No. 666,225. Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.) 7 Sheets—Sheet 1.

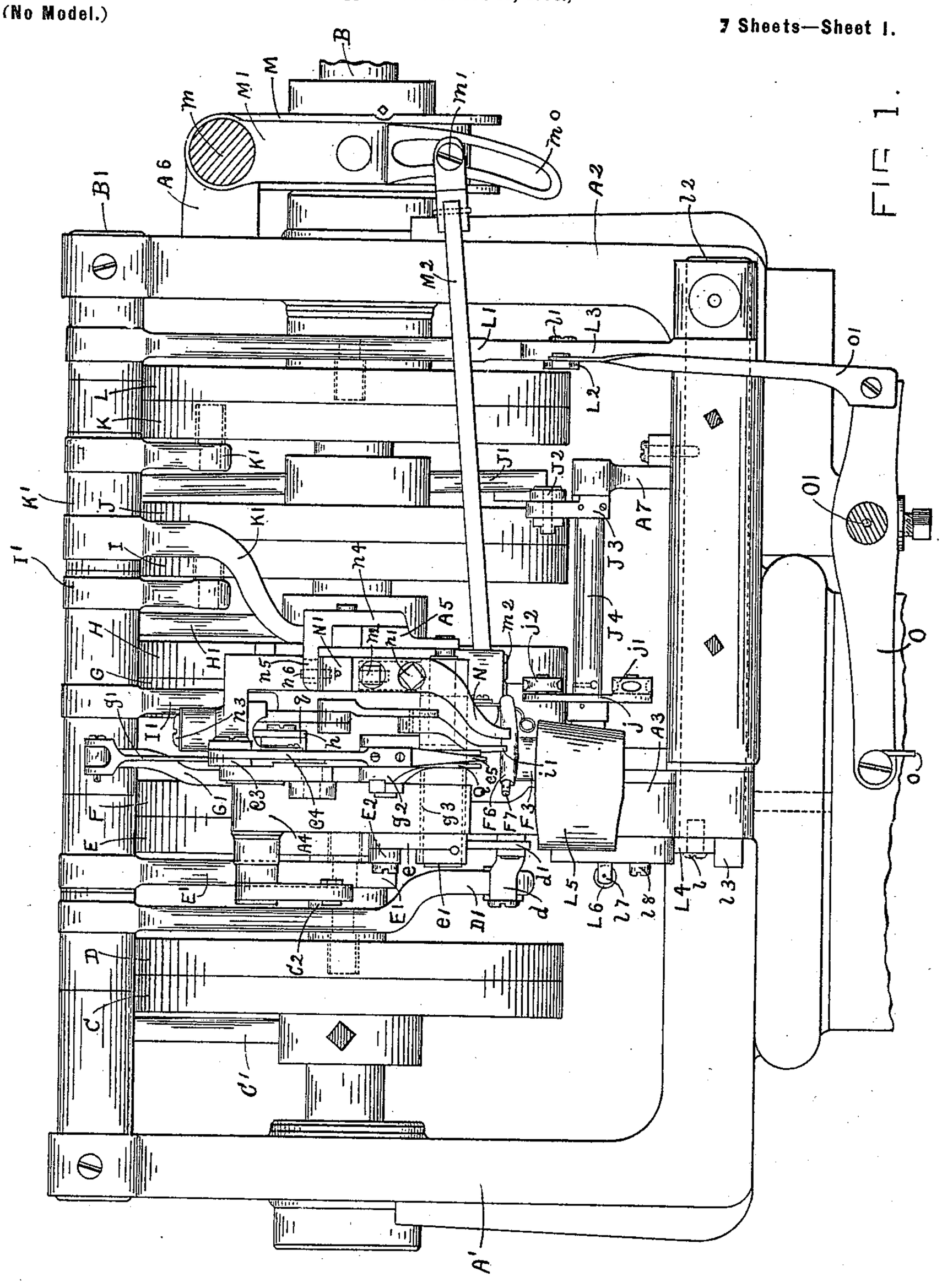

FIG 1.

WITNESSES:

Chas. S. Butters

M. C. Jaquith.

INVENTOR

EDWIN E. BEAN.

BY

Louis H. Haiman

ATTORNEY.

No. 666,225.

Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.)

7 Sheets—Sheet 2.

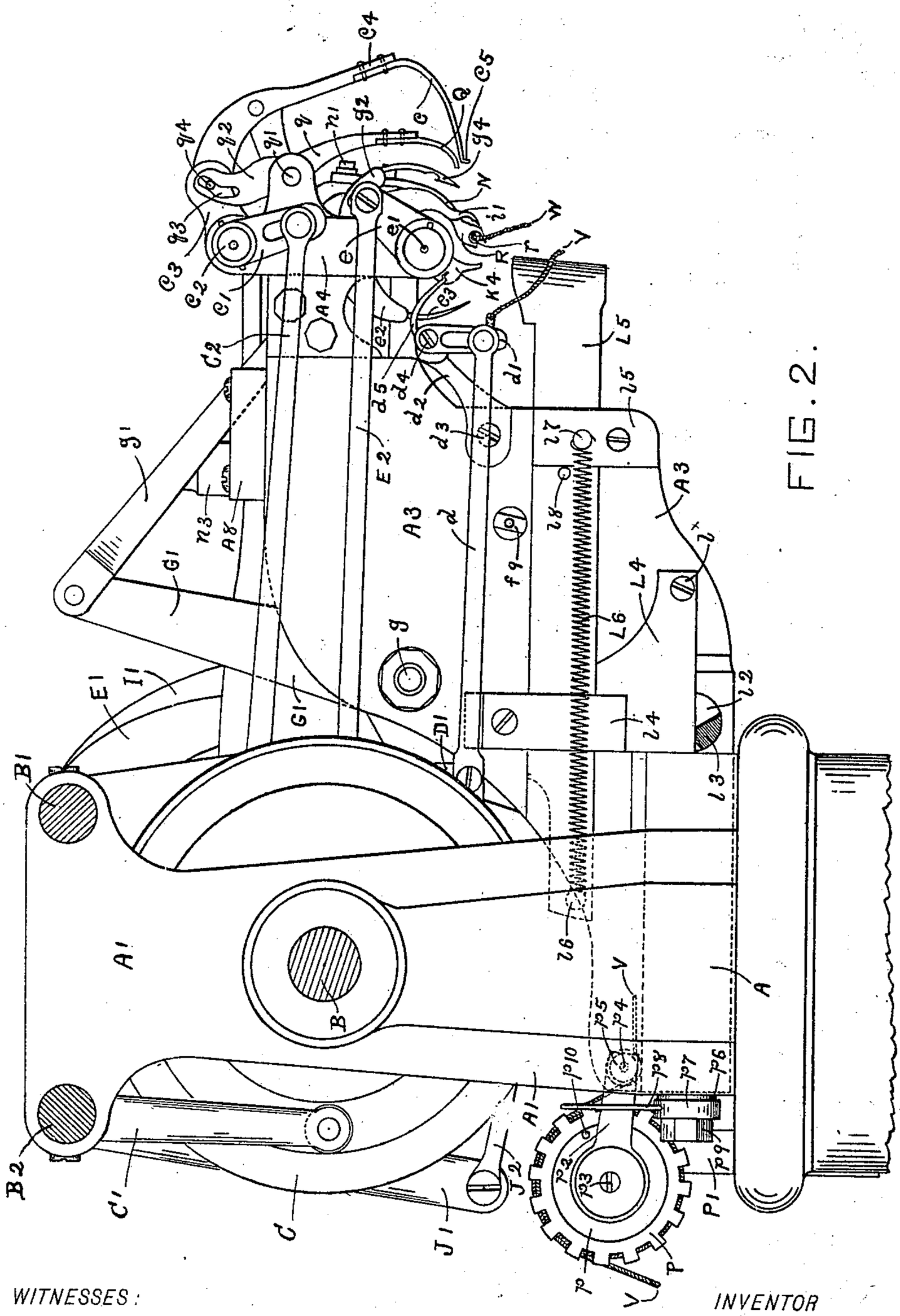

FIG. 2.

WITNESSES:

Chas. S. Butters.

M. C. Jaquith.

INVENTOR

EDWIN E. BEAN.

BY

Louis H. Haminan

ATTORNEY.

No. 666,225.

Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.)

7 Sheets—Sheet 3.

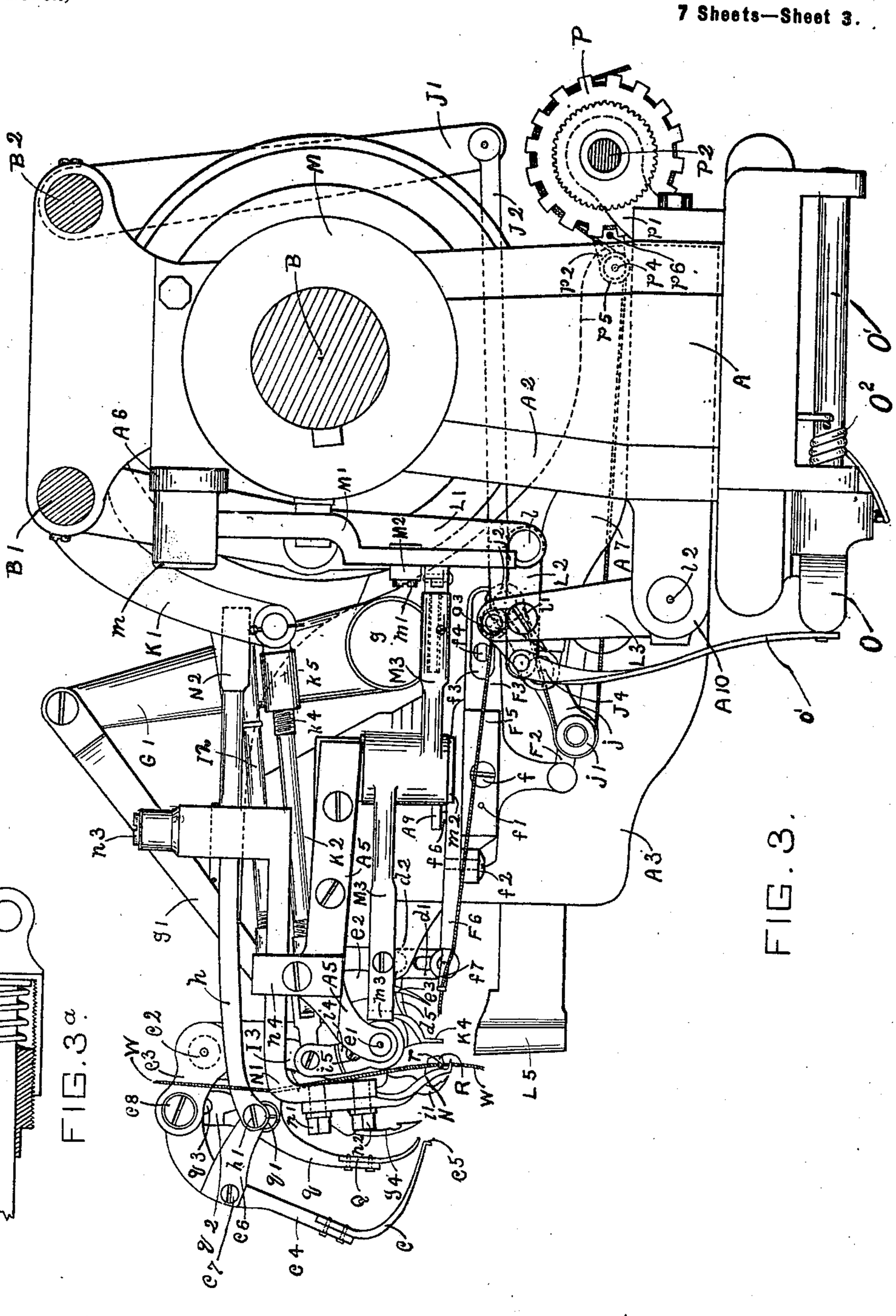

FIG. 3.

