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L. GODDU.

SOLE SEWING MACHINE.

No. 581,819. Patented May 4, 1897.

Fig. 1a.

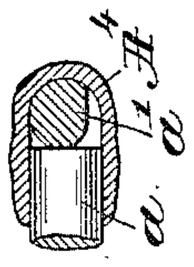

Fig. 1.

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L. GODDU.

SOLE SEWING MACHINE.

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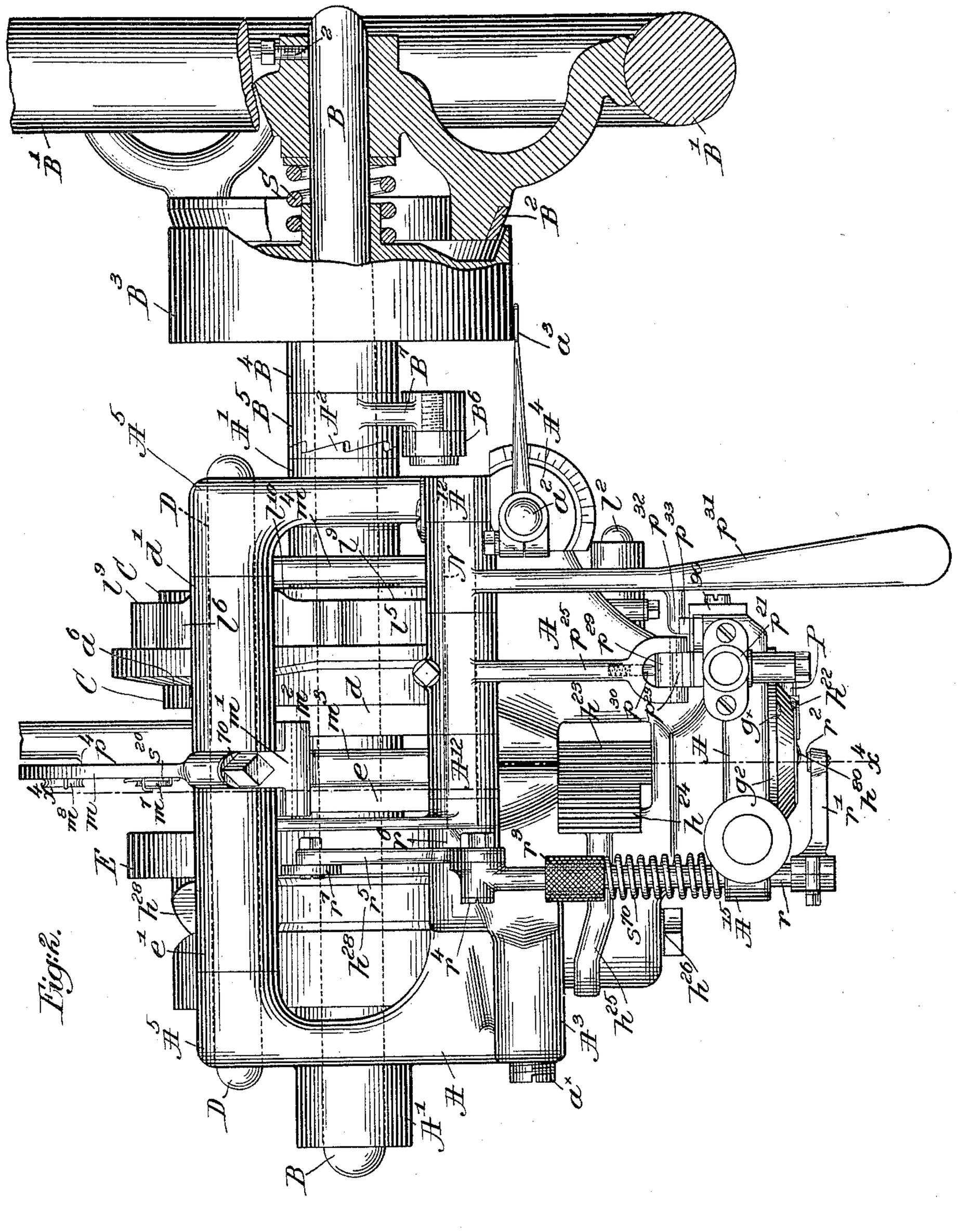

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L. GODDU.

SOLE SEWING MACHINE.

