(No Model.) 5 Sheets—Sheet 1.

# F. DOUCET.

## SEWING MACHINE.

No. 457,578. Patented Aug. 11, 1891.

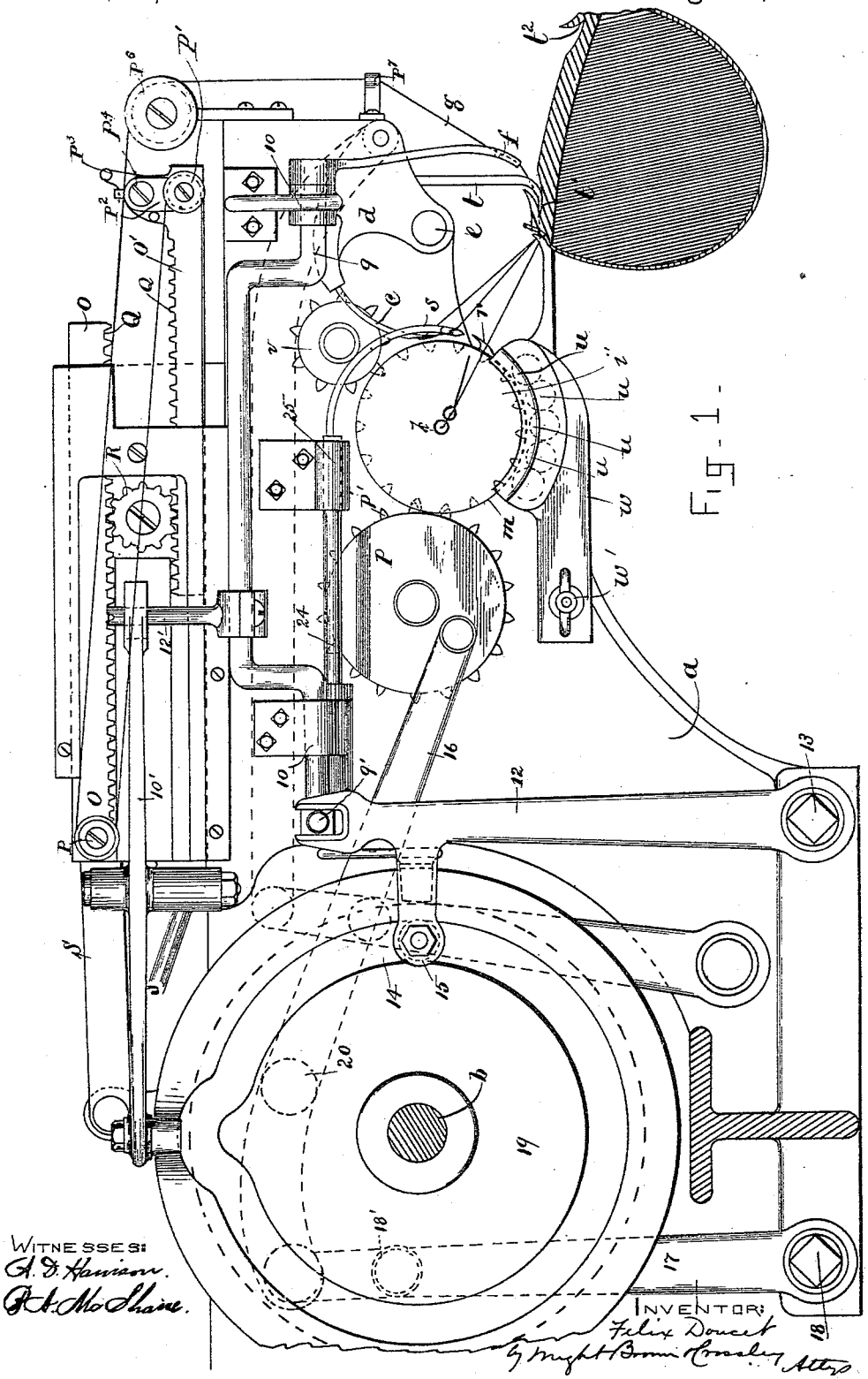

Fig. 1.

WITNESSES:
A. D. Harrison.
R. K. McShane.

INVENTOR:
Felix Doucet
by Wright Brown Quinby & Atty's

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# F. DOUCET.

## SEWING MACHINE.

No. 457,578. Patented Aug. 11, 1891.

