(No Model.) 3 Sheets—Sheet 1.

D. WILLIAMSON.

SHUTTLE AND SHUTTLE ACTUATING MECHANISM FOR SEWING MACHINES.

No. 507,192. Patented Oct. 24, 1893.

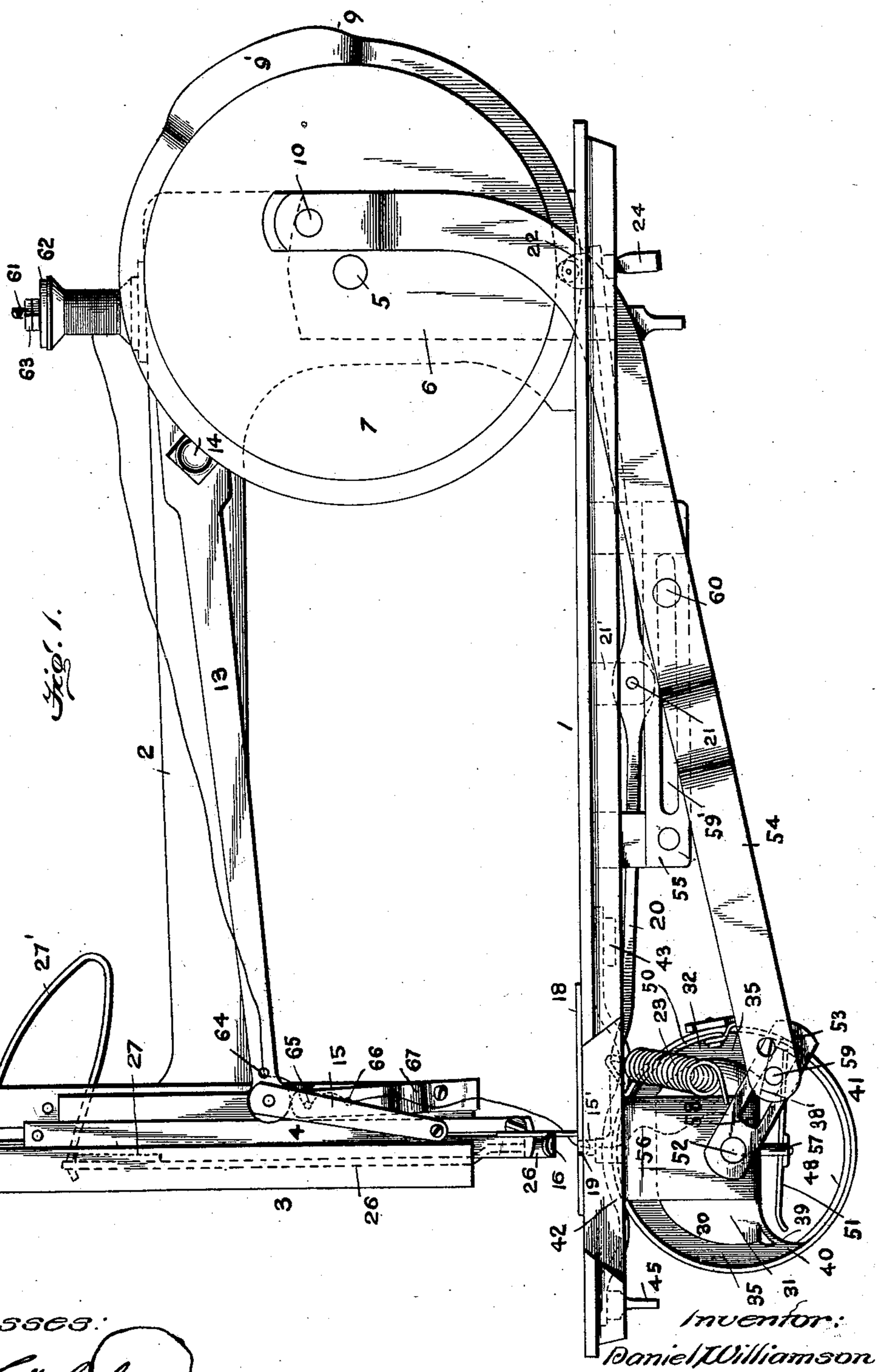

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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SHUTTLE AND SHUTTLE ACTUATING MECHANISM FOR SEWING MACHINES.

No. 507,192. Patented Oct. 24, 1893.

Fig. 2.

