Feb. 22, 1938. J. S. KAMBORIAN 2,108,859

METHOD AND MEANS FOR USE IN LASTING SHOES

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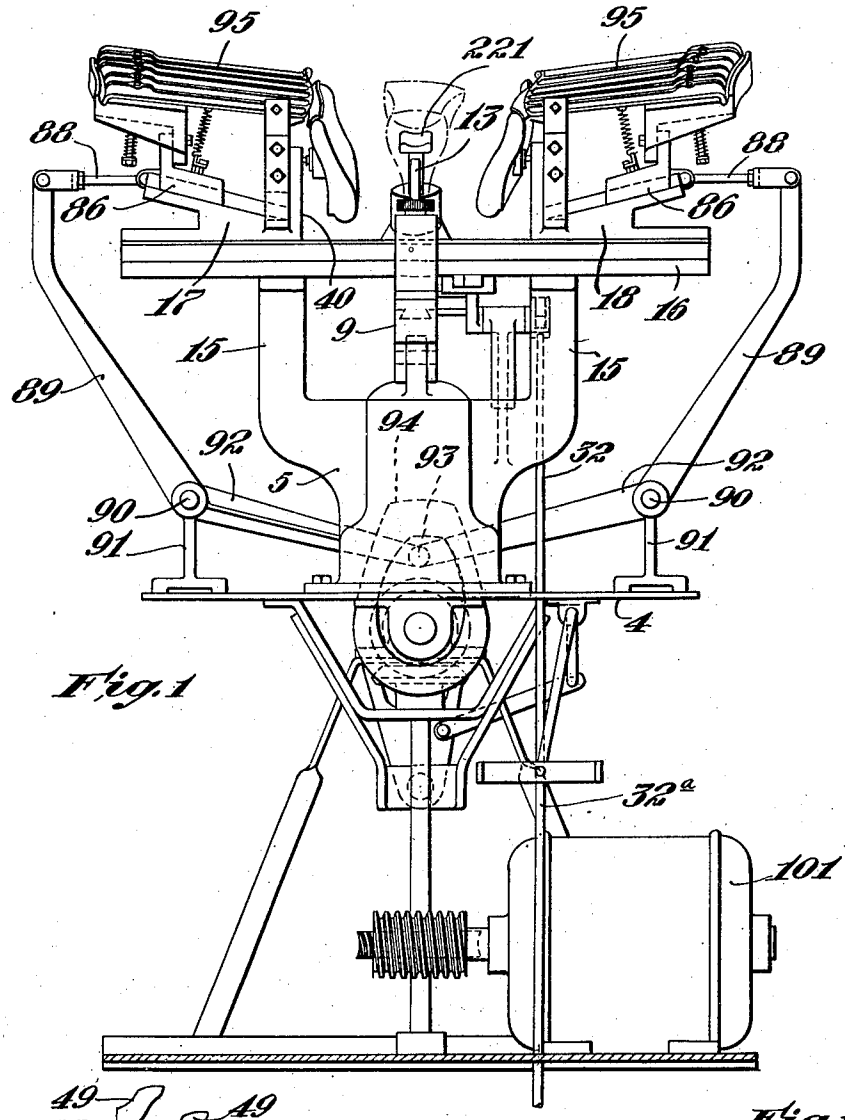



Fig. 1

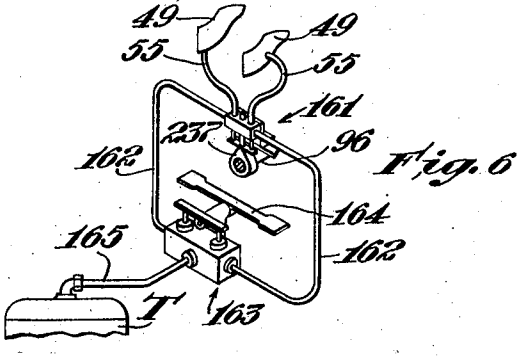



Fig. 6

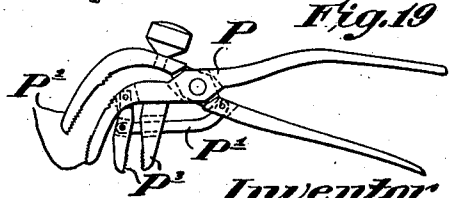


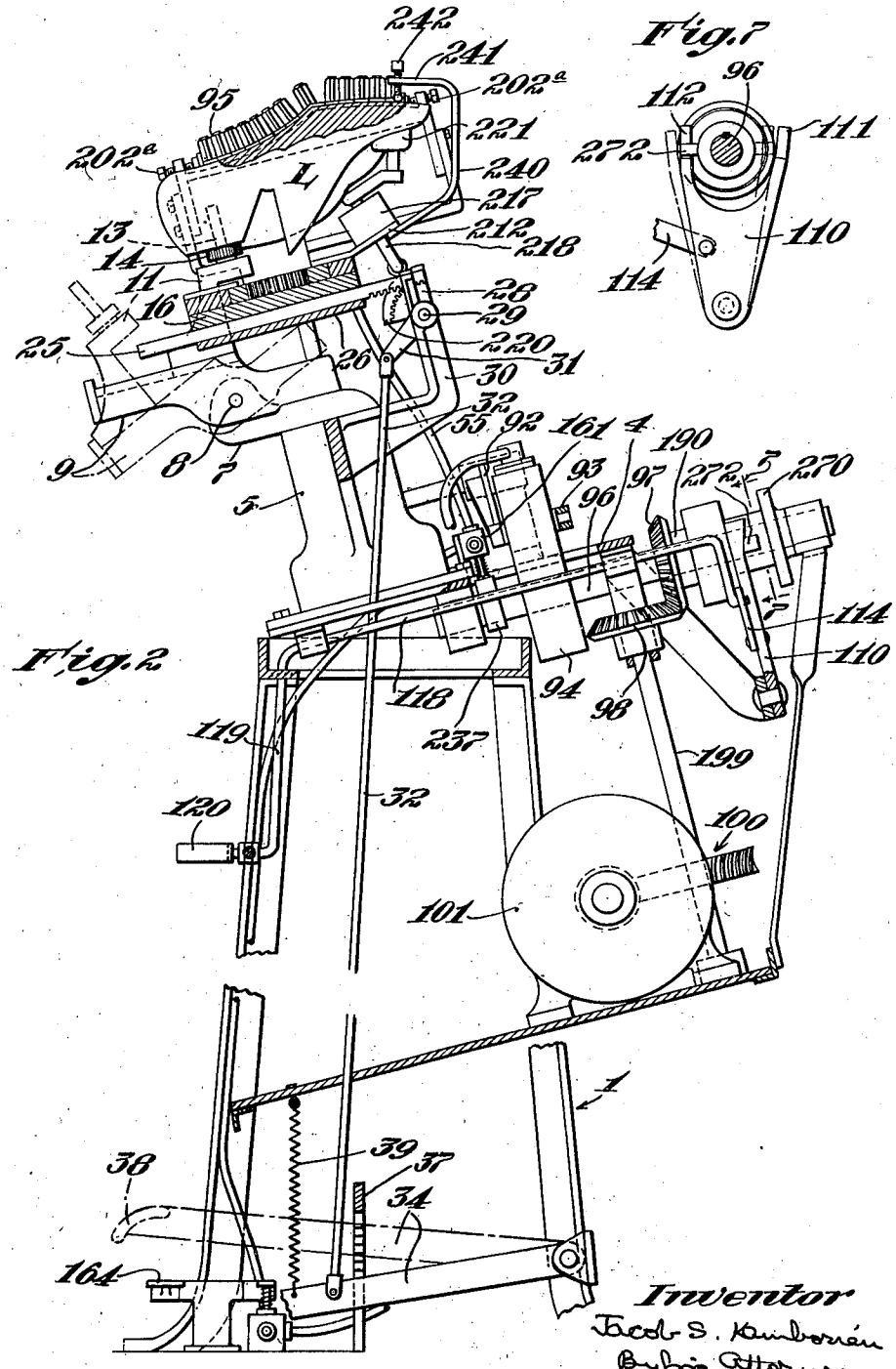

Fig. 19

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METHOD AND MEANS FOR USE IN LASTING SHOES

