

Dec. 13, 1949

F. C. EASTMAN ET AL

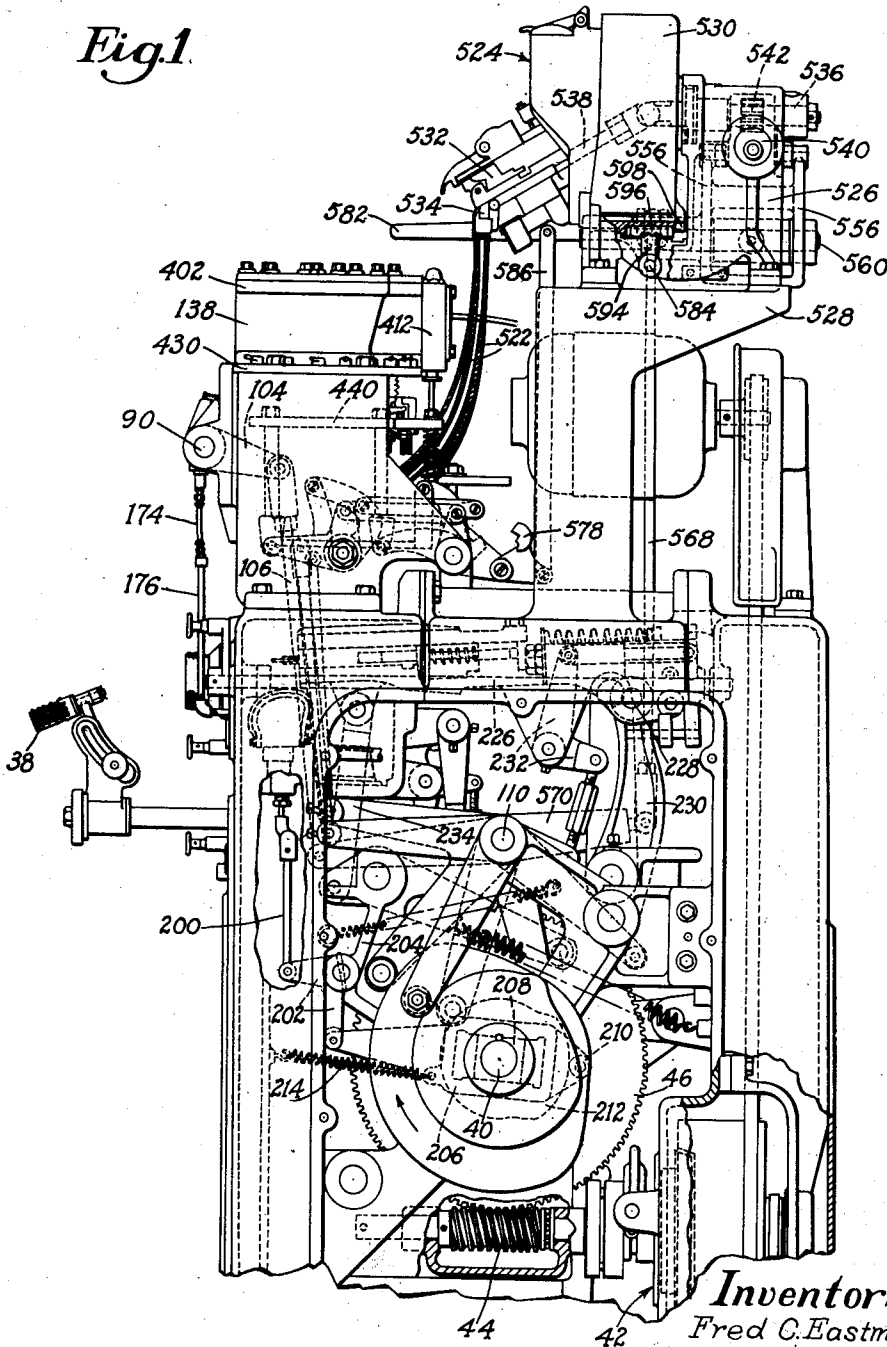
2,490,900

END LASTING MACHINE

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13 Sheets-Sheet 1

Fig. 1.



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13 Sheets-Sheet 2

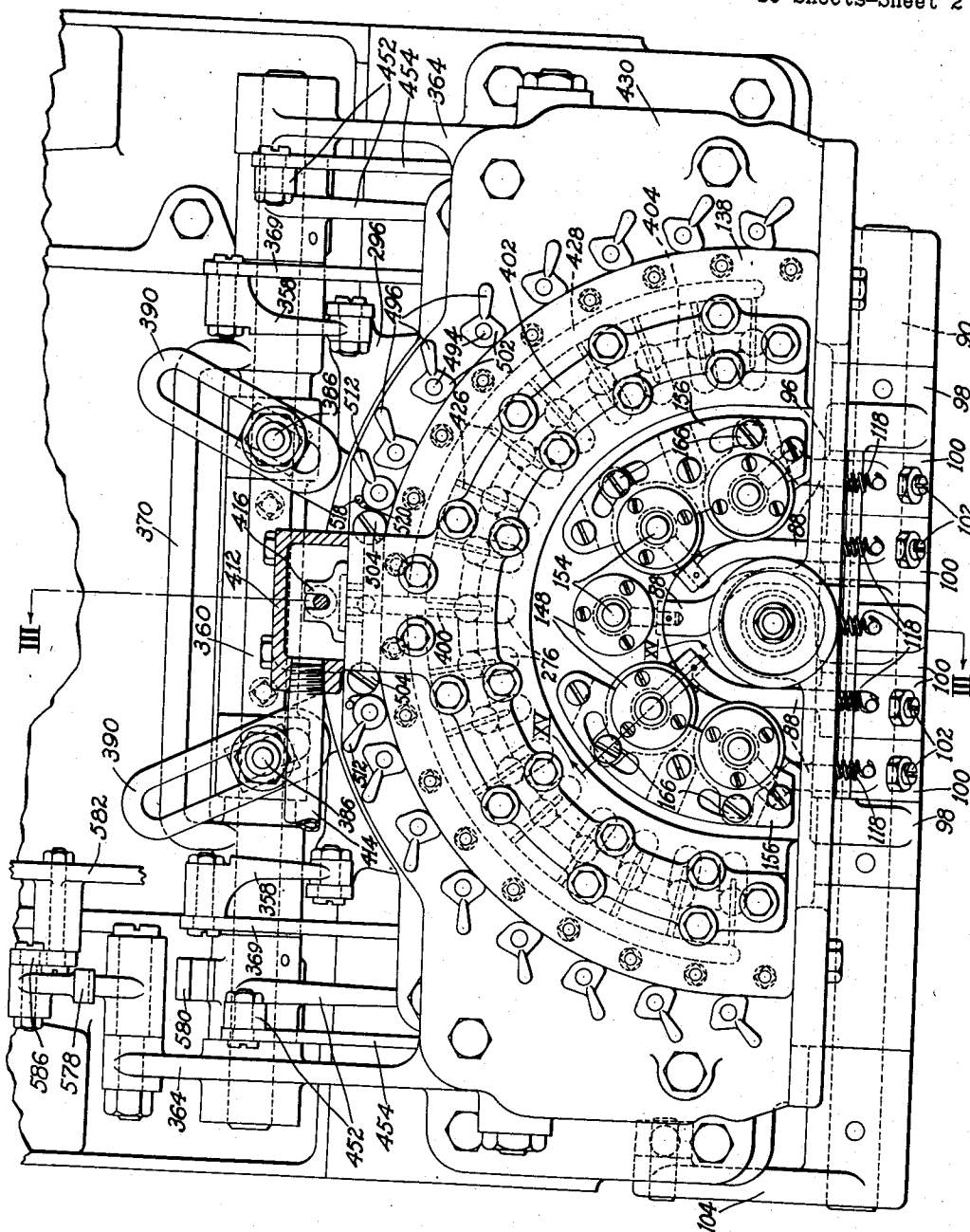


Fig. 2.

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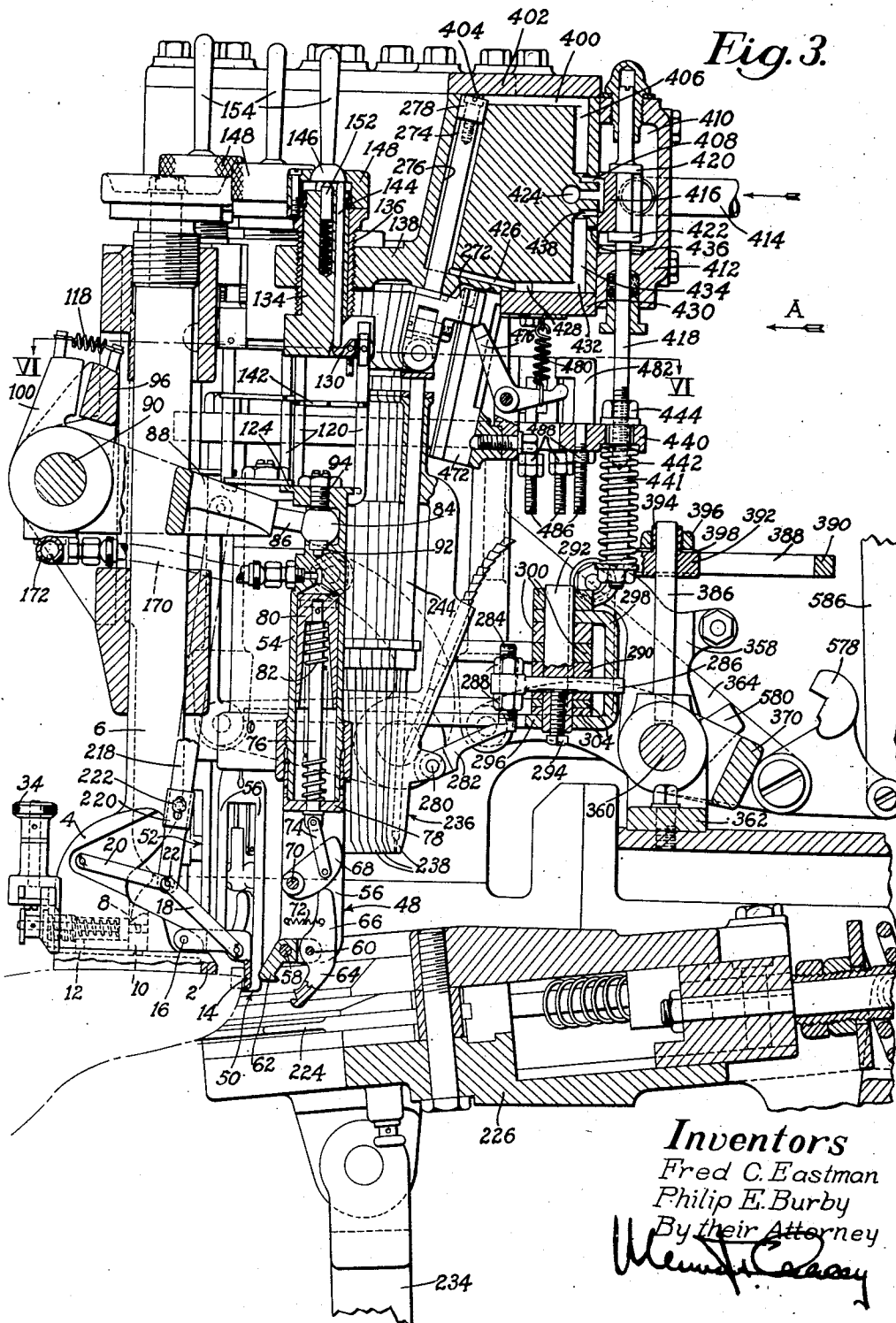
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Fig. 4.

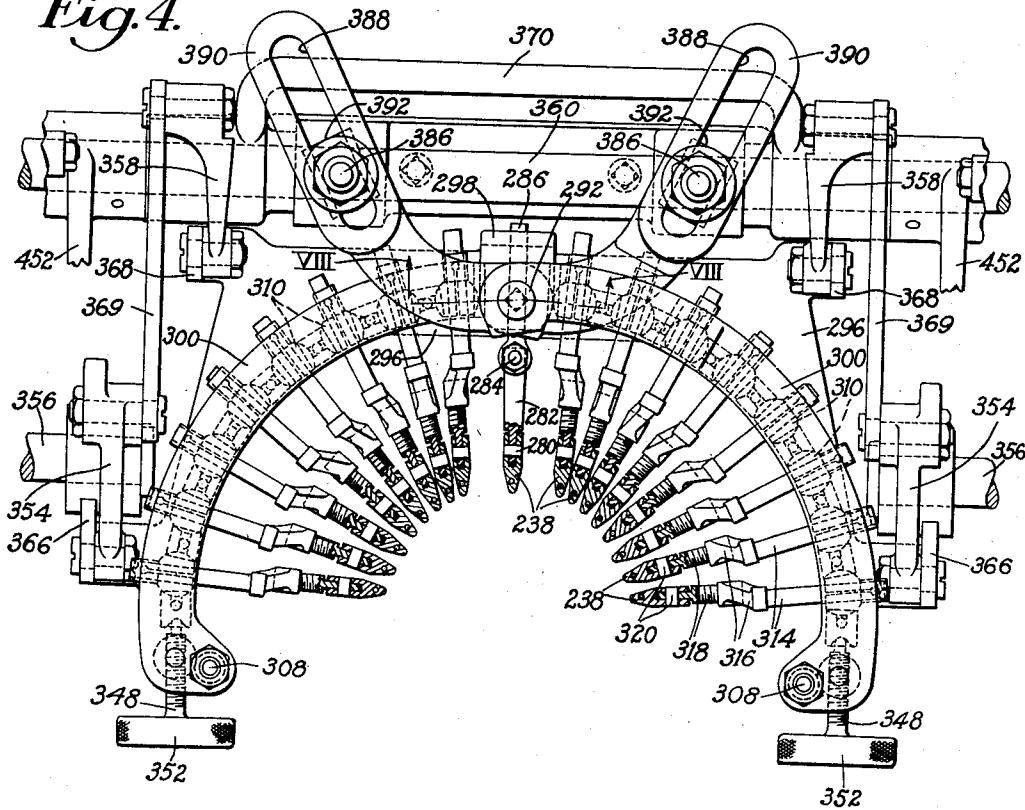
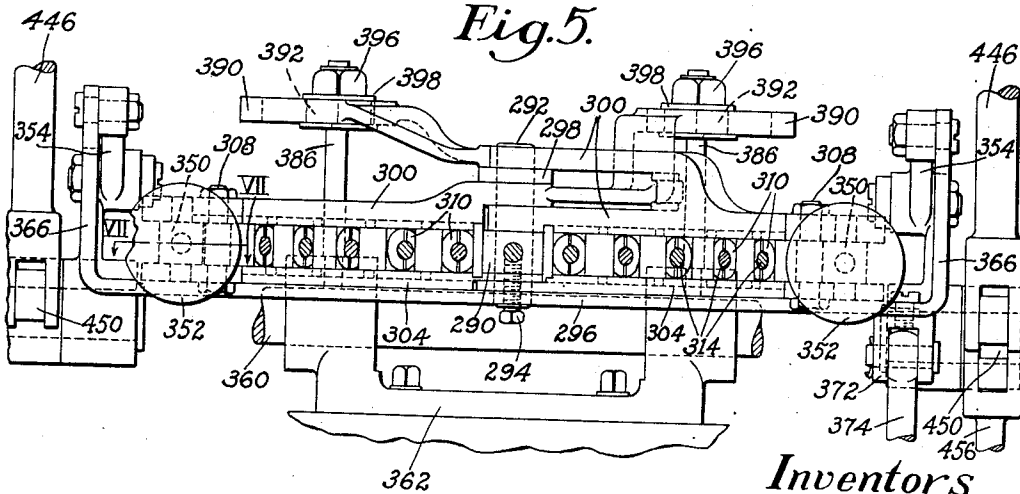


Fig. 5.



