3 Sheets—Sheet 1.

M. J. STEIN.

Sewing Machine for Sewing Boots and Shoes.

No. 113,593. Patented April 11, 1871.

Fig. 2

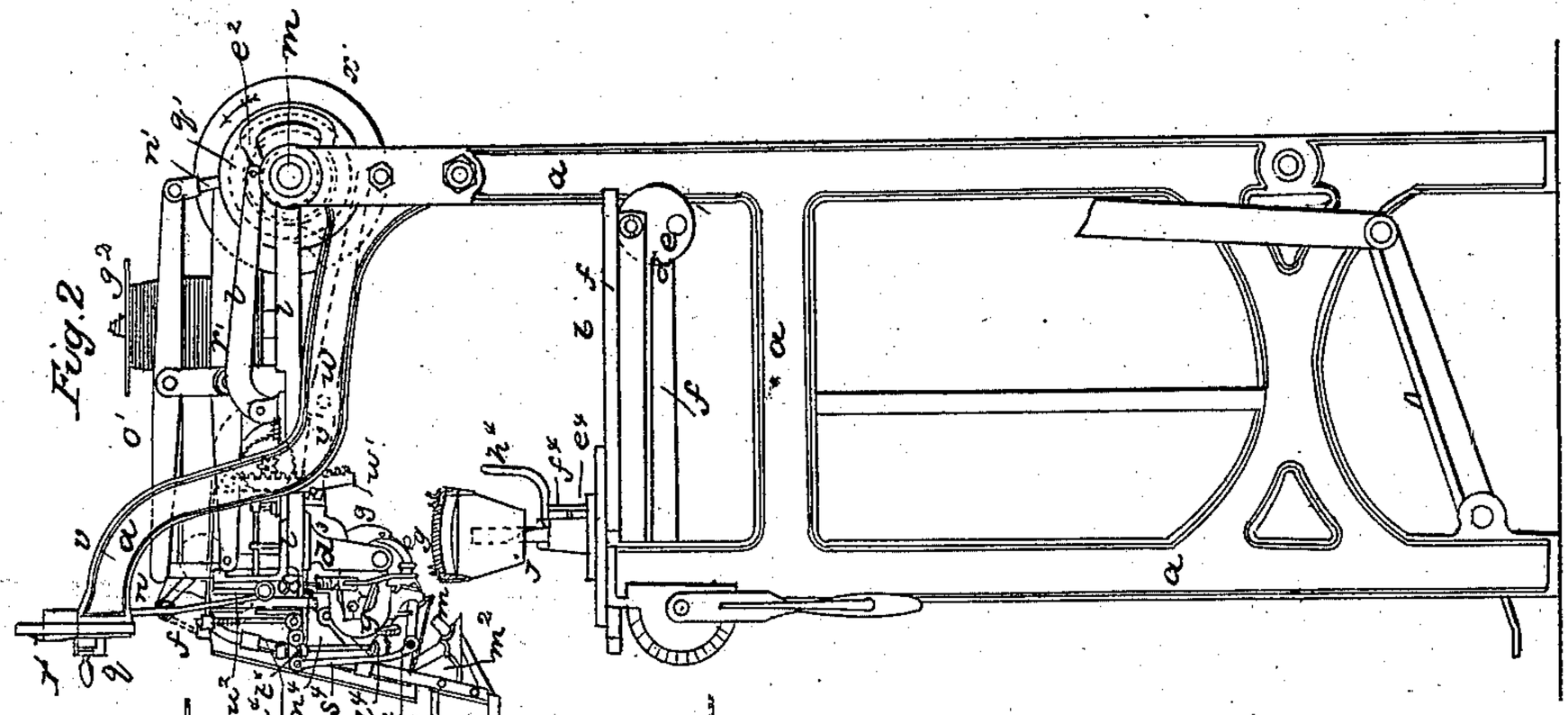


Fig. 9

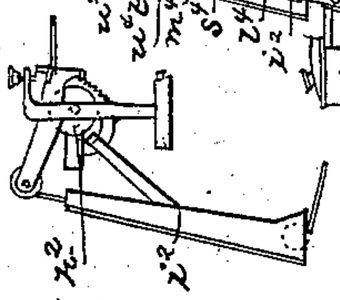


Fig. 10

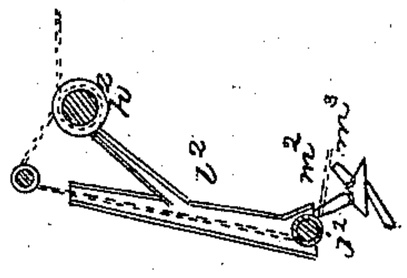
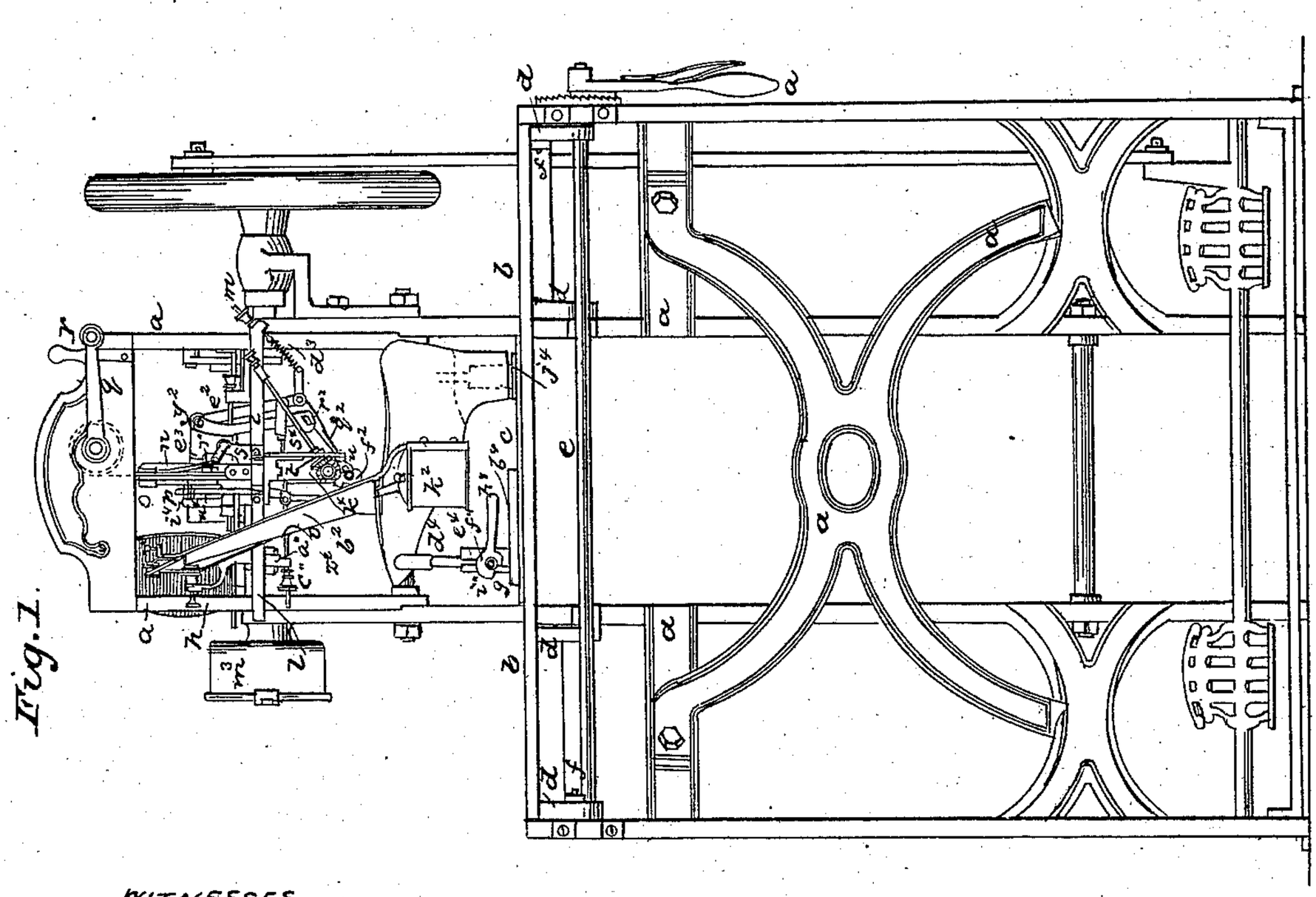


Fig. 1.



WITNESSES

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M. J. STEIN.

Sewing Machine for Sewing Boots and Shoes.

No. 113,593. Patented April 11, 1871.