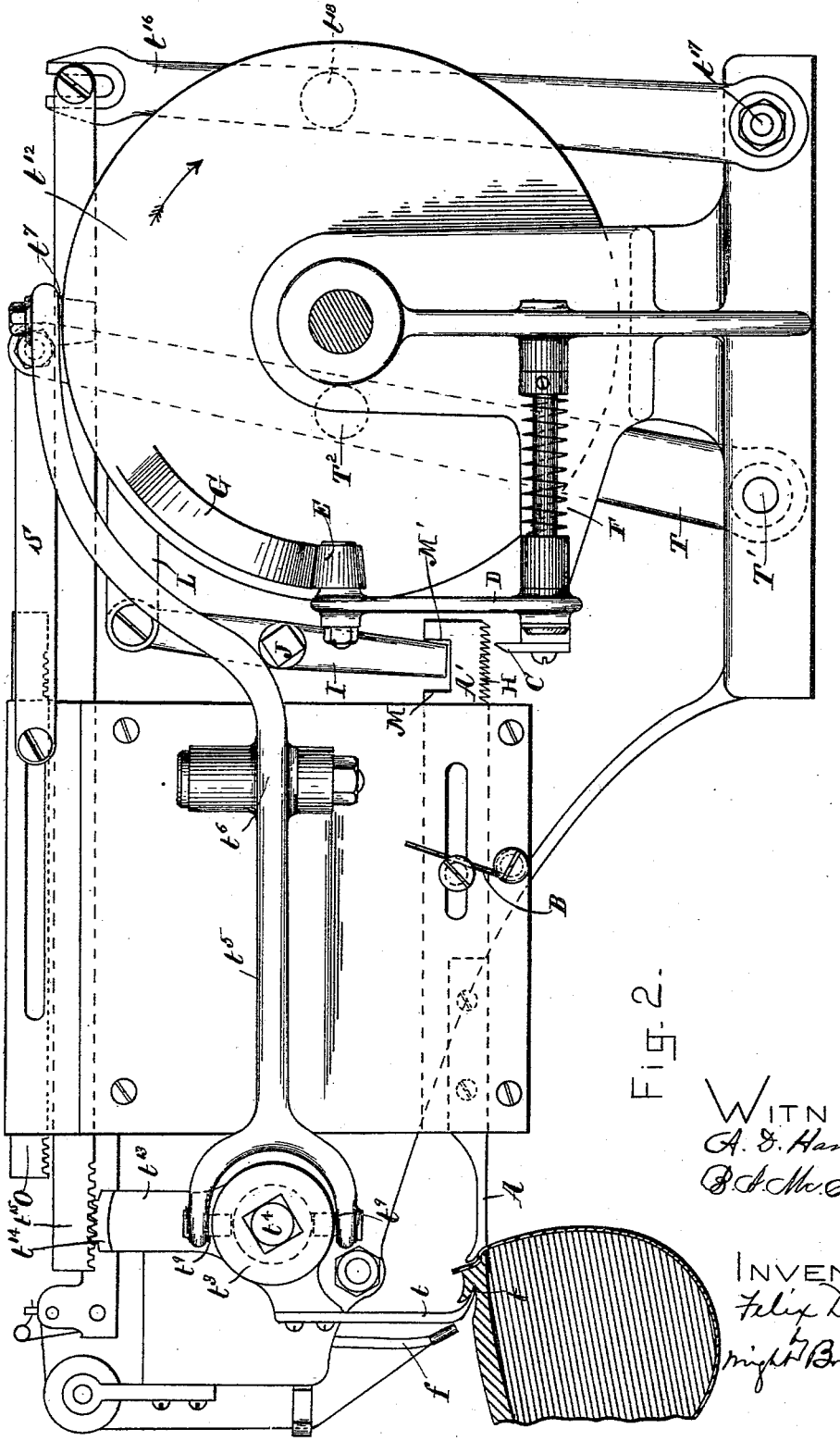


Fig. 2.

