2 Sheets—Sheet 1.

J. KEATS.

Machine for Sewing Boots and Shoes.

No. 198,120. Patented Dec. 11, 1877.

Fig. 2.

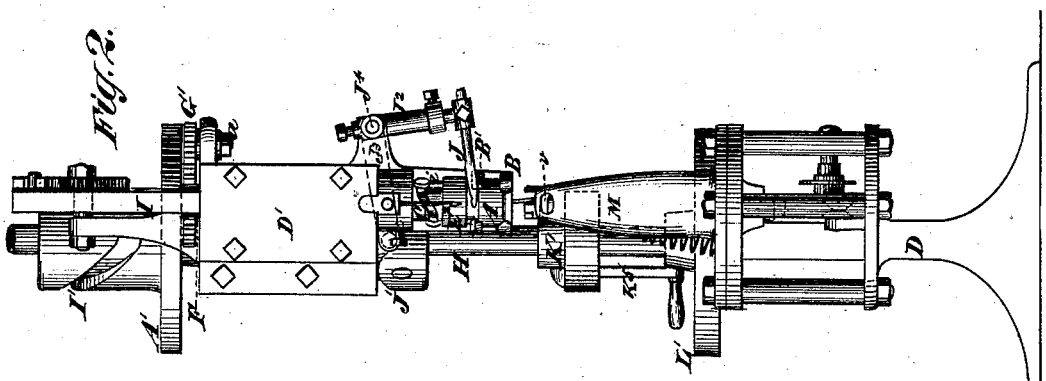
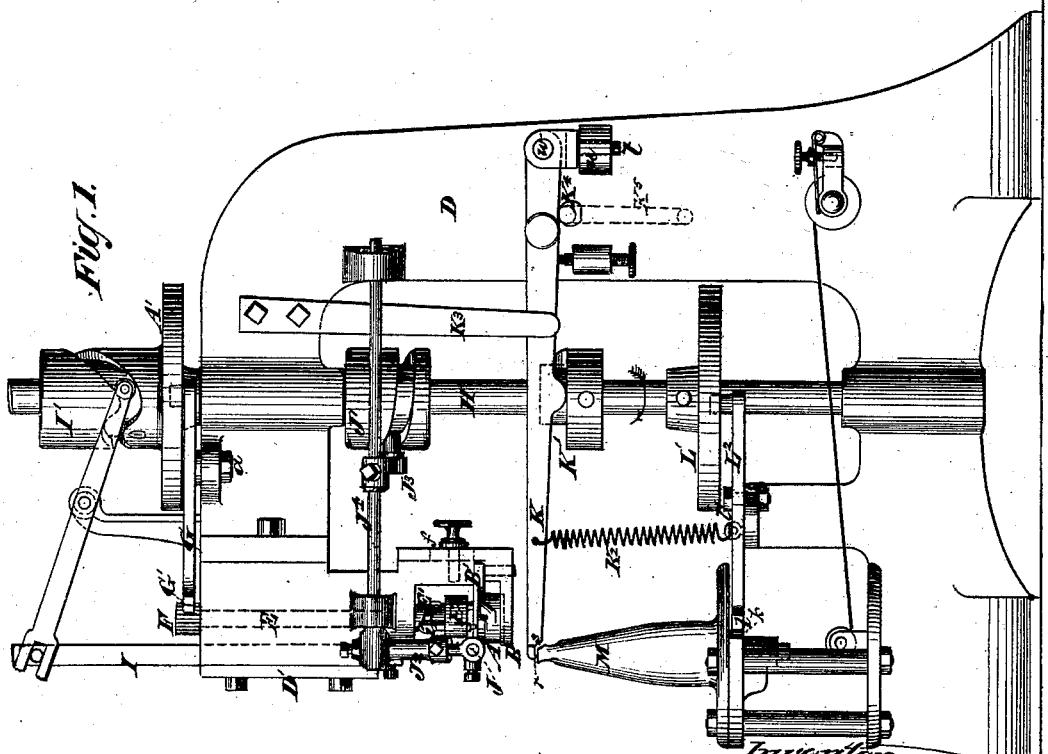


Fig. 1.