Fig. 3

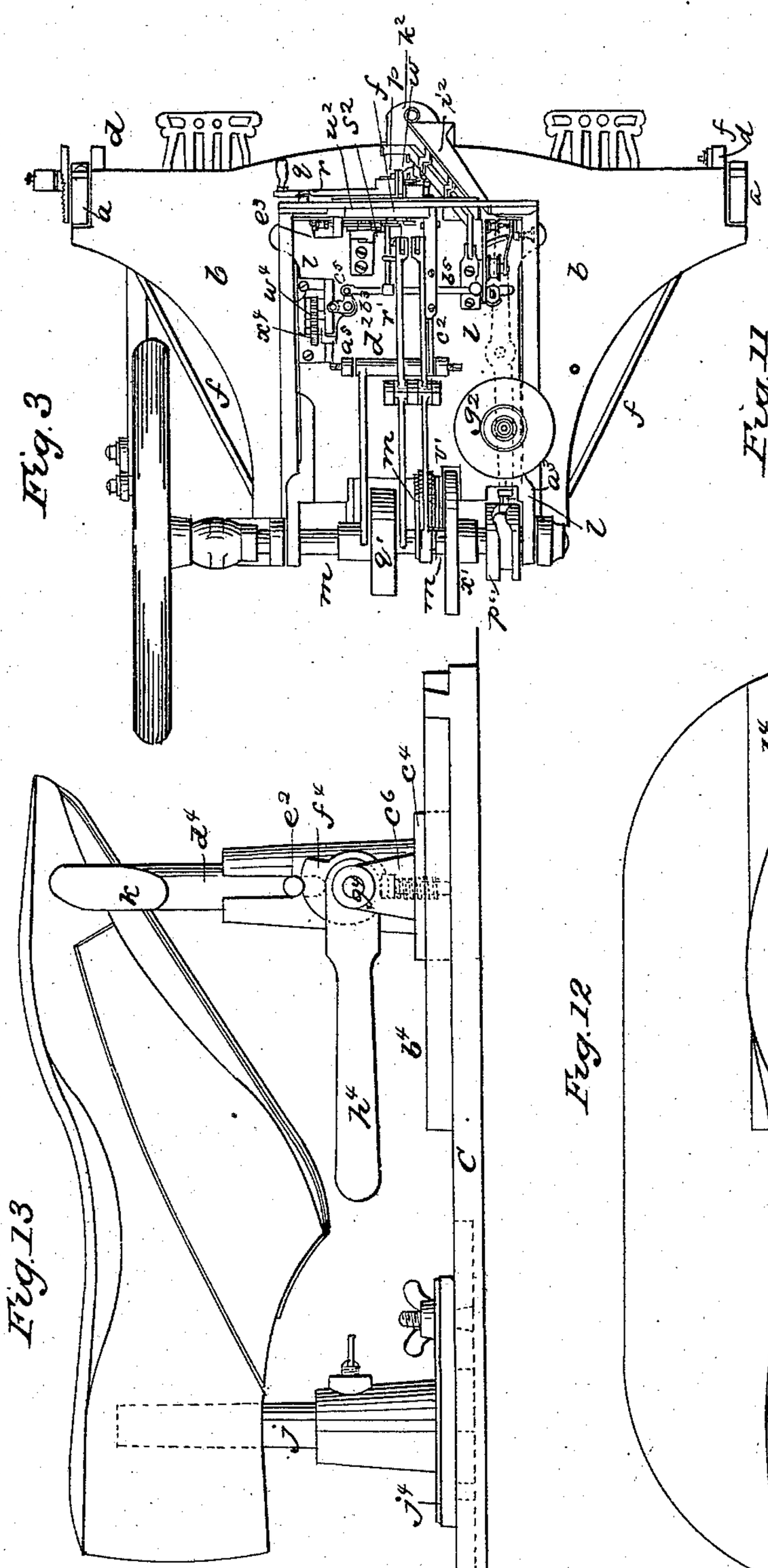


Fig. 11

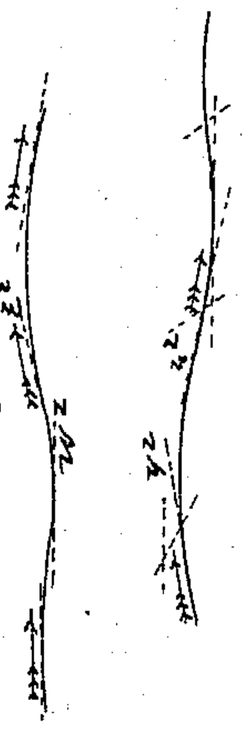
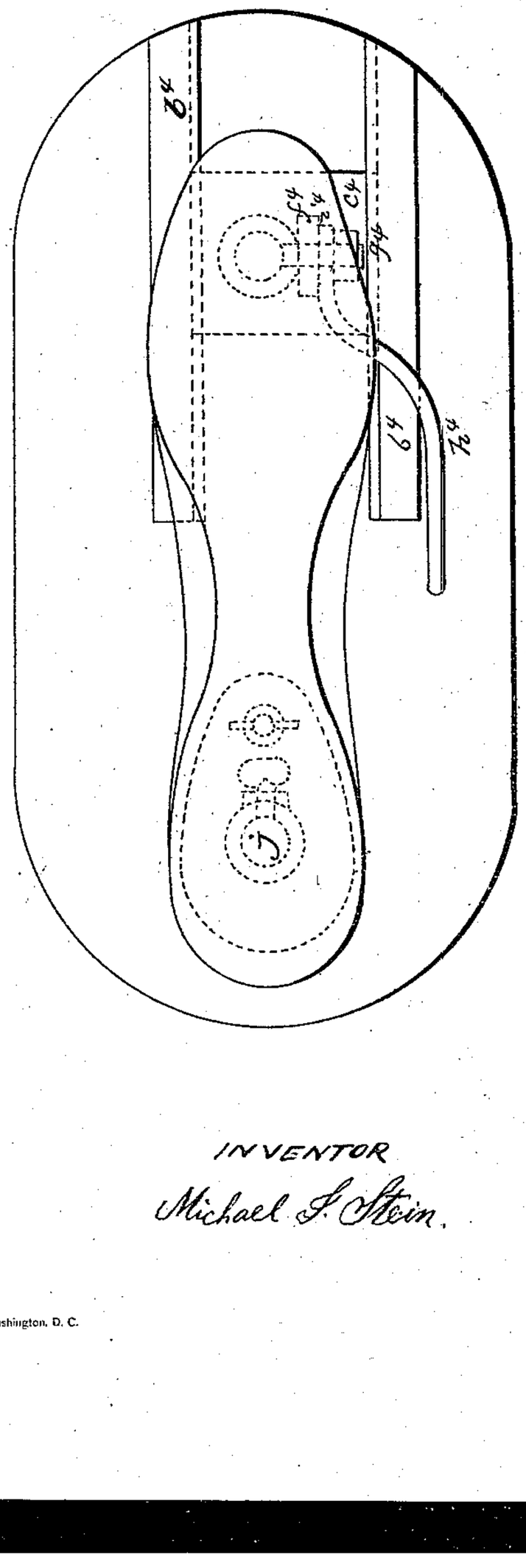


Fig. 13

Fig. 12



WITNESSES

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3 Sheets—Sheet 3.

