(No Model.) 5 Sheets—Sheet 1.

J. L. FOLLETT.

SEWING MACHINE.

No. 512,105. Patented Jan. 2, 1894.

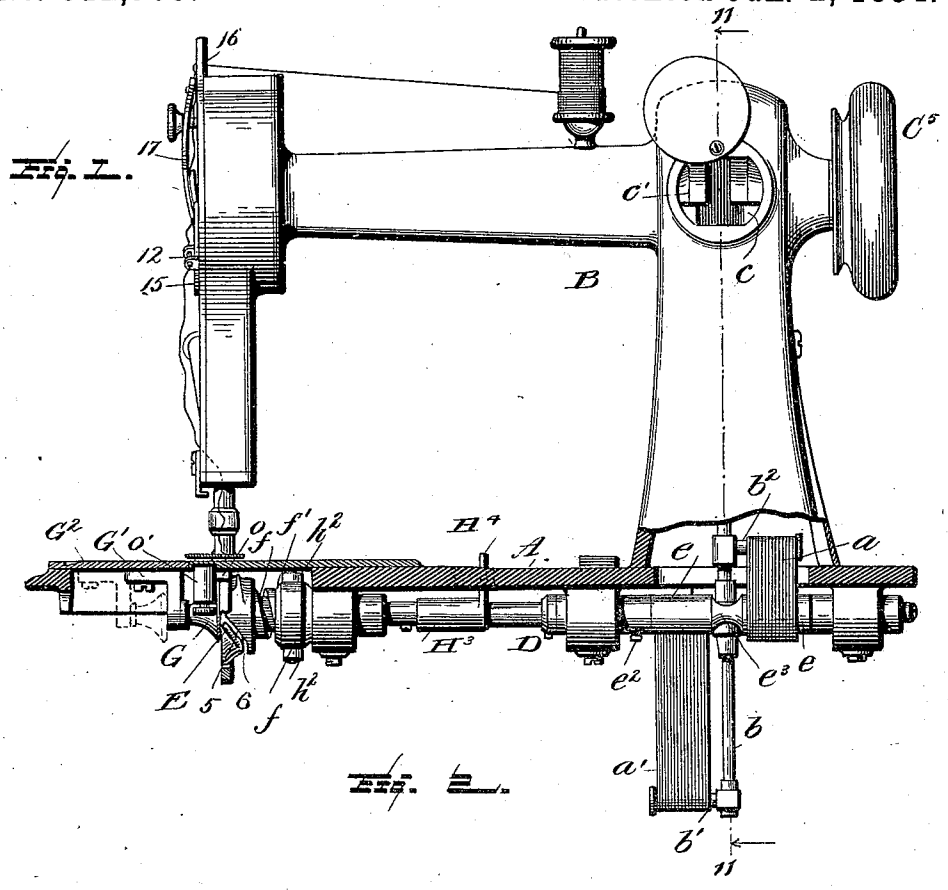
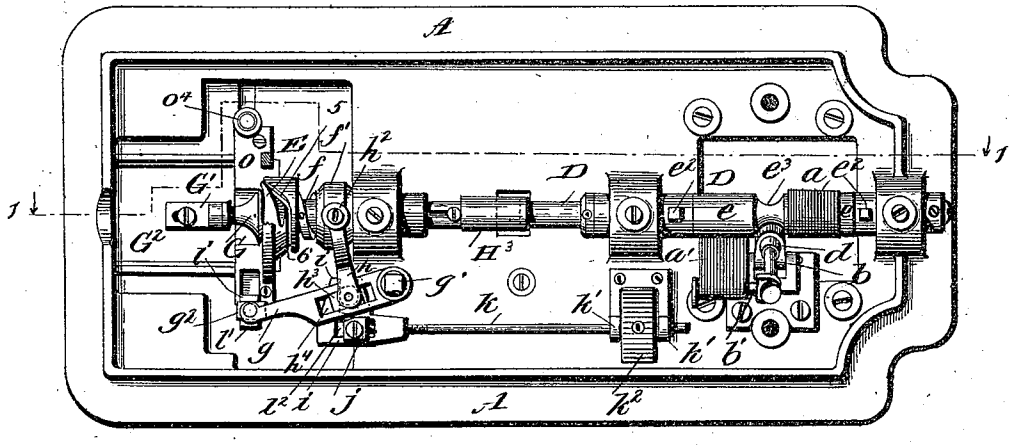


Fig. 1.

Fig. 2.



Witnesses
L. C. Mills.
Ewell & Dick

Inventor
Joseph L. Follett
by Marcellus Bailey
his Attorney

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J. L. FOLLETT.

SEWING MACHINE.

No. 512,105. Patented Jan. 2, 1894.

Fig. 5.

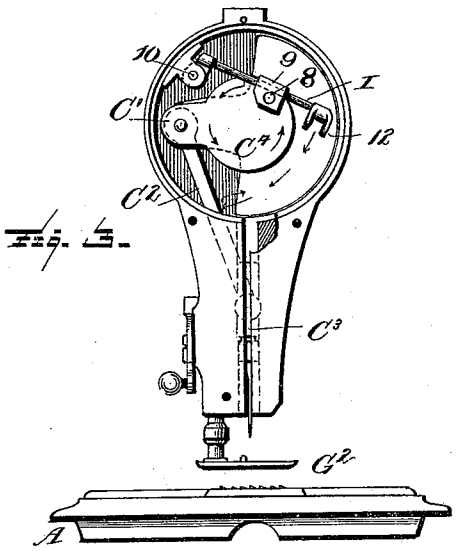


Fig. 4.