WITNESSES:
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INVENTOR:
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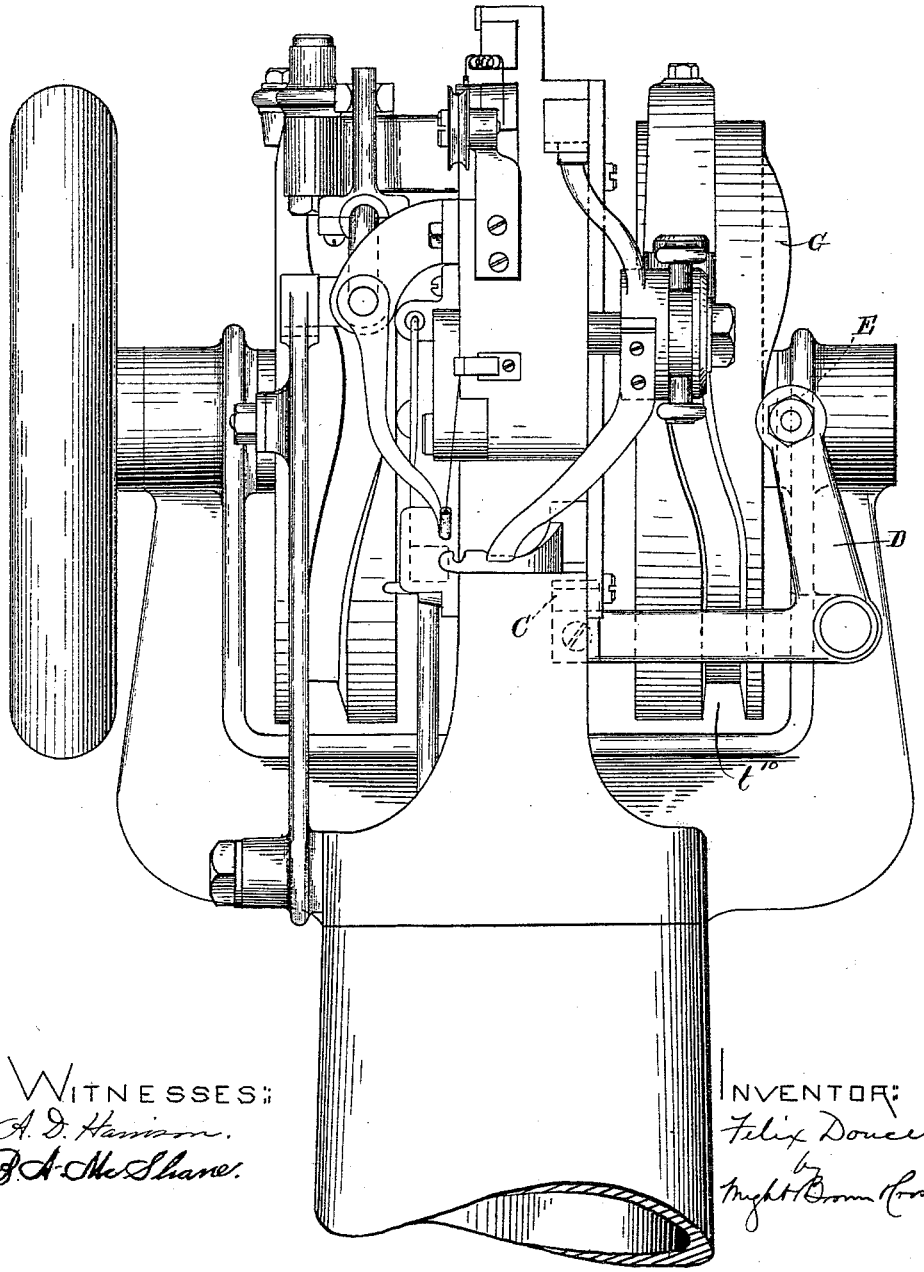
# F. DOUCET.

## SEWING MACHINE.

No. 457,578. Patented Aug. 11, 1891.

Fig. 3.




WITNESSES:
A. D. Harrison.
B. A. McShane.

INVENTOR:
Felix Doucet
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(No Model.) 5 Sheets—Sheet 4.

# F. DOUCET.

## SEWING MACHINE.

No. 457,578. Patented Aug. 11, 1891.

Fig. 4.

