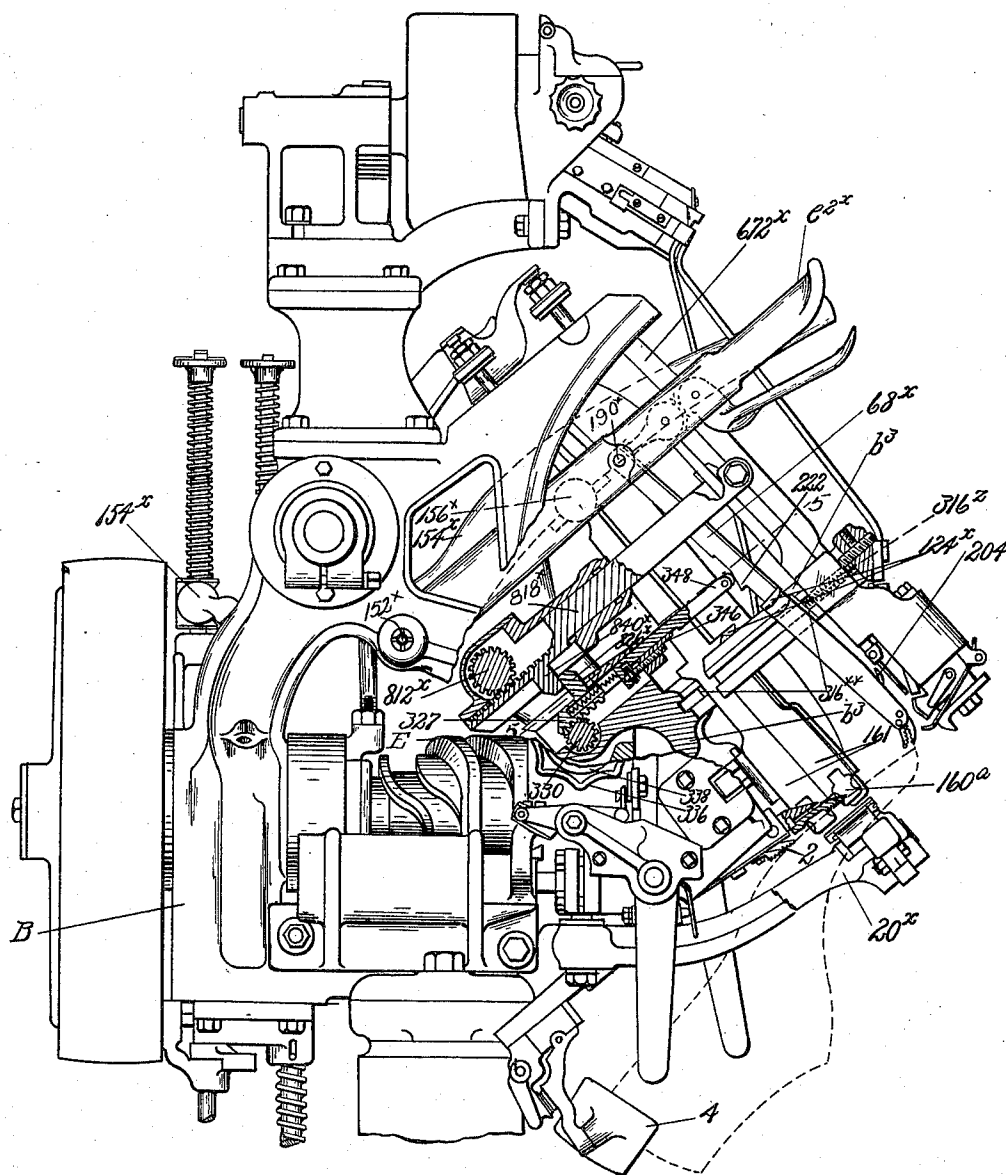


1,030,522.

R. F. McFEELY.
PULLING-OVER MACHINE.
APPLICATION FILED MAR. 28, 1904.

Patented June 25, 1912.

4 SHEETS-SHEET 1.



WITNESSES.

Robert H. Lawson.

Arthur L. Russell.

Fig. 1.

INVENTOR.

Ronald F. McFeely

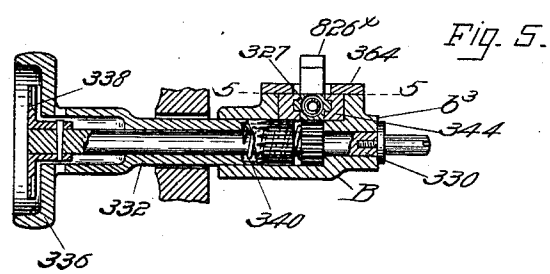
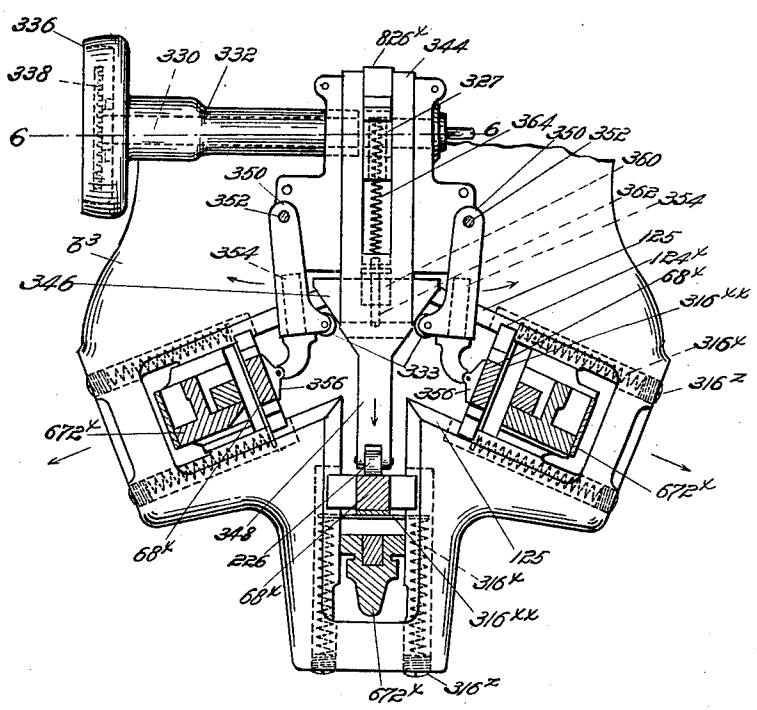


Fig. 6.

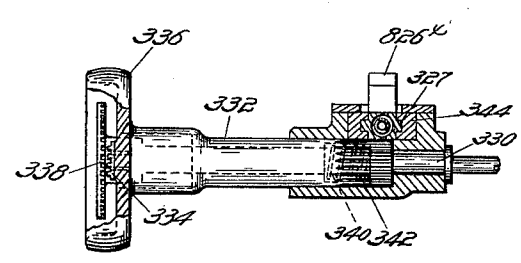


Fig. 7.