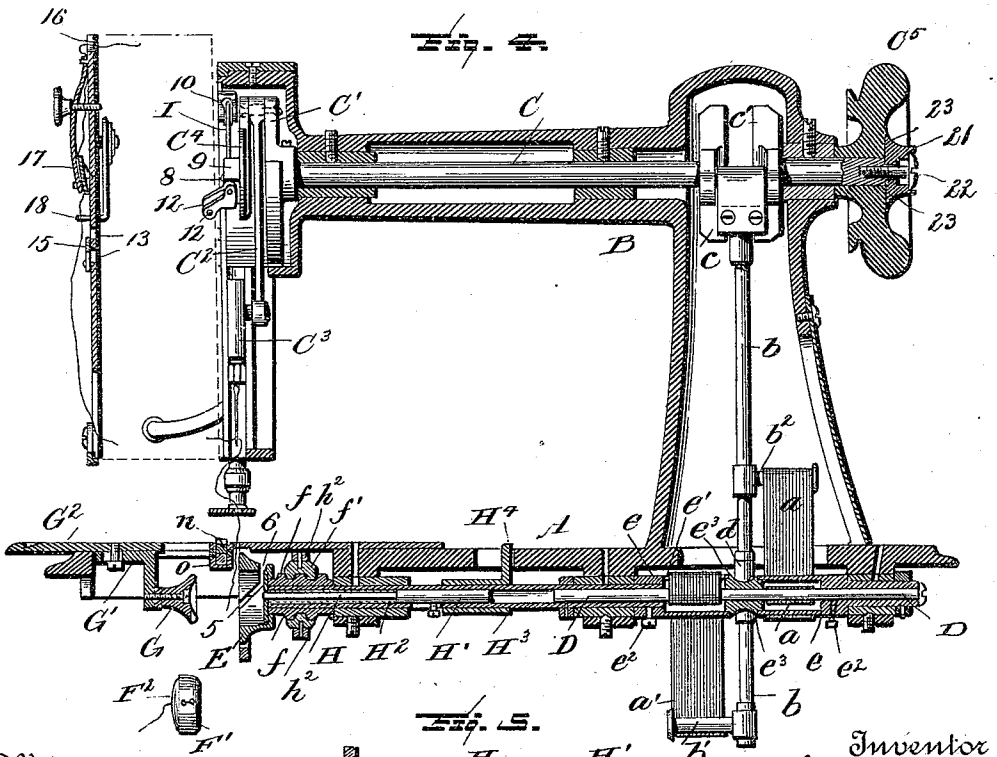
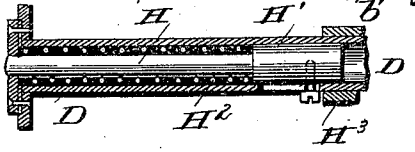


Fig. 5.



Witnesses
L. C. Hills.
Ewell A. Burr

Inventor
Joseph L. Follett
by Marcellus Bailey
his Attorney

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WASHINGTON, D. C.

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J. L. FOLLETT.

SEWING MACHINE.

No. 512,105. Patented Jan. 2, 1894.

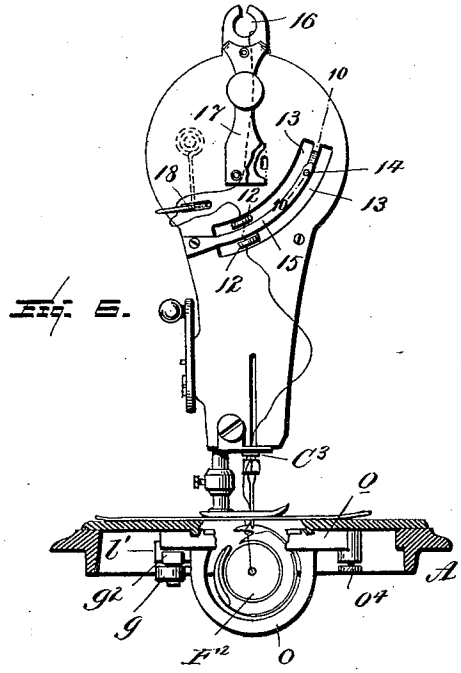

Fig. 6.

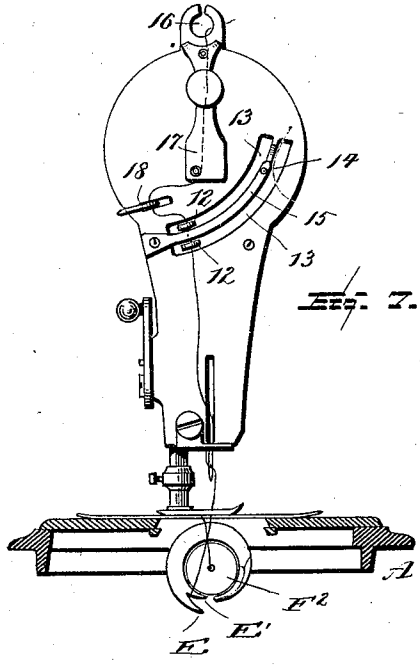

Fig. 7.

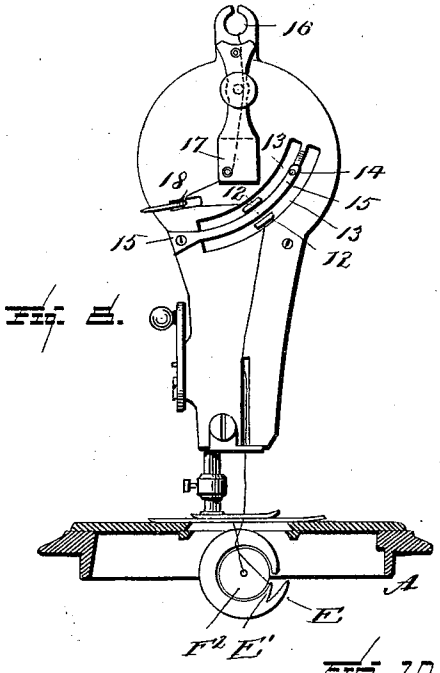

Fig. 8.

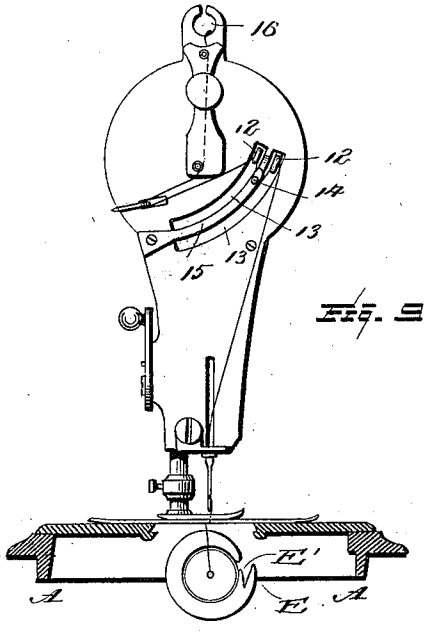

Fig. 9.