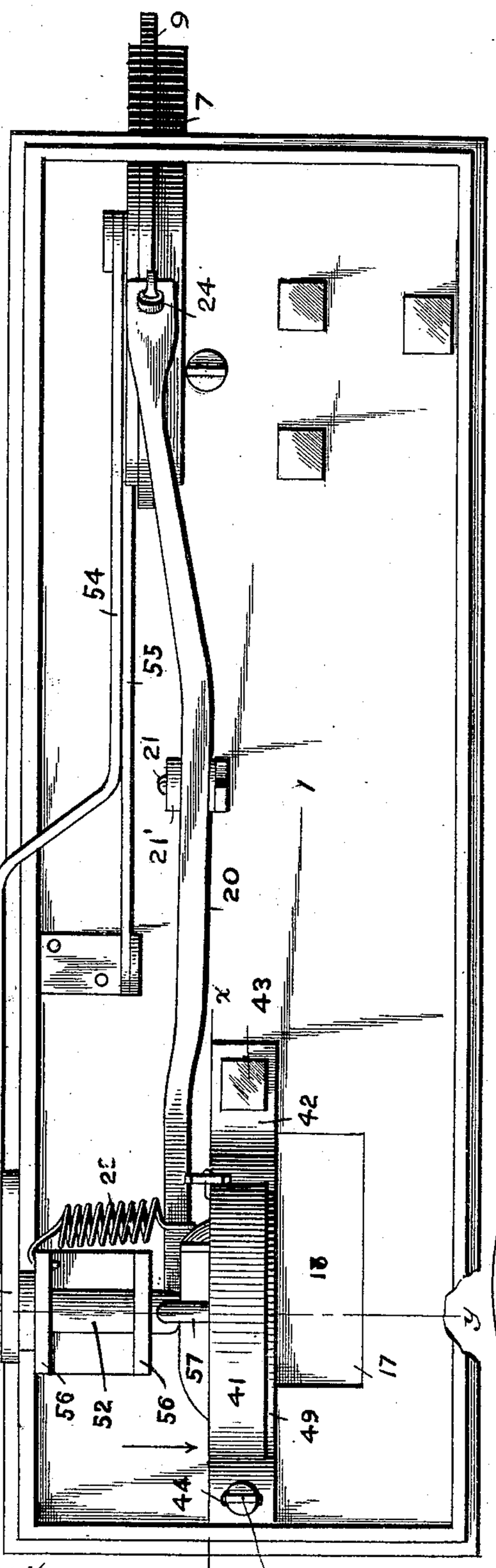

Fig. 5.

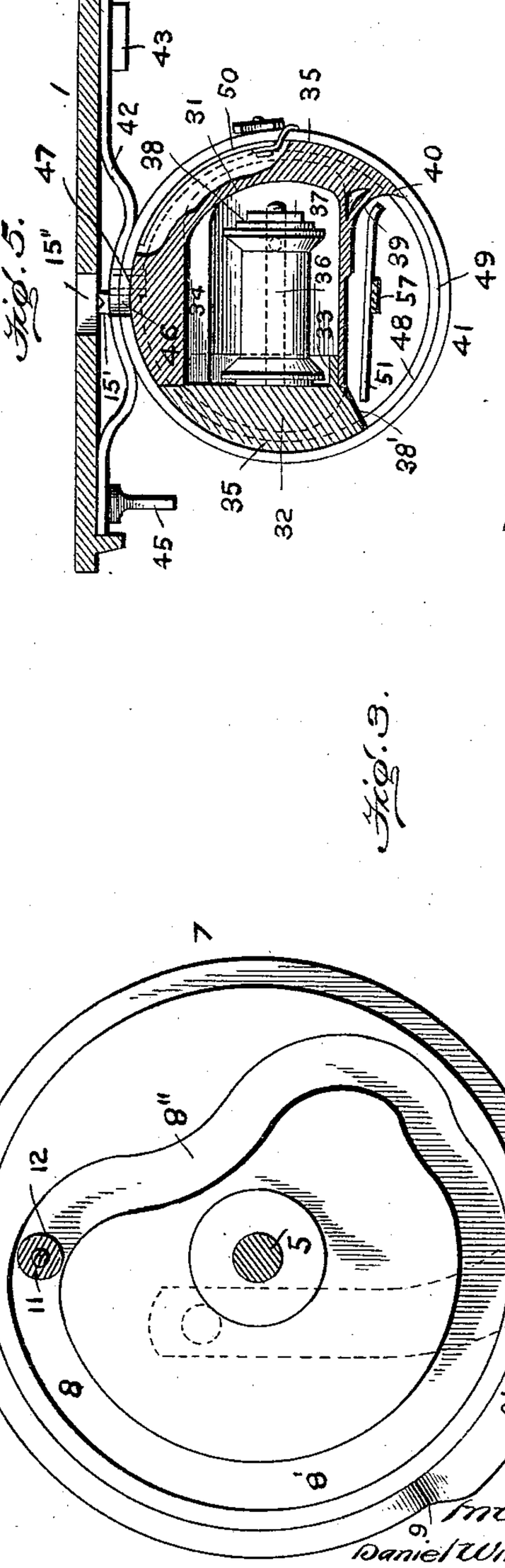

Fig. 3.