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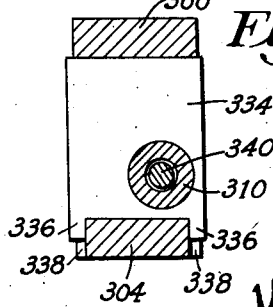
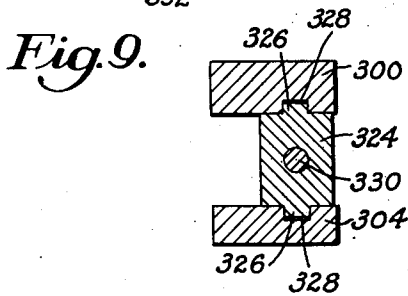
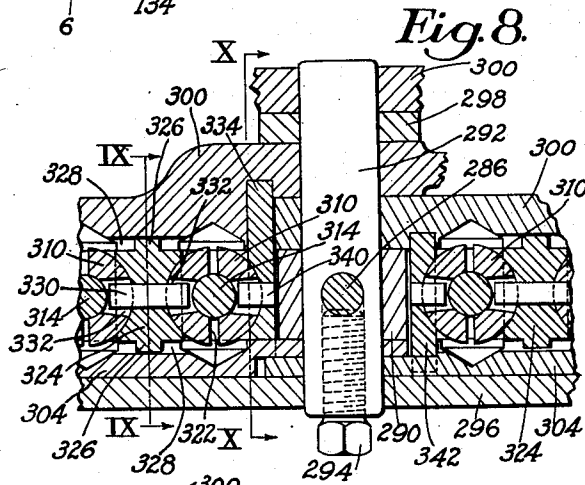
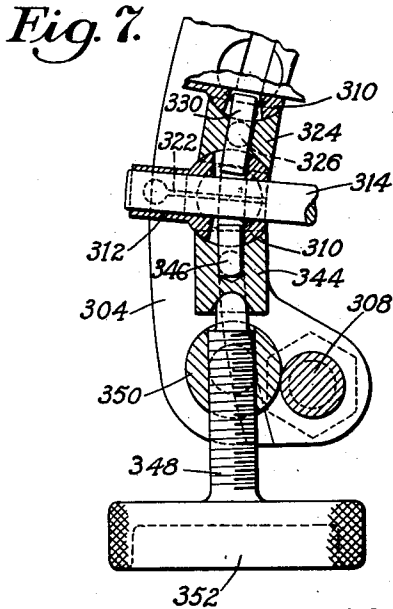
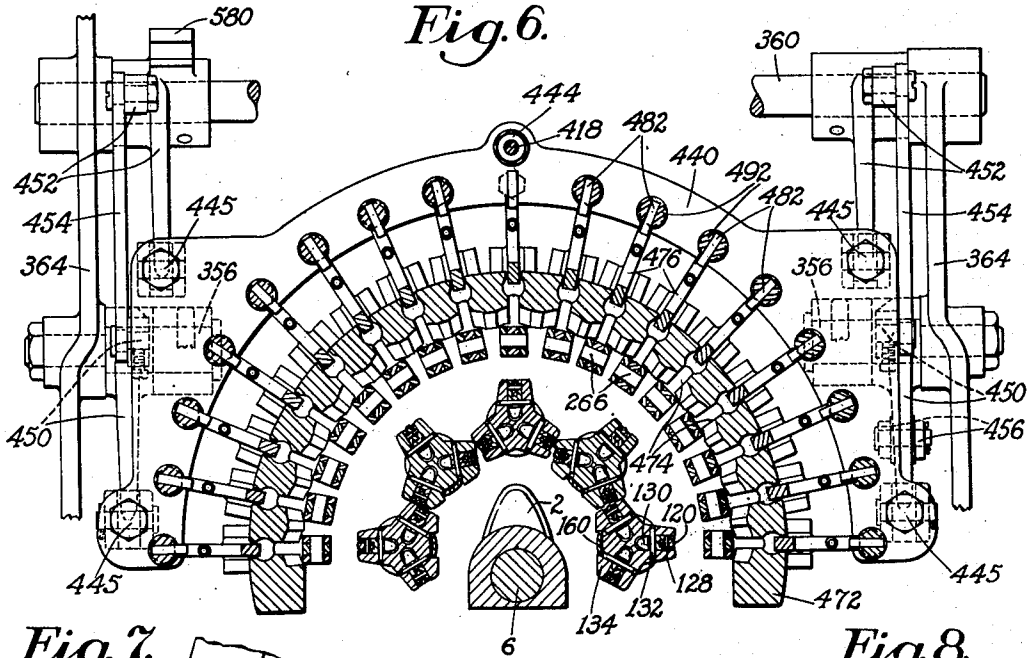
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Fig.14.

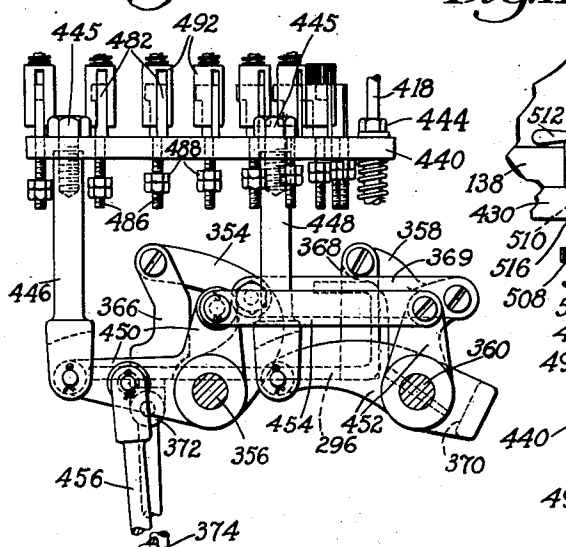


Fig.11.

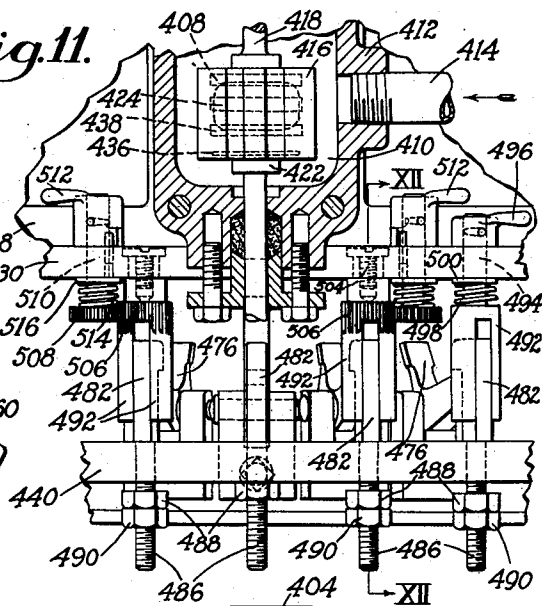


Fig.12.

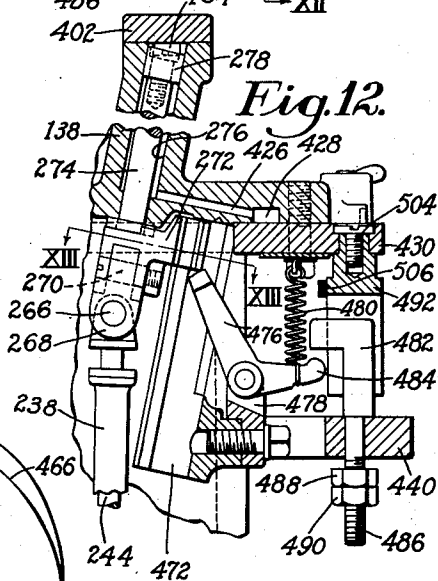
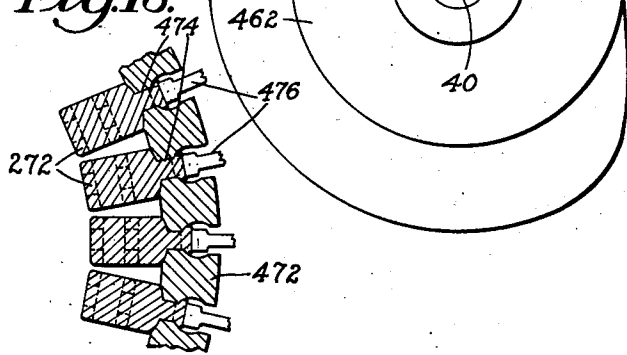


Fig.13.



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Fig. 15.

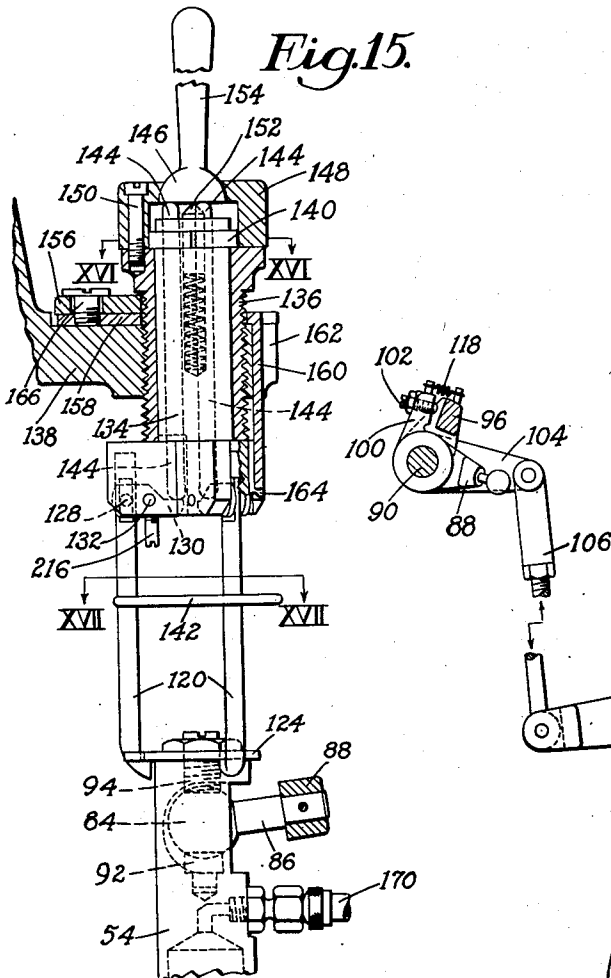


Fig. 18.

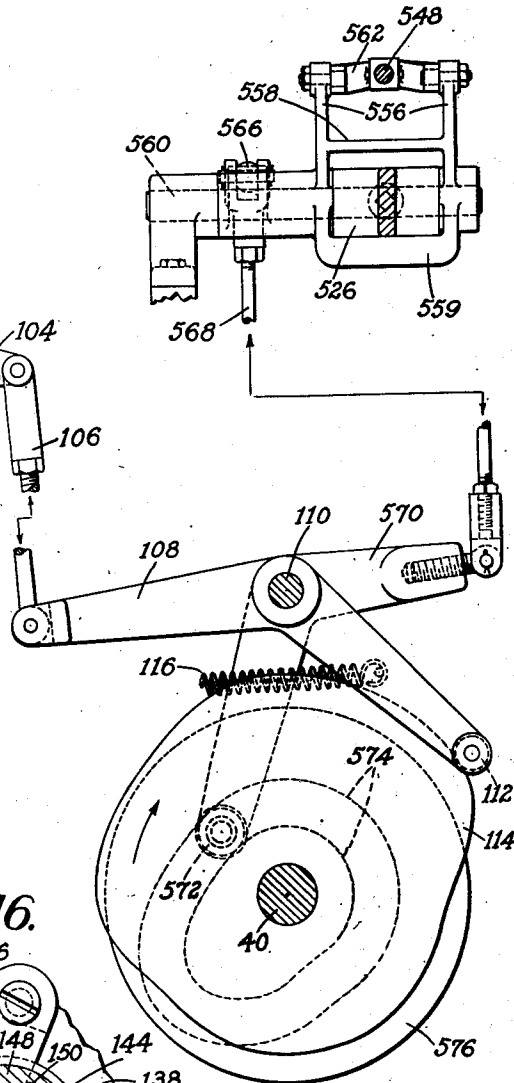
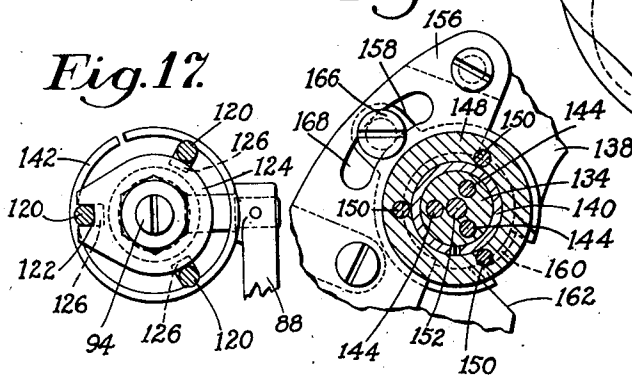


Fig. 16.

Fig. 17.



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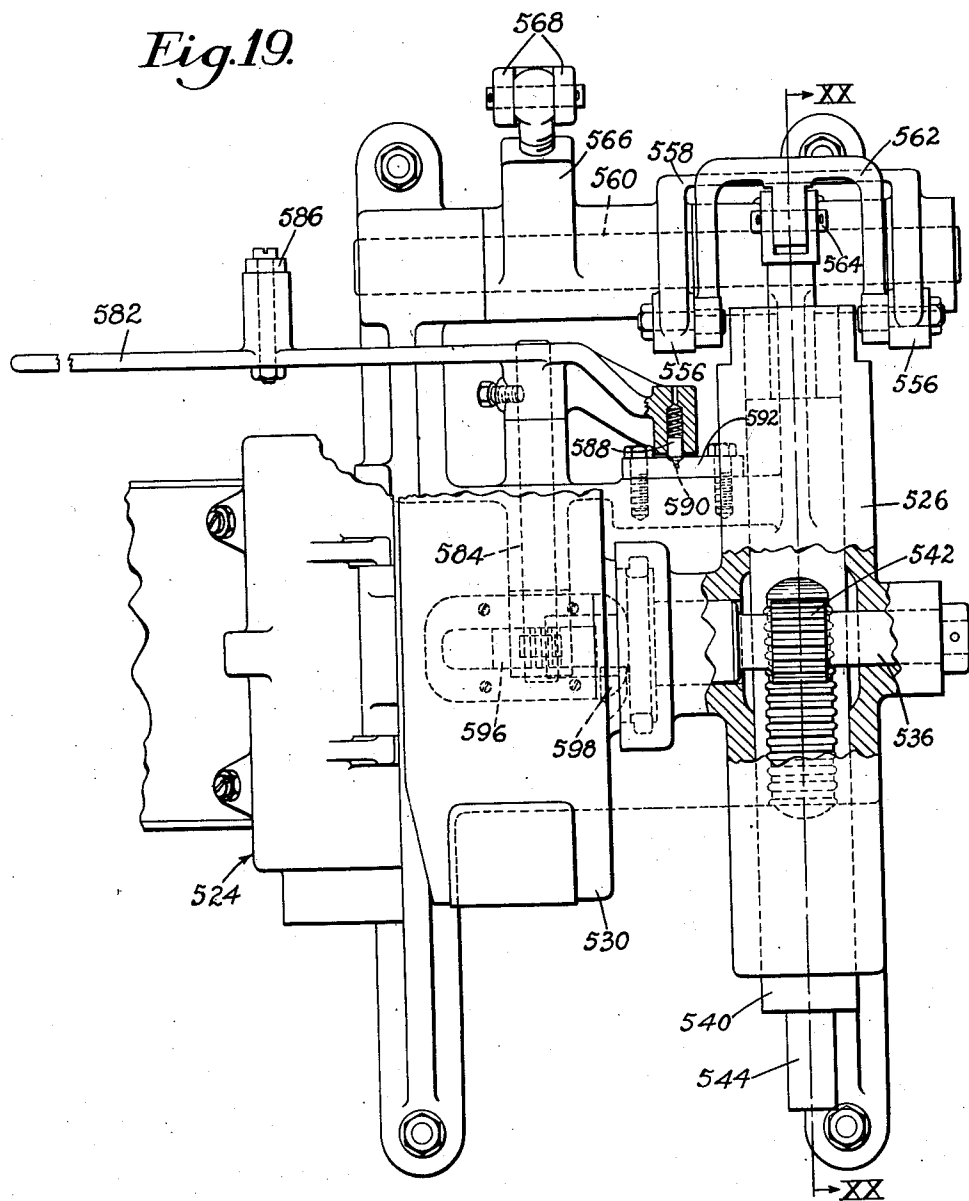
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Fig. 19.



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Fig. 20.

