E. E. WINKLEY.

SHOE SEWING MACHINE.

APPLICATION FILED MAR. 26, 1897.

993,490.

Patented May 30, 1911.

7 SHEETS—SHEET 1.

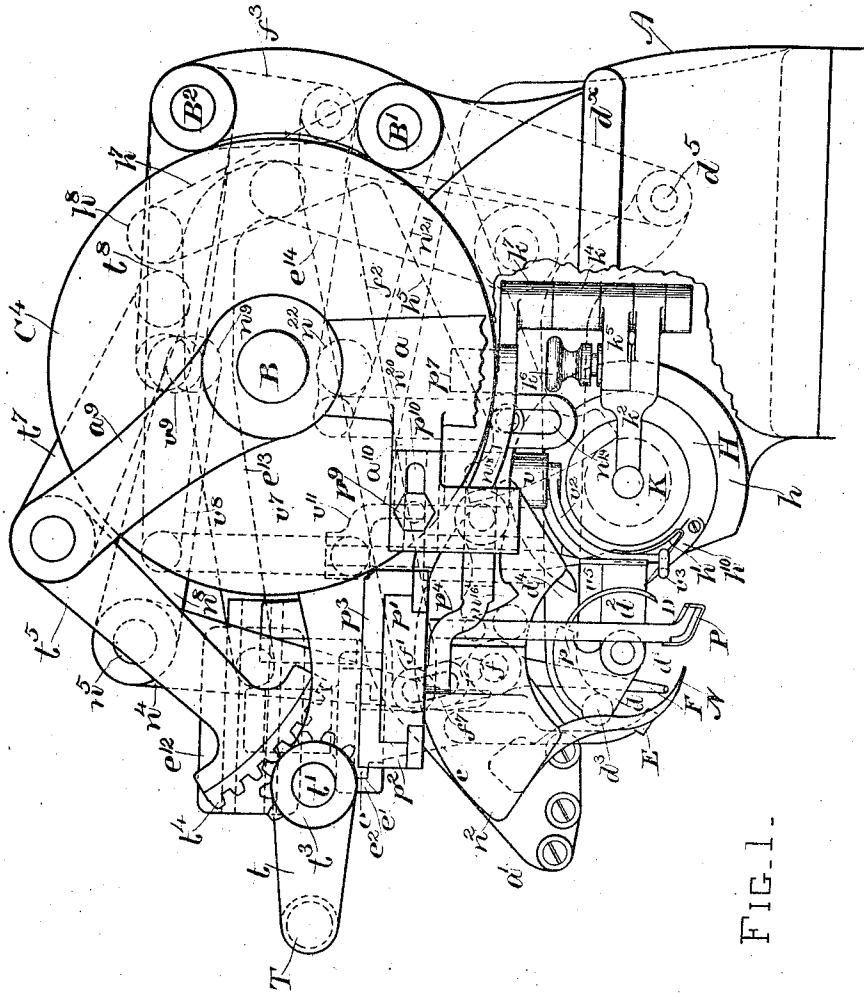

FIG. 1.

WITNESSES.

D. C. Hyde.

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7 SHEETS—SHEET 2.

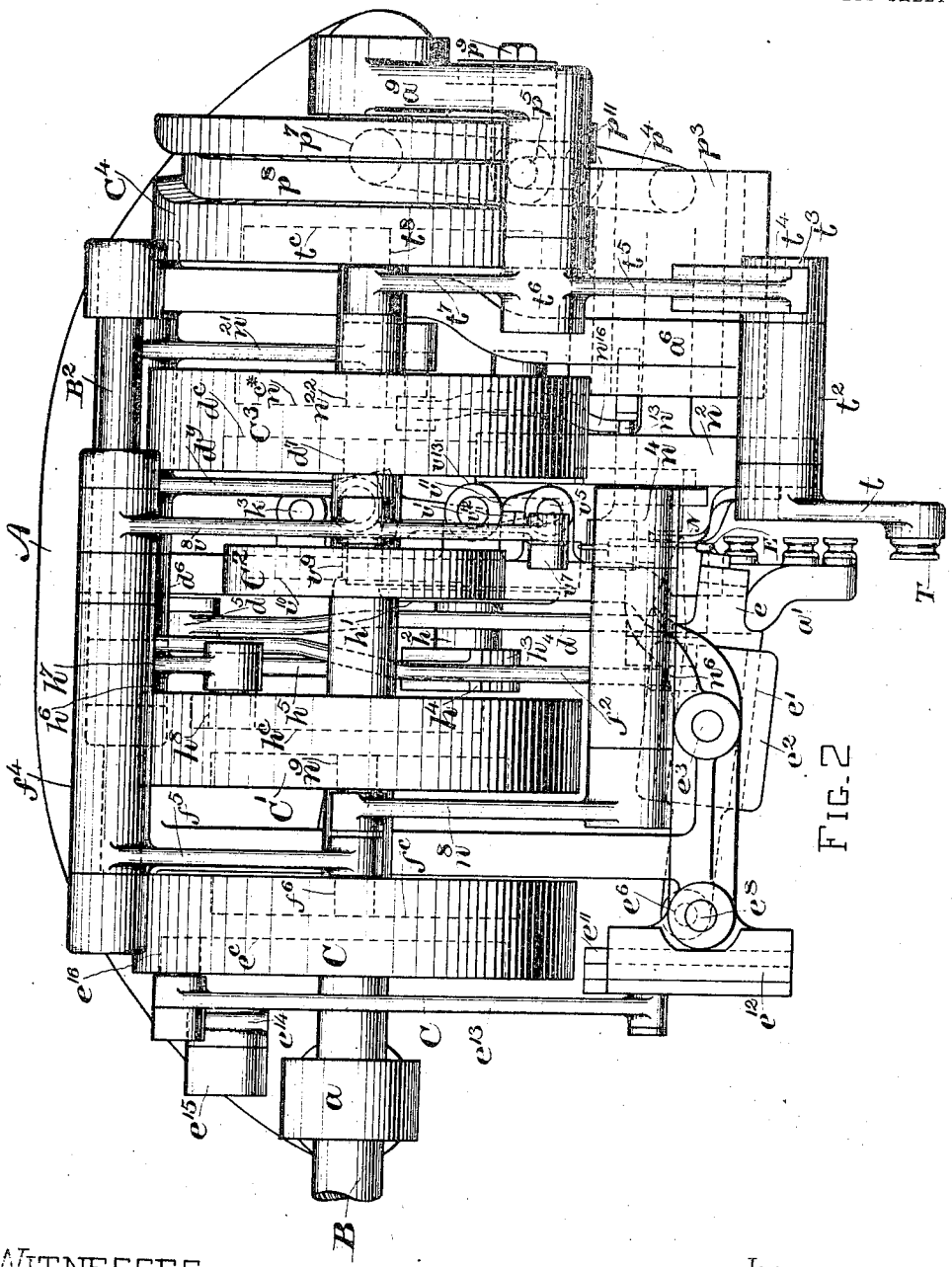

FIG. 2

WITNESSES.

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7 SHEETS—SHEET 3.

