(No Model.)

6 Sheets—Sheet 1.

W. CAREY.

MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS OR SHOES.

No. 444,126. Patented Jan. 6, 1891.

Fig. 1

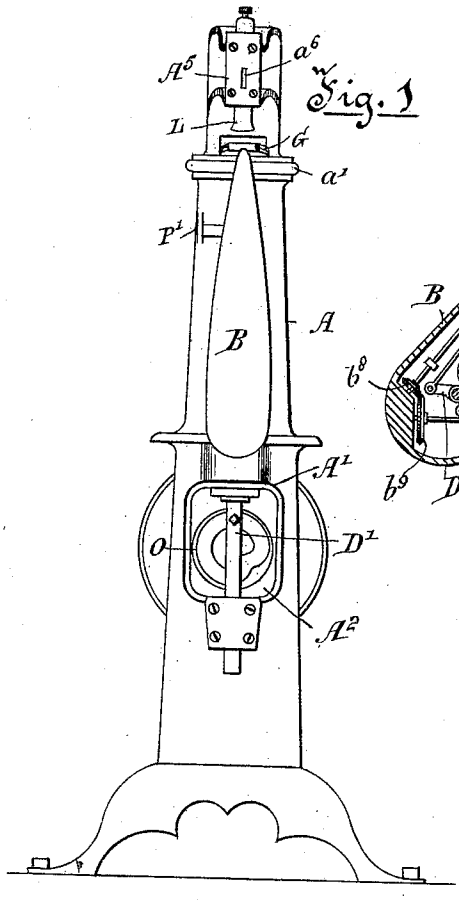


Fig. 2

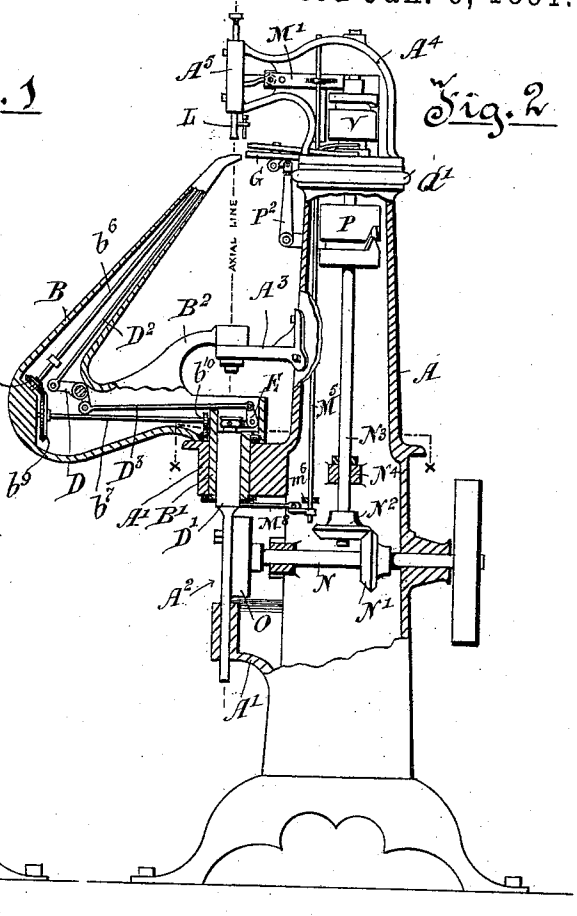


Fig. 3

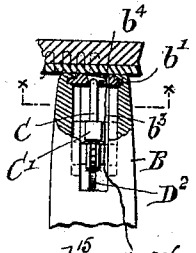


Fig. 4

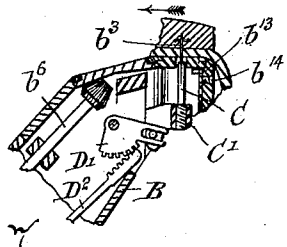


Fig. 5

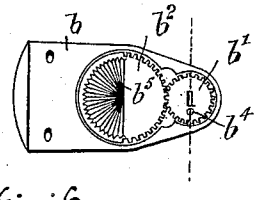


Fig. 7

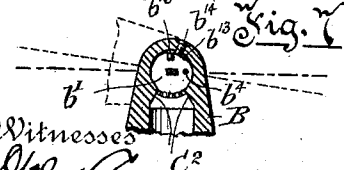
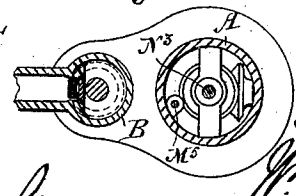


Fig. 8

Fig. 6



Witnesses

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(No Model.) 6 Sheets—Sheet 2.

W. CAREY.

MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS OR SHOES.

No. 444,126. Patented Jan. 6, 1891.

