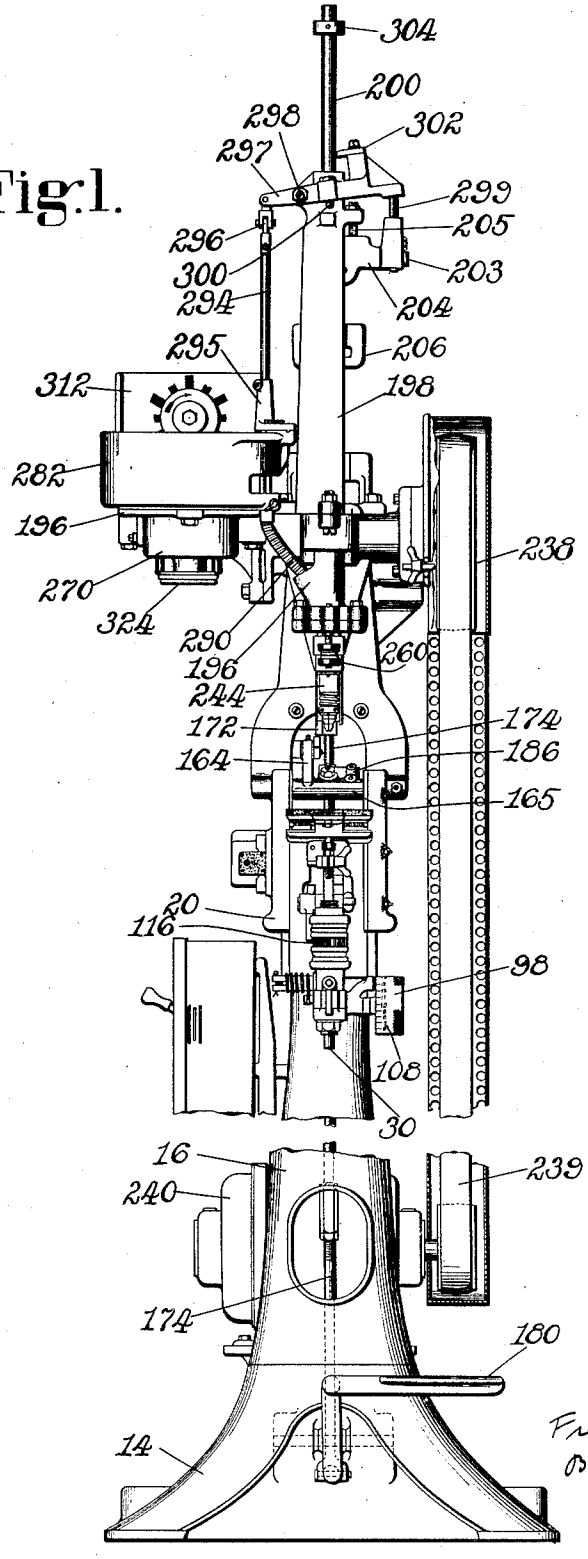
Feb. 27, 1934. F. E. BERTRAND 1,948,499

MACHINE FOR ATTACHING HEELS TO SHOES

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Fig. 1.



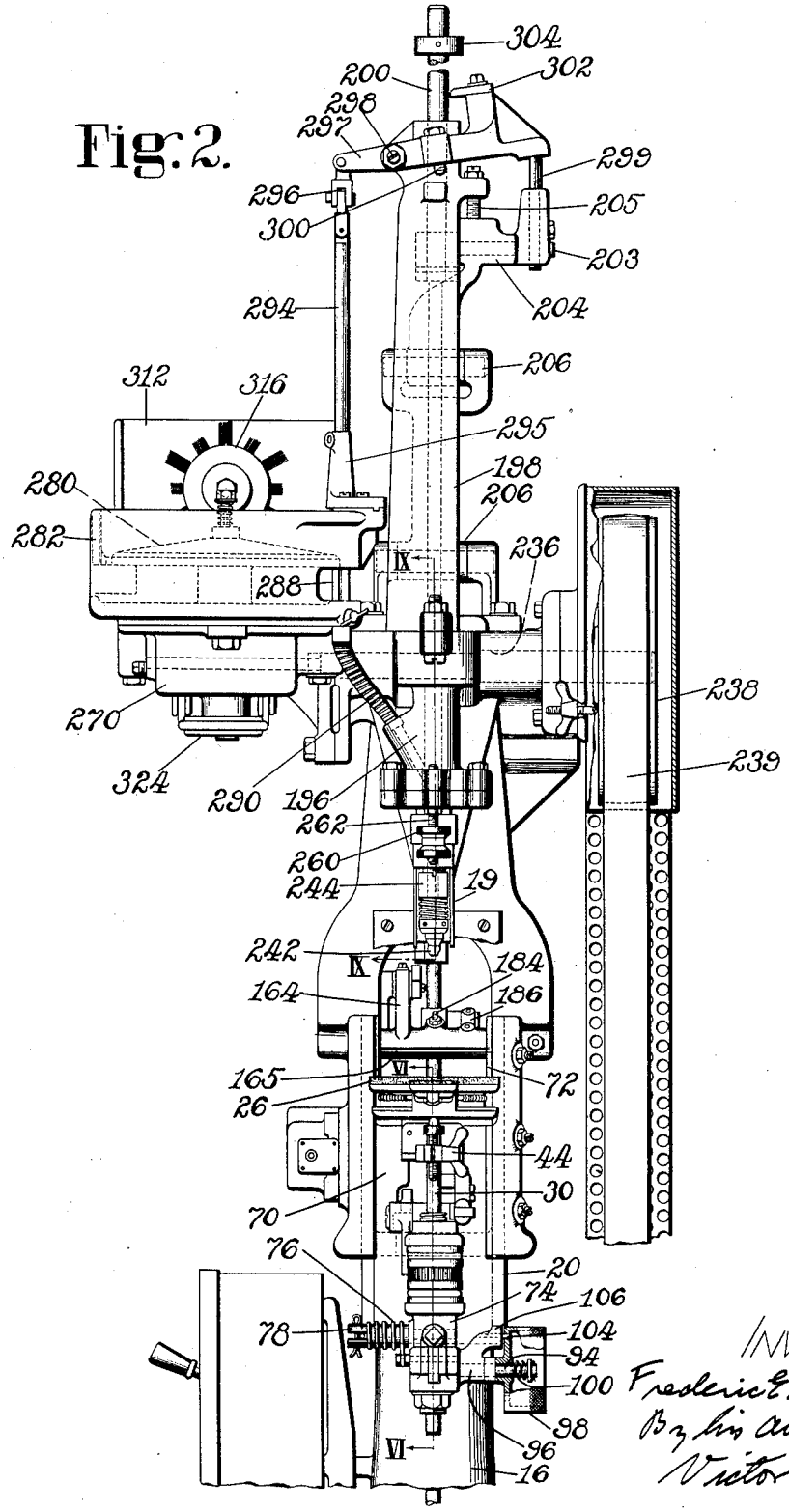
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MACHINE FOR ATTACHING HEELS TO SHOES

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Fig. 2.



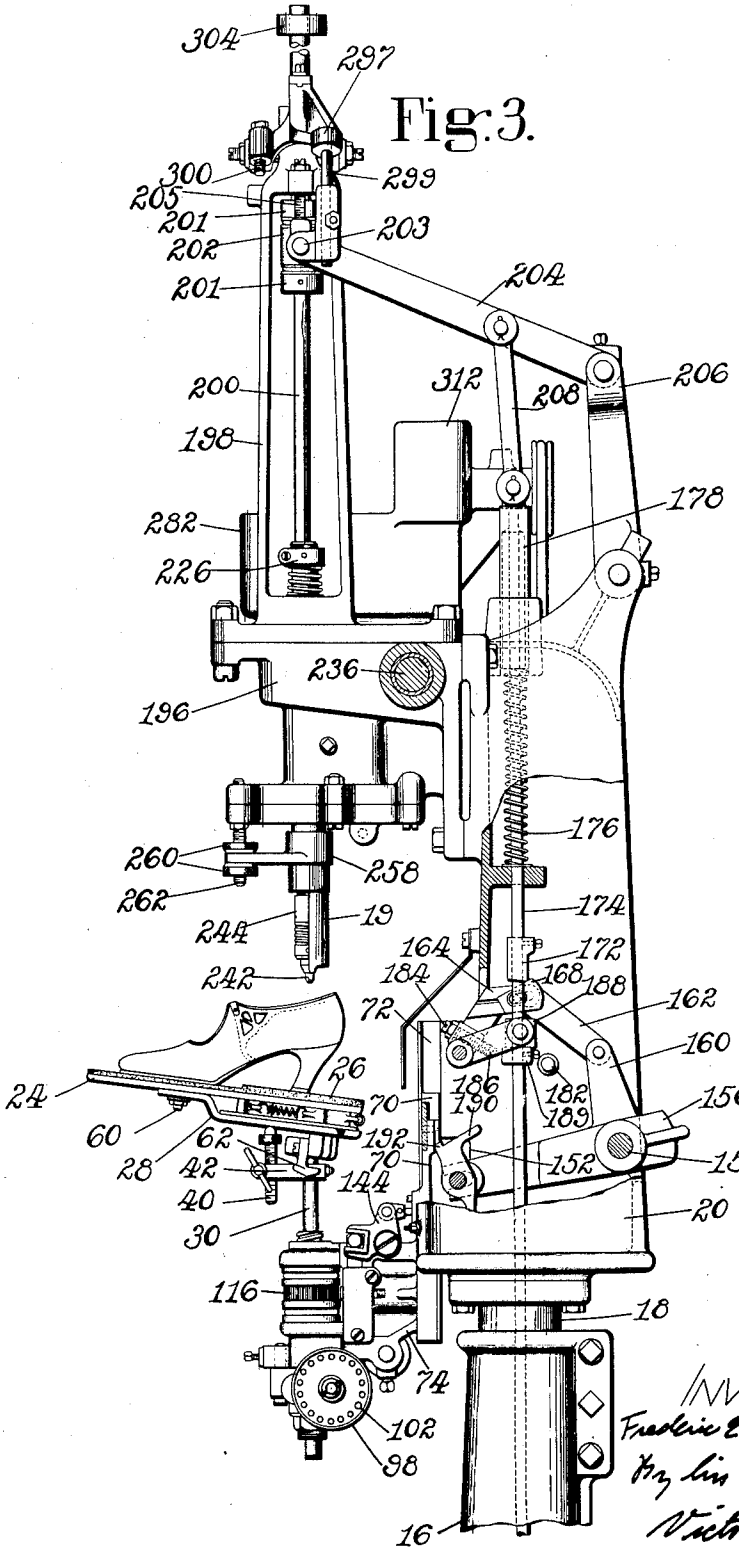
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MACHINE FOR ATTACHING HEELS TO SHOES