WITNESSES.

Robert H. Lawson.

Arthur L. Russell.

INVENTOR.

Ronald F. McFeely

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4 SHEETS—SHEET 4.

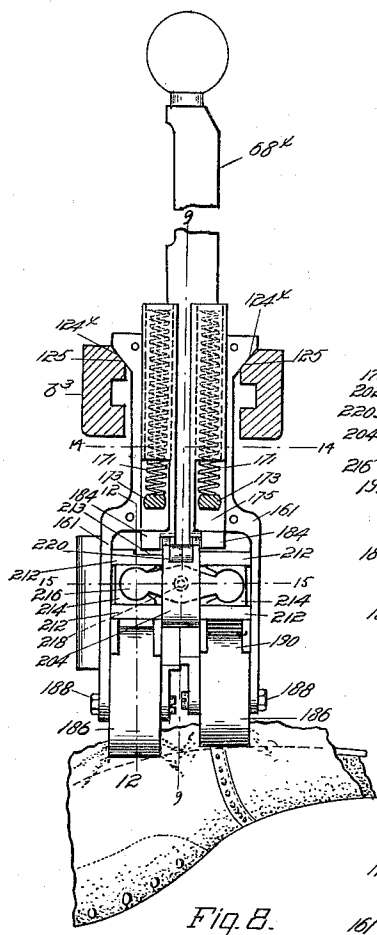


Fig. 8.

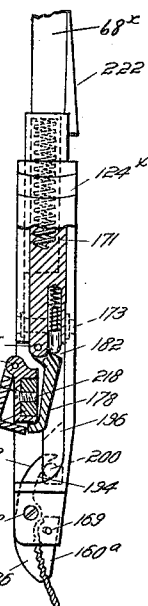


Fig. 9.

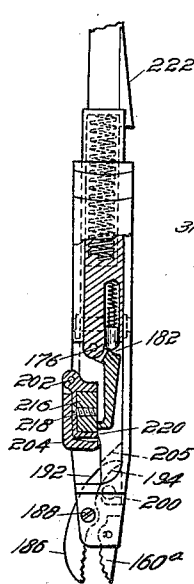


Fig. 10.

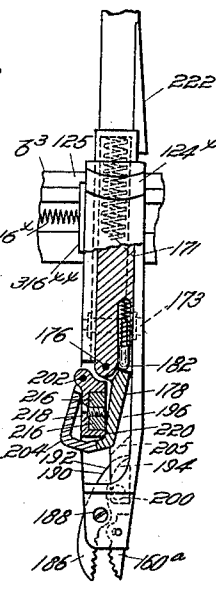


Fig. 11.

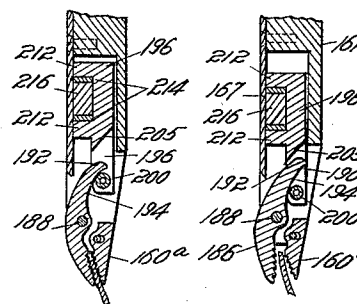


Fig. 12.

Fig. 13.

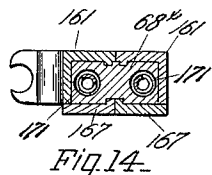


Fig. 14.

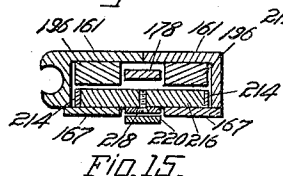


Fig. 15.

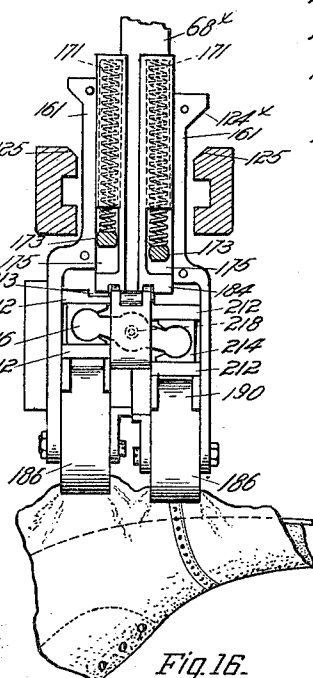


Fig. 16.

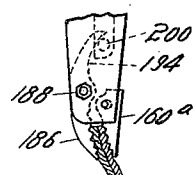


Fig. 17.

WITNESSES.

Robert H. Lawson
Arthur L. Russell

INVENTOR.

Ronald F. McFeely

UNITED STATES PATENT OFFICE.

RONALD F. McFEELY, OF BEVERLY, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY COMPANY, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PULLING-OVER MACHINE.

1,030,522.

Specification of Letters Patent.

Patented June 25, 1912.

Original application filed March 28, 1903, Serial No. 149,966. Divided and this application filed March 28, 1904. Serial No. 200,342.

To all whom it may concern:

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

This invention relates to pulling-over machines which are used for preparing boots and shoes for lasting by performing the operation known as "pulling-over" and the invention is shown as applied to a machine of the type illustrated in United States Letters Patent No. 663,777, granted December 11, 1900, and in application for Letters Patent of the United States Serial No. 149,966, filed March 28, 1903, from which application this application is a division.

The invention relates particularly to the means for engaging and pulling the upper and to the actuating and adjusting mechanisms associated therewith.

A very important feature of the invention consists in providing a plurality of pairs of grippers for engaging the upper upon the same side of the last and causing each pair of grippers to strain the portion of upper acted upon to the same degree. In the preferred embodiment of this feature of the invention side grippers mechanisms are employed which consist of two pairs of grippers each for engaging each side of the upper. The front pairs are arranged to grasp the edges of a portion of the upper extending across the last at about the junction of the toe-cap with the vamp and the rear pairs are arranged to grasp the edges of a portion of the upper which extends across the last farther back over the instep of the last. Obviously the portion or belt of upper extending between the rear pairs of grippers across the instep of the last is longer than the portion or belt which extends across the last nearer the toe, and therefore it is necessary, in order to take the stretch out of the two belts of upper to the same degree, to move the rear pairs of grippers through a greater distance than the front pairs. For this purpose the two pairs of grippers of each side grippers

mechanism are, in the embodiment of the invention herein shown, connected by a lever or equalizing device to a single operating bar in such manner that an equal force is applied to each pair of grippers for straining the two belts of upper and putting them under equal tension. Sometimes, however, it may be desired to put a greater strain on one portion of an upper than on another and the lever may obviously have arms of proper relative lengths for applying to the different pairs of grippers forces which have any desired ratio to each other. It is also obvious that more than two pairs of grippers might be employed on each side of the last and that they might be actuated for straining, each pair with the same force, or with predetermined different forces, the portions of the upper engaged thereby. I have also arranged the means for closing the several pairs of grippers of each side grippers mechanism so that one pair may be closed to a different extent from another pair to accommodate the different thicknesses of different portions of the upper, and so that each pair of grippers may be acted upon by approximately the same force, independent of the extent to which it is closed. I have also provided improved means for adjusting the side grippers mechanisms and the toe grippers mechanism toward and from each other to adapt them for grasping and pulling-over the uppers of shoes of different sizes.