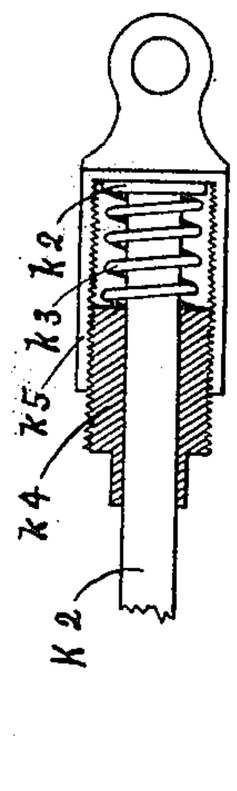

FIG. 3a.

WITNESSES:

Chas. S. Butters

M. C. Jaquith

INVENTOR

EDWIN E. BEAN.

BY

Louis H. Laimans

ATTORNEY.

No. 666,225.

Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.)

7 Sheets—Sheet 4.

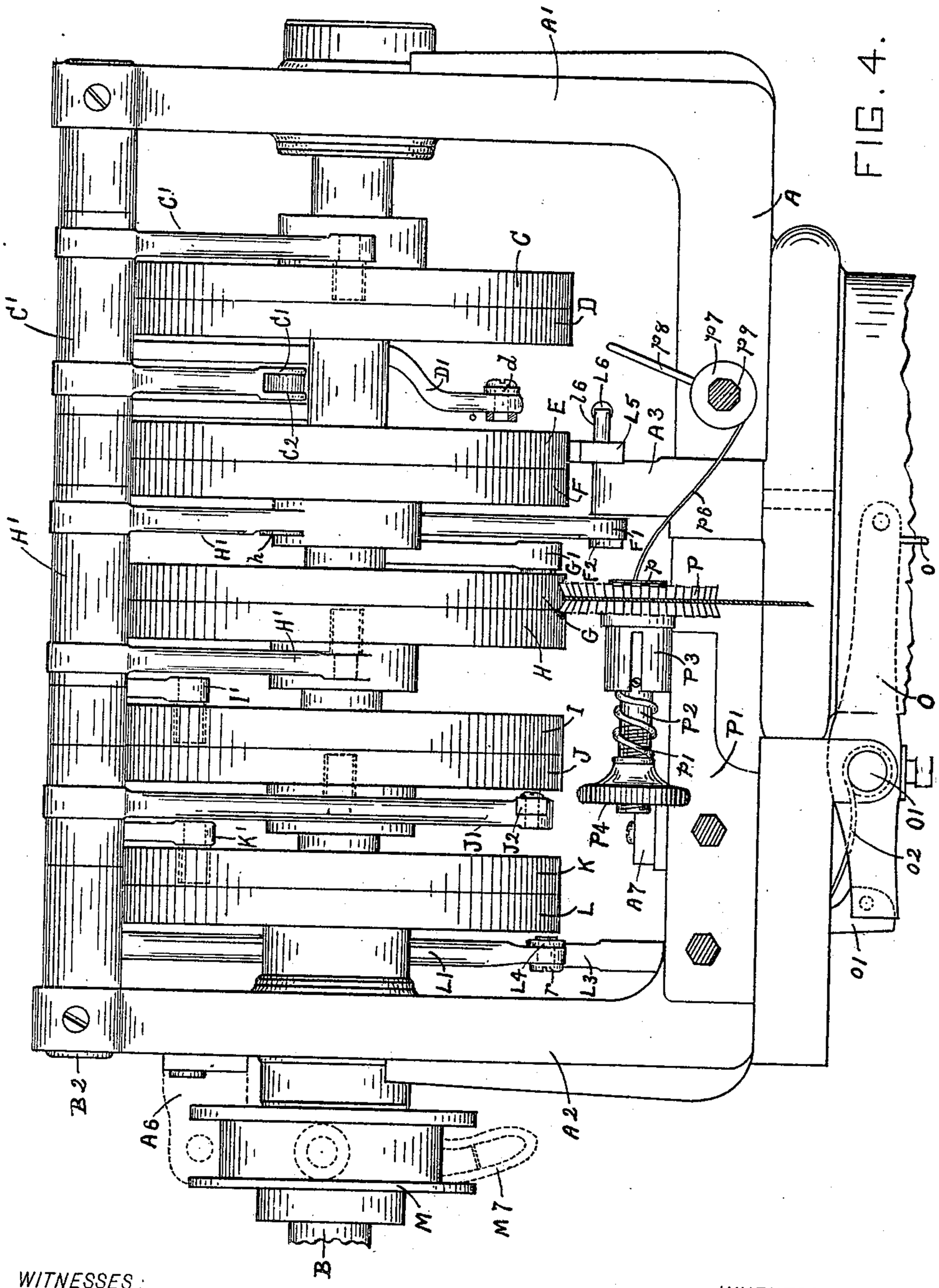

FIG. 4.

WITNESSES:

Chas. S. Butters.

M. C. Jaquith.

INVENTOR

EDWIN E. BEAN.

BY

Louis H. Hamman,

ATTORNEY

No. 666,225.

Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.)

7 Sheets—Sheet 5.

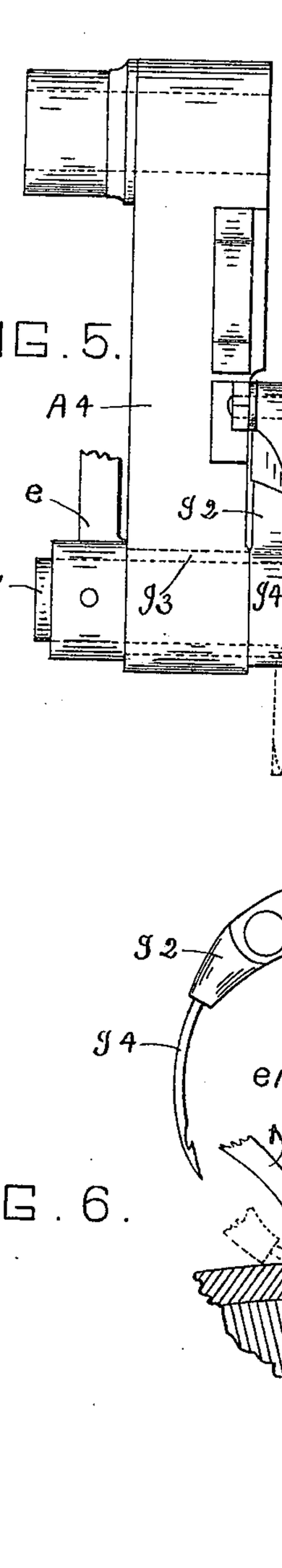

FIG. 5.

FIG. 9.

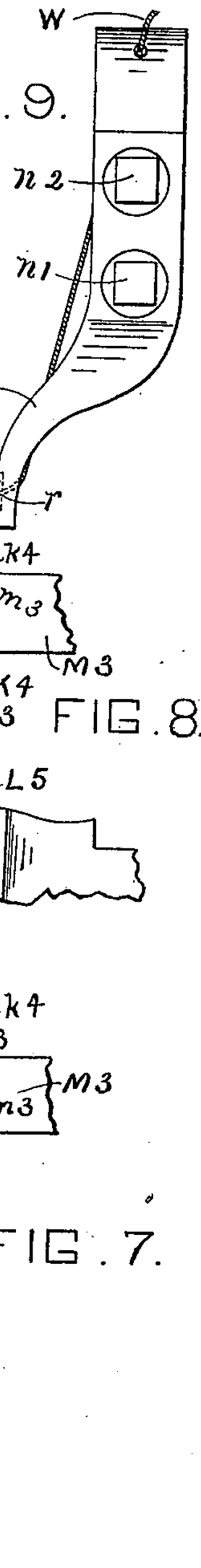

FIG. 10.

FIG. 8.

FIG. 6.

FIG. 7.

WITNESSES:

Chas S. Butters.

H. C. Jaquith.

INVENTOR

EDWIN E. BEAN.

BY

Louis H. Harriman,

ATTORNEY.

No. 666,225. Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.) 7 Sheets—Sheet 6.