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METHOD AND MEANS FOR USE IN LASTING SHOES

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Fig. 3

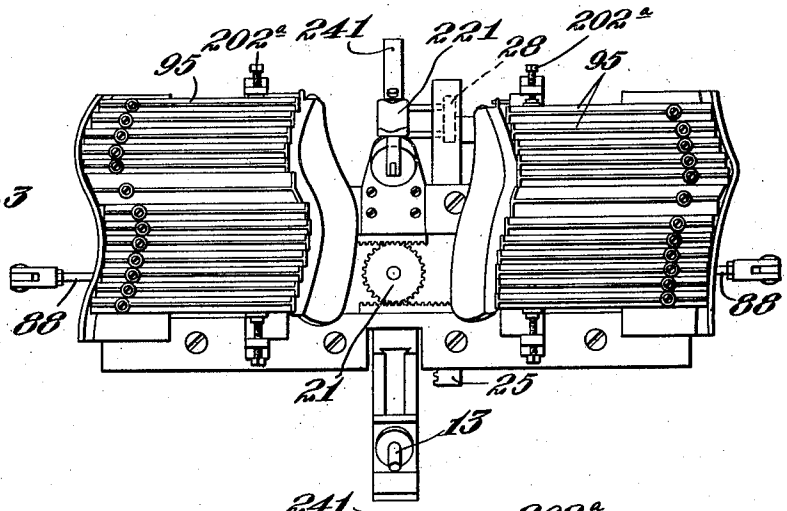



Fig. 4

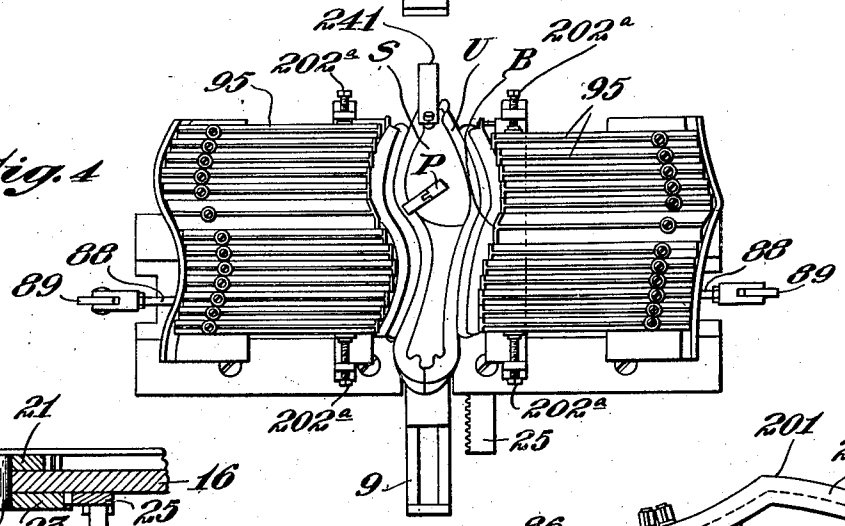






Fig. 8

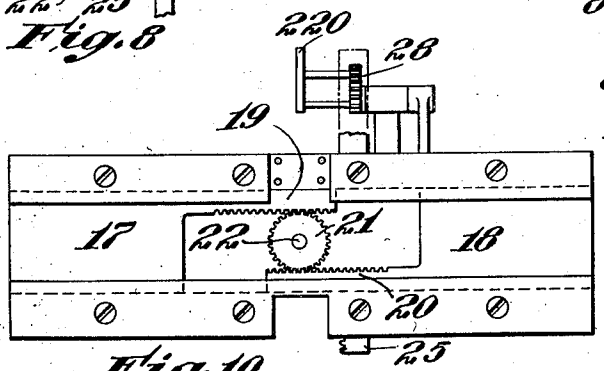



Fig. 10

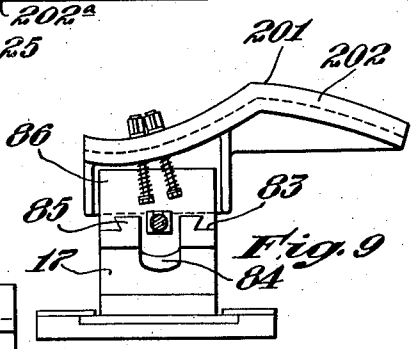



Fig. 9

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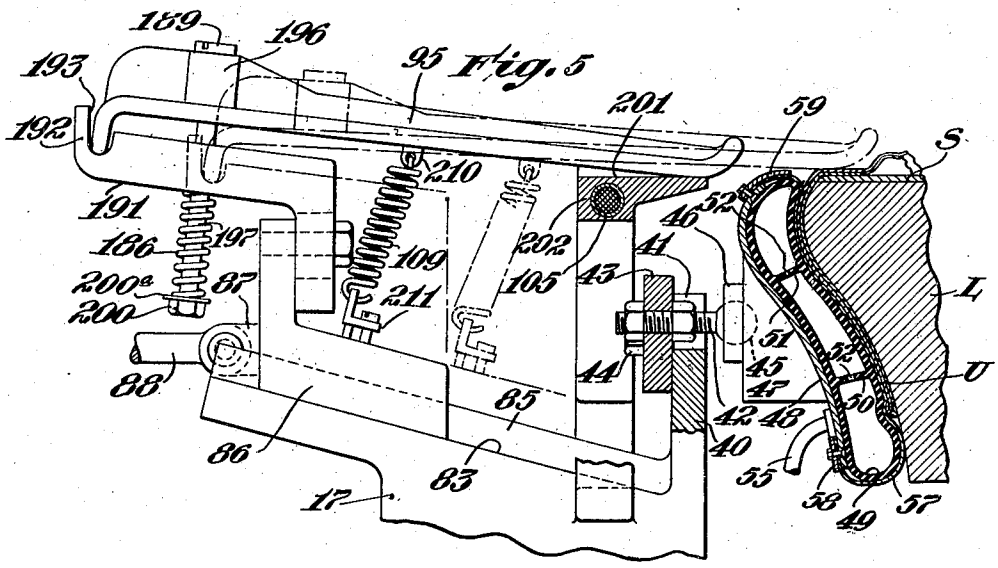



