11 Sheets—Sheet 1.

S. W. WARDWELL, Jr.

Wax-Thread Sewing-Machine.

No. 218,464. **Patented Aug. 12, 1879.**

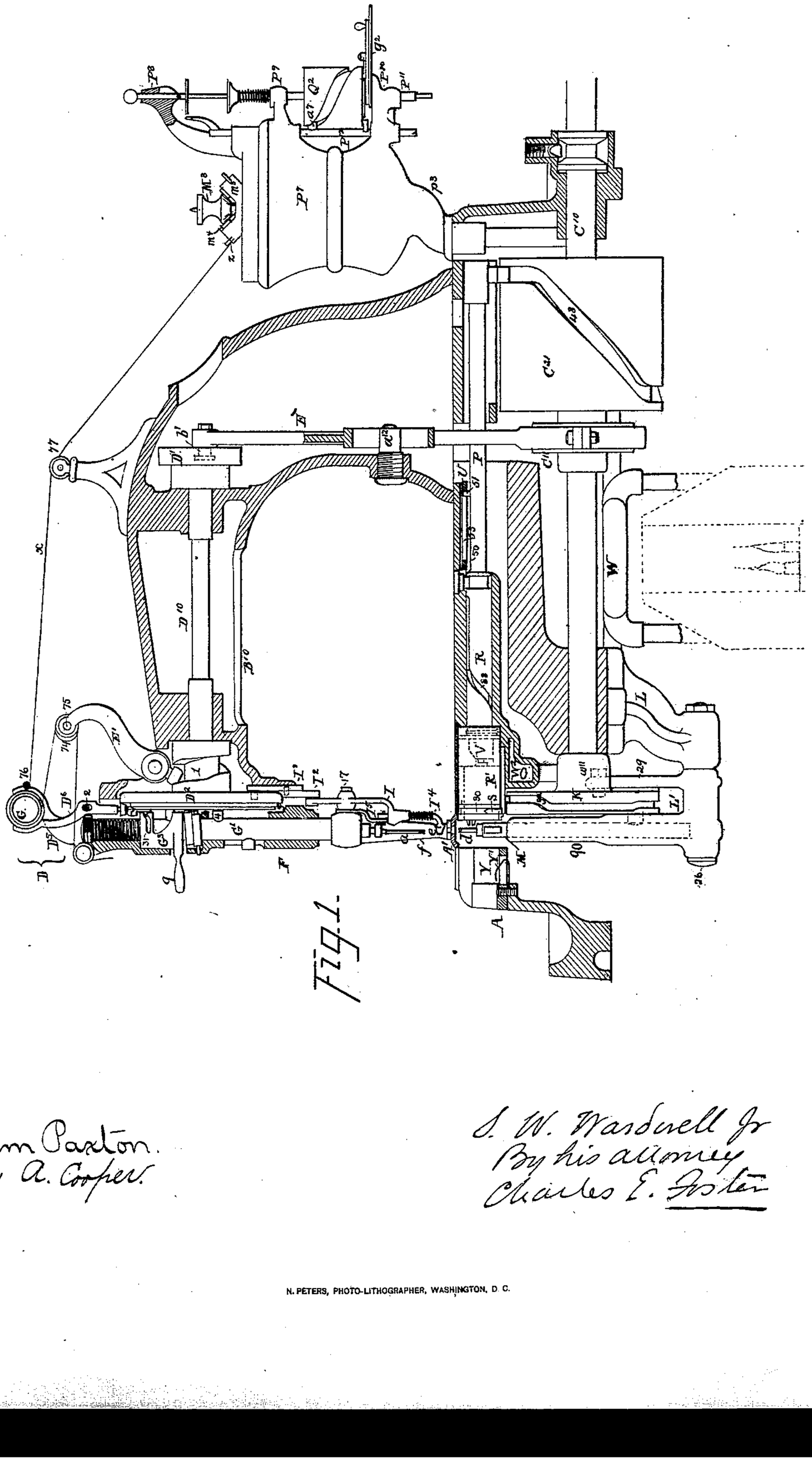

FIG. 1.

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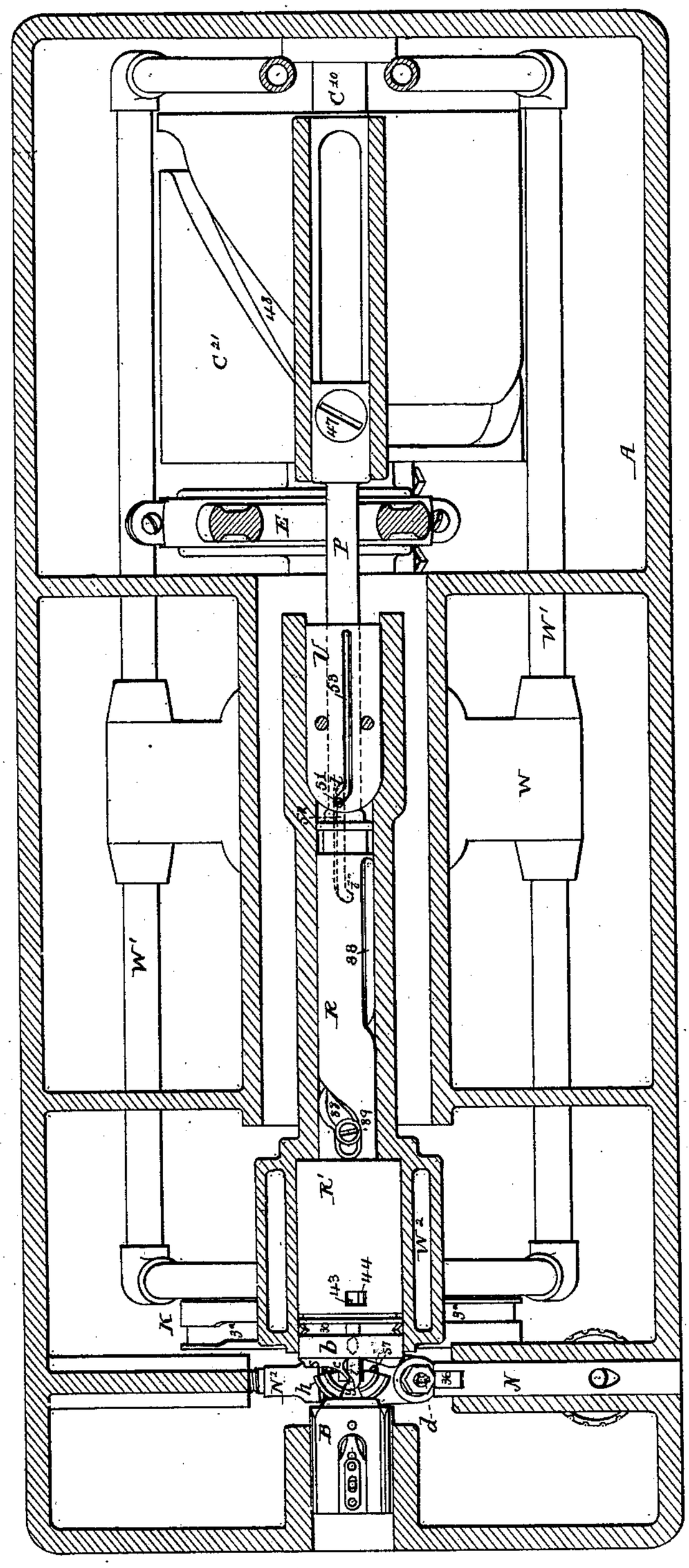

Fig. 2.

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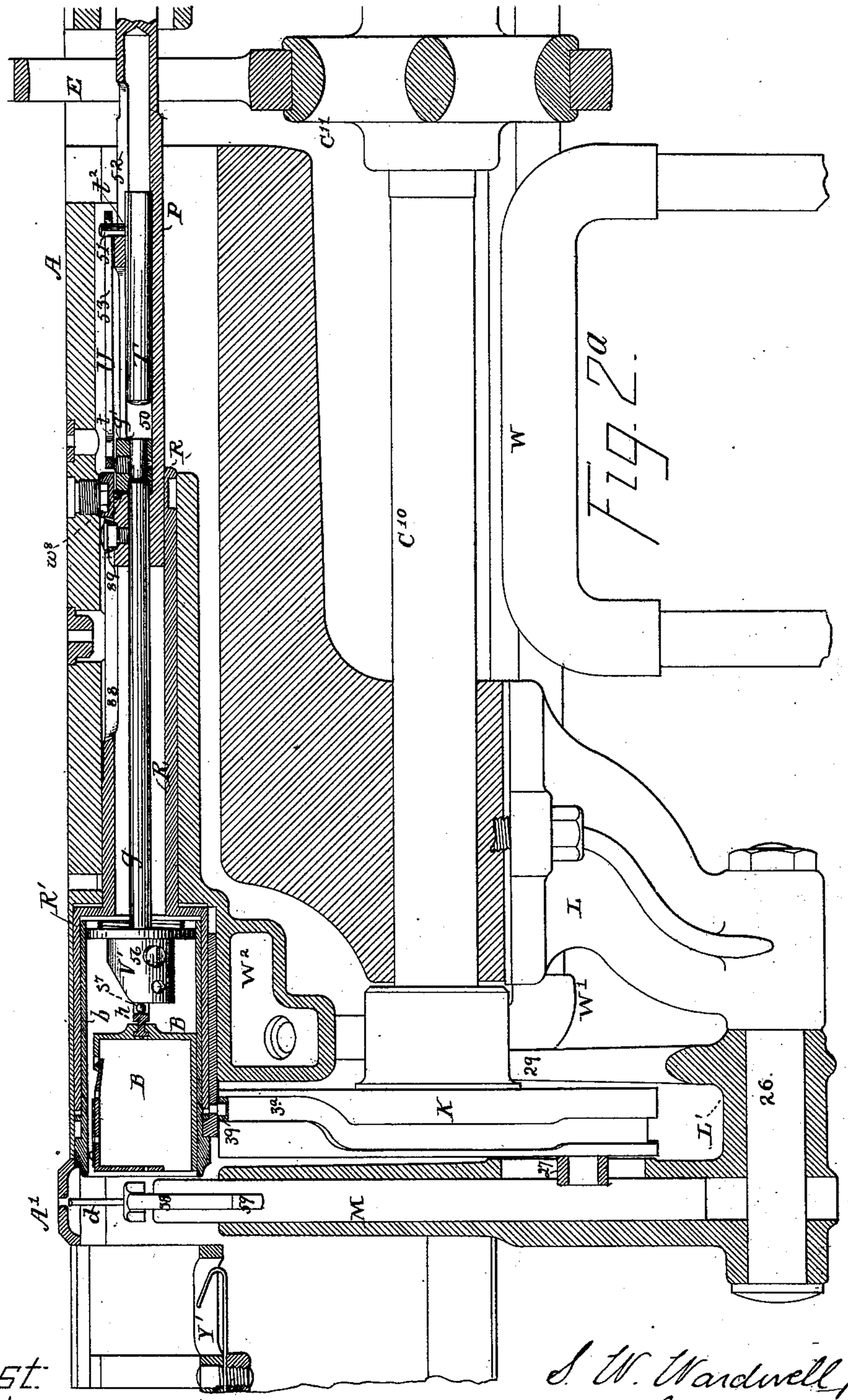

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Wax-Thread Sewing-Machine.