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John Keats
by his Attorneys
Brown & Allen

2 Sheets—Sheet 2.

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Fig. 3.

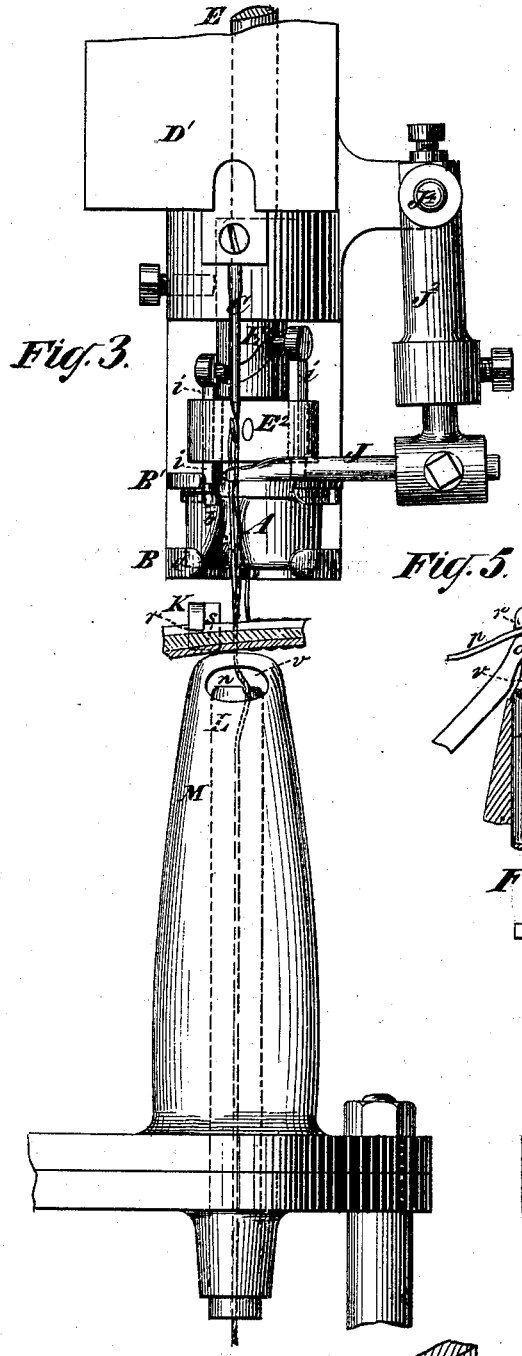

Fig. 4.