Fig. 5

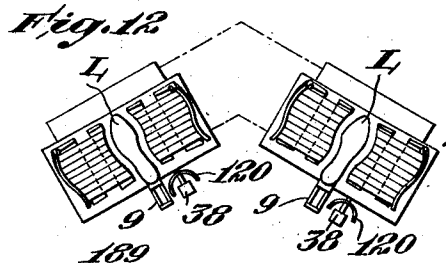



Fig. 12

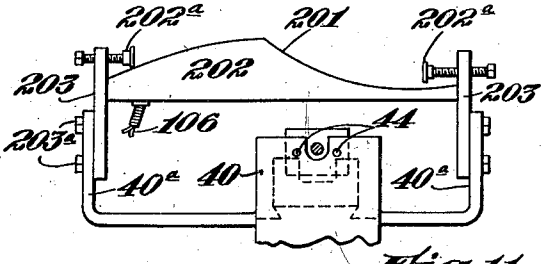



Fig. 11

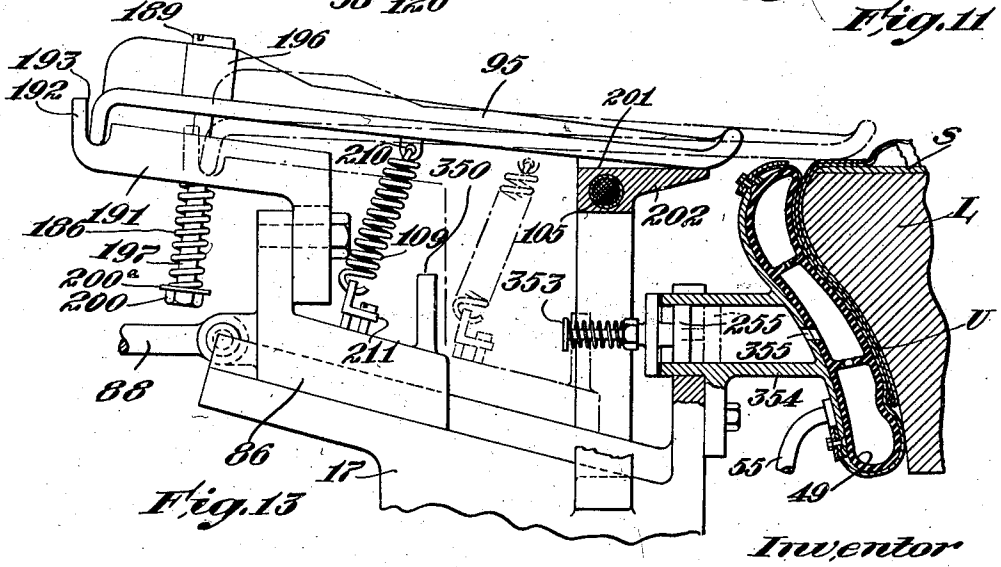



Fig. 13

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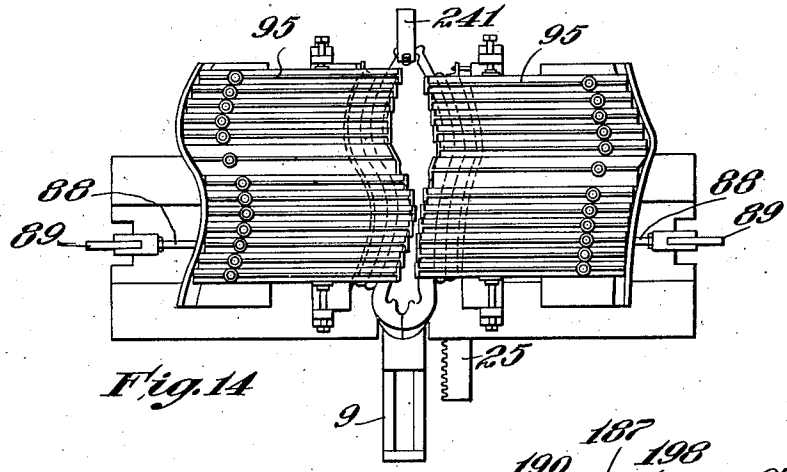



Fig. 14

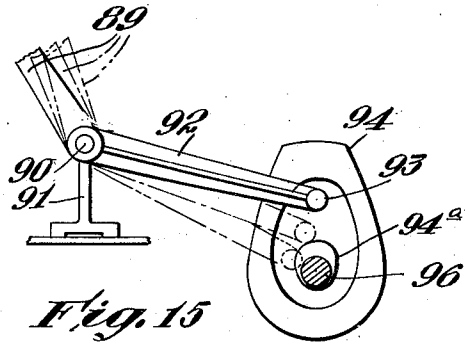



Fig. 15

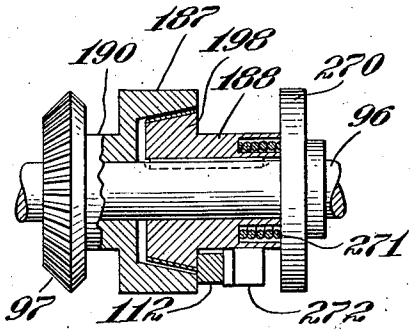



Fig. 16

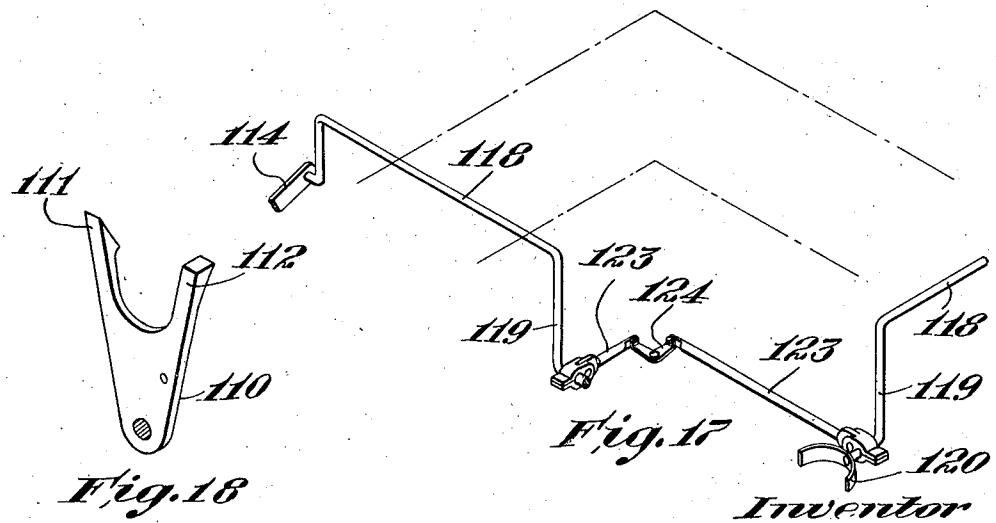



Fig. 18

Fig. 17

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Patented Feb. 22, 1938 2,108,859

# UNITED STATES PATENT OFFICE

2,108,859

## METHOD AND MEANS FOR USE IN LASTING SHOES

Jacob Simon Kamborian, Newton, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Application June 8, 1935, Serial No. 25,626

17 Claims. (Cl. 12—7)

This invention relates to a method of and apparatus for lasting footwear, and particularly for lasting those lateral portions of shoe uppers which intervene between the heels and toes thereof. Apparatus of the illustrated type is particularly adapted to facilitate and effect lasting operations without the necessity of employing fastening elements, such as tacks or staples, for securing the margin of an upper to the insole.

The present invention affords improvements which are particularly applicable to machines of the type disclosed in my United States Patent No. 1,979,000, which issued October 30, 1934. A machine of this type may be employed to support the partially completed shoe, preferably bottom up, so that the upper may be stretched, for example by the use of hand lasting nippers, while pressure is being applied to the sides of the upper (beginning substantially at the start of the lasting operation). This pressure is caused first to bear against the upper near the top of the last and in accordance with a preferred procedure is gradually advanced toward the last bottom as the pulling and stretching operation is carried on. For this purpose I prefer to employ fluid pressure applied in such a way as to exert force substantially normal to the last surface at all points, and by the time the stretching operation is completed this pressure may become substantially uniform at all parts of the upper in contact with the lateral surfaces of the last.

