3 Sheets—Sheet 1.

J. W. & R. H. LUFKIN.

SEWING-MACHINE.

No. 170,284. Patented Nov. 23, 1875.

Fig. 1.

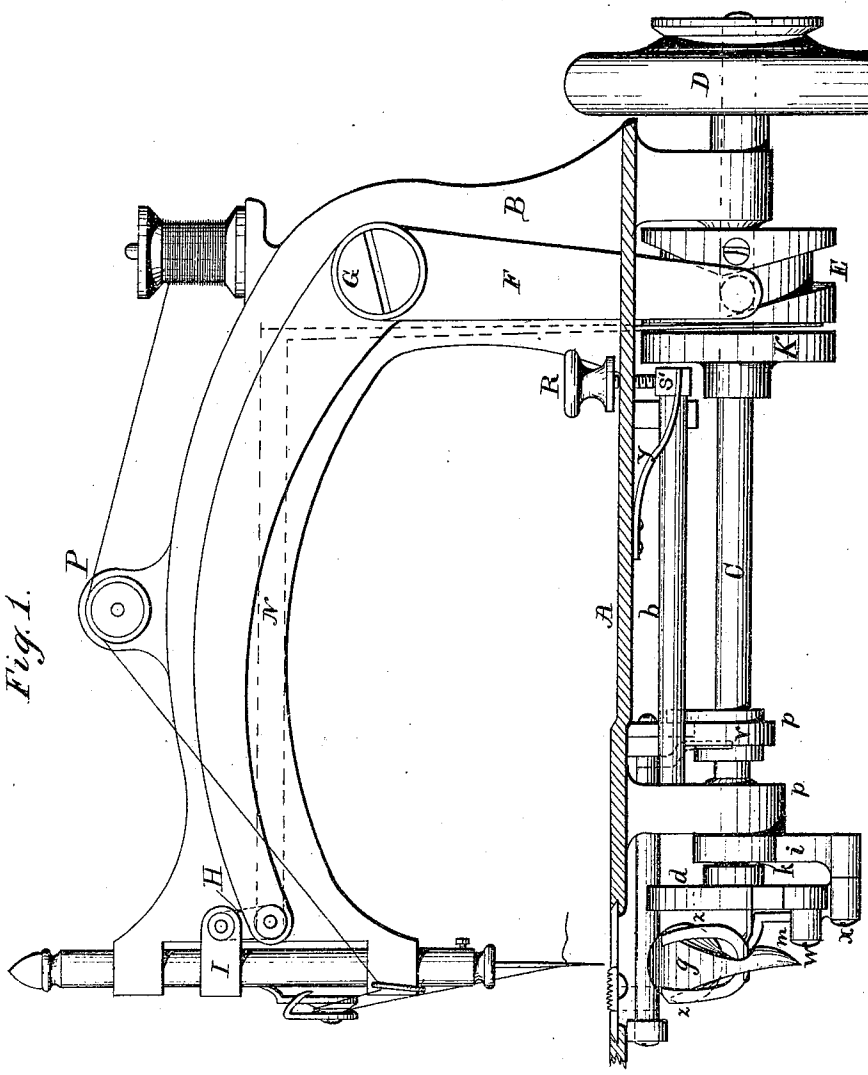
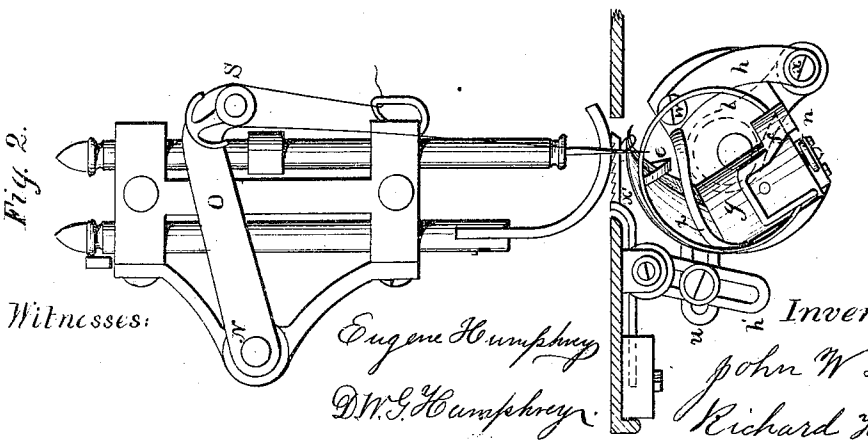


Fig. 2.