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Fig. 3.



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MACHINE FOR ATTACHING HEELS TO SHOES

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Fig. 4.

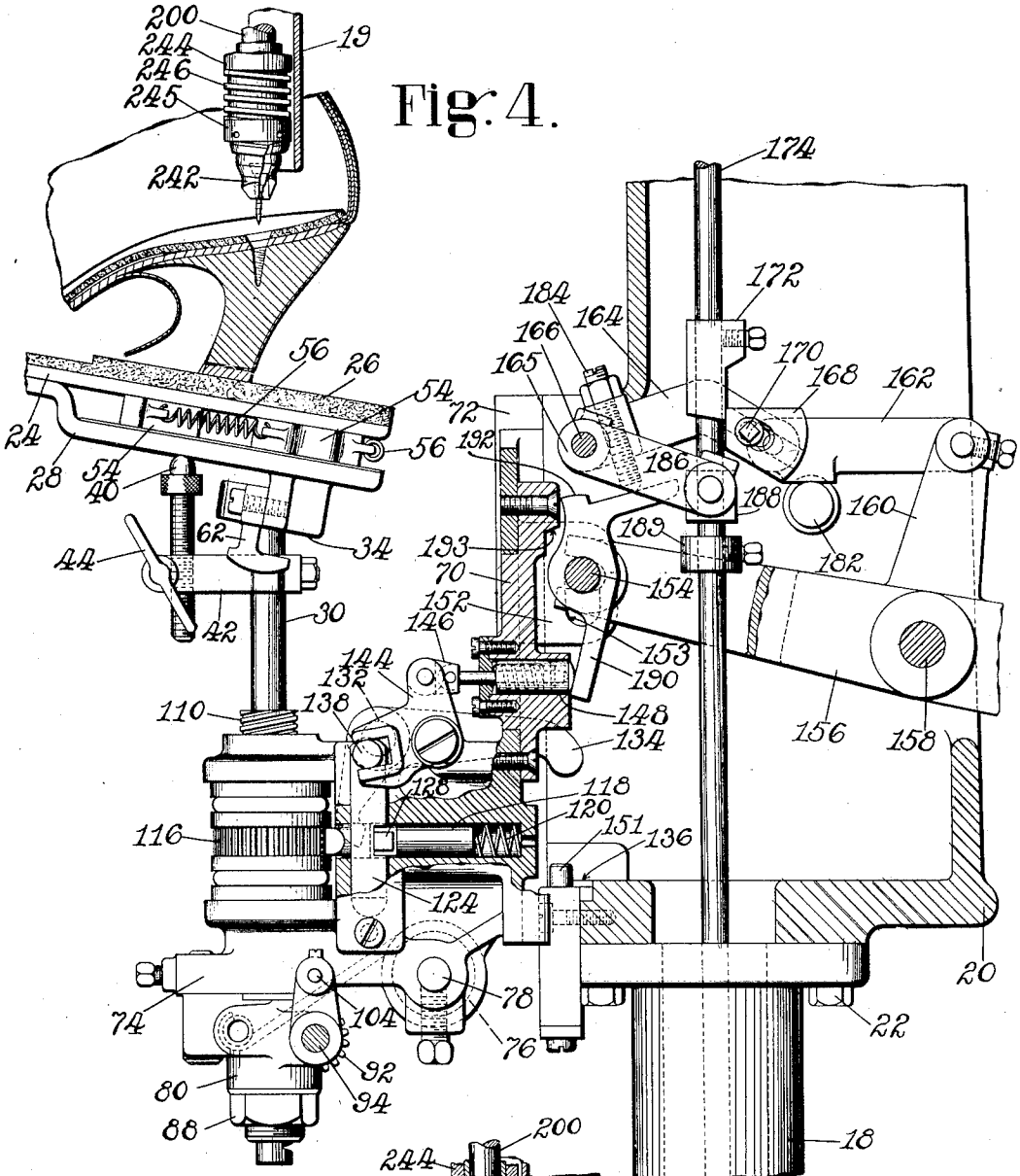
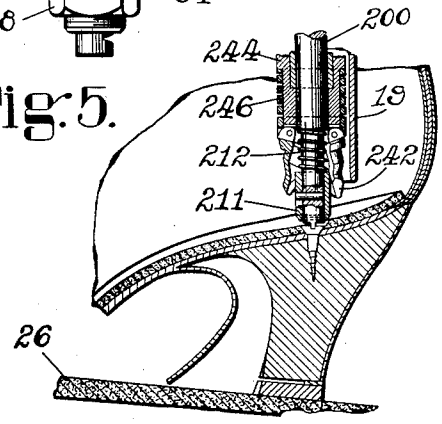


Fig. 5.



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Fig. 6.

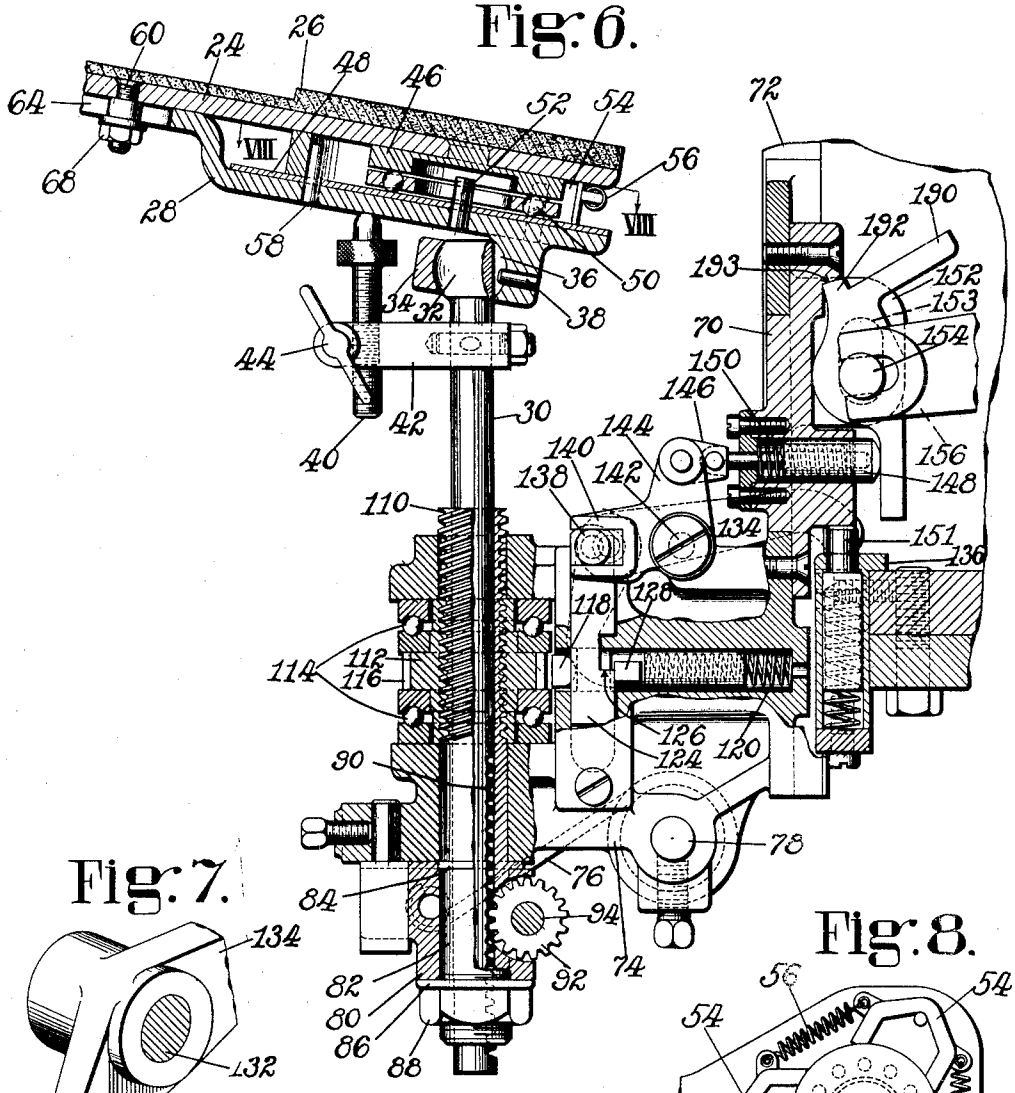


Fig. 7.

