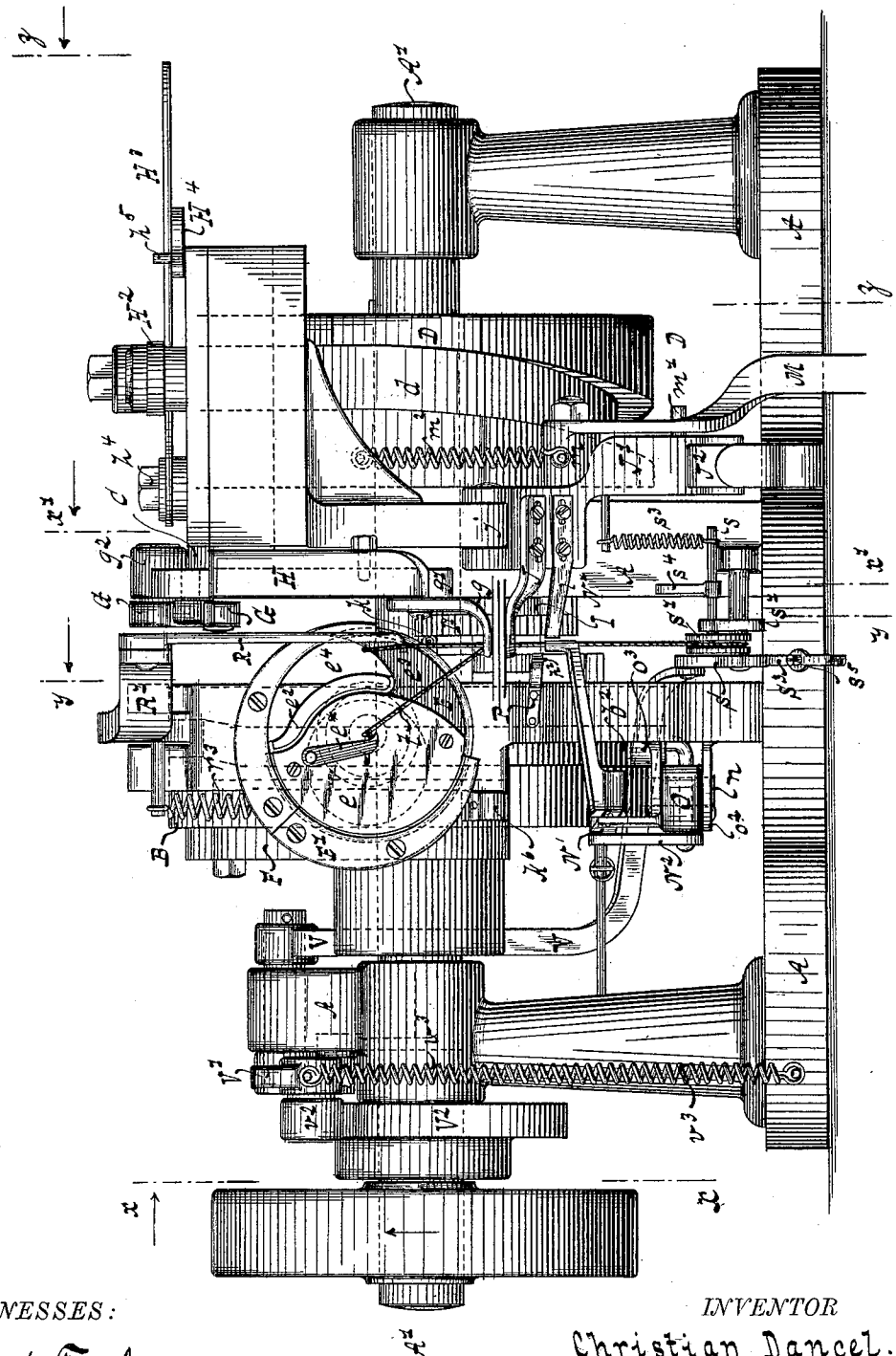
(No Model.) 6 Sheets—Sheet 1.

C. DANCEL.

SOLE SEWING MACHINE.

No. 366,935. Patented July 19, 1887.

Fig. 1.



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(No Model.) 6 Sheets—Sheet 2.

C. DANCEL.

SOLE SEWING MACHINE.

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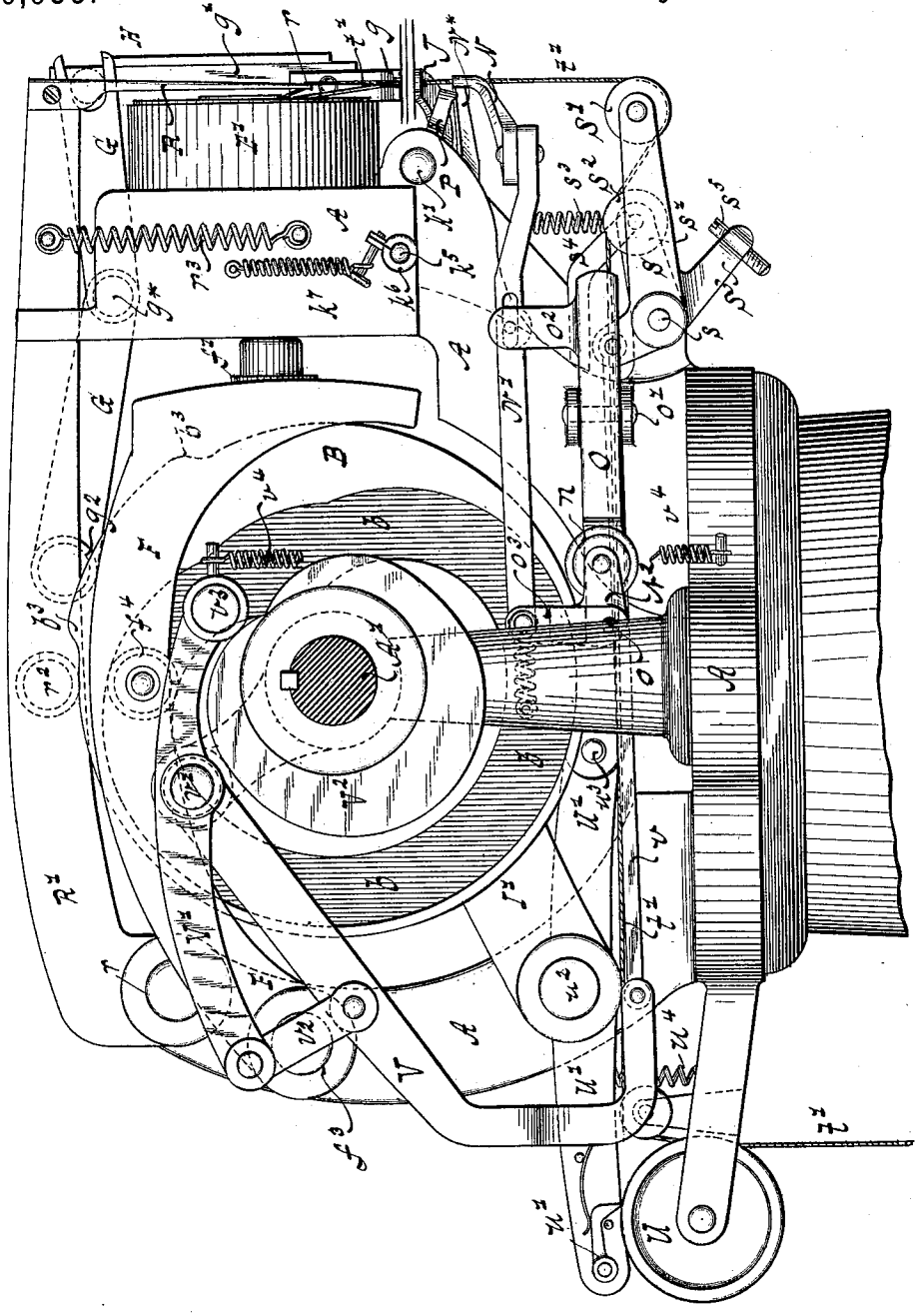

