

April 6, 1943.

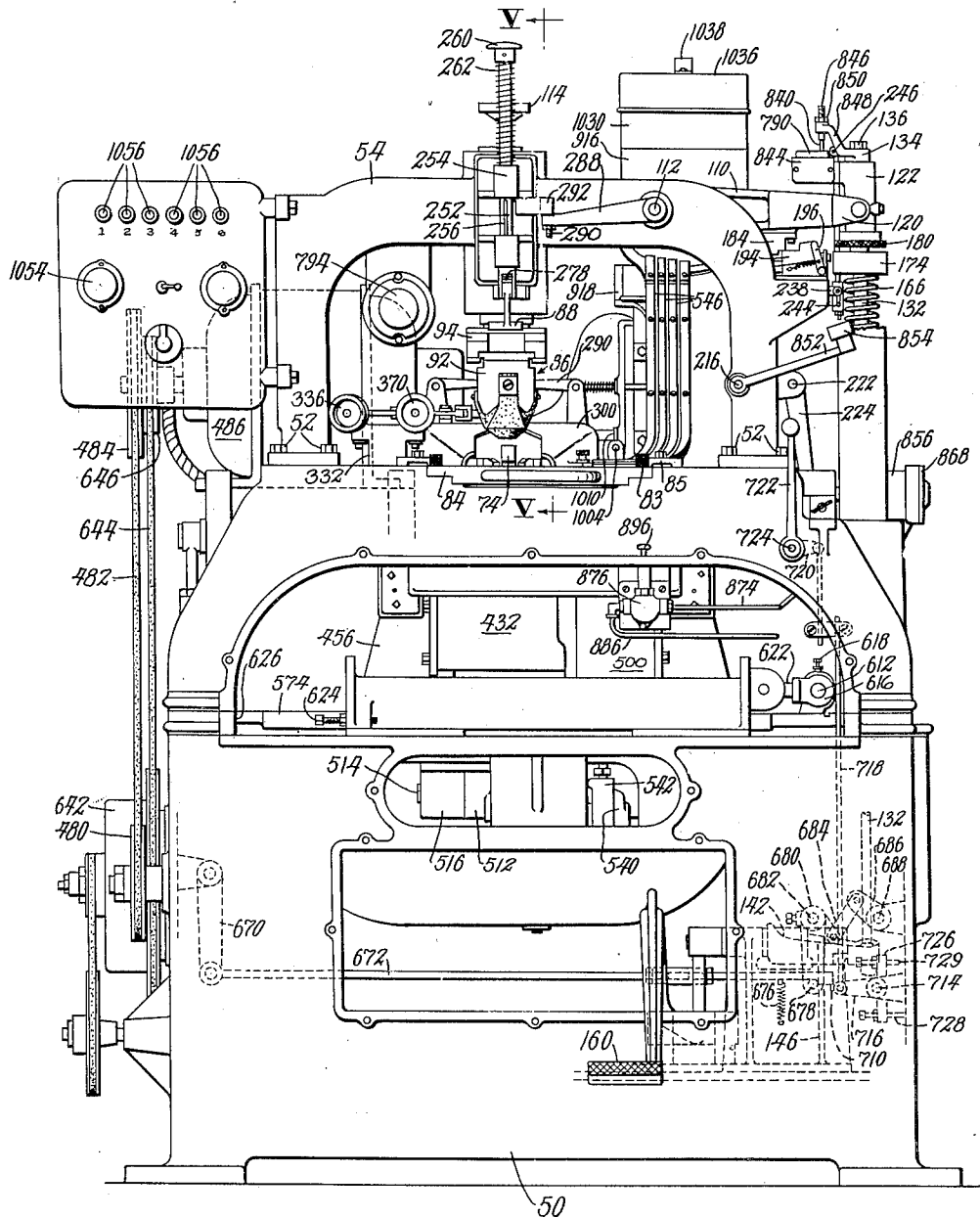
A. R. SCHOENKY

2,315,548

MACHINE FOR OPERATING UPON WORK

Filed Jan. 2, 1941

14 Sheets-Sheet 1



INVENTOR
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14 Sheets-Sheet 2

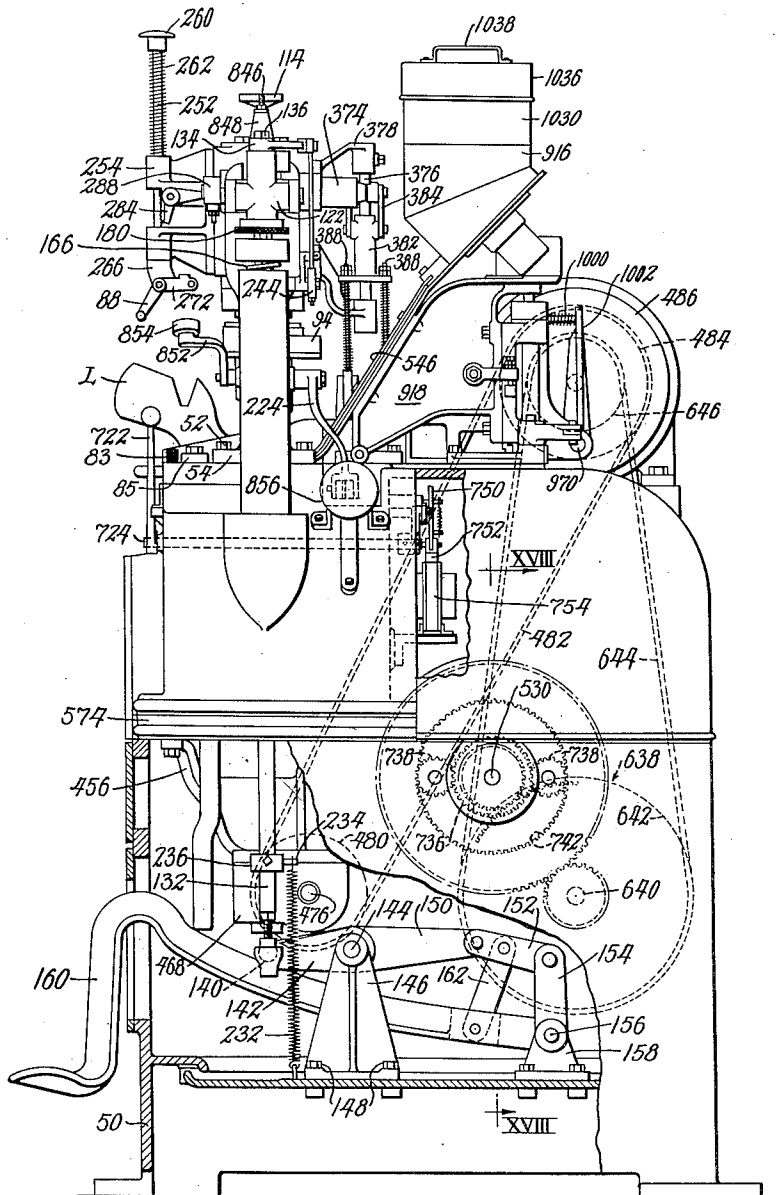


Fig. 2.

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Fig. 4.

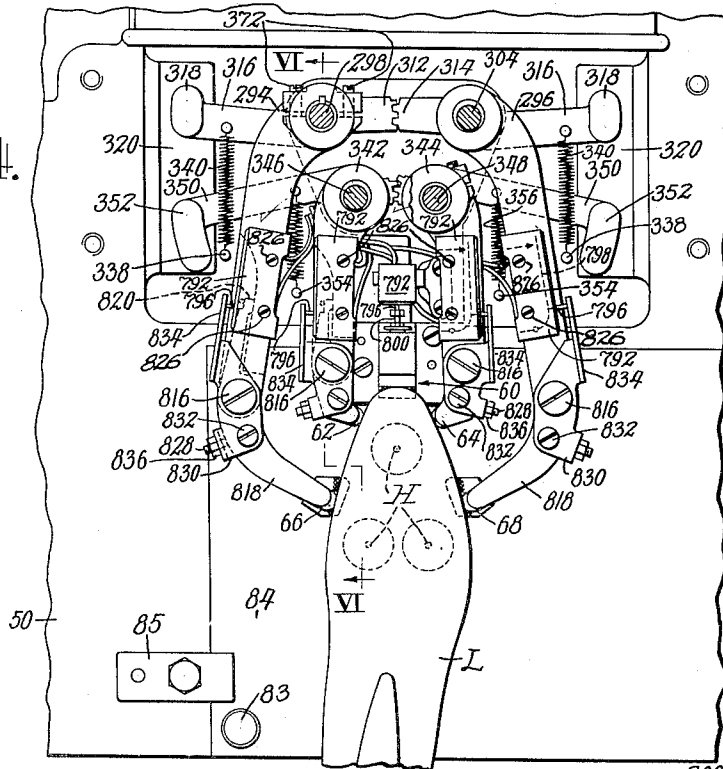
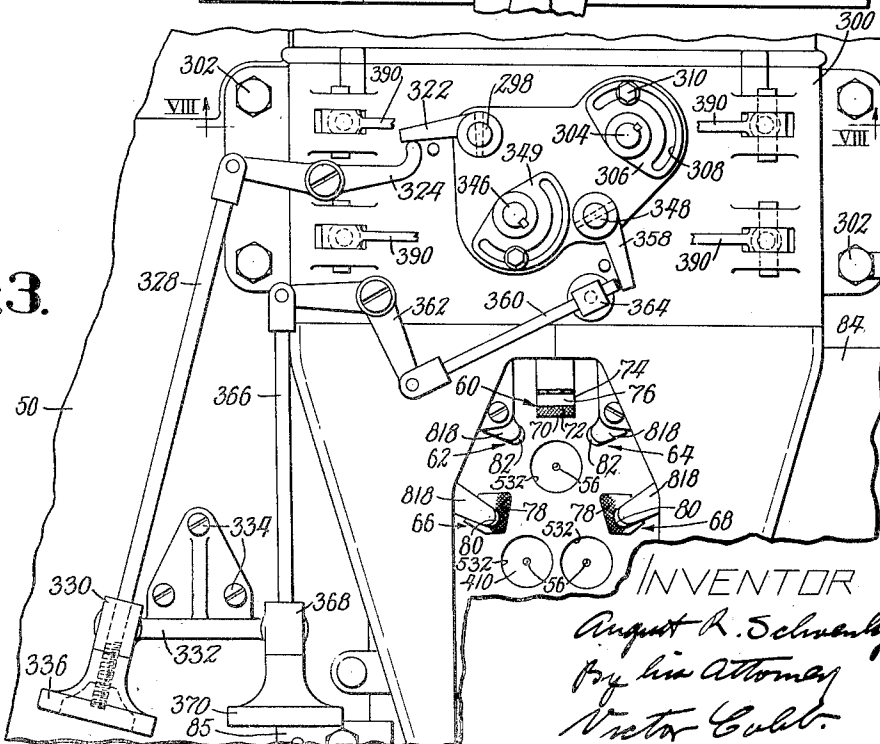


Fig. 3.



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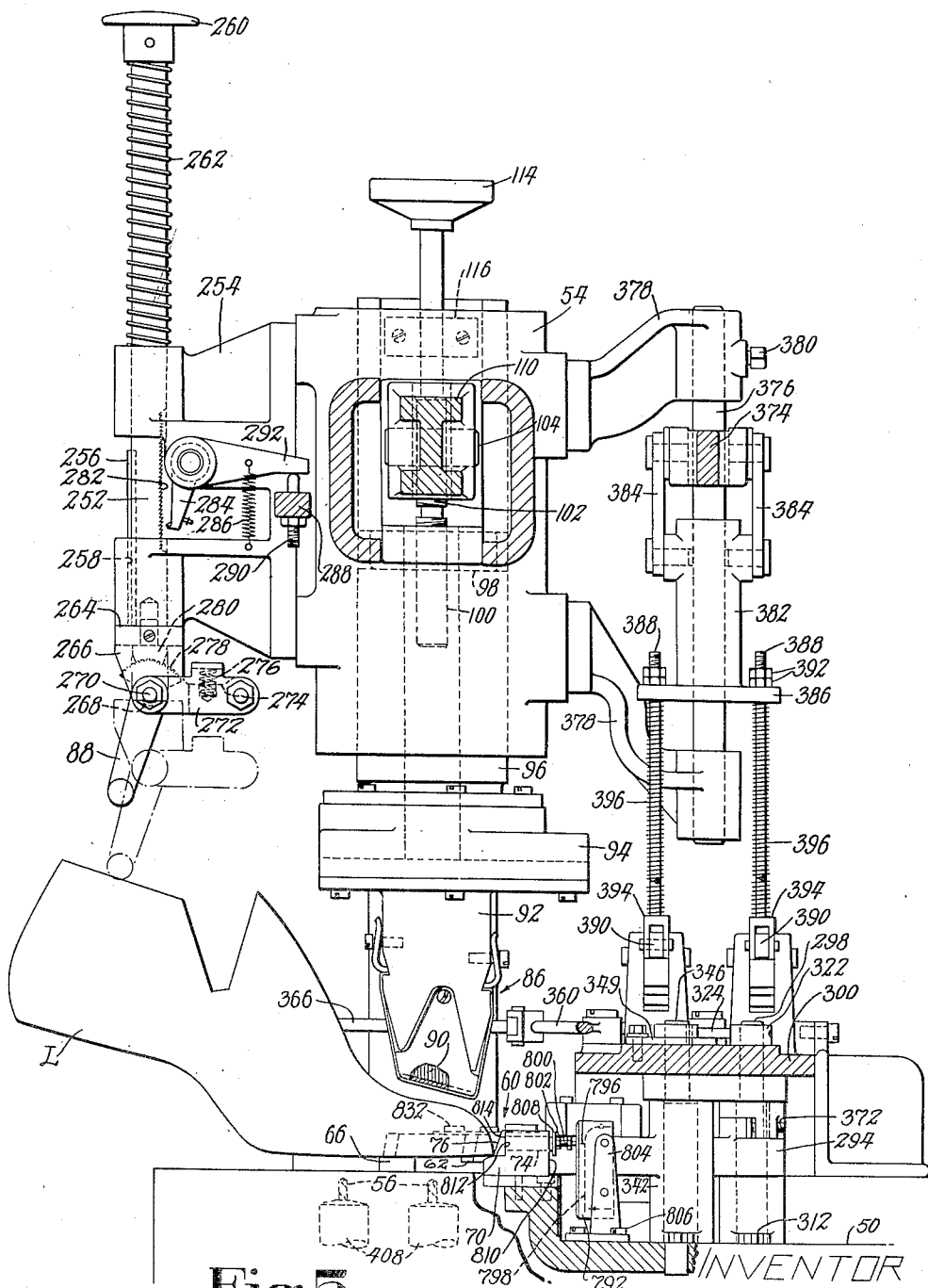


Fig. 5.

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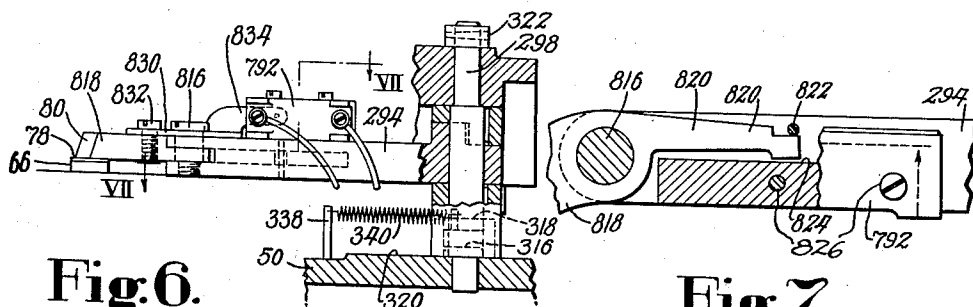


Fig. 6.

Fig. 7.

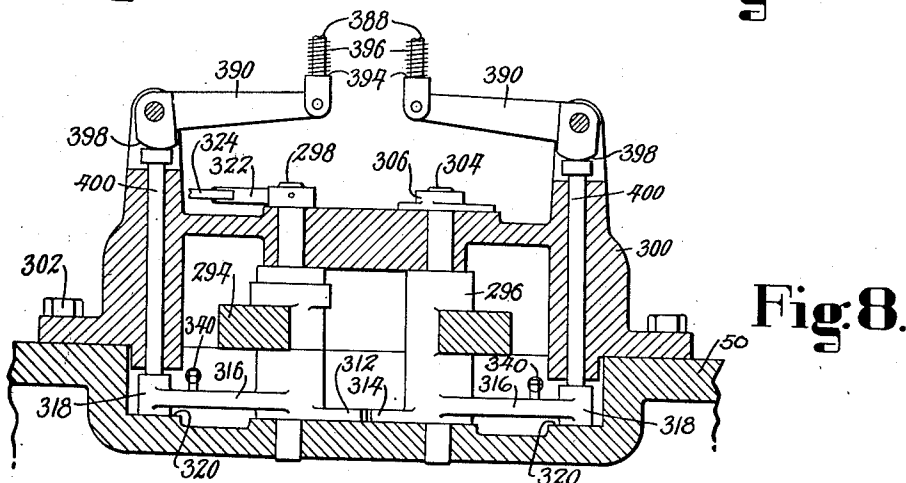


Fig. 8.

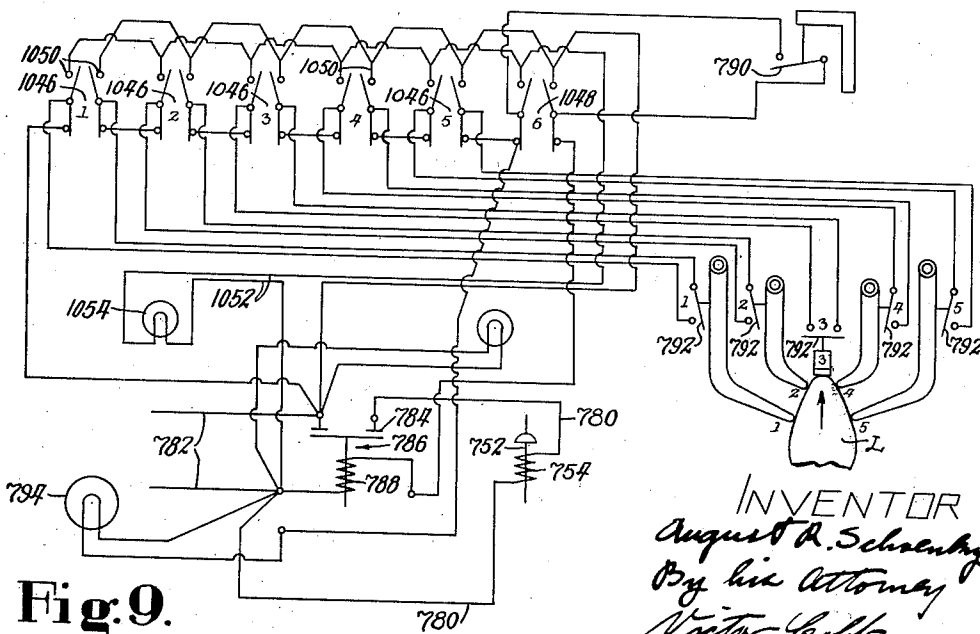


Fig. 9.

