4 Sheets—Sheet 1.

G. W. COPELAND, E. WOODWARD & M. BROCK.

Machine for Lasting Boots and Shoes.

No. 208,156 **Patented Sept. 17, 1878.**

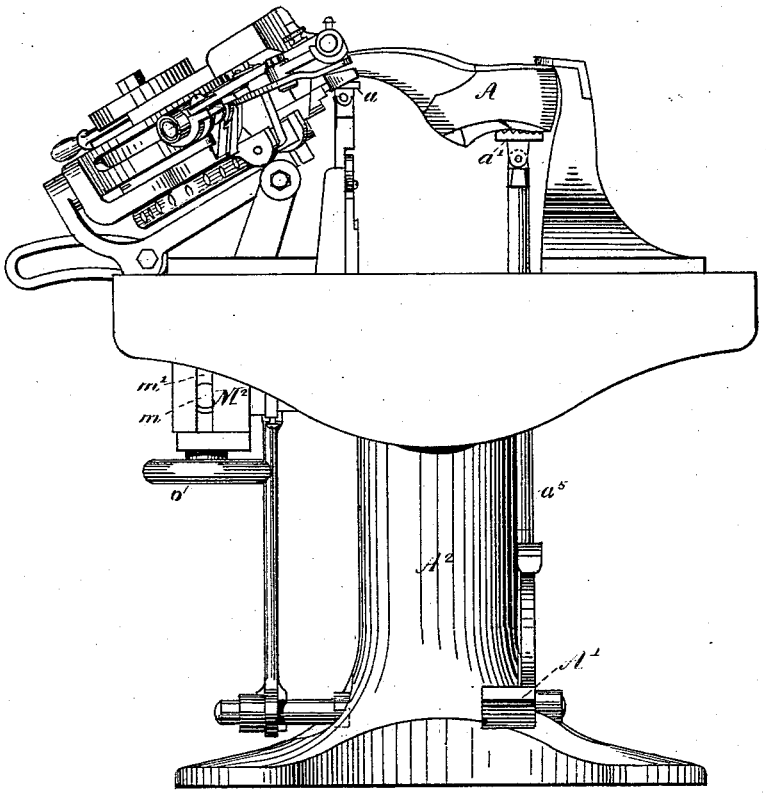

Fig. 1.

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4 Sheets—Sheet 2

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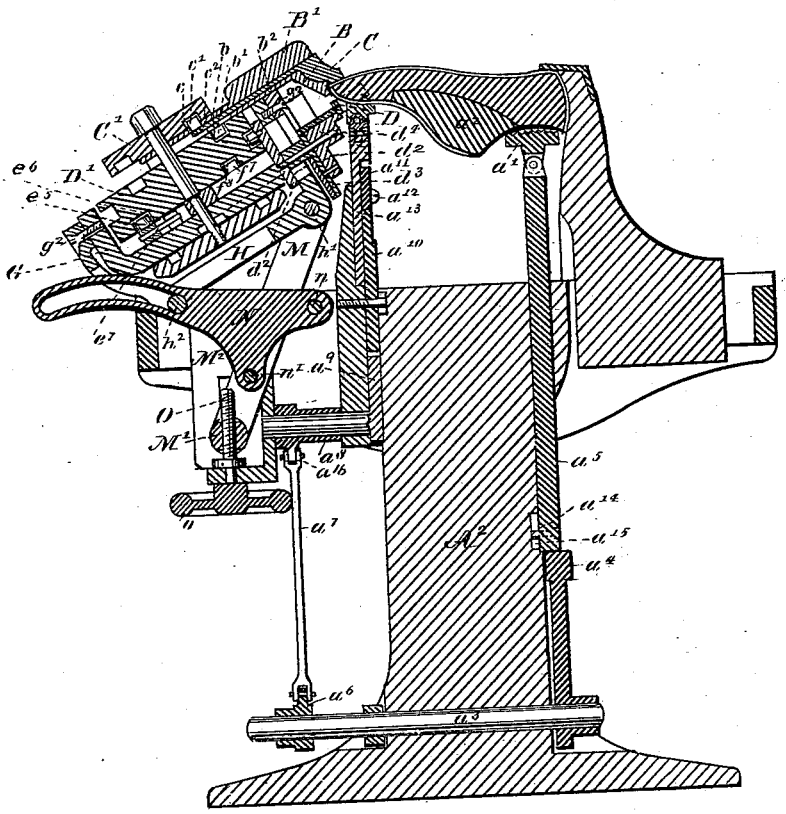

Fig. 2.