Fig. 10

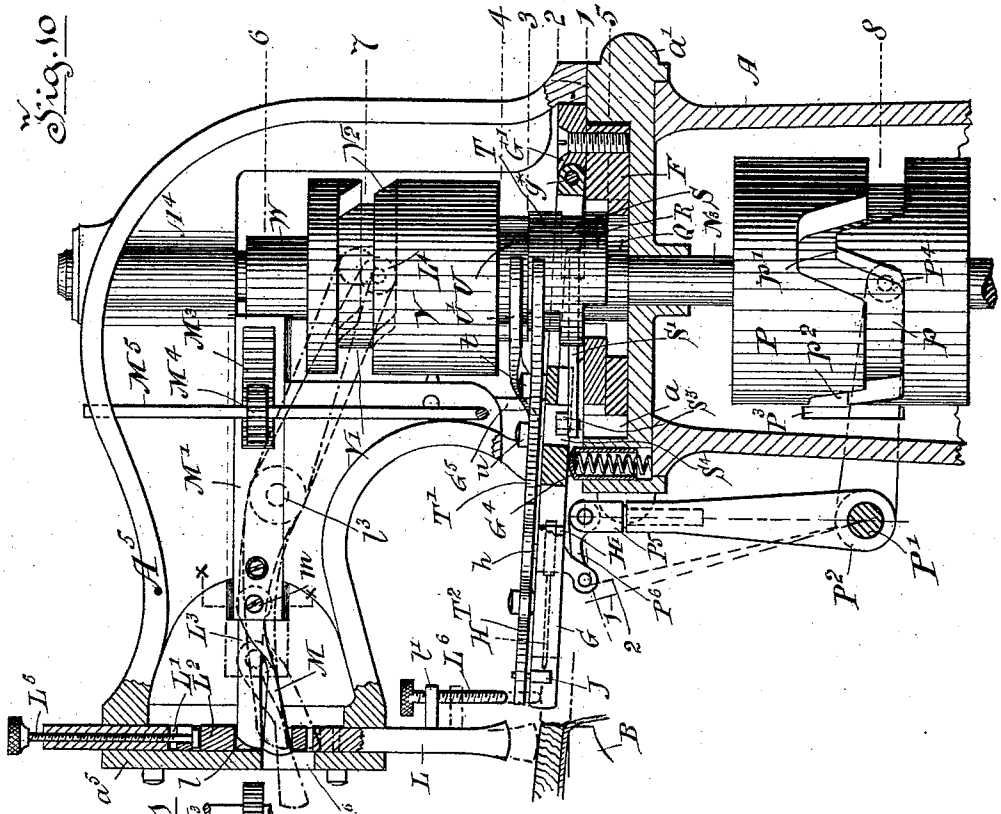


Fig. 11

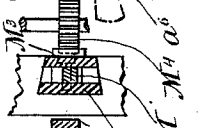
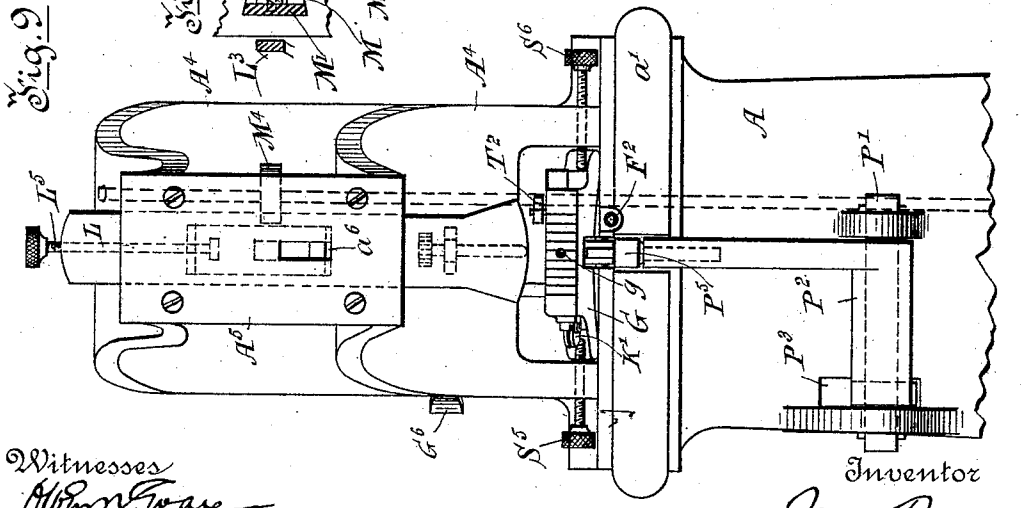


Fig. 9



Witnesses
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(No Model.) 6 Sheets—Sheet 3.

W. CAREY.

MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS OR SHOES.

No. 444,126. Patented Jan. 6, 1891.

Fig. 12

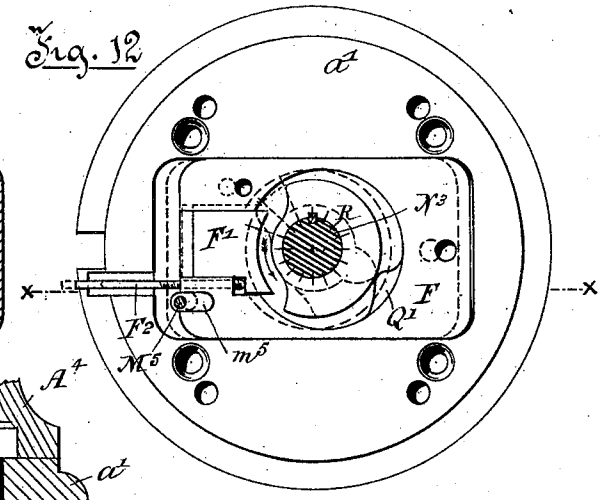


Fig. 16

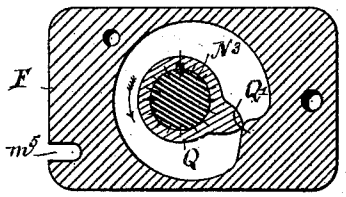


Fig. 22

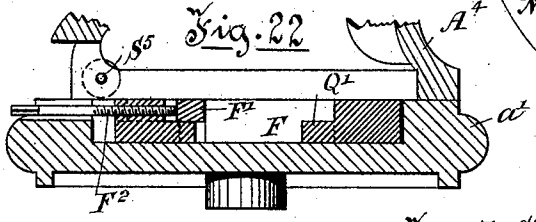


Fig. 13

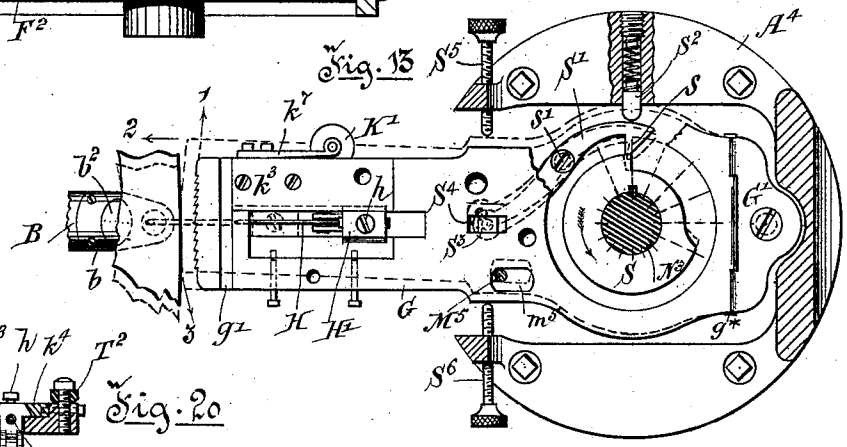


Fig. 20

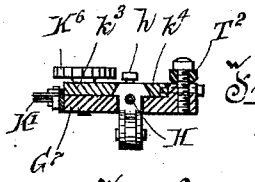
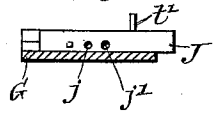


Fig. 21



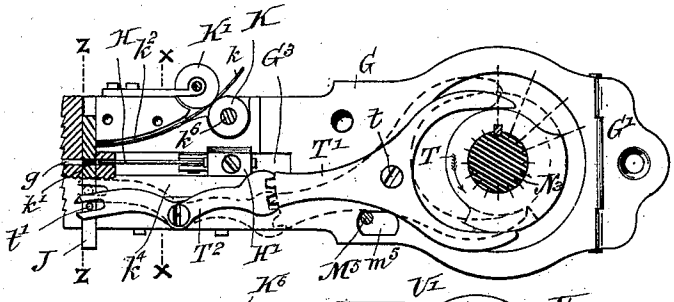


Fig. 14

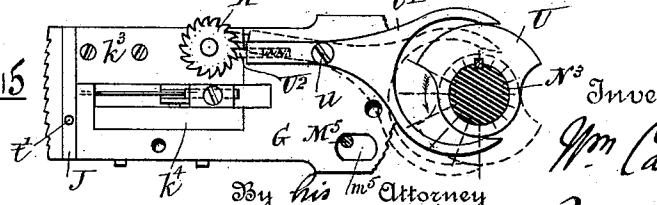


Fig. 15

Witnesses

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(No Model.) 6 Sheets—Sheet 4.

