C. C. BLAKE.

SEWING MACHINE.

APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 1.

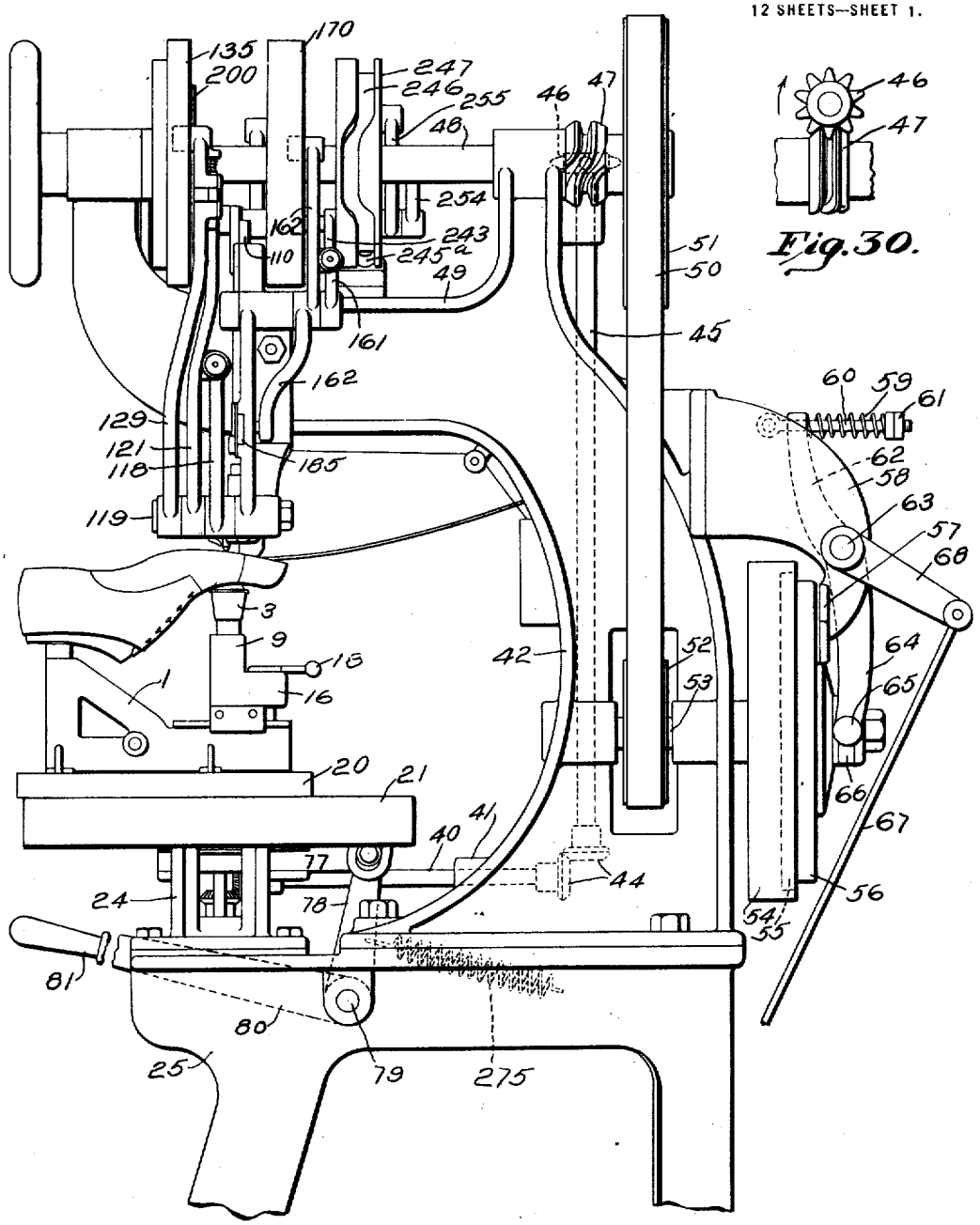


Fig. 1.

Fig. 30.

Witnesses,
Powell T. Watts
Mark E. Fenwald

Inventor:
Charles C. Blake
by Charles K. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

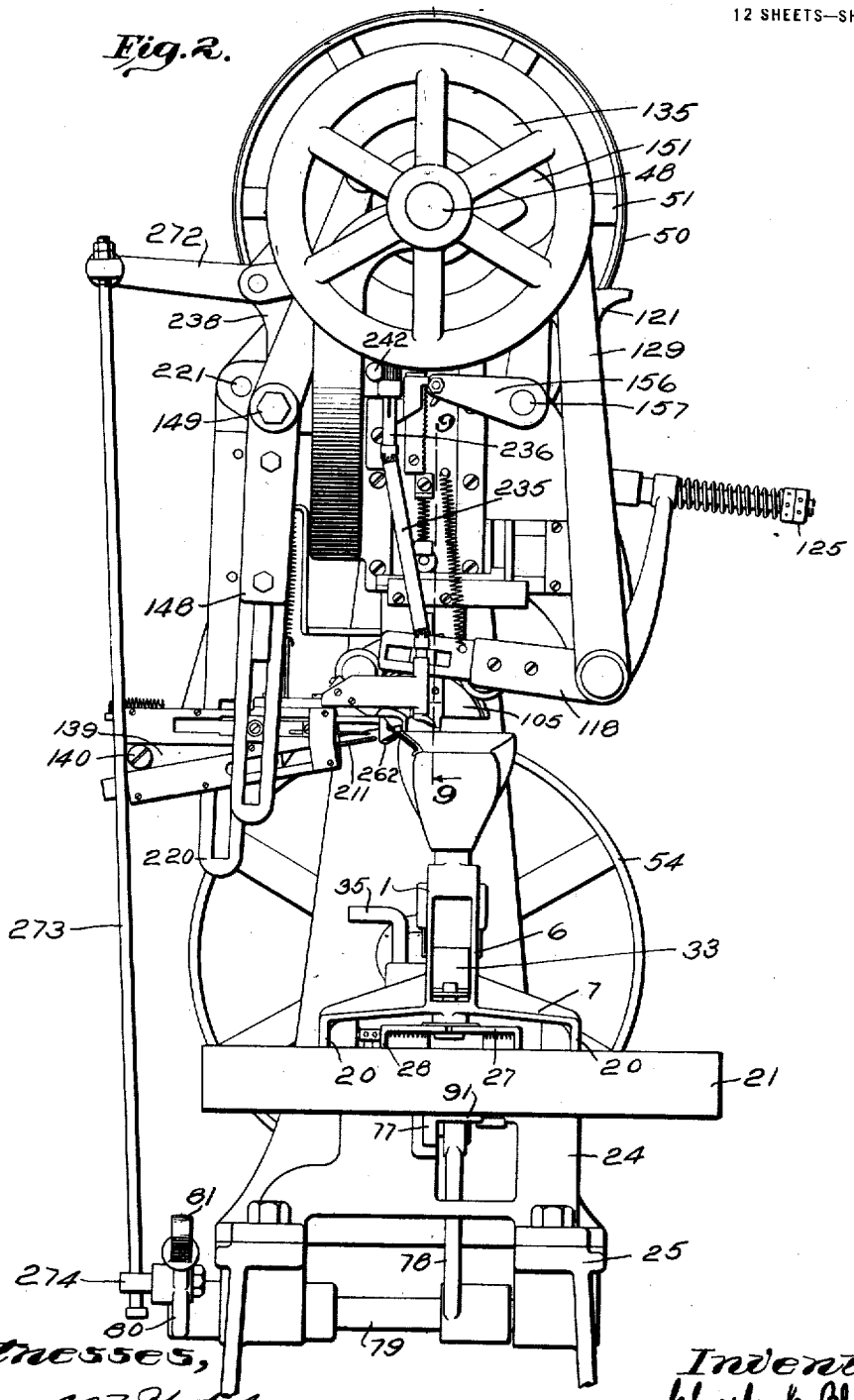
APPLICATION FILED AUG. 16, 1913.

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Patented Nov. 12, 1918.

12 SHEETS—SHEET 2.

Fig. 2.



Witnesses,
Powell T. Hatch.
Mark E. Fenald

Inventor,
Charles C. Blake
by Charles W. McDermott
his attorney

C. C. BLAKE.

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12 SHEETS—SHEET 3.

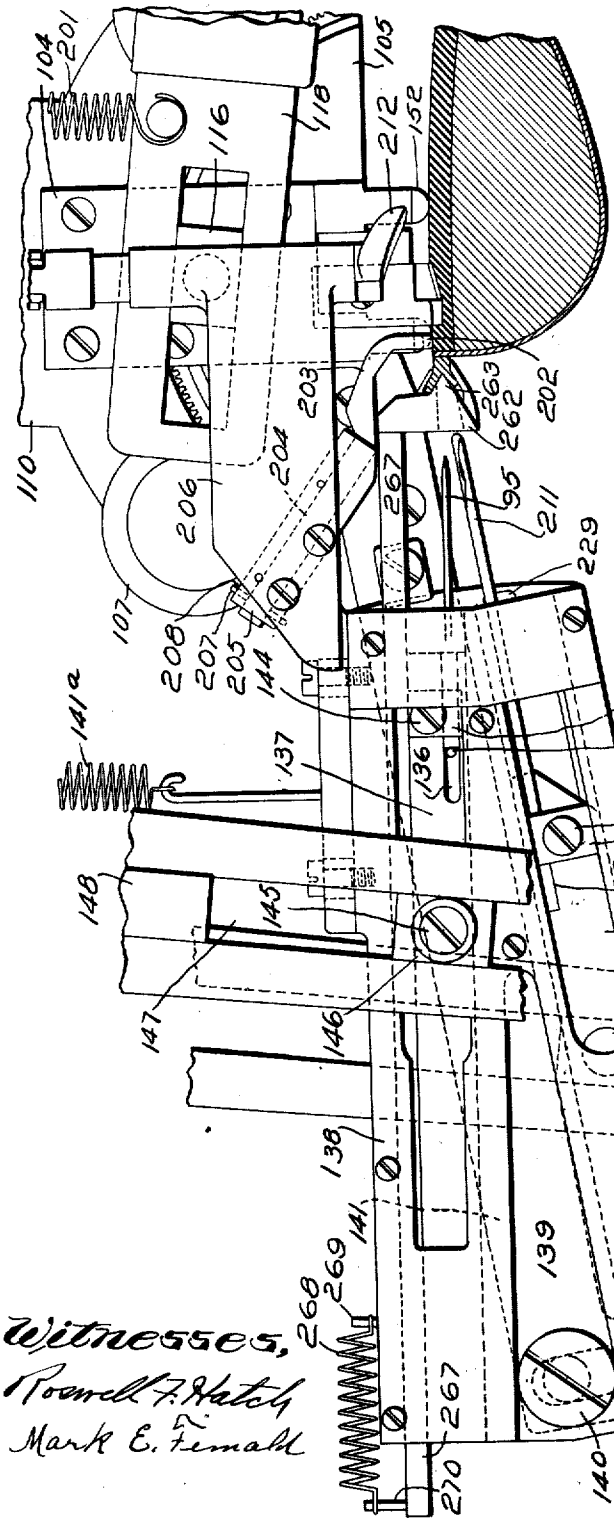


Fig. 3.



Fig. 4.

Witnesses,
Roswell F. Hatch
Mark E. Fenald

Inventor;
Charles C. Blake
by Charles W. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

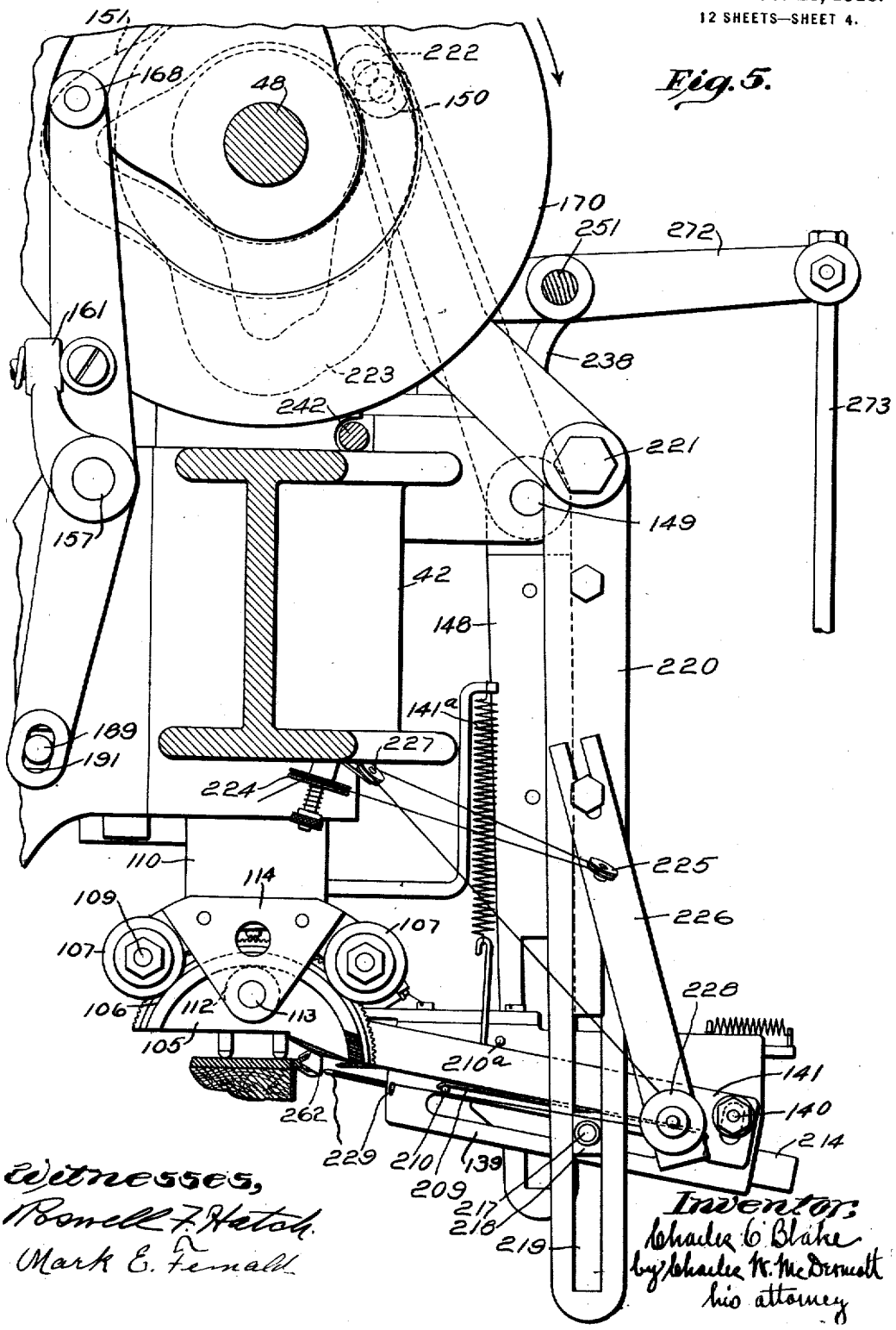
APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 4.