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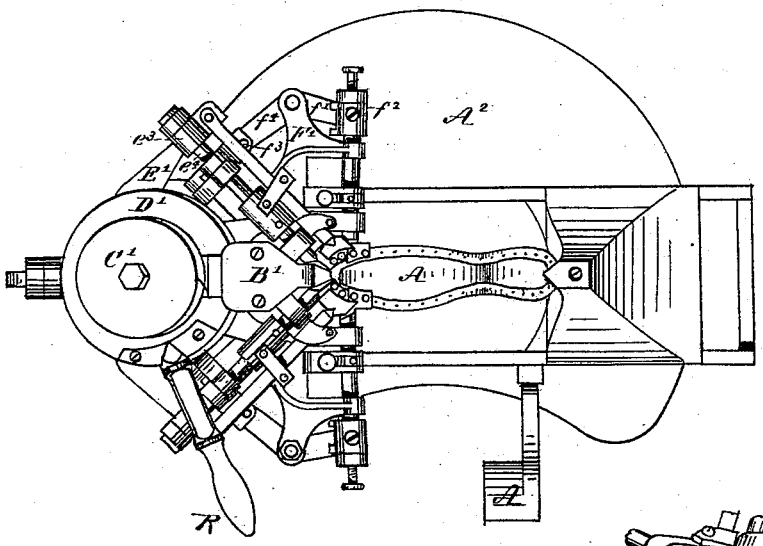

Fig. 3.

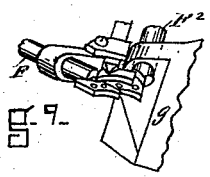

Fig. 9.

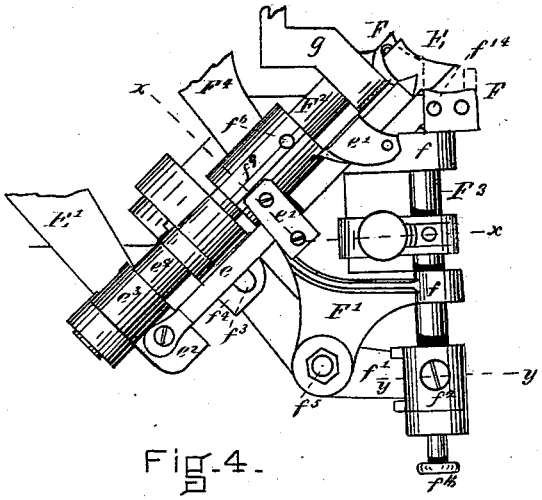

Fig. 4.

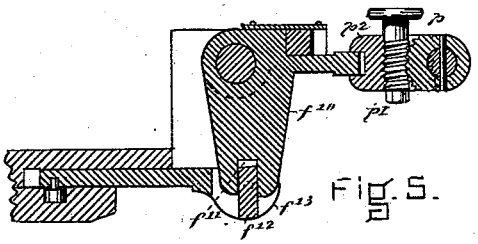

Fig. 5.

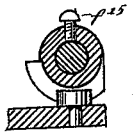

Fig 6

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G. W. COPELAND, E. WOODWARD & M. BROCK.

Machine for Lasting Boots and Shoes.

No. 208,156. Patented Sept. 17, 1878.

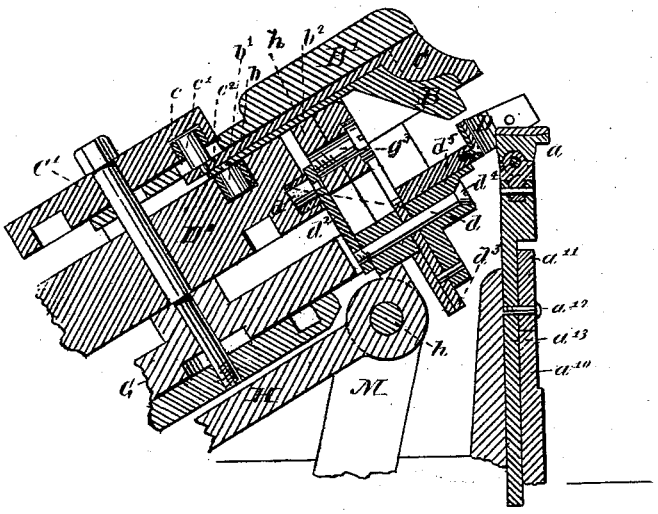

Fig. 7.