W. CAREY.

MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS OR SHOES.

No. 444,126. Patented Jan. 6, 1891.

Fig. 17

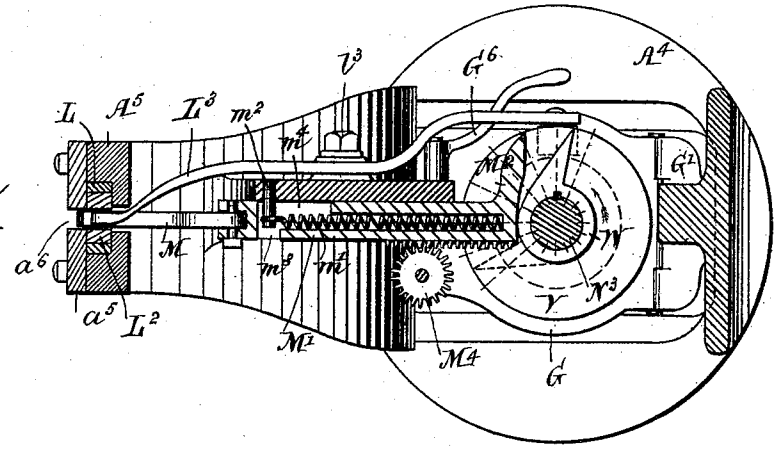


Fig. 18

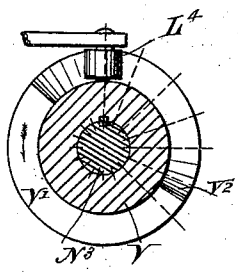
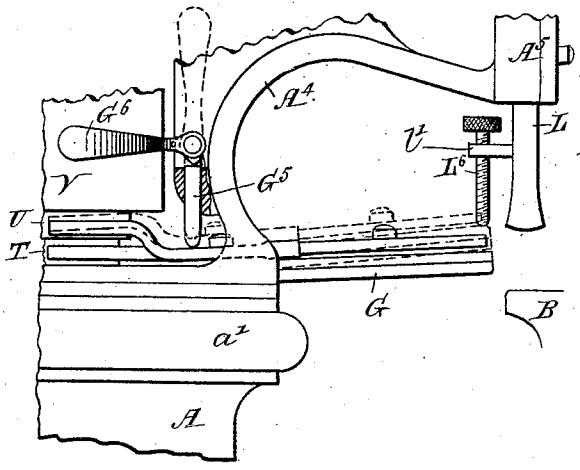


Fig. 27



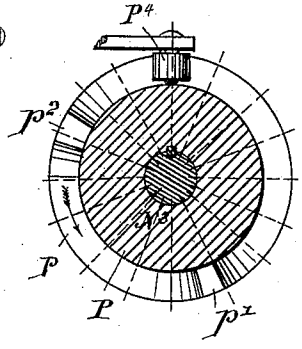


Fig. 19

Witnesses

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Inventor

Wm. Carey

By his Attorney

Russell Cargill

(No Model.) 6 Sheets—Sheet 5.

W. CAREY.

MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS OR SHOES.

No. 444,126. Patented Jan. 6, 1891.

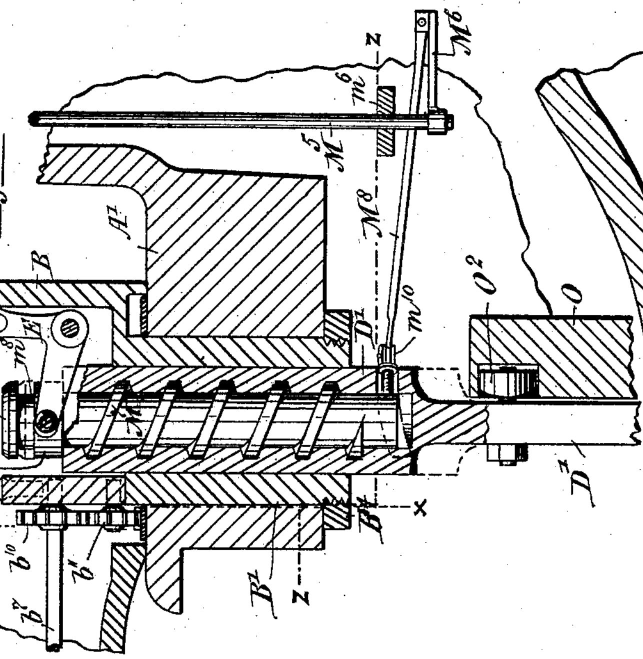

Fig. 23

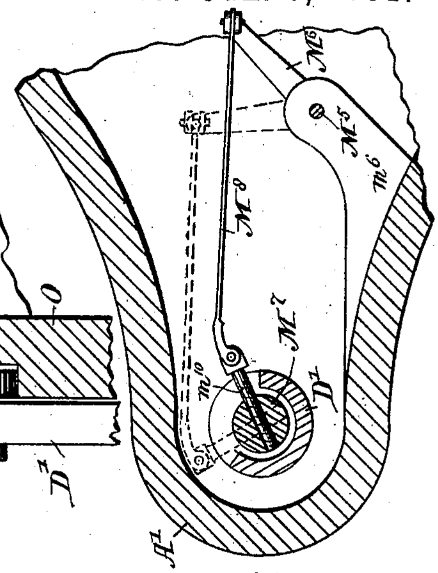

Fig. 24

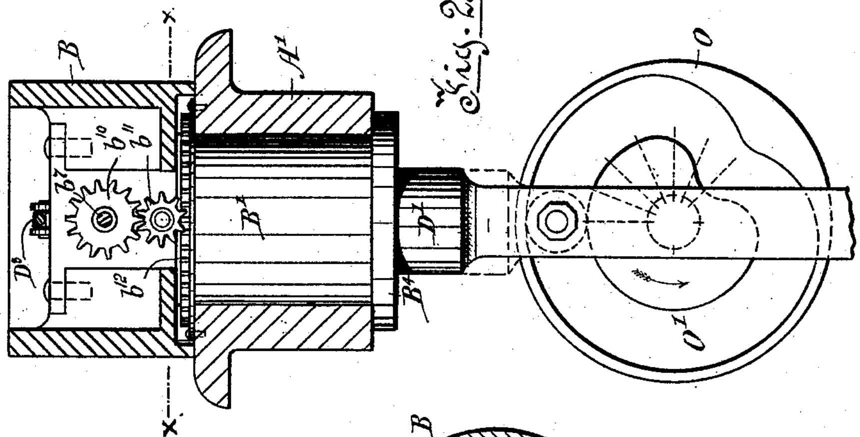

Fig. 25

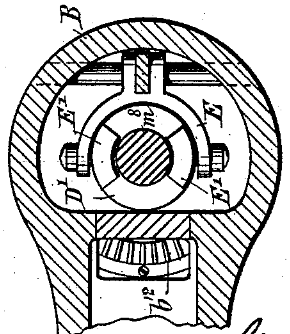

Fig. 26

Witnesses

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By his Attorney

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

(No Model.)