Witnesses:

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3 Sheets—Sheet 2.

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Fig. 3.

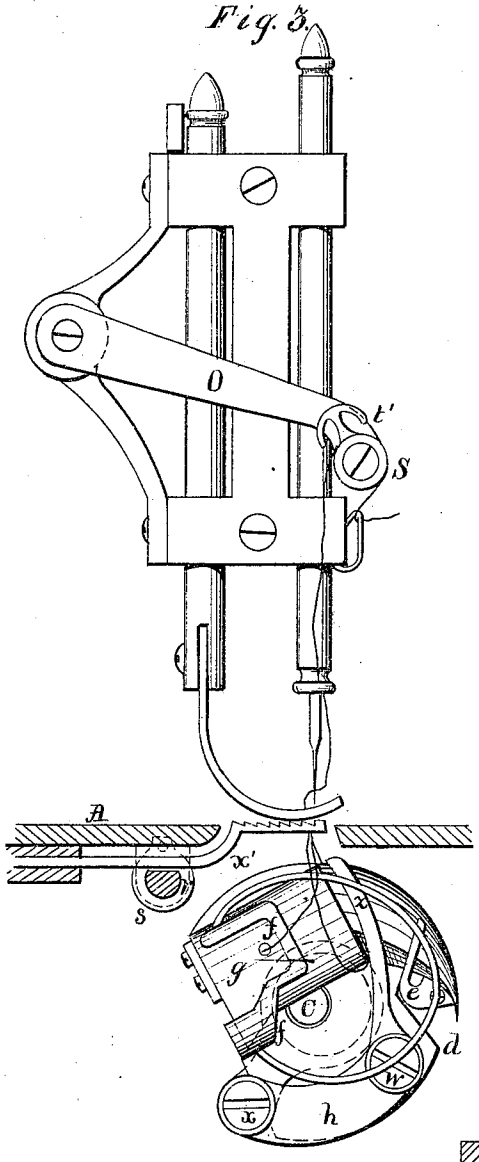


Fig. 4.

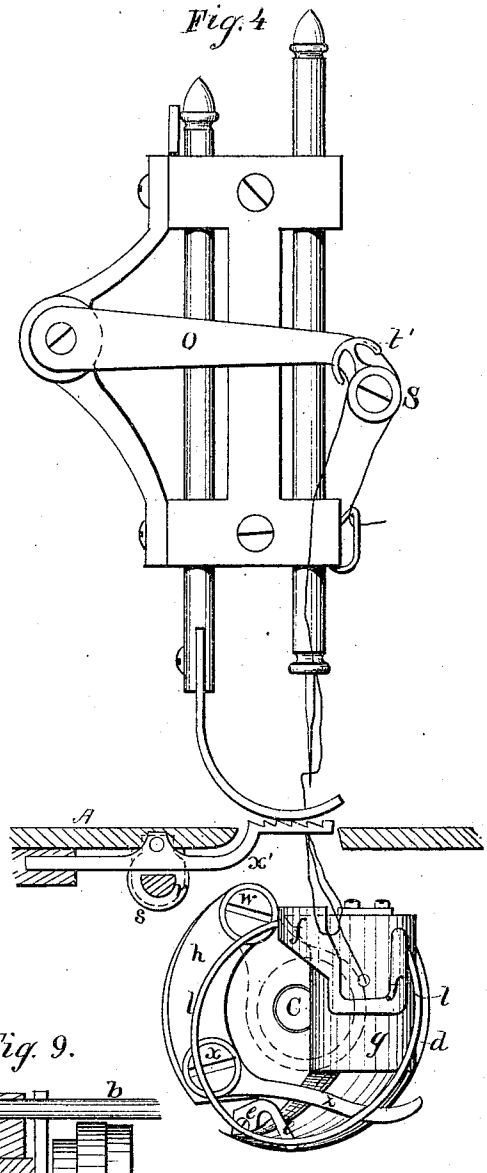
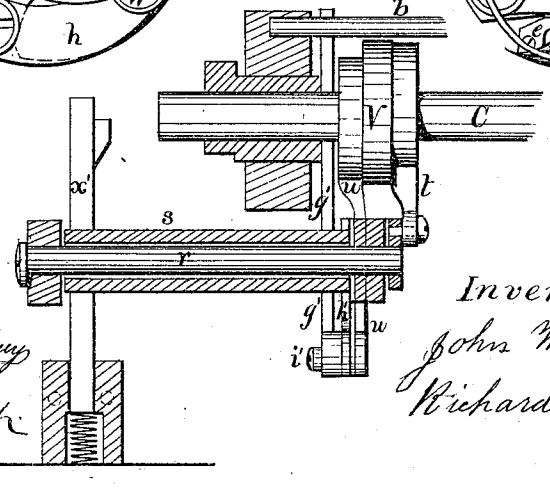


