(No Model.)

9 Sheets—Sheet 1.

L. GODDU.

SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

Fig. 1.

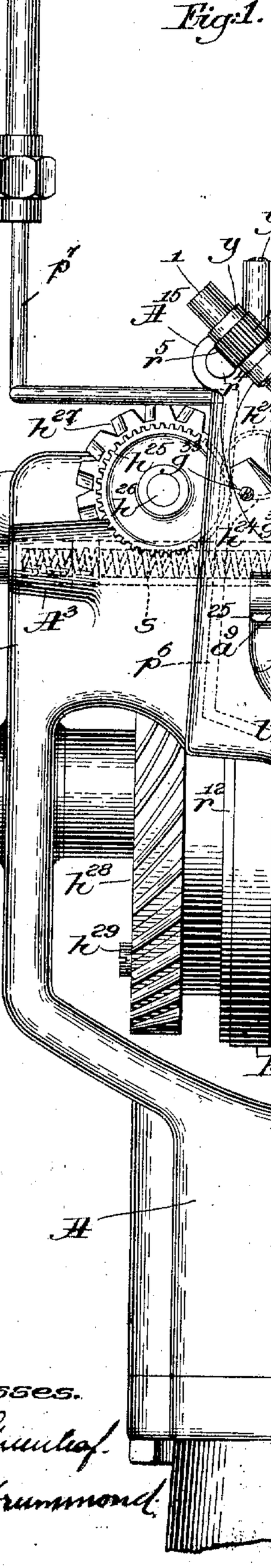
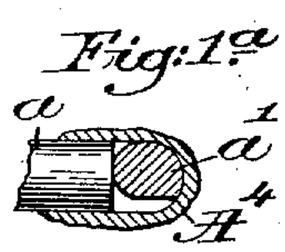


Fig. 1a.



Witnesses.
Fred. L. Gunther.
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(No Model.)

9 Sheets—Sheet 2.

L. GODDU.

SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

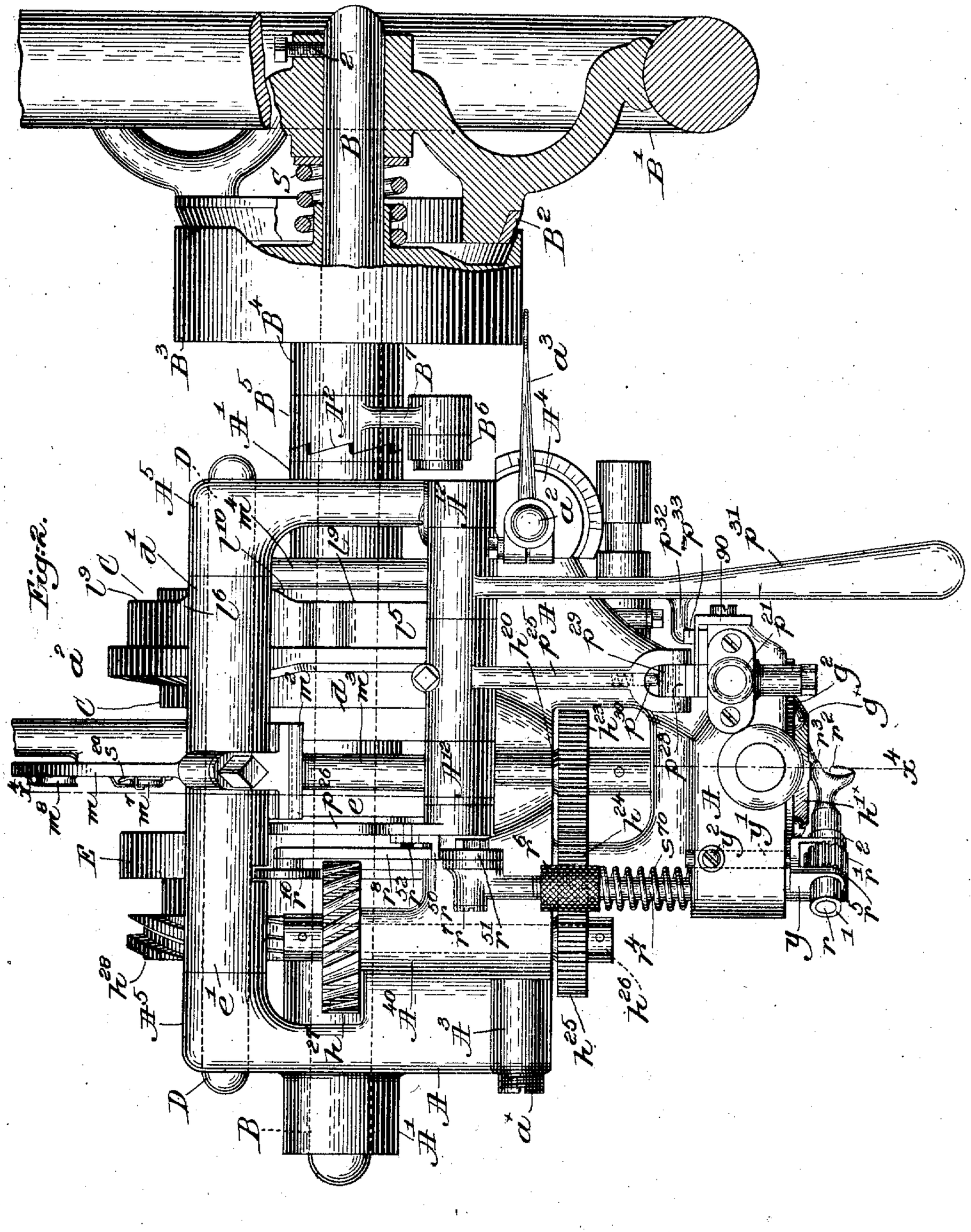

Fig. 2.

Witnesses.
Fred. L. Gunderf.
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(No Model.)

9 Sheets—Sheet 3.

L. GODDU.

SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

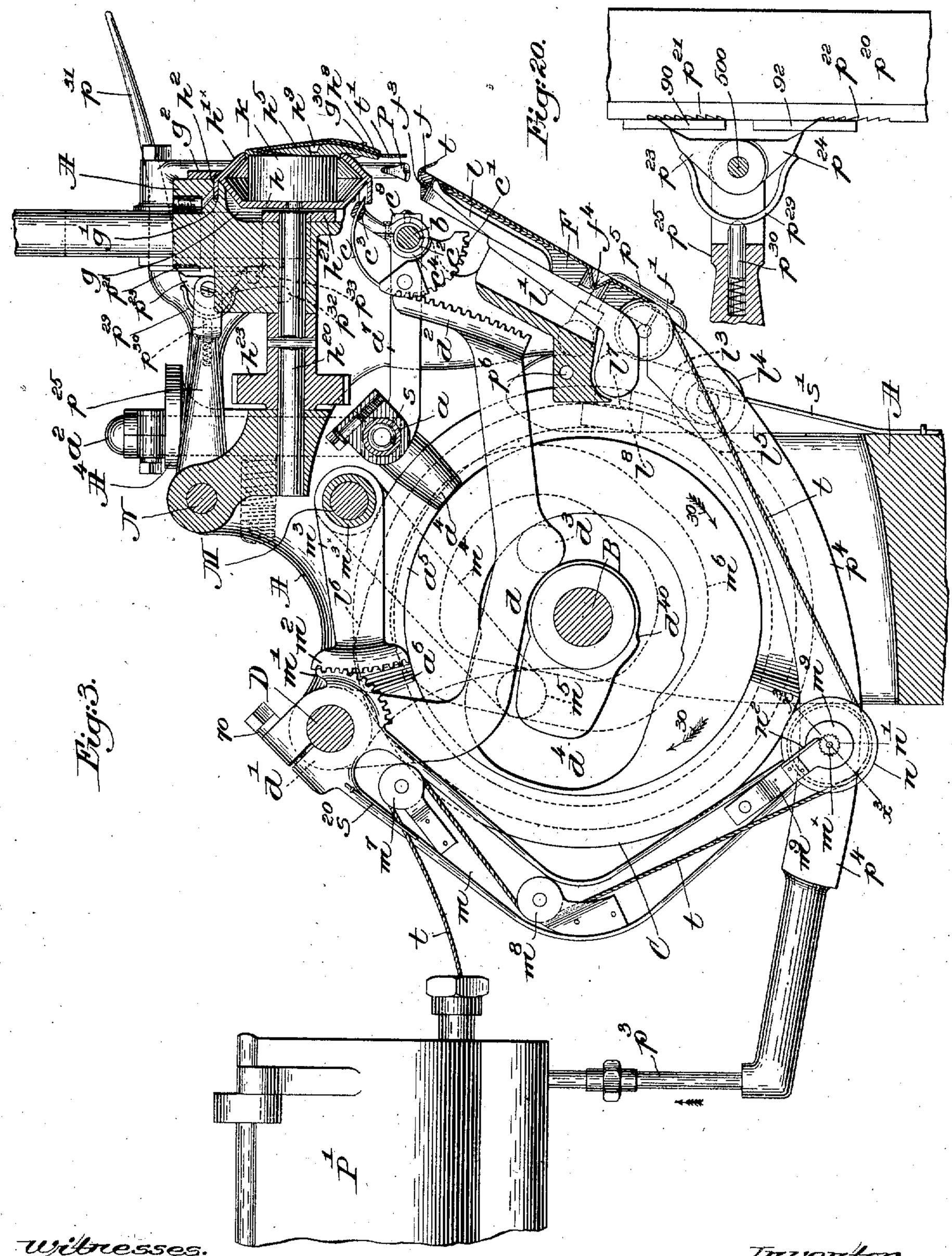

Fig. 3.

Fig. 20.

Witnesses.
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9 Sheets—Sheet 4.

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SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

Fig. 3a.

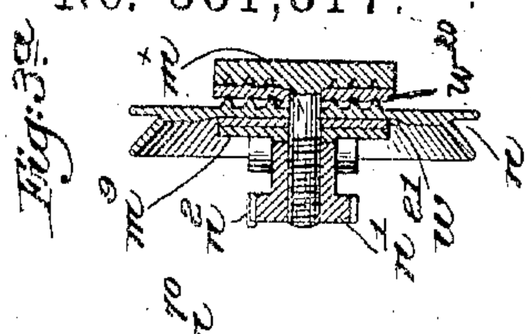

Fig. 3b.

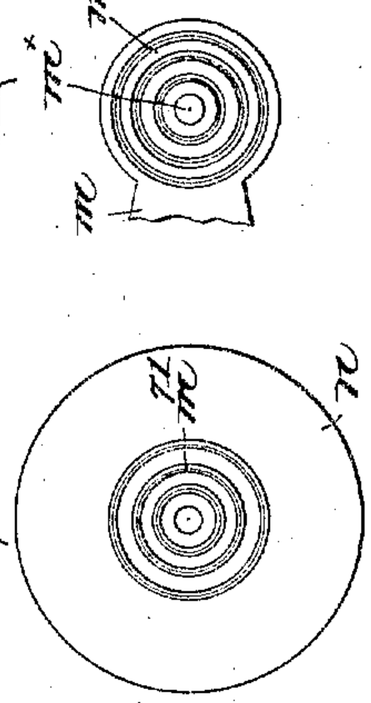

Fig. 6.

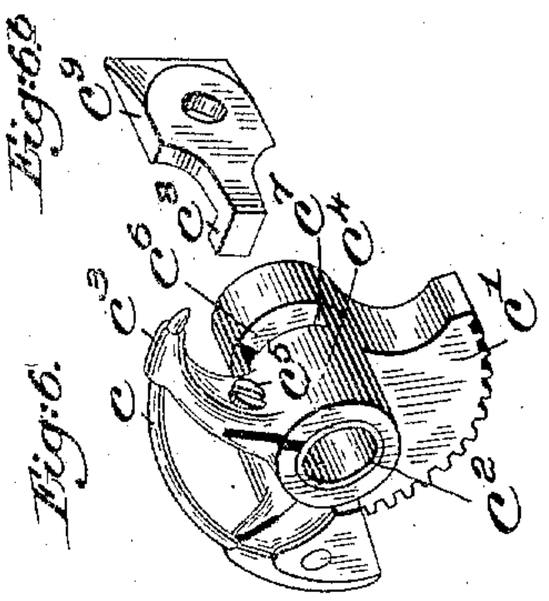

Fig. 5.

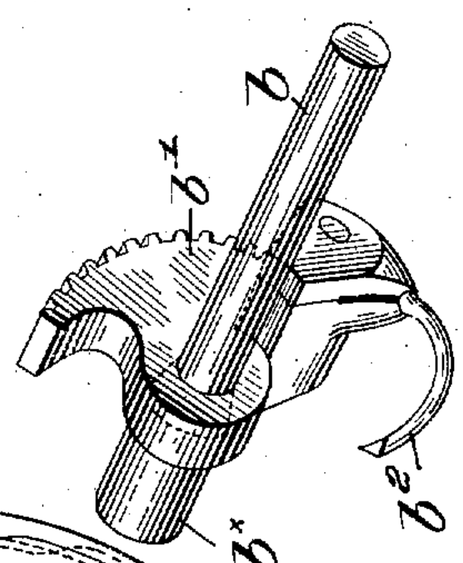

Fig. 4.

Witnesses.
Fred. S. Grinlaf.
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(No Model.) 9 Sheets—Sheet 5.

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SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

Fig:7.