Fig. 5.



Witnesses,
Ronell T. Hatch
Mark E. Fenwall

Inventor:
Charles C. Blake
by Charles N. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

APPLICATION FILED AUG. 16, 1913.

1,284,856.

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12 SHEETS—SHEET 5.

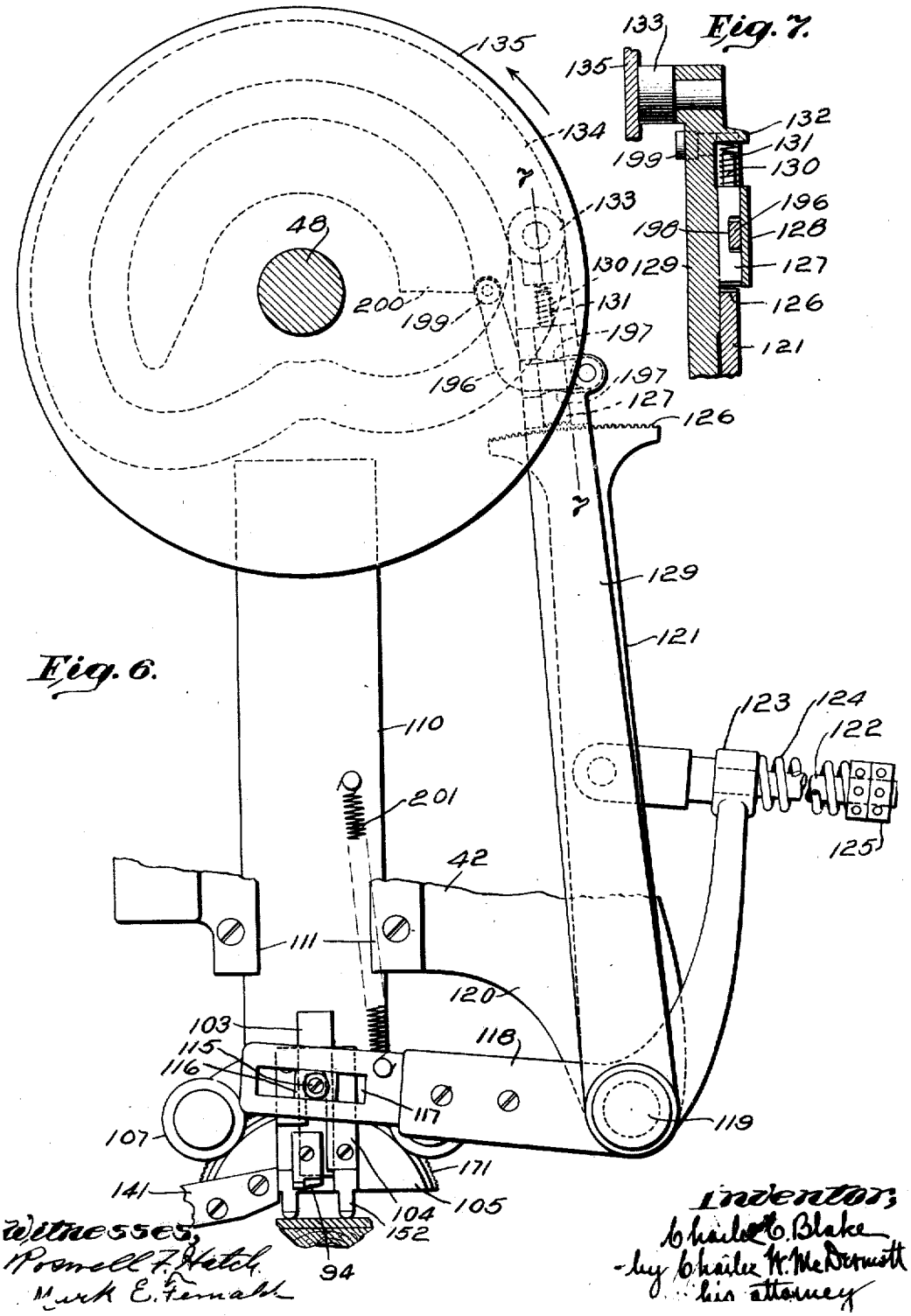


Fig. 6.

Fig. 7.

Witnesses:
Powell F. Hatch
Mark E. Fenaish

Inventor:
Charles C. Blake
by Charles W. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

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12 SHEETS—SHEET 6.

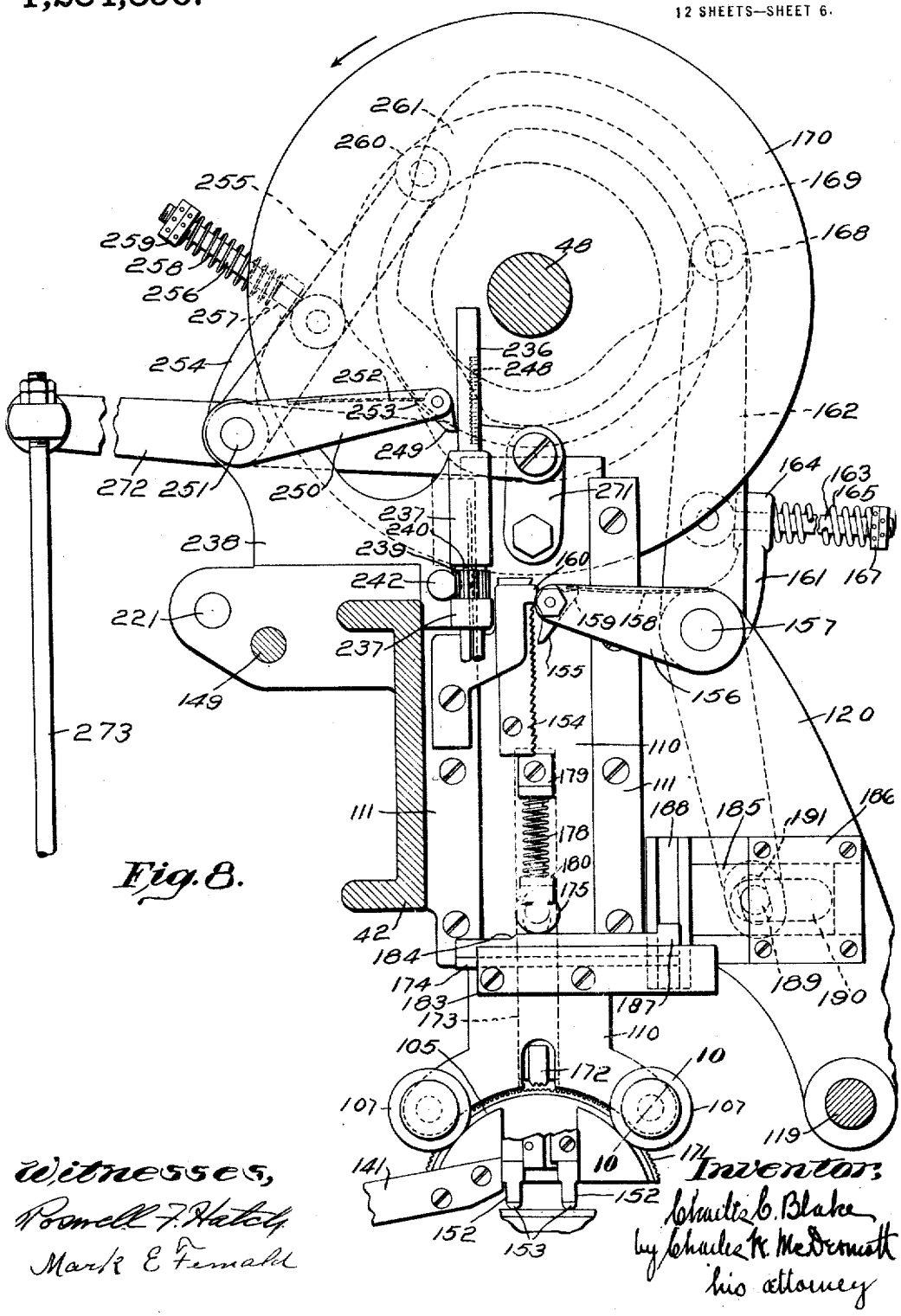


Fig. 8.

Witnesses,
Powell T. Hately
Mark E. Fenwald

Inventor:
Charles C. Blake
by Charles K. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 7.

Fig. 10.

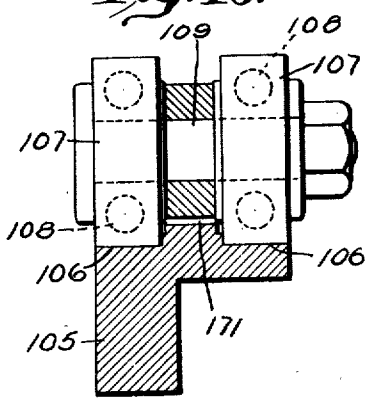
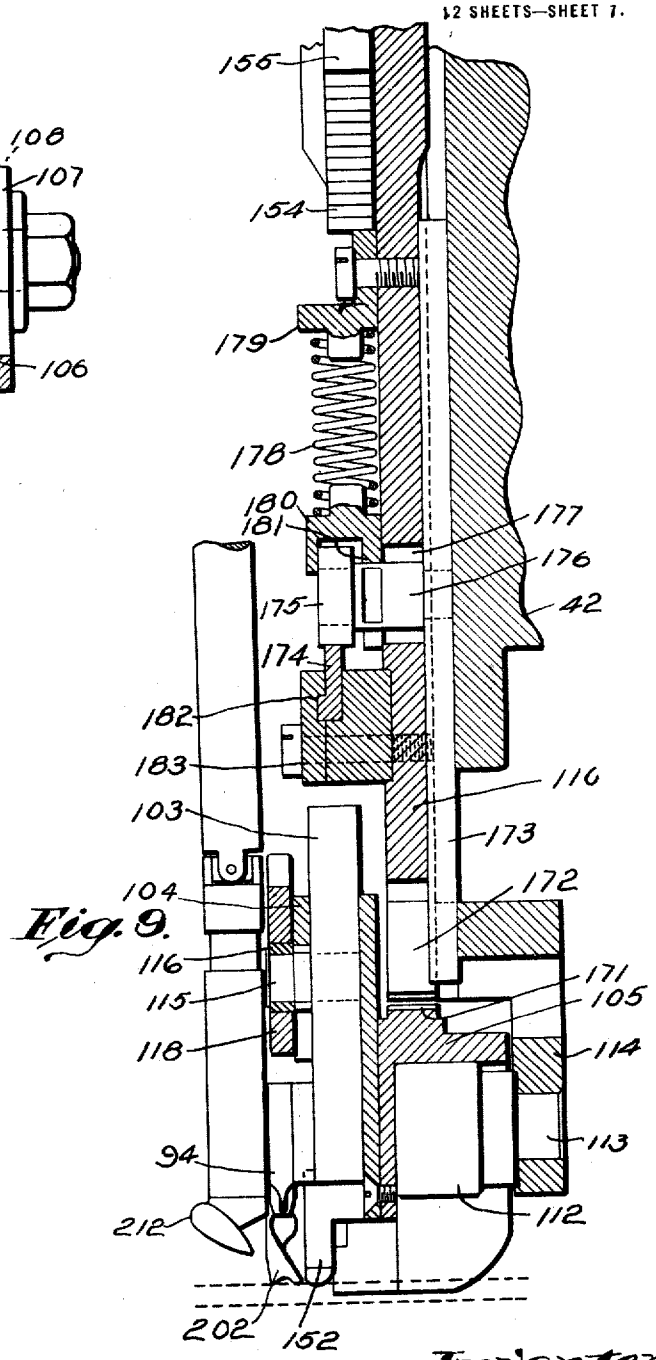


Fig. 9.



Witnesses,

Ronald T. Watch.

Mark E. Fenald

Inventor,

Sebastian C. Blake

by Charles H. McDermott

his attorney

C. C. BLAKE.

SEWING MACHINE.