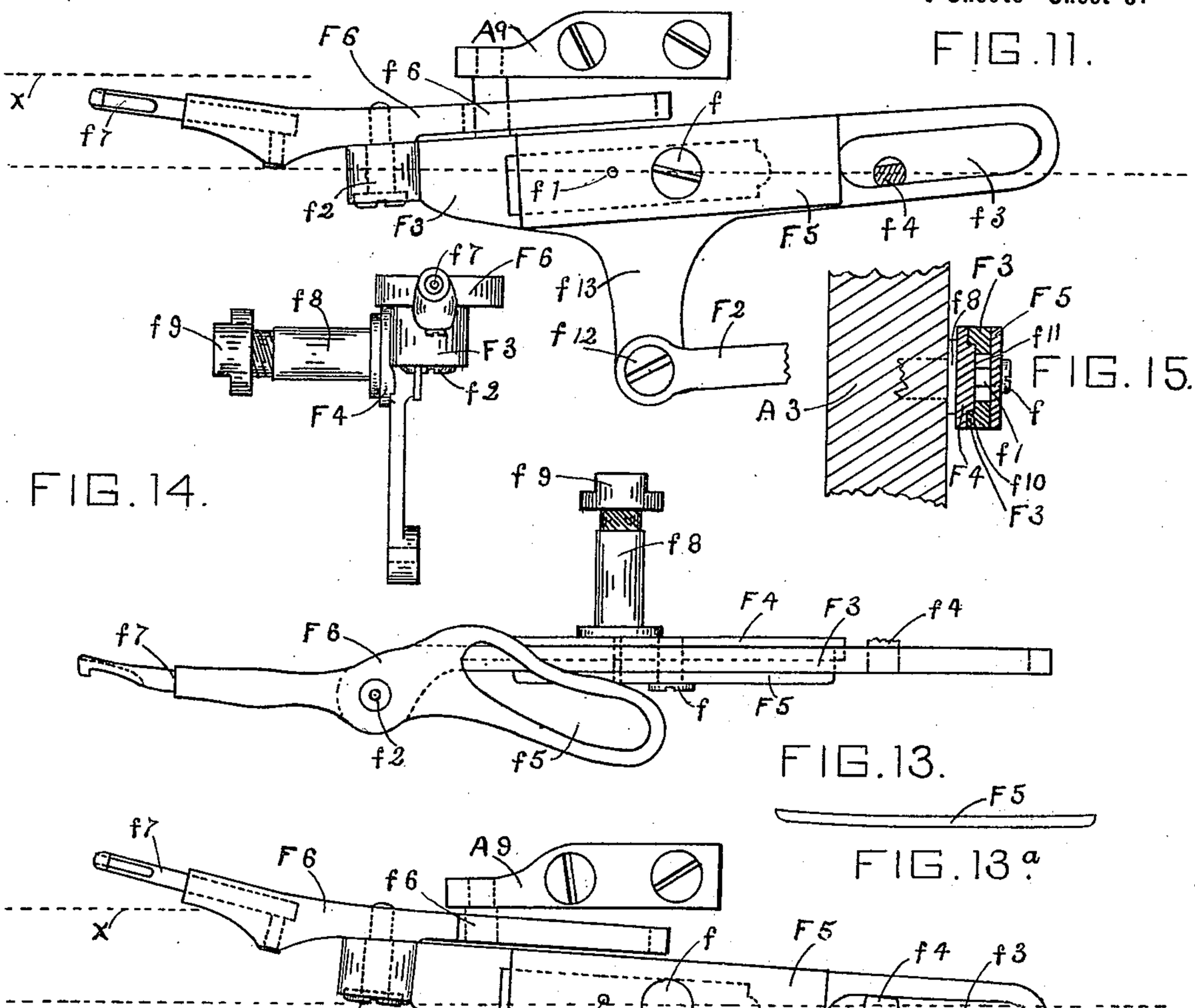

FIG. 11.

FIG. 15.

FIG. 14.

FIG. 13.

FIG. 13a.

FIG. 12.

FIG. 16.

FIG. 17.

WITNESSES:

Chas. S. Butters,

M. C. Jaquith.

INVENTOR

EDWIN E. BEAN.

BY

Louis H. Laniman,

ATTORNEY.

No. 666,225. Patented Jan. 15, 1901.

E. E. BEAN.

SHOE SEWING MACHINE.

(Application filed Oct. 11, 1899.)

(No Model.) 7 Sheets—Sheet 7.

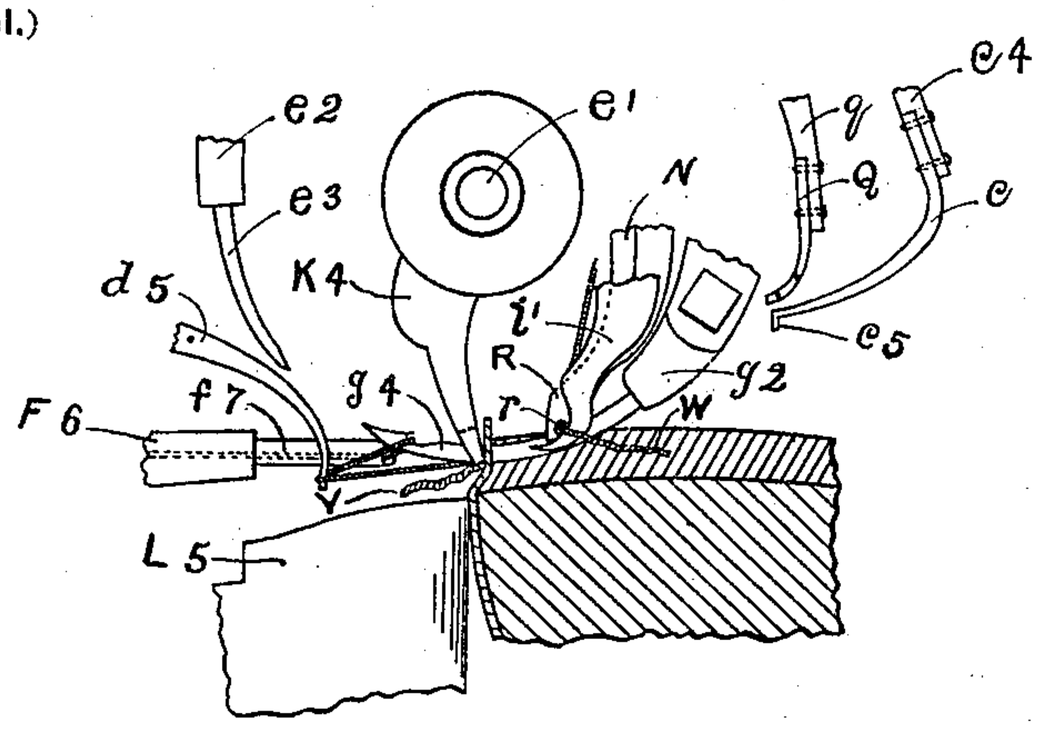

FIG. 18.

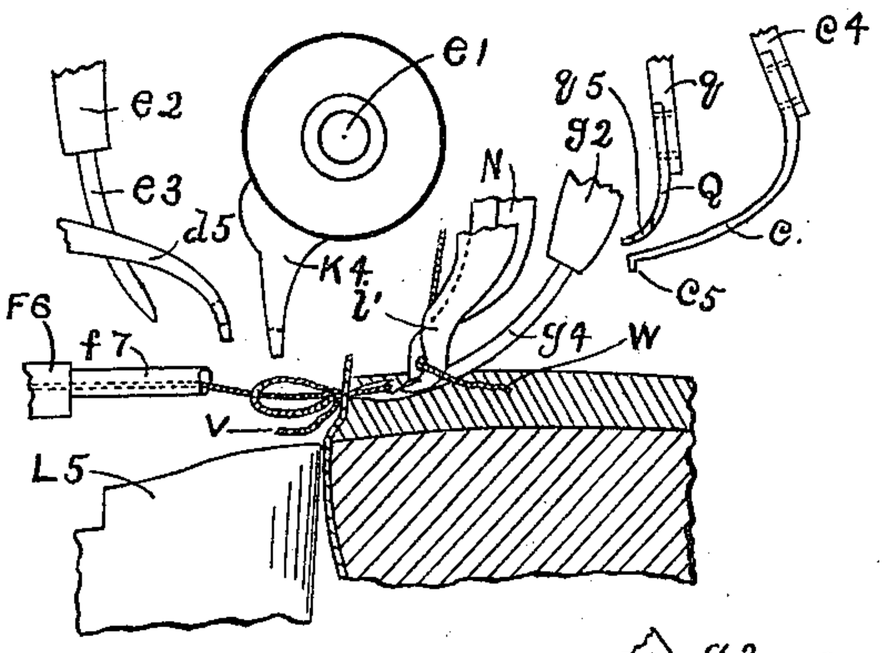

FIG. 19

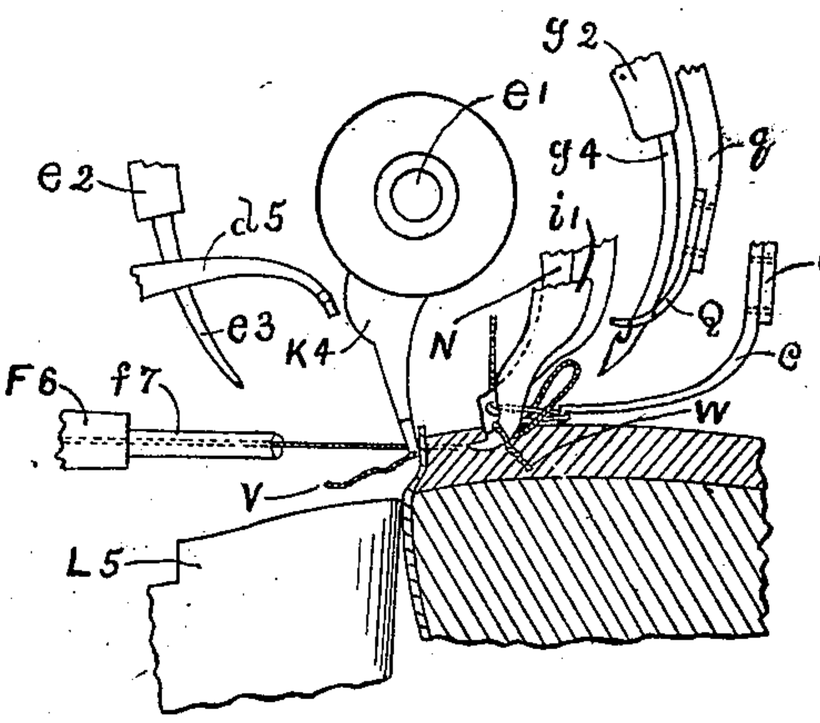

FIG. 20.

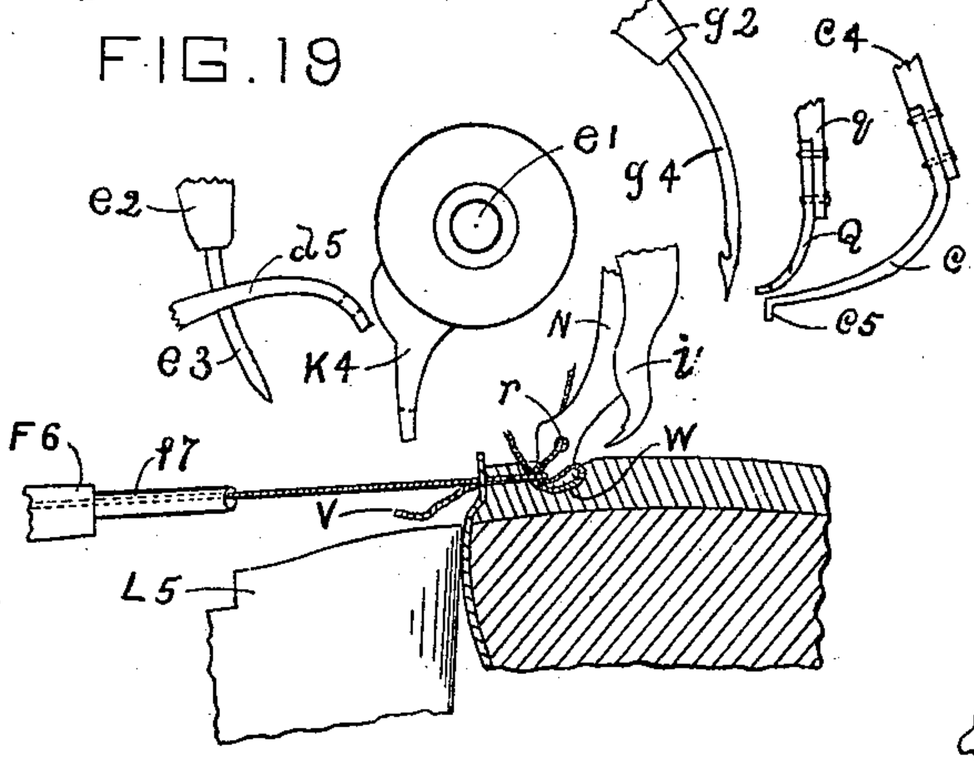

FIG. 21.