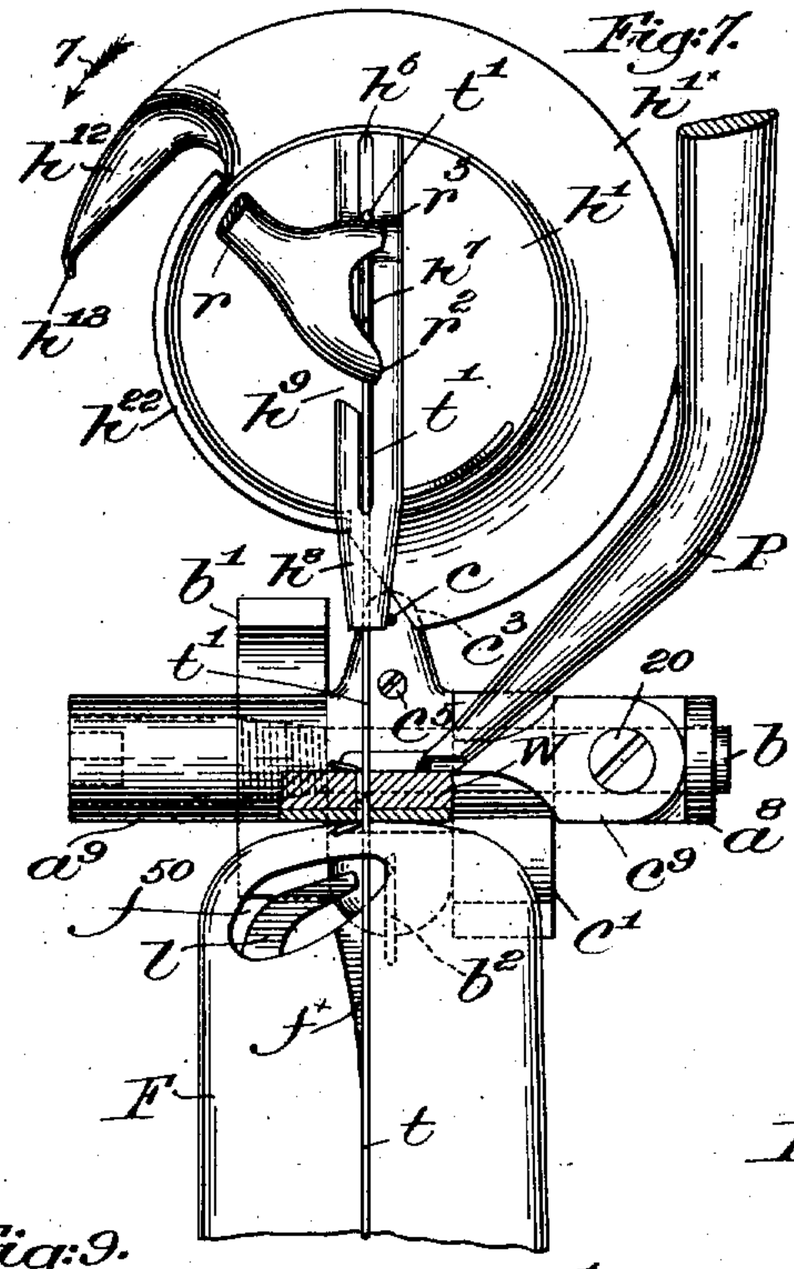

Fig:8.

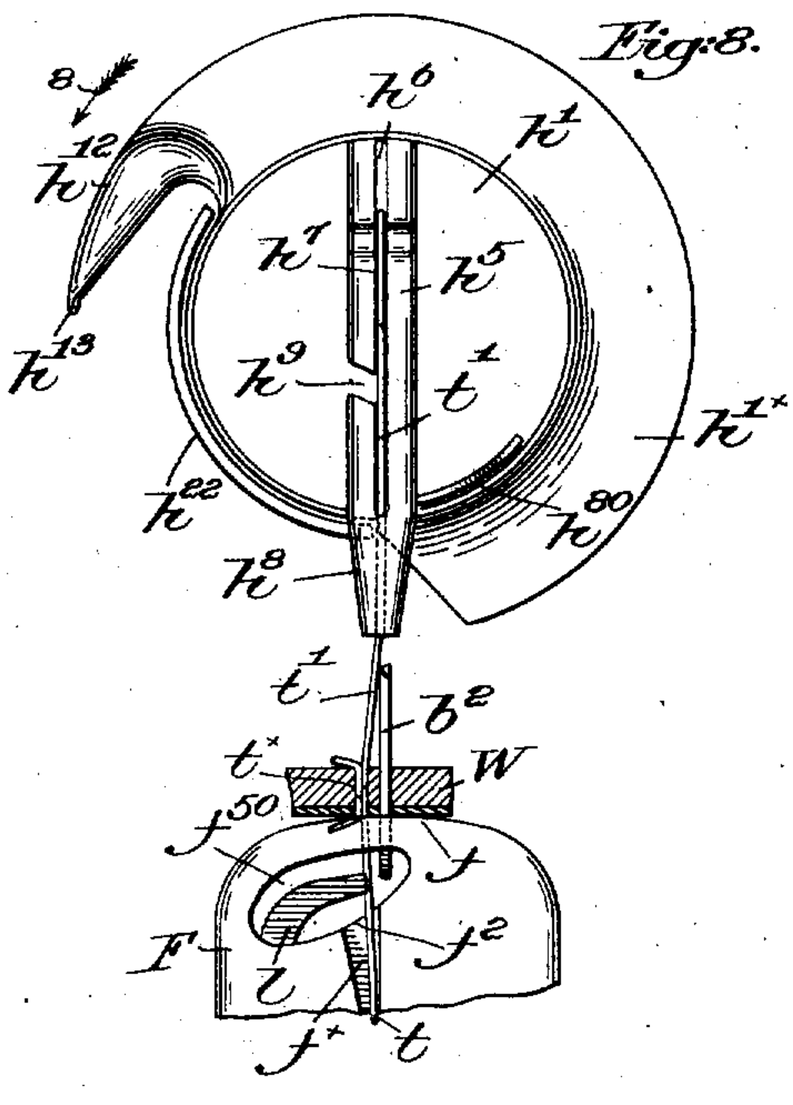

Fig:9.

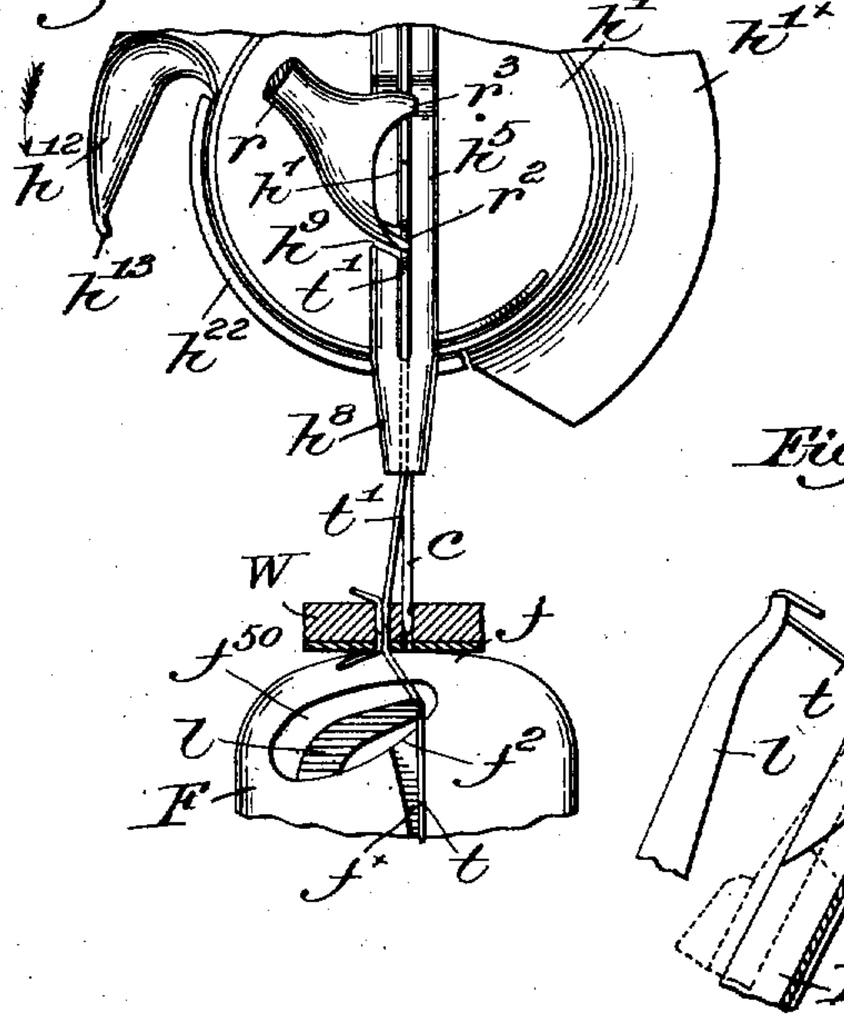

Fig:10.

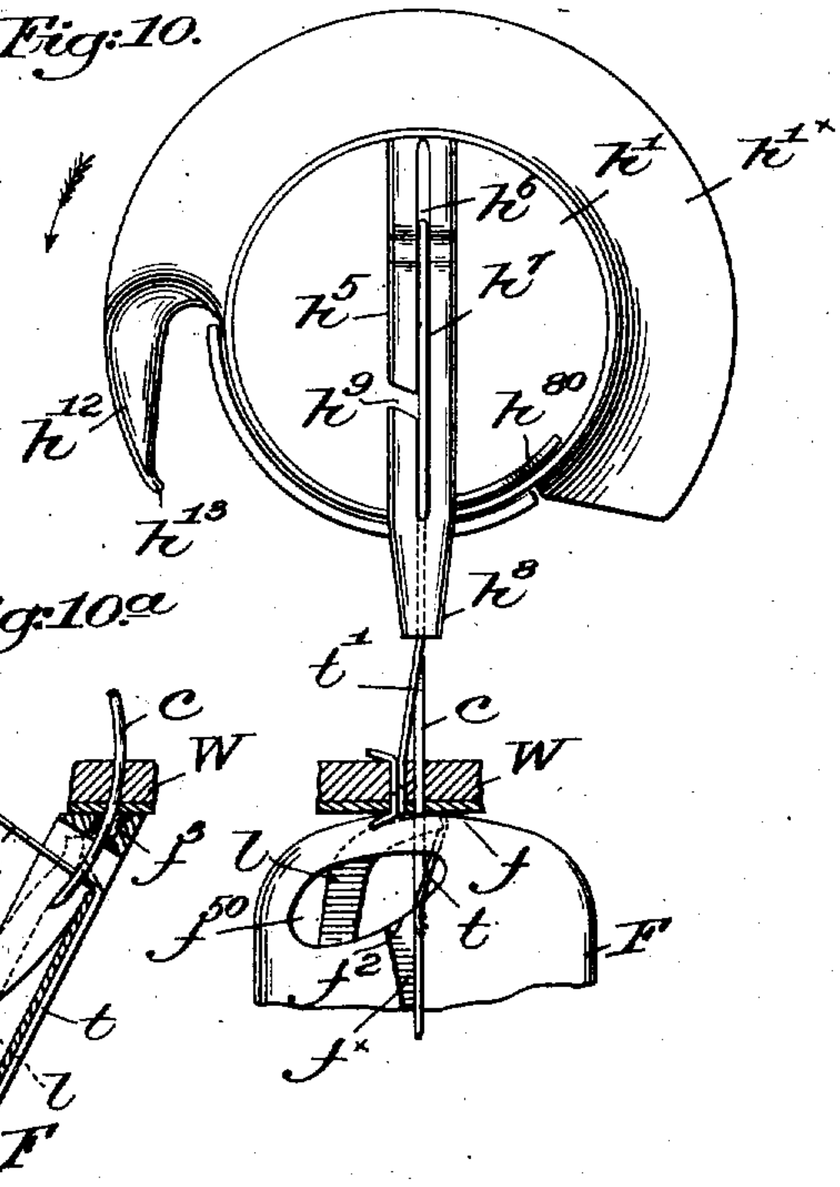

Fig:10a.

Witnesses.
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(No Model.) 9 Sheets—Sheet 6.

L. GODDU.

SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

Fig:11.

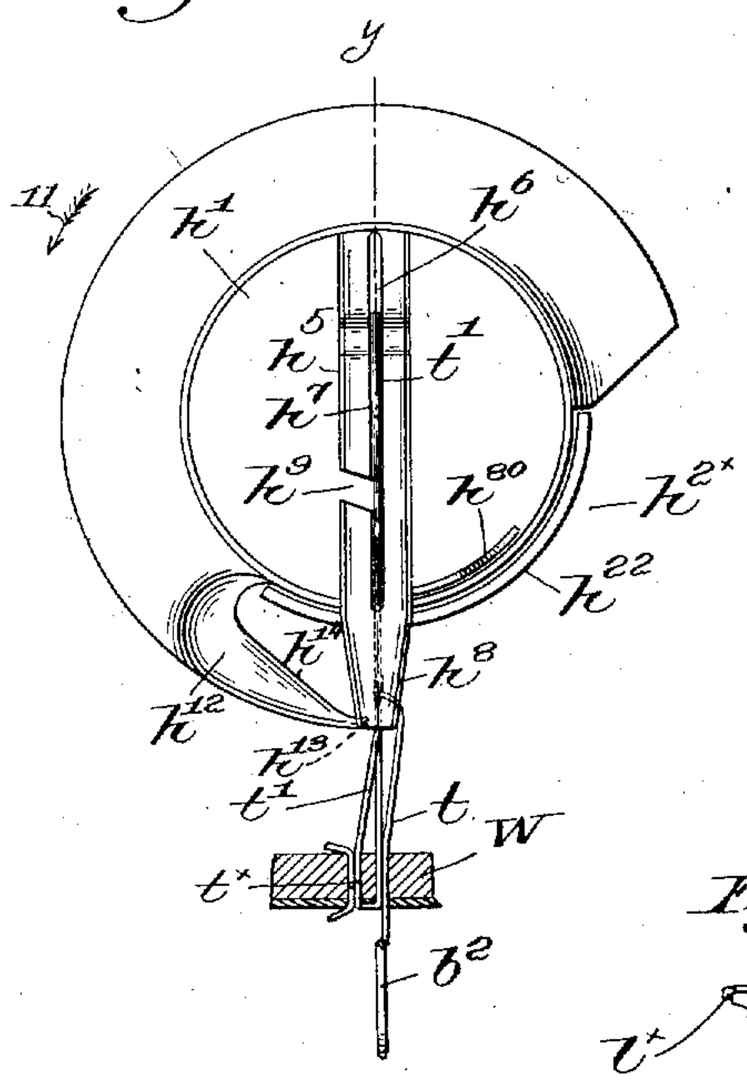


Fig:12.