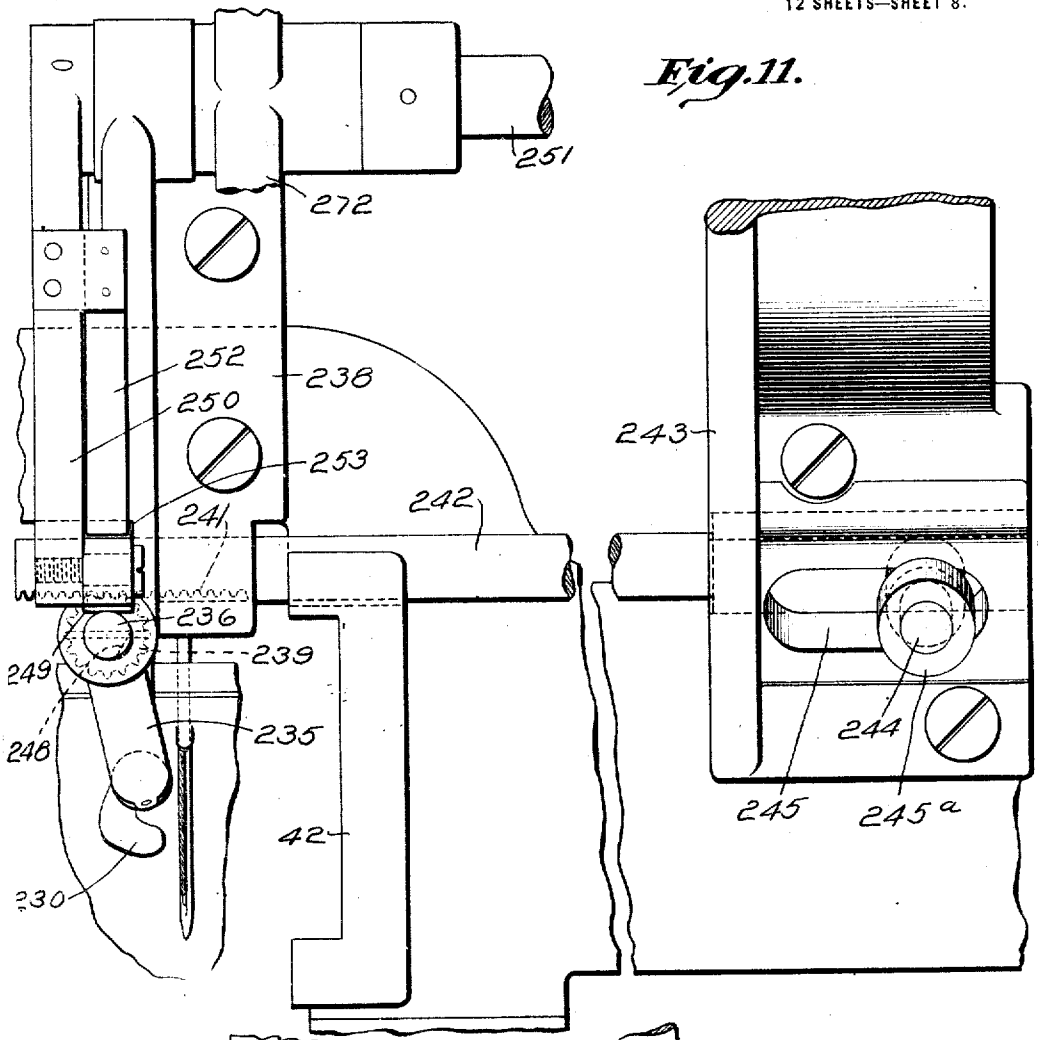
APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 8.

Fig. 11.



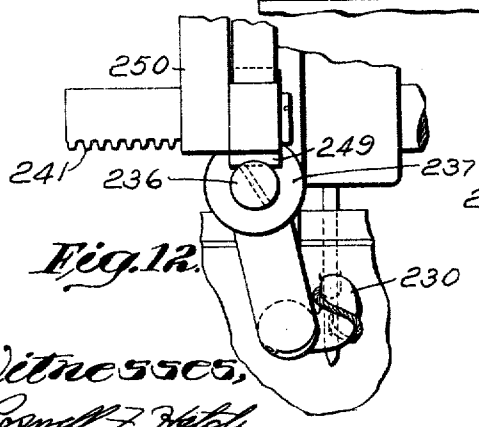


Fig. 12.

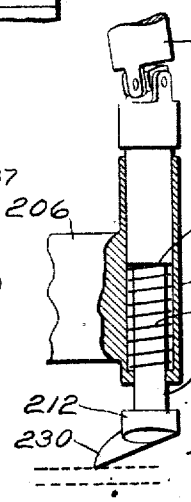


Fig. 13.

Witnesses,
Ronald T. Fatell.
Mark E. Fenald

Inventor;
Charles C. Blake
by Charles N. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 9.

Fig. 14.

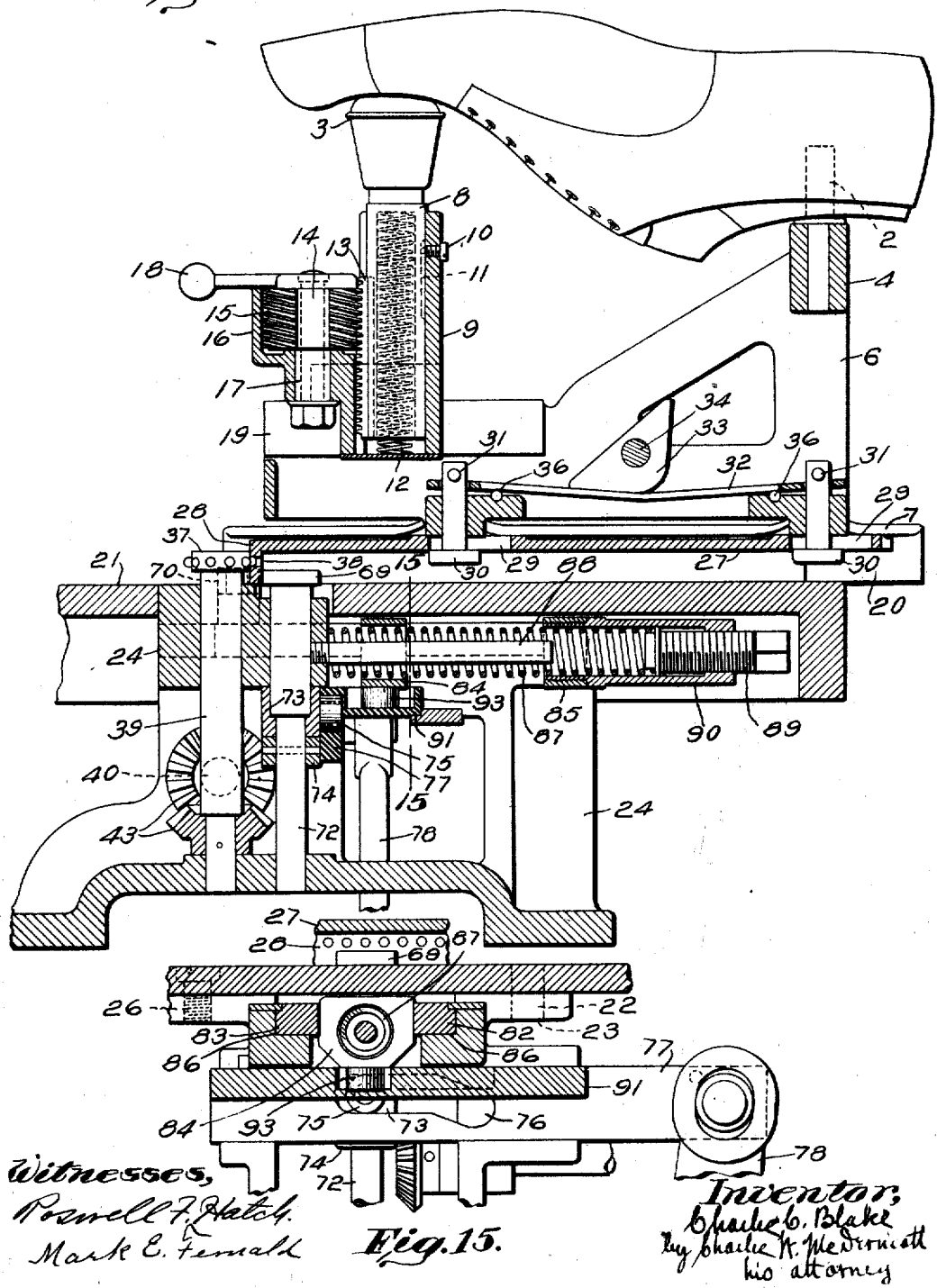


Fig. 15.

Witnesses,
Powell T. Hatch.
Mark E. Fenald

Inventor;
Charles C. Blake
by Charles N. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

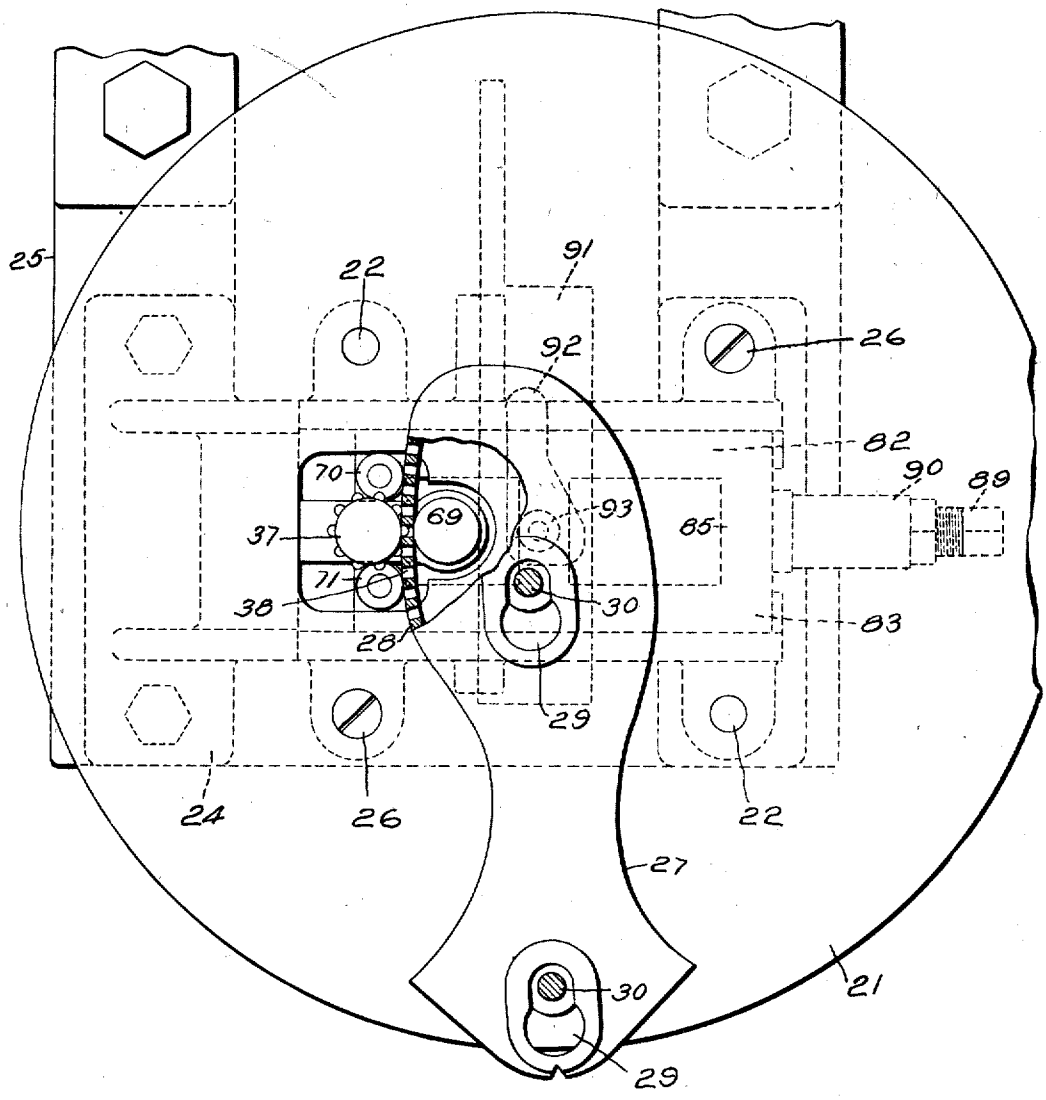
APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 10.

Fig. 16.



Witnesses,
Powell F. Hatch
Mark E. Finnald

Inventor:
Charles C. Blake
by Charles W. McDermott
his attorney

C. C. BLAKE.

SEWING MACHINE.

APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 11.

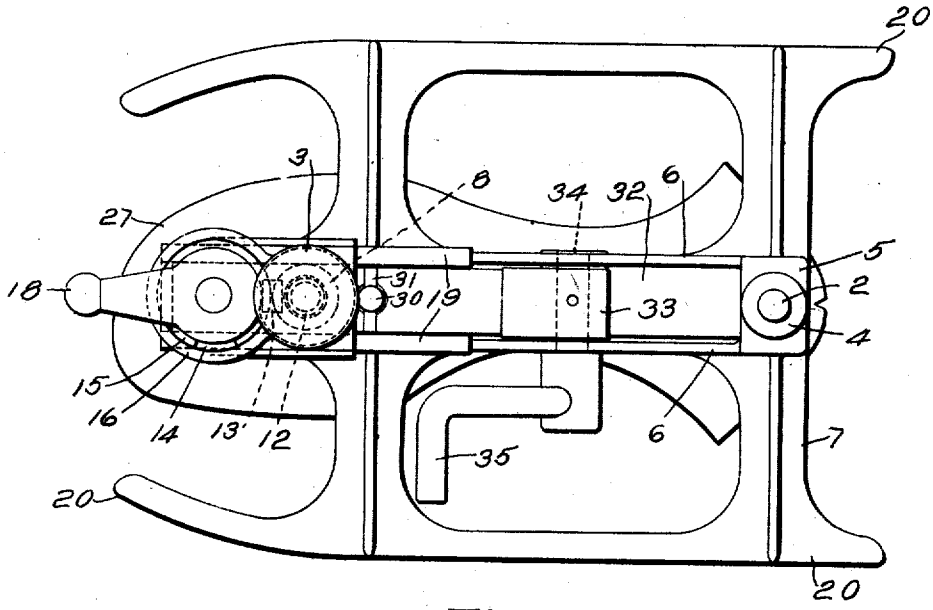


Fig. 17.

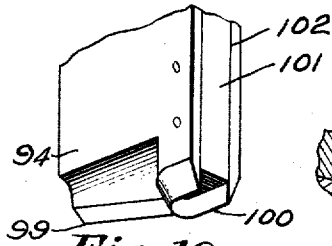


Fig. 19.

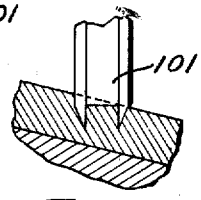


Fig. 20.

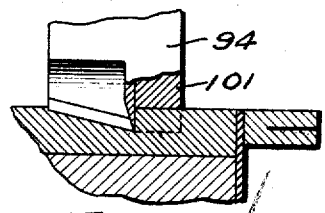


Fig. 18.

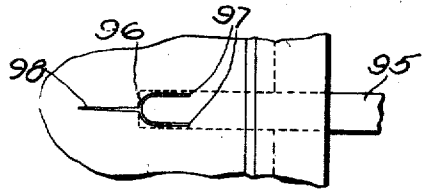


Fig. 21.

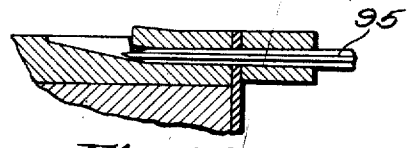


Fig. 22.

