin, such as the straps 562 (Fig. 20) or a gap 564, as at the toe of open-toe shoes, which are not to be roughened.

Operation of the machine, probably understood in large measure from the foregoing details, will now be briefly summarized. It will be assumed that the number and relative positions of the cams 484 of the holder 106 have been determined to accord with the pattern of roughing and non-roughing that is required in the shoe bottoms to be treated. Having selected and mounted on the jack 32 a suitable pattern assembly comprising the patterns 300, 302 which are the largest and smallest size and of the same letter width as the shoes to be roughened, the treadle 212 is first depressed to separate the toe fork 38 and the heel fork 40 lengthwise and then released to permit these forks to clamp the shoe endwise under the influence of the springs 234 and 240. This treadle action also effects clamping of the shoe by the holddown 274 cooperating with the heel rest 36. The shoe then occupies the starting position shown in Figs. 1 and 20, and the adjusted position of the heel bracket 196 has automatically acted through movement of the gears 364 and 474, respectively, to: (1) impart proper grading influence to the roughing tool 30 by establishing the heightwise position of the roll 380 with respect to the grading plate 348 as above stated, and (2) position the wheel 482 radially with with respect to the cam holder 106 so that said wheel is engaged by the cam or cams 484 at the appropriate instant to shift the operating spool 500 and thus modify the roughing action of the tool 30. It will be noted that, having fixed the radial positions of the cams 484 for one style of shoe, the automatic endwise shifting of the rod 470 assures that exactly corresponding marginal portions of the shoe bottoms of all sizes in that style will be similarly roughened or non-roughened. For example, all strap portions 562 of the several sizes in that style will receive no roughening and no adjustment of the cams 484 is required until the shoe style is changed. The motors 50 and 508 having been started, the operator retracts the plunger 132 to cause the jack 32 to be driven and thus move the shoe with combined rotation and oscillation through a single operating cycle during which the point of operation of the tool 30 traverses the entire shoe-bottom margin. The tool 30 is swung clockwise, as viewed from above, from its removed position to an operative position over the shoe bottom. This movement is caused by the spring 382 as permitted by movement counterclockwise (as viewed from above) of the lever 434 under the control of the cam 430.

At the start of the cycle the roll 380 is automatically locked against heightwise movement by the toggle action instituted by the cam 310, and this cam serves similarly at the end of the cycle to unlock the grading mechanism. Because of greater curvature at the toe portion than at the sides of a shoe bottom and the fact that the toe portion is more distant from the axis of rotation (the axis of the spindle 42) it is desirable for uniform roughing results to compensate by varying the angular velocity of the jack, decreasing the speed of relative movement of the operating point of the tool 30 at the toe portion or, conversely, increasing such relative speed along the shoe-bottom sides. Angular rotation of the jack 32 is accordingly slower when the tool 30 operates on the toe end and faster during operation along the shoe sides. This is the function served by oscillating the jack 32 during its rotation, the center of rotation thus being carried farthest from the operating point of the tool 30 when the latter is engaging the toe end or the heel end of the shoe bottom. The tool is automatically caused to commence operation at one corner of the heel-breast area by the combined action of the cams 430 and 462, continues operating in a plane substantially at right angles to the path of roughing on the overlasted margin, and is returned to its remote inoperative position on arriving at the other corner of the heel-breast area by the combined action of the cams 430 and 466, the cam 430 effecting timed rotation of the sleeve 328 for this purpose.

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

1. A machine for treating shoe bottoms comprising means yielding separable lengthwise of a shoe to support a shoe of any one of different sizes and styles, a tool engageable with the margin of the bottom of the shoe so supported, means for moving the shoe supporting means to carry the point of operation of said tool progressively about the shoe bottom, and grading means operatively connected to the tool and responsive to lengthwise separating movement of said supporting means during adjustment to receive the supported shoe for influencing the operating path of said tool according to the size of said shoe.

2. A machine for treating shoe bottoms comprising means yieldingly separable lengthwise of a shoe to support a shoe of any one of different sizes and styles, a tool engageable with the margin of the bottom of a shoe so supported, means for moving the shoe supporting means to carry the point of operation of said tool progressively about the shoe bottom margin with a substantially uniform rate of relative movement, and grading means operatively connected to the tool and responsive to lengthwise movement of said supporting means for influencing the operating path of said tool according to the size of said shoe.