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Sewing Machine for Sewing Boots and Shoes.

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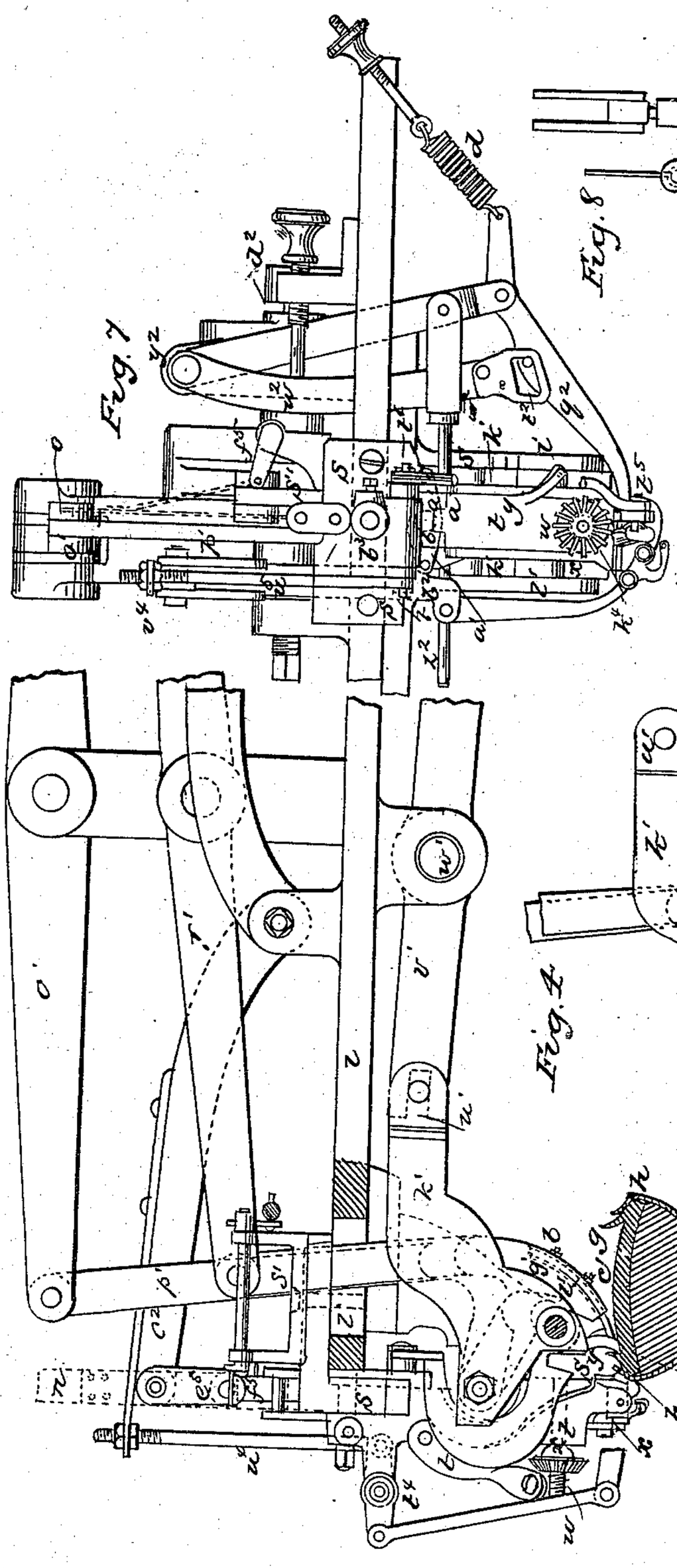