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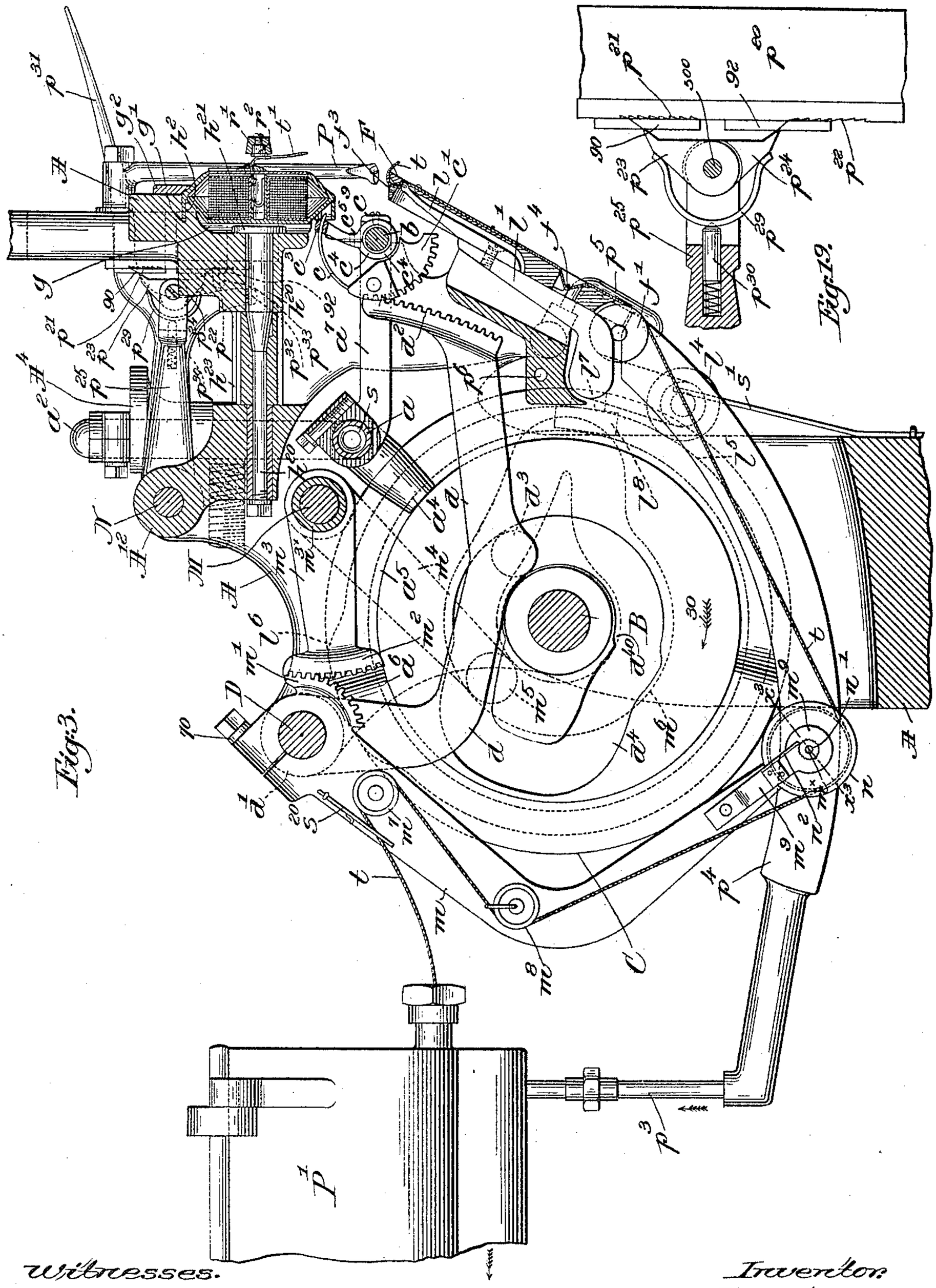

Fig. 3.

Fig. 19.

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SOLE SEWING MACHINE.

No. 581,819. Patented May 4, 1897.

Fig. 6a.

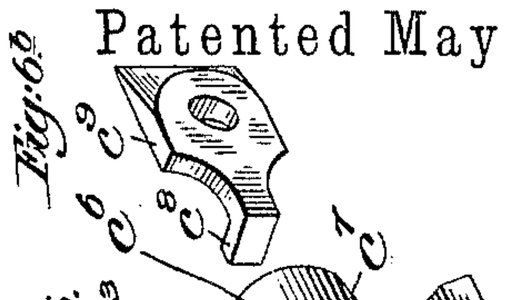

Fig. 6.

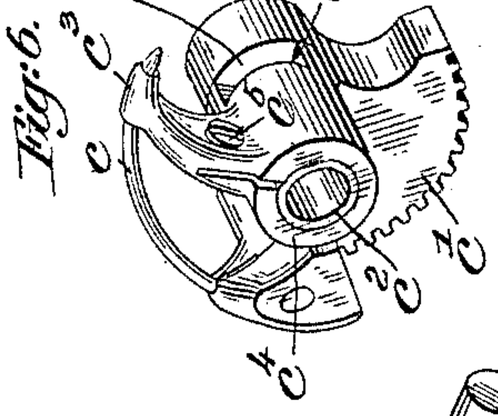

Fig. 3a.

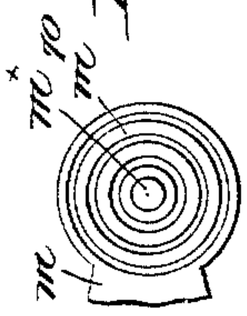

Fig. 3b.

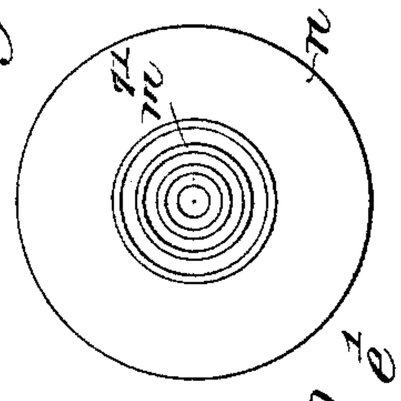

Fig. 5.

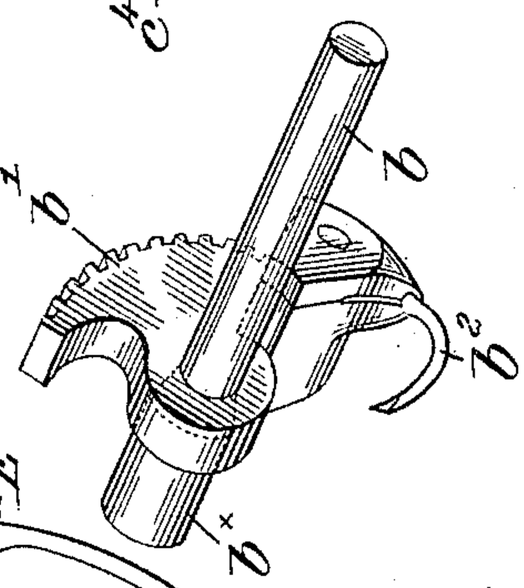

Fig. 4.

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SOLE SEWING MACHINE.

No. 581,819. Patented May 4, 1897.

Fig: 7.

