(No Model.) 2 Sheets—Sheet 1.

G. McKAY & H. P. FAIRFIELD.

LASTING MACHINE.

No. 458,000. Patented Aug. 18, 1891.

Fig. 1.

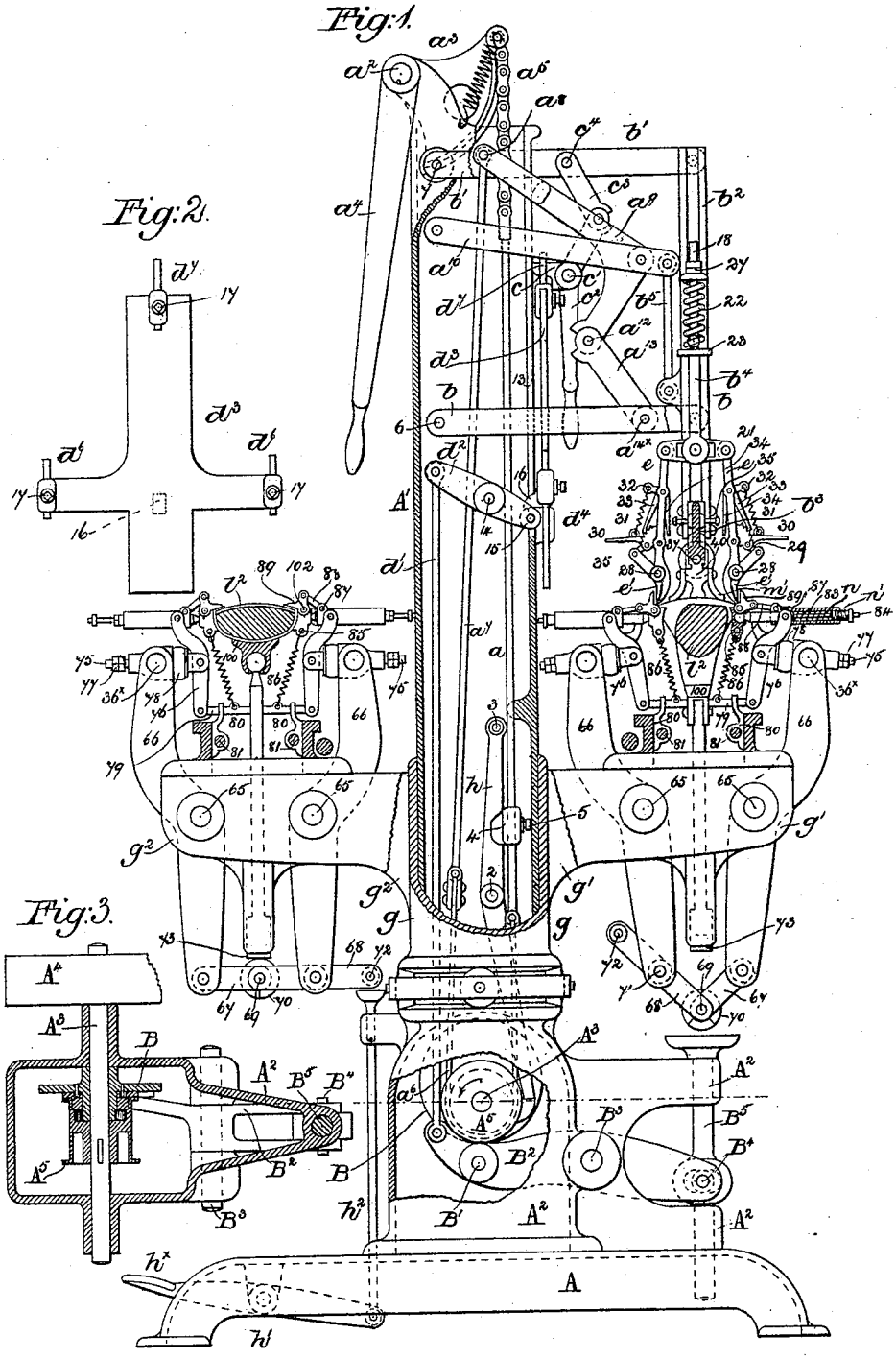


Fig. 2.

Fig. 3.

WITNESSES

Arthur S. Davis

Frederick L. Emery

INVENTORS

Gordon McKay,

Hadley P. Fairfield,

by Crosby & Gregory Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig:4.

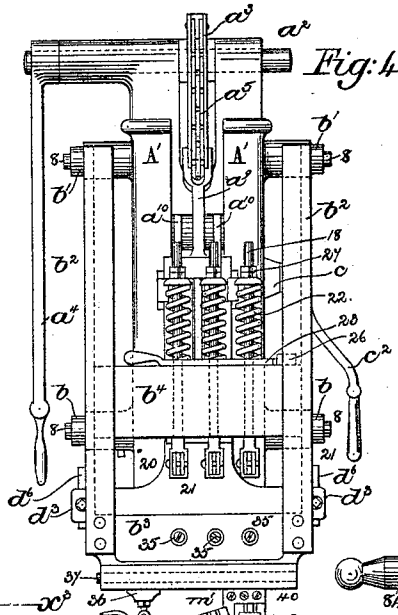


Fig:14

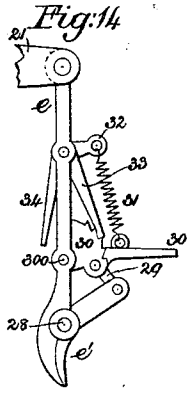


Fig:15.