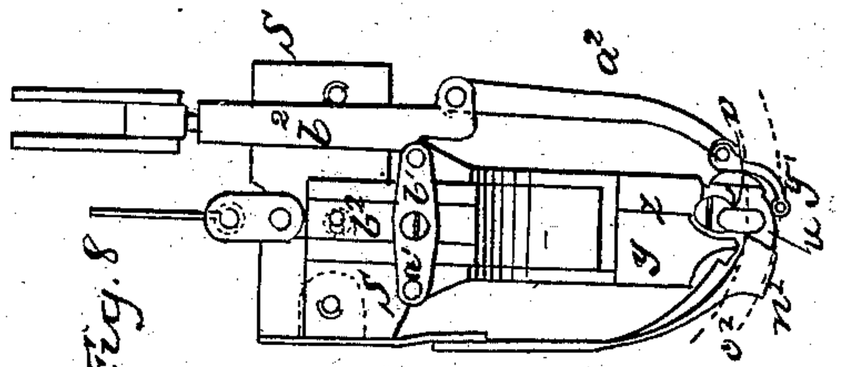

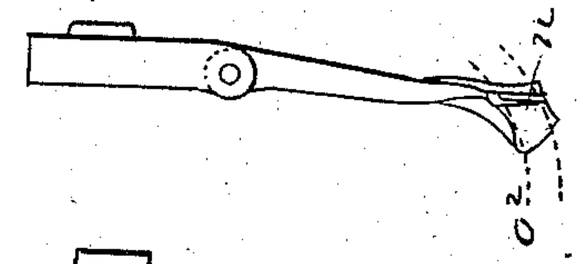

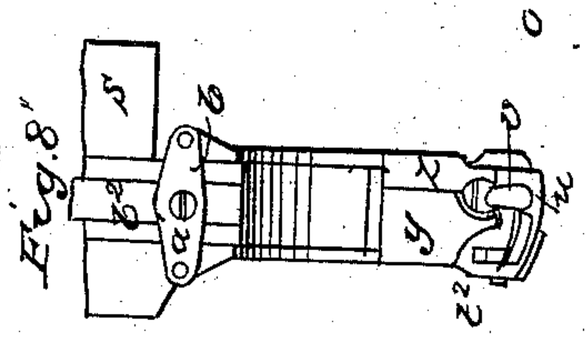

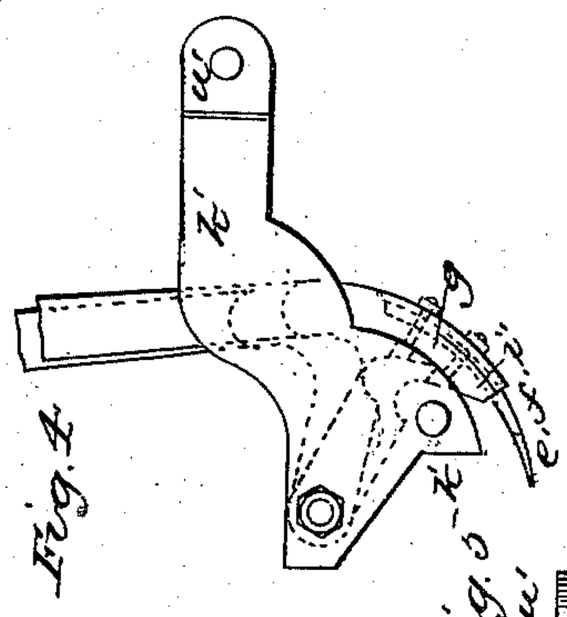

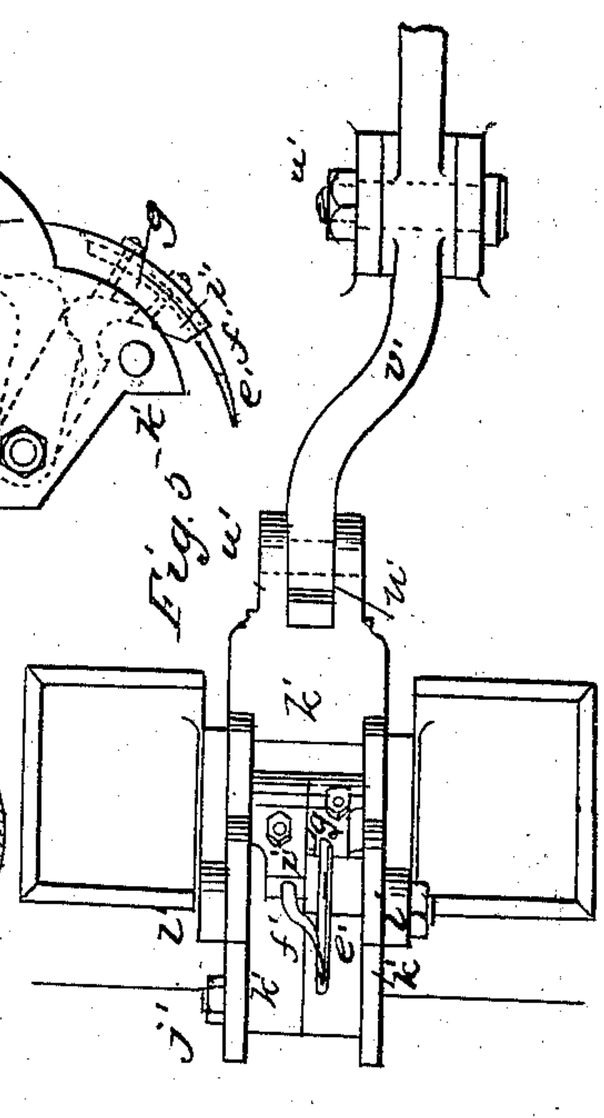

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Fred Hayden

INVENTOR
Michael J. Stein

UNITED STATES PATENT OFFICE.

MICHAEL J. STEIN, OF NEW YORK, N. Y.

IMPROVEMENT IN SEWING BOOTS AND SHOES.

Specification forming part of Letters Patent No. **113,593**, dated April 11, 1871.

To all whom it may concern:

Be it known that I, MICHAEL J. STEIN, of the city, county, and State of New York, have invented certain new and useful Improvements in Machinery for Sewing the Uppers to the Soles of Shoes and Boots, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a front elevation of a machine for sewing the uppers to the soles of shoes and boots, having my improvements applied to it; Fig. 2, a side elevation thereof; Fig. 3, a top view of the same. Figs. 4 and 5 are side and bottom views of the needle and cast-off, with their stocks connected. Figs. 6, 7, and 8 represent side, front, and back elevations of the rests for guiding the needle, shown in connection with the guide and the stock by which they are connected with the sewing mechanism. Figs. 9 and 10 are an elevation and section of a flue and thread-guides used in the machine; Fig. 11, a diagram showing the curve of the sole on which the rests act; and Figs. 12 and 13, a plan and side elevation of the last-holder.

The same letters of reference indicate like parts in all the figures.

My said invention relates to improvements on machinery for sewing the uppers to the soles of shoes and boots.

The invention consists, first, in certain means for securing the last to the carriage, consisting in a combination of the crutch, its base-block, made adjustable in ways on the carriage, and mechanism for operating the crutch and securing its base-block in any desired position on the carriage to suit lasts of different sizes. Secondly, the invention consists in a combination with these devices of a pin made to enter a hole in the last, and having its base adjustable longitudinally on the carriage for different lengths of last. Thirdly, the invention consists, in combination with the guide for directing the edge of the sole, and holding the upper in position, in certain means whereby the operator is enabled to adjust its position with the thumb and finger, while his hand rests upon the movable plate, to