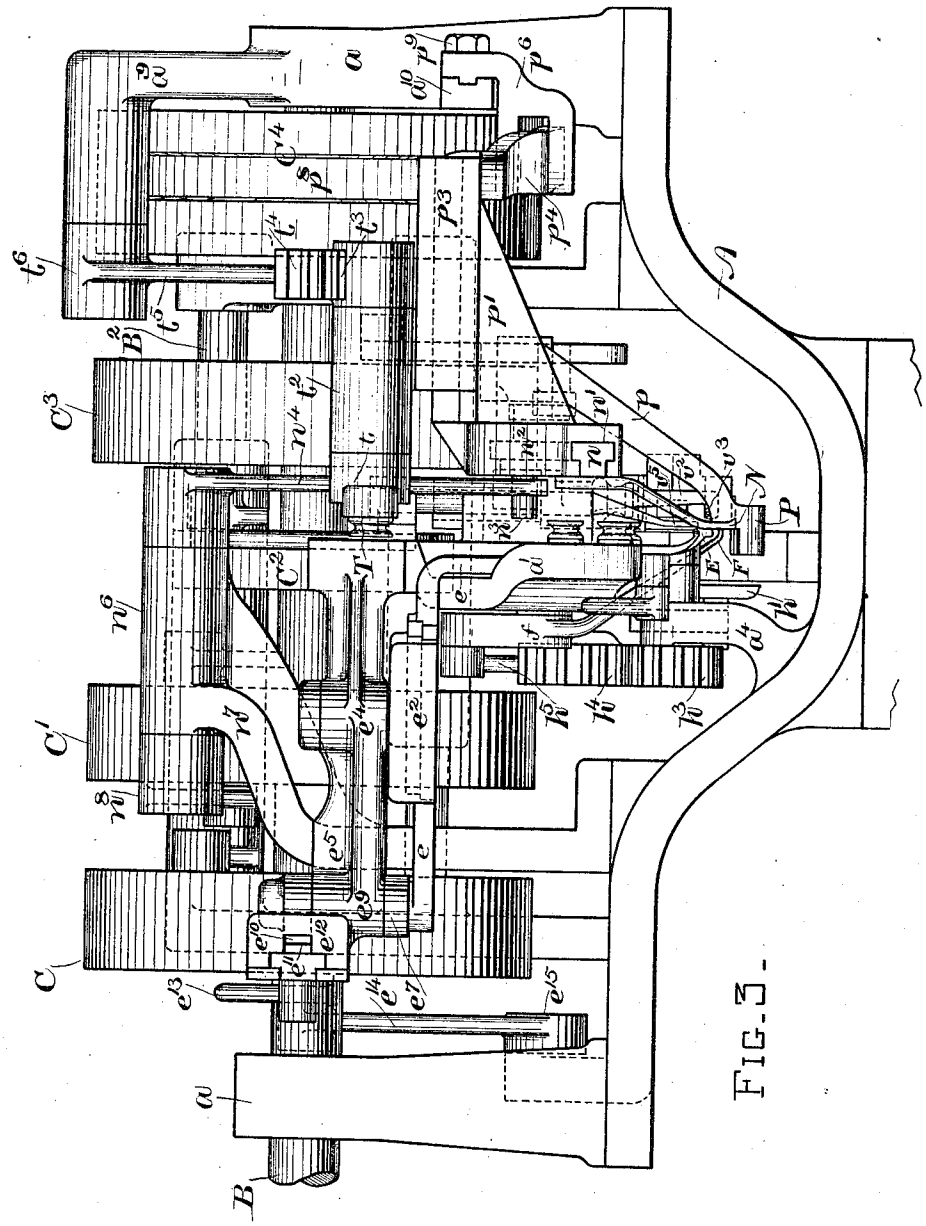

FIG. 3.

WITNESSES.

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7 SHEETS—SHEET 4.

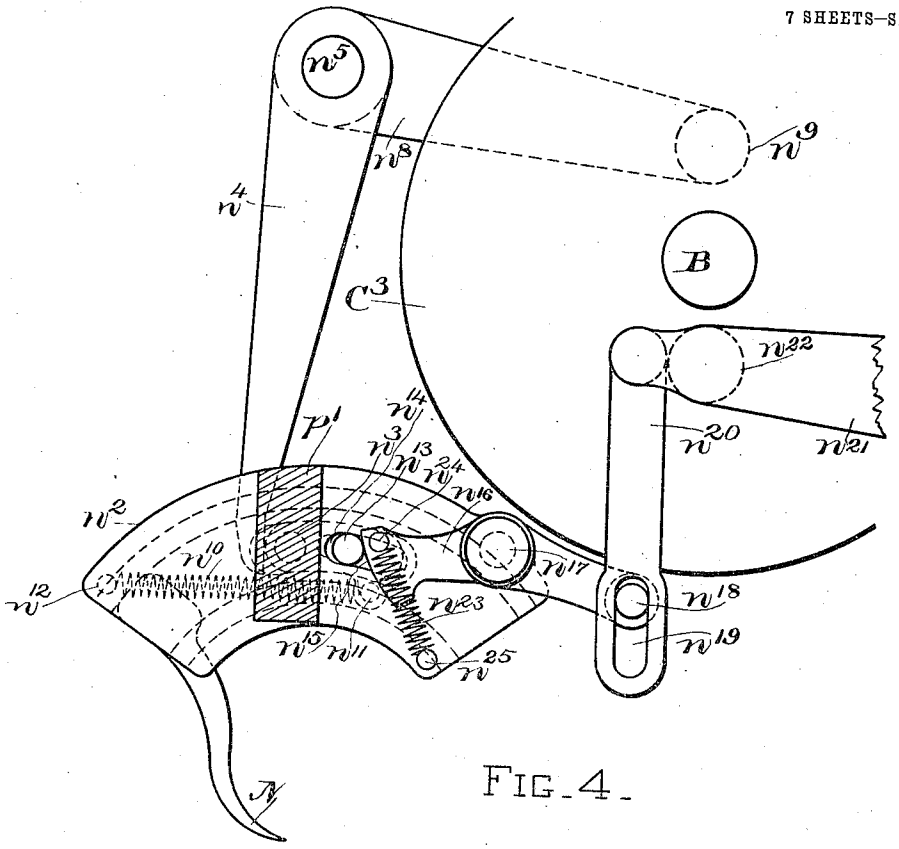


FIG. 4.

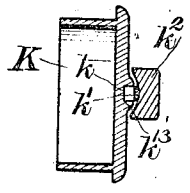


FIG. 12.

WITNESSES.

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7 SHEETS—SHEET 5.