No. 218,464. **Patented Aug. 12, 1879.**

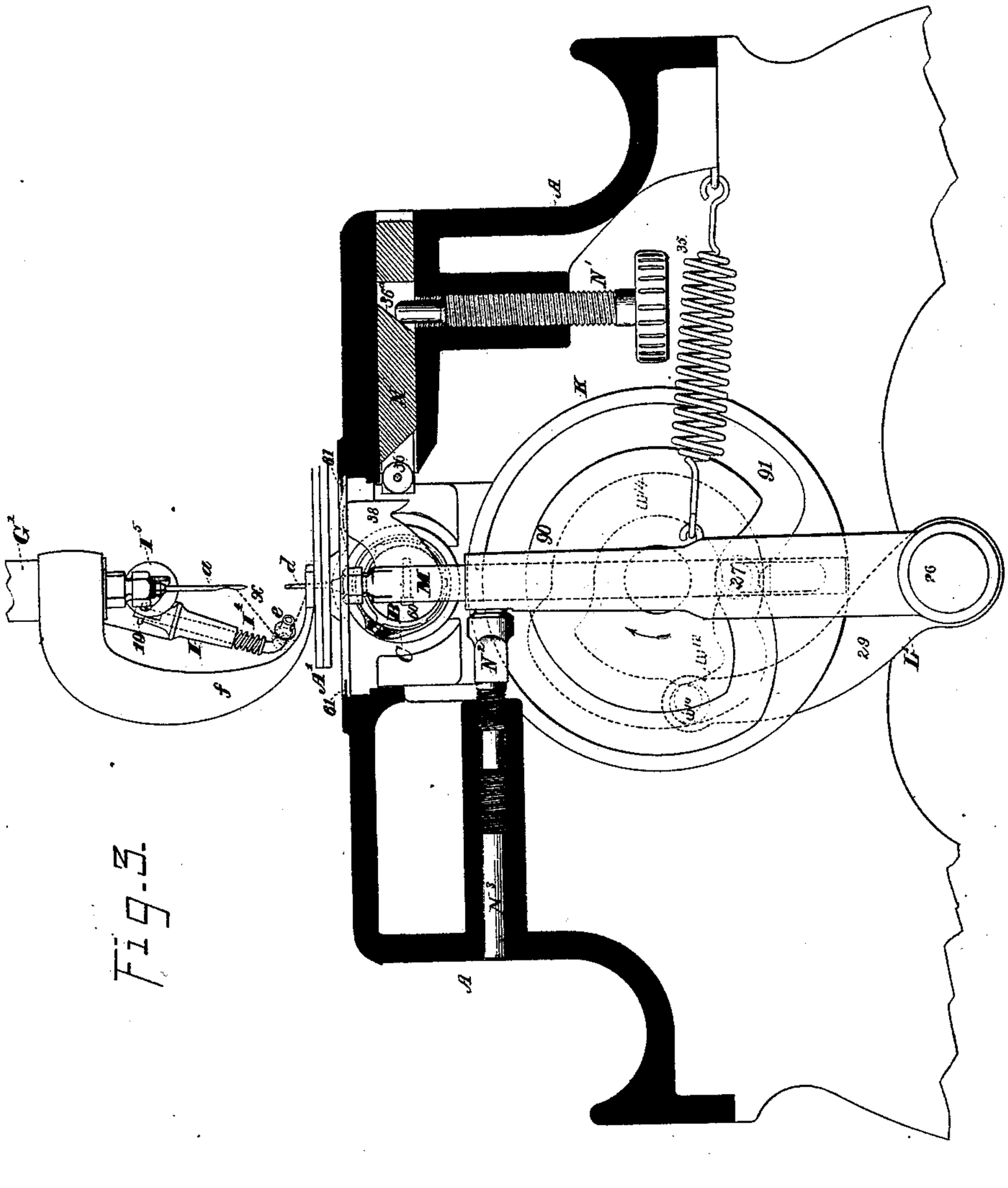

Fig. 3.

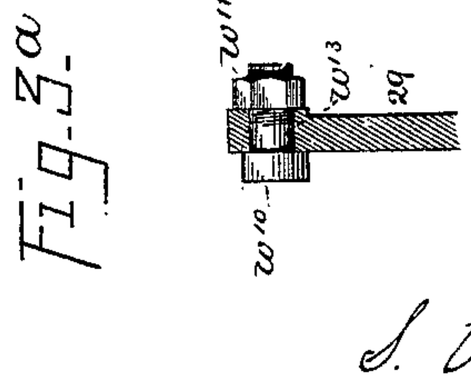

Fig. 3a.

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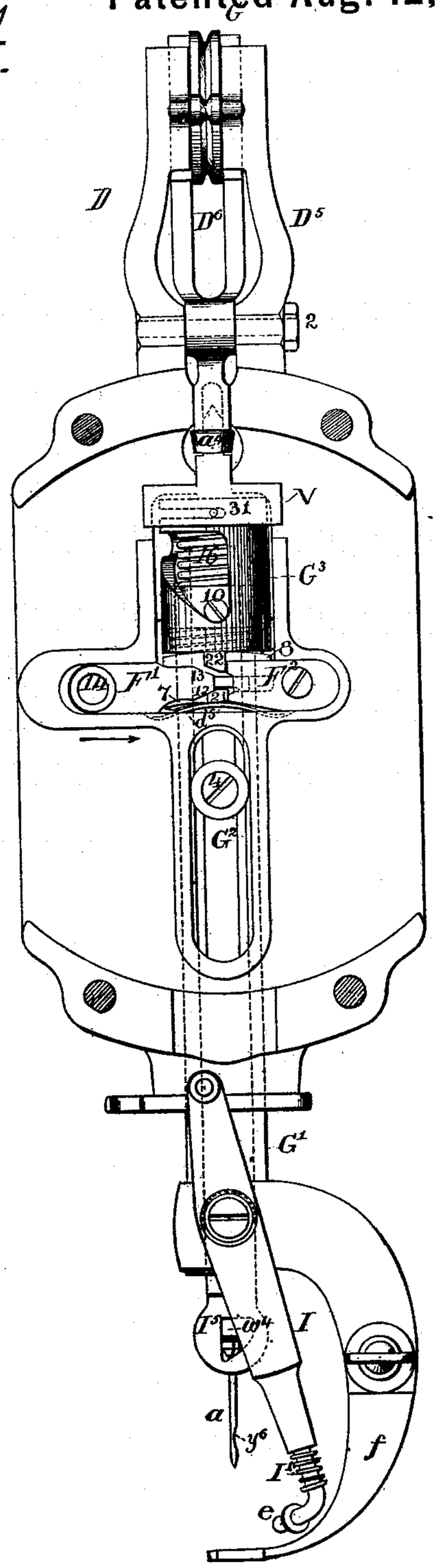
Fig. 4.



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No. 218,464. Patented Aug. 12, 1879.