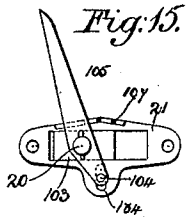


Fig:7.

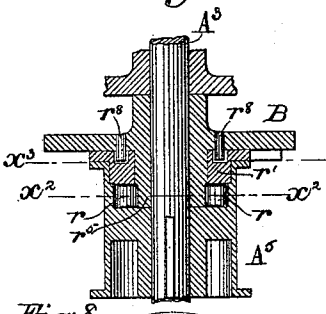


Fig:10.

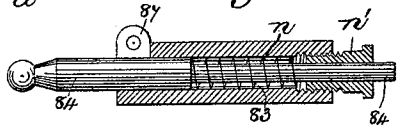


Fig:6.

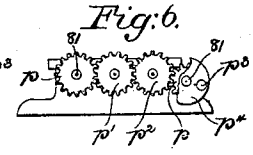


Fig:8.

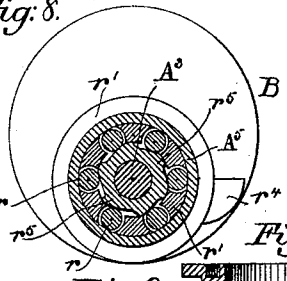


Fig:9a.



Fig:9.

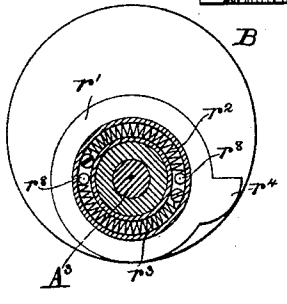


Fig:11.

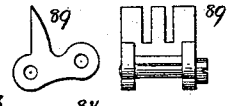


Fig:13.

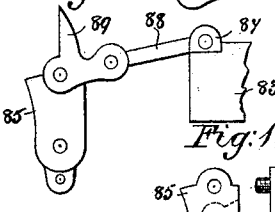


Fig:12.

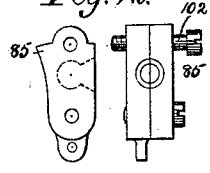
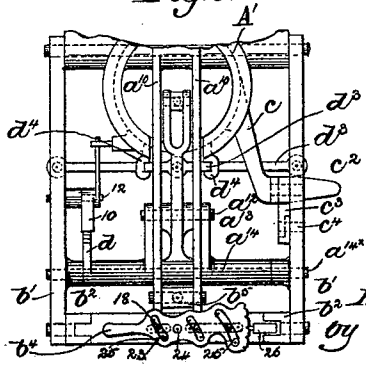


Fig:5.



Witnesses:
Arthur S. Davis
Frederick L. Emery

Inventors:
Gordon McKay,
Hadley P. Fairfield,
by Crosby & Gregory Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GORDON McKAY, OF NEWPORT, RHODE ISLAND, AND HADLEY P. FAIRFIELD, OF MEDFORD, MASSACHUSETTS, ASSIGNORS TO THE McKAY & COPELAND LASTING MACHINE COMPANY, OF PORTLAND, MAINE.

LASTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 458,000, dated August 18, 1891.

Application filed February 10, 1890. Serial No. 339,803. (No model.)

To all whom it may concern:

Be it known that we, GORDON McKAY, of Newport, Newport county, and State of Rhode Island, and HADLEY P. FAIRFIELD, of Medford, Middlesex county, and State of Massachusetts, have invented an Improvement in Lasting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention is an improvement more particularly on that class of machines represented in United States Patent No. 250,450, but some of the features of invention are applicable to other forms of lasting-machines.

In the machine herein to be described the pinchers or pullers are mounted in pairs upon eveners shown as pivoted bars mounted upon spring-supported slide-bars, so that the pinchers or pullers of each pair may be made to pull and stretch to any desired extent the particular part of the upper engaged thereby irrespective of the strain put upon other parts of the upper engaged by other pairs of pinchers or pullers.

The machine herein to be described contains a series of side-lasting and closing-down devices, the side-lasting devices impinging the upper against the sides of the last at the edge of the inner sole and holding the same, while the closing-down devices move over toward and act to lay the projecting edges of the upper over and down upon the inner sole, the pinchers or pullers at such time being automatically released, the release being preferably accomplished by or through the movement of the closing-down devices. These side-lasting devices are mounted upon a slide-rod contained in a sleeve pivoted upon auxiliary levers, in turn jointed to side jaws or levers supported upon a two-armed jack adapted to be rotated about a central standard. The double jack in its use is productive of economy in labor, as one shoe may be jacked or be removed from the jack while another shoe is being lasted. The auxiliary levers are connected together in pairs by rods and their lower ends are always at the same distance apart, and each side-lasting device actuated by the said levers is adapted to stop as soon as it comes against the upper at the side of the last, whether the last is a right or left foot last, each side-lasting device adapting itself to the last, whatever may be its shape in cross-section. The auxiliary levers referred to are pivoted on studs and their lower ends, connected together, as described, are adapted to be moved simultaneously toward and from each other at each side of the last by adjusting devices shown as variable screws, adjustment of the said levers enabling the side-lasting devices to be adjusted simultaneously, according to the length of the last, the said screws being preferably geared together, so as to be rotated simultaneously.