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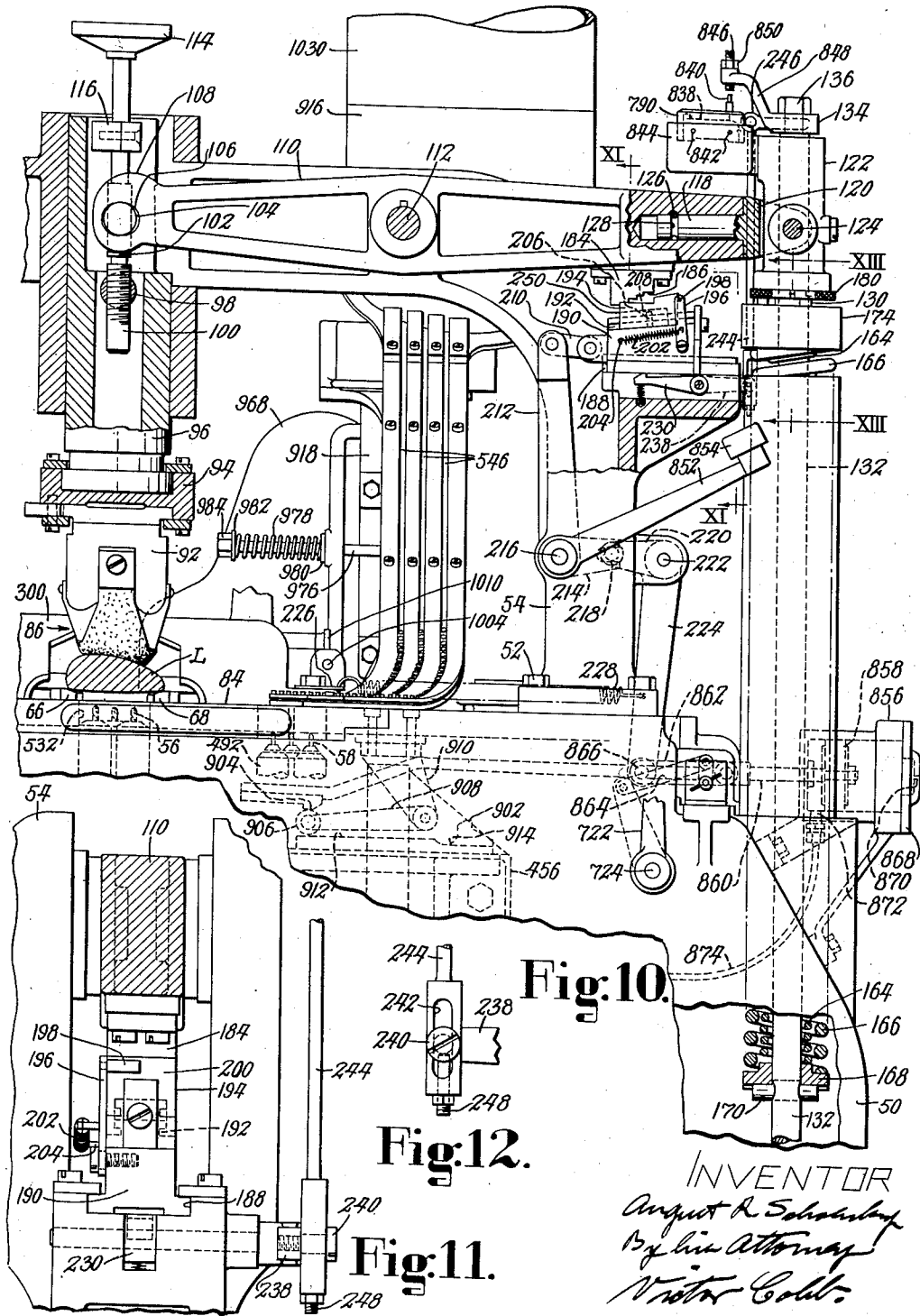
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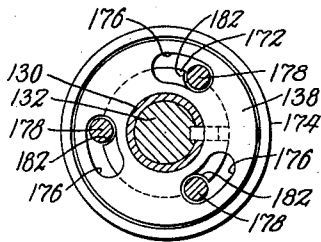


Fig. 14.

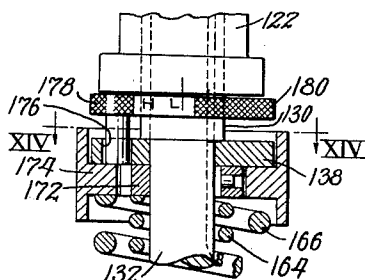


Fig. 13.

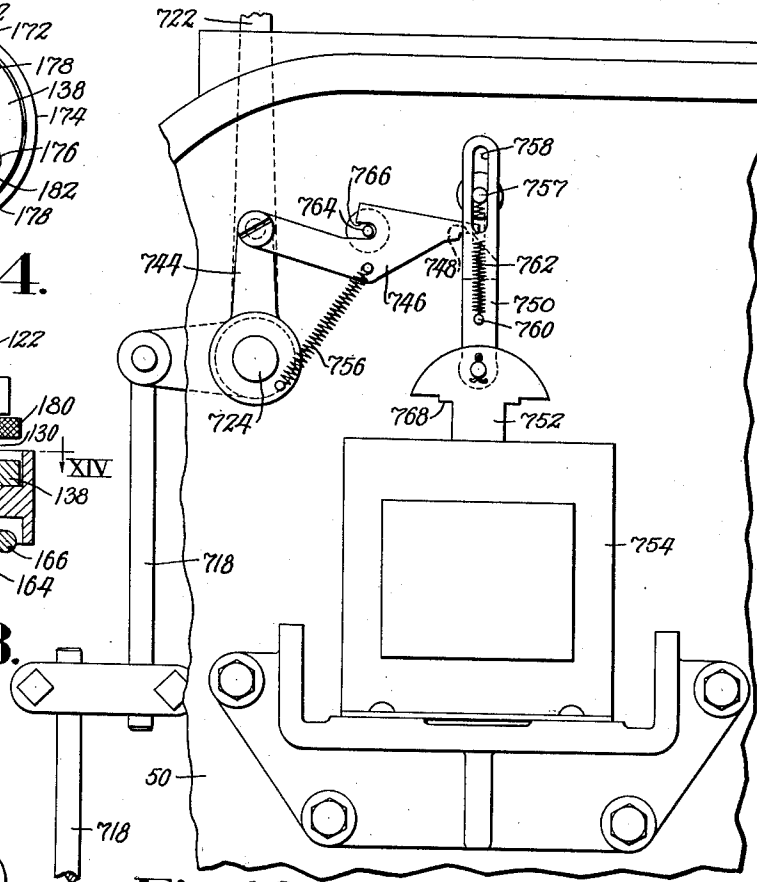


Fig. 16.

Fig. 17.

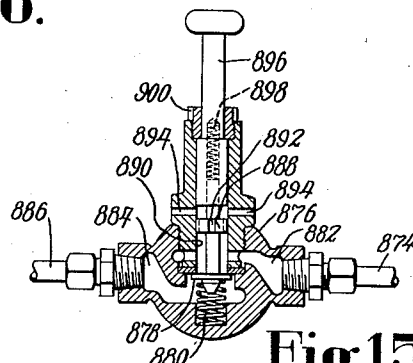
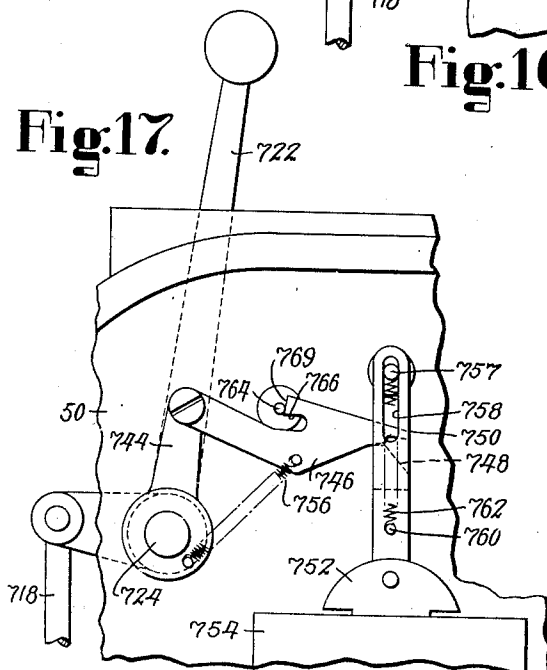


Fig. 15.

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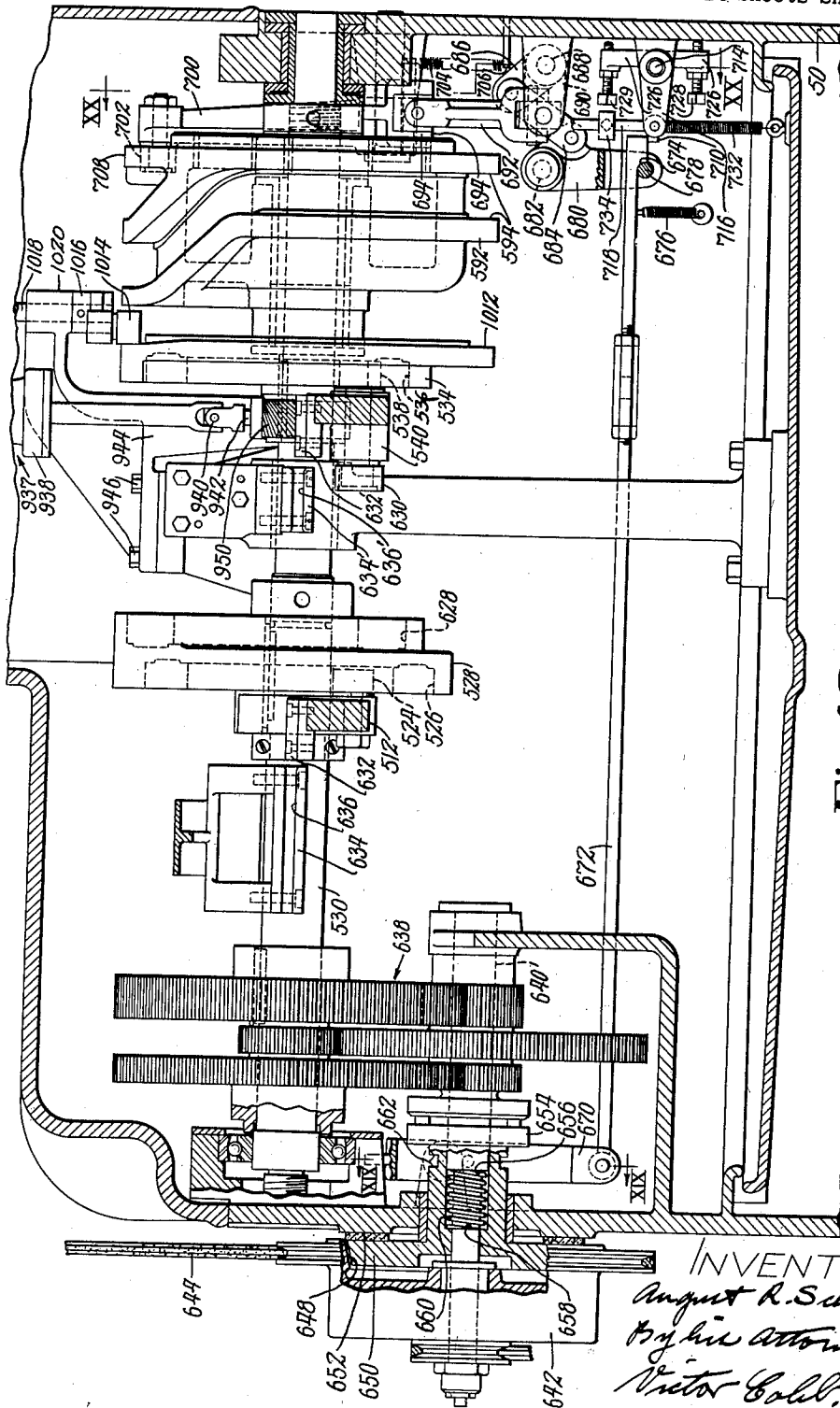


Fig. 18.

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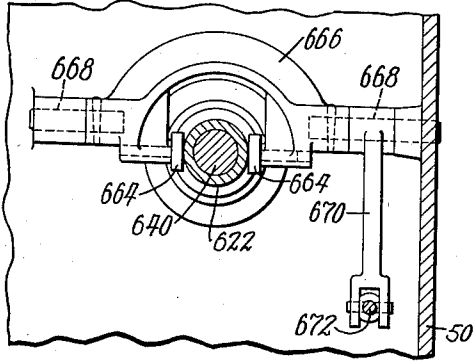


Fig. 19.

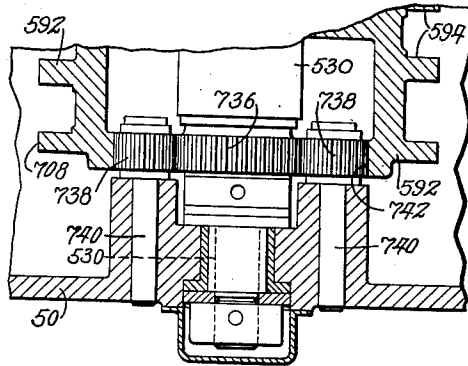


Fig. 21.

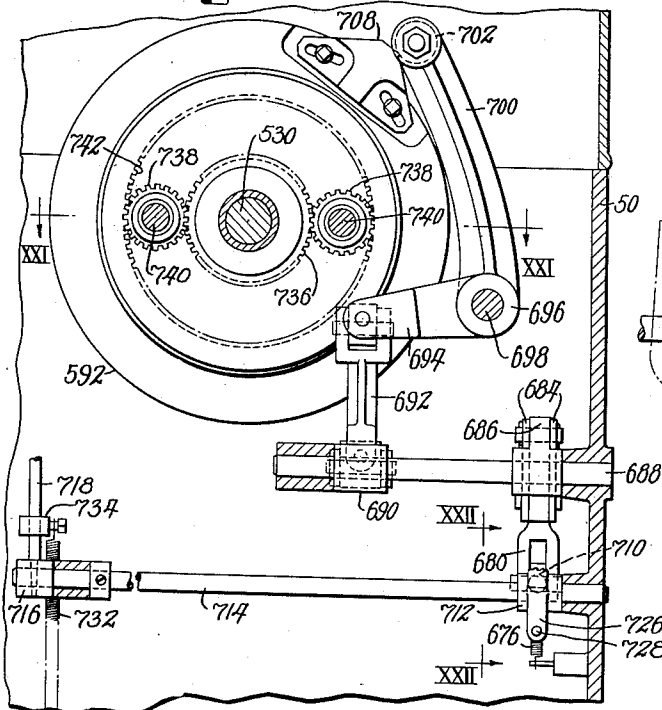


Fig. 20.

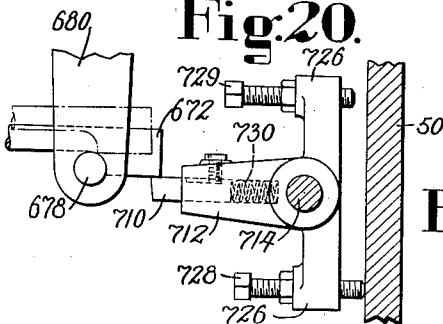


Fig. 22.

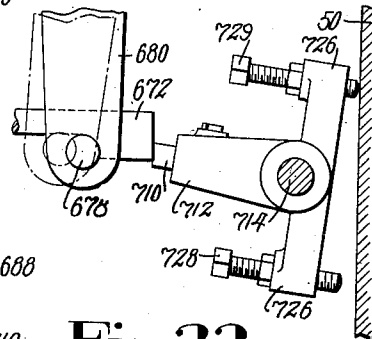


Fig. 23.

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MACHINE FOR OPERATING UPON WORK

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MACHINE FOR OPERATING UPON WORK

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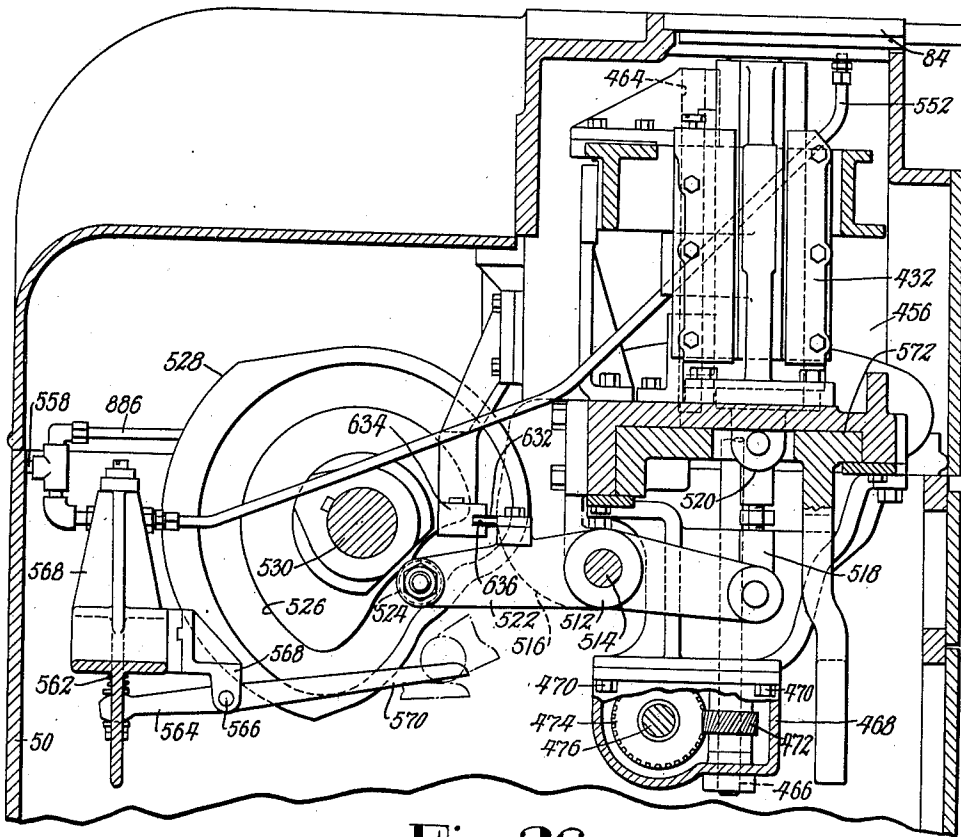


Fig. 26.