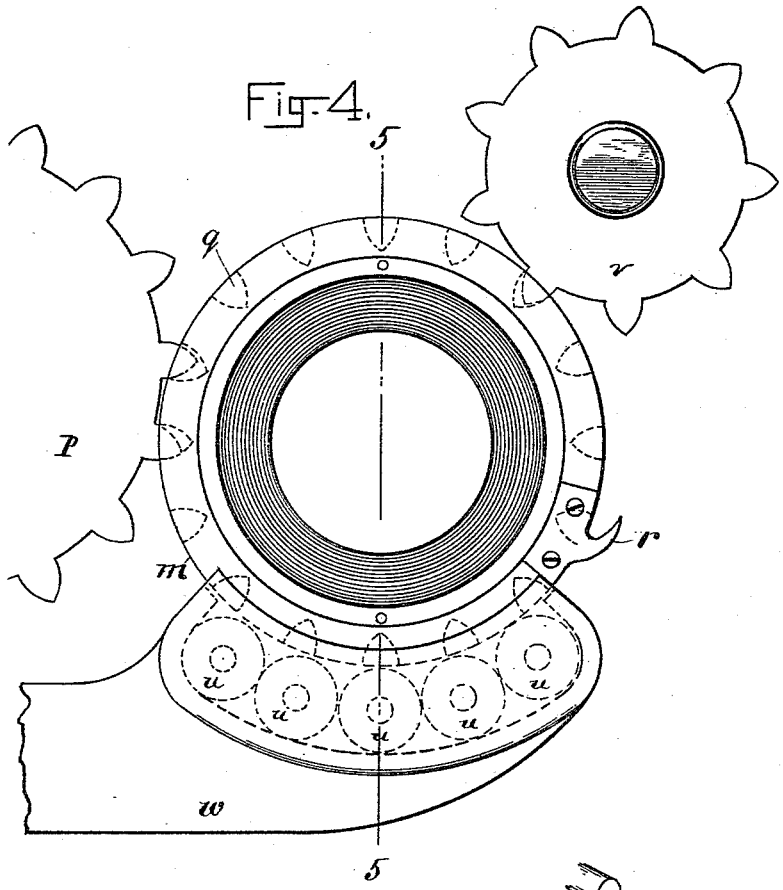



Fig. 5.

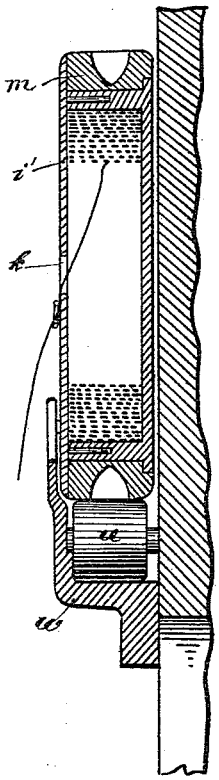



Fig. 6.

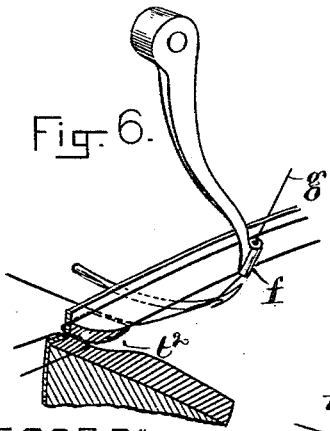
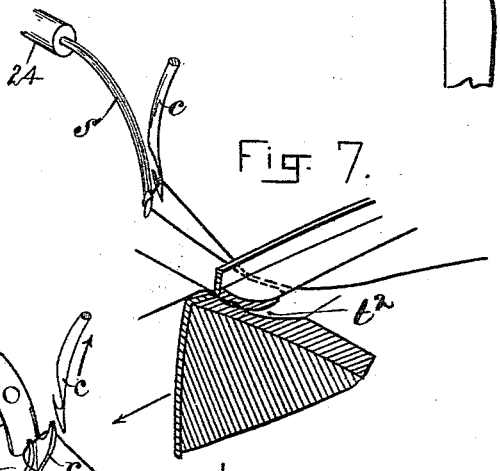



Fig. 7.



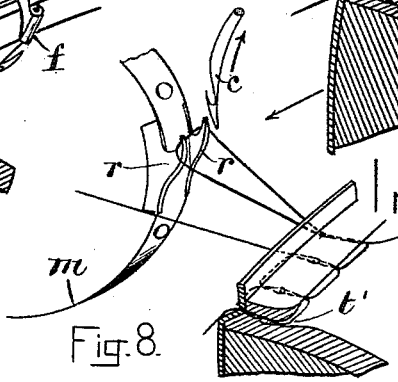




Fig. 8.

WITNESSES:
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(No Model.) 5 Sheets—Sheet 5.

# F. DOUCET.

## SEWING MACHINE.

No. 457,578. Patented Aug. 11, 1891.

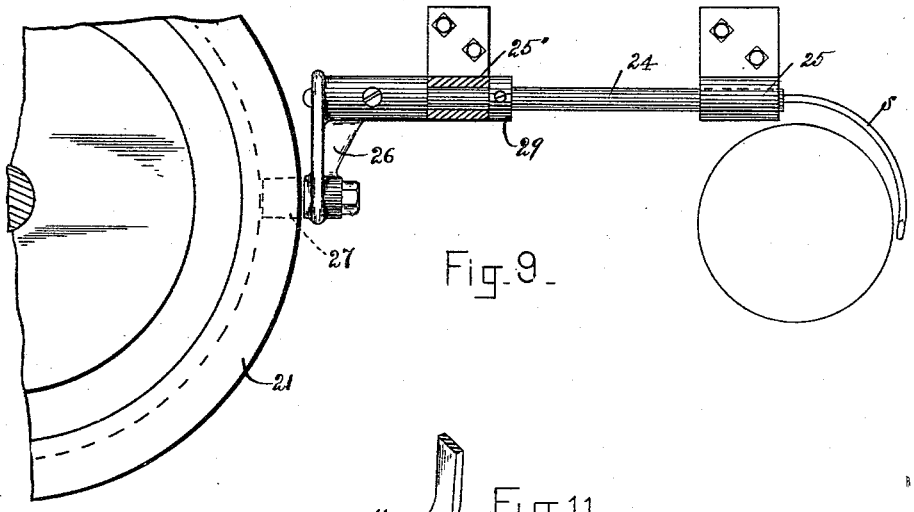


Fig. 9.