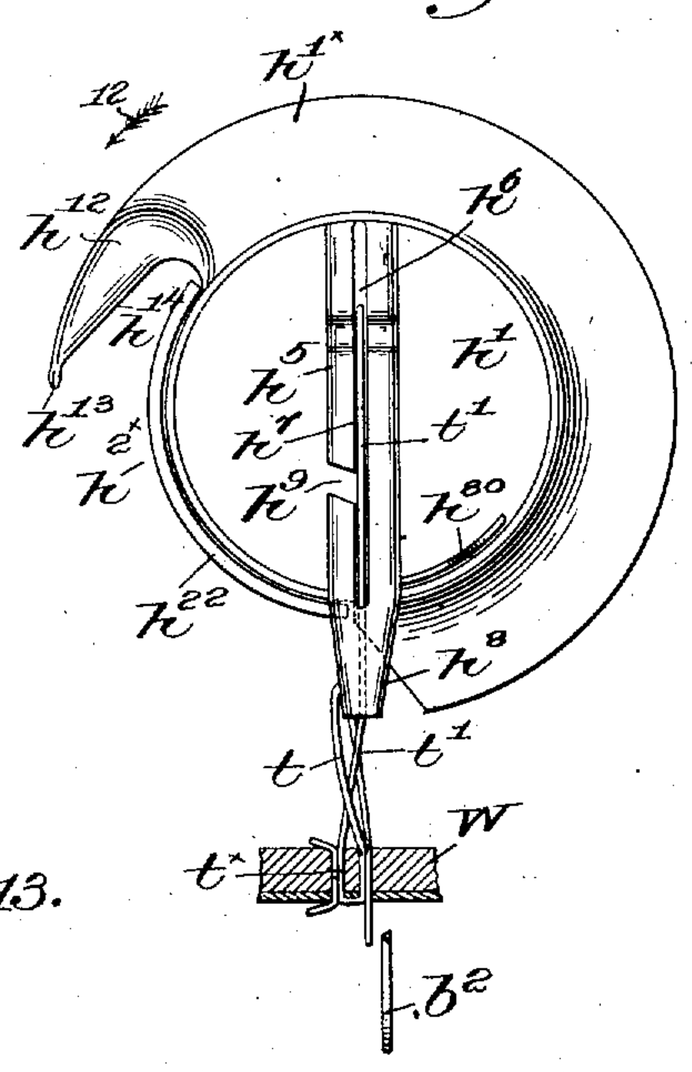


Fig:13.

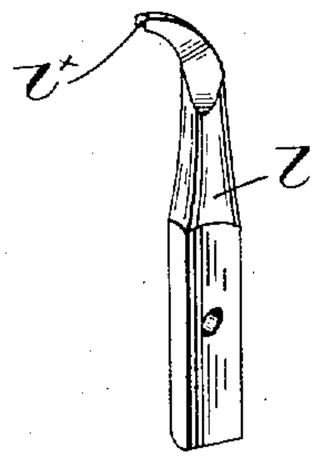


Fig:15.

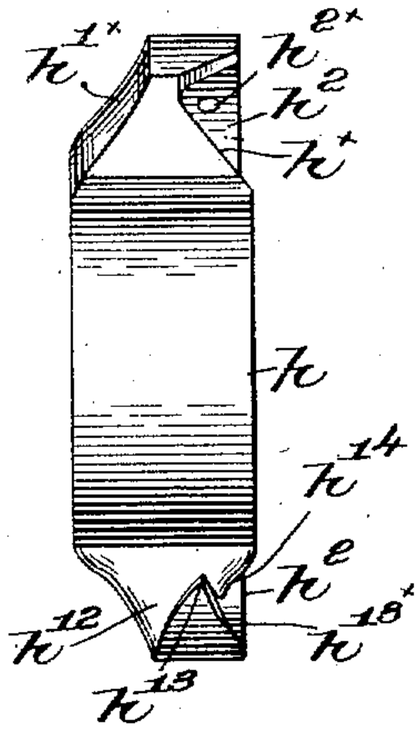


Fig:14.

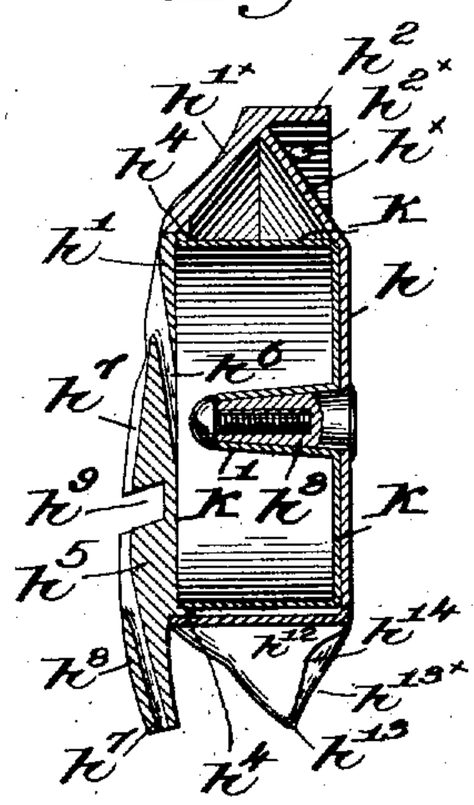
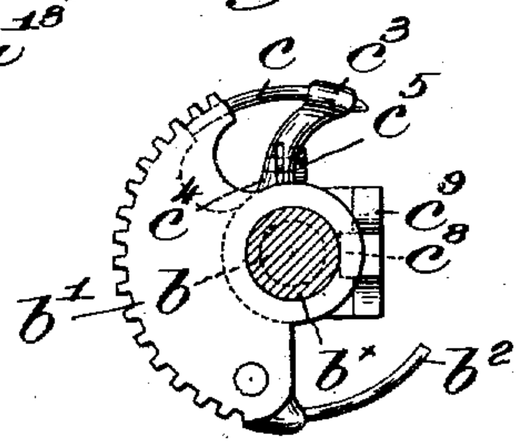


Fig:6a.



Witnesses.
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(No Model.) 9 Sheets—Sheet 7.

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SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897

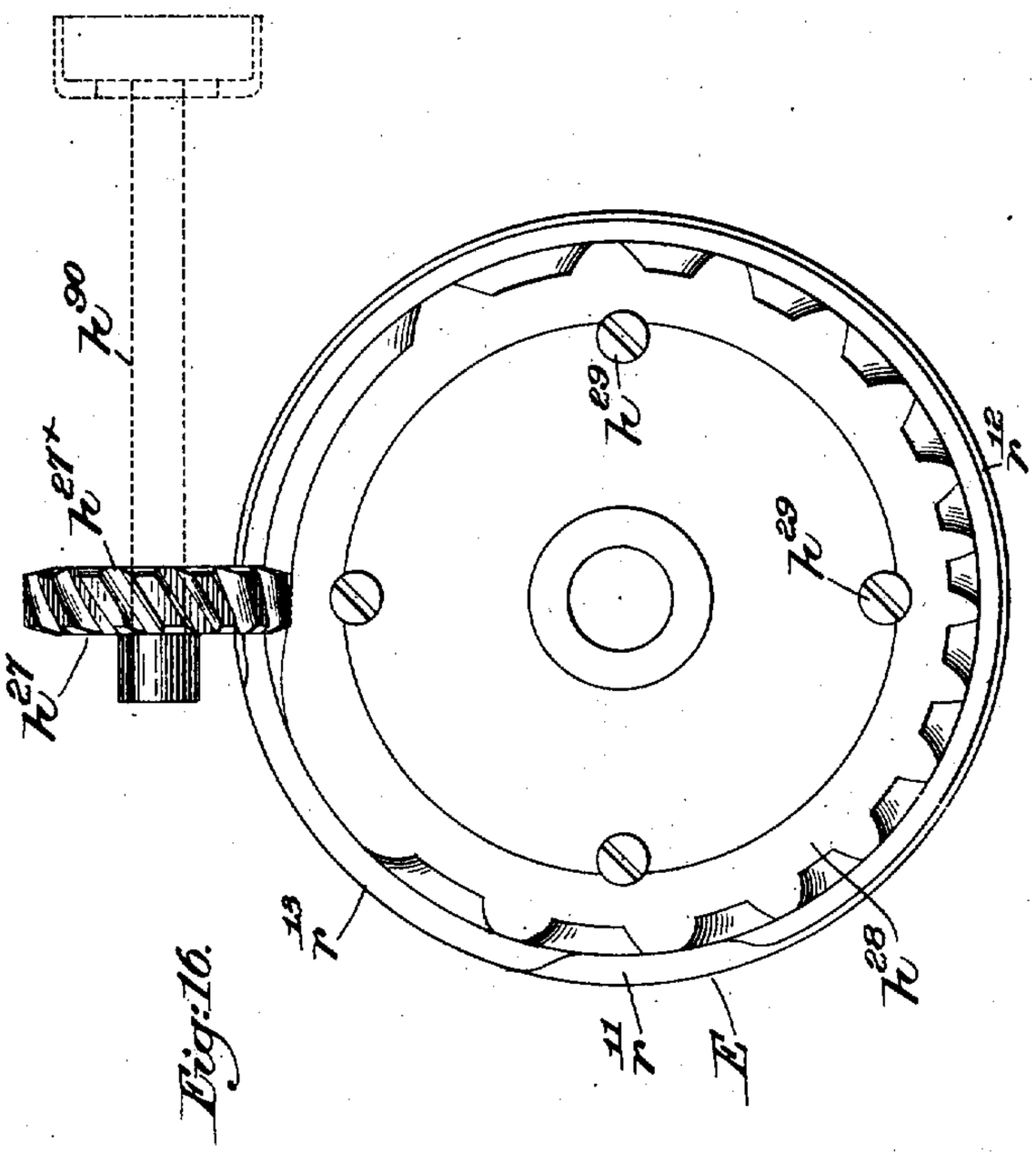

Fig: 16.

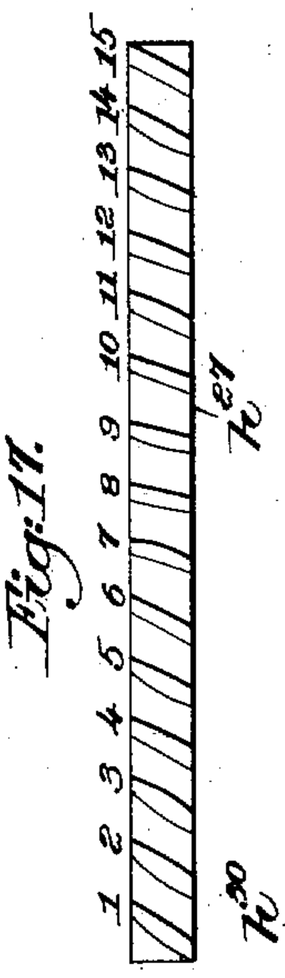

Fig: 17.

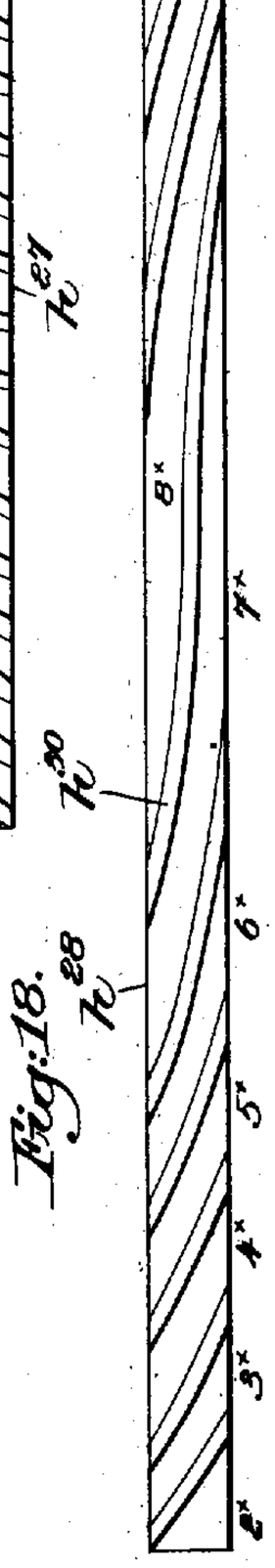

Fig: 18.

Witnesses.
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(No Model.) 9 Sheets—Sheet 8.

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SOLE SEWING MACHINE.

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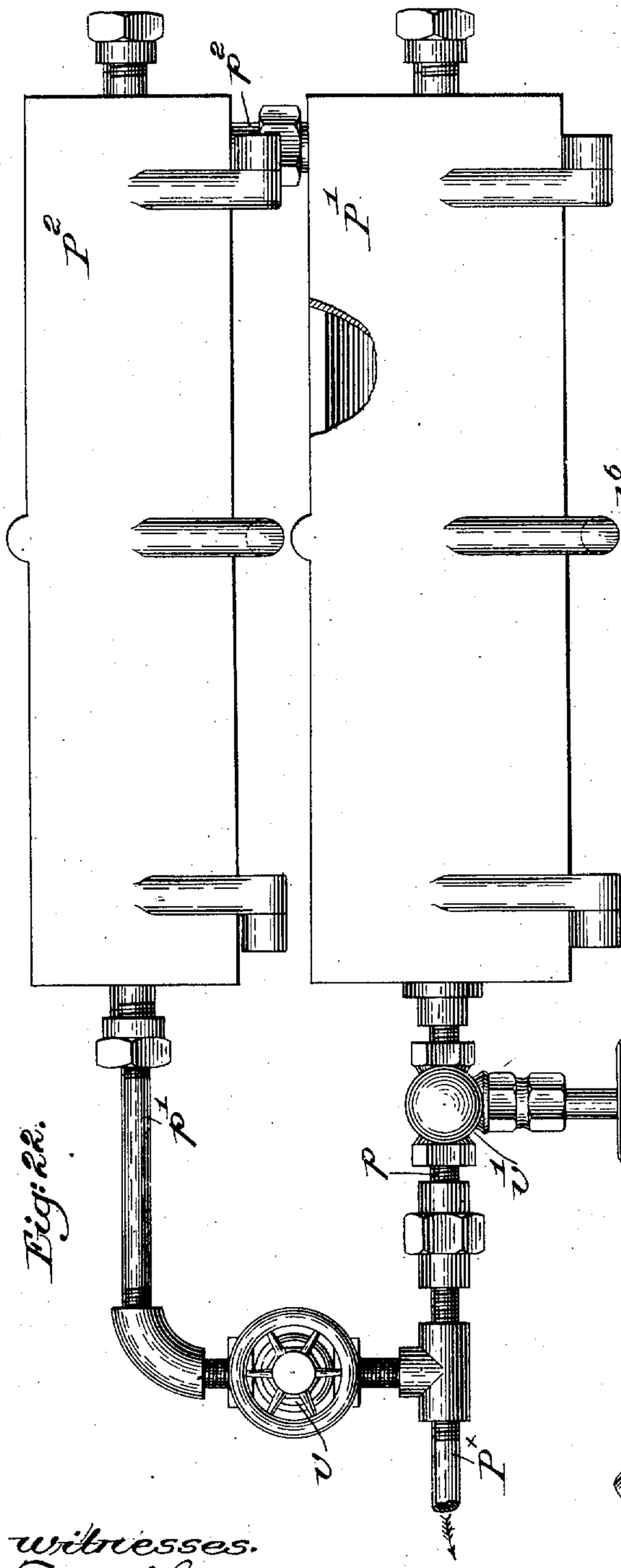

Fig: 22.