Fig. 10.

Witnesses
L. C. Hills.
Everett Wise

Inventor
Joseph L. Follett
by Munn & Co. Bailey
his Attorney

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Fig. 11.

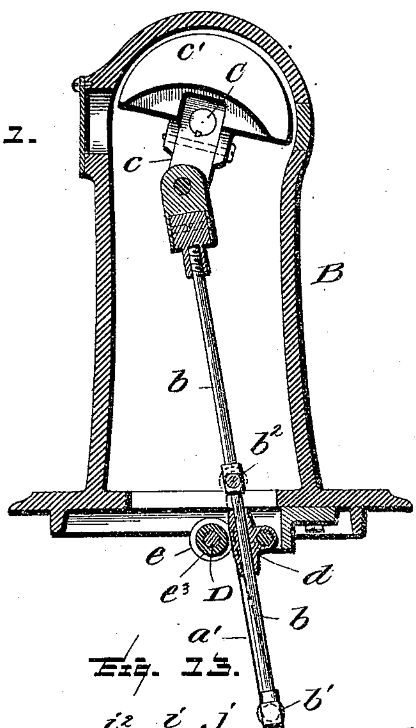


Fig. 12.

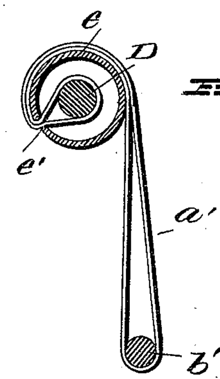


Fig. 13.

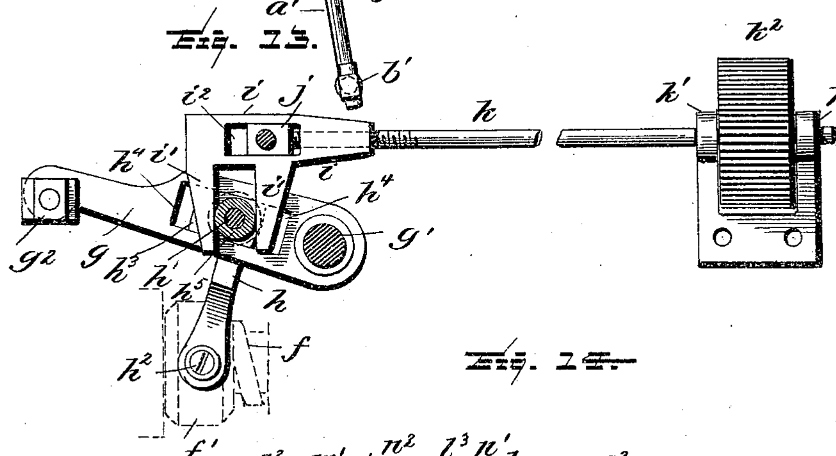
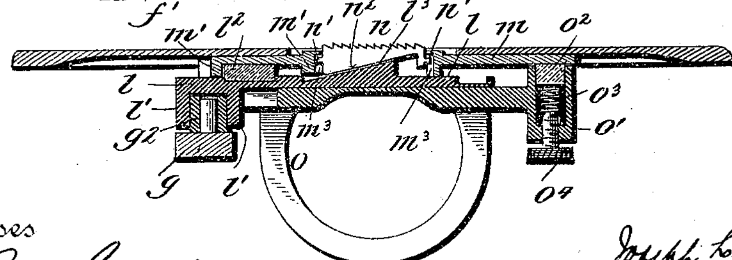


Fig. 14.



Witnesses
L. C. Hills.
Ewell A. Dick

Inventor
Joseph L. Follett
by Marcellus Bailey
his Attorney

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WASHINGTON, D. C.

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SEWING MACHINE.

No. 512,105. Patented Jan. 2, 1894.

Fig. 25.

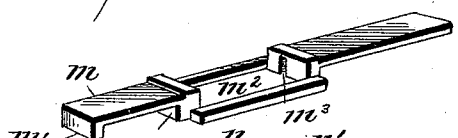


Fig. 26.

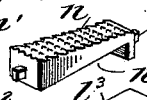


Fig. 27.

Fig. 28.

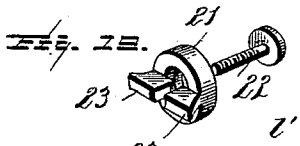


Fig. 29.

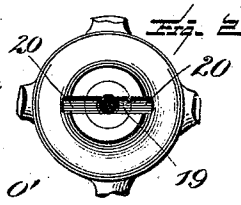


Fig. 30.

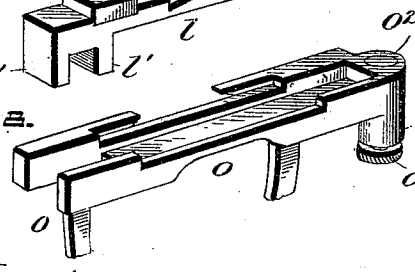


Fig. 31.

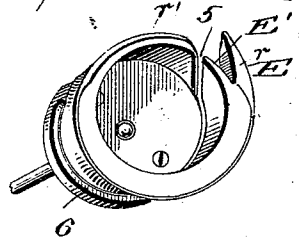


Fig. 32.

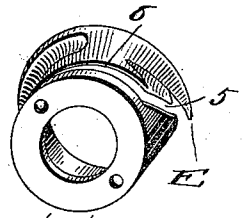


Fig. 33.

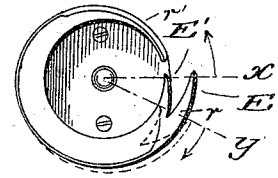


Fig. 34.

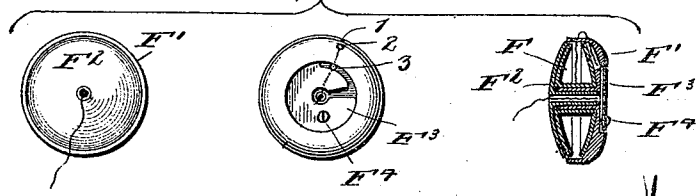


Fig. 35.