The pinchers or pullers having been engaged with the upper on a last suppported by any suitable heel-pin and toe-rest, the operator will start the machine and cause the pinchers to be lifted and stretch and fit the upper to the last, which done, a cam previously loose on the main shaft is clutched to the shaft, and thereafter the said cam, through suitable devices, effects the closing of the side jaws or levers carrying the auxiliary levers which actuate the side-lasting and closing-down devices, the said auxiliary levers also setting into motion devices for lifting the guide-frame containing the movable cross-head supporting the slide-rods carrying the eveners, which at their opposite ends support the pinchers or pullers, the lifting of the guide-frame taking place after the pinchers or pullers are released, such release as herein provided for being by or through the closing-down devices, the pinchers or pullers and hold-downs (which latter during the pulling operation rest on the inner sole of the last) being thereafter lifted out of the way, so that the jack may be swung around to place the shoe, the upper of which has been stretched and turned over on the inner sole, in position to have its upper properly secured to the said inner sole, the jack in its rotation bringing the shoe next to be lasted in place under the pinchers or pullers.

Mounting the pinchers or pullers in pairs upon independent eveners constitutes one important part of our invention.

Mounting the side-lasting devices and the closing-down devices at the ends of rods actuated by auxiliary levers connected at their lower ends and pivoted on side levers, so that one member of a pair of side-lasting devices may stop as soon as it meets the upper, leaving the other of the said pair of side-lasting devices to continue to move until it meets the upper, is also an important feature of our invention. We have also devised means whereby the slide-bars carrying the eveners, and also the auxiliary levers carrying the side-lasting devices, may be simultaneously adjusted to lasts of different lengths.

Other features of our invention will be hereinafter described, and specified in the claims.

Figure 1 in elevation and partial section represents a sufficient portion of a lasting-machine embodying our invention to enable our improvements to be understood, that side of the guide-frame shown at the left in Fig. 4 being omitted, the link b at the left and supporting the lower end of the guide-frame being broken off near its free end, while the link b' at the left and near the upper end of the guide-frame is broken off quite back to its pivotal point on the central column, (shown broken out,) one half of the hub of the jack being broken out, the front arm of each pair of arms at opposite sides of the hub of the jack being also broken off with the hub inside the pivots 65, as designated by the broken lines near the said hub in Fig. 1. In said figure the upper and inner soles have been omitted from the last shown at the right, and the said last is shown in section across the shank, while at the left the last shown in cross-section across the toe is represented as provided with an upper and inner sole, the last at the left showing the upper and inner sole in the condition in which it will be left by the pinchers or pullers and side-lasting devices shown at the right in Fig. 1 after the upper has been closed down upon the insole. The upper has been omitted from the right in Fig. 1 chiefly to avoid confusion in the drawing and because if the upper was shown the action of the side-lasting devices could not be as readily seen. Fig. 2 is a detail showing the lifting-slide, which at the proper time is elevated to lift the arms supporting the guide-frame and turn the lever a^9 and break the toggle-joint which holds up the cross-head b^4 and the pinchers or pullers. Fig. 3 is a detail of the main shaft, the pulley thereon to give motion to the devices for actuating the pinchers or pullers, the said shaft having a cam adapted to be rotated with the main shaft at desired times through a clutch to be described. Fig. 4 is a partial elevation viewing Fig. 1 from the right, Fig. 4 showing that side of the guide-frame omitted from Fig. 1, part of the jack being broken out and two of the auxiliary levers being broken off, the said figure showing the last in elevation with an inner sole thereon, the upper being partially broken out, the pinchers or pullers having been omitted to avoid confusion, the screw-rod 81 shown being that nearest the column at the right in Fig. 1. Fig. 5 is a top or plan view showing part of the central column, the arms, the guide-frame supported by them, and the cross-bar having the slide-bars for giving motion to the pinchers, the springs supporting the slide-bars being omitted because fully shown in Fig. 4. Fig. 6 is a detail, to be referred to, of gears on and to connect the shafts 81 for adjusting the side-lasting and closing-down devices in the direction of the length of the last. Fig. 7 is a longitudinal sectional detail of the cam loose on the main shaft and a clutch device to connect it with the main shaft at desired times. Fig. 8 is a section on the line x^2, Fig. 7. Fig. 9 is a section on the line x^3; Fig. 9^a, the clutch-ring detached. Fig. 10 is a longitudinal sectional detail of the sleeve containing a rod which in practice supports a side-lasting device; Fig. 11, two different views of a closing-down device. Fig. 12 shows two views of a side-lasting device detached. Fig. 13 shows an attached side-lasting and closing-down device. Fig. 14 is a detail view, enlarged, of one pair of pinchers or pullers. Fig. 15 is an enlarged view of the evener-lever which will carry the shank-lasting pinchers, the exact construction of said evener not being shown in Fig. 1 because of lack of space.

The frame-work consists, essentially, of a base A, a column A′, and a stand A^2, they being of proper shape to support bearings for the working parts to be described.