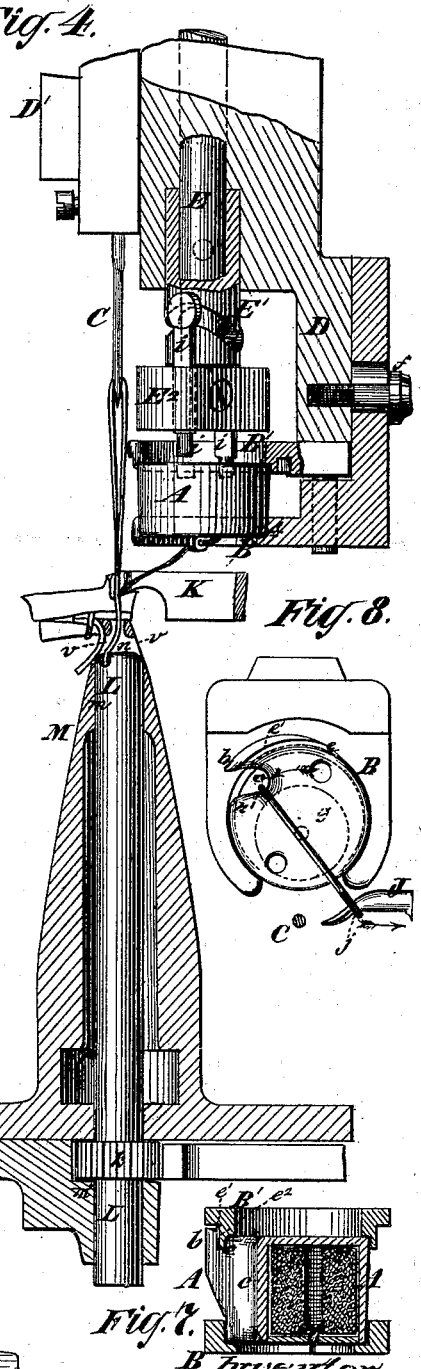

Fig. 5.

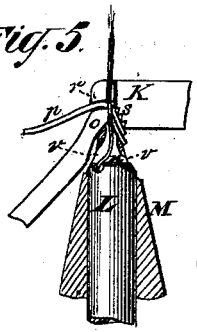

Fig. 5*

Fig. 8.

Fig. 6.

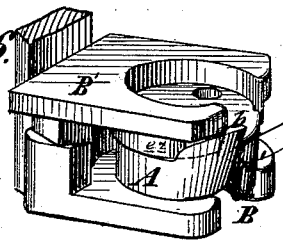

Fig. 7.

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UNITED STATES PATENT OFFICE.

JOHN KEATS, OF WOOD GREEN, ENGLAND.

IMPROVEMENT IN MACHINES FOR SEWING BOOTS AND SHOES.

Specification forming part of Letters Patent No. **198,120**, dated December 11, 1877; application filed August 31, 1877.

To all whom it may concern:

Be it known that I, JOHN KEATS, of Wood Green, in the county of Middlesex, England, have invented certain new and useful Improvements in Sewing-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention consists in the novel construction of a reciprocating rotary shuttle and of a shuttle-holder for containing the same, whereby provision is afforded for keeping the shuttle in proper relation with the needle; also, in novel means of driving such a shuttle.

It also consists in the combination of a reciprocating rotary shuttle and a hooked needle, both arranged above the support on the upper surface of which the material to be sewed is supported, and means arranged below the said support for supplying thread to the said needle; also, in the combination of a loop-opener with such needle and shuttle, and means of supplying thread to the needle.

It further consists in the novel construction of a work-supporting post, in which is arranged a whirl for supplying thread to a hooked needle.

In the accompanying drawings, Figure 1 is a side elevation of a sewing-machine embodying my improvements. Fig. 2 is a front elevation of the same. Fig. 3 is a front view of the needle-box, the needle, the shuttle, the loop-opener, and the post of the machine. Fig. 4 is a side view, partly in section, of the same parts shown in Fig. 3. Fig. 5 is a side view, partly in section, of the parts of the post, the thread-whirl, and the feeding and pressing device. Fig. 5* is an inverted plan of the end of the feeding and pressing device. Fig. 6 is a perspective view of the shuttle and shuttle-holder. Fig. 7 is a central vertical section of the shuttle and shuttle-holder. Fig. 8 is a plan of the shuttle and loop-opener, showing also the position of the needle.

In the machine represented, the shuttle A, which is arranged above the work, is supported with its axis in a vertical position parallel with the line of motion of the hooked needle C, in a stationary pendent bracket-holder, B B′, formed upon or secured to the head of the framing D of the machine, behind the needle-box D′. Above the shuttle thus arranged, and concentric with it, is a vertical spindle, E, which drives it, the said spindle being fitted to suitable bearings in the framing, and furnished at its upper end with a toothed pinion, F, which gears with a toothed sector, G′, on the front end of a horizontal lever, G, which works on a fulcrum-pin, *a*, on the top of the framing, and the rear end of which is furnished with a bowl working in a groove in a cam, A′, on the upright rotating main shaft H of the sewing-machine. This shaft H also carries a cam, F′, for working the needle-slide I, a cam, J′, for working the loop-opener J, a cam, K′, for working the feed-lever K, and a cam, L′, for working the thread-whirl L.