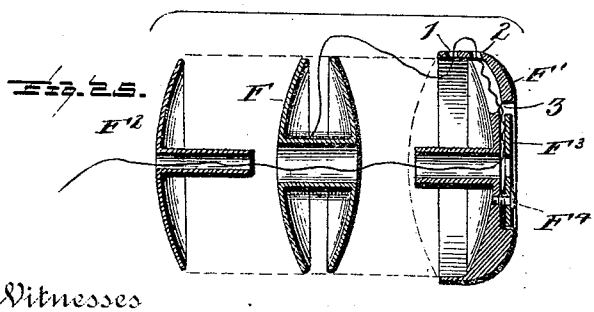
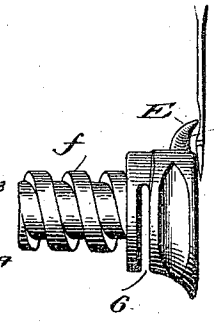


Fig. 36.



Witnesses
L. C. Hills.
Estella Fisk

Inventor
Joseph L. Follett
by Marcellus Bailey
his Attorney

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH L. FOLLETT, OF NEW YORK, N. Y.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 512,105, dated January 2, 1894.

Application filed April 4, 1893. Serial No. 468,968. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. FOLLETT, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

The machine in which my improvements are embodied is what is known as an oscillating hook lock-stitch sewing machine—that is to say, a sewing machine in which the under device which co-operates with the needle to form the lock stitch is a hook to which oscillatory movement is imparted by appropriate means. The hook is one which moves very much more than a half revolution in each direction for each rise and fall of the needle bar, or in other words for one full revolution of the needle-bar driving shaft; consequently the shaft on which the hook is secured oscillates nearly a full revolution in each direction during every complete revolution of the needle bar driving shaft. To so connect these two shafts as to obtain easy and noiseless operation of the two under these conditions, and to adapt for use in this connection the other devices such as the take-up and the feed mechanisms, which co-operate with the needle and hook in the sewing operation, are the main objects of my improvements.

The invention can best be explained and understood by reference to the accompanying drawings in which I have represented a lock-stitch sewing machine of the oscillating hook type embodying my improvements in their preferred form.

In the drawings—Figure 1 is a sectional side elevation of a sewing machine—the line of section of the base being on line 1—1, Fig. 2. Fig. 2 is a bottom plan of the under side of the machine. Fig. 3 is a face view of the head of the machine with the front plate removed. Fig. 4 is a longitudinal vertical central section of the complete machine with the front plate of the head detached and placed at a distance to the left of the head, in order to avoid obscuring the parts; and also with the bobbin ejected and occupying a position below the machine. Fig. 5 is a sectional detail on enlarged scale of the bobbin ejector. Figs. 6, 7, 8 and 9 are front views of the stitch forming devices showing the take up and hook in the different positions which they assume during the operation of forming a stitch. Fig. 10 is an enlarged sectional detail of the thread retainer which operates in connection with the take up arm or lever. Fig. 11 is a section on line 11—11 Fig. 1. Fig. 12 is an enlarged sectional detail of one of the driving straps for the under shaft, and the parts to which it is secured. Fig. 13 is a top plan on enlarged scale of the feed actuating and adjusting devices. Fig. 14 is a transverse vertical section on enlarged scale through the cloth plate and centrally of the feed bar and its adjuncts. Figs. 15, 16, 17, and 18 are enlarged perspective views of the several portions of the feed proper. Figs. 19 and 20 are views of the wheel and the device for securing it to the upper shaft. Fig. 21 is an enlarged perspective view of the hook looking at it from the front. Fig. 22 is a like view looking at it from the rear; in this figure the plate which closes the rear of the hook is removed. Fig. 23 is a front elevation of the hook. Fig. 24 represents a front elevation, a rear elevation and an axial section of the bobbin case and bobbin on enlarged scale. Fig. 25 is an axial section on still more enlarged scale, of the bobbin case and cover, and bobbin detached from each other. Fig. 26 is a side elevation on enlarged scale of the hook, a portion of its shaft and the needle with which the hook co-operates.

A is the bed plate.

B is the bracket arm or goose-neck.

C is the upper or driving shaft provided with a fly and pulley wheel C^5; from this shaft the needle bar and take up are actuated.

D is the under or counter-shaft, from which the feed and the hook derive their movements.

The hook which is so constructed that in itself it takes, spreads and sheds the loop of needle thread, has a rotary movement of nearly a full circle in each direction, for each up and down movement of the needle, and as the needle moves up and down once during each revolution of the driving shaft, it follows that the under or counter-shaft on which the hook is mounted must rotate nearly a full revolution in each direction for every complete revolution of the driving shaft. The

means which I prefer to employ for this purpose are as follows: The under or driven shaft D is connected at its rear to the rotating driving shaft by means of two straps or belts a, a' attached at one end to shaft D and extending from opposite sides of the same to connections which in this instance are in the shape of studs or pins b', b^2, extending from opposite sides of a reciprocatory connecting rod b connected at its upper end to a crank c or its equivalent on the driving shaft C, and supported and passing at its lower end through a rocking bearing d, in which it can slide back and forth. The rod extends crosswise of the driven shaft, and the pins or laterally projecting studs b', b^2 (which may be armed with loose friction sleeves if desired) to which the belts or straps a, a' are secured, are located on the rod respectively above and below the shaft D. A balance weight c' on the driving shaft steadies the revolution of the latter. When the driving shaft is rotated oscillatory movement will be imparted to the under shaft by the pull on the straps due to the reciprocations of the rod b, the straps being for this purpose wound in opposite directions on the under shaft, and the arrangement being such that as the one strap winds upon, the other unwinds from the under shaft. The length of that part of each strap which winds upon the driven shaft must of course at least equal the throw of the crank c; and the extent of oscillatory movement imparted to the counter or hook shaft D depends upon the length of throw of the eccentric, and the diameter of that portion of the shaft D upon which the straps wind. I prefer that each strap should consist (as shown in Fig. 12) of an endless belt or band (preferably oiled linen tape) which at one end passes around the wrist pin or stud on the rod b and at the other end passes around the shaft D, to which latter it is held by a sleeve e encircling the shaft so as to draw the band closely around the latter and longitudinally slotted at e' for the passage of the two plies of the band. Each sleeve is held to the shaft by a set screw e^2; and the interior opposite ends of the two sleeves fit upon and are supported by a cylindrical hub or thimble e^3 placed on the shaft between the two sleeves. By loosening the set screws e^2 the sleeves can be turned and adjusted on the shaft so as to take up slack and secure any desired tension on the belts or straps. In this way for every revolution of the driving shaft there is imparted to the hook shaft a rotary movement of nearly a complete revolution in each direction, and at all times absolutely positive, smooth and uniform and without shock or jar.