Witnesses,

Ronald F. Hatch.

Mark E. Fenald

Inventor;

Charles C. Blake

by Charles W. McDermott

his attorney

C. C. BLAKE.

SEWING MACHINE.

APPLICATION FILED AUG. 16, 1913.

1,284,856.

Patented Nov. 12, 1918.

12 SHEETS—SHEET 12.

Fig. 23.

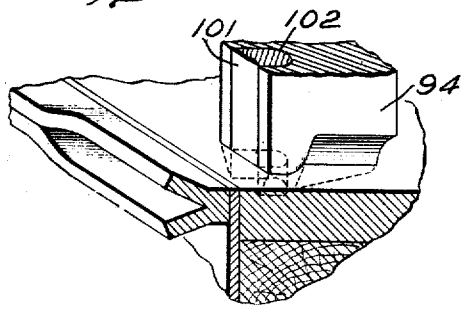


Fig. 24.

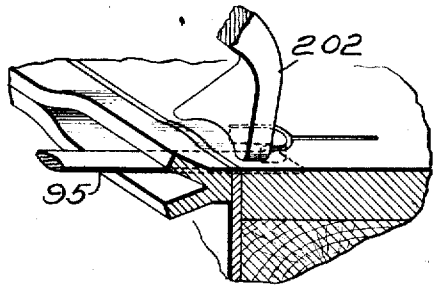


Fig. 25.

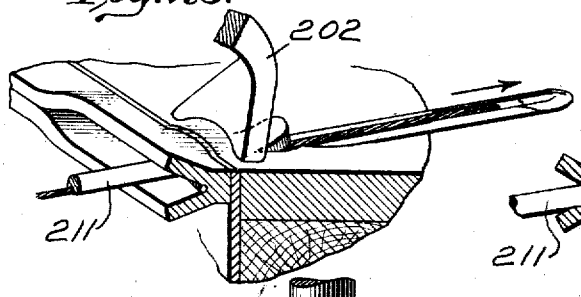


Fig. 26.

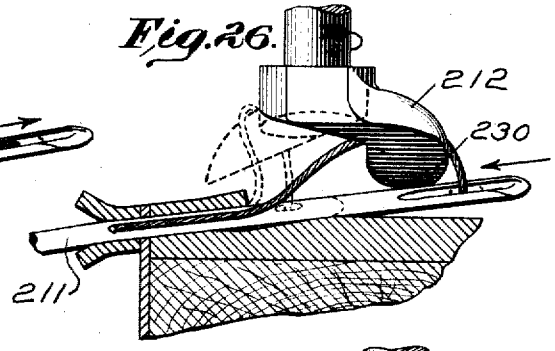


Fig. 27.

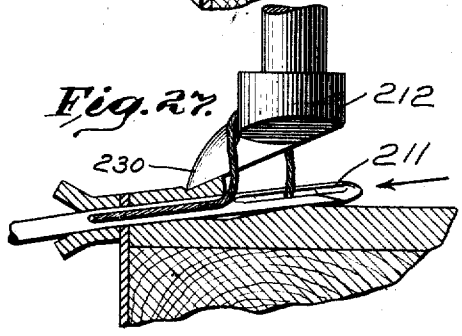


Fig. 28.

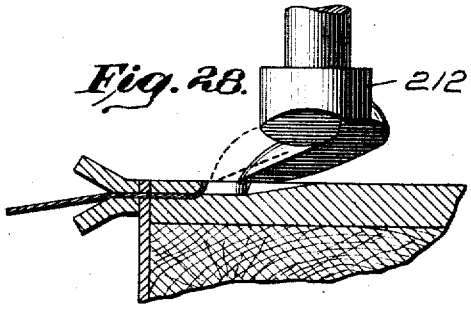
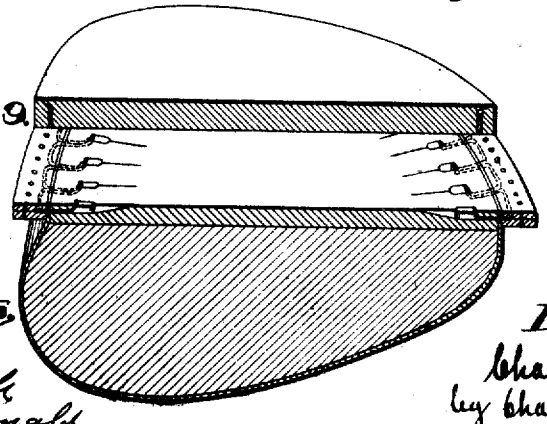


Fig. 29.



Witnesses,

Ronald F. Hatch

Mark C. Fenwald

Inventor,

Charles C. Blake

by Charles K. McDermott

his attorney

UNITED STATES PATENT OFFICE.

CHARLES C. BLAKE, OF BROOKLINE, MASSACHUSETTS, ASSIGNOR TO C. C. BLAKE, INCORPORATED, OF BOSTON, MASSACHUSETTS, A CORPORATION OF NEW YORK.

SEWING-MACHINE.

1,284,856. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed August 16, 1913. Serial No. 785,142.

To all whom it may concern:

Be it known that I, CHARLES C. BLAKE, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Sewing-Machines, of which the following is a specification.

The present invention relates to sewing machines which are used to connect various components of articles together such, for instance, as the shoe upper, welt and insole of a welt shoe.

Such insoles are usually prepared for the sewing operation, that is, the operation of securing the shoe upper, welt and insole together, by a channeling operation which consists in slitting a sole shaped blank along its edge around the shank and forepart to form a lip and a feather or by slitting its edge and also cutting one face of the blank within the edge cut thereby forming a flap parallel to the lip. The lip or lip and flap are turned up at right angles to the cut face of the blank to form a marginal abutment the base of which receives the stitches during the sewing operation. After the sewing and inseam trimming operations the cavity bounded by the marginal abutment hereinbefore referred to is filled with ground cork mixed with a suitable binder. This construction permits the shoes to be exhibited to the trade with the forepart of the insoles in a flat condition. As soon, however, as these shoes are worn the cork filler becomes displaced in the space between the inner and outer soles resulting in the formation of a concave trough in the forepart of the insole. The formation of a trough in the forepart of the insole is a source of great discomfort and injury to the feet.

I propose to prevent the formation of this objectionable trough in the forepart of the insole by eliminating the necessity for the formation of a marginal abutment to receive the inseam stitches and consequently the need of using a filler between the inner and outer soles to fill the cavity bounded by the marginal abutment. As a substitute for the marginal abutment to hold the inseam stitches I employ tongues formed in one face of the insole over which the thread connecting the welt, upper and insole of a welt shoe or the sole and upper of a turn shoe is looped. It has been proposed heretofore to employ tongues to hold the stitches in both welt and turn shoes, but the construction of the tongues and the methods employed for their formation have been found impracticable.

The method employed in forming the tongues for holding the stitches in turn shoes consisted in providing a sewing machine with an inclined V-shaped chisel which cut a V-shaped incision in the face of the sole thus forming a tapering V-shaped tongue integral therewith over which the thread connecting the upper and sole looped. This method was found impracticable, however, as it proved to be impossible for the operative to hold the shoe in his hand and swing and tip the shoe at the proper time and to the proper extent so that the chisel would uniformly penetrate the sole at the correct angle and depth. It was found that any deviation in the angle or depth of cut seriously affected the size or position of the tongues which prevented the sewing instrumentalities from properly handling the thread and setting it in position over the tongues. As these tongues also taper in width and thickness throughout their length it was found impossible to properly set the thread in position thereover, even when correctly formed, as the tension with which the stitch was set caused the tapered tongue to buckle and thus permit the thread to slip therefrom.

For welt work it was proposed to first channel the insole and then slit the channel flap transversely into short sections, the alternate ones of which were used as tongues. While by this method tongues were formed having a uniform width throughout their length this method also proved to be impracticable as it involved a separate channeling operation and it produced tongues tapering in thickness which in the same manner as the V-shaped tongues employed in turn work permitted the tongue to buckle under the tension employed in setting the stitch and the thread to slip therefrom.

The principal object of the present invention is to provide novel and improved means for forming tongues for the reception of

the stitches which connect the shoe upper, welt and insole of a welt shoe or the shoe upper and outsole of a turn shoe or the parts of any article which it may be desired to secure together.

To the accomplishment of this object a feature of the invention contemplates the provision in a machine provided with tongue forming devices, of means for insuring the uniform formation of the tongues. The means for insuring the uniform formation of the tongues may be constructed and arranged either to gage the relative operative position of the tongue forming devices and the work or to relatively tip the tongue forming devices and the work to maintain the tongue forming devices substantially normal to the work. It is preferred, however, to so construct the means for insuring the uniform formation of the tongues in the work that it will gage the relative operative position of the tongue forming devices and the work and relatively tip the tongue forming devices and the work to maintain the tongue forming devices substantially normal to the work since with this construction all care and attention upon the part of the operative in forming the tongues are obviated.

Another object of the present invention is to simplify and improve the devices for forming the tongues.

To this end a further feature of the invention contemplates the provision in a machine for forming tongues, of a knife arranged to operate in a plane substantially normal to the work, and an awl arranged to operate in a plane substantially normal to the plane of operation of the knife. With this construction all the tongues formed in the work have a rectangular cross section substantially uniform in width and thickness throughout their length which provides a maximum amount of material to receive the stitches. Broadly considered the knife and awl may be constructed and arranged to form tongues rectangular in cross section and substantially uniform in width and thickness throughout their length in any manner found desirable or expedient. It is preferred, however, to construct the knife so that it cuts a furcular slash in the work and to arrange the awl so that it intersects the slash below the surface of the work, thus separating the material of the work bounded by the tines of the fork from the body portion of the work and forming a tongue integral therewith.

In the broader aspects of the invention the gaging means for controlling the relative operative position of the tools and the work may take any elected form whether or not it positively controls the relative position of the tools and work or is merely indicative to the operative of the time, direction and extent at or to which it is necessary for him to swing or tip the work to maintain the surface and edge of the work in proximity to the tools in a horizontal plane and in the line of feed, respectively. But it is preferred to employ either a depth gage for controlling the depth of cut of the knife or a surface gage for controlling the depth below the surface of the sole at which the awl operates or both a gage for the knife and a gage for the awl, one or both of which may also form part of the means for relatively tipping the tool and the work to maintain the tool substantially normal to the work.

While the invention contemplates forming the tongues in an independent machine, if found desirable or expedient, it is preferred to form the tongues in the same machine that forms the stitch to secure the parts of the work together. Heretofore in sewing machines provided with an awl and a needle operating upon the same side of the work it has been customary to operate the awl and needle in parallel planes and provide mechanism either for shifting the needle so that the needle will operate through the hole made by the awl or for shifting the awl to bring the awl-hole in position for the operation of the needle.

A further feature of the invention contemplates the provision in a sewing machine, of a needle and an awl arranged to operate in intersecting paths in the same plane whereby the necessity of shifting the needle into and out of the path of the awl in making the awl hole or the shifting of the awl into and out of the path of the needle is obviated.

Further features of the invention contemplate the provision of a simplified and improved welt guide whereby a welt slit longitudinally along one edge may be supported and guided; the provision in a machine for sewing members together, one of which is tongued, in which is a looper, of improved means for actuating the looper whereby the thread is looped over the tongues; the provision in a machine for sewing members together, one of which is tongued, in which is a looper, of means for actuating the looper whereby the tongues are subjected to pressure to depress them substantially below the surface of the sole; the provision in a tongue forming machine, of improved means for actuating the knife whereby the knife is preliminarily adjusted to the height of the work prior to its slashing stroke; the provision in a shoe machine provided with a sole support, an operating tool, and means for relatively actuating the support and tool to transfer the point of operation of the tool around the shoe, of improved means for relatively tipping the tool and shoe whereby the tool is maintained substantially normal to the sole; the pro-

vision in a shoe machine provided with an operating tool and a work supporting jack, of improved means for elevating the tool into an inoperative position and unclamping the jack whereby the work may be conveniently inserted and withdrawn from the machine; of improved means for securing a shoe supporting jack to a pattern plate whereby the jack may be adjusted upon the pattern plate to permit the work on the jack to be brought into correct relation with the pattern plate, and in certain devices, combinations and arrangements of parts tending to improve and simplify the operation of shoe and other sewing machines and enable them to operate with certainty and without liability of breakage of parts. The advantages of these devices, combinations and arrangements of parts will be obvious to those skilled in the art from the following description.

The various features of the present invention will be best understood from an inspection of the accompanying drawings illustrating the best form of the invention at present devised, in which,

Figure 1 is a right side elevation of the machine;

Fig. 2 is a front elevation;

Fig. 3 is an enlarged detail in front elevation of the tongue and stitch forming devices;

Fig. 4 is a detail in right side elevation of the welt guide;

Fig. 5 is a detail in rear elevation of the needle and its actuating mechanism;

Fig. 6 is a detail in front elevation of the knife, its actuating devices and its supporting carrier;

Fig. 7 is a sectional elevation on the line 7—7, (Fig. 6);

Fig. 8 is a detail in front elevation of the devices for depressing and locking the carrier and also a portion of the mechanisms for operating the looper;

Fig. 9 is a sectional elevation on the line 9—9, (Fig. 2);

Fig. 10 is a sectional elevation on the line 10—10, (Fig. 8);

Fig. 11 is a broken detail in plan of the looper and its actuating mechanism;

Fig. 12 is a detail in plan showing another position of the looper and its actuating mechanisms;

Fig. 13 is an elevation, partly in section, of the looper;

Fig. 14 is a sectional elevation of the jack and its supporting, actuating and guiding mechanisms;

Fig. 15 is a sectional elevation on the line 15—15, (Fig. 14);

Fig. 16 is a plan, partly in section, of the pattern plate and its associated parts;

Fig. 17 is a plan of the jack, attached to the pattern but removed from the machine;

Fig. 18 is a detail elevation, partly in section, showing the manner in which the furcular slashes are formed in the sole;

Fig. 19 is a perspective of the knife employed to slash the sole;

Fig. 20 is a detail elevation showing the operation of the knife on a longitudinally inclined surface;

Fig. 21 is a detail plan showing the awl penetrating the edge of the sole, intersecting the slash below the surface of the sole and separating the material of the sole bounded by the tines of the fork from the body portion of the sole;

Fig. 22 is a detail sectional elevation of the parts illustrated in Fig. 21;

Fig. 23 is a perspective, partly in section, additionally showing the manner in which the knife forms the furcular slashes in the insole;

Fig. 24 is a perspective, partly in section, showing the position of the surface gage and the manner in which the material humps beneath it during the penetration of the awl;

Fig. 25 is a perspective, partly in section, showing the operation of the needle which enters the work in the slit of the welt and emerges from the face of the sole through the stem of the furcular slash;

Figs. 26, 27 and 28 are perspectives showing various positions of the looper in looping the thread over a tongue and subjecting the tongue to pressure;

Fig. 29 is a perspective, partly in section, of a finished shoe having its inseam sewn by the machine; and

Fig. 30 is a detail in plan of a portion of the driving and locking mechanism for the pattern plate.

