(No Model.) 4 Sheets—Sheet 1.

A. EPPLER.

SEWING MACHINE.

No. 487,214. Patented Nov. 29, 1892.

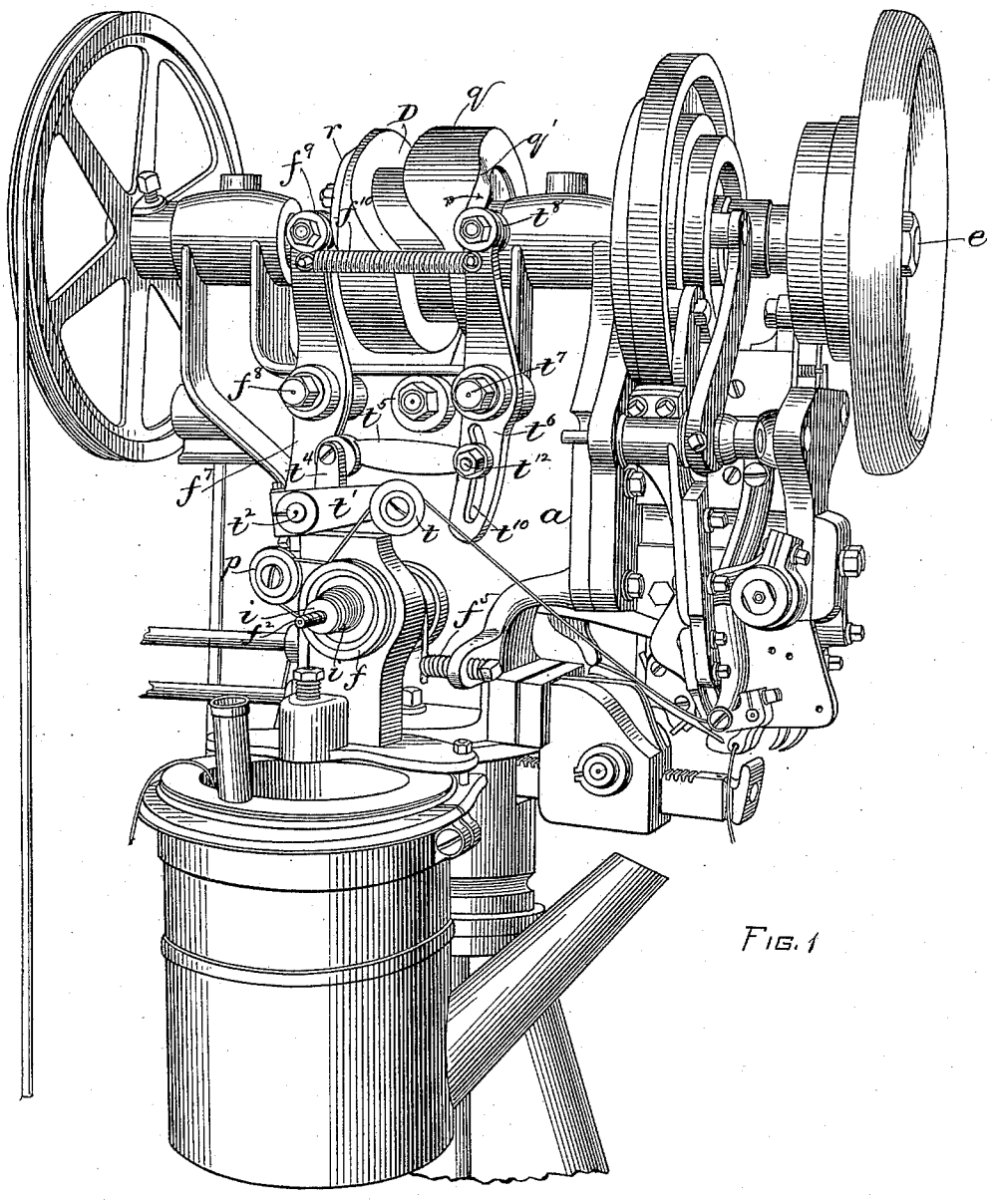

FIG. 1

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A. EPPLER.

SEWING MACHINE.