The hook which is fast upon the front end of the shaft D of course partakes of the movement of the shaft. The feed also takes its movement from the same shaft. Manifestly however, inasmuch as the shaft moves considerably more than a half revolution in each direction, an eccentric or crank connection for actuating the feed would be impracticable. To overcome this difficulty and to impart a regular and positive to and fro movement to the feed bar, without cam or spring, and irrespective of the degree or extent of oscillation of the shaft from which the movement is derived, I proceed as follows: Upon the under shaft D, near its forward end and just back of the hook is a screw thread f; and encircling the shaft at this point and engaging the thread is a correspondingly internally screw threaded runner sleeve or nut f', which is held so that it shall not rotate with the under shaft D. Consequently when the shaft is in motion the sleeve will move back and forth on the shaft as the latter oscillates. And the movement will at all times be perfectly regular, uniform and positive, although the extent of that movement will of course be determined by the extent of oscillation of the shaft as well as by the pitch of the screw. To this sleeve the feed bar is to be connected by intermediaries the construction of which may be widely varied by the skilled mechanic. The means which I now prefer and in practice use are as follows: The vibratory lever which is connected to and reciprocates the feed bar, is shown at g (Figs. 2 and 13) pivoted at g' to the under side of the bed plate. It is connected to the sleeve f' by a connecting rod h pinned to the lever at h', and having its other end in the shape of a yoke the two ends of which are pinned at h^2 to diametrically opposite sides of the sleeve f'. In this way, when the sleeve moves back and forth, the lever g, through the connecting rod h, will be vibrated. To vary the stroke of the lever g and consequently the length of movement of the reciprocatory feed bar, the connecting rod h instead of being pinned directly to the feed lever g is pinned to a slide h^3, mounted and capable of movement in a slot h^4 formed in and lengthwise of the feed lever. This slide on its upper side or the side opposite to that on which the connecting rod is pinned, carries a roller stud h^5, which is received and held between the parallel jaws i' of an adjuster i (Fig. 13) which is longitudinally slotted at i^2 to fit upon and be held by a guide block j fixed to the under side of the cloth plate. The adjuster can move back and forth on the stationary guide block, and in so moving will carry with it the slide h^3, thus moving the point of attachment h' of the connecting rod nearer to or farther from the fulcrum of the feed lever. The nearer it is to the fulcrum the greater will be the throw of the feed lever, and consequently the more extensive will be the reciprocations of the feed bar connected to it. In this way the feed can be easily regulated.

To provide for the ready adjustment of the adjuster i the fixed block j has swiveled to it a screw threaded rod or shaft k which passes through and engages the adjuster and thence extends back to a point on the under side of the bed plate, where its rear end is supported in bearings k', and is provided with a milled

wheel k^2 which projects partly up through a slot formed for this purpose in the bed plate. By turning this wheel the feed can be readily and conveniently adjusted to a nicety by the operator while the machine is in full operation.

I proceed now to a description of the feed-device-proper, which is shown in detail in Figs. 14 to 18 inclusive. It consists of four parts—the feed bar l, a second bar m which I will term the tension bar, the feed block n, and the supporting frame o. The frame o which when in place is secured to the under side of the cloth plate, is properly formed and recessed to receive and accommodate the moving parts of the feed. In it is first placed the sliding feed bar l, and over the latter is placed the tension bar m with the feed block n. The feed bar has on its under face ribs l' forming a guide way in which fits and plays the slide g^2, to which is pinned the vibrating feed lever g as indicated in Figs. 14 and 2. On its upper face it has a projection l^2 (preferably of some sound deadening material) which lies between and is intended to intermittently engage one or the other of two ribs or projections m' on the under side of tension bar m for the purpose of imparting to the latter an intermittent movement of reciprocation; and it is further provided on its upper face with a wedge shaped or inclined projection l^3 through the instrumentality of which the feed block n is given its up and down movement. The tension bar is provided, as already stated, with the two under ribs or shoulders m', and it is formed in addition with a central opening m^2 for reception of the feed block. The feed block n fits loosely in this opening resting by gravity upon the feed bar l; and when it is in place in the machine and the usual presser foot is down, the latter of course bears upon the feed block in the customary way. The block has its upper surface armed with ordinary or suitable feed teeth, and to prevent it from accidentally tipping out of the machine, I prefer to provide its ends with dowel pins n' which fit in vertically elongated recesses or slots m^3 formed in the tension bar. The block can thus move up and down freely and to the required extent, but is prevented from accidentally getting out of place when the presser foot is up. The under surface of the feed block is inclined at n^2 to match the incline or wedge l^3 of the feed bar. There is sufficient space between the ribs m' to allow the projection l^2 of the feed bar a certain freedom of motion between them. During this portion of its movement the wedge on the feed bar acts on the feed block to bring about the up or down motion and then the engagement of the feed bar projection l^2 with one or the other of the ribs m' will produce the longitudinal movement of the tension bar and consequently of the feed block.

In order to retain the tension bar in position during the up and down movements of the feed, I provide the frame o at its farther end, with a socket o' containing a pad o^2 which by a spring o^3 is pressed against the adjoining under faces of the tension bar n as shown more plainly in Fig. 14. The pressure of this spring is controlled by a regulating screw o^4, by means of which the spring can be caused to bear with more or less force as desired against the friction pad. By removing the tension to a great extent if not entirely, the feed when properly adjusted will move the lightest fabrics without raising the presser foot and forcing the teeth into the goods to their injury.

The hook E is fast to the front end of and moves with the oscillating shaft D. It is provided as usual with a circular recess for holding the bobbin which latter with its case is represented more clearly and in detail in Figs. 24 and 25.

