2 Sheets—Sheet 1.

L. GRAF.

Boot and Shoe Lasting Machine.

No. 212,460. **Patented Feb. 18, 1879.**

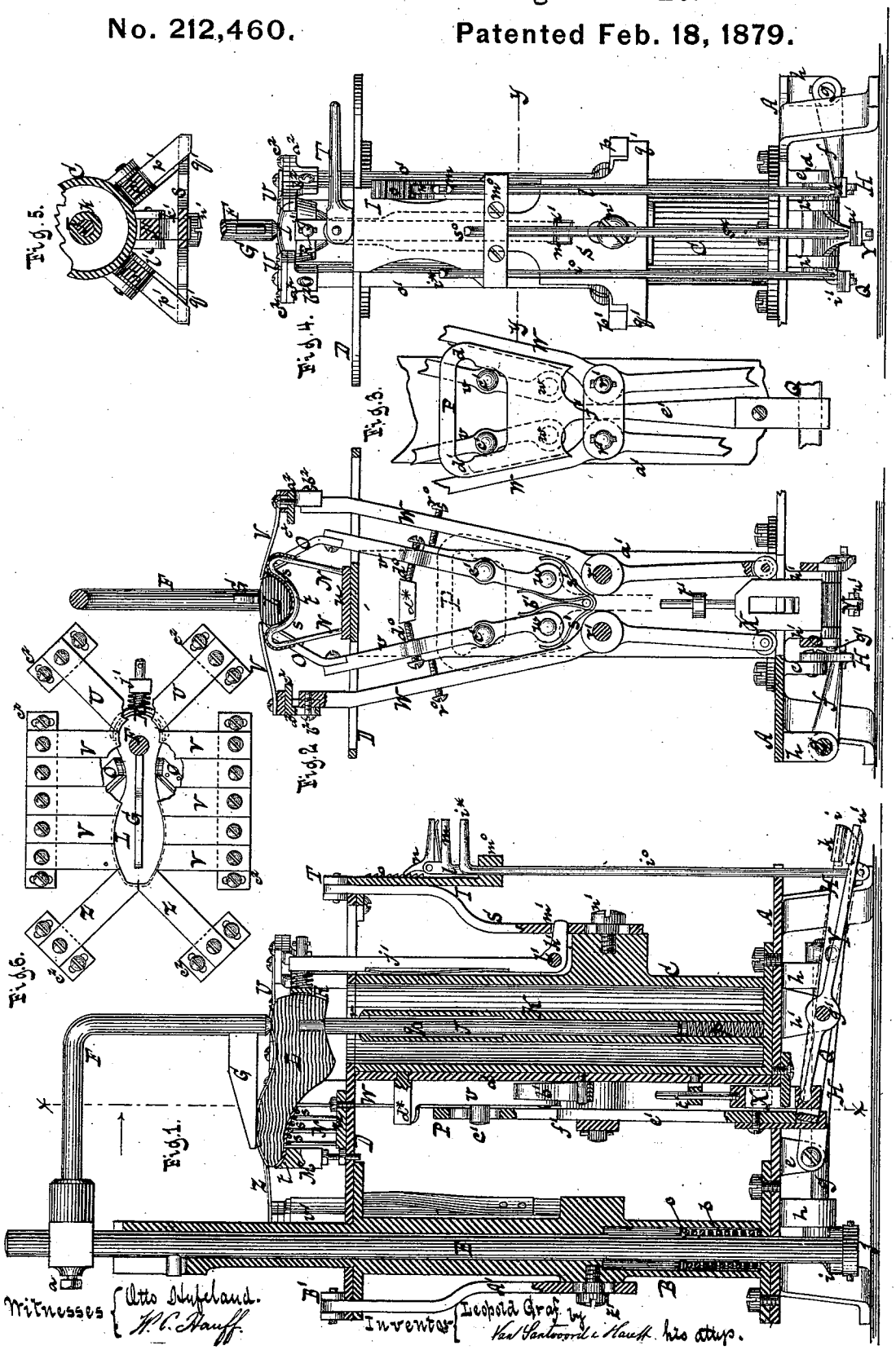

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Fig. 6.