Another novel feature of this invention is found in provision for automatically centering or returning to proper position a gripper which may have been displaced laterally during a previous operation.

Another feature of my invention consists in causing the grippers to travel in a path directed outwardly from the last while pulling the upper, whereby to carry said upper away from and out of contact with the edge of the last and out of contact with the edge of the inner-sole. This avoids all danger of the inner-sole being lifted from the last by the upper as the upper is strained and subsequently overlaid upon the innersole by the grippers and also reduces the friction between the upper being strained and the last so that the upper is better stretched. This provision for causing the toe gripper, by which the upper is stretched longitudi-

nally and the side grippers by which the upper is stretched transversely, to pull the upper outwardly from the last so that it is stretched and drafted with a minimum of frictional resistance and then is wrapped around the last in the overlaying movement of the grippers is an important feature of these improvements upon prior machines.

Other features of the invention, including certain details of construction and combinations of parts, will be hereinafter described and definitely pointed out in the claims.

Those portions of the pulling-over machine which are concerned in the present invention and also those parts nearly associated therewith are shown fully in the accompanying drawings and described in detail herein. For a full description of the entire machine reference may be had to the above-mentioned Letters Patent and pending application.

Figure 1 of the drawings is a left-hand side elevation, partly in longitudinal section, of the head of a pulling-over machine embodying the present invention. Fig. 2 is a right-hand side elevation of the lower portion of the machine head shown in Fig. 1. Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 2. Fig. 4 is a perspective view of the mechanism for spreading the grippers. Fig. 5 is a view of a portion of the mechanism shown in Fig. 4 as seen from the line 5—5 of Figs. 1 and 6. Fig. 6 is a sectional view on the line 6—6 of Fig. 5. Fig. 7 is a view similar to Fig. 6 and showing certain parts in the position to which they are forced for permitting adjustment. Fig. 8 is a view of one of the side grippers mechanisms, the cover plates of the grippers carriers being removed. Fig. 9 is a sectional view of the grippers mechanism on the dotted line 9—9 of Fig. 8. Fig. 10 is a view similar to Fig. 9, but showing the grippers mechanism when the unlatching device has been actuated to permit the grippers to open. Fig. 11 is a view similar to Fig. 9, but showing the parts of the grippers mechanisms in the positions which they assume when the grippers are about to be closed. Fig. 12 is a sectional view on the dotted line 12—12 of Fig. 8. Fig. 13 is a view similar to Fig. 12, but showing the grippers opened. Fig. 14 is a cross-sectional view on the dotted line 14—14 of Fig. 8. Fig. 15 is a cross-sectional view on the dotted line 15—15 of Fig. 8. Fig. 16 is a view similar to Fig. 8, but showing the position of the several parts when the grippers mechanism has risen to pull the upper. Fig. 17 is a side elevation of the right-hand grippers shown in Fig. 8.

The head B of the machine supports the sole-rest 2 and the heel-rest 4, the side clamps, one of which 20^x is shown, the tack

presenting and inserting mechanisms, designated at 672^x, arranged to operate at the sides and toe of the shoe, and the grippers mechanisms also arranged at the two sides and the toe of the shoe. The head also supports the means for actuating each of these mechanisms in desired sequence, as fully explained in said application Se. No. 149,966.

The present invention has to do with the grippers and the mechanism employed for actuating and adjusting the grippers. In the embodiment of the invention herein illustrated each of the grippers mechanisms includes an operating bar 68^x. The operating bar of the toe grippers mechanism is pivotally connected at 190^x to a lever *e*^{2x} and the operating bars for the side grippers mechanisms are connected to levers 154^x by universal joints, as indicated at 156^x in Fig. 1, which shows the grippers mechanisms located at the right-hand side of the machine. The levers *e*^{2x} and 154^x, 154^x are fulcrumed on a support 152^x in the head B and are actuated for depressing and lifting the grippers mechanisms by cams, not shown, mounted upon the main shaft D and acting through suitable connections which may be arranged as shown in said prior Letters Patent. After the grippers have engaged the upper and been lifted to strain it about the last, the grippers mechanisms are moved inwardly over the last, toward each other, to draw the pulled upper over the inner-sole in position to be fastened. This inward movement of the grippers is yieldingly effected by springs 316^x; see Figs. 5 and 11, mounted in chambers in the portions *b*³ of the frame B through which the grippers are guided. There are two of these springs for each grippers mechanism and they are arranged with their inner ends resting against the ends of plates 316^{xx}, which in turn bear against the grippers operating bars. The springs are backed up and their tension is adjusted by stop-screws 316^z. After the upper has been released the grippers are spread apart again to occupy positions approximately over the upstanding edge portions of the upper at the toe and sides of the next shoe presented to the machine. The outward movement of the grippers to their initial positions is effected positively by suitably actuated spreading mechanism which is retracted automatically at the proper time in the operation of the machine for allowing the springs to move the grippers inwardly.

The machine may be the same in the respects thus far specified as that shown in my prior Letters Patent before mentioned.

It is necessary to adjust the spreading mechanism so that it will spread the grippers more or less for putting them in different initial positions for grasping the uppers of shoes of different sizes. Pulling-

over machines as heretofore constructed have been provided with means for varying the initial positions of the grippers by adjusting the actuator for the spreading mechanism so as to vary the stroke of said mechanism, the extent of the stroke varying with the size of the shoe being operated upon. This arrangement has proved not to be entirely satisfactory because approximately the same amount of inward movement of the grippers for overdrawing the upper is required for a small shoe as for a large one. I have, therefore, provided means for adjusting the position of the spreading mechanism with relation to its actuator whereby the stroke of the spreading mechanism and therefore the inward and outward swing of the grippers remains uniform in extent, but takes place between different limits. By my improved arrangement the actuator has always a uniform stroke and imparts to the spreader a uniform stroke whatever initial position said spreader may be adjusted to assume.