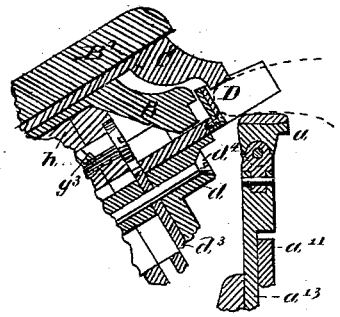

Fig. 8.

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UNITED STATES PATENT OFFICE.

GEORGE W. COPELAND, OF MALDEN, AND ERASTUS WOODWARD AND MATTHIAS BROCK, OF BOSTON, MASSACHUSETTS, ASSIGNORS TO THE COPELAND LASTING MACHINE COMPANY, OF HARTFORD, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR LASTING BOOTS AND SHOES.

Specification forming part of Letters Patent No. **208,156**, dated September 17, 1878; application filed May 15, 1878.

To all whom it may concern:

Be it known that we, GEORGE W. COPELAND, of Malden, in the county of Middlesex, ERASTUS WOODWARD, of Boston, in the county of Suffolk, and MATTHIAS BROCK, of said Boston, all in the Commonwealth of Massachusetts, have invented an Improvement in Machines for Lasting Boots and Shoes, of which the following is a specification:

This invention consists particularly in mechanism for lasting the toe and heel of boots and shoes; but it is shown in the drawing as applied to toe-lasting only. It is designed to be used in connection with any suitable side-lasting mechanism.

The special features embraced in our invention consist in various adjustments of converging folding-plates in relation to that portion of the bottom of a last upon which they are designed to close, and for this purpose we have provided the same, first, with an oscillating movement much like that described in Patent 197,607, granted us November 27, 1877, the improvement consisting in combining with said oscillating or rocking movement of the plates a vertical adjustability; second, with an independent adjustability of the lower outer folding-plates, hereinafter more fully described.

The invention further consists in two sets of folding plates or slides, one above the other, so arranged and operated that the upper set shall partly fold over and conform the upper to the last, and the lower set shall complete the folding and conforming of the upper upon the last, as will hereinafter be fully set forth; in the combination of said converging folding-plates, provided with the adjustments named, with the vertically-adjustable lasting-jack for supporting the toe and back of the last; in the combination of an upwardly-moving toe stretching and smoothing pad and a movable downhold and abutment; in the combination of the toe stretching and smoothing pad, movable abutment and downhold, and double series of adjustable converging folding-plates; in the various actuating mechanisms described for adjusting said folding-plates, for closing the same, for operating the toe stretching and smoothing pad, and for vertically adjusting the said converging folding-plates and the mechanism operating the same, and for actuating the supporting-jack.

In the drawings, Figure 1 represents a side elevation of our improved toe-lasting mechanism, showing the last in position upon the jack. Fig. 2 is a longitudinal vertical central section of said mechanism. Fig. 3 is a plan of the toe-lasting devices, showing the folding-plates and position of the actuating mechanism after the upper has been folded upon the insole. Fig. 4 is an enlarged detail view of the two series of converging plates. Fig. 5 is a vertical section on the line $x\ x$, Fig. 4. Fig. 6 is a vertical section on the line $y\ y$, Fig. 4. Fig. 7 is a longitudinal vertical section of the abutment, downhold, toe stretching and smoothing pad, and mechanism for operating the same and the toe-rest. Fig. 8 is a detail view elaborating Fig. 7. Fig. 9 is a perspective view of the two-series or duplex converging folding-plates.

Heretofore toe and heel lasting have been done by folding-plates generally provided with converging movements upon the surface of the last's bottom in folding the edge of the upper thereon; but until our invention of the mechanism set forth in the Letters Patent above named no adjustability had been given the said folding-plates except, perhaps, a somewhat rude longitudinal tipping movement of the table or support carrying the toe-lasting devices.

In the said patent an improvement was begun by providing the converging folding-plates with lateral adjustability by hanging the table or support which carried the said plates and their operating mechanism so as to oscillate from a center, extending directly backward from the center of the heel-downhold.

In this invention we still provide the converging folding-plates, with the oscillating table or support arranged to oscillate from a center, extending backward from the center of the downhold longitudinally; but we further provide the said table with vertical adjustability upon an elliptic curve, of which the extreme upper front of the abutment is the moving center.

We also provide our improved mechanism

with two sets of folding-plates closing on parallel or substantially parallel planes, with the exception of the outer lower folding-plates, which have a vertical adjustability. The upper set of folding-plates first operate in partially folding the upper upon the inner sole, and in holding that portion thus partly folded down, while the lower set of converging plates are operated to completely break down, fold, and conform that portion of the upper upon the insole.