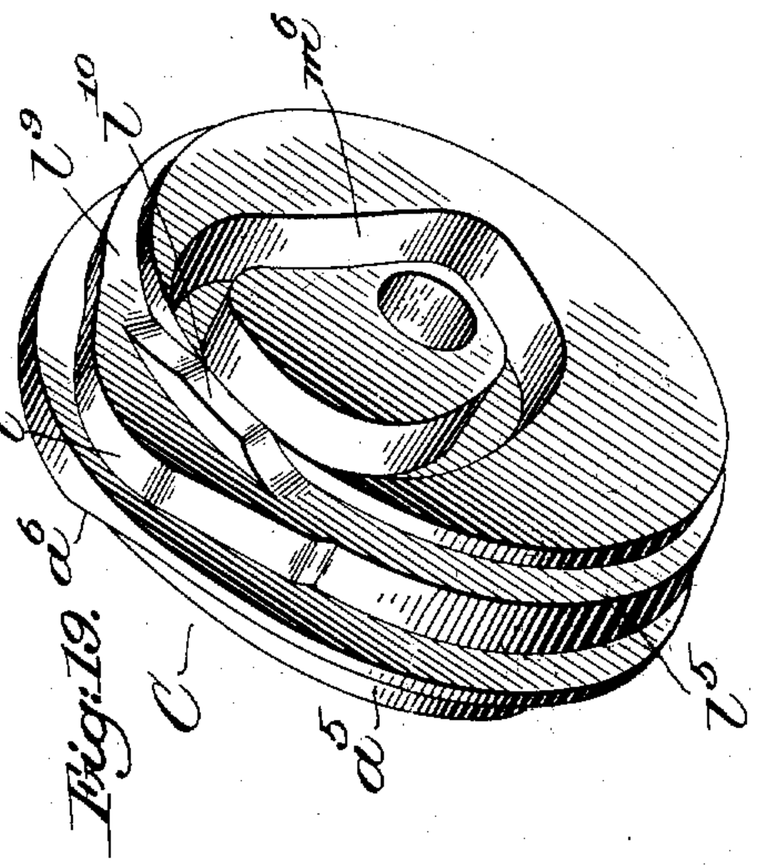

Fig: 19.

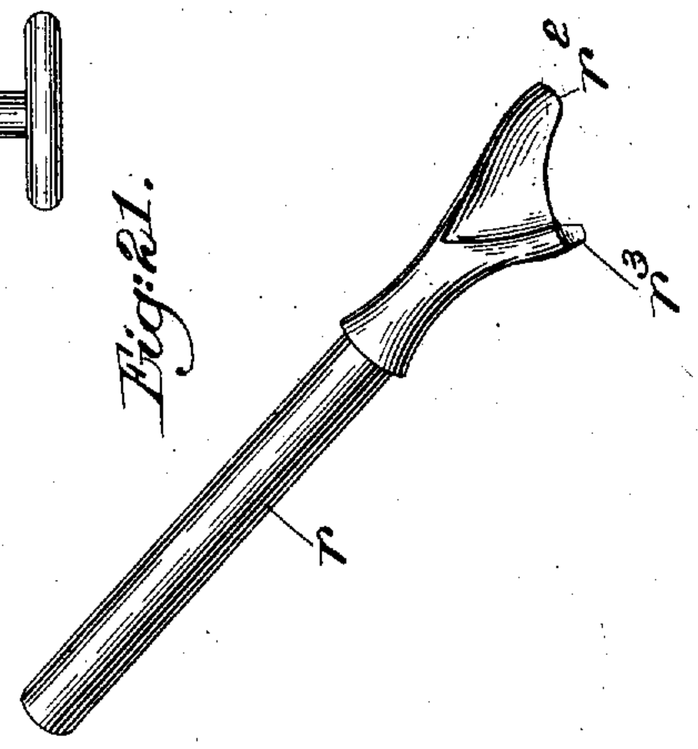

Fig: 21.

Witnesses.
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9 Sheets—Sheet 9.

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SOLE SEWING MACHINE.

No. 581,817. Patented May 4, 1897.

Fig. 23.

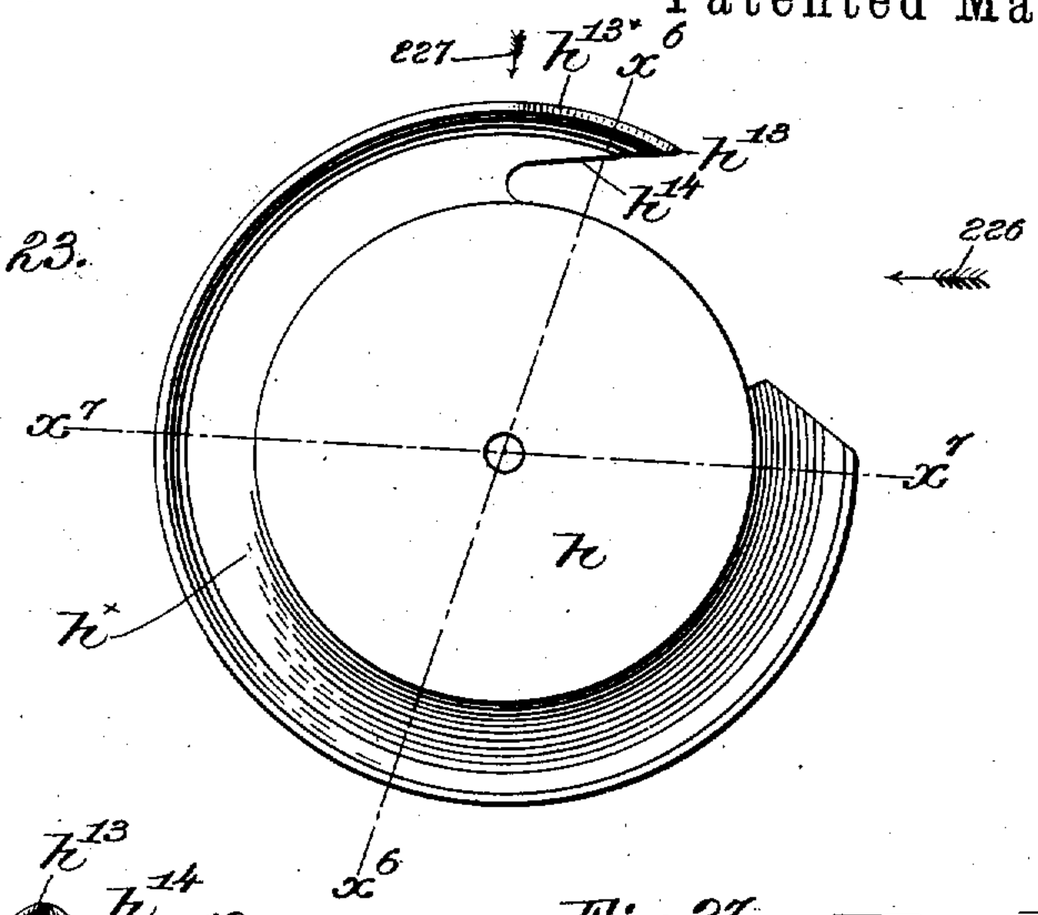


Fig. 26.

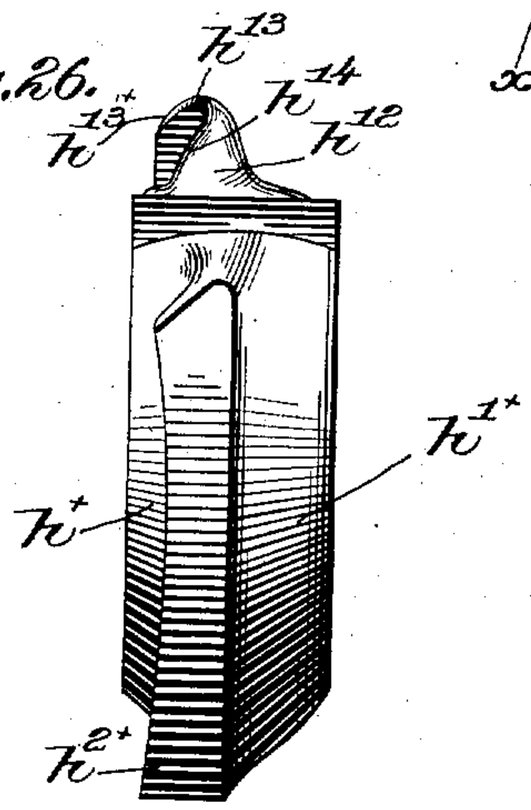


Fig. 27.

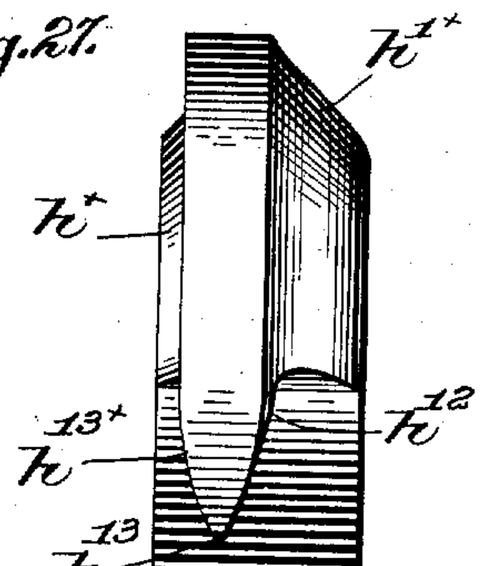


Fig. 24.

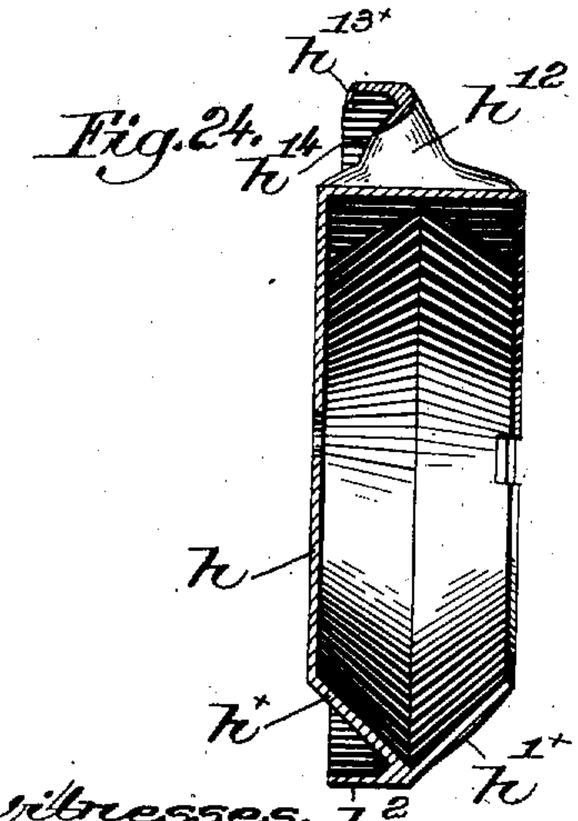
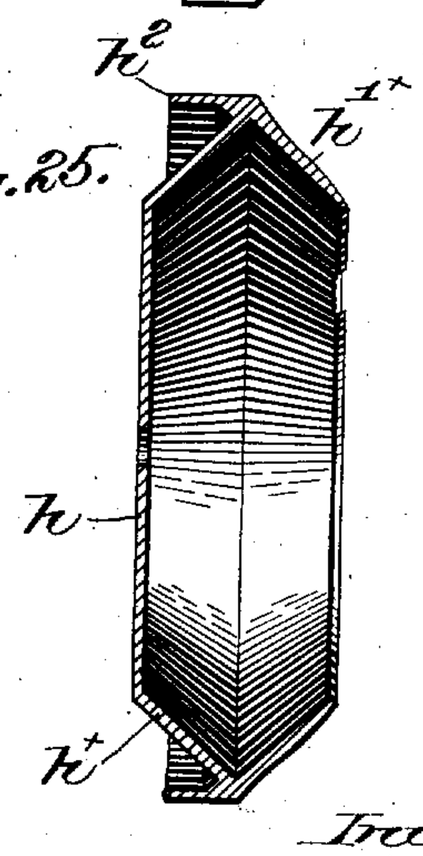


Fig. 25.



Witnesses.
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UNITED STATES PATENT OFFICE.

LOUIS GODDU, OF WINCHESTER, MASSACHUSETTS, ASSIGNOR TO JAMES W. BROOKS, TRUSTEE, OF PETERSHAM, MASSACHUSETTS.

SOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 581,817, dated May 4, 1897.

Application filed April 11, 1896. Serial No. 587,183. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GODDU, of Winchester, county of Middlesex, and State of Massachusetts, have invented an Improvement in Sole-Sewing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to shoe-sewing machines, and particularly to machines of that general class adapted to unite the outer sole to the welt of what is commonly known as "welted" boots and shoes by the interlocking of two threads, forming the usual lock-stitch.

My improved machine hereinafter to be described has a rotary shuttle which is driven continuously, but at a variable speed, the said shuttle having a loose face-plate, on a portion of which the shuttle-thread lies, and coöperating with the face-plate I have provided a thread measuring and locking device which in one position acts upon and pulls a portion of the shuttle-thread from the cop in the shuttle, to be used in the next stitch, and in its other position the device locks the shuttle-thread, preventing its delivery. The position within the work of the interlocking portion of the threads for each stitch is thus determined by or through the shuttle-thread, a predetermined length thereof being measured or drawn off prior to the formation of each stitch irrespective of the thickness of the work, the needle-thread accommodating itself to such variation in thickness. The shuttle-thread after it has been drawn off or measured is locked during the completion of the stitch formation, so that the interlocking portions of the two loops of thread will always be at a fixed distance from the upper surface of the work, which latter rests upon a stationary work-support.