Fig. 4ª

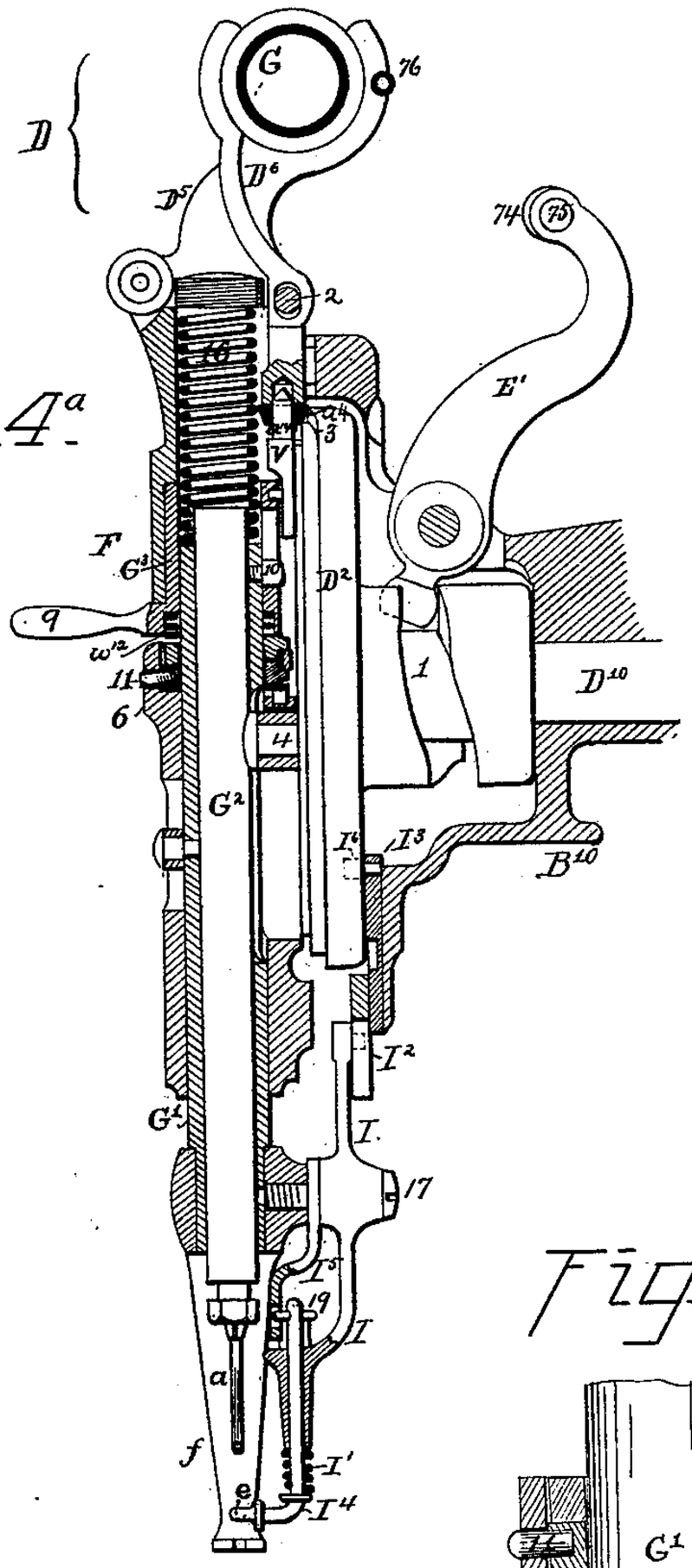


Fig. 5ª

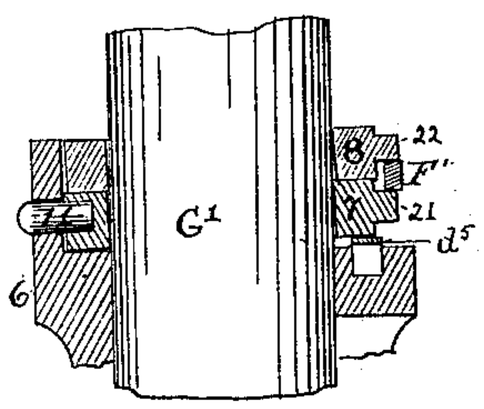
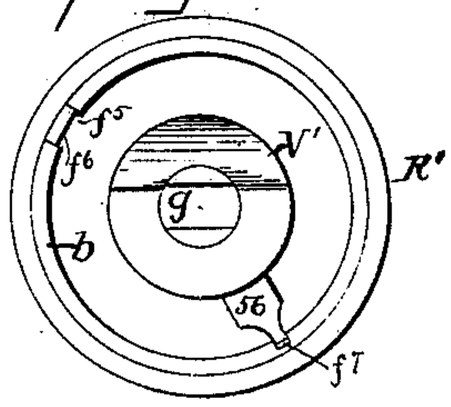


Fig. 6ª



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Wax-Thread Sewing-Machine.

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Fig 5

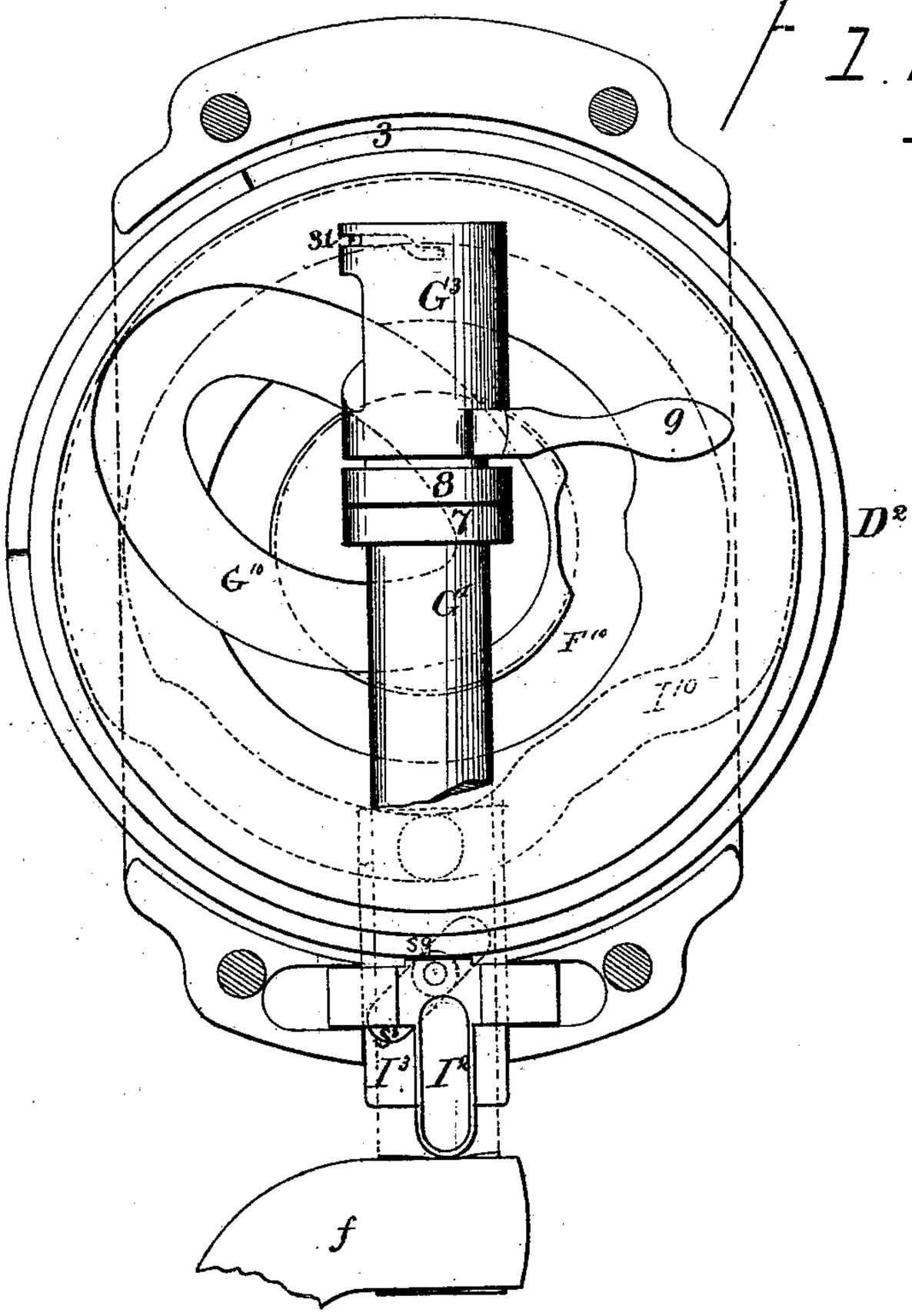
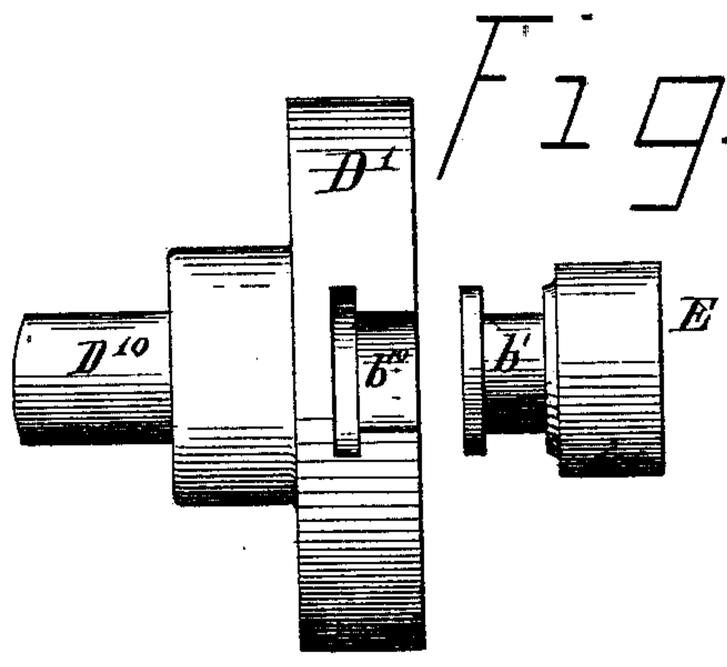


Fig 6



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Wax-Thread Sewing-Machine.

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Fig. 7.

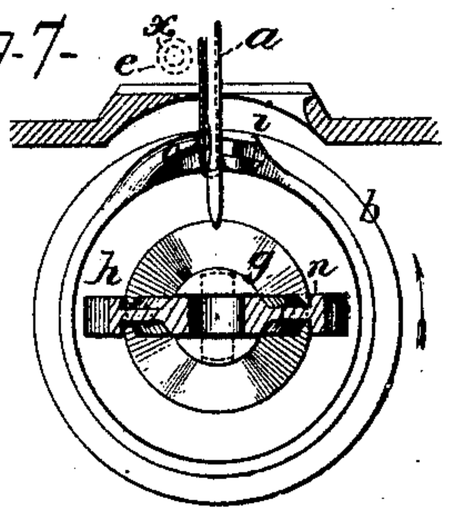


Fig. 8.

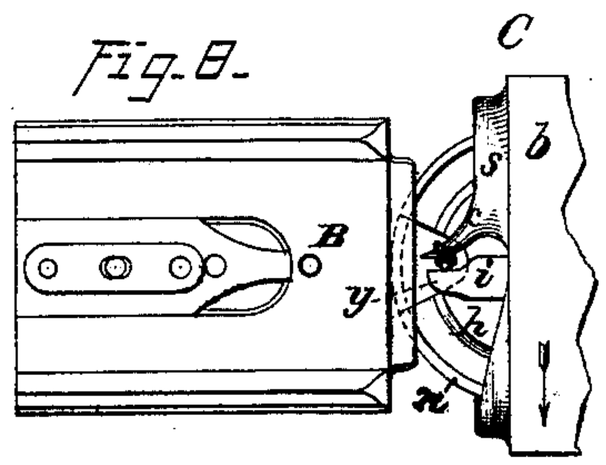


Fig. 14.