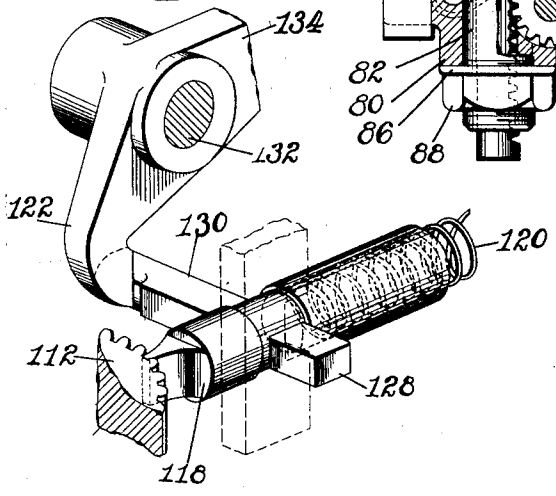
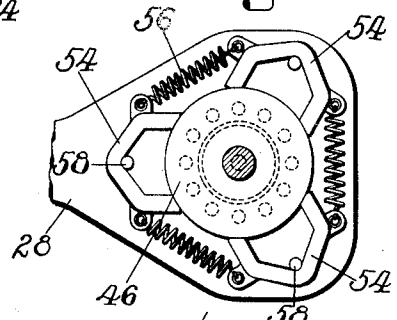


Fig. 8.



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MACHINE FOR ATTACHING HEELS TO SHOES

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Fig. 9.

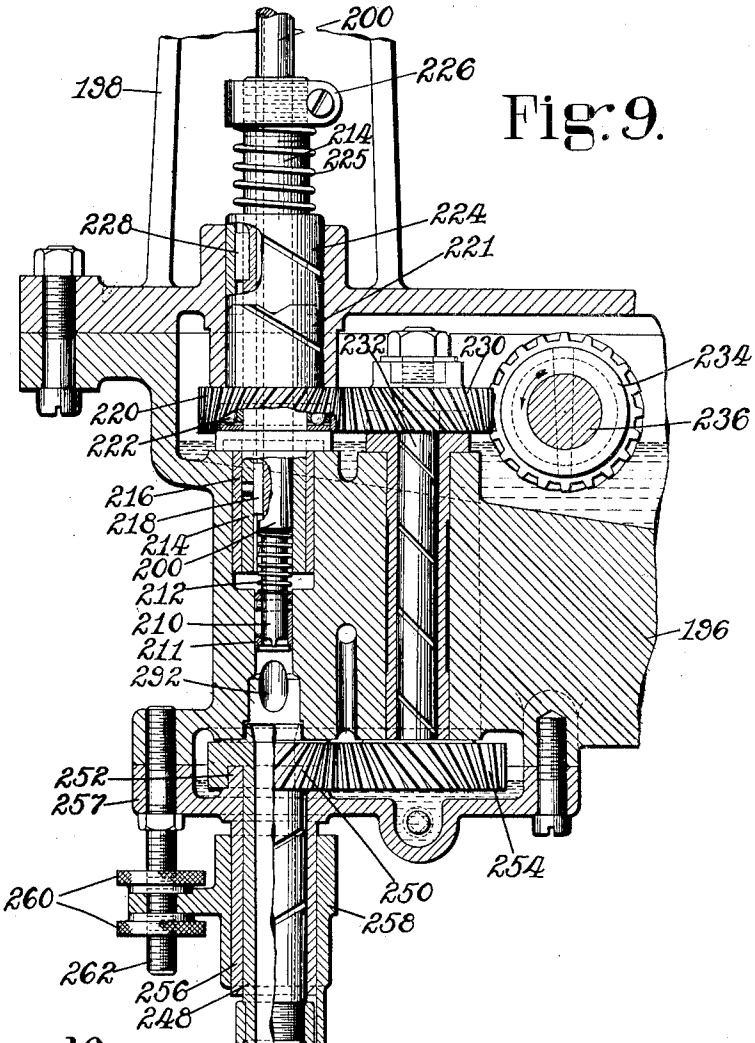
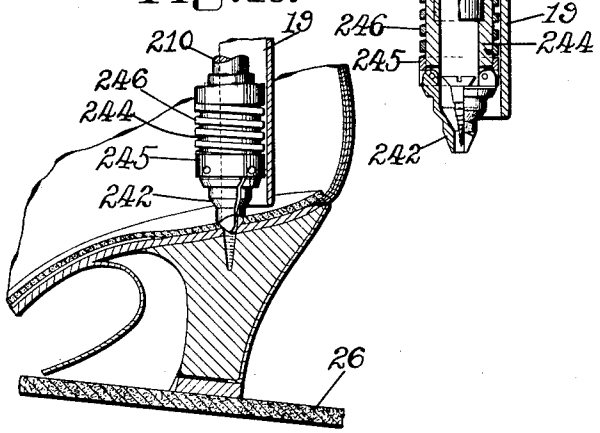


Fig. 10.



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Fig:11.

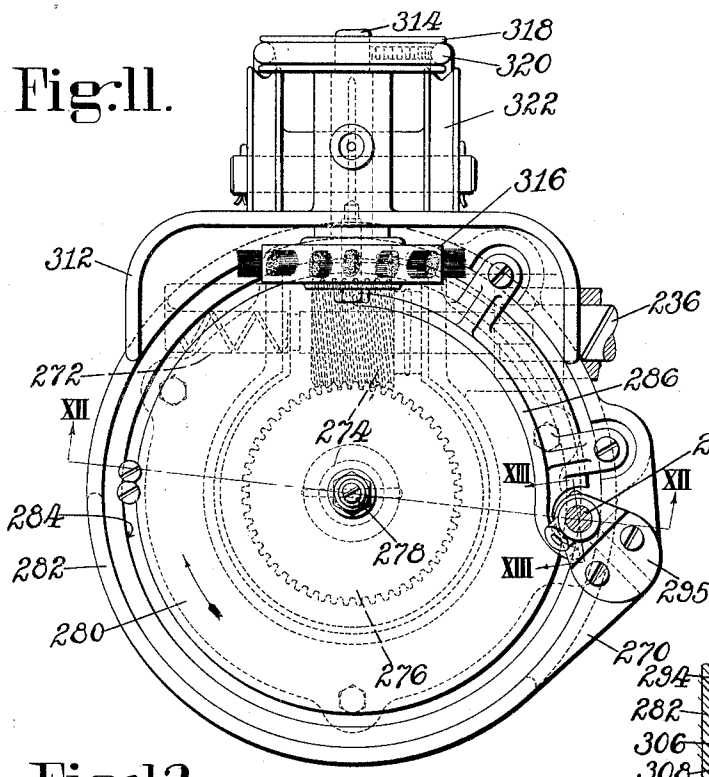


Fig:13.

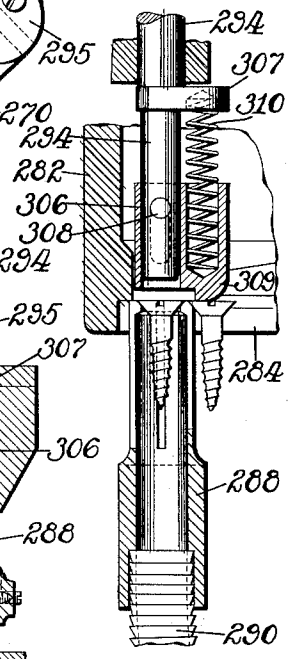
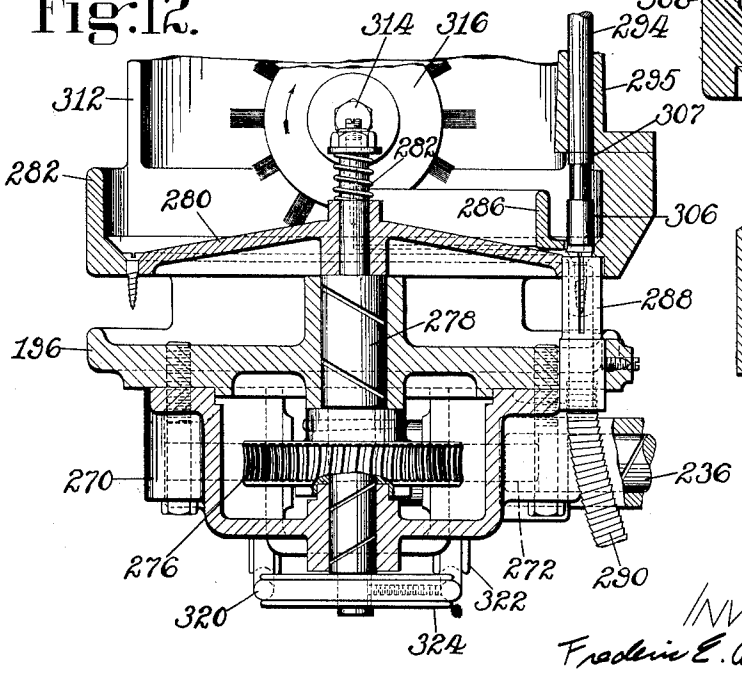


Fig:12.