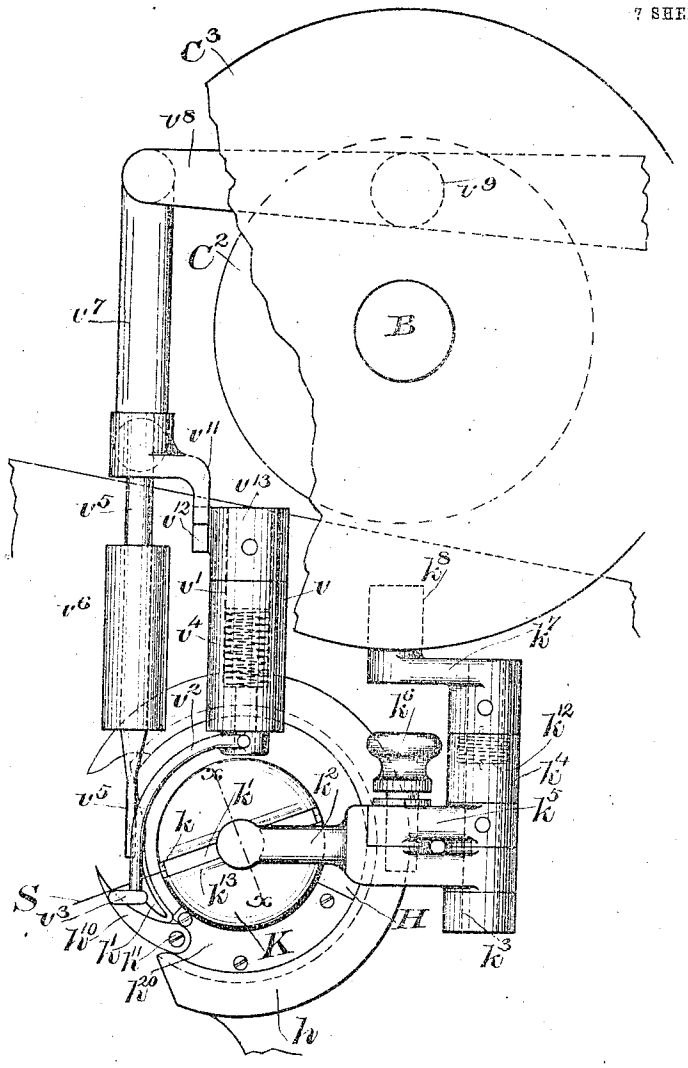


FIG. 5

WITNESSES.

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7 SHEETS—SHEET 6.

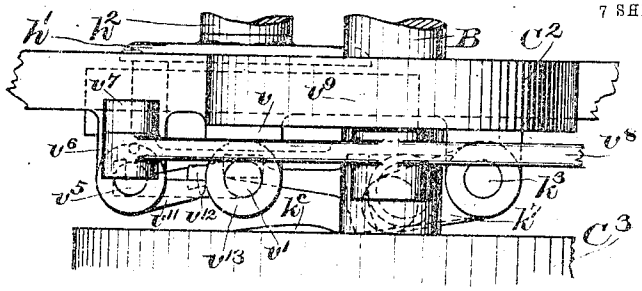
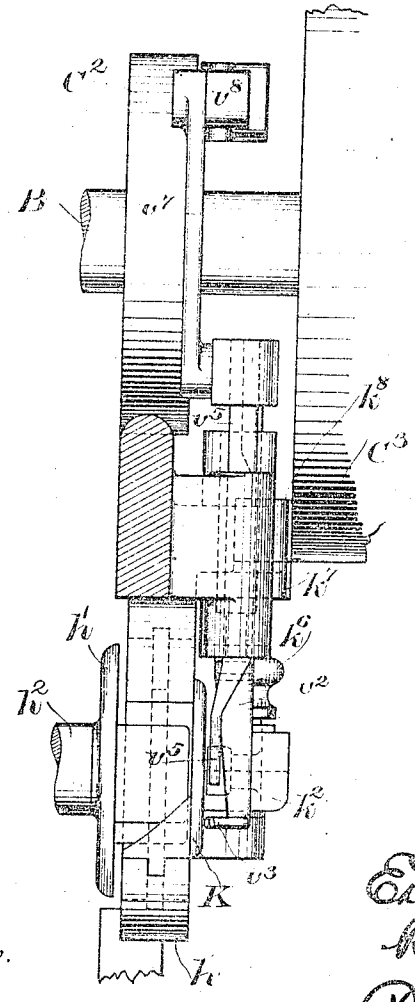


FIG. 6.

FIG. 7.



WITNESSES.

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7 SHEETS—SHEET 7.

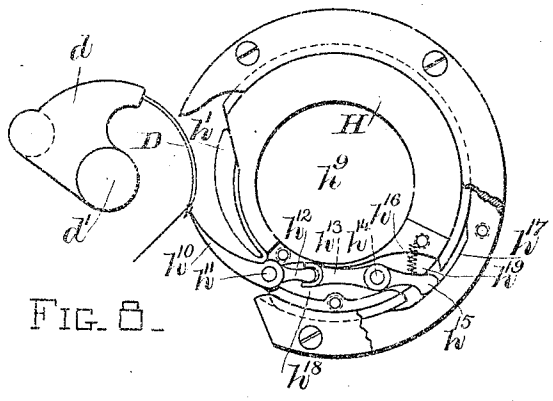


FIG. 8.

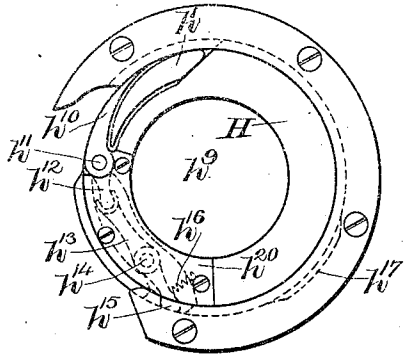


FIG. 9.

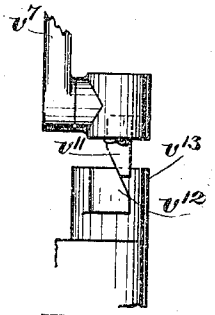


FIG. 10.

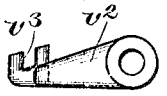


FIG. 11.

WITNESSES.

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By his attorneys,

Phillips & Anderson.

# UNITED STATES PATENT OFFICE.

ERASTUS E. WINKLEY, OF LYNN, MASSACHUSETTS.

## SHOE-SEWING MACHINE.

993,490. Specification of Letters Patent. Patented May 30, 1911.

Application filed March 26, 1897. Serial No. 629,411.

*To all whom it may concern:*

Be it known that I, ERASTUS E. WINKLEY, citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Shoe-Sewing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in shoe sewing machines and more particularly to improvements in that class of shoe sewing machines which unite the welt to the lasted upper and insole.

Machines of the above class, which have heretofore been successful in their operation, and have been adopted by the trade, are generally of the chain stitch type, great difficulty having been heretofore found in adapting lock stitch mechanisms to this class of machines.

In a welt machine it is essential that the welt and upper should be tightly drawn against the shoulder (or lip) of the insole as the stitch is set, and in so far as I am advised of the art, one of the greatest difficulties in adapting lock stitch mechanism to this class of work, is to properly regulate the relative tension of the shuttle and supply threads, so that the take up will properly set the stitch and position the lock. It may be said in this connection that if the shuttle tension is too heavy, the thread, while the stitch is being set, will draw from the supply over the take up, and the stitch is apt to be loose, and the lock or bight left at or too near the outside of the between substances, while if the tension of the shuttle thread is too light the bight or lock is apt to be drawn through the between substance, also leaving a loose stitch. It is also a well known fact that if a too heavy tension is carried upon the shuttle thread the machine is apt to break the thread causing delay and producing imperfect work.