3. A machine for treating the marginal portion of a workpiece comprising grading means including a pair of patterns mounted with their faces in spaced relation one of which patterns is larger than said workpiece and the other of which is smaller, means for rotating the workpiece and patterns in phase, a tool movable about an axis extending heightwise of the workpiece and operatively engageable with the workpiece margin, means for oscillating the rotating workpiece in its plane of rotation to effect a substantially uniform rate of travel of its successive marginal portions with respect to the operating portion of said tool, said grading means de-

termining the operative path of said tool relatively to the workpiece and being adapted to move the tool about said axis according to the inclination of a gradient progressively spanning the peripheries of said patterns.

4. In a machine for roughing shoe bottoms, a work support having toe and heel engaging portions which are controlled for movement toward and apart from each other in a predetermined ratio, means yieldingly urging said toe and heel engaging portions into clamping relation with a shoe, a roughing tool mounted for swinging movement about an axis extending heightwise of the shoe so supported and engageable with the overlasted margin on its bottom, a pair of patterns carried by the work support and relatively to which said shoe bottom is intermediate in graded size, means for moving the work support to carry successive portions of the shoe bottom margin progressively into operative engagement with the tool, a gradient member progressively in contactual relation with edge portions of said patterns and in phase with the marginal engagements of said tool, and means for influencing swinging movement of the tool about said axis to vary the path of roughing during movement of the work support according to the extent of separation of its toe and heel engaging portions, said tool influencing means being automatically controlled by the clamping position of one of said portions and the variable inclinations of said gradient member as the roughing progresses.

5. A machine for roughing the margins of shoe bottoms comprising a support for a shoe, a rotary roughing tool mounted for swinging movement about an axis extending heightwise of the shoe on said support and for movement toward and from operative engagement with the margin of the shoe bottom, means for moving the support through a single revolution to carry successive marginal portions of the shoe bottom into position for engagement by the operative portion of said tool, and mechanism operative in time relation with said means and operatively connected to said tool for carrying it into engagement with the shoe bottom at one corner of the heel breast area and subsequently removing the tool therefrom at the opposite heel breast corner.

6. A machine for roughing shoe bottom margins comprising a work support having relatively movable toe and heel clamping members, a rotary roughing tool, means for moving the support through a cycle to carry the bottom margin of a shoe clamped by said members progressively into position for engagement by said tool, means mounted for movement about an axis extending heightwise of the shoe to carry the tool into and out of proximity to the shoe bottom, mechanism actuated by said support moving means for so operating said tool carrying means at predetermined times in the cycle, power means connected to the tool carrying means for forcibly moving the tool into or out of operative engagement with the margin at such times, and controls for said power means arranged to be operated in time relation dependent on the relative positions of said clamping members.

7. A machine for roughing the margins of shoe bottoms comprising a shoe support having relatively movable heel and toe clamping members, a roughing tool mounted for movement about an axis extending heightwise of a shoe on said support and for movements heightwise of said shoe, means for moving the support through one revolution to carry successive portions of the shoe bottom margin into position for engagement by the operative portion of said tool, grading means for controlling the operative path of the tool with respect to said axis and according to the lengthwise separation of said heel and toe clamping members, power means connected to said tool for changing the pressure of its engagements with marginal portions of the shoe bottom, and controls arranged to operate said power means at predetermined times in the revolution.

8. A machine for roughing the margins of shoe bottoms comprising a shoe support having relatively movable heel and toe clamping members, a roughing tool mounted for movement about an axis extending heightwise of a shoe on said support and for movements heightwise of said shoe, means for moving the support through one revolution to carry successive portions of the shoe bottom margin into position for engagement by the operative portion of said tool, grading means for controlling the operative path of the tool with respect to said axis and according to the lengthwise separation of said heel and toe clamping members, power means connected to said tool for changing the pressure of its engagements with marginal portions of the shoe bottom, and spaced controls arranged to operate said power means at predetermined times in the revolution, the times of actuation of said power means being dependent on the relative spacing of said controls and the extent of lengthwise separation of said heel and toe clamping members.