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UNITED STATES PATENT OFFICE

1,948,499

MACHINE FOR ATTACHING HEELS TO SHOES

Frederic E. Bertrand, Lynn, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Application July 18, 1931. Serial No. 551,631

37 Claims. (Cl. 12—42)

This invention relates to machines for operating upon heels, and more especially to machines for attaching heels to shoes by one or more fastenings driven from the inside of the shoe through the heel seat of the shoe and into the heel.

In one aspect my invention consists in a machine organized to insert screws for permanently attaching a heel to a shoe after the heel has been partially attached or otherwise positioned on the shoe. In practice the preliminary attaching operation is effected by gluing or nailing or by inserting a temporary screw fastening through a hole in the last in accordance with the method described in U. S. Letters Patent 1,615,258, granted January 25, 1927 upon an application of M. V. Bresnahan. By whatever process the heel is positioned upon the shoe, it is advantageous to drill the heel and countersink the sole preparatory to inserting permanent attaching screws in order to improve the accuracy of the operation, avoid the danger of splitting the heel, in the case of wood heels, and insure a smooth heel seat under the foot of the wearer. The machine of the present invention is particularly well adapted to operate upon shoes which have been brought to this stage in their manufacture and have such a hole in the heel seat which is to be located and countersunk to receive an attaching screw. Shoes made by the method disclosed in the patent above mentioned have a suitable hole provided when the temporary fastening is withdrawn and those in which other temporary fastening means are used may be drilled preparatory to presenting them to the machine herein disclosed.

One important feature of the invention consists in a work support having the property of free transverse movement for the purpose of permitting the supported shoe to center itself with respect to the countersinking tool and to accommodate variations in the angle of the tread face of the shoe. It will be understood that in presenting a shoe having a previously drilled heel seat, it is important that the tapering countersinking tool should be centered with respect to the axis of the hole. As herein shown, this is effected by providing the work support with a table which is freely movable transversely to the axis of the countersinking tool. In addition to its capacity for adjustment in this manner, the table is also mounted for universal angular adjustment so that the heel seat surface in which the screw is to be inserted may be positioned normally with respect to the inserting movement of the screw.

An important feature of the invention consists in the combination with a work support of means for countersinking a hole in the shoe and means for driving a fastening through the countersunk hole into the heel. In this connection invention is also to be recognized in a movable work support associated with means for moving it to one position to present the work for countersinking and then to another position where the work is disengaged from the countersinking tool and the fastening is driven.

In the illustrated machine the fastening driving tool is a screw driver which rotates about the same axis as the countersink, the latter being constructed and arranged to open or expand and permit the screw driver and a screw to pass through it. The timing of the movements of the work support is such that the work and the countersinking tool are sufficiently separated to permit the tool to open freely when the screw and screw driver are projected through it.

Both the screw driver and the countersinking tool may rotate continuously and, in accordance with a further feature of the invention, treadle-operated mechanism may be provided for effecting, in proper time relation, the movements of approach and separation of the work support and tools, a complete cycle of operation being preferably carried out for each complete depression of the treadle.

Another important feature of my invention consists in the combination with countersinking and screw driving tools of mechanism for automatically delivering a screw in position to be inserted at the conclusion of the countersinking operation. As herein shown, the expansible countersinking tool is provided with a tubular passage through which the driving tool is advanced when the countersinking operation is completed. Assorting and delivering mechanism is provided which supplies a screw to this tubular passage at the proper time in the cycle of the machine to be advanced by the driving tool upon the completion of the countersinking operation.

The machine of my invention may be employed for rapidly, effectively and accurately driving permanent fastenings, such as wood screws, in exactly the desired location in the heel seat and to precisely the right depth to produce a permanent and reliable attachment of the heel to the shoe. From this standpoint, mechanism for countersinking the screw hole is not necessarily an essential part of the invention, although when incorporated in a unitary machine and combined with the novel screw driving mechanism of my invention certain important advantages are secured which will be hereinafter pointed out.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings, in which

Fig. 1 is a view of the entire machine in front elevation;

Fig. 2 is a similar view upon an enlarged scale of the upper portion of the machine;

Fig. 3 is a view in side elevation of the upper portion of the machine with parts broken away to reveal some of the internal mechanism;

Fig. 4 is a view partly in side elevation and partly in section showing the work support and cooperating mechanism in position for driving a screw;

Fig. 5 is a vertical sectional view showing the relation of the screw driver and the countersinking tool when a screw has been completely driven;

Fig. 6 is a vertical sectional view upon an enlarged scale of the work support and associated parts;

Fig. 7 is a perspective view of a detail of the work support locking mechanism;

Fig. 8 is a plan view of the rear portion of the work table carrier;

Fig. 9 is a vertical sectional view showing the mechanism for driving the countersinking tool and the screw driver;

Fig. 10 is a view similar to Fig. 5 but showing the relative position of the work and the countersinking tool at the termination of the operation of the latter;

Fig. 11 is a plan view of the screw assorting mechanism;

Fig. 12 is a vertical section upon the line XII—XII of Fig. 11; and

Fig. 13 is a vertical section on the line XIII—XIII of Fig. 11.

Before proceeding to a detailed description of the construction of the machine, it will be convenient to refer briefly to the principal instrumentalities thereof in order at the outset to have a clear idea of its manner of operation. The head 20 of the machine carries a combined countersinking and screw driving tool, the elements of which are concentric and rotate about a vertical axis and are arranged to operate upon a shoe presented in a position determined by a stationary but vertically adjustable gage member 19. Arranged in alignment with and beneath the countersinking and driving tool and the gage 19 is a work table 24 adapted to receive a shoe with its heel positioned thereon and in upright position so that its heel seat is located directly beneath the countersinking and driving tool. The work table is freely movable in all directions transversely to the axis of the tool so that a previously drilled hole in the heel seat may be brought into line with the tool and so that the table may shift with the shoe as the latter centers itself with respect to the tool. The table is moved upwardly in a yielding manner by depressing the treadle and during this upward yielding movement the countersinking operation is effected. Immediately thereafter the table is dropped vertically a predetermined distance and locked rigidly in position. This carries the countersinking tool away from the sole and so affords space for an attaching screw to be automatically delivered to the countersunk hole, and in the continued depression of the treadle the driving element of the tool is advanced to insert the screw, leaving its head flush with the inner surface of the sole. When the treadle is released the table is restored to its initial lowered position and the driving element is retracted in readiness for a repetition of the cycle.

The machine base 14 supports a hollow upright standard 16 in which is adjustably clamped a vertical column 18. The head 20, consisting of a hollow casting, is secured to the upper end of the column 18 by bolts 22 and affords means for supporting the operating mechanism of the machine.

The work support is supported by connections with the head 20 and consists of a floating table 24 (see Figs. 3, 4, and 6) to the upper surface of which is secured a cover 26 of rubber, or similar material, which will afford a firm, non-slipping surface upon which a shoe, with a heel temporarily attached thereto, may be placed. The table 24 is mounted upon a carrier 28 which in turn is supported upon the upper end of an upright post 30 by a universal joint consisting of a ball 32 formed upon the upper end of the post and a cooperating socket member 34 on the under side of the carrier. A slot 36 in the rear side of the ball 32 receives a pin 38 which projects from the carrier and prevents the latter from swinging sidewise but permits it to tip or swivel freely in all other directions. The forward portion of the carrier 28 normally rests upon the tip of a stop screw 40 which is adjustably threaded through a bracket 42 mounted upon the post 30 and may be clamped in adjusted position by a binding screw 44 in the bracket. The rocking movement from side to side of the carrier and table is confined to convenient limits by downwardly-extending stop members 62 bolted to the socket member 34 and straddling the bracket 42.