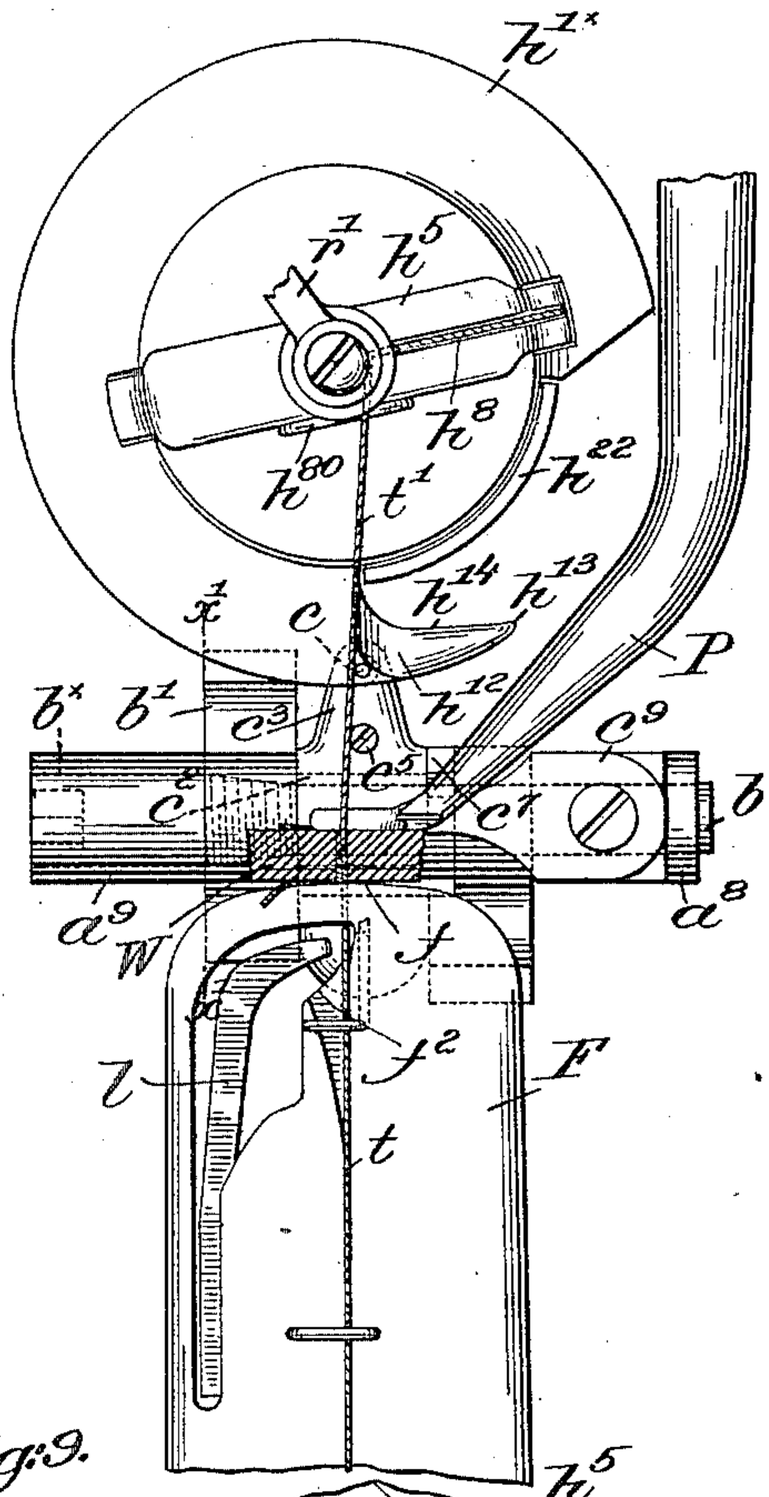


Fig: 8.

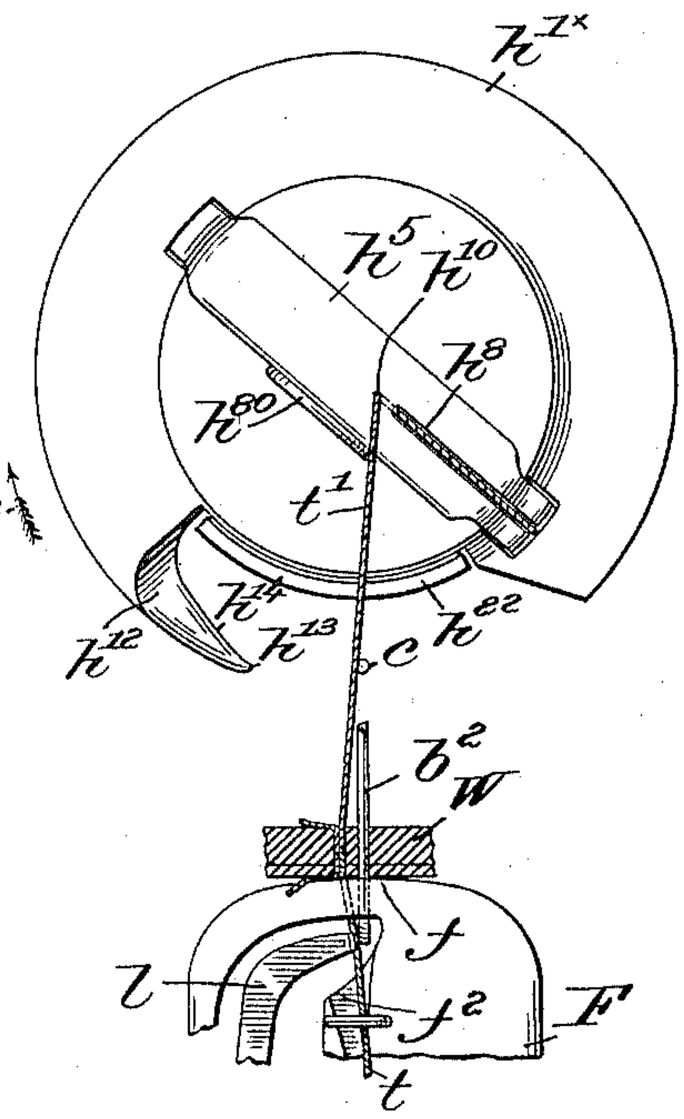


Fig: 9.