To a certain extent the adjustment of the folding-plates to the slope of the surface of the last is automatic, and is determined by the under surface of the downhold. The other adjustments which are given the folding-plates, and which enable us to last and fold an upper upon a surface of any conformation, are regulated by the operator, as the case may require.

The last A, with the upper secured thereon at the toe and heel, is placed in the machine with its toe resting upon the toe-rest a, and the portion back of the instep, where a spindle usually is inserted in jacking the same, is supported by the main rest a^1, which is of sufficient length to also support and hold in position the fore-block a^2 of the last. The last also contacts at the toe with the abutment B, and the downhold C projects somewhat upon the surface of the insole at the toe.

By the movement of the treadle A^1, which is fastened to the end of shaft a^3, and is provided with the cam a^4, which lifts the rod a^5, carrying the main rest a^1, and which also operates, through the shaft a^3 and lever a^6, rod a^7, rock-shaft a^8, cam a^9, the sector a^{10}, the cam a^{11}, fastened by the set-screw a^{12} to the rod a^{13}, which carries the toe-rest a.

To firmly hold the last in position against the abutment B and under the downhold C while the lasting is in progress, the rock-shaft a^3 has a suitable bearing in the standard A^2, and the spindle or rod a^5 is also furnished with a suitable bearing within said standard A^2, and is further provided with the stop a^{14}, which plays in the recess a^{15} in the standard A^2. The rod a^7 is provided with the slots a^{16}, in which the end of the rock-shaft a^8 is given a limited movement.

The main rest a^1 is hinged upon the spindle a^5, and thereby given a longitudinal adjustability. It may also be hinged to swing laterally, or it may be supported on a universal joint. The toe-rest a is also hinged to oscillate longitudinally. It may also swing laterally or be supported on a universal joint. The toe-rest is also covered with a thin layer of rubber, and the main rest a^1 may also be provided with a rubber covering. The last is thus supported firmly under the downholds against the abutment B.

The next manipulation in the operation of the machine is the withdrawal of the abutment B and the partial withdrawal and falling of the downhold C.

The abutment B is operated by the cam-groove b, in which plays the cam-pin b^1 upon the end of the connecting-bar b^2. This bar is furnished with suitable guides in the block B^1, and preferably the abutment B is caused to drop slightly as it withdraws. Simultaneously with the withdrawal of the abutment occurs the partial withdrawal of the downhold C and upward movement of the toe stretching and smoothing pad D. The downhold is withdrawn by the cam-grooves c on the under side of the disk C′, in which plays the cam-pin c^1, which is fastened upon the end of the bar c^2. The downhold, however, is not withdrawn quite as far as the abutment, and it is also preferably provided with a downward movement. Like the bar b^2, the bar c^2 is guided in the block B^1.

The under portion of the downhold B corresponds in shape to the upper portion of the abutment C, which fits therein when the abutment is moved against the toe of the last, and it will be seen that the downhold is inclined on its under surface from the extreme point downwardly until it contacts with the abutment, when it is curved upwardly to conform to the curved upper surface of the abutment.

This construction permits the toe stretching and smoothing pad to lift, between the projecting foot of the downhold and the end of the abutment, in performing its work, after the abutment has been withdrawn.

This toe stretching and smoothing pad consists of a curved metal support or spring, shaped to substantially conform to the toe of the last, and lined preferably with leather or rubber on its inner side, and is more fully described in the patent above referred to.

It will be observed that the movement of this pad is upward, substantially parallel with that portion of the last upon which it is designed to operate, and that it lifts between the under portion of the downhold and the upper portion of the abutment, so that its ends almost contact with the under portion of the upper set of converging folding-plates E. It then drops slightly simultaneously with the closing of said upper plates. This pad is operated by the cam-groove d in the disk D′, in which the cam-pin d^1 plays through the connecting-slides d^2 d^3, each of which reciprocates vertically in suitable guides in a portion of the frame projecting downwardly from the block b^1.

The slides are connected with each other by the short rod d^4, and the slide d^3 carries the bracket d^5, which supports the toe stretching and smoothing pad D, which plays in ways thereon, and may be provided with horizontal adjustment in relation thereto.

After dropping sufficiently to allow the under set of converging plates F to close, this toe stretching and smoothing pad remains stationary during the remainder of the operation of the machine, closely hugging and clamping the upper to the last.

The upper plates, E, which operate to partially break down, turn over, and conform the margin of the upper upon the last's bottom, consist of two or more thin plates, shaped

upon their inner edge to conform substantially to the vertical contour of the edge of that portion of the last over which they close. They are attached to the ends of the sliding bars *e*, which are guided in the guides e^1 upon the hinged connecting-plate F^1.