which the sewing mechanism is attached. Fourthly, the invention embraces, in combination with a self-adapting plate, to which the sewing mechanism is attached, certain mechanism for holding the said plate in a fixed position at the time the needle enters the sole, and for liberating it, so that it may be self-adapting to the undulations of the sole during the feeding motion. Fifthly, the invention consists in so suspending the self-adapting rests as that they may be made conjointly adjustable, in such manner as that they may be set higher or lower, to adapt them to lasts of different sizes and curvatures.

Referring to the accompanying drawing, *a* represents a suitable frame, and *b* a movable table, on which the last-holder rests and moves. This table is flat and fitted to slide up and down on the vertical posts of the frame, and rests on four eccentric rollers, *d*, arranged in pairs on parallel shafts *e*, and coupled by joint-links *f*, so that by turning the one shaft the several eccentrics operate in unison to set the table higher or lower, to suit shoes and lasts of different sizes, as also lasts of different curvature on the surface of the sole, and whereby—that is, by the adjustment of the table relatively to the sewing mechanism—the needle, in working on lasts of different curvatures and heights, is made to enter the leather of the sole at the bottom of the inner channel *g*, (see Fig. 6,) and come out at the angle of the outer channel *h*, or, where the leather is not prepared with an outer channel so that the needle will come out at a proper and like distance from the outer edge of the sole. The last-holder *c* is a carriage, which rests on the surface of the table *b*, so as to slide thereon in any direction required. There is a hole made in the upper part of the last to fit a perpendicular stud, *j*. This pin *j* is fitted to and secured in a socket in an adjustable base, j^4, by a set-screw; but it may be permanently secured. The base j^4 is fitted to the surface of the carriage, so that it can be shifted and secured at a different distance from the end to suit large and small lasts. Toward the other end the carriage is provided with ways b^4, in which a base-block, c^4, can slide toward or from the pin *j*. A crutch, *k*, of a suitable shape to bear up against the inverted instep of the last, is formed with a cylindrical stem, d^4, fitted to slide up and down in a socket in the base block c^4, and a projection, e^4, from the side of