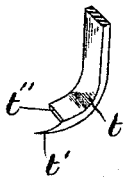


Fig. 11.

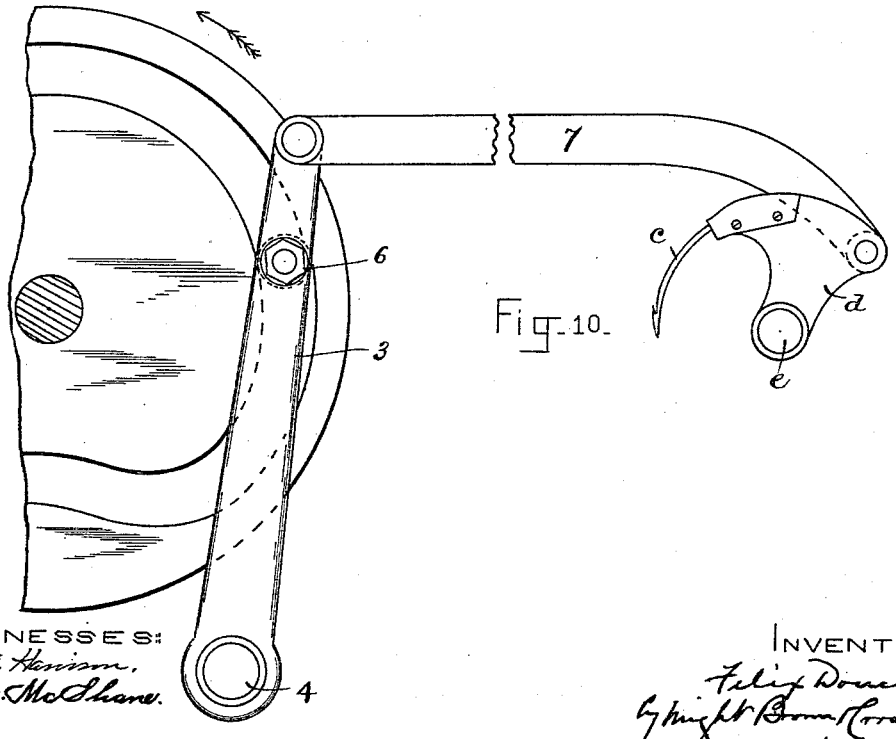


Fig. 10.

WITNESSES:
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P. A. McShane.

INVENTOR:
Filip Doucet
by Wright Brown Quinby & Atty.

# UNITED STATES PATENT OFFICE.

FELIX DOUCET, OF MONTREAL, CANADA.

## SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 457,578, dated August 11, 1891.

Application filed February 7, 1891. Serial No. 380,552. (No model.)

*To all whom it may concern:*

Be it known that I, FELIX DOUCET, of Montreal, in the Province of Quebec, Canada, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention has for its object to provide a simple and effective lock-stitch wax-thread sewing-machine adapted to stitch uppers to soles of turned boots or shoes and to stitch welts to uppers and inner soles of welted boots or shoes; and to this end it consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents an elevation of one side of a wax-thread sewing-machine embodying my invention. Fig. 2 represents an elevation of the opposite side of the same. Fig. 3 represents a front end elevation. Fig. 4 represents an enlarged side elevation of the fixed shuttle and the rotating ring surrounding it, the cap covering the side of the shuttle being removed. Fig. 5 represents a section on line 5 5, Fig. 4. Figs. 6, 7, and 8 represent perspective views showing different steps in the operation of forming the stitch. Fig. 9 represents a detached view of the loop-spreader and its operating devices. Fig. 10 represents a detached view of the needle and the means for operating it; and Fig. 11 represents a perspective view of the feed-dog.

In the drawings, *a* represents a suitable supporting frame or head having bearings for the driving-shaft *b*, which is rotated by power applied in any suitable way.

*c* represents a curved needle, which is attached to an oscillating arm *d*, mounted on a bearing *e*, and is oscillated by means presently described to cause the needle to alternately penetrate and recede from the work.

*f* represents a looper, which is adapted to present the needle-thread *g* to the barb of the needle when the latter is projected.