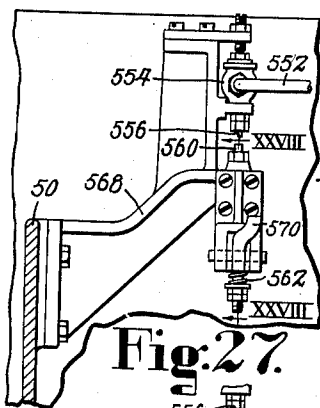


Fig. 27.

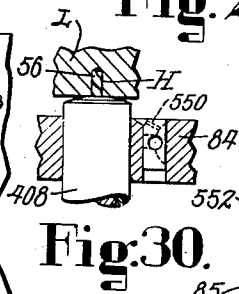


Fig. 30.

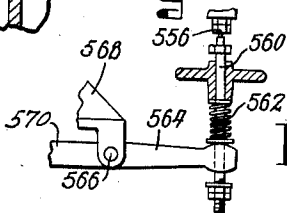


Fig. 28.

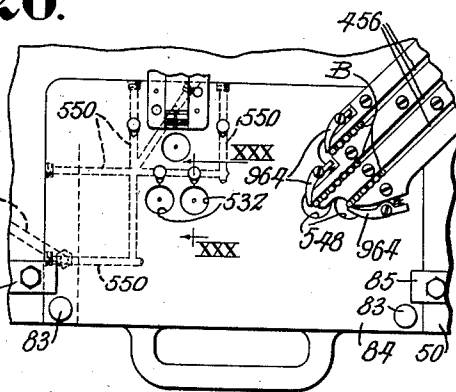


Fig. 29.

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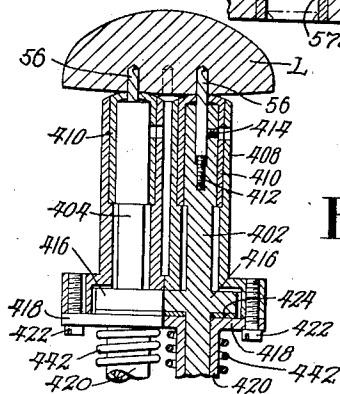
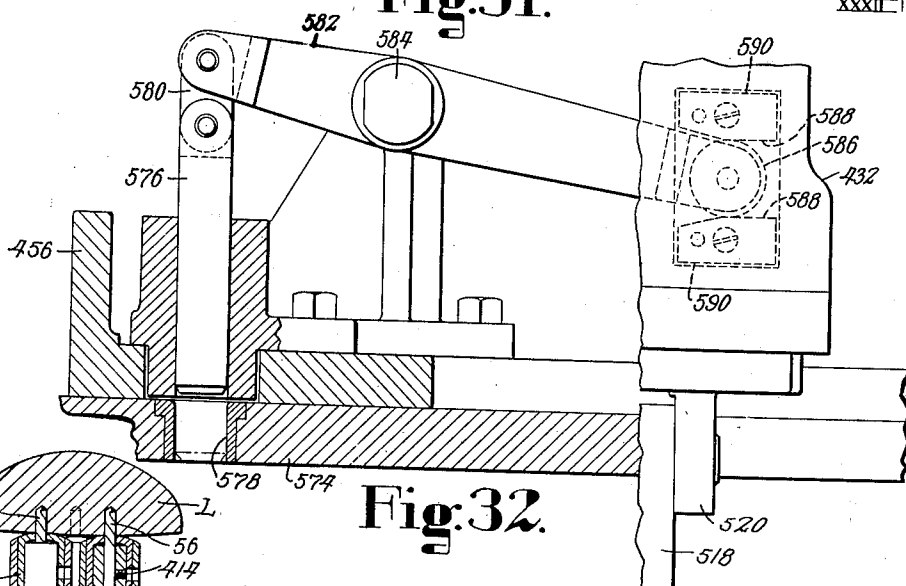
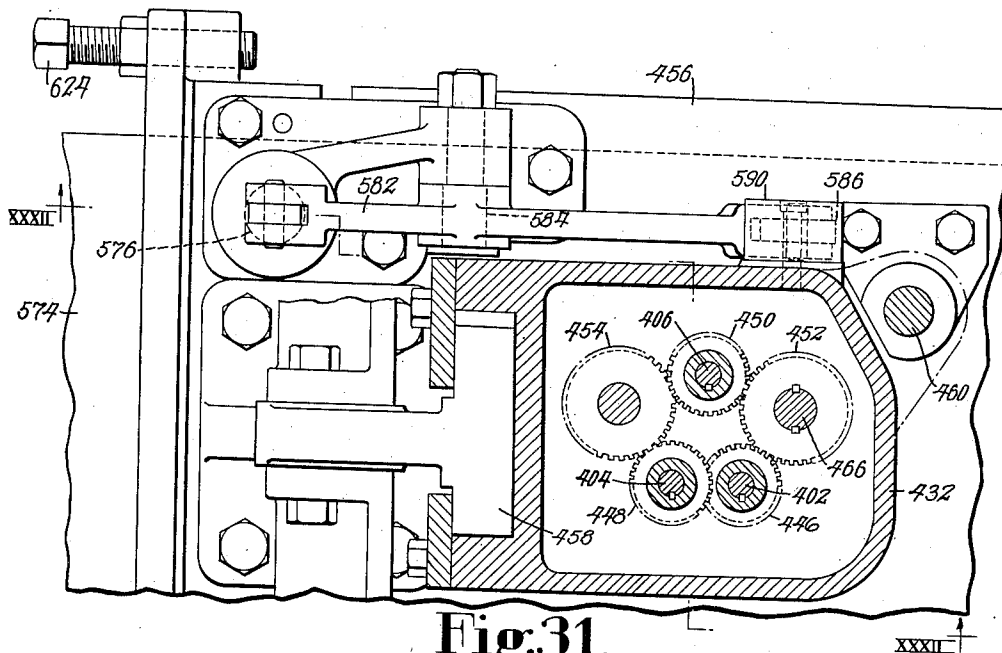
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MACHINE FOR OPERATING UPON WORK

Filed Jan. 2, 1941

14 Sheets-Sheet 12



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MACHINE FOR OPERATING UPON WORK

Filed Jan. 2, 1941

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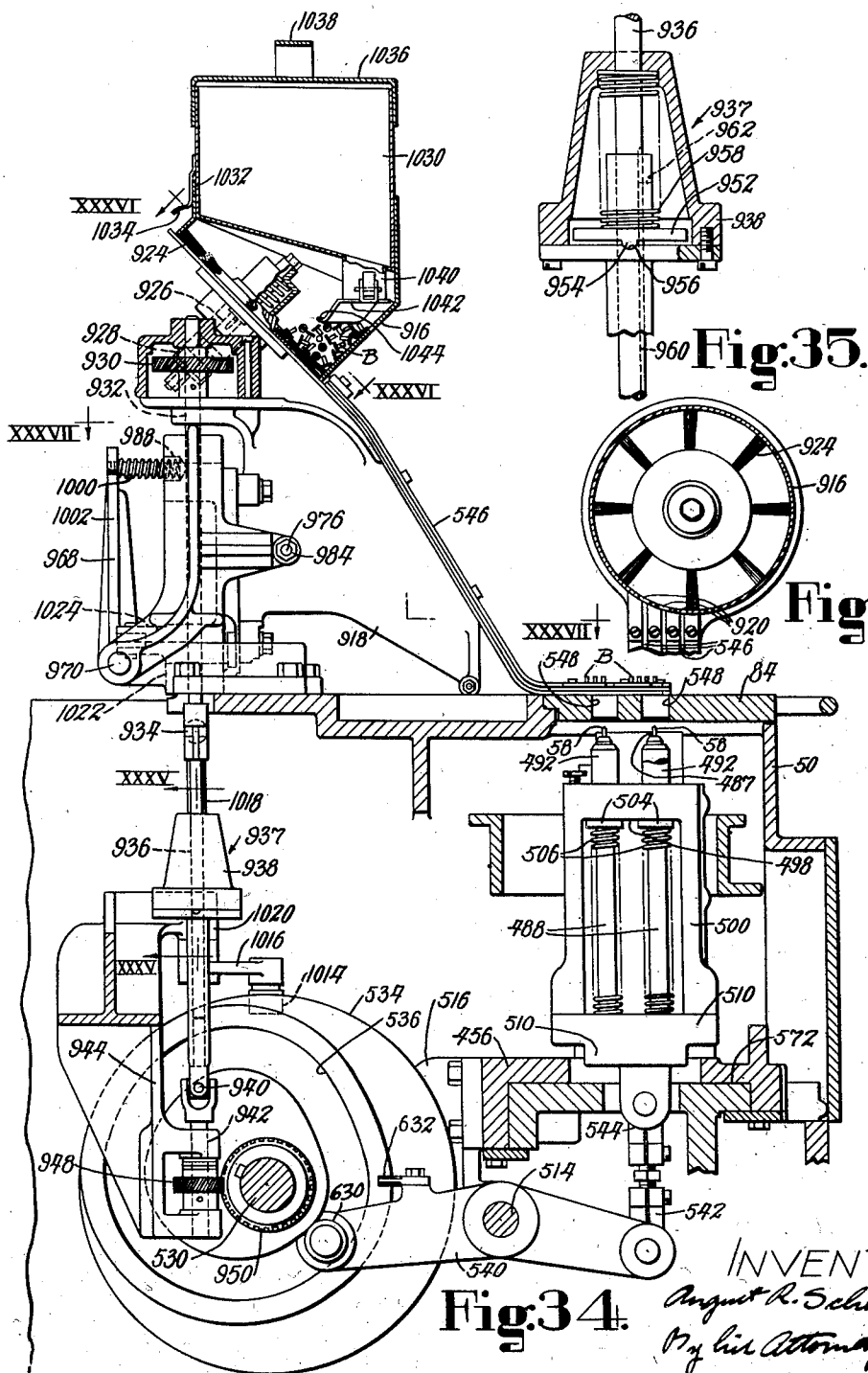


Fig. 34.

Fig. 35.

Fig. 36.

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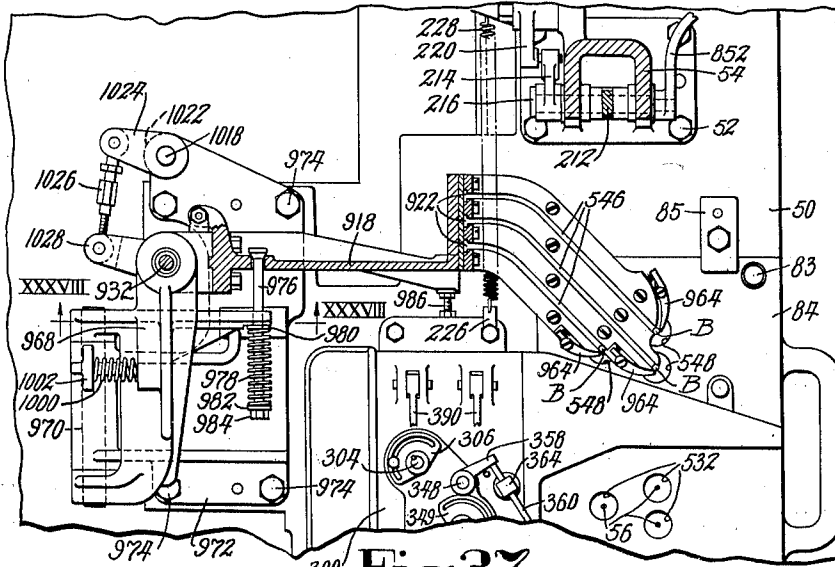


Fig. 37

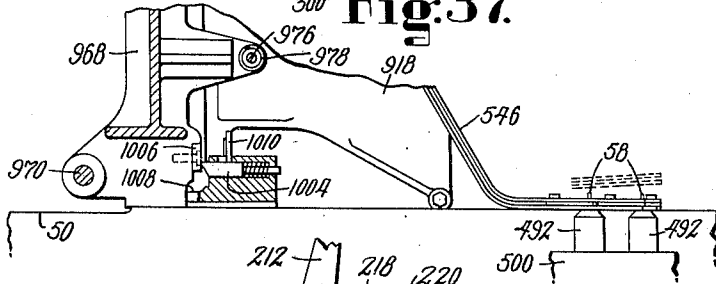


Fig. 38.

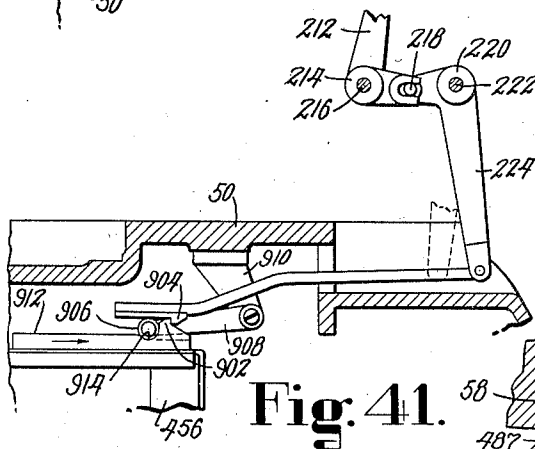


Fig. 41.

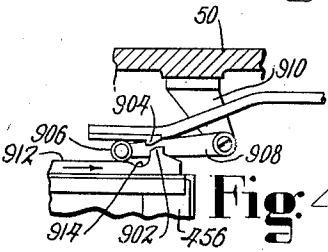


Fig. 42.

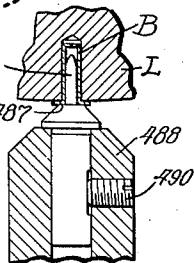


Fig. 40.

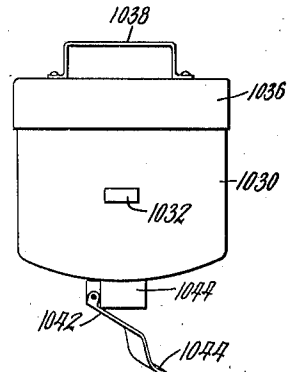


Fig. 39.

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UNITED STATES PATENT OFFICE

2,315,548

MACHINE FOR OPERATING UPON WORK

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Application January 2, 1941, Serial No. 372,749

41 Claims. (Cl. 144—278)

This invention relates to machines for operating upon work and more particularly to machines for operating upon lasts. The invention is herein illustrated as embodied in a machine of the same general type as that disclosed in Letters Patent of the United States No. 1,938,689 granted December 12, 1933, upon an application of I. C. Buckminster, although it will be understood that the invention in some aspects is not limited to machines of the particular type illustrated or to machines for operating upon lasts.

A machine of the type shown in the above-mentioned patent includes in its organization means for positioning a last and for clamping it in predetermined relation to means for operating upon the last comprising one or more, preferably three, drills for drilling three positioning holes in the bottom of the forepart of the last in predetermined relation to one another and to the edge of the last bottom, and three inserting tools for inserting three bushings in the holes drilled in the last to adapt the last for use in practicing the method disclosed in United States Letters Patent No. 1,674,060 granted June 19, 1928, upon an application of A. F. Pym, the positioning holes in the last being utilized with similar holes formed in an insole to position the work in a shoe machine. Such drilling machines are provided with gaging means, comprising devices arranged to engage the edge of the last bottom at the toe end and at opposite sides of the toe and to position the last in predetermined relation to the drills and inserting tools, and with a support or clamping member arranged by engagement with the top of the forepart of the last to clamp it in the position determined by the gaging means for the operation of the drills and the inserting tools. Power-operated means is provided for rotating the drills and for operating them and the inserting tools alternately to form the holes in the last and to insert the bushings, and such machines are usually provided with a hand lever which is movable by the operator to start the power-operation of the machine after the last has been clamped in the position determined by the gaging means. In the use of such machines it has been found that the operator sometimes fails to position the work in engagement with all of the gaging devices or, if the work is properly positioned in engagement with all of the gaging devices, the work may be accidentally moved out of engagement with one or more of these devices in the clamping operation. If this occurs, it will result in faulty work, since the

three positioning holes will not be formed in the last in the definitely predetermined relation to the edge of its bottom face required in carrying out the method disclosed in the above-mentioned Letters Patent No. 1,674,060.

In view of the above, it is an object of the present invention to provide in a machine of the above-mentioned type means enabling the operator to start the power operation of the machine only when the work has been clamped by the support in the position determined by all of the gaging devices, thus rendering the starting of the power operation of the machine dependent upon the work being in the correct position determined by the gaging devices both before and after the clamping operation. For the purpose in view, there is provided, in the construction herein shown, means for locking the usual starting lever of the machine against movement in the direction to start the power operation of the machine, means for operating the support, and means controlled by all the gaging devices and the means for operating the support for releasing the starting lever for movement in that direction. As herein shown, there is pivotally connected to the starting lever a latch arranged by engagement with an abutment to lock the starting lever against movement in the direction to start the machine. An electrical device, herein illustrated as a solenoid, is provided for moving the abutment out of engagement with the latch to release the starting lever. Connected in series in the energizing circuit for the solenoid are a plurality of contact devices associated one with each of the gaging devices and arranged to be closed in response to pressure of the last against the gaging devices. Connected in series with the contact devices associated with the gaging devices is a contact device arranged to be closed after the support has been moved into clamping position. Closure of the contact device associated with the support will act to close the energizing circuit of the solenoid only if the other contact devices remain closed in response to continued pressure of the last against them, thus insuring that the solenoid will be energized to operate the locking means to release the starting lever for movement in the direction to start the machine only when the last is clamped in the position determined by the gaging devices.