The needle-thread is laid in the open hook or barb in one side of a preferably-curved needle by a looper coöperating with a thread-guide inclined in front of and across the needle-path, the looper and thread-guide being mounted upon or carried by the work-support, the inclination of the thread-guide tending to draw the thread directly into the needle-hook.

I have herein shown the device for measuring the shuttle-thread as a finger supported independently of the shuttle, means being provided to move said finger at the proper time and also to bring a stop into position to act upon and lock said thread lying on the face-plate of the shuttle. I have also provided a take-up to give up to the shuttle sufficient needle-thread to be passed about it and thereby interlocked with the shuttle-thread in usual manner, said take-up having thereon a tension device to act upon the thread at all times, yet permitting an excess of needle-thread to be drawn off for the formation of the stitch whenever required by the thickness of the work.

The shuttle and the means for giving it the requisite movement herein shown and described are of novel and peculiar construction, as will hereinafter appear.

In sewing-machines for sewing outer soles or welts it has usually been customary and considered necessary to employ a measuring device to act on the needle-thread and automatically take from the needle-supply a varying quantity of thread sufficient for the thickness of the material at the stitch next to be made, and then said thread is locked and held while the take-up acts to take up the loop and complete the stitch.

In my improved machine I have entirely dispensed with both the variable measuring and locking devices for the needle-thread, and instead I supply thread from the wax-pot and take up the loop of thread by a peculiar take-up, it consisting, essentially, as herein shown, of a movable arm provided at some point with a frictionally-held thread-sheave about which the needle-thread is wound, said arm having a range of movement sufficient to both give all of the needle-thread required to pass over the shuttle and in its reverse movement to take up completely all the loop discharged from the shuttle, the sheave rotating a little as the take-up finishes its backward movement to enable it to automatically give up the necessary amount of thread to complete the stitch, and in both these movements the thread is taut without any slack between the sheave and the work. The take-up arm is shown as provided with a plurality

of sheaves, the extra sheaves merely serving the purpose of thread-guides, the thread being at all times taut between the said sheaves. The arm is shown as pivoted, and the sheave or guide nearest its pivotal end is so located that in the forward movement of the take-up to give up thread for the stitch to be made it will act on the needle-thread between the arm and the wax-pot and pull thread from the wax-pot sufficient for material of the greatest thickness.

Providing the take-up arm with a frictionally-held sheave is a matter of very great importance, and while I prefer to mount said sheave near the free end of the said arm it will be understood that it may be mounted on any part of the said arm and yet operate as herein provided for and be within the scope of my invention.

By giving out and taking up the thread wholly by movement of the take-up, while the latter moves the thread, all devices over which the thread has heretofore been drawn in such action are dispensed with and the thread is not subjected to wear and strain over devices which deflect it from a straight-line pull, nor is the thread flattened or crushed by locking it.

It is a great desideratum in sole-sewing machines where the seam has to be made in close quarters, as in the shank, that the parts for manipulating the thread be arranged in the most compact space possible. To effect this, I have provided a narrow work-support, and above and close to it I have arranged a circularly-moving shuttle of peculiar construction, it having its periphery beveled from its back and front to an edge which is substantially at the median line of the shuttle or at the middle in the direction of its thickness, the point of the shuttle-hook lying a little to one side of said median line and branching toward its base or root in opposite directions to the front and back of the shuttle. The shuttle has a deep circular non-continuous groove entirely within its body, in which the point of the hooked needle normally stands, with its end substantially at the median line of the shuttle, and the needle is moved forward from its normal position to engage the needle-thread just after the heel of the shuttle passes the needle, leaving a clear space in front of the latter. The shuttle at that time is moving at its slowest speed and the needle enters the stock, engages the needle-thread and pulls it through the material, and holds it just in the path of the point of the shuttle-hook as the latter arrives in the rotation of the shuttle into position to enter the needle-loop, the breast of the shuttle-hook being of such shape as to coöperate with the rear side of the loop and lift the thread from the hook of the needle. The loop having been discharged from the needle, the point of the latter again enters and stands in the groove in the body of the shuttle.

Various other features of my invention will be hereinafter described and particularly pointed out in the claims.

Figure 1 is a front elevation, partially broken out, of a sole-sewing machine embodying my invention, the lower part of the supporting-standard being omitted. Fig. 1^a is a detail sectional view, taken on the line $x\,x$, Fig. 1, of the feed-regulating mechanism to be described. Fig. 2 is a top or plan view of the machine shown in Fig. 1, the balance-wheel and clutch being partially broken out to show the construction more clearly. Fig. 3 is a vertical sectional view taken on the line $x'\,x'$, Fig. 1, looking to the right, with the oil-cup omitted. Fig. 3^a is a transverse sectional detail on the line $x^3\,x^3$, Fig. 3, of the tension device on the take-up lever, enlarged. Fig. 3^b shows details of the tension device and its support. Fig. 4 is a vertical sectional view on the line $x^4\,x^4$, Fig. 2, looking to the left. Fig. 5 is an enlarged perspective view of the awl and awl-segment. Fig. 6 is a similar view of the needle, needle-segment, and needle-hook-guard. Fig. 6^a is a side elevation of the needle and awl segments in position side by side. Fig. 6^b is a perspective detail of the stop for the needle-guard. Fig. 7, on an enlarged scale in front elevation, shows the shuttle, work-support, and presser-foot, the needle and awl being retracted, the shuttle-thread being locked, and the shuttle moving at its slowest speed. Fig. 8 is a like view of the stitch-forming devices, the presser being omitted, the awl being shown as in and having fed the work, the shuttle having been moved forward a short distance in the direction of the arrow 8; Fig. 9, a similar view, but showing the needle as entering the work and about to have the loop of needle-thread placed within its hook or barb by the looper. Fig. 10 shows more clearly the movement of the needle-thread by the looper, the latter having passed to the rear of the needle. Fig. 10^a is a side view of the parts shown in Fig. 10 with the looper at two points in its path of movement. Fig. 11 shows the shuttle as having moved in the direction of the arrow 11 sufficiently to bring its hook into position to take from the needle its loop of needle-thread, the needle being shown as nearly at the upper end of its path of movement. Fig. 12 shows the position of the parts after the shuttle has made substantially a complete revolution in the direction of the arrow 12 from its position shown in Fig. 7, carrying the loop of needle-thread around the shuttle and the shuttle-thread, a fixed or measured length of the latter having been drawn off, as will be described, and locked from further delivery until the stitch is completed. Fig. 13 is a perspective view of the looper detached. Fig. 14 is a transverse sectional view of the shuttle and its cop support or case, taken on the line y, Fig. 11. Fig. 15 is a side elevation or edge view of the shuttle, looking toward the loop-taking point. Fig. 16 is a detail view in elevation of the shuttle-actuating device. Figs.

17 and 18 are developments of the faces of the gears shown in Fig. 16. Fig. 19 is a perspective view of the looper-actuating cam. Fig. 20 is a detached detail view in elevation of the presser-controlling mechanism. Fig. 21 is a detached perspective view of the finger or device for measuring and locking the shuttle-thread. Fig. 22 is a plan view of the wax-pots. Fig. 23 is a rear elevation of the shuttle. Fig. 24 is a diametral section thereof on the line x^6 x^6, Fig. 23, looking to the left. Fig. 25 is a similar section on the line x^7 x^7, Fig. 23. Fig. 26 is an edge view of the shuttle shown in Fig. 23, looking in the direction of the arrow 226; and Fig. 27 is a similar view looking in the direction of arrow 227.

Referring to Figs. 1, 2, and 3, the head or frame A, of suitable shape to sustain and provide bearings for the operative parts of the machine, is mounted upon a suitable standard or column A^{70}, said head having bearings A′ for a main shaft B, to which, as best shown in Fig. 2, is rigidly secured, by a suitable set-screw 2, a fly or balance wheel B′, having secured to or forming a part of it one member, as B^2, of a preferably coned friction-clutch, the other member B^3 of the clutch, loose on the said shaft, being shown as adapted to receive a belt or band to be continuously rotated, the clutch members being normally separated by a spring S in usual manner. (Shown only in Fig. 2.)

Between the hub B^4 of the movable clutch member and the adjacent bearing A′ is inserted a sleeve B^5, having serrated or cam faces to engage suitable corresponding cam-faces A^2, secured to or forming a part of the bearing.

Partial rotation of the sleeve B^5, by means of a link B^6, operated by a suitable treadle (not shown) and connected at is upper end to an arm B^7 of the sleeve, throws the clutch into operative position, release of the treadle permitting the spring S to throw the clutch out of operation.

The head A has in its upper front portion a long bearing, a portion of which is shown at A^3, to receive therein a shaft *a*, bored out longitudinally at one end (see dotted lines, Fig. 1) to receive therein a spring *s*, held in place by a threaded nut $a^\times$, screwed into the outer end of the bearing A^3, tending to normally press the said shaft *a* to the right (viewing Fig. 1) against the cam-shaped end *a*′ of a vertical shaft a^2, mounted in an upright bearing A^4 of the head, said shaft a^2 having at its upper end a suitable handpiece a^3, by which it may be turned more or less to present different portions of its cam end *a*′ to contact with the end of the longitudinally-movable shaft *a*.

Preferably the upper end of the bearing A^4 will be graduated or provided with a scale, as shown in Fig. 2, to indicate the position of the cam-stop *a*′.

The slide-shaft *a* has secured thereto a suitable roller or other stud a^4, (see Fig. 3,) held against an edge-cam a^5 on the cam-disk C, having a wedge-shaped cam portion a^6 thereon to contact with the stud or roll a^4 and thereby move the shaft *a* to the left, Fig. 1, to effect the feed of the work, as will be described, the spring *s* returning the shaft to position against the stitch-regulating cam *a*′, it being understood that the smaller the return movement of the shaft the shorter will be the feed and length of stitch, and vice versa.

The shaft *a* has rigidly secured thereto like arms a^7, (see Figs. 3 and 4,) extended forwardly through the slotted open front of the head or frame A and provided with bosses a^8 and a^9, adapted to slide in bearings 25 in the head, the boss a^9 (shown on the left-hand arm, Fig. 1) being the larger of the two to receive the enlarged end $b^\times$ of a rock-shaft *b*, (see Fig. 5,) which has rigidly secured thereto the awl-segment *b*′, carrying a curved awl b^2, upturned to penetrate the work from below, the bearing a^9 preventing longitudinal movement of the shaft *b* and the parts supported thereby in one direction.

The needle *c*, herein shown as curved and having an open hook or barb at one side near its end, is rigidly secured to a needle-segment *c*′, having a laterally-extended hub c^2, (clearly shown in Fig. 6,) the said hub being adapted to receive and turn freely upon the shaft *b*, while a needle-hook guard c^3 forms part of a split hub or boss c^4, frictionally secured upon the hub of the needle-segment by a suitable set-screw c^5.

The needle-segment and hook-guard are mounted upon the shaft *b* between the awl-segment *b*′ and the boss a^8, and consequently all of the parts carried by the arms a^7 must move in unison laterally during the feed of the work, while the needle and awl have an oscillatory motion given them by means to be described.

The hub c^4 of the hook-guard is cut away to form a notch c^6, having at one end a shoulder c^7, (see Fig. 6,) which engages the inturned lug c^8 of a guard c^9, (shown separately in Fig. 6^b,) to thereby stop the hook-guard, the said guard-stop c^9 being attached to the boss a^8 by a suitable screw, as 20, Fig. 1.

When the needle is retracted, the friction between the guard-hub c^4 and the needle-segment hub c^2 will carry the hook-guard back with the needle until stopped by engagement of the shoulder c^7 and lug c^8, and when the needle has completed its backward throw its hook will be covered and completely protected by the guard, as shown in Figs. 3, 6, and 6^a.

When the needle moves forward toward the work, the hook-guard moves frictionally therewith and will ordinarily engage the work and will be stopped thereby, the needle continuing to move forward into the work with its hook uncovered, the guard at such time acting to guide the needle.

If the work should be very thin, the guard

c^3 will be stopped in its forward movement by engagement of the guard-stop with the opposite end of the notch c^6 in the hub c^4.

A horizontal rod or shaft D is supported in bearings A^5 at the rear upper part of the head, (see Figs. 2, 3, and 4,) and the take-up and needle and awl actuators are mounted to rock thereupon, the needle-actuator being shown as a lever d, Fig. 3, having a long sleeve-like hub d', Fig. 2, through which the shaft D is extended, said lever having a segment-gear d^2 thereon at its front end to engage the toothed needle-segment c', said lever being provided with a suitable roller or other stud d^3 (see Fig. 3) to enter a cam-groove d^4 (shown mostly in full lines in Fig. 3) in the face of the cam-disk C, said cam being rotated in the direction of the arrows 30, Figs. 3 and 4.

The shape of the cam-groove d^4 is such that the needle will be retracted to draw out the loop and be held so that the point of the loop-taker may enter and take the loop of needle-thread out of the hook of the needle, and then the part d^{40} of the groove further retracts the needle to conceal its open hook within the hook-guard c^8, it being retained in such position while the shuttle is rotated to interlock the shuttle and needle threads, the needle remaining in such position until the awl has again entered the work, fed it forward, and begun its withdrawal. This concealment or covering of the point of the hook obviates any possibility of the needle-thread catching against the hook of the needle, fraying or wearing it as the needle-thread is passed about the shuttle in the formation of the stitch.

Referring now to Figs. 2 and 4, an arm e, having an elongated sleeve-like hub e', loose upon the shaft D, is provided at its front end with a toothed segment e^2 to engage the teeth of the awl-carrying segment b' to impart the proper oscillatory motion to the awl, said lever having a suitable roller or other stud e^3 thereon to enter a cam-groove e^4 in the inner face of a cam-disk E, fast on the main shaft, whereby the awl is oscillated at the proper time to enter and recede from the work, the said hubs d' and e' being located at opposite sides of the take-up, to be described.

The work-rest is shown as an upturned portion F of the head, preferably rounded at its upper end and forming at f an acute or beveled edge to enter between the welt and the upper as the work is supported, it being understood that the boot or shoe is held upside down upon the work-rest with the outer sole uppermost.