this stem bears on the periphery of a cam; f^4, on a short arbor, g^4, mounted in the base-block, and provided with a handle, h^4, so that the operator, by turning the arbor, causes the cam f^4 to lift the crutch, and thus force it up against the instep of the last; and as the last is fitted onto the pin j, before described, the last, by so forcing the toe end, becomes firmly secured to the carriage. To secure the base-block of the crutch at any desired distance from the pin j there is another cam, i^4, on the arbor g^4, which acts on the upper end of a spring-clip, c^6, (see Fig. 13,) to force it down into contact with the upper surface of the carriage; and the form of the two cams f^4 and i^4 and their position on the arbor should be such that by the turning of the arbor g^4 the base-block is first secured in position before the crutch k is forced up against the instep of the last. The sewing mechanism is mounted on a plate, l, the rear part of which is free to vibrate on the cam-shaft m, which is to be rotated in the direction of the arrow. The forward end of this plate is guided in its movements up and down by the vertical side pieces of the frame, and it is suspended by a strap, n, (shown, also, by red lines in Figs. 6 and 7,) to the periphery of a wheel, o, (see dotted lines in Fig. 1,) on a short shaft, p, provided with a crank-handle, q, which is held by a spring-catch, r, when the mechanism is to be held up, or when a shoe is to be removed and another substituted; but after a shoe and last-holder are put into the machine the spring-catch r is pushed back to liberate the crank-handle q, and permit the mechanism to rest by its weight on the sole of the boot or shoe to be sewed, that it may be free to follow the undulations thereof.

A metal stock, s, Figs. 6, 7, and 8, is firmly secured to the plate l, and formed to extend below said plate. To the front of this stock is hinged the upper end of an arm, t, the inner face of the lower end of which forms the gage u, against which the edge of the sole and margin of the upper of the shoe to be sewed is pressed, to guide it relatively to the needle as it is moved along by the feeder. (See Fig. 6.) Said guide has a perforation, v, in it for the point of the needle to pass through, and another hole for the passage of a threaded stem, w, which projects from the stock s, and which is provided with a nut, x, by means of which the said gage can be adjusted relatively to a rest, y, to be presently described, to suit the distance between the bottom of the channel g and the outer edge of the sole. This adjustment can be effected by turning the nut x with the fingers, but preferably by means of a bevel-wheel, k^4, on the body of the nut, and a like bevel-wheel, l^4, on a short arbor, m^4, provided with a thumb-and-finger wheel, n^4, said arbor being mounted in suitable bearings projecting from the front edge of the plate l, and in an inclined position, so that the thumb-and-finger wheel will be in a convenient position to be operated by the attendant while he rests his hand on the corner of the plate l, to insure its proper movements up and down as the guides follow the undulations of the sole. There are two rests, y and z, fitted to slide, one on each side of the said stock s. They are hinged at their upper ends to a cross balance-lever, a^1, that is free to vibrate on a fulcrum-pin, b^1, secured to a vertical slide, b^2, fitted in the stock s, so that when either of the rests rises or descends the other must move to an equal extent in the opposite direction. The lower ends of these rests are formed to bear on the sole c^1 (see Fig. 6) of the shoe, so that it can slide under them, and, as they rest on the sole, and are borne down by the weight of the plate l and mechanism carried by it, assisted, if necessary, by the hand of the operator, or by a spring or additional weight, they can adapt themselves to the undulations of the sole; and as the needle works midway between the two, and in the plane of their under surfaces in every position in the sole they are made to assume, they effectually guide the needle, so that it shall at all times be at the required elevation to enter the leather of the sole at the right place, which, in case of the sole having double channels, is the bottom of the inner channel g. The slide b^2, that carries the balance-lever a^1, to which said rests are hinged, is raised or lowered by turning an eccentric wrist-pin, b^3, or by any other suitable means, whereby the rests are set higher or lower, to adapt them to lasts of different sizes and curvatures.

If both guides or rests were formed like the one y, to enter, and, with their beveled edges, to bear against the bottom of the inner channel g of the sole, and to perform, in addition to the duty above described, the further offices of keeping the channel open, and of resisting the pull of the needle in tightening the stitch during its back movement, they would present the following difficulties: To admit of sewing around the usual curves at the heel and toe, the two rests require to be within a short distance of each other, for, if placed too far apart, the curved parts of the sole could not pass between them and the gage, and, when placed within a practical distance to avoid this difficulty, the one on the off side conflicts with the loop of thread which connects the last-formed stitch with the one which is being formed. Two such instruments are indispensable to the guiding of the needle, that its point may enter at the bottom of the channel in following the undulations of the sole. To meet all necessary requirements, therefore, they are so formed and located that one of them, y, fits into and bears against the bottom of the channel g, and the other one, z, on the off side stands back some distance from the bottom of the channel, but so that it shall rest on the surface of the sole. In this way it is made to answer the purpose of a balance to the one which rests against the bottom of the channel, that the point of the needle may be properly guided along to fol-

low the undulations of the sole, while at the same time it avoids all conflict with the loop of thread, and admits of sewing along any curve, however small, and even around an angle, as in sewing square-toed shoes.

The needle e^1 has a hook near its point, and is of a curved and tapering character, so that it operates as an awl to pierce the leather, as well as a device to carry the thread or loop through the same in its return stroke or action. Its tapering or eccentric form has many advantages. It is made flat on the side of the cast-off f^1, and the latter is made of like form, so that the faces of the two may work in contact, but without any interlocking tongue and groove, so that on tightening the stitch the needle may spring independently of the cast-off. The said cast-off is pointed, so that when it advances to cover the hook of the needle it may enter the leather easily, to close the hook before it, (the hook,) on the back motion of the needle, reaches the loop which is to be cast off; and as this loop is at the time lying on the surface of the sole, and below the needle and cast-off, it is important that the cast-off should be brought to a point from the under side; otherwise, in advancing to close the hook of the needle its point would be liable to catch onto the thread of the loop, particularly in sewing along the up-grade, as on one side along the shank of the sole from the heel part forward, where the surface of the sole inclines upward. The stocks g^1 i^1 of the needle and cast-off are both mounted on a fulcrum-pin, j^1, so as to vibrate thereon, the inner faces of both being concentric with this fulcrum-pin, and their outer surfaces eccentric thereto, while their contiguous faces move in contact. The two stocks g^1 i^1 are secured in a recess in one arm of a bent lever, k^1, and connected therewith by the fulcrum-pin j^1, and this lever k^1 is mounted on two hangers, l^1 l^1, the axis of vibration being back of the fulcrum-pin j^1, and a little below the horizontal plane thereof, for a purpose to be presently described.