When the upper has thus been stretched, it may be held in stretched condition by maintaining and by further increasing the fluid pressure, and after the inner surface of the margin of the upper and/or the opposed surface of the insole have been rendered sticky or adhesive, for example by coating one or both surfaces with rubber latex or other cement which dries quickly, paticularly in the presence of heat, a set of wiper fingers which may be heated are advanced into engagement with the margin of the upper. Thus the latter is wiped onto the sole member, the wipers being arranged to exert a very substantial and preferably progressively increasing pressure as they advance. Obviously, the inner surface of the margin of the upper material, or the margin of the insole, or both, may be coated with adhesive before assembly, and caused to adhere during lasting by the application of heat and pressure or pressure alone.

The wipers are arranged so that they only contact the marginal material which is to be wiped in, and accordingly even when heated they do not injure the appearance or finish of the exposed parts of the shoe. The wipers are held in advanced position until the cement has set sufficiently to retain the shoe parts in lasted position and while the wipers are thus holding the parts in position, a second shoe may be lasted in the same manner as the first shoe.

Machines of the character disclosed herein preferably are arranged so that certain parts thereof, such as the wipers, are differently designed for right and left shoes respectively, and accordingly it is advantageous to arrange the mechanism in pairs, both pairs being controlled by a single operator.

In order to facilitate the lasting operation and to require the minimum of effort and operations by the operator, the present invention provides improved control arrangements, including means to facilitate the quick location of the last with the upper and insole thereon in proper position in the machine,—the ready movement of the pressure applying elements and the wipers into juxtaposition to the last, and the ready movement of the wipers over the last. Furthermore, means are provided facilitating the individual control of the fluid pressure in the pads or the like which are pressed against the opposite sides of the shoe upper. Associated with arrangements of this type I may provide, as herein disclosed, means to produce an increase in the lateral pressure upon the last when the wiping fingers are advanced into engagement with the margin of the upper. Preferably a driving motor is arranged so that the wiper fingers themselves may be advanced and retracted by power, thus facilitating the control of these operations and requiring less muscular effort upon the part of the operator.

The method aspect of the present invention involves the progressive application of pressure upon each side of the last in turn, and the forcible stretching of each side of the upper while progressively increasing and advancing the area of pressure application from the top of the last toward its bottom upon that side of the upper which is being stretched. The area of pressure application may thus be increased until it is substantially coextensive with the entire area of the side of the last, and after this has been done in turn at both sides of the upper, the pressure may be maintained while the margins of the stretched upper are wiped inwardly onto the insole.

In accordance with a further development of the invention, the two mechanisms constituting the operative pairs above described, have their control elements so interconnected that the op-

eration of a control member in one mechanism, whereby to cause the wipers to advance to operative position, is automatically effective to cause retraction of the wipers of the other mechanism, as well as to cause release of the pressure which has been applied to the sides of the upper. Thus as the operator moves from one mechanism to the other, the shoe and last in the second mechanism is automatically released so that it may readily be removed and replaced by a fresh last with an assembled upper and insole. Further advantages relate to details of structure and improved control means for regulating the supply of the fluid which imparts pressure upon the sides of the shoe.

In the accompanying drawings,

Fig. 1 is an elevational view of the major portion of the machine as viewed from its front when looking upwardly in an inclined direction, parts being broken away and shown in section, and the parts of the machine being shown in the position which they occupy at the beginning of the lasting operation on, for example, a left shoe;

Fig. 2 is a vertical section of the upper part of the machine with parts broken away and parts shown in optional dotted line positions;

Fig. 3 is a fragmentary top plan view showing certain parts of the machine, including the pressure applying bags and wipers, in their retracted positions;

Fig. 4 is a view similar to Fig. 3 but showing the pressure applying bags in their advanced positions, and showing a last with an insole and upper positioned on the machine, the parts here being in the position that they occupy when the lasting operation is partially completed;

Fig. 5 is a fragmentary, transverse, vertical section, on a larger scale, showing one of the movable carriages with related parts;

Fig. 6 is a diagrammatic view with parts broken away illustrating the arrangement of the bags, the means for supplying fluid under pressure thereto, and the control arrangements and devices for said means;

Fig. 7 is a section indicated by line 7—7 of Fig. 2 and showing a portion of the clutch controlling mechanism;

Fig. 8 is a sectional detail showing a portion of the control means for the movable carriages;

Fig. 9 is an elevational detail of one of the movable carriages and related parts;

Fig. 10 is a plan view, with certain parts omitted, illustrating the carriages which support the pressure applying means, together with a portion of the actuating mechanism therefor;

Fig. 11 is an inside elevation of a wiper carriage and heater device with certain parts omitted;

Fig. 12 is a diagrammatic plan view illustrating mechanisms for lasting right and left shoes mounted upon the same base;

Fig. 13 is a view similar to Fig. 5 but illustrating an optional arrangement which permits the application of increased pressure by the pressure applying bags when the wipers are advanced;

Fig. 14 is a view similar to Fig. 4 but also showing the wipers in their advanced positions where they are holding the margin of the upper against the insole;

Fig. 15 is a sectional detail showing the arrangement of the cam mechanism and one of the arms controlled thereby;

Fig. 16 is a sectional view showing the clutch arrangement;

Fig. 17 is a diagrammatic view showing the interconnected portions of the control assemblies of a pair of mechanisms;

Fig. 18 is a perspective view of the cam controlling member; and

Fig. 19 is an elevation of an improved nipper device which may be advantageously employed with an operative pair of mechanisms of the type disclosed herein.

Preferably the apparatus is so arranged as to hold the shoe with its bottom side up while the lasting operation is performed, but when hereinafter I refer to the "bottom" of the last, I intend to indicate that portion of the last which receives the sole, and when I refer to the "top" of the shoe upper, I thereby mean that part which is at the top of the shoe when the latter is being worn.

As herein disclosed, my improved machine comprises a frame having a table-like lower portion 1 supporting an inclined skeletonized platform 4 upon which a portion of the operative mechanism is mounted. The platform 4 supports the machine head 5, which may be in the form of a casting and extends upwardly at right angles to the platform and at an angle to the vertical. The head has a forwardly projecting extension 7 (Fig. 2) which carries a pivot pin 8 on which a jack-supporting bracket 9 is pivotally mounted. This bracket is arranged to swing in a vertical plane between the positions illustrated in full and dotted lines in Fig. 2. The bracket 9 supports a slidable carriage 11 which carries a jack spindle 13 that is vertically adjustable by means of a hand screw 14. Spindle 13 fits within the socket provided for this purpose in lasts of ordinary construction. A last L is indicated in Fig. 2 as mounted on the jack, and as illustrated in Fig. 5 the last carries a shoe upper U and an insole S.

A pair of upwardly extending bracket arms 15 project from the opposite sides of the head 5, as shown particularly in Fig. 1, and support a base member 16 which has an inclination similar to that of the table 4. Carriages 17 and 18 (Fig. 1) are arranged to move on the base member 16 and are furnished with horizontal arms 19 and 20 (Fig. 10), these arms having teeth upon their inner faces which mesh with a pinion 21 mounted upon an upwardly extending shaft 22 journaled in an opening in the base member 16. Below the base member a second pinion 23 (Fig. 8) is mounted on the shaft 22. A rack bar 25 has teeth meshing with the pinion 23 and is slidable in a guideway at the lower part of base 16. The lower part of rack bar 25 is provided with teeth which mesh with a gear sector 28 fixed to a shaft 29 mounted on a bracket 30 extending upwardly from the head 5. The shaft 29 is provided with a lever arm 31 to which a link 32 is articulated. This link has a pivotal connection with a treadle lever 34, the end of which is pivotally connected to the lower part of the frame 1. The forward end of the lever 34 extends outwardly beyond the front of the frame 1 to support a treadle 38 in a position where it may readily be engaged by the foot of the operator. The treadle 38 may be provided with suitable locking means 37, permitting it to be retained in depressed position. A coil tension spring 39 normally tends to move the lever 34 upwardly.