The needle-thread t, Fig. 3, is led from the take-up about a guide-sheave f' at the lower end of the work-support and thence along the longitudinal groove $f^\times$, formed in the outer face of the said work-support and flared or enlarged at the upper end, the work-support being cut away at f^{50}, as shown best in Figs. 7 to 10, inclusive, to leave a downwardly-inclined edge f^2, extending across the plane of and in front of the needle-path.

The needle-thread as it is delivered to the needle by the looper passes from the enlarged upper end of the guide-groove $f^\times$ over the guide edge f^2 to the interior of the work-rest and up through the needle-opening f^3 therein, (shown clearly in Figs. 3, 4, and 10^a,) the awl also passing through said opening f^3 to penetrate the work from below.

The work-support is preferably recessed near its lower end, and a spring-hook f^4 is located therein, about which the thread is passed to aid in keeping it taut as it passes up over the outer side of the work-support should there be any irregularity in the movement of the take-up.

The looper l (shown separately in Fig. 13) is notched at $l^\times$ at its upper offset end to engage the thread, and it is attached to an arm l', extended up within the hollow work-support F and rigidly secured to a rock-shaft l^2, rotatable and longitudinally movable in a boss or hub-like bearing A^6, (see Fig. 1,) extended laterally from the lower part of the work-support.

The rock-shaft l^2 is provided with an arm l^3, upon which is mounted a roller l^4, held by a spring s' against an edge cam l^5 on the periphery of the cam-disk C, (see Figs. 2 and 19 and dotted lines, Fig. 3,) the raised portion l^6 of the cam acting upon the roller l^4 to rock the shaft l^2, and thereby move the looper rearwardly from the front of the work-support, to thereby carry the needle-thread t back past the path of the needle.

The hub of the arm l^3 has a stud l^7, provided with a roll l^8 (see Fig. 1 and dotted lines, Fig. 3) at right angles to the roll l^4 and held by the spring s' in engagement with a face-cam l^9 on the outer face of the disk C, as shown in Fig. 19. The raised portion l^{10} of the cam moves the looper to the right, viewing Fig. 7, into position to meet the needle-thread, and thereafter the looper is moved to one side of the arc of the needle-path, as in dotted lines, Fig. 10^a, so that the needle when it descends may pass between the looper and the inclined thread-guide f^2, with the thread at the barbed side of the needle.

While the needle remains in the work, as in Fig. 10, the part l^6 of cam l^5 moves the looper to the rear, and at the same time it is moved to the left back of the needle, so that the thread is drawn down the inclined thread-guide f^2 into the open hook of the needle, which rises as the looper returns to its normal position near the front of the work-support. The movement of the looper to the rear and left hand, described, also serves to measure or draw off a sufficient length of thread as it is given up by the take-up to form one side of the loop, the looper thereafter giving up the thread to the needle as the latter rises into position to have its loop removed by the point of the loop-taker or shuttle, thus completing the other side of

the loop, continued movement of the take-up in the same direction giving up thread as the shuttle passes through the loop thereof. This drawing off of the thread by the looper prevents rending of the thread through the needle-hook as the latter rises—a point of the utmost importance in a machine running at high speed, for the rending of the thread in the needle-hook will fray or break it.

A presser P, to be more fully described hereinafter, clamps the work firmly upon the work-support as the awl b^2 ascends therethrough, releasing the work when the work is to be fed forward by the lateral movement of the awl due to the wedge a^6 acting on the roller a^4, as has been described, and then again clamping the work as the awl is withdrawn and the needle c comes forward to enter the awl-hole and receive its loop of needle-thread.

Above the work-support the head is cut away to form a nearly circular recess g to receive therein the shuttle continuously rotated at variable speed. (Shown in section in Figs. 3 and 4 and on a larger scale in Figs. 14 and 15 and Figs. 23 to 27, inclusive.)

The shuttle herein shown is discoidal in shape, having a closed substantially circular end or bottom h and annular side walls $h^\times$ $h'^\times$ of the body flaring oppositely, hollowed out interiorly from near the heel to near the point or beak of the shuttle (see Figs. 14, 24, and 25) to reduce weight.

A cylindrical lip or flange h^2, concentric to the axis of the shuttle, is formed on the periphery of the flaring side walls, the inner and outer faces of the flange forming bearing-surfaces to support the shuttle in its rotation, the bottom or end h extending beyond the edge of the flange h^2, as shown clearly in Figs. 14, 15, and 24 to 27, inclusive, to provide a circular groove on the rear side of the shuttle within the plane of the end h.

A preferably conical stud h^8 is erected on the inner side of the end h of the shuttle, and a circular case k for the bobbin or cop of shuttle-thread t' is provided with a suitably-shaped hub k' to slip loosely over the stud h^8, a screw $k^\times$ being shown in Fig. 14 as entering the end of the stud to retain the cop-case in place.

The wound mass of shuttle-thread is inserted in the case and is drawn therefrom through an opening substantially in the center of the face-plate h' of the shuttle.

As best shown in Fig. 14, the face-plate h' is circular in form and is provided with an inturned lip or flange h^4 to snap over or hug the cylindrical wall of the cop-case k, the face-plate forming the removable end for the shuttle. The face-plate is thus retained in place when in operative position relative to the shuttle, the latter rotating while the cop-case and face-plate are held stationary, as will be described.

As shown in Figs. 7 to 12, inclusive, and in Fig. 14, the face-plate h' is thickened or enlarged diametrically to form a rib h^5 on its outer side, having a radial hole or passage h^6 leading from its inner face at or near the center to its outer face near its periphery for the shuttle-thread t'. A groove h^7 on the exterior of the rib leads from the outer end of the passage h^6 to and through a nose or extension h^8 of said rib, said nose projecting beyond the circumference of the face-plate h', as clearly shown in the drawings, the shuttle-thread being delivered through the nose h^8.

The rib h^5 is cut away at h^9 transversely to and intersecting the thread-guide h^7 to cooperate with the thread measuring or drawing-off device, which acts upon the shuttle-thread at the point where it crosses the recess h^9 and depresses it therein, one end of the thread being held by the work, so that a predetermined length of thread is drawn off from the cop, as will be described, to provide the requisite shuttle-thread for the next stitch.

The body of the shuttle and the flange h^2 are cut away at $h^{2\times}$ for the entrance of the actuator h^{22}, to be described. One end of the flange h^2 thus cut away is inwardly beveled at h^{12} gradually from the part $h'^\times$ of the side wall and reduced longitudinally in width (see Figs. 14, 15, 26, and 27) to form a hook or loop-taker, the gradual increase in width from the point h^{13} of the hook to the full width of the flange h^2 along the edge $h^{13\times}$ acting to spread the loop then in the hook of the needle, while the upwardly and inwardly inclined edge h^{14} of the said hook, forming the heart, acts to spread the loop of needle-thread as the shuttle continues to rotate in the direction of the arrow, Fig. 11, to thereby remove the loop from the hook of the needle. As the shuttle continues to move in such direction after having thus removed the loop of needle-thread from the needle the latter will be withdrawn by its actuating mechanism into the position shown in Fig. 3, with its hook concealed, and the loop of needle-thread is carried around the shuttle to be interlocked with the portion of shuttle-thread which has been previously measured off. When the hook or loop-taker arrives at the position shown in Fig. 12, the loop of needle-thread is almost drawn off from the shuttle by the take-up, the measured portion of shuttle-thread passing therethrough being at such time slack and locked, as will be described, so that no more can be drawn from the cop or bobbin for that stitch, the measuring and subsequent locking of the shuttle-thread preferably being effected only after the outer side of the loop of needle-thread has passed over the shuttle-thread support on the face-plate. As the loop of needle-thread is drawn down into the work W it will interlock with the measured or fixed length of shuttle-thread t', and the interlocked portion of the two loops, as $t^\times$, will be drawn into the work a certain distance below its upper surface or the bottom of a channel made therein, said distance being regulated by the

length of the shuttle-thread measured or drawn off.

A yoke y, Figs. 1, 2, and 4, has a shank y' extended into a hole in the face of the head A above and at one side of the center of the shuttle, the yoke being held in adjusted position by a set-screw y^2 engaging the shank y', (see dotted lines, Fig. 2,) the yoke providing bearings for a rocking shaft r. This shaft has fast thereon a gear r' and collars 1 and 2 and an enlarged lower end terminating in a finger r^2, which is adapted to at times engage the shuttle-thread t' and depress it into the recess h^9 in the face-plate of the shuttle, thus drawing from the cop or bobbin a length of thread corresponding to the extent of movement of the finger into the recess.

The end of the shaft r is shaped somewhat as the thumb and finger of the human hand, the part r^2 corresponding to the forefinger, and the part r^3, corresponding to the thumb, is adapted to be moved into position by oscillation of the shaft r to positively engage the shuttle-thread t' and hold or lock it from movement. As herein shown, the stop r^3 is brought tightly against the thread as it emerges from the passage h^6 in the face-plate h' as the take-up is completing the stitch, as will be described, to lock the shuttle-thread from being at such time drawn off from the cop or bobbin.

A rod r^4 is mounted to slide horizontally in a bearing A^{15}, said rod having at its front end a rack r^5 to engage the teeth of gear r', a spring s^{70} surrounding the rod between its bearing and a nut r^6, adjustable on the rod, the spring tending to retract the rod r^4 and thereby turn the shaft r to relieve the pressure of the stop r^3 upon the shuttle-thread, unlocking the latter or actuating the measuring-finger. The slide-rod is pivotally connected at r^7 to a bell-crank lever r^8, the sleeve-like hub r^9 of which is mounted to rock on the laterally-extended hub $m^{8\times}$ of the take-up-actuating arm m^8, said bell-crank lever r^8 having thereon a roll r^{10}, held in engagement with the periphery of the cam-disk E, said cam-disk, as shown in dotted lines, Fig. 4, having a depression r^{11} therein for a portion of its length to receive the roll, thereby permitting the spring s^{70} to move the rack r^5 to partially turn the shaft r and move the finger against the shuttle-thread to draw off a fixed portion from the shuttle.

The stop r^3 and its actuating mechanism form a bobbin-thread-locking device for the purpose hereinbefore described.

In order to adjust or vary the length of shuttle-thread measured or drawn off, I have provided an adjustable detent r^{50} (see Figs. 2 and 4) for a roll r^{51} on the slide-rod r^4, adjustably secured by a set-screw r^{52} to any suitable part of the machine and herein shown as mounted on a pawl-actuating lever p^{26}, to be described. To draw off a smaller length of shuttle-thread, the detent r^{50} is set so that the slide-rod r^4 will not have the full throw permitted by the depression r^{11} of the cam, which depression determines the greatest amount which can be measured or drawn off. The slightly-depressed portion r^{12} of the cam retains the stop and the measuring-finger away from or out of contact with the thread, to thereby allow the loop of needle-thread to pass between them and the face-plate and until the interlocking portions of the loops of needle and shuttle thread are to be drawn into the work by the loop-taker, at which time the low part of the cam permits the spring s^{70} to operate the measuring-finger r^2, and then high part r^{13} of the cam acts upon the roll r^{10} to move the slide-rod r^4 positively to cause the thread to be locked.

As the measured portion of shuttle-thread is always of the same predetermined length for each and every stitch it follows that the interlocked portion $t^\times$ of each and every stitch will be located within the work at substantially the same distance from its outer surface. In this instance the upper surface is the bottom surface of the outer sole of the finished shoe, any inequalities in the thickness of the work being accommodated by the needle-thread. The needle, after the loop of needle-thread has been removed therefrom, is retracted into the position shown in Fig. 3, with its point between and protected by the flange h^2 and the adjacent wall of the shuttle, while the hook-guard c^8 covers the opening of the hook.

Above the shuttle-recess g, as herein shown, a circular groove or race g' is formed in the face of the head A to receive the flange h^2 of the shuttle to sustain it in position to be rotated, a curved retaining-plate g^2, secured to the head by suitable screws $g^\times$, projecting over the part $h'^\times$ of the side wall of the shuttle.

Referring to Figs. 3 and 4, a shaft h^{20} is supported in bearings in the head and extends forward into the recess g behind the shuttle, said shaft having at its front end a laterally-extended arm h^{21}, upturned or flanged at h^{22} (see Fig. 17) to enter the cut-away portion $h^{2\times}$ of the shuttle-body and its flange h^2 to actuate said shuttle as the shaft h^{20} is rotated. It will be seen in Fig. 3 that the loop of needle-thread can pass readily around the shuttle and between it and the arm h^{21} of the shuttle-actuator, as in Fig. 12, the shaft h^{20} having fast thereon a gear h^{23} in mesh with an intermediate smaller gear h^{24}, rotatably mounted on a stud on the head, said intermediate in turn meshing with a larger gear h^{25}, fast on a shaft h^{26}, (see Fig. 2,) mounted in a long bearing A^{40} above and at right angles to the main shaft B. At its rear end the hub of a circular gear h^{27} is secured to the shaft h^{26}, said gear having, as herein shown, fifteen spirally-arranged teeth $h^{27\times}$, varying slightly in angularity, as shown in the development thereof, Fig. 17, to mesh with the peculiarly-arranged teeth of a larger circular gear h^{28}, mounted on the shaft B and shown as secured by screws h^{29} to the cam-disk E.

The teeth h^{30} of the gear h^{28} differ in length and in angularity, the longer teeth, of lesser

angularity, producing a slower rate of speed in rotating the gear h^{27}, while the shorter teeth, of greater angle, produce a higher rate of speed, the speed of rotation of the said gear h^{27} being variable in consequence, and this variation of speed is transmitted by the intermediate train of gears to the shuttle, so that the latter, while continuously rotating in the same direction, will move faster at some times than at other times. The machine may thus be run at a very high speed without detriment, as there is no inertia to be overcome, nor shock and jar, as in the case of an oscillatory shuttle, the shuttle in my present invention making one complete rotation for each stitch.

While the awl and the needle are moving one after another to enter the work the shuttle is rotating at its lowest speed, its hook or point being in about the position shown in Fig. 7 and rotating in the direction of arrow 7 until the needle *c*, with the loop of thread *t*, is withdrawn from the work, as in Fig. 11, ready to have the point h^{13} enter the loop. From this point the shuttle moves with increasing speed to spread the loop, the latter being passed around the shuttle and shuttle-thread while the shuttle attains its highest speed, the speed decreasing to the minimum thereafter.