The main shaft A^3 of the machine has fast upon it a belt or other power-driven pulley or wheel, as A^4, and, as herein shown, the said shaft has secured to it a pulley A^5, (shown as a friction-pulley,) the said shaft and pulley being rotated, it will be supposed, continuously. Herein the said friction-pulley acts at desired times to engage a belt or eqivalent a^6 and move the same whenever the friction between the belt and pulley is sufficient to overcome the weight of the parts to be moved, the said belt being made to hug the said pulley more or less closely by or through movement of lever, as A^4, to be described. This pulley A^5 and belt have been used in lasting-machines as part of the train of devices to actuate pinchers or pulleys to measure the strain on the upper, and instead of the pulley and belt we may use any well-known equivalent devices.

The shaft A^3 has a cam B, adapted at times to be rotated with the said shaft by or through an intervening clutch device—such, for instance, as that known as the "Horton" clutch shown substantially in United States Patent No. 260,394—it containing a series of friction-rolls r, carried by a clutch-ring r', (see Fig. 9^a,) under the control of two springs r^2 and r^3, (see Fig. 9,) the said ring having a projection r^4, which, when engaged by a suitable catch h, keeps the said friction-rolls from engagement with cam-surfaces of a sleeve-like hub r^5 of the cam B; but when said projec-

tion is released from the said catch the clutch-ring is turned by the springs r^2 r^3, which rest at their ends partially compressed against pins or projections r^8, fast to the cam B and extended into the annular groove in which the said springs lie, the movement of the said ring by the said springs causing the friction-rolls to be interposed between the cam-shaped hub r^5 and the inner wall of the hub of the pulley A^5, so that the pulley A^5 will thereafter, through the clutch, cause the pulley B to be rotated at the speed of the said shaft.

The cam B, it will be understood, may be made to rotate at desired times to thus act upon a roll B′ of a lever B^2 pivoted at B^3, said lever being represented as forked at its outer end to embrace a pin, as B^4, which, as herein shown, enters an eye in a plunger or bar B^5, arranged vertically in bearings in the stand A^2, the plunger having an enlarged head.

The catch *h*, referred to for holding the projection r^4 of the clutch-ring, is herein shown as a lever pivoted at 2 and having at or near its upper end a roll or projection 3, which is struck by a lug or projection 4, (shown as adjustable by a screw 5 on a rod *a* to be described,) the said projection 4 acting automatically to turn the said catch and release the said clutch-ring and cause the said cam to move with the said shaft A^3 after the upper has been stretched and fitted to the last by the pinchers or pullers and the time has arrived for the side-lasting device to operate.

The column A′ has at its top suitable ears to support a rock-shaft a^2, having an attached sector a^3 and a starting or hand lever a^4. The sector a^3 has jointed to it, as herein shown, a flexible connection a^5, preferably a chain, which is jointed to a rod *a*, the lower end of which is shown as attached to a belt a^6, which is extended about the pulley A^5, the opposite end of the said belt being in turn connected to a rod a^7, jointed at a^8 to an elbow-lever a^9, pivoted on a link a^{10}, to be described, the opposite end of the said elbow-lever being jointed at a^{12} to an arm a^{13}, attached to a rock-shaft $a^{14\times}$, suitably journaled in arms *b*, to be described. The short arm of the elbow-lever a^9 and the arm a^{13} of the rock-shaft $a^{14\times}$ constitute a toggle-joint connection between the bifurcated-lever a^{10} and the said rock-shaft for moving the pinchers or pullers, and we shall call said toggle the "pincher-toggle."

The column A′ has two pairs of arms *b b′*, pivoted to it, respectively, at 6 7. In Fig. 1, one of the arms *b′* at the front of the figure has been broken off, the like arm at the farther side of the machine being shown; and so, also, in said figure I have broken off the outer end of that one of the arms *b* nearest the front of the machine. The arms *b′ b′* referred to are both shown in Fig. 5, and the front ends of both sets of arms *b b′* are shown in Fig. 4. These arms at their front ends embrace like pins 8, projected outwardly from two grooved U-shaped bars b^2, connected at their lower ends by a cross-bar b^3 of the shape shown in cross-section in Fig. 1, the said U-shaped bars and cross-bar constituting a vertically-movable guide-frame in which slides the cross-head b^4, the latter deriving its movement from a link b^5, jointed to the front end of the lever a^{10}.

The column A′ has a bracket *c*, provided with a pin *c′*, upon which is mounted a lever c^2, the upper or short arm of the said lever being jointed to a link c^3, connected by a pivot c^4 to the right-hand one of the arms *b′*, before referred to, viewing Fig. 4, the said toggle being straightened when the guide-frame is lifted by the lifting-slide d^3, the breaking of the toggle by moving the lever c^2 by hand lowering the guide-frame for the hold-downs, to be described, to rest on the shoe after the jack has been turned into place and it is desired to engage the uppers by the pinchers.