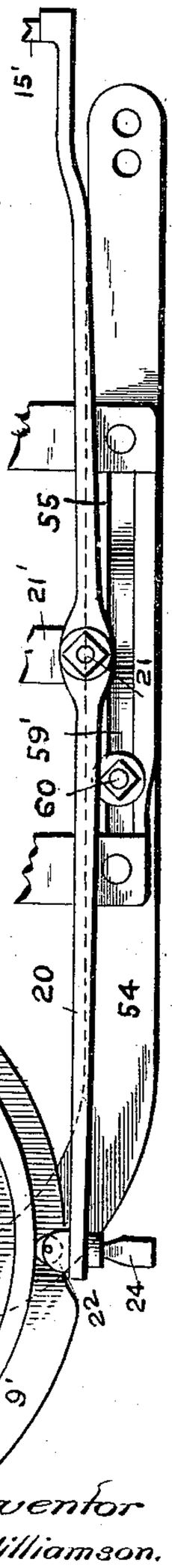

Fig. 4.

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SHUTTLE AND SHUTTLE ACTUATING MECHANISM FOR SEWING MACHINES.

No. 507,192. Patented Oct. 24, 1893.

Fig. 4.

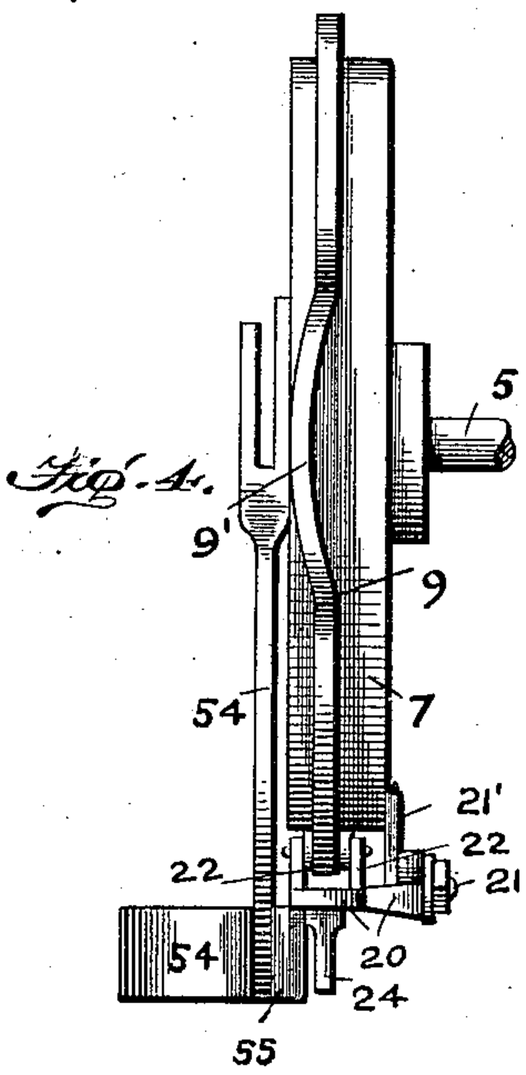


Fig. 6.

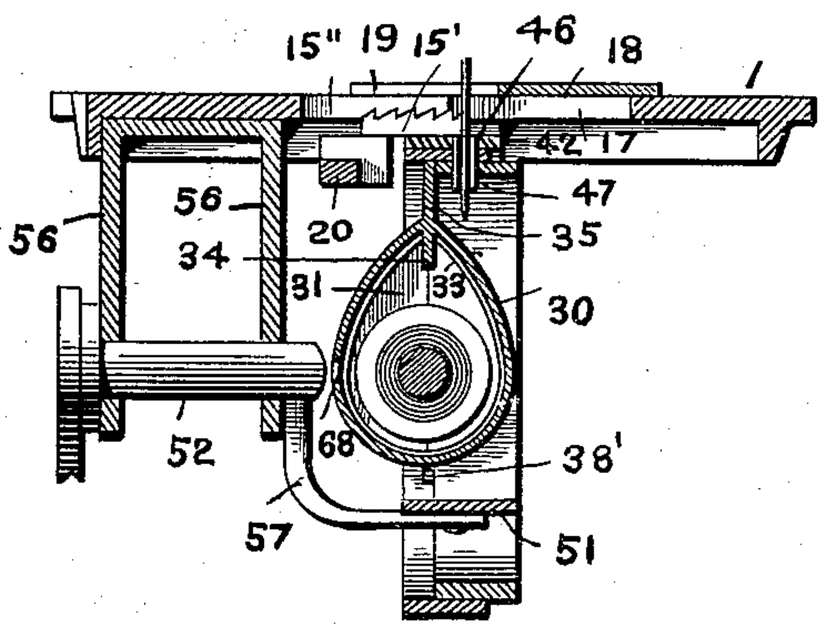


Fig. 7.