The curved plate g^2, which retains the shuttle in place, is provided with a lug or projection g^{30} at one side of and adjacent the nose h^8 of the face-plate, and a wing or auxiliary plate g^{32} is secured by a suitable screw g^{33} to the plate g^2 at the opposite side of the nose to prevent the face-plate from rotating with the shuttle, yet without interfering with the loop of needle-thread as it is carried around or released from the shuttle, said wing also serving to prevent undue bowing and snarling of the loop as it is cast off from the shuttle.

When the loop is being drawn down to the work after it leaves the shuttle, it sometimes tends to whip against the shuttle-thread, but the nose h^8 in my present invention takes up the blow of the loop and protects the shuttle-thread.

Between the sleeve-like hubs d' and e' on the shaft D is clamped, by a set-screw 70 or in other suitable manner, the take-up lever *m*, shown in Fig. 3 as bent between its ends and having secured thereto adjacent its fulcrum a toothed segment m', in engagement with the teeth of a segmental gear m^2 of an arm m^3, fast on a rock-shaft M, said rock-shaft having fast thereto a second arm m^4, (see dotted lines, Fig. 3,) provided with a roller or other stud m^5 to enter a cam-groove m^6, (shown in full lines in the face of the cam disk or hub C,) rotation of the latter rocking the shaft M, and thereby the take-up lever, to swing its free end forward and upward as the loop of needle-thread is carried around the shuttle and to thereafter withdraw the take-up into the position shown in Fig. 3 to tighten the stitch. The needle-thread is drawn from a suitable wax-pot P′, adjacent the said take-up, the thread passing from the wax-pot through a clamp or tension device, (shown as a spring s^{20} on the take-up near its fulcrum,) thence around suitable grooved sheaves m^7 and m^8 on the lever *m*, to and completely around a tension-thread sheave *n*, mounted in the free end of the take-up, from which the thread passes to the guide-sheave f' and the stitch-forming devices described.

An enlarged sectional view of the tension-sheave is shown in Figs. 3^a and 3^b, wherein a stud $m^\times$, projecting from the outer face of the take-up lever *m*, passes through the hub of the light sheave *n*.

The arm *m* has upon its side about the stud $m^\times$ a series of concentric rings or projections m^{70}, and the adjacent face of the sheave has a like series of rings or projections m^{71}, arranged to enter the spaces between the rings on the arm and between these faces I have arranged a suitable washer w^{20}. The rings or projections add materially in supporting the sheave on the arm and reduce the strain thereof on the stud $m^\times$. Upon the outer threaded end of the stud is screwed a nut n', having ratchet-teeth thereon, to be engaged by a suitable spring-detent n^2 to prevent accidental rotation of the nut, the detent being carried, as shown in Fig. 3, on an arm m^9, secured to the take-up lever, and having a hole therein through which the stud $m^\times$ is passed, a second friction-washer w^{21} being interposed between the said arm m^9 and the hub of the sheave, all of the parts weighing very little to reduce the effect of momentum. By screwing the nut n' up more or less tightly the friction upon the sheave *n* is regulated to yield more or less freely to the strain of the thread, the detent n^2 maintaining the tension adjusted.

It will be seen from Fig. 3 that the thread between the clamp s^{20} and the tension-sheave is always maintained taut and so prevented from flying about in the movement of the take-up, or from catching in any of the adjacent parts of the mechanism. The tension of the sheave *n* having been adjusted on the forward movement of the take-up, a quantity of thread will be drawn from the wax-pot P′, more than sufficient to provide for the next stitch, and as the take-up in its return movement draws the thread taut, if the thickness of the work should require more than the average quantity of needle-thread drawn off, the excess required will draw from the slack between the wax-pot and clamp s^{20}, the sheave turning the necessary amount.

No matter how rapidly the machine may be run it is impossible for the thread on the take-up to become displaced or caught in adjacent parts, and by making the devices at the end of the long take-up lever very light I am enabled to overcome the effects of momentum thereupon.

It will be evident from an inspection of Fig. 3 that the thread is free between the ten-

sion-sheave n and the work-support, and the tension-sheave being located at or near the extremity of the take-up lever m I am enabled to make a long throw or stroke of the latter take the place of a short throw and intermediate multiplying devices.

With the long throw, if the take-up lever and parts carried by it should be heavy, the momentum would be so great that it would be added to the effect of the tension, and it would be impossible to form the stitches evenly and uniformly with any speed.

In Fig. 16 I have shown two wax-pots P′ and P², the former for the needle-thread and the latter for the shuttle-thread, said wax-pots being heated, preferably, by steam exhausted therefrom through pipes pp', respectively, branching from a common exhaust P×, leading to a suitable point of discharge.

The shuttle-thread is only drawn from its wax-pot when winding a cop or bobbin, and it is therefore desirable to be enabled to turn off the heating medium from said wax-pot when not in use, and for its purpose I have inserted in the branch pipe p' a suitable valve at v, so that such pot can be disconnected from the exhaust independently of the pot P′. So, too, in order to cut off the needle-thread wax-pot P′, I have interposed a valve v' in the branch p, so that it can be cut off when desired from the exhaust.

A common union-inlet p^2 connects the front ends of the wax-pots, and a pipe p^3 leads thereto from a hollow curved heater p^4, having a plane outer face, against which the take-up lever slides in order to maintain the thread soft on its way to the stitch-forming devices, Fig. 3 showing clearly the proximity of the thread to the heater p^4 between the tension-sheave n and the guide-sheave f' when the take-up is retracted, the front end of the heater p^4 extending up to the base of the work-support.

Referring now to Fig. 1, the front of the head A is provided with a duct or passage p^6, (see dotted lines,) connected at its lower end by a pipe p^5 to the upper front end of the heater p^4 to conduct the steam or other heating medium thereto after passing through the head adjacent the stitch-forming devices, said duct or passage p^6 passing through the rear of the work-support and near the recess in which the bobbin-carrier moves to maintain the latter heated, the pipe p^7 serving to conduct the live steam to the head.

Referring now to Figs. 1, 2, and 3, the head of the machine is upturned at A¹⁰ and longitudinally slotted to receive therein a slide-block p^{20}, normally depressed by a spring s^{25}, controlled as to its tension by a suitable nut p^{21}, (shown only in Figs. 1 and 2,) said slide-block having securely bolted thereto the presser-foot or presser P. The slide-block extends through the bearing A¹⁰ at the rear, as shown in Figs. 2 and 3, and has formed thereon two sets p^{21} and p^{22} (see Fig. 19) of oppositely-inclined or reversed ratchet-teeth in vertical alinement with each other coöperating, respectively, with two pawls p^{23} p^{24}, concentrically mounted on a stud 500 in the slotted pawl-carrier p^{25}, rigidly secured to a horizontal rock-shaft N, mounted in bearings A¹² of the head, said rock-shaft, as shown in Figs. 2 and 4, having fast thereon a lever p^{26}, provided with a roller or other stud p^{27}, to enter a face cam-groove p^{28} in the cam-disk E, as clearly shown in Fig. 4, the shape of the groove being such that the presser will be positively lifted during the feeding of the work by the awl by the part of the cam between the points 200 and 201 and thereafter depressed by its spring and held clamped upon the work between the points 201 and 202, while the needle descends through the work and is retracted, after which the lock on the presser is released until the awl is about to enter the work, as between the points 202 and 203 of the cam, at which time the presser is again clamped or locked positively upon the work between the points 203 and 200 of the cam. The two pawls p^{23} and p^{24} are oppositely extended to engage with one or other of the series of ratchet-teeth p^{21} or p^{22}. A shield 90, fixed on a part of the main frame, covers more or less of the teeth p^{21}, according to the thickness of the work, so that when the pawl-carrier p^{25} is raised, it having a constant throw, the presser will always be raised the same distance above the work no matter what the thickness of the latter, for the thicker the work the lower down upon the ratchet will the pawl p^{23} engage, as more of the teeth will be uncovered by the shield in such cases, and vice versa. When the pawl-carrier descends, due to the cam-groove p^{28}, the pawl p^{24} will engage the first uncovered tooth of the ratchet p^{22}, said ratchet also having a shield 92 projecting from the main frame to lock the presser positively upon the work, the spring s^{25} being more or less compressed, according to the thickness of the work.

When the work is thick, the pawl p^{25} will not in its downstroke engage a tooth of the ratchet p^{22} until it reaches nearly the end of its stroke, owing to the shield 92. If the work be thinner, the pawl will engage a tooth higher up on the ratchet, as more of the latter will be uncovered by the shield 92. A saddle p^{29}, bearing equally on the two pawls, is held against them by a spring-pressed pin p^{30} in the pawl-carrier to maintain the pawls always in position to engage a ratchet-tooth of one or the other series at the proper time.

A hand-lever p^{31} is fulcrumed on the shaft N and is provided with an offset-toe p^{32} to engage a suitable projection p^{33} on the slide-block p^{20} in order that the presser may be lifted by hand to insert the work when the pawls are in the intermediate position, the presser being then unlocked.

To prevent any accidental catching of the loop of needle-thread as it is carried around the shuttle with the shuttle-thread, which

might accidentally draw off from the shuttle an additional portion of thread, I have placed a guard h^{80} on and projecting from the face-plate adjacent the thread-guide h^{7} to lift the adjacent part of the needle-thread loop over the shuttle-thread as it crosses the face-plate.

The machine forming the subject-matter of this invention is strong and positive in its operation, comprises a comparatively small number of parts, and may be run at a very high speed without destroying the positive and exact operation of all of the stitch-forming devices.

The teeth $h^{27\times}$ of the gear h^{27} are in Fig. 17 indicated by a series of small numbers from 1 to 15, inclusive, and the spaces between the teeth h^{30} of the gear h^{28} are indicated on Fig. 18 by the numbers from $1^{\times}$ to $15^{\times}$, inclusive, to show the spaces which are entered by the teeth of the gear h^{27}.

While in Figs. 1 and 2 I have shown the gear h^{27} on a shaft h^{20}, which through a train of intermediate gears h^{23} h^{24} h^{25} rotates the shuttle-actuator shaft h^{20}, my invention is not restricted to such construction, as I may mount the gear h^{27} directly on the shuttle-actuator shaft, as h^{90}, (see dotted lines, Fig. 16,) the construction herein used being chiefly to enable me to maintain a well-known and established relation of parts which in this instance of my invention I did not care to disturb.

My invention is not restricted to the precise construction and arrangements of parts herein shown and described, as it is obvious that various changes or modifications may be made therein without departing from the spirit and scope of my invention.

By reversing the location of the needle-hook—that is, placing it at the opposite side of the needle—and rotating the shuttle in the reverse direction from that shown a lock-stitch with a knot at the crossing will be formed.

The only function of my improved take-up is to take up the loop of needle-thread and pull needle-thread from the waxing device, and said take-up in no way coöperates with any measuring device or pull-off for the needle-thread to control its delivery, I depending wholly on the frictionally-held sheave at the free end of the take-up lever to take up the loop of needle-thread and give up thread held by it as required. The said sheave in no way rotates except in the delivery of the thread in the formation of the stitch. The movement of the sheave at the free end of the take-up lever is in a very slight or flat curve, so that the pull on the thread between the work and the sheave is in a substantially straight line without any sharp or other bends. The double pawls are moved by one and the same carrier, and one works as the carrier moves in one direction and the other in the opposite movement of the carrier.

By the term "length of the teeth of the spiral gears" as herein used I mean the distance from one to the other end of each tooth, measured on its face in the direction of the plane of rotation of the gear.

The flange h^{2} is provided with a suitable number of apertures $h^{2\times}$ for the passage of oil, oil being supplied to the race or groove in which said flange travels from an oil cup or reservoir t^{10}, (see Fig. 1,) the stem of said cup (see Fig. 4) entering a threaded hole t^{13}, leading to the said race or groove.

The mechanism herein described for imparting to the shuttle continuous rotation in the same direction at a variable speed is not claimed herein, as it forms the subject-matter of another application filed by me April 11, 1896, Serial No. 587,182.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a sewing-machine of the class described, devices to form a loop of needle-thread, a shuttle containing a bobbin, an independent coöperating measuring device, to measure a fixed quantity of shuttle-thread to be interlocked with the needle-loop, a take-up to draw the interlocked portion of said thread into the work, and a shuttle-thread lock to determine the position of the interlocked loops in the work, substantially as described.

2. In a sewing-machine of the class described, stitch-forming mechanism including a hooked needle, a shuttle and its contained bobbin, means independent of the shuttle to measure a fixed quantity of shuttle-thread to be interlocked with the needle, a take-up, and a locking device for the shuttle-thread, substantially as described.

3. In a sewing-machine of the class described, stitch-forming devices, including a shuttle having a bobbin, means independent of the shuttle to draw off a measured quantity of shuttle-thread, and a lock to prevent feed of the said thread at predetermined times, substantially as described.

4. In a sewing-machine of the class described, stitch-forming devices, including a shuttle having a bobbin, a stationary face-plate having a longitudinal thread-guide and a transverse intersecting notch, and an independent finger to at times engage the shuttle-thread and depress it into the notch, to thereby draw off a measured quantity of the thread, substantially as described.

5. In a machine of the class described, stitch-forming devices, including a rotating shuttle having a contained bobbin, a face-plate having a thread-delivery and an external thread-guide, and a locking device movable toward and from the guide, to directly engage and clamp the exposed shuttle-thread and prevent delivery thereof at predetermined times, substantially as described.

6. In a machine of the class described, stitch-forming devices, including a shuttle having a bobbin, a face-plate having a thread-guide and an intersecting depression, and a connected finger and stop, to alternately act

directly upon the shuttle-thread, to respectively draw off a fixed quantity and to positively lock it thereafter and prevent its delivery, substantially as described.

7. In a machine of the class described, a rotatable shuttle having a contained bobbin, an independent face-plate having a depression in its face below the path of the thread, a shaft provided with a finger to engage and move a portion of the thread into said recess, to thereby measure a fixed quantity of shuttle-thread, and means to rock the shaft at predetermined times, to move the finger into operative or inoperative position, substantially as described.