6 Sheets—Sheet 6.

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MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS OR SHOES.

No. 444,126. Patented Jan. 6, 1891.

Fig. 28.

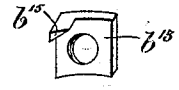
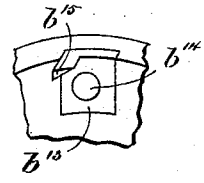


Fig. 29.



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Fred. J. Sears.

Inventor
William Carey.
By his Attorney
Thos. A. Serrell

UNITED STATES PATENT OFFICE.

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MACHINE FOR UNITING THE SOLES AND UPPERS OF BOOTS AND SHOES.

SPECIFICATION forming part of Letters Patent No. 444,126, dated January 6, 1891.

Application filed December 18, 1889. Serial No. 334,163. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CAREY, of the city of Montreal, in the district of Montreal and Province of Quebec, Canada, have invented certain new and useful Improvements in Machines for Uniting the Soles and Uppers of Boots and Shoes; and I do hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to that class of machines principally used for securing together the soles and uppers of boots and shoes by a seam composed of a continuous thread or wire in loops and short lengths of wire or other like material inserted in same.

The objects of the invention are to provide means for producing a union which shall not require a complete perforation of the two or more substances or parts to be secured, to avoid the necessity of preparing the short lengths of wire in any way, such as bending, &c., previous to their insertion, and to do away with the necessity of turning the boot or shoe inside out and of channeling the sole.

The distinguishing features of the invention are, first, a loop-inserter and an awl, or, as it might be otherwise termed, a "combined awl and nail-driver," arranged to work at right angles to each other, the former forcing the continuous thread or wire in loops entirely through one or more of the pieces being secured and partially through the remaining piece, and the awl serving to drive from the edge of the latter piece inward the short lengths of wire fed into the machine and to locate them within the loops of the continuous thread, so as to form a locking-toggle; secondly, the adaptation of the well-known swinging horn of boot and shoe machinery to this class of machines to carry the articles to be united; thirdly, an arrangement of parts allowing the uniting of substances of varying thicknesses, and, fourthly, means for severing the continuous thread in a sense automatically when the work is completed, and so allowing the article to be removed from the horn freely. Such mechanism I will now describe in detail, and for full comprehension of the same reference must be had to the annexed drawings, in which—

Figure 1 is a front view of the machine, showing the swinging horn in a central position; Fig. 2, a part vertical elevation and sectional view of same, taken at right angles to Fig. 1; Figs. 3, 4, and 5, detail views of the nose of the horn and mechanism arranged therein for introducing the continuous thread; Fig. 6, a horizontal section of machine on line $x\,x$, Fig. 2; Fig. 7, a horizontal section on line $x\,x$, Fig. 3, looking up, showing cutting device; Fig. 8, a detail perspective view of loop-inserter; Fig. 9, a detail front view of goose-head and upper portion of body of machine; Fig. 10, a part vertical elevation and sectional view of same at right angles to Fig. 9; Fig. 11, a section on line $x\,x$, Fig. 10; Figs. 12, 13, 14, 15, 16, 17, 18, and 19, sections, respectively, on lines 1, 2, 3, 4, 5, 6, 7, and 8, Fig. 10; Figs. 20 and 21 are cross-sections of front part of awl-carrier on lines X and Z, Fig. 14; Fig. 22, a vertical section on line x, Fig. 12; Fig. 23, a detail vertical section of portions of operating mechanism and adjusting mechanism for varying thicknesses of material; Fig. 24, a horizontal section on line Z Z, Fig. 23, showing a portion of such adjusting mechanism in plan view; Fig. 25, a vertical section on line $x\,x$, Fig. 23; Fig. 26, a horizontal section on line X X, Fig. 25; and Fig. 27, a side elevation of a portion of the head-section and forward end of carrier. Figs. 28 and 29 are detail perspective views of the cutter for severing the wire when work is completed.

Similar letters of reference indicate like parts.

A is the main frame of the machine in the form of a hollow tapering pedestal or column having an extension A′, with an opening A^2 in it, and arm A^3 extending from its front, also carrying on its upper end a top plate a', perforated to accommodate a vertical shaft and carrying a head-section A^4, also perforated to form a bearing for the vertical shaft and cut away to accommodate cams on the same, and terminating in a goose-head A^5, which is in line with the extension A′ and arm A^3.

B is the horn, hollow, and provided with a vertical sleeve B′, projecting from the inner end of its horizontal portion down through

the upper part of the extension A′, which forms a bearing for it, and has screwed upon its end a collar B^4 to prevent vertical movement. To insure a steady vertical alignment throughout the sidewise rotation or swinging movement of the horn, an arm B^2 from the upper side of its horizontal portion is pivoted to the arm A^3 in the axial line (indicated in Fig. 2) of the sleeve B′. In the nose of the horn is arranged the loop-inserter, and this, with the presser-foot carried by the goose-head A^5, works vertically in the axial line of the sleeve B′, the presser-foot offering the necessary resistance to the action of the loop-inserter and awl, and in this respect fulfilling a function of the usual work-table.

C is the loop-inserter, (shown in detail in Fig. 8,) flat in cross-section, grooved at its upper end and partially down the side edges to carry the continuous thread of uniting material, and having a screwed lower portion for insertion into the screwed eye of a movable cross-head C′, working in vertical guides C^2 on the inner sides of the nose of the horn. (Shown in Figs. 3 and 4.) Vertical reciprocating movement is imparted to this cross-head C′ preferably by cam mechanism, together with a vertical sliding bar extending vertically across the opening A^2 in the extension of the frame, working in the sleeve B′ of the horn, and a guide in the lower part of such extension, a screw in such bar, all to be more fully described, and bell-crank levers D and E, a geared segment D′, and connecting-rods D^2 D^3, these latter arranged within the horn and connected as shown in Fig. 2.

Fig. 3 is a section taken through portions of two substances, (in the present case,) resting on the nose of the horn and also through such horn on the line of the union, the view being in the direction indicated by the arrow in Fig. 4, and as it is necessary for the loop-inserter C, not being round, but flat, to be kept always in a line at right angles to the forward movement of the awl whatever may be the position of the horn, (which right-angle line will be as indicated by the dotted line, Fig. 5,) the mechanism hereinafter described is used to retain the loop-inserter in such position.