The object of the present invention is to obviate the difficulty hereinbefore suggested, and generally to improve the construction and operation of machines of this class, and to the above end the present invention consists in improved shuttle thread tension devices whereby the tension upon the shuttle thread is increased to prevent the shuttle thread from being drawn off while the stitch is being set, and diminished after the stitch is set to allow the amount of shuttle thread to be drawn from the shuttle, which is required in forming the next stitch; the present invention further consists of a shuttle thread measuring device whereby the amount of shuttle thread required in forming the next stitch is drawn from the shuttle before the tension on the shuttle thread is increased as above stated; the present invention also consists of certain improvements in the form and arrangement of the shuttle, and of the mechanisms controlling the looper and channel guide, also of an improved arrangement of the channel guide and welt guide to grip or clamp the between substances and feed the work, and of other improved devices and combinations of devices hereinafter more specifically pointed out and claimed.

A preferred form of the present invention is illustrated in the accompanying drawings in which—

Figure 1 is a side view of a welt sewing machine embodying a preferred form of the present invention, a portion of the frame broken away to show underlying parts, and the supporting column omitted. Fig. 2 is a plan view. Fig. 3 is a front elevation. Fig. 4 is a side view partially in section showing the channel guide and immediately associated parts detached. Fig. 5 is a side view of the shuttle and shuttle thread measuring devices, and immediately associated parts detached. Figs. 6 and 7 are respectively top and front views of the mechanism illustrated in Fig. 5. Figs. 8 and 9 are side views of the shuttle and shuttle race, showing the hook in two positions. Figs. 10 and 11 are detached views of details of the shuttle thread measuring device, and Fig. 12 is a section through the bobbin case, on line *x x* Fig. 5, showing also a portion of the shuttle tension mechanism.

Similar letters refer to similar parts throughout the several views.

In the drawings A represents a head or frame suitable to support the working parts of the machine and which is conveniently supported by the usual base or column (not shown.) As is usual in this class of machines the head A is provided with the standards *a*, in which are provided suitable bearings for the main shaft B of the machine, hereinafter called the cam shaft. Upon the cam shaft B are mounted a series

of disks C, $C^1$, $C^2$, $C^3$ and $C^4$, arranged to rotate with said shaft and in which are formed a series of cam ways controlling the operation of the several parts of the machine as hereinafter described.

D represents the needle mounted upon the needle segment $d$, pivoted at $d^1$ to a fixed part $d^2$ of the frame A. To the needle segment $d$ is pivotally connected at $d^3$, the link $d^4$ which is also pivotally connected at $d^5$, to one arm $d^x$ of a bent lever $d^6$, fulcrumed on the shaft $B^1$, supported in frame A and parallel to the cam shaft B. One arm $d^y$ of the bent lever $d^6$, carries a cam roll $d^7$ (see Fig. 2) which engages a cam path $d^c$ formed in the disk $C^3$. The above described arrangement is such, that a rotation of the cam disk $C^3$ oscillates the lever $d^6$ about its fulcrum on the shaft $B^1$, and imparts a motion of reciprocation to the link $d^4$, which oscillates the segment $d$ about its center $d^1$, causing the needle D to be advanced and retracted along a circular path.

E represents the looper, which is carried by a slide $e$, arranged to reciprocate, and held in position in a guide way $e^1$, formed in the underside of the horizontally swinging guide block $e^2$; as shown, the guide block $e^2$ is provided with inturned flanges or gibs along the guide way $e^1$, which support the slide $e$. The guide block $e^2$ is pivotally supported by a stud $e^3$, held in a suitable bearing $e^4$ in a bracket $e^5$ projected from the frame A.

The slide $e$ is projected beyond the guide block $e^2$, and its outer end is connected by a crank pin $e^6$, with a crank disk $e^7$, which is carried by a short vertical shaft $e^8$, mounted in a bearing $e^9$ in the bracket $e^5$. The shaft $e^7$, above said bearing, carries a segmental pinion $e^{10}$, which meshes with a rack $e^{11}$, mounted to reciprocate in a bearing $e^{12}$, on bracket $e^5$, and connected by a link $e^{13}$, with a swinging lever $e^{14}$, fulcrumed at $e^{15}$ on the frame A. At the point of connection between the link $e^{13}$ and lever $e^{14}$ is provided a cam roll $e^{16}$ engaging a cam path $c^e$ in the disk C. The above described arrangement is such, that a rotation of the disk C imparts a motion of oscillation to the lever $e^{14}$, which, by means of the connecting link $e^{13}$, reciprocates the rack $e^{11}$ in its bearings $e^{12}$, and by means of the segmental pinion $e^{10}$, oscillates the shaft $e^8$, and the crank disk $e^7$ carried thereby, which, by means of the crank pin $e^6$, imparts to the slide $e$ a reciprocating motion along guide way $e^1$, and an oscillatory motion with the guide block $e^2$ about the stud $e^3$ as a center, and the combined movement thus imparted to the slide $e$, causes the looper E to move in a curved path around the needle D to place its thread in the hook thereof.

F represents the supply thread measurer, or thread measurer proper, which is pivotally supported at $f$, upon a forwardly projecting bracket $a^1$ in the frame A.

The thread measurer F carries above its fulcrum $f$, a rigid projection $f^1$, which is connected by a link $f^2$, with one arm $f^3$ of a bent lever $f^4$, which is fulcrumed upon the shaft $B^2$, which is mounted in suitable bearings in frame A and is substantially parallel to shaft B. The other arm $f^5$ of the bent lever $f^4$ carries a cam roll $f^6$, which engages a cam path $f^c$ in the face of disk C. In practice I provide in the projection $f^1$ an adjustment way $f^7$, along which the point of connection of link $f^2$ may be moved to vary its distance from the center $f$. The above described arrangement is such that a rotation of cam disk C, oscillates the bent lever $f^4$, and, by means of the connecting link $f^2$ and the rigid projection $f^1$, imparts a swinging or oscillating movement to the thread measurer F.

As shown in Fig. 1, the thread measurer F is shown in position to engage the thread between the looper E, and the work, and it is to be noted in this connection, that the position of the center $f$ is such, that as soon as the thread measurer F has engaged the thread, it is carried by the movement hereinbefore described, upward and outward, that is, toward the medial line of the sole, an arrangement which prevents undue strain on the between substances, and keeps the thread measurer out of the way of the work during the operation of the machine.

H represents the shuttle mounted in a circular race $h$, in a fixed portion of the frame A, and which is engaged by the shuttle driver $h^1$ between the hook and the heel in the usual manner, said shuttle driver $h^1$ being carried by a short shaft $h^2$, projected through a bearing in the bracket $a^4$ on the frame A. Outside of its bearing in the bracket $a^4$, the shaft $h^2$ carries the pinion $h^3$, which is engaged by a segmental gear $h^4$, carried on one arm $h^5$ of a bent lever $h^6$, fulcrumed upon shaft $B^1$, the other arm $h^7$ of said lever carrying a cam roll $h^8$, engaging a cam groove $h^c$ in the face of disk $C^1$. The above described arrangement is such that a rotation of the cam disk $C^1$ oscillates the bent lever $h^6$ and the segmental gear $h^4$ carried thereby, thereby oscillating the pinion $h^3$ on the shaft $h^2$, which actuates the shuttle driver $h^1$, and imparts an oscillatory movement to the shuttle H.