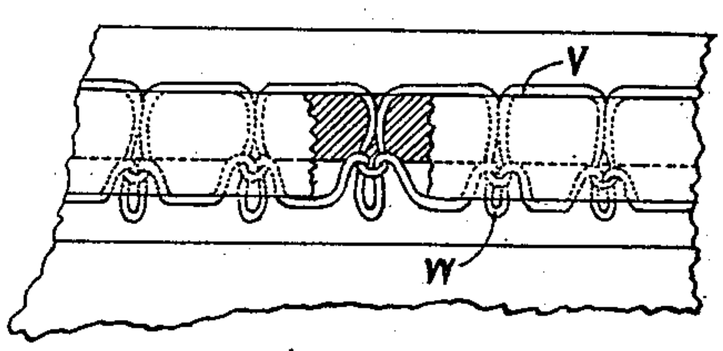

FIG. 22.

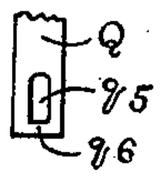

FIG. 23.

WITNESSES:

Chas. S. Butters.

M. C. Jaquith.

INVENTOR

EDWIN E. BEAN.

BY

Louis Harriman,

ATTORNEY.

UNITED STATES PATENT OFFICE.

EDWIN E. BEAN, OF WARNER, NEW HAMPSHIRE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE LOOP LOCK MACHINE COMPANY, OF PORTLAND, MAINE.

SHOE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 666,225, dated January 15, 1901.

Application filed October 11, 1899. Serial No. 733,278. (No model.)

To all whom it may concern:

Be it known that I, EDWIN E. BEAN, a citizen of the United States, and a resident of Warner, in the county of Merrimac and State of New Hampshire, have invented certain new and useful Improvements in Shoe-Sewing Machines, of which the following is a specification.

This invention relates to an improvement in shoe-sewing machines for forming a stitch which consists of a waxed thread which is drawn through the work and locked by a loop of dry thread which is not passed through the work, this stitch being known as the "tufted" stitch. Prior to this invention I have devised various machines for forming this stitch, two of which are disclosed in my former patents, Nos. 524,986 and 612,150.

The object of my invention is to produce a sewing-machine of the general character above referred to which will sew welted or turned shoes in such a manner that they will be free from certain defects which now exist in the boots or shoes of this class which have been sewed by the various machines now employed for this purpose and which will render them more flexible and comfortable to the foot and more durable and less expensive to produce. The defects above referred to are caused partly by the inability of the present machines to sew the soles or welt and sole to the upper without cutting a deep channel into the sole. This deep channel leaves the "between substance," which extends from the bottom of the channel to the upper to which the stitch is anchored, very narrow and weak, especially when the soles are thin or of poor quality. In such cases the stitch is liable to tear out easily, greatly affecting the durability of the shoe, and as the channel has also to be cut deeply into the sole in order to allow the sewing mechanism to work practically there exists but a small percentage of wearing material between the channel and outside of the sole. The consequence is that when the sole is worn down to the channel the shoe is worthless. Another disadvantage resulting from cutting this channel deep is that the portion of the sole beneath the channel is so weakened that when the shoe is turned the leather falls or caves in from the outside on a line with the channel and it requires a greater amount of labor to beat out or level the sole, so as to get a good finish on the surface than it does where these conditions do not exist.

The channeling of the soles to be sewed by the present machine requires great skill, and consequently an additional expense in their preparation.

The above-described channeling process is indispensable where machines which form a chain or lock stitch are employed to do the sewing, but it is not requisite in a machine making a tufted stitch similar to mine. Prior to my invention, however, these latter machines have not been successfully used, owing principally to the defective manner in which they lock the stitch. In these machines the loop or bight in the waxed thread is laid under the locking-loop of the dry thread in the channel or on the inside of the sole—that is, the locking-loop passes through the waxed-thread loop from the under side of the latter, so that the locking-loop stands up at nearly right angles to the sole, and when the shoe is beaten out the end of the locking-loop will be pressed down on top of the waxed-thread loop, forming a bunch at each stitch, and therefore a ridge on the inside of the shoe. This ridge is objectionable to such an extent as to preclude the use of these machines, and my present invention has for one of its objects to do away with this objectionable feature, and thereby utilize this form of stitch, which I consider is superior in all other respects to any of the stitches which are now in practical use for the purposes referred to, for the reason that it does not impair the flexibility of the shoe, and that each individual stitch is locked independently of the others, obviating all danger of the shoe becoming ripped. In this stitch the waxed thread does not cross itself at any point, but the parts thereof which pass through the leather lie side by side therein, and the loop forms a hinge which is not strained or chafed by the bending of the sole in wearing. A maximum amount of service is thus insured, and the liability of the threads becoming abraded, disintegrated, or cut by the reason of the hammering it receives in beating out and leveling the bottom in the finishing process is

greatly reduced. Another important advantage of this stitch over the chain or lock stitch is that while the waxed thread is of the same quality and cost as that in general use the locking-thread is amply effective when common inexpensive wrapping-twine is employed, so that the cost of thread is reduced to the mininum.

It will be seen that the paramount objects of my invention are to produce a machine which will sew the parts to be connected in such a manner that the stitches shall embrace the greatest amount of between substance, and thus secure the soles of the upper to the best advantage, and also reserve the greatest amount of substance for wear between the stitches and outside of the sole. The defects of former machines have rendered it necessary to mutilate the sole, and thus deteriorate its value, in order to place the stock in condition for sewing by them. The defects above referred to are due chiefly to the inequalities invariably to be found in nearly all kinds of sole-leather, some parts of the same sole being hard and firm and some being soft and spongy, and consequently some parts are weak and some are strong. As the thread is anchored to the between substance, the strength of the seam as a whole is measured by the weakest part of the material afforded for its anchorage, and it is obvious that by passing the stitch through a greater amount of substance its holding power is proportionately increased. As the firm portions of the sole resist the passage of the needle through the between substance when of considerable width, the necessity arises when these prior machines are used for the adoption of the defective plan of cutting the channel deeply into and near enough to the edge of the sole to allow the needle to penetrate and pass through the upper and between substance and draw in the stitches. When this is done, the stitches may or may not hold in the firm parts of the leather; but in the soft and spongy parts the stitches easily break away from the anchorage and render the shoe worthless. By use of the instrumentalities employed by me in my new invention and machine I am enabled to cause the needle to penetrate with ease through the maximum amount of between substance and draw in the stitches, which will inclose enough of the between substance to withstand any strain which is liable to be brought to bear on the weakest parts of the sole, and also place the stitches nearer the inside surface of the sole, leaving its thicker portion between the stitches and the outside of the sole. The advantages of such condition will be readily apparent.

Another important feature of my invention is the employment of a needle having its hook located on its side of shortest curvature or side nearest its axis of motion, which enables the thread to be carried over the needle instead of under it when it is placed in the hook, so that the thread-carrier will not come in contact with the lining of the shoe and deface the same by causing the wax which accumulates on the end of the carrier to be deposited thereon. This position of the hook also enables me to locate and operate my simple and novel device for disengaging the loop from the hook outside of the path of the needle, thereby leaving the space embraced within the path of the needle free from obstruction, so that I am enabled to more easily operate an awl to penetrate the upper and between substance and open a clear passage for the needle. An awl is much preferable for this purpose, as its point is solid and stronger than that of the needle, the point of which is weakened on account of being cut away to form its hook, and hence it is not so well adapted to force its way through the resistance encountered when the sole is fitted with a thick between substance. Moreover, as the awl in my machine penetrates the material from the outside of the upper, where the lasting-tacks are located, it forces them aside and prevents them from coming in contact with the point of the needle and breaking the same.

Another feature of my invention consists of a clamp which forces the upper firmly against the shoulder on the edge of the sole, so that the upper will be in place when the awl and needle penetrate the work, and the strain on the thread usually required to draw the upper against the sole will be avoided. This feature is of great importance, particularly in sewing those portions of the shoe which include the counter and toe-cap.

Having stated in a general way the object of my invention, I will proceed to point out its particular features more fully in the following description and claims at the end of the specification.

The term "between substance" employed by me refers to that part of the sole lying between the groove at the point where the needle enters the sole and its outer edge, and the term "upper" means that portion of the shoe that is joined to the edge of the sole by the stitches, whether it is a turned or welted shoe.

Referring to the drawings, Figure 1 is a front elevation of my machine. Fig. 2 is a right-hand side elevation. Fig. 3 is a left-hand side elevation, Fig. 3ª being a section of a detail. Fig. 4 is a rear elevation. Figs. 5 to 8, inclusive, are enlarged detail views of the awl, needle, and feeding-segments, showing their construction and relation with each other. Figs. 9 and 10 are full-sized details of the channel-guide and dry-thread guide. Figs. 11 to 17, inclusive, are full-sized details of the waxed-thread-guiding devices, showing their construction and relation with each other. Figs. 18 to 21, inclusive, show the relation of the several devices for forming a stitch. Fig. 22 shows an enlarged view, partially in section, of the stitch as it is laid in the work. Fig. 23 shows a detail view of the end of the cast-off.

The frame of my machine consists of a horizontal base-piece A, from the outer ends of which two supports A′ A² project upwardly and carry the main driving-shaft B, which rotates in bearings in the said supports. (See Figs. 1 and 2.) The cams C, D, E, F, G, H, I, J, K, and L are mounted on and secured to the main shaft B and have grooves cut into their several faces of the proper conformation to transmit the desired motion to the several devices to which they are connected. The cam M is located and secured to the shaft B outside of the support A² and has its groove in its periphery, the shaft B extending beyond it and having a driving-wheel (not shown) secured thereto in the usual manner.

Two fixed shafts B′ B² are secured to the uprights A′ A² above, parallel with and equidistant from the shaft B, and serve as fulcrums for the levers C′, D′, E′, F′, H′, I′, J′, K′, and L′, on which they turn freely, each of the levers receiving its movements from its corresponding cam through intermediate studs and rolls which project from the levers into the grooves in the faces of the cams in the usual manner. The free ends of the above levers are connected to the various devices employed for holding and controlling the shoe, manipulating the threads, &c., by pivoted connecting-rods, which devices are in turn mounted on and secured to a mid-plate A³, which is secured to the base-piece A and projects upward and forward to the bracket-piece A⁴, being secured to the front end thereof by cap-screws. (See Figs. 1 and 2.) The bell-crank lever G′, which is operated by the cam G, is fulcrumed to the mid-plate A³ by the stud *g*, and the pendent lever M′, which is operated by the cam M, is pivoted to a bracket-piece A⁶, secured to the support A² by the stud *m*. (See Figs. 1 and 3.)

Having now shown the general location of the mechanism representing the sources from which the movements of the several devices more closely connected with the sewing of the shoe are secured, I will proceed to point out the construction, location, and respective movements of these devices.