The needle and looper may be arranged and operated in any suitable way and they form of themselves no part of my invention. In fact all the parts of the stitch-forming mechanism of a curved-needle sewing-machine, excepting as hereinafter provided, may be the same as in many of the well-known machines now in use, and my present invention resides mainly in the rotating ring or case inclosing the shuttle or the cap when no shuttle is used, the devices for supporting and rotating said ring, the loop-spreading device, and the feed-dog which enters the channel of a boot or shoe sole and is adapted to feed the work, all as hereinafter fully described.

*m* represents a rotary ring or case, which is formed to receive the supply from which the lower thread *g'* is drawn. The supply of lower thread may be in the form of a cop inserted without a shuttle in the cavity in the ring or case, although in the present instance I have shown a shuttle *i*, adapted to contain the cop and formed to be contained in the cavity or interior of the ring. Said shuttle is of cylindrical form and is provided with a removable cover *i'*, which holds the cop in place, and is secured to the side of the shuttle in any suitable way, said cover having an orifice *k* at its center for the passage of the shuttle-thread *g'* from the center of the shuttle.

The ring *m* is rotated by means of a spur-wheel *p*, which is driven by a connection with the driving-shaft *b*, and is provided with teeth *p'*, entering recesses *q* in the periphery of the ring.

The ring *m* is provided with hooks *r r*, which are formed to engage the loop drawn through the work by the needle, as shown in Fig. 8.

*s* represents a loop-spreader, which is oscillated in such a path that when moving in one direction it engages one strand of the needle-loop, as shown in Fig. 7, and spreads the loop and holds it in substantially the position shown in Fig. 8, so that the hooks *r r* are caused to engage the needle-loop and carry it around the shuttle, the needle-loop being thus interlocked with the shuttle-thread.

The work to be stitched, which is here shown as a boot or shoe mounted on a last, is presented to the machine by the operator, who in this case holds the stitch-receiving channel or groove in the outer face of the sole against a dog *t*, supported by the frame or head of the machine, said dog being formed to enter the channel *t'* in the sole and to engage the material of the sole sufficiently to

enable it to feed the work, as presently described. The work being held in this position, the needle advances and penetrates the upper and the portion of the sole known as the "between substance" and emerges from the channel, as shown in Fig. 6. The looper then moves to press the needle-thread against the hook side of the needle, so that when the needle is retracted it draws a loop through the between substance and the upper, as shown in Fig. 7. The loop-spreader moves in the direction indicated by the arrow in Fig. 7, while the loop is held by the retracted needle, and is thus caused to spread the loop just as the hooks *r r* are brought by the rotation of the ring *m* into position to enter the loop. Said hooks engaging the loop carry it over the ring *m* and around the rear side of the shuttle, the loop being disengaged from the hooks and tightened or taken up by the take-up mechanisms presently described, while the hooks are moving downwardly toward the lowest point of their movement. The loop is thus carried around the shuttle and interlocked with the shuttle-thread.

The ring or case *m* is held in engagement with its driving-wheel by means of suitable idle-rolls *u v* bearing at different points on its periphery. The roll *v* is journaled in fixed bearings in the frame *a*. I prefer to employ a series of rolls *u*, mounted on the end of a pivoted arm *w*, which is movable, so that the rolls *u* may be adjusted to bear against and support the ring or case *m* or to be depressed to permit the removal of the said ring or case *m*. The arm *w* is here shown as attached to the frame *a* by a clamping-screw *w'*, which, when tightened, rigidly supports the arm, and when loosened permits the arm and the rolls *u* to be lowered. The arm *w* may have but one roll *u* instead of a series. The peripheries of the roll *u* are cut away to permit the revolving movement of the hooks *r r*.

Any suitable mechanism for giving motion to the devices above described may be employed, and I will now describe suitable operating devices, although I do not limit myself thereto.