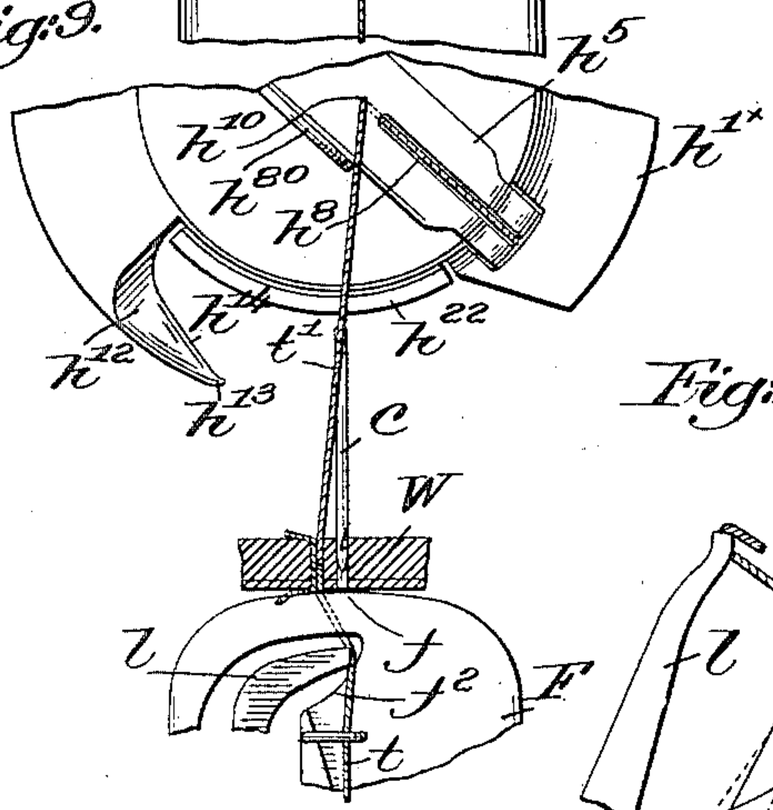


Fig: 10.

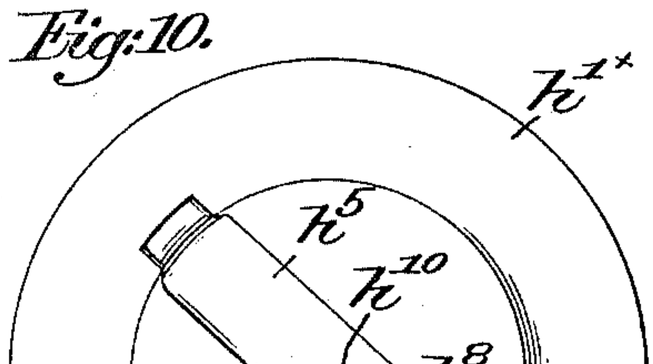
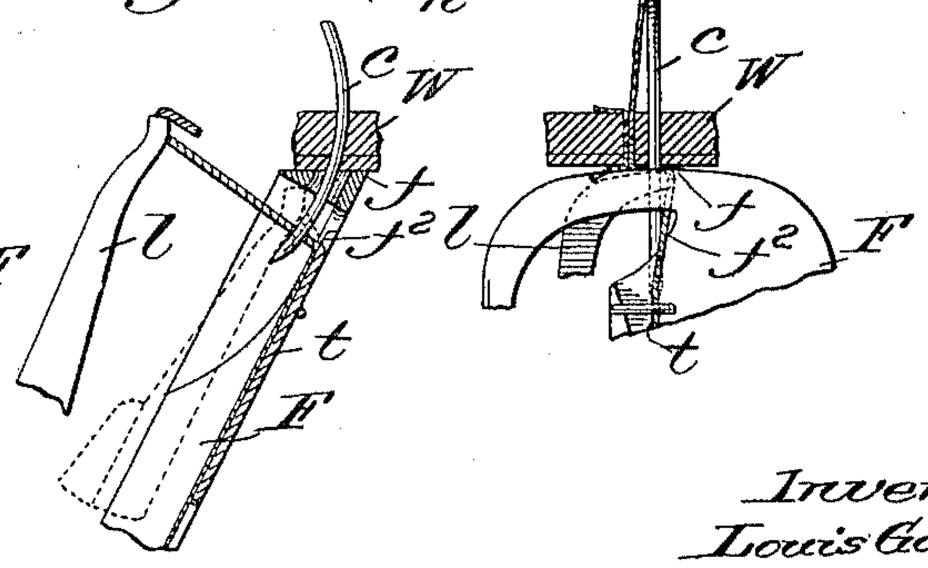


Fig: 10a.



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SOLE SEWING MACHINE.

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Fig: 11.