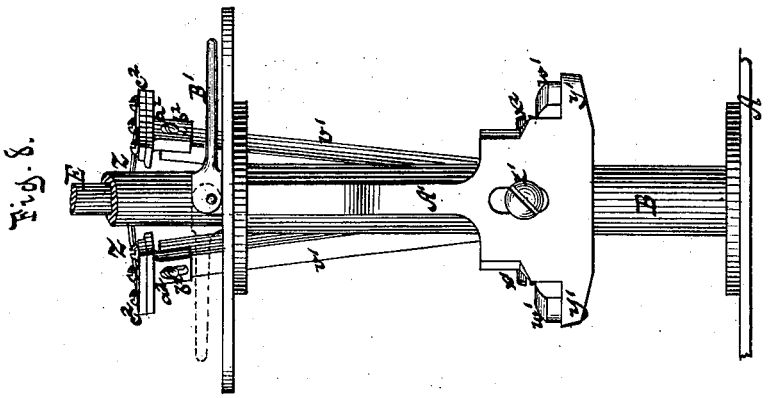
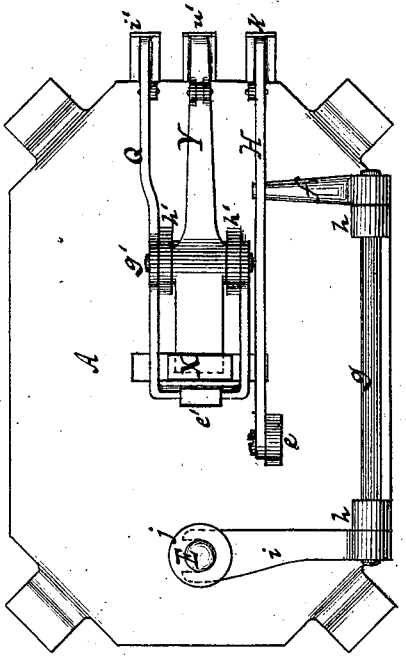


Fig. 7.



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UNITED STATES PATENT OFFICE.

LEOPOLD GRAF, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN BOOT AND SHOE LASTING MACHINES.

Specification forming part of Letters Patent No. **212,460**, dated February 18, 1879; application filed December 19, 1878.

To all whom it may concern:

Be it known that I, LEOPOLD GRAF, of Newark, in the county of Essex and State of New Jersey, have invented a new and Improved Machine for Lasting Boots and Shoes, which invention is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a longitudinal vertical section. Fig. 2 is a transverse vertical section in the plane *x x*, Fig. 1. Fig. 3 is an elevation of the mechanism for operating the shank-clamps. Fig. 4 is a front view. Fig. 5 is a horizontal section in the plane *y y*, Fig. 4. Fig. 6 is a plan or top view, showing all the stretchers when closed. Fig. 7 is an inverted plan. Fig. 8 is a rear elevation.

Similar letters indicate corresponding parts.

This invention consists in the combination, with a yielding last-support, and with mechanism for depressing the last, of toe-clamps, which are covered with an elastic apron and extend beneath the toe part of the last from opposite sides, so that when the last (on which the upper has been placed) is depressed the toe part of the upper is drawn up tight against the last; also, in the combination, with the vertically-moving last, and with the toe-clamps, of shank-clamps, and of mechanism for forcing said shank-clamps up against the last for the purpose of drawing the rear portion of the upper against the last at the same time with the front portion, when during the time the last is depressed said shank-clamps are forced inward against the last; further, in the combination, with the vertically-moving last, with the toe-clamps, and the shank-clamps, of toe-stretchers, side-stretchers, and heel-stretchers, and of mechanism for forcing the several stretchers toward the last for the purpose of drawing the edge of the upper over the insole ready to be tacked; also, in the combination, with the yielding last-support, with the last, and with mechanism for drawing the upper up to the last and cover the insole, of a tube surrounding the last-support to afford room for the leg of a boot; further, in the peculiar mechanism for imparting the required movements to the several parts, as will be hereinafter more fully described.