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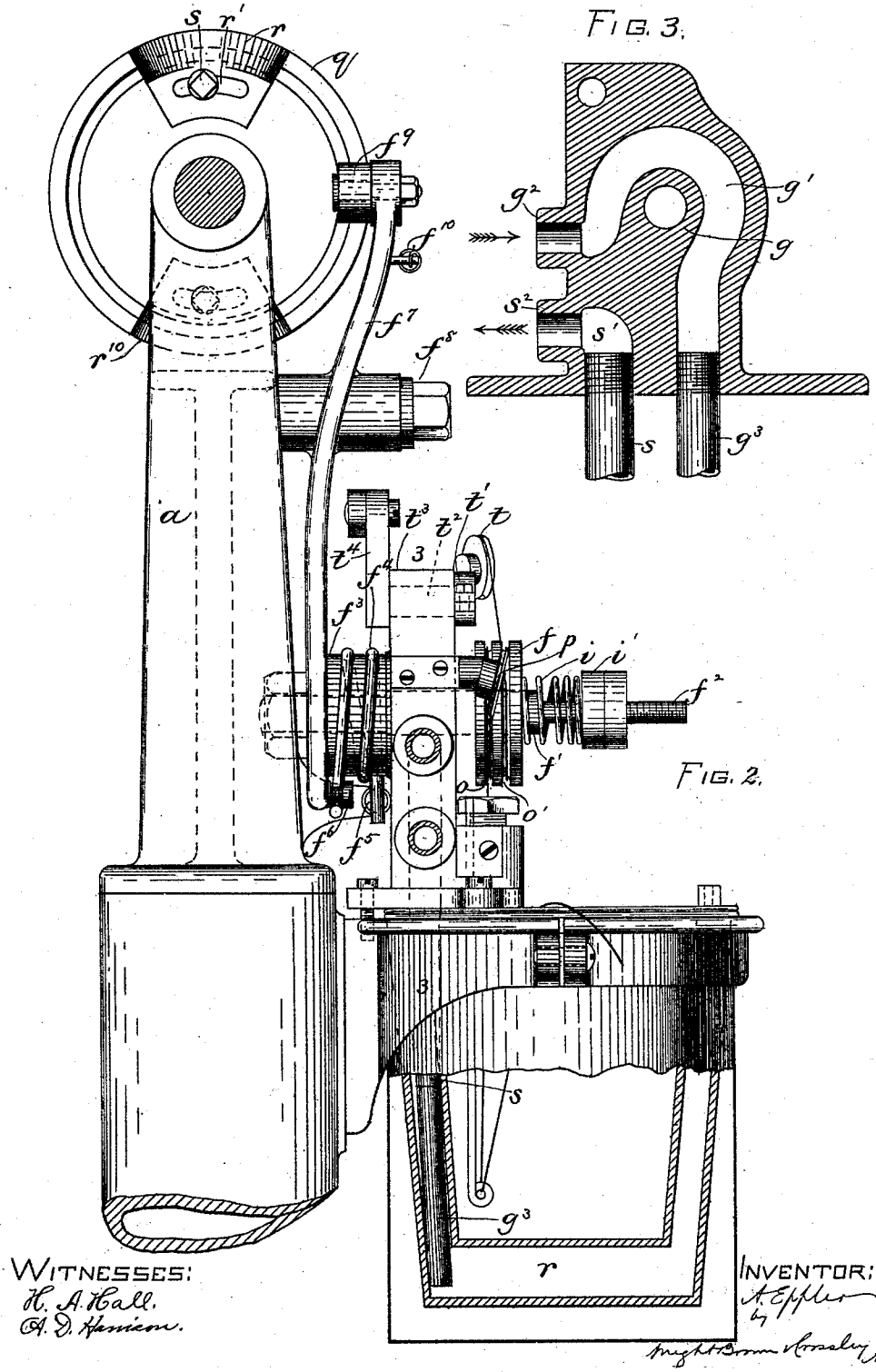

FIG. 3.

FIG. 2.

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(No Model.) 4 Sheets—Sheet 3.

A. EPPLER.

SEWING MACHINE.