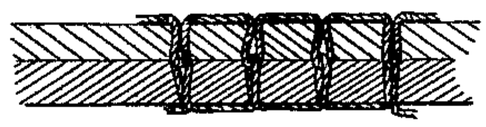


Fig. 9.

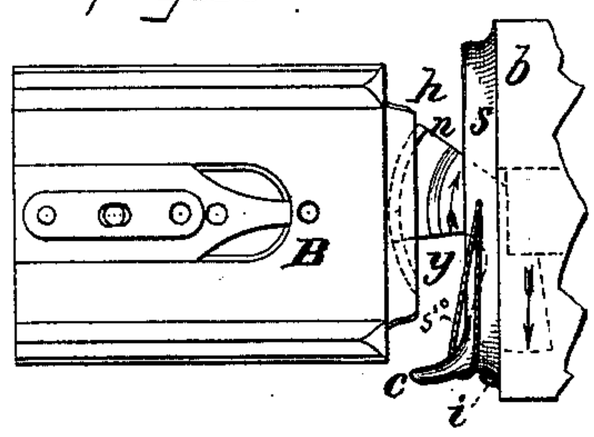


Fig. 10.

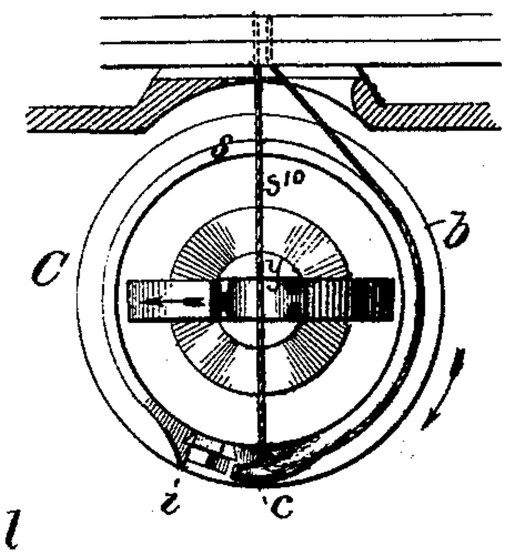


Fig. 13.

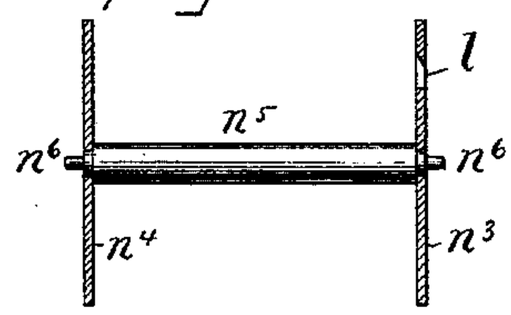


Fig. 11.

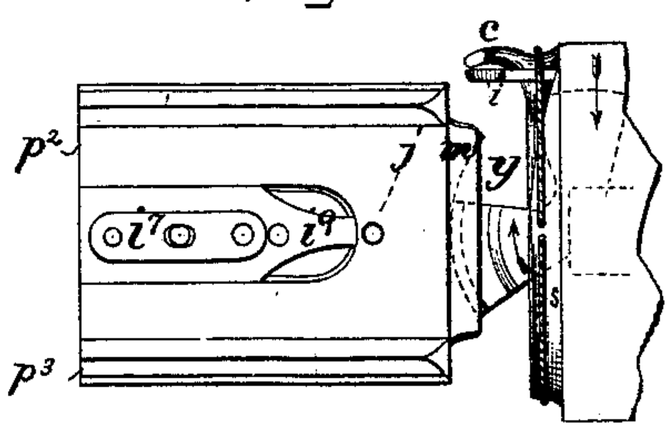
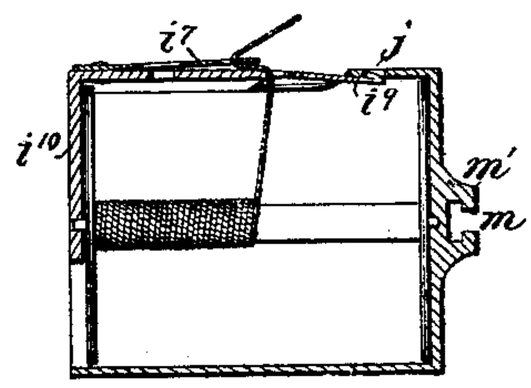


Fig. 12.



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Wax-Thread Sewing-Machine.

No. 218,464. **Patented Aug. 12, 1879.**

Fig. 15.

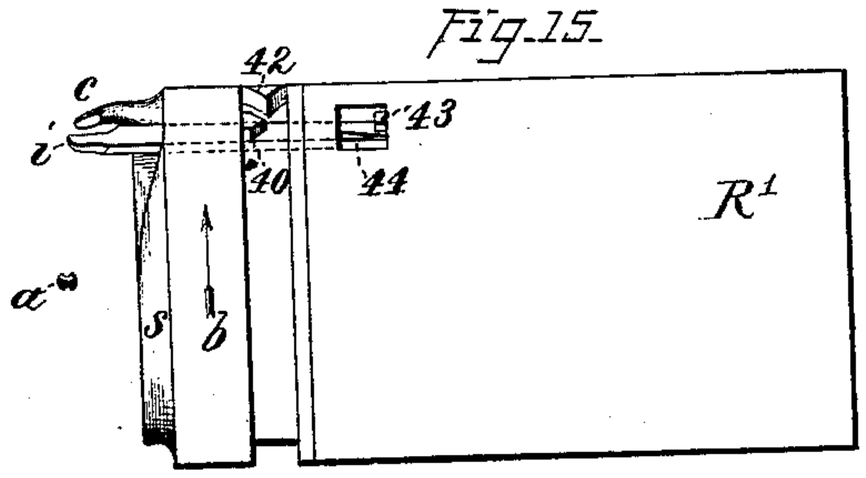

Fig. 16.

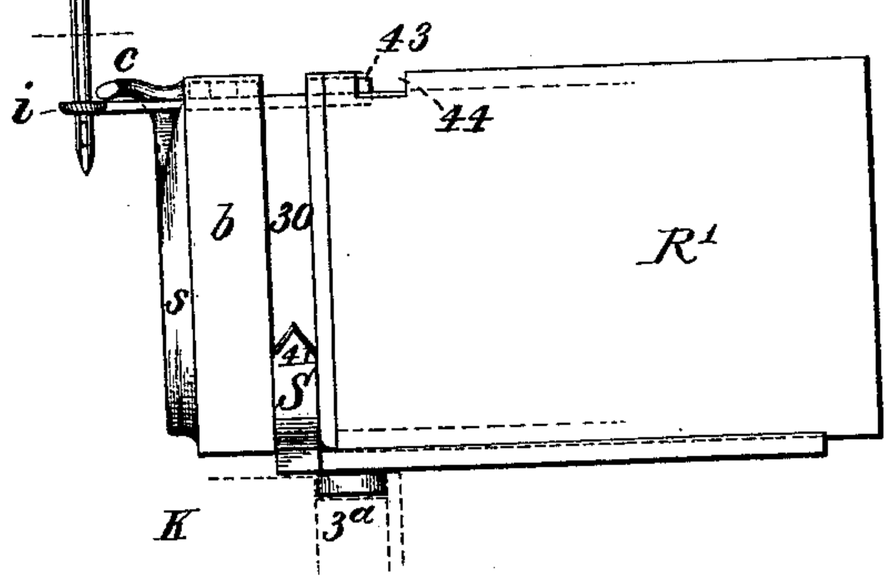

Fig. 17.

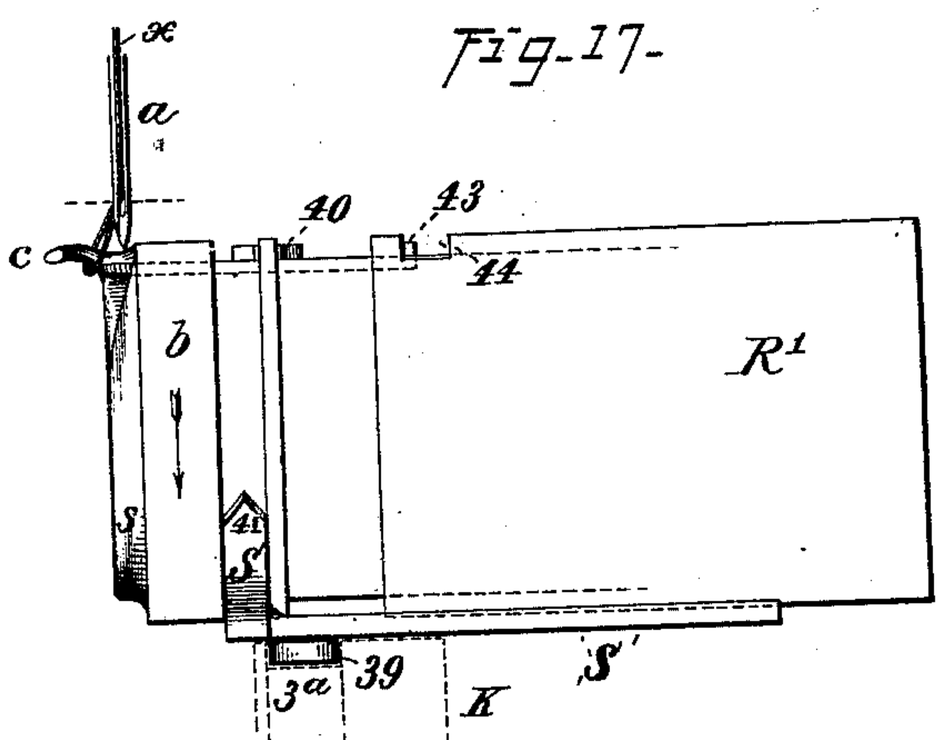

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Fig. 18.