The needle-segment g^2, which carries the needle g^4, is secured to a short hollow shaft or sleeve g^3, which projects from the left-hand side thereof and is journaled in the lower part of the bracket-piece A⁴. (See dotted lines on Figs. 1 and 5.) The needle-segment is oscillated by the cam G through the bell-crank lever G′ and connecting-rod *g*′, the cam G being so constructed as to give the needle two strokes forward and back while making one revolution, one of which forces the needle forward through the material (see Fig. 18) and withdraws it to its fullest extent (see Fig. 21) and the other carries it forward a short distance through the cast-off (see Fig. 20) and then withdraws it to its fullest extent, as shown in Fig. 21.

The awl-segment e^2 (see Figs. 1 and 5) is made fast to a shaft *e*′, the larger end of which is journaled in the bracket A⁴ inside the hollow shafting or sleeve g^3, its smaller end being journaled in the bracket-piece A⁵, which is firmly secured to a projection on the mid-plate A³. (See Figs. 1, 3, and 5.) The larger end of the shaft *e*′ extends through the bracket A⁴ and has a crank-arm *e* secured thereto, the hub of which is larger than the outside diameter of the sleeve g^3 and serves as a collar to keep the needle and awl segments from sliding laterally in their respective journals, thereby keeping the needle g^4 and awl e^3 in alinement. The awl e^3 has a single forward and back movement which is communicated to it by the cam E through the lever E′, connecting-rod E², crank-arm *e*, shaft *e*′, and segment e^2. The needle and awl are secured to their respective segments by clamps in the usual manner.

The feed-spur *i*′ (see Figs. 1 and 5) is firmly secured to the side of the segment I³ which is nearest to the awl-segment, and from its opposite side a hollow sleeve i^2 projects, which is journaled on the small part of the shaft *e*′, the combined length of the segment I³ and its sleeve i^2 being equal to the distance between the awl-segment e^2 and the bracket A⁵ minus the length of the longest stitch required. The segment I³ may therefore oscillate and slide laterally on the shaft *e*′.

The feed-spur *i*′ has a swinging forward and back movement during the formation of the stitch, and also forward and back lateral movement in the same time, its swinging movements being communicated to it from the cam I through the lever I′, connecting-rod I², and segment I³, the connecting-rod I² being provided with universal joints at its end in the usual manner to accommodate the compound movements of the feed-spur segment. The lateral movements of the segment I² are indirectly transmitted to it through the feed-clamp segment K³, which will be more fully explained in describing the feed-clamp K⁴ and its movements. The compound movements of the feed-spur are such as to cause the same to swing forward and engage the between substance of the sole at a point between the needle and the channel-guide N and then move laterally in the direction of and past the path of the needle a sufficient distance to allow the needle in its movements to pass by it, (see dotted position in Fig. 5,) carrying the shoe along with it a distance equal to the desired length of the stitch. The feed-clamp K⁴ is firmly secured to a projection extending from the inner side of segment K³ at a point below the axis of motion of the latter. This segment K³ is hollow and is journaled on the sleeve i^2 of the segment I³ and oscillates thereon. It is prevented from sliding laterally on the sleeve i^2 by a tongue-piece i^4, which is secured to the upwardly-projecting arm of the clamp-segment K³ by the screw i^5 and engages an annular groove i^3 in the projecting end of sleeve i^2. The feed-clamp K⁴ has two swinging forward and

back movements, one of which is simultaneous with the forward and back swinging movement of the feed-spur i', so that they move simultaneously toward and from each other on opposite sides of the between substance and clamp and hold the material firmly between them as they approach each other and release it as they recede. The lateral movements of the feed spur and clamp are simultaneous, both being operated by the cam M and pendant on M′, to which latter a universally-jointed connecting-rod M^2 is adjustably connected. The opposite end of rod M^2 is pivotally connected to one end of horizontal lever M^3, which latter is fulcrumed to the mid-plate M^3 by the bolt m^2 and is connected at its opposite end to clamp-segment K^3. (See Figs. 3 and 7.) The forward end of the lever M^3 is provided with a vertical groove m^3, (see dotted lines, Figs. 3 and 7,) into which a tongue k^4, (see Fig. 7,) projecting from the clamp-segment K^3, fits, so that as the end of lever M^3 swings laterally it gives the segments K^3 and I^3 simultaneous and coincident lateral movements. The swinging movements of the feed-clamp are transmitted to it by the cam K through the lever K′, universally-jointed connecting-rod K^2, and segment K^3. The lower end of clamp K^4 is forked or cloven, (see Fig. 5,) so that the needle and awl may pass directly between the forks of the clamp, while it is holding the upper against the shoulder on the sole. As the needle when it draws back the loop would lay the thread from the preceding stitch over the adjacent fork of the clamp, the clamp has a back and forward movement independent of the feed-spur at the time the needle is drawing in the loop. The clamp is swung back by the cam K sufficiently to allow the thread from the preceding stitch to be drawn under it, and then it is advanced and forces the upper against the sole just as the thread is drawn tight against the upper, thus assisting the needle in drawing in the upper tight against the sole, so that the stitch will be set tight against the upper and held in its locked position until the stitch is locked by the locking-loop, as hereinafter explained. This feeding-clamp, moreover, has a lasting action, since it draws in the upper to some extent when it clamps the same against the sole before the awl passes through the work, and it holds the upper in this position, so that the hole in the upper will be held in register with the hole in the sole as the needle is passing therethrough to receive its loop, thus avoiding all possibility of the awl's drawing the upper away from the sole as it recedes and of the needle's making a new hole in the upper. The lasting action above referred to is of especial advantage when the shoe is poorly lasted and has the advantage of making the upper fit the last smoothly under all conditions. By having the clamp swing on an axis coincident to that of the needle, and therefore inside the path of the latter, I secure various advantages, one of the most important of which is that I remove it from all possible interference with the looper and shank of the awl and enable the forks to grasp the upper close to the path of the needle. As the action of the force exerted by the clamp is in line with the thrust of the awl and needle, it has no tendency to move the shoe in the hands of the operator in directions which are different from the path of movement of the awl and needle.

The connecting-rod K^2 is made elastic to allow variable thicknesses of material to be embraced by and between the feed-spur and feed-clamp through the agency of a spiral spring k^3, (shown in vertical cross-section, Fig. 3^a,) which is interposed between the fixed button or collar k^2 on the end of rod K^2 and the inner end of the adjusting-screw k^4, which is held in position by being threaded to the shell k^5, through which the rod K^2 slides freely. By this arrangement the feed-clamp does not approach the feed-spur too nearly when they engage the thicker portions of the stock, such as counters and toe-caps, as the spring allows the rod K^2 to lengthen or shorten, according to the varying thicknesses of material encountered. The stitch is varied in length by moving the adjusting-screw m' to the desired position in the slot m^0.

The channel-guide N (see Figs. 1 and 3 and enlarged detailed views Figs. 8, 9, and 10) is secured to a swinging lever having arms N′ N^2 by the adjusting-screws n' n^2, this lever being fulcrumed to the mid-plate A^3 by the screw n^3. The arm N^2 of the lever projects rearwardly, so that its end is in close proximity to the lower end of arm K′. The end of the arm N^2 is beveled on its side nearest to the arm K′, the latter being also beveled on its side next to the beveled end of arm N^2. The lever N′ N^2 is loose on its pivot, so that when the shoe is fed along the guide N is carried along with it by the friction between the guide and the sole, so that the guide will be carried close to the path of the needle. As the lever K′ advances to throw back the clamp K^4 while the needle is drawing the loop through the stock it will engage the end of arm N^2 and throw the same toward the mid-plate, thus throwing the guide in the opposite direction the desired distance away from the path of the needle. A right-angle bracket n^4 is secured to bracket A^5, which latter is secured in turn to the mid-plate A^3. The arm of bracket n^4 extends over arm N′ and is provided with a slot n^5 in its overhanging part. A vertical stop-pin n^6 in arm N′ projects into slot n^5, so that the movement of the guide toward the needle will be arrested upon the engagement of the pin n^6 with the end of slot n^5, the parts being adjusted so that the guide cannot move so close to the path of the needle as to interfere with the passage of the needle through the work.

The objects of arranging the guide N so

that it may move laterally in the manner just described are, first, to prevent the friction between the guide and the channel in the sole as the shoe is fed along, and, second, to have the point of the guide as nearly opposite the awl as possible when the latter penetrates the stock, so that the guide will be in a position to better resist the thrust of the awl and hold the channel in proper alinement. The parts are arranged so that the guide will be moved back in advance of the feed-spur and so that the latter may move back in the same direction at its proper time and reëngage the stock between the guide and the needle. As the feed-spur is on one side of the path of the awl or needle and the channel-guide on the other at the time the awl is penetrating the stock, they act together to hold the shoe in precisely the right position and also distribute the resistance necessary to resist the thrust of the awl on both sides of the path thereof.

The back-rest L^5 acts in conjunction with the guide N to hold the shoe in place when the feeding spur and clamp are moving back to grasp the work again, and consists of a sliding bar having a semicircular headpiece at its end which bears against the shoe opposite the guide N. Its rear end extends nearly under the main shaft (see Fig. 2) and slides easily in a longitudinal groove in the mid-plate A^3 and is held therein by the clips l^4 l^5, as shown. A pin l^6 projects from the rear end of the back-rest, and a spiral spring L^6 is connected to said pin at one end, its other end being connected to a pin l^7 in the clip l^5. The rest L^5 is prevented from being drawn too far forward by the spring by the stop-pin l^8, which abuts against the clip l^5. The friction-shoe L^4 is pivoted to the mid-plate A^3 at $l^\times$ and is pressed up against the sliding bar by an eccentric projection l^3 on shaft l^2. Shaft l^2 is journaled in the mid-plate at one end and extends laterally and is journaled in a bracket A^{10} at its opposite end. When the shaft l^2 is oscillated, it will alternately lock and release the sliding bar or back-rest L^5 by causing the eccentric projection l^3 to press the shoe L^4 up against the bar and then permit the same to drop. The shaft l^2 is oscillated alternately to lock and unlock the back-rest by the cam L. The lever L', which is swung by cam L, has a link L^2 (see Fig. 3) pivoted to its lower end by pin l. The opposite end of the link is pivoted on the pin l', which is arranged in the slot o^3 in the end of arm L^3. The arm L^3 is secured to shaft l^2, so that as the arm is swung the shaft will be rocked.

The back-rest L^5 is constantly kept up against the shoe by the action of the spring L^6, so that the channel-guide point is held in the bottom of the groove in the sole of the shoe. (See Fig. 6.) When the feed spur and clamp are disengaged from and are being moved back to reëngage with the between substance and upper, while this reëngagement is taking place and until after the shoe has been fed forward, the back-rest is free to slide back and forth; but after the shoe has been fed forward the rest is securely locked by the action of the mechanism just described in whatever position it may assume with respect to the channel-guide by reason of the irregularity of the form of the last, the object being to aid the operator in holding the shoe properly and also to assist the feed-clamp K^4 to resist the thrust of the needle and draft of the thread when the stitches are drawn up and set.