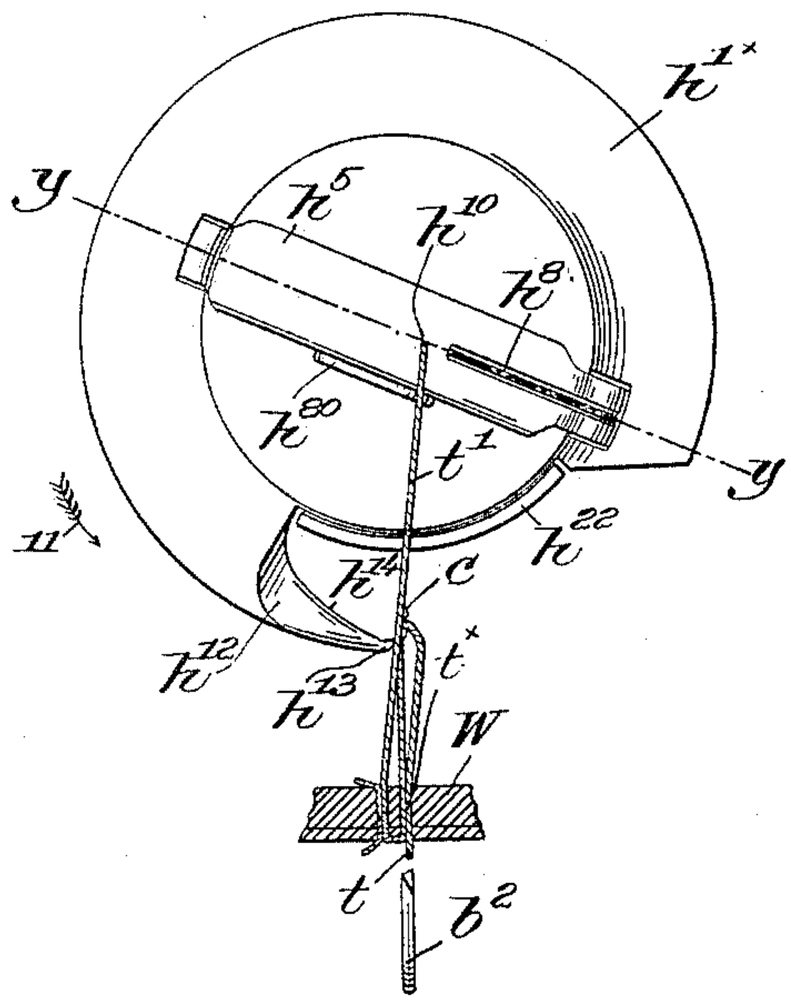


Fig: 12.

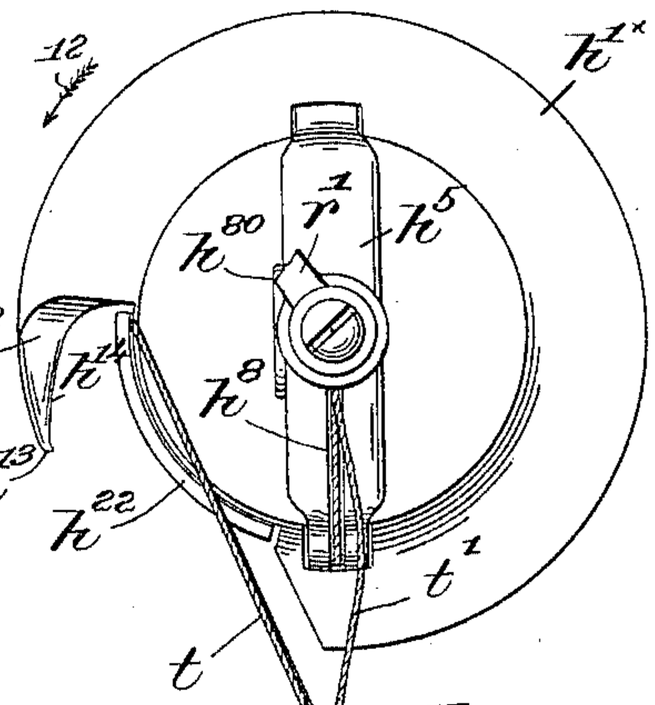


Fig: 13.

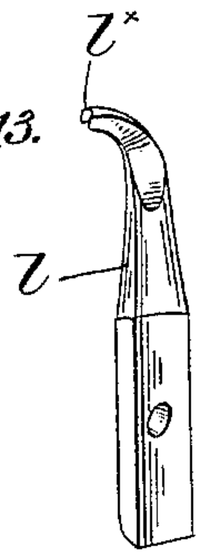


Fig: 17.

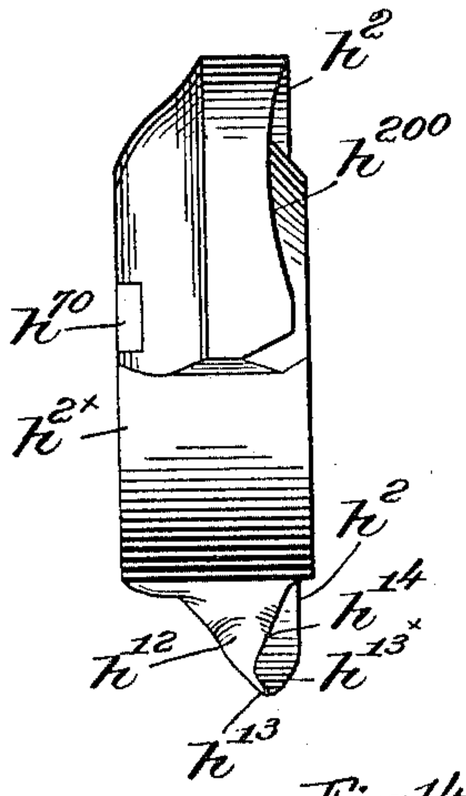


Fig: 14.