The mechanism for spreading the grippers apart after they have been moved inwardly by the springs and for holding them apart during the updrawing movement of the grippers comprises a lever 802^x mounted on a pin 800^x in the head B, see Figs. 2 and 3. The lever has one end 816^x in position to be actuated by the groove 804^x in a cam block E. The upper end of the lever 802^x is provided with a toothed rack 808^x which meshes with a pinion 810^x on a shaft 812^x mounted in the machine head B. The shaft 812^x is provided with gear-teeth 822^x adapted to engage rack-teeth formed on a reduced portion of a bar 818^x, see Figs. 1 and 3. The bar 818^x has a depending lug 840^x adapted to engage a cooperating lug 826^x standing up from a slide bar 327, herein called the "actuator" for the spreading mechanism. The slide bar 327 is provided on its lower face with rack-teeth which actuate a pinion fast on a shaft 330, see Figs. 1, 4, 6, and 7. The shaft 330 is surrounded by a sleeve shaft 332 to which it is connected by a clutch. The clutch comprises a segmental rack-plate 334, see Fig. 7, secured to a flange 336 on the sleeve shaft, and rack-teeth formed on the adjacent side of a flange 338 formed on the end of the interior shaft 330. The flange 336 on the sleeve shaft is cup-shaped so as to inclose the flange 338. The sleeve shaft is acted upon by a spring 340 to press it normally outwardly and hold the rack-teeth on the segment 334 in engagement with the rack-teeth on the flange 338.

The sleeve shaft 332 is provided with gear-teeth 342 which engage rack-teeth formed on the lower side of a sliding bar 344. The sliding bar 344 supports a wedge-shaped head 346 for spreading the side

grippers mechanisms apart and said bar has projecting forwardly from it an arm 348 provided with a roller 226 to engage the operating bar 68^x of the toe grippers mechanism. Between the inclined sides of the wedge-shaped spreader block 346 and the side grippers operating bars 68^x are interposed blocks 350 connected by vertical pivots 352 to the machine head B, and provided with anti-friction rollers 333 for engaging the inclined sides of the spreader block 346. The blocks 350 are bored to receive for rotative movement therein stems 354 having pivotally connected to their outer ends contact plates 356 for engaging with the operating bars 68^x of the side grippers mechanisms. The contact plates 356 are supported on pivots extending vertically at right angles to the axis about which the stems 354 turn. This permits the contact plates 356 to have movement in all directions in order that they may maintain complete contact with the operating bars 68^x in the various positions to which said bars 68^x are moved.

The mechanism above described will operate to hold the grippers mechanisms normally spread apart, as described, until in the operation of the machine, the upper has been strained about the last. Thereupon the shaft 812^x is actuated for retracting the slide bar 818^x and permitting the spreader mechanism to be moved rearwardly under the influence of the springs 316^x which, acting on the several grippers mechanisms, move them toward the middle of the last. After the grippers have released the upper the spreading mechanism is advanced by a reverse movement of the shaft 812^x and slide bar 818^x and forces the grippers apart until they occupy their original or initial positions.

For adjusting the spreading mechanism to cause the grippers to assume different initial positions the sleeve shaft 332 above referred to may be unclutched from the interior shaft 330 by pressing it longitudinally inwardly on said shaft against the action of the spring 340. The sleeve shaft may then be rotated in either direction and in so doing it will, through the gear-teeth 342 and the rack-teeth on the bar 344, relatively to the bar 327 adjust said bar 344 for causing the side grippers mechanisms to be spread apart more or less and the toe grippers mechanism to be moved toward or away from the side grippers mechanisms, so that they will occupy positions over the upstanding edge portion of the upper of the larger or smaller shoe next to be pulled-over. After the desired adjustment has been effected and the longitudinal pressure on the sleeve shaft discontinued the spring 340 will automatically move the sleeve shaft outwardly to cause it to become clutched to the interior shaft, and thereafter, in the opera-

tion of the machine, the spreading mechanism will be actuated to move the grippers always back to their new initial positions. It will be seen that with this construction the actuating bar 327 is always in the same relation to the lug 840^x, while the spreading devices are adjustable toward and from said actuating bar. Therefore the spreading devices and grippers will have imparted to them the same range of movement whether operating on small or large shoes. A spring 364 is arranged to bear at one end against a lug depending from the bar 344 and at its other end against the actuating bar 327 to keep said actuating bar always forced to the left, with its lug 826^x against the lug 840^x on the slide 818^x.

It is sometimes desirable to adjust the side grippers mechanisms toward or from each other without adjusting the toe grippers mechanism, as, for instance, for shoes varying considerably in width and but slightly or not at all in length. For this purpose the wedge block 346 is adjustably mounted on the sliding bar 344 of the spreader. The wedge block is provided on its lower side with a lug 360 in which works a screw bolt 362, the rear end of which abuts against a lug depending from the sliding bar 344. By turning the screw bolt 362 to move it backwardly the wedge block 346 is adjusted forwardly for spreading the side grippers mechanisms farther apart. By turning the screw bolt in the opposite direction the wedge block is permitted to be moved rearwardly by the pressure of the side grippers mechanisms against its inclined faces.

The portions of the operating bars 68^x of the grippers mechanisms which are engaged by the contact plates 356 and the contact roller 226 of the spreading mechanism are provided with inclined faces shown at 222 in Figs. 1, 4, and 9, for the purpose of causing the grippers to be moved outwardly away from the last as indicated in dotted lines in Fig. 4 while they are being raised to pull the upper. By this means the marginal portions of the upper are carried away from the sides of the last and the edges of the last bottom and inner-sole as the upper is being pulled so that the inner-sole is not lifted by the contact of the moving or stretching upper with its edges and the upper is transversely stretched out of contact with the sides of the last with a minimum of frictional resistance from contact with the last.

The toe grippers mechanism comprises a single pair of grippers which may be the same in construction as the grippers shown and described in my pending application for Letters Patent Serial No. 141,384, filed January 31, 1903. The two side grippers mechanisms arranged to engage the upper

at the opposite sides of the last are duplicates of each other and a description of one of them will suffice for both.

A side grippers mechanism comprises, besides the operating bar 68^x, duplicate grippers carriers 161, 161, see Figs. 8 and 16, each provided with a fixed and a movable grippers member or jaw, and means arranged to be connected to the operating bar at times for causing the grippers to be closed for gripping the upper and then for causing the grippers and carriers to be lifted for pulling the upper. The grippers mechanism also has provision for releasing the closing and lifting means from the operating bar to permit the grippers to be opened at the proper times for releasing the upper.