The upper surface of the nose of the horn is composed of a plate *b*, conforming to the usual contour of such nose, screwed in place and having two circular openings, whose axes are in line with the longitudinal axis of the horn, with interior annular recesses in the plate encircling them, in which fit, so that their exteriors will be flush with the exterior of the plate, two geared disks b' b^2, the former having a central slot parallel with the dotted line shown in Fig. 5, up into which the end of the loop-inserter C projects, and through which it works to drive the continuous thread b^3 in a loop into the substances, as shown in Fig. 3, and an eye b^4 in the same line as the slot through which the thread is drawn, and b^2 having on its interior face radial teeth b^5, with which meshes a bevel-pinion on the end of a shaft b^6, running down the horn, and by means of another shaft b^7 and other gears b^8 b^9 b^{10} b^{11}, so as to communicate with an annular rack b^{12} on the extension A′ encircling the sleeve B′ of the horn. These disks are held in place simply by confinement between the plate *b* and the body of the horn, and are in mesh with each other and free to be rotated in such bearing. By such means and the screw-connection of the awl with the cross-head C′ the loop-inserter, whether the horn be turned to right or left, will not turn, as the gear b^{11}, being rotated by traveling along the rack b^{12}, transmits motion through the system of shafts and gears to give a rotation to the gear b^2 opposite to that of the nose of the horn, and so counteracts any rotation that b' would have with it and the cross-head C′, the eye of this latter simply working on the screw, which is of very low pitch, as shown in Fig. 8, of the loop-inserter, and so allowing it to remain substantially in the same position.

b^{13} is the cutter for severing the continuous thread when the work is completed, as shown in Figs. 4, 7, 28, and 29, and consists of a plate with inwardly-projecting knife-edge b^{15}, held in place in a recess to receive it in the vertical end of the nose of the horn by a screw b^{14} passing through the same. The knife-edge fits close up to the bottom of the disk b' and projects inward sufficient to shear past the eye b^4 in it, and so cut the wire extending from same when the horn is swung beyond its usual half-circle, as indicated by dotted lines, Fig. 7.

The mechanism for adjusting the length of throw of the loop-inserter C will be better understood after the parts connected with the awl and presser-foot mechanism have been described.

In an oblong recess *a* in the top plate *a′* (see Figs. 10 and 12) is arranged a slide F, corresponding in shape and depth to the recess, so as to be flush with the top plate, but shorter in length, and having a central opening for cams, mounted on the vertical shaft referred to and to be hereinafter described, to work in. To this slide toward the rear is pivoted the section G′ of a hinged carrier formed of two sections G G′, g^3 being the hinge-pin. The head-section A^4 of the machine is cut away at its base and front to accommodate the section G of this carrier, which is also formed with an opening to accommodate cams on the vertical shaft and projects out through the front of such head-section toward the nose of the horn, and is normally held in an inclined position, for reasons to be mentioned farther on, with its nose higher than the top of such horn, such position being determined by the lower end of a vertical pin G^5, (with which the carrier makes contact, as will be more fully explained,) socketed in a channel in the web of the head-section and adjusted by means of a cam-lever G^6, pivoted above it, and by a spring-support G^4, socketed in the top plate *a′* near the front, holding the

carrier up, as shown in Figs. 10 and 27. The awl H of the machine is arranged in this carrier, and, as shown in Figs. 13, 14, 15, and 20, is secured by screw h in a cross-head H′, located in a longitudinal slot G^3 in the forward end of carrier G and adapted to receive a reciprocating motion from mechanism to be hereinafter described. The nose of carrier G is perforated, as shown at g, Fig. 14, for the passage of the awl, and in a groove g' at right angles to this perforation a slide J, with two channels $j\,j'$ parallel with the perforation, is arranged to work and serve to cut the short lengths of wire to be inserted by the awl H from a continuous strand fed into channel j from feeding mechanism at certain intervals through another channel to be described, and also to locate them in a position in front of the awl, as will be explained in the operation of the machine.

K K′ are two horizontal disks with serrated peripheral grooves, as shown in Fig. 20, for feeding the continuous strand k from which the short strips k', as shown in Fig. 14, are cut into the channel k^2 in the interior of the forward end of the carrier and leading to channel j of the slide J. The channel k^2 and recesses for the disks K K′ are formed in the upper surface of a portion G^7 of the carrier about half its thickness, (see Fig. 20,) and by means of plates $k^3\,k^4$ the carrier is evened up to the full thickness. This construction is also convenient for providing the proper dovetail guideways for the cross-head H′. The disk K is keyed on a spindle k^6, passing completely through the carrier and having mounted on its upper end a ratchet K^6, to be operated as will be described farther on, and K′ is pivoted in the free end of a spring-holder k^7, screwed to the side of the carrier, by which the necessary friction is secured for feeding various sizes of wire and compensating for any wear.

Referring now to Figs. 9, 10, 11, and 17, L is the presser-foot bar, secured in place in a vertical channel in the goose-head A^5 by face-plate a^5, having slot a^6 and adapted to work vertically in such head above and in line with the loop-inserter C.

L′ indicates a longitudinal slot in the central portion of bar L, in which slot is fitted so as to be adjustable in it a slide L^2. This slide has a slot l, into which project the ends of the operating-lever L^3, and an adjusting wedge-piece M, to be more particularly described, and has the lower end of a vertical adjusting-screw L^5, working through the upper portion of the bar L, connected with its upper end, as shown in Fig. 10, whereby it is moved up or down to accommodate exceptional thicknesses of material, and another vertical adjusting-screw L^6 is arranged to work in a bracket l', projecting from the back side of bar L in a line over the forward end of carrier G and come in contact with same for purposes to be mentioned farther on.

In a horizontal dovetail groove in the web of the head-section, about level with the slot l in slide L^2 when the presser-foot is in its raised position, as in Fig. 10, is arranged to work a slide M′, to the forward end of which the wedge-piece M is pivoted at m. This slide is hollowed almost from end to end to accommodate a coiled expansion-spring m', as shown in Fig. 17, one end of which is secured to a fixed stud m^2, passed through an aperture m^3 in the face of the slide, and a slot m^4 in the back of same and screwed into the web of the frame beyond, and the other end bears against the interior of the inner end of the slide, so as to keep a bearing-surface M^2, projecting at right angles thereto, pressed against an operating-cam to be presently described with several others. A rack M^3 is formed on the face of the slide for about half its length from the rear end, with which meshes a pinion M^4, mounted on a vertical shaft M^5, extending from a bearing in top of the head-section down through apertures m^5 in the carrier G, slide F, and top plate a' to and through the bearing m^6, situated in the interior of the pedestal A about level with the collar on the end of sleeve B′ of the horn, and on its lower end is fixed an arm M^6.