In accordance with a further feature, the invention provides novel means for supporting the clamping member positively in any position to which it has been moved to clamp work pieces of

different sizes in the position determined by the above-mentioned gaging devices. In the illustrated construction, after the clamping member has been moved into engagement with the work its pressure on the work is increased through the action of spring means which is arranged to be subjected to stress by the continued movement of another member in the direction to move the clamping member into operative position. For supporting the clamping member positively in work-clamping position, there is provided a block which is movable with the clamping member and has formed thereon a series of steps, a second block movable relatively to the first block into engagement with a shoulder separating two of the steps, and means for quickly moving the second block in the direction of movement of the first block into engagement with one of the steps. As herein shown, the second block is carried by a wedge which is released to the action of spring-operated means substantially at the time when the clamping member is moved into engagement with the work, the wedge moving relatively to the two blocks after the second block has been moved into engagement with a shoulder on the first block to effect a quick relative movement of approach between the two blocks, thus effectively locking the clamping member positively against movement in a direction away from the work. If the work is accidentally displaced out of engagement with one or more of the above-mentioned gaging devices in the clamping operation, it will be necessary for the operator to unlock the clamping member and to reposition the work, and for this purpose there is provided, in accordance with a further feature, means enabling the operator at will to operate the wedge to release the clamping member either manually or by power through the action of fluid-operated means. As herein illustrated, there is provided also automatic means for thus operating the wedge in the normal operation with the machine substantially at the end of its cycle.

The above and other features of the invention, including various novel details of construction and combinations of parts will now be more particularly described by reference to the accompanying drawings and pointed out in the claims.

In the drawings:

Fig. 1 is a view in front elevation of a machine in which the invention is embodied;

Fig. 2 is a view partly in right-hand side elevation and partly in section of the machine shown in Fig. 1;

Fig. 3 is a plan view on an enlarged scale of the mechanism for adjusting the gaging devices;

Fig. 4 is a view similar to Fig. 3, but with the cover plate for the gaging devices removed to show more clearly the construction thereof;

Fig. 5 is a section on the line V—V of Fig. 1;

Fig. 6 is a section on the line VI—VI of Fig. 4;

Fig. 7 is an enlarged section on the line VII—VII of Fig. 6;

Fig. 8 is a section on the line VIII—VIII of Fig. 3;

Fig. 9 is a diagram showing the circuit connection for the machine;

Fig. 10 is a view partly in front elevation and partly in section on an enlarged scale of a portion of the machine shown in Fig. 1, illustrating the mechanism for operating the last-clamping member and parts associated therewith;

Fig. 11 is a section on the line XI—XI of Fig. 10;

Fig. 12 is a detail view of a portion of the mechanism shown in Fig. 11;

Fig. 13 is a section on the line XIII—XIII of Fig. 10;

Fig. 14 is a section on the line XIV—XIV of Fig. 13;

Fig. 15 is a vertical sectional view of an air valve with which the machine is provided;

Fig. 16 is a view in rear elevation of a portion of the mechanism shown in Fig. 2, illustrating the means for controlling the starting lever of the machine with the parts in their initial positions;

Fig. 17 is a similar view but showing the parts in the positions they occupy when the machine is in operation;

Fig. 18 is a section on the line XVIII—XVIII of Fig. 2;

Fig. 19 is a section on the line XIX—XIX of Fig. 18;

Fig. 20 is a section on the line XX—XX of Fig. 18;

Fig. 21 is a section on the line XXI—XXI of Fig. 20;

Fig. 22 is a section on the line XXII—XXII of Fig. 20, showing some of the parts of the clutch-controlling mechanism in their initial starting positions;

Fig. 23 is a similar view but showing the parts in the positions they occupy after the clutch has been released;

Fig. 24 is a view partly in front elevation and partly in section of the mechanism for operating the drills and bushing-inserting tools;

Fig. 25 is a detail view of a portion of the driving connections;

Fig. 26 is a section on the line XXVI—XXVI of Fig. 24;

Fig. 27 is a view in front elevation of a portion of the mechanism shown in Fig. 26;

Fig. 28 is a section on the line XXVIII—XXVIII of Fig. 27;

Fig. 29 is a detail plan view of a portion of the top plate of the machine;

Fig. 30 is a section on the line XXX—XXX of Fig. 29;

Fig. 31 is a section on line XXXI—XXXI of Fig. 24;

Fig. 32 is a section on the line XXXII—XXXII of Fig. 31;

Fig. 33 is an enlarged vertical sectional view of a portion of the last-drilling means;

Fig. 34 is a section on the line XXXIV—XXXIV of Fig. 24;

Fig. 35 is a section on the line XXXV—XXXV of Fig. 34;

Fig. 36 is a section on the line XXXVI—XXXVI of Fig. 34;

Fig. 37 is a section on the line XXXVII—XXXVII of Fig. 34;

Fig. 38 is a section on the line XXXVIII—XXXVIII of Fig. 37;

Fig. 39 is a view in side elevation of the bushing cover;

Fig. 40 is a transverse section of a portion of a last with one of the bushings inserted therein;

Fig. 41 is a detail view of a portion of the mechanism for unlocking the last-clamping member with the parts in the positions they occupy substantially at the time when the clamping member is released; and

Fig. 42 is a similar view but showing the relative positions of some of the parts at a later time in the cycle.

The illustrated machine comprises a base 50 to the upper surface of which is secured by bolts 52 a yoke-shaped bracket 54 which supports mechanism for clamping a last L (Fig. 5) in the posi-

tion determined by gaging means, hereafter more particularly described, which acts to position the last in predetermined relation to means for drilling a plurality of parallel holes H (Fig. 4) to a predetermined depth in the bottom of the forepart of the last and for inserting bushings B in said holes, as illustrated in Fig. 40. The last-drilling means, comprising three drills 56 (Fig. 24), and the inserting means, comprising three inserting tools 58, are mounted in the base 50 below the last-positioning and clamping means; and automatic means, more particularly hereinafter referred to, is provided for operating the drills and the inserting tools alternately to drill the holes and to insert the bushings. The gaging means comprises a toe gage 60 (Figs. 4 and 5) for engaging the edge of the bottom face of the last at the toe end, a pair of gages 62, 64 for engaging the edge of the bottom face of the last at the opposite sides of the toe end, and a pair of gages 66, 68 for engaging the edge of the bottom face of the last at the opposite sides at a substantially greater distance from the toe gage 60 than the side gages 62, 64. The toe gage 60 is formed in two parts for purposes more particularly hereinafter explained and comprises a block 70 secured to the base 50 and provided with a roughened or corrugated face 72 (Fig. 3) that extends inwardly of the edge of the last bottom at the toe end and is inclined downwardly at a slight angle to the horizontal, and a second block or plunger 74 mounted for limited sliding movement on the block 70 and having its last-engaging face 76 inclined rearwardly of the machine at a slight angle to the substantially vertical toe end face of the last. The side gages 66 and 68 are also provided with inwardly and downwardly inclined corrugated faces 78 and with upwardly and outwardly inclined faces 80. The last-engaging faces 82 of the side gages 62, 64 are also inclined slightly relatively to the substantially vertical lateral face of the last, the construction being such that the toe and side gages act by engagement with the edge of the last bottom to locate it in a predetermined position longitudinally, laterally, and angularly relatively to the drills 56, the toe gage 60 and the side gages 66 and 68 also acting to support the last in predetermined heightwise relation to the drills with the edge of its bottom face in a horizontal plane. As more particularly hereinafter described, the side gages 62, 64, 66 and 68 of each pair are interconnected for simultaneous movement toward or from each other laterally of the last, and spring means is provided for urging them inwardly toward each other and holding them initially in predetermined positions, spaced apart slightly less than the width of the last to be operated upon. As shown particularly in Fig. 10, the side gages 66 and 68 slidably engage a plate 84 removably mounted at the top of the base 50. The plate 84 is located in proper relation on the base 50 by pins 83 and is clamped to the base by straps 85 (Figs. 4 and 24).

For clamping the last in the position determined by the above-mentioned gaging means, there is provided a toe rest 86 (Figs. 5 and 10) which is movable downwardly, by mechanism hereinafter described, from an elevated position into position to engage the top of the forepart of the last, and a member 88 also movable downwardly independently of the toe rest 86 into position to assist in supporting the last by engagement with the top face of the heel end of the last. The toe rest 86 herein shown is substantially

like that disclosed in Letters Patent No. 1,957,604, granted May 8, 1934, on an application of F. N. La Chapelle and accordingly is not shown in detail. Briefly, the toe rest 86 comprises a plurality of small metal rods 90 (Fig. 5) arranged in parallel and contiguous relation, covered by a cap of thin flexible leather and having their upper ends engaging a rubber pad (not shown) which permits them to move relatively to one another in response to pressure of the last thereon and thus to conform to the contour of the top of the forepart of the last, the pins being mounted in a block 92 slidably mounted for limited movement in directions lengthwise of the last in a holder 94, which is rotatably connected to the lower end of a hollow shaft 96 vertically movable in the bracket 54. The hollow shaft 96 is bored to receive a laterally extending pin 98, through which there is threaded a rod 100 having an upwardly extending, oppositely threaded portion 102 extending through a pin 104 which projects into slightly elongated slots 106 in the arms of a forked portion 108 of a lever 110 fulcrumed at 112 to the bracket 54. Fast to the upper end of the rod 100 is a hand wheel 114 for turning it, and adjustably clamped to the rod 100 within the hollow shaft 96 is a rectangular block 116 that acts to hold the rod 100 frictionally against turning movement. It will be evident that by turning the hand wheel 114 the position of the shaft 96 relatively to the lever 110 may be quickly adjusted to vary the heightwise position of the toe rest 86.

At its opposite end the lever 110 is bored to receive the shank portion 118 of a yoke 120, the arms of which straddle a sleeve 122 and are pivotally connected thereto by trunnions 124 (Fig. 10). A pin 126 in the lever 110, engaging a circumferential groove 128 in the shank 118, holds the parts in assembled relation while permitting the yoke 120 to turn relatively to the lever 110. The sleeve 122 is bored slidably to receive a bushing 130 that surrounds the upper end portion of a rod 132 between the hub of a lever 134, secured to the reduced upper end portion of the rod by a nut 136, and a disc 138 on the rod 132 (Fig. 13). At its lower end the rod 132 has a ball and socket connection 140 (Fig. 2) with the forwardly extending arm of a lever 142 pivoted at 144 to a bracket 146 which is secured by screws 148 to the base 50. The lever 142 has a rearwardly extending arm 150 which is connected by a link 152 to a second substantially vertical link 154, pivotally connected at 156 to a bracket 158 secured to the base 50. Also pivotally connected at 156 to the bracket 158 is a treadle 160 which is connected to the above-mentioned link 152 by means of a link 162. Provision is afforded for applying the toe rest to the last with different degrees of force through the use selectively of one or both of two springs 164, 166 of which the spring 166 is the heavier. The lower ends of both these springs are supported on a washer 168 (Fig. 10) which rests on a pin 170 that extends through the rod 132. At their upper ends the springs 164, 166 are in engagement respectively with rings 172, 174 which are vertically movable on the rod 132 independently of each other. The rings 172 and 174 are held by the springs 164 and 166 in engagement with the disc 138, which is provided with three equally spaced elongated slots 176 (Fig. 14) through which extend three equally spaced pins 178 carried by a ring 180 that surrounds the bushing 130 below the sleeve 122. At their lower ends

the pins 178 rest on the ring 174, and formed in the ring 172 are three equally spaced recesses 182, which are in alignment with the pins 178 when the ring 180 is in the position shown in Figs. 13 and 14. By turning the ring 180 the pins 178 may be moved out of alignment with the recesses 182 and into positions in which they will bear on both rings 172 and 174. It will be understood that depression of the treadle 160 will first cause the rod 132 and the parts supported thereon to move upwardly as a unit until the lever 110 has been swung about its pivot 112 far enough to move the toe rest downwardly into engagement with the top of the forepart of the last, after which as further upward movement is imparted to the rod 132 by continued depression of the treadle 160, further upward movement is imparted to the sleeve 122 to force the toe rest more firmly against the last, either through the spring 166 or both springs 164 and 166 selectively.

As the toe rest is thus forced firmly against the top of the forepart of the last through one or both of the springs 164, 166, the treadle 160 will preferably have been depressed far enough to swing the link 152 and the arm 150 on the lever 142 into substantially parallel relation and, in order to hold the last thus firmly clamped in the position determined by the above-mentioned gaging means, there is provided means for locking the lever 110 positively against reverse swinging movement. This means comprises a block 184 (Fig. 10) which is secured to the lever 110 and has its bottom face provided with a series of steps 186. Slidably mounted on a horizontal guideway 188 formed on the bracket 54 directly beneath the block 184 is a wedge 190 provided with an inclined guideway 192 for a second block 194 the upper face of which for a substantial portion of its length is substantially parallel to the horizontal guideway 188. Pivotal-ly connected to the wedge 190 is a short upwardly extending arm 196 carrying a pin 198 that extends inwardly and is held in engagement with the end face 200 of the block 194 by a spring 202 that extends between the arm 196 and a pin 204 in the wedge 190 (Figs. 10 and 11). A pin 206 projecting upwardly from the wedge 190 into an elongated slot 208 in the block 194 limits movement of the block relatively to the wedge 190 in one direction. The wedge 190 is connected by a link 210 to the upper end of one arm 212 of a bell crank lever 214 pivotally connected at 216 to the bracket 54. The bell crank lever 214 has a second arm, having a pin and slot connection 218 with one arm of a bell crank lever 220 pivoted at 222 to the bracket 54. The bell crank lever 220 has a second downwardly extending arm 224 between which and a plate 226 fastened to the base 50 there extends a spring 228 that tends to swing the bell crank lever 220 and, through the pin and slot connection 218, the bell crank lever 214 in the direction to move the wedge 190 to the left (Fig. 10). Initially the wedge 190 is held against the resistance of the spring 228 at the extreme right-hand end of the guideway 188 by means of a spring-operated latch 230, which is pivotally connected to the bracket 54. With the wedge 190 thus held by the latch 230, downward movement of the rod 132 to swing the lever 110 in the direction to raise the toe rest is limited by engagement of the block 194 with one of the steps 186 on the block 184. A spring 232 (Fig. 2), connected at one end to the base 50 and at the other end to a pin 234 projecting from an ad-

justable collar 236 secured to the rod 132, tends normally to impart downward movement to the rod 132 and to hold the block 184 in engagement with the block 194. The latch 230 has a lateral-ly extending arm 238 carrying a shouldered screw 240, the body portion of which extends through an elongated slot 242 formed in a link 244 which is pivotally connected at its upper end to an arm 246 of the lever 134. It will be understood that as the rod 132 is raised by depression of the treadle 160, the link 244 moves upwardly with the rod. Threaded in the lower end of the link 244 is an adjustable screw 248, arranged by engagement with the screw 240 to swing the latch 230 in the direction to release the wedge 190 to the action of the spring 228 as the link 244 is thus moved upwardly. The wedge 190 is thus released substantially at the time in the upward movement of the rod 132 when the toe rest 86 is moved into engagement with the top of the forepart of the last. Accordingly, as the wedge is moved to the left (Fig. 10), the block 194 moves with it until its end face 250 engages one of the substantially vertical faces or shoulders on the block 184 separating two of the steps 186, continued movement of the wedge 190 to the left then acting to raise the block 194 until it engages one of the steps 186 on the block 184. It will be understood that in operating upon lasts of different sizes, the position of the lever 110 will vary in accordance with variations in thickness of the foreparts of such lasts. By providing the block 184 with a plurality of steps 186, a wedge 190 having a slight inclination may be used, thereby rendering the parts self-locking while affording sufficient amplitude of movement to cause the block 194 to engage one of the steps 186 in any position into which the lever 110 may be moved in operating upon lasts of different sizes.

The above-mentioned member 88, for engaging the top of the heel end of the last, is carried by an upwardly extending rod 252 (Fig. 5) that is vertically movable in bearings formed in a bracket 254 secured to the bracket 54. The rod 252 is held against turning movement in the bracket by means of a tongue 256 that slidably engages a groove 258 in the bracket 254, and surrounding the rod 252, between the bracket and the head 260 of the rod, is a spring 262 which tends normally to uphold the rod with a shoulder 264 thereon in engagement with a portion of the bracket 254 and with the member 88 in an elevated position. The member 88 is in the form of an inverted T, the crossbar of the T being rounded and of sufficient length to engage the top face of the heel end of the last for substantially its entire width. The member 88 is connected to the rod 252 for adjustment about an axis extending laterally of the last to vary the position of its last-engaging end relatively to the toe rest 86, as may be necessary in operating upon lasts of different lengths. As shown, the lower end portion 266 of the rod 252 is forked to straddle the member 88, the arms of the forked portion 266 being provided with elongated slots 268 through which extends a pin 270 carried by the arms of a yoke 272 that straddles the forked lower end 266 of the rod 252. The yoke 272 is pivoted to a projection 274 on the forked end 266 of the rod and seated in a recess in the projection 274 is a spring 276 that bears at its upper end against a laterally extending rib on the yoke 272. The spring 276 upholds the yoke 272 and the member 88, with segmental teeth 278 on the

member 88 in engagement with a toothed block 280 secured to the rod 252. The construction is such that by pulling down on the member 88, against the resistance of the spring 276, the member 88 may be disengaged from the toothed block 280 and swung relatively to the rod 252 to vary the position of its last engaging end lengthwise of the last, after which it may be released to the action of the spring 276 for engagement with the toothed block 280 which locks it in adjusted position. Formed on the rod 252 are upwardly facing ratchet teeth 282, and pivotally connected to the bracket 254 is a pawl 284, urged by a spring 286 in a direction to hold it in engagement with one of the ratchet teeth 282 and thus to lock the member 88 in engagement with the heel end of the last. It will be understood that the member 88 is moved into engagement with the heel end of the last by depression of the rod 252, which is effected by the operator, preferably after the toe rest 86 has been moved into position to clamp the toe end of the last. For unlocking the member 88 at the end of the last drilling and bushing inserting operations, there is fast to the shaft 112 an arm 288 carrying an adjustable screw 290, which is arranged to engage a tail portion 292 on the pawl 284 as the lever 110 is swung in the direction to elevate the toe rest and to swing the pawl out of engagement with the ratchet teeth 282, thus releasing the rod 252 to the action of the spring 262 for upward movement.