Forming a part of the table 24, or rigidly secured to the lower face thereof, is a circular boss 46 (see Fig. 6) between which and a hardened plate 48 upon the carrier 28 is interposed an annular ball bearing 50 and upon this bearing the table rests and is freely movable in all directions. A pin 52 prevents escape of the ball bearing, and the rear portion of the table is normally held centered by three keepers 54 engaging the boss 46 and normally drawn toward each other by springs 56 which tend to hold the keepers in engagement with fixed pins 58 but yield to allow the table 24 to be moved transversely in any direction.

Secured in the forward portion of the table 24 is a screw 60 having an enlarged cylindrical portion which is freely movable in a longitudinal slot 64 in the carrier 28. A washer 66 and nut 68 hold the table 24 down to the carrier but permit the forward portion of the table to slide freely lengthwise of the carrier. By virtue of the described construction the table 24 is easily movable lengthwise of the carrier 28, and in addition can swing about the axis of the screw 60 in all positions the screw may occupy in the guide slot 64.

The post 30 is carried by a slide 70 which is movable in vertical guides 72 in the stationary head 20 of the machine. The mounting of the post 30 includes a bracket 74 which is bolted to the slide 70, a coil spring 76 wound around a pin 78 projecting from one side of the bracket (see Fig. 2), and a sleeve 80 which is supported yieldingly by the outer end of the spring 76 and is secured to the lower end of a bushing 82 through which the post 30 passes. The bushing 82 is provided with a shoulder 84 between which and a washer 86 the sleeve 80 is rigidly secured by a

nut 88 threaded upon the lower end of the bushing so that the bushing and the sleeve virtually constitute an integral carrier structure which is vertically movable in a bore formed through the front portion of the bracket 74, the upper face of the sleeve being normally held up against the under side of the bracket by the spring 76.

The post 30 has a sliding fit in the bushing 82 and is provided with rack teeth 90 which are engaged by a pinion 92 secured to a shaft 94 journaled in a bearing bracket 96 which forms a part of the sleeve 80. It will be apparent that rotation of the shaft 94 will effect vertical adjustment of the post 30, and the work support carried thereby, relative to the bushing 82. For the purpose of making such adjustments, a drum 98 is mounted upon the outer end of the shaft 94 in such a manner that the shaft and drum are constrained to rotate together while the drum is permitted to move also longitudinally of the shaft. A coil spring 100 encircling the shaft 94 tends to move the drum inwardly or toward the left, as seen in Fig. 2, to cause any one of a series of holes 102 in the drum (see Fig. 3) to be engaged by a pin 104 mounted in an extension 106 of the bracket 96, to lock the shaft and, consequently, the post 30, in any desired position of vertical adjustment relatively to the sleeve 80. The drum 98 is graduated, as shown at 108 in Fig. 1, to indicate the thickness of the work for which the work support is adjusted, and when it is desired to change the adjustment to suit work of a different thickness the drum 98 is pulled toward the right, turned to the proper position, released and locked by the pin 103.

As above stated, the bushing 82, with the work support sustained therein, is arranged to yield downward against the tension of the coil spring 76. For reasons which will be explained in detail later, it is desired at certain times to lock the bushing and post to the bracket 74. For this purpose the upper portion of the bushing is provided with external multiple screw threads 110 of steep pitch which are engaged by a nut 112 arranged between upper and lower ball bearings 114 so that it may turn freely. The ball bearings are so mounted in the bracket 74 that the nut 112 is maintained in a fixed vertical position in the said bracket. Now, if the work support and bushing 82 be depressed against the tension of the spring 76 the nut 112 will spin unless it is locked against rotation. For the purpose of so locking it, and thus locking the post 30 rigidly to the bracket 74, the periphery of the nut is provided with teeth 116 arranged to be engaged by a locking bolt 118 which is under the influence of a compression spring 120 tending to force the bolt into locking engagement with the teeth 116. The position of the locking bolt 118 is determined by a lever 122 (see Fig. 7) and a vertically slidable latch 124. The latch is provided with a notch 126, as shown in Fig. 6, and the bolt has a projection 128 so disposed that when the latch is elevated the bolt is held retracted, as in Fig. 6, while, when the latch is lowered, as in Fig. 4, the projection 128 is permitted to enter the notch 126 and the spring 120 projects the bolt into locking engagement with the teeth 116. The opposite side of the bolt also has an arm or projection 130, arranged to be engaged by the lever 122 to retract the bolt and unlock the nut 112. The lever 122 constitutes one arm of a bell crank which is pivoted upon a stud 132 in the bracket 74, the other arm 134 of the bell crank extending rearward, as shown in Figs. 4 and 6. By virtue of this arrangement the rear end of the arm 134 of the bell crank engages a stationary abutment 136 in the machine head when the slide 70 is lowered, causing the lever 122 to be moved rearward and the locking bolt 118 to be retracted. As soon as the slide is raised, however, the bolt is free to be projected by the spring 120 whenever the latch 124 is moved downward to bring the notch 126 in front of the projection 128.

The position of the sliding latch 124 is controlled by mechanism which will now be described. A pin 138 in the upper portion of the latch is engaged by the bifurcated end of one arm 140 of a bell crank which is pivoted upon a stud 142 in the bracket 74. The other arm 144 of this bell crank is connected by a link 146 to a plunger 148 which is carried in the slide 70 and is under the influence of a compression spring 150 tending to move it to the right, as seen in Fig. 6, and, consequently, to raise the latch 124 to its uppermost position. At suitable times the plunger 148 is moved forwardly against the compression of the spring 150 to lower the latch 124 and permit the lock bolt 118 to operate, by means which will presently be described.

The slide 70 normally rests in its lower position upon a spring plunger 151 mounted in a casing secured to the base of the machine frame 20 and forming a yielding bumper for the slide when the latter is lowered at the conclusion of the machine cycle. The slide itself is provided with a pair of oppositely-disposed-inwardly-extending flanges 152 provided with parallel vertical slots 153. A cross pin 154 extends between the flanges 152 and fits freely within the slots 153. A forked lever 156 engages the cross pin 154 and constitutes the immediate means for lifting the slide 70. The forked lever 156 is fulcrumed upon a pin 158 extending between the sides of the frame 20 and is provided with an upwardly-extending arm 160 to which is connected a toggle comprising the link 162 connected to the arm 160 and the bent link 164 which is formed integral with a sleeve 165 journaled upon a transverse shaft 166 extending between the sides of the frame 20. When the slide occupies its lowermost position, as shown in Fig. 3, the toggle 162—164 is broken upwardly and the forward end of the lever 156 is lowered.

By straightening the toggle 162—164, the forked lever 156 is swung in a clockwise direction and the slide 70 is elevated. The toggle is straightened by treadle mechanism which will now be described. A treadle lever 180 is pivotally mounted in the machine base 14 and connected to a vertical treadle rod 174 which extends upwardly through the column 16 and the head 20. At a point above the toggle 162—164, the treadle rod 174 is provided with an adjustable contact sleeve 172 and this is arranged to bear at its lower face upon a cooperating contact piece 168 adjustably secured to the bent toggle link 164 and having an inclined upper face. The contact piece 168 is slotted and adjustably secured in position upon the link 164 by a clamping screw 170. It will be seen that as the treadle rod 174 is depressed the contact sleeve 172 will ride along the inclined surface of the contact piece 168, swinging the link 164 downwardly and straightening the toggle to the position shown in Fig. 4. A stop stud 182 projecting from the inner wall of the head frame 20 is engaged by the toggle link 162 when the toggle is straight-

ened and so prevents it from being broken past its mid position. When the toggle is moved into substantially its straightened position, as shown in Fig. 4, the lower face of the contact sleeve 172 passes off of the upper face of the contact piece 168 and thereafter the treadle rod 174 is free to be further depressed without affecting the toggle. During the straightening of the toggle and the consequent lifting of the slide 70 and the work support, the countersinking operation is effected and during the further depression of the treadle rod, which occurs after the toggle has been straightened, the screw driving operation is effected, as will be presently described.

The forked lever 156 is arranged to be connected to the slide 70 in two relative positions. To this end it is provided with a pivoted latch piece 190 having a tooth 192 which is arranged initially to engage with an overhanging shoulder 193 of the slide 70 and to lift the slide through this connection as the lever is rocked in a clockwise direction. When the lever 156 is connected to the slide 70 by the engagement of the tooth 192 with the shoulder 193, the cross pin 154 occupies a position at the lower end of the slots 153 in the flanges 152 of the slide. The latch 190 is pivotally mounted upon the cross pin 154 and is arranged to be rocked in a clockwise direction to perform two functions when the slide is lifted to a predetermined point. To this end it is provided with a downwardly-extending arm arranged to bear against the inner end of the plunger 148 and with an upwardly and rearwardly-extending arm arranged to be brought into contact with an adjustable stop screw 184 which is threaded into a boss upon the sleeve 165. By reference to Fig. 4, it will be seen that when the slide 70 is elevated sufficiently to bring the upper arm of the latch 190 into contact with the lower end of the stop screw 184, the latch is rocked in a clockwise direction so that the tooth 192 is disengaged from the shoulder 193 and the slide 70 is allowed to drop a distance determined by the length of the slots 153. In practice this drop is about one-half an inch and it is effective to withdraw the countersinking tool from the sole so that it may be expanded to permit the presentation of an attaching screw in line with the axis of the tool. Also, when the latch 190 is rocked in this manner the plunger 148 is moved toward the left, the bell crank lever 144 is rocked in a counter clockwise direction, and the latch 124 is moved downwardly to a position in which the locking bolt 118 is permited to engage the teeth 116 of the nut 112. Preferably, the adjustment of the parts is such that the locking bolt 118 is tripped slightly ahead of the release of the slide 70 and this is an advantageous sequence of operations in that it insures locking of the post 30 in vertical position before the descent of the slide 70, which might otherwise tend to disturb the relative location of these parts.