In the drawings, the letter A designates the bed-plate of my machine, from which rise two hollow columns, B C, which support the platform D. The column B extends up above the platform D, and it forms the guide for a rod, E, to the upper end of which is secured an angular bar, F, provided with a foot, G. The point of the bar F is intended to act on the heel of the last L, while the foot G acts on the front portion of said last, so that when the rod E is depressed the presser-bar F, with its foot G, serves to carry the last down uniformly at the heel and at the toes thereof. Said presser-bar is secured to the rod E by means of a set-screw, *a*, so that it can be adjusted up or down for lasts of different sizes.

In the bottom part of the column B is placed a spring, *b*, which acts on a pin, *c*, extending transversely through the rod E, and has a tendency to force said rod, together with the presser-bar, upward. A treadle, H, Fig. 7, serves to depress the rod E against the action of its spring. This treadle has its fulcrum on a pivot, *d*, secured in a lug, *e*, Figs. 1 and 4, which projects from the under surface of the bed-plate A, and it engages with an arm, *f*, which projects from a rock-shaft, *g*, that has its bearings in lugs *h h*, secured to the under side of the bed-plate. From the rear end of this rock-shaft extends a forked arm, *i*, which straddles the rod E and bears upon a head, *j*, secured to the bottom end of this rod.

On the front end of the treadle H is secured a pedal, *k*, and from said treadle rises a rod, *l*, Fig. 4, which is guided in a block, m^o, secured to a bracket, I, that is firmly secured to the front edge of the platform D. From said rod projects a handle, *m*, Figs. 1 and 4, and in its upper end is secured a spring-dog, *n*, which engages with a serrated bar, *o*, fastened to the bracket I.

When the treadle is depressed, the presser-bar F forces the last down, and the spring-dog *n* retains the parts in the position to which they have been depressed.

By grasping the handle *m* the spring-dog is thrown out of gear with the serrated bar *o*, and the presser-bar rises to its original position. The last L is provided with a socket to engage with the upper end of a rod, J, which is guided in a tube, K, Figs. 1 and 5, that rises from the bottom of the column C. In

the bottom part of said guide-tube is placed a spring, *p*, which has a tendency to force the last-support J upward. From the side of the last-support projects a stop, *q*, a portion of the tube K being bored out large enough to allow this stop to move freely therein, and in the upper end of said tube is a slot, *r*, through which said stop can be introduced.

When the last-support, after having been introduced into the guide-tube K, is turned round, the stop *q* can readily be brought in line with the slot *r*, and the last-support can be withdrawn.

Between the guide-tube K and the inner surface of the hollow column C sufficient space is left for the introduction of a boot-leg, so that my machine can be used conveniently for lasting boots as well as shoes.

By referring to Fig. 1 of the drawings, it will be seen that by the rod J the last is supported at its heel part. For the purpose of supporting its toe part I use a standard, M, the surface of which is concave, to fit the last, while its shank screws into the platform D, so that said standard can be readily adjusted up or down. Close in front of the toe-support M are situated the toe-clamps N, which are constructed of springs with concave arms *s*, (see Fig. 2,) extending beneath the last alternately from opposite sides, and interlocking with each other, and over these concave arms is stretched an apron, *t*, of india-rubber or other elastic material.

When the last, together with the upper, is depressed upon the toe-clamps, the concave arms *s* yield, and by the action of the apron *t* the upper is firmly drawn up against the last before said last reaches the toe-support M. The toe-clamps N are secured in a plate, *u*, which is fastened on the platform D, and for different sizes of lasts toe-clamps of different size and shape may be provided; but the elasticity of the concave spring-arms *s* is such that they adapt themselves to almost all sizes of lasts.