Referring first to Figs. 1 and 19 to 29 for a preliminary general description of the machine of the drawings and the work performed thereby the lasted shoe is supported upon a jack which is actuated automatically to transfer the point of operation of the tools around the shoe. These tools comprise tongue forming devices and stitch forming devices. The tongue forming devices comprise a knife for forming a vertical furcular slash in the margin of the sole and an awl for intersecting the furcular slash below the surface of the insole and separating the material of the insole bounded by the tines of the fork from the body portion of the insole thus forming a tongue integral therewith. The knife and awl thus form a series of tongues rectangular in cross section along the peripheral margin of the sole for the reception of the inseam stitches. The knife and awl are maintained substantially normal to the face and edge of the insole respectively and also to each other as their points of operation are transferred around the shoe thus insuring the formation of uniform tongues. As the furcular slashes and awl-

cuts are formed normal to the face and edge of the insole respectively the sides of each tongue are perpendicular to the face of the insole and the top and bottom faces of each tongue are parallel, thereby producing a substantial piece of stock for rigidly holding the stitches. The stitch forming devices comprise a straight eye-pointed needle for carrying the thread through the welt, upper and insole and a looper or spreader for looping the thread over the tongues and subjecting the tongues to pressure to depress them substantially below the surface of the sole.

In the illustrated embodiment of the invention the lasted shoe hereinafter termed for convenience the "shoe" is mounted upon a jack 1 having a spindle 2 and a saddle 3 (Fig. 14). By a lasted shoe I mean the step product of the lasting operation. Broadly considered this step product may be produced by the ordinary lasting process employed in lasting Goodyear welt shoes. Preferably, however, the lasted shoe, as shown in Figs. 18 to 29 inclusive, comprises a stretched upper secured to the edge face of the insole on the bottom of the last. The spindle 2 is secured to a boss 4 formed on a plate 5 (Fig. 17) carried by two vertical plates 6 rising from a base 7. The saddle 3 consists of a pad of yielding material mounted upon the upper end of a chambered post 8. The post 8 is mounted in a standard 9 and is guided to slide vertically therein by a screw 10 which is arranged to engage a slot 11 formed in the post 8. The saddle 3 is normally held elevated by a coiled spring 12 which is interposed between the bottom of the standard 9 and the top of the chamber in the post 8. To permit the saddle to be forced upwardly to jack the shoe the post 8 carries a rack 13 which, when the saddle is under the influence of the spring 12, registers with an opening 14 formed in a worm 15. This worm is mounted in a housing 16, on a vertical shaft 17 journaled in the standard 9, and is provided with a handle 18 by means of which the operative may engage the worm with the rack 13 and force the saddle 3 upwardly to jack the shoe. To permit the jack to accommodate different sizes of shoes the standard 9 is mounted to slide on ways 19 formed on the plates 6. The base 7 is provided with a pair of runners 20 (Figs. 14 and 17) which are arranged to slide over the smooth upper surface of a platen 21 (Figs. 12, 14 and 16). The platen is provided with a pair of dowels 22 (Figs. 15 and 16) arranged to engage sockets 23 formed in the upper surface of a bracket 24 which is bolted (Fig. 1) to the leg frame 25 of the machine. The platen 21 is additionally secured to the bracket 24 by means of a pair of screws 26 (Figs. 15 and 16).

In order to automatically slide the jack over the platen to transfer the point of operation of the tools around the shoe the jack is secured to a pattern plate 27 (Figs. 14, 15 and 16) which is provided with a guiding flange 28 the internal periphery of which has the same contour as the edge of the sole on the jack. In order to permit the peripheries of the sole and the pattern to be vertically alined so that similar portions of the sole and pattern will move in unison throughout the operation of the machine the pattern plate is provided with a pair of button hole slots 29 (Fig. 16) which receive headed bolts 30 (Fig. 14) carried by the base 7 of the jack. With this construction the jack may be placed upon the pattern by passing the heads of the bolts 30 through the large ends of the buttonhole slots 29. The jack is then shifted on the pattern until the edge of the sole is vertically alined with the internal edge of the pattern. This movement of the jack brings the shanks of the bolts within the small ends of the buttonhole slots 29. To clamp the jack to the pattern plate the ends of the shanks of the bolts are provided with pins 31 which are engaged by the opposite ends of a leaf spring 32 arranged to embrace the shanks of the bolts. The spring is bowed to exert clamping pressure upon the bolts and thus clamp the jack to the pattern by a triangular cam 33 secured to a shaft 34 journaled in the plates 6 and actuated through a handle 35 (Figs. 2 and 17) carried by the shaft. The base 7 carries a pair of pins 36 which act as fulcrums for the leaf spring 32 during the bowing thereof.

The pattern plate is actuated to transfer the point of operation of the tool around the shoe by a pin wheel 37 which engages a series of holes 38 bored in the guiding flange 28. The pin wheel 37 is secured to the upper end of a vertical shaft 39 journaled in bearings formed in the bracket 24. The shaft 39 is driven from a horizontal shaft 40 (Fig. 1), one end of which is journaled in the bracket 24 and the other end of which is journaled in a boss 41 suitably formed on a head 42 for the operating tools, through bevel gears 43 (Figs. 1 and 11). The shaft 40 is driven through bevel gears 44 (Fig. 1) from a vertical shaft 45 journaled in the head 42. The upper end of the shaft 45 carries a pin wheel 46 which is driven intermittently by a modified worm 47 carried by a camshaft 48 journaled in a yoke 49 formed on the head 42. The cam shaft 48 is driven by a belt 50 which passes over a pulley 51 on the cam shaft and a pulley 52 carried by a horizontal shaft 53 journaled in the head 42. The shaft 53 loosely carries a pulley 54 which is driven through a belt (not shown) from some suitable source of power. The pulley 54 carries a friction disk 55 which is arranged to be engaged by a similar disk

56 splined on the shaft 53. The disk 56 is normally held away from the disk 55 and in contact with a braking surface 57, formed on a bracket 58 carried by the head 42, by a spring 59 coiled around a rod 60 pivoted on the bracket 58. The spring is interposed between adjusting and locking nuts 61 on the rod 60 and the upper arm of a modified bell crank lever 62 secured to a rock shaft 63 journaled in the bracket 58. The lower arm 64 of the lever 62 is formed as a yoke and is provided with trunnions 65 arranged to engage a disk 66 loosely mounted on the shaft 53. When it is desired to rotate the shaft 53 the disk 56 is moved away from the braking surface 57 and into contact with the disk 55 on the pulley 54 against the tension of the spring 59 by the operative through a treadle rod 67 which is connected to an arm 68 projecting from the rock shaft 63.

In order to swing the jack laterally as the points of operation of the tools are transferred around the shoe to maintain the edge of the shoe sole in proximity to the tools in the line of feed the guiding flange 28 on the pattern plate is engaged by a guide roll 69 arranged to engage inside the flange and by guide rolls 70 and 71 arranged to engage outside the flange (Figs. 14 and 16). The guide roll 69 is carried on the upper end of a vertical pin 72 (Fig. 14) which is rotatably mounted in a bearing formed in the bracket 24. The pin 72 carries a plane surfaced sleeve 73, between the bracket 24 and a collar 74 on the pin, which is provided with a roll 75 embraced by a cam slot 76 (Fig. 15) formed in a slide 77 slidably mounted in the bracket 24. The slide 77 is connected to an arm 78 (Fig. 1) projecting from a rock shaft 79 journaled in the leg frame 25. A second arm 80 projecting from the rock shaft 79 is provided with a handle 81 by means of which the slide 77 may be actuated to cause the cam slot 76 to act upon the roll 75 and depress the guide roll 69 below the guiding flange 28 and also below the surface of the platen. By engaging the flange 28 the guide rolls 69, 70, and 71 act to swing the jack laterally about an axis tangential to the edge of the shoe sole to bring the edge of the last or shoe sole into the desired position with relation to the line of feed. In order to enable the rolls to engage the flange at all times without binding as they traverse the reverse curves of the flange at the shank and around the toe the guide rolls 70 and 71 are journaled respectively in arms 82 and 83 (Figs. 14 and 16) which are tied together by a pair of tie-pieces 84 and 85. The arms 82 and 83 reciprocate in guideways 86 (Fig. 15) formed in the frame 24 and are actuated in a direction to press the guide rolls 70 and 71 against the flange 28 by means of a spring 87 loosely coiled around a guiding pin 88 on the frame 24 and interposed between the frame 24 and a tension adjusting screw 89 carried by a chamber 90 secured to the tie piece 85. To withdraw the guide rolls 70 and 71 from the guiding flange at the same time as the guide roll 69 is withdrawn therefrom the slide 77 is provided with a horizontal extension 91 (Figs. 14, 15 and 16). This extension is provided with a cam slot 92 (Fig. 16) which embraces a roll 93 carried by the tie piece 84. With this construction a downward movement of the handle 81 simultaneously depresses the guide roll 69 and withdraws the guide rolls 70 and 71 from the flange 28 against the tension of their actuating spring 87. It will be noticed from an inspection of Fig. 16 that the cam slot 92 is wide enough to permit the roll 93 to move therein as the guide rolls 70 and 71 yield to the curves of the pattern plate.

The devices for forming a series of tongues along the peripheral margin of one face of the sole comprise a knife 94 (Fig. 19) and an awl 95 (Figs. 21 and 22). The knife is constructed to form a furcular slash comprising a fork 96 (Fig. 21) having two tines 97, and a stem 98 connected to the fork. To this end the knife is provided with a straight cutting edge 99 for forming the stem and a U-shaped cutting edge 100 for forming the fork and tines. The knife also carries a block 101, arranged in a U-shaped channel 102, which acts as a gage for limiting the depth of cut (Figs. 18 and 23). The formation of the tongue commenced by the knife is completed by the awl 95 which has a width substantially greater than the knife (Fig. 21) so that when it penetrates the sole and intersects the slash below the surface of the sole it will separate the material bounded by the tines of the fork of the slash from the body portion of the sole thus forming a tongue integral with the sole.

The knife 94 is secured to the lower end of a slide 103 (Fig. 6) mounted to slide beneath a cover plate 104 in square ways formed on a segmental carrier 105. This carrier is provided upon its exterior face with two tracks 106 (Fig. 10) which are engaged by four rolls 107 arranged in pairs one pair being located on each side of the carrier (Figs. 6 and 8.) Each pair of rolls is journaled upon ball bearings 108 carried in races formed on a stud 109 which is secured to a slide 110 (Figs. 6, 8 and 9) mounted to slide vertically beneath cover plates 111 in square ways formed in the head 42. The slide 110 is loosely supported in its ways so that it may rise and fall in accordance with the varying heights of work. The interior face of the carrier 105 is engaged by a fifth roll 112 (Figs. 5 and 9) which is journaled on a stud 113 carried by an extension 114 of the slide 110. With this con-

struction the carrier 105 is free to tip laterally on the slide 110.

In order to actuate the knife to slash the sole the slide 103 is provided with a pin 115 upon which is loosely mounted a block 116 which is loosely embraced by a slot 117 formed in the horizontal arm of a bell crank lever 118 pivotally mounted upon a rod 119 carried by a bracket 120 bolted to the head 42. The vertical arm of the bell crank lever 118 is yieldingly connected to an arm 121 pivotally mounted on the rod 119. This connection consists of a rod 122, pivoted to the arm 121 and arranged to pass loosely through a boss 123 formed on the vertical arm of the bell crank lever 118, and a spring 124, coiled around the rod 122 and interposed between the boss 123 and adjusting and locking nuts 125 on the rod. The upper end of the arm 121 is provided with a ratchet 126 which is engaged by a four-toothed pawl or detent 127. The pawl 127 is mounted to slide beneath a cover plate 128 (Fig. 7) in ways formed on an arm 129 pivoted on the rod 119. The pawl is normally held in engagement with the ratchet 126 by a spring 130 which is coiled around a pin 131 carried by the pawl and interposed between the top of the pawl and an overhanging ledge 132 formed on the arm 129. The upper end of the arm 129 is provided with a roll 133 engaged in a groove 134 formed in the rear face of a disk 135 (Fig. 1) on the cam shaft 48.

The awl 95 is mounted in a slot 136 (Fig. 3) formed on a slide 137 mounted to slide beneath a cover plate 138 in square ways formed on a support 139. The support 139 is pivoted at 140 on an arm 141 secured to the carrier 105. The weight of the arm 141 and the parts carried thereby is counterbalanced by a spring 141ª (Fig. 5.) The awl is held against a pin 142 in the slot 136 by a block 143 which is held in place by a screw 144. In order to actuate the awl the slide 137 carries a pin 145 upon which is loosely mounted a block 146 which is loosely embraced by a slot 147 formed in the lower arm of a modified bell crank lever 148 which is pivotally mounted on a pin 149 (Figs. 2 and 5) carried by the head 42. The upper arm of the bell crank lever 148 is provided with a roll 150 which engages a groove 151 formed on the front face of the disk 135.

In order to insure the formation of uniform tongues it is desirable to maintain the knife throughout its operation upon the sole substantially normal to the face of the sole at its point of operation and to maintain the awl substantially normal to the edge of the sole at its point of operation. While a shoe sole is curved both laterally and longitudinally, I have discovered that it is only necessary to accommodate the knife and awl to the lateral curvature of the sole in order to obtain uniform tongues. I find that in operating upon a longitudinally curved surface, for instance, at the juncture of the shank and ball, the depth gage 101 compresses the stock upon the high side of the work (Fig. 20) so that the surface of the material bounded by the tines 97 of the slash remains parallel to the cut formed by the awl. No misshapen tongues are therefore formed notwithstanding the fact that the machine is not provided with mechanism for longitudinally tipping the tongue forming devices. By maintaining the knife and awl substantially normal to the face and edge of the sole respectively, the sides of the tongues are formed perpendicular to the face of the insole and the top and bottom faces of the tongues are parallel. This construction produces a tongue substantially uniform in width and thickness throughout its length thus insuring a substantial piece of stock to hold the stitches. With this construction all danger of the tongue buckling so that it can be pulled back through the awl-cut when the stitch is being set and thus permit the thread to slip from the tongue is obviated.