Fig. 9.



Witnesses:

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3 Sheets—Sheet 3.

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SEWING-MACHINE.

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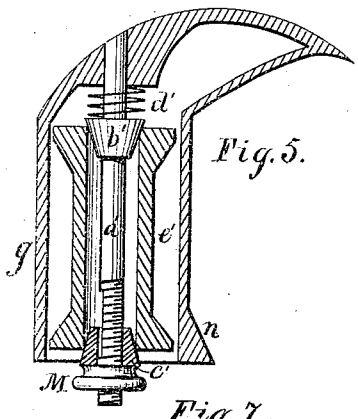


Fig. 5.

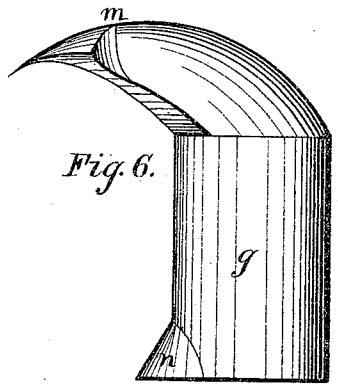
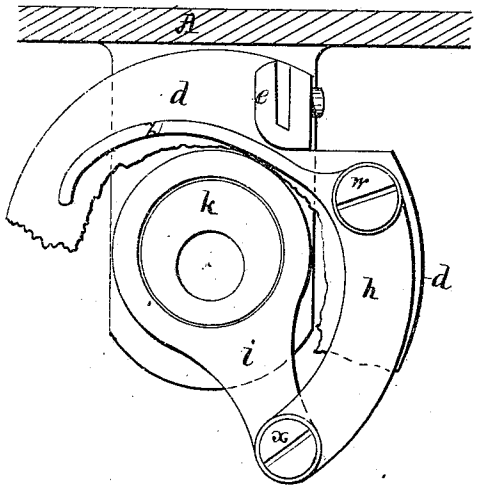


Fig. 6.

Fig. 7.

Fig. 8.



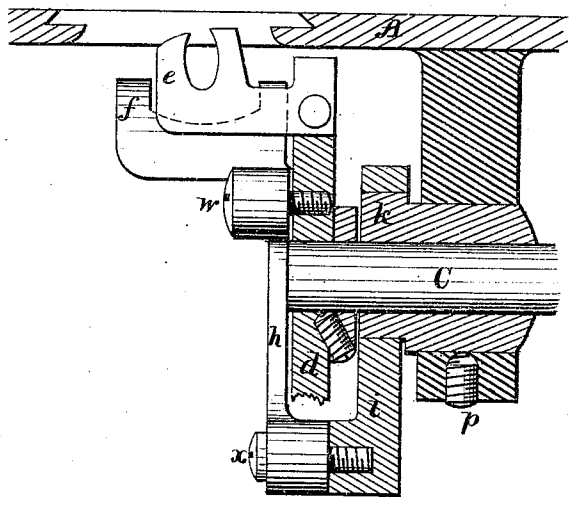


Fig. 10.