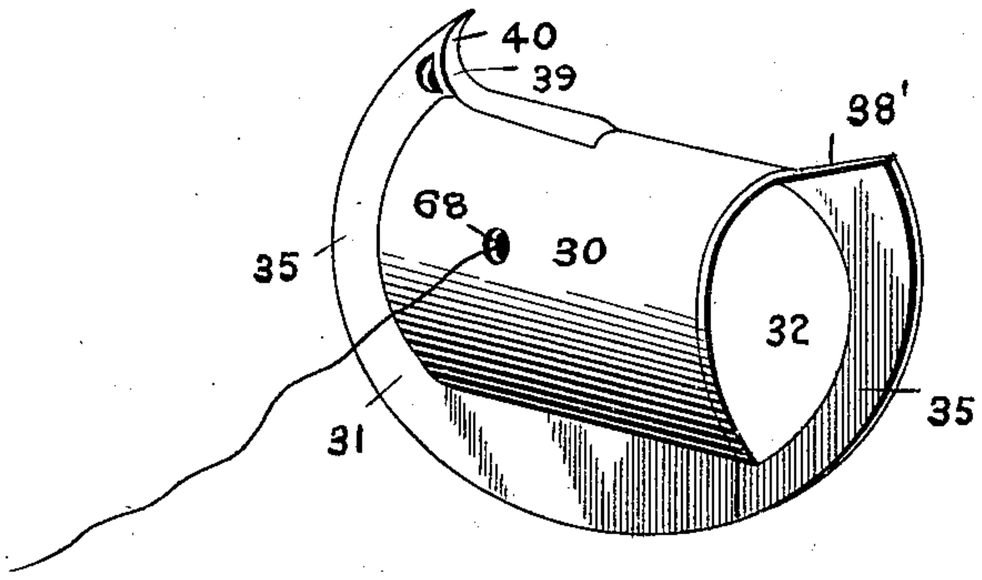
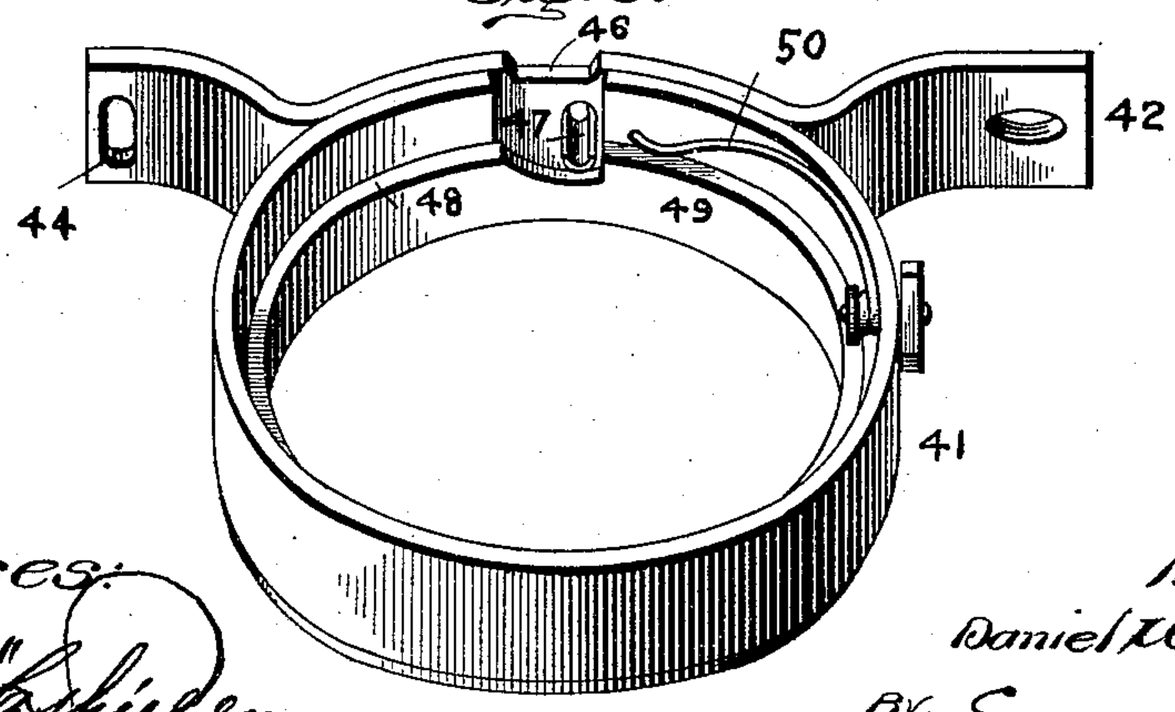


Fig. 8.