The general form of the shuttle A is that of a short cylinder, or of a frustum of a cone of very slight taper, having on one side a nose, *b*, projecting from the body a little outside of the circle of its periphery, and a recess, *c*, inside of the said nose, which combines with the nose to form a hook, and which is rounded off at *n*, on the side opposite the nose, to form a heel. It has a thread-cavity, *g*, to contain a cop or bobbin, *h*, such cavity being preferably somewhat eccentric to the outer periphery of the body, in order that it may be made as large as the shuttle will admit of, and thereby be capable of containing as large a cop or bobbin as possible. The nose is so formed and tapered that its point is the highest part, or at least as high as any other part of the shuttle. In the upper side of the nose there is a groove, *e*, shown in Figs. 7 and 8, the outer face of which is concentric with the circular periphery. When the shuttle is arranged above the work, as represented, its thread passes out through an eye in its under side.

The shuttle-holder B B′ is composed of an upper fork, B′, and a lower fork, B, the spaces included between the prongs of the said forks being made of true circular form, and the opening left between the points of each, opposite the needle, being so much less than half of its circle that the shuttle is securely retained in place therein, with its nose projecting between the upper and lower forks. The lower fork is made with a seat, *d*, in the lower part of its circular interior for the bottom edge of the shuttle to sit in. The lower face of the

upper fork is made with a rabbet, as shown in Figs. 6 and 7, or otherwise so shaped in its transverse section as to enter the concentric groove *e* in the upper face of the shuttle, so that the shuttle, when in place, is supported in the lower fork, and is held upright not only by fitting within the upper fork, but by the bearing e^2, provided, as shown in Figs. 6 and 7, on the outside of the fork, for the outer concentric bearing-surface e^1 of the groove *e*, inside of the shuttle-nose, the bearing e^2 on the outside of the fork helping especially to sustain the shuttle against the lateral pull to which it is subject in spreading the loop of the needle-thread. The lower fork B′ is made movable up and down, to provide for taking out and replacing the shuttle by slackening the screw-bolt *f*, which attaches it to the framing D.

The shuttle-driver consists of a pair of vertical pins, *i i*, which are free to slide through a carrier plate or block. E^2, which is fast on the lower end of the spindle E above the shuttle, and which are supported by a stationary cam, E^1, which is secured to the head of the frame of the machine, and through which the spindle E passes, the said cam having in its periphery a groove which forms a race for the upper ends of the said pins *i i* to travel in, while they have a rotary motion given to them in opposite directions alternately, as the spindle E receives such a motion through the pinion F, sector G′, lever G, and cam A′. The lower ends of these driving-pins *i i* are caused by the cam to project into holes or recesses in the upper face of the shuttle, and to rise alternately out of contact with the shuttle, to permit the passage of the loop of the needle-thread under them. The movement thus given to the shuttle is a little less than a complete revolution in each direction.

The loop-opener J, by which the loop of the needle-thread is opened for the entrance of the nose of the shuttle, and which retains the loop during its passage over the shuttle, consists of a pointed instrument of slightly-curved form, as shown in Figs. 3 and 8, with a notch, *j*, near its point on that side which is farthest from the shuttle. This loop-opener, which has a reciprocating motion between the path of the needle and the shuttle, is carried by one arm, J^2, of a horizontal rock-shaft, J^4, which works in suitable bearings on one side of the machine-frame, and another arm, J^3, of which is furnished with a wrist, which enters the groove of the cam J^1, by which the necessary motion is given to the loop-opener.