Since the carriages 17 and 18 and the associated parts are similar except for slight variations in detail which will be hereinafter referred to, I will only describe the carriage 17 in de-

tail. The carriage 17 comprises an inner substantially vertical wall 40 having a slot 41 (Fig. 5) through which a bolt 42 extends. The latter is in screw-threaded engagement with a plate 43 disposed at the outer side of the wall 40. The plate 43 is held in position by means of suitable cap screws 44 (Figs. 5 and 11) while the bolt 42 is provided with a nut on its outer end. The inner end of bolt 42 has a ball-like head 45 engaging a socket in a block 46, the latter being secured to a bracket member 47 which is thus supported on the ball-like end of the bolt 42 for universal tilting movement. The bracket 47 carries an abutment plate 48 against which an inflatable pressure applying pad or bag 49 rests. This bag may be formed of rubber or other suitable elastic and stretchable material; preferably the bag has one or more substantially horizontal septums 50, 51 which divide it into a plurality of longitudinal compartments, each septum has an orifice 52, while the lower wall of the lower compartment communicates with a fluid supplying pipe 55. Preferably the orifice in the lowest septum is of a larger diameter than that in the next septum.

The upper surface of the bag may be shaped substantially to conform to the contour of the side of the shoe bottom which is in proximity thereto, it being evident that the upper walls of the bags at the opposite sides of the last will be differently contoured to correspond to the inner and outer sides of the last bottom. Preferably the side of the bag or pad which is opposed to the last is protected by means of a piece of leather 57 or other flexible material which is secured by means of a clamping strip 58 to the lower part of the abutment plate 48, while the upper part of the leather sheet 57 is clamped to the plate 48 by a plate 59. Preferably the latter extends substantially across the upper edge of the bag in order to protect the latter from direct contact with the heated wipers hereafter described and to form a guide for these wipers.

The fluid supply pipe 55 extends from the bag 49 to a release valve assembly 161 (Fig. 6) from which pipes 162 extend to a control valve assembly 163. The latter is connected by means of a duct 165 to a suitable source of fluid under pressure, as for example a compressed air tank T.

The carriage 17 has an upper inclined guide surface 83 preferably divided by a slot 84 (Fig. 9). The carriage also has an upstanding rib 85, also divided by the slot 84, which is undercut at its opposite sides, being engaged by a sliding wiper carrier 86 which is adapted to slide inwardly and downwardly upon the surface 83 of carriage 17. The carrier 86 is provided with an outstanding ear 87 to which one end of a link 88 is pivoted. The other end of the link 88 (Fig. 1) is pivotally connected to an arm 89, which is secured to a shaft 90. Thus, as shown, the shafts 90 are mounted upon brackets 91 at opposite sides of the inclined table 4.

Arms 92 extend inwardly from the shafts 90 and have ends supporting roller followers 93 which may engage opposite sides of a cam means 94. The cam means 94 is provided with similar grooved portions upon its opposite faces, one of these portions being illustrated in Fig. 15. Within this grooved portion is a cam proper 94a, a portion of the groove having a width so that the arm 92 may readily swing to move the corresponding follower 93 out of juxtaposition to the cam proper 94a, this position being shown in full lines in Fig. 15. When the carriages 17 and 18 are moved inwardly, each follower 93 is automatically moved downwardly into juxtaposition to the cam proper 94a, this being the intermediate position which is illustrated in dot and dash lines in Fig. 15. When the parts are in this position the shaft 96, upon which the cam means 94 is fixed, may be rotated so that each follower 93 is received in the narrow part of the corresponding groove and held against the cam 94a, thus swinging the corresponding arm 92 to its lowest position, and swinging each arm 89 inwardly so that the links 88 are effective in moving the carriers 86 and the wiper fingers 95 inwardly to their advanced positions.

A concentric sleeve 190, which is supported on the shaft 96, carries a beveled gear 97 (Fig. 2) which meshes with a similar gear 98. The latter is secured to the upper end of an inclined shaft 199, which is driven by worm gearing 100, the latter in turn being driven by an electric motor 101.

As shown in Fig. 16, the sleeve 190 supports the driving member 187 of a clutch. The driven member 198 thereof is mounted on a sleeve 188. A flange 270, which is secured to the shaft 96, limits the movement of sleeve 188 and member 198 away from member 187. A spring 271 engages flange 270 and tends to hold the clutch members in engagement. A lug 272 projects from the sleeve 188 in spaced relation to the member 198.

The clutch throw-out mechanism includes an oscillating member 110 (Fig. 18) which may be automatically effective in throwing the clutch out of engagement after the shaft 96 has made one-half of a revolution. The member 110 is bifurcated and provided with oppositely beveled fingers 111 and 112, which are receivable in the space between the lug 272 and the driven member 198 of the clutch (Fig. 18). When the member 110 is swung to one position, as shown in full lines in Fig. 7, its beveled finger 112 may engage the lug 272 to compress the spring 271 and automatically to move the driven member 198 of the clutch out of engagement with the driving member 187. Thus the clutch remains disengaged until the member 110 is swung to its other position, indicated in dot and dash lines in Fig. 7, whereupon the finger 112 thereof is moved out of engagement with the lug 272 so that the clutch is reengaged. When the shaft 96 has moved through half a revolution, however, the lug 272 is engaged by the beveled portion of the opposite finger 111, which thereupon automatically again throws the clutch out of engagement.

A link 114 is pivotally connected to the member 110 and to the crank-like end of a control shaft 118. The latter is provided with a crank-like end 119 at the front of frame 1, a suitable stirrup 120 being secured to the part 119 at a convenient point for engagement by the knee of the operator of the machine. Thus while the motor 101 is operating, the shaft 199 and the gears 97 and 98 are continually being driven. If the clutch is in engagement, the shaft 96 is also driven and thus is effective to rotate the cam 94. The latter, as shown in Fig. 15, is shaped to actuate the arms 92 which are effective through shafts 90 and links 88 in moving the carriers 86 when the carriages 17 and 18 are disposed adjoining the last.

The throw-out mechanism, including the beveled arms of member 110, is effective in automatically throwing the clutch out of engagement after the shaft 96 has moved through half

a revolution. Thus upon one actuation of the member 120 by the knee of the operator, the clutch may be engaged so that the motor is effective in moving the carriers 86 inwardly or, if the carriers are occupying their innermost positions, i. e., the positions closest to the last, a half of a revolution of the shaft 96 is effective in causing retraction of the carriers, i. e., their movement to their outermost positions.