The in-and-out motions of the needle are derived from an eccentric, m^1, on the shaft m. The rod n^1 (see Fig. 2) from the eccentric is connected with the needle-stock g^1 by a lever, o^1, and connecting-rod p'. The motions of the cast-off are derived from a cam-groove, q^1, Fig. 2, on the same shaft, which cam acts on one arm of a lever, r^1, the other arm of which is connected with the stock i^1 of the cast-off by means of a connecting rod, s^1. The periods of the relative motions of the needle and the cast-off are such that the needle advances a certain distance while the cast-off stands still to allow the loop to get out of the needle-hook, and then the cast-off follows the needle in its forward motion, to get between the loop so liberated and the hook, and that its point may enter the leather a short distance and there stop; the needle, in its continued forward motion, then passes through the leather until its hook is carried sufficiently through the material and the hole v in the outside gage u to receive the thread, which is delivered into the hook by the thread-carrier. The needle then moves back, drawing the thread through the material, and as soon as the hook is covered by the cast-off the two move together to the end of the back motion.

The new loop of thread being inclosed by the cast-off in the hook of the needle, it is drawn through the previously-formed loop, which, by the continued back motion, is drawn up to tighten the previously-formed stitch. As the needle enters, and for a portion of its passage through the leather, its point has a depressing motion given it, and for the balance of its forward stroke is lifted, and remains raised during its return. This is effected by hinging the rear arm w^1 of the bent lever k^1 to the short arm of a lever, v^1, Fig. 6, that works on a fulcrum-pin, w^1, and the other arm is provided with a pin, fitted to a cam groove (see dotted black lines in Fig. 2) in the face of a cam-wheel, x^1, on the shaft m, (see Fig. 2,) whereby the fulcrum-pin on which the stocks of the needle and cast-off vibrate is elevated and depressed as required.

The thread f^2 passes through an eye in the thread-carrier y^1, which vibrates on a fulcrum, z^1, on the gage u, through which the thread also passes, said carrier serving to carry the thread so that it may be caught by the hook of the needle, to do which the carrier is vibrated to pass from one side of the needle under it, and around to the other side a short distance above the needle as the latter is advancing, after which it moves back again. This is done by connecting the carrier, through a rod, a^2, with a vertical slide, b^2, the upper end of which is connected, by two joint-links, with one arm, c^2, of a rock-shaft, d^2, which has another arm with a pin fitted to a cam-groove, e^2, in the cam-wheel q^1 on the cam-shaft before described.

The thread f^2 from a spool, g^2, mounted on the plate l, passes around a tension-wheel, h^2, and down through a flue, i^2, attached to the plate l, and around another guide, j^2, at the lower end of this flue, and from this to and through the eye of the thread-carrier. The front plate of this flue i^2 is hinged to give access to the thread. To the lower end of this flue is suspended a lamp, k^2, with a conical cap, l^2, over the burner, said cap having two branch pipes, m^2—one to direct the heat into the flue i^2, to gradually heat the wax on the thread as it is descending, and the other to direct the heat to the eye of the thread-carrier y^1, to prevent the wax from clogging said eye.

To adapt the machine to the sewing of welted shoes or boots there is combined with the sewing mechanism a welt-guide, n^2, (see Fig. 8,) which consists of a mortise of sufficient size to receive and permit the welt o^2 to pass through. The arm of this guide is placed by the side of the sewing mechanism, near to the needle. It is hinged, by its upper end, to the stock s, so as to be self-adapting in position.

After the welt has been introduced and the first stitch taken, the strip of welt will be drawn through the guide-mortise as wanted by the feeding motion applied to the sole. As it is hinged to the machine, when the machine is used for sewing turned shoes it is turned up out of the way.

To adapt the feed to the undulations of the sole, so as to preserve a uniformity in the stitches, the feeding-pawl q^2 (see Fig. 7) is provided with side pins r^2 not far from where the pawl is hinged to the lever s^2, from which it receives its reciprocating motion. These pins work in cam-like slots t^2 in the lower end of a hanger, w^2, the slots being of such form that when the pawl acts on an upward inclination, as at v^2, Fig. 11, it will act on the sole through the whole throw of its operating-lever. When it acts on a level part of the sole, as at w^2, in moving back and forth, the pins ride part of the way on the lower part of the cam-slot, so that the acting part of the pawl clears the sole for a part of the throw of the lever, and after the required range of lost motion has been attained the pawl then acts on the sole, and continues so to act, giving the required extent of motion to space the stitch; and in acting on a reversed inclined surface, as at x^2, during the back and forward motions, the pins ride on the bottom of the slot for a greater portion of the throw of the lever, that there may be more lost motion. In this way are the stitches spaced equally along the whole of the undulating surface of the sole. The upper end of the lever s^2, which actuates the feeding-pawl, is hinged to a standard, y^2, of the plate l, and this lever is connected by a rod, z^2, with one arm of a lever, a^3, Fig. 1, which vibrates horizontally on a fulcrum-pin attached to the under side of the plate l, the other arm of the said lever being acted upon by a cam-groove, b^3, (see Fig. 3,) on the shaft m; and as this lever receives at all times an equal range of motion, and it is desirable at times to vary the spacing of the stitches, the rod z^2 is made to pass through a hole in the lever a^3, and is provided with an adjusting-nut, c^3, so that the lever a^3 gives the feeding motion to the pawl by striking the nut c^3 on the rod z^2, (see Fig. 1,) and the feeding-pawl is drawn back by a spring, d^3, so that the range of feeding motion can be regulated by the set of the nut c^3. To adjust the position of the feeding-pawl relatively to the cam-slots t^2, so that the range of lost motion, and the position of the point of the pawl relatively to the rest, may be adjusted, the said cam-slots are formed in the lower end of the hanger w^2, which is hinged by its upper end to the same standard, y^2, to which the lever s^2 is hinged, and that end of the connecting-rod z^2 which is hinged to the lever s^2 is slotted to embrace the hanger w^2. Back of the hanger w^2 is a set-screw, e^3, (see Fig. 7,) which acts as a stop to the back motion of the hanger. When the spring d^3 pulls back the feeding-hand the hanger w^2 is drawn back at the same time by the back of the cam-slot striking the pin r^2 on the pawl until stopped by the set-screw e^3, so that the range of the lost motion of the feeding-pawl can be adjusted by one set-screw, and the range of direct motion adjusted by the nut c^3.