The shuttle H see Figs 5, 8 and 9, is provided with the usual bobbin receiving opening $h^9$ preferably concentric with its axis of motion, and with the movable hook $h^{10}$, which is pivoted at $h^{11}$ to the rim of the shuttle H. The hook $h^{10}$ has a rearward extension $h^{12}$, projected beyond its fulcrum $h^{11}$, which is engaged by the bifurcated end of a lever $h^{13}$, which is pivoted at $h^{14}$ to the rim of the shuttle H. The lever $h^{13}$ also has a

rearward extension, projected beyond its fulcrum $h^{14}$, which is provided with a toe $h^{15}$, which is normally held by a suitably placed spring $h^{16}$ in contact with the shuttle race. The spring $h^{16}$ conveniently consists of a coiled spring bearing at one end against the lever $h^{13}$, and at its other end seated in a recess in the shuttle H. In the shuttle race $h$ is formed a cam shaped depression $h^{17}$, into which the toe $h^{15}$ of the lever $h^{13}$ is adapted to be forced by the spring $h^{16}$ upon each oscillation of the shuttle. The rim of the shuttle H is cut out, as shown at $h^{18}$, to form a recess into which the projection $h^{12}$ of the hook $h^{10}$ projects, and in which is located the lever $h^{13}$, the toe $h^{15}$ thereof, projecting therefrom through an aperture $h^{19}$ to bear upon the shuttle race as before stated. The recess $h^{18}$ is conveniently closed by a plate $h^{20}$ secured to the shuttle rim by suitable screws or other securing means. The above described arrangement is such, that as the needle oscillates, the hook $h^{10}$ is held within the periphery of the shuttle H, but when the needle reaches its retracted position, the hook $h^{10}$, being clear of the race, is thrown out by the action of the spring $h^{16}$, forcing the toe $h^{15}$ of the lever $h^{13}$ into the recess $h^{17}$, and takes the thread from the needle.

The above described arrangement I consider to be an important feature of the present invention, as it removes any necessity for providing mechanism for moving the shuttle toward and away from the needle, as is common in machines of this class.

In the aperture $h^9$ of the shuttle H is placed the bobbin case K, having a thread groove $k$ extending preferably diametrically across its face, the lead of the thread S from the bobbin being along said groove $k$ across the face of the bobbin case K. In accordance with the present invention the thread S is adapted to be locked in the bobbin case during the operation of the take up in setting the stitch as hereinafter described, and such result is preferably secured as follows: Located within the groove $k$ is a tension spring $k^1$ preferably extending substantially the length of the groove $k$, and adapted when compressed to hold the thread S against the bottom of the groove $k$ with sufficient force to prevent said thread from being drawn off of the bobbin by the action of the take up in setting the stitch.

For the purposes hereinafter described I find it desirable to alternately compress the spring $k^1$, to hold the thread S from being drawn off the bobbin, and release the spring $k^1$, to allow the thread to be drawn off the bobbin, and for this purpose I have provided the following mechanism: The spring $k^1$ has, preferably, the general shape of a bow flattened toward its ends, and upon its central portion which is raised above the bottom of the groove $k$ (see Fig. 12) bears the end of a lever $k^2$, which is free to swing upon a shaft $k^3$, mounted in a bearing $k^4$, secured to a fixed portion of the head A. To the shaft $k^3$ is fixed a short arm $k^5$ which is connected with the lever $k^2$ by a pin $k^6$, fitted to a bearing in the arm $k^5$, and engaging a recess in the lever $k^2$, so that the lever $k^2$ is locked by the pin $k^6$ to the arm $k^5$ and turns with the shaft $k^3$. To the upper end of shaft $k^3$ is secured a lever $k^7$, which carries a cam roll $k^8$, which bears against the face of the disk $C^3$, and is arranged to come in contact with a projection $k^c$ thereon, the arrangement being such that a rotation of the disk $C^3$, by means of the lever $k^7$ will turn the shaft $k^3$ and the lever $k^2$, and thereby compress the spring $k^1$, and pinch the thread S against the bottom of the thread groove $k$. The cam roll $k^8$ is held in contact with the face of the disk $C^3$ by means of a spring $k^{12}$, (see dotted lines in Fig. 5) which is seated in a recess in the bearing $k^4$ surrounding the shaft $k^3$, and one end of which engages said recess, while the other end engages the lever $k^7$. The groove $k$ is formed in a rib $k^{13}$ which extends along the face of the bobbin case K, and which is engaged by the concave end of the lever $k^2$, (see Fig. 12) to restrain the bobbin case K from rotation with the shuttle H. The lever $k^2$, also acts as a holder to retain the bobbin case K in the shuttle H, and when desired to remove the case K from the shuttle H, the pin $k^6$ is raised to release the lever $k^2$ from the arm $k^5$, and since the lever $k^2$ is free to swing upon the shaft $k^3$, when released as above stated it may be readily swung back and the case K removed.

The shuttle thread measurer hereinbefore referred to is preferably arranged as follows: Mounted in a bearing $v$ is a shaft $v^1$, upon the lower end of which is fixedly secured an outwardly and downwardly curved arm $v^2$, the lower end of which carries a pair of laterally projecting prongs forming the thread measuring fork $v^3$. Within the bearing $v$, and surrounding the shaft $v^1$, is a coiled spring $v^4$, which acts upon the shaft $v^1$ to hold the arm $v^2$ in its retracted position, with thread measuring fork $v^3$ out of the vertical plane of the line of the thread. Coöperating with thread measuring fork $v^3$ is a vertically reciprocating thread measuring plunger $v^5$, the plane of movement of which is the vertical plane of the line of the thread. The plunger $v^5$ is mounted to reciprocate in a bearing $v^6$, secured to a fixed portion of the head A. To the plunger $v^5$ is pivotally connected a link $v^7$, which is in turn pivoted to the end of a lever $v^8$, which is fulcrumed upon the shaft $B^2$, and, between its point of connection with the link $v^7$ and its fulcrum upon the shaft $B^2$, carries a cam roll $v^9$, which engages a cam path

$v^{10}$ in the disk $C^2$. From the plunger $v^5$ is projected a downwardly bent arm $v^{11}$, the lower end of which is beveled off at one side (see Fig. 10) and engages a beveled lug $v^{12}$ formed upon a collar $v^{13}$, fixedly secured to the shaft $v^1$ above its bearing $v$. The above described arrangement is such that upon a rotation of the disk $C^2$, a vertical reciprocation is imparted to the plunger $v^5$, and as the plunger $v^5$ descends, the beveled lower end of the arm $v^{11}$, engaging the beveled lug $v^{12}$ upon the collar $v^{13}$, turns the shaft $v^1$ and the arm $v^2$, until the thread measuring fork $v^3$ is brought into the vertical plane of the line of the thread, and into vertical alinement with the plunger $v^5$, so that the thread as it leads from the shuttle lies across the thread measuring fork, and as the plunger $v^5$ descends, it forces a bight of thread down between the prongs forming the thread measuring fork, which bight is drawn from the bobbin (the tension of spring $k^1$ being then released) and determines the amount of shuttle thread released for the next stitch.