9. In a machine for roughing the margins of shoe bottoms, a shoe support having relatively movable heel and toe clamping portions, a roughing tool mounted for movement about an axis extending heightwise of a shoe on said support and for movements heightwise of said shoe, a pair of flat patterns arranged with their faces in spaced relation and relatively to which the bottom periphery of said shoe is intermediate in graded size, a member mounted for variable inclination corresponding to a gradient progressively spanning the edges of said patterns, means for moving the patterns and support in unison to carry successive marginal portions of the shoe bottom progressively into operative engagement with the tool and to cause said member to assume inclinations corresponding in phase with the traverse of said tool, means actuated by the member and extending therefrom to the tool for variably effecting movements of the latter about said axis, and mechanism controlled by the relative positions of said clamping portions for modifying the degree to which the tool movements with respect to said axis will be imparted by said member.

10. A machine for operating on shoe bottoms comprising a support for a shoe, a tool engageable with the margin of the bottom of the shoe and mounted for movement heightwise thereof, means for moving the shoe support in a cycle to carry successive marginal portions of the shoe bottom into operative position relative to the tool, power means connected to said tool to move it heightwise to apply and relieve the pressure of its shoe bottom engagements as different portions of the shoe bottom margin are traversed, and a plurality of controls for operating said power means, said controls being mounted as a unit for movement in a cycle corresponding in phase to that of the shoe support, and the individual controls being movable relatively to one another to change the portions of a cycle when said tool is operated under pressure and when it is relieved from so operating on the margin.

11. A machine for operating on shoe bottoms comprising a support for a shoe, a tool engageable with the bottom of the shoe and movable laterally and heightwise thereof, means for moving the shoe support in a cycle to carry successive marginal portions of the shoe bottom into operative position relative to the tool, power means normally acting to press the tool against the successive marginal portions, and a series of controls movable in a cycle for interrupting said power means, said controls being selectively spaced with respect to each other to determine the marginal portions of the shoe bottom to be operated on effectively by the tool in a cycle.

12. A machine for operating on shoe bottoms comprising a support for a shoe, a tool engageable with the bottom of the shoe and movable laterally and heightwise thereof, means for moving the shoe support in a cycle to carry successive marginal portions of the shoe bottom into operative position relative to the tool, power means normally acting to press the tool against the successive marginal portions, and a series of controls movable

in a cycle by the shoe support moving means for interrupting said power means, said controls being selectively spaced with respect to each other to determine the marginal portions of the shoe bottom to be operated on effectively by the tool in a cycle.

13. A machine for operating on shoe bottoms comprising a support adapted to hold a shoe of any one of different sizes and styles, a tool engageable with the bottom of the shoe and movable laterally and heightwise thereof, means for moving the shoe support and the tool relatively to one another to carry the point of operation of the tool into operative position with respect to successive marginal portions of the shoe bottom, power means for urging the tool toward the shoe bottom margin, control means effective alternately to interrupt and to restore operation of said power means to determine the marginal portions of the shoe bottom to be operated on by the tool, and mechanism for actuating the control means in a cycle corresponding to the operating cycle of the tool relative to the shoe bottom margin.

14. A machine for operating on shoe bottoms or the like comprising a support having members separable to hold a shoe of any one of different sizes and styles, a tool

engageable with the bottom of the shoe and movable laterally and heightwise thereof, means for moving the shoe support and the tool relatively to one another to carry the point of operation of the tool into operative position with respect to successive marginal portions of the shoe bottom, power means for pressing the tool against the shoe bottom margin, controls respectively arranged to interrupt and to restore operation of said power means during a cycle of operation of the tool on the shoe bottom margin, and connections between one of said shoe holding members and said controls for modifying the intervals of effective operation of said tool in its cycle according to the size of the shoe.

References Cited in the file of this patent

UNITED STATES PATENTS

47,341	Sargent	Apr. 18, 1865
212,116	Stirckler	Feb. 11, 1879
1,663,097	Prindle	Mar. 20, 1928
1,753,498	Bourn	Apr. 8, 1930
1,867,728	Card, Jr.	July 19, 1932
1,912,555	Weinstat	June 6, 1933