It is sometimes desirable to release the back-rest L^5 when it is locked by the action of the cam L, and for this purpose I employ a horizontal lever O, (see Fig. 3,) which is fulcrumed to the frame A by means of rod O'. The inner end of lever O is connected with a foot-treadle (not shown) by the rod o, and its other end is connected to the link L^2 by the connecting-rod o' and is held in its lowest position by the spring O^2. The upper end of the lever L^3 is provided with a diagonal slot o^3, in which the screw l' works up and down. The screw l' is secured in link L^2. When the operator depresses the treadle, the screw l' is forced upward in the slot o^3. This movement draws the arm L^3 toward the lever L', turns the shaft l^2, and releases the back-rest L^5. When the treadle is released, the spring o^2 draws the screw l' down to its normal position in the lower end of the slot o^3, relocking the back-rest.

The devices just described form a group of mechanism whose function it is to seize, hold, feed, guide, control, and prepare the stock for the reception of the stitch. As previously indicated, this stitch is composed of two threads, one of which is waxed and the other unwaxed, and for convenience I will hereinafter use the terms "waxed thread" and "dry thread" when referring to them, they being indicated in the drawings by the letters V and W, respectively.

I will now describe the group of mechanism the function of which is to manipulate and control the thread when forming, introducing, and completing the stitches in the material.

The tension devices for controlling the waxed thread are best seen in Figs. 2, 3, and 4, and consist of an ordinary main tension-wheel P, mounted on a bracket P', secured to the frame A, which receives the thread from the ordinary waxer (not shown) and delivers it to the sewing mechanism. The wheel P is controlled in the ordinary way by friction-washers, (not shown,) between which it rotates on a bolt P^2. This bolt extends through a supporting-sleeve P^3, carried by bracket P', and is provided with a large head p at one end and an adjusting-nut P^4 at the other. A spiral spring is interposed between the outer end of the supporting-sleeve P^3 and nut P^4, so that the tension may be adjusted in the usual way.

The take-up mechanism (see Figs. 1 and 3)

consists of a horizontal shaft J^4, one end of which is journaled in the mid-plate A^3 and the other end in a bracket A^7, and which has an arm j secured thereto between its ends. Each end of said arm is provided with an anti-friction-sheave j' j^2, respectively, around which the waxed thread is drawn in its passage from the tension-wheel to the needle. (See Fig. 3) The axes of these sheaves are parallel to and equally distant from the axis of shaft J^4. Secured to the outer end of shaft J^4 is a crank-arm J^3, said arm being connected to the lever J' by the connecting-rod J^2. The action of cam J upon lever J' causes the sheaves to be moved back and forth in the arc of a circle which has its center in the axis of shaft J^4. It will be apparent that as the sheave j^2 is moved toward the needle and the sheave j' in the reverse direction the path followed by the thread from the tension-wheel P to the needle is shortened, and vice versa, so that as shaft J^4 is oscillated the sheaves will alternately deliver and take up the thread.

The mechanism for operating the take-up is adjusted so that the take-up will be rotated forward to give off slack thread as the needle draws its loop through the work, and will then be rotated back, so as to take up the thread and set the stitch after the loop is cast off from the needle-hook, the last part of the backward movement of the take-up after it has set the stitch acting to draw off sufficient thread from the tension-wheel for the succeeding stitch. In order that the needle may draw the stitch tight against the upper as it draws back the loop, the forward movement of the take-up must be arrested just before the needle reaches its extreme backward position. The thread must therefore be under a certain tension during the last part of the backward movement of the needle, and unless other provision is made it will be placed under a tension equal to the full tension of the tension-wheel—that is, the needle would have to draw a certain amount of thread through the stock direct from the tension-wheel. This causes such a strain on the thread as to almost invariably either break it or break the needle. To relieve this overstrain upon the thread, I employ an intermediate device between the main tension-wheel and the point where the stitch is set, which consists of an arm p^2, which is pivoted to the center of the bolt-head p by the screw p^8. The outer end of this arm p^2 extends beyond the periphery of the main wheel P and rests while in its normal position on the frame A. A pin p^4 projects laterally from the end of arm p^2, on which a concave anti-friction-roller p^5 is free to rotate. (See dotted lines, Figs. 2 and 3.) The outer end of the arm p^2 is held down to the frame by its spring p^6, one end of which bears thereon and the other end of which is adjustably secured to the frame A by the screw p^9 and disk p^7. This disk p^7 may be turned to the right or the left by the pin p^8 after the screw p^9 has been slackened to properly adjust the tension of the spring. The outer end of spring p^6 rests in a hole in the arm p^2. The arm p^2 is prevented from being carried upward too far from the frame by the stop-pin p^{10}, secured in the bolt-head p. The thread V is passed from the tension-wheel under the roll p^5, so that the thread is deflected from a straight course between the point at which it leaves the tension-wheel and the point where it is taken onto the sheaves of the take-up. When the needle has taken up all the slack thread which has been given off by the take-up and starts to draw the thread tight against the upper, the necessary tension for this purpose is supplied by the lifting of the roll p^5. The spring p^6 is adjusted so that the roller p^5 will lift before the thread will break or before the needle can draw thread from the tension-wheel. The needle is thus supplied with extra thread under tension to finish its back stroke and set the stitch tightly along the upper of the shoe. The amount of extra thread required for this purpose is slight and does not raise the arm p^2 up to the stop-pin p^{10}; but when the take-up is drawing back the thread and setting the stitch around the dry-thread loop the strain exerted on the waxed thread by the take-up first draws the arm p^2 up against the stop-pin, and then as the take-up continues to swing it draws sufficient thread from the tension-wheel for the succeeding stitch. The machine is thus supplied with two tension devices, each of which acts independently of the other, one of said tensions being comparatively light and acting to draw the thread tight against the upper and the other being comparatively strong and acting to set the stitch by drawing the waxed-thread loop around the locking-loop.

The waxed-thread-carrying mechanism which deposits the waxed thread in the hook of the needle is provided with a thread-guide f^7, having a longitudinal thread-passage at its forward end. (See Figs. 1 and 3 and detail views Figs. 11 to 17, inclusive.) The thread is admitted to guide f^7 by an opening in the side thereof, as shown. The rear end of guide f^7 is socketed in the forward end of a horizontally-swinging arm F^6. This arm F^6 is pivoted to the sliding bar F^3 by a screw f^2, and its opposite end is provided with a curved slot f^5. A fixed pin f^6 projects into said slot, said pin being supported by a bracket-piece A^9, which is secured to the mid-plate A^3. The sliding bar F^3 is provided with a longitudinal groove f^{10} on its inner side, into which a tongue f^{11} on the face of the supporting-piece F^4 projects, as shown in the cross-sectional view in Fig. 15. The opposite side of supporting-piece F^4 has secured thereto, about midway between its ends, a laterally-extending trunnion f^8, which is journaled in the mid-plate and held against lateral movement by a nut f^9. The sliding bar F^3 is held against

the supporting-piece F^4 by a spring-plate F^5, (shown in detail in Fig. 13ª,) which is secured to the plate F^4 by a screw *f*, which extends through a longitudinal slot in the bar F^3 (see dotted lines, Figs. 11 and 12, and cross-section in Fig. 15) and is screwed into the supporting-piece F^4. A pin *f'* is also secured in the piece F^4 and extends forward through a hole in the spring-plate to prevent it from turning on the screw *f*. The rear end of bar F^3 is provided with a wide slot f^3, into which a stop-pin f^4, which is secured in the mid-plate A^3, projects. The bar F^3 has reciprocating horizontal movements imparted to it by the cam F through the lever F' and connecting-rod F^2, the latter being pivoted to the downward-projecting arm f^{13} of bar F^3 by a screw f^{12}. The bar F^3 would slide freely between its supporting-piece F^4 and the plate F^5 but for the fact that the ends of plate F^5 are bent inwardly, as shown in Fig. 13ª, forming a spring which bears on the bar F^3 and presses it against the piece F^4 with considerable force. A friction between piece F^4 and bar F^3 is thus created which impedes the sliding movements of the latter, so that the forward end thereof will be forced to tilt upward or downward as the rod F^2 begins to draw its downwardly-projecting arm f^{13} forward or back before the rod F^2 can cause the bar to slide forward or back on its supporting-piece or guideway F^4. The tilting movements of bar F^3 are limited by the stop-pin f^4 in the slot f^3, and its sliding movements are determined by the remaining throw of rod F^2 after it is tilted.

As the thread-measuring mechanism acts in conjunction with the mechanism just described, I will explain its construction and operation in this connection. It consists of a thread-finger d^5, (see Figs. 2, 16, 17, 18, and 20,) which is socketed and secured in the outer end of the shaft d^4, said shaft being journaled in the end of the bracket-piece d^2, which is secured in the mid-plate A^3 by the screw d^3. The shaft d^4 is provided with a crank-arm *d'*, to which the link *d* is adjustably connected by a pin which passes through a long slot in the arm. The opposite end of link *d* is connected to lever D', which is swung by cam D. When the cam D throws lever D', the finger d^5 will be swung in an arc which is concentric with the axis of shaft d^4.

The purpose of the thread-measuring device is to form, after the shoe has been fed along in the position for the next stitch, a loop of slack thread between the needle and the previous stitch of sufficient length to nearly make one-half of the loop required by the needle in drawing the loop through the stock back to its limit. When the measuring-finger is in its extreme downward position, the end of the finger is interposed between the thread which leads from the previous stitch to the carrier, the latter then being nearly opposite, as shown in Fig. 16, and the path of the needle. As the thread-carrier moves forward and diagonally across from one side to the other of the path of the needle it bends the thread around the finger of the thread-measurer d^5, as shown in Figs. 16, 17, and 18, thereby forming the slack loop required between the previous stitch and the needle. Another important function of the thread-measurer is to engage the upper side of the thread, so as to draw or hold it down, as shown in Fig. 18, as the carrier or looper places the thread in the hook. If the measurer were not formed so as to do this, the thread would slip off the finger as the looper carries it up and lays it in the hook. By engaging the thread at its upper as well as at its inner side the measurer permits the looper to draw the thread down firmly into the needle-hook. When the needle has retreated with the thread until its hook is in the stock, the finger is carried to its highest position, freeing the loop, and when the needle has nearly completed its backward stroke the slack loop is drawn up against the upper. The shaft of the take-up mechanism is rotated forward, so that it delivers slack thread to the needle at the same time that the needle is drawing the loop through the work. The amount of slack thread delivered by the take-up is the same as that measured off by the thread-measuring finger, so that as the threads are slack on each side of the needle throughout nearly the whole backward movement thereof the thread does not slide or render through the hook, as it would were all the slack threads supplied from one side of the needle.