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UNITED STATES PATENT OFFICE.

DANIEL WILLIAMSON, OF SUNBURY, PENNSYLVANIA.

SHUTTLE AND SHUTTLE-ACTUATING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 507,192, dated October 24, 1893.

Application filed December 2, 1892. Serial No. 453,875. (No model.)

To all whom it may concern:

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

My invention relates to improvements in sewing machines of that class which employ a rotary hook in connection with a vertically reciprocating needle-bar; and the prime object that I have in view is to so construct and arrange the coacting devices as to obviate the employment of a take-up mechanism for the stitch and to dispense with the usual bobbin winding mechanism.

A further object of the invention is to construct a novel form of rotating hook and spool-carrier in which an entire spool of cotton or thread can be held and properly fed to the work. I am thus enabled to produce a machine which sews the fabric with threads taken from two spools, one of which is placed on the stationary spool holder, stud or post in the usual way, and the other in the spool carrier of which the rotary hook forms a part, whereby I dispense with a separate bobbin and the mechanism for winding the threads thereon usually supplied with sewing machines. The spool carrier is constructed in two parts, which are removably locked or held together so that the parts can be separated to enable ready access to be had to the inside of the carrier for adjusting or removing the spool; and the rotating spool carrier and hook are confined in an annular support which is pivoted to the under side of the bed plate and has its free end normally locked in position so that the tubular needle throat is in the vertical plane of movement of the reciprocating needle, to enable the latter to pass through the needle throat and permit the rotating hook to take into the loop of the needle-thread.

The invention further consists in the novel combination of devices and construction and arrangement of parts which will be hereinafter fully described and pointed out in the claims.

I have illustrated my improved sewing machine in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a side elevation of the machine. Fig. 2 is a bottom plan view looking at the under side of the bed plate and showing the various devices for interlocking the threads and feeding the work. Figs. 3 and 4 are detail views, in elevation and edge view, respectively, of the single driving wheel that actuates the needle bar lever, the drive-pitman for the rotating hook and spool carrier, and the lever that moves the feed-foot. Fig. 5 is a longitudinal detail section on the line *x*—*x* of Fig. 2, showing the rotating hook and spool carrier and its annular support in side view. Fig. 6 is a transverse section on the line *y*—*y* of Fig. 2. Fig. 7 is an enlarged perspective view of the hook and spool carrier, detached, and Fig. 8 is a like view of the annular support for the hook and spool carrier.

Like numerals of reference denote corresponding parts in all the figures of the drawings.

1 designates the usual bed plate, 2 the horizontal arm united or rigid at the rear end with the bed plate, and 3 is the depending vertical guide rigid with the front end of the arm 2 and having vertical ways for the vertically-reciprocating needle bar 4.

5 is the main shaft of the machine journaled in a bearing in the rear part of the arm 2 and in a standard 6 attached to the bed plate, and this shaft carries the single driving wheel 7 which is rigidly secured to the shaft 5 in any suitable way. This driving wheel is formed with a plurality of cams or eccentric faces; one of which consists of a groove or way 8 cut into the inner face of the disk or wheel and comprising the concentric part 8′ and the irregular side 8″ which curves inward toward the shaft 5 and joins the ends of the concentric part 8′ of the groove; the second cam being formed on the periphery of the wheel or disk by extending the edge at 9 beyond the circumference of the wheel or disk, forming the raised surface concentric with the main shaft 5 and about the middle

of the concentric part 8′ of the cam groove 8 in the inner face of the wheel; and the third eccentric formed by a stud or pin 10 which is rigid with the wheel, on the outer face thereof and eccentric to the axis of said disk or wheel.