The inner end of the lever B^2 has jointed to it a rod *d′*, connected at its upper end to a lever d^2, pivoted at 14 to the column A′, the outer end of the said lever having a roll 15, (shown by dotted lines in Fig. 1,) which acts upon a lug 16 at the rear side of the lifting-slide d^3, herein shown as cruciform in shape and adapted to slide in suitable guides d^4, forming part of the column A′. The lifting-slide d^3 has a pair of studs or projections d^6 and a stud or projection d^7, preferably made adjustable by suitable set-screws, as 17, so as to act sooner or later upon the devices to be operated by them—viz., the arms *b* and the lever a^9—to break the toggle connecting the arms *b* with the lever a^{10} or the pincher-toggle, the said projections in rising also acting to lift the guide-frame b^2, it being supposed that the lever a^4 is at such times in such position as to hold the belt a^6 out of contact with the friction-pulley A^5. The cross-head b^4 (best shown in Figs. 4 and 5) has a series of slots to receive a series of slide-bars 18, each bar having pivoted to it at its lower end, as by a pivot 20, an evener 21, the said bars above the cross-head being surrounded by like springs 22 of proper strength, the lower ends of the said springs resting upon an adjusting device 23, (shown best in Figs. 4 and 5,) it being pivoted at 24 and having a series of slots, as 25, placed diagonally with relation to the length of the cross-head, each slot receiving one of the bars 18, a suitable dog or locking device, as 26, engaging the notched end of the said adjusting device to hold it in adjusted position, the movement of the said adjusting device about its center causing the bars 18 to be simultaneously moved toward or from each other, to thus adapt them in position to the length of the last being used. The bars 18 above the springs 22 have screwed upon them suitable nuts 27 to adjust the tension of the springs. Normally the springs 22 keep the pivots 20 of the eveners up at the same height; but the springs permit the slide-

bars to stop sooner or later as the cross-head b^4 rises in the guide-frame, according to the requirements of the upper engaged by the pinchers or pullers.

The eveners 21 have pivoted to them at each end (see Figs. 1 and 14) a pair of pinchers or pulleys composed of a bar e, properly shaped at its lower end to constitute one-half of a pair of pinchers or pullers, the other member e' of each pair being shown as a short lever pivoted upon the bar e at 28, the upper end of each member e' being connected by a link with a toothed sector-lever 30, in turn pivoted upon the bar e at 300, each sector-lever having a suitable handle, to which is secured a spring 31, attached at its opposite end to one arm 32 of a three-armed lever, one arm 33 of the said three-armed lever acting as a pawl to engage the teeth of the sector-lever, while the other arm 34 of the said three-armed lever is at the proper time, in the operation of the machine, forced against a pin or stud 35 in the cross-bar b^3 at the lower end of the guide b^2, before referred to, the contact of the arm 34 with a pin 35 effecting the release of the pawl-member 33 of the said three-armed lever from the said sector-lever, which permits the pinchers or pullers to release the upper. The eveners may be slotted centrally, as best shown in Fig. 15, to receive a block 103, mounted on the pivot 20. The pivot 20 also acts as the fulcrum for a lever 105, having a pin 104, which enters a hole or slot 184 in the evener. The evener is provided with notches at 107 to be engaged by the lever 105 to hold the latter in adjusted position.

The movement of the lever 105 on the stationary pin 20 enables the evener to be moved longitudinally, as is sometimes necessary to enable the particular pair of pinchers or pullers carried thereby to be adjusted to the work to be done—as, for instance, when the pinchers are pulling on the upper across a last very much steeper on one side than on the other, one arm of the evener-lever should be longer than the other to thus equalize the strain in a better manner; or if an unequal strain on the two sides of the upper is required it can be produced by the same means.

The cross-bar b^3 referred to has a pin 35 for each pair of pinchers, and the lower end of the said cross-bar, provided with a dovetailed groove, (shown best in Fig. 1,) receives suitable hold-down carriages 36 and 40, preferably dovetailed in cross-section and screw-threaded, to be engaged by a suitable right and left threaded screw 37, so that the said carriages may be simultaneously adjusted toward and from each other, according to the length of the last being used. The hold-down carriages 36 and 40 at their lower ends are provided, respectively, with suitable downholds, as l' m', to bear upon the inner sole on the last, said screw-shaft, carriages, and downholds being substantially the same as in United States Patent No. 231,076, granted to us August 10, 1880.

Surrounding the column A′ loosely above the main shaft is a jack, the hub g of which has extended from it two pairs of arms g' g^2, which support the pivots 65 on which turn between the arms of each pair of arms the hubs of the side levers 66, one of each pair of arms g' and g^2 being broken off at the front in Fig. 1, one-half of the hub and part of the column being broken out to show the parts within the column. The lower ends of the side levers 66 are connected together by links 67 and 68, jointed at 69 and having a roll 70, the link 68 being extended beyond its fulcrum 71 and provided with a suitable roll, as 72.

The flanged head of the slide B^5, when the parts are in the position shown at the right in Fig. 1 acts, as it rises, upon the roll 70 to straighten the toggle 67 68 and force the lower ends of the side jaws or levers 66 apart, the roll 70 contacting, when the toggle is straightened, as at the left in Fig. 1, with the lower end of a cross-piece 73. When the toggle 67 68 is to be broken or changed from its position shown at the left in Fig. 1 to that shown at the right preparatory to unjacking a lasted shoe, the operator will put his foot upon a lever $h^\times$, pivoted at h', and elevate the rod h^2 against the roll 72, thus breaking the toggle. The side jaws or levers 66 are double levers—that is, they have two arms projecting above and below their hubs which turn upon the pivots 65. The upper ends of the two arms referred to are joined by a bar $36^\times$, preferably cored for the sake of lightness. The upper end of each side jaw 66 is provided with suitable holes for the reception of suitable stud-bolts 75, forked at their inner ends to receive between them the auxiliary levers 76, the outer ends of the stud-bolts receiving upon them nuts 77, the said stud-bolts having between their forked heads and the cross-bar $36^\times$, preferably, suitable rubber blocks, as 78, to constitute a sort of yielding support for the stud-bolts. The stud-bolts may be oscillated about their own center to a limited extent. The lower ends of the auxiliary levers 76 are connected by links 79, and each link between the lower ends of the side levers is extended through slots in suitable sliding nuts 80, having threaded holes of different diameter, which are engaged by portions of screw-threads on screw-rods 81. Preferably these screw-rods 81 are of different diameters in their length (see Fig. 4) where they are threaded, so that each of the threads at parts of the rods may be passed through the threaded holes in some of the nuts 81 without the threads of the rod touching the threads of the said nuts, each threaded part engaging only its own nut. The threads of the screw-rods engaging the two threaded nuts at the right in Fig. 4 are supposed to be right-hand threads of different pitch, while the thread engaging the nut at the left in Fig. 4 is supposed to be a left-hand thread of yet different pitch, so that by the rotation of the said