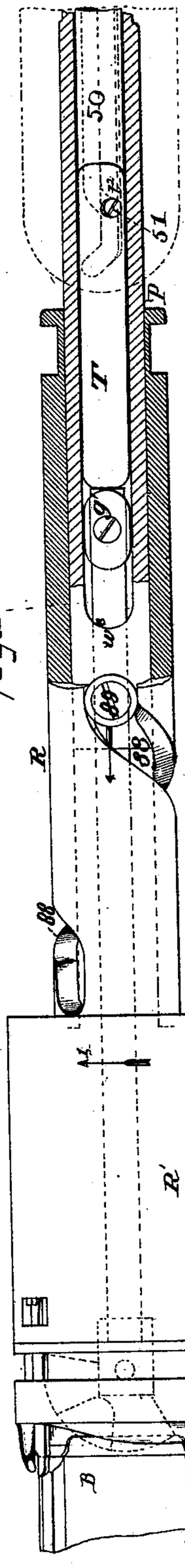


Fig. 19.

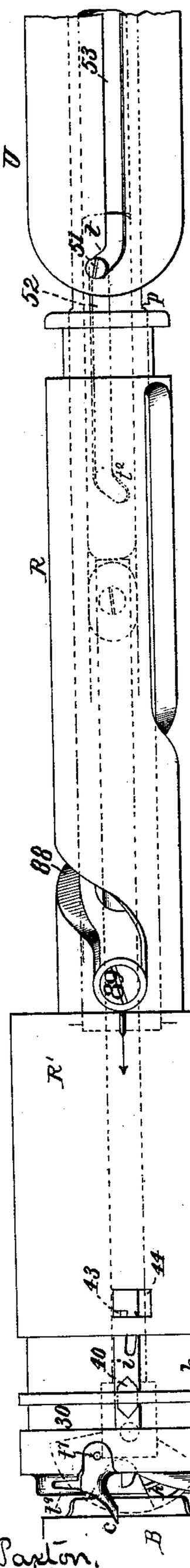
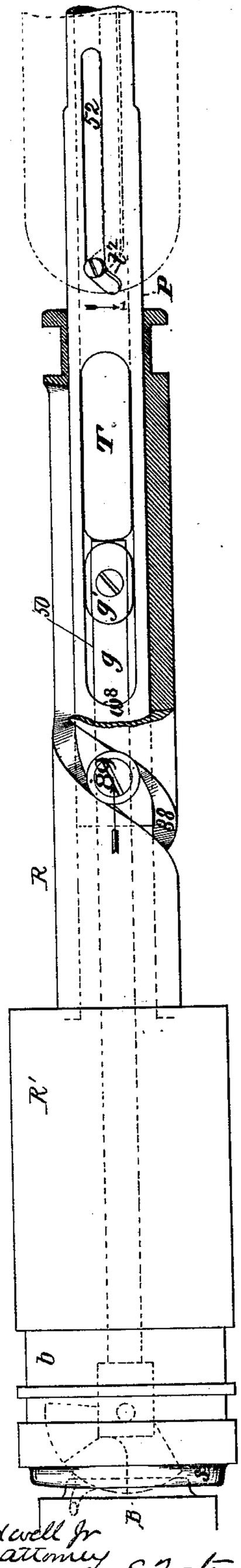


Fig. 20.



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Wax-Thread Sewing-Machine.

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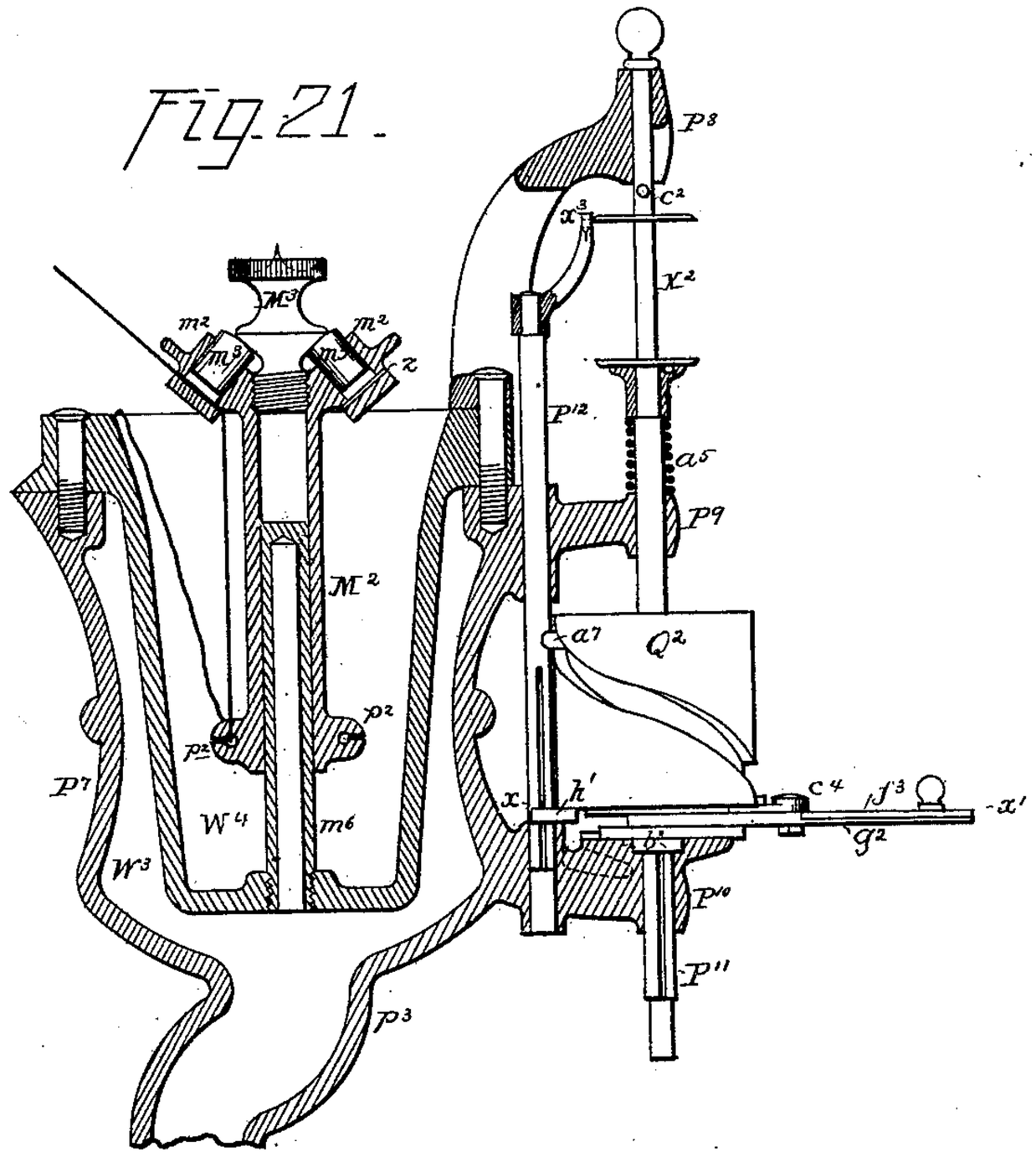
Fig. 21.



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Courtney A. Cooper.

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By his attorney
Charles E. Foster

UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, JR., OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO HAUTIN SEWING MACHINE COMPANY.

IMPROVEMENT IN WAX-THREAD SEWING-MACHINES.

Specification forming part of Letters Patent No. **218,464**, dated August 12, 1879; application filed April 29, 1879.

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, Jr., of Providence, Providence county, Rhode Island, have invented Improvements in Wax-Thread Sewing-Machines, of which the following is the specification.

The main object of my invention is to sew leather and other materials with two waxed threads—that is, with threads thoroughly saturated with shoe-maker's wax—locking said threads at some point between the faces of the material; and this I effect by means of a machine embodying new and improved mechanisms and devices, which will be hereinafter fully described.

In the drawings forming part of this specification, Figure 1 is a sectional elevation of the machine. Fig. 2 is a sectional plan; Fig. 2ª, a partial longitudinal section, showing the devices within the bed or case. Fig. 3 is a partial transverse sectional elevation on the plane of the needle, looking from the front of the machine; Fig. 3ª, a sectional detached view, showing the end of one of the arms of the awl-frame; Fig. 4, a transverse elevation on the plane of the needle, looking from the rear, showing the parts above the work-plate; Fig. 5, a detached view, showing the face of the front cam and parts adjacent thereto; Fig. 6, a detached view, showing the crank-wheel and the end of the connecting-arm; Fig. 4ª, a section of the devices carried by the overhanging arm; Fig. 5ª, a detached section of the presser-bar-locking devices; Fig. 6ª, an end view of the shuttle-carrier and adjacent appliances; Figs. 7, 8, 9, 10, and 11, detached views illustrating the formation of the stitch and the stitch-forming mechanism; Fig. 12, a section of the shuttle or bobbin case; Fig. 13, a section of the bobbin; Fig. 14, a section illustrating the stitch; Figs. 15, 16, and 17, views illustrating parts of the stitch-forming mechanism; Figs. 18, 19, and 20, detached views, showing devices for operating the stitch-forming mechanism; and Fig. 21, the wax-pot and bobbin-winder in section.

The invention is comprised in two main divisions, the first including the devices for carrying the needle-thread through and looping it beneath the fabric, and passing the shuttle through the loop without contact therewith, which devices may be operated by various mechanisms; and the second including the appliances which I have employed to impart the requisite movements to the first-named devices, feed the material sewed, and regulate the supply of thread.

In addition, my invention comprises various improved details applicable to this and other sewing-machines.