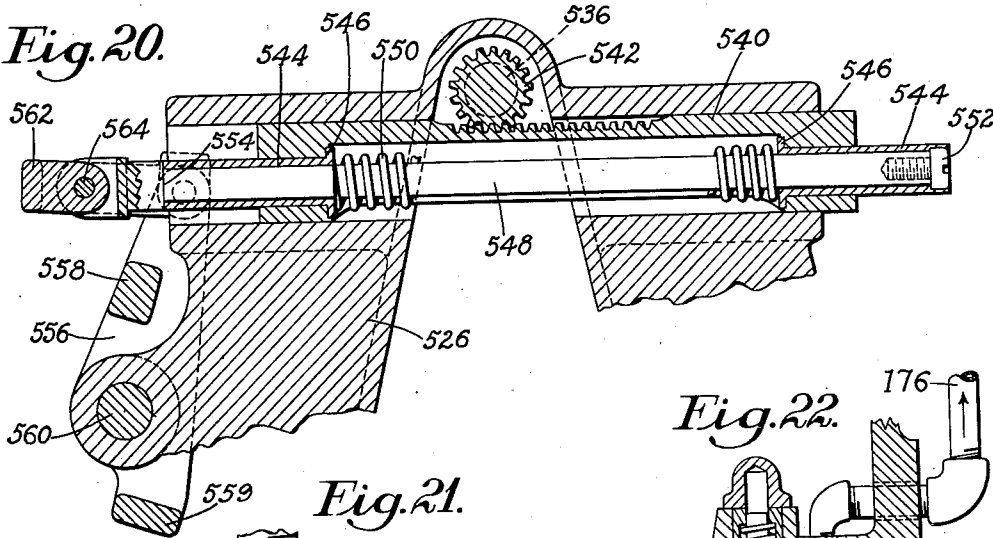


Fig. 21.

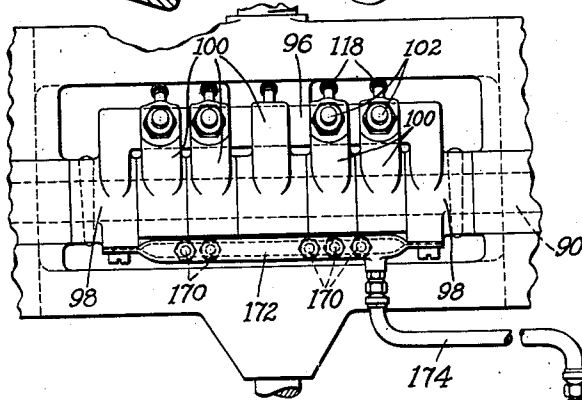
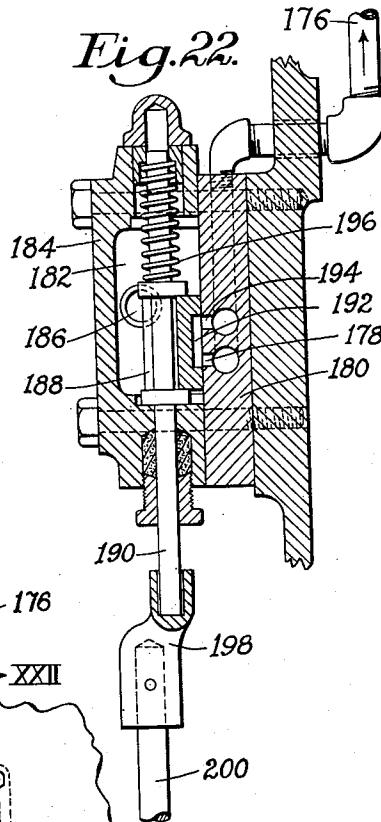


Fig. 22.



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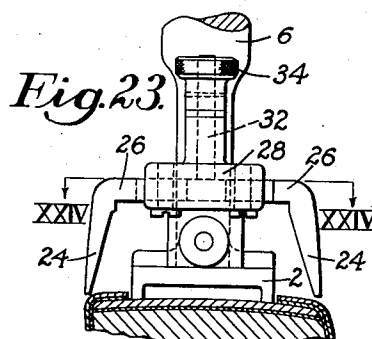
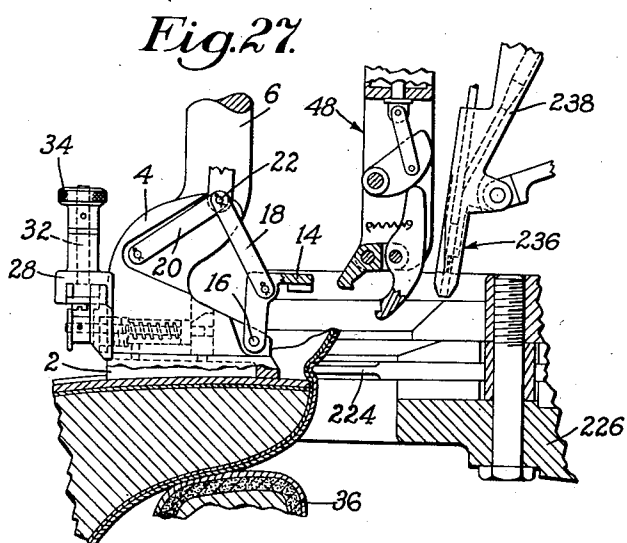
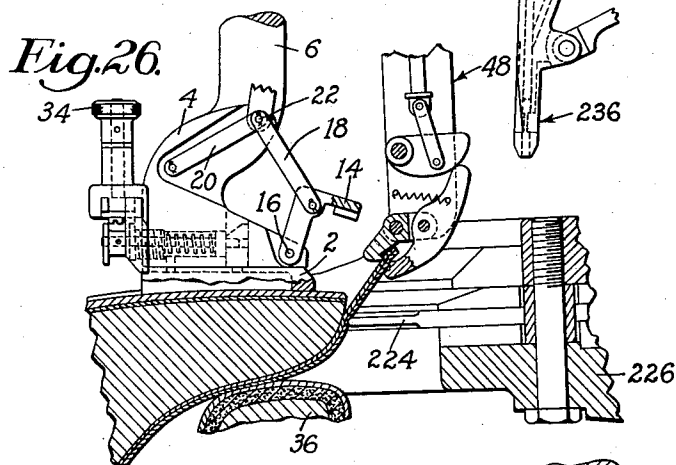
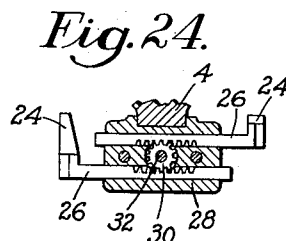
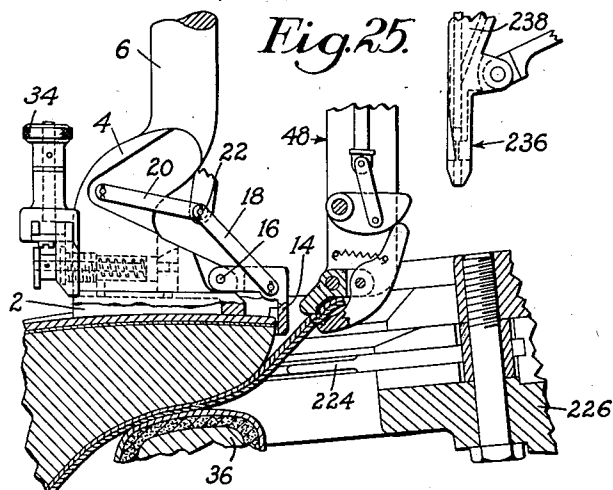
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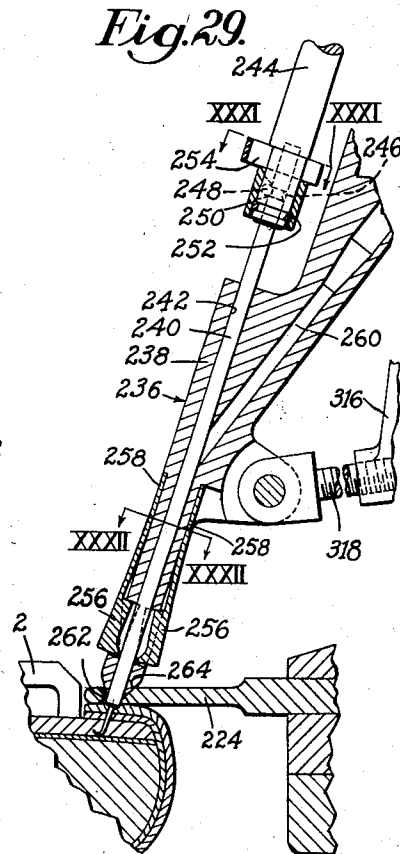
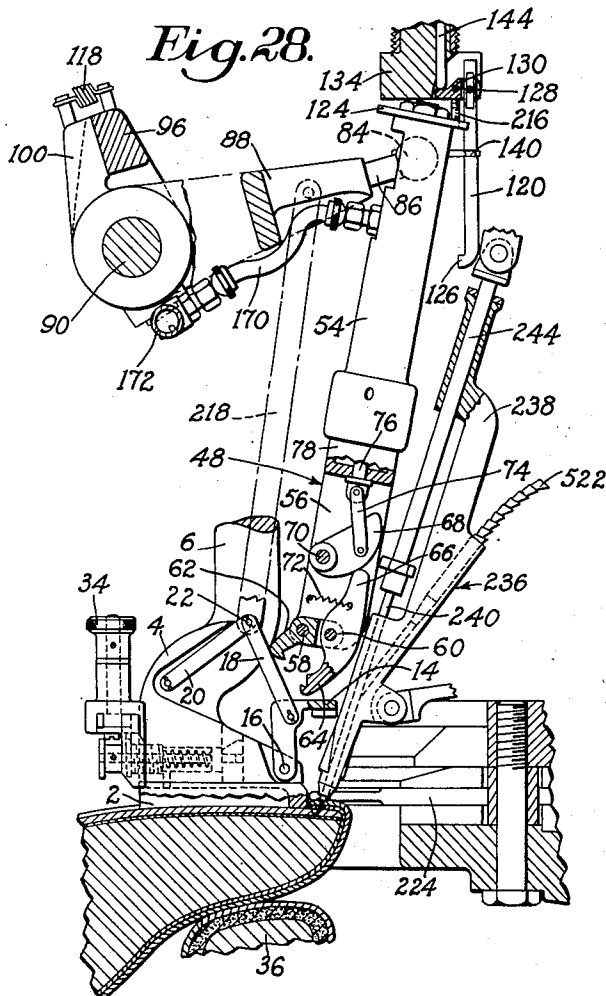


Fig. 30.

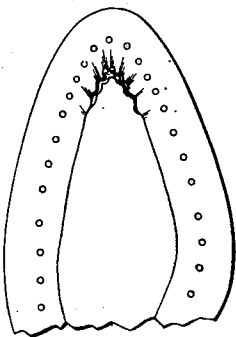


Fig. 32.

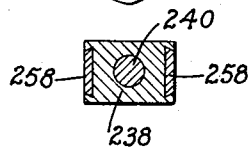
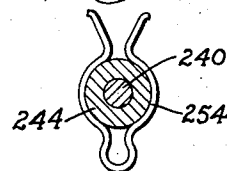


Fig. 31.



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Fig.33.

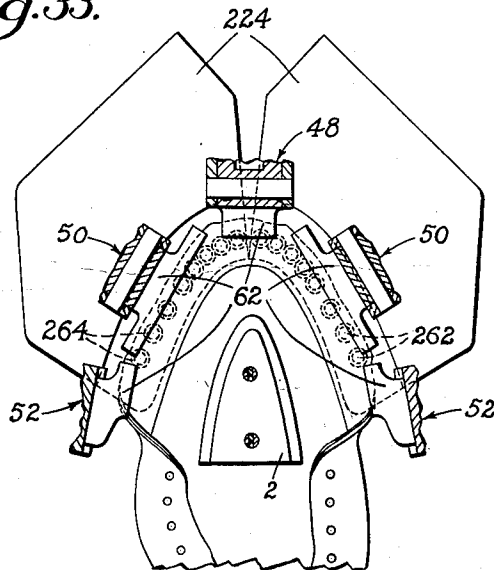
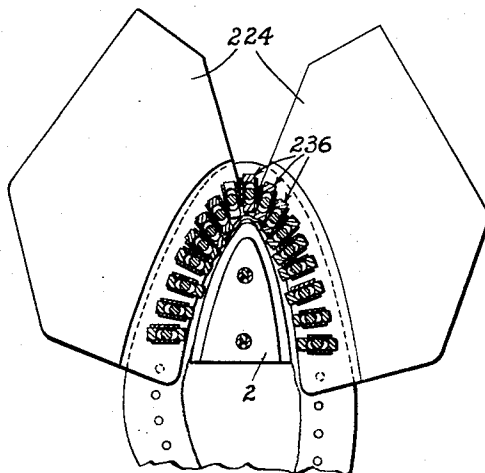


Fig.34.



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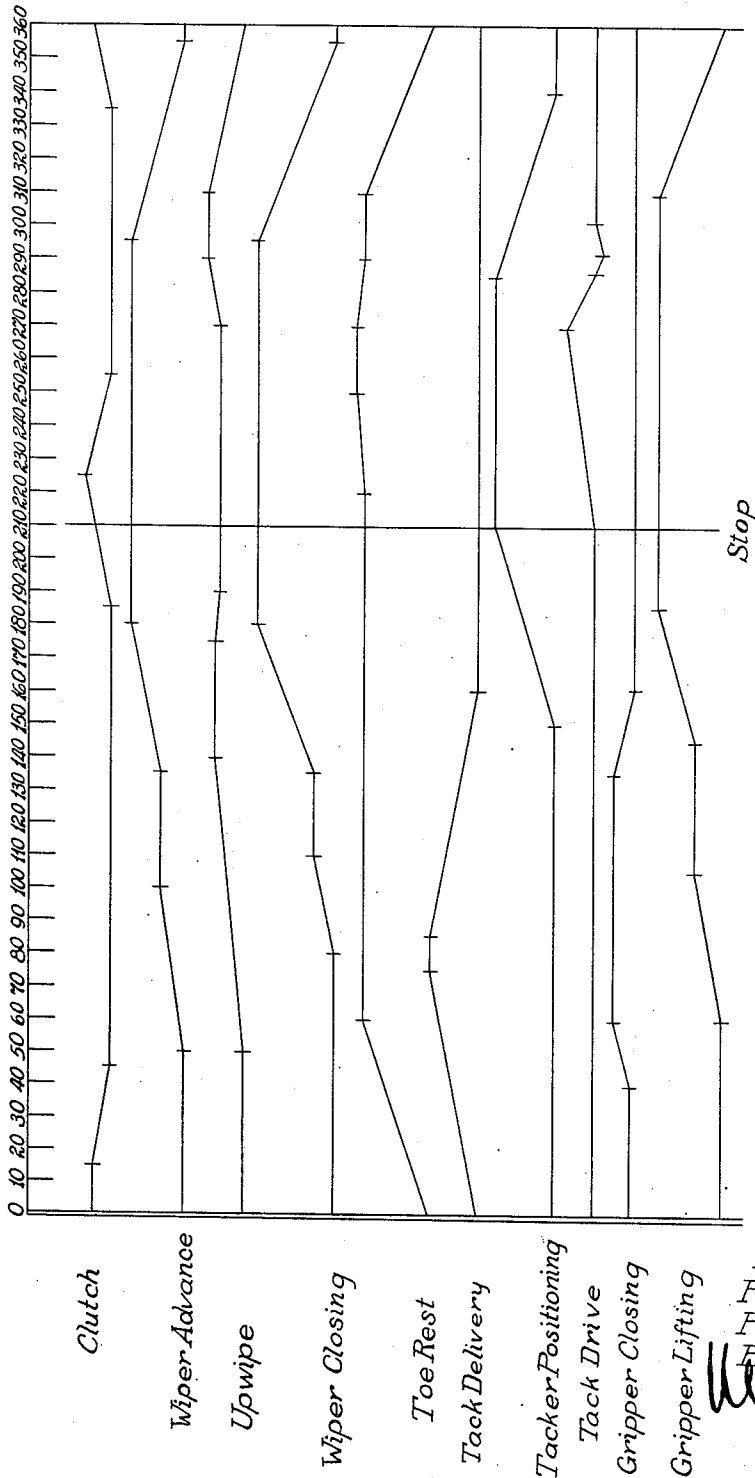


Fig. 35.

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UNITED STATES PATENT OFFICE

2,490,900

END LASTING MACHINE

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Application March 6, 1946, Serial No. 652,472

69 Claims. (Cl. 12—10.2)

1

This invention relates to machines for use in the manufacture of shoes, and is herein shown as embodied in a modification of a power-operated toe-lasting machine such as disclosed in United States Letters Patent No. 2,160,846, granted on June 6, 1939, on an application of F. C. Eastman's and A. F. Pym's. It is to be understood, however, that in various novel aspects the invention is not limited to the illustrative embodiment.

The toe-lasting machine shown in the above-mentioned Letters Patent is provided with grippers for pulling the toe end of the upper over the last and with wipers for wiping its marginal portion inwardly over an insole on the last. The machine is intended especially for the lasting of welt shoes and is so constructed as to permit the operator to apply a binder wire about the toe to hold the upper in lasted position. An object of the present invention is to adapt the machine for the lasting of shoes of that type in which the margin of the upper over the insole lies throughout its width in substantially parallel relation to the bottom of the last when the outsole is applied to the shoe. To this end, the machine herein shown is provided with means for driving a plurality of fastenings to fasten the marginal portion of the upper to the insole after it has been wiped inwardly by the wipers and with a different organization of means from that shown in the above-mentioned Letters Patent for pulling the upper preparatory to the action of the wipers thereon.