F is the bobbin.

F′ is the case; and F^2 is the cover or shield.

The bobbin has a hollow barrel which fits upon a hollow stem projecting from the rear end of the case F′; and the cover or shield F^2 has also a hollow central stem which fits into the hollow stem of the case F′. In this way when the parts are fitted together there is provided a tubular passage axially through the bobbin and bobbin case from front to rear. Through this passage the bobbin thread leads from the bobbin to the work. The object of this central or axial thread delivery is to always have the bobbin thread the same length from the delivery end of the bobbin or bobbin case to the goods without slack, thus giving uniform length of thread and correct and perfect tension and preventing the under thread from catching on the point of the hook, which it would do if at any time slack. The shield or cover also assists the bobbin case in entirely surrounding the bobbin, which is thus removed from any influence that might otherwise be exerted upon it by the hook or by the upper thread, and is left to play inside the case perfectly free, the case and shield being so proportioned that when fitted together around the bobbin, the latter is pressed against neither of them.

The rear face of the bobbin case has a shallow circular external recess in it to receive the slotted spring tension plate or disk F^3, which is secured to the case by a screw F^4 that also serves as an adjusting screw by which the tension may be regulated. The form of the tension disk F^3 is shown in the rear elevation of the bobbin case in Fig. 24. It is slotted and cut away from the periphery to the center to form a spring tongue under which the thread can be drawn, the slot terminating at a point where it leaves open the axial thread passage through the bobbin case. The course of the thread from the bobbin to the outside is shown in Fig. 25. From the bobbin it passes through the three holes 1, 2, 3, in the bobbin case, thence under the spring tension tongue and thence through the axial

thread passage from rear to front of the bobbin case. When thus threaded the under thread is in position for use without further adjustment.

The bobbin case and inclosed bobbin are kept in place in the receptacle in the hook by a holder G (Figs. 1 and 4) attached to a bracket G′ adjustably secured to the under side of a sliding cover G^2 in the cloth or bed plate. For the purpose of readily removing the bobbin (which of course can only be done when the holder G is drawn back as in Fig. 4) I provide an ejecting mechanism substantially like that employed for the same purpose in my Patent No. 300,458 of June 17, 1884—consisting of an ejector rod H, arranged to slide within the front portion of the shaft D (which is tubular) and to project through an axial hole in the rear end of the hook. The rod is secured at its rear end to a cylindrical guide block H′ which fits and can slide in the shaft D, and is held retracted by a spring H^2. A pin on the block H′ projects through a longitudinal slot in the shaft (see Fig. 5) so as to be in the path of a sleeve H^3 loosely encircling the shaft and having a vertical portion H^4 extending up through a slot in the bed plate, in a position to be easily manipulated. By pushing forward the handle H^4, the ejector will be advanced and caused to eject the bobbin.

Of the sewing devices which are located below the cloth plate it remains only to describe the oscillating hook E. Its range of oscillation will be seen and appreciated by reference to Fig. 23, in which x represents the line from which it starts in moving forward or to the left, and y is the line which it reaches on the completion of that forward movement—nearly a full revolution in fact; and of course it moves back in the same path, thus making nearly two complete revolutions, one in each direction, for each up and down movement of the needle.

In my Letters Patent of April 30, 1889, No. 402,429, I have shown and described an oscillating hook having a range of movement of over one hundred and eighty degrees. But in that mechanism I employed, for the purpose of spreading the loop and carrying it over the back of the bobbin or spool, an oscillating spreader pointed and moving in a direction opposite to that in which the hook was pointed and moved. But I now dispense with the spreader, my object being to provide a hook which shall in and of itself and without the assistance of extraneous devices be capable of taking, spreading and shedding the loop of needle thread without friction or drag and with that uniformity and certainty which is absolutely essential in a high speed sewing machine. To attain this result I form the hook as follows: The hook and the receptacle for the bobbin case are formed in one for convenience' sake. From the loop taking point of the hook, diagonally back to the rear plate there is a slot 5 which after it reaches the rear plate extends circularly around the hook as at 6 for more than a half circle. The exterior or periphery of the hook back of the point is beveled from front to rear, thus providing a continuous incline whereby as the hook, after having taken the loop, proceeds on its way, the loop is spread, and the leg of the loop farthest removed from the needle is cast easily and surely over the back of the hook, following the diagonal slot 5, until it reaches and passes into the circular slot 6, and is carried over and around the under thread. In Fig. 6 the hook is represented as just taking the loop, and in Fig. 8 as just shedding or casting it off. To attain this result it is essential that the hook should have in substance the shape specified and that it also should have the extended range of oscillation hereinbefore indicated. The hook E is provided also—as in my Patent No. 402,429 of April 30, 1889—with a loop retainer E′ between which and the hook is a space for the bight of the loop taken by the hook. The retainer operates, after the hook passes below the bobbin and beyond its center, to retain the loop until the latter is brought past the center and to a position where it is ready to be cast off as in Fig. 8.

The needle which I in practice use is a very short needle recessed just above the eye on the side next to the hook as indicated in Fig. 26, and the point of the hook in taking the loop passes close to the needle and in this recess. The part of the hook next to the needle is thus really within the vertical line of the body of the needle, so that the swell of the needle, or rather the unrecessed portion of the needle below its eye, in moving up and down would rub against the hook, and thus press the thread between the hook and the needle, creating friction and possibly breaking the thread, unless some means were taken to prevent this from occurring. I obviate all difficulty on this score by recessing the front face of the hook at the points where the needle passes it in its ascent and descent—these points being just back of the point, and at or near the heel—say at the points r and r' as indicated in Figs. 21, 23, and 26—so as to provide sufficient clearance to prevent injurious friction between the needle and hook.

There are surface grooves represented at one or more points in the hook; but they are simply occasioned by the removal of surplus metal, with a view to make the hook as light as consistent with strength and durability.