Before describing the construction of the mechanism from which the stitch-forming devices derive their movements, and by which such movements are timed and regulated, I will refer to those parts which are most immediately connected with the operations upon the threads and the material, and their movements in the formation of stitches. These parts are an eye-pointed needle, *a*, carrying a waxed thread, *x*; a shuttle, B, Fig. 2, having a reciprocating motion at right angles to and across the path of the needle; a looping device consisting of a looper, *c*, projecting from a shoulder, *s*, of a carrier, which is shown as a cylinder, *b*; an awl, *d*, Fig. 3, which may also act as a feed; a needle-thread feeder, *e*, which vibrates above the end of the presser-foot *f* across the path of the needle-thread; a griping device or clamp, D, Fig. 1; a take-up, E′, and a needle-gage, *i*, Fig. 2, which is shown as being carried by the carrier *b*.

Without referring minutely to the construction of these devices, I will state that the gage *i* reciprocates longitudinally in a groove in the carrier *b*; that the latter has a reciprocating rotary and a reciprocating longitudinal movement; that the shuttle carries a bobbin of thoroughly-waxed thread, and is constantly in connection with a reciprocating driving-rod, *g*, Fig. 2ª, through the medium of a vibrating segment, *h*, Fig. 8, having edge flanges *n*, and adapted to a T-shaped groove, *m*, in a projection, m^1, of the shuttle-case p^2, Fig. 12.

The segment is cut away to form a central recess, *y*, but only to such an extent as will insure a portion of the segment being always in the groove *m*.

At the commencement of the formation of the stitch the parts are in a position shown in Figs. 3, 15, the length of the thread between

the eye of the needle and upper side of the fabric, passing around the feeder *e*, being sufficient to supply the needle as it descends to the position shown in Fig. 7, with the thread taut at both sides of the needle below the fabric. A sufficient supply of thread is of the utmost importance, for waxed thread bent through the eye of a needle cannot be drawn through the eye while the needle is in the material. An insufficient supply, therefore, would cause the thread to break. When the needle is elevated the shuttle is in the carrier *b*, as shown in Fig. 2ª, and the feeder *e* in the position shown in dotted lines in Fig. 3, holding the thread. As the needle descends the shuttle is carried forward to the position shown in Fig. 8, the feeder *e* turns to the position shown in Fig. 4, and the thread slips off and is carried down with the needle. The first movement of the carrier *b* is in the direction of the arrow, Fig. 7, until the gage *i*, which has been thrust out, strikes the needle, and the looper *c* is opposite the line between the needle and the thread, Figs. 7 and 16.

The relative position of the gage *i* and looper *c* is such that when the needle bears on the gage *i* as an abutment, the looper *c*, on then moving forward, is brought with its edge exactly between the side of the needle and the thread, the latter having sufficient elasticity to permit the entrance of the thin edge of the looper, or the needle having a slight side recess, as at y^6, Fig. 4, to receive this edge. Thus, if the needle is sprung to one side toward the awl from any cause, the gage invariably brings it to a position which, whatever it may be, is always such that the looper will certainly pass between the needle and the thread.

The importance of the positive relation of these parts above named will be seen from the fact, before set forth, that no deficiency in the loop can be made up by drawing the thread through the needle while the latter is in the material, and also from the fact that the ascent of the needle cannot, as in dry-thread machines, be relied upon to form a loop at the side for the entrance of the looper, as a thoroughly-waxed thread will adhere more firmly to the polished face of the needle than to the leather or fabric. It would, therefore, if not caught below, slip through the fabric with the needle, when the latter ascends, without forming a loop.

Simultaneously with the entrance of the looper between the thread and needle the latter begins its ascent, leaving the thread carried by the needle looped upon the looper, Fig. 17, which still retains the thread absolutely taut, so that there is no change in the quantity of thread below the fabric, the needle ascending while the thread remains stationary and taut. As there is no upward movement of the needle to form a loop, and the looper takes the loop when the needle is at its lowest point, there is no slacking or variation of the thread which is held tightly, so that the stitches are close, taut, and even.

The looper continues to retain the loop until the eye of the needle is above the thickest fabric the machine is capable of sewing, and then rotates in the direction of the arrow, Figs. 9, 10, 11, and carries and spreads the loop around the shoulder *s* of the carrier. The shuttle then passes inward, carrying the thread, which extends to the fabric, through the distended loop. The carrier *b* now moves inward and drops the loop. The clamp D holds the thread immovable at that point. The take-up E′, moving back, draws the portion of thread below the clamp upward in an almost straight course through the eye of the needle, until the shuttle-thread is drawn in a loop into the body of the fabric and there locked with the needle-thread, as shown in Fig. 14.

As the loop, after being first caught by the looper, is carried around with the latter toward the side of the segment *h*, the latter is turned to the position shown in Fig. 9, so that the recess *y* coincides with the path of the portion of thread forming the side s^{10} of the loop, which enters said recess without contact with the shuttle or with the segment.

As the thread crosses the face of the shuttle by the rotation of the looper a continued movement of the segment in the direction of its arrow, Fig. 9, maintains the recess *y* of the segment *h* and thread coincident, Fig. 10, until the segment is in the position shown in Fig. 11, when the recess is open for the thread to pass wholly onto the shoulder *s* and out of the path of the shuttle, which then moves inward through the distended loop. While the thread is by these means distended upon the shoulder *s* and carried between the segment and the shuttle the said segment is at no time disconnected from the shuttle, nor is there any contact of the thread with the shuttle-case or segment—a matter of vital importance, as otherwise the parts would soon be clogged up with wax, and so rendered inoperative. Further, any contact of the thread with the parts named would result in the transfer of the lubricating-oil to the thread, dissolving and diluting the wax, and destroying its adhesive and stiffening qualities.

After the shuttle-thread has been drawn into the fabric, the shuttle being in the carrier *b*, Fig. 2ª, the awl *d*, Fig. 3, rises, penetrating the fabric, travels, carrying the latter until the awl is in a line with the path of the needle, and then descends and moves back to its first position, when another stitch is formed in the same manner as the first, and so on.

Having thus described the operations by which a stitch is formed, it will be apparent that different means may be employed for imparting the requisite movements to the various devices specified and in their relative order; but I will now describe the construction and arrangement and operation of devices which, in practice, I have found operative in effecting the desired result.

The frame of the machine consists of a plate or case, A, and an overhanging arm, B^{10}, se-

cured detachably to the case by side bolts, and carrying at the outer end a head, F. There are two horizontal shafts, C^{10} D^{10}, the former turning in bearings below the base-plate and carrying an eccentric, C^{11}, and cam-cylinder C^{12}, and the latter in bearings of the arm and carrying a crank-wheel, D^1, and cam-wheel D^2. A slotted connecting-lever, E, both sliding and vibrating on a fulcrum-pin, a^{12}, adapted to a threaded opening in the arm B^{10}, is recessed at the lower end to receive the eccentric C^{11}, and has at the upper end a T-headed crank-pin, b^1, Fig. 6, adapted to a flanged socket, b^{10}, in the crank-wheel D^1, said socket being open at one side to receive the said T-headed crank-pin. This permits the pin to slip from the socket when the arm B^{10} is raised from the base, the fulcrum-pin a^{12} being previously removed, thus facilitating the ready detaching of the arm and its appliances.

The cam-wheel D^2 has a cam-edge, 3, and is grooved on both front and rear faces and in the hub, the groove 1 in the latter operating directly the take-up lever E′, the short lower arm of which (provided with a friction-roller) enters the said groove 1.

A grooved thread-pulley, G, is adapted to curved bearings in the clamping-jaws D^5 D^6, the former stationary on the head F, and the latter pivoted to an eccentric-pin, 2, which may be turned to regulate its throw, and having in its lower shorter arm a recess to receive a pointed pin, a^{14}, projecting from a sliding plate, V, Figs. 4 and 4^a, said pin carrying a friction-roller, a^4, against which operates the cam-edge 3 of the wheel D^2, Fig. 5.

The presser-foot *f*, Fig. 4^a, is carried by a sleeve, G^1, through which slides the needle-bar G^2, which is provided with a stud, 4, extending into a groove, G^{10}, in the face of the cam-wheel D^2, from which the bar derives a positive vertical reciprocating motion.

The sleeve G^1 is depressed by a spring, 16, bearing at its upper end, and at a point above a shoulder, 6, of the head F is encircled by two griping-rings, 7 8, and by a cam-ring, G^3, Figs. 4, 4^a, 5, provided with a handle, 9, and bearing with its inclined edge on and beneath a stud, 10, of the sleeve G^1, so that the latter and the presser-foot *f* may be lifted or depressed by turning the cam-ring.

A stud, 11, Fig. 4^a, holds down the ring 7 at its forward side, and a spring, d^5, Fig. 4, beneath, throws up the other side, thus canting the ring, so as to bite on the sleeve, lock it in position against any upward movement, with the foot firmly down upon the work-plate A^1. In like manner the ring 8, when canted and raised. will bite on the sleeve and carry the latter with it.

The rings have beveled lugs 21 22, Figs. 4, 5^a, between which extends a slide, F^1, having shoulders 12 13, so arranged that on the movement of the slide in the direction of the arrow, Fig. 4, the lower shoulder, 12, shall first strike the lug 21, leveling and loosening the lower ring to permit the upward movement of the sleeve and presser-foot, when the inclined shoulder 13, passing beneath the lug 22, lifts the ring 8 and with it the presser-foot.

The slide F^1 has a stud, 14, projecting into a cam-groove, F^{10}, in the face of the cam-wheel D^2, which so moves the slide that the foot is lifted just prior to and during each feeding movement of the material, as before described, the foot being at other times locked down upon the fabric, preventing the latter from being displaced. The foot can be elevated at any time, however, by turning the cam-ring G^3, which, bearing upon levels both rings 7 8, so that the sleeve can slide through them without resistance.

A plate, F^2, serves as an abutment for the lugs 21 22, and prevents the rings from turning.

A stud, 17, Figs. 1 and 4^a, projecting from the rear of the hub of the presser-foot, carries a vibrating lever, I, deriving its motion from a slotted plate, I^2, Figs. 1, 4^a, 5, reciprocated laterally in the head by the action of a plate, I^3, sliding vertically, and having an inclined groove, s^3, into which a stud, s^9, (dotted lines, Fig. 5,) on the plate I^2 projects.