screw-rods the two nuts at the right in Fig. 4 will be moved in the same direction at different speeds, while the nut at the left will be moved in the opposite direction at about the same speed as the middle nut, said screw-rods being employed to adjust the levers 76 and the parts carried by them with relation each to the other to adapt them to lasts of different lengths.

The screw-rods 81 have each a gear p at one end, and the said gears are operatively connected by two intermediates p' p^2, so that when one shaft 81 is rotated by a handle p^3 on a disk p^4, connected to one gear p, the two shafts 81 will be rotated in unison, but in an opposite direction.

Each lever 76 is forked at its upper end and has pivoted therein a sleeve 83, (see Fig. 10,) through which is extended a rod 84, the front end of which, as herein represented, has a globular head, upon which is mounted the side-lasting device 85, it being made in two parts, (see Fig. 12,) so as to grasp the said globular head, the screw or pivot holding together the lower ends of the side-lasting device, having a spring 86 connected to it and to one of the links 79, the point to which the rod 84 may descend when the side-lasting device is not in contact with the upper being determined by a lug. The reduced part of the rod 84 inside the sleeve 83 is surrounded by a spring n, the outer end of which bears against a tubular nut n', screwed into the outer end of the sleeve 83, the said spring normally pushing the rod 84 toward the last l^2. The sleeve 83 has suitable ears 87, to which is jointed a link 88, which is pivoted at its inner end to a closing-down device 89, in turn pivoted upon a side-lasting device 85 at 102.

As the upper ends of the side jaws or levers 66 are moved toward each other, they carry with them the auxiliary levers 76, the latter being held at such time at a defined distance apart by the links 79, and as the side jaws or levers are so moved toward each other at their upper ends the upper ends of the auxiliary levers 76 carry the sleeves 83 forward, and through the springs therein acting on the rods 84 cause the latter to push the side-lasting devices 85 against the upper lying at the side of the last, and as soon as the side-lasting devices come against the upper, which they do sooner or later during the closing movement of the side levers, (that depending upon the shape of the last or whether it is a right or left last), either of the side-lasting devices may stop, the spring n surrounding the rod 84 so arrested being thereafter compressed during the further movement of the sleeve 83 by the lever 76. In this manner one side-lasting device of a pair may stop against the upper at one side of the last and the other side-lasting device of the pair continue to move until it is brought in contact with the upper, and that at the opposite side of the shoe—as, for instance, (see Fig. 1,) where the side-lasting devices are both open.) It will be understood that when the side jaws or levers are closed by straightening the toggle at the lower ends the side-lasting device at the other side of the shank will first contact with the upper at that side of the last, and will stop, while in the further closing movement of the side jaws or levers the side-lasting device at the inner side of the shank will continue to move until it comes in contact with the upper at that side of the last. In other words, the side-lasting device which first contacts with the upper at one side of the last serves as a fulcrum about which the other parts turn in play.

Operation: A shoe having been placed on a last and put into the jack and the jack turned to place the shoe under the guide-frame, the operator will turn the handle c^2 to break the toggle c^3 and cause the guide-frame to descend and the hold-downs to rest upon the inner sole on the last, and then the operator will engage the pinchers or pullers with the edges of the upper and move the lever a^4 from the position, Fig. 1, far enough to the right to bring the belt a^6 in frictional contact with the friction-pulley a^5 or other device used to turn the lever a^9, the operator keeping up such contact and causing said pulley by pulling on the said belt to pull the rod a^7 down and depress the long arm of the said lever a^9, and cause the pivot a^{12}, carried by the short arm of the said lever, to move to the right with the arm a^{13}, thus straightening the pincher-toggle a^9 a^{13} and lifting the lever a^{10}, causing it, through the link b^5, to lift the cross-head b^4, the cross-head acting upon the springs 22, in turn lifting the bars 18 and the eveners and attached pinchers, causing the said pinchers then in engagement with the upper to stretch the same firmly about the last between the shank and toe, and especially along the ball and shank of the last, the said eveners adjusting themselves to the upper in the particular line of strain. When the pincher-toggle has been straightened and the pinchers or pullers have been drawn upwardly to sufficiently stretch the upper, the projection 4, carried by the rod a, will act upon and remove the catch or lever h from engagement with the projection r^4, so that the cam B of the clutch, previously stationary, will be started automatically and be made to rotate with the main shaft, the said cam acting upon and moving the lever B^3 and lifting the slide B^5, causing it to act on the toggle 67 68 to close the side jaws 66 and bring the side-lasting devices into operation. During this stretching operation of the upper the hold-downs rest upon the inner sole, keeping the last down upon the heel-support 100 and upon the toe-rest 101, both of which may be of any usual or suitable construction. The further inward movement of the sleeve 83, after the side-lasting devices come to a bearing upon the stretched upper held by the pinchers, causes the closing-down devices 89