Fig. 2.

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C. DANCEL.

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No. 366,935. Patented July 19, 1887.

Fig. 3.

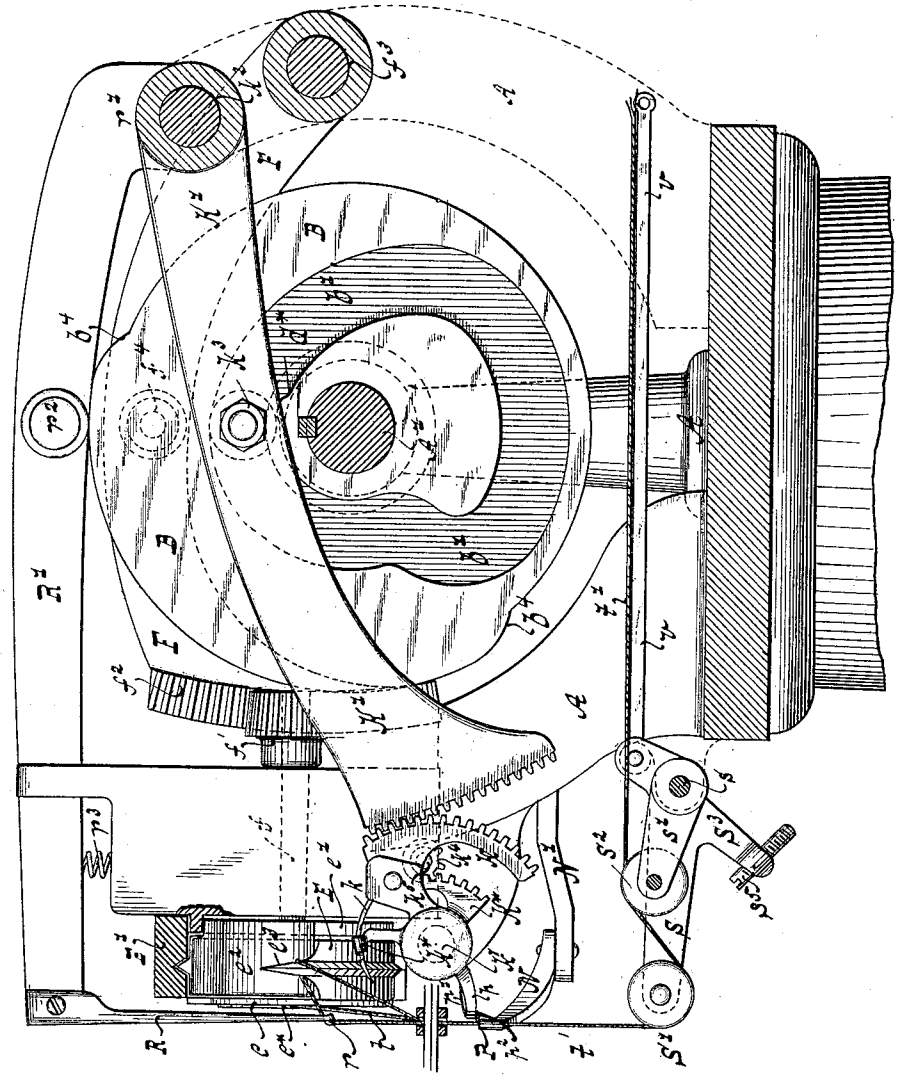
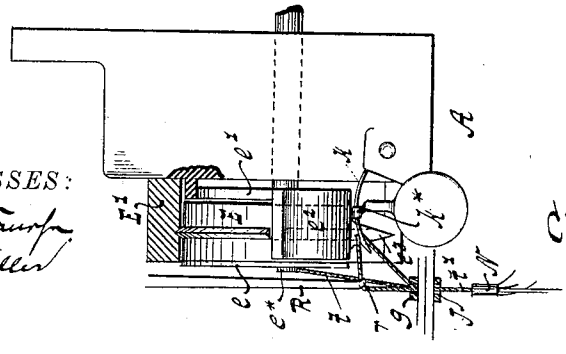


Fig. 4.



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SOLE SEWING MACHINE.