As a part of the above-mentioned upper-pulling means the invention provides novel mechanism for imparting to different grippers upper-pulling movements which differ in extent as required by different portions of an upper engaged thereby. The construction shown comprises a gripper for gripping the upper at the end of the toe, a pair of grippers for gripping it respectively at the opposite sides of the toe near the end thereof, and another pair of grippers for gripping it also at the sides of the toe but in locations farther from the end of the toe. Since the portion of the upper acted upon by the last-mentioned grippers is close to a portion beyond the toe which in accordance with the usual practice has already been lasted, it requires less pull than the portion acted upon by the pair of grippers near the end of the toe. Accordingly, provision is afforded for moving the pair of grippers near the end of the toe a determinately greater distance than the other pair, the construction shown being further such that

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a movement of determinately greater extent also may be imparted to the end gripper than to the side grippers. In the illustrative embodiment of the invention the several grippers are thus moved by levers which are mounted for movements independently of one another about a common axis and are operated in the proper time relation to one another by a member also movable about that axis, provision being afforded for adjustably varying the times when this member begins to act on the different pairs of side grippers. It is contemplated that for the purpose in view this member will first begin to move the end gripper and will thereafter successively pick up and operate the pairs of side grippers located respectively near the end of the toe and farther from the end of the toe.

The invention further provides novel gripper-adjusting and controlling means, herein shown as associated with each of the several grippers. In the illustrative embodiment of the invention each gripper comprises a pair of jaws and a casing supporting the jaws and mounted for universal swinging movement relatively to the gripper-operating lever associated therewith, novel mechanism being provided for adjustably swinging the gripper in any direction relatively to the lever. This mechanism includes a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing respectively in different locations around the casing, the fingers being relatively movable heightwise of the last thus to adjust the gripper. Such relative movement of the fingers is effected by a manually operated member which is, for that purpose, mounted for universal tipping movement, the fingers being held in their adjusted relation by means in frictional engagement with this member. A support for the fingers, moreover, is movable to adjust the gripper bodily heightwise of the last through the fingers and also to turn it adjustably about an axis extending heightwise of the last. Further to assist in accomplishing the objects of the invention the construction shown is such that as the gripper is moved to pull the upper it is released by the fingers for universal swinging movement, thus permitting it to position itself as determined by the resistance of the upper in the upper-pulling operation and after its release of the upper to be swung to a position where it will not interfere with the fastening of the upper. Such swinging of the gripper, in a direction inwardly over the bottom of the last, is effected in response to further movement thereof heightwise of the

last after its release of the upper. In the return of the parts to starting positions control of the gripper by the fingers with respect to swinging movement is reestablished.

In a further novel aspect the invention relates more particularly to the control of means provided for fastening the upper after its marginal portion has been wiped inwardly over the insole by the wipers. For thus fastening the upper the machine has a plurality of fastening-inserting devices, each including a holder for a fastening and a driver bar and driver for driving the fastening, and there is provided novel means for moving these devices from initial retracted positions where they are out of the way of the grippers into positions for the driving of the fastenings. In the construction shown the fastening-inserting devices are mounted to swing transversely of the edge of the shoe bottom about connections between the driver bars and their operating means, and to position them for the driving of the fastenings they are swung inwardly over the shoe bottom into alignment with openings in the wipers through which the fastenings are driven, the holders being also moved heightwise of the shoe relatively to the driver bars to seat them in recesses formed in the wipers adjacent to the openings. In thus positioning the devices different groups thereof which drive their fastenings respectively along the opposite side portions of the shoe bottom are swung both lengthwise and laterally of the shoe by levers which for that purpose are moved bodily lengthwise of the shoe and receive swinging movements laterally of the shoe in response to such bodily movements, the levers also being moved bodily heightwise of the shoe to seat the holders in the recesses in the wipers. In order that the positions to which the fastening-inserting devices are thus moved lengthwise and laterally of the shoe may be varied for shoes of different styles or sizes, provision is further afforded for preliminarily adjusting the devices relatively to one another, each of the above-mentioned levers having thereon means for securing the several devices controlled thereby in their adjusted relation.

Further to assist in accomplishing the objects of the invention, the machine herein shown is so constructed that while the toe-end portion of the upper is held in lasted position by the wipers the fastenings for securing it to the insole are not driven simultaneously, but in an adjustably predetermined time relation to one another, the timing being preferably such that after the driving of a single fastening at the end of the toe different pairs of fastenings are driven successively with the fastenings of each pair located respectively at the opposite sides of the toe. One advantage of this construction is that it serves to avoid such comparatively heavy pressure on the bottom of the toe end of the shoe as would result from the driving of all the fastenings simultaneously, thus guarding against excessive pressure on the top of the toe end of the shoe of a toe rest which supports that portion of the shoe in the toe-lasting operation. A further advantage arises from the fact that in the construction shown the several drivers are operated respectively by fluid-operated members associated therewith, since simultaneous operation of all these members would utilize such a comparatively large volume of operating fluid as might result in undesirable reduction of the pressure of the fluid and therefore of the speed of the drivers in the driving operation. By operating different

pairs of drivers respectively at different times, as above described, insurance is afforded that the pressure of the fluid will remain high enough to move the drivers with the required speed and force, the force being applied, moreover, simultaneously at the opposite sides of the shoe bottom to avoid any tendency to displace the shoe.

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

In the drawings,

Fig. 1 is a view in right-hand side elevation of the greater portion of the machine in which the invention is herein shown as embodied, with parts broken away;

Fig. 2 is a plan view on an enlarged scale of the upper front portion of the machine, with parts broken away;

Fig. 3 is a section on the line III—III of Fig. 2;

Fig. 4 is a plan view of a portion of the means for controlling the fastening-inserting devices, with parts in section;

Fig. 5 is a view in front elevation of the structure shown in Fig. 4, with parts broken away;

Fig. 6 is a section on the line VI—VI of Fig. 3;

Fig. 7 is an enlarged plan view of a portion of the structure shown at the left-hand side of Fig. 4, with parts in section on the line VII—VII of Fig. 5;

Fig. 8 is a section on the line VIII—VIII of Fig. 4, on an enlarged scale;

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

Fig. 10 is a section on the line X—X of Fig. 8;

Fig. 11 is a view mainly in rear elevation of the portion of the structure toward which the arrow A points in Fig. 3;

Fig. 12 is a section on the line XII—XII of Fig. 11;

Fig. 13 is a section on the line XIII—XIII of Fig. 12;

Fig. 14 is a view in right-hand side elevation of a portion of the means for controlling the driving of the fastenings;

Fig. 15 is a section on the line XV—XV of Fig. 2 on an enlarged scale;

Fig. 16 is a section on the line XVI—XVI of Fig. 15;

Fig. 17 is a section on the line XVII—XVII of Fig. 15;

Fig. 18 is a view mainly in right-hand side elevation of portions of the mechanisms for operating the grippers and for feeding the fastenings;

Fig. 19 is mainly a plan view of the feeding mechanism;

Fig. 20 is a section on the line XX—XX of Fig. 19;

Fig. 21 is a view in front elevation showing means provided for controlling the closing of the grippers by fluid pressure;

Fig. 22 is a section on the line XXII—XXII of Fig. 21, on an enlarged scale;

Fig. 23 is a view in front elevation of means provided for positioning the shoe;

Fig. 24 is a section on the line XXIV—XXIV of Fig. 23;

Figs. 25 to 28 inclusive are mainly vertical sectional views illustrating the relation of certain parts to the shoe at different times in the operation of the machine;

Fig. 29 is a vertical sectional view on a larger scale than Fig. 28 showing one of the fastening-

inserting devices in its relation to the wipers and the shoe at the end of the fastening-inserting operation;

Fig. 30 is a plan view of the bottom of the forepart of a shoe after the operation of the machine thereon;

Fig. 31 is a section on the line XXXI—XXXI of Fig. 29;

Fig. 32 is a section on the line XXXII—XXXII of Fig. 29;

Fig. 33 is mainly a plan view illustrating the relation of the wipers and the grippers to the shoe at the same stage in the operation of the machine as in Fig. 26;

Fig. 34 is a view similar to Fig. 33 illustrating the relation of the wipers and the fastening-inserting devices to the shoe at the same stage in the operation as in Fig. 28; and

Fig. 35 is a chart showing the timing of operations performed by the machine.

For positioning the shoe the machine is provided with means constructed mainly as disclosed in Figs. 16 to 19 inclusive of Letters Patent No. 2,224,146, granted on December 10, 1940, on an application of F. C. Eastman's. This means includes a plate 2 (Figs. 3 and 23) detachably secured to a holder 4 formed on the lower end of a vertically adjustable post 6. The plate is held in place on the holder by a spring-pressed pin 8 extending into an opening formed in a stud 10 projecting upwardly from the plate into the holder, its position being further determined by a pin 12 extending downwardly from the holder into a hole in the plate. The plate 2 has a downwardly extending rim arranged to engage the bottom face of the insole about the end and along the sides of the toe far enough from the edge of the insole to permit the margin of the upper to be lasted inwardly over the insole. The position of the shoe lengthwise is determined by an end gage 14 arranged to serve as an abutment in contact with the toe-end face of the last and formed, as more fully disclosed in the last-mentioned Letters Patent, to centralize the end of the last and shoe laterally. In the construction herein shown this gage is mounted for swinging movements heightwise of the shoe on a pin 16 mounted in the holder 4 and is controlled by two toggle links 18 and 20 pivotally connected respectively to the gage and to the holder 4. These two links are connected together by a pin 22 controlled by means hereinafter described for withdrawing the gage from operative position at the proper time in the operation of the machine. Arranged to cooperate with the end gage 14 further to determine the proper position of the shoe are two side gages 24 (Fig. 23) comprising fingers extending downwardly toward the opposite side edges of the shoe bottom at or near the ball portion of the shoe to indicate visually the proper position of this portion of the shoe laterally. These side gages have horizontally extending arms 26 (Fig. 24) mounted in guideways in a bracket 28 fastened on the front of the holder 4, the arms being provided with rack teeth engaging the opposite sides of a pinion 30 fast on a shaft 32 which may be turned by a knob 34 on its upper end. By this means the gages are so adjusted that their lower ends are substantially the same distance apart as the opposite side edges of the corresponding portion of the shoe bottom. It will be understood that the operator presents the work to the machine with the toe-end face of the last in engagement with the end gage 14 and further positions the shoe laterally by sight as

determined by the side gages 24 before starting the machine. Shortly after the starting of the machine the shoe is clamped against the plate 2 in the position thus determined by a toe rest 36 which is moved upwardly into clamping position as illustrated in Fig. 25, and it is further held against lengthwise displacement by a heel rest 38 (Fig. 1) which is moved rearwardly into engagement with its heel-end face as fully disclosed in Letters Patent No. 2,160,846. In accordance further with the disclosure of the last-mentioned Letters Patent the cycle of operations of the machine corresponds to one complete revolution of a cam shaft 40 which carries cams for operating various instrumentalities with which the machine is provided, this cam shaft being driven through a clutch 42 which is actuated to start the machine by means of a treadle (not herein shown). This clutch drives a worm 44 in engagement with a worm gear 46 fast on the cam shaft.

For applying a pull to the toe-end portion of the upper machine is provided with means differing substantially from the disclosure of Letters Patent No. 2,160,846, including a gripper 48 (Figs. 3 and 33) arranged to grip the marginal portion of the upper at the end of the toe, a pair of grippers 50 for gripping it along the greater portions of the sides of the toe and a pair of additional side grippers 52 arranged to grip shorter sections of the upper beyond the main side grippers 50, the object being to apply a pull to substantially all portions of the upper extending as far heelwardly as the portions already lasted at the sides of the forepart beyond the toe. Except for such differences in shape as are illustrated in Fig. 33, the grippers are all substantially alike and may be described by reference to the toe-end gripper 48 shown in Figs. 3 and 28, corresponding parts of all the grippers and of their operating mechanisms being identified by the same reference characters.

The toe-end gripper includes a casing 54 a portion of which is shaped to provide a hollow cylinder and has extending downwardly from it a pair of arms 56 which are spaced from each other. Secured in fixed relation to these arms by two pins 58 and 60 is a jaw 62 arranged to engage the inner face of the marginal portion of the upper. Pivotally mounted on the pin 60 for swinging movement toward and from the jaw 62 is a jaw 64 which engages the outer face of the upper, this jaw having an upwardly extending tail portion 66 engaged by a cam 68 pivotally mounted between the arms 56 on a pin 70. A spring 72 connected to the tail portion of the jaw 64 tends to swing this jaw away from the jaw 62 and holds its tail portion against the cam. The cam is connected by a link 74 to the lower end of a rod 76 extending upwardly through a cap 78 fast on the lower end of the cylindrical portion of the casing 54, the rod being connected at its upper end to a piston 80 movable in the cylinder provided by the casing. Between the cap and the piston is a compression spring 82 which tends to raise the piston and against the resistance of which the piston is moved downwardly to operate the cam 68 and thereby to close the gripper on the upper by swinging the jaw 64 toward the jaw 62. The piston is thus operated by fluid admitted to the gripper cylinder as hereinafter described. At its upper end the casing 54 is supported for universal swinging movement on the ball-shaped end 84 of a pin 86 carried by a lever arm 88 which is rotatably mounted on a rockshaft 90 supported in bearings on the front of the frame. The ball-

shaped end of the pin 88 is engaged below by the concave face of a bearing member 92 mounted on the casing 54 and is engaged above by the similarly shaped lower end of a screw 94 threaded in the casing. It will be understood that the several grippers are supported in this manner on corresponding lever arms 88 and that the manner in which they are thus supported permits them each to be adjusted in any direction about the ball-shaped end 84 of the pin 88, as hereinafter more particularly described. The arms 88 are all rotatably mounted independently of one another on the rockshaft 90 and are alike in function but differ in shape as required by the relation of the different grippers to one another (Fig. 2).

For operating the several arms 88 to impart the upper-pulling movements to the grippers there is provided a bar 96 extending lengthwise of the rockshaft 90 and having on its opposite ends offset bosses 98 (Figs. 2 and 21) whereby it is mounted on and secured to the rockshaft. This bar is arranged to act, in response to turning movement of the rockshaft in a counterclockwise direction with reference to Fig. 3, on upwardly extending arms 100 which are integral respectively with the several arms 88, each arm 88 and the corresponding arm 100 forming a bell-crank lever. To operate the end gripper 48 the bar 96 directly engages the arm 100 associated with this gripper (Fig. 28), but to operate the other grippers the bar engages screws 102 (Figs. 2 and 18) threaded in the corresponding arms 100. By reference to Fig. 2 it will be seen that the arms 88 which operate the two main side grippers 50 (Fig. 33) are somewhat shorter than the arm which operates the end gripper, and that the arms which operate the additional side grippers 52 are considerably shorter than the arms which operate the grippers 50. From this construction it naturally follows that if the arms 88 are moved the same number of degrees about the axis of the rockshaft 90 upper-pulling movements of less extent are imparted to the main side grippers 50 than to the end gripper and movements of still less extent than those of the grippers 50 are imparted to the grippers 52. This is in conformity to the requirements of the different portions of the upper engaged respectively by the different grippers, since the portions engaged by the grippers 52, which are adjacent to portions already lasted, require less upper-pulling movement than the portions engaged by the grippers 50, and the latter grippers, moreover, need not move so far as the end gripper 48 to pull the upper properly over the last. Preferably such differences between the movements of different grippers are determinately increased by beginning the operative movements of different arms 88 at different times, as determined by adjustments of the screws 102. It is contemplated that preferably these screws will be so adjusted that the bar 96 will first begin the operation of the end gripper 48, after which in its continued movement it will pick up and also operate the arms 88 connected to the main side grippers 50 and then the arms 88 connected to the additional side grippers 52. In this manner a partial upper-pulling movement of positively predetermined extent will be imparted to the end gripper prior to the beginning of the movements of the main side grippers, and partial upper-pulling movements of positively predetermined extent will be imparted to these grippers prior to the beginning of the movements of the additional side grippers. It will be understood, however, that the screws 102 are capable of such ad-

justments as to cause the several grippers to be operated in any desired time relation to one another.

For imparting the operative turning movement to the rockshaft 90 there is fast on one end of the rockshaft an arm 104 (Figs. 1, 2 and 18) connected by a link 106 to one arm of a bell-crank lever 108 mounted to turn about a shaft 110, the other arm of this bell-crank lever carrying a roll 112 engaged by the periphery of a cam 114 on the cam shaft 40. A spring 116 connected to the lever 108 acts on the lever, when permitted by the cam, to turn the rockshaft in the direction to operate the grippers, the pulling of the upper being therefore effected yieldingly by the spring. The cam 114 acts on the lever to impart return movements to the rockshaft 90 and the bar 96 near the end of the cycle of operations of the machine, and to insure the return of the grippers at this time to their starting positions the bar 96 is connected to the several arms 100 by springs 118.