In order to accommodate the knife and awl to the lateral curvature of the sole the carrier 105 is provided with a pair of gages or feet 152 having rounded bottoms 153 arranged to engage the sole. When the jack is actuated to transfer the points of operation of the tools around the shoe these feet drag over the sole under the influence of the weight of the slide 110 and its associated parts. As the carrier 105 is mounted for free lateral movement on the slide 110 the feet uniformly engage the sole notwithstanding the variations in the lateral curvature thereof and thus swing the carrier to maintain the knife and awl substantially normal respectively to the surface and edge of the sole.

With this construction the knife is tipped laterally to maintain it substantially normal to the surface of the sole and is also caused to rise and fall in accordance with the varying heights of the work. In order to obviate any danger of the feet not adapting themselves accurately to the curvature of the sole under the influence of gravity the machine is provided with mechanism for additionally exerting pressure upon the feet to insure their accommodation to the surface of the sole. To this end the slide 110 carries a ratchet 154 (Fig. 8) which is engaged by a pawl 155 pivotally mounted on an arm 156 projecting from a rock shaft 157 journaled in the bracket 120. The pawl 155 is pressed toward the ratchet 154 by a leaf spring 158 carried by the arm 156 and arranged to engage a tail 159 on the pawl. When the feet 152 are accommodating themselves to the lateral curvature of the sole under the in-

fluence of gravity the pawl 155 is held out of engagement with the ratchet 154 by a dog 160 carried by one of the cover plates 111. To actuate the pawl 155 to engage the ratchet 154 and depress the slide 110 after the gravity operation of the feet 152 the rock shaft 157 carries a second arm 161 which is connected by a yielding connection to the upper arm of a modified bell crank lever 162 pivoted on the rock shaft 157. The yielding connection consists of a rod 163 pivoted to the lever 162 and arranged to pass loosely through a boss 164 formed on an arm 161, and a spring 165, coiled around the rod 163 and interposed between the boss 164 and adjusting and locking nuts 167 on the rod. The upper arm of the bell crank lever 162 carries a roll 168 engaged in a groove 169 formed in the back face of a disk 170 on the cam shaft 48.

In order to lock the carrier 105 in the position determined for it by the feet 152 the carrier is provided, between the tracks 106, with a series of teeth 171 (Figs. 6, 8, 9 and 10) which are engaged by a three-toothed detent 172 (Figs. 8 and 9). The detent is carried by a slide 173 (Fig. 9) mounted to slide on the back of the slide 110. The detent 172 is normally held out of engagement with the teeth 171 by a horizontal cam slide 174 arranged to engage a roll 175 which is journaled on a stud 176 secured to the slide 173 and arranged to work in a slot 177 formed in the slide 110. The roll 175 is held against the cam slide 174 by a coiled spring 178 which is interposed between a bracket 179 secured to the slide 110 and a block 180 arranged to partially house the roll 175 and provided with a yoke 181 arranged to straddle the stud 176. The cam slide 174 is mounted in ways 182 formed in a plate 183 secured to the slide 110. The cam slide 174 is provided with a depression 184 (Fig. 8) which permits the roll 175 to drop and thus allow the detent 172 to engage the teeth 171. To actuate the cam slide 174 to elevate the roll 175 the slide is connected to an actuating block 185 (Fig. 8) mounted to slide beneath a cover plate 186 in square ways formed on the bracket 120. The connection between the cam slide 174 and its actuating block 185 comprises a tongue 187 formed on the slide and a vertical groove 188 formed on the block. This construction permits the cam slide 174 to move vertically with the slide 110 without breaking its connection with the block. The block 185 is actuated to lock and unlock the carrier 105 by a connection between the block and the lower arm of the bell crank lever 162. To this end the block 185 carries a pin 189 which passes through a slot 190 formed in the bracket 120 and is loosely embraced by a vertical slot 191 formed in the lower arm of the bell crank lever 162. With this construction the slide 110 and the actuating block 185 are both actuated from the cam groove 169 but owing to the location of the depression 184 in the cam slide 174 the slide 110 is depressed before the roll 175 drops into the depression for the purpose of locking the carrier 105.

In order to permit the knife to shift with the carrier as the carrier 105 moves vertically to measure the height of the work and tips laterally to maintain the knife substantially normal to the face of the sole at its point of operation the machine is provided with mechanism for releasing the pawl 127 from the ratchet 126 and thus allow the bell crank lever 118 and its associated parts to follow the movements of the knife. To this end the arm 129 carries a bent lever 196 pivoted on the arm and arranged to engage ridges 197 formed on the walls of a slot 198 formed in the detent 127. The upper end of the lever 196 carries a roll 199 arranged to be engaged by a cam plate 200 secured to the back face of the cam disk 135. This plate 200 is constructed to actuate the roll 199 to withdraw the pawl 127 from the ratchet 126 during the height measuring and curvature finding movements of the carrier 105. Prior to the locking of the carrier 105 the roll 199 rides off the plate 200 and the pawl 127 then engages the ratchet 126 in the position to which it has been moved by the carrier 105. With this construction the height of the work is first measured by one mechanism and the knife is actuated by an independent mechanism which is connected to the first named mechanism by an adjustable or breakable connection. When the ratchet 126 is released from the pawl 127 the weight of the bell crank lever and its associated parts tend to move the knife toward the work. To overcome this tendency the horizontal arm of the bell crank lever 118 is connected to the slide 110 by a coiled counterbalancing spring 201 (Fig. 6).

In order to accurately determine the distance below the face of the insole at which the awl operates the support 139 carries a foot or gage 202 (Figs. 2 and 3) arranged to engage the marginal portion of the sole adjacent the point of operation of the knife. The gage is formed on the end of a bent arm 203 which is provided with a shank 204 rotatably mounted in a sleeve 205 secured to a bracket 206 carried by the support 139. The axis about which the gage rotates intersects the medial line of the gage at the surface of the sole so that the gage may readily adapt itself to the longitudinal curvature thereof. The shank 204 carries a pin 207 the opposite ends of which engage lugs 208 formed on the sleeve 205 and thus limit the rotation of the gage in both directions. The gage is pressed against the sole by a leaf spring 209 (Fig. 5) one end of which is secured to the arm 141

carried by the carrier 105 and the other end of which engages a pin 210 secured to the support 139. Movement of the gage under the influence of the spring 209 is limited by a pin 210ª (Fig. 5). The gage has a two point contact with the sole (Figs. 24 and 25) so that the material displaced by the awl may hump beneath the gage and thus prevent the spring pressed gage from binding the awl in the work.

After a tongue is completed the stitch forming devices operate to form the stitch. These devices comprise a needle 211 (Figs. 2, 3, 25, 26 and 27) and a looper 212, (Figs. 2, 11, 12, 13, 26, 27 and 28). The needle carries the thread through the welt, upper and insole entering the work by the welt and emerging from the work through the stem 98 of the furcular slash. The needle elevates the tongue as it passes through the insole so that the thread can be looped over the tongue by the looper as the needle withdraws from the work. The looper also subjects the tongue to pressure after the thread is looped over the tongue to depress the tongue substantially below the surface of the sole.

The needle 211, of the straight eye-pointed type, is secured in a slot 213, formed in a slide 214 mounted to slide beneath the cover plate 138 in ways formed in the support 139, by a plate 215 held in place by a screw 216 (Fig. 3). By employing a straight needle to carry the thread through the work it is possible to operate the awl and needle in planes intersecting in the work thus obviating the necessity of providing mechanism for relatively shifting the awl and needle to cause them to operate successively at the same point on the sole. To actuate the needle the slide 214 carries a pin 217 (Fig. 5) upon which is loosely mounted a block 218 which is loosely embraced by a slot 219 formed in the lower end of a modified bell crank lever 220 pivotally mounted upon a pin 221 carried by the head 42. The upper arm of the bell crank lever 220 is provided with a roll 222 engaged in a cam groove 223 formed in the front face of the disk 170.

The wax thread used by the needle is drawn from a suitable source of thread supply through a tension device 224, around a grooved pulley 225 rotatably mounted upon an arm 226 adjustably carried by the bell crank lever 220, around a second grooved pulley 227 rotatably mounted upon the head 42, through a second tension device 228 carried by the lower end of the arm 226, and finally through a slot 229 formed in the support 139 to the eye of the needle.

The looper 212 consists of a bent nose 230 formed on the lower end of a shaft 231 which is rotatably and slidably mounted in a bearing 232 formed on the bracket 206. The looper is normally maintained elevated above the work by a spring 233 (Fig. 13) coiled around the shaft 231 and interposed between the bottom of the bearing 232 and a shoulder 234 formed on the shaft. After the needle has passed completely through the work in the manner illustrated in Fig. 25, it is withdrawn from the work and forms a loop in the thread (Fig. 26) during the first part of its return stroke. The looper is then oscillated in a direction to pass the nose 230 between the shank of the needle and the thread (Fig. 26). This oscillating movement continues as the needle withdraws from the work (Figs. 12 and 26) until the thread is looped over the tongue. As the needle returns to its original position the needle arm simultaneously pulls upon the thread looped over the tongue by the looper to set the stitch and draw a fresh supply of thread from the thread supply.

In order to oscillate the looper in the manner described the shaft 231 is universally jointed, through a rod 235, to a shaft 236 (Figs. 2 and 8) which is slidably and rotatably mounted in bearings 237 formed on a bracket 238 carried by the head 42. Splined to the shaft 236 is a pinion 239 which is held from longitudinal movement on the shaft by a collar 240 interposed between the pinion 239 and the upper bearing 237 (Fig. 8). The pinion is actuated to oscillate the looper first in one direction and then in the other by a reciprocating rack 241 (Fig. 11) formed on a rod 242 the forward end of which is journaled in the bracket 238 and the rear end of which is rectangular and journaled in a square bearing formed in a bracket 243 carried by the head 42. The rectangular portion of the rod 242 carries a pin 244 which reciprocates through a slot 245 formed in the bracket 243. The pin 244 carries a roll 245ª which engages a peripheral groove 246 (Fig. 1). formed in a disk 247 on the cam shaft 48.

After the thread has been looped over the tongue the looper is actuated to subject the tongue to pressure to depress it substantially below the surface of the sole. To this end the upper end of the shaft 236 is provided upon one side with a series of teeth 248 which, after the looper is at the end of its thread looping stroke, are positioned for the operation of a pawl 249 pivotally mounted upon one end of an arm 250 projecting from the front end of a rock shaft 251 journaled in the brackets 238 and 243. The pawl is normally held against the shaft 236 by a leaf spring 252 one end of which is secured to the arm 250 and the other end of which presses upon a tail 253 formed on the pawl. The rear end of the rock shaft 251 is provided with a second arm 254 which is connected by a yielding connection to a third arm 255 loosely mounted on the rock shaft 251. The yielding connection consists of a rod 256 pivoted to the arm 255

and arranged to pass loosely through a boss 257 formed on the arm 254, and a spring 258, interposed between the boss 257 and adjusting and locking nuts 259 on the rod. The upper end of the arm 255 is provided with a roll 260 engaged in a groove 261 formed in the rear face of the disk 247. With this construction a partial rotation of the shaft 236 in one direction oscillates the looper to pass between the thread and the shank of the needle and loop the thread over the tongue. At the end of this oscillating movement of the looper one of the teeth 248 is engaged by the pawl 249 (Fig. 12). The pawl is then actuated to engage the looper with the tongue (Figs. 13 and 27). While the looper is engaged with the tongue the return oscillating stroke of the looper takes place which causes the looper to wipe over the tongue (Fig. 28). When the looper wipes completely over the tongue the tooth 248 engaged by the pawl is oscillated out of engagement with the pawl and the spring 233 snaps the looper back to its elevated position above the work where it remains as the looper returns to its original position.

The welt used in the machine is slit longitudinally along one edge so that the welt may be sewn to the sole while it is supported entirely outside the peripheral edge of the sole and with its upper surface or flesh face in the same plane as the flesh face of the sole. In order to support and guide the welt the machine is provided with a welt guide 262 (Figs. 3 and 4). The welt guide is provided with a V-shaped nose 263 arranged to engage in the slit of the welt, and a pair of feet 264 and 265 arranged to engage respectively the top and bottom faces of the welt. The welt guide 262 is also provided with a slot 266 to permit the awl and needle to pass freely through the guide as they operate upon the work. The welt guide is carried upon one end of a slide 267 which is arranged to slide beneath the cover plate 138 upon the top of the slide 137. The welt guide is held against the welt by a coiled spring 268 one end of which is secured to a pin 269 on the support 139 and the other end of which is secured to a pin 270 on the slide 267.

In order to permit the slide 110 to be elevated into an inoperative position to permit the insertion and removal of the work the slide 110 is connected through a link 271 with one end of an arm 272 which is centrally pivoted on the rock shaft 251. The other end of the arm 272 is loosely connected to the upper end of a rod 273 which is loosely connected at its lower end to a perforated lug 274 loosely mounted on the arm 80. With this construction the operative may by manipulation of the handle 81 unclamp the jack and elevate the tools. To remove the weight of the handle lever 80 and its connected parts from the rod 273 so that the slide 110 may move freely vertically while adapting itself to the height of the work the arm 78 is connected to the leg frame 25 by a counterbalancing spring 275. When the handle 80 is actuated downwardly to unclamp the jack and elevate the slide 110 the tendency of this spring to return the handle 80 to its elevated position is overcome by the frictional engagement of the rolls 75 and 93 with the walls of the cam slots 76 and 92, respectively.