to act upon the edges of the upper projecting above the inner sole on the bottom of the last and lay the said projecting edges over upon the inner sole, said movement of the closing-down devices carrying the pinchers or pullers with them, and just before the said turning-down devices have partaken of their full movement the arms 34 of the three-armed levers carried by the pinchers strike the pins or projections 35 of the cross-bar b^3, which results in turning the said levers and removing the arms 33 from the sector-levers, after which the pinchers or pullers are free to open and release the upper. As soon as the pinchers are released the springs 22 quickly act to elevate the bars 18, carrying the pinchers. While the side-lasting and closing-down devices are being operated, as described, the lever d^2 is being moved by the rod d', connected to the lever B^2, and the lifting-slide d^3 is lifted, and just about as the pinchers are released the projections d^6 d^7 in succession strike and lift the arms b and the lever a^9 and break the pincher-toggle, the slide d^3 descending by gravity as the cam B completes its rotation, the weight of the slide B^5 also aiding to raise the inner end of the lever B^2 as the smaller radius of the cam B comes above the roll B', the projection r^4 of the clutch-ring meeting the catch h just as the cam B completes one rotation, the stopping of the clutch-ring immediately stopping the cam B, when the jack may be rotated, the guide-frame being held up by the toggle c^3.

In the machine herein described the jack rotates in a definite plane, but the top of the inner sole on the last may occupy different horizontal planes, that depending upon the thickness of the inner sole and the particular shape of the last; but inasmuch as the pinchers or pullers and their actuating devices are carried by a vertically-movable guide-frame having attached hold-downs to rest upon the inner sole, it will be apparent that this guide-frame may come to rest always in the same relative position to the shoe being lasted, so that the pinchers or pullers and the side-lasting devices are always in proper relation to the surface and edge of the inner sole, no matter what may be its thickness, and in practice the jack is moved to swing the shoe into position while the guide-frame is elevated, and then the frame is lowered by the toggle-lever c^2 c^3.

We claim—

1. A lasting-machine containing the following instrumentalities, viz: a column, a series of pinchers or pullers to engage the upper, a series of eveners to support the said pinchers or pullers, devices supported by the said column to actuate the said eveners, and a rotating jack having two sets of side-lasting devices and means to operate them, the hub of the jack rotating about the said column to bring either jack in succession under the pinchers or pullers, as and for the purpose described.

2. A lasting-machine containing the following instrumentalities, viz: a series of eveners, a series of pairs of pinchers or pullers pivoted upon the opposite ends of the said eveners, a series of evener-supporting bars, springs connected therewith, and a vertically-movable cross-head to support the said bars, whereby the movement of the cross-head, acting through the springs, determines the extent of strain put upon the upper by the pinchers, substantially as described.

3. In a lasting-machine, two pairs of pinchers or pullers, a slotted longitudinally-adjustable evener, to which the said pinchers or pullers are jointed, and devices to support the said eveners, substantially as described.

4. A lasting-machine containing the following instrumentalities, viz: a series of eveners, a series of pairs of pinchers or pullers pivoted upon the opposite ends of the said eveners, a series of evener-supporting bars, springs connected therewith and nuts to adjust the said springs, and a vertically-movable cross-head to support the said bars, whereby the movement of the cross-head, acting through the springs, determines the extent of strain put upon the upper by the pinchers, the strain being adjusted to be more or less at different points of the shoe by the adjustment of the said nuts, substantially as described.

5. In a lasting-machine, pinchers or pullers composed of two jaws joined by a sector-lever, and a link 29 to form a toggle, combined with a pawl to engage the said sector-lever to keep the jaws closed, substantially as described.

6. In a lasting-machine, pinchers or pullers composed of two jaws joined by a sector-lever, and a pawl having two arms, one to engage the sector-lever to keep the jaws closed, the other arm being adapted to be acted upon during the lateral movement of the pincher or puller, as described, to effect the release of the sector-lever and permit the jaws of the pincher or puller to be opened, substantially as described.

7. The guide-frame having a cross-bar provided with projections 35, the evener, pairs of pinchers or pullers pivoted at the opposite ends thereof and having each two jaws or members held closed by a sector-lever, and pawls having arms 33 and 34, the arms 33 engaging the sector-levers to keep the jaws closed, movement of the pinchers toward the said cross-bar causing the arms 34 to strike the said projections 35 and release the arms 33 from the said sector-levers, substantially as described.

8. In a lasting-machine, the guide-frame, its two pairs of supporting-arms b' b, and the toggle-arms c^2 c^3 to lower the guide-frame and hold-down to enable the latter to rest on the inner sole of the shoe to be lasted, substantially as described.

9. The guide-frame, the arms *b*, the cross-head, a series of bars guided in the cross-head and having attached eveners, pinchers or pullers pivoted on the eveners, and means to lift the cross-head, substantially as described.

10. The guide-frame, the arms *b*, the rock-shaft $a^{14\times}$, supported by the said arms and having an arm a^{13}, the lever a^{9}, pivoted on the lever a^{10} and jointed to the arm a^{13}, the cross-head, the link b^{5}, bars 18 and attached eveners and pinchers, and means to move the lever a^{9} on its fulcrum to lift the said cross-head, substantially as described.