T represents the take-up which is carried by the take-up lever $t$, fixed to the end of a short horizontal shaft $t^1$, mounted in a bearing $t^2$ on the bracket $a^6$ on frame A. The shaft $t^1$ carries on the opposite side of the bearing $t^2$, a segmental pinion $t^3$, which engages a segmental gear $t^4$, carried by one arm $t^5$ of a bent lever $t^6$, fulcrumed on a fixed projection $a^9$ on standard $a$, the other arm $t^7$ of said lever carries a cam roll $t^8$ engaging a cam path $t^9$ in the face of the disk $C^4$. The above described arrangement being such that a rotation of the cam disk $C^4$ oscillates the lever $t^6$, and, by means of the gear $t^4$ and pinion $t^3$, oscillates the shaft $t^1$, and imparts to the take-up lever $t$, and the take-up T carried thereby, a vertically oscillating or swinging movement toward and from the work.

In the machine of the drawings no feed awl is provided but the feed of the work is accomplished by a lateral movement of the channel guide and welt guide while the work is clamped between the same.

P represents the welt guide, which may be of any usual or convenient construction, and which is carried by the inclined arm $p$ which is rigidly secured to the feed slide $p^1$. The feed slide $p^1$ is mounted to reciprocate in a guide groove $p^2$, which is formed in the underside of a block or head $p^3$, fixedly secured to the bracket $a^6$ on frame A. Upon the outer end of feed slide $p^1$ is pivotally connected one end of a horizontally swinging lever $p^4$, which is fulcrumed at $p^5$ upon an adjustable bracket $p^6$, the outer end of lever $p^4$ carrying a cam roll $p^7$, engaging a cam path $p^8$ on cam disk $C^4$. The bracket $p^6$ is connected by a horizontal tongue and groove connection to a horizontal projection $a^{10}$ on the standard $a$ of the frame A, and is held in position by means of a set screw $p^9$, tapped into the projection $a^{10}$, and is projected through a horizontal slot $p^{10}$ in the bracket $p^6$. The lever $p^4$ is provided with a longitudinal slot $p^{11}$ along which the fulcrum $p^5$ is movable, so that by an adjustment of the bracket $p^6$, as hereinbefore described, the throw of lever $p^4$ will be varied to adjust the length of the feed as hereinafter described.

N represents the channel guide shown as an inwardly curved downwardly projecting finger, shaped to properly engage the channel in the sole, fixedly secured to a segmental slide $n$, which is mounted to reciprocate along a curved guide way $n^1$, formed in a guide block $n^2$, fixedly secured to the feed slide $p^1$. The segmental slide $n$ is actuated as follows: Upon the slide $n$ is located a laterally projecting stud $n^3$, which is engaged by a swinging lever $n^4$, fixedly secured to a short horizontal shaft $n^5$, mounted in a bearing $n^6$, secured on an upward projection $n^7$ of the bracket $e^5$. On the opposite side of the bearing $n^6$, the shaft $n^5$ carries a lever $n^8$, which carries a cam roll $n^9$ engaging a cam path $n^c$ in the face of the disk $C^1$. As shown at $n^{10}$ I have provided a spring, preferably a coiled spring, one end of which is secured at $n^{11}$ to the slide $n$, and the other end of which is secured at $n^{12}$ (see Fig. 4) to the guide way $n^2$, the spring $n^{10}$ normally acting to hold the slide $n$ in an advanced position, with the end of the channel guide engaging the work. The above described arrangement is such that a rotation of the cam disk $C^1$, by means of the lever $n^8$ oscillates the shaft $n^5$, imparting to the lever $n^4$ a vertically swinging movement, the inward movement of the lever $n^4$ causing its lower end to engage the stud $n^3$ and force the slide $n$ inward against the tension of the spring $n^{10}$, thereby bringing the slide $n$ into its retracted position, and disengaging the channel guide N from the work. When the lever $n^4$ begins to swing outward the spring $n^{10}$ acts to force the slide $n$ outward and to bring the channel guide N into engagement with the between substances, clamping the work between the channel guide N and the welt guide P. The throw of the lever $n^4$ is preferably such that it allows the spring $n^{10}$ to approximate the lower end of the channel guide N and the welt guide P, more closely than they are approximated when the between substances are inserted between the same, so that the lever $n^4$ never interferes with the proper gripping of the work between the channel guide and welt guide.

To prevent any slipping of the work, which would lead to irregularities in the feed, I have provided a locking mechanism conveniently the following: On the back of the slide $n$ is projected a lateral stud $n^{13}$,

which extends through a segmental slot $n^{14}$ in the back of the guide block $n^2$. The stud $n^{13}$ is arranged to be engaged by the cam shaped heel $n^{15}$ of a lever $n^{16}$, fulcrumed at $n^{17}$ upon the guide block $n^2$. The lever $n^{16}$ is projected beyond its fulcrum $n^{17}$, and carries, adjacent to its outer end, a laterally projecting stud $n^{18}$, which engages a longitudinal $n^{19}$ in a link $n^{20}$. The link $n^{20}$ is pivotally connected with a swinging lever $n^{21}$, which is fulcrumed on the shaft $B^1$. Between the point of connection with the link $n^{20}$ and its fulcrum on the shaft $B^1$, the lever $n^{21}$ carries a cam roll $n^{22}$, which engages a cam path $n^{c*}$ in the face of the cam disk $C^3$. A spring $n^{23}$ is provided, one end of which is secured to lever $n^{16}$ at $n^{24}$, adjacent to the heel of the lever $n^{16}$, and the outer end of which is secured at $n^{25}$ to the guide block $n^2$. The above described arrangement is such that a rotation of the cam disk $C^3$, by means of the lever $n^{21}$ and the link $n^{20}$, depresses the outer end of the lever $n^{16}$, causing its heel $n^{15}$ to rise and allow the slide $n$ to be retracted by the action of lever $n^4$ as hereinbefore described, and a further rotation of the cam $C^3$ raises the link $n^{20}$ and allows the stud $n^{18}$ to be raised by the action of spring $n^{23}$, which depresses the heel $n^{15}$ of the lever $n^{16}$ until it firmly engages the stud $n^{13}$, and locks or clamps the slide $n$ in its advanced position, with the channel guide N in engagement with the between substance. It will be noted in this connection that by means of the slot $n^{19}$, I have provided for different positions of channel guide N and slide $n$ due to varying thickness of the between substances.

As hereinbefore stated both the channel guide N and welt guide P are carried by the feed slide, and when the work is firmly clamped between them, and the channel guide is locked as above stated, the channel guide and welt guide are simultaneously moved laterally by the movement of the feed slide as before described to feed the work. It will be noted in this connection that the studs $n^3$ and $n^{18}$ are made long enough to permit of the feeding movement without disengaging them from their connection as before described.