The various positions of the thread-carrying device are shown in Figs. 11, 12, 13, 16, and 17, it being shown in combination with the thread-finger in Figs. 16 and 17. In Fig. 12 the sliding bar F^3 is shown as tilted upward to its fullest extent by rod F^2, in which position the end of the carrier d^5 is above the dotted line X, which indicates a line on a level with the eye of the hook of the needle. In Fig. 11 bar F^3 is shown as drawn down to its lowest position below the hook of the needle by the reverse movement of the connecting-rod F^2. The lateral movements of the carrier-arm F^6 are shown in Fig. 16, with the carrier f^7 at the right and left of the path of the needle. The change of position of the carrier laterally is caused by the pin f^6 as it engages with the slot f^5, while the bar F^3 is moved forward by the rod F^2. The forward end of the thread-carrier moves in the path indicated by the dotted lines Z' Z and in the direction of the arrow, it being above the needle when advancing and below when retreating. (See Fig. 17.) It also moves from the right-hand side of the needle to the left-hand side thereof in the path indicated by the dotted line Z in Fig. 16, so that its combined movements carry it in a circuit completely around the path of the needle. Fig. 16 shows the extreme lateral, and Fig. 17 the extreme vertical, positions of the end of the carrier, these figures also showing the ex-

treme front and back position thereof. The several positions of the end of the socket of guide f^7 shown in these figures are numbered, respectively, 1 2 3 4 5 6, position 1 indicating the normal position just before starting to thread the needle, position 2 being directly over position 1 and the same as position 5, and position 6 being on the same level as positions 2 and 3 and directly over position 4. The varying positions of the waxed thread are also shown in Figs. 16 and 17 in their relation to the thread-measuring finger and the needle, the former being shown as interposed between the point where the thread leaves the upper from the previous stitch to the carrier in Fig. 16 and the thread being shown as bent around the finger in Figs. 16 and 17 after the carrier has advanced to its forward position.

The cast-off Q, Figs. 1, 2, 3, and 18 to 21 and detail view Fig. 23, consists of a bent arm which is curved inwardly at its lower end and has a vertical hole q^5 at its forward end, (see Fig. 23,) which is of sufficient size to permit the passage of the needle therethrough. The upper part of the cast-off is secured to the lower end of a swinging lever q by screws, as shown, said lever being pivoted to a projection on a bracket-piece A^4 by the screw q' and having an arm q^2 extending upward, which is provided at its upper end with a crooked slot q^3, through which a pin q^4, which is secured to arm c^3, projects. Arm c^3 swings up and down in operating the looping-hook, hereinafter to be described, so that the pin q^4 is carried from the upper to the lower end of slot q^3, swinging the cast-off in the plane of the path of the needle or a plane parallel thereto. When the pin is at the upper end of slot q^3, the forward end of the cast-off is drawn away from the path of the needle, as shown in Fig. 19, and when it is moved down to the lower end of the slot the cast-off will be moved in the position shown in Fig. 20, so that the needle in its forward end is in line with the path of the needle. After the needle has drawn its loop fully back it advances until its hook descends and passes through hole q^5, as shown in Fig. 20. In doing this the end or bar q^6 of the cast-off, which is beyond hole q^5, engages the under side of the loop, so that the loop is lifted from the hook and may then be drawn back around the dry-thread loop, as hereinafter explained, to set the stitch in the material.

The device for controlling the dry thread W consists of a thread-guide R, which is secured to the inner side of the channel-guide N and is provided with a thread-passage r, the thread-passage being so located as to conduct the dry thread leading from its supply to a point between the shoulder of the channel in the sole or point where the needle enters the sole and the upper, (see Figs. 6 and 8,) so that the thread will always be laid between the feed-spur and feed-clamp and in position to be engaged by the looping-hook, hereinafter described in detail, which swings in the plane of the path of the needle and draws a loop of the dry thread through the waxed-thread loop. The thread W is drawn through the passage r of the guide R forward and across the path of the needle by the action of the feed spur and clamp as they feed along the shoe. Each time the shoe is fed forward from the guide R sufficient thread is drawn through the thread-passage to reach from the guide to the previous stitch, where it is confined to the sole of the shoe by the waxed thread. It will readily be seen that if the feed-spur were moved only as far as the left side of the path of the needle and were not made to cross the path thereof and the path of the looping-hook when the shoe was abruptly turned to a right angle with the axis of the needle the end of the thread attached to the sole would be carried around with the shoe and the thread leading from the guide R to its secured end would be drawn parallel, or nearly so, with the path of the looping-hook, and therefore the hook could not engage with the thread under such conditions. These conditions arise when sewing around a shoe having a pointed toe, and although the shoe would not be likely to be turned to such an extreme extent as that just mentioned, yet it would be enough to render the machine inoperative by the inability of the looping-hook to grasp the dry thread. Hence it is imperative that the feed-spur should move across the path of the needle and prevent that part of the thread extending from the guide R to the feed-spur from being carried into a diagonal position with respect to the path of the looping-look, so that under all conditions the thread will be presented practically at a right angle with the path of the looping-hook.

The looping-hook c (see Figs. 1, 2, 3, and 19) is provided at its forward end with a hook c^5, which is secured to a swinging arm c^4, said arm being hinged in the end of arm c^3 on the pivot c^8, said arm being secured to a shaft c^2, said shaft being journaled in the bracket-piece A^4. An arm c' is secured to the outer end of shaft c^2, said arm being connected with the cam C by the connecting-rod C^2 and lever C'. By these means the arm c^3 is moved up and down, carrying with it the looping-hook c and pin q^4. The hook c^5 is swung longitudinally by the cam H in the plane of the path of the needle through the medium of the lever H', connecting-rod h, and arm c^6, the latter being secured to arm c^4 by screw c^7, and rod h being pivoted to arm c^6 by screw h'. The looping-hook c^5 has two horizontal forward and back movements—viz., a long one to carry it forward through the waxed-thread loop from the under side thereof into engagement with the dry thread and a short one backward to draw a loop of dry thread through the waxed-thread loop, (see Fig. 20,) followed by a short one forward to disengage its hook from the loop and thence backward

out of the way of the needle. Its downward movement takes place when its hook has reached its extreme forward movement, and its upward movement simultaneously with its short forward movement, both of its vertical movements being simultaneous with the forward and back movements of the cast-off. The length of the locking-loop which is drawn through the waxed-thread loop may be adjusted by loosening screw c^7 and swinging arm c^6 so as to vary the leverage of rod h with respect to pivot c^8, thus varying the length of the short backward throw of hook c^5 as it draws the locking-loop through the waxed-thread loop. The waxed thread leads from a waxer (not shown) to and around the tension-wheel P, thence downward and under the roll p^5, thence forward and around the sheave j', thence upward through a hole in the shaft J^4 and over the sheave j^2, and forward through the thread-carrier f^7, and the dry thread W passes from its thread-supply through a hole in the arm N′ and thence downward and through the thread-passage r in the guide R.

Although I have described the sole to be sewed as fitted with a groove or channel, yet this channel is not absolutely essential to the operation of the machine, as it is quite possible to sew it to the upper without any channel in the former. In practice, however, it is desirable to provide the sole with a very shallow channel to serve as a guide for the operator and to permit the feed-spur to engage the sole to better advantage.

The cams being properly shaped and timed, the operation is as follows: When starting to sew with the above-described machine, the several devices for forming the stitches are in their initial position, as shown in the principal drawings, Figs. 1, 2, and 3, with the needle, awl, cast-off, looping-hook, feed-spur, feed-clamp, thread-measuring finger, and thread-guide drawn away from the work to their fullest extent, with the back-rest forward and resting against the shoe and the channel-guide in position in the groove. (See Figs. 6 and 8.) To introduce the work into the position shown, the operator presses the shoe against the back-rest, which is now unlocked, and forces it back sufficiently to hook the channel-guide into the channel, as shown in Fig. 8. During the first revolution of the shaft B the operator holds the loose ends of the thread in position to be seized by the needle and looping-hook. This first revolution will secure the thread to the upper and sole, and the first stitch will have been taken. When this is done, the vertical position of the parts will be the same as before stated. The lateral positions of the feed-spur, feed-clamp, and channel-guide will now be at the left-hand side of the needle and at such a distance that when they have been moved forward and laterally to their fullest extent the shoe will have been fed along to a distance equal to the length of the desired stitch. As the machine starts to take the next stitch the feed-spur moves toward the between substance and engages with it between the channel-guide and the needle, and at the same time the feed-clamp moves forward and clamps and holds the upper firmly against the edge of the sole and forces the between substance firmly against the feed-spur. (See Fig. 7.) Then they are moved laterally to their fullest extent, carrying the work along with them. At the end of this movement the feed-spur will be on the opposite side of the needle and the feed-clamp, with its cloven end, will be in position for the needle and awl to pass through it. (See dotted lines, Fig. 5.) The back-rest is now locked, and the awl moves forward and punctures a hole through the upper and between substance and immediately retreats, closely followed by the needle, which advances to its fullest extent. (See Figs. 6 and 18.) The thread-carrier now advances from its normal position 1 and moves upward to positions 2 and 5, then forward and laterally to position 3 and to position 6, then downward to position 4, (see Figs. 16 and 17,) and traveling in the directions of the arrows and in a path represented by the dotted lines Z Z′. Before the thread-carrier starts to move forward, as just described, the thread-measurer descends to its lowest position (see Figs. 17 and 18) and is interposed between the thread leading from the previous stitch to the carrier and the path of the needle, (see Fig. 16,) and as the thread-carrier has a lateral movement from position 5 on one side of the needle's path to position 6 on the other (see dotted line Z, Fig. 16) simultaneous with its forward movement the thread extending from the previous stitch is bent around the thread-measurer and carried forward across the hook and then downwardly on its opposite side, (see Figs. 16 and 17,) so that the needle-hook engages the thread at such a point as to leave a loop of thread between the previous stitch and the one being formed. (See Fig. 18.) After the thread-carrier has reached position 4 and deposited the thread securely in the hook of the needle it moves backward and laterally toward its starting-point until its delivering end is in line with the needle's path, where it rests, and the needle withdraws, with the thread, until its hook is in the material, when the thread-measurer moves upwardly to its highest position and becomes disengaged from its loop, so that the latter is free to be drawn up by the needle. When the thread-carrier starts from position 1 to bend the thread about the thread-measuring finger and lay it in the needle-hook, the take-up shaft begins to rotate forward and continues to move the take-up so that it will give off sufficient slack thread while the carrier is making these movements to relieve the latter from any strain and supply the thread-finger with its loop. Up to the point described the take-up has advanced about one-half of its forward movement, and as the needle recedes, drawing the loop