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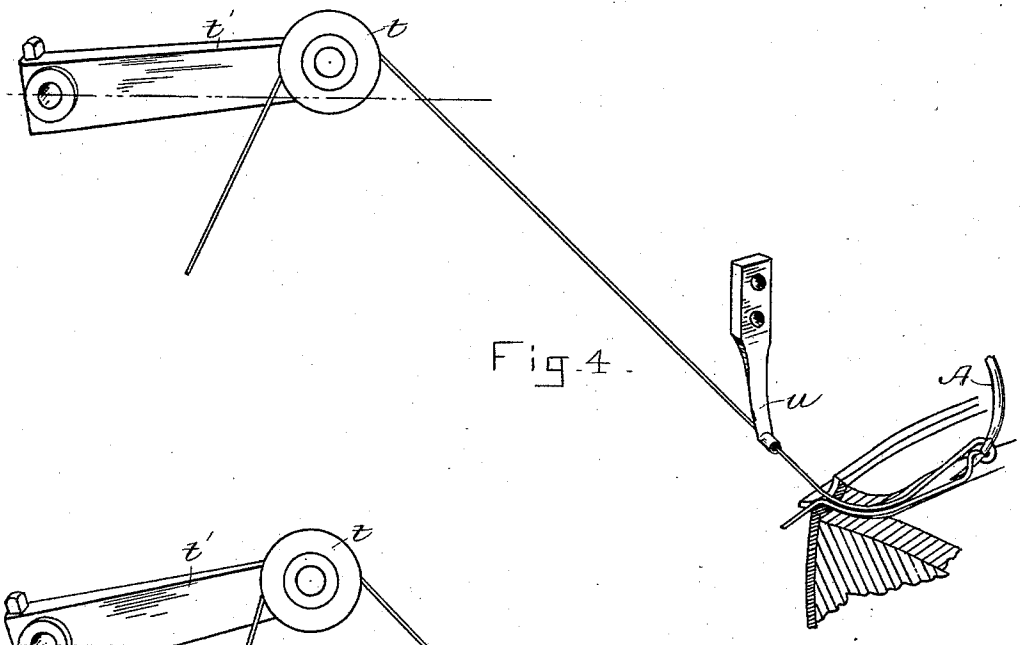

Fig. 4.

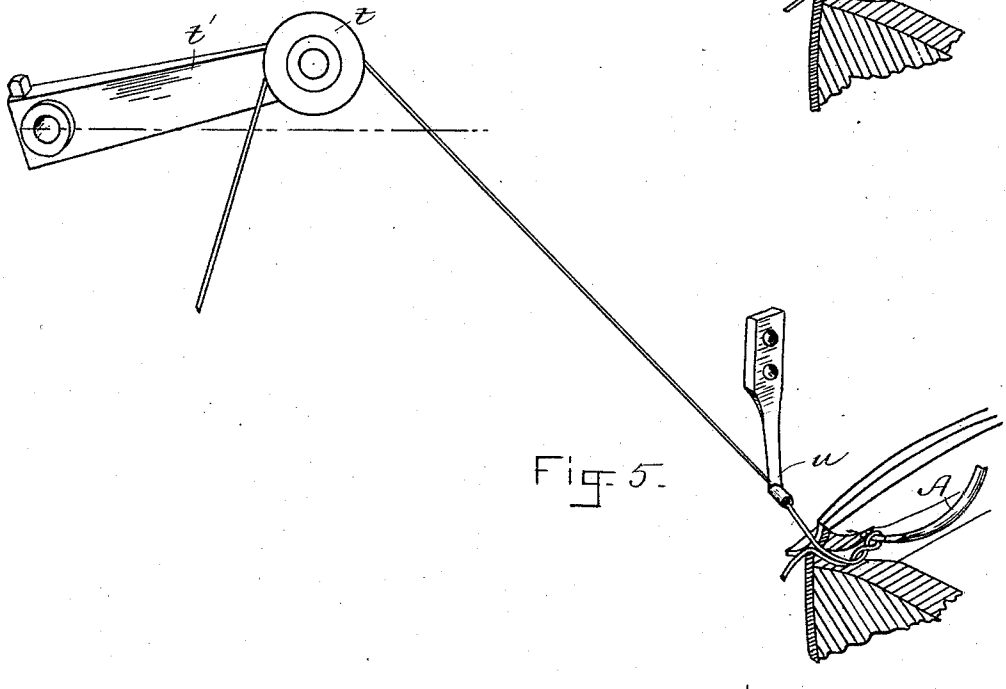

Fig. 5.

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(No Model.) 4 Sheets—Sheet 4.

A. EPPLER.

SEWING MACHINE.