At the conclusion of the driving operation the treadle lever 180 is released and the treadle rod 174 is lifted by the action of a compression spring 176 which encircles its upper end and is interposed between a perforated boss or flange in the interior of the head frame 20 and a cylindrical cap 178 secured to the upper end of the treadle rod. In this movement the toggle 162—164 is broken upwardly by a collar 189 which is adjustably secured to the treadle rod and which encounters a block 188 pivotally connected to an arm 186 integral with the sleeve 165, above referred to. The block is vertically perforated to permit the treadle rod to pass freely therethrough. When the collar 189 encounters the block 188 the arm 186 is swung upwardly and the sleeve 165 is rocked with the link 164 so that the toggle is broken and the slide 170 allowed to drop to its initial lowermost position, wherein the locking bolt 118 is again retracted by the action of the bell crank lever 122—134.

An auxiliary head casting 196 is bolted to the face of the machine head 20 and in this are mounted the countersinking and driving tools together with the gearing for operating them. Bolted to the upper face of the casting 196 is an elongated casing member 198 in which are formed upper and lower guides for the vertical screw driver shaft 200. The shaft 200 extends upwardly through the upper end of the casing member 198 and within the casing is provided with a pair of vertically-adjustable threaded collars 201 which receive between them a swivel block 202. A pin 203 extends transversely from the block 202 and is connected to the free end of an operating lever 204. At its rear end the lever 204 is pivotally connected to a forked link 206 which, in turn, is connected to a stud extending between ears on the upper portion of the head frame 20. At an intermediate point the operating lever 204 is connected by a pair of spaced parallel links 208 to the upper end of the cylindrical cap or sleeve which is fast to the upper end of the treadle rod 174. The compression spring 176 already mentioned, therefore, acts normally to hold the operating lever 204 in its uppermost position, as shown in Fig. 3, and this is adjustably determined by a stop screw 205 threaded into a lug projecting from the upper end of the casing member 198 in position to bear against the forward end of the lever 204. On the other hand, when the treadle 180 is depressed the operating lever 204 is swung downwardly, advancing the shaft 200, and this motion continues after the work support has been located and locked, all in the continuous movement of the treadle.

The screw driver tool 210 is threaded into the lower end of the shaft 200, as best shown in Fig. 9. At its lower end it is provided with a sleeve 211 having a pin and slot connection with the tool and being normally projected slightly beyond the end thereof by a compression spring 212 which encircles the tool between the upper end of the sleeve 211 and the lower end of the shaft 200. The sleeve 211 operates to center the screw head with reference to the blade of the screw driving tool during the operation of inserting the screw and yields upwardly when the screw is fully driven into the sole. Its position at the conclusion of the driving operation is shown in Fig. 5.

The shaft 200 and the driving tool 210 are driven by mechanism which will now be described. The body of the casting 196 is provided with a bushing 216 in the bore through which the shaft 200 passes. Interposed between the bushing 216 and the shaft is a long sleeve 214, terminating flush with the bushing at its lower end and extending upwardly into the casing member 198. A key 218 is fast in the sleeve 214 and extends into a long keyway in the side of the shaft 200. The shaft 200 and the sleeve 214 are thus constrained to rotate together while the shaft is free to slide longitudinally within the sleeve. Surrounding the sleeve 214 above the bushing 216 is a gear 220 having an elongated cylindrical hub 221 with clutch teeth formed in its upper end. The gear 220 is mounted upon ball bearings 222 which rest upon the flange of the bushing 216

or similar ring member. Above the hub 221 and freely slidable upon the sleeve 214 is mounted a clutch sleeve 224 having teeth formed in its lower edge which mesh with the teeth of the gear hub 221. The sleeve 214 extends beyond the clutch sleeve 224 and is provided at its upper end with an adjustable collar 226. Between this collar and the upper end of the clutch sleeve 224 is interposed a compression spring 225 which holds the two clutch members in yielding engagement. A key 228 is fast in the sleeve 214 and arranged to slide in a vertical keyway in the clutch sleeve 224.

It will be seen, therefore, that when the gear 220 is rotated rotary motion is imparted to the sleeve 214 through the clutch sleeve 224 so long as the two clutch members are maintained in driving engagement and this is ensured by the spring 225 during the screw driving operation. When the screw is fully driven, further rotation of the screw driving tool 210 is arrested and under these circumstances the clutch sleeve rises against the compression of the spring 225 and lost motion occurs between the clutch members.

The gear 220 is driven through an intermediate gear 230 fast upon the upper end of a vertical counter shaft 232 journaled in bearings in the casting 196. The gear 230 in turn is driven by a gear 234 secured to a horizontal shaft 236 journaled in bearings in the casting 196 and carrying at its outer end a pulley 238. The pulley 238 is driven by a vertical belt 239 from a pulley fast on the end of the shaft of a motor 240 mounted near the bottom of the column 16 of the machine and furnishing motive power for the countersinking and driving tools and the screw assorting mechanism, to be presently described. The upper portion of the casting 196 is formed as an oil reservoir, as shown in Fig. 9, and the gear 234 runs in oil and so lubricates its connected gears 230 and 220.

The lower side of the casting 196 is closed by a cover plate 257 in which is formed another oil reservoir which is utilized to lubricate the driving mechanism of the countersinking tool. The countersinking tool is made in separable sections 242 pivotally connected to the lower end of a sleeve 244 which is detachably secured to the lower end of the vertically-disposed tubular hub 248 of the gear 250. The gear 250 is journaled upon an annular bearing ring 252 which projects upwardly from the inner face of the cover plate 257 while the hub 248 extends downwardly through the cover plate and beyond a tubular boss 257 which is formed integral therewith. A compression spring 246 surrounds the sleeve 244 and this bears at its lower end against a ring 245 having a tapered inner surface which acts normally to maintain the sections 242 of the countersinking tool in closed operative position.

It will be noted that the countersinking tool is thus mounted to operate at a fixed height in the machine and that it has no vertical movement. It is driven by the gear 250 which meshes with a gear 254 fast on the lower end of the vertical countershaft 232. The gear 254 is somewhat larger than the gear 230 on the upper end of the countershaft and the gearing ratio is such as to drive the countersinking tool at a higher rate of speed than the screw driving tool. It will be seen also that both of these tools are in a state of continuous rotation so long as the shaft 236 is driven.

A gage sleeve 258 surrounds the tubular boss 256 of the cover plate 257 and this is extended downwardly to form the curved elongated gage 19, already mentioned. At its lower end the gage 19 extends into proximity to the countersinking tool 242 and, consequently, limits the extent to which the countersinking tool may be forced into the sole. In Fig. 10 the countersinking tool 242 is shown in its operative position in the work and the end of the gage 19 almost at its limiting point. The gage sleeve 258 has a laterally-extending perforated arm through which passes a threaded stud 262. Upon either side of the arm are provided knurled nuts 260 by manipulating which the vertical position of the gage may be adjusted to regulate the penetration of the countersinking tool.

The mechanism for assorting and delivering screws in position to be driven after the countersinking operation will now be described. The auxiliary head casting 196 is extended laterally toward the left, as viewed from in front, and beneath this extension is secured a hollow casting 270 in which is journaled a short horizontal worm shaft 272 having a tongue and slot connection with the end of the shaft 236, already referred to. The casting 270 is secured in place by a bushing which extends into the head 196 and a supplementary attaching bolt and may be readily removed as a unit with the worm shaft contained therein. The shaft 272 carries a worm 274 which is arranged to mesh with a worm wheel 276 fast upon a vertical shaft 278 journaled in an upper bearing formed in the casting 196 and in a lower bearing formed in the casting 270. At its upper end the shaft 270 carries a convex disk 280 which constitutes the rotary bottom of a hopper in which the screws are contained in mass. The cylindrical body 282 of the hopper is secured to the upper side of the extension of the auxiliary head casting 196 and between the rotary bottom of the hopper and its stationary wall is formed a circumferential groove 284 of a width suitable to receive the body of a screw which may be suspended by its head. The action of the rotary bottom 280 is to agitate the screws, causing them to enter the slot and then advance in clockwise direction to the discharge port. A segmental guard 286 extends over the groove 284 in the vicinity of the discharge port for the purpose of preventing displacement of those screws which have been properly positioned by those contained in mass in the hopper.