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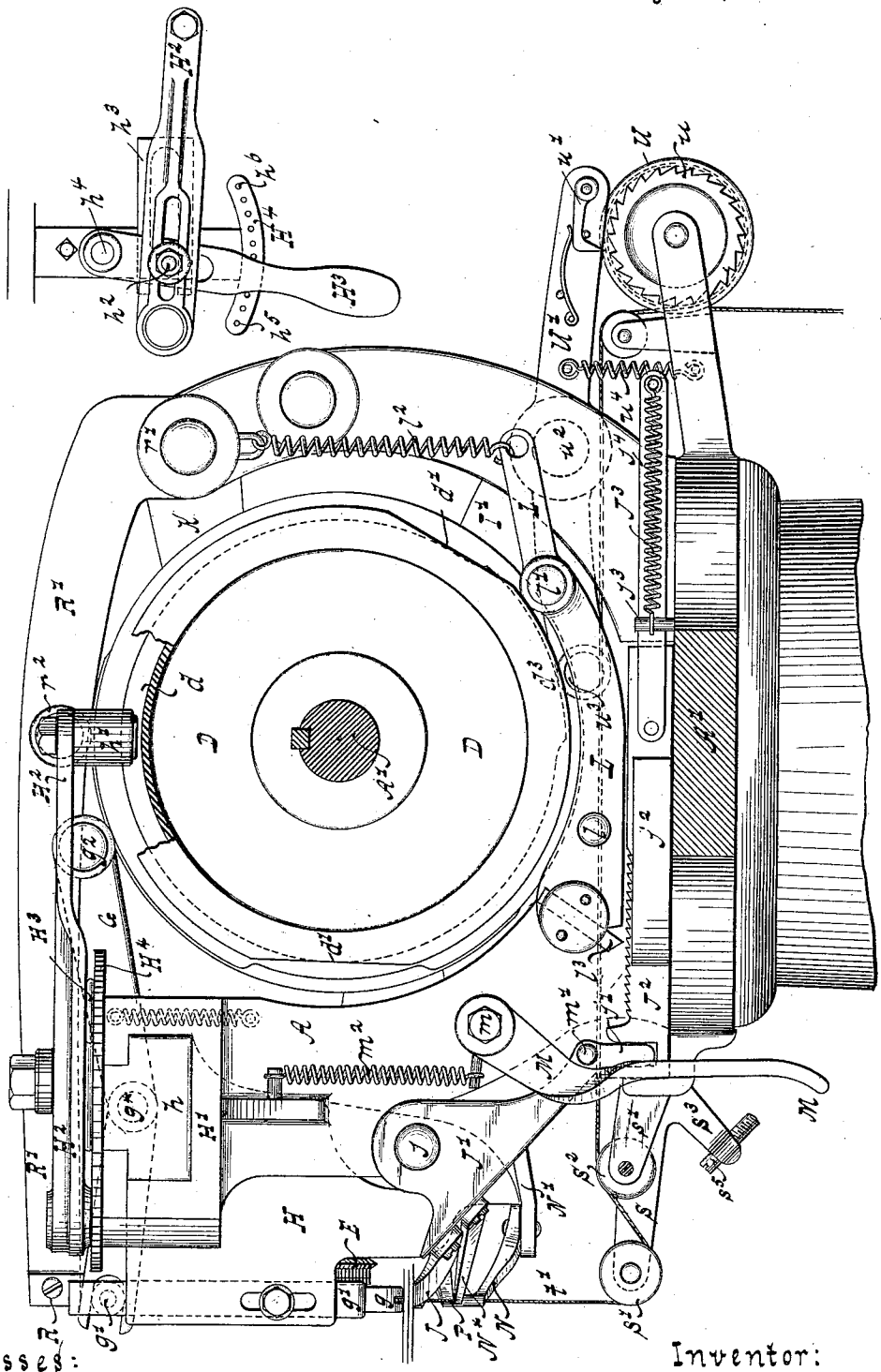
Fig. 6.

Fig. 5.



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(No Model.) 6 Sheets—Sheet 5.

C. DANCEL.

SOLE SEWING MACHINE.

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Fig. 7.

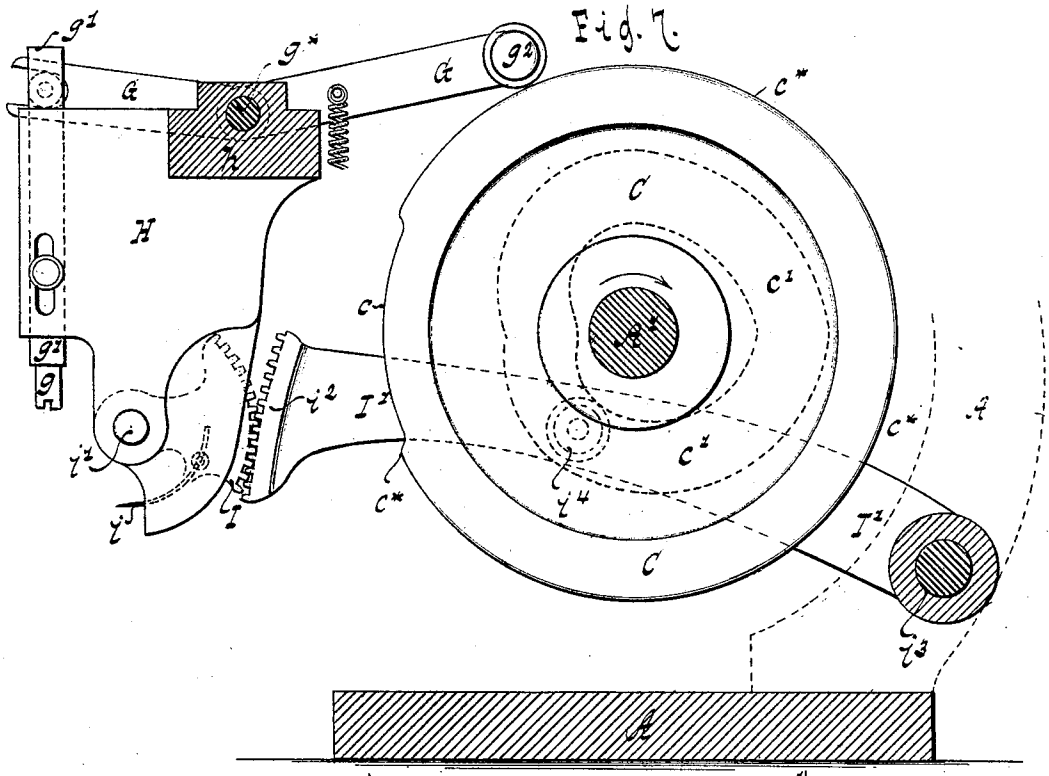


Fig. 8.