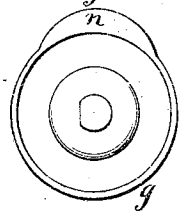


Fig. 11.

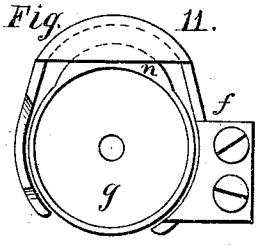


Fig. 16.

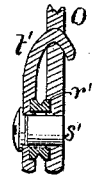


Fig. 17.

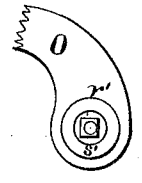


Fig. 12.

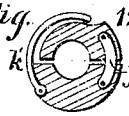


Fig. 13.

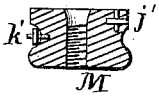
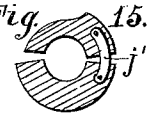


Fig. 14.

Fig. 15.



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JOHN W. LUFKIN AND RICHARD H. LUFKIN, OF CHELSEA, MASS.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **170,284**, dated November 23, 1875; application filed June 9, 1875.

To all whom it may concern:

Be it known that we, JOHN W. LUFKIN and RICHARD H. LUFKIN, of Chelsea, in the county of Suffolk and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification:

Our invention relates to that class of machines known as "double-thread" or "lock-stitch" sewing-machines; and consists, chiefly, in new devices for passing the under thread through the loops of the upper in the formation of the usual shuttle or lock stitch, whereby we are enabled to use thread directly from the usual commercial spools, such as the trade is supplied with, for the under interlocking-thread, without rewinding. It also consists in new arrangements and combinations of devices for tightening or "setting" the stitch, for operating and adjusting the movements of the feed-bar, and in improved devices for guiding the threads and producing proper tension upon the same.

The principal object of our invention is to produce a machine which shall carry a larger amount of under thread than is customary or feasible with the common lock-stitch shuttle-machines, and shall obviate the necessity of rewinding the thread onto bobbins specially adapted for machine use, and thereby save the time and trouble incident to such rewinding, which in large stitching factories is very considerable, and the annoyance and imperfection in sewing resulting from imperfectly-wound bobbins.

Our invention is illustrated in the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a front-side elevation of the machine. Fig. 2 is a front-end elevation of the same. Figs. 3 and 4 are similar views, showing the spool-carrier in different positions, which will be hereinafter explained. Fig. 5 is a section of the spool-carrier, showing its internal arrangement, with the spool in position. Fig. 6 is an external view of the spool-carrier. Fig. 7 is an end view of a portion of the mechanism for holding and rotating the spool-carrier. Fig. 8 is a vertical section of the same, taken through the axis of the driving-shaft C. Fig. 9 is a vertical section of the feed-operating mechanism, taken through the axis of the driving-shaft C. Fig. 10 is a bottom view of the spool-carrier. Fig. 11 is a bottom view of the bracket, which supports the spool-carrier when in working position, as therein shown. Figs. 12, 13, 14, and 15 are views showing the peculiar construction of the tension-nut, which secures the spool in its carrrier with the proper pressure to regulate the tension on the under thread. Figs. 16 and 17 are views showing the peculiar construction of the top-thread guide on the end of take-up arm O, Figs. 3 and 4.

Upon the driving-shaft C, Fig. 1, there is a face-plate, *d*, secured thereto by a set-screw, as shown in Fig. 8. Surrounding said shaft C, and forming one of the bearings of the same, is a short stationary shaft, secured in the hanger, which projects downward from the bed A, by the set-screw *p*. The end *k* of this short shaft is eccentric to shaft C, and rotating upon this stationary eccentric portion is the arm or strap *i*, shown also in end view, Fig. 7.