The plate I^3 has a stud, I^6, (dotted lines, Fig. 4^a,) projecting into a cam-groove, I^{10}, at the back of the wheel D^2, which thus imparts a vertical reciprocating movement to said plate.

A shaft, I^4, Fig. 4^a, carried by the lever I and connected to a coiled spring, I^1, Fig. 4, supports the thread-feeder *e*, said shaft I^4 being provided at the upper end with an arm, 19, which enters a cam-opening, w^4, in a plate, I^5, secured to the hub of the presser-foot, and so constructed that as the lever vibrates, the arm, by its contact with the edges of the opening, will turn the shaft and the feeder to its proper position, to hold or release the thread, as heretofore described.

A groove, 31, Figs. 1, 4, and 5, in the cam-ring G^3 receives a pin on the plate V, which is thus lowered when the ring is turned to raise the presser-foot, the pointed end of the pin being thus brought into the lower end of the opening in the jaw D^6, which may then vibrate sufficiently to loosen the ring G and permit the thread, otherwise tightly clamped, to be drawn freely to thread the needle.

Grooved pulleys 76 77 are arranged to conduct the thread from the wax-pot P^7 to the pulley G, from which it passes to a grooved pulley, 74, carried by the take-up E′, and turning on an eccentric-pin, 75, by adjusting which the amount of thread taken up by the vibration of the lever is regulated.

The shaft C^{10} carries, besides the main cam-cylinder C^{21} and eccentric C^{11}, a forward cam-wheel, K, the latter having face and peripheral cam-groves, Figs. 1, 2, 3.

On the stud 26 of a bracket, L, beneath the base-plate, vibrates a slotted two-armed frame, L′, in one arm, 90, of which slides the awl-bar M, the latter deriving its vertical movement from the face-groove 91 of the wheel K, which

receives a stud, 27, on the bar; and the groove w^{14}, (shown in dotted lines, Fig. 3,) at the back of the wheel receives a stud, w^{10}, on the arm 29 of the frame L′, and vibrates the latter, imparting the forward or feeding motion after the awl is raised, a spring, 35, retracting the frame.

The groove w^{14} is wider than the stud except opposite the projection w^{12}, (which thrusts the stud suddenly outward from the center,) thereby permitting the lateral play of the stud in the groove when necessary; but the spring 35 tends to hold the stud always against the inner edge of the groove, which edge thus carries the arm 29 outward to bring the awl to the path of the needle and feed the work, while the spring draws the arm back, the outer edge of the groove having no effect.

The extent of the feed is regulated by an adjustable bar, N, having an inclined face, 36ª, against which bears the end of an adjusting-screw, N¹, the said bar carrying a roller, 36, which is struck by a wing, 38, on the awl-bar M as the latter rises. The position of the roller 36 will determine the point at which the awl will enter the material—the farther the roller is from the path of the needle the longer is the stitch, the limit of the forward movement of the awl during the operation of the machine and when once adjusted being invariable.

The stud w^{10} is arranged eccentrically on a pin, w^{13}, which may be turned in the arm 29 and secured by a nut, w^{11}, to alter the lateral position of the stud and vary the throw of the frame. By this means the awl may be brought into exact line with the needle on the termination of the forward movement of the frame.

To prevent the momentum of the material from carrying the awl past the exact line of the path of the needle, owing to any spring or undue play of the frame L′, a stud, N², screws into the frame, and serves as an adjustable abutment, against which the arm 90 of the frame L′ strikes on moving forward, a jam-screw, N³, securing the stud after adjustment.

A sliding driving-rod, P, Figs. 1, 2, 18, 19, and 20, operated by the main cam-cylinder C²¹, reciprocates in a sleeve, R, carrying at its front end a cylindrical case, R′, within which operates the carrier *b*. One or more longitudinal slots f^5, Fig. 6ª, in said carrier *b* receive studs f^6 on the inside of the case, so that the carrier must rotate with, but can slide in, the case, the sliding motion being imparted from the peripheral groove 3ª, Figs. 1, 16, of the cam-wheel K through the medium of a yoke, S, fitted to an annular groove, 30, of the carrier *b*, and carried by a slide, S′, a stud, 39, from which enters the groove 3ª, Figs. 1, 16, 17.

The gage *i*, Figs. 15 to 20, is a short bar sliding in a longitudinal groove in the carrier *b*, and provided with a double-pointed lug, 40, which, as it is brought alternately by the rocking and sliding of the carrier *b* against the pointed ends 41 42 of the yoke S, is carried, with its slide, back or forward.

Near the rear end of the gage is a lug, 43, which enters a short slot, 44, in the case R′, and, striking the ends of said slot as the carrier is carried in or out, arrests the further movement of the gage with the carrier, leaving the lug 40 in position to be engaged with the end of the yoke S at the next rotary reciprocation of the carrier and case, to throw said gage either forward or backward, as may be required. Thus, as the looper *c* carries the loop, on the revolution of the case, in the direction of the arrow, Fig. 17, the front end of the lug 40, striking the rear beveled face of the yoke end 41, is driven back with the gage, and so continues until the lug is above the opposite end, 42, of the yoke, when the carrier, with its looper, is drawn back, as shown in Fig. 15, the gage remaining stationary, but, relatively to the looper, moving forward.

On the reverse movement of the case in the direction of the arrow, Fig. 15, the lug strikes the end 42 of the yoke forward of the center, and the gage is driven outward to the position shown in Fig. 16, so as to strike the needle.

The case R′ and its sleeve R derive their rotary motion from the reciprocating rod P, a stud, 89, on which enters a slot, 88, part straight and part spiral, in the sleeve R. (See Figs. 2, 2ª, 18, 19, and 20.)

The rod P has a chamber, 50, Figs. 2ª, 18, and 20, to receive the head or block *g′* on the end of the shuttle-carrying bar or shaft *g*, which passes through the end of the rod P; and in the chamber 50 also lies loosely a bar, T, Figs. 2ª, 18, and 20, a pin, 51, from which projects up through a slot, 52, of the rod P, and into a slot, 53, of a stationary plate, U, secured to the under side of the bed-plate, Fig. 1.

The slots 52 53 are a little out of line laterally, and at their forward ends are curved in opposite directions, so as to present inclined or transverse shoulders tt^2. The pin 51, therefore, cannot slide in the slot 53 unless it is in the laterally-bent part of the slot 52; nor can it slide in the slot 52 unless it lies in the bent end of the slot 53, and when in the straight part of either slot its lateral play is prevented, while the shoulders of the bent portions retain it longitudinally. It is only when the bent portions of the slots are brought adjacent to each other that the pin can turn laterally to coincide with the straight portion of one or the other. Thus, when the rod P is in the position shown in Fig. 1 and starts forward, its shoulder t^2 bears on the pin 51, carries it forward with the bar T, the pin, Fig. 18, moving along the slot 53 of the plate U, Fig. 19, until the end of the bar T strikes the block *g′*, when the latter, its bar *g*, and the shuttle carried by the bar will move together until the pin 51 strikes the forward end of the slot 53. The bar P will continue its movement, and its stud 89, entering the spiral portion of the groove 88, will revolve the sleeve R and its case R′ in the direction of the arrow 1, Fig. 18. As the stud 89 enters the spiral portion of the groove, the shoulder w^8 of the rod P moves forward from

the block g', and the latter, its rod, and shuttle remain at rest, the pin 51 having turned into the bent portion of the slot 53, as shown in Fig. 19, to permit the forward movement of the rod P, the slot 52 of which then coincides with the pin 51, as shown in Fig. 20.

As the rod P recedes the case and carrier are rotated in a reverse direction, while the shuttle-bar is locked in place by the pin 51 bearing against the shoulder t, Fig. 19; but when the curved end of the slot 52 reaches the pin it will be turned laterally in the direction of the arrow 1, Fig. 20, through the curved end of the slot 53, (shown in dotted lines, Fig. 20,) into the straight portion of said slot, and will be carried backward, lying in the position shown in Fig. 18. The shuttle and its bar, although now free, do not immediately move back, owing to the distance between the head g' and the shoulder w^8, formed by the closed end of the rod P, Figs. 18, 20; but after a delay sufficient to permit the looping-finger to complete its movement, the block and shoulder w^8 will be brought in contact just as the loop is formed, when the shuttle will be carried back by the recession of the rod P and pass through the loop, the cylinder b will recede, the loop be discharged and drawn up, and the parts assume their first position.

It will be seen that these movements are positive, invariable, and all, except the longitudinal motion of the carrier b, derived from the reciprocation of the rod P without the use of springs, levers, or other appliances liable to result in lost motion and irregular action. Thus the backward and forward movements of the rod P, carrying the pin 89 in the slot 88, impart a reciprocating rotary movement to the case R′, and through the latter to the looper and gage. It further carries the bar T back and forth together with the shuttle, locking and unlocking the latter.

It will be noted that the spiral and straight groove 88 and the locking-grooves 52 53 are relatively so proportioned and arranged that the shuttle is locked in its forward position during the time that the carrier is turning to spread the loop.

A further operation results from the movement of the same shaft—that is, the oscillation of the segment h, which is vibrated by a cam, V′, Figs. 1, 2^a, and 6^a, the inclined forward end of which bears alternately on lugs s^7 at the rear edge of the segment, the straight end forcing out first one wing and then the other of said segment. The cam is turned on the forward end of the shaft g by the carrier b into a longitudinal slot, f^7, in which, Fig. 6^a, extends a lug, 56, from the said cam V′, so that the cam will turn with the carrier without being carried longitudinally thereby, but can slide back and forth with the shuttle in and independent of said carrier.

The shuttle, when carried forward of the needle, enters a race, Y, in which it rests while the thread is carried from the needle onto the shoulder s, a spring, Y′, serving to prevent any rebound of the shuttle on entering the race, and holding it so that the friction of the block g' in the hollow rod P shall not carry the shuttle inward before the thread has passed fully across the mouth of the carrier b.