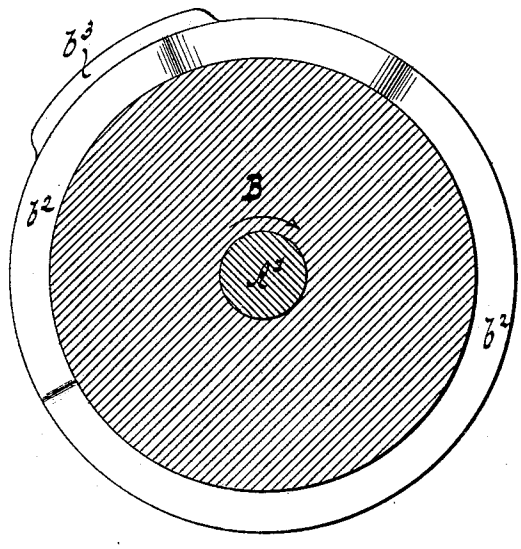
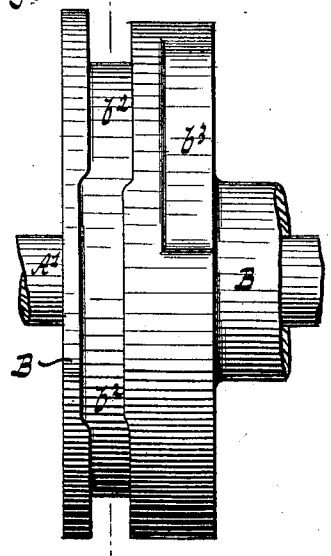


Fig. 9.



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C. DANCEL.

SOLE SEWING MACHINE.

No. 366,935. Patented July 19, 1887.

Fig. 10

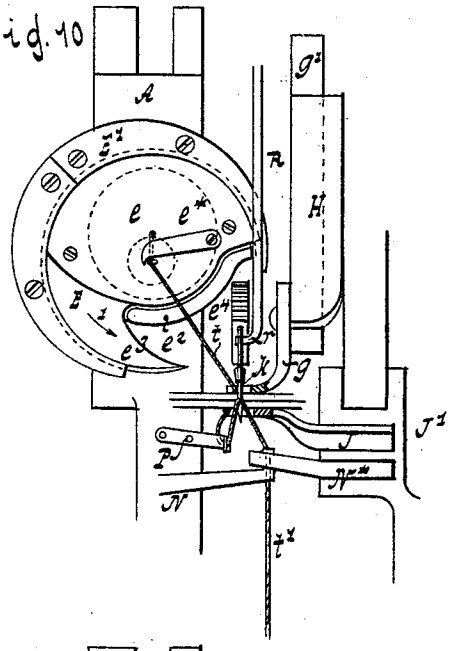


Fig. 11.

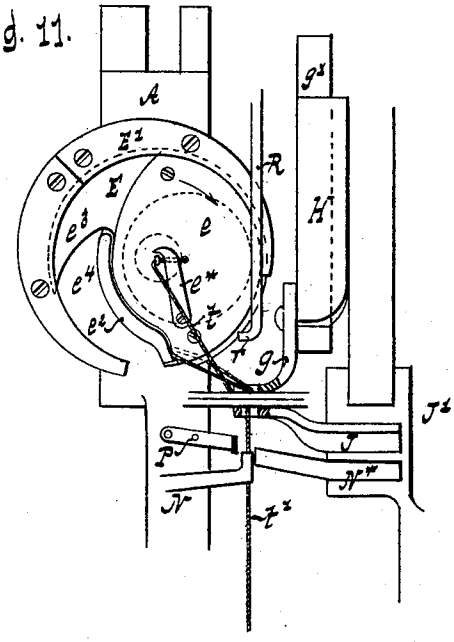


Fig. 12

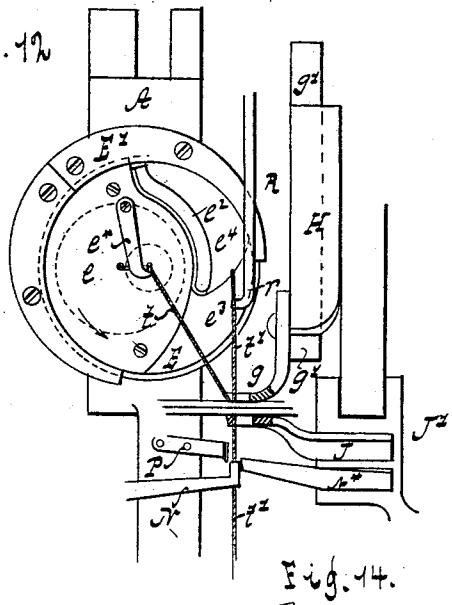


Fig. 13.

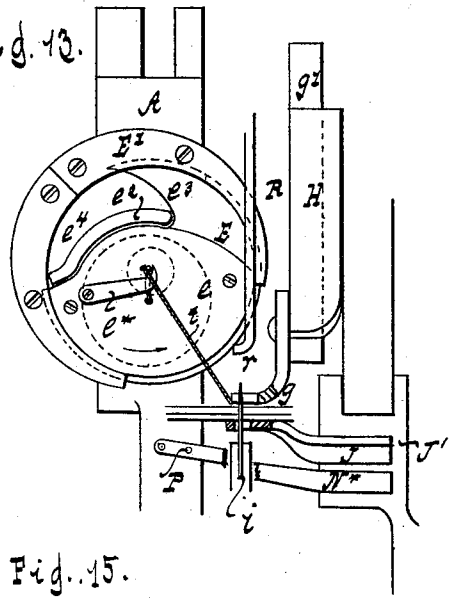


Fig. 14.

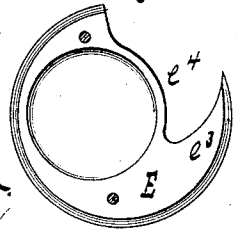
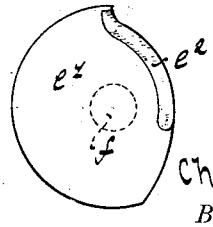


Fig. 15.



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UNITED STATES PATENT OFFICE.