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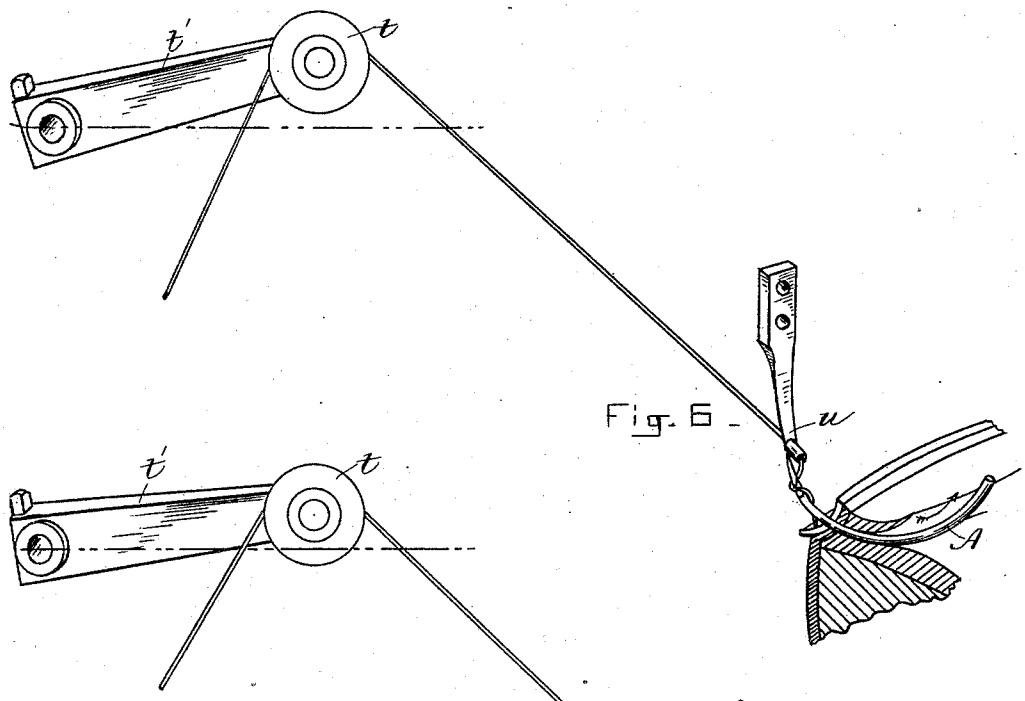

Fig. 6.

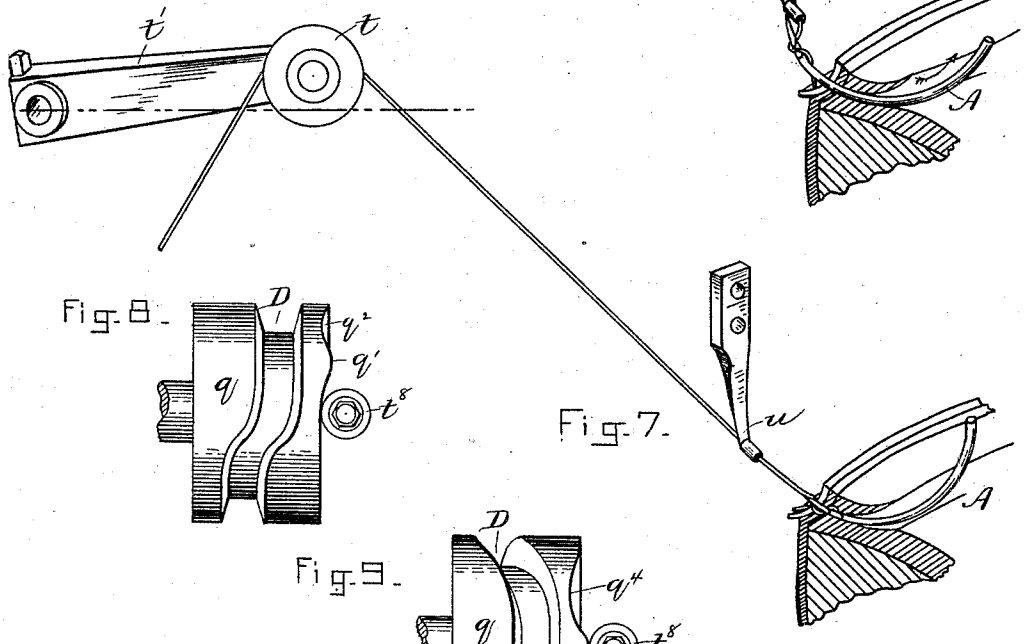

Fig. 7.

Fig. 8.

Fig. 9.

WITNESSES:

H. A. Hall.

A. D. Harrison.

INVENTOR:

A. Eppler

by Wright Brown Quinby & Atty.

UNITED STATES PATENT OFFICE.

ANDREW EPPLER, OF NEWTON, MASSACHUSETTS.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 487,214, dated November 29, 1892.

Application filed December 8, 1891. Serial No. 414,390. (No model.)

To all whom it may concern:

Be it known that I, ANDREW EPPLER, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention relates principally to boot or shoe sewing machines, and has been made with special reference to the machine for sewing welted boots or shoes, shown and described in Letters Patent No. 447,872, granted to me March 10, 1891, although the invention is not limited to machines organized as described in said patent, but may be applied to other boot or shoe sewing machines and to machines for sewing turned as well as welted work.