The carrier 86 (Fig. 5) comprises an outer portion 191 which is adjustably secured to the body portion of the carrier by bolt and slot connections or the like, and the upper surface of part 191 has substantially the contour shown in Fig. 5, providing an upstanding rib 192 defining the outer edge of a trough 193 which receives the downturned ends of a series of wiper fingers 95. Each wiper finger is provided with a boss 196 having an opening extending downwardly therethrough for the reception of a bolt 197 having a head 189 at its upper end. Each bolt is encircled by a coiled compression spring 186 bearing at its upper end against the under side of the carrier and at its lower end against the washer 200a supported by nut 200 at the lower end of the bolt. The inner ends of the wiper fingers 95 constitute the wipers proper and normally rest upon and slide across the upper surface 201 of a supporting member 202 (Figs. 5 and 11) having downwardly directed legs 203 which are adjustably secured to upstanding lateral flanges 40a projecting from carriage 17. The legs 203 are held in adjusted position relative to the slotted members 40a by means of retaining bolts 203a. When properly adjusted, the surface 201 is slightly below the surface of the shield plate 59 and also below the exposed surface of the insole on the last.

The support 202 preferably is provided with a heating element 105 so that the wipers may be heated while they rest upon the support. As here shown, the heating element consists of an electrical resistance coil receiving electrical energy through a cable 106. Any suitable control box and rheostat may be provided to permit regulation of the amount of current delivered to the coil and consequent regulation of the temperature of the support 202.

In order to keep the inner end portions of the wiper fingers 95 in a proper position in a front to rear direction, the support 202 is provided with set screws 202a (Fig. 11) which, in effect, define the front and rear edges of a channel in which the inner ends of the fingers 95 are guided. The surface 201, which constitutes the floor of this shallow channel, is curved in a longitudinal direction in accordance with the contour of the bottom face of the adjacent part of the last. The inner ends of the fingers 95 preferably are curved upwardly, as shown in Fig. 5, and are adapted to ride over the guide plate 59 and wipe the margin of the upper material.

Each wiper is provided with a spring 109 secured at its upper end to a bracket 210 secured to the wiper and anchored at its lower end to a bracket 211 secured to carrier 86. As the rounded ends of the wipers advance, they engage the guide plate 59 and are raised from the surface 201 and guided so as to pass easily over the edge of the insole as they begin to wipe the upper inwardly. As they advance, their outer ends drop, thereby causing their advancing ends to rock and pass smoothly over the insole while keeping the point of application of the compressive force close to the edge of the shoe bottom, the advancing ends of the wipers being now wholly supported by the wiped-in material, while the springs 109 are stretched, the net result being to apply a progressively increasing pressure to the wiper-in material.

A bracket 212 is secured to the rear part of base member 16 and supports a cylindrical guide member 217 through which a rod 218 slidably extends. The lower end of this rod is provided with a roller follower which engages a cam 220 on shaft 29. The upper end of the rod 218 is provided with an offset portion upon which a toe rest or anvil 221 is mounted. A bracket 240 is connected to the bracket 212 and has an arm 241 which overhangs the toe portion of the last when the latter is in its normal position. An adjustable screw 242 is arranged in screw-threaded engagement with an opening in the end of arm 241 and has a ball-like end portion which may be positioned in engagement with the toe portion of the insole, thus to hold the latter in place when the anvil 221 is moved upwardly. Thus, as the shaft 29 is rotated by actuation of the treadle 38, the rod 218 is slid upwardly to cause the anvil firmly to engage the toe portion of the last and press the insole against the screw 242.

The valve mechanism 161 is provided with a cam 237 on the shaft 96 (Fig. 6) so that this mechanism is actuated when the shaft turns to a position to move the wipers to their retracted positions. Thus when the operator engages the stirrup 120 with his knee and actuates the clutch for moving the wipers 95 away from the last, he also causes the valve mechanism 161 automatically to release the pressure in the bags. It is evident that the treadle 38 may then be released to permit the carriages 17 and 18 to move away from the last, and the latter may then readily be removed from the machine.

The control valve assembly 163 is provided with a double-ended treadle 164, either end of which may be depressed to actuate the valve associated with one of the bags 49 so that the operator may regulate the flow of fluid under pressure to each of the bags. When the treadle is in its normal horizontal position the fluid can not flow into either bag.

The operation of lasting with the apparatus disclosed is substantially as follows, it being assumed that at the beginning of the operation the machine parts occupy the positions shown in Figs. 1 and 3, and that a shoe upper U and insole S have been assembled on the last L and pulled over in any usual or desired manner, it being noted that if the pulling-over operation is properly done, and the lasting allowance is correct, the top edge of the upper will be properly positioned at the sides of the last.

The operator then takes the last with the upper and insole thereon and mounts it upon the jack spindle 13, which may be swung to the dotted line position shown in Fig. 2 for this purpose. The jack is then returned to its operative position, shown in full lines in Fig. 2, and adjusted in order to bring the ball portion of the shoe substantially in line with the central wipers, as indicated at B in Fig. 4. By adjusting the jack up and down, as experience may indicate to be desirable and in accordance with the size of the shoe to be operated upon, the last L is brought to substantially the proper position. If the quarter lining and forward corners of the counter have not already been properly lasted in, this operation may now be performed.

The operator then depresses the treadle 38,

thus causing the carriages 17 and 18 to approach each other to bring the pressure bags or pads 49 into contact with opposite sides of the shoe upper. This operation is also effective in bringing the saddle or toe rest 221 into firm engagement with the toe portion of the upper and pressing the insole against member 242. Having locked the treadle 38 in its depressed position, the operator then seizes the upwardly projecting margin of the shoe upper at one side of the last by means of lasting pincers P, preferably of the improved construction illustrated in Fig. 19, and draws the upper taut and snug about the side of the last in a well known manner. However, before he exerts a substantial pull on the upper in this manner, the operator depresses one side of the double treadle 164 to admit fluid under pressure, such as compressed air, to the hollow pad or bag 49 at the side of the last upon which he is working.

The fluid first enters the lower compartment of the bag and expands the inner wall thereof against the shoe upper near the top of the last. This holds the top edge of the upper at the position in which it was located during the pulling-over operation, that is to say, in a position wherein the top edge of the upper is disposed in proper symmetrical relation to the last and such as results from the operation technically known as "spindling". Since the upper is thus clamped at its extreme top before the operator exerts any substantial strain upon the upper, such strain does not displace the upper from its original properly determined position. As the operator continues to pull on the upper, the pressure of the fluid in the bag gradually extends over an area which progressively advances toward the bottom of the last, or, as viewed for example in Fig. 5, upwardly from compartment to compartment of the bag. Thus during the pulling and stretching operation, the stretching may be continued at the lower margin of the upper, where it is most necessary and where the upper material must be caused to deform in order to conform to the sharp curvature at the shank and ball of the shoe, while the top parts of the upper are clamped and held against excessive stretch. After one side of the upper has been worked in this manner, the operator repeats the operation upon the opposite side of the upper, admitting air into the other bag and thus causing the pressure upon that side of the upper progressively to increase as the upper is stretched upwardly by the nippers or the like.

When the upper has thus been pulled snugly about the last at each side of the latter as described, the operator applies a suitable adhesive either to the inner surface of the margin of the upper or to the margin of the insole or to both, such an adhesive, for example, as rubber latex, although other adhesives may be suitable for this purpose. However, as before suggested, adhesive may be applied before lasting, being of a nature to respond to the application of heat and pressure or pressure alone to become effective to unite the parts.

After the opposed surfaces of the marginal upper material and insole have become sticky, the operator actuates the clutch mechanism by means of his knee, which he engages with the stirrup member 120, thus causing the wiper carriers 86 to advance inwardly and causing the wipers 95 (which have become heated by contact with the support 202) to move inwardly over the guard plates 59 and into contact with the upstanding margin of the upper. It is to be noted that at this time substantially the entire lateral area of the upper from its top edge substantially to the region where it engages the outer edge of the insole is firmly clamped in its stretched condition so that it can not contract during the wiping operation.