11. In a lasting-machine, the guide-frame, a cross-head therein, a series of bars guided in the cross-head and having attached pinchers or pullers, a link connected to the said cross-head, a lever a^{10}, to which the said link is attached, a toggle-lever connected to said lever a^{10}, a strap a^{6}, a friction-pulley to drive it, and means to hold the strap against and to be driven by the said pulley, substantially as described.

12. The cross-head, its series of bars supporting eveners, and pinchers or pullers at the ends of the eveners, combined with means to adjust the said bars toward and from each other longitudinally to adapt the pinchers to lasts of different lengths, substantially as described.

13. The main shaft, the fixed pulley A^{5}, the cam B, loose on the shaft and having a hollow hub provided with a series of cams or inclines, a clutch-ring interposed between the said sector and the inner side of the pulley A^{5} and provided with a series of rolls, springs to move the clutch-ring, combined with a catch to release the said clutch-ring and effect the clutching of the cam to the shaft A^{3} to rotate therewith and with the lever B^{2}, the slide B^{5}, and the side-closing arms and intermediate device to close the upper ends of the said arms, substantially as described.

14. In a lasting-machine, a clutch, a catch *h*, and side-lasting devices, combined with a rod *a*, having an adjustable projection to move the said catch and start the closing in of the said side-lasting devices sooner or later in the movement of the said rod, substantially as described.

15. The side jaws, the auxiliary pivoted levers carried by the side jaws, the sleeves, the rods, side-lasting devices carried by the rods, and links to connect the lower ends of the auxiliary levers, substantially as described.

16. The auxiliary levers, side-lasting devices carried thereby, the pivoted supports for the said levers, and connections composed of links 79 to connect the said auxiliary levers in pairs at their lower ends, and nuts and screws engaging the said connections and adapted to move the lower ends of the said auxiliary levers to adjust the side-lasting devices to the length of the boot or shoe being operated upon or to lasts of different lengths, substantially as described.

17. The pivoted auxiliary levers, the connecting-link at the lower ends of the said levers, and means to move the fulcra of the said auxiliary levers toward and from each other for equal distances and at equal speeds, combined with side-lasting devices and sleeves, springs, and rods between them and the said levers, whereby the side-lasting devices are adapted to stop independently of each other on coming against the upper at the sides of the last according to the shape of the last in cross-section, substantially as described.

18. The side-lasting devices 85, the sliding supports 84, upon which they are pivoted, combined with the closing-down devices 89, pivoted on the side-lasting devices substantially on the line of the bottom of the last and adapted to act upon and close down the edge of the upper held in contact with the last or the edge of the sole thereon by the side-lasting devices, substantially as described.

19. The side-lasting devices, the rods on which they are pivoted, the closing-down devices pivoted on the said side-lasting devices, the sleeves and connections between said sleeves, and means to move the sleeves after the side-lasting devices take bearing on the upper of the shoe, substantially as described.

20. An organized lasting-machine containing the following instrumentalities, viz: pinchers or pullers to engage the upper, means to actuate the said pinchers or pullers, side jaws or levers, auxiliary levers having side-lasting devices, a cam to actuate the side levers, a clutch to engage and rotate the said cam, and devices set in motion by the train of mechanism employed to actuate the pinchers or pullers to automatically start the said cam in rotation to close the said side jaws or levers, for the purposes set forth.

21. In a lasting-machine, side-lasting devices, means, substantially as described, to operate them, upper-stretching devices and means to actuate them, a clutch to control the time of action of the side-lasting devices, and means set in motion by the connections employed to actuate the upper-stretching devices to release the said clutch, substantially as described.

22. A lasting-machine containing the following instrumentalities, viz: a column or support, a series of slide-rods, a series of eveners pivoted thereon at their lower ends, pinchers or pullers pivoted to the opposite ends of the said pivoted eveners and adapted to engage the upper, and means to adjust the tension given to the upper by said pinchers, whereby the tension may be made greater or less at one pair of pinchers than at the other pair or pairs of pinchers, and whereby the tension of one pincher of a pair may be made greater or less than that of the other pincher in the same pair, substantially as described.

23. A lasting-machine containing the following instrumentalities, viz: a column or support, a series of pinchers or pullers to engage the upper, a series of pivoted eveners,

to the opposite ends of which the said pinchers or pullers are connected, a reciprocating cross-head, slide-bars extended therethrough and to the lower ends of which said eveners are pivoted, and springs surrounding said bars between the cross-head and the upper end of said bars to yieldingly support each of the said evener-levers and to adjust the pull of each pair of pinchers on the upper, a jack to support the shoe to be lasted, and side-lasting jaws or appliances co-operating with the jack to turn the upper pulled up or stretched by the pinchers over upon the inner sole, to operate substantially as described.

24. A lasting-machine containing the following instrumentalities, viz: a vertically-movable guide-frame, a series of pinchers or pullers mounted in pairs on opposite ends of pivoted eveners, and actuating devices for the said pinchers or pullers, said devices moving vertically in the direction of the movement of the said frame, substantially as described, a jack to carry the shoe to be lasted, and hold-downs to rest on the inner sole of the shoe to be lasted.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GORDON McKAY.
HADLEY P. FAIRFIELD.

Witnesses:
GEO. W. HAMMATT,
WALTER SOFFORD.