The invention has for its object, first, to provide means for automatically pulling up a part of the loop formed by the needle after the needle has commenced to move forward, thereby shortening the loop preparatory to tightening it to complete the stitch, and means for automatically giving out an equal amount of thread for the next stitch without drawing from the wax-pot.

The invention also has for its object to enable the needle during the latter part of its retracting movement, to tighten the thread of the stitch last formed, the thread being comparatively loose or under light tension during all but the concluding portion of said retracting movement, thus avoiding strain on the needle and other parts of the stitch-forming mechanism, as well as liability of breaking the thread, which would be experienced if the thread were at all times under the necessary tension to insure a proper tightening of the stitch.

The invention also has for its object to provide an improved tension-wheel of such form as to prevent the thread from becoming slack.

I have also shown means for heating the tension-wheel and for heating the wax-pot through which the thread is passed on its way to the needle.

To these ends the invention consists in the improvements which I will now proceed to describe and claim.

In the accompanying drawings, forming part of this specification, Figure 1 represents a perspective view of a boot or shoe sewing machine provided with my improvements. Fig. 2 represents an end elevation of the same, the driving-pulley shown at the left in Fig. 1 being removed. Fig. 3 represents a section on line 3 3, Fig. 2. Figs. 4, 5, 6, and 7 are perspective views representing the manner in which the thread is automatically taken up and let out during the formation of the stitches. Figs. 8 and 9 represent side elevations of the take-up-operating cam.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents the supporting head or frame of the machine having bearings for the main driving-shaft *e*, the latter having the cams which give motion to the stitch-forming mechanism.

For a full description of the construction and operation of a machine to which my present improvements are applicable reference may be had to Letters Patent No. 447,872, above referred to. I refer to said patent as a means for illustrating my present invention, but not as a limitation of my improvement to the particular type of machine shown in said patent.

In carrying out that part of my invention which relates to the variable tension, whereby the thread is restricted to the strain required to draw in the stitches only during the latter part of the retracting movement of the needle A, I provide means for locking the thread on its way to the needle during the latter part of said retracting movement and for unlocking it before the needle again engages the thread to form another loop, the thread remaining comparatively loose or under a light tension from the time it is first engaged by the needle until it has been drawn through the work, and being then locked just before the needle reaches the end of its outward movement, so that during the latter part of said outward movement the needle will exert sufficient strain on the thread to pull the last stitch down upon the welt and upon the between substance.

The means shown in the present case for locking and releasing the thread are as follows: *f* represents a tension-wheel, which is mounted to rotate on a fixed stud *f'*, said

wheel having a grooved periphery and being adapted when locked or prevented from rotating to lock the thread passing to the needle and prevent movement of the thread, the thread passing around the grooved periphery of the wheel. When said wheel is not locked by the means hereinafter described, it is free to rotate, its rotation being controlled by the pressure of an adjustable tension-spring *i* against its outer side, said spring being regulated by an adjusting-nut *i'* on a fixed screw-threaded stud f^2. f^3 represents a hub or collar rigidly secured to the tension-wheel *f* in any suitable way, so that said hub or collar and the tension-wheel necessarily rotate together. f^4 represents a clamp, which is adapted to tightly grasp the collar f^3, and thereby prevent the rotation of said collar and the tension-wheel when it is desired to lock the latter. Said clamp is in this instance composed of a piece of wire coiled helically, its convolutions encircling the collar f^3. One end of the wire is supported by a stud f^5, affixed to the frame of the machine in any suitable way, while the other end bears on a stud or projection f^6, affixed to one end of a lever f^7, which is mounted to oscillate on a fixed stud f^8, attached to the supporting-frame. The opposite end of the lever f^7 is provided with a trundle-roll f^9, which is pressed by a spring f^{10} against one side of a wheel or disk *q* on the driving-shaft, said disk containing in its periphery a cam-groove D, which gives motion to certain parts of the mechanism of the machine, as shown in the patent above referred to. *r* represents a cam, which is secured to said disk *q*, on which the trundle-roll f^9 bears, said cam being made adjustable by a set-screw *s*, which passes through the slot *r'* on said cam and secures the cam to the disk, the object of said adjustment of the cam being described hereinafter. When the roll f^9 bears against the said disk *q*, the lower end of the lever f^7 is in the position which permits the opening or partial uncoiling of the clamp f^4, so that said clamp does not prevent the rotation of the collar f^3 and the tension-wheel, the latter being free to be rotated by the thread, its rotation being resisted only by the pressure of the spring *i*. When the cam *r* reaches the roll f^9, the upper end of the lever f^7 is forced outwardly, and its lower end, with the stud f^6, is forced inwardly, the clamp being thus caused to grasp the collar f^3 and lock the tension-wheel, thus causing the latter to lock or prevent the movement of the thread. The cam *r* is timed so that the locking of the thread takes place during the latter part of the retracting movement of the needle and terminates after the needle has completed its outward movement and before it again engages the thread. The thread is therefore subject to strong tension only during the latter part of the retracting movement of the needle, and at all other times it may be under a very light tension, the period during which the thread is locked occupying only so much of the backward movement of the needle as is necessary to enable the needle to properly tighten the stitch last formed. The extent of the strain exerted on the thread by the needle may be varied by adjusting the cam *r*, so that the strain may be made greater or less, according to the size and strength of the thread. By thus allowing the thread to run under light tension up to the last part of the outward movement of the needle and then subjecting it to sufficient strain to tighten the stitch last formed I avoid liability of breaking both the needle and the thread, which would exist if the thread were at all times under the tension required to tighten the stitches. It is desirable, in order to give the thread a sufficient length of bearing on the tension-wheel *f*, to wind the thread more than once around the periphery of said wheel.