Further to control and adjust the several grippers there are provided, for each gripper, three upwardly and downwardly extending fingers 120 (Figs. 3, 15 and 17) the lower end of one of which lies in a notch 122 in a flange 124 formed on the upper end of the gripper casing 54 and each of which has on its lower end a projection 126 (Fig. 28) which engages the lower face of the flange. At their upper ends the fingers are pivotally mounted on pins 128 in the forked outer ends of small levers 130 which are pivotally mounted midway between their opposite ends on pins 132 in recesses provided in radially projecting portions (Fig. 6) of an otherwise cylindrical member 134. This member extends upwardly within a sleeve 135 which is threaded in a casting 138 on the frame, and near its upper end it is provided with an annular groove in which lies a split ring 140 resting on the top of the sleeve. In this manner the member 134 is supported by the sleeve. Extending around the group of fingers 120 in recesses formed in the fingers is a split resilient ring 142 which holds the fingers against the flange 124. Slidingly mounted in the member 134 are three rods 144 (see Fig. 16) which bear at their lower ends on the inner end portions of the three small levers 130. The upper ends of the three rods 144 are engaged by the flat lower face of a substantially semi-spherical member 146 the curved face of which is engaged by a complementarily curved surface formed on a cap member 148 fastened by three screws 150 on the top of the sleeve 136. The member 146 is held against its seat on the cap member 148 by a spring-pressed pin 152 in the member 134, and extending upwardly from the member 146 is a handle 154. It will thus be seen that each gripper is supported initially, not by its operating arm 88, but by the corresponding group of fingers 120, the member 134 and the sleeve 136, and that by turning the sleeve the gripper may be adjusted in directions heightwise of the shoe, the sleeve being rotatable on the member 134. For thus turning the sleeve the cap member 148 has a knurled periphery. It will be understood that such adjustment of each gripper is permitted by the fact that initially the gripper-operating bar 96 is spaced more or less from the arm 100 associated with the end gripper and from the screws 102 in the corresponding arms 100 associated with the other grippers. As illustrated in Fig. 3, the adjustment is preferably such that the jaws of the end gripper 48 are somewhat lower than the

jaws of the main side grippers 50, and the jaws of the latter also are preferably lower than those of the additional side grippers 52, these being the positions best adapted for receiving the margin of the toe-end portion of the upper in the relation which it bears to the last when the shoe is presented to the machine. It will be evident that adjustment of the end gripper 48 downwardly or upwardly will vary the extent of its effective upper-pulling movement by varying the amount of lost motion between the bar 96 and the corresponding arm 100. While the same result is a natural incident of similar adjustments of the other grippers, the screws 102 associated with those grippers provide means for further varying the extent of their upper-pulling movements as hereinbefore explained. Each of the several grippers, moreover, may be preliminarily adjusted by swinging it in any desired direction about the ball-shaped end 84 of the pin 86 on which it is mounted, this being done by tipping the controlling member 146 by means of the handle 154. It will be understood that by reason of the relation of the small levers 130 to the rods 144 and the fingers 120, such tipping movement of the member 146 forces downwardly one or more of the rods 144 and raises the corresponding finger or fingers 120 connected to the flange 124 on the gripper casing 54, thus swinging the gripper, the other fingers or finger 120 being permitted to move downwardly as the gripper is thus adjusted. After any such adjustment the gripper is maintained in adjusted position by the member 146 by reason of the frictional engagement of this member with its seat on the cap member 148.

Each of the side grippers is further adjustable about an axis extending heightwise of the shoe to position its jaws in proper relation to shoes of different shapes. Associated with the two side grippers at each side of the toe is a plate 156 (Figs. 2, 15 and 16) which is secured by screws on the top of the casting 138 but has on its lower face bosses which space portions of it above the casting. Extending under the plate in the spaces thus provided are two gripper-adjusting plates 158, one for each gripper, each of these plates 158 having an opening through which the sleeve 133 extends and being provided with an arm 160 extending downwardly through an opening 162 in the casting 138 into a recess 164 (Fig. 15) formed in the lower end portion of the member 134. It will thus be seen that by turning the plate 158 the member 134 may be turned in its bearing in the sleeve 136, and since one of the fingers 120 lies in the notch 122 in the flange 124 of the gripper casing, as hereinbefore explained, the turning of the member 134 also serves to turn the gripper relatively to the ball-shaped end 84 of the pin 86. The plate 158 may thus be turned by engaging the head of a screw 166 which is threaded in the plate and extends upwardly through a slot 168 in the fixed plate 156. After the adjustment the screw 166 may be turned to clamp the plate 158 to the plate 156 and thereby to hold the gripper in its adjusted position.

Prior to their upper-pulling movements the grippers may be closed on the upper by any suitable operating fluid admitted to the gripper cylinders above the pistons 80 therein, but it is contemplated that preferably compressed air will be used as the operating fluid. The air may be obtained from an extraneous source of supply, or, if desired, the machine may be provided with an air compressor and with suitable storage means.

The air is conducted to each gripper through a flexible tube 170 (Figs. 3 and 21) communicating with the upper end of the gripper cylinder and also with a metal tube 172 secured at its opposite ends to the two offset bosses 98 formed on the gripper-operating bar 96 so that this tube moves with the rockshaft 90. Communicating with the tube 172 is a flexible tube 174 (Fig. 21) leading from a pipe 176 which is in communication at one end with a port 178 (Fig. 22) formed in a plate 180 fast on the frame, this port being arranged to communicate at times with a chamber 182 enclosed partly by the plate 180 and partly by a casting 184 secured to the plate. Compressed air is conducted into the chamber 182 from the source of supply through an inlet port 186. Movable in the chamber 182 in sliding contact with the plate 180 is a valve 188 mounted on a rod 190 which is guided in the casting 184, this valve being provided with a recess 192 through which, as the parts are positioned in Fig. 22, communication is established between the port 178 leading to the gripper cylinders and an exhaust port 194. Upward movement of the valve against the resistance of a spring 196 serves to open the inlet port 178 to the chamber 182, thus permitting the compressed air to flow to the several grippers for closing them on the upper. For imparting such upward movement to the valve the lower end of the rod 190 is seated in a socket in a member 198 fast on a rod 200 which is pivotally connected at its lower end to one arm of a bell-crank lever 202 (Fig. 1) supported by a spider 204 on the frame, the other arm of this bell-crank lever being pivotally connected to a member 206 slidingly movable on a block 208 which has a bearing on the cam shaft 40. Mounted on the member 206 is a roll 210 engaged by the periphery of a cam 212 on the cam shaft, and connected to the member and to the frame is a spring 214 which holds the roll 210 at all times against the cam and serves, when permitted by the cam, to impart the upward movement to the valve 188 to cause the closing of the grippers. The lower end of the rod 190 is seated loosely enough in the socket in the member 198 to permit such slight lateral movement of the lower end of the rod 200 as results from its connection with the bell-crank lever 202. It will be understood that when the member 206 is returned by the cam 212, thus lowering the rod 200, the valve 188 is returned to exhaust position by the spring 196, thus causing the opening of the grippers. When the grippers thus open and release the upper they are moved farther upwardly to make way for the upper-fastening means (hereinafter described) by reason of the shape of the cam 114, as indicated on the chart (Fig. 35), and near the end of such further upward movement of each gripper the flange 124 on the gripper casing is engaged by a screw 216 (Fig. 28) in the member 134 to swing the gripper inwardly over the bottom of the shoe and thus to insure proper clearance between it and the fastening means.

The gripper-operating movement of that arm 88 which is connected to the end gripper 48 serves also to withdraw the end gage 14 from its operative position (Fig. 3) to an idle position away from the shoe, as illustrated in Fig. 26. For this purpose there is pivotally connected at its upper end to the arm 88 a link 218 the lower end of which extends into a socket in a coupling member 220 mounted on the pin 22 which connects the two toggle links 18 and 20. A screw 222

threaded in the lower end of the link 218 and extending through a slot in the member 220 serves to secure the link and the member adjustably together.

After the pulling of the upper by the grippers its toe-end portion is wiped into lasted position by a pair of toe-embracing wipers 224 (Figs. 33 and 34) which, except for the timing of their operative movements, are operated by mechanism of substantially the same construction as disclosed in Letters Patent No. 2,160,846, which mechanism therefore need not be described in detail. Briefly, the wipers are supported by a wiper carrier 226 (Figs. 1 and 3) pivotally mounted at 228 on the upper end of a cam-operated lever 230 whereby the carrier and the wipers are advanced and retracted lengthwise of the shoe. Supported on the wiper carrier is cam-operated mechanism, including a bell-crank lever 232, whereby the wipers are closed and opened in directions widthwise of the shoe. The wiper carrier is swung upwardly about its connection with the lever 230 while the grippers are holding the upper under tension to cause the wipers to wipe the upper heightwise of the last by cam-operated mechanism including a pair of links 234, after which the wipers are advanced and closed to wipe the marginal portion of the upper inwardly over the insole and then hold the upper in lasted position until it is fastened by means now to be described.

For fastening the upper in lasted position the machine is provided with a plurality of fastening-inserting devices 236, hereinafter referred to as tackers, which are herein shown as seventeen in number (Fig. 34) for driving a maximum of seventeen tacks. Each tackler (Figs. 28 and 29) includes a tack holder 238 and a tack driver 240 movable in a driver passage 242 in the tack holder to drive the tack, the driver-being detachably secured to a driver bar 244 which is also guided by the tack holder and may be considered a part of the tackler. The driver extends upwardly into a socket in the lower end of the driver bar and is provided with an annular groove 246 in which lies a ball 248 mounted in a recess in one side of the driver bar and confined in the recess by a ring 250 to hold the driver in place. This ring is mounted on a diametrically reduced lower end portion of the driver bar and is held against downward movement beyond the position in which it is shown in Fig. 29 by a split ring 252 which lies partly in a groove in the driver bar and partly in an annular recess in the lower end portion of the ring 250. The ring 250 is held down in its normal position by a spring clip 254 (see Fig. 31) positioned above it on the diametrically reduced portion of the driver bar. When this spring clip is removed the ring may be moved upwardly to bring its above-mentioned annular recess opposite the ball 248 and thus to permit the driver to be detached from the driver bar and a new driver to be substituted. Near its lower end the tack holder 238 is provided with a pair of tack fingers 256 arranged to extend inwardly through openings in its opposite sides to support the tack in the driver passage prior to the tack-driving operation. The tack fingers have integral therewith upwardly extending leaf springs 258 the upper end portions of which are dovetailed in cross section (Fig. 32) and are inserted in complementally shaped recesses formed in opposite sides of the tack holder. It will be understood that when the driver is operated to drive the tack it forces the tack

fingers apart to permit it to pass between them. Tacks are fed as hereinafter described into tack-receiving passages 260 in the several tack holders and when the drivers are retracted above the lower ends of these passages the tacks are admitted into the driver passages 242.

One of the tackers, which may be termed the end tackler, drives its tack in the V-shaped recess between the wipers 224 when the latter are in their closed positions, as illustrated in Figs. 28 and 34. The other tackers drive the tacks through holes 262 (Figs. 29 and 33) in the wipers, the tapering lower ends of the tack holders 238 being seated in recesses 264 in the wipers when the tacks are driven. In order, however, to provide room for the grippers the several tack holders occupy initially positions in which they are both upwardly and outwardly retracted substantial distances from their tacking positions, as shown in Fig. 3. To permit such outward retractive movements of the tack holders and to provide further for adjustments of the tackers relatively to one another, each driver bar 244 is pivotally mounted at its upper end on a pin 266 (Fig. 12) supported in a block 268 which is pivotally mounted on a pin 270 at right angles to the pin 266 and supported in a block 272 fast on the lower end of a piston rod 274 through which the driver bar is operated. This piston rod extends upwardly into a cylindrical bore or cylinder 276 formed in the casting 138 and has fast on its upper end a piston 278 operated by compressed air as hereinafter described, the cylinders and pistons being arranged in a semi-circular series (Fig. 2). By means also hereinafter described each piston 278 is maintained initially at the upper end of the cylinder in which it is mounted. It will be evident that the above-described connection between each driver bar 244 and the block 272 provides a universal joint permitting the tackler to be swung laterally in any direction.

To support and control the tack holder 238 of the end tackler, this tack holder has pivotally connected to it by a pin 280 (Fig. 3) an arm 282 having thereon a threaded stem 284 extending upwardly through an opening formed in the front end of a horizontal pin 286 and secured adjustably to this pin by nuts 288 threaded on the stem 284 above and below the pin. The pin 286 extends rearwardly through a block 290 and through a vertical pin 292 mounted in this block and it is secured adjustably in fixed relation to the vertical pin by a setscrew 294 threaded in the lower end of the vertical pin. The block 290 is supported by an underlying horizontal plate 296 (Figs. 4, 5 and 8) through which the lower end of the pin 292 extends and which is itself supported and controlled as hereinafter described. The plate 296 is provided midway between its opposite side edges with an L-shaped upward and forward extension 298 (Fig. 3) through which the upper end portion of the pin 292 extends and through which also the rear end of the pin 286 extends. Also supported by the plate 296 and mounted for swinging movements about the pin 292 are two forwardly curved levers 300, the right-hand lever being forked as shown in Fig. 5 to provide portions mounted on the pin respectively above and below an upwardly offset portion of the left-hand lever. Under the forwardly extending curved arms of these two levers are similarly curved arms 304 pivotally mounted on the pin 292 and resting on the plate 296, the left-hand arm 304 having an upwardly offset por-

tion overlapping the other arm (Fig. 8) and on which the block 290 rests. At their front ends the levers 300 and the corresponding underlying arms 304 are secured together by bolts 308 which are diametrically enlarged between the levers and the arms to maintain them in properly spaced relation. Between the levers 300 and the underlying arms are mounted mechanisms for supporting and controlling the tack holders 238 of the several tackers other than the end tacker. These mechanisms include two series of what may be termed ball-shaped members 310 through which, and through sleeve portions 312 (Fig. 7) formed on these members, extend rods 314 integral with the upper end portions of downwardly inclined arms 316 (Fig. 4). Threaded in the lower ends of these arms are pins 318 pivotally connected by studs 320 to the respective tack holders 238. Each of the ball-shaped members 310 and its sleeve 312 has therein a slot 322 extending from top to bottom thereof but terminating short of the outer end of the sleeve, so that by forcing the two halves of the ball-shaped member toward each other the rod 314 may be firmly clamped to the member. Between each two adjacent ball-shaped members is a block 324 having on its opposite sides curved seats for the members and provided on the top and bottom thereof with round projections 326 lying in slots 328 formed respectively in the corresponding lever 300 and the underlying arm 304. In this manner the blocks are held in proper alignment with the ball-shaped members. Fast in each block 324 is a pin 330 extending into larger openings 332 in the adjacent ball-shaped members to assist in maintaining the parts in proper assembled relation while permitting any such turning movements of the ball-shaped members as may be necessary to adjust the tack holders. The rearmost of the left-hand series of ball-shaped members is in engagement with a curved seat formed on a plate 334 (Fig. 8) which extends upwardly into a recess in the corresponding lever 300 and has at its lower end projections 336 (Fig. 10) lying in notches 338 formed in the sides of the corresponding lower arm 304, this plate having therein a pin 340 extending into a larger opening in the adjacent ball-shaped member and performing the same function as the pins 330. The plate 334 thus serves to confine at one end the left-hand series of ball-shaped members. The same function is performed with respect to the right-hand series of members by a plate 342 which is smaller than the plate 334 but is held in the same manner in fixed relation to the corresponding lever 300 and arm 304. At the front end of each series of ball-shaped members is a block 344 anchored to the corresponding lever 300 and arm 304 in the same manner as the blocks 324 and provided with a curved seat for the adjacent ball-shaped member, this block having fast therein a pin 346 performing the same function as the pins 330. Extending into a depression in each end block 344 is the rounded end of a screw 348 which is threaded in a stud 350 reduced end portions of which are mounted to turn in bearings in the lever 300 and the arm 304. This screw may be turned by a hand wheel 352 formed thereon to apply pressure to the series of ball-shaped members 310 and thus to clamp these members in fixed relation to one another and to cause them by contraction to grip the rods 314 in fixed relation thereto. It will be understood that this is done after the tack holders 238, other than the end tack holder, have been

adjusted in proper relation to one another and that after such adjustment the tack holders of each group are maintained in adjusted relation by the pressure applied through the corresponding screw 348 to the members 310. The procedure involved in such adjustment of the tack holders will be hereinafter more fully explained.