These sliding bars *e* are fastened upon the brackets e^2 projecting from the collars e^3, which slide upon the sleeves e^4. These collars e^3 are reciprocated upon the sleeves by the levers E′, which are pivoted to the oscillating plate G, and are operated by the cam-groove e^5 in the under portion of the disk D′, in which the cam-pin e^6, which is fastened on the upper end of one of the levers E′, plays. This cam and cam-pin e^5 e^6 operate each of the levers E′, the one directly and the other by means of a short swiveling connection, e^7, which fastens the end of the other lever to the cam-pin.

Upon the closing of the upper set of converging folding-plates the lower set, F, commence to operate preferably the ones on each side of the downhold, advancing a little in advance of the outer ones, though not so rapidly.

The action of these plates completes the breaking down and folding commenced by the upper plates; and it will be observed that the corner plates or those next the downhold commence to operate a little in advance of the outer plates, but that the outer plates advance more quickly, and finish the folding of that part of the upper upon which they operate at the same time that the other two folding-plates end their work, though closing preferably a little farther upon the surface of the last.

These outer plates are provided with a lateral adjustability, which will hereinafter be explained, to adapt them to varying widths of lasts.

The converging folding-plates F are similar in edge conformation to that given the upper set of plates; and in determining said conformation we are governed by the vertical conformation of the last. They are supported upon the ends of the rods F^2 F^3. The rods F^3, carrying the outer plates, are provided with bearings in the brackets *f* projecting from the plate F^1, and each of these rods F^2 F^3 is operated by the curved lever f^1, which is pivoted to the sleeve f^2, which surrounds the end of the rod F^3. This lever f^1 is also pivoted at f^3 at the end of the arm or bracket f^4 on the inner end of the sleeve e^4. This operating-lever f^1 is laid hold of at about the center of its length f^5 by the plate F^1, from which project the brackets *f*, as above stated. This connecting-plate F^1 is operated by the rod F^2, to which it is pinned at f^6. Each of the rods F^2 F^3 is provided with bearings in the brackets *g*, which project upwardly and outwardly from the plate G. The rod also has a further bearing in the sleeve e^4, upon which the lever E^1 plays in operating the bar *e*.

Each of the said rods F^2 F^3 is operated by a lever, F^4, which is pivoted to the plate G, and is actuated by a cam-pin, f^7, in the cam-groove f^8 in the under portion of the disk D′. The outer end of this lever lays hold of the block f^9 at the end of lever f^1, and said lever f^1 is provided with the downward-projecting bracket f^{10}, provided with recess f^{11} at its bottom, which fits over the guide f^{12}, supported by the brackets f^{13} projecting from the plate G, to steady and direct the reciprocating lever f^1.

The cam-disks C′ D′ are bolted to the oscillating plate G. This plate G is pivoted to oscillate laterally to the carriage H at g^2, and at g^3 to the standard *h* projecting upwardly from said carriage H.

This oscillating plate supports all the mechanism for actuating the downhold, the abutment, the toe stretching and smoothing pad, and the folding-plates, and therefore all this mechanism oscillates with it. The purpose in giving these devices this oscillating movement is to effect a lateral adjustment of said devices in relation to the plane of the bottom of the last upon which it is intended to operate. Therefore, as nearly as possible, the said plate and the mechanism thereon contained should correspond and be of the same plane as the plane of that portion of the surface of the last on which the folding-plates are to close. This plane may be determined by such a contrivance as we have described in our said patent, called a "centering-shoe," or by the downhold itself being of sufficient breadth upon its under surface to govern said oscillating plate, and cause it to conform in plane, as above stated, or by suitable projections upon the under portion of either of the converging plates, which shall determine the plane of the oscillating plates as they close in upon the surface of the last by contacting therewith, and for this purpose we show, in Fig. 4, one of the plates F provided with a projecting guide curved upwardly upon its under surface.

The next adjustment which we give the lasting devices supported by the plate G is that of a vertical tipping adjustability by lifting said plate upon the elliptic curve, which has for its moving center the extreme end of the under portion of the abutment. This we effect by means of the levers M, which lay hold of the carriage H at h^1, and the slotted lever N, which is stationarily pivoted at *n*, and is pivoted to the lever M at *n*′. This lever N also supports the carriage H at h^2, which is pivoted therein to move upon the arc of the circle determined by the slot in the end of said lever N. The lever M is provided with the nut M^1 and with the guides *m*, which move freely in the ways *m*′ in the bracket M^2, projecting downwardly from the frame of the machine. The screw O engages with the nut M^1, is supported at the bottom of the frame M^2, and is provided with the handle *o* to operate the lever M in elevating the carriage H, carrying the oscillating plate G.