Heretofore tension-wheels have had but one thread-receiving groove, so that the convolutions or coils of the thread around the wheel rub against each other, the result being that the tension is not as uniform as could be desired, owing to the said rubbing contact of the convolutions of the thread upon the wheel. To prevent this, I provide a tension-wheel with a plurality of independent grooves *o o'*, the grooves being preferably two in number, and provide at a point in suitable proximity to the wheel a guide so arranged as to support a bight or loop of thread between said grooves, one arm of the said bight or loop extending from one groove onto the said guide, while the other arm extends from the guide into the other groove. The thread is thus given a sufficiently-long bearing upon the tension-wheel without that objectionable rubbing of one convolution upon another which would be involved if both convolutions were contained in one groove. The said loop-supporting guide is preferably a loose pulley *p*, which is mounted upon a suitable fixed bearing and has its axis arranged obliquely to the axis of the tension-wheel, as shown in Fig. 2, the lower portion of the wheel being thus brought substantially in line with the groove *o*, while the upper or highest portion is substantially in line with the groove *o'*. Hence the thread passes almost directly from the lower portion of the groove *o* to the lower portion of said pulley, and in passing around said pulley is deflected, so that in leaving the highest portion of the pulley it passes directly to the highest part of the groove *o'*. The groove *o*, which first receives the thread from the wax-pot, hereinafter described, is made of greater depth than the groove *o'*, from which the thread passes to the needle, so that the thread-supporting periphery formed by the bottom of the groove *o* is of less diameter than the thread-supporting periphery formed by the bottom of the groove *o'*. This difference between the diameters of the bottoms of the two grooves gives the bottom of the groove *o'* a tendency to move the thread faster than

the bottom of the groove *o*. Hence the thread is always kept taut between the groove *o'* and the wax-pot, and the formation of slack thread at any point between the said limits is prevented. This provision for preventing slack thread greatly improves the operation of the machine, as I have demonstrated by practical experience.

I do not limit myself to the employment of the obliquely-arranged pulley as the bight or loop support, although I prefer it to any other form of support of which I am aware. The loop or bight may be supported by any other suitable device.