Jointed to the end of this strap *i*, and also to the face-plate *d* by the screws *w x*, is a nipper-lever, *h*, which has two arms or branches, *z z*, (shown in Fig. 1,) whose functions are to alternately nip and release, at proper intervals, the spool-carrier, for the purposes hereinafter explained. The connection of the lever *h* with face-plate *d* by screw *w* causes said lever to rotate with said face-plate, which is attached to the driving-shaft C, and by connecting said lever *h* also with the eccentric strap *i* by screw *x*, said strap is caused to rotate around and upon its eccentric bearing *k* by the rotation of plate *d* on shaft C, and thus the nipper-lever *h* is rocked during each revolution upon the screw *w*, and caused to alternately press upon and relieve the spool-carrier, as before mentioned. There is also attached to said face-plate *d* a bracket, *f*, (shown in Figs. 2, 3, 4, and 11,) which serves as a seat for the spool-carrier *g*, and is so constructed as to partially encircle said carrier, embracing that portion or lip *n* thereof, (shown in Figs. 6 and 11,) in such a manner as to prevent the carrier from being displaced or thrown out of said bracket when the machine is in

operation. This bracket also forms a part of, and serves as a support for, the thread-guard *l*, which prevents the under thread, during the rotation of the same, from crossing the path of the carrier, and entangling with the upper thread and breaking. The encircling portion of bracket *f*, which forms a part of the thread-guide, is so shaped as to pass angularly around the aperture in the carrier, through which the thread is drawn from the spool, and in front thereof. It is necessary that it should thus pass in front of the aperture; otherwise there would be no escape for the threads over the rear end of the carrier as it revolved through the loop of the upper thread, and they would consequently be broken upon the guard. Upon the face-plate *d* there is also a yoke, *e*, (see Figs. 2, 3, and 8,) which supports the front end of the carrier *g*, and holds it securely in proper position to insure its passage into the loop of the upper thread.

This completes the description of the devices, and their arrangement, which are grouped together for holding and rotating the carrier *g*.

The carrier itself is constructed and arranged, internally, as shown in Fig. 5, having a spindle, *a'*, upon which are two cones, *b'* and *c'*, and a spiral spring, *d'*. Upon the cones rests the thread-spool *e'*. The front end of the spindle *a'* is threaded and flattened on one side, as shown, the flattening being for the purpose of preventing the cone *c'*, which is adapted thereto, from turning on said spindle as an axis, and the threading being for the purpose of adapting it to the threaded nut M, which is constructed as shown in Figs. 12, 13, 14, and 15, and hereinafter described, and for the purpose of preventing it from jarring loose when the machine is in operation. This nut, being turned against the cone *c'*, presses it into the end of spool *e'*, which is thus forced onto cone *b'*, and this cone is in turn pressed against the yielding spiral spring *d'*. Thus more or less friction is produced between the spool and the cones, which serve as bearings upon which the spool turns, and a corresponding tension is produced upon the thread as it is drawn from the spool in the process of stitching. The projection or lip *n* enables the carrier to be secured in the bracket *f* without obstructing the passage for the removal and replacing of the spools, and said bracket being correspondingly adapted, such changes of spools can be readily and conveniently made without removing the carrier from the bracket, or disturbing it from its proper working position. Externally the forward portion of said carrier is irregularly diminished in a tapering curve from a cylindrical form to a point. (See Fig. 6.) This portion is so shaped, with reference to the line of movement of the carrier, that as the point passes into the loop of the upper thread it gradually opens and enlarges said loop without producing any sharp angles in the thread, and thereby enables it to pass relatively back onto the cylindrical portion with but slight friction or tendency to follow the carrier, and thus the carrier passes freely through without pushing or dragging the loop along with it.