The wipers continue their movement until they occupy a position such as indicated in dotted lines in Fig. 5, and in full lines in Fig. 14, whereupon the half-revolution clutch mechanism automatically disengages, leaving the wipers in this position. During the inward movement of the wipers, the springs 109 pull the wipers down toward the surfaces 201, but as the inward movement is continued, no further support is provided by the surfaces 201 so that the free ends of the wipers exert a progressively increasing pressure on the upper in a direction substantially perpendicular to the face of the insole. During the inward movement of the wiper carrier it moves downwardly, thus, as above described, being effective to rock the advancing ends of the wipers so that they ride easily and smoothly over the insole, the action of the springs 109 being more and more pronounced as the wipers advance.

It is evident that both wiper carriers move inwardly simultaneously to the inner ends of their paths. The wipers may then remain in this position with the margins of the upper firmly held in place under heat and pressure while the operator proceeds to last another shoe; for example, if he first lasts the left shoe, the right shoe may be lasted upon corresponding apparatus while the cement upon the first shoe is setting.

As shown particularly in Fig. 12, two mechanisms of the character disclosed herein may be arranged in angular relation to each other so that the operator may turn from one to the other with a minimum of lost motion. After the second shoe has been lasted and the wipers left in their advanced positions, the operator may return to the first mechanism and again actuate the stirrup 120 to cause the clutch to engage, thus effecting the outward movement of the carriers 86, moving the wipers to their retracted positions and releasing the air from bags 49 through valve mechanism 161. He may then release the treadle 38 from its depressed condition, thus causing the bags 49 to move away from the last.

Preferably, however, the two mechanisms or machines for lasting the right and left shoes may have their control means interconnected so that when the operator actuates the control mechanism of one machine to cause the wipers 95 to move inwardly to press and hold the margin of the upper against the insole, the outward movement of the wiper fingers upon the other machine will be automatically and simultaneously effected and the air will be released from bags 49. Thus a separate control operation is not necessary in order to move the wipers of the first machine to their retracted positions when the operator returns thereto.

For this purpose control linkage may be arranged in the manner particularly illustrated in Fig. 17, the cranked end 119 of each shaft 118 being connected by a link 123 to a bell-crank 124. Accordingly, for example, when the stirrup 120 and crank 119 at the right of Fig. 17 are swung toward the bell-crank, a corresponding movement will be imparted to the other crank 119. Thus both shafts 118 will turn in corresponding directions at the same time, the cam means 94 upon one machine being arranged in a diametri-

cally opposite relation to the cam means upon the other machine. Thus the arms **92** upon one machine will be swung to a position to advance the wipers **95** while the cam means upon the other machine is moving to a position to retract the wipers **95** and release the air from the bags **49**. In other words, the cam means **94** upon the respective machines are arranged so that the arms **92** on one machine will occupy the intermediate position shown in dot and dash lines in Fig. 15, while the arms **92** upon the other machine will occupy the lower position indicated in dot and dash lines in that figure. It is thus evident that the wipers **95** will be held in their advanced position upon one machine while they are in their retracted positions upon the other machine where the operator is working.

When the second upper-pulling operation has been completed, the operator actuates the stirrup member **120** on the machine upon which he has been working, thus causing the corresponding clutch **187—198** to engage so that the wiper fingers **95** advance to their operative positions. Simultaneously through the linkage connecting the two machines the movement of the stirrup **120** is effective in actuating the clutch throw-out mechanism of the first machine so that the clutch may reengage on the first machine to cause the wipers **95** to retract and the air to be released. Thereupon the operator may return to the first machine and release the treadle **38** so that the carriages **17** and **18** move away from the last which is then ready for removal from the machine. Thereafter the operator may start lasting another shoe on the first machine while the cement is setting between the insole and upper on the second machine.

The nippers P may be of the type disclosed in Letters Patent No. 2,063,167, granted on December 8, 1936 upon an application of mine, and are provided with a main pair of jaws $P^2$ and a secondary pair of jaws $P^3$, one of the latter being secured to a main jaw and the other being connected by a link $P^1$ to the handle extending from the opposite main jaw. Thus the jaws of both pairs may simultaneously move together or separate. This arrangement is particularly useful since it permits the operator to grip the margin of the upper with either pair of jaws, while employing the other pair of jaws as a fulcrum. Thus both sides of the upper may conveniently be worked although the operator remains at one side of the machine. When the machines are arranged in an operative pair the operator can accordingly remain in the angular space between the machines and the adjoining areas in front of the respective machines.

Fig. 13 illustrates an optional embodiment of the invention wherein the carrier **86** is provided with an upstanding lug **350** which may engage a spring-held plunger **353** that extends through the head of a cylinder **354** and is connected to a piston **255** within that cylinder. The interior of cylinder **354** communicates through an opening **355** with the interior of bag **49**. Thus when the fingers **95** are moved to their advanced positions, the lug **350** engages the plunger **353** to actuate the piston **255**. The latter is effective in further compressing the air within the cylinder and within the compartments of the bag so that as the wipers reach their advanced positions, an unusually firm clamping pressure is imparted to practically the entire side surface of the upper.

I claim:

1. Method of lasting shoes comprising assembling an upper and insole upon a last, applying pressure to one side of the upper by means of a fluid medium throughout an area extending longitudinally of the upper near the top of the last, gripping the lower edge of that side of the upper and stretching it while causing said area progressively to advance toward the last bottom, then, while maintaining the application of said pressure, similarly applying pressure by means of a fluid medium to the opposite side of the upper throughout an area extending longitudinally near the top of the last, gripping the lower edge of that side of the upper and stretching it while causing said second-named area progressively to advance toward the last bottom, and thereafter wiping in the margins of the upper over the last bottom while increasing the pressure applied at the sides by said fluid medium.

2. Method of lasting shoes which comprises as steps assembling an upper and insole upon a last, applying lasting stress by means of a hand lasting appliance to draw the upper of the shoe snugly into contact with one side of the last while concomitantly applying pressure to the upper at said side, thereby to prevent the top portion of the upper from slipping relatively to the last, thereafter applying lasting stress by means of a hand lasting appliance to draw the upper snugly into contact with the other side of the last while concomitantly applying pressure to the upper at said latter side to prevent the top portion of the upper from slipping relatively to the last, causing the marginal lower portion of the upper to become sticky, and simultaneously advancing wiper means from opposite sides of the shoe thereby to wipe in the margin of the upper along the entire forepart of the shoe at both sides of the latter, allowing the wipers to remain in advanced position until the sticky margin of the upper adheres to the insole, and simultaneously retracting the wipers and releasing the clamping pressure at both sides of the shoe.

3. A lasting machine of the class described comprising a last support, pressure applying means arranged to clamp the upper of a shoe against a last mounted on said support, a set of wipers disposed at each side, respectively, of the last support, independent means operative to actuate the pressure applying means and to advance the wipers of both sets to operative position, and a common actuator operative to release the clamping pressure and to cause both sets of wipers to retract from operative position.

4. A lasting machine comprising a pair of mechanisms operative to last a right and a left shoe, respectively, each mechanism comprising clamping means operative to press a shoe upper against the lateral surface of a last and each mechanism also comprising wiper means operative to wipe the marginal portions of the shoe upper over onto the under surface of an insole on the respective last, means operative to actuate the clamping means and the wiping means of each mechanism, and control means operative as the wiper means of one mechanism is advanced toward operative position to cause the clamping and wiping means of the other mechanism to become inoperative and to release the shoe for removal from said latter mechanism.