The grippers carriers 161 comprise recessed blocks which are L-shaped in cross-section, as shown in Figs. 14 and 15. The carriers have cover plates 167 for closing one of their open sides and they are placed with their open edges against each other, as shown in Figs. 14 and 15, thus forming a chamber within which the lower portion of the operating bar 68^x is received. The operating bar has a latch 178 which is adapted to engage a block or casing 220. The casing 220 supports a lever 216 fulcrumed at 218. The two ends of the lever are pivotally connected with blocks 214, 214, see Fig. 8, which are slidably mounted between flanges 212, 212 formed on devices 196, herein called the "loose slides". The loose slides 196 are freely movable vertically in the grippers carriers 161 and each is provided at its lower end with a roller 200, see Fig. 13. The movable grippers members 186 are pivotally supported at 188 in their carriers and each has an upwardly extending arm 190 which is provided on its rear face with a cam surface 194 in engagement with the roller 200 of the cooperating loose slide. The arrangement is such that when the operating bar 68^x is raised the loose slides 196 are drawn up, moving the rollers 200 upwardly along the cam surfaces 194 of the movable grippers members, thereby rocking said movable members toward the fixed grippers members, and closing the grippers upon the work. In the continued rise of the operating bar 68^x the loose slides are prevented from further movement independently of the grippers by the engagement of the rollers 200 with the faces 194, and therefore said slides not only hold the grippers closed, but also lift the grippers together with the grippers carriers for pulling the upper. The two loose slides together with the casing 220, the slide blocks 214, the lever 216, the lower portion of the operating bar 68^x, and latch 178 are all contained in the chamber formed by the two grippers carriers 161, 161 with their cover plates 167, 167, as shown in Figs. 8 and 15.

The operating bar 68^x has two chambers for receiving two springs 171, 171, see Figs. 8, 14, and 16, one of which operates in connection with each grippers carrier. Each spring is under tension, its upper end bearing against the end of its chamber in the operating bar, while its lower end rests upon a cross-bar 173, supported at its end in a grippers carrier. The cross-bars extend across the chambers formed in the operating bar, and, for the purpose of permitting the operating bar to move with relation to these cross-bars, the operating bar is slotted transversely at 175, 175, as shown in Figs. 8 and 16. The springs 171 tend to move the grippers carriers downwardly and the operating bar 68^x in the opposite direction.

The grippers carriers are provided with shoulders 124^x which are adapted to cooperate with surfaces 125 formed on a portion 6³ of the head B through which the grippers are guided. When the grippers mechanism is moved downwardly by the movement of the levers 154^x, which in the instance shown is effected positively by a cam on the main shaft D, the shoulders 124^x on the grippers carriers meet the surfaces 125, thereby stopping the grippers carriers before the downward movement of the operating bar 68^x by the lever 154^x is completed. In the continued downward movement of the operating bar after the grippers carriers have been stopped the springs 171 are compressed and the latch 178, which is pivotally connected to the operating bar 68^x at 176, is carried into position, see Fig. 11, where it may engage under the casing 220. The latch is acted upon by a spring-pressed plunger 182 for swinging it on its pivot to cause it to engage under the casing 220 when it is in position to do so. When the machine is at rest, before a pulling-over operation is commenced, the parts are in the position just described, namely, with the grippers carriers sustained by the surfaces 125 of the head B and the operating bar depressed for putting the springs 171 under tension and hooking the latch 178 to the casing 220, the grippers being open, as shown in Figs. 11 and 13. A shoe is thereafter put into position with the upper standing within the open jaws of the grippers. The shoulders 124^x are oppositely inclined downwardly and inwardly as shown in Fig. 16 and the surfaces 125 with which said shoulders engage are similarly inclined or beveled so that when the grippers are lowered to shoe receiving position the grippers will be automatically centered between the surfaces 125 notwithstanding the grippers may have been moved either forwardly or backwardly during the operation of the machine, as, for example, in the tip straightening adjustment. This construction is not claimed herein, but forms the subject-matter of

claims in my co-pending application, Serial No. 540,221, filed January 26, 1910. When the machine is next started the levers 154^x are actuated by their connections with the cams on the main shaft for lifting the grippers mechanism. During the first portion of this movement of each lever the operating bar 68^x rises with relation to the grippers carriers, as rapidly as said cams will permit, by reason of the expansion of the springs 171, which, acting on the cross-bars 173, hold the grippers carriers and grippers depressed as far as the contact of surfaces 124^x and 125 permit until the loose slides, which are at this time latched to the operating bar, as above stated, have been lifted far enough to close the grippers upon the work. When the grippers have been completely closed on the work, as shown in Figs. 9, 12, and 17, and the rollers 200 can move no higher with relation to the cam faces 194 of the movable grippers members, the grippers are lifted by the continued upward movement of the operating bar 68^x, effected now by said cams on the main shaft, and the upper is thereby pulled.

At the proper time in the operation of the machine the grippers mechanisms are operated for first slackening the tension on the pulled upper and then releasing the upper to permit said upper to be secured to the inner-sole. To this end the grippers mechanisms are each provided with an unlatching device 204, see Figs. 8, 9, 10, and 11, pivoted at 202 to the casing 220 and adapted to be actuated automatically at the proper time by some moving part of the machine, as, for instance, a member of the fastener carrying and inserting mechanism, for disengaging the latch 178 from under the casing 220. The disengagement of the latch carried by the operating bar from the casing supported in the grippers carriers permits the springs 171, acting upon the cross-bars 173 of the grippers carriers, to depress the grippers carriers until said cross-bars meet with shoulders 184 on the lower end of the operating bar. This movement carries the grippers downward and slackens the tension on the pulled upper, which may be held from slipping back, in the interval before the fastener inserting mechanisms operate, by wiping and pressing devices with which the machine is provided, as explained in said Letters Patent. It is to be noted that in this movement produced by the springs 171 all the parts move downwardly with relation to the operating bar 68^x for slackening the pull on the stock, but the gripper jaws do not necessarily open. The shoulders 184 abruptly arrest the descent of the grippers carriers, while the casing 220 and loose slides 196, being free to move downwardly with relation to the grippers carriers, are carried down by their momen-

tum farther than said grippers carriers when the movement of the carriers and grippers is thus suddenly checked. In this independent, downward movement of the loose slides the rollers 200 travel down along the cam faces 194 of the movable grippers members and the faces 205 with which the loose slides are provided are brought into contact with the faces 192 of said movable grippers members and open the grippers, as shown in Fig. 13.

The lever 216, by means of which the two loose slides 196 are connected to the casing 220, is an equalizing device for causing the force of the operating bar to be applied, as shown, equally to the two loose slides for closing the two pairs of grippers with equal force and also for lifting the said two pairs of grippers with equal force. This provision permits the two pairs of grippers of a side grippers mechanism to be closed to different extents to accommodate the varying thicknesses of the stock at different portions of the edge of the upper. In practice it frequently happens that the portion of the upper engaged by the front pair of side grippers includes the toe-cap and the toe-stiffener besides the usual thicknesses of upper and lining which are engaged by the rear pair of grippers. When this occurs the upward movement of the loose slide cooperating with the front pair of grippers will be checked before that of the other loose slide by reason of the front pair of grippers closing to a less extent than the other pair, and, for completely closing the other pair of grippers, the lever will be rocked slightly upon its pivotal connection at 218 with the casing 220.