I pass now to a description of that portion of the sewing mechanism above the cloth plate—best seen in Figs 1, 3, 4, 6 to 9 inclusive of the drawings. On the forward end of the upper or driving shaft C is a balanced crank C′ connected by a pitman C^2 to the needle bar C^3, which latter reciprocates vertically in a guide way in the head of the bracket arm in the usual way. Rigidly secured to the crank C′ is a disk or plate C^4 on which is swiveled at 8 the bearing 9 through which passes the take up

lever I which at 10 is pivoted to the head of the machine. As the crank revolves, the bearing 9 will move with it, and this will impart to the take up lever I a vibrating movement on its pivot 10 as an axis—the lever in thus moving sliding back and forth through the swiveled bearing 9. The parts thus far described are the same in a broad way as the like parts in my Letters Patent No. 300,458, of June 17, 1884, where I impart vibratory movement by the same means to a take up lever. But in their organization and mode of operation the two are substantially different in the respects about to be noted—the former take-up being intended to be used with a rotating hook or shuttle revolving in unison with the needle driving shaft, while the present one is adapted to the needs of an oscillating hook which travels nearly twice as fast as the needle driving shaft.

The oscillating hook action hereinbefore described requires a quick delivery of the needle thread to the hook, and a comparatively slow take up movement at first, followed by very speedy take up action. The quick delivery is required because of the rapid movement of the hook; the initial comparatively slow take up movement is made necessary because the hook at this time is still within the loop and the movement necessarily must be gradual until it withdraws; the final speedy take up action is required because all of the slack, of which considerable remains after the hook withdraws, must be taken up during the short remaining part of the driving crank's movement which can be availed of for that purpose, particularly if it be desired to set the stitch before the needle again enters the work. It is my object to thus actuate the take up lever from the driving crank, without requiring irregularity in the movement of the driving mechanism or the interposition of special appliances for imparting the varied movements required. The crank C′ and the part attached to it are revolved by the driving shaft C in the direction of the arrows, on the part C^4 in Fig. 3—a direction it may be noted the reverse of that in which the same parts move in my Patent No. 300,458. In this way I obtain the quick delivery, and comparatively slow initial take up movement. The extreme upward movement of the take up lever is when the swiveled bearing 9 is vertically over the axis of motion of the crank C′; as the latter proceeds on its way the bearing 9 moves nearer to the axis or fulcrum of the take up lever, thus imparting to the take up lever a very rapid downward or delivery movement, in contradistinction to the slow delivery movement of the take up of my Patent No. 300,458. The rate of movement will be appreciated by inspection of Figs. 9 and 6. In Fig. 9 the take up is at its highest point, the hook is about to oscillate backward and the needle has nearly entered the cloth. By the time the needle has completed its descent, and the hook has returned and has just entered another loop, as in Fig. 6, the take up will have moved from the position shown in Fig. 9, to that shown in Fig. 6; it will indeed have completed the whole of its down movement, save the slight distance indicated as existing between the take up's position in Fig. 6, and that in Fig. 7, where the take up is at the end of its down stroke. From that point the take up movement begins; but that movement is gradual at first for the reasons hereinbefore explained. This gradual and comparatively slow movement is obtained because the swiveled bearing 9 is traveling at this time through that portion of its course where it is more distant from the fulcrum of the take up lever. It recedes from the fulcrum until it rises above the horizontal diameter of the circle in which it travels; and consequently its movement at this time and indeed for some time following is slow, as will be understood by a comparison of Figs. 7 and 8. Fig. 7 represents the parts as they stand when the take up is at the extreme of its down movement and Fig. 8 represents them in the position which the take up assumes when the hook has traveled far enough to about cast off the loop. In this way I obtain two of the movements I have in view. To obtain the third, viz: the quick final take-up action, I proceed as follows: The take up lever at its outer end has two eyes 12, 12, through which the thread is threaded. These eyes project out from the front plate of the head of the machine through slots 13, 13, therein, curved to the path of movement of the eyes. On the part of the plate between these slots, and at the proper point in the up stroke of the take-up lever, is a pin 14. When the take up is at that point of its stroke requiring quick take-up action, the thread which is stretched across between the two eyes 12, will bring up against the pin 14. Further upward movement of the take up will have the effect, as indicated in Fig. 9, of taking up very much more thread than would be possible during the same movement in the absence of the pin; the fact is that the parts can be so adjusted, and they are so adjusted by me in practice, that by this quick action, not only is the loop completely taken up and the switch set, but at the same time sufficient thread is pulled from the spool for the next stitch and to form a loop long enough to pass over the under thread without straining. The pin 14 is engaged by a metallic guard strip 15 fastened at one end to the face plate and provided with a hole to receive the pin as shown in Fig. 10. This is a mere retaining device to prevent the thread (which passes between the face plate and the strip) from ever escaping the pin 14. The thread passes from the spool through the open bearing 16 on top of the head, then through the tension 17, around the spring yielding hook 18, thence through the eyes 12 of the take up lever and thence to the needle.

The construction of the tension 17 is shown

clearly in Figs. 4 and 6; but it does not require particular description, inasmuch as any known suitable tension device can be used.

The spring hook 18 projects through and plays back and forth in a slot in the face plate. Its shank terminates in a coiled spring which is secured to the inner side of the face plate as seen in Fig. 4.

The pulley and fly wheel C^5 is on the rear end of the driving shaft C, which in its end has a cross slot 19 and a central screw threaded hole. In the hub of the wheel also there is a cross slot 20, to match the slot 19. To secure the pulley to the shaft I make use of an attachment consisting of a boss 21, with a hole for passage of a screw 22, and lugs 28 projecting from the boss and forming a key. This key is inserted into the single slot formed by the registering of slots 19 and 20, and the wheel and shaft are thus locked together making it impossible for the wheel to turn on the shaft. In practice the shaft does not quite come to the outer end of the hub of the wheel, so that the lugs 23 bear on the hub only; and thus when the screw 22 is driven home into the end of the shaft it will drive the wheel up as far as it can go on the shaft, taking up all lost motion or end play.

Having described my improvements and the best way now known to me of carrying the same into effect, what I claim herein as new and of my own invention is—

1. The combination with the needle bar, take up, feed and hook, of the upper or driving rotary shaft connected to and operating the needle bar and take up, the under oscillating shaft connected to and operating the hook and the feed, the reciprocating rod connected to and actuated by a crank on the driving shaft and extending crosswise of the under shaft, and straps connected to the said under shaft and extending from opposite sides thereof to connections on the reciprocating rod located respectively above and below the under shaft, and arranged so that when the rod reciprocates the one strap will wind upon as the other unwinds from the under shaft, imparting to the latter an oscillating movement of nearly a full revolution in each direction for each complete rotation of the driving shaft, substantially as and for the purposes hereinbefore set forth.