Another feature of my invention which is of much importance is the automatic means for automatically taking up and letting out portions of the thread at different stages of the movement of the needle for the purpose of tightening the stitches already formed, the last stitch formed being tightened by taking up a part of the loop formed by the needle during the operation of making the next stitch. In carrying out this part of my invention I provide a take-up, which, in the present instance, is shown as a loosely-rotating grooved pulley *t*, mounted on the swinging end of an arm *t'*, which is secured to a rock-shaft t^2, journaled in a fixed bearing t^3. The pulley *t* is arranged to support the thread passing from the tension-wheel *f* to the looper *u*, the position of the pulley *t* being such that it deflects the thread and holds it in the form of a bight between the tension-wheel and looper. Means are provided for oscillating or raising and lowering the pulley *t* to cause it to alternately take up and let out a portion of said bight. The pulley is raised and caused to take up a part of the thread between it and the looper while the needle is descending or moving forward from the position shown in Fig. 4 to that shown in Fig. 5, the pulley being in the position shown in Fig. 4 at the commencement of the forward movement of the needle and raised to the position shown in Fig. 5 during the forward movement of the needle. When the thread is being taken up, as above described, the tension-wheel is locked by the action of a cam r^{10}, Fig. 2, on the lever f^7, said cam being arranged on the disk *q* about opposite the cam *r* and adapted to act during a part of the forward movement of the needle, so that all the thread taken up by the said upward movement of the take-up comes from the loop last drawn through the material by the needle, said loop having been disengaged from the needle before the take-up operates. The said loop is therefore shortened during the forward movement of the needle, so that when it is subsequently drawn in to set the stitch the completed stitch will be tighter than would otherwise be the case. After the barb of the needle in moving forward has passed through the material the take-up pulley is depressed to loosen the bight of thread and let out what thread the looper *u* requires in carrying the thread around the needle to form a twisted stitch, as described in my above-mentioned patent. After the looper has carried the thread around the needle the take-up pulley is raised sufficiently to tighten the convolutions of thread around the needle, and then as the needle commences its backward movement from the position shown in Fig. 6 the take-up pulley is depressed, as shown in Fig. 7, to give out thread for the new loop, and continues to give out thread until the needle in its backward movement has emerged from the material. At this time the tension-wheel is released, so that the thread is drawn from the wax-pot and does not slip or reeve through the eye of the needle when the loop is being drawn through the material. Before the needle completes its backward movement and after the barb has emerged from the material the movement of the take-up pulley ceases, so that it does not let out thread during the concluding or stitch-setting portion of the backward movement of the needle, the take-up pulley being held stationary during said movement, so that the preceding loop, through which the last loop is now drawn by the needle and which had previously been partly taken up and shortened by the action of the take-up, as above described, is wholly taken up or drawn in to set or complete the stitch by the final backward movement of the needle, the stitch being set or completed by a shorter movement of the needle than would have been possible if the loop forming it had not been previously taken up, as above described. The tension-wheel is locked by the cam *r* during the concluding portion of the backward movement of the needle and while the stitch is being set, as already described.

An important advantage resulting from the preliminary taking up or shortening of each loop while the needle is moving forward and the letting out of the thread during the formation of the next loop by the backward movement of the needle until the needle has passed through the stock is found in the fact that the thread does not slip or reeve through the eye of the needle during any part of the stitch-forming operation, excepting when the needle is making the last part of its backward movement and after it has emerged from the stock, so that the strain on the thread is less than it would be if the thread were under tension while it is being drawn through the material.

The mechanism whereby the take-up is given the described movements to alternately take up and let out the thread, as here shown, comprises an arm t^4, affixed to the rock-shaft t^2, which supports the pulley-carrying arm *t'*, a rod t^5, connected to the upper end of the arm t^4, a lever t^6, mounted to oscillate upon a fixed stud t^7 on the supporting-frame, said lever being connected below its pivot with the rod t^5, a series of cams or cam projections at one end of the disk *q*, one of said cams being shown at *q'*, Fig. 1, and a spring arranged to hold a trundle-roll t^8 on the upper

end of the lever t^6 in contact with the end of the disk q and cause said trundle-roll to follow the undulations of the cams or projections thereon, said spring being here shown as the spring f^{10}, which performs a similar office for the lever f^7, one end of the spring being connected to the lever t^6 and the other to the lever f^7. When the upper end of the lever t^6 is moved in the direction indicated by the arrow in Fig. 1 by one of the cam-shaped projections, an upward movement is communicated to the take-up pulley t through the described connecting mechanism, and when the spring f^{10} moves the upper end of the lever t^6 in the opposite direction the take-up pulley is depressed.

In Figs. 8 and 9 I show elevations of the disk q and the cam-shaped projections thereon. The projection q' is formed to take up the thread during the forward movement of the needle, and thereby shorten the loop, as above described. A recess q^2, following the projection q', permits the spring f^{10} to give the take-up pulley the brief downward movement which loosens the thread while the looper is carrying the thread around the needle. The projection q^3 is formed to give the take-up pulley the brief upward movement which tightens the thread around the needle after the operation of the looper, and the depression q^4 permits the spring to give the take-up pulley the downward movement which lets out and loosens the thread during the backward movement of the needle, all as above described. The lever t^6 is provided with a slot t^{10}, which receives the bolt t^{12}, that connects the rod t^5 with said lever. Said slot permits the adjustment of the point of connection of the rod t^5 to the lever t^6 for the purpose of varying the throw or movement of the take-up pulley, thus causing the latter to take up and let out more or less thread. It is desirable to vary the amount of thread taken up and let out, according to the thickness of the material through which the needle passes.

I do not limit myself to the described mechanism for automatically taking up and letting out the thread and may use any other suitable means which will automatically accomplish the result described. I believe it to be broadly new to automatically take up the thread between the take-up device and the work during the forward movement of the needle for the purpose of shortening the loop previously formed before entirely taking up said loop to set the stitch.