In the eccentric groove 8 of the driving wheel fits a stud 11, having an anti-friction roller 12 loosely mounted thereon, and this stud is rigidly secured to the heel of the needle-bar lever 13 which is arranged alongside of the arm 2 and is fulcrumed thereto at an intermediate point of its length, on a stud or axle 14; and the front end of this lever 13 is linked at 15 to the vertically reciprocating needle bar 4, in order to raise or lower the latter as the heel of the lever 13 is moved vertically by the cam groove 8 of the driving wheel 7. The feed foot 15 is arranged in a slot or opening 15′ formed in the bed plate 1 below the presser foot 16, said slot 15′ communicating with a larger slot or opening 17 in said bed-plate. This opening 17 is usually covered by a face plate 18 held in position in any suitable way, and provided with a slot 19 which is of sufficient size to allow the feed foot 15 to have the necessary vertical and horizontal movements. This feed foot 15 consists of a plate having the usual corrugated or roughened surface, and one end of this plate is rigidly attached to one end of a lever 20 that is actuated by the cam 9 on the periphery of the driving wheel 7. This lever 20 is pivoted in a manner to permit the lever to have a four way motion; *i. e.* an up and down movement and a horizontal movement to the right and left to impart to the feed dog the desired vertical and horizontal movements in order to, first, lift the work with the feed dog against the presser foot; second, move the work horizontally beneath the presser foot 16 to feed the work the distance of a stitch; then depress the feed foot away from the work, and finally move the feed foot horizontally in a backward direction to restore the feed foot to its initial position so as to be again ready to feed the work on the next lift of the needle and needle-bar. The feed lever 20 is fulcrumed at an intermediate point of its length on a bolt or pin 21 which is fixed in a depending lug 21′ on the bed plate 1, the bolt being so held that the lever 20 is free to turn in a vertical direction on said bolt and to have a limited lateral play between the bolt head and the lug 21′. The cam 9 on the driving wheel 7 not only projects beyond the periphery of the drive wheel but is also bent or inclined at its middle out of line at 9′ with the circumferential rib on the periphery of the drive wheel; the extended edge of the cam 9 serving to depress the heel of the lever 20 while the lateral deflection 9′ in the cam serves to impart to the lever the horizontal or lateral play. At its heel, the lever 20 is provided with two pins or studs, 22, 22, (which may be provided with friction rollers if desired) and these studs loosely embrace the circumferential rib of the driving wheel in such a manner that the lateral deflection 9′ in the cam serves to move the lever horizontally while the extended edge of the cam rides on the heel of the lever to depress the latter when the cam is brought, on the rotation of the wheel 7, into position to bear against the lever. To assist in returning the lever 20 to its normal position, I provide a tension spring 23 which is connected to the lever near its free end and to a depending support on the bed plate so that the spring will pull the lever backward and downward after the cam 9 clears the heel of the lever and its studs 22.

To regulate the vertical movement of the feed lever 20 in order to vary the throw of the feed foot 15′ and the length of the stitches, I provide a regulating screw 24 which works in a threaded opening at the heel of the feed lever. This regulating screw is adjustable in the heel of the lever so as to furnish a bearing for the projecting edge of the cam 9, and the screw can be turned toward or from the drive wheel in order to cause the cam on the latter to vary the movement of the lever and consequently of the feed foot 15, as will be readily understood.

The presser foot 16 is carried by a vertically movable presser bar 26 which is suitably connected to the upright guide 3 on the arm 2; and this presser-bar can be raised or lowered by a cam-lever 27 pivoted to the presser-bar and bearing on the upper end of the guide 3, the presser-bar being held by the spring 27′ when lowered into position for use.

I will now proceed to describe my improved rotating hook and spool carrier, and the mechanism for imparting rotary motion to said parts in synchronism with the needle bar and the feed foot.

The spool carrier consists of a sectional elongated shell 30 of oval form in cross section, and a segmental divided rib 35 which is arranged centrally around the two ends and one side of the shell 30; and this rib extends beyond the shell 30 for a suitable distance to adapt the same to ride against the race on the inner surface of the annular support which will be presently described. The shell consists of the large and small sections 31, 32, each of which has a part of the segmental rib 35 rigid therewith; and the small section 32 of the shell is provided with a flange 33 which is adapted to fit snugly into the open end of the large section 31. The outside faces of the shell sections are flush with each other as shown, and the parts of the rib coincide with each other when the shell sections are fitted together, and the flange 33 has a notch in which fits a key-lip 34 that serves to prevent the sections of the shell from turning on each other and thus holds the sections in proper position. Either section of the shell, preferably the small section 32, is provided with a spool holding stem 36 having an outer threaded end on which is screwed a nut 37; and the spool containing the thread is slipped over

this stem, with one end of the spool bearing against the head of the shell, after which a friction disk 38 may be applied against the other end of the spool, and finally the nut 37 is screwed onto the end of the stem and bears against the friction disk, whereby the spool is prevented from turning freely on the stem 36 but its rotations are held in check by the nut so that the thread is only unwound from the spool by the pull of the needle thread on the spool thread. As heretofore stated, the segmental rib does not extend entirely around the shell, but the ends of said rib terminate on one side of the shell, one end of the rib forming an abrupt shoulder 38′ which may however be inclined, but the other end of the rib is tapered and extended into the pointed hook 40, the face of the hook being curved backward and inward, at 39, to the point where the hook joins with the shell.