CHRISTIAN DANCEL, OF NEW YORK, N. Y., ASSIGNOR TO THE GOODYEAR & McKAY SEWING MACHINE COMPANY, OF BOSTON, MASSACHUSETTS.

SOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 366,935, dated July 19, 1887.

Application filed July 15, 1886. Serial No. 208,033. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN DANCEL, a citizen of the United States, residing at New York, in the county and State of New York, have invented new and useful Improvements in Sole-Sewing Machines, of which the following is a specification.

This invention relates to sole-sewing machines; and it has for its object to provide novel and efficient mechanism, whereby a lock-stitch is obtained and the outsole can be stitched to the shoe through the shank, regardless of the width of the last, and while the shoe is upon the latter.

The object of my invention I accomplish in the manner and by the means hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a front elevation of a sole sewing machine embodying my invention. Fig. 2 is a vertical section in the plane *x x*, Fig. 1. Fig. 3 is a similar section in the plane *y y*, Fig. 1. Fig. 4 is a sectional view in the same plane, showing the shuttle in a different position. Fig. 5 is a vertical section in the plane *z z*, Fig. 1. Fig. 6 is a top view, on a smaller scale than the preceding figures, of the feed-adjusting mechanism. Fig. 7 is a section in the plane *x' x'*, Fig. 1. Fig. 8 is a vertical section in the plane *y' y'*, Fig. 9, of the looper-cam. Fig. 9 is a top view of the same. Figs. 10, 11, 12, and 13 are elevations showing the stages in the formation of the stitches. Figs. 14 and 15 are detail views of the shuttle and shuttle-driver.

Similar letters indicate corresponding parts.

In the drawings, the letter A' designates the main shaft of the machine, to which a rotary motion is imparted by a suitable belt and-pulley connection with a counter-shaft, and said main shaft A' carries hubs B, C, and D, having proper projections, depressions, and grooves to correctly actuate the various parts of the machine to produce the stitch.

The shuttle E is located above the work-support J, and is carried in an open case, E', being arranged to turn about its center therein. In the discoidal body of this shuttle is formed a cell for the reception of the thread *t*, which cell is closed by a cover, *e*, secured to the shuttle and lies to one side of the center of the shuttle. The thread is led from the center of the cell and through an eye in the center of the shuttle, between which two points the thread is pressed upon by a tension-plate, $e^{3\times}$. The shuttle is actuated by means of a driver, *e'*, Figs. 14 and 15, which lies in the casing at the rear of the shuttle and has a projecting portion or follower, e^2, which engages with the shuttle. A nose or hook, e^3, extending from the body of the shuttle, takes up the lower thread, *t'*, from the ball or spool, as the case may be, such thread finally passing between the body of the shuttle and the follower e^2, and entwines the shuttle-thread to form a lock-stitch. The shuttle is held clear of the driver, so as to form a threadway between it and the driver by a V-shaped guide, which enters a corresponding raceway in the case E', so that the spool-thread can be drawn over the shuttle.

The proper oscillating motion is imparted to the shuttle driver Fig. 3 by means of a gear, *f'*, thereon, which is engaged by a rack, f^2, at one end of an arm, F, that is pivoted at f^3 to the frame, and the said arm has a roller-stud, f^4, which engages with a cam-groove, *b*, in the side of the hub B, Fig. 2. By observing the course of this cam-groove *b* the motion of the shuttle is apparent—viz., is first turned in the direction of the arrow 1, Fig. 10; then it remains at rest for a short period of time, and, finally, it is turned in an opposite direction to arrow 1, Fig. 10, such motions and stop corresponding to the taking up of the loop, the discharge of the same, and the return of the shuttle to its original position.

The pressure-foot or channel gage *g* has its shank or carrying-bar *g'* fitted into a groove in a carriage, H, so as to be movable longitudinally, and it carries a stud, which is embraced by the bifurcated end of a lever, G, pivoted at $g^{3\times}$, and connected with a spring to depress its rear end, which end carries a roller-stud, g^2, so as to hold this stud in contact with the cam-shaped periphery of one edge of the hub C, Figs. 1, 2, 5, and 7. The spring acts to depress the rear end of the said arm and lifts the pressure-foot when the roller-stud g^2 comes to the depressed part *c*, Fig. 7, of its actuating-cam, this lift of the pressure-foot

taking place while the needle is in the material, and so permitting the pressure-foot to be moved backward over the material, after having been moved forward to assist in feeding the material.

When the roller stud g^2 rests on the high portions c^* of the actuating-cam Fig. 7, the pressure-foot holds the material down to a certain determined level with relation to the extreme upward pull of the needle, notwithstanding variations in the thickness of the material being sewed.

The carriage H, previously mentioned, is provided with a guide-block, h, extending at right angles thereto, and which is fitted in guideways formed in a rigid housing, H′, that constitutes part of the frame of the machine Figs. 1, 5, 6, and 7. To move the carriage H in and out, so as to feed the material, a lever, H^2, is used, which is pivoted to the housing H′, and is provided at one end with a roller-stud, h', that enters a cam-groove, d, in the hub D, so as to vibrate said lever H^2 about its point of pivoting. This lever is slotted at or near its central portion Fig. 6, and in this slot plays a stud, h^2, the lower end of which is extended into a grooved block, h^3, (the groove being shown by dotted lines in Fig. 6,) that is rigidly attached to the carriage H. The carriage at the lower end of its vertical portion has attached to it a pivot, i', Fig. 7, which supports the awl-carrier or awl-segment I, so that as the carriage is moved transversely the circularly-curved awl i being in the material is made to act as a feeding device. The awl-segment I and the awl are oscillated by a rack, i^2, at one end of an arm, I′, pivoted at i^3 to the frame, and said arm I′ has a roller-stud, i^4, which enters a cam-groove, c', in the hub C, (said groove being shown by dotted lines in Fig. 7.) The teeth of the rack i^2 are made wide enough to remain constantly in engagement with the teeth of the awl-segment I as it is moved laterally with the carriage H each time the material is fed, the work plate or support J having a long slot for a throat to permit this lateral motion of the awl.

The circularly-curved needle k is attached to a needle-segment, K, which is mounted on a pivot, k', Fig. 3, that is secured to the frame A, and said needle-segment is oscillated by a toothed driving-segment, K′, which swings about a pivot, k^2, and carries a roller-stud, k^3, which enters a cam-groove, b', in the hub B. A depression, d^*, in the cam-groove gives the needle a slight "dip" as the shuttle takes the thread, so that the same is readily released from the needle.