D′ is the vertical sliding bar previously mentioned in relation to the loop-inserter C, having its upper portion, which works in the sleeve B′ of the horn, hollow and screw-threaded to receive the screw M^7, provided with a head m^7 and neck m^8, projecting above the top of the bar, the latter, as shown in Fig. 26, being partially encircled loosely by the collar-segments E′, pivoted to the ends of the forked bell-crank lever E, pivoted in the horn. A screw-pin m^{10}, projecting from the screw M^7 near its lower end, is connected with the arm M^6 on the shaft M^5 by a rod M^8, and the adjusting mechanism of the presser-bar is thereby connected with that of the vertical awl and a unison of operation, to be described, effected.

It now remains to explain the mechanism for operating the parts just described and the complete operation of the machine.

N is the driving-shaft, carried in suitable bearings horizontally through the frame A at a height which brings its front end opposite the center of the opening A^2, and having mounted on its rear end the driving-pulley, on its front a disk O for operating the vertical awl, and having a cam-shaped groove O′ in its face, in which fits a roller O^2, carried by sliding bar D, and about midway a bevel-gear N′, intermeshing with a similar one N^2 on the end of a vertical counter-shaft N^3, extending up through a lower bearing N^4 in the pedestal to an upper one formed in the top of the head-section A^5.

P is a cam-roller (for operating the awl) keyed on shaft N^3 just below top plate a', having a peripheral groove p on it, containing a high "rise" p' and a lower "rise" p^2.

On a spindle P′, carried in projections from the front of the pedestal, is mounted a bell-

crank lever P^2, with one arm projecting horizontally through a slot P^3 in the pedestal and carrying at its end a roller P^4 to fit the groove *p* in such cam-roller P, and its other arm extending vertically up toward the carrier G and having socketed in its end (so as to allow for certain lateral play of such carrier, as will be fully explained) the neck of a head-piece P^5, with which the cross-head H′ is connected by a link P^6, pivoted to the downwardly-projecting lugs of such cross-head and to such head-piece.

Proceeding upward, the first Q of a series of cams above the top plate on the shaft N^2 is for giving a backward throw to the slide F, its contour being shown in Fig. 16 above the slide F, one R of the shape shown in Fig. 12 for giving it a forward movement, and upon these in succession, one S (shown in horizontal section in Fig. 13) required to move the carrier G laterally, and another T (shown in horizontal section in Fig. 14) for operating the slide J, which cuts the small pieces of wire from the continuous strand and feeds them to the awl, and then the one U that operates the feed for such continuous strand. Above these again is situated a cam-roller V, having a peripheral groove V′ in it containing a rise V^2 for operating the presser-foot bar, whose lever L^3, pivoted at l^3 to the web of the head-section, carries on its inner end a roller L^4, which fits such groove. The uppermost cam W is that which operates the slide M′, to which wedge-piece M is attached, its horizontal section being shown in Fig. 17.

The description of the intermediate connections between the parts first described and those just referred to will be better given in the explanation of the working of the machine and the adjustment of its several parts for accommodating varying sizes of material, with which explanation I will therefore now proceed.

In order that a complete conception of the machine may be had and of the size of the stock or material it is capable of accommodating, it may be as well to say that Fig. 10 is drawn to a scale approximately half full size, and that the two substances indicated on the horn would therefore be about a medium size of the stock in the class to which the particular work of this kind of machine is applicable. Before either the loop-inserter or the awl is inserted into such material it is necessary for the presser-foot to come down on top of and the nose of carrier G to be in contact with the edge of said material, as indicated by dotted lines, Fig. 10, and after the stitch has been completed to feed the same forward.

To allow the stock to be placed on the horn conveniently, the cam-lever G^6, which when depressed acts to keep the carrier G at the maximum elevation required for the largest thicknesses of material, is turned up and the nose of the carrier G raised by the action of spring-support G^4 to the height shown by dotted lines, Fig. 27, so as to leave plenty of space between both noses.

To accommodate a less or greater projection of the edge of the material beyond the nose of the horn, the forward throw of the carrier G must be regulated by hand before the machine is started, as will now be explained, reference being had to Figs. 12 and 22.

In the front portion of the slide F, to which slide the carrier is pivoted, is a dovetail section F′, against the inner end of which cam R works, whose near approach to or recedence from such cam will cause a greater or less forward throw of the carrier, the screw F^2, whose head projects through a perforation in the front of the top plate, being the means for securing the necessary adjustment, and that adjustment (shown in Fig. 12) being what is required by a medium projection of the material, the slide being moved only half-way toward the cam. For greater or less vertical thickness of material there must be an accommodating and corresponding variation in the depression of the presser-foot, the elevation of the carrier G, in which the awl is carried and the movement of the loop-inserter, in order that the two implements will always work in the required relation to each other, and to effect this the adjusting mechanism embracing the wedge-piece M, screw L^6, rack-slide M′, pinion M^4, vertical shaft M^5, and screw M^7, with connections between them, is used.

The maximum height at which the horizontal awl may work is shown by the inclination of the carrier in Figs. 10 and 27, (secured by spring-support G^4 and cam-lever G^6, as before mentioned,) which is its normal position after the work is placed on the horn, and in order that the awl may be inserted at lower points the adjusting-screw L^6 is used to depress the carrier when the presser-foot bar is brought down. In the present case, as medium-sized stock is shown in place, it will be necessary to depress the carrier to the position indicated by dotted lines in Fig. 10, and if the stuff were thinner the screw L^6 would be lowered accordingly and if thicker raised to suit.

Everything is now in readiness to start, and in order that the relative operation of the several parts may be thoroughly understood it will be well to divide a single rotation of the horizontal and vertical shafts of like speed into the sixteen degrees of movement indicated by radial dashes wherever the shafts show in section and extended at different points when required. The rotation of the shafts is in the direction indicated by the arrows, and the first degree of movement will, as shown in Fig. 13, allow the projection *s* on the end of the curved lever S′, pivoted at *s′* to the slide F, to be pressed into the recess in the cam S by means of a spring-pin S^2, located horizontally in the base of the head-section, and by means of a nut S^3, pivoted vertically on the opposite end of such lever