8. In a sewing-machine, a shuttle, a non-continuous circular flange projecting rearwardly therefrom, a support for the shuttle having a curved race to receive the flange, a continuously-rotated actuator to operate the shuttle, and a fixed retaining device independent of said actuator to hold the shuttle in its race, substantially as described.

9. A discoidal bobbin-containing shuttle, consisting of a fixed circular end and a removable circular end, an intermediate annular connecting-wall, inwardly flared from each of said ends, and a non-continuous flange extended rearwardly from the periphery of said wall parallel with the shuttle-axis, substantially as described.

10. In a sewing-machine, a shuttle having a hook, means to rotate it, a stationary face-plate for and independent of the shuttle, said face-plate having a thread passage and guide, and a delivery-nose extended from the face-plate substantially to the path of the hook of the shuttle, substantially as described.

11. In a sewing-machine, a shuttle, means to rotate it, a stationary face-plate for and independent of the shuttle, having a thread passage and guide, and a delivery-nose for the thread radially extended beyond the face-plate, substantially as described.

12. In a sewing-machine, a rotatable shuttle, its support, a face-plate for the shuttle, having a thread-passage communicating with the interior of the shuttle and a thread-delivery, and a fixed retaining device for the shuttle, having projections to engage and prevent rotation of the face-plate, substantially as described.

13. A shuttle having an open and a closed circular end, a cop or bobbin holder loosely mounted axially upon the closed end, and a detachable face-plate adapted to engage the cop-holder, said face-plate having an external rib provided with a diametrical thread-guide and an intersecting depression, and a radially-extended delivery-nose, substantially as described.

14. In a sole-sewing machine, a work-support, having a needle-hole, and also a thread-guide in its outer face below the said hole, the upper end of the guide terminating in an opening in the work-support below the needle-hole, a portion of the opening having a downwardly-inclined edge in front of the needle-path and over which edge the thread passes, a curved hooked needle to enter the needle-hole, and a looper to engage the thread back of the thread-guide and between the needle-hole and the inclined edge of the guide-terminal opening, to put the thread into position to be taken by the needle-hook, substantially as described.

15. In a sewing-machine, a rotating shuttle, a stationary face-plate therefor having an open thread-guide, a stop supported independently of the shuttle, and means to move said stop to act upon the shuttle-thread and clamp it upon the said face-plate, substantially as described.

16. In a sewing-machine, a rotating shuttle, a stationary face-plate therefor having an exterior recess crossed by the shuttle-thread, a finger supported independently of the shuttle, and means to move said finger against the thread and into the recess in the face-plate, to draw off a fixed quantity of shuttle-thread, substantially as described.

17. In a sewing-machine, a shuttle, a stationary face-plate having an open thread-guide and an intersecting recess, and an independently-supported combined shuttle-thread lock and measuring device, clamping the thread against the face-plate to lock it, and engaging the thread and entering the recess to measure off a fixed length of shuttle-thread, substantially as described.

18. A discoidal shuttle, having a closed circular end, an axially-mounted cop-holder thereon, an annular wall having sides inwardly divergent from its periphery, a non-continuous rearwardly-extended flange on the wall having a hook in continuation of said flange, and a closure for the shuttle and cop-holder, adapted to be secured to the latter, substantially as described.

19. In a sewing-machine, a rotatable shuttle, a face-plate over which the shuttle-thread is led and exposed, a combined thread lock and measuring device, to alternately engage the shuttle-thread, and means to actuate said locking and measuring device and to retain it out of engagement with the shuttle-thread as the loop of needle-thread passes around the shuttle, substantially as described.

20. In a sewing-machine, a feeding-awl, a shaft upon which it is mounted and having a longitudinal recess in one end thereof, means to positively move said shaft longitudinally to effect the feed, a spring located within said recess to return the shaft and awl into starting position, an adjusting-shaft provided with a cam to bear against the opposite end of the awl-shaft, and means to rotate said cam-shaft to thereby regulate the length of feed, substantially as described.

21. In a sole-sewing machine, stitch-forming devices, including an oscillating hooked needle, a looper coöperating therewith, a shuttle having a contained bobbin, said shuttle being moved in a path at right angles to

and intersecting the needle-path, a peripheral flange at the rear end of said shuttle, cut away to permit passage of the needle and having a hook at one end of said recess to enter and spread the loop of needle-thread, and a needle-guard, said needle when retracted being protected by the flange and guard, substantially as described.

22. In a sewing-machine, a shuttle adapted to pass through a loop of thread, a non-continuous circular flange projecting rearwardly therefrom, but within the plane of the shuttle end, and provided with a loop-engaging hook, a shuttle-support having a curved race to receive the said flange, and means to continuously rotate said shuttle at a variable speed, substantially as described.

23. In a sole-sewing machine, a fixed support, a yielding presser having two sets of oppositely-inclined ratchet-teeth upon its bar, a pawl-carrier having a constant throw, two concentrically-mounted, oppositely-pointed pawl-fingers thereon, one for each of said sets of ratchet-teeth, and a fixed shield to permit more or less of the ratchet-teeth of both sets to be exposed according to the thickness of the work, engagement of one of said pawl-fingers with its set of teeth lifting the presser, the other pawl-finger locking the presser when in engagement with its set of teeth, substantially as described.

24. In a sole-sewing machine, a fixed work-support, a yielding presser having two sets of opppositely-inclined ratchet-teeth in alinement upon its bar, a fixed shield to permit more or less of the ratchet-teeth to be exposed according to the thickness of the work, a pawl-carrier having a constant throw, and two concentrically-mounted, oppositely-pointed pawls thereon adapted to ride over the shield and engage the exposed ratchet-teeth at the ends thereof, one pawl serving to positively lift the presser and the other pawl to hold it clamped upon the work, substantially as described.

25. In a wax-thread sewing-machine, stitch-forming devices, a wax-pot, a take-up intermediate said wax-pot and stitch-forming devices, to draw thread from the former and coöperate with the latter in the formation of the stitch, and tension devices on said take-up, at the delivery end thereof and near the wax-pot respectively, to maintain the thread taut upon said take-up during its movement, substantially as described.

26. In a sewing-machine, a take-up lever bent between its ends, means to rock it, a thread-tension device near its fulcrum and a second tension device at its free end, to effect the drawing off and delivery of the needle-thread, and thread-guides intermediate said devices, whereby the thread is held taut on the take-up at all times, substantially as described.

27. In a sewing-machine, a take-up lever bent between its ends, means to actuate it, a spring-clamp near its fulcrum, to bear upon the thread, an adjustable tension-sheave at the delivery end of said lever, and guide-sheaves intermediate said devices, to maintain the thread taut at all times on and during the movement of the said lever, substantially as described.

28. In a wax-thread sewing-machine, stitch-forming devices, a wax-pot, a take-up intermediate said wax-pot and stitch-forming devices, to draw thread from the former and cooperate with the latter in the formation of the stitch, tension devices on said take-up, and adjusting means whereby said devices may be made to act constantly and uniformly upon the thread, substantially as described.

29. In a sewing-machine, a thread-supply, stitch-forming devices, an intermediate take-up arm, a thread-tension device thereon, adjusting means to cause said devices to act constantly and uniformly upon the thread, and means to move said arm to draw off thread from the supply and deliver it to the stitch-forming devices, and to thereafter draw the thread taut to complete the stitch, the tension device yielding to the pull of the thread when the stitch is completed, substantially as described.

30. In a sewing-machine, a thread-supply, stitch-forming devices including a shuttle, a take-up arm located between said supply and stitch-forming devices and provided with a sheave, and with means to hold said sheave to act upon the thread with a constant and measured degree of friction to enable it to aid in drawing back the thread in completing the stitch, combined with means to move said arm positively, to give up to the shuttle the necessary thread-loop to pass around it, and thereafter to take up said thread, substantially as described.

31. In a sewing-machine, a thread-supply, stitch-forming devices, including a rotatable shuttle, a take-up arm to draw thread from the supply during one direction of its movement, and to give up thread to the shuttle as required thereby in the formation of the loop, said arm having at one end a sheave, and means to hold the said sheave to act upon the thread with a constant and measured degree of friction to enable it to draw back the thread and complete the stitch after withdrawing the loop of needle-thread from the shuttle, combined with means to move said arm positively, substantially as described.

32. In a wax-thread sewing-machine, a vibrating take-up having at its free end a frictionally-held tension-sheave, combined with an arc-shaped heating-surface against which the end of the take-up bears throughout its movement, to thus continuously and uniformly heat the said sheave and the thread as drawn off therefrom, substantially as described.

33. In a sewing-machine, a rotatable shuttle to pass entirely through a loop of thread, having a non-continuous cylindrical flange projecting rearwardly from the periphery of

the shuttle-body, one end of said flange tapering in the direction of its length to form a hook-and-loop spreader, substantially as described.

34. In a sewing-machine, stitch-forming devices comprising a hooked needle, a circularly-moving shuttle, and a looper, combined with a take-up having a frictionally-held sheave thereon, adjusting means for said sheave, to cause it to act with a constant and measured degree of friction upon the thread, actuating mechanism for the take-up and looper, whereby the former gives up thread to the looper as it lays the thread in the hook of the needle, and needle and shuttle actuating means, continued movement of the take-up giving up needle-thread as the loop thereof passes around the shuttle, substantially as described.

35. In a sewing-machine, a hooked needle, a looper, a take-up having a frictionally-held sheave carried by and moving with it, means to move the looper to lay the thread into the hook of the needle and to provide sufficient thread for one side of the loop, a controlling device for the sheave, to cause it to act constantly and uniformly upon the thread, and take-up actuating mechanism, the take-up first giving up thread to the looper and thereafter continuing its movement in the same direction to give up the necessary thread for the other side of the loop, substantially as described.

36. In a sewing-machine of the class described, the following instrumentalities, viz: a curved hooked needle, a circularly-movable shuttle, a looper, and a take-up provided at its end with a frictionally-held sheave about which the needle-thread is wound, combined with means to move the said devices in the order substantially as described, whereby the take-up is made to give up to the looper the thread to be presented to the hook of the needle, and then by a further movement in the same direction give up sufficient needle-thread to enable the shuttle to pass through a loop therein, when the take-up by a movement in the reverse direction pulls the thread of the loop discharged from the shuttle directly back from the work on which the stitch is made and completes the stitch, substantially as described.

37. In a sewing-machine of the class described, the following instrumentalities, viz: a curved hooked needle, a circularly-moving shuttle having a point to enter and expand the loop of needle-thread, combined with a take-up provided with a frictionally-held sheave, and means to move said sheave toward the material while the shuttle is passing through the loop of needle-thread, and to move it away from the material after the loop of needle-thread has been carried around the shuttle, whereby the sheave is enabled to exert a direct pull on the needle-thread extended from it to the material when completing the stitch, substantially as described.

38. In a sewing-machine, a rotatable shuttle having a contained bobbin, an independent face-plate having a recess in its face below the path of the thread, a finger to engage and move a portion of the thread into the recess to measure a fixed quantity of shuttle-thread, and means to actuate the finger at predetermined times, and an adjusting device to regulate the movement of the finger and thereby the amount of shuttle-thread drawn off, substantially as described.

39. A circularly-moving shuttle having a hook provided with an inwardly-inclined breast, said shuttle having at its rear side an inwardly-directed groove, one side of which presents a bevel substantially tangent to the path of the needle, and a non-continuous flange extended toward but within the plane of the back of the shuttle to form the other side of said groove, said flange being tapered to join the base of the shuttle-hook, combined with a curved hooked needle adapted to enter said groove adjacent the stitch-forming point, the tapering part of said flange and the inclined breast of the hook serving to lift the thread from the hook of the needle, substantially as described.

40. In a sewing-machine, a circularly-moving shuttle provided with a hook and having at its rear side a groove leading from the side of the point of said hook, combined with a curved, hooked needle to enter and stand in said groove during the passage of the shuttle through the loop of needle-thread, whereby the point of the needle may remain close to the stitch-forming point, in position to have the thread taken from it by the hook of the shuttle, substantially as described.

41. In a sewing-machine of the class described, a shuttle having at its median line a hook provided with an inclined breast, and having a groove in its body extended inwardly to the plane of the path of the shuttle-hook point, combined with a curved hooked needle adapted to enter said groove, and stand when fully retracted with its hook substantially in the path of rotation of said hook-point, substantially as described.

42. In a sewing-machine of the class described, a curved hooked needle to form a loop, a work-support, a circularly-movable shuttle located above the work-support and provided with a bobbin-case, and a face-plate provided with a thread-delivering nose extended to the periphery of the shuttle, the said nose receiving and aiding in delivering the cast-off loop of needle-thread close to the material, substantially as described.

43. In a sewing-machine of the class described, a work-support, a curved hooked needle, a circularly-movable shuttle located in a vertical plane above the said work-support and at right angles to the path of the needle, said shuttle having its periphery oppositely beveled and having a hook the point of which is at one side of the median line of the shuttle, said shuttle having at its rear side and wholly within its body a groove open at the

heel of the shuttle, and means to move the said shuttle at a variable speed to cause the needle to operate to take the needle-thread between the heel and point of the shuttle-hook, substantially as described.

44. In a sewing-machine of the class described, a looper, a curved hooked needle and a shuttle, and means to move them, combined with a take-up arm provided with a frictionally-held thread-sheave, a controlling device for said sheave to cause it to act constantly and uniformly upon the thread, and means to move said armor-sheave in one direction to supply the thread required by the looper, the needle and the shuttle, and to move them in the opposite direction after the loop of needle-thread has been passed around the shuttle to draw the discharged loop back through the material, the take-up at all times keeping the thread taut between it and the devices manipulating it in the formation of the loop and taking up the loop as soon as discharged from said devices, substantially as described.

45. In a sewing-machine of the class described, a work-support, having a recess therein, a guide-roll at the lower portion thereof and a take-up movable toward and from said guide-roll, combined with a yielding hook mounted in the recess in the work-support and in engagement with the thread between said guide-roll and the material, to normally deflect the thread slightly, but permitting the thread to assume a straight line when under tension to compensate for stretch in the thread, substantially as described.

46. In a sewing-machine of the class described, a shuttle having a hook and provided at its rear side, within the plane of the back of the shuttle, with a circular groove which extends through the heel and the side of the hook adjacent its face, combined with a grooved needle, the point thereof when retracted remaining in said groove, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS GODDU.

Witnesses:
GEO. W. GREGORY,
JOHN C. EDWARDS.