The front pair of grippers of the side grippers mechanism engages one end of a belt of upper which extends about the ball of the last, the other end of said belt being engaged by the front pair of grippers of the other side grippers mechanism. The rear pair of grippers engages one end of a belt of upper which extends about the last higher up on the instep, the other end of said belt being engaged by the rear pair of grippers of the other side grippers mechanism. Obviously the belt of upper engaged by the rear grippers is longer than the belt engaged by the front grippers, and if said grippers are acted upon by the same force in pulling the upper, the longer, rear belt will stretch a greater distance than the shorter, forward belt, as is indicated in Fig. 16. The provision of relatively movable grippers carriers actuated by an equalizing device enables the belts of upper to be pulled with the same force, regardless of any difference in any amounts which the two belts stretch. The equalizing device thus not only permits the two loose slides

to have independent movement for closing the two pairs of grippers to a different extent, but also permits the two grippers carriers to move through different distances for stretching long and short belts of upper, though acting always with the same force on each of the pairs of grippers.

It is to be noted that the springs 171 effect the closing of the grippers, acting for this purpose through the operating bars, equalizing lever 216, and the loose slides, and that after the grippers are closed the levers 154* take control of the operating bars and, acting through the same equalizing lever and loose slides, effect the lifting of the grippers. It is clear that it is not necessary in the broadest aspect of this invention that the closing and the lifting of the grippers be effected through the same equalizing lever and connected devices, as it is obvious that the means for applying equal or other predetermined relative forces to the grippers for closing them and for lifting them might be wholly or partially independent of one another, and such a construction would be within the scope of this invention.

As shown in Figs. 8 and 16, the upper flange 212 of the loose slide for the rear pair of grippers is cut away at 213 for permitting the rear grippers to be moved higher than the forward grippers to accommodate the greater stretch of the belt engaged by the rear grippers. Extra provision is thus made for allowing the two grippers to have the unequal range of movement which is necessary for stretching belts of upper of different lengths.

It is, of course, obvious that the lever 216 might have arms of different lengths in order to cause the operating bar to act upon the two pairs of grippers for closing them and for pulling the different belts of upper with unequal forces, the relative amount of said two forces being predetermined by the relative length of the two arms of the lever.

For the purpose of making permanent provision for one pair of grippers to engage a thicker portion of the work than is engaged by the other pair of grippers, the fixed grippers member 160^a of the front pair of grippers may be spaced farther from its cooperating member 186 than the fixed member of the rear pair of grippers is from its cooperating member. This is illustrated in Figs. 9 and 17 which show respectively side elevations of the rear and the front pairs of grippers of the side grippers mechanism shown in Fig. 8.

In the operation of the machine the grippers spreading mechanism will have been properly adjusted by manually pressing inwardly the sleeve shaft 332 and turning it to move the spreading mechanism forwardly

or backwardly until the position is reached in which the grippers stand over the upstanding edge portions of the upper at the toe and sides of the shoe and then the pressure on the sleeve shaft is withdrawn and the spring 340 permitted to move it outwardly and clutch the teeth 334 with the teeth 338 of the interior shaft 330. If it should be found that the side grippers do not stand in proper relation to the upstanding portion of upper at the sides of the shoe when the toe grippers are properly adjusted, then the screw bolt 362 is manipulated to move the wedge block 346 until the side grippers are positioned to receive the edge of the upper. The workman then presents the shoe with the inner-sole and upper materials assembled on the last and positions it with the inner-sole against the sole-rest, the heel against the heel-rest, and the edge of the upper between the jaws of the grippers, it being understood that when the machine is at rest ready to receive the work, the front ends of the grippers carrying levers are depressed, the shoulders 124^x of the grippers carriers rest on the supports 125 by which the two pairs of grippers have been restored to their normal relative gripping positions after operation on the previous shoe, the springs 171 are under compression, the latches 178 are engaged with the casings 220, the loose slides are depressed and the grippers held open by the engagement of the faces 205 and 192, as shown in Figs. 11 and 13. When the machine is started the front ends of the grippers carrying levers are raised, thus allowing the springs 171 to expand and force the operating bars and the loose slides upwardly. In this upward movement of the loose slides the rollers 200 turn the movable grippers members and close each pair of grippers securely on the work regardless of differences in thickness of the stock at the different places where it is gripped. When the grippers have been closed and the springs can move the operating bars no farther relatively to the grippers, the grippers and grippers carriers are lifted with the operating bars for stretching the upper during the remainder of the movement of the carrying levers. As the grippers mechanisms are lifted the cam faces 222 in contact with the faces 226 and 356 of the spreading mechanism cause the grippers to be swung outwardly, carrying the stretching upper away from the edges of the last and inner-sole so that it does not bind thereon and so retard its stretching or lift the edge of the inner-sole. In the further operation of the machine, after the upper has been pulled, the spreader is withdrawn and the springs 316^x force the grippers mechanisms inwardly toward the middle of the last. The grippers are followed

in their inward movement by the fastener presenting and inserting mechanisms 672^x, which, as they approach the grippers mechanisms, engage the unlatching devices 204 by which the latches 178 are turned to disconnect the operating bars from the casings 220. This permits the grippers carriers, grippers, and loose slides to be forced downwardly by the springs 171 until the bars 173 on the carriers meet the lugs 184 on the operating bar, when the movement of the carriers and grippers is suddenly checked while the loose slides continue to descend, carrying the rollers 200 downwardly with relation to the inclined faces 194 of the movable grippers members, which are thereby permitted to open for releasing the upper. It is to be noted that the grippers are first permitted to descend for slackening the strain on the upper and then are opened to release it, thus avoiding danger of the upper being torn as it escapes from between the grippers jaws, which usually are roughened as shown. After the upper is released from the grippers and the fastenings are inserted the spreading mechanism is advanced and forces the grippers outwardly to their initial positions, where they are lowered and fully opened in readiness for receiving the next shoe.

It will of course be understood that this invention is not limited to the embodiment thereof described and shown in this specification, but that the invention may be embodied in many different mechanical forms and that many of its features are capable of advantageous use independently of other features.

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

1. In a pulling-over machine, the combination with grippers arranged to engage opposite sides of a shoe, of means for positioning the grippers comprising the positioning block 346, the slide 344 on which said block is mounted, the block 327, the adjustable connection between said block and slide, and power driven means for actuating the latter block.

2. In a pulling-over machine, the combination with grippers arranged to engage opposite sides of a shoe, of means for positioning the grippers comprising the positioning block 346, the rack slide 344 on which said block is mounted, the rack block 327, pinions normally locked together and turning on the same axis for engaging said racks, means whereby relative adjustment of the two pinions may be effected, and means acting directly upon the block 327 for driving the positioning block through said pinions and racks.

3. In a pulling-over machine, the combi-

nation with grippers arranged to engage opposite sides of a shoe, of the positioning block 346, driving connections including the lugs 840^x and 826^x held in continuous engagement, and an adjustable connection including the hand wheel 336 between the lug 826^x and the positioning block 346 to spread the grippers more or less independently of their driving mechanism.