5. Apparatus for lasting shoes comprising means for supporting a last having a shoe upper and an insole mounted thereon, a pair of pressure applying means, each of said means being arranged progressively to apply pressure to the side of an upper mounted on said supporting means

by initially applying the pressure in the region of the top of the upper and gradually advancing the pressure toward the bottom of the same, control means for the pressure applying means arranged to effect the independent application of pressure by the respective means, wipers for wiping in the margins of an upper mounted on the support, means to advance the wipers over the last, and means to effect a simultaneous increase of the lateral pressure imposed by said pressure applying means when the wipers are thus advanced.

6. Apparatus for lasting shoes comprising a support for a last with a shoe upper and insole assembled thereon, carriages movable toward said support, means on said carriages for applying pressure to the sides of the upper upon the last, wipers mounted upon the carriages and movable relative thereto, a control instrumentality to effect the simultaneous movement of the carriages to and from the last, independent manually controlled devices to regulate the application of pressure by said means, and independently controllable power driven mechanism to advance the wipers over the last or retract them therefrom when the carriages are disposed adjoining the last.

7. Apparatus for lasting shoes comprising a support for a last with a shoe upper and insole assembled thereon, carriages movable toward said support, means on said carriages for applying pressure to the sides of the upper upon the last, wipers mounted upon the carriages and movable relative thereto, a control instrumentality to effect the simultaneous movement of the carriages to and from the last, independent manually controlled devices to regulate the application of pressure by said means, and independently controllable power driven mechanism to advance the wipers over the last or retract them therefrom when the carriages are disposed adjoining the last, said means for applying pressure to the sides of the upper being arranged so that pressure may be independently applied to one side of the upper at a time.

8. Apparatus for lasting shoes comprising a support for a last with a shoe upper and insole assembled thereon, carriages movable toward said support, means on said carriages for applying pressure to the sides of the upper upon the last, wipers mounted upon the carriages and movable relative thereto, a control instrumentality to effect the simultaneous movement of the carriages to and from the last, independent manually controlled devices to regulate the application of pressure by said means, and independently controllable power driven mechanism to advance the wipers over the last or retract them therefrom when the carriages are disposed adjoining the last, said power driven mechanism being arranged simultaneously to advance the wipers upon both sides of the last.

9. Apparatus for lasting shoes comprising a support for a last with a shoe upper and insole assembled thereon, carriages movable toward said support, means on said carriages for applying pressure to the sides of the upper upon the last, wipers mounted upon the carriages and movable relative thereto, a control instrumentality to effect the simultaneous movement of the carriages to and from the last, independent manually controlled devices to regulate the application of pressure by said means, independently controllable power driven mechanism to advance the wipers over the last or retract them therefrom when the carriages are disposed adjoining the last, said pressure applying means being arranged to receive fluid under pressure thereby to grip the sides of the upper, and control means associated with the power operated mechanism and with said pressure applying means effective to release the fluid pressure from the pressure applying means when the power driven mechanism is actuated to retract the wipers.

10. Apparatus for lasting shoes comprising a support for a last with a shoe upper and insole assembled thereon, carriages movable toward said support, means on said carriages for applying pressure to the sides of the upper upon the last, wipers mounted upon the carriages and movable relative thereto, a control instrumentality to effect the simultaneous movement of the carriages to and from the last, an independent, manually controlled device to regulate the application of pressure by said means, independently controllable power driven mechanism to advance the wipers over the last or retract them therefrom when the carriages are disposed adjoining the last, and a toe rest movable against the upper on the last when the carriages are moved toward the support.

11. Apparatus for lasting shoes comprising a pair of similar mechanisms for lasting right and left shoes respectively, each of said mechanisms including a support for a last with an upper and insole assembled thereon, said mechanisms each having movable wipers to advance over the margins of an upper mounted upon the corresponding last and having power driven actuating means operative to advance and retract the wipers, and control means for said power driven actuating means arranged to cause the wipers of one mechanism to advance over the corresponding last while causing the actuating means of the other mechanism to retract the corresponding wipers.

12. Apparatus for lasting shoes comprising a pair of similar mechanisms for lasting right and left shoes respectively, each of said mechanisms including a support for a last with an upper and insole assembled thereon, said mechanisms each having movable wipers to advance over the margins of an upper mounted upon the corresponding last and having power driven actuating means operative to advance and retract the wipers, and control means for said power driven actuating means arranged to cause the wipers of one mechanism to advance over the corresponding last while causing the actuating means of the other mechanism to retract the corresponding wipers, each of said mechanisms having means to impose lateral pressure upon the sides of an upper mounted upon the corresponding last, said actuating means including release means operative to release the pressure imposed by said pressure applying means when the corresponding power driven actuating means retracts the corresponding wipers.

13. Apparatus for lasting shoes, comprising a support for a last with a shoe upper and insole assembled thereon, a pair of pressure applying means disposed respectively at opposite sides of the last and arranged to clamp the sides of the upper against the last, wipers movable inwardly over the bottom of the last, control means to cause said pressure applying means to press against the sides of the last, and independent means to effect the inward movement of the wipers, said pressure applying means being arranged automatically to increase the pressure

upon the sides of the last when the wipers are thus moved inwardly.

14. Apparatus for lasting shoes comprising a support for a last with a shoe upper and an insole assembled thereon, carriages movable toward the support widthwise of the last, wipers mounted upon the carriages and movable relative thereto to wipe the upper over the insole between its toe and heel end portions, a control instrumentality operative to effect the simultaneous movement of the carriages toward and from the last, and independently controllable power driven mechanism to cause the movement of the wipers relative to the carriages thus to cause them to advance over the last or retract therefrom.

15. Apparatus for lasting shoes comprising a support for a last with a shoe upper and an insole assembled thereon, wipers movable over the last between its toe and heel end portions and retractable therefrom, power driven mechanism to advance the wipers over the last or to retract them, said mechanism including a continuously operating driving member, half-revolution clutch means, a cam means rotatable through a half-revolution by said driving member when the clutch means is engaged, and linkage connecting said cam means to the wipers whereby the latter are advanced during one-half revolution of the cam means and are retracted during the succeeding one-half revolution of the cam means.

16. Apparatus for lasting shoes comprising a support for a last with a shoe upper and an insole assembled thereon, wipers movable over the last and retractable therefrom, power driven mechanism to advance the wipers over the last or to retract them, said mechanism including a continuously operating driving member, half-revolution clutch means, a cam means rotatable through a half-revolution by said driving member when the clutch means is engaged, linkage connecting said cam means to the wipers whereby the latter are advanced during one-half revolution of the cam means and are retracted during the succeeding one-half revolution of the cam means, and a control member to cause the engagement of said clutch means, said member being positioned to be actuated by the knee of the operator of the machine.

17. Apparatus for lasting shoes comprising a support for a last with a shoe upper and an insole assembled thereon, wipers movable over the last and retractable therefrom, power driven mechanism to advance the wipers over the last or to retract them, said mechanism including a continuously operating driving member, half-revolution clutch means, a cam means rotatable through a half-revolution by said driving member when the clutch means is engaged, linkage connecting said cam means to the wipers whereby the latter are advanced during one-half revolution of the cam means and are retracted during the succeeding one-half revolution of the cam means, and inflatable bags to impose lateral pressure upon the sides of a shoe upper mounted on the last, said cam means also being effective to release the pressure from said inflatable bags in the course of the retractive movement of the wipers.

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