For the purpose of drawing the shank portion of the upper close up against the last, I use the shank-clamps O. (Best seen in Fig. 2.) They are secured to the upper ends of levers *v v*, which have their fulcra on pivots *w w*, secured in a plate, a^1, which is firmly attached to the rear side of the hollow column C. A spring, b^1, has a tendency to throw the shank-clamp levers open, and they are closed up by the action of a cage, P, Fig. 3, the inner edges of which are inclined and caused to act on studs c^1 c^1, secured in the shank-clamp levers *v v*. When this cage is drawn down the studs *c'* drop into recesses *d' d'* in the corners of the cage P, (see Fig. 3,) and the shank-clamps are thrown wide open by the action of the spring b^1; but when the cage P is forced upward, the shank-clamp levers are gradually compressed by the action of the inclined sides of said cage on the studs c^1.

Set-screws d^o, Fig. 2, serve to regulate the closing position of the shank-clamps O for lasts of different sizes. When the shank-clamp levers are closed up, the tips of these set-screws strike a block, *d**, which is firmly secured to the plate *a'*.

The shank *e'* of the cage P extends through a suitable guide, *f'*, secured to the plate *a'*, and its lower end engages with a treadle, Q, which swings on a pivot, *g'*, Fig. 7, secured in lugs *h'*, which project from the under surface of the bed-plate A, the pedal *i'* of said treadle being situated in front of the machine, so that it can be conveniently reached with the foot. The faces of the shank-clamps O are covered with india-rubber or other equivalent material; and if said clamps are closed up during the time the last is being depressed, their faces take hold of the upper and draw the shank portion thereof up tight against the last. From the treadle Q rises a rod, i^o, with a handle, *i**, so that said treadle can be operated either by hand or by foot.

The heel part of the upper is closed up against the last by a spring-supported concave jaw, R, Figs. 1 and 6, which is secured in the vertical arm *j'* of a bell-crank lever, *l' k'*, that has its fulcrum on a pivot, *l'*, extending through lugs which project from the hollow column C. The horizontal arm *k'* of this bell-crank lever extends into a slot, *m'*, in a slide, S, the upper end of which is guided in a slot between the bracket I and the platform D, while its lower end is guided on a screw, *n'*, secured in a lug which projects from the hollow column C, Figs. 1 and 4. To the upper end of said slide is pivoted a knuckle-lever, T; and if this lever is swung to the position shown in Fig. 4, the slide S is forced upward and the heel-jaw R is caused to grasp the upper and to press it up tightly against the heel of the last. The slide S also serves to actuate the heel-stretchers U, which consist of spring-blades, (see Figs. 1 and 6,) and are secured to the upper ends of the vertical arms *o'* of bell-crank levers *o' p'*, (see Figs. 4 and 5,) the horizontal arms *p'* of which bear upon toes *q'*, which project from the slide S. When this slide is forced upward by the action of the knuckle-lever T, the heel-stretchers are caused to move inward to the position shown in Fig. 6, and the edge of the upper projecting over the heel of the last is drawn in and depressed upon the insole ready to be tacked.

The side edges of the upper are drawn in over the edges of the insole by the side-stretchers V, (best seen in Figs. 2 and 6,) which are constructed each of a series of spring-blades, and secured to the upper ends of levers W, their front edges being bent and curved to conform to the shape of the last. By making these side-stretchers each of a series of detached spring-blades, they are enabled to take a firm hold of the upper along its entire edge and to hold the same securely down upon the insole. The levers W swing on pivots *r'*, which are secured in the plate *a'* on the inner side of the column C, and they are exposed to the action of a spring, *s'*, which keeps their lower