I have not shown herein in detail the form of the several cam paths herein referred to, for the reason that having read the foregoing description of the form and arrangement of the several parts of the machine of the drawings and their mode of operation, and the following description of their correlative operation, any person of average skill in the art could readily develop said cam paths without the exercise of invention or of greater skill than is possessed by an average skilled mechanic.

I have not described in detail the construction of the welt guide P as the same may be of any usual or convenient construction.

I desire to call attention to the fact that the curvature of the slide $n$ is such that its center of motion is in horizontal alinement with the center of motion of the needle segment, so that the working point of the channel guide N travels a circular path of the diameter of the path traveled by the needle. This feature is of great importance as insuring the correct positioning of the shoe so that the needle will properly enter the welt and between substances and emerge from the channel.

The operation of the machine of the drawings is as follows: Assuming that the take-up has just set the preceding stitch, the work is then clamped between the channel guide and welt guide, and fed along the length of the next stitch by operation of the feed slide, the tension upon the shuttle thread having been released prior to the feeding movement. A further rotation of the cam shaft causes the needle, heretofore in its retracted position, to enter the work to get the loop of supply thread for the next stitch. While this operation is occurring the shuttle thread measuring plunger is depressed and the thread measuring fork brought into the vertical plane of the thread in vertical alinement with the plunger, which passes between the prongs thereof and measures off the amount of shuttle thread required for the next stitch, and the plunger is raised and the thread measuring fork swung out of the plane of the shuttle thread, to be out of the way of the supply thread when brought up by the needle. While the needle is entering the work, the supply thread measurer is actuated as hereinbefore described to engage the thread between the looper and the work, to draw off enough of the supply thread to form half of the loop drawn back by the needle in returning to its retracted position, the take-up descending to give down the thread for this purpose. As the needle reaches its advanced position the looper is operated by the combined swinging and reciprocating movement of its slide and throws the loop of supply thread into the hook of the needle. The needle is then retracted drawing up the loop of supply thread, the supply thread measurer moving toward the work as the needle is retracted to keep a tension on the loop of supply thread and insure its retention in the hook of the needle. As the needle is approaching its retracted position, the shuttle commences to oscillate, so that when the needle has reached its retracted position the hook of the shuttle is thrown out, by the mechanism hereinbefore described, to engage and remove the loop of supply thread from the hook of the needle, which by further oscil-

lation of the shuttle is carried by the center of the shuttle into position to be drawn off by the take-up. After the loop of supply thread has passed the center of the shuttle and at the time the take-up is setting the stitch, the shuttle tension is increased, as hereinbefore described, to substantially lock the shuttle thread, to prevent the same from being drawn off during the operation of the take-up in setting the stitch. It should be stated in this connection that while the needle is in the material as before described, the channel guide is unlocked and raised to its retracted position, and the channel guide and welt guide moved laterally into position for feeding the work, and just before the needle leaves the material, the channel guide, by the mechanism hereinbefore described, is brought in engagement with the between substance by the action of the spring which controls it, but remains unlocked until just before the feeding movement, so that an opportunity is then afforded for the removal of a shoe from or its adjustment upon the machine. Just before the feeding movement, the channel guide is locked in position to firmly grip or clamp the work between the channel guide and welt guide, and the operations hereinbefore described are repeated to form the next stitch. It is to be noted that the welt guide is moved in an opposite direction to the feed, and the welt drawn through the same, while the needle is in the material and holds the welt, so that no strain is brought upon the seam by the drawing of the welt through the welt guide, a result of great importance in this class of machines, and to which I desire to call attention as being a feature of the present invention.

Having thus described my invention and its mode of operation I claim as new and desire to protect by Letters Patent of the United States.

1. A shoe sewing machine, having, in combination, stitch forming mechanism, a channel guide and a welt guide, the welt guide being held from movement transversely to the line of feed, mechanism for moving the channel guide toward and from the welt guide, and mechanism for simultaneously moving the channel guide and welt guide to feed the work, substantially as described.

2. A shoe sewing machine, having, in combination, stitch forming mechanism, a welt guide mounted on a support and restrained from movement transversely to the line of feed, and mechanism for moving the support and guide in the direction of the feed, substantially as described.

3. A shoe sewing machine, having, in combination, stitch forming mechanism, a channel guide and welt guide, means to move the channel guide along a curved path toward the welt guide to clamp the work, independent means to lock the channel guide in its work clamping position, and means to move said channel guide and welt guide in the direction of the feed, substantially as described.

4. A shoe sewing machine, having, in combination, stitch forming mechanism, a channel guide mounted upon a curved slide, means for moving said slide and guide transversely to the line of feed of the work, and means for intermittently positively locking said slide at different positions along its path of movement, substantially as described.

5. A shoe sewing machine, having, in combination, stitch forming mechanism, a channel guide, a curved slide upon which said channel guide is mounted movable transversely to the line of feed of the work, a fixed projection on said slide, a cam arranged to engage the fixed projection to lock the slide in different positions along its path of movement, and means for intermittently actuating said cam, substantially as described.

6. A shoe sewing machine, having, in combination, stitch forming mechanism including a needle and means for actuating it, a channel guide, a welt guide, a support for said welt guide, held from movement transversely to the line of feed, and means for moving the channel guide and welt guide toward and from the path of movement of the needle, the movement away from the needle taking place while the needle is in the work, substantially as described.

7. A shoe sewing machine, having, in combination, stitch forming mechanism, a welt guide, a channel guide, actuating mechanism for moving the channel guide toward and from the welt guide and means independent of said actuating mechanism for locking the channel guide in its work clamping position, substantially as described.

8. A shoe sewing machine, having, in combination stitch forming mechanism including a curved needle, a channel guide said needle and the work engaging end of the channel guide being movable along curved paths parallel to each other and contained in the same curved surface, means for supporting and actuating the needle and channel guide and means for locking the channel guide in any required position along its path of movement, substantially as described.

9. A shoe sewing machine, having, in combination, stitch forming mechanism, a welt guide, a channel guide, means for moving the channel guide toward and from the welt guide, said means comprising a spring for moving the channel guide toward the welt guide, and independent mechanism for locking the channel guide in its work clamping position, substantially as described.

10. A shoe sewing machine, having, in combination, stitch forming mechanism including a curved needle, a channel guide, said needle and the work engaging end of the channel guide being movable along circular paths contained in the same cylindrical surface, means for supporting and actuating the needle and channel guide and means for locking the channel guide in any required position along its path of movement, substantially as described.

11. A shoe sewing machine, having, in combination, stitch forming mechanism, a channel guide mounted upon a circularly curved slide, a circularly curved support for said slide, and means for moving said slide, substantially as described.

12. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle and its bobbin case, a tension spring upon the face of the bobbin case, bearing on the thread, a movable holder for the bobbin case arranged to bear upon said spring and means to actuate said holder to alternately compress and release said spring, substantially as described.

13. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle and a bobbin case having a thread groove in its face, a tension spring in said groove bearing on the thread and means to alternately compress and release said spring to increase and diminish the tension on the shuttle thread, substantially as described.

14. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle and a bobbin, a shuttle thread measuring device independent of the shuttle and bobbin, and mechanism to actuate the shuttle thread measuring device to cause it to draw from the shuttle and bobbin, the amount of shuttle thread required to form the next stitch, substantially as described.

15. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, a shuttle thread tension, a cam and suitable connections for increasing and diminishing the shuttle thread tension during the formation of each stitch, substantially as described.

16. A shoe sewing machine, having, in combination, stitch forming mechanism, a thread measurer comprising movable members, movable into and out of alinement with each other and having a relative movement when in alinement to draw off the required amount of thread, and connected mechanism for actuating the members, substantially as described.

17. A shoe sewing machine, having, in combination, stitch forming mechanism, a thread measurer comprising a plunger and a fork, means for intermittently placing said fork under the thread and in line with the plunger and mechanism to relatively actuate the plunger and fork to force a bight of thread between the prongs of the fork, substantially as described.

18. A shoe sewing machine, having, in combination, stitch forming mechanism, a thread measurer comprising a movable plunger, the path of motion of which intersects the line of the pull of the thread, a fork movable into and out of the path of motion of the plunger, and connected mechanism to actuate the plunger and fork, substantially as described.

19. A shoe sewing machine, having, in combination, stitch forming mechanism, comprising a shuttle and bobbin, a shuttle thread tension device, a shuttle thread measuring device independent of the shuttle and bobbin, and means to release the shuttle thread from the tension device while acted upon by the measuring device, substantially as described.

20. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, a shuttle thread tension device, an independent shuttle thread measuring device and connected mechanisms controlling the tension and actuating the measuring device acting to diminish the tension on the shuttle thread while it is acted upon by the measuring device, substantially as described.

21. A shoe sewing machine, having, in combination, stitch forming mechanism including a take-up and shuttle, a shuttle thread measurer independent of the shuttle arranged to draw off the shuttle thread, a shuttle thread tension device, and connected mechanism operating automatically to decrease the tension on the shuttle thread while acted on by the shuttle thread measurer, and to increase the tension on the shuttle thread at the time the take-up is setting the stitch, substantially as described.

22. A shoe sewing machine, having, in combination, stitch forming mechanism including a take-up and shuttle, a shuttle thread measurer arranged to draw off the shuttle thread, an independent shuttle thread tension device, and connected mechanisms for actuating the take-up and measurer and controlling the tension device, acting to decrease the tension on the shuttle thread while it is acted on by the thread measurer, and to increase the tension on the shuttle thread at the time the take-up is setting the stitch, substantially as described.

23. A shoe sewing machine, having, in combination, stitch forming mechanism including a curved needle and mechanism to actuate the same, a circularly movable shuttle, the shuttle and needle moving about substantially parallel axes, a movable hook carried by the shuttle, and means to actuate

said hook to project its point to intersect the path of movement of the needle, when the needle is retracted, to take the loop of needle thread from the needle, substantially as described.

24. A shoe sewing machine, having, in combination, a needle, a looper, actuating mechanism for the needle and looper, a thread measurer having a rigid projection, actuating mechanism for the measurer, a link connecting the rigid projection with the actuating mechanism for the measurer, means for adjusting the point of connection of link and rigid projection to vary the throw of the measurer, substantially as described.

25. A shoe sewing machine, having, in combination, stitch forming mechanisms, including a circularly movable shuttle, a shuttle race within which said shuttle moves, means to actuate said shuttle, a movable hook carried by said shuttle and means to move the point of said hook from a point within to a point outside of the shuttle race during each cycle of movement of the shuttle, substantially as described.

26. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle and shuttle race, said shuttle having a hook movable from a point within to a point outside of the shuttle race, of a lever carried by the shuttle and connected with the hook, and means in the shuttle race for actuating the lever to move the hook, substantially as described.

27. A shoe sewing machine, having, in combination, stitch forming mechanism including a needle and shuttle, a variable shuttle thread tension device, a shuttle thread measurer, a channel guide movable toward and from the work and toward and from the path of movement of the needle, a welt guide coöperating with the channel guide to feed the work, and suitable mechanism for actuating the parts, substantially as described.

28. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, an elastic shuttle thread tension device, a shuttle thread measuring device and connected mechanism controlling the tension and actuating the measuring device acting to diminish the tension on the shuttle thread while it is acted upon by the measuring device, substantially as described.

29. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, an elastic shuttle thread tension, a cam and suitable connections for increasing and diminishing the shuttle thread tension during the formation of each stitch, substantially as described.

30. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, a shuttle thread tension acting at all times to exert a pressure on the shuttle thread, and means for increasing and diminishing the pressure on the shuttle thread during the formation of each stitch, substantially as described.

31. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, a shuttle-thread tension device, and means acting directly upon said tension device for increasing and diminishing the tension on the shuttle-thread during the formation of each stitch, substantially as described.

32. A shoe sewing machine, having, in combination, stitch forming mechanism including a shuttle, an elastic shuttle-thread tension device, and means acting directly upon said tension device for increasing and diminishing the shuttle-thread tension during the formation of each stitch, substantially as described.

33. A shoe sewing machine, having, in combination, stitch forming mechanism including an oscillating shuttle, a shuttle-thread tension device, and means to actuate the same to increase and diminish the tension on the shuttle-thread during the formation of each stitch, substantially as described.

34. A shoe sewing machine, having, in combination, stitch forming mechanism including an oscillating shuttle having loop-drawing and idle return movements in an opposite direction, and means for locking the shuttle-thread after the shuttle has completed its loop-drawing movement, substantially as described.

35. A shoe-sewing machine, having, in combination, stitch forming mechanism, and feed mechanism consisting of a feed clamp, one member of which engages the channel and the other member of which engages the upper, means for relatively moving the members about a stationary axis to clamp the work, and means for moving the members in the direction of the axis to feed the work, substantially as described.

36. A shoe-sewing machine, having, in combination, stitch forming mechanism, a work feeding clamp having coöperating members, one of which engages the channel and the other of which engages the upper, means for relatively moving the members to clamp the work, means for positively moving the members to unclamp the work, and means for moving the clamped members to feed the work and the unclamped members to return them to their original position, substantially as described.

37. A shoe sewing machine having, in combination, stitch-forming mechanism, and feed mechanism consisting of independently supported clamping members, of which one engages the channel and the other the upper, resilient means for moving the channel-engaging member toward the upper-engaging member to clamp and hold the work while

the latter member remains fixed, and means for moving both members to feed the work, substantially as described.

38. A shoe sewing machine, having, in combination, stitch forming mechanism, a channel gage, a welt guide, means for relatively moving the channel gage and welt guide to clamp the stock, means for locking the channel gage and welt guide in working position, means for actuating the welt guide and channel gage to feed the stock, and mechanism acting automatically to engage the shoe and hold it during the return movement of the guide and gage.

In testimony whereof I affix my signature, in presence of two witnesses.

ERASTUS E. WINKLEY.

Witnesses:

A. E. WHYTE,

JOHN J. COLLINS.