The race Y is arranged at such a distance from the end of the carrier b, which, in fact, constitutes the other portion of the race, as to leave the intervening space for the passage of the loop and the operation of the awl-carrier.

The wing 38 of the awl-carrier bar M, Fig. 3, is made detachable, having a dovetailed edge fitting a dovetailed slot in the bar, and being secured by a screw, 60.

To prevent the work-plate A′ from becoming loose in the usual undercut recess in which it slides, slots 61, Fig. 3, are cut in the side edges, which thus bear with a spring-pressure against the guiding-edges.

It will be noted that the needle a and rotating and sliding looper c are arranged so that the looper when at its highest point will take the loop directly below the work-plate on a line central with the axis of the looper-carrier, thereby reducing the throw of the needle and its length to a minimum, reducing the risk of breaking, while the tendency of the loop to fall across the path of the shuttle, which results on taking the loop from a needle passing at one side of the carrier, is avoided. The perforation made by the awl is only barely sufficient in size to admit the needle and its thread. The stitches therefore fill the holes, take a strong hold upon the material, and the knots formed by the interlocking loops within the body clinch the stitches, so that those on one side are held even if the others are cut or worn.

No increase of tension is required to draw the under loop into the fabric, this being effected positively by the vibration of the take-up lever E′, Figs. 1 and 4^a, while the thread is clamped above it, the throw of the lever being such as to take up all the thread carried down by the looper to form the loop, and as much more as may be necessary to draw the under thread the required distance into the fabric, so that the amount of thread drawn up and the position of the lock in the fabric is absolutely uniform as long as the adjustment of the pulley 74 is unaltered. By this means the lock can be drawn to any desired position in the fabric, and no slip can take place.

The cam-ring G^3 and its adjuncts perform three offices: first, to raise and lower the presser-foot; second, to unlock the jaw G^6, to permit the thread to be drawn freely when the foot is up; and, third, to uncant the biting-rings, so that the sleeve G^1 can be moved upward through them. Any other equivalent device or devices may, however, be used for effecting these operations.

By imparting a rocking motion to the feeder e the thread is cast off uniformly and with precision; and the feeder is made in the form of a roller, to prevent the wax from being scraped from the thread.

To melt the wax, and maintain that on the thread, especially when the latter is upon the looper, at a proper temperature, which should be such that the thread will not become stiff and wiry, a hollow box or steam-chest, W, Figs. 1 and 2, is arranged beneath the bed-plate, and is supplied with steam or other fluid, heated by a lamp below the chest, as shown in dotted lines, Fig. 1, which is conveyed through pipes or channels W^1 to a steam-case surrounding the wax-pot P^7, and to a steam-case, W^2, surrounding a receptacle in which the case R′, revolves, and which is in close proximity to the looper.

The radiation of heat from the parts thus heated warms the wax sufficiently to maintain the thread flexible, and prevent the loops from setting or hardening on the looper.

The steam in the chamber W^3, Fig. 21, maintains the wax in the inner receptacle, W^4, in a melted condition, a hollow central stem, m^6, also receiving the steam and facilitating the heating of the wax.

Upon the stem m^6 slides a sleeve, M^2, having at the lower end one or more slotted ears, p^2, and at the upper end arms m^2, with sockets for receiving blocks m^3, which are shown arranged angularly on opposite sides of a set-screw, M^3, an inclined-faced annular rib on which bears on each block. Each arm has a transverse channel, z, below a pad upon which the block presses.

When a thread is to be waxed the sleeve is raised, the thread passed through the eye of one of the ears p^2, and through one of the channels z of the stripper, and the sleeve is then depressed.

As the thread is drawn upward the wax adheres; but the superfluous wax is stripped therefrom by the pressure of the pad as the thread is drawn through the channel z. The thread is thus thoroughly saturated without being weighted with an undue external coating of wax.

The wax-pot is made the support for a bobbin-winding device, that the thread may be drawn directly from the pot to the bobbin.

The construction of this device need not be here described, as it forms the subject of a separate application for Letters Patent, filed May 3, 1879.

The above-described mechanism may be varied in some of its features without departing from the principles of my invention.

Thus the carrier of the looper may be a revolving ring or arm carried in a circular or elliptic path, and may be arranged at the inner end of the race V; or a reciprocating gage may be arranged to slide or vibrate beneath the base-plate, carrying the needle to its position prior to the seizure of the thread by the looper.

The looper c may be pivoted to the carrier, and bear against a spring, t^9, as shown in Fig. 19, so as to yield slightly to insure absolute contact with needles of different thicknesses.

By means of suitable slots and pins I have imparted the reciprocating movement to the carrier b from the rod P, instead of using the cam-wheel K for this purpose; and I have found it preferable to place a buffer-spring behind the cam V′. A spiral spring, w^{12}, may also be placed between the ring 8 and the cam-ring G^3, as shown in Fig. 4^a.

Other devices may be substituted for the thread-feed e.

In place of the vibrating segment h, two bars projecting from opposite ends of a rocking lever into spring-sockets in the shuttle-head may be used, and the shuttle may be driven by devices at the forward end, and may be thrown instead of being driven positively. In some instances a single ring, 8, may be used in place of two rings, the slide F^1 bearing against the under side of the ring instead of upon the lug 21; and any equivalent device may be substituted for the slide F^1. For instance, a lug on the ring may extend into a groove in the cam D^2, or a pin on the cam-wheel strike under and tilt and lift the ring.

It will further be apparent that although the various devices are shown in connection with a machine for forming locked stitches with two waxed threads, some of them are adapted to chain-stitch and dry-thread sewing-machines.

While I have shown a shuttle of peculiar construction and thread take-up and griping devices, I do not here claim the same; nor do I claim the sewing of waxed threads to form a lock-stitch, as these will constitute the subjects of separate applications for Letters Patent; but

I claim—

1. The combination of the looper, its shoulder s, the eye-pointed needle arranged to reciprocate vertically in a line with the axis around which the looper revolves, and mechanism, substantially as described, whereby the looper is reciprocated longitudinally across the face of the needle when the latter is at its lowest point, retained until the needle ascends above the material, and then rotated to carry the thread onto the shoulder s, substantially as set forth.

2. The combination of the eye-pointed needle, looper, and gage with appliances for reciprocating the needle and looper, and moving the gage to bring the needle in a position to insure the operation of the looper, substantially as set forth.

3. The combination of the looper, devices for revolving and sliding the same, and a gage occupying a fixed position laterally to said looper, but arranged and constructed to slide independently thereof, substantially as set forth.

4. The combination of the awl-bar M, devices for reciprocating and vibrating the same, and the bar N, and devices for adjusting the same, and securing it in a fixed position to act as an abutment to guide the bar M as it slides upward, as set forth.

5. The combination of the awl-carrier, de-

vices for sliding and vibrating the same, and adjustable abutment N², arranged to prevent any excess of movement by the carrier, as specified.

6. The combination of the reciprocating shuttle, loop-distending devices, and a driving-rod, and devices connecting the same positively to the shuttle, having variable points of attachment, to permit the passage of the needle-thread between the shuttle and the rod without contact therewith, as set forth.

7. The combination of the shuttle and driving-rod, recessed segment connecting the two, and appliances for vibrating the segment to maintain its recess coincident with the needle-thread in its passage across the face of the shuttle, substantially as set forth.

8. The combination, with the rod *g* and devices for reciprocating it longitudinally, of the connecting vibrating segment, cam V′, and mechanism for operating said cam, substantially as set forth.

9. The combination of the shuttle, loop-distending mechanism, driving-rod, and locking device, whereby the longitudinal movement of the shuttle is prevented until the loop is distended for its passage, substantially as specified.

10. The combination of the shuttle and driving-rod, and the slotted shaft P, block T, and pin 51, and the stationary slotted plate U, constructed and operated to permit the partial movements of the shaft independent of the rod, and to lock the latter in position during said movements, and release and carry it after the completion of the same, substantially as specified.

11. The looper *b*, its carrier, and gage *i*, in combination with a double-pointed lug, 40, yoke S, having pointed ends, and devices for sliding the yoke and gage, substantially as set forth.

12. The combination, with the looper and its carrier, of a case, R′, inclosing and supporting the carrier, and devices for rotating the case with the carrier and sliding the latter independently of the case, substantially as set forth.

13. The combination, with the case R′, of a sleeve, R, having a slot, 88, and the bar P, having a pin, 89, adapted to said slot, substantially as and for the purpose set forth.

14. The combination of the case R′, its slotted sleeve, cylinder *b*, the shuttle, and its driving-rod, the bar P, mechanism for sliding the bar back and forth longitudinally, and appliances, substantially as described, whereby the alternate rotation of the carrier and reciprocation of the shuttle are imparted from the sliding movement of the bar, as specified.

15. The combination, with the thread-feeding lever, of a shaft, I⁴, devices for turning it to throw off the thread, and a roller, *e*, arranged to turn under the friction of the thread, substantially as set forth.

16. The combination of the presser-foot bar, biting-ring, and devices for depressing the ring and elevating the bar through the same, substantially as specified.

17. The combination of the presser-foot bar, rings 7 and 8, and slide F¹, having shoulders arranged to bear successively against the rings as the slide is moved, and devices for reciprocating the slide, as and for the purpose set forth.

18. The combination of the presser-bar and its biting-rings, elevating-cam G³, clamp D, and appliances, substantially as described, whereby the turning of the cam loosens the rings and clamp and elevates the bar, as specified.

19. The combination, with the shuttle-race, of a surrounding fluid-chamber, W², and appliances for heating the fluid and conveying it to said chamber, as set forth.

20. The combination, with the wax-pot, of the adjustable sleeve M², provided with one or more slotted ears, *p*², and one or more strippers for removing the superfluous wax from the thread, substantially as set forth.

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

SIMON W. WARDWELL, JR.

Witnesses:

FRED H. BISHOP,

EDWIN J. PEIRCE, Jr.