4. In a pulling-over machine, the combination with grippers arranged to engage opposite sides of a shoe, of gripper spread adjusting mechanism including parallel rack bars, pinions on the same axis engaging said bars, means for locking said pinions normally together, and means arranged for movement in one direction to unlock said pinions and for movement in a different direction to adjust the pinions relatively.

5. In a pulling-over machine, a plurality of grippers for engaging the upper at the sides and at the toe of the last and an actuator for spreading said grippers apart, said actuator having a uniform movement, in combination with means for simultaneously varying the relation of the several grippers to the actuator whereby the grippers may be given different initial positions to accommodate shoes of different sizes.

6. In a pulling-over machine, a plurality of pairs of grippers for engaging the toe portion and the sides of an upper and an actuator for said grippers, in combination with means for varying the relation of said grippers and said actuator, whereby the distances between the several grippers are varied to accommodate shoes of different sizes, and independent means for adjusting the side grippers relatively to the actuator to adapt the machine for shoes of the same length and different widths.

7. In a pulling-over machine, grippers for gripping an upper and pulling it over a last, means for relatively actuating the grippers and last for pulling the upper, and means for holding the upper away from the edge of the last while it is being pulled.

8. In a pulling-over machine, the combination with grippers for pulling an upper over a last, and actuating mechanism for causing a relative movement of the grippers and the last for pulling the upper, of means whereby the grippers are actuated outwardly from the last while the upper is being pulled.

9. In a pulling-over machine, the combination with grippers and means for moving them in a direction substantially perpendicular to the last bottom, of means for simultaneously moving the grippers in a direction transverse to the last bottom whereby the upper is pulled in a direction obliquely outward and upward from the edge of the last.

10. In a pulling-over machine, the combi-

nation with grippers and means for actuating them for pulling the upper, of a cam, and means cooperating therewith for moving the grippers outwardly while the upper is being pulled.

11. In a pulling-over machine, the combination with grippers and a bar for operating the grippers to pull an upper over a last, of a cam on said bar and a part occupying a relatively fixed position during the movement of the bar for operating the grippers, said part cooperating with the cam for moving the grippers outwardly from the last while the upper is being pulled.

12. In a grippers mechanism for pulling an upper over a last, a plurality of pairs of grippers for engaging the same side of the upper, a single operating means for closing and lifting said grippers, and equalizing means whereby the several pairs of grippers are caused to put the different portions of upper acted upon under the same strain.

13. A grippers mechanism for pulling an upper over a last comprising a plurality of pairs of grippers for engaging the same side of the upper, and a single operating means for closing and lifting said grippers, said mechanism having provision for allowing said pairs of grippers to pull the portions of upper engaged thereby through different distances.

14. A grippers mechanism comprising a plurality of pairs of grippers for engaging the upper and a single actuating means for both closing and lifting the grippers, said actuating means having provision for closing one pair of grippers to a different extent from another to accommodate stock differing in thickness at different places.

15. A grippers mechanism comprising a plurality of pairs of grippers for engaging the upper and actuating mechanism therefor including automatic means for closing one pair of grippers to a different extent from another controlled by the same means to accommodate stock differing in thickness at different places.

16. A grippers mechanism comprising a plurality of pairs of grippers for engaging the upper and actuating mechanism therefor, said actuating mechanism having provision for closing one pair of grippers to a different extent from another to accommodate stock differing in thickness at different places and being arranged to put the stock under the same stress at the different points of engagement.

17. A grippers mechanism comprising a plurality of pairs of grippers and a single actuating mechanism, including means for automatically closing one pair of grippers to a different extent from another controlled by the same means to accommodate stock differing in thickness at different

places and for automatically putting the stock under the same stress at the different points of engagement.

18. In a grippers mechanism, the combination with a plurality of grippers carriers and a pair of grippers on each carrier, of a single operating bar, and means to be actuated by said bar for closing each pair of grippers and thereafter causing said grippers carriers and grippers to be lifted by said bar.

19. A grippers mechanism comprising a plurality of pairs of grippers, an operating bar and a lever to be actuated by said bar for closing each pair of grippers and thereafter causing said grippers to be lifted by the bar.

20. In a grippers mechanism, the combination with a plurality of pairs of grippers, of an operating bar, and means to be actuated by said bar for closing the grippers and thereafter causing said grippers to be lifted by the bar, said grippers closing means being adapted for movement relatively to the bar for relaxing the bite of the grippers.

21. In a grippers mechanism, the combination with a plurality of grippers carriers and a pair of grippers mounted on each carrier, of an operating bar, and mechanism actuated by movement of said bar for closing the grippers together, said last-mentioned mechanism having provision for closing the pairs of grippers to different extents.

22. In a grippers mechanism, the combination with a plurality of grippers carriers and a pair of grippers mounted on each carrier, of an operating bar and means actuated by the operating bar for closing the several pairs of grippers, said closing means including a plurality of members mounted for relative movement and an equalizing device between said members.

23. In a pulling-over machine, a grippers mechanism comprising a plurality of pairs of grippers, an operating bar by which the grippers are lifted after they are closed, and means actuated by the operating bar for closing the several pairs of grippers, said closing means including a plurality of members mounted for relative movement, a lever connecting said members for the purpose described.

24. In a grippers mechanism, the combination with a plurality of pairs of grippers, of an operating bar, means actuated by the operating bar for closing the several pairs of grippers, said closing means including a plurality of members mounted for relative movement, an equalizing device between said members, and a connecting device between said operating bar and said closing means, said connecting device being movable rela-

tively to the operating bar to permit the bite of the grippers to be relaxed.

25. A grippers mechanism, comprising a plurality of pairs of grippers, an operating bar, and a lever to be actuated by said bar for closing the grippers, said lever being adapted for movement relatively to the bar for relaxing the bite of the grippers.

26. In a grippers mechanism, the combination with a plurality of pairs of grippers, of a single operating bar, means to actuate the operating bar for closing the grippers, and for causing the grippers to be lifted, and means for causing the bite of the several grippers to be relaxed simultaneously.

27. In a grippers mechanism, the combination of a plurality of pairs of grippers, of a single operating bar, means to actuate the operating bar for closing the grippers together, and for causing the grippers to be lifted, and means for moving the grippers reversely with relation to the operating bar, said mechanism also having provision for opening the grippers.

28. In a pulling-over machine, mechanisms for engaging the upper at opposite sides of the last, each of said mechanisms comprising a plurality of devices adapted to engage belts of upper extending about the last, and actuating means for automatically causing the individual devices of each mechanism to engage and to pull the upper with equal force, whereby the different belts of the upper are strained to the same extent.

29. In a pulling-over machine, mechanisms for engaging the upper at opposite sides of the last, each of said mechanisms comprising a plurality of devices whereby belts of upper extending about the last are engaged, actuating means for causing said mechanisms to grip the upper simultaneously and to pull the belts of upper, and means for determining the relative forces by which the different belts of upper are strained.