and working in a slot S^4 in the carrier enable the lever to throw such carrier sidewise in the direction indicated by arrow 1 to the position shown by dotted lines, which is determined by the adjusting-screw S^5, working horizontally in the base of the head-section and arresting the throw of the carrier. It is by means of this screw S^5 and a similar one S^6, arranged in like manner opposite it in the base, that the feed of the material on the horn to secure a long or short space between each locking-toggle is regulated, as will be more fully explained. Two degrees of rotation, as seen in Fig. 12, will enable cam R to throw slide F forward in the direction of arrow 2, and with it carrier G, by the rise of such cam coming in contact with the projecting inner end of the section F′ of such slide to the position shown by dotted lines in Figs. 12 and 10—*i. e.*, into contact with the edge of the material on the horn. Three degrees will, by means of the rise of cam T, (shown in Fig. 14,) throw the forked end of a lever T′, pivoted at *t* to carrier G, into the position shown by dotted lines, and the opposite geared end of this lever in mesh with teeth on an end of another lever T^2, also pivoted to the carrier, will cause the opposite forked end of this latter lever, in which works a pin *t′*, projecting up from slide J, to move such slide into a position that brings its channels *j j′*, respectively, in line with the channel k^2 (through which the wire to be cut into short pieces is fed) and the perforation *g*, (through which awl H works.) From three to five degrees, by means of the rise of cam U, (shown in Fig. 15,) will move the forked end of a lever U′, pivoted at *u* to the carrier, to the dotted position shown, and the spring-bolt U^3, projecting from the opposite end of same in contact with ratchet K^6, will rotate same a single step and cause disk K to feed the strand of wire held between it and K′ along channel K^2 into channel *j* in the slide J. Almost simultaneously with this feed and during the fifth degree of rotation the rise of cam S comes in contact with the end of lever S′ and presses it back to its original position, thus throwing the carrier in the direction of arrow 3 and so feeding the stock a step, the nose of the carrier being serrated to afford a grip. In connection with this feeding movement of the carrier, it will be obvious that by adjusting the screw S^5 nearer to or farther from the side of the carrier the length of the spaces between each locking-toggle can be shortened or lengthened, the opposite screw S^6 serving to always arrest the return movement of the table at the same point with relation to the horn—viz., with the axis of the horizontal awl in line with that of the vertical one. Half a degree more will, through the rise V^2 in the peripheral groove of cam-roller V, elevate the end of lever L^3, carrying roller L^4, and depress the forward end of same, which enters the slot *l* in the adjustable portion of the presser-foot bar. A quarter of a degree's rotation beyond this will be sufficient to free the slide M′ from the rise of cam W, (shown in Fig. 17,) which has from the start of the machine been pressing it forward until the bearing-section of the wedge-piece has its narrower portion situated between the forward downward bearing-point of the lever L^3 and the bottom edge of the slot *l*, as shown by dotted lines, Fig. 10, at which moment the slide becomes subject to the action of the spring *m′* within it, whose force will throw it backward to a distance dependent upon the thickness of the material under operation on the horn, as will be seen from the following: As the lever L^3 has an invariable throw of, say, three-eighths of an inch, and it is required that the presser-foot be depressible for distances varying from three-eighths of an inch to reach the thickest to five-eighths for the thinnest "stuff," this difference of two-eighths must be made up by the forcing of the wedge when the thinnest material is in place in between the points mentioned—viz., the bearing-point of the lever and the bottom edge of the slot. As will be easily seen, any such adjustment as has been described in connection with the awl and presser-foot must necessitate a corresponding adjustment in the throw of the loop-inserter, and this is secured by transmitting the variation through the rack M^3, pinion M^4, shaft M^5, and arm M^6 to the screw M^7, located in the sliding bar D′.

Before explaining the particular operation of screw M^7, it will be best to point out that the sliding bar D′ has an invariable vertical throw, or, to be more exact, a vertical drop, as it is by the falling of the roller O^2 carried by it, into the "fall" in the groove O′ in the face of disk O (shown in Fig. 25) and the consequent downward movement of the bar that the upward movement of the loop-inserter is effected. This vertical movement of the loop-inserter will take place on the sixth degree of rotation of the shafts, the position of the sliding bar D′, and the intermediate connections between it, and the loop-inserter being in the meantime in the positions shown by Figs. 4 and 23. It will be noticed that the horizontal arms of bell-crank lever E in Fig. 23 are thrown upward by the top of the sliding bar bearing against the under side of the collar-segments E′, and that the head of the screw which is required to depress such horizontal arms of the lever E is out of contact with and some distance above same, which distance corresponds in effect to the two-eighths difference mentioned in connection with the depression of the presser-foot bar. Now before the rise of the loop-inserter takes place the proper adjustment is communicated to the screw M^7 through the means mentioned, and this consists in diminishing the distance between the head of the screw and the collar-segments of the lever E by rotating the screw in one direction and so lowering it as the material may become thicker and a long throw of the loop-inserter C be re-

quired, as it will easily be seen that if during the downward movement of bar D′ any portion of such motion is lost to the lever E, as will be the case in uniting the thinnest material, the loop-inserter cannot possibly be raised as high as when the head of D′ is in contact with the lever E before it starts to descend. The rotation between the seventh and eleventh degrees will, through the high rise p' in the peripheral groove p of cam-roller P, acting on the end of lever P^2, carrying roller P^4, cause the vertical arm of such lever to be thrown forward the distance indicated by axial line 1, and so drive the cross-head H′ forward and the awl through the loop of the stitch that has been formed by the loop-inserter and withdraw it. The eleventh degree will cause cam T to throw slide J back to its original position, with channel j in line with perforation g, and by so doing sever the length of wire that has been fed into channel j, and so locate it in the path of the awl which, between the thirteenth and fifteenth degrees of rotation, is, by means of the lower rise p^2 of cam-roller throwing the vertical arm of lever P^2 the distance indicated by axial line 2, caused to drive forward the piece of wire in front of it and locate it in the loop, thus locking the loop. The last degree of rotation will cause the rise of cam Q to come in contact with the rise Q′ on the face of the circular opening in slide F, as shown in Fig. 16, and thus return the same and the carrier G with it to its original position, thus completing an entire operation.

What I claim is as follows:

1. In a machine for uniting the soles and uppers of boots and shoes, having a work-support and means for holding the work in place, a loop-inserter and a combined awl and nail-driver arranged to work actually or approximately at right angles to each other, means for imparting reciprocating movement to same, and means for placing in the path of said nail-driver wire locking-pieces, for the purpose set forth.

2. In a machine for uniting the soles and uppers of boots and shoes, having a work-support and means for holding the work in place, a loop-inserter and a combined awl and nail-driver, the one adapted to force a continuous thread in loops into the substances to be united and the other to puncture one of such substances and drive short pieces of locking material into same, and means for inserting said loop-inserter once into such substances and inserting the combined awl and nail-driver twice into one of such substances to form a single locking-toggle, as set forth.

3. In a machine for uniting the soles and uppers of boots and shoes, having a work-support and means for holding the work in place, a loop-inserter and a combined awl and nail-driver, and means for inserting the former once a limited distance into the substances to be united and driving the latter forward twice for different distances, for the purpose described.

4. In a machine for uniting the soles and uppers of boots and shoes, having a work-support and means for holding the work in place, the combination, with a loop-inserter and a combined awl and nail-driver, arranged to work approximately at right angles to each other, and means for imparting reciprocating movement to same, of means for varying the extent of movement of said loop-inserter and the angle at which said awl works, for the purpose described.