The needle and awl turn about centers arranged in one and the same straight line, but at a distance apart, so that as the work is fed forward by the awl the puncture formed thereby in the material is brought in line with the needle. It will also be observed that the needle acts from above while the awl acts from below the work-support—that is to say, they act in opposite directions.

The needle guide or support is carried by a sector, K*, the teeth of which engage with a pinion, k^4, mounted on a short spindle, k^5, upon the outer end of which is a split collar, k^6, Figs. 1 and 2, that has an arm subjected to the action of a spring, k^7, which constantly keeps the needle-guide pressed as close to the work as possible in such a manner that it follows lows with the needle as the same moves toward the material, and is returned by the action of the projecting lug on the needle against the guide or support on the return of said needle.

The discoidal shuttle E is located above the work-support, and oscillates in a plane at right angles, or nearly so, to the plane of the path of the needle—that is, the path of the shuttle lies outside of the path of the needle; but, as seen by inspection of Fig. 3, the needle segment is larger in diameter than the arc in which the needle oscillates, and therefore the paths of the shuttle and needle segment intersect. To permit the parts to pass, a proper recess, e^4, is formed in the shuttle, through which the segment extends as the needle penetrates the material, and during the period of time in which this takes place the shuttle, owing to the contour of its actuating-arm, remains stationary.

The narrow work support J, Figs. 1 and 5, projects from a bed, J′, which is pivoted at j to the frame A of the machine, and said bed J′ is provided with an arm, j', which is engaged by a slide-bar, J^2, held or directed in its longitudinal movement by a guide-box, j^2, Fig. 5. A strong spring, J^3, connected with a rigid stud, j^3, and a connecting-rod, j^4, attached to the slide-bar J^2, acts to force the work-support firmly against the material.

The work-support J, in contact with the usual welt of the boot or shoe, is automatically locked in position during the time that the needle penetrates the material and while the pressure-foot is moved backward from its forward position, immediately after which, and as the pressure-foot is descending upon the material, the support is unlocked to permit the same to rest in the channel of the outer sole and to place the bottom of the channel always at the same uniform level, the support then yielding to compensate for all variations in the thickness of the material. After the pressure-foot is depressed, the needle is raised from the material; but just before it leaves the material the support is again locked, and is held thus while the awl pierces the material and until the feed takes place. The locking device, to hold the support or its bed J′ rigidly in position, is herein shown as a lever, L, which is pivoted at l to the frame A, and carries a roller-stud, l', which is in contact with the cam-surface of the hub D. A spring, l^2, constantly presses the roller-stud against this cam-surface, which has two depressions, d' d', so that the lever L is vibrated twice for each revolution of the cam, causing the pawls l^3 on its forward end to engage with ratchet-teeth formed

on the sliding bar J^3, so as to hold it in place—that is, prevent it from moving backward. During the time that the lever L is not in engagement with the teeth on the sliding bar J^3, the work-support is free to yield.

In order to depress the work-support for the insertion or removal of the work, a hand-lever, M, is pivoted to the frame at *m*, and is in engagement with a pin or stud, *m'*, projecting laterally from the bed J', so that by pressing the hand-lever inward the work-support is lowered. A spring, m^2, returns the hand-lever to its original position. It will be observed, however, that the work-support can only be lowered when the hub D is in certain positions, as explained.

The looper N, Figs. 1, 2, 10, and 11, having the usual eye, is located beneath the work-support and is secured to an arm, N', which arm N' is attached to one arm of a bell-crank lever, N^2, that carries on its other arm a roller-stud, *n*, which is in contact with a cam on the hub B. The bell-crank lever is pivoted at *o* to a swivel-bar, O, which is pivoted at *o'* to the frame and has supports o^2 for the arm N', which carries the looper N. This bar O carries a roller-stud, o^3, which enters a cam-groove, b^2, in the hub B, the course of which cam is clearly shown in Figs. 8 and 9, and causes the bar to vibrate and impart to the looper a motion from one side of the line of needle to the other. The cam engaged by the roller-stud *n* of the lever N^2 has a projection, b^3, which causes the arm N' to be thrown in and out, thus giving the looper a motion in a direction at right angles to the motion imparted thereto by the bar O. A slot in the arm N allows this arm N' to be moved freely, and a spring attached to the crank-lever N^2 constantly keeps its roller-stud *n* against its cam.

To the frame A, and between the looper and the work-support, is attached a loop-retaining device, P, which consists of a rigid plate or prong, *p*, to which is secured a spring-blade, *p'*, so that this device will retain the thread if said thread is inserted between its parts. In order that the looper may readily insert the thread into this loop-retainer a small lip, p^2, projecting downwardly is formed on the spring-blade *p'*, which is impinged upon by the looper to force the spring-blade apart from the rigid plate, so that the thread can enter between the two parts. The object of this loop-retainer is to provide a supply of thread, which is taken up through the work by the needle without sliding in the eye or barb of the same while it is passing through the work. The action of the looper, due to the combined action of the arm and swivel-bar, is first to lay the thread in the loop-retainer P, which holds the thread until pulled away from it by the needle, then to lay the thread in the eye of the needle, then to the right of the line of needle, and finally back to its normal position, as shown in Fig. 1.

The loop held by the loop-retainer P is drawn upward through the material by the needle, and to bring said loop in a proper position to be taken up by the shuttle nose or hook e^3 a loop spreader or lifter, R, is used, which has a tongue or lip, *r*, which extends parallel, or nearly so, to the face of the needle-segment and in a plane outside of the plane of the same. The hook of the loop-spreader lies under or within the inner periphery of the needle, and is actuated to move in a perpendicular direction across the path of the needle—that is to say, across the arc of vibration of the same—and receives the thread from the needle and spreads the loop so that the shuttle nose or hook will pass through it. One of the functions of this loop retractor, lifter, and spreader is to draw sufficient thread after it is released from the needle-hook so that the shuttle may pass through the loop without the shuttle being necessitated to pull up its own thread.