The spool carrier and hook are fitted within and supported by an annular support 41 which is arranged in a vertical position, with its face presented to the bed plate; and this support is arranged immediately beneath the presser foot and the vertically reciprocating needle bar. This annular support is provided with a horizontal plate 42 which extends across the top of the annular support, and one end of this plate is pivoted to the bed plate at 43 while the other end of the plate is provided with a transverse aperture 44 through which passes the threaded shank of a set screw 45 which is screwed into a threaded socket in the bed plate and serves to hold the annular support in proper position. Through this horizontal plate 42 is formed a needle-aperture 46 and from the lower side of this plate depends a needle-throat 47 which is in vertical alignment with the needle aperture, and this tubular throat depends into the annular support at one side of the path of the hook 40 and rib on the rotating spool carrier. The annular support is further provided with the interior race 48 which is formed by an annular rim 49 and a part of the internal circumference of the annular support, and on this annular race 48 bears the segmental rib of the spool-carrier, while against the face of the rim 49 bears one side of said segmental rib on the spool carrier. This spool carrier and the hook are free to rotate or turn within the fixed annular support, and the rims 49 serve to prevent displacement of the spool carrier in one direction while a retainer 50 holds the spool carrier from displacement in the opposite direction. This retainer 50 preferably consists of a yielding arm which extends alongside of the rim 49 for a suitable distance, one end of the retainer being fastened to the annular support by a bolt or other suitable fastening.

The spool carrier and hook are separate, and easily removed, from the annular support, and they are also disconnected from the mechanism which imparts rotary motion to the carrier and hook; and to enable the carrier to be easily removed from the annular support, I pivot the latter in the manner described so that the support and its contained carrier and hook can be swung horizontally a limited distance in order to clear the carrier and hook from the driving mechanism, provided for imparting rotary motion to said carrier and hook. This driving mechanism for the spool carrier and hook consists of a contact plate 51 adapted to fit in the space between the hook 40 and the other end 38′ of the segmental rib and below or within the point of the hook, a shaft 52 to which the contact plate is fastened, a slotted crank arm 53 rigid with one end of the shaft 52, a driving lever 54 having a loose connection at one end with a slotted crank arm 53 of the shaft 52 and pivotally connected at its other end with the eccentric stud or pin 10 of the driving wheel 7, and a guide bar 55 to which the driving lever 54 is pivotally connected at an intermediate point of its length. The shaft 52 is journaled in suitable bearings 56 which are rigid with and depend from the bed plate at one side thereof, and the contact plate 51 is secured to the inner end of the shaft by means of a curved or bent arm 57 whereby the contact plate is projected beyond and to one side of the shaft so as to be held by the arm in proper position to contact with the shuttle carrier without interfering with the proper action of the hook 40 and the needle on the vertically reciprocating needle bar. The crank arm 53 is rigidly secured to the outer end of the shaft 51 and provided with a longitudinal slot 58 through which passes the pivot pin 59 that connects the forward end of the driving lever 54 to said arm 53. The guide 55 is in the form of a long bar which is rigidly secured at its ends to the under side of the bed-plate, and this guide bar 55 has a longitudinal slot 59′ through which passes a guide and fulcrum pin 60 which is secured to the lever so that the lever is free to have a longitudinal movement with the pin 60 in the slotted guide bar and also to turn or rock on the pin 60 in order to move vertically at its free end. The forward end of the driving lever is bent or curved laterally from its connection with the guide-bar in order to permit its forward end to be properly connected to the slotted arm, and the heel of the lever is curved upward, through a slot in the bed plate, in order to properly connect with the wrist pin on the driving wheel. As the main shaft and driving wheel are turned, the wrist or eccentric pin serves to raise and lower the heel of the lever which turns on its pivot-bolt, and as this bolt is limited by the slotted guide bar the lever plays or reciprocates back and forth, the slotted connection between the forward end of the drive lever and the crank arm on the shaft 52 permitting the lever to have such movements. The lever thus serves to turn the crank arm 53 and the shaft 52 continuously in one direction, and thus the contact plate 51 impinges against and turns the spool

carrier and hook constantly in the proper direction, such movement of the hook being so timed that the hook will engage with the needle-thread-loop when the needle and needle bar are depressed. As is usual, the arm 2 is provided with a fixed stem 61 on which a spool of thread is fitted, and the spool is prevented from turning freely on the stem by a friction disk 62 and a nut 63 which is screwed on the threaded end of the stem and bears down on the disk and the spool. This thread is passed through an eye 64 on the needle-bar-lever, thence through eyes 65, 66, on a yielding tension plate 67 fixed to the guide arm 3 in a manner to bind or hold the thread between the tension plate and the guide arm 3, and then the thread is carried to and passed through the eye of the needle suitably secured to the lower end of the needle bar. The thread from the spool carried is passed through the opening 68 in the shell of the spool carrier.