5. In a machine for uniting the soles and uppers of boots and shoes, having a work-support and means for holding the work in place, a loop-inserter and a combined awl and nail-driver, arranged and operating in such relation to the work-support that the former will force a continuous thread in loops entirely through one or more of the pieces being united together and partially through the remaining piece, and the nail-driver drive inward from the edge of the latter piece short locking-pieces within the loops of the continuous thread, for the purpose described.

6. In a machine for uniting the soles and uppers of boots and shoes, having a work-support, means for holding the work in place, and a combined awl and nail-driver, with means for imparting reciprocating motion thereto, a loop-inserter located within and adapted to work in and project through said work-support, and means for imparting a reciprocating motion thereto, as and for the purpose described.

7. In a machine for uniting the soles and uppers of boots and shoes, having a swinging work-supporting horn, and a loop-inserter carried by and working in and through the nose of same, the combination, with such loop-inserter, of means for holding it laterally in position during its vertical movement.

8. In a machine for uniting the soles and uppers of boots and shoes, having a work-supporting horn, and a loop-inserter carried by and working in and through the nose of same, the combination, with such loop-inserter, of a disk carried in the nose of such horn, having a slot corresponding to the shape in cross-section of such loop-inserter, which works through it, and an eye in line with such slot, through which a continuous thread may be drawn, and means for preventing any movement of such disk with the horn, for the purpose described.

9. In a machine for uniting the soles and uppers of boots and shoes, having a work-supporting horn, and a disk carried in the nose of such horn, having an eye through which a continuous thread may pass, and a fixed cutter carried by said horn for severing such thread within the horn at the completion of the stitching, for the purpose described.

10. In a machine for uniting the soles and uppers of boots and shoes, having a reciprocating loop-inserter and a combined awl and

nail-driver working approximately at right angles to each other, a hinged carrier for such awl with depressers, and a yielding support adapted to vary the angle between such loop-inserter and awl, for the purpose described.

11. In a machine for uniting the soles and uppers of boots and shoes, having a reciprocating loop-inserter and a combined awl and nail-driver working approximately at right angles to each other, the combination, with a carrier for such awl capable of movement in three different directions, of means for varying the extent of movement in each of such directions, for the purpose described.

12. In a machine for uniting the soles and uppers of boots and shoes, the combination of a loop-inserter and a combined awl and nail-driver working approximately at right angles to each other, a work-support, presser-foot bar, and means for supporting, connecting, and operating the same, for the purpose described.

13. In a machine for uniting the soles and uppers of boots and shoes, the combination of a loop-inserter and a combined awl and nail-driver working approximately at right angles to each other, a work-support, a presser-foot bar depressible to varying distances, means for supporting, connecting, and operating the same, and means for effecting such varying depression of the presser-foot bar, for the purpose described.

14. In a machine for uniting the soles and uppers of boots and shoes, the combination of a loop-inserter and a combined awl and nail-driver, a swinging work-supporting horn carrying such loop-inserter, a presser-foot bar in line with same, a carrier for the awl, and means for supporting, connecting, and operating the whole, for the purpose described.

15. In a machine for uniting the soles and uppers of boots and shoes, the combination of a loop-inserter and a combined awl and nail-driver working approximately at right angles to each other, a swinging work-supporting horn carrying such loop-inserter, a presser-foot bar depressible to varying distances in line with loop-inserter in horn, a carrier for the awl capable of varying the angle between the loop-inserter and awl, and means for operating same and presser-foot and of varying their working relation to each other, for the purpose described.

16. The combination of horn B, having guides C^2, loop-inserter C, cross-head C′, geared segment D′, pivoted to horn, connecting-rods D^2 D^3, bell-crank levers D E, and means for operating the latter, for the purpose described.

17. The combination, with horn B, loop-inserter C, carried by and working in and through the nose of same, and disk b', through which said loop-inserter works, of disk b^2 in eccentric relation to and intermeshing with disk b', and mechanism whereby upon the oscillation of the horn the disk b^2 is rotated and serves by such rotation to prevent any movement of disk b' with said horn, for the purpose set forth.

18. The combination, with horn B and disk b', having eye b^4, of cutter b^{13}, fixed in said horn so as to be flush with the bottom of disk b' and act in conjunction with such eye to sever the thread extending through the latter.

19. The combination of top plate a', slide F, hinged carrier G G′, pivoted to same, and means for imparting a reciprocating movement to such slide, for the purpose described.

20. The combination of a top plate a', slide F, hinged carriage G G′, pivoted to same, spring-support G^4, and means for depressing such carrier, as shown, and for the purpose described.

21. The combination of head-section A^4, hinged carrier-section G, spring-support G^4, pin G^5, and cam-lever G^6, for the purpose described.

22. The combination, with hinged slotted carrier-section G, of combined awl and nail-driver H, cross-head H′ for carrying the same, and means for giving a reciprocating movement to such cross-head, for the purpose described.

23. The combination of carrier-section G, having channel k^2, combined awl and nail-driver H, means for giving a reciprocating movement to such slide, disks K K′, spring-holder k^7, spindle h^6, ratchet K^6, and means for rotating such ratchet, all as and for the purposes described.

24. The combination, with the presser-foot bar, the loop-inserter, wedge-piece M, slide M′, and means for operating the same, of sliding bar D′, screw M^7, connections between same and loop-inserter, and connections between said slide M′ and screw M^7 for rotating the latter, as and for the purpose set forth.

25. The combination of presser-foot bar L, having a slot L′, slide L^2, fitting such slot, and screw L^5 for adjusting such slide in same, for the purpose described.

26. The combination, with head-section A^4, slide M′, and cam W, of stud m^3 and spring m' and slide M′, for the purpose described.

27. The combination, with awl-carrier G and presser-foot bar L, having a bracket l', of adjusting-screw L^6, for the purpose described.

28. The combination, with the pedestal A and shaft N^3, of cam-roller P, spindle P′, carried in suitable bearings, bell-crank lever P^2, roller P^4, cross-head H′, combined awl and nail-driver H, and connections between said cross-head and said lever P^2, for the purpose described.

29. The combination, with the shaft N^3 and slide F, having a rise Q′ on the face of the circular opening in same, of cam Q and carrier-sections G G′, secured to such slide, for the purposes described.

30. The combination, with the shaft N^3, slide F, having adjustable section F′ and screw F^2, of cam R and carrier-sections G G′, secured to such slide, for the purposes described.

31. The combination, with head-section A^4, shaft N^3, and carrier-sections G G', the former having slot S^1, of cam S, lever S', pivoted to the slide F, nut S^3, and spring-pin S^2, for the purpose described.

32. The combination of shaft N^3, cams T and U, carrier-section G, slide J, levers T', T^2, and U', pivoted to such carrier-section, and the latter having spring-bolt U^2, pin i', ratchet K^6, disks K K', and combined awl and nail-driver H, all as and for the purposes described.

Montreal, 5th day of December, 1889.

WILLIAM CAREY.

Witnesses:
OWEN WAVE,
WM. P. MCFEAT.