The lower set of converging folding-plates F are provided with holes f^{14} near their outer edge, through which the lasting tacks or fastenings for securing the upper to the insole are driven. In some instances, where the surface

of the last is round or convex, instead of a uniform plane it is necessary that the lower outer plates, F, should be provided with a longitudinal tipping movement from one end of the plate, which end must be a given point determined by the center of the rod operating the said plate. To give these outer plates this tipping movement we provide each of the operating-rods F^3 with a suitable gear, *p*, which is keyed to the rod and is operated by the worm-gear p^1, having a bearing in the carriage p^2, which slides on the plate F^1 and lays hold of the rod. The rod F^3 is made movable in said supporting-brackets and in the sleeve f^2 by means of the set-screws f^{15} f^{16}, whereby the plate may be moved laterally to and from said bracket in making an adjustment for varying widths of lasts.

The cam-disks are operated by the handle or lever R; but it is intended that all the movements shall eventually be automatic and operated by power.

The operation of our machine is as follows: The last, with the upper thereon, is placed under the downhold, and the toe and main supports are then raised to firmly clamp the last in position. The toe-lasting mechanism is then adjusted so that the plane of the oscillating plate shall be as nearly parallel as possible with the plane of the surface of the last, and the necessary adjustment to secure this position of the toe-lasting devices, as well as to secure the proper conformation of the lower set of plates to the surface upon which they are to close, is then made. The downhold and abutment are then withdrawn simultaneously with the upward movement of the toe stretching and smoothing pad, which is followed by the closing of the upper plates, the shutting of the lower plates, and the withdrawal of the upper plates, leaving the holes in the lower plates exposed for the purpose of tacking or uniting the margin of the upper to the insole.

The advantages of the various adjustments herein described are very great. By them we are enabled to secure, it may be said, almost universal adjustability and conformation of the converging folding-plates to that portion of the surface of the last upon which they are intended to operate, so that whatever the surface of the last at that point may be, and whatever its width at that point, whether it is inclined regularly from the ball of the last to the toe or whether it is additionally inclined from the median line extending from the ball of the last to the toe toward each edge, whether it be lower on one side than upon the other, or whatever inequality there may be upon the surface of the last upon their proper adjustment, the said lasting appliances act with uniformity and precision in successfully breaking down and perfectly folding the edge of the upper upon the insole. We are also enabled to easily jack the last in the machine without the use of a spindle, which results in a saving of time.

Although the upper set of converging plates are shown and described as advancing and completing their work before the closing of the under set of plates, and are then withdrawn, and although the lower set of folding-plates are provided with differential motions, we do not confine ourselves in the use of this duplex series of plates to this particular manner of operation; neither do we confine ourselves to their use in combination with the mechanism shown or with the adjustments given; but we may use them at the heel, or upon any other portion of the last, in folding the upper thereon, where it may be desirable to break over and fold the edge of the upper upon the insole by a double series of folding-plates, one series above the other.

Having thus fully described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In a machine for lasting the uppers of boots and shoes, the improved jack described, consisting of a vertically-adjustable toe-rest, *a*, and the main rest a^1, adapted to support the heel end of a last and to project under the fore-block of a last to prevent the same from slipping downwardly in the lasting process, substantially as described.

2. In a machine for lasting the uppers of boots and shoes, a support or rest for receiving the last, adapted to furnish a support for the heel of a last and for the fore-block, but not entering the same, whereby the fore-block is prevented from slipping while the lasting is in progress and the last easily adjusted on the said rest or support provided with a longitudinal rocking motion, substantially as and for the purposes described.

3. In a machine for lasting the uppers of boots and shoes, a rest for supporting both the fore-block and heel of a last, consisting of a flat table or plate, a^1, not entering the last, and provided with means for vertical adjustment in relation to a heel-downhold, substantially as described.

4. In a machine for lasting the uppers of boots and shoes, a longitudinally-rocking table or plate, a^1, adapted to act as a support for the fore-block of a last as well as for the heel portion thereof, as described, provided with means for automatic vertical adjustment, substantially as described.

5. In a machine for lasting the uppers of boots, the combination of a toe-rest and main rest or table adapted to support the heel portion and fore-block of a last, substantially as described, each provided with means for automatic vertical adjustment in relation to the toe and heel downholds of a lasting-machine with said toe and heel down-holds, substantially as and for the purposes set forth.