The discharge port of the hopper is formed by a vertically-extending sleeve 288 secured in the casting 196 and extending upwardly into a position adjacent to the periphery of the hopper bottom 280 and in alignment with the circumferential groove 284. The upper end of the sleeve 288 is split, resilient in character and of a size to arrest and hold a screw in concentric position therein, as shown in Fig. 13. It is provided in one side with an opening through which the screws may be delivered to it successively from the slot 284. Screws so delivered are forced downwardly into the sleeve 288, and thus freed from engagement with its upper edge, by a vertically-moving plunger, which will be presently described, and when so released pass down through the sleeve and into a flexible conduit 290, by which they are conducted to an inlet opening 292 in the casting 196. The inlet opening 292 leads into the bore in which the driving tool 210 is mounted, at a point below the end of the tool. A screw entering the bore by this opening 292 will drop through the tubular hub 248 of the gear 250 into the countersinking tool 242, where it will be held in concentric position, as shown in Fig. 9.

The body 282 of the hopper is provided with an upwardly-extending wall 312 in which is journaled a horizontal shaft 314 carrying at its inner end a rotary brush 316 which is arranged to clear the groove 284 of improperly located screws at the entering end of the guard 286. At its outer end the shaft 314 carries a grooved pulley 318 over which runs a round belt 320. This is guided downwardly by idle pulleys 322 and passes about a driving pulley 324 fast to the lower end of the vertical shaft 278. The brush 316 is thus driven from the same shaft which operates the rotary hopper bottom 280.

The mechanism for effecting and timing the discharge of screws from the hopper will now be described. Secured to a portion of the wall 312 is a bearing bracket 295 in which is guided a vertical ejector rod 294 connected at its upper end through a universal joint 296 to one end of a rocker lever 297. The rocker lever 297 is forked to straddle the upper end of the casing member 198 and fulcrumed upon a stud 298 therein. At its free end it extends above a pin 299 which projects vertically and adjustably from a boss formed on the end of the operating lever 204. The lever 297 also carries an adjustable stop screw 300 which cooperates with the lug on the casing member 198 to limit the movement of the lever in one direction and has an upwardly-extending arm to which is secured a contact piece 302. The latter extends in range of a collar 304 secured to the upper end of the driving rod 200. It will be apparent that the lever 297 is rocked in a counterclockwise direction when the operating lever 204 is moved upwardly and in a clockwise direction when the driving rod 200 is moved downwardly, there being considerable lost motion between the collar 204 and contact piece 302.

At its lower end the ejecting rod 294 carries a loose foot 306 which is held upon the end of the rod for limited sliding movement by a transverse pin 308 which extends into a slot in the foot. The foot has a socket in one side in which is received a compression spring 310 which bears at its upper end against an arm 307 projecting from the ejecting rod. Formed on the lower face of the foot 306 is a tooth or projection 309 which is arranged to engage the head of the endmost screw in the groove 284 and cause the latter to assume a vertical position or to tilt it away from the discharge port, thus avoiding the possibility of interference with a screw which is being discharged by the direct action of the ejecting rod itself. The construction of these parts is best shown in Fig. 13, from which it will be apparent that when the ejecting rod is depressed, as it is when the operating lever 204 is lifted at the conclusion of the machine cycle, the end of the rod will engage the head of the screw suspended in the sleeve 288, forcing it downwardly and freeing it so that it may drop. At the same time the tooth 309 will engage the head of the adjacent screw, positioning it while the ejecting rod is moved downwardly through the foot 306.

The operation of the illustrated machine will be clear from the foregoing description but for convenience will be summarized as follows. Fig. 3 shows the machine in its initial position, the shoe supports being lowered and the nut 112 unlocked, while the operating lever 204 and shaft 200 occupy their uppermost position. The operator first presents to the work table a shoe having its heel in place thereon, temporarily or partially secured, and having a hole drilled through the heel seat and into the heel. The operator then depresses the treadle 180, elevating the slide 70 and the work table yieldingly through the medium of the spring 76, the nut 112 remaining unlocked. In this operation the work table is moved transversely by the operator as the shoe is elevated until the tapering countersinking tool 242 finds the hole in the sole. As the countersinking tool is meanwhile rotating at a high rate of speed, it will tend to shift the shoe and center the same with respect to its axis of rotation and in this operation the free transverse movement of the table is of substantial benefit. Continued depression of the treadle by the operator forces the shoe upon the countersinking tool and the hole is countersunk to a depth determined by the setting of the gage 19. In this operation the work table is free to tilt or swivel. Thus the shoe is accommodated and adjusted to the action of the countersinking tool regardless of the angle of the heel or the tread surface of the shoe.

During the movement of the shoe which effects the countersinking operation, the nut 112 is free to spin and thus lost motion occurs between the work table and the slide 70. This lost motion is regulated to take care of variations in the height of heel and thickness of sole and is always sufficient fully to effect the countersinking operation in the shoe having the lowest heel being handled. The higher the heel the greater the amount of lost motion permitted by the spinning of the nut 112. To accommodate shoes having a greater variation in height of heel an initial adjustment in the height of the post 30 is effected by turning the drum 98 and this adjustment, of course, is effected without disturbing the manner of operation above outlined.

The upward movement of the slide 70 continues as the treadle is depressed and after the completion of the countersinking operation until the latch 190 reaches its tripping position, whereupon the latch 124 is moved to release the locking bolt 118 and the tooth 192 is disengaged from the slide 70, allowing the whole work support assembly to drop with the shoe away from the countersinking tool. Meanwhile, as the final step in the preceding cycle, a screw has been discharged from the hopper and delivered through the inlet port 292 to the interior of the countersinking tool, as shown in Fig. 9. In the further and continued depression of the treadle, the contact sleeve 172 passes off the contact piece 168 and the treadle rod 174 is moved downwardly independently of the toggle 162—164, leaving the work support locked in position by the nut 112. The screw driving tool 210 is thus advanced through the tubular barrel of the countersinking tool, being in a continued state of rotation. It finally encounters the head of the screw, centering the same by the action of the sleeve 211 and thereupon forces the rotating screw out between the expansible sections of the countersinking tool and into the countersunk hole which is awaiting it. Continued depression of the treadle fully drives the screw into the heel and when further rotation of the screw driver is arrested the clutch 221—224 releases the driving tool and the clutch teeth click over each other. The operator thereupon releases the treadle and the parts return to their initial position. As a final step in this sequence of operations, the lever 297 is rocked and a screw ejected from the hopper into the discharge port 288.

It will be noted that I have provided an organized machine operating by a single continuous de-

pression of the treadle to perform a long sequence of related steps. These include the initial lifting of the work support for locating and countersinking, the retraction of the work support to permit the countersinking tool to be expanded, the locking of the work support, the advancing of the driving tool to a variable point to effect the full driving operation regardless of the thickness of the work interposed, and finally the control of the delivery of screws to the work. It will be apparent, therefore, that the machine is particularly well adapted for operation at high speed and for reliably carrying out its intended functions without requiring undue skill on the part of the operator.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine for operating on heels, having in combination, a frame, a power driven countersinking tool mounted therein, an oppositely-disposed support for a shoe having its heel in place thereon, means for relatively moving the support and tool, and means for so mounting the support that it may move freely with the shoe transversely to the axis of said tool, thereby permitting the shoe to center itself on the tool with respect to a previously formed hole in its heel seat.

2. A machine for operating on heels, having in combination, a driven countersinking tool, a table for a shoe having its heel in place thereon, a flat carrier beneath the table, anti-friction bearings between the table and the carrier positioning the former for free movement transversely of the axis of the tool, and stops for limiting the range of such free movement.

3. A machine for operating on heels, having in combination, a driven overhead tool, a table having a friction surface adapted to support the tread face of a shoe having its heel in place thereon, anti-friction bearings beneath the heel end of said table, and a sliding pivotal connection to the forepart end thereof.

4. A machine for operating on heels, having in combination, countersinking and driving tools, an oppositely-disposed table for supporting the tread face of a shoe with its heel in place thereon, a pivot connection for the forepart end of the table, anti-friction bearings for the heel end of the table, and supporting means constructed and arranged to permit tilting of the table about a longitudinal axis.

5. A machine for operating on heels, having in combination, countersinking and driving tools, an oppositely-disposed table for supporting the tread face of a shoe with its heel in place thereon, a pivot connection for the forepart end of the table, anti-friction bearings for the heel end of the table, supporting connections permitting the table to adjust itself angularly under the shoe, and means for bodily adjusting the height of said table.

6. A machine for operating on heels, having in combination, a combined countersinking and driving tool, a vertically-movable post disposed in alignment therewith, a carrier mounted to swing and tilt upon said post, a table having a non-slipping covering and being adapted to support the tread face of a shoe with its heel in place thereon, connections for guiding the forepart end of the table for movement longitudinally with the shoe supported thereon, anti-friction bearings for the heel end of the table, and means for yieldingly maintaining the same in a central position.

7. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support, and means for moving the support toward the tools to effect the countersinking operation constructed and arranged automatically to drop the support away from the tools at the conclusion of the countersinking operation and preparatory to the driving operation.

8. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support, means for moving the support toward the tools to effect the countersinking operation constructed and arranged to drop the support away from the tools at the conclusion of the countersinking operation, and means for thereafter advancing the driving tool.

9. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support, a treadle, and connecting mechanism for moving the support toward the tools to effect the countersinking operation as the treadle is depressed constructed and arranged to drop the support away from the tools at the conclusion of the countersinking operation and thereupon to advance the driving tool.

10. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support, and means for moving the shoe support toward said tools in a yielding manner to a predetermined point and thereupon to release said support for limited movement away from said tools.

11. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support, and a lever having a lost-motion connection with said support and being operated to lift the support toward the tools and then release it to drop a distance determined by said lost-motion connection.

12. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support, an operating lever having a lost motion connection therewith, a latch movable with the support and lever to a predetermined position, and an adjustable stop for tripping the latch in said position to permit the support to recede a distance determined by said lost motion connection.

13. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support including a post having yielding positioning means, operating mechanism for advancing the post to a predetermined point through said yielding positioning means, and means governed by the position of the shoe support for locking the post in fixed position.

14. A machine for operating on heels, having in combination, countersinking and driving tools, a shoe support including a post having a threaded nut thereon, treadle mechanism for advancing the post toward the tools while the nut is free to rotate on the post, and means for automatically locking the nut when the post reaches substantially its point of nearest approach to the tools.

15. A machine for operating on heels, having in combination, a frame, a shoe support, a countersinking tool mounted in the frame, means for effecting relative approaching movement of the support and tool to effect the countersinking operation, a driving tool movable thereafter to insert a screw in the countersunk hole, and power driven mechanism for operating both tools.

16. A machine for operating on heels, having in combination, a shoe support, a countersinking tool, operating mechanism for effecting rela-

tive approaching movement of the support and tool to effect the countersinking operation, a driving tool arranged to be moved by said mechanism to insert a screw after the countersinking operation, means for positioning both tools in the machine, and power driven mechanism for operating them.

17. A machine for operating on heels, having in combination, a shoe support, a countersinking tool, operating mechanism for moving the support toward the tool to effect the countersinking operation, and a driving tool connected to said mechanism and arranged to be moved thereby toward the work support after the countersinking operation.

18. A machine for operating on heels, having in combination, a shoe support, a countersinking tool, operating mechanism for yieldingly moving the support toward said tool to countersink the shoe, means for locking the support, and a driving tool arranged to be moved toward the locked support after the countersinking operation.

19. A machine for operating on heels, having in combination, a shoe support, a continuously rotated countersinking tool, means for effecting relative approaching movement of the support and the rotating tool to effect a countersinking operation, a rotary driving tool movable thereafter to insert a screw in the countersunk hole, and power driven mechanism for operating both tools.

20. A machine for operating on heels, having in combination, a shoe support, a countersinking tool operating at a fixed location in the machine, means for rotating said tool, operating mechanism for moving the support toward said tool to effect a countersinking operation and thereafter to drop the support at the conclusion thereof, and a rotary driving tool connected to said mechanism and arranged to be moved thereby toward the supported shoe.

21. A machine for operating on heels, having in combination, a shoe support, rotary countersinking and driving tools arranged in axial alignment, operating trains communicating with the respective tools in separated locations, and means for automatically delivering a screw in a position between said trains.

22. A machine for operating on heels, having in combination, rotary countersinking and driving tools arranged to act successively, a shoe support including a post having a threaded nut thereon, mechanism for advancing the support and post toward the tools while the nut is free to rotate, and a single controlling device operating at a predetermined point in the path of said support to cause locking of said nut and movement of the post away from said tools.

23. A machine for operating on heels, having in combination, rotary countersinking and driving tools arranged for successive operation, a shoe support having a movably mounted post therein, mechanism including a latch piece for advancing the support toward the tools while the post is free to move therein, and means for tripping the latch at a predetermined point in the path of the support, whereby the support is released to a limited extent and the post is locked at substantially the same time.

24. A machine for operating on heels, having in combination, a rotary countersinking tool, a shoe support movable relatively to said tool to present a shoe thereto and effect the insertion of the countersinking tool therein to a predetermined depth, means for automatically freeing the tool from the shoe when it has reached that depth, and means for thereafter inserting a screw in the countersunk hole.

25. A machine for operating on heels, having in combination, rotary countersinking and driving tools arranged for successive operation, a shoe support including a slide carrying a movably mounted post, means for adjusting the post with respect to the slide, separate means for locking the post, and a latch for controlling said locking means arranged to be tripped upon the movement of the slide to a predetermined point in its path.

26. A machine for operating on heels, having in combination, rotary countersinking and driving tools arranged to operate successively, a shoe support including a slide, a threaded post carried thereby and having a nut which is initially free to spin thereon, means for adjusting the post with respect to the slide and through said nut, locking means for the nut, and a latch for tripping said locking means at a predetermined point in the path of the slide.

27. A machine for operating on heels, having in combination, rotary countersinking and driving tools, a shoe support including a reciprocatory carrier, a threaded post mounted therein and having a nut thereon, a sleeve in which the post is mounted, means for yieldingly supporting the same, means for adjusting the post in the sleeve while the nut is free to spin thereon, and means for automatically locking the nut at a predetermined point in the cycle of the machine and so holding the post in position independently of said sleeve.

28. A machine for operating on heels, having in combination, a driven tool, a shoe support including a reciprocatory carrier, a threaded post mounted therein and having a nut thereon, a locking member for the nut normally tending to engage and lock the nut to position the post positively in the carrier, and separate mechanisms for retracting said locking member, one being operative in the initial position of the carrier and the other at a predetermined point in its path of movement toward said driven tool.

29. A machine for operating on heels, having in combination, a driven tool, a shoe support including a reciprocatory slide carrying a threaded post, a nut rotatable on the post, a spring locking bolt for the nut, mechanism including a lever arranged to retract the bolt when the slide is moved to its initial position, and mechanism including a latch initially maintaining said bolt in retracted position and arranged to be tripped when the slide is moved to a predetermined point in its path.

30. A machine for operating on heels, having in combination, a driven tool, a shoe support including a reciprocatory slide carrying a relatively movable post, a nut rotatable on the post and a locking bolt associated therewith and tending always to engage said nut, an operating lever having a lost motion connection with the slide and carrying a pivoted latch, means for positively retracting said locking bolt when the slide occupies its initial position, a sliding latch for thereafter maintaining said locking bolt retracted, and an adjustable stop for tripping said pivoted latch at a predetermined point in the movement of the slide toward the tool to release the locking bolt from the sliding latch and shift the point of connection between said slide and its operating lever.

31. A machine for operating on heels, having in combination, a work support, rotary countersinking and driving tools arranged in concentric axial alignment, the countersinking tool having a hollow center therein for the passage of the driving tool and the driving tool being normally retracted therein, screw assorting and delivering mechanism communicating with the countersinking tool, and mechanism for advancing the driving tool arranged to time the delivery of screws to the countersinking tool.

32. A machine for operating on heels, having in combination, a support for a shoe with its heel in place thereon, a driven countersinking tool, a gage associated with the countersinking tool, and treadle-operated mechanism for advancing the support in a yielding manner to present the heel seat of the shoe to the countersinking tool and countersink the same to a depth determined by said gage.

33. A machine for operating on heels, having in combination, a support for a shoe with its heel in place thereon, a driven countersinking tool, a fixed but adjustable gage associated therewith, and mechanism for advancing the support in a yielding manner to force the heel seat of the shoe upon said countersinking tool until arrested by said gage, said mechanism being thereupon operative to cause separation of the tool and heel seat.

34. A machine for operating on heels, having in combination, a shoe support, a driven countersinking tool operating at a fixed height in the machine, an adjustable gage adjacent thereto, mechanism having a lost motion connection with the support operating a lift the same until arrested by the gage at the conclusion of the countersinking operation, means operating automatically thereafter to effect a lowering of the support to free the shoe from said tool, and a rotary driving tool operating thereafter.

35. A machine for operating on heels, having in combination, a shoe support, rotary driving and countersinking tools, the latter being expansible and arranged to hold a screw therein preparatory to the inserting operation, a stop gage associated with said countersinking tool, screw assorting mechanism, a treadle, and operating mechanism associated therewith for advancing the shoe support until the shoe is arrested by encountering the gage, for thereafter clearing the shoe from the tool, advancing the driving tool, and finally to effect the delivery of a screw to the countersinking tool from said assorting mechanism.

36. A machine for attaching heels, comprising a frame, a support thereon for a shoe having a heel positioned upon its heel-seat, a power operated countersinking tool mounted in the frame and movable toward the support to countersink the heel-seat of the shoe and then transversely to an inoperative position, a power operated driving tool, and means for guiding it for operative movement in alignment with the countersunk hole in the heel-seat at the conclusion of the countersinking operation.

37. A machine for attaching heels, comprising a frame, a support thereon for a shoe having a heel positioned thereon, a power operated tool guided for movement toward the support to countersink the heel-seat of the shoe, means acting thereafter and in the retracting movement thereof to displace the countersinking tool, and a power operated driving tool guided for movement in alignment with the countersunk hole.

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