The plate 296 which supports the above-described means for controlling the tack holders is suspended horizontally on a front pair of curved arms 354 (Figs. 4 and 14) mounted to turn about studs 356 supported on the frame, and on a rear pair of arms 358 mounted to turn about a rock-shaft 360 supported in bearings formed on a bracket 362 (Fig. 5) which is fast on the frame and also in bearings formed on ribs 364 (Figs. 2 and 6) on the frame. The front pair of arms 354 are pivotally connected to upwardly extending lugs 366 on the plate 296, and the rear pair of arms 358 are pivotally connected to upwardly extending lugs 368 on the plate. The front arms 354 and the rear arms 358 are connected together by links 369. The two rear arms 358 are connected rigidly together by a web 370 extending across from the hub of one to the hub of the other. Fastened to the front right-hand portion of the plate 296 underneath is a U-shaped coupling 372 connected by a link 374 to one arm of a bell-crank lever 376 mounted to swing about the shaft 110, the other arm of this bell-crank lever carrying a roll 380 engaged by the periphery of a cam 382 on the cam shaft 40. A spring 384 connected to the bell-crank lever holds the roll against the cam and, when permitted by a drop on the cam, serves to apply a downward pull to the plate 296. This causes the arms 354 and 358, which function as parallel links, to swing in the direction both to lower the plate 296 and to move it forwardly lengthwise of the shoe. In this manner, through bodily movements of the levers 300, the several tack holders 238 are moved downwardly toward the wipers 224 and forwardly lengthwise of the shoe toward their tacking positions, the tack holders sliding downwardly along the drivers 240 and the driver bars 244 and the driver bars swinging about their connections with the blocks 272. In response to the forward movement of the plate 296 the levers 300, together with the underlying arms 304, are also swung about the pin 292 to move all but the end tack holder in directions widthwise of the shoe to positions corresponding to the holes 262 in the wipers when the wipers are in positions for the driving of the tacks. For thus swinging the levers 300 there are provided rods 386 (Figs. 3, 4 and 5) fixed at their lower ends in the bracket 362 and extending upwardly through slots 388 formed in arms 390 of the levers which extend rearwardly in divergent relation to each other, the two levers crossing each other in the vicinity of the pin 292. Slidably movable on the rods 386 are blocks 392 which are mounted in the slots 388, each block having flanges extending under the corresponding arm 390 and having also an upwardly extending sleeve portion 394 on which is threaded a nut 396 engaging a washer 398 bearing on the top of the arm. It will be understood that as the plate 296 is carried forward and downward the arms 390 slide along the blocks 392 and the latter slide downwardly on the rods 386.

In adjusting the tackers for use on shoes of a given size and style, after wipers suitable for use on such shoes have been mounted in the machine, the operator turns the cam shaft 40 by

manual means customarily provided for that purpose until that point in the cycle is reached when the wipers are in their fully advanced and closed positions and the plate 296 is substantially at the limit of its forward and downward movement. He then turns the screws 348 to loosen the two series of ball-shaped members 310, so that these members are free to turn in their bearings and the rods 314 are free to be moved lengthwise or turned relatively to the ball-shaped members. The operator then moves the several tack holders 238, other than the end tack holder, into positions where their lower ends are seated in the corresponding recesses 264 in the wipers. In this operation the threaded pins 318 (Fig. 4) may turn in the arms 316. The operator then turns the screws 348 to secure the tack holders in the positions determined by the recesses in the wipers. Thereafter the several tack holders controlled by the levers 300 will be moved to their proper positions relatively to the wipers at the required time in each cycle of operations. While the end tack holder may be adjusted heightwise or lengthwise of the shoe by the means shown in Fig. 3, it will ordinarily not need to be thus readjusted for use on shoes of different sizes or styles.

Compressed air is conducted to the upper ends of the several cylinders 276 to operate the tack drivers through a passageway 400 (Figs. 2 and 3) formed in the casting 138 and closed above by a cover plate 402 on the casting, this passageway leading directly to the middle cylinder and communicating also with the upper ends of the other cylinders through a semi-circular passage 404 in the casting. The passageway 400 communicates at its rear end with a vertical passageway 406 arranged to communicate through a port 408 with a valve chamber 410 formed in a casing 412 secured to the casting 138 and receiving compressed air through a pipe 414. Movable in the valve chamber is a slide valve 416 mounted on a rod 418 and confined between flanges 420 and 422 on the rod. When the rod is moved downwardly, as hereinafter described, to a position determined by engagement of the flange 422 with the casing 412 it uncovers the port 408 to admit air from the chamber 410 to the upper ends of the several cylinders, and when it is moved upwardly from that position it closes communication between the chamber 410 and the port 408 and opens communication between this port and an exhaust passage 424 in the casting 138 to permit exhaust of the air from the upper ends of the cylinders. For returning the pistons 278 and thereby retracting the tack drivers air is admitted to the lower ends of the cylinders through passageways 426 in the casting 138 from a semi-circular passageway 428 which is closed underneath by a plate 430 on which the casting 138 rests. Air is conducted to this semi-circular passageway through a horizontal passageway 432 and a vertical passageway 434, the latter being arranged to communicate with the valve chamber 410 through a small port 436 when the valve 416 is moved upwardly beyond the position in which it is shown in Fig. 3. The valve 416 also controls an exhaust port 438 through which air is conducted from the lower ends of the cylinders to the exhaust passage 424. The port 436 is smaller than the port 408 leading to the upper ends of the cylinders to prevent the tack drivers from being retracted so rapidly as to involve danger of breakage of parts.

The valve 416 is operated by downward and upward movements of a substantially semi-circular horizontal plate 440 (Figs. 3, 6 and 14) through

which an enlarged lower section 441 of the rod 418 loosely extends, the valve being moved downwardly through a spring 442 by downward movement of the plate and moved upwardly by engagement of the plate with a nut 444 on the rod. The plate is secured by screws 445 (Fig. 6) on the upper ends of a pair of rods 446 extending downwardly from the front ends of the plate and on another pair of rods 448 extending downwardly at the rear of the rods 446. The rods 446 are pivotally connected at their lower ends to forwardly extending arms of a pair of bellcrank levers 450 mounted to swing on the studs 356, and the rods 448 are pivotally connected at their lower ends to forwardly extending arms of another pair of bell-crank levers 452 fast on the previously mentioned rockshaft 360. Upwardly extending arms of the front and rear bell-crank levers at each side of the machine are connected together by a link 454. Accordingly, the several levers swing in unison and the plate 440 is kept horizontal as it is moved downwardly and upwardly. The forwardly extending arm of the right-hand bell-crank lever 450 is connected by a link 456 to one arm of a bell-crank lever 458 mounted to turn on the shaft 110, and the other arm of this bell-crank lever carries a roll 460 in engagement with the periphery of a cam 462 on the cam shaft 40. A spring 464 connected to the bell-crank lever 458 holds the roll against the cam and, when permitted by a drop 466 on the cam, moves the plate 440 downwardly to move the valve 416 into position to admit compressed air to the upper ends of the cylinders 276 for operating the tack drivers. The spring 442 (Fig. 3) permits the plate 440 to be moved farther downwardly, for a purpose hereinafter explained, after the valve has been stopped in the proper position by engagement of the flange 422 on the rod 418 with the casing 412. After the driving of the tacks a rise 468 on the cam 462 moves the valve upwardly to open the upper ends of the cylinders 276 to the exhaust passage 424 and to admit air to the lower ends of the cylinders through the port 436 to retract the drivers, the valve closing the exhaust port 438. Thereafter a short drop 470 on the cam causes the valve to return to the position in which it is shown in Fig. 3 in which the port 436 is covered by the valve and both ends of the cylinders are open to the exhaust passage.

The blocks 272 on the lower ends of the piston rods 274 are guided in their downward and upward movements by a substantially semi-circular downward extension 472 (Figs. 3, 12 and 13) of the casting 138, portions of the blocks lying in guideways 474 in the extension. Pawls 476 pivotally mounted on holders 478 which are secured to the extension 472 are normally held by springs 480 with their upper ends under the blocks 272 and against the extension 472 adjacent to the guideways. Even though compressed air is admitted, therefore, to the upper ends of the cylinders 276, operation of the tack drivers is prevented by the pawls until they are moved out from under the blocks 272. For thus operating the pawls to release the blocks the plate 440 carries a plurality of L-shaped members 482 arranged to engage tail portions 484 of the pawls and thus to swing the pawls out from under the blocks in response to the downward movement of the plate 440. In order to avoid such increase of pressure of the toe end of the shoe on the toe rest 36 as would result from simultaneous operation of all the tack drivers, and also to restrict the amount of compressed air needed at any one time to operate the pistons

278, the construction herein shown is such that some of the drivers are operated respectively at different times. Each of the L-shaped members 482 is provided with a stem 486 extending downwardly through a hole in the plate 440, and threaded on the stem below the plate is a nut 488. As illustrated, the member 482 controlling the pawl associated with the end tacker, i. e., the one which drives the tack at the extreme end of the toe, is held by its nut 488 in fixed relation to the plate 440 (Figs. 3 and 11), while the nuts associated with the other members are spaced more or less below the plate. Accordingly, the end tacker is the first to drive its tack, the driving of the other tacks being delayed until such times as the plate 440 engages the corresponding nuts 488 and operates the respective pawls. The springs 480 are of sufficient strength to support the other members 482 while still maintaining the pawls in their operative positions until the plate 440 has moved downwardly along the stems 486 to engage the nuts 488. It will be evident that these nuts may be so adjusted as to cause the tacks to be driven in any desired order. Preferably, as illustrated, the two tackers located at opposite sides respectively of the end tacker drive their tacks simultaneously after the driving of the end tack, after which the next two tackers operate simultaneously, and so on until all the tacks are driven. Also threaded on all the stems 486 except the middle one are locknuts 490 for holding the nuts 488 in adjusted positions.

All the L-shaped members 482 except the one associated with the end tacker are maintained in proper relation to the corresponding pawls 476 by forked members 492 (Figs. 11 and 12) supported by the fixed plate 430 and extending downwardly at opposite sides of the L-shaped members. All the forked members except the two members associated with the tackers which are next adjacent to the end tacker are provided with stems 494 extending upwardly through the plate 430 and having fast on their upper ends handles 496 (Fig. 2). A spring 498 (Fig. 11) confined between each of these forked members and a washer 500 engaging the lower face of the plate 430 provides sufficient friction between the plate and the washer and also between the plate and the hub of the handle 496 to prevent the member 492 from turning too freely. In this manner the corresponding L-shaped members 482 are maintained in proper relation to the respective pawls, the hub of each handle 496 having thereon a projection 502 (Fig. 2) arranged to engage the side of the casting 138 to determine the proper position of the forked member 492. Each of the two forked members 492 associated with the tackers which are next adjacent to the end tacker has an upwardly extending portion mounted to turn in a bearing in the plate 430, and in this upwardly extending portion is threaded a screw 504 (Fig. 12) the head of which is mounted in a recess in the plate 430 to support the member rotatably. Formed on this member are gear teeth 506 engaged by a gear 508 (Fig. 11) from which a stem 510 extends upwardly through a bearing in the plate 430, a handle 512 being fast on the upper end of this stem. A spring 514 between the gear 508 and a washer 516 engaging the plate 430 provides friction for holding the corresponding member 482 in proper relation to the pawl 476 which it controls, the proper position of the forked member 492 being determined by a pin 518 (Fig. 2) in engagement with a lug 520 on the hub of the handle 512. In addition to maintain-

ing the members 482 normally in operative relation to the pawls which they control, the forked members 492 may be turned by the handles 496, 512 associated therewith to move any of the corresponding members 482 selectively into such positions that they will not operate the pawls to release the corresponding tack drivers when the plate 440 is moved downwardly. The member 482 associated with the end tacker may, moreover, be adjusted to such a position that it will not operate the corresponding pawl. In this manner the number and arrangement of the tacks which are driven may be varied at will by rendering different tack drivers selectively inoperative.

Tacks are delivered to the tack-receiving passages 260 of the several tack holders 238 through flexible tubes 522 (Fig. 1) leading from tack-supplying means designated generally by the reference character 524 and of the same general character as disclosed in Letters Patent No. 1,129,882, granted on March 2, 1915, on an application of R. F. McFeely's. The parts of this tack-supplying mechanism are supported by a casting 526 mounted on a bracket 528 on the frame. Included in the mechanism is an oscillatory tack hopper 530 for delivering tacks to a plurality of inclined raceways (not shown), from the lower ends of which raceways tacks are separated and delivered by movements of a reciprocating separator slide 532. In view of the large number of tacks which are driven into each shoe, and the inconvenience of providing a correspondingly large number of raceways, two complete reciprocations of the separator slide 532 are required to deliver the necessary number of tacks, a receiving slide 534 being provided to receive the tacks from the separator and to deliver them into the proper tubes 522, as disclosed in the last mentioned Letters Patent. In view, moreover, of the fact that the machine herein shown drives an odd number of tacks, a device not shown is provided to cause the separator in one of its two reciprocatory movements to deliver one fewer tacks than in its other reciprocatory movement. This device is of the same construction as disclosed in Letters Patent No. 2,212,584, granted on August 27, 1940, on an application of P. E. Burby's.

For oscillating the tack hopper 530 there is provided, as heretofore, a rockshaft 536 connected by a universal joint to another rockshaft 538 through which the separator slide 532 and the receiving slide 534 are operated. In the construction herein shown the rockshaft 536 is operated by a horizontal rack bar 540 (Figs. 19 and 20) movable in the casting 526 and engaging a pinion 542 on the rockshaft. Mounted in bearings in downwardly extending opposite end portions of the rack bar 540 are sleeves 544 having on their inner ends flanges 546 normally engaging shoulders on the rack bar, and mounted within the sleeves is a rod 548 connected to operating means presently to be described. Surrounding the rod between the two sleeves 544 is a compression spring 550. Threaded in one end of the rod 548 is a screw 552 the head of which serves as an abutment in engagement with the outer end of the corresponding sleeve 544. The outer end of the other sleeve is arranged to abut against a shoulder 554 on the rod. When the rod, therefore, is moved in either direction it acts through one of the sleeves and through the spring 550 to move the rack bar 540 in that direction, and if anything prevents the movement of the rack bar the spring 550 yields to permit the rod 548 to complete its movement independently of the

rack bar. The means thus provided for yieldingly operating the tack hopper is also of the same general character as provided heretofore in mechanisms of the type illustrated.

For operating the rod 548 there are provided two arms 556 (Figs. 18, 19 and 20) connected together by webs 558 and 559 and mounted to swing about a shaft 560 secured to the casting 526. The two arms 556 are pivotally connected to a U-shaped member 562 which is itself pivotally connected by a pin 564 to the rod 548. Extending from the hub of one of the arms 556 is another arm 566 connected by a link 568 to one arm of a bell-crank lever 570 mounted to swing about the shaft 110, the other arm of this bell-crank lever having thereon a roll 572 lying in a cam groove 574 which is formed in one side of a cam member 576 on the cam shaft 40. It will thus be seen that movements in opposite directions are imparted positively to the rod 548. The cam groove 574 is so formed that in each cycle of operations of the machine one complete reciprocation is imparted to the rod 548 to turn the shafts 536 and 538 first in one direction and thereafter in the opposite direction. As will be understood, however, from the disclosure of Letters Patent No. 1,129,882, the connections between the shaft 538 and the separator slide 532 are such that the separator slide receives two complete reciprocations in response to the one complete reciprocation of the rod 548.