In the illustrated construction, the side gages 66 and 68 are carried by pivoted arms 294 and 296 that are geared together for simultaneous movement toward or from each other, the arm 294 being keyed to a vertical shaft 298 supported partly in the base 50 and partly in a cover plate 300, which is secured to the base by screws 302 (Figs. 3 and 4). The arm 296 is loosely mounted on a shaft 304, similarly supported partly in the base 50 and partly in the cover plate 300. The portion of the shaft 304 that extends through the hub of the arm 296 is eccentric to the upper and lower end portions of the shaft, and keyed to the upper end portion of the shaft and resting on the top face of the cover plate 300 is a collar 306, provided with an arcuate slot 308 through which extends a cap screw 310 threaded into the cover plate and arranged to hold the collar 306 on the shaft 304 against turning movement. The slot 308 is concentric with the axis of the upper and lower end portions of the shaft 304, and by loosening the screw 310 it will be evident that the collar and the shaft 304 may be turned to vary the spaced-apart positions of the arms 294, 296 to insure the proper meshing of their inwardly extending toothed portions 312, 314. Each arm 294, 296 has a laterally extending projection 316 provided at its outer end with a boss 318 engaging a finished surface 320 on the base 50 (Fig. 8). The shaft 298 projects above the cover plate 300 and has keyed to its upper end a finger 322 which is arranged to be engaged by one arm of a lever 324 pivotally connected to the cover plate 300 and provided with a second arm to which there is pivotally connected a forwardly extending rod 328. The rod 328 extends through a block 330, swivelled in a small bracket 332 secured to the base 50 by screws 334, and threaded on the outer end of the rod 328 is a hand wheel 336. Extending between the projections 316 of the arms 294, 296 and pins 338 in the base 50 are springs 340 that tend to swing the arms toward each other, the movement of

the arms toward each other being limited by engagement of the finger 322 on the shaft 298 with the arm of the lever 324. By turning the hand wheel 336 it will be evident that the finger 322 on the shaft 298 may be rotated to vary the spaced-apart positions of the side gages 66, 68, as may be necessary in operating upon lasts of different widths. The side gages 62 and 64 are similarly mounted, being carried by arms 342, 344 (Fig. 4) geared together for simultaneous movement toward or from each other and mounted on parallel vertical shafts 346, 348. Shaft 346 has an eccentric portion, on which the arm 342 is mounted, and has keyed to its upper end a collar 349 similar to the collar 306 of the shaft 304. Each arm 342, 344 has a lateral projection 350 provided at its outer end with a boss 352 resting on the finished surface 320 of the base 50, and extending between the projections 350 and pins 354 in the base are springs 356. Pinned to the upper end of the shaft 348 is a finger 358 engaged by the end of a rod 360 which is pivotally connected to one arm of a lever 362 pivotally connected to the cover plate 300. The rod 360 is guided for movements toward and from the finger 358 by means of a block 364 swivelled in the cover plate 300. The lever 362 has a second arm to which there is pivotally connected a forwardly extending rod 366 that extends through a block 368 swivelled in the bracket 322, and threaded on the outer end of the rod 366 is a hand wheel 370. It will be evident that by turning the hand wheel 370 the spaced-apart positions of the side gages 62, 64 may be varied in operating upon lasts of different widths. As shown particularly in Figs. 4 and 6, the hub portion of the arm 294 is formed in two parts, one part being keyed to the shaft 298 and carrying screws 372 engaging the other part of the hub, which is loosely mounted on the shaft, this construction affording a finer adjustment of the gages 66 and 68, to insure that they will be spaced apart equal distances from a "center line" passing through one of the drills 56, when in operative relation to the last, and through the toe gage 60. The hub of the arm 344 carrying the side gage 64 is similarly constructed.

In the illustrated machine, means is provided for locking the arms 294, 296, 342 and 344 against outward movement in response to the swinging movement of the lever 110 in the direction to move the toe rest 86 into engagement with the top of the forepart of the last. This means comprises an arm 374 (Fig. 2), which is keyed to the shaft 112 and is forked to straddle a vertical rod 376 (Fig. 5) which is supported by brackets 378 secured to the bracket 54 and is held against endwise movement in the brackets 378 by means of a set screw 380. Slidably mounted on the rod 376 is a flanged sleeve 382 connected by links 384 to the forked end of the arm 374. A flange 386 of the sleeve 382 is bored to receive four rods 388 that are pivotally connected at their lower ends to levers 390 which are pivotally connected to the above-mentioned cover plate 300 (Fig. 8). Threaded on the upper end of each rod 388 are nuts and lock nuts 392 and surrounding each rod between the flange 386 and a shoulder 394 on the rod is a spring 396. Each lever 390 (Fig. 8) has formed thereon a cam surface 398 which engages the head of a pin 400 vertically movable in the cover plate 300 and engaging at its lower end one of the above-mentioned bosses 318, 352. The construction is such that as the lever 110 is swung in the direc-

tion to impart downward movement to the toe rest 36, the arm 374 is swung in the direction to move the sleeve 382 downwardly on the rod 376. As the sleeve 382 is thus moved, it acts to compress the springs 390 and to impart swinging movements to the levers 390 in directions to cause the cam surfaces 393 to force the pins 400 hard against the bosses 313, 352, which rest on the finished surfaces 328 of the base 53. The arms 294, 296 and 342, 344 are thus held against relative swinging movement to assist in preventing displacement of the side gages 62, 64, 66 and 68 as the last is clamped by the toe rest 36 in the position determined by the gages.

The mounting of the three drills 56 and the three bushing inserting tools 58 and the mechanism for operating these two sets of tools will now be described. The drills 56 are rotated rapidly by constantly driven spindles 402, 404 and 406 to bore the three parallel holes H (Figs. 4 and 33) extending from the bottom face of the last at a predetermined angle, i. e., substantially a right angle to the general plane of the bottom of the forepart of the last, after which three bushings B are forced to the bottoms of the holes by the inserting tools 58. Preferably the bushings are of slightly larger diameter than the bored holes so that they will be retained by friction in the last after they have been forced into the last. Surrounding the upper end portion of each spindle 402, 404 and 406 is a sleeve 436, bored to provide a drive fit for a nonrotatable bushing 410 through which the drill 56 extends, the bushing 410 being seated against a shoulder on the sleeve 436 (Fig. 33). Each spindle is provided with a central bore to receive its associated drill 56, which rests on the head of an adjustable screw 412 in the spindle and is secured to the spindle by a set screw 414. It will be evident that by adjustment of the screws 412 the distance which the drills 56 project above the upper ends of the nonrotatable bushings 410 may be varied to vary the distance to which the holes H are drilled in the last L. Each spindle has formed thereon a circular flange 416 between which and a flange 418 which is formed on a second bushing 420 slidably engaging the spindle below the sleeve 436 and secured to the sleeve by screws 422 there is a thrust washer 424. The sleeves 436 are fitted to slide in holes 426 bored in a plate 423, which is secured by screws 439 to a vertically movable slide or drill head 432 (Fig. 24). The drill head has a ribbed portion 434 provided with three holes 436 in axial alignment with the holes 426 formed in the plate 423. The holes 436 are large enough to receive bushings 438, and the rib 434 on its upper face is counterbored to receive the heads of upwardly extending bushings 440 in which the spindles 402, 404 and 406 are fitted to slide. Surrounding the bushings 420 and 440 between the flanges 418 and the heads 441 of the bushings 440 are springs 442. The spindles 402, 404 and 406 extend at their lower ends into bearings 444 formed in a plate 445 secured to the drill head 432, the bearings 444 being formed in the plate in axial alignment with the holes 436 and 426. Between the bottom plate 445 and the rib 434 there are keyed to the spindles 402, 404 and 406, respectively, pinions 446, 448 and 450 for rotating them (Fig. 31). The pinions 446 and 450 are rotated in the same direction by a gear 452, the pinion 450 acting through an idler 454 to rotate the pinion 448 in the same direction.

The drill head 432 is vertically movable on a

carrier 456 and is guided for such movement by means of a guideway 458 on the carrier and a rod 460, which is secured to the drill head by means of a set screw 462 and the upper and lower end portions of which extend into and slidably engage aligned bores 464 in the carrier (Fig. 26). The above-mentioned gear 452 is keyed to a constantly driven shaft 466, the keys slidably engaging keyways in the gear to permit the gear to move lengthwise of the shaft in the upward movement of the drill head 432. The shaft 466 is supported at its upper end by a bearing in the drill head 432 and at its lower end by a bearing in a bracket 468, which is secured by screws 470 to the carrier 456. Pinned to the shaft 466 is a spiral gear 472 (Figs. 24 and 26) that meshes with a similar spiral gear 474 fast on a horizontal shaft 476, splined within a sleeve 478 (Fig. 25), which is held against endwise movement and to which is keyed a pulley 480 connected by a belt 482 to a pulley 484 driven by an electric motor 486 secured to the top of the base 50.

The inserting tools 58 are provided with reduced upper end portions arranged to extend into the bushings B and with shoulders 487 on which rest the heads of the bushings (Fig. 40). The tools are carried by three parallel shafts 488 each of which is provided with a central recess to receive its associated tool 58 which is secured to the shaft by means of a set screw 489. Surrounding the shafts 488 at their upper ends are sleeves 492 which are secured to the shafts by set screws 494 (Fig. 24), the sleeves being fitted to slide in three holes 496 bored in a rib portion 498 of the tool head or slide 500 which is vertically movable on a guideway 502 formed on the carrier 456. The sleeves 492 are provided with heads 504 yieldingly held in engagement with the bottom finished face of the rib 498 by springs 506 that surround the shafts 488 and bear at their lower ends against washers 508 seated within a recess in a bottom plate 510 secured to the slide 500, the plate 510 having formed therein bearings for the lower end portions of the shafts 488 in alignment with the holes 496.

The mechanism for imparting upward movement to the drills 56 and the drill head 432 comprises a cam lever 512 (Figs. 24 and 26) loosely mounted on a laterally extending shaft 514 supported by depending ears 516 on the carrier 456. The lever 512 has a forwardly extending arm to which there is pivotally connected an upwardly extending adjustable link 518, which is pivotally connected at its upper end to depending ears 520 on the bottom plate 445 of the drill head 432. The lever 512 has a rearwardly extending arm 522 carrying a cam roll 524 arranged to extend into a cam path 526 formed in the side face of a cam wheel 528 which is fast on a laterally extending shaft 530 supported by suitable bearings in the base 50. The shape of the cam path 526 is such that at a predetermined time in the operation of the machine, as more particularly hereinafter described, the lever 512 is swung about its supporting shaft 514 in the direction to impart upward movement to the drill head 432 to cause the drills 56 to drill the three parallel holes H in the bottom of the forepart of the last. As the drill head 432 is moved upwardly, the sleeves 408 slidably engage three bored holes 532 formed in the plate 54 in alignment with the holes 426 in the plate 423 of the drill head, the drills 56 being thus

supported close to the bottom face of the last during the drilling operation. It will be evident that as each non-rotatable bushing 410 engages the bottom face of the last L its associated spring 442 will yield in the continued upward movement of the drill head 432, so that the depths to which the holes H are drilled in the last will depend upon how far the drills project above the upper face of their respective bushings 410. By setting the drills 56 so that they extend the same distance above their respective bushings 410, three holes H of exactly the same depth will be drilled in the last regardless of the curvature of its bottom face.

Also fast on the shaft 530 is a cam wheel 534 (Figs. 18 and 34) having formed in one side a cam path 536 into which extends a cam roll 538 (Fig. 18) carried by the rearwardly extending arm of a lever 540 loosely mounted on the shaft 514 (Fig. 34). The lever 540 has a forwardly extending arm connected by an adjustable link 542 to depending ears 544 on the bottom plate 510 of the slide 500. The shape of the cam 536 is such that, substantially at the time when the drill head 432 is moved upwardly to operate the drills 56 to drill the three holes H in the last, the lever 540 is swung in the direction to impart upward movement to the slide 500 to cause the tools 58 to enter three bushings B located in axial alinement with the tools 53 at the delivery ends of three raceways 546. To assist in guiding and supporting the tools 58 as they are thus moved upwardly, the plate 84 has formed therein three bored holes 548 to receive the sleeves 492, the holes 548 being in axial alinement with the three holes 496 in the rib 498 of the slide 500. As more particularly hereinafter described, as the slide 500 completes its upward movement to insert the tools 58 into the three bushings B, the three raceways 546 are swung laterally of the tools 58 to release the three bushings, after which, as the lever 540 is swung by the cam 536 in the direction to lower the slide 500 and the tools 58, the raceways 546 are swung reversely to their initial positions.

In order to insure that the chips caused by the drilling of the last will be removed from the holes H before the bushings B are inserted into the holes, the plate 84, as shown particularly in Figs. 29 and 30, is provided with a plurality of passages 550 for directing a blast of compressed air at each drill 56 during the drilling operation, the passages being connected by a pipe 552 to a valve casing 554 in which there is a valve (not shown) of known type, normally held closed, preferably by means of a spring, and provided with a stem 556 (Figs. 27 and 28) by means of which it may be opened to admit compressed air to the pipe 552 from any convenient source of supply to which the valve casing 554 is connected by means of a pipe 553. For opening the air valve at the proper time in the cycle, there is provided a plunger 560 for engaging the stem 556 of the valve, the plunger being lifted through a spring 562 by means of a lever 564 (Fig. 26) pivotally connected at 566 to a bracket 568 secured to the frame 50. The lever 564 has a laterally extending arm 570 that lies in the path of movement of the arm 522 of the cam lever 512. As the cam lever 512 is swung in the direction to raise the drill head 432 to operate the drills 56, the cam lever 512 engages and swings the lever 564 in the direction to lift the plunger 560 through the spring 562 to open the air valve. It will be understood that the air valve is closed

in the reverse swinging movement of the cam lever 512 when the arm 522 moves out of engagement with the arm 570, the spring 562 then acting to move the plunger 560 downwardly out of engagement with the valve stem 556.

In the illustrated machine, the carrier 456 is mounted for movement in directions laterally of the last on ways 572 formed on a plate 574 supported by the base 50, and automatic means is provided for moving the carrier transversely to bring the tools 58 into operating position beneath the forepart of the last after it has been clamped in the position determined by the gagging means and the drills 56 have been operated to drill the three holes H in the bottom of the forepart of the last. During the drilling operation the carrier 456 is locked against movement laterally of the last, with the drills 56 located in predetermined relation to the last, by means of a pin 576 (Figs. 31 and 32) that is inserted automatically into a bored hole 578 in the cross-plate 574 in response to the upward movement of the drill head 432. As shown particularly in Figs. 31 and 32, the pin 576 is connected by a short link 580 to one arm of a lever 582 fulcrumed at 584 to the carrier 456 and provided with a second arm carrying a roll 586 that extends into a slot 588 formed by two plates 590 secured to the drill head 432. As the drill head is moved upwardly to operate the drills 56, the lever 582 is swung in the direction to insert the pin 576 into the hole 578 in the plate 574, thus locking the carrier against movement with the sleeves 492 in axial alinement with the holes 532 in the plate 84. As the drill head 432 is lowered to return the drills 56 to their initial starting positions, the carrier is unlocked as the pin 576 is withdrawn from the hole 578 in the reverse swinging movement of the lever 582.

Mounted on the cam shaft 530 is a cam wheel 592 having formed thereon a peripheral cam path 594 into which extends a cam roll 596 carried by one arm 600 of a lever 600 fulcrumed at 602 to a small bracket 604 secured to the frame 50 by screws 606 (Fig. 24). The lever 600 has a second upwardly extending arm 608, forked at its upper end to straddle a block 610 carrying a pin 612 that extends through slots 614 in the arms of the forked upper portion of the arm 608 and into openings in the arms of a yoke 616 that straddles the forked upper end of the arm 608, the pin 612 serving pivotally to connect the yoke 616 to the arm 608. Extending through the pin 612 is a screw 618, having an oppositely threaded portion 620 extending into the arm 608. Threaded into the yoke 616 is a link 622 pivotally connected to the carrier 456. The shape of the cam path 594 is such that, substantially at the time when the drill head 432 is returned to its lowermost position on the carrier 456 after the completion of the last-drilling operation and with the locking pin 576 withdrawn from engagement with the plate 574 in the hole 578, the carrier is moved to the left (Fig. 24) to position the tools 58 in proper relation to the last L for the bushing-inserting operation. It will be evident that by turning the screw 618 the effective length of the arm 608 may be varied to vary the extent of movement imparted to the carrier 456 to position the tools 58 in proper widthwise relation to the last L with their sleeves 492 in axial alinement with the holes 532 in the plate 84, adjustable screws 624 in the carrier 456 preferably engaging a finished stop surface 626 on the plate 574 as the tools 58 are

thus moved into axial alinement with the holes H bored in the last by the drills 56.

The illustrated machine, like the machine of the prior Letters Patent No. 1,938,689, is provided with a single cam wheel 528, having formed therein two cam paths for imparting operative movement alternately to the drill head 432 to operate the drills 56 and to the slide 500 to operate the inserting tools 58. For the latter purpose, the cam wheel 528 has formed in its side face a cam path 628 (Fig. 18), arranged to be engaged by a cam roll 630 carried by the cam lever 540 as the carrier 456 completes its movement to the left (Fig. 24) to move the tools 58 into axial alinement with the holes H bored in the last L. It will be understood that as the carrier 456 is thus moved the cam rolls 524 and 538 are moved out of engagement respectively with the cam paths 526 and 536 formed in the cam wheels 528 and 534, and that as the carrier 456 is moved reversely to the right (Fig. 24) to return the parts to their initial starting positions, the cam rolls 524 and 538 are again moved into engagement with the cam paths 526 and 536. With the tools 58 located in axial alinement with the bored holes H in the last L, the cam lever 540 is swung by the cam 628 to elevate the slide 500 to cause the tools 58 to force the bushings B on the tools 58 into the holes H in the last, each spring 536 yielding in the upward movement of the slide 500 when the head of the bushing B carried by its associated tool 58 engages the bottom face of the last. After the three bushings B have been fully inserted into the holes H in the last, the lever 540 is swung reversely by the cam 628 to return the slide 500 to its lowermost position on the carrier 456, after which the carrier is returned to its initial starting position on the plate 574 by the action of the cam 592 and the lever 600 (Fig. 24).

In order to hold the levers 512 and 540 positively against swinging movement during the reciprocatory movements of the carrier 456, the levers 512, 540 have secured thereto respectively plates 632 and 632'. As each reciprocatory movement is imparted to the carrier 456 the plates 632 and 632' engage blocks 634 and 634' in slots 636 and 636' formed respectively in the blocks. The length of the block 634' associated with the lever 540 is such that the plate 632' carried by the lever 540 enters the slot 636' in that block before the cam roll 538 is moved out of engagement with the cam path 536 or the cam roll 630 is moved out of engagement with the cam path 628, the plate 632' moving out of engagement with the slot 636' after the cam roll 538 is moved into engagement with the cam path 536 or the cam roll 630 is moved into engagement with the cam path 628. The block 634 associated with the cam lever 512 is of such length that, before the cam roll 524 is moved out of engagement with the cam 526 in the movement of the carrier 456 to the left (Fig. 24), the plate 632 carried by the lever 512 engages that block 634 in the slot 636 and remains in engagement with the block until the cam roll 524 is again moved into engagement with the cam 526 in the reverse movement of the carrier 456 to the right to return the parts to their initial starting positions.