On the back movement of the needle and the tightening of the stitch, the tendency is to lift the edge of the sole, and, if so lifted, the needle, in making its next penetration in passing through the leather, would come out too near that surface of the sole next to the last; and when the needle has passed through the sole, and comes in contact with that portion of the upper through which the stitching is to be made, the point of the needle pushes it back against the outside gage.

From this it follows that the needle passes through the upper so near to the outer edge of the sole that on the back motion of the needle, in drawing the stitch, the upper cannot be drawn into the angle of the outer channel h without too great a strain on the parts. To avoid these difficulties I employ what may be termed a "depressor and holder," which may be simply a short lever, r^4, (see Fig. 8*,) that vibrates on a fulcrum-pin, t^5, in the lower part of the arm t, and so formed that its acting end, when depressed, will bear on, and not only depress the edge of the sole in close proximity to the needle, and just before the needle advances, and hold it down until the needle has completed its back motion, but also forces and holds the upper in the channel-way in the position required when sewed, so that when the stitches are drawn tight the upper will not be strained.

The outer end of this depressor and holder is connected by a joint-link, s^4, to one arm of a rock-shaft, t^4, the other arm of which is connected by another link, u^4, with a spring, v^4, attached to the arm c^2 of the rock-shaft d^2, so that the required motions are derived therefrom, and the sole purpose of interposing the spring is that it may yield, instead of breaking or straining the parts, if at any time there should be some impediment.

As pressure is made against the sole to keep it down, and all the sewing mechanism is attached to the plate l, which rides on the sole, there is a tendency to lift the plate. It is important to prevent this tendency to lift before and at the time the needle is entering the leather; otherwise the needle will be liable to enter the leather at too high a point. To prevent this I lock the plate l just before the depressor and holder makes pressure on the edge of the sole. The special mechanism to effect this important result consists of a segment-rack, w^4, permanently attached to the frame, and extending down through a mortise in the plate l, and the cogs of this rack engage the cogs of a pinion, x^4, (see Fig. 2,) on the shaft of a stop or brake wheel, y^4, mounted in suitable bearings in the plate l. The periphery of this wheel I prefer to have made with fine teeth; but a rough surface may be substituted.

It will be seen that when the stop-wheel is

locked or held so that it cannot turn, the plate *l* cannot be moved either up or down; but when the wheel is unlocked the plate *l* will be free to move. The brake-wheel is locked by a lock-bolt, z^4, (see Fig. 3,) which is forced into the teeth or against the roughened surface by the tension of a spring, a^5; but as the plate must be free to move during the feeding motion, that it may take position for the next succeeding stitch, the lever a^3, which gives motion to the feeding-pawl, is connected by a rod, b^5, with an arm of a bell-crank, c^5, (see Fig. 3,) the other arm of which is, in turn, connected with the sliding lock-bolt z^4, so that when the feeding motion takes place the lock-bolt is drawn from and liberates the stop-wheel, and as soon as the feeding-lever returns the wheel is firmly locked to hold the plate. It is desirable that the operator should have control of this mechanism, as he will frequently have occasion to lift the plate *l* to take off a finished shoe and put in another, and for other purposes. As it may be necessary to do this when the feeding-lever a^3 is in the position required for locking the stop-wheel, means have been provided to meet such emergencies.

The connection of the feeding-lever a^3 with the rod b^5 is by a pin, which is free to slide in an elongated slot, as at d^5, (see Fig. 3,) and the strap *n*, by which the plate *l* can be lifted by the attendant, has a branch, e^5, connected with one arm of a bell-crank, f^5, the other arm of which is connected with the rod b^5, so that in the very act of turning the wheel *o* to lift the plate *l* the lock-bolt z^4 is drawn back to liberate the stop or brake wheel.

Connected with the cam-shaft *m* is an indicator, m^3, to register the amount of work done by the machine. It is preferred to so gear the indicator with said shaft as that either may be detached and removed, for repair or otherwise, without disturbing the other. This may be done by reducing the end of the shaft *m* and corresponding end of the indicator-shaft, so that while the former shaft, in rotating, drives the latter one, either may be moved longitudinally or vertically without interfering with the other.

Having described my invention for sewing by mechanism soles to the uppers of shoes and boots which are to be turned after being sewed, and also as adapted to the sewing of the upper and welt to an inner sole for boots and shoes which are not to be turned, what I here claim, and desire to secure by Letters Patent, is—

1. The means hereinbefore described for securing the last to the carriage, consisting of the combination of the crutch, its base-block, adjustable in ways on the carriage, and the mechanism for operating the crutch and securing its base-block in any desired position on the carriage to suit lasts of different sizes, substantially as described; and these I also claim in combination with the pin which enters a hole in the last, and the base of which is adjustable longitudinally on the carriage for different lengths of last, as described.

2. In combination with the guide for directing the edge of the sole and holding the upper in position, the means herein described to enable the operator to adjust its position with the thumb and finger while his hand rests on the movable plate, to which the sewing mechanism is attached, as herein described.

3. In combination with the self-adapting plate, to which the sewing mechanism is attached, the mechanism, substantially as herein described, for holding the said plate in a fixed position at the time the needle enters the sole, and for liberating it, that it may be self-adapting to the undulations of the sole during the feeding motion.

4. The self adapting rests, which ride or bear on the sole, hung or supported substantially as described, and adjustable, to adapt them to lasts of different sizes and curvatures, substantially as specified.

MICHAEL J. STEIN.

Witnesses:

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J. W. COOMBS.