When no work is in the machine the slide 110 is elevated to hold the operating tools in an inoperative position and the internal guide roll 69 is depressed below the platen 21 and the guide rolls 70 and 71 are held in an inoperative position. After the lasted shoe has been placed in position on the jack and the jack shifted on the pattern to aline the sole edge with the interior edge of the guiding flange 28 on the pattern plate the jack is clamped to the pattern plate and placed upon the platen 21. The pin wheel 37 is then engaged with the holes 38 in the guiding flange at the point at which it is desired to commence to sew and the handle 81 is elevated to permit the guide rolls to engage the opposite sides of the guiding flange 28 and the carrier 105 and gage 202 to drop upon the work. The treadle is then actuated to throw in the clutch to rotate the cam shaft 48. When the shaft 48 commences to rotate the feet 152 upon the carrier are pressed by the weight of the slide 110 and its connected parts upon the sole. As the carrier 105 is free to tip laterally upon the slide 110 the feet swing the carrier to bring the knife and awl substantially normal to the face and edge of the sole respectively. Then the cam groove 169 operates to actuate the pawl 155 to depress the slide 110 to place an additional pressure upon the feet 152 to insure their accommodation to the lateral curvature of the sole. The cam groove 169 also operates to position the depression 184 beneath the roll 175 so that the detent 172 may engage the teeth 171 in the carrier after the slide 110 has been depressed and thus lock the carrier in the position determined by the feet. While the slide 110 moves vertically and the carrier tips laterally under the influence of gravity the pawl 127 is held out of engagement with the ratchet 126 by the cam plate 200 to permit the ratchet to adjust itself to the shifting movement of the knife. During the downward stroke of the slide 110 under the influence of the cam groove 169 the pawl roll 199 rides off the cam plate 200 and the pawl 127 engages the ratchet. The cam groove 134 then operates the knife to form a fuscular slash in the sole. Then the cam groove 151 actuates the awl 95 to pass through the slotted welt guide 262 and penetrate the welt, upper and insole inter-

secting the slash formed by the knife below the surface of the sole and separating the material bounded by the tines of the fork from the body portion of the insole to provide a tongue for the reception of the inseam stitches.

After the awl withdraws the cam groove 223 operates to actuate the needle 211 to pass through the awl hole and carry the thread through the welt, upper and insole. The needle enters the work by the welt, elevates the tongue and emerges from the work through the stem of the furcular slash. When the needle commences to withdraw a loop is formed in the thread. The cam groove 246 then operates to oscillate the looper so that the nose 230 thereof passes between the thread and the shank of the needle and loops the thread over the elevated tongue. The cam groove 261 then operates to actuate the pawl 249 to depress the looper to subject the tongue to pressure. The looper is then oscillated in a direction to return it to its original position. During the first part of its return movement the looper wipes over the tongue until the pawl 249 clears the teeth 248 when the spring 233 elevates the looper clear of the work. During the penetrating stroke of the needle sufficient slack thread is formed between the tension device 228 and the grooved wheel 227 to permit the needle to carry the thread through the work without danger of breaking the thread. When the needle arm returns to its original position this slack thread is taken up, but as some of the thread remains in the work the needle arm on its back stroke simultaneously pulls on the thread looped over the tongue to set the stitch and pulls on the thread supply to obtain enough thread for the next stitch. As soon as the stitch is set the cam groove 169 operates to unlock the carrier 105 and engage the pawl 155 with the dog 160 to release the slide 110. The worm 47 now operates to actuate the jack a distance equal to the space between the stitches. As the jack is fed the guide rolls 69, 70 and 71 by engagement with the guiding flange 28 swing the jack laterally about an axis tangential to the sole edge to maintain the edge of the sole in proper relation to the operating tools. As the jack moves the feet 152 drag over the sole and swing the carrier in accordance with the lateral curvature engaged thereby. The jack now comes to rest and the cycle of operations hereinbefore described are repeated until the inseam sewing operation is completed.

From an inspection of Figs. 1 and 30 it will be seen that the worm 47 is provided with a straight groove terminating at its ends in two oppositely disposed curved grooves. With this construction while one of the pins of the pin wheel 46 is engaged with the straight groove the pattern plate is locked from movement. As soon however as the curved grooves engage the pin wheel 46 the pin previously engaged by the straight groove is moved in the direction of the arrow, (Fig. 30), by the left hand curved groove (viewing Fig. 1) while another pin is moved into position for engagement with the straight groove by the right hand curved groove (Fig. 1). The pattern plate is thus intermittently driven and is locked from movement between the feeding steps by a simple and compact mechanism which may be driven at a high speed.

It is not deemed necessary to illustrate and describe the particular form of the several cam paths and surfaces employed on the cam disks of the machine as any person skilled in the art by the exercise of ordinary mechanical skill could construct such cam paths and surfaces from the foregoing description of the construction, organization and mode of operation of the machine.

While the invention has been illustrated and described as embodied in a machine for sewing the welt, upper and insole together it will be readily apparent to those skilled in the art that the machine may be employed to sew the upper and outsole of a turn shoe or, in fact, the parts of any article which it may be desired to secure together.

It will also be clear to those skilled in this class of machines, with the general objects of the present invention in view, that changes may be made in the details of structure, the described and illustrated embodiment thereof being intended as an exploitation of its underlying essentials, the features whereof are definitely stated in their true scope in the claims herewith.

What is claimed as new, is:

1. A tongue forming machine, having, in combination, tongue forming devices, and means for insuring the uniform formation of the tongues, substantially as described.

2. A tongue forming machine, having, in combination, a work support, means for forming tongues in the work, and means for insuring the uniform formation of the tongue, substantially as described.

3. A tongue forming machine, having, in combination, a work support, means for forming tongues in the work, and mechanism for insuring the uniform formation of the tongues comprising gaging means for controlling the relative operative position of the tongue forming means and the work, substantially as described.

4. A tongue forming machine, having, in combination, a work support, means for forming tongues in the work, and means for insuring the uniform formation of the tongues comprising mechanism for relatively tipping the tongue forming means and the

work to maintain the tongue forming means substantially normal to the work, substantially as described.

5. A tongue forming machine, having, in combination, a work support, means for forming tongues in the work, and mechanism for insuring the uniform formation of the tongues comprising gaging means for controlling the relative operative position of the tongue forming means and the work and mechanism for relatively tipping the tongue forming means and the work to maintain the tongue forming means substantially normal to the work, substantially as described.

6. A shoe machine, having, in combination, a support for a lasted shoe, tongue forming devices, means for relatively actuating the shoe and tongue forming devices to transfer the point of operation of the tongue forming devices around the shoe, and means for insuring the uniform formation of the tongues, substantially as described.

7. A shoe machine, having, in combination, a support for a lasted shoe, tongue forming devices, means for relatively actuating the shoe and tongue forming devices to transfer the point of operation of the tongue forming devices around the shoe, and mechanism for insuring the uniform formation of the tongues comprising gaging means for controlling the relative operative position of the tongue forming devices and the work, substantially as described.

8. A shoe machine, having, in combination, a support for a lasted shoe, tongue forming devices, means for relatively actuating the shoe and tongue forming devices to transfer the point of operation of the tongue forming devices around the shoe, and means for insuring the uniform formation of the tongues comprising mechanism for relatively tipping the shoe and tongue forming devices to maintain the tongue forming devices normal to the shoe, substantially as described.

9. A shoe machine, having, in combination, a support for a lasted shoe, tongue forming devices, means for relatively actuating the shoe and tongue forming devices to transfer the point of operation of the tongue forming devices around the shoe, and means for insuring the uniform formation of the tongues comprising gaging means for controlling the relative operative position of the tongue forming devices and the work and mechanism for relatively tipping the shoe and tongue forming devices to maintain the tongue forming devices normal to the shoe, substantially as described.

10. A tongue forming machine, having, in combination, a work support, a knife arranged to operate in a plane substantially normal to the work, and an awl arranged to operate in a plane substantially normal to the plane of operation of the knife, substantially as described.

11. A tongue forming machine, having, in combination, a work support, a slashing knife arranged to operate in a plane substantially normal to the work to cut a slash in the work, and an awl arranged to operate in a plane substantially normal to the plane of operation of the knife to form a cut intersecting the slash below the surface of the work, substantially as described.

12. A tongue forming machine, having, in combination, a work support, a knife having a furcular cutting edge arranged to operate in a plane substantially normal to the work to cut a furcular slash in the work, and an awl arranged to operate in a plane substantially normal to the plane of operation of the knife to form a cut intersecting the slash below the surface of the work and separating the material bounded by the tines of the fork from the body portion of the work, substantially as described.

13. A tongue forming machine, having, in combination, a work support, a knife arranged to operate in a plane substantially normal to the work to cut a slash in the work, means for relatively actuating the support and knife to transfer the point of operation of the knife over the work, and a depth gage for insuring the formation of slashes uniform in depth, substantially as described.

14. A tongue forming machine, having, in combination, a work support, a knife arranged to operate in a plane substantially normal to the work to cut a slash in the work, and means for relatively actuating the support and knife to transfer the point of operation of the knife over the work, substantially as described.

15. A shoe machine, having, in combination, a sole support and means for forming a series of furcular slashes along the peripheral margin of one face of the sole, while the sole is supported entirely by the support.

16. A shoe machine, having, in combination, a sole support, means for forming a tongue in the peripheral margin of one face of the sole, and mechanism for relatively actuating said means and support to transfer the point of operation of said means around the sole, substantially as described.

17. A shoe machine, having, in combination, a sole support, and means for forming a series of tongues rectangular in cross section along the peripheral margin of one face of the sole, substantially as described.

18. A shoe machine, having, in combination, a sole support, and means for forming a series of vertical furcular slashes along the peripheral margin of one face of the sole, substantially as described.

19. A tongue forming machine, having, in

combination, a work support, and means for forming a series of tongues along the margin of one face of the work comprising a knife for cutting a furcular slash in the work and an awl for intersecting the slash below the surface of the work, substantially as described.

20. A tongue forming machine, having, in combination, a work support, and means for forming a series of tongues along the margin of one face of the work comprising a knife and an awl having a width substantially greater than the cutting edge of the knife, substantially as described.

21. A shoe machine, having, in combination, a support for a lasted shoe, a knife for cutting a furcular slash in the peripheral margin of one face of the sole, and means for relatively actuating the support and knife to transfer the point of operation of the knife around the shoe, substantially as described.

22. A shoe machine, having, in combination, a support for a lasted shoe, a knife for cutting a furcular slash in the peripheral margin of one face of the sole, means for relatively actuating the support and knife to transfer the point of operation of the knife around the shoe, and means for relatively tipping the support and knife to maintain the knife substantially normal to the face of the sole as the point of operation is transferred around the shoe, substantially as described.

23. A shoe machine, having, in combination, a support for a lasted shoe, a knife for cutting a furcular slash in the peripheral margin of one face of the sole, means for relatively actuating the support and knife to transfer the point of operation of the knife around the shoe, and means for relatively tipping the support and knife laterally to maintain the knife substantially normal to the face of the sole as the point of operation is transferred around the shoe, substantially as described.

24. A tongue forming machine, having, in combination a work support, a knife, mechanism for relatively actuating the support and knife to cause the knife to slash the work, and automatic means for adjusting said mechanism in accordance with the height of the work, substantially as described.

25. A tongue forming machine, having, in combination, a work support, a knife, mechanism for relatively actuating the support and knife to cause the knife to slash the work, automatic means for measuring the height of the work, and means for adjusting said mechanism in accordance with the height determined by the measuring means, substantially as described.

26. A tongue forming machine, having, in combination, a work support, a knife, and mechanisms operating automatically and successively to relatively actuate the support and knife to measure the height of the work and cause the knife to slash the work, substantially as described.

27. A tongue forming machine, having, in combination, a knife, an actuating lever therefor, a connection between said lever and knife, and means for actuating said connection to release the knife to allow it to accommodate itself to varying heights of work, substantially as described.

28. A tongue forming machine, having, in combination, a knife, an actuating lever therefor, a ratchet mounted to move with the knife, a pawl carried by the lever, and means for moving the pawl into and out of engagement with the ratchet, substantially as described.

29. A tongue forming machine, having in combination, a knife, an actuating lever therefor, a ratchet mounted to move with the knife, a pawl carried by the lever, means for moving the pawl into and out of engagement with the ratchet, and means for accommodating the knife to the height of the work while the pawl is disengaged from the ratchet, substantially as described.

30. A tongue forming machine, having, in combination, a knife, an actuating lever therefor, a ratchet mounted to move with the knife, a pawl carried by the lever, a spring for moving the pawl into engagement with the ratchet, and a cam for moving the pawl out of engagement with the ratchet, substantially as described.

31. A tongue forming machine, having, in combination, a knife, an actuating lever therefor, a ratchet lever, a pawl lever, a yielding connection between the actuating lever and the ratchet lever, and means for moving the pawl into and out of engagement with the ratchet, substantially as described.

32. A shoe machine, having, in combination, a sole support, a knife arranged to cut a slash in the peripheral margin of one face of the sole, and an awl arranged to operate in a plane substantially normal to the plane of operation of the knife, substantially as described.

33. A shoe machine, having, in combination, a sole support, a slashing knife arranged to cut a slash in the peripheral margin of one face of the sole, and an awl arranged to cut a hole through the edge of the sole intersecting the slash below the surface of the sole, substantially as described.

34. A shoe machine, having, in combination, a sole support, a knife having a furcular cutting edge arranged to cut a furcular slash in the peripheral margin of one face of the sole, and an awl arranged to cut a hole

through the edge of the sole intersecting the slash below the surface of the sole and separating the material bounded by the tines of the fork from the body portion of the sole, substantially as described.

35. In a tongue forming machine, a knife having a straight cutting edge and a U-shaped cutting edge, substantially as described.

36. In a tongue forming machine, a knife consisting of a block having a straight cutting edge and a U-shaped channel sharpened at its end adjacent the straight cutting edge, and a depth gage mounted in the channel, substantially as described.

37. A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, and a plurality of feet mounted on the carrier arranged to engage the sole and adapt themselves to the curvature thereof and directly swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, substantially as described.

38. A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, and a plurality of feet mounted on the carrier arranged to engage the sole and adapt themselves to the lateral curvature thereof and directly swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, substantially as described.

39. A shoe machine, having, in combination, a sole support, a knife, means for relatively actuating the support and knife to transfer the point of operation of the knife around the sole, a knife slide, a carrier therefor, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the curvature of the sole and swing the carrier during the transfer of the tool around the sole to maintain the knife substantially normal to the sole, and means for reciprocating the knife slide, substantially as described.