The combined operations of the shuttle, the loop-opener and the hooked needle are as follows: When the needle, moving upward, draws up its thread in the form of a loop from the whirl or thread-carrier L, and through the work, and during the latter portion of such upward movement, the loop-opener J enters the loop, but does not enter it far enough to expand it wider than the needle-throat, and therefore does not strain it. As the needle commences its downward movement, and thus relieves the loop of tension, the loop-opener continues advancing into the loop, and spreads it open, at the same time slightly rising within it to retain it, and pressing it slightly away from the needle, so that it may be easily liberated from the hook thereof by the continued descent of the latter. The loop is thus left upon the loop-opener in a condition and position to be entered by the shuttle, which, at the time of the transfer of the loop from the needle to the loop-opener, has been stationary at the end of its backward movement, with its point at the left-hand side of the vertical opening between the ends of the forks of the shuttle-holder, as shown by Fig. 3. The shuttle then commences its forward movement, and its nose passes into the loop, the back side of which then passes into the recess *c*. As the forward movement of the shuttle proceeds it carries round over it the back side of the loop, which is thus passed more than half-way over it, while the front side is retained by the notch *j* of the loop-opener. As the shuttle is completing its forward movement, the loop, having passed more than half-way over it, becomes slack, and the loop-opener retires from it, and by the time the said movement is completed the loop is left on the heel *n′* of the shuttle, which then remains stationary while the needle completes its downstroke, and makes such portion of its return-stroke as is sufficient for it to draw up the new loop so far as to pull the loop first mentioned over the heel of the shuttle. The return or backward movement of the shuttle is almost entirely made during the remaining portion of the ascent of the needle, being completed just as the needle commences its next descent. During the whole operation of the passage of the shuttle through the loop the shuttle remains firm and solid, in positive bearing-contact with the holder, not having to be raised therefrom by the loop, or to permit the passage of the loop over or around it, as the loop never passes between the exterior of the shuttle and the supporting-surfaces of the holder, that side of the loop which is carried over the shuttle entering the hook of the shuttle, and passing over the heel thereof, through the vertical opening left between the points of the prongs of the forks B B′ of the holder; and hence waxed thread may be used without liability of accumulation of wax on the shuttle-supporting surfaces.

By making the shuttle and its bearing in the forks B slightly conical, and arranging the smaller part of the shuttle downward, as represented in the drawings, the wear of the shuttle and its bearings is prevented from changing the proper relation between the shuttle and the needle, for if the shuttle should wear it will always maintain the same axial position, and, its axis being parallel with the path of the needle, its nose will always remain equally near the path of the needle.

The shuttle and its holder, thus constructed, may be employed above the work, or with the work between it and the work-supporting de-

vice, whether such device be a post, as represented in the drawing, a table, or a horn.

It will be seen that I have represented the shuttle, thus constructed and supported, in combination with a work-supporting post, M, containing a rotary whirl or thread-carrier, L, having an upright axis, and, therefore, the axis of the shuttle is not only parallel with the path of the needle, but also with the axis of the thread-carrier or whirl.

The whirl or thread-carrier L represented, through which the needle-thread is supplied, and by which the said thread is laid into the hook of the needle, is made in the form of a long spindle, which reaches up to near the top of the work-supporting post M, and extends down through the whole depth or height of the post, and down through the bottom thereof. The said spindle has a bearing at *m* in the upper part of the post M and a bearing at *m'* at the bottom thereof, and has on its lower part a pinion, *k*, which gears directly with a toothed sector, *l*, on one end of the horizontal lever L^2, which receives motion on a fixed fulcrum, *l'*, from the cam L' on the main shaft. By thus extending the whirl downward through the post in spindle form, and putting the pinion *k* on the lower part of it, I am enabled to drive it directly by the sector without the intermediate gearing heretofore employed for driving the whirl. It is not necessary, although it may be preferable, in order thus to dispense with the intermediate gearing, that the spindle should extend right through the bottom of the post, as the pinion *k* might be inside of the post, and there might be an opening in the side or back of the post to permit the sector *l* to gear with the pinion within the post. This construction and method of driving the whirl, by getting rid of gearing in the upper part of the post, enables the top of the post, which constitutes the bearing for the work, to be made very small, so as to afford the greatest facility for the easy manipulation of the work upon and around it. The top surface of the post must, of course, be long enough in the direction of the feed to give a proper length of support to the work in that direction; but in the transverse direction it needs to be, for many of the various operations of boot and shoe making, only wide enough to contain the hole for the passage of the needle and thread.