2. In combination with the oscillating under shaft, a runner sleeve engaging a screw thread on said shaft, whereby it is caused to have a regular movement of reciprocation during the oscillating movement of the shaft, a sliding feed bar, and connections between said feed bar and runner sleeve whereby the said bar is reciprocated by or from said sleeve, substantially as and for the purposes hereinbefore set forth.

3. The combination with the oscillating hook shaft, and the runner sleeve engaging a screw thread on said shaft, of a feed bar, a vibratory feed lever connected to and adapted to move the feed bar, and a connecting rod pinned on the one hand to the sleeve and on the other hand to the feed lever—substantially as and for the purposes hereinbefore set forth.

4. The combination with the oscillating hook shaft and the runner sleeve engaging a screw thread thereon, of a feed bar, a vibratory feed lever connected to and adapted to move the feed bar, a slide or bearing on the feed lever adjustable to and from the fulcrum of said lever, and a connecting rod jointed on the one hand to the runner sleeve, and on the other hand to the adjustable slide or bearing on the feed lever, substantially as and for the purposes hereinbefore set forth.

5. The combination of the oscillating under shaft; the runner sleeve engaging a screw thread thereon; a feed bar; a vibratory feed lever for reciprocating said bar; a connecting rod jointed on the one hand to the runner sleeve, and on the other hand to a slide or bearing mounted on and movable lengthwise of the feed lever, and means for adjusting said slide provided with an operating handle which projects up through the bed plate of the machine, substantially as and for the purposes hereinbefore set forth.

6. In combination with the vibratory feed lever, the adjustable slide on the same for attachment of the connecting rod by which the lever is actuated, the adjuster engaging a stud on said slide and longitudinally movable for the purpose of adjusting said slide, and the screw threaded adjusting rod supported in bearings beneath the bed plate, engaging said adjuster, and provided with a handle extending up through a slot in the bed plate, substantially as and for the purposes hereinbefore set forth.

7. The reciprocable tension bar and the feed block contained loosely in said bar so that while moving lengthwise with the bar it may be capable of an up and down movement independently of said bar, in combination with the reciprocatory feed bar provided with a projection to intermittently engage projections on the tension bar for the purpose of giving the to and fro feed movement, and having an incline which in the intervals between the to and fro movement of the tension bar, engages and causes the rise and fall of the feed block carried by said tension bar, substantially as and for the purposes hereinbefore set forth.

8. The reciprocable tension bar, and the feed block carried by said bar and movable up and down independently thereof, in combination with the reciprocatory feed bar, adapted to intermittently operate the tension bar and provided with an incline or swell to produce the rise and fall of the feed block, while the tension bar is at rest, and an adjustable tension device arranged to act on the tension bar so as to offer a resistance (variable at pleasure) to the movement of the latter, substantially as and for the purposes hereinbefore set forth.

9. The combination of the feed bar, *l*, the tension bar, *m*, the feed block *n*, the frame *o*, and the spring tension device—these parts being constructed and arranged together for joint operation as hereinbefore shown and set forth.

10. The oscillating hook, having a central receptacle for the bobbin, a loop taking point, and, bounding the rear edge of said hook, a diagonal slot which extends back to the rear and joins a circular slot extending part way round the body of the bobbin receptacle, the hook back of its point gradually widening and being beveled or made sloping from its front to its rear face, so that the loop which it takes shall be spread and carried over the body of the hook without friction or strain, substantially as set forth.

11. The bobbin case having a spring tension device located in an external recess in its back, thread holes through which the thread from the bobbin may be led to said tension, and a central thread passage through which the bobbin thread may be led from the tension on the back, to and out from the front of the case, substantially as and for the purposes hereinbefore set forth.

12. The bobbin, the bobbin case provided with a spring tension located in an external recess on its back, and with thread holes, and the bobbin cover or shield, all three of said devices, the bobbin, bobbin case and bobbin shield, having a central tube, nesting the one in the other, and forming when the parts are put together a central thread passage through which the thread can be led from the tension on the back of the case out to and beyond the front of the shield or cover, substantially as set forth.

13. The combination with the reciprocating needle and needle bar, the oscillating hook and means for imparting to it movement of more than one hundred and eighty degrees in each direction during each up and down movement of the needle, of take-up mechanism arranged and timed in its movements and operating substantially in the manner described to deliver the needle thread quickly at the time the hook is taking the loop, to take up slowly and gradually so long as the hook is in the loop, and finally during the return movement of the hook to rapidly take up the thread and set the stitch, substantially as set forth.

14. The combination with the reciprocating needle and needle bar, the oscillating hook and means for imparting to it movement of more than one hundred and eighty degrees in each direction during each up and down movement of the needle, of the vibrating take-up lever, the swiveled crank bearing through which said lever extends and slides, and the upper or driving shaft from which said crank bearing is driven, said shaft being rotated in a direction to cause the swiveled crank bearing to move toward the fulcrum of the take up lever during that portion of its stroke in which the thread is delivered to the needle and hook, thus insuring rapid delivery of the needle thread, and a comparatively slow initial take up movement substantially as and for the purpose hereinbefore set forth.

15. In combination with the pivoted take up lever, and the swiveled crank bearing therefor arranged in its revolution to move toward the fulcrum of the lever at the time the latter is moving in a direction to deliver the thread, of a retaining pin arranged in the path of movement of the thread carried by the take up lever so as to meet that thread at the required point in the up, or take-up, movement of the lever, and to hold back the thread at this point while the lever completes its stroke, substantially as and for the purposes hereinbefore set forth.

16. The combination of the swiveled crank bearing, the pivoted take up lever, provided with two eyes projecting through slots in the front plate of the head of the machine curved to conform to the path of movement of the take-up eyes, the thread retaining pin placed between the two slots, and the guard strip or plate, under which that portion of the thread between the two eyes passes, substantially as and for the purposes hereinbefore set forth.

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

JOSEPH L. FOLLETT.

Witnesses:
W. F. POND,
LAWRENCE RICHARDS.