This being the construction of my two-thread sewing machine, the operation may be described as follows:—With the needle bar lifted, and the feed foot depressed, the shuttle carrier is in such position that the hook is approaching the needle throat. With the parts in these positions, the stud on the needle-bar lever is in the middle of the irregular part 8″ of the cam groove 8 in the driving wheel, and as the shaft and wheel are turned, one side of the irregular groove 8″ serves to lift the heel of the needle bar lever, thus depressing the needle bar and causing the needle to pass through the needle throat, but as the stud passes from the irregular part 8″ of the cam groove into the long concentric part 8′ the needle bar is lifted slightly, thus opening or spreading the loop of the needle-thread. In the meantime, the feed foot remains at rest, but the spool carrier continues to turn so that the hook takes into the spread loop of the needle thread. The hook continues to rotate and carry with it the loop of the needle thread, which is crossed by the thread of the spool in the spool carrier and thus interlocked therewith, forming a lock stitch, but the needle remains at rest while the stud on the needle bar lever travels in the concentric part 8′ of the cam groove 8, until the hook completes half a revolution, at which time the stud on the needle bar lever enters the other half of the irregular part 8″ of the cam groove, at which time the needle bar and needle are quickly lifted. On the ascent of the needle, the feed-foot is lifted by the cam 9 acting on the heel of the lever, and as the needle completes its upstroke the lateral deflection in the cam 9 causes the feed lever to move the feed foot quickly forward to feed the work, and then downward and backward, by which time the hook is again approaching the position occupied by the needle when lowered, and the needle bar is in position to again descend. The operations of the several parts are repeated and the work of sewing the fabric by a continuous chain of lock stitches can be carried forward.

I am aware that changes in the form and proportion of parts and details of construction of the devices herein shown and described as an embodiment of my invention can be made without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such changes and alterations as fairly fall within the scope and spirit of my invention.

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

1. In a sewing machine, the combination with a bed plate, the driving disk, and a rotary spool carrier, of the short shaft 52 journaled at right angles to the spool carrier and provided with a driver adapted to impinge against said spool carrier, the longitudinal fixed guide on said bed plate, a horizontal four-motion lever 54 having its fulcrum 60 connected with said fixed guide to slide longitudinally and rock therein and the rear end of said lever provided with an upright arm which is pivoted eccentrically to the drive disk, and a crank rigid with the outer end of the short shaft 52 and pivotally connected with said lever 54, substantially as and for the purposes described.

2. In a sewing machine, the rotatable spool carrier comprising the transversely divided shell 30 and rib 35, said shell having its separable sections fitted flush with each other, and said rib 35 arranged in line with the longer axis of the shell, nearly around the same, and having its sections rigid with the respective sections of the shell, substantially as and for the purpose described.

3. In a sewing machine, the rotatable spool carrier comprising the hollow stem constructed with detachable sections 30, 32, formed to fit together flush with each other, the segmental rib 35 having its parts rigid with the respective sections of said shell, and a spool holder stem fastened to the end of one shell-section and adapted to fit into the other shell-section, substantially as and for the purpose described.

4. In a sewing machine, the rotatable spool holder comprising the elongated body constructed in detachable sections and the segmental rib arranged centrally of the body and having one end thereof extended into the pointed hook, one of the sections provided with a notched flange which fits in the other section and receives a key-rib to keep the sections in proper alignment, substantially as and for the purpose described.

5. In a sewing machine, the rotatable spool carrier comprising the elongated sectional shell, the external segmental rib having its parts secured centrally around the respective sections of said shell, and the spool-holding-stem fixed at one end to one of the shell sections and extending into the other section of the shell when the two sections are coupled

together, said stem having means for confining the spool thereon, substantially as described.

6. In a sewing machine, the rotatable spool carrier comprising the elongated sectional shell, the segmental rib extending partially around the sections of the shell and projected at one end into the hook 40, the spool holding stem extending longitudinally of the shell and fixed at one end to one of the shell-sections, and a nut fitted on the free end of the stem to hold a spool thereon, substantially as described.

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

DANIEL WILLIAMSON.

Witnesses:
WN. G. MECKLY,
C. E. RHOADS.