By rounding off the upper end of the spindle and forming a cavity in the post between its head and the top of the whirl, as shown at *n* in Figs. 4 and 5, the post may be so much tapered and thinned toward the top as to leave a sharp edge at the tip of its head, as shown in Fig. 5.

In thus reducing the upper part of the post I remove the metal altogether from those opposite sides of the cavity *n* on the broader sides of the post, so as to form lateral openings *v*, as shown in Figs. 3, 4, and 5, and leave an open bridge elevated above the whirl. The lateral openings *v* of this bridge afford such free play for the thread between the whirl and the head or tip of the post as could not be afforded if the post were equally contracted without such openings.

The feed-lever K, which is also the presser, is shown in Figs. 1, 5, and 5* as constructed with an angular recess, *r s*, in its end. One face, *r*, of said recess being horizontal or nearly so, to constitute the pressing-surface, is to press upon the work over or above the work-supporting surface, and the other face, *s*, which is serrated, toothed, or roughened, being arranged at an angle to the pressing-surface, that it may present itself at an angle to the work-supporting surface, and so act against one edge of the work or material being sewed to make what may be termed a "side feed," while the pressing-surface presses upon the face. The feeder and presser, thus constructed, also allow the material being sewed to be bent over one edge of the post or other work-supporting surface, as shown in Fig. 5, in which *o* and *p* indicate two pieces of material which are being sewed together; and in that case the pressing-face *r* holds down the material upon the post, while the feeding-face *s* operates against the portion of the material which is bent over the side of the post. The pressing-face *r* may be arranged at a sufficient inclination as to hold and press the work obliquely against the opposite side of the post to that on which the feeding-surface acts, and thereby permit the needle to pass through the work in a direction oblique to the general surface of the latter.

The lever K is represented as occupying a horizontal position, and in order to enable it to have a vertical movement to raise the presser from the work, and bring it down thereon, and a horizontal movement to produce the feed, it has two fulcrums, viz: one consisting of a horizontal pin, *w*, Fig. 1, which is secured in the head of a vertical pin, *t*, which constitutes the other fulcrum, and which works in a suitable bearing, *u*, provided on the frame. The cam K^1 has two faces, one to produce the vertical, and the other to produce the horizontal, motion, and the lever has applied to it two springs, viz: one, K^2, to produce the downward pressure, and another, K^3, to produce its horizontal return movement after feeding. It has also applied to it a cam, K^4, with a handle, K^5, to lift it by hand to permit the introduction and removal of the work to and from the machine.

I claim—

1. The combination of the reciprocating rotary shuttle, and a forked shuttle-holder within which the said shuttle works, provided with a bearing, *e*, outside of the fork, and a corresponding bearing-surface, *e'*, provided inside of the shuttle-nose, substantially as and for the purpose herein described.

2. The combination, with the reciprocating rotary shuttle, of the rotary spindle E, carry-

ing-block E^2, pins *i i*, cam E^1, pinion F, toothed sector G′, lever G, and cam A′, substantially as and for the purpose herein set forth.

3. The combination of a reciprocating rotary shuttle and a hooked needle, both arranged above the support on the upper surface of which the material to be sewed is placed, and mechanism for supplying thread to the said needle arranged below the said support, substantially as herein described.

4. The combination of a reciprocating rotary shuttle and a hooked needle, both arranged above the support on the upper side of which the material to be sewed is supported, mechanism for supplying thread to the said needle below said support, and a loop-opener for opening, spreading, and holding said loop, substantially as herein described.

5. The combination of a hooked needle, mechanism for delivering thread to the same, and a reciprocating rotary shuttle, the axis of rotation of which is parallel or approximately so with the path of the needle and with the axis of the whirl, substantially as herein described.

6. The combination, with a rotary whirl for laying the thread into the hook of the needle, of a work-supporting device containing said whirl, and having its upper part or head raised above the whirl, tapered on two opposite sides, and leaving openings *v v* therein, whereby the said head is made to present a narrow open bridge, substantially as and for the purpose herein specified.

JOHN KEATS.

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