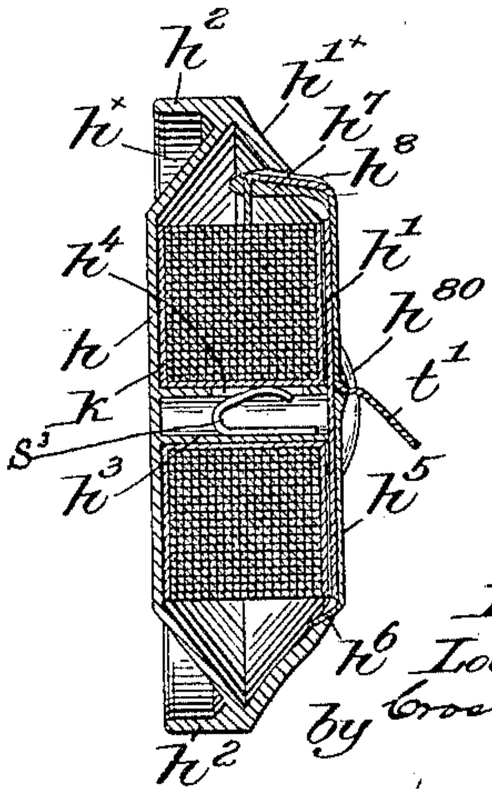
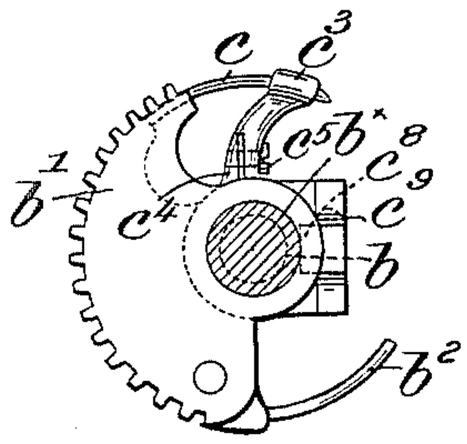


Fig: 6a.



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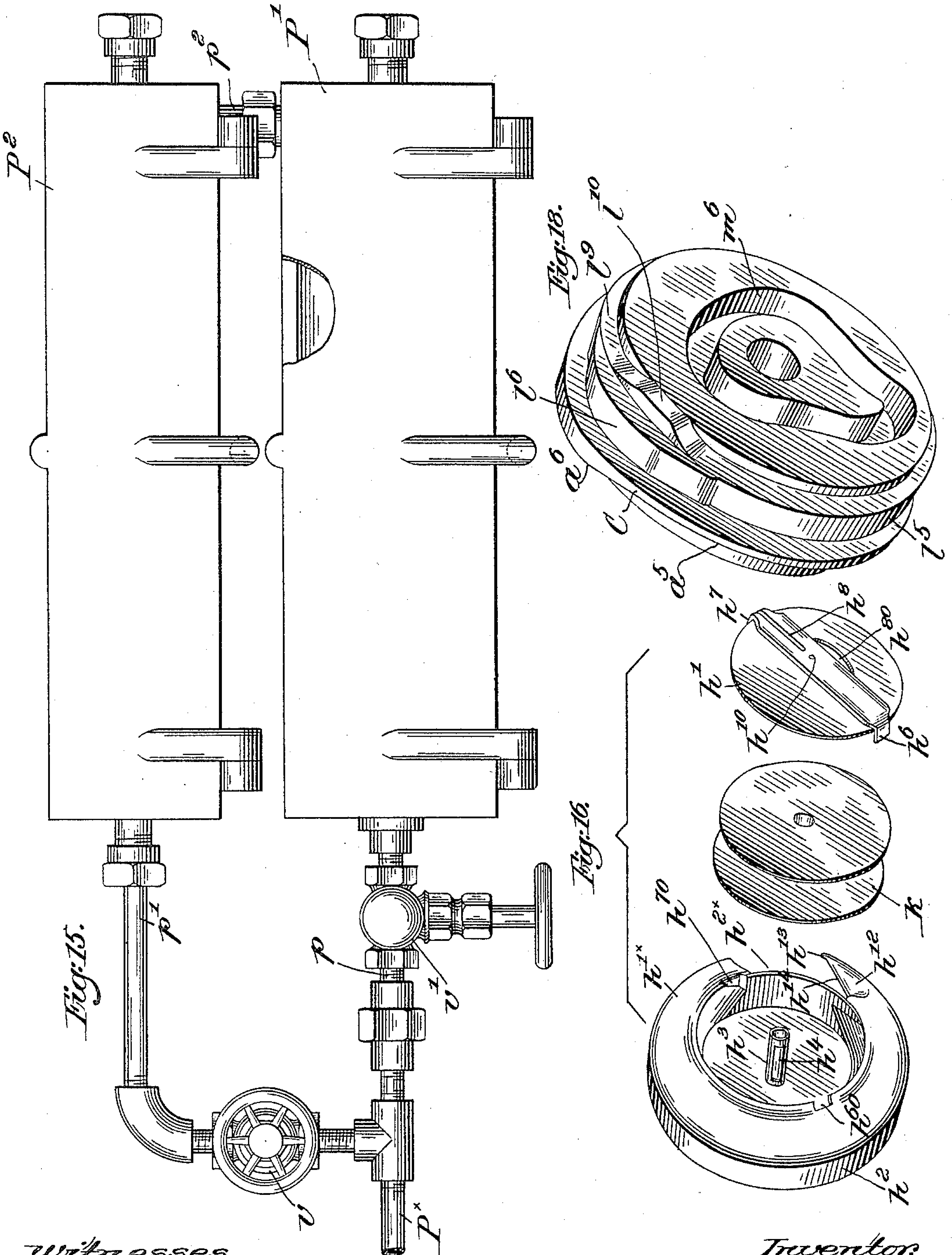

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UNITED STATES PATENT OFFICE.

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

SOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 581,819, dated May 4, 1897.

Application filed January 2, 1896. Serial No. 574,042. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GODDU, of Winchester, county of Middlesex, 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.

In this invention the position within the work of the interlocking portion of the threads for each stitch is determined by or through the shuttle-thread, a fixed length of such thread 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.

By the invention to be hereinafter described the shuttle or bobbin thread, after it has been drawn off or measured, is locked during the remainder 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.