ends in contact with a cam-slide, X. The upper end of this cam-slide, Figs. 1 and 2, is guided in a lug, t', projecting from the plate a^1, and its lower end engages with a treadle, Y, Fig. 1, which has its fulcrum on the pivot g', and is provided with a pedal, u', situated in front of the machine. By depressing this pedal the cam-slide X is forced upward to the position shown in Fig. 2, and the side-stretchers are caused to close up toward the opposite sides of the last, so that they force the side edges of the upper in over the insole and retain the same in position for tacking. The closing position of the side-stretchers is regulated by set-screws r^o. A handle, s^o, which projects from a rod, s^*, secured to the treadle Y, serves to operate the side-stretchers by hand.

The toe-stretchers Z are mounted like the heel-stretchers U on the vertical arms v' of bell-crank levers v' w', (see Fig. 8,) which swing on pivots x', secured in the column B, and the horizontal arms w' of which bear upon toes y', which project from a slide, A′, Figs. 1 and 8. The lower end of this slide is guided on a screw, z', secured in the column B, and its upper end extends through a hole in the platform D, and to it is pivoted a knuckle-lever, B′. By swinging this lever to the position shown in dotted lines in Fig. 8, the slide A′ is raised and the toe-stretchers are caused to close up and to press the edge of the toe part of the upper over the insole, ready for tacking.

The heel-stretchers, the side-stretchers, and the toe-stretchers are secured to their respective levers by means of brackets a^2 and set-screws b^2, so that they can be raised or lowered, and they are not fastened directly to the upper surfaces of said brackets, but to intermediate plates c^2, which can be adjusted in or out, so that the several stretchers can be readily adjusted for lasts of different sizes.

It has previously been remarked that the several stretchers are made of elastic or spring blades. The object of this is that said stretchers, on striking the heel, ride up thereon or draw the edge of the upper down tightly upon the insole.

From the foregoing description the operation of my machine will be readily understood. After the upper has been placed on the last, the last is attached to the last-support J, and by depressing the treadle H the last is forced downward. At the same time the shank-clamps are compressed against the sides of the last by depressing the handle i^*, and the upper is drawn up close to the last at the shank by the shank-clamp, and at the toe by the toe-clamp, the last being retained in its depressed position by the dog n and serrated bar o. When this has been accomplished, the heel-stretchers, the side-stretchers, and the toe-stretchers are brought to act on the upper, so as to draw the edge thereof over the insole and retain it in the proper position for tacking.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a yielding last-support, and with mechanism for depressing the last, of toe-clamps N, composed of concave spring-arms s, extending alternately from opposite sides beneath the last, and of an elastic apron covering said concave interlocking spring-arms, all constructed and adapted to operate substantially as shown and described.

2. The combination, with a yielding last-support, with mechanism for depressing the last, and with a toe-clamp, N, of shank-clamps O, and of mechanism for forcing said shank-clamps up against the last during the time the last is being depressed, substantially as and for the purpose set forth.

3. The combination, with the vertically-moving last, with the toe-clamps N, and the shank-clamps O, of elastic toe-stretchers, elastic side-stretchers, and elastic heel-stretchers, and of mechanism for forcing the several stretchers toward the last, all constructed and adapted to operate substantially as shown and described.

4. The combination, with the yielding last-support, with the last, and with mechanism, substantially such as described, for drawing the upper up to the last and over the last and over the insole, of a tube surrounding the last-support, to afford room for the leg of a boot, substantially as set forth.

5. The combination, with the shank-clamps O and their supporting-levers v, of a cage, P, acting on studs c^1, secured in the levers v, and of recesses d', for receiving said studs and retaining the shank-clamps in their open position, substantially as described.

6. The combination, with the heel-stretchers U and their supporting-levers o' p', of a slide, S, and knuckle-lever T, for the purpose of operating said heel-stretchers and retaining them, when closed, securely in position, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 16th day of December, 1878.

LEOPOLD GRAF. [L. S.]

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.