Near the point of the carrier, and upon the side opposite to that which comes in close proximity to the needle when it passes into the loop, is a swell, *m*, which serves the purpose of keeping the carrier from having too much backward play in the yoke *e* at such times as the arms *z z* of the nipper-lever *h* are not pressed upon the carrier to hold it rigidly in place. When the carrier is placed in working position in the bracket *f* and yoke *e*, and stands with its swell *m* a little forward of the yoke *e*, the operation of this portion of our invention is as follows: When the upper needle has passed its lowest point and has thrown out its loop, as shown in Fig. 2, by the rotation of shaft C and its face-plate *d*, to which are attached said bracket and yoke containing the carrier *g*, said carrier is brought into the position shown, with its point entering the loop of the upper thread. At this point in its revolution the nipper-lever *h*, which also travels with face-plate *d*, and is connected with the eccentric strap *i*, as hereinbefore described, by screw *x*, is, at said point of connection, now farthest from the center of the driving-shaft, and consequently it is rocked upon its face-plate connection *w* to such an extent as to depress its arms *z z* upon the carrier, thus forcing it into the yoke *e*, and holding it rigidly in position. Then, as the whole mechanism progresses in its rotation with shaft C toward the position shown in Fig. 3, the carrier opens the loop, and passes into it beyond the swell *m*, and while so doing said eccentric draws the end of lever *h* nearer the center of shaft C, and thus rocks said lever upon screw *w*, and removes the arms *z z* from the carrier, which, when thus relieved, falls back slightly in said yoke *e*, and allows and assists the loop to pass freely through said yoke and under the arms *z z*, and as the rotation proceeds to the position shown in Fig. 4 the loop slides freely along the cylindrical portion of the carrier, which, being free from the pressure of the arms of the nipper-lever, is also free to allow the loop to pass between it and its bracket and escape from the carrier. The carrier thus proceeds and draws, for a time, on the under thread in opposition to the take-up, which draws up the loop of upper thread, and thus the stitch is "set" and completed, while the carrier is moving again into the position shown in Fig. 2 to commence to form another stitch. So at each revolution of the driving-shaft the carrier passes entirely through the loop of the upper thread and carries its spool of under thread through the same. The needle-bar is connected, through clasp I and link H, with lever F, which is attached to arm B by screw G, upon which it rocks when operated by cam E. Upon the back side of arm B are fastened bearings, in which a horizontal

rock-shaft N operates. This shaft is connected with a vertical rod, through which it is operated by cam K. The shaft and rod are indicated by dotted lines in Fig. 1. To the outer end of said rock-shaft is attached a take-up arm, O, Fig. 2, to the end of which is attached the thread-guide and pulley S, more fully shown in Figs. 16 and 17. This take-up is operated independently of the movements of the needle-bar by the cam K, and its movements are so timed relatively to the movements of the needle-bar and under-thread carrier as to properly take care of the slack upper thread, and draw up the loops, and assist in setting the stitch.

The tension upon the upper thread is obtained, in the usual way, by means of two disks, P, set together with yielding pressure, between which the thread passes from the spool to the needle.

The feed employed by us for moving the work and spacing the stitches is the well-known "four-motion" feed-bar; and we will now describe our peculiar method of operating said bar as a part of our invention.

On the driving-shaft C, Fig. 9, and secured thereto by a set-screw, is a collar, *v*, having two eccentric bearings upon it, which work, respectively, in the arms or straps *t* and *u*, which are connected with cranks on shafts *r* and *s*. Shaft *s* is hollow, and shaft *r* works within the same. By the rotation of the two eccentric bearings on collar *v* the arms *t* and *u* are made to rock the shafts *s* and *r*. The hollow shaft *s* has a projection on its upper side, through which a groove is cut, into which a pin projecting out from the feed-bar *x'* rests, as shown in Fig. 4. The rocking of this shaft imparts the requisite horizontal reciprocating movement to the feed-bar. Shaft *r* is flattened at one end, upon which flat surface the feed-bar *x'* rests, and slides backward when not in contact with the goods, as also shown in Fig. 4. The rocking of this shaft by means of the eccentric *t* presents said flat surface alternately parallel with, and at an angle with, said bar, and thus imparts to the feed-bar *x'* a vibrating vertical movement; and the movements imparted to these two shafts by the eccentrics *t* and *u* are so timed relatively to each other as to make the downward vertical movement of the feed-bar *x'* immediately precede the backward horizontal movement of the same, and the upward movement to immediately precede its forward movement. Thus the goods are moved forward upon the bed, and under and past the needle, in the usual way, in the process of stitching. To regulate the length of the stitches we employ the rod *b*, Fig. 1, upon the right-hand end of which is a crank, *f'*. Attached to the under side of the bed of the machine is a spring, *y*, the free end of which rests under the crank *f'*, and keeps it against the end of screw R, as shown. On the opposite end of rod *b*, Fig. 9, is another crank, *g'*, which is connected with the crank *h'* of the feed-shaft *s*, and through the latter to the eccentric strap *u* by the screw-stud *i'*. The two last-named crank-arms are slotted, as shown in Fig. 2, so that connecting-stud *i'* may be moved along said slots to a position nearer to, or farther from, the axis of the rocking shaft *s*, and thereby the extent of the rocking movement of said shaft is regulated, and through that the horizontal movement of the feed-bar *x'*, which spaces the stitches. The screw R, Fig. 1, which is threaded in the bed A, rests against the crank *f'* on rod *b*, and is used to depress said crank, and partially rotate said rod, which has the effect to raise the crank *g'* on the opposite end of the rod, and with it the connecting-stud *i'*, thereby shortening the leverage of the eccentric strap *u*, increasing the rocking movement of the shaft *s*, and lengthening the horizontal vibrations of the feed-bar, and the length of the stitches spaced thereby. By retracting the screw R, and allowing the crank *f'* to follow it by force of the spring *y*, a reversal of the effects just described are produced, and the stitches are thus shortened.