Figure 1 is a front elevation, partially broken out, of a sole-sewing machine embodying my invention, the lower part of the head or frame and its 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. 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 a 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 bobbin-carrier, work-support, and presser-foot, the needle and awl being retracted, the bobbin-carrier being stationary and protecting the point of the needle. 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 bobbin-carrier having been moved in the direction of the arrow 8 to uncover the needle; 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 bobbin-carrier as moving in the direction of the arrow 11 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 bobbin-carrier has made nearly a complete revolution in the direction of the arrow 12, carrying the loop of needle-thread around the bobbin-carrier and the bobbin-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 set. Fig. 13 is a perspective view of the looper detached. Fig. 14 is a transverse sectional view of the bobbin-carrier and its bobbin, taken on the line $y\ y$, Fig. 11. Fig. 15 is a top or plan view of the wax-pot. Fig. 16

is a perspective view of the bobbin-carrier, bobbin, and removable end for the carrier. Fig. 17 is a side elevation of the bobbin-carrier, looking toward the loop-taking point. Fig. 18 is a perspective view of the looper-actuating cam, and Fig. 19 is a detached detail view in elevation of the presser-controlling mechanism.

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, (not shown herein,) 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 its upper end to an arm B^7 of the sleeve, throwing 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 and provided at its upper end with a suitable handpiece a^3, by which the vertical shaft a^2 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 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, which engages the inturned lug c^8 of a guard-stop 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, 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′*, 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^3, it being retained in such position while the bobbin-carrier is rotated to interlock the bobbin 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 bobbin-carrier 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 is led from the take-up about a guide-sheave f' at the lower end of the work-support and thence along a 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 thereat, as shown best in Fig. 7, 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 and 4,) the awl also passing through said opening f^3 to penetrate the work from below.

The work-support is 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 18 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.

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 and within the arc of the needle-path, as in dotted lines, Fig. 10^a, so that the needle when it descends may pass in front of the looper and between it and the inclined thread-guide f^2.

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 from the take-up to form one side of the loop, the looper 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. 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 intermittingly-rotatable bobbin-carrier. (Shown in section in Figs. 3 and 4 and on a larger scale in Figs. 14, 16, and 17.)

The bobbin-carrier is discoidal in shape, having a substantially circular closed end *h*, the annular side walls $h^{\times}$ and $h'^{\times}$ of the body portion flaring oppositely from the ends of the body and being cut out interiorly from near the heel to near the point of the carrier, as shown in Fig. 14, to reduce weight.

At the greatest circumference of the side walls is formed a cylindrical lip or flange h^2, concentric to the axis of the bobbin-carrier, the inner and outer faces of the flange forming bearing-surfaces to support the bobbin-carrier in its movements.

A hollow stud h^3 is erected on the inner side of the closed end *h* of the bobbin-carrier, and it is longitudinally slotted at h^4 to permit a bent spring s^3 within the stud to project therefrom and engage the hub of a bobbin *k*, upon which the bobbin-thread *t'* is wound, the bobbin being slipped on or removed from the stud h^3 when the removable end or cover *h'* of the bobbin-carrier is removed. This removable end *h'* is retained in place when the bobbin-carrier is in operation by a retaining device (shown as an elongated metallic plate h^5) secured thereto, one end of the plate being made as a spring h^6 to pass within a notch h^{60} in the side wall of the bobbin-carrier, while the other end is bent over and laterally grooved to pass through a second notch h^{70} in the side wall of and enter some distance within the bobbin-carrier, as at h^7, at one side of the bobbin.

As shown in Fig. 14, the bobbin-thread guide h^7 draws the bobbin-thread over from the side of the bobbin, free rotation of which is prevented by the spring s^3, so that overrunning or entangling of the thread is prevented, a positive pull thereon being necessary to draw off the measured or fixed quantity for the formation of each stitch. A hole in the inner extremity of the bent portion h^7 receives the bobbin-thread and acts as a guide therefor, the thread being led thence to a longitudinal groove or recess h^8 in the outer side of the plate h^5, (see Fig. 12,) said groove terminating in a hole leading to the under side of the plate. The thread passes through this hole under the plate and then out again through a hole h^{10}, eccentric to the center of rotation of the bobbin-carrier, so that supposing the starting position of the bobbin-carrier to be either as shown in Figs. 8, 9, or 10 movement therefrom in the direction of the arrow 11, Fig. 11, until the hole h^{10} occupies its highest position relative to the work-support will draw off a measured or fixed length of bobbin-thread from the bobbin to provide the requsite bobbin-thread for the next stitch.

The body of the bobbin-carrier and the flange h^2 are cut away at $h^{2\times}$, Figs. 16 and 17, 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 Fig. 17) 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 $h^{13\times}$, Fig. 17, acting to lift the loop out of the hook of the needle, while the upwardly and rearwardly inclined edge h^{14} of the said hook acts to spread the loop of needle-thread as the bobbin-carrier continues to move in the direction of the arrow, Fig. 11.

As the bobbin-carrier 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 bobbin-carrier to be interlocked with the portion of bobbin-thread which is simultaneously measured off, so that when the hook or loop-taker arrives at the position shown in Fig. 12 the loop of needle-thread is being drawn off from the bobbin-carrier by the take-up, the measured portion of bobbin-thread passing therethrough being at such time slack and locked, as will be described, so that no more can be drawn from the bobbin for that stitch.

As the loop of needle-thread is drawn down into the work W it will interlock with the measured or fixed length of bobbin-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 on the bottom of a channel made therein, said distance being regulated by the length of the bobbin-thread measured or drawn off.

As the measured portion is always of the same 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—that 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 bobbin-carrier, while the hook-guard c^3 covers the opening of the hook.

Above the 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 bobbin-carrier to sustain it in position to be intermittingly oscillated, 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 bobbin-carrier and retaining it in place.

Referring to Fig. 17, I have shown the flange h^2 near its heel as cut away to leave a clearance h^{200} to permit the loop of needle-thread to pass over and about the bobbin-carrier as freely and easily as possible as the take-up comes forward to permit it.

Referring to Fig. 3, a shaft h^{20} is supported in bearings in the head and extends forward into the recess g behind the bobbin-carrier, said shaft having at its front end a laterally-extended arm h^{21}, upturned or flanged at h^{22} (see Fig. 1) to enter the cut-away portion of the carrier-body and its flange h^2 to actuate said bobbin-carrier as the shaft h^{20} is oscillated.