In the example shown in the drawings, Fig. 3, the loop-spreader R is attached to the free end of an arm, R', which is pivoted at *r'* to the frame A, and carries a roller-stud, r^2, that is in peripheral contact with the cam-face on the hub B. This hub has a long projection, b^4, so that when the roller-stud r^2 rides on said projection the loop-spreader is drawn upward. A spring, r^3, keeps the roller-stud constantly in engagement with the cam-face, Figs. 2 and 3.

On inspection of Fig. 4 it will be perceived that loop-spreader R engages the loose thread leading from the looper N to the barb of the needle, and carries such strand of the loop upward, so that the shuttle passes by and in front of the portion of the loop nearest to it and takes up the thread on the side of the needle farthest away, and therefore the shuttle acts on that part of the thread which leads from the take-up mechanism through the looper to the barb of the needle. The shuttle then disengages the thread from the needle without drawing the thread through the barb—that is, it is slipped off the barb.

To draw the thread *t'* off the shuttle at the proper time, a "take-up" device is used, which in the example shown in the drawings consists of a bell-crank lever, S, that is secured to a spindle, *s*, having bearings in the frame A and said bell crank lever carries on one arm a pulley, S'. A second pulley, S^2, is carried by an arm, *s'*, which is mounted on the spindle *s*, but can turn independently of the same, and over the two pulleys S' S^2 is passed the thread from the wax-chamber, said thread first passing around a tension-wheel, U, having bearings in a frame at the back of the machine. The arm S is acted on by a spring, s^3, and carries a stop, S^1, Fig. 2, which abuts against the frame. An arm, S^3, extends also from the take-up lever S and has a nut for an adjusting-screw, s^5, so that the arc of vibration of the take-up lever S can be regulated for varying thickness of material and length of stitch. To actuate the take-up lever at the proper moment its vertical arm is connected by a

link, v, with an arm, V, Fig. 2, that is swung on a spindle, v', from the frame A, and is connected by a link, v^2, with a lever, V', that oscillates about the spindle v' and carries a roller-stud, v^3, on the end of its free arm. This roller-stud v^3 bears on a heart-cam, V^2, that is secured to the main shaft A' of the machine, and is held in contact with the same by a spring, v^4, extending to the frame.

The spindle of the tension-wheel U carries two toothed wheels, u u, Fig. 5, which are adapted to be engaged by pawls u' u', said pawls being acted upon by springs swung on either side of a lever, U', that is pivoted at u^2 to the frame and carries on its inner end a roller-stud, u^3, that bears upon a cam-face formed on the hub D, said cam-face containing a projecting portion, d^3, which engages the roller-stud to raise the pawls u' u' clear of the toothed wheels u u, so as to permit the withdrawal of the thread at the proper time—that is to say when the lifter or shuttle takes up the loop—but is locked when the take-up is drawing the loop downward. A spring, u^4, keeps the roller-stud in contact with its cam-face at all times. The spring-pressed arm s' and its pulley S^2 take up the slack formed by the looper owing to the action of the spring s^3.

The general operation of the machine in forming the stitch is as follows: The threads being properly arranged, the work is inserted between the presser-foot and the work-support, the latter being first drawn downward to facilitate its introduction. Referring at present to Figs. 10, 11, 12, and 13, the awl Fig. 13 first moves upward and pierces the material, and while it is in the same the feed takes place, which brings the puncture in line with the needle. As the needle approaches the puncture, the awl recedes, and after the needle has penetrated the material the pressure-foot and awl return to their normal position. At the same time the looper carries the thread to the loop-retainer, and as the needle projects beyond the material the looper crosses the needle and lays the thread in its barb or hook. The needle now draws the loop through the material Fig. 10, after which the proper strand of the loop is grasped by the loop-spreader, which had previously been lowered within the arc of oscillation of the needle. The loop-spreader now rises and brings the loop within the reach of the shuttle, the nose of which enters the loop and draws it over the shuttle Figs. 4, 5, and 12. The shuttle continues to move until in the position shown in Fig. 11, in which position it remains stationary until the loop is drawn over the shuttle by the action of the take-up and entwines the shuttle-thread, whereby a lock-stitch is formed.

When sewing the shank of the shoe or boot, it is desirable to make the stitches longer than when sewing about the fore part of the shoe. To be able to quickly change from the maximum length of feed to the minimum, or the reverse, and insure like length of stitches on all work of certain sizes, the pin h^2, Fig. 6, in the slotted lever H^2, is placed under the control of a feed-regulator, H^3, pivoted at h^4, so that the pin by shifting said regulator is caused to traverse the slot in the lever H^2, and is placed at a greater or less distance from the fulcrum-pin of the said lever, according as the feed is to be long or short.

Near the regulator H^3 is a plate, H^4, provided with holes, in any two of which may be placed the adjusting-pins h^5 h^6, two being used at a greater or less distance apart, so that when the regulator rests against the pin h^5 or feed-stop the feed will be short, and when against pin h^6 long. The change of feed is made instantly by throwing the regulator against one or the other stop.

A guard, N*, prevents the upper of the shoe from interfering with the motion of the looper.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a lock-stitch sewing-machine, of the work-support, an oscillating barbed or hooked circularly-curved needle, an oscillating discoidal shuttle arranged above the work-support, an awl, and means for giving the awl a lateral movement while in the material, whereby it operates as a feeding device, substantially as described.

2. The combination, in a lock-stitch sewing-machine, of the work-support, an oscillating shuttle arranged above the work-support, an oscillating circularly-curved awl, an oscillating circularly-curved needle, mechanism for moving said awl and needle in opposite directions, and a longitudinally-moving presser-foot or channel-gage operating with the awl in feeding the work, substantially as described.

3. In a lock-stitch sewing-machine, the combination of the oscillating circularly-curved hooked needle, a needle guide or support, a discoidal shuttle oscillating around its own axis in a plane at right angles, or nearly so, to the plane of the needle, and a looper, substantially as described.

4. In a lock-stitch sewing-machine, the combination of the oscillating circularly-curved hooked needle and a discoidal shuttle oscillating around its own axis in a plane at right angles, or nearly so, to the plane of the needle, and having a hook moving in a path which does not intersect the path of the needle, substantially as described.

5. In a lock-stitch sewing mechanism, the combination of a circularly-curved needle and a circularly-curved awl mounted in toothed lever-segments of larger radius than the radius of the needle and awl with a discoidal shuttle oscillating in a plane at right angles, or nearly so, to the plane of the needle, and having a hook moving in a path which does not intersect the path of the needle, substantially as described.