As indicated on the chart (Fig. 35), the machine comes to a stop at that time in the cycle of operations when the wipers are holding the margin of the upper in lasted position on the insole but before the tacks are driven. This permits the operator, if he so desires, to feel the upper at the sides of the toe with his fingers to determine whether it is smoothly lasted. The machine is so constructed that if for any reason the upper has not been properly conformed to the last the cycle of operations may be completed without the driving of any tacks, so that the shoe may be operated upon again from the beginning of another cycle of operations. In order to prevent the driving of any tacks when the machine thus completes its cycle there is pivotally mounted on the left-hand rib 364 of the frame a latch 578 (Fig. 3) which may be moved into position to engage a lug 580 formed on the hub of the left-hand bell-crank lever 452 (Fig. 2). In this manner the downward movement of the plate 440 (Fig. 14) by the spring 464 to cause the operation of the tack drivers is prevented. For moving the latch 578 into operative position there is provided a hand lever 582 (Figs. 1 and 19) fast on a shaft 584 which is mounted to turn in a bearing in the casting 526, the hand lever being connected to the latch by a link 586. A spring-pressed pin 588 carried by the lever 582 has a conical end arranged to enter one or the other of two depressions 590 formed in a plate 592 which is fast on the casting 526 to hold the lever either in the position in which the latch 578 is operative or in the position in which it is inoperative. When the machine is thus made to complete its cycle without driving any tacks it is necessary to prevent any more tacks from being delivered to the tack holders 238 until after the tacks already in the holders have been driven in the latter portion of the next cycle of operations. For this purpose the shaft 584 which is turned by the latch-operating movement of the hand lever 582 carries a gear segment 594 (Fig. 1) in engagement with teeth formed on the lower face of a slide 596 (see also Fig. 19) movable

in a guideway in the casting 526. When the hand lever is moved into position to cause the latch 578 to prevent the driving of tacks the slide 596 is moved into the path of a lug 598 formed on the tack hopper 530 to prevent such turning of the hopper as to cause the delivery of any tacks. It will be understood that when the hopper is thus prevented from turning, the rod 548 (Fig. 20) is moved idly without operating the rack bar 546, as permitted by the spring 550. After the first portion of the next cycle of operations has been performed and the machine has come to a stop the operator returns the hand lever 582 to its initial position to permit the tacks in the tack holders to be driven in the latter portion of that cycle.

As hereinbefore explained, the number and locations of the tacks driven into a shoe may be varied at will by moving the handles 496, 512 (Fig. 2) to render the tack drivers selectively inoperative. It will be evident that when any such drivers are rendered inoperative delivery of tacks to the corresponding tack holders also should be prevented. This may be done by disconnecting the flexible tack delivery tubes 522 from those tack holders and providing a suitable receptacle to catch the tacks delivered from those tubes. Alternatively the delivery of tacks to some of the tack holders which are farthest from the end of the toe may be prevented by the use of mechanism such as disclosed in Letters Patent No. 2,196,212, granted on April 9, 1940, on an application of J. C. Jorgensen's.

The manner of operation of the machine will now be briefly summarized, with reference particularly to the chart (Fig. 35). The machine having been provided with wipers suitable for use on shoes of the style and size on which it is to operate, and the groups of tackers controlled by the levers 300 having been adjusted in the manner described relatively to these levers so that their tack holders will be moved in each cycle of operations into the corresponding recesses 264 in the wipers, the operator presents a shoe to the machine in the position determined by the insole-engaging member 2, the end gage 14 and the properly adjusted side gages 24. In thus presenting the shoe the operator positions the margin of the toe-end portion of the upper between the open jaws of the several grippers, the grippers also having been previously adjusted as described. The shoe having thus been properly presented, the machine is started by depression of the clutch-actuating treadle. Substantially at the beginning of the cycle of operations the toe rest 36 is moved upwardly to clamp the toe end of the shoe against the member 2, and near the beginning of the cycle also the heel rest 38 is moved rearwardly into engagement with the heel-end face of the shoe. Substantially as soon as the shoe is engaged by the toe rest the valve 188 (Fig. 22) is operated to admit compressed air to the gripper cylinders and thus to cause the grippers to close on the upper (Fig. 25). Immediately thereafter the grippers are moved upwardly in the previously described time relation to one another by the lever arms 88 to pull the upper, the end gage 14 being withdrawn from operative position in this operation as shown in Fig. 26. In the course of the pulling of the upper the wipers are partially advanced and closed and are also moved upwardly into positions to begin an effective upwiping action on the upper (Fig. 26), and after the completion of the upper-pulling movements of the grippers the wipers are moved farther upwardly to wipe the upper heightwise of the

last. Thereafter the wipers are further advanced and closed to wipe the marginal portion of the upper inwardly over the insole, the valve 188 being moved reversely to cause the grippers to release the upper just after the wipers have begun their inward wiping movements (Fig. 27). When these movements are substantially completed, the wipers are forced more firmly down on the margin of the upper. Upon their release of the upper the grippers are moved farther upwardly away from the shoe, near the end of which movements they are swung inwardly over the shoe bottom by the action of the screws 216 (Fig. 28) thereon to provide room for the tackers. Before the completion of the inward wiping movements of the wipers the tackers are positioned and the tackers are moved forwardly and downwardly, the levers 300 thereon being also swung inwardly, to carry the tackers toward tacking positions, these movements of the tackers being completed and the lower ends of the tack holders being seated in the recesses 264 in the wipers after the completion of the movements of the wipers. At this point in the cycle the machine comes automatically to a stop. By reference to the chart it will be further seen that in the course of this portion of the cycle the tacks are separated and are delivered to the tack holders.

If for any reason it should appear to be desirable, after the machine has thus come to a stop, to operate on the shoe again from the beginning of a cycle, the operator moves the hand lever 582 into position to cause the latch 578 (Fig. 3) to engage the lug 580 and thus to prevent downward movement of the tackers. The operator then starts the machine again to cause it to complete its cycle without driving any tacks, after which he presents the shoe again to the machine to receive the operations of the grippers and the wipers in the first portion of another cycle, the hand lever 582 being returned to its initial position only after the machine has come to a stop in the course of that cycle. In case, as ordinarily, the operator does not thus use the hand lever to prevent the tacking operation, he starts the machine the second time after it has come to a stop as above described, whereupon the tackers are moved downwardly, first operating the valve 416 to admit compressed air above the upper ends of all the driver-operating pistons 278 and then causing the L-shaped members 482 to operate the pawls 476 and thereby to release the driver-operating pistons in the order predetermined by the adjustments of the nuts 488. It will be understood that each piston, upon its release by the corresponding pawl, is immediately forced downward by the compressed air above it to drive the corresponding tack and to clinch it on the usual metal plate on the bottom of the last (Figs. 28 and 29). As indicated by the chart, the toe rest is so controlled as to increase its upward pressure on the shoe in the tacking operation. After the driving of the tacks the parts are returned in their proper order to starting positions, the valve 416 being moved reversely to admit compressed air through the restricted port 436 to cause the return of the pistons 278 into positions where they are again held by the pawls 476, the upper ends of the cylinders 276 being opened to exhaust. The valve then receives

a short reverse movement to cover the port 436 and to leave both ends of the cylinders in communication with the exhaust passage 424. The tack holders are lifted clear of the wipers before the latter receives their retractive movements, and prior to such movements also the pressure of the wipers on the shoe is relieved by moving them slightly upward and by decreasing the upward pressure of the toe rest on the shoe.

Novel features of the fastening-inserting means per se are claimed in a divisional application, Serial No. 723,912, filed on January 24, 1947.

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

1. In a shoe machine, grippers arranged to grip an upper on a last at the opposite sides of the toe respectively, other grippers arranged to grip the upper also at the opposite sides of the toe respectively in locations farther from the end of the toe than said first-named grippers, means for closing all said grippers simultaneously on the upper, and automatic power-operated means for imparting to said first-named grippers upper-pulling movements heightwise of the last and for similarly imparting to said other grippers upper-pulling movements of less extent during a portion only of the movements of the first-named grippers.

2. In a shoe machine, grippers arranged to grip an upper on a last at the opposite sides of the toe respectively, other grippers arranged to grip the upper also at the opposite sides of the toe respectively in locations farther from the end of the toe than said first-named grippers, means for closing all said grippers simultaneously on the upper, and automatic power-operated means for imparting to said first-named grippers upper-pulling movements heightwise of the last and for similarly imparting to said other grippers upper-pulling movements of determinately less extent only after the beginning of the movements of the first-named grippers.

3. In a shoe machine, grippers arranged to grip an upper on a last at the opposite sides of the toe respectively, other grippers arranged to grip the upper also at the opposite sides of the toe respectively in locations farther from the end of the toe than said first-named grippers, and automatic power-operated means for imparting to said first-named grippers partial upper-pulling movements of positively predetermined extent heightwise of the last while said other grippers are stationary and for thereafter also operating said other grippers to pull the upper heightwise of the last during continued upper-pulling movements of the first-named grippers.

4. In a shoe machine, grippers arranged to grip an upper on a last at the opposite sides of the toe respectively, levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, other grippers arranged to grip the upper also at the opposite sides of the toe respectively in locations farther from the end of the toe than said first-named grippers, other levers connected respectively to said other grippers for similarly operating them, and automatic power-operated means for imparting gripper-operating movements to said first-named levers and for similarly operating said other levers during a portion only of the movements of the first-named levers.

5. In a shoe machine, grippers arranged to grip an upper on a last at the opposite sides of the

toe respectively, levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, other grippers arranged to grip the upper also at the opposite sides of the toe respectively in locations farther from the end of the toe than said first-named grippers, other levers connected respectively to said other grippers for similarly operating them, and automatic power-operated means for imparting gripper-operating movements to said first-named levers and for similarly imparting to said other levers gripper-operating movements of determinately less extent than the movements of the first-named levers.

6. In a shoe machine, grippers arranged to grip an upper on a last at the opposite sides of the toe respectively, levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, other grippers arranged to grip the upper also at the opposite sides of the toe respectively in locations farther from the end of the toe than said first-named grippers, other levers connected respectively to said other grippers for similarly operating them, and automatic power-operated means for imparting to said first-named levers partial gripper-operating movements of positively predetermined extent while said other levers are stationary and for thereafter imparting gripper-operating movements also to said other levers during continued movements of the first-named levers.

7. In a shoe machine, a pair of grippers arranged to grip an upper on a last at the opposite sides of the last respectively, a pair of levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, another pair of grippers arranged to grip the upper also at the opposite sides of the last respectively in different locations lengthwise of the last than said first-named grippers, another pair of levers connected respectively to said other grippers for similarly operating them, means for closing all said grippers on the upper independently of movements of said levers, and automatic power-operated means for first operating one of said pairs of levers and for thereafter operating the other pair during continued operative movements of said one pair.

8. In a shoe machine, a pair of grippers arranged to grip an upper on a last at the opposite sides of the last respectively, a pair of levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, another pair of grippers arranged to grip the upper also at the opposite sides of the last respectively in different locations lengthwise of the last than said first-named grippers, another pair of levers connected respectively to said other grippers for similarly operating them, and automatic power-operated means for imparting first to one of said pairs of levers partial gripper-operating movements of positively predetermined extent while said other pair are stationary and for thereafter imparting gripper-operating movements to the other pair during continued movements of said one pair.

9. In a shoe machine, a pair of grippers arranged to grip an upper on a last at the opposite sides of the last respectively, a pair of levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, another pair of grippers arranged to grip the upper also at the opposite sides of the last respectively in different locations lengthwise of the

last than said first-named grippers, another pair of levers connected respectively to said other grippers for similarly operating them, and an operating member mounted for swinging movement about an axis extending widthwise of the last to operate first one of said pairs of levers and then to pick up and operate the other pair while continuing the operative movements of said one pair.

10. In a shoe machine, a pair of grippers arranged to grip an upper on a last at the opposite sides of the last respectively, a pair of levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, another pair of grippers arranged to grip the upper also at the opposite sides of the last respectively in different locations lengthwise of the last than said first-named grippers, another pair of levers connected respectively to said other grippers for similarly operating them, an operating member mounted for swinging movement about an axis extending widthwise of the last to operate first one of said pairs of levers and then to pick up and operate the other pair while continuing the operative movements of said one pair, and means for adjustably varying the extent of the movements imparted to said one pair of levers prior to the beginning of the movements of the other pair.

11. In a shoe machine, a plurality of grippers arranged respectively to grip different portions of an upper mounted on a last, levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, said levers being mounted for movements independently of one another about a common axis, and means also movable about said axis to operate said levers in predetermined time relation to one another.

12. In a shoe machine, a plurality of grippers arranged respectively to grip different portions of an upper mounted on a last, levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, said levers being mounted for movements independently of one another about a common axis, and means also movable about said axis to pick up and operate different levers in succession.

13. In a shoe machine, a plurality of grippers arranged respectively to grip different portions of an upper mounted on a last, levers connected respectively to said different grippers for moving them heightwise of the last to pull the upper, said levers being mounted for movements independently of one another about a common axis, and a member common to said levers and also movable about said axis to operate them in adjustably variable time relation to one another.

14. In a shoe machine, a gripper arranged to grip an upper on a last at the end of the toe, a lever connected to said gripper for moving it heightwise of the last to pull the upper, other grippers arranged to grip the upper at the opposite sides of the last respectively, other levers connected respectively to said other grippers for similarly operating them, all said levers being mounted for movements independently of one another about a common axis, and a member also movable about said axis to operate said first-named lever and then to pick up and operate said other levers while continuing the movement of the first-named lever.

15. In a shoe machine, a pair of grippers arranged to grip an upper on a last at the opposite sides of the last respectively, a pair of levers con-

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nected respectively to said different grippers for moving them heightwise of the last to pull the upper, another pair of grippers arranged to grip the upper also at the opposite sides of the last respectively in different locations lengthwise of the last than said first-named grippers, another pair of levers connected respectively to said other grippers for similarly operating them, the different pairs of levers being mounted for movements independently of each other about a common axis, and a member also movable about said axis to operate first one of said pairs of levers and then to pick up and operate the other pair while continuing the operative movements of said one pair.

16. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last and to pull the upper heightwise of the last, said gripper being mounted for universal swinging movement in directions transverse to the direction of its pull on the upper, and mechanism including a handle mounted for universal swinging movement for thus swinging the gripper adjustably in any direction in accordance with the direction of the movement of the handle.

17. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last and to pull the upper heightwise of the last, the gripper being mounted for universal swinging movement in directions transverse to the direction of its pull on the upper, mechanism including a manually operated member for thus swinging the gripper adjustably in any direction in accordance with the direction of the movement of the manually operated member, and additional means for holding the gripper in any adjusted position by frictional engagement with the manually operated member.

18. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last and to pull the upper heightwise of the last, the gripper being mounted for universal swinging movement in directions transverse to the direction of its pull on the upper, and a plurality of controlling members arranged to engage the gripper respectively in different locations and relatively movable heightwise of the last to swing the gripper adjustably in any direction.

19. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last and to pull the upper heightwise of the last, the gripper being mounted for universal swinging movement in directions transverse to the direction of its pull on the upper, a plurality of controlling members arranged to engage the gripper respectively in different locations and relatively movable heightwise of the last to swing the gripper adjustably in any direction, and a manually operated member mounted for universal tipping movement to effect such relative movement of the controlling members.

20. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, said gripper comprising a pair of upper-gripping jaws and a casing supporting said jaws, an operating member connected to said gripper casing for moving the gripper heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, and a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing respectively in different locations around the casing, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to said operating member.

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21. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, said gripper comprising a pair of upper-gripping jaws and a casing supporting said jaws, an operating member connected to said gripper casing for moving the gripper heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing respectively in different locations around the casing, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to said operating member, and means for maintaining the gripper in adjusted position by control of said fingers.

22. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, said gripper comprising a pair of upper-gripping jaws and a casing supporting said jaws, an operating member connected to said gripper casing for moving the gripper heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing respectively in different locations around the casing, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to said operating member, and a manually operated member mounted for universal tipping movement to effect such relative movement of the fingers and thereby to adjust the gripper in different directions determined by the directions of the movement of the manually operated member.

23. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, said gripper comprising a pair of upper-gripping jaws and a casing supporting said jaws, an operating member connected to said gripper casing for moving the gripper heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, and a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing in locations farther from the last than its connection with the operating member, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to the operating member.

24. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, said gripper comprising a pair of upper gripping jaws and a casing supporting said jaws, an operating member connected to said gripper casing for moving the gripper heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing respectively in different locations around the casing, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to said operating member, a plurality of rods also arranged to extend heightwise of the last and relatively movable to effect the relative movements of the fingers, and means for thus relatively moving said rods.

25. In a shoe machine, a gripper arranged to

grip the marginal portion of an upper mounted on a last, said gripper comprising a pair of upper-gripping jaws and a casing supporting said jaws, an operating member connected to said gripper casing for moving the gripper heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper casing respectively in different locations around the casing, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to said operating member, a plurality of rods also arranged to extend heightwise of the last and relatively movable to effect the relative movements of the fingers, and a manually operated member arranged to engage the ends of said rods which are more remote from the fingers and mounted for universal tipping movement to effect the relative movements of the rods.

26. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last and to pull the upper heightwise of the last, the gripper being mounted for universal swinging movement in directions transverse to the direction of its pull on the upper, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper respectively in different locations, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction, a member supporting said fingers, and means for adjusting said member heightwise of the last to effect a corresponding adjustment of the gripper through the fingers.

27. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last and to pull the upper heightwise of the last, the gripper being mounted for universal swinging movement in directions transverse to the direction of its pull on the upper, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper respectively in different locations, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction, and a member supporting said fingers and mounted for turning movement about an axis extending heightwise of the last, the gripper being adjustable about said axis by the turning of said member.

28. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of fingers arranged to extend heightwise of the last and to engage the gripper respectively in different locations, said fingers being relatively movable heightwise of the last to swing the gripper adjustably in any direction relatively to said operating member, a plurality of rods also arranged to extend heightwise of the last and relatively movable to effect the relative movements of the fingers, a member supporting the fingers and in which said rods are thus movable, and means for adjusting said member heightwise of the last to effect a corresponding adjustment of the gripper through said fingers.

29. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said

gripper, means for operating said member to move the gripper heightwise of the last to pull the upper and to move it still farther heightwise of the last after its release of the upper, and means for swinging the gripper inwardly over the bottom of the last in response to such further movement thereof.

30. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper, means for operating said member to move the gripper heightwise of the last to pull the upper and to move it still farther heightwise of the last after its release of the upper, and a member into engagement with which the gripper is carried in such further movement thereof heightwise of the last for swinging it relatively to said operating member inwardly over the bottom of the last.

31. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, and means for determining adjustably the initial position of the gripper with respect to any such swinging movement and for thereafter releasing it for universal swinging movement in the pulling of the upper heightwise of the last.

32. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, and means for adjustably swinging said gripper in any direction relatively to the operating member and for holding it initially in adjusted position, said adjusting means being arranged to free the gripper for universal swinging movement in response to the movement of the gripper heightwise of the last.

33. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, and controlling means for adjustably swinging said gripper in any direction relatively to the operating member and for holding it initially in adjusted position, said controlling means being arranged to free the gripper from such control as the gripper is moved heightwise of the last to pull the upper and to reestablish such control thereof in response to return movement of the gripper.

34. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, and controlling means for adjustably swinging said gripper in any direction relatively to the operating member and for holding it initially in adjusted position, the gripper being movable relatively to said controlling means to release it from such control in the upper-pulling operation and to reestablish such control thereof after the upper-pulling operation.

35. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted

on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for swinging movements relatively to said operating member, and controlling means arranged to engage a portion of said gripper located farther from the last than its connection with said operating member to swing the gripper adjustably in different directions relatively to the operating member and to hold it initially in adjusted position, the gripper being movable relatively to said controlling means to free it from such control in the upper-pulling operation.

36. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of controlling members arranged to engage the gripper respectively in different locations and relatively movable to swing the gripper adjustably in any direction relatively to the operating member, and means for holding said controlling members in the relation to one another thus assumed in adjusting the gripper, the gripper being movable relatively to said controlling members to free it from such control in the upper-pulling operation.

37. In a shoe machine, a gripper arranged to grip the marginal portion of an upper mounted on a last, an operating member connected to said gripper for moving it heightwise of the last to pull the upper, the gripper being mounted for universal swinging movement relatively to said operating member, a plurality of controlling members arranged to engage the gripper respectively in different locations and relatively movable to swing the gripper adjustably in any direction relatively to the operating member, and means for holding said controlling members in the relation to one another thus assumed in adjusting the gripper, said controlling members being arranged automatically to release the gripper from such control in the upper-pulling operation and thereafter to reestablish such control thereof in response to return movement of the gripper.

38. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars movable relatively to said holders to drive the fastenings, means for operating said driver bars, connections between the outer ends of the bars and said operating means providing at said outer ends axes about which the bars and the holders may swing in directions transverse to the edge of the shoe bottom, and means for swinging the bars and said holders about said axes to position the holders opposite the shoe bottom and for also moving the holders heightwise of the shoe relatively to the wipers into positions for the driving of the fastenings prior to the operative movements of the driver bars.

39. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders

for the fastenings and driver bars guided by said holders for driving the fastenings, means for operating said driver bars, universal connections between the outer ends of the bars and said operating means to permit the bars and said holders to swing as units in directions transverse to the edge of the shoe bottom, and means for swinging said bars and holders about axes provided by said universal connections to position the holders opposite the shoe bottom and for also moving the holders heightwise of the shoe relatively to the bars and the wipers into positions for the driving of the fastenings.

40. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars guided by said holders for driving the fastenings, means for operating said driver bars, connections between the outer ends of the bars and said operating means providing at said outer ends axes about which the bars and the holders may swing in directions transverse to the edge of the shoe bottom, and means for swinging the bars and said holders about said axes to position the holders opposite the shoe bottom by engagement with portions of the holders in which the fastenings are received and for also by such engagement moving the holders heightwise of the shoe relatively to the wipers into positions for the driving of the fastenings.

41. In a lasting machine, the combination with wipers arranged to operate on a shoe positioned bottom upward to wipe the margin of the upper about an end of the shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars guided by said holders for driving the fastenings, means above said drive bars for operating them, connections between the bars and said operating means providing axes about which the bars and the holders may swing in directions transverse to the edge of the shoe bottom, and means supporting said holders by engagement with their lower end portions, said supporting means being movable to swing the bars and the holders relatively to the wipers about said axes to position the holders over the shoe bottom and also to carry the holders heightwise of the shoe into positions for the driving of the fastenings.

42. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars guided by said holders for driving the fastenings, means for operating said driver bars, connections between the driver bars and said operating means providing axes about which the bars and the holders may swing in directions transverse to the edge of the shoe bottom, and means for moving the holders relatively to the wipers to position them opposite the shoe bottom by swinging them with the bars about said axes and for

also moving the holders heightwise of the shoe relatively to the bars and the wipers into positions for the driving of the fastenings.

43. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars guided by said holders for driving the fastenings, said bars and holders being mounted to swing as units relatively to the wipers transversely of the edge of the shoe bottom about axes at the outer ends of the bars to position the holders opposite the shoe bottom, and means connected to the several holders at one portion only of each holder thus to swing them and the bars and also to move the holders heightwise of the shoe relatively to the wipers into positions for the driving of the fastenings.

44. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars movable relatively to said holders to drive the fastenings, fluid-operated members associated respectively with the several driver bars for operating them, the several fastening-inserting devices being mounted to swing relatively to said members in directions transverse to the edge of the shoe bottom, and means for thus swinging the devices relatively to the wipers inwardly over the shoe bottom prior to the driving of the fastenings.

45. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices including holders for the fastenings and driver bars movable relatively to said holders to drive the fastenings, fluid-operated pistons associated respectively with the several driver bars for operating them, connections between said bars and pistons providing axes about which the bars and the holders may swing in directions transverse to the edge of the shoe bottom, and means for thus swinging the bars and the holders to position the holders opposite the shoe bottom and for also moving the holders heightwise of the shoe relatively to the bars and the wipers into positions for the driving of the fastenings.

46. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, a pair of controlling members associated respectively with different groups of said fastening-inserting devices for moving said devices relatively to the wipers inwardly over the shoe bottom to position them prior to the insertion of the fastenings, and means for moving said controlling members bodily lengthwise of the shoe and for also swinging them laterally of the shoe in response to their bodily movements to impart cor-

responding positioning movements to said devices.

47. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, a pair of levers associated respectively with different groups of said fastening-inserting devices for moving said devices relatively to the wipers inwardly over the shoe bottom to position them prior to the insertion of the fastenings, said levers being mounted to swing laterally of the shoe each about an axis extending heightwise of the shoe, and means for moving the levers bodily lengthwise of the shoe and for also swinging them laterally of the shoe in response to their bodily movements to impart corresponding positioning movements to said devices.

48. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, a pair of levers having curved arms associated respectively with different groups of said fastening-inserting devices for moving said devices relatively to the wipers inwardly over the shoe bottom to position them prior to the insertion of the fastenings, said levers being mounted to swing laterally of the shoe each about an axis extending heightwise of the shoe and having other arms provided with slots therein, means for moving the levers bodily lengthwise of the shoe to position the fastening-inserting devices in that respect relatively to the shoe and the wipers, and members extending into said slots for swinging said levers laterally of the shoe in response to their bodily movements further to position said devices.

49. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said devices including holders for the fastenings, controlling members connected respectively to different groups of said holders for moving them relatively to the wipers to position them prior to the insertion of the fastenings, and means for moving said controlling members bodily lengthwise and heightwise of the shoe and for thereby imparting corresponding positioning movements to said holders and for also swinging them laterally of the shoe further to position the holders.

50. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said devices including holders for the fastenings, a pair of levers connected respectively to different groups of said holders for moving them relatively to the wipers to position them prior to the insertion of the fastenings, means for moving said levers bodily lengthwise and heightwise of the shoe and for thereby imparting corresponding positioning movements to said holders, and means for also swinging said

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levers laterally of the shoe each about an axis extending heightwise of the shoe further to position the holders.

51. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said devices including holders for the fastenings, a pair of controlling members connected respectively to different groups of said holders for moving them relatively to the wipers to position them prior to the insertion of the fastenings, means for moving said controlling members bodily lengthwise and heightwise of the shoe and for thereby imparting corresponding positioning movements to said holders, and means for swinging said members laterally of the shoe each about an axis extending heightwise of the shoe in response to their movement lengthwise of the shoe further to position the holders.

52. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said devices including holders for the fastenings, a pair of controlling members connected respectively to different groups of said holders for moving them relatively to the wipers to position them prior to the insertion of the fastenings, a support for said controlling members, arms connected to said support and mounted for swinging movements to carry it in an arc lengthwise and heightwise of the shoe and thereby to impart corresponding positioning movements to said holders, and means for also swinging said controlling members laterally of the shoe each about an axis extending heightwise of the shoe further to position the holders.

53. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, and controlling means for moving all said fastening-inserting devices lengthwise of the shoe and for moving some of them also laterally of the shoe to position them relatively to the wipers prior to the insertion of the fastenings, said fastening-inserting devices being each individually adjustable relatively to said controlling means to vary their relation to one another in the fastening-inserting operation.

54. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, and controlling members associated respectively with different groups of said fastening-inserting devices for moving the devices of each group lengthwise and laterally of the shoe to position them relatively to the wipers prior to the insertion of the fastenings, the devices of each group being adjustable each individually in directions lengthwise of the edge of the shoe bottom and transversely of the edge of the shoe bottom relatively to the controlling member associated there-

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with to vary the positions of said devices in the fastening-inserting operation.

55. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices being mounted each independently for swinging movements in directions transverse to the edge of the shoe bottom, a pair of controlling members associated respectively with different groups of said fastening-inserting devices for thus swinging said devices relatively to the wipers inwardly over the shoe bottom to position them prior to the insertion of the fastenings, means for moving said controlling members bodily lengthwise of the shoe and for also swinging them laterally of the shoe each about an axis extending heightwise of the shoe thus to position said devices, and adjustable connections between the devices and said controlling members.

56. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices being mounted each independently for swinging movements in directions transverse to the edge of the shoe bottom, a pair of controlling members associated respectively with different groups of said fastening-inserting devices for thus swinging said devices relatively to the wipers inwardly over the shoe bottom to position them prior to the insertion of the fastenings, means for moving said controlling members bodily lengthwise of the shoe and for also swinging them laterally of the shoe each about an axis extending heightwise of the shoe thus to position said devices, connections between the devices and said controlling members adjustably movable to vary the relation of said devices to one another, and means carried by said members for securing said connections in their adjusted relation.

57. In a lasting machine, the combination with wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, of a plurality of fastening-inserting devices for inserting fastenings about the end of the shoe bottom to fasten the upper, said fastening-inserting devices being mounted each independently for swinging movements in directions transverse to the edge of the shoe bottom, a pair of controlling members associated respectively with different groups of said fastening-inserting devices for thus swinging said devices relatively to the wipers inwardly over the shoe bottom to position them prior to the insertion of the fastenings, means for moving said controlling members bodily lengthwise of the shoe and for also swinging them laterally of the shoe each about an axis extending heightwise of the shoe thus to position said devices, connections between the devices and said controlling members movable to adjust the devices relatively to said members in directions transverse to the edge of the shoe bottom and also in directions lengthwise of the edge of the shoe bottom, and means carried by said members for clamping said connections in their adjusted relation.

58. In a lasting machine, wipers for wiping the margin of an upper about an end of a shoe in-

wardly over the shoe bottom into lasted position, said wipers being provided with a plurality of openings through which to drive fastenings to fasten the upper, a plurality of fastening-inserting devices for driving the fastenings through said openings, and means for moving said fastening-inserting devices relatively to the wipers lengthwise and laterally of the shoe into alignment with said openings in the wipers prior to the driving of the fastenings.

59. In a lasting machine, wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, said wipers being provided with a plurality of openings through which to drive fastenings to fasten the upper, a plurality of fastening-inserting devices including holders for fastenings and drivers for driving the fastenings through said openings, and means for moving said fastening-inserting devices relatively to the wipers lengthwise and laterally of the shoe into alignment with said openings and for also moving said holders heightwise of the shoe toward the wipers prior to the driving of the fastenings.

60. In a lasting machine, wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, said wipers being provided with a plurality of openings through which to drive fastenings to fasten the upper and with recesses adjacent to said openings, a plurality of fastening-inserting devices including holders for fastenings and drivers for driving the fastenings through said openings, and means for moving said fastening-inserting devices relatively to the wipers lengthwise and laterally of the shoe into alignment with said openings and for also moving said holders heightwise of the shoe relatively to the drivers into positions in said recesses in the wipers prior to the driving of the fastenings.

61. In a lasting machine, wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, said wipers being provided with a plurality of openings through which to drive fastenings to fasten the upper, a plurality of fastening-inserting devices for driving the fastenings through said openings, and means for moving said fastening-inserting devices relatively to the wipers lengthwise and laterally of the shoe into alignment with said openings in the wipers prior to the driving of the fastenings, said fastening-inserting devices being preliminarily adjustable each individually to position them relatively to one another in accordance with the relative positions of said openings in the wipers.

62. In a lasting machine, wipers for wiping the margin of an upper about an end of a shoe inwardly over the shoe bottom into lasted position, said wipers being provided with a plurality of openings through which to drive fastenings to fasten the upper, a plurality of fastening-inserting devices for driving the fastenings through said openings, and controlling members associated respectively with different groups of said fastening-inserting devices for moving the devices of each group lengthwise and laterally of the shoe into alignment with corresponding wiper openings prior to the driving of the fastenings, the devices of each group being each individually adjustable relatively to the controlling member associated therewith to position them relatively to one another in accordance with the relative positions of the corresponding wiper openings.

63. In a lasting machine, the combination with wipers formed to embrace an upper about an

end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, of means for driving different pairs of fastenings in succession with the fastenings of each pair located respectively at the opposite sides of the shoe bottom to fasten the upper while it is held by the wipers.

64. In a lasting machine, the combination with wipers formed to embrace an upper about an end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, of means for driving a fastening at the extreme end of the shoe bottom and for thereafter driving different pairs of fastenings successively in locations progressively farther from the extreme end of the shoe bottom with the fastenings of each pair located respectively at the opposite sides of the shoe bottom to fasten the upper while it is held by the wipers.

65. In a lasting machine, the combination with wipers formed to embrace an upper about an end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, of a plurality of fastening-inserting devices for driving a corresponding number of fastenings about the end of the shoe bottom to fasten the upper while it is held by the wipers, and means for operating said fastening-inserting devices in such order as to drive different fastenings successively.

66. In a lasting machine, the combination with wipers formed to embrace an upper about an end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, of a plurality of fastening-inserting devices for driving a corresponding number of fastenings about the end of the shoe bottom to fasten the upper while it is held by the wipers, and means for operating said fastening-inserting devices in such order as to drive different pairs of fastenings in succession with the fastenings of each pair located respectively at the opposite sides of the shoe bottom.

67. In a lasting machine, the combination with wipers formed to embrace an upper about an end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, of a plurality of fastening-inserting devices including drivers for driving a corresponding number of fastenings about the end of the shoe bottom to fasten the upper while it is held by the wipers, fluid-operated members associated respectively with said different drivers for operating them by fluid pressure, and means to cause said members to operate in such order as to drive different fastenings successively.

68. In a lasting machine, the combination with wipers formed to embrace an upper about an end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, of a plurality of fastening-inserting devices including drivers for driving a corresponding number of fastenings about the end of the shoe bottom to fasten the upper while it is held by the wipers, fluid-operated members associated respectively with said different drivers for operating them by fluid pressure, and means to cause said members to operate in such order as to drive different pairs of fastenings in succession with the fastenings of each pair located respectively at the opposite sides of the shoe bottom.

69. In a lasting machine, wipers formed to embrace an upper about an end of a last and movable to wipe the margin of the upper inwardly over an insole on the last into lasted position, said wipers being provided with openings

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through which to drive fastenings to fasten the upper and having recesses adjacent to said openings, a plurality of fastening-inserting devices including holders for fastenings and drivers for driving the fastenings, means for moving said fastening-inserting devices relatively to the wipers into alinement with said openings and for moving said holders into positions in said recesses in the wipers, and means for thereafter operating said drivers in such order as to drive different fastenings successively.

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