30. In a pulling-over machine, mechanisms for engaging the upper at opposite sides of the last, each of said mechanisms comprising a plurality of devices adapted to engage belts of upper extending about the last, and actuating means for causing said devices to engage the ends of the belts of upper automatically and to pull the belts of upper, said mechanisms having provision for allowing the devices engaging different belts of upper to be moved through different distances.

31. In a pulling-over machine, mechanisms for engaging the upper at opposite sides of the last, each of said mechanisms comprising a plurality of devices adapted to engage belts of upper extending about the last, and actuating means for causing the

individual devices of each mechanism to engage the ends of the belts of upper automatically and to pull the upper with equal force, the devices of said mechanism having provision for moving relatively to compensate for differences in the stretch of the belts of upper acted upon.

32. In a grippers mechanism, the combination with a plurality of pairs of grippers, of operating mechanism therefor including spring-actuated means for automatically closing the several pairs of grippers before they are lifted.

33. In a grippers mechanism, the combination with a plurality of pairs of grippers, of operating mechanism therefor including spring-actuated means having provision for automatically causing the pairs of grippers to grip different thicknesses of stock with the same force.

34. In a grippers mechanism, the combination with a plurality of pairs of grippers, of grippers controlling devices, means to actuate the controlling devices to close each pair of grippers according to the thickness of the stock presented to it, and means for further actuating said devices for lifting the grippers.

35. In a pulling-over machine, the combination with grippers for automatically engaging the upper at the sides and at the toe of the shoe, of means for actuating the side grippers upwardly relatively to the last bottom, and means for actuating the toe grippers forwardly and upwardly.

36. A grippers mechanism for pulling an upper over a last, comprising a plurality of pairs of grippers for engaging the same side of the upper, said grippers being arranged to stand normally at different levels, and a single operating means for closing and lifting the grippers, said mechanism having provision for allowing the pair of grippers normally at the lower level to move farther than the other pair of grippers.

37. In a grippers mechanism, the combination with two pairs of grippers each comprising one member pivotally mounted for closing movement toward the other member of the pair, and means for closing the members of a pair to grip stock and then moving them upwardly together to pull the stock, of yielding means for holding the gripper members from upward movement until they have closed.

38. A pulling-over machine, having, in combination, grippers for engaging the upper at the toe and at opposite sides of a last, means for relatively actuating the grippers and the last to stretch the upper longitudinally and transversely, and positioning and guiding means for the side grippers to cause them to pull the upper outwardly away from the side faces of the last.

39. A pulling-over machine, having, in combination, grippers for engaging the upper at the toe and at opposite sides of a last, means for relatively actuating the grippers and the last to stretch the upper longitudinally and transversely, and means to cause the grippers to pull the upper outwardly from the side faces of the last and later to move inwardly for wrapping the upper about the sides and over the edge of the last.

40. A machine of the class described, having, in combination, means for positioning a last, grippers arranged to engage the upper at opposite sides of the ball of the last, and operating mechanism for the grippers arranged to cause simultaneously pulling of the upper at the two sides of the last outwardly away from the side face of the last, and then inwardly toward the last to wrap the pulled upper about the side and over the edge of the last.

41. A machine of the class described, having, in combination, means for positioning a last, grippers arranged to engage the upper at opposite sides of the ball of the last, operating mechanism for the grippers arranged to cause simultaneous pulling of the upper at the two sides of the last outwardly away from the side face of the last, and then inwardly toward the last to wrap the pulled upper about the side and over the edge of the last, and means to fasten the upper in the position to which it is carried by said movements of the gripper.

42. A pulling-over machine, having, in combination, grippers arranged to engage an upper at opposite sides of a last, means to close the grippers, means to move the grippers laterally away from the last to pull the upper transversely of the last out of contact with the side faces of the last, and means for moving the grippers with the upper under tension inwardly toward and over the edge of the last, into position to be fastened.

43. A pulling-over machine, having, in combination, grippers arranged to engage an upper at opposite sides of a last, means to close the grippers, means to move the grippers laterally away from the last to pull the upper transversely of the last out of contact with the side faces of the last, power operated means arranged to be started after the upper has been so pulled and operating to control movement of the grippers with the upper under tension inwardly toward the sides of the shoe and lay it over the edge of the shoe bottom; and means for securing the upper so overlaid by the grippers.

44. A pulling-over machine, having, in combination, grippers arranged to engage an upper at the opposite sides of a last, means for closing the grippers upon the up-

per, additional means by which the grippers may be manually moved to stretch the upper transversely and away from the side faces of the last, and power driven mechanism to cause the grippers to draw the upper under tension inwardly toward and over the edges of the last.

45. A pulling-over machine, having, in combination, a last positioning device 2, toe and side grippers, means for actuating said grippers to grip and stretch the upper including the levers 22^x and 154^x, cam faces 222, and guides 226, 356 to cause the grippers to pull the upper outwardly away from the side faces of the last, handles on said levers by which the grippers may be manually moved in directions determined by said guide and cam faces, power driven means to retract the guides 226 and 356, spring 316^x to force the grippers to carry the upper inwardly toward the side faces and over the edges of the last, and the tacking mechanisms 672^x to fasten the upper so overworked by the grippers, substantially as described.

46. A pulling-over machine, having, in combination, grippers arranged to engage an upper at the toe and the opposite sides of the shoe, means for actuating the toe gripper forwardly to pull the upper longitudinally, means for actuating the side grippers laterally away from the sides of the last to pull the upper transversely, and means for thereafter causing all the grippers to move inwardly toward the last for wrapping the upper over the edge of the last.

47. In a grippers mechanism a plurality of pairs of grippers, a single operating means for actuating said grippers to pull an upper, equalizing means arranged to permit the grippers to move unequally, and means for restoring the grippers to a normal relative position and maintaining them open to receive the next shoe.

48. In a grippers mechanism for pulling an upper over a last, a plurality of grippers for engaging the upper at the same side of the last, a single operating means for lifting said grippers, equalizing means arranged to permit an unequal lifting of the grippers dependent upon the resistance of different gripped portions of the upper, and mechanism for holding the grippers open preparatory to receiving work, said mechanism having provision for insuring the return of the grippers to a uniform relative gripping position.

49. In a grippers mechanism, the combination with the operating bar 68^x, the equalizer 216, the two pairs of grippers connected to said bar by the equalizer, the frame in which the pairs of grippers are guided, and the cooperating shoulders 124^x, 125, for restoring the grippers to relative position when they are lowered for gripping, substantially as described.

In testimony whereof I have signed my name to the specification in the presence of two subscribing witnesses.

RONALD F. McFEELY.

Witnesses:

ROBERT H. LAWSON,
ARTHUR L. RUSSELL.