The nut shown in Figs. 12, 13, 14, and 15, for securing the under spool in its carrier, and producing the graduated pressure required to regulate the tension on the under thread, is constructed in two parts, as shown in Figs. 12 and 15. These parts are united by a strap, *j'*, inserted in the parts, as shown, and pivoted at its ends to said parts, so as to form a hinge, which allows the parts to separate at the opposite side. This separation is closed by a curved spring, *k'*, which is riveted to one part of the nut, as shown in Fig. 12, while its free end embraces a portion of the other part, and bears upon the same with a spring-force sufficient to close the two halves together, as shown. This constant spring-pressure has the effect to prevent the nut from jarring loose and getting out of position on the spool-spindle, and disarranging the tension when the machine is in operation.

The top take-up S, attached to arm O, Fig. 2, is constructed, as shown, in sections, Figs. 16 and 17. The arm O has a circular recess, into which one side of the grooved roll *r'* is inserted, and prevents the thread from getting out of the groove in that direction. Through the arm, and riveted into the same, is the roll-stud *s'*, the front end of which is square, as shown in Fig. 17. To this end of the stud the cap *t'* is fastened by a screw, *u'*, passing through said cap and roll, as shown in Fig. 16. Said cap is recessed similarly to arm O, and covers the front side of the roll, so as to prevent the thread from getting out of the groove of the roll in that direction, and through said cap is a square hole, which adapts it to the square end of the stud *s'*, and prevents it from turning thereon when screwed thereto by a single screw, as described. The cap *t'* has two arms, *v' v'*, which are bent at an angle with the edges of arm O, and project be-

yond the same, and which confine the thread between the said arm and cap, and secure it against accidental escape therefrom, while at the same time the thread is very easily passed from the outside into the groove in said roll when threading the machine.

Having completed the description, what we claim as our invention is—

1. The carrier *g*, rotary shaft C, the disk *d*, yoke *e*, and bracket *f*, constructed, combined, and arranged to operate together, as and for the purposes specified.

2. The combination, with the spool-carrier *g* and its two supports, *e* and *f*, of the rotary shaft C, disk *d*, clamping-lever *h*, and operating mechanism, as described, whereby the said carrier is held in proper relative position to be passed through the loop of the needle-thread, and be intermittently clamped and released, as and for the purposes set forth.

3. The carrier *g*, constructed as described, and provided with the swells *m* and *n*, arranged relatively thereon, as and for the purposes set forth.

4. The combination, with the rotary thread-carrier *g* and bracket *f*, of the thread-guard *l*, arranged as shown, whereby the under thread is prevented from crossing the path of the said thread-carrier *g* during its rotation, and entangling with the upper thread, as described.

5. The nipper-lever *h*, combined with the rotary plate *d*, eccentric *k*, and connecting mechanism, as described, whereby a rotary and rocking movement is imparted to the clamping-lever, as and for the purposes specified.

6. The carrier *g*, with its thread-guard *l*, in combination with take-up arm O and intermediate mechanism, as described, whereby said carrier and arm are made to move relatively to each other, as and for the purposes specified.

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