40. A shoe machine, having, in combination, a sole support, a knife, means for relatively actuating the support and knife to transfer the point of operation of the knife around the sole, a knife slide, a carrier therefor, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the curvature of the sole and swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, and means for reciprocating the knife slide comprising an actuating lever and a pin and slot connection between the lever and the slide, substantially as described.

41 A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the curvature of the sole and directly swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, and means for pressing the feet against the sole, substantially as described.

42. A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the curvature of the sole and swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, and means for pressing the feet against the sole comprising a slide for the carrier, a ratchet thereon, a pawl, and means for moving the pawl into and out of engagement with the ratchet, substantially as described.

43. A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the curvature of the sole and swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, means for pressing the feet against the sole, and means for locking the carrier from swinging movement during the operating stroke of the tool, substantially as described.

44. A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the curvature of the sole and swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, means for pressing the feet against the sole, and means for locking the carrier from swinging movement during the operating stroke of the tool comprising a segment on the carrier and a detent arranged to engage the segment, and means for moving the detent into and out of engage-

ment with the segment, substantially as described.

45. A shoe machine, having, in combination, a sole support, an operating tool, means for relatively actuating the support and tool to transfer the point of operation of the tool around the sole, a tool carrier, a plurality of feet mounted on the carrier and arranged to engage the sole and adapt themselves to the lateral curvature of the sole and swing the carrier during the transfer of the tool around the sole to maintain the tool substantially normal to the sole, means for locking the carrier from swinging movement during the operating stroke of the tool comprising a segment on the carrier and a detent arranged to engage the segment, and means for moving the detent out of engagement with the segment comprising a roll mounted to move with the detent and a cam for elevating the roll, substantially as described.

46. A sewing machine, having, in combination, tongue forming devices, and stitch forming devices including a straight eye pointed needle, substantially as described.

47. A machine for sewing members together one of which is tongued, having, in combination, a needle arranged to carry the thread through the members, a looper arranged to pass between the thread and the shank of the needle subsequent to the passage of the needle through the tongued member, and means for actuating the looper in the direction of width of the tongue to guide the thread over the tongue as the needle withdraws from the tongued member, substantially as described.

48. A machine for sewing members together one of which is tongued, having, in combination, a needle arranged to carry the thread through the members and elevate the tongue as it passes through the tongued member, a looper arranged to pass between the thread and the shank of the needle subsequent to the passage of the needle through the tongued member, means for actuating the looper to guide the thread over the elevated tongue as the needle withdraws from the work, and means for actuating the looper to depress the elevated tongue, substantially as described.

49. A shoe sewing machine, having, in combination, tongue forming devices, a needle arranged to carry the thread through the welt, upper and insole, a looper arranged to pass between the thread and the shank of the needle subsequent to the passage of the needle through the insole, and means for actuating the looper in the direction of width of the tongue to guide the thread over the tongue as the needle withdraws from the insole, substantially as described.

50. A sewing machine, having, in combination, tongue forming devices, and stitch forming devices including an oscillating looper movable in the direction of width of the tongues for looping the thread over the tongues, substantially as described.

51. A sewing machine, having in combination, tongue forming devices, and stitch forming devices including an oscillating looper for looping the thread over the tongues, and means for actuating the looper to subject the tongues to pressure, substantially as described.

52. A sewing machine, having, in combination, tongue forming devices, and stitch forming devices including an oscillating and a reciprocating looper for looping the thread over the tongues and subjecting the tongues to pressure, substantially as described.

53. A sewing machine, having, in combination, tongue forming devices, and stitch forming devices including a looper for looping the thread over the tongues, and means for oscillating the looper comprising a shaft, a pinion carried thereby, a rack meshing with the pinion, and means for reciprocating the rack, substantially as described.

54. A sewing machine, having, in combination, tongue forming devices, stitch forming devices including a looper for looping the thread over the tongues, and means for actuating the looper to subject the tongues to pressure comprising a shaft, a ratchet thereon, a pawl, and means for actuating the pawl, substantially as described.

55. A sewing machine, having, in combination, tongue forming devices; and stitch forming devices including a looper for looping the thread over the tongues; means for oscillating the looper comprising a shaft, a pinion splined thereto, a spring for maintaining the shaft normally elevated, a rack meshing with the pinion and means for reciprocating the rack; and means for reciprocating the looper during a portion of its oscillating movement to subject the tongues to pressure comprising a ratchet on the shaft, a pawl, and means for actuating the pawl, substantially as described.

56. In a machine for sewing members together, one of which is tongued, stitch forming devices including an oscillating looper movable in the direction of width of a tongue for looping the thread over the tongues, substantially as described.

57. In a machine for sewing members together, one of which is tongued, stitch forming devices including a looper for looping the thread over the tongues, and means for actuating the looper to subject the tongues to pressure, substantially as described.

58. In a machine for sewing members together, one of which is tongued, stitch forming devices including an oscillating and reciprocating looper for looping the thread over the tongues and subjecting the tongues to pressure, substantially as described.

59. A sewing machine, having, in combi-

nation, a needle and an awl arranged to operate in intersecting paths in the same plane, substantially as described.

60. A sewing machine, having, in combination, a needle and an awl arranged to operate in intersecting paths in the same plane, said paths intersecting in the work, substantially as described.

61. A sewing machine, having, in combination, an awl arranged to operate in a plane normal to the work, and a needle arranged to operate in a plane inclined to the plane of the awl, substantially as described.

62. A sewing machine, having, in combination, an awl arranged to operate in a plane normal to the work, and a needle arranged to operate in a plane inclined to the plane of the awl, said planes intersecting in the work, substantially as described.

63. A sewing machine, having, in combination, stitch forming devices, a support therefor, a carrier for the support, means for tipping the carrier to adapt the stitch forming devices to the curvature of the sole, and a gage carried by the support for controlling the relative vertical position of the stitch forming devices and the work, substantially as described.

64. A sewing machine, having, in combination, stitch forming devices, and a gage arranged to engage the work movable about an axis intersecting the medial line of the gage at the surface of the work, substantially as described.

65. A sewing machine, having, in combination, stitch forming devices including a needle and an awl, and a gage for controlling the relative vertical position of the stitch forming devices and the work said gage having a two point contact with the work to permit the material of the work to hump under the gage during the penetration of the needle and the awl, substantially as described.

66. A sewing machine, having, in combination, stitch forming devices including a needle and an awl, and a gage for controlling the relative vertical position of the stitch forming devices and the work movable about an axis intersecting the medial line of the gage at the surface of the work, substantially as described.

67. A sewing machine, having, in combination, stitch forming devices including a needle and an awl, and a gage for controlling the relative vertical position of the stitch forming devices and the work movable about an axis intersecting the medial line of the gage at the surface of the work said gage having a two point contact with the work to permit the material of the work to hump under the gage during the penetration of the needle and the awl, substantially as described.

68. A sewing machine, having, in combination, means for forming a series of furcular slashes along the peripheral margin of one face of the insole, and a needle arranged to enter the edge of the insole and emerge from the face of the insole through the stem of the furcular slash, substantially as described.

69. A sewing machine, having, in combination, a knife for cutting a furcular slash in one face of the sole, an awl arranged to intersect the slash below the surface of the sole and separate the material bounded by the tines of the fork from the body portion of the sole, and a needle arranged to enter the edge of the sole and emerge from the face of the sole through the stem of the furcular slash, substantially as described.

70. A sewing machine, having, in combination, means for supporting a welt having one edge longitudinally slit, and means operating through the support for securing the slit welt to a lasted shoe, substantially as described.

71. A sewing machine, having, in combination, means for guiding a welt having one edge longitudinally slit, and means operating through the guide for securing the slit welt to a lasted shoe, substantially as described.

72. A machine of the class described, having, in combination, means out of contact with the work for feeding a welt having the edge which is exposed in the finished shoe longitudinally slit, and means operating between the flaps of the slit to secure the welt to a lasted shoe.

73. A machine of the class described, having, in combination, means for supporting, guiding, and feeding a welt having the edge which is exposed in the finished shoe longitudinally slit, said feeding means being out of contact with the work, and means operating between the flaps of the slit to secure a welt to a lasted shoe.

74. An inseaming machine, having, in combination, means for supporting a lasted shoe, means for supporting a welt entirely outside the peripheral edge of the insole of the lasted shoe, and means for securing the welt to the lasted shoe while so supported.

75. An inseaming machine, having, in combination, means for supporting a lasted shoe, means for supporting a welt entirely outside the peripheral edge of the insole of the lasted shoe and with the flesh faces of the welt and insole in the same plane, and means for securing the welt to the lasted shoe while so supported.

76. An inseaming machine, having, in combination, means for supporting a lasted shoe, means for supporting a welt, having the edge which is exposed in the finished shoe longitudinally slit, entirely outside the peripheral edge of the insole of the lasted shoe and with the flesh faces of the welt and insole in the same plane, and means operating between the flaps of the slit in the

welt for securing the welt to the lasted shoe while so supported.

77. A shoe machine, having, in combination, a sole support, and means for forming a stitch-anchoring tongue uniform in thickness throughout its length in the marginal portion of one face of the sole, substantially as described.

78. A shoe machine, having, in combination, a sole support, and means for forming a stitch-anchoring tongue substantially uniform in width throughout its length in the marginal portion of one face of the sole, substantially as described.

79. A shoe machine, having, in combination, a sole support, and means for forming a stitch-anchoring tongue substantially uniform in width and thickness throughout its length in the marginal portion of one face of the sole, substantially as described.

80. A shoe machine, having, in combination, a support for the sole of a shoe, means for forming stitch-anchoring tongues in the marginal portion of one face of the sole, and means for slashing the sole adjacent the stitch-anchoring tongues to impart flexibility to the sole when the tongues are stiffened with stitches, substantially as described.

81. A shoe machine, having, in combination, a support for the sole of a shoe, means for slashing the marginal portion of one face of the sole, means for relatively feeding the support and slashing means longitudinally, and means for relatively swinging the support and slashing means laterally during the longitudinal feed to maintain the slashes in the sole radial to the edge thereof, substantially as described.

82. A machine of the class described, having, in combination, a support for the sole of a shoe, means for slashing the marginal portion of one face of the sole, means for feeding the sole longitudinally, and means for swinging the sole laterally during its feed longitudinally to maintain the slashes in the sole radial to the edge thereof, substantially as described.

83. A tongue-forming machine, having, in combination, a support for the sole of a shoe, and devices for forming stitch-anchoring tongues in the marginal portion of one face of the sole comprising a knife and an awl coöperating therewith, substantially as described.

84. A tongue-forming machine, having, in combination, a support for the sole of a shoe, devices for forming stitch-anchoring tongues in the marginal portion of one face of the sole comprising a knife and an awl coöperating therewith, and means for relatively actuating the support and tongue-forming devices to transfer the points of operation of the tongue-forming devices around the sole, substantially as described.

85. A tongue-forming machine, having, in combination, a support for the sole of a shoe, devices for forming stitch-anchoring tongues in the marginal portion of one face of the sole comprising a knife and an awl coöperating therewith, means for relatively feeding the support and tongue-forming devices longitudinally, and means for relatively swinging the support and tongue-forming devices laterally during the feed longitudinally to maintain the edge of the sole adjacent the operating point in the line of feed, substantially as described.

86. A tongue-forming machine, having, in combination, a support for the sole of a shoe, devices for forming stitch-anchoring tongues in the marginal portion of one face of the sole comprising a knife and an awl coöperating therewith, means for relatively actuating the support and tongue-forming devices to transfer the points of operation of the tongue-forming devices around the sole, and means for relatively tipping the support and tongue-forming devices to maintain the knife and awl normal to the face and edge of the sole, respectively, substantially as described.

87. A tongue-forming machine, having, in combination, a support for the sole of a shoe, devices for forming stitch-anchoring tongues in the marginal portion of one face of the sole comprising a knife and an awl coöperating therewith, means for relatively actuating the support and tongue-forming devices to transfer the points of operation of the tongue-forming devices around the sole, and means for relatively tipping and swinging the support and tongue-forming devices to maintain the knife and awl normal to the face and edge of the sole, respectively, and the edge of the sole adjacent the operating point in the line of feed, substantially as described.

88. A shoe machine, having, in combination, a support for a lasted shoe, tongue-forming devices, and automatic mechanism for relatively actuating the shoe and tongue-forming devices to transfer the point of operation of the tongue-forming devices around the shoe, substantially as described.

89. A shoe machine, having, in combination, a sole support, an awl for cutting a slash in the edge face of the sole, means for relatively actuating the support and awl to transfer the point of operation of the awl around the sole, an awl carrier, and a plurality of feet mounted on the carrier arranged to engage the sole and adapt themselves to the lateral curvature thereof and swing the carrier to maintain the awl substantially normal to the edge face of the sole, substantially as described.

90. A shoe machine, having, in combination, a sole support, an awl for cutting a slash in the edge face of the sole, means for relatively actuating the support and awl

to transfer the point of operation of the awl around the sole, an awl carrier, a plurality of feet mounted on the carrier arranged to engage the sole and adapt themselves to the lateral curvature thereof and swing the carrier to maintain the awl substantially normal to the edge face of the sole, and means for actuating the awl, substantially as described.

91. A shoe machine, having, in combination, a sole support, an awl for cutting a slash in the edge face of the sole, means for relatively actuating the support and awl to transfer the point of operation of the awl around the sole, an awl slide, a carrier therefor, a plurality of feet mounted on the carrier arranged to engage the sole and adapt themselves to the lateral curvature thereof and swing the carrier to maintain the awl substantially normal to the edge face of the sole, and means for actuating the awl slide comprising an actuating lever and a pin and slot connection between the lever and slide, substantially as described.

92. A sewing machine, having, in combination, tongue-forming devices, and stitch-forming devices including a straight needle, substantially as described.

93. A sewing machine, having, in combination, tongue-forming devices, and stitch-forming devices including an eye-pointed needle, substantially as described.

94. A sewing machine, having, in combination, a needle and an awl arranged to operate in intersecting paths in the same vertical plane, means for reciprocating the awl in substantially a horizontal plane, and means for reciprocating the needle in a plane inclined to the plane of reciprocation of the awl, substantially as described.

CHARLES C. BLAKE.

Witnesses:
WILLIAM F. TORREY,
MARK E. FERNALD.