It will be seen in Fig. 3 that the loop of needle-thread can pass readily around the bobbin-carrier and between it and the arm h^{21} of the carrier-actuator, the latter having fast thereon a long pinion h^{23} in engagement with a toothed segment h^{24}, formed on one end of a lever h^{25}, fulcrumed in the frame at h^{26} and provided with a roller or other stud h^{27}, entering a peripherally-grooved cam h^{28}, secured to or forming a part of the outer side of the cam-disk E, the shape of the cam-groove being such that the bobbin-carrier will be oscillated intermittingly at the proper time to take the loop and then to release it in the formation of the stitch.

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 bobbin-carrier 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, and thence around suitable grooved sheaves m^7 and m^8 on the lever m, to and completely around a tension thread-sheave n, mounted on the free end of the take-up, from which the needle-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-truck 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 be drawn 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 tension-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 P^2, the former for the needle-thread and the latter for the bobbin-thread, said wax-pots being heated, preferably by steam exhausted therefrom through pipes p p', respectively branching from a common exhaust $P^{\times}$, leading to a suitable point of discharge. The bobbin-thread is only drawn from its wax-pot when winding a 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 this 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 A^{10} 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 A^{10} at the rear, as shown in Figs. 2 and 3, and has formed thereon two sets of oppositely-inclined or reversed ratchet-teeth p^{21} and p^{22} (see Fig. 19) in vertical alinement with each other, coöperating, respectively, with two pawls p^{23} p^{24}, mounted on a stud 500 in the slotted pawl-carrier p^{25}, rigidly secured to a horizontal rock-shaft N, mounted in bearings A^{12} 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 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 case, 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.

As shown best in Figs. 2 and 4, a rod r is mounted to slide horizontally in a suitable bearing A^{15} of the main frame, said rod having depending therefrom at its front end an arm r', carrying a pad r^2, which is located opposite to the delivery-opening h^{10} of the bobbin-carrier when said opening reaches its highest point, a spring s^{70}, surrounding the slide-rod r between the bearing A^{15} and an adjustable nut r^3 on the rod, tending to retract said rod and bring the pad r^2 tightly against the said thread-delivery opening as the take-up is completing the stitch, as has been described, to lock the bobbin-thread

from being drawn off at such time from the bobbin. The slide-rod is pivotally connected at r^4 to a bell-crank lever r^5, the sleeve-like hub r^6 of which is mounted to rock upon the laterally-extended hub $m^{3\times}$ of the take-up-actuating arm m^3, said bell-crank lever r^5 having thereon a roll r^7, held in engagement with the periphery of the cam-disk E, said cam-disk, as shown in Figs. 1 and 4, having a depression r^8 therein for a portion of its length to receive the roll, thereby permitting the spring s^{70} to move the locking-pad r^2 against the bobbin-thread to lock it as the interlocking portions of the loops of needle and bobbin thread are drawn into the work by the loop-taker. The pad r^2 and its actuating mechanism form a bobbin-thread-locking device, for the purposes hereinbefore described.

To prevent any accidental catching of the loop of needle-thread as it is carried around the bobbin-carrier with the bobbin-thread, which might accidentally draw off from the bobbin an additional portion of thread, I have placed a guard h^{80} adjacent the thread-delivery h^{10}, projecting from the face of the cover, to lift the adjacent part of the needle-thread loop over the bobbin-thread at the delivery-opening.

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 the stitch-forming devices.

My invention is not restricted to the precise construction and arrangement 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 hook in the reverse direction from that shown a lock-stitch with a knot at the crossing will be formed.

The take-up mechanism and thread-tension devices coöperating therewith, the presser and its controlling means, the adjusting mechanism for the shaft which supports the feeding-awl, the rotating shuttle having a stationary face-plate provided with a thread-delivery and an external thread-guide, with which cooperates a locking device movable toward and from the guide to control the delivery of the shuttle-thread, the work-support provided with the peculiar thread-guide and the coöperating looper, and the continuously-rotated shuttle having a peripheral flange at the rear end thereof cut away to permit passage of the needle and having a hook at one end of the recess to enter and spread the loop of needle-thread are not broadly claimed herein, as they form the subject-matter of and are claimed in another application, Serial No. 587,183, filed by me April 11, 1896.

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

1. In a machine of the class described, stitch-forming devices, including a bobbin-carrier having an eccentric thread-delivery opening in its face, to draw off a fixed quantity of bobbin-thread, a bobbin, and a locking-finger movable toward and from the carrier-face, to clamp the bobbin-thread thereon at predetermined times and prevent its delivery, substantially as described.

2. A discoidal bobbin-carrier, consisting of a fixed circular end and a removable circular end, an axial bobbin-support on said fixed end, an annular wall connecting and inwardly flared from each of said ends, a non-continuous rearwardly-extended flange on said wall, a hook on one end of said flange, and a retaining device for the removable end independent of said end, substantially as described.

3. A discoidal bobbin-carrier, consisting of a fixed circular end and a removable circular end, an axial bobbin-support on said fixed end, an annular wall connecting and inwardly flared from each of said ends, a non-continuous rearwardly-extended flange on said wall, a hook having a point h^{13}, and a retaining device for the removable end having a thread-delivery opening therein eccentric to the axis of the carrier, substantially as described.

4. A discoidal bobbin-carrier having a fixed end, an axial bobbin-support thereon, a bobbin, means to control its rotation on said support, a removable end for the carrier, and a removable thread-guide within the carrier at one side of the bobbin, substantially as described.

5. A discoidal bobbin-carrier having a fixed end, an axial bobbin-support thereon, a bobbin, means to control its rotation on said support, a removable end for the carrier, and a retaining device therefor having a thread-guide to enter the carrier at one side the bobbin, and a thread-delivery opening in said retaining device eccentric to the carrier-axis, 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.