6. In a machine for lasting the uppers of boots and shoes, the combination of a main rest adapted to act as a support for the fore-block of a last and for the heel portion thereof, whereby the former is prevented from slip-

ping in the lasting process, suitable connecting mechanism, and the lever A^1, substantially as described.

7. In a machine for lasting the uppers of boots and shoes, the combination of a toe-rest, the connecting mechanism described, and the operating-lever A^1, substantially as set forth.

8. In a machine for lasting the uppers of boots and shoes, the combination of toe and heel downholds, a toe-rest, and a main rest adapted to support both the heel portion and fore-block of a last, whereby the latter is prevented from slipping in the lasting process, suitable connecting mechanism, and the actuating-lever A^1, whereby the said rests are simultaneously operated and the last firmly clamped under the downholds, substantially as described.

9. In a machine for lasting the uppers of boots and shoes, the adjustable cam a^{11}, with the sector a^{12}, for adjusting the lift of the toe-rest a, substantially as and for the purposes described.

10. In a machine for lasting the uppers of boots and shoes, the combination of a downhold and abutment with the mechanism for simultaneously operating said downhold and abutment, whereby the downhold is moved downward and backward upon the surface of the last, but not entirely removed therefrom, and the abutment is moved backward sufficiently to allow of the upward movement of the toe stretching and smoothing pad between it and the said downhold, substantially as described.

11. In a machine for lasting the uppers of boots and shoes, the combination of a downhold provided with substantially a horizontal movement upon the surface of the last, an abutment provided with a movement to and from the end of a last, and a toe stretching and smoothing pad provided with an upward movement substantially parallel with the side of a last, successively or simultaneously actuated, substantially as described.

12. In a machine for lasting the uppers of boots and shoes, the combination of a reciprocating abutment with a toe stretching and smoothing pad, having means for vertical adjustment, and arranged to be operated upon the withdrawal of the abutment, substantially as described.

13. In a machine for lasting the uppers of boots and shoes, the duplex system of folding-plates for breaking down and turning over the upper upon the last's bottom, one set arranged above the other, substantially as and for the purposes described.

14. In a machine for lasting the uppers of boots and shoes, the combination of one set of folding-plates adapted to partially turn over the margin of an upper upon the last's bottom with a lower set of folding-plates adapted by their closing to completely finish the turning over and plaiting of the upper upon the insole, substantially as and for the purposes set forth.

15. In a machine for lasting the uppers of boots and shoes, the combination of one pair of converging plates with two pairs of converging folding-plates arranged immediately below said first pair, in such a way that the first pair shall operate over the joints occurring between each of the second pairs, substantially as shown and described.

16. In a machine for lasting the uppers of boots and shoes, the combination of three pairs of converging folding-plates, the upper pairs closing first to partially turn over the margin of an upper upon the insole, the lower pairs having differential movements in relation to each other, substantially as described.

17. In a machine for lasting the uppers of boots and shoes, the combination of a suitable jack for firmly supporting the last with two pairs of converging folding-plates, the outer pair provided with a quicker movement than the inner pair, substantially as described.

18. In a machine for lasting the uppers of boots and shoes, the combination of a suitable jack and devices for holding a last upon said jack with the duplex system of folding-plates, one set arranged over the other to partially turn over the margin of an upper upon the insole, and the lower set to complete the folding and to operate after said upper set, substantially as and for the purposes described.

19. In a machine for lasting the uppers of boots and shoes, the combination of one set of folding-plates for partially turning over and folding the edge of an upper upon the insole, and, second, an under set of folding-plates to complete said folding and plaiting, with the means for operating said plates in the order named and for withdrawing said upper plates while said lower plates are closing, substantially as described.

20. In a machine for lasting the uppers of boots and shoes, the combination of two pairs of converging folding-plates, the outer plates being provided with a longitudinal tipping movement in relation to the inner plates, substantially as and for the purposes set forth.

21. In a machine for lasting the uppers of boots and shoes, a folding-plate, in combination with the gear p and worm-gear p^1 for tipping the same, as described, whereby said folding-plate is provided with a longitudinal tipping movement for the purpose of adjustment to a plane parallel or substantially parallel with that portion of the surface of a last's bottom upon which it is designed to close, substantially as described.

22. In a machine for lasting the uppers of boots and shoes, the combination of the duplex folding-plates, provided with means for vertical adjustment upon an elliptic curve having the extreme point of the abutment as a center, substantially as described.