The cam shaft 530 makes two complete rotations during each cycle of the machine and is driven through gearing including a train of reduction gears, indicated by the reference numeral 638 (Fig. 18), from a shaft 640 on which is loosely mounted a pulley 642 connected by a belt 644 to

a pulley 646 driven by the electric motor 486. The pulley 642 has an internal friction clutch face 648 arranged to cooperate with a clutch member 650 slidably mounted for lengthwise movement on the shaft 640 and which is arranged to engage a stationary brake surface 652 when it is not in engagement with the clutch face 648. The clutch member 650 is connected to the gearing 638 by means of a positive pin clutch 654, and surrounding the shaft 640, between a shoulder 656 on the shaft and a shoulder 658 on the clutch member 650, is a spring 660 which tends to move the clutch member 650 into engagement with the clutch face 648 on the pulley 642. The hub of the clutch member 650 is provided with an annular groove 662 into which extends blocks 664 (Fig. 19) carried by a yoke 666 pivotally connected to the base 50 by short axially aligned shafts 668, on one of which is fast a downwardly extending arm 670 to the lower end of which is pivotally connected an adjustable rod 672 that extends laterally of the machine (Fig. 18). The rod 672 has formed thereon a shoulder 674 which, when the parts are in the positions shown in Fig. 18, is held by a spring 676 in engagement with a pin 678 and thus maintains the arm 670 in position to disengage the clutch member 650 from the clutch face 648 and to hold it in engagement with the brake surface 652. The pin 678 is carried by a downwardly extending arm 680, the lower end of which is forked to straddle the rod 672, the arm 680 being pivotally connected at 682 to the base 50. The arm 680 is connected by links 684 to an arm 686 fast on a shaft 688 journaled in the base 50. Fast to the shaft 688 is a second arm 690 (Figs. 18 and 20) connected by means of a universal joint to a link 692. At its upper end the link 692 has a universal joint connection with one arm 694 of a lever 696, which is fulcrumed at 698 to the base 50 and has a second upwardly extending arm 700 carrying a cam roll 702, a spring 704 (Fig. 18), extending between the arm 694 and a pin 706 projecting from the frame 50, tends to swing the lever 696 in the direction to hold the roll 702 in engagement with the edge face of a wedge-shaped plate 708 carried by the cam wheel 592.

Engaging the right-hand end of the rod 672 is a pin 710 carried by an arm 712 fast to a forwardly and rearwardly extending shaft 714 supported by bearings in the base 50. Fast to the shaft 714 is a second arm 716, to which is pivotally connected an upwardly extending adjustable rod 718 pivotally connected at its upper end to a lateral projection 720 on a hand lever 722 fulcrumed at 724 to the base 50 (Fig. 1). The arm 712 is provided with oppositely projecting arms 726 (Figs. 22 and 23) carrying adjustable screws 728 and 729 arranged by engagement with the base 50 to limit swinging movement of the arm 712 in opposite directions. The pin 710 is mounted in the arm 712 for limited sliding movement and is held initially in its outermost position by means of a spring 730. A spring 732, connected at one end to an adjustable collar 734 secured to the rod 718 and at its opposite end to the base 50, tends to swing the arms 712 and 716 in the direction to hold the adjustable screw 728 in engagement with the base 50 with the pin 710 in engagement with the rod 672. From the above description it will be evident that by movement of the hand lever 722 to the left (Fig. 1) the arm 712 may be swung in the direction to cause the pin 710 to lift the rod 672 out of engagement

with the pin 678 carried by the arm 680, thus releasing the clutch member 650 to the action of the spring 660 for engagement with the clutch face 648 on the pulley 642 to start the power operation of the machine.

In the illustrated construction the cam wheel 592 is loosely mounted on the cam shaft 530 and is connected thereto by means of a gear 736 (Figs. 20 and 21) pinned to the shaft 530, pinions 738 rotatably mounted on short shafts 740 supported by the base 50 and meshing with the gear 736 and with internal gear teeth 742 on the cam wheel 592, the arrangement being such that the cam wheel 592 receives one complete movement of rotation in each cycle while the cam shaft is rotated twice. In the power-operation of the machine, as the plate 708 (Fig. 20) is moved out engagement with the cam roll 702, the spring 704 swings the lever 696 in the direction to hold the roll 702 in engagement with the concentric peripheral face of the cam wheel 592. As the cam lever 696 is thus swung, the arm 680 through the above-described connections receives a swinging movement in a clockwise direction (Fig. 18) to carry the pin 678 into position to be engaged by the shoulder 674 on the rod 672, the spring 676 swinging the rod 672 in the direction to effect such engagement of the pin and the shoulder. It will be evident that the extent to which the hand lever 722 may be swung to the left (Fig. 1), to operate the arm 710 to lift the rod 672 and thus to start the machine in operation, is limited by engagement of the adjustable screw 729 with the base 50. At the end of the cycle of operations, the plate 708 again engages the roll 702 of the lever 696 and swings that lever in the direction to impart counterclockwise swinging movement to the arm 680 (Fig. 18), thus causing the arm to move the rod 672 in the direction to disengage the clutch member 650 and the clutch face 648 and to move the member 650 into engagement with the brake surface 652 to stop the power operation of the machine, the spring 732 acting, when permitted to do so by means hereinafter described, to swing the arms 716 and 712 reversely until the adjustable screw 728 engages the base 50, thus resetting the hand lever 722.

The illustrated machine is further provided with means for locking the starting lever 722 against movement in the direction to start the power operation of the machine and for releasing it for movement in that direction only when the last is presented in the position determined by the above-mentioned toe and side gages and is clamped in that position by the toe rest 86. As shown particularly in Figs. 2, 16 and 17, there is fast on the shaft 724 an upwardly extending arm 744 to which there is pivotally connected a latch 746, the free end of which is notched for engagement with a projection 743 on a link 750 that is pivotally connected at its lower end to a plunger forming an armature 752 of a solenoid 754 mounted on the base 50. A spring 756, extending between the latch 746 and the hub of the lever 744, tends to swing the latch in a direction to hold it in engagement with the projection 743. The link 750 is guided for vertical movement by means of a pin 757 that projects from the base 50 and extends into an elongated slot 758 in the link. Between the outer end of the pin 757 and a pin 760 in the link 750 is a spring 762 that tends to uphold the link and the armature 752. Also projecting from the base 50 is a pin 764 that extends into a recess 766 in the latch 746. It will be evident

that, with the parts in the positions shown in Fig. 16, movement of the hand lever 722 in a clockwise direction to cause the starting of the power operation of the machine is prevented by engagement of the latch 746 with the projection 743 on the link 750. When the solenoid 754 is energized, the plunger 752 and the link 750 are moved downwardly, thus unlocking the lever 722 and releasing it for swinging movement in a clockwise direction, a shoulder 768 on the armature acting by engagement with a portion of the solenoid casing to limit downward movement of the plunger 752. As the lever 722 is swung in a clockwise direction by the operator (Fig. 16), the latch 746 is moved relatively to the pin 764 until it is released to the action of the spring 756 for downward swinging movement into engagement again with the projection 743 on the link 750, the pin 764 then engaging a shoulder 769 on the latch 746 to lock the starting lever 722 against reverse swinging movement toward its initial starting position (Fig. 17). When the solenoid 754 is de-energized, the armature 752 and the link 750 are moved upwardly by the spring 762, the latch 746 also being swung reversely against the resistance of the spring 756 until the latch engages the pin 764. As the hand lever 722, after being thus unlocked, is returned to its initial starting position by the action of the spring 732 on the adjustable rod 718, the plunger 752, link 750 and latch 746 are returned to their uppermost positions, with the pin 764 again extending into the recess 766 in the latch 746 and with the notched end portion of the latch in engagement with the projection 743 on the link 750, thus locking the hand lever 722 as it is reset against movement in the direction to start the power operation of the machine.

Conductors 780 (Fig. 9) join the winding of the solenoid with one side of a source of supply of current 782 and with one of the contacts 784 of a relay switch 786. The coil 788 of the relay switch is connected to one side of the current source 782 and to the other side of the current source in series through a switch 790, which is connected in series with a plurality of switches 792, conveniently a light 794 being provided in the circuit between the current source and the series switches 792. The closing of the switches 792 is controlled by the above-mentioned toe and side gages and the closing of the switch 790 is controlled by the movement of the toe rest 86 into position to clamp the last L in the position determined by the toe and side gages, the construction being such that when all of the switches 792 are closed the circuit through the light 794 is closed and when the switch 790 is closed the coil 788 is energized, thus closing the relay switch 786 and causing immediate energization of the solenoid 754. Energization of the solenoid 754 will cause the armature 752 and the link 750 to be moved downwardly, thus unlocking the hand lever 722 and releasing it for movement in the direction to start the power operation of the machine. The switches 792 (Fig. 4), herein illustrated as five in number, are associated one with each of the above mentioned toe and side gages and are preferably of the snap type, each switch being provided with a plunger 796 the inner end of which engages a resilient contact arm 798 which is swung in a direction to close the switch in response to a slight movement of depression of the plunger 796 (Fig. 4). These switches are not herein shown in detail since they are substantially like that fully shown in Letters Patent of the

United States No. 1,960,020, granted May 22, 1934, on application of P. K. McGall.

As previously pointed out, the toe gage 60 is formed in two parts, comprising a fixed block 70 and a second block or plunger 74 slidably mounted on the block 70. Carried by the sliding block 74 is an adjustable screw 200, which is held in adjusted position by means of a lock nut 802 (Fig. 5). The screw 200 is arranged to engage the plunger 796 of the switch 792 associated with the toe gage, the switch 792 being secured to a small bracket 864 which is fastened to the base 50 by screws 806. The block 74 has formed thereon a collar 998 which is normally held in engagement with the end face 818 of the block 70 by the action of the resilient contact arm 793 of the switch on the plunger 796 (Fig. 5). The block 74 has also formed thereon a shoulder 812 which is arranged to engage a shoulder 814 on the block 70 to limit rearward movement of the block 74, the construction being such that the shoulder 812 engages the shoulder 814 when such slight rearward movement is imparted to the block 74 by pressure of the last against it as is necessary to cause the screw 800 to move the plunger 796 far enough to close the switch 792.

As above described, the side gages 62 and 64 are carried respectively by arms 342 and 344 and the side gages 63 and 65 are carried respectively by arms 234 and 236. Except that the arms 234, 236 and 342, 344 of each pair are of different lengths they are identical in construction, and accordingly a description of one arm will be sufficient for all. Each arm (Figs. 4 and 6) is formed in two halves pivotally connected together by means of a shouldered screw 816. The forward portion 818 of each arm has a rearwardly extending finger 820 (Fig. 7) which is arranged by engagement either with a pin 822 in the rear portion of the arm or a finished surface 824 on the rear portion, to limit relative swinging movement of the two halves of the arm.

The rear portion of each arm 234, 236, 342 and 344 has secured to it by screws 826 one of the above-mentioned switches 792. Adjustable about the axis of each shouldered screw 816 by means of a screw 828 is a plate 830 which is held in adjusted position relatively to the forward portion 818 of the arm by means of a screw 832 which is threaded into the forward portion 818 and extends through a slightly elongated slot in the plate 830. Formed integral with each plate 830 is a rearwardly extending finger 834 which is arranged to engage the plunger 796 of its associated switch 792. The resilient contact arm 793 of each switch 792 acts normally to urge its associated plunger 796 outwardly and to hold the forward portion 818 of each arm with its finger 820 in engagement with the pin 822 in the rear portion of the arm. The pin 822 (Fig. 7) is located in such spaced relation to the finished surface 824 on the rear portion of the arm as to permit only such slight movement of the forward portion 818 of the arm relatively to the rear portion as is necessary to cause the finger 834 of the plate 830 to depress the plunger 796 far enough to close the switch 792 on the arm. It will be understood that by means of the adjustable screw 828 the position of the finger 834 relatively to the finger 820 may be adjusted to cause the plunger 796 to be moved far enough to close the switch 792, when the forward portion 818 of the arm and the side gage carried thereby have been moved relatively to the rear portion of the arm far enough to cause the finger 820 to engage the finished surface 824.

For holding the screw 828 in adjusted position, there is provided a lock nut 838.

The last L will be presented with its toe end face in engagement with the inclined face 75 of the plunger 74 and with the bottom of its forepart inclined relatively to the plate 34, after which the heel end of the last will be swung downwardly until the edge of the bottom face of the forepart is located in the angle determined by the inclined faces 78, 80 of the side gages 66, 68 and the angle determined by the inclined faces 76 and 72 of the toe gage 60. As thus presented, the last will be positioned with the "center line" of its forepart in predetermined relation to the drills 56 and with the edge of the bottom face of the forepart of the last in a horizontal plane. Pressure of the last, as it is thus presented, on the two pairs of side gages 62, 64 and 66, 68 will cause such slight movement of the side gages and the forward portion 818 of the arms 342, 344 and 234, 236 relatively to the rear portions of the arms as is necessary and permitted by the lost motion between the fingers 820 and the pins 822 and surfaces 824, to close the four switches 792 associated with the two pairs of side gages by the action of the fingers 834 on the plunger 796 of the switches. Similarly, pressure of the last on the block 74 will cause it to move rearwardly, far enough to effect the closing of the switch 796 associated with the toe gage by pressure of the screw 800 on the plunger 796 of the switch. As previously pointed out, closing of all five of the switches 792 will cause the light 794 to light, thus notifying the operator that the last is in engagement with all of the toe and side gages and is positioned in the proper relation to the drills 56.

The switch 790 is of the same type as the above-mentioned switches 792, except that its resilient contact arm 838 (Fig. 10) in its normal position closes the switch and in response to a slight movement of depression of its plunger 840 the free end of the contact arm is moved out of contact position to open the switch. The switch 790 is fastened by screws 842 to a bracket 844, which is secured to the above-mentioned sleeve 122. When the machine is initially at rest the plunger 840 of the switch is held depressed by means of an adjustable screw 846 carried by an arm 848 on the bracket 134 fast on the rod 132, a lock nut 850 being provided for holding the screw 846 in adjusted position. As previously pointed out, after the last L has been presented by the operator in the position determined by the toe and side gages, the rod 132 is moved upwardly by depression of the treadle 160, the sleeve 122 being moved upwardly with the rod through one or both of the springs 164, 166 to cause the lever 110 to be swung in the direction to move the toe rest 36 downwardly into engagement with the top of the forepart of the last. Thereafter, in response to continued upward movement of the rod 132, as the treadle 160 is further depressed, one or both of the springs 164, 166 acts on the sleeve 122 to cause the toe rest to be forced hard against the last, the lever 110 being then locked against swinging movement by engagement of the block 184 with the stepped block 184. It will be understood that, as the last is thus firmly clamped in the position determined by the toe and side gages through the yielding of one or both of the springs 164, 166 in the continued upward movement of the rod 132, the screw 846 will be moved out of engagement with the plunger 840 of the switch 790, thereby permitting the switch to close and to

complete the circuit through the relay switch 786 to cause immediate energization of the solenoid 754. Since the switch 790, however, is connected in series with the above-mentioned five series switches 792, any slight displacement of the last in the clamping operation from the position determined by the toe and side gages will cause one or more of the five switches 792 to open, thus preventing the closing of the circuit through the relay switch 786. If this occurs, the solenoid of course will not be energized to unlock the starting lever 722 and it will be necessary for the operator to unlock the toe rest 86 and to reposition the last L.

For thus unlocking the toe rest 86 and the lever 110 there is fast on the shaft 216 a hand lever 852 provided with a rubber pad 854 which may be struck by the hand of the operator to cause the bell crank lever 214 to be swung in the direction to move the wedge 190 to the right (Fig. 10) into position to be engaged by the latch 230, thus unlocking the lever 110 and the toe rest. As the lever 110 and the toe rest are thus unlocked, the spring 232 will act on the rod 132 and through the bracket 134 and sleeve 122 to swing the lever 110 in the direction to elevate the toe rest 86. The machine is further provided with fluid pressure-operated means for unlocking the lever 110 to relieve the operator of the necessity of manually striking the hand lever 852. This means comprises a cylinder 856 (Fig. 10) secured to the base 50 and in which there is fitted to slide a piston 858. The piston 858 is connected by means of a rod 860 to a link 862, which is provided with an elongated slot 864 into which extends a pin 866 carried by the downwardly extending arm 224 of the bell crank lever 220. At one end the cylinder 856 is partially closed by a cover plate 868, in which there is a restricted opening 870 for the admission and exhaust of air to and from the cylinder. Adjacent to its opposite closed end the cylinder is provided with a port 872 which is connected by a pipe 874 to a valve casing 876 (Fig. 15), in which there is a valve 878 normally held in engagement with a seat on the casing by means of a spring 880 to prevent communication between a chamber 882 in the casing that communicates with the pipe 874 and a chamber 884 which is connected to a source of supply of pressure fluid, preferably compressed air. For connecting the chamber 884 to the pressure source there is provided a pipe 886 which is connected to the above-mentioned supply pipe 558. Formed on the valve 878 is a collar 888 fitted to slide in a vertical bore 890 in the casing 876. When the valve 878 is closed, the cylinder 856 is open to the atmosphere through the port 872, pipe 874, bore 890, vertical passages 892 in the collar 888, and lateral passages 894 in the casing 876. The reduced shank portion of the valve 878, above the collar 888, extends into a central opening in a plunger 896 which is fitted to slide in the bore 890 and is held by a spring 898 with a shoulder on the plunger in engagement with a cap 900 threaded into the upper end of the casing 876. When it is desired to operate the fluid pressure means to unlock the lever 110, the operator will move the plunger 896 downwardly into engagement with the collar 888 on the valve 878, thus closing the lateral passages 894 in the casing 876, and then by further downward movement of the plunger will open the valve 878 to connect the pressure source and the cylinder 856. With the valve 878 held open by the operator, the

pressure fluid will act to move the piston 858 to the right (Fig. 10), thus causing the bell crank lever 220 to swing the bell crank lever 214 in the direction to operate the wedge 190 to unlock the lever 110 and to move the wedge into position to be engaged by the latch 230. It will be evident that, by providing the link 862 with the elongated slot 864, the operation of the wedge 190 to unlock the lever 110 may be effected either manually or by power. If the power means is used, the return movement of the piston 858 to the left (Fig. 10) when the valve 878 is closed is permitted by the pin and slot connection between the link 862 and the arm 224 of the bell-crank lever 220.