through the work, the take-up advances the remainder of its forward movement, giving off an amount of slack thread equal in length to the length of the loop made by the thread-finger. It is desirable, though not wholly necessary, to have the take-up cam move the take-up back slightly as the thread is laid in the needle-hook, so that the thread will be drawn firmly therein. The needle moves back until all the slack thread given off by the thread-finger and take-up has been taken up on both its sides. Just before the needle is drawn back out of the stock the feed-clamp moves back to its fullest extent away from the upper (see Fig. 19) to allow the slack loop from the thread-finger to be drawn up against the upper. (See Fig. 21.) When the needle has taken up all the slack thread afforded by the thread-finger and take-up, it still has a short distance to move before completing its stroke and obtains its thread for this purpose by straightening the deflected thread lying between the thread-supply and take-up and lifting the deflecting antifriction-roll against the resistance of its spring. This gives sufficient extra thread under tension to draw the slack loop from the thread-finger up tightly against the upper, and when this is done the needle has reached its extreme backward movement and the feed-clamp has moved forward against the upper, as seen in Fig. 20, one prong of its forked end holding the part of the stitch thus formed tightly against the upper until the stitch is set around the locking-loop. While the needle is drawing in its loop, as just described, the looping-hook is carried forward through the needle-loop from the under side thereof to its fullest extent beyond and over the dry thread, which is then lying at right angles with the path of the hook. The hook is then moved downward onto the thread and then backward a short distance, drawing a loop of dry thread through the needle-loop. (See Fig. 20.) When the needle is at its highest point after drawing the waxed thread tightly against the upper, the cast-off is moved forward until its aperture coincides with or is in line with the needle's path, and the needle is then moved forward a short distance until its hook passes through the aperture far enough to carry the end of its barb below the upper side of the end of the cast-off, so that the bar at the end of the cast-off will engage the under side of the loop and lift the same from the needle's hook. (See Fig. 20.) The movement of the take-up is reversed by the time the waxed-thread loop is cast off from the needle, drawing this loop tightly around the locking-loop of dry thread and setting the stitch. The dry-thread loop is held by the looping-hook until the waxed-thread loop is drawn down to it. Then the hook is swung forward slightly and lifted so that it becomes disengaged from the dry-thread loop just before the waxed thread is drawn tightly about the dry-thread loop. The hook is then swung back to its normal position. (See Fig. 21.) When the stitch is set, the locking-loop of dry thread is drawn firmly against the bottom of the channel in the sole, and the end of the loop is laid out flat in the channel beyond the waxed-thread loop, as shown in Figs. 21 and 22, so that there is no danger of an objectionable bunch being formed by the locking-loop projecting up over the waxed-thread loop, as in prior machines. The take-up continues its reverse movements until it has drawn sufficient thread from the tension-wheel to form the succeeding stitch, after which it is moved in the opposite direction sufficiently to relieve the thread hwich extends from the thread-carrier to the tension-wheel from strain and allow the roll p^5 to swing to its normal position. The thread-carrier then finishes its stroke by moving backward and laterally into position 1. When the stitch has been completed, the back-rest is unlocked and the feed-clamp and feed-spur are withdrawn from the stock into their position shown in Fig. 8 and moved back laterally into their original position when starting, the shoe being held in place by the channel-guide and back-rest until the clamp and spur again engage the work. All the other mechanism is then in position to repeat the operation.

Having described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is as follows:

1. A shoe-sewing machine comprising a curved needle having a hook on its side of shortest curvature, in combination with a pivoted cast-off, an arm or bar carried thereby, means for oscillating said needle so as to draw in its loop, means for swinging said cast-off so that said arm or bar is inside the arc of the path of the needle, and means for advancing the needle so that the barb of the hook passes below said arm or bar; whereby said arm or bar will engage said loop and lift the same from the hook.

2. A shoe-sewing machine comprising a curved needle having a hook on its side of shortest curvature, a pivoted cast-off having an aperture therein, and means for swinging said cast-off so that said aperture will coincide with the path of the needle at predetermined intervals.

3. A shoe-sewing machine comprising a curved hooked needle having a hook on its side of shortest curvature, which is adapted to draw a loop of thread through the work, in combination with a cast-off comprising an arm which is pivoted to swing in the plane of the path of the needle, said arm being pivoted and swinging outside the arc of the path of the needle, and having a portion thereof which is adapted to be swung inside the path of the needle so as to engage the under side of the loop and lift the same from the hook as the needle is advanced.

4. A shoe-sewing machine comprising a curved needle having a hook at its end, means for oscillating the same, in combination with a cast-off consisting of a pivoted lever having

an aperture at one end, a slot in its opposite end, a swinging arm, a pin carried thereby, which is arranged in said slot, said parts being arranged so that upon movement of said swinging arms, said lever will be moved so that said aperture will coincide with the path of the needle.

5. A shoe-sewing machine comprising a curved needle having a hook on its side of shortest curvature, means for oscillating the same, a thread-carrier for placing the thread in said hook consisting of a pivoted guideway, a bar which is adapted to slide thereon, means for creating friction between said bar and said guideway, a thread-guide carried by said bar, a rod for reciprocating said bar which is pivoted thereto at one side of the middle line of said guideway, whereby the bar will be tilted by the rod before it will be reciprocated thereby, and means for limiting the tilting movement of said sliding bar.

6. A shoe-sewing machine of the class described comprising a curved, hooked needle, means for oscillating and for causing the same to draw a loop of thread through the work, in combination with a thread-guide arranged to deliver a locking-thread inside the arc of the path of the needle, means for drawing a loop of said locking-thread through said needle-loop, so that the strand composing the loop of said locking-thread enters and passes out at the same side of said needle-loop, and means for drawing the needle-loop around the locking-loop.

7. A shoe-sewing machine of the class described comprising a curved, hooked needle, means for oscillating and for causing the same to draw a loop of thread through the stock, a thread-guide which is arranged to deliver a locking-thread above and at one side of the path of the needle, means for engaging said locking-thread on the opposite side of the path of the needle so as to draw the same in a line substantially at right angles to and inside the arc of the needle's path, a looping-hook, means for moving said hook so as to engage said locking-thread between said guide and said means, and for causing said hook to draw a loop of locking-thread through the needle-loop, so that the strand composing the loop of said locking-thread enters and passes out at the same side of said needle-loop.

8. A shoe-sewing machine of the class described, comprising a needle for drawing a loop through the stock, a thread-guide which is arranged to deliver a locking-thread at one side of the path of the needle, an arm which is interposed between the path of the needle and said locking-thread, means for moving said arm across the path of the needle, a hook for drawing a loop of said locking-thread through said needle-loop, and means for moving said hook so as to engage said locking-thread at a point between said arm and said thread-guide while said arm is on the opposite side of the needle's path from said thread-guide.

9. A shoe-sewing machine of the class described, comprising a needle for drawing a loop through the stock, a thread-guide which is arranged to deliver a locking-thread at one side of the path of the needle, an arm, means for causing the same to engage the stock between the path of the needle and said guide, and for moving the same, while in engagement, across the path of the needle, a looping-hook, and means for moving the same so as to engage said locking-thread at a point between said arm and said thread-guide, and for drawing a loop of said locking-thread through the needle-loop.

10. A shoe-sewing machine of the class described comprising an oscillating needle for drawing a loop of thread through the work, in combination with a looping-hook for drawing a locking-thread through the needle-loop, means for moving said hook both longitudinally and vertically; whereby it is made to pass through said needle-loop, engage said locking-thread and draw the same through the needle-loop and move forwardly and upwardly so as to become disengaged from the locking-loop.

11. A shoe-sewing machine of the class described comprising a curved needle having a hook which is so located that when the thread is placed therein it will lie substantially at right angles to the path of the needle, means for placing the needle-thread in said hook, means for causing the needle to draw a loop of thread through the work, in combination with a looping-hook which is normally located outside the arc of the needle's path, means for swinging said hook in the plane of the path of the needle, and means for moving said hook vertically and for causing said hook to pass forward through the needle-loop from the under side thereof, to engage the locking-thread and draw a loop of the same back through the needle-loop, means for moving said looping-hook so as to become disengaged from the locking-loop, and means for drawing the needle-loop about the locking-loop.

12. A shoe-sewing machine of the class described, comprising in combination, a curved needle having a hook which is so located that when the thread is placed therein it will lie substantially at right angles to the needle's path, a looping-hook for drawing a locking-loop through the needle-loop consisting of an arm having a hook at its lower end, a crank to which said arm is pivoted at its upper end, a reciprocating rod which is pivoted to said arm at an intermediate point thereof, means for moving said arm in the plane of the path of the needle, said arm being normally in a position outside of the arc of the path thereof.

13. A shoe-sewing machine comprising a curved needle having a hook on its side of shortest curvature, a movable thread-carrier, means for causing the same to pass over the needle-hook and lay the thread therein, and a take-up, in combination with a thread-fin-

ger, means for swinging said finger downwardly so that it will be interposed between the thread leading from the preceding stitch to the thread-carrier and the path of the needle, will engage the thread so as to hold it away from the work and below or outside the path of the needle-hook, and will measure off a loop of the desired length as the carrier lays the thread in the needle-hook, means for causing said finger to release said loop, and for causing said take-up to give off thread as the needle is drawing its loop through the work.

14. A shoe-sewing machine comprising a hooked needle, means for placing a loop of thread in said hook, means for causing said needle to draw said loop through the work, a tension device which places the thread under a constant tension, a take-up, means for causing the same when moved in one direction, to give off slack thread to the needle, and when moved in the opposite direction, to draw up the slack thread from the needle-loop and set the stitch, and to pull off thread from the tension device for the next stitch, a movable arm which is arranged to engage the thread between the tension device and the needle, a spring for holding said arm in a position to deflect the thread from its normal course, means for adjusting the tension of said spring, and means for limiting the movement of said arm in either direction; the tension of said spring being adjusted so that the arm will yield before the needle can draw thread from the tension device.

15. In a shoe-sewing machine of the class described, the combination of the following instrumentalities, a curved hooked needle which is adapted to draw a loop of thread through the work, a thread-carrier which is adapted to place the thread in the needle-hook, a thread-measurer for forming a slack loop on one side of the needle, a take-up which is adapted to deliver slack thread on the opposite side thereof, and which is also adapted to take up the thread to set the stitch, a tension mechanism for determining the strain on the thread when the stitch is set, a cast-off which is adapted to disengage the thread from the needle, a hook which is adapted to draw a locking-loop through the needle-loop, a feeding mechanism for feeding along the work and means for actuating the said instrumentalities so that they will perform their several functions.

16. A shoe-sewing machine of the class described comprising a curved hooked needle, means for oscillating and for causing the same to draw a loop of thread through the work, means for delivering a locking-thread inside the arc of the path of the needle, a looping-hook, means for causing the same to pass through said needle-loop from the outer side thereof to engage said locking-thread, and to draw a loop of the same through said needle-loop, and means for drawing said needle-loop around the locking-loop.

17. A shoe-sewing machine comprising a curved hooked needle, means for oscillating and for causing the same to draw the thread through the sole and upper, in combination with a movable clamp comprising two arms which extend outwardly from within the arc of the path of the needle, and which are adapted to engage the upper in close proximity to, and at each side of the path of the needle therethrough, and press the upper against the sole at points other than below the path of the needle.

18. A shoe-sewing machine comprising a curved hooked needle, means for oscillating the same about a fixed axis and for causing the same to draw the thread through the work, in combination with a clamp which is pivoted to swing on the same axis as that of the needle, and is provided with two arms which are adapted to engage the upper at each side of the path of the needle, and means for operating said clamp.

In testimony whereof I have affixed my signature in presence of two witnesses.

EDWIN E. BEAN.

Witnesses:
LOUIS H. HARRIMAN,
M. C. JAQUITH.