23. In a machine for lasting the uppers of boots and shoes, the combination of two pairs of converging folding-plates, F, provided with means for vertical adjustment on an elliptic curve, of which the extreme point of the abutment is the center, substantially as described.

24. In a machine for lasting the uppers of boots and shoes, the combination of two converging folding-plates for closing upon the end of a last upon either side of the converging end plates, as shown, provided with means for vertical tipping adjustment, as set forth, to conform to the plane of that portion of the last's surface upon which they are designed to close, with means for further vertical adjustment upon the arc of an ellipse, substantially as described.

25. In a machine for lasting the uppers of boots and shoes, the combination of a suitable lasting-jack with an abutment, the extreme end of which forms a center in determining the relation of the folding-plates to that portion of the surface of a last upon which they are designed to close, substantially as described.

26. In a machine for lasting the uppers of boots and shoes, the combination of a suitable jack for supporting the last with a toe stretching and smoothing pad, having an upward movement in relation to the sides of the last, a toe-downhold, and a movable abutment when said toe stretching and smoothing pad is provided with vertical adjustment upon the elliptic curve, of which the extreme end of the abutment is a moving center, substantially as described.

27. In a machine for lasting the uppers of boots and shoes, the combination of a suitable jack for supporting a last, a toe stretching and smoothing pad provided with an upward vertical movement, a movable abutment, and two or more converging folding-plates, when said plates, abutment, and toe stretching and smoothing pad are provided with vertical adjustment upon the arc of an ellipse having the extreme end of the abutment as a moving center, substantially as shown and described.

28. In a machine for lasting the uppers of boots and shoes, the combination of an oscillating plate for supporting the mechanism which operates the converging folding-plates, the downhold, the abutment, and the toe stretching and smoothing pad with a carriage for lifting said plate upon an arc of ellipse, of which the extreme end of the abutment is the center, substantially as described.

29. In a machine for lasting the uppers of boots and shoes, the combination of a carriage, H, for supporting the oscillating plate G with the lever N and the slotted lever M, each pivoted, as shown, and operated by the screw O, substantially as and for the purposes described.

30. In a machine for lasting the uppers of boots and shoes, the combination of the lever M, pivoted as shown, and operating the lever N, provided with the guides *m* and the nut M^1 with the operating-screw O, substantially as and for the purposes described.

31. In a machine for lasting the uppers of boots and shoes, the combination of the edge cam-groove *d*, suitable connecting mechanism, and the toe stretching and smoothing pad D, substantially as described.

32. In a machine for lasting the uppers of boots and shoes, the combination of the cam-groove e^5, levers e^1, pivoted to the oscillating plate G, as shown, and operating movable bars on the sleeve e^4, with the converging folding-plates E and connecting-rods *e*, having suitable bearings in plates F^1, substantially as shown and described.

33. In a machine for lasting the uppers of boots and shoes, the combination of the cam-groove f^8, levers f^1, pivoted upon the oscillating plate G, as shown, and operating the collars f^7, with the plates F and sliding rods F^2, having bearings in the brackets *g* and in the sleeve e^4, and guides f^{12} in the slotted projection f^{10}, substantially as and for the purposes described.

34. In a machine for lasting the uppers of boots and shoes, the combination of the cam-groove f^8, levers F^4, pivoted to plate G, as shown, and operating through collar f^9, the converging lasting-plates F, with the hinges or connecting-plates F^1, which operate the levers f^1, laying hold of and pivoted to the caps or barrels f^2 at the end of rods F^3, with the outer converging folding-plates F, and said rods F^3, provided with bearings in the brackets *f*, substantially as shown and described.

35. In a machine for lasting the uppers of boots and shoes, the combination of the rod F^3 and set-screws f^{15} f^{16}, and supporting-brackets *f*, substantially as and for the purposes described.

36. In a machine for lasting the uppers of boots and shoes, the combination of the rod F^3, provided with the guiding-carriage p^2, with means for partially revolving the said rods in either direction, substantially as described.

37. In a machine for lasting the uppers of boots and shoes, the combination of a duplex series of converging folding-plates, one set for breaking down and partially folding the edge of the upper upon the insole, and the other set for finishing said folding, with the cams described, and suitable connecting mechanism for operating said converging folding-plates, substantially as set forth.

38. In a machine for lasting the uppers of boots and shoes, the combination of the duplex series of folding-plates, the upper set of which partially breaks over and folds the edge of the upper upon the last, and the lower set of which completes said folding when the upper plates are withdrawn, after the said lower plates are closed, and when said lower plates are perforated, substantially as shown and for the purposes described.

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