The needle is oscillated by means of a cam-groove in a disk 2 on the driving-shaft, a lever 3, pivoted at 4 to the supporting-frame and having a trundle-roll 6, entering said cam-groove, and a connecting-rod 7, which connects the lever 3 with the needle-arm *d*. The looper *f* is attached to a rock-shaft 9, which is adapted to oscillate and to move endwise in bearings 10 10 on the supporting-frame. Said shaft is moved endwise by means of a lever 12, which is pivoted at 13 to the supporting-frame, and a cam-groove 14, engaged with a trundle-roll 15 on the lever 12. The swinging end of lever 12 has a slot which receives a stud 9' on the shaft 9. The said shaft is oscillated by means of a pivoted lever 10', engaged at one end with a cam-groove and at the other end with an arm 12', affixed to the shaft 9. These two motions—viz., the longitudinal and oscillating motions of the rock-shaft—are timed to give the looper *f* the movements required to cause it to present the thread to the barb of the needle. The wheel *p*, which rotates the ring *m*, is connected by a rod or pitman 16 with a lever 17, which is pivoted at 18 to the supporting-frame, and is provided with a trundle-roll 18', entering a cam-groove in a disk 19 on the shaft *b*. The lever 17 is oscillated by the rotation of the disk 19 and imparts a reciprocating motion to the rod 16. Said rod has a trundle-roll 20, which enters a cam-groove in another disk on the shaft *b*, said cam-groove being formed to give the rod 16 an oscillating movement while it is being reciprocated, the combined movements thus imparted to the rod 16 causing it to rotate the wheel *p*. The loop-spreader *s* is a curved arm attached to a rock-shaft 24, which is adapted to turn in fixed bearings 25 25. (See Fig. 9.) Said rock-shaft has an arm 26, provided with a trundle-roll 27, engaged with a cam-groove in one of the disks on the driving-shaft. Said cam-groove is timed to give the loop-spreader its required operative movements. The feed-dog *t* is provided with a point or spur *t'*, Figs. 1 and 11, which is adapted to enter the channel $t^2$ of a sole, and is formed to penetrate the between substance at the bottom of the channel, so that said feed-dog will be engaged with the work and feed the same. The depth of the penetration of the point or spur *t'* into the work is limited by a shoulder *t''* on the dog *t*, Fig. 11, said shoulder being broad and thin, so that it can enter the channel and bear on the bottom thereof, and by its extended bearing on said bottom prevent the point or spur *t'* from passing entirely through the between substance and into the upper. The feed-dog *t* is attached to a hub or collar $t^3$, which is adapted both to oscillate and move laterally on a horizontal stud $t^4$ on the frame *a*.

$t^5$ represents a lever pivoted at $t^6$ to the frame *a* and provided at one end with a trundle-roll $t^7$, engaged with a cam-groove $t^{10}$, Fig. 3, in a disk $t^{12}$ on the driving-shaft. The other end of said lever is forked and provided with studs $t^9$ $t^9$, which enter grooves in the hub or collar $t^3$. The lever $t^5$ is oscillated horizontally by the cam-groove $t^{10}$ and imparts lateral reciprocating movements to the hub $t^3$ and feed-dog *t*. Said hub has an upwardly-projecting arm $t^{13}$, which has teeth at its upper end engaged with rack-teeth $t^{14}$ on a slide $t^{15}$. Said slide is movable horizontally in a fixed guide, and is reciprocated by means of a lever $t^{16}$, which is pivoted at $t^{17}$, and has a trundle-roll $t^{18}$ engaged with a cam-groove (not shown) in the disk $t^{12}$. The upper end of the lever $t^{16}$ is engaged with the slide $t^{15}$, so that the oscillating movements of the said lever reciprocate the slide horizontally and cause its teeth $t^{14}$, engaged with the teeth of the arm $t^{13}$, to oscillate the hub $t^3$, and thus give the feed-dog a movement at right angles to its work-feeding movement, the feed-dog being

thereby caused to enter and withdraw from the channel.

The described feed-dog-operating mechanism is so timed that the feed-dog is moved forward into the channel, and is withdrawn sufficiently from the bottom of the channel to disengage the point or spur $t'$ from the between substance during the movement opposite to that which feeds the work.

A represents the back gage, which supports the work against the inward pressure exerted upon it by the operator. Said gage is attached to a slide A′, which is movable in a guide in the frame $a$, and is normally pressed outward toward the feed-dog by a spring B, (when the back gage is not retracted by the mechanism presently described,) so that the gage is adapted to conform to the surface of the boot or shoe which requires a varying distance between the back gage and the feed-dog. The back gage is locked during the operation of forming the stitch by means of a locking-dog C on an arm of a bell-crank lever D. The other arm of said lever has a trundle-roll E, which is pressed by a spring F against one side of the disk $t^{12}$. Said disk has a cam projection G, which co-operates with spring F in oscillating bell-crank lever D. The dog C is thus alternately raised and lowered. When raised, it engages one of a series of teeth H on the slide A′ and locks said slide and the back gage to enable the latter to firmly support the work during the formation of a stitch. The back gage is retracted while the work is being fed by means of a lever I, pivoted at J, to frame $a$, and connected at one end by a rod L with a cam-groove (not shown) in one of the disks on the driving-shaft. The other end of lever I is adapted to play between two shoulders M M′ on slide A′ and strikes the shoulder M′ to retract the back gage.