6. In a lock-stitch sewing mechanism, the combination of a circularly-curved hooked needle, a discoidal shuttle operating at right

angles to said needle, a hook formed on said shuttle, and a loop retractor or spreader for carrying the loop into the path of the shuttle-hook, substantially as shown and described.

7. In a lock-stitch sewing mechanism, the combination of a circularly-curved hooked needle having an oscillating motion, a discoidal shuttle oscillating in a plane at right angles, or nearly so, to the plane of the needle, a loop retractor or spreader having a path intersecting the path of the needle, and means, substantially as described, for imparting to said loop-retractor a reciprocating motion in a plane parallel, or nearly so, to the plane of the needle, substantially as described.

8. In a lock-stitch sewing mechanism, the combination of a circularly-curved hooked needle, a discoidal shuttle, a hook formed on said shuttle, a looper for conveying the thread to the needle, a loop spreader or retractor, and means to cause the said spreader to engage that strand of the loop which leads to the looper and to carry it into the path of the shuttle-hook, substantially as shown and described.

9. In a lock-stitch sewing mechanism, the combination, with a work-support and with a circularly-curved hooked needle having a rotary reciprocating motion, of a discoidal shuttle having an oscillating motion in a plane at right angles, or nearly so, to the plane of the needle, a hook formed on said shuttle and made to move in a path not intersecting the path of the needle, a looper beneath the work-support for conveying the thread to the needle, a loop-spreader above the work-support, and means to cause the said spreader to engage that strand of the loop which leads directly from the eye of the needle to the looper and to carry it into the path of the shuttle-hook, substantially as shown and described.

10. In a lock-stitch sewing-machine, the combination of a work-support, an oscillating circularly-curved hooked needle, a circularly-curved awl, means for moving the awl and needle in opposite directions, an oscillating discoidal shuttle operating at right angles to the needle and arranged above the work-support, a hook on the shuttle for taking up the lower thread, and take-up mechanism below the work-support for drawing the loop off the shuttle, substantially as described.

11. In a lock-stitch sewing-machine, the combination of a work-support, an oscillating circularly-curved hooked needle, an oscillating awl, an oscillating discoidal shuttle arranged above the work and having a hook, a loop retractor or spreader for carrying the loop in the path of the shuttle-hook, a take-up mechanism below the work-support, and means, substantially such as described, for drawing the loop off the shuttle and yielding when the shuttle takes up the loop, as set forth.

12. In a lock-stitch sewing mechanism, the combination of a circularly-curved hooked needle, a discoidal shuttle, a hook formed in said shuttle, a looper, a loop-retainer, a loop-spreader having a reciprocating motion in a plane parallel to the plane of the needle, and intersecting the path of said needle for bringing the loop into the path of the shuttle-hook, and a take-up for drawing down the loop to form the stitch after said loop has been taken up by the shuttle, substantially as described.

13. In a lock-stitch sewing mechanism, the combination of a circularly-curved hooked needle, an oscillating shuttle moving in a plane at right angles to the needle, a hook thereon moving outside of the plane of the needle, and a loop spreader or retractor moving up and down in a plane parallel to the needle, and intersecting the path of the needle to receive the thread from the needle and place it in the path of the shuttle, substantially as shown and described.

14. In a lock-stitch sewing mechanism, the combination of the circularly-curved hooked needle having an oscillating motion, an oscillating discoidal shuttle rotating in a plane at right angles to the path of the needle, a hook formed on said shuttle and moved in a path not intersecting the path of the needle, a loop spreader or retractor, an arm bearing said loop-spreader, and a cam operating said arm, and which imparts a rising and falling motion to the same, substantially as shown and described.

15. In a lock-stitch sewing mechanism having a circularly-curved hooked needle and an awl working in opposite directions, the oscillating shuttle E above the support for the work, the shuttle-driver for the same, a driving-shaft extending from said driver and operated by a lever-segment, and a cam, causing said lever-segment to rotate the shaft, substantially as shown and described.

16. In a lock-stitch sewing mechanism having a circularly-curved needle and a circularly-curved awl, and means to turn said needle and awl about the same center line, but in opposite directions, the combination of an oscillating shuttle and a shuttle-driver mounted upon a shaft extending from said driver at right angles to the center line of the needle and awl, substantially as shown and described.

17. The combination, with the oscillating shuttle and loop forming and spreading mechanism, of the swinging take-up bell-crank lever S, carrying the pulley S′, the pivoted arm s', carrying the pulley S^2, the link v, connected with one arm of the bell-crank lever, the vertical swinging arm V, connected with said link, and means for actuating said vertical swinging arm, substantially as described.

18. The combination, with the oscillating shuttle, the loop forming and spreading devices, and the work-support, of the take-up lever S, directly below the work-support, the pulley S′, carried thereby, the spring-supported arm s', the pulley S^2 thereon, the adjustable stop on the take-up lever, and means, substantially as shown and described, for actuating the take-up lever from the rear of the machine, substantially as shown and described.

19. In a lock-stitch sewing mechanism, the combination, with a circularly-curved hooked needle having an oscillating motion, a discoidal shuttle having an oscillating motion in a plane at right angles to the plane of the needle, and with loop forming and spreading devices, of the take-up lever and its pulley, and the tension-wheel having means to enable it to be free to rotate when the shuttle is taking up the thread, substantially as shown and described.

20. In a lock-stitch sewing mechanism, the combination, with a circularly-curved hooked needle having an oscillating motion, a discoidal shuttle having an oscillating motion in a plane at right angles to the plane of the needle, and with the loop-forming device, of the tension-wheel at the rear of the machine, a toothed wheel or wheels connected with the tension-wheel, a lever carrying a pawl or pawls, engaging with said toothed wheel or wheels, and a cam for oscillating said lever, substantially as shown and described.

21. The combination, with the shuttle and the needle, of the loop-retainer P, the looper N, the cam-surfaces engaging the roller-studs on a swivel-bar, and bell-crank lever to impart to the looper a motion toward the loop-retainer and across the needle, substantially as shown and described.

In testimony whereof I have hereto set my hand in the presence of two subscribing witnesses.

CHRISTIAN DANCEL.

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.