The machine is provided with a wax-pot q^5 and a means for simultaneously heating said wax-pot and a tension-wheel f, so that the wax, which is heated in the wax-pot, is prevented from cooling too rapidly in passing around the tension-wheel. The bearing g, in which the shaft of the tension-wheel is journaled, is provided with a flue or conduit g', which passes through said bearing, substantially as shown in Fig. 3, and by conducting steam through the bearing sufficiently heats the latter to enable it to transmit heat to the tension-wheel. The flue g' is provided at one end with a tubular projection or nipple g^2, or is otherwise adapted to be connected with a steam-pipe, which conducts steam to said conduit. To the other end of the conduit g' is connected a steam-pipe g^3, which extends downwardly into the lower portion of a steam-jacket r, surrounding the wax-pot. Said jacket is separated from the exterior of the wax-pot by a space which receives steam from the pipe g^3.

s represents a pipe, which extends from the upper portion of the steam-jacket r and communicates with an outlet-passage s' in the bearing g, said passage s' terminating in the nipple s^2, to which a pipe may be connected for the purpose of conducting away the waste steam and water of condensation that accumulates in the jacket r.

I claim—

1. In a sewing-machine, the combination, with stitch-forming mechanism, including an oscillating curved needle, of an automatic take-up and mechanism for positively actuating said take-up to alternately take up and let out the thread passing to the needle, said take-up being timed to take up the thread during the forward movement of the needle, and thereby shorten the loop last drawn through the material, as set forth.

2. In a sewing-machine, the combination, with stitch-forming mechanism, including an oscillating curved needle, of an automatic take-up mechanism for positively actuating said take-up to take up the thread passing to the needle during the forward movement of the needle and to release the thread thereafter, and a thread-locking device adapted to lock the thread between the source of supply and the take-up while the latter is taking up the thread, whereby the take-up is caused to draw the thread from the work and shorten the loop last formed, as set forth.

3. In a sewing-machine, the combination, with stitch-forming mechanism, including an oscillating curved needle, of an automatic take-up arranged to deflect the thread between the source of supply and the work, and mechanism for positively actuating said take-up to cause it to alternately take up and let out the thread passing to the needle, said mechanism being timed to take up the thread when the needle is moving forward and to let out the thread when the needle is moving backward, as set forth.

4. In a sewing-machine, the combination, with stitch-forming mechanism, including an oscillating curved needle, of an automatic take-up arranged to deflect the thread between the source of supply and the work, mechanism for positively actuating said take-up to cause it to alternately take up and let out the thread passing to the needle, said mechanism being timed to take up the thread when the thread is moving forward to let out the thread and deprive it of tension during

a part of the backward movement of the needle and to support the thread and permit the locking of the same during the latter part of the backward movement of the needle, and means for locking the thread while it is being taken up to shorten the loop and during the stitch-setting movement of the needle, as set forth.

5. In a sewing-machine, a tension-wheel having two thread-receiving grooves, combined with a guide adjacent to said wheel, arranged to support a bight or loop of thread between said grooves, as set forth.

6. In a sewing-machine, the combination, with stitch-forming mechanism, of a tension device for putting a normally-light tension on the thread, a thread-locking device, means for positively locking the latter, first, during a part of the forward movement of the needle while the previously-formed loop is being shortened by the take-up, and, second, during the latter part of the backward movement of the needle, whereby the thread is under a light tension while it is being drawn through the material by the backward movement of the needle and then locked during the stitch-tightening movement of the needle, as set forth.

7. In a sewing-machine, the combination, with stitch-forming mechanism, of a thread-supporting wheel or disk adapted when locked to arrest the thread and when free to permit the movement of the thread, a collar rigidly connected with said wheel, a clamp adapted to engage said collar and normally out of engagement therewith, and means for moving the clamp into engagement with the collar during parts of the forward and backward movements of the needle, and subsequently out of engagement with said collar, whereby the said wheel is alternately locked and released, as set forth.

8. In a sewing-machine, the combination, with stitch-forming mechanism, of a thread-supporting wheel having thread-receiving grooves in its periphery, a collar rigidly attached to said wheel, a clamp adapted to engage and lock said collar, a pivoted lever controlling said clamp, a rotating wheel or disk having an adjustable cam adapted to move the lever into position to engage the clamp with the collar, and means for securing said cam at any position to which it may be adjusted, the cam being adapted by its adjustability to regulate or vary the tension or force exerted on the thread by the needle while the thread is locked, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 27th day of November, A. D. 1891.

ANDREW EPPLER.

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