The take-up mechanism consists of two parallel slides O O′, having thread-receiving pulleys P P′, arranged as shown in Fig. 1, the pulley P being on one end of slide O and the pulley P′ on the opposite end of slide O′. Said slides are adapted to move in guides on frame $a$, and are provided with rack-teeth Q on their adjacent edges, with which a pinion R is engaged, said pinion being mounted on a bearing affixed to frame $a$. The slide O is connected by a rod S with a lever T, which is pivoted at T′ to frame $a$, and has a trundle-roll $T^2$, Fig. 2, engaged with a cam-groove (not shown) in one of the disks on the driving-shaft. The slide O is reciprocated by the lever T and imparts a movement in the opposite direction to the slide O′ through the pinion R. The thread-pulleys P P′ are thus caused to alternately approach and recede from each other, the needle-thread $g$ being taken up by the movement of said rolls away from each other and loosened by the movement of said rolls toward each other. The pulley P′ is mounted on an arm $P^2$, which is pivoted at $P^4$ to an ear on slide O′, and is acted on by a spring $P^3$, so that pulley P′ exerts a yielding tension on the thread. This take-up mechanism is simple and is adapted to be operated with less expenditure of power than any other of which I am aware, the taking-up movement being divided between the two slides O O′, so that the lever T that gives motion to said slides has to move only half as far as it otherwise would. The needle-thread passes from the usual wax-pot (not shown) around the pulley P′, and from thence back over the pulley P, and then over a guiding-pulley $P^6$ on a fixed bearing and through a fixed guiding-eye $P^7$ to the looper.

It will be seen that the ring or case $m$, holding the lower thread, is arranged with its axis about parallel with the direction of the feed movement of the work and well back of or behind the feed-dog. The said ring being narrow does not obstruct the space around the back gage and feed-dog. Hence the boot or shoe being stitched may be freely moved to any position that the convenience of the operator may require without obstruction by the ring or case $m$. The freedom of movement of the work is further increased by the arrangement of the feed-dog and its operating mechanism, the feed-dog carrying hub or collar $t^3$ being elevated considerably above the point where the stitches are formed, while the shank of the feed-dog is inclined from said hub, as shown in Fig. 3, so that there is plenty of room at the right of the feed-dog for the boot or shoe sole to be inclined upwardly or in any other direction required.

I am enabled by the described improvements to use a lock-stitch in sewing turned and welted shoes, the stitch-forming mechanism being arranged, as stated, to permit all the freedom of movement of the work that can possibly be desired.

I am not aware that prior to my invention the stitch-forming mechanism of a lock-stitch sewing-machine has ever been arranged so that it can be used in combination with a back gage to support the upper and a dog or finger to enter the channel of a turned or welted boot or shoe. I am aware that chain-stitch-forming mechanism has been used in connection with a back gage and a channel-gage, as in the well-known Goodyear sewing-machine; but in such machines the advantages of a lock-stitch cannot be secured. The machine is here shown as adapted to connect the upper and sole of a turned boot or shoe; but it will be readily seen that the machine may be adapted for sewing a welt to an upper and an inner sole by providing a suitable welt-guide.

I claim—

1. The combination of a rotary ring or case adapted to contain the lower thread and provided with hooks projecting outside of its periphery to engage the needle-loop, a spreader for the needle-loop, idle-rolls supported in position to bear on and support the ring, and means for rotating the ring, as set forth.

2. The combination of a rotary ring or case adapted to contain the lower thread and provided with hooks projecting outside of its periphery to engage the needle-loop, a spreader for the needle-loop, means for rotating said ring, idle-rolls bearing on the periphery of the ring, and a movable support for one or more of said rolls, whereby the ring is adapted to be removed from the machine, as set forth.

3. The combination of a rotary ring provided with hooks projecting outside of its periphery to engage the needle-loop, a spreader for the needle-loop, a shuttle removably inserted in said ring, and idle-rolls supported in position to bear on and support the ring, as set forth.

4. The combination of a non-rotating shuttle, a rotary ring surrounding said shuttle and provided with hooks projecting outside of its periphery to engage the needle-loop, the positively-rotated driving-wheels engaged with the periphery of the ring, and idle-rolls bearing on other portions of the periphery of the ring.

5. In a sewing-machine, the combination, with a back gage and stitch-forming devices, of a feed-dog having a flat thin end or edge, the line of which is in the direction of the feed movement of said dog and parallel with the work-supporting surface, whereby the said flat edge may enter to the bottom of the channel of a shoe-sole, and said dog having a point or spur projecting beyond the said edge to penetrate the work, substantially as described.

6. The combination, with a back gage and lock-stitch-forming mechanism, substantially as described, of a feed-dog, a hub or collar elevated above the feed-dog and secured to the shank of said dog, the toothed arm $t^{13}$ on said hub, the reciprocating rack engaged with said arm, and the oscillating lever $t^{5}$, engaged with the hub, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 10th day of January, A. D. 1891.

FELIX DOUCET.

Witnesses:
C. F. BROWN,
A. D. HARRISON.