The illustrated machine is further provided with automatic means for operating the wedge 190 to unlock the arm 110 near the end of the cycle after the bushing-inserting operation has been completed. This means comprises a latch 902, which is secured to the carrier 456 (Fig. 10) and is arranged by engagement with a pivoted latch 904, connected to the downwardly extending arm 224 of the bell crank lever 220 by the pin 866, to swing the bell crank lever 220 in the direction to thus operate the wedge 190, in response to the reverse movement of the carrier 456 to return the tools 58 and the drills 56 to their initial starting positions. As shown particularly in Fig. 10, when the carrier 456 is in its initial starting position the pivoted latch 904 is engaged by a roll 906 carried by an arm 908 pivotally connected to a bracket 910 secured to the base 50. The roll 906 rests on a flat surface 912 on the carrier 456, with the pivoted latch 904 upheld in an elevated position in which it will not be engaged by the latch 902 as the carrier 456 is moved to the left to position the tools 58 in axial alignment with the holes 532 in the plate 84 for the bushing-inserting operation. As the carrier 456 completes its movement to the left, the roll 906 enters a recess 914 in the carrier 456 to permit the pivoted latch 904 to swing downwardly into position in front of the latch 902 on the carrier (Fig. 41). Thereafter, as the carrier starts its return movement to the right, the bell crank lever 220 is swung in the direction to operate the bell crank lever 214 to move the wedge 190 to the right into position to be engaged by the latch 230, thus unlocking the lever 110. The construction is such that as the wedge is thus moved into position to be engaged by the latch 230, the roll 906 rides out of the recess 914 and acts to lift the pivoted latch 904 out of engagement with the latch 902 (Fig. 42).

The mechanism for delivering the bushings B automatically to the tools 58 comprises a hopper 916 for the bushings (Fig. 34), supported on a bracket 918 with its bottom face at an inclination to the horizontal to cause the bushings to bunch in front of outlet ports 920 in the hopper that communicate with the raceways 546 (Fig. 36). The channels 922 of the raceways in cross section are in the shape of an inverted T to receive the bushings head downward, which are propelled toward the outlet ports 920 in the hopper 916 by means of a rotary brush 924 which may be driven by any suitable means. The means for driving the brush 924 in the illustrated construction comprises a shaft 926 on which there is fast a spiral gear 928 that meshes with a similar gear 930 fast on a vertical shaft 932 which is rotatably mounted in bearings in the bracket 918. The shaft 932 has a universal joint connection 934 with a second shaft 936 which is driven

through a clutch 937, the driving member 938 of which is connected by means of a universal joint connection 940 with a vertical shaft 942 rotatably mounted in bearings formed in a bracket 944 which is secured to the base 50 by screws 946 (Fig. 18). Fast on the shaft 942 is a spiral gear 948 that meshes with a similar gear 950 fast on the cam shaft 530. The clutch 937 is of the positive type in which the driven member 952 (Fig. 35) has formed thereon a projecting lug or tooth 954 arranged to engage a similarly shaped recess 956 in the driving member 938, the tooth and recess being held in interlocking relation by means of a spring 958, against the resistance of which the clutch may slip and disengage if excessive resistance to the rotation of the brush 924 in the hopper 916 is encountered due to the bunching of the bushings B. As shown, the driving member 938 of the clutch is bored to receive the shaft 936 which is provided with a keyway 960 slidably engaged by a key 962 in the driven member 952.

The endmost bushings B at the delivery ends of the raceways 546 are retained therein by spring-controlled fingers 964 that are pivotally connected to the raceways (Fig. 37). The bracket 918, for supporting the hopper 916 and the raceways, is mounted for limited swinging movement about the axis of a substantially vertical shaft 932 mounted to turn in bearings in a bracket 968, which is mounted for swinging movement about the axis of a horizontal shaft 910 supported by a bracket 972, which is secured to the base 50 by screws 974. Projecting from the bracket 918 is a bolt 976 that extends through an enlarged opening in the bracket 968 and the end portion of which is surrounded by a spring 978 that bears at one end against a washer 980 engaging a finished surface on the bracket 968 and at its other end against a washer 982 supported by a nut 984 threaded on the outer end of the bolt 976. The spring 978 tends to swing the bracket 918 in a clockwise direction (Fig. 37) and to hold it with an adjustable screw 986 carried by the bracket in engagement with a portion of the base 50. The lengths of the raceways 546 are preferably such that, by means of the screw 986, the raceways and the bracket 918 may be adjusted about the axis of the shaft 936 to position the delivery ends of the raceways, with the bushings B engaged by the fingers 964, in axial alinement with the inserting tools 58. Seated within a recess 988 in the bracket 968 (Fig. 34) is a spring 1,000 that bears at its opposite end against an upwardly extending arm 1,002 on the bracket 972. The spring 1,000 tends normally to swing the bracket 968 about the axis of the shaft 970 in the direction to hold the forward, substantially horizontal, end portions of the raceways 546 pressed yieldingly down on the above-mentioned plate 84, but is arranged to yield to permit upward swinging movement of the raceways in the event that one or more of the bushings B, previously delivered to the tools 58, have not been inserted into the last previously operated upon and accordingly are still on the tools in the next operation of the machine as the tools are moved upwardly relatively to the raceways. This may sometimes occur when one of the drills 56 becomes broken or if one of the bushings is defective, that is, not large enough to be retained by friction in one of the holes H in the inserting operation. If a bushing remains on one of the tools 58, it will act by engagement with one of the bushings at the delivery ends of the raceways to lift the raceways against the

resistance of the spring 1,000 as the tools 58 are moved upwardly in the next operation of the machine, thereby avoiding any danger of damage to the parts. As the raceways 546 are thus swung upwardly, they will be held in an elevated position by means of a spring-operated pin 1004 (Fig. 38), which is slidably mounted in the bracket 972 and is arranged to engage the bottom face of a plate 1006 carried by the bracket 968, the bracket 968 being provided with an enlarged opening 1008 to receive the pin as the bracket 968 and the raceways are swung upwardly. With the raceways latched by the pin 1004 in an elevated position, the operator will of course replace the broken drill or drills or remove the defective bushing, after which the latch pin 1004 may be withdrawn from engagement with the bottom face of the plate 1006 by means of a pin 1010 to permit the spring 1000 to lower the raceways again into engagement with the plate 84.

As previously pointed out, as the slide 500 completes its upward movement to insert the tools 58 into the bushings B, located by the fingers 964 at the delivery ends of the raceways in axial alinement with the tools, the raceways are swung laterally of the tools 58, the spring-controlled fingers 964 yielding as the raceways are thus swung to release the bushings to the tools. For thus swinging the raceways 546 at the proper time, there is provided a cam path 1012 formed on the side face of the cam wheel 534 (Fig. 18). Engaging the cam 1012 is a roll 1014 carried by an arm 1016 fast on the lower end of a vertical shaft 1018 supported by a boss 1020 on the bracket 944 and by a boss 1022 on the bracket 972. Fast on the upper end of the shaft 1018 is an arm 1024 connected by means of an adjustable link 1026 to an arm 1028 on the bracket 918 which, as previously pointed out, is mounted for limited swinging movement about the axis of the shaft 966. As previously explained, the shape of the cam 1012 is such that, as the slide 500 completes its upward movement to insert the tools 58 into the endmost bushings B in the raceways 546, the bracket 918 and the raceways are swung in a counterclockwise direction (Fig. 37) to release the bushings to the tools 58, after which, as the slide 500 and the tools 58 are lowered, the shape of the cam 1012 is such as to permit the spring 978 to swing the bracket 918 and the raceways 546 reversely until the adjustable stop screw 986 engages a portion of the base 50.

For supplying bushings B to the hopper 916, the illustrated machine is provided with a reservoir 1030 which is substantially cylindrical in form and is arranged to be inserted into the upper end of the hopper 916, the upper portion of the wall of which is substantially vertical. The reservoir 1030 has formed thereon a lug 1032 which is arranged to engage the top face of the wall of the hopper and thus to serve as a stop to determine the correct relative positions of the reservoir and hopper when in assembled relation. Riveted to the reservoir 1030 is a leaf spring 1034 which acts by engagement with the wall of the hopper to assist in holding the parts in assembled relation. A cover 1036 is provided for the reservoir on which is a handle 1038, by means of which it may be readily removed to permit a supply of bushings to be placed in the reservoir. As shown particularly in Fig. 34, the bottom face of the reservoir is inclined so that the bushings will gravitate toward a nozzle 1040, with which the

reservoir is provided and through which the bushings are fed to the hopper 916. The nozzle 1040 is preferably located so as to discharge the bushings into the hopper from a position immediately above the discharge ports 920 in the hopper, and pivotally connected to the nozzle 1040 is a gate 1042. By reference to Fig. 39 it will be seen that the gate 1042 is arranged to extend across the mouth or delivery end of the nozzle 1040 and has a downwardly bent, curved end portion 1044 arranged to rest on the bushings in the hopper 916, the bushings acting to lift the gate 1042 to close the nozzle 1040 when they rise to a predetermined level in the hopper. Thus only a limited number of bushings may be permitted in the hopper at any one time. The arrangement is such that the mass of bushings in the hopper is reduced to a minimum, sufficient however to keep the raceways 546 filled. This eliminates packing or jamming of the bushings in the hopper, with the result that the feeding of the bushings into the raceways is greatly facilitated and there is less danger of damage to the brush 924 or to the bushings because of the agitating action of the brush.

By reference to Fig. 9 it will be seen that the circuit through the five switches 792 contains five double-pole, double-throw switches 1046 and the circuit through the switch 790 a double-pole, double-throw switch 1048, the switches 1046 and 1048 being connected in series through one set of contact points. Each switch 1046 has its movable arms or blades bridged across the contact points of one of the switches 792 and the switch 1048 has its movable blades bridged across the contact points of the switch 790. From the contact points 1050, associated with the normally inoperative blades of the switches 1046, 1048, taps lead to a testing circuit 1052 connected to the current source 782 and in which there is a light 1054. Each of the switches 1046, 1048 may be operated by depression of a button 1056 (Fig. 1) to disconnect one of the switches 792 or the switch 790 from its normally operating circuit and connect it to the testing circuit 1052, thus permitting the operator, by depression of the button 1056, to determine readily by watching the light 1054 whether any one of the above-mentioned fingers 834 or the screw 846 requires adjustment.

In the operation of the machine, with the parts in the positions shown in Fig. 1 and with the side gages properly adjusted for the size of last to be operated upon, a last L will be presented with its toe end face in engagement with the inclined face 76 of the plunger 74 and with the bottom face of its forepart inclined upwardly, after which the heel end of the last will be swung downwardly until the edge of the bottom face of the forepart is located in the angles S formed by the inclined faces 78, 80 of the side gages 66 and 68 and the angle formed by the inclined faces 72, 76 of the toe gage 60. As the heel end of the last is thus swung downwardly, the edge of the bottom face of the last is engaged by the inclined faces 82 of the side gages 62 and 64, the two pairs of side gages acting to position the forepart of the last with its "center line" in predetermined relation to the drills 56, the toe and side gages 66 and 68 acting to support the last with the edge of the bottom face of the forepart in a horizontal plane. It will be understood that as the last L is thus presented pressure of the last on the toe and side gages will cause the above-mentioned switches 792 to close, thus caus-

ing the lamp 794 to light. With the last presented in the position determined by the toe and side gages, the operator will depress the treadle 160 to cause the toe rest 86 to be moved downwardly into engagement with the top of the forepart of the last and then to be forced firmly against the last through one or both of the springs 164, 166. As the toe rest 86 is thus forced firmly against the last, the rod 132 and the bracket 134 will move upwardly relatively to the sleeve 122 to operate the latch 230 to release the wedge 190 to the action of the spring 228 and to move the adjustable screw 846 out of engagement with the plunger 840 of the switch 790, thus permitting the switch 790 to close. If the last has not been moved out of the position determined by the toe and side gages as it is thus clamped by the toe rest 86, closing of the switch 790 will complete the circuit through the relay 786 the closing of which will close the circuit through the solenoid 754 which will be immediately energized to cause the unlocking of the starting lever 722 for movement in the direction to start the power-operation of the machine. It will be understood that as the wedge 190 is released to the action of the spring 228 it will be moved to the left (Fig. 10) to carry the block 194 into engagement with one of the shoulders on the block 184 separating two of the steps 186, after which it will effect a quick relative movement of approach between the blocks 194 and 184 to lock the toe rest 86 in engagement with the last. If however, the last has been moved out of engagement with one of the toe and side gages in the clamping operation, one of the switches 792 will open, thus preventing the closing of the circuit through the solenoid 754 and the unlocking of the starting lever 722. If one of the switches 792 opens in the clamping operation, the light 794 will, of course, not remain lighted, thus notifying the operator that he must release the last and reposition it.

For releasing the last the operator may use either the hand lever 852 to move the wedge 190 in the direction to be engaged by the latch 230 to effect the unlocking of the lever 110 and the toe rest 86, or he may depress the plunger 896 to cause the fluid-pressure means to thus operate the wedge 190. With the last L clamped by the toe rest 86 in the position determined by the toe and side gages and with the treadle 160 held depressed to maintain the switch 790 closed, the operator will depress the rod 252 to move the member 88 downwardly into engagement with the top of the heel end of the last and will then swing the starting lever 722 to the left (Fig. 1) to start the power operation of the machine. It will be understood that as the lever 110 is swung in the direction to move the toe rest 86 into engagement with the last, the arms 294, 296 and 342, 344 carrying the side gages 62, 64 and 66, 68 will be locked against swinging movement by the action of the cam surfaces 398 on the pins 430 in the cover plate 390. It will be understood also that at this time the drills 56 are being rotated at high speed by the motor 436 and that the carrier 456 is at its extreme position to the right as shown in Fig. 24 with the drills in alignment with the holes 532 in the plate 54. The cam rolls 524 and 538 are accordingly in engagement with their respective cams 526 and 536, the cam 526 acting to impart upward movement to the drill head 432 and the drills 56 to cause the drills to bore the holes H in the bottom of the last. It will be understood that each spring 442 will yield independently of the others in the upward

movement of the drill head as its associated non-rotatable bushing 410 engages the bottom face of the last.

Meanwhile the cam 536 has swung the cam lever 540 in the direction to raise the slide 500 to cause the tools 58 to be inserted into the three bushings B located at the delivery ends of the raceways 546 by the fingers 964 in axial alinement with the tools 58, and the cam 1012 has acted on the arm 1016 to swing the bracket 918 and the bushings B laterally of the tools 58 to release the bushings B to the tools 58. As the drill head 432 moves upwardly it acts to swing the lever 582 in the direction to insert the pin 576 into the locating hole 578 in the plate 574, thereby effectively locking the carrier 456 against movement during the drilling operation, after which the cams 526 and 536 act on their respective levers 512 and 540 to lower the drills 56 and the inserting tools 53, the cam 1012 then permitting the spring 973 to swing the bracket 918 and the raceways 546 reversely until the adjustable stop 986 engages a portion of the base 50 with a new set of bushings B in alinement with the tools 58. As the drill head 432 is moved to its initial position, the pin 576 is withdrawn from engagement with the plate 574 to unlock the carrier 456, after which the cam 594 acts to move the carrier to the left (Fig. 24) to position the tools 58 in axial alinement with the holes 532 in the plate 84 and the holes H bored in the last for the bushing-inserting operation and with the adjustable stop 624 on the carrier in engagement with the fixed stop 626 on the plate 574. It will be understood that as the cam lever 512 is swung in the direction to impart upward movement to the drills 56 it engages and swings the lever 554 in the direction to open the valve in the casing 554, thereby causing a blast of compressed air to be directed at each drill 56 in the drilling operation and into each hole H to insure that no chips will remain in the holes H after the drilling operation to obstruct the insertion of the bushings B therein.

With the carrier 456 in its left-hand position on the plate 574 the cam roll 630 on the cam lever 540 is in engagement with the cam 628 which then acts to impart upward movement to the slide 500 and the tools 58 to cause the tools to insert the bushings B into the holes H in the last. As each tool 58 forces its bushings B fully to the bottom of its hole in the last, its associated spring 506 yields in the continued upward movement of the slide 500. Thereafter, the cam 628 moves the slide 500 to its lowermost position on the carrier 456 and the cam 594 moves the carrier to its right-hand position on the plate 574 (Fig. 24). As the carrier is thus moved, the lever 110 is unlocked automatically by the action of the latch 902 on the pivoted latch 904, the spring 232 then acting on the rod 132 to impart upward swinging movement to the front end of the lever 110 to elevate the toe rest 86. As the lever 110 is thus swung, the arm 283 is also swung upwardly through the rock-shaft 112 to operate the pawl 284 to release the rod 252 to the action of the spring 262 to move the member 88 out of engagement with the heel end of the last. As the carrier 456 completes its movement to the right (Fig. 24), the wedge plate 708 acts to swing the lever 700 and, through the previously described connections, the arm 630 in the direction to move the clutch member 650 out of engagement with the internal friction clutch face 648 on the pulley 642 and into engagement with the brake sur-

face 652 to stop the power-operation of the machine.

The features of the mechanism for supplying bushings to the inserting tools herein disclosed are not claimed in this application since they form the subject-matter of a copending divisional application Serial No. 447,234, filed June 16, 1942.

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

1. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, a support movable relatively to said gaging means to clamp the work in said position, operator-controlled starting means for starting the power operation of the machine comprising a member initially held against movement in the direction to start the machine, and means arranged to be actuated by the movement of the support into clamping position for releasing said member for movement in that direction only when the work is clamped in the position determined by said gaging means.

2. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, means for clamping the work in said position, a member for starting the power operation of the machine, and means for locking said member against movement in the direction to start the machine and for releasing it for movement in that direction only when the work is clamped in the position determined by said gaging means.

3. In a power-operated machine, an operating tool, gaging means comprising a plurality of gages movable in response to pressure of a work piece against them when presented by the operator to determine the position of the work piece relatively to said operating tool, a support for clamping the work piece in the position determined by the gages for the operation of said operating tool, a starting member, means for locking said starting member against movement in the direction to start the power operation of the machine, and means controlled by all said gages for operating said last-named means to release said starting member only when the work piece is clamped in the position determined by the gages.

4. In a power-operated machine, an operating tool, a plurality of gages movable in response to pressure of a work piece against them when presented by the operator to determine the position of the work piece relatively to said operating tool, a member movable relatively to said gages for clamping the work piece in said position, means for operating said clamping member, a starting member, means for locking said starting member against movement in the direction to start the machine, and means for operating said last-named means to release the starting member for movement in that direction arranged to be actuated by the movement of all said gages and the means for operating said clamping member.

5. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, a support movable to clamp the work in the position determined by said gaging means for the operation of said operating tool, a member movable to start the power operation of the machine, means for locking said member against movement in the direction to start the machine, and electrical means for operating said locking means to release the starting member for movement in

the direction to start the machine after the support has been moved into work-clamping position.

6. In a power-operated machine, an operating tool, gaging means movable in response to pressure of the work when presented by the operator to determine the position of the work relatively to said operating tool, a member for clamping the work in the position determined by said gaging means for the operation of said operating tool, means for moving said clamping member into operative position, a lever movable to start the power operation of the machine, means for locking said lever against movement in the direction to start the machine, and electrical means for operating said locking means to release said starting lever for movement in the direction to start the machine, said electrical means being arranged to be actuated in response to the movement of said gaging means and the means for moving said work-clamping member.

7. In a power-operated machine, an operating tool, gaging means comprising a plurality of gages movable in response to pressure of a work piece against them when presented by the operator to determine the position of the work piece relatively to said operating tool, a member movable to clamp the work in the position determined by the gages, operating means for moving said work-clamping member into operative position, a lever movable to start the power operation of the machine, means for locking said lever against movement in the direction to start the machine, and electrical means for operating said last-named means to release the lever in response to the movement of all said gages and the operating means for said work-clamping member.

8. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, means for clamping the work in the position determined by said gaging means for the operation of said operating tool, a member movable in a direction to start the power operation of the machine, means for locking said starting member against movement in that direction, an electrical device for operating said locking means to release said starting member for movement in the direction to start the machine, an energizing circuit for said electrical device, and a plurality of contact devices associated with said gaging means and said clamping means for closing said energizing circuit only when the work is clamped in the position determined by said gaging means.

9. In a power-operated machine, an operating tool, a plurality of gages for determining the position of the work relatively to said operating tool, a member movable to clamp the work in the position determined by said gages, a lever movable to start the power operation of the machine, means for locking said lever against movement in the direction to start the machine, electro-magnetic means for operating said locking means to release said starting lever, an energizing circuit for said electro-magnetic means, a switch in said energizing circuit for each of said gages, said switches being connected in series and arranged to be closed in response to pressure of the work against the gages, and another switch in said energizing circuit connected in series with said first-named switches and arranged to be closed only when the movement of said clamping member into clamping position has been substantially completed.

10. In a power-operated machine, an operating

tool, a plurality of gages for determining the position of the work relatively to said operating tool, a member movable to clamp the work in the position determined by said gages, a lever movable to start the power operation of the machine, means for locking said lever against movement in the direction to start the machine, a solenoid for operating said locking means to release said starting lever, an energizing circuit for said solenoid, a contact device for each of said gages arranged to be closed in response to pressure of the work against the gage, said contact devices being arranged in series in said energizing circuit, and a contact device in series with said first-named devices for closing said energizing circuit after the clamping member has been moved into position to clamp the work.

11. In a power-operated machine, an operating tool, a plurality of gages for determining the position of the work relatively to said operating tool, a member movable to clamp the work in the position determined by said gages, a lever movable to start the power operation of the machine, means for locking said lever against movement in the direction to start the machine, a solenoid for operating said locking means to release said starting lever, an energizing circuit for said solenoid, a relay for closing said energizing circuit, an energizing circuit for said relay, a contact device for each of said gages arranged to be closed in response to pressure of the work against the gage, said contact devices being arranged in series in said last-named circuit, and a contact device connected in series with said first-named devices and arranged to be closed only after said clamping member has been moved into position to clamp the work.

12. In a power-operated machine, an operating tool, a plurality of gages for determining the position of the work relatively to said operating tool, means for holding the work in the position determined by said gages for the operation of said operating tool, a member for starting the power operation of the machine, means for locking said starting member against movement in the direction to start the machine, a solenoid for operating said locking means to release said starting member, an energizing circuit for said solenoid, a relay for closing said circuit, an energizing circuit for said relay, and means controlled by all said gages and by said working-holding means for closing said last-named circuit.

13. In a power-operated machine, an operating tool, a plurality of gages for determining the position of the work relatively to said operating tool, a member movable to clamp the work in the position determined by said gages for the operation of said operating tool, a lever movable to start the power operation of the machine, a latch pivotally connected to said lever, an abutment arranged by engagement with said latch to lock the lever against movement in the direction to start the machine, and electrical means for moving said abutment relatively to said latch to release said starting lever, said electrical means being arranged to be actuated only when the work is clamped in the position determined by all said gages.

14. In a power-operated machine, an operating tool, a plurality of gages for determining the position of the work relatively to said operating tool, means for clamping the work in the position determined by said gages for the operation of said operating tool, a lever for starting the

power operation of the machine, means for locking said starting lever against movement in the direction to start the machine, a solenoid for operating said locking means to release the starting lever, an energizing circuit for said solenoid, a contact device associated with said work-clamping means for closing said energizing circuit, and a contact device for each of said gages arranged to be closed in response to pressure of the work against the gage, said contact devices associated with the gages being connected in series with one another and with said first-named contact device to prevent the closing of the energizing circuit in the event that the work is moved out of engagement with any one of said gages in the clamping operation.

15. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to bore a hole in a last, gaging means comprising a plurality of gages movable in response to pressure of the last against them when presented by the operator to determine the position of the last relatively to said drill, means for clamping the last in the position determined by said gages for the operation of the drill, and manually-operated means for starting the power operation of the machine only when the last has been clamped in the position determined by all said gages.

16. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to bore a hole in a last, a starting lever, means for locking said lever against movement in the direction to start said power-operated means in operation, gaging means comprising a plurality of gages movable in response to pressure of the last against them when presented by the operator to determine the position of the last relatively to said drill, means for clamping the last in the position determined by said gages for the drilling operation, and means controlled by all said gages for operating said locking means to release said starting lever only when the last has been clamped in the position determined by said gages.

17. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to bore a hole in a last, gaging means for determining the position of the last relatively to said drill, means for clamping the last in the position determined by said gaging means, a member movable to start the power operation of the machine, and means for locking said member against movement in the direction to start the power operation of the machine and for releasing it for movement in that direction only when the last is clamped in the position determined by said gaging means.

18. In a machine for operating upon lasts, a drill, power-driven means for operating said drill to bore a hole in a last, a lever for starting said power-driven means in operation, means for locking said starting lever against movement in the direction to start said power-driven means in operation, gaging devices for determining the position of the last relatively to said drill, said devices each comprising a gaging member movable in response to pressure of the last against it while other parts of the device are stationary, a member movable relatively to said gaging devices for clamping the work in the position determined by said gaging devices, operating means for moving said clamping member into operative position, and means controlled by the movement of all said gaging devices and the

operating means for said clamping member for operating said locking means to release said starting lever for movement in the direction to start the power-driven means in operation.

19. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to drill a hole in a last, a plurality of gages movable in response to pressure of the last against them when presented by the operator to determine the position of the last relatively to said drill, means for clamping the last in the position determined by said gages, a member movable by the operator in a direction to start the power operation of the machine, means for locking said member against movement in that direction, and means for operating said locking means to release said starting member at the end of the clamping operation in response to continued pressure of the last against all said gages.

20. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to drill a hole in a last, gaging means comprising a plurality of gages movable in response to pressure of the last against them when presented by the operator to determine the position of the last relatively to said drill, a member movable to clamp the last in the position determined by said gages, a lever movable to start the power operation of the machine, means for locking said lever against movement in that direction, and electrical means for operating said locking means to release said starting lever when the clamping member has completed its movement into position to clamp the last and in response to continued pressure of the last against all said gages.

21. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to bore a hole in a last, a plurality of gages movable in response to pressure of the last against them when presented by the operator to determine the position of the last relatively to said drill, a member movable to clamp the last in the position determined by said gages, a starting lever, means for locking said starting lever against movement in the direction to start the power operation of the machine, electro-magnetic means for operating said locking means to release said starting lever, an energizing circuit for said electromagnetic means, a switch in said energizing circuit arranged to be closed after the movement of said clamping member into position to clamp the last has been substantially completed, and a switch in said energizing circuit for each of said gages arranged to be closed in response to pressure of the last against the gage, said last-named switches being connected in series with one another and with said first-named switch to control said energizing circuit.

22. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to bore a hole in a last, a plurality of gages for determining the position of the last relatively to said drill, a member movable to clamp the last in the position determined by said gages for the operation of said drill, a lever movable to start the power operation of the machine, a latch pivotally connected to said lever, an abutment arranged by engagement with said latch to lock said starting lever against movement in the direction to start the power-operated means in operation, and electrical means for moving said abutment out of engagement with said latch to release said starting lever, said electrical means being arranged to be actuated only when the last

is clamped in the position determined by said gages.

23. In a machine for operating upon lasts, a drill, power-operated means for operating said drill to bore a hole in a last, a plurality of gages for determining the position of the last relatively to said drill, means for clamping the last in the position determined by said gages for the operation of said drill, a starting lever, a latch connected to said starting lever, an abutment arranged by engagement with said latch to prevent movement of said starting lever in the direction to start said power-operated means in operation, a solenoid for moving said abutment out of engagement with said latch to release said starting lever, an energizing circuit for said solenoid, a contact device associated with said last-clamping means for closing said energizing circuit, and a contact device for each of said gages arranged to be closed in response to pressure of the last against the gage, said last-named contact devices being connected in series with one another and with said first-named device to cause the energizing circuit to remain open to prevent the release of said starting lever in the event that the last is moved out of engagement with any one of said gages in the clamping operation.

24. In a machine for operating upon work, the combination with means for positioning work pieces of different sizes, of a member for clamping a work piece in the position determined by said positioning means, and means for positively supporting said member while in clamping position comprising a pair of blocks, one of which has formed thereon a series of steps, said blocks being relatively movable into a position determined by a shoulder separating two of the steps on said one of the blocks, and means for effecting a relative movement of approach between the blocks to cause one of the steps to be engaged by the other block and thus to support the clamping member positively in any position into which it has been moved to clamp work pieces of different sizes.

25. In a machine for operating upon work, the combination with means for positioning work pieces of different sizes, of a member for clamping a work piece in the position determined by said positioning means, and means for positively supporting said member while in clamping position comprising a block movable with said member and provided with a series of steps, a second block movable relatively to said first block into engagement with a shoulder separating two of said steps, and means for moving said second block in the direction of movement of said first-named block into engagement with one of said steps to compensate for slight variations in the position of said clamping member in operating upon work pieces of different sizes.

26. In a machine for operating upon work, the combination with means for positioning work pieces of different sizes, of a member movable into position to clamp a work piece in the position determined by said means, a block movable with said clamping member and having formed thereon a series of steps, a second block movable relatively to said first-named block into engagement with a shoulder separating two of said steps, and a wedge for quickly effecting a relative movement of approach between said two blocks to cause the second block to engage one of said steps and thus to support the clamping member positively in any position into which it has been moved to clamp work pieces of different sizes.

27. In a machine for operating upon work, the combination with means for positioning work pieces of different sizes, of a member movable into position to clamp a work piece in the position determined by said positioning means, a block movable with said clamping member and having formed thereon a series of steps, a block movable relatively to said first-named block into position to engage a shoulder separating two of said steps, and a wedge for quickly moving the second block relatively to the first-named block into engagement with one of said steps to support the clamping member positively in any position into which it has been moved to clamp work pieces of different sizes.

28. In a machine for operating upon work, the combination with work-supporting means, of a clamping member movable relatively to said supporting means into position to engage work pieces of different sizes, a block movable with said clamping member and having formed thereon a series of steps, a second block movable relatively to said first-named block into engagement with a shoulder separating two of said steps, and a member for thus moving the second block, said member being movable thereafter relatively to said second block and having formed thereon an inclined surface to cause the second block to be moved into engagement with one of said steps to support the clamping member positively in any position into which it has been moved in clamping work pieces of different sizes.

29. In a machine for operating upon work, the combination with work-positioning means, of a member movable into position to clamp a work piece, and means for positively supporting said clamping member while in work-clamping position comprising a block movable into different positions in response to the movement of said clamping member to clamp work pieces of different sizes, said block having formed thereon a series of steps, a second block movable relatively to said first-named block into engagement with a shoulder separating two of said steps and a wedge for thus moving the second block after the completion of the movement of the clamping member into clamping position, said wedge being movable thereafter relatively to said blocks to effect a quick relative movement of approach between the blocks to compensate for slight variations in the position of said clamping member in operating upon work pieces of different sizes.

30. In a machine for operating upon work, the combination with work-positioning means, of a work support, means for moving said work support into operative position, and means for positively supporting the work support after it has been moved into operative position comprising a block movable with said work support and having a plurality of steps formed thereon, a second block arranged to engage any one of the steps on said first-named block, a wedge on which said second block is mounted, and means for moving the wedge in time relation to the movement of the work support to carry the second block into engagement with a shoulder on said first block separating two of said steps and for then moving the wedge relatively to said second block to move the second block into engagement with one of said steps.

31. In a machine for operating upon work, the combination with work-positioning means, of a work support, a member for moving said work support into operative position, spring means arranged to be compressed in the movement of

said member to cause the work support to be pressed yieldingly against the work, and positive means for locking the work support in operative position after it has been thus yieldingly operated, said means comprising a block movable with the work support and having formed thereon a plurality of steps, a second block arranged to engage any one of said steps, a spring-operated wedge on which said second block is mounted, and a latch for releasing said wedge to the action of its spring substantially at the time in the movement of said member when the work support has been moved into operative position to cause the second block to be moved by the wedge into engagement with a shoulder on the first block separating two of said steps and then to be forced into engagement with one of said steps by the continued movement of the wedge.

32. In a machine for operating upon lasts, the combination with last-positioning means, of a support for the top of the forepart of the last, a lever for moving said support heightwise of the last into operative position, and mechanism for locking said lever against reverse swinging movement with the support in operative position, said mechanism comprising a pair of members relatively movable in two directions into interlocking engagement to compensate for variations in the position of said lever in operating upon lasts of different sizes.

33. In a machine for operating upon lasts, the combination with last-positioning means, of a support for the top of the last, a lever for moving said support heightwise of the last into operative position, a member movable to operate said lever, and means for positively locking said lever against reverse swinging movement comprising a block carried by said lever and having formed thereon a series of steps, a second block arranged to engage one of said steps in any position into which the lever has been moved in operating upon lasts of different sizes and a spring-operated wedge for moving said second block into engagement with a shoulder on said first block separating two of said steps after the movement of said lever has been substantially completed, said wedge being movable thereafter relatively to said second block to move it into engagement with one of said steps.

34. In a power-operated machine, an operating tool, a work-clamping member, means for operating said clamping member to force it yieldingly into engagement with the work, positive means for locking the clamping member in engagement with the work after it has been thus yieldingly operated, operator-controlled means for starting the power operation of the machine only when the work has been clamped by said clamping member, and power-operated means enabling the operator at will to operate said locking means to release said clamping member prior to the power operation of the machine.

35. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, a member for clamping the work in the position determined by said gaging means, means for operating said clamping member to force it yieldingly against the work, positive means for locking the clamping member in engagement with the work, a member for starting the power operation of the machine, and power-operated means controlled independently of said starting member enabling the operator at will to operate

said locking means to release said clamping member.

36. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, a member for clamping the work in the position determined by said gaging means, means for operating said clamping member to force it yieldingly against the work, positive means for locking the clamping member after it has been thus yieldingly operated, a member movable to start the power operation of the machine only when the work has been clamped in the position determined by said gaging means, and fluid-pressure means under control of the operator for operating said locking means to release said clamping member.

37. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, a member for clamping the work in the position determined by said gaging means, means for operating said clamping member to force it yieldingly against the work, positive means for locking said clamping member after it has been thus yieldingly operated, a member movable to start the power operation of the machine, means controlled by said gaging means for releasing the starting lever for movement in the direction to start the machine only when the work has been clamped in the position determined by said gaging means, means movable by the operator for operating said locking means to release said clamping member, and additional means for operating said locking means alternatively by power.

38. In a power-operated machine, an operating tool, gaging means for determining the position of the work relatively to said operating tool, a member for clamping the work in the position determined by said gaging means, means for operating said clamping member to force it yieldingly against the work, positive means for locking said clamping member after it has been thus yieldingly operated, a member movable to start the power operation of the machine, electrical means controlled by said gaging means for releasing said starting member for movement in the direction to start the machine only when the work is clamped in the position determined by said gaging means, and fluid-pressure means under control of the operator for operating said locking means at will to release said clamping member.

39. In a machine for operating upon lasts, a drill, a bushing-inserting tool, means for positioning lasts of different sizes in predetermined relation to said drill and tool, a support for the top of the last, means for operating said support to force it yieldingly against the last, positive means for locking the support after it has been thus yieldingly operated and before the drill operates on the last, power-operated means for operating said drill and tool alternately to drill a hole in the last and then to insert a bushing into said hole, and automatic means for operating said locking means to release said last support after the last has been operated upon by said tool.

40. In a machine for operating upon lasts, a drill for drilling a hole in a last, a tool for inserting a bushing into said hole, means for positioning a last in predetermined relation to said drill and tool, a support for the last, means for operating said support to force it yieldingly

against the last, positive means for locking the support after it has been thus yieldingly operated, power-operated means for operating said drill and tool alternately, a carrier movable in one direction to move said drill out of operative relation to the last and to position the tool in operative relation to the last after the drilling operation has been completed and then movable reversely to its initial starting position, and mechanism operative in response to the reverse movement of said carrier for operating said locking means to release said last support.

41. In a machine for operating upon lasts, a drill for drilling a hole in a last, a tool for inserting a bushing into said hole, means for positioning a last in predetermined relation to said drill and tool, a member for clamping the last in the position determined by said means, means for positively supporting said member while in clamping position comprising a block movable with said member, a second block, a wedge on which said second block is mounted and a spring-operated lever for moving said wedge in the di-

rection to carry said second block into engagement with a shoulder on said first block and for thereafter moving the wedge relatively to said second block to force it into locking engagement with said first block, power-operated means for operating said drill and tool alternately, a carrier movable in one direction to move the drill out of operative relation to the last and to position the tool in operative relation to the last after the drilling operation and then movable reversely to its initial starting position, and means for connecting said spring-operated lever and the carrier substantially at the end of the movement of the carrier to position the tool in operative relation to the last to cause the carrier during its reverse movement to swing said lever against the resistance of its operating spring in the direction to move said wedge reversely to carry the second block out of engagement with said first block and thus to release said clamping member.

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