W. A. MACK.

Sewing Machine.

No. 111,359. Patented Jan'y 31, 1871.

FIG. 3.

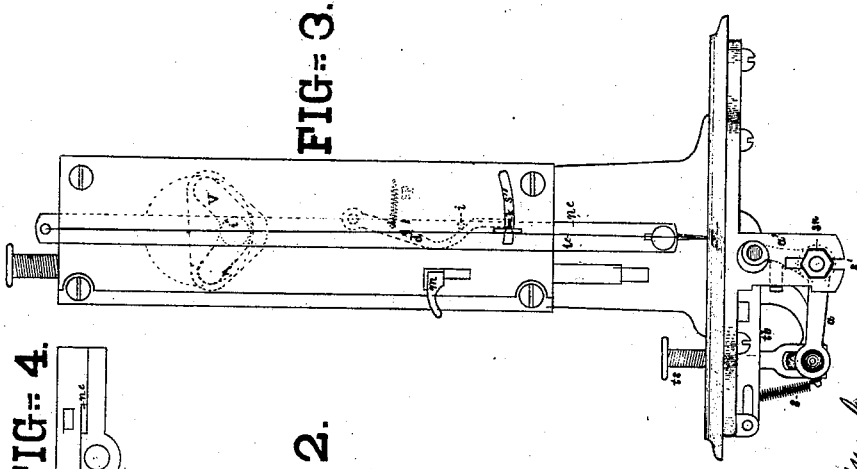


FIG. 4.

FIG. 2.

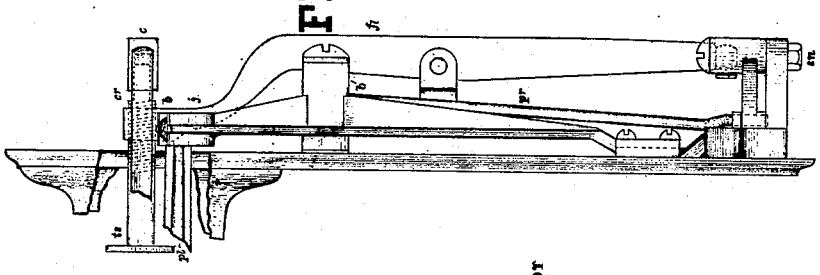


FIG. 5.

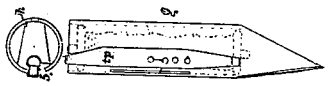


FIG. 6.

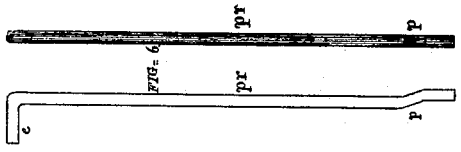
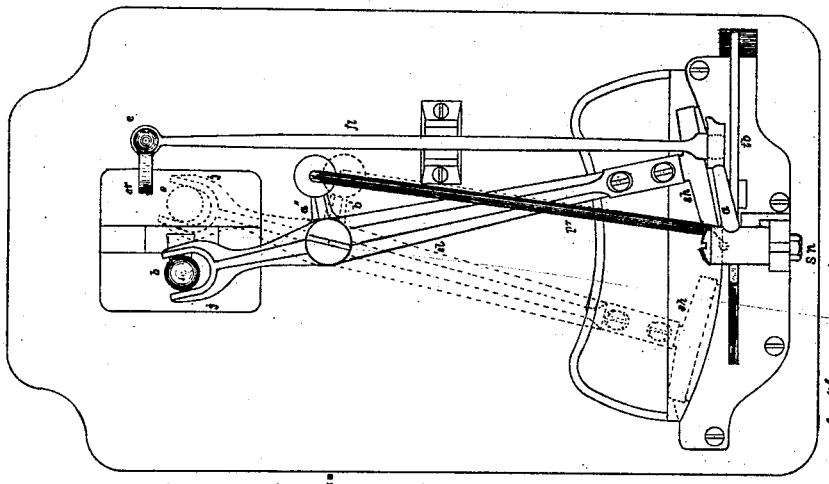


FIG. 1.



Witnesses,
Henry J. Ferguson
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UNITED STATES PATENT OFFICE.

WILLIAM A. MACK, OF NORWALK, OHIO.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **111,359**, dated January 31, 1871.

To all whom it may concern:

Be it known that I, WILLIAM A. MACK, of Norwalk, in the county of Huron and State of Ohio, have invented certain Improvements in Sewing-Machines, of which the following is a specification.

My invention relates, first, to the feeding mechanism of a sewing-machine, coming technically under the head of "drop" or "four-motioned" feed, the required motion coming from an elevated main shaft; also, to the "take-up" device of a sewing-machine, controlled alternately by spring and positive motion; also, to shuttle, spring, and tension, and shuttle-head contrived to secure the greatest possible length of bobbin and evenness of tension.

In the accompanying drawings, Figure 1 is a bottom view of the sewing-machine. Fig. 2 is a side view of the parts shown in Fig. 1. Fig. 3 is an end view of the same, and of the take-up and accessories. Fig. 4 is a cross-section of "face," showing the needle-bar race. Fig. 5 is the shuttle and end piece. Fig. 6 is a view of the "push-rod" of the feed, from two positions.

a designates one arm of a double-armed device, and is of a piece with a collar or bearing held in place by the stay-nut *sn*, staying a pin in the slot *s'*.

a' designates the other arm, and grasps the extreme end of the push-rod *pr*, while *a* grasps that of the feed or walking-beam lever *fl*, neither too tightly; *a''*, an arm of the shuttle-lever *sl; b*, a ball on the end of the pendent lever *pl; b'*, the bearing of *sl; c*, the cup of the rod *cr*, which has only vertical motion; *d*, the take-up arm; *e*, the turned-up end of *pr*, to be inserted in the arm *a''; h*, the shuttle-head; *i*, the pin on the needle-bar *ne; j*, the jaw of *sl; k*, the eye of the arm *d; p*, the shouldered end of *pr; s*, the feed or retreating spring; *s''*, the slot for *k*, working in slot *s'; sh*, the shuttle piece; *tb*, the feed-bar; *tp*, the tension-spring of shuttle; *ts*, the thumb-screw which regulates the step or stitch; and *g* is the shuttle.

The operation of the feed mechanism is as follows, viz: Commencing at the moment when the shuttle arm or lever *sl* is about to carry the shuttle forward to engage the loop yet only incipiently formed by the thread of the descending or descended needle, the push-rod *pr*, its bent-up end *e*, socketed in the end of a short arm, *a''*, projecting from the side of the box, hub, or bearing *b'* of the shuttle-lever *sl*, lies across the shuttle-lever *sl* at a slight angle. The short arm *a''*, being a part of the same casting and placed at right angles with the shuttle-lever *sl* at its bearing-point, is at this stage at the extreme point of its backward movement, as the shuttle-lever also is. Consequently the moment forward movement begins in the shuttle-lever *sl* endwise movement also begins in the push-rod *pr*, which is curved or bent downward about one inch from its outer end at *p*, much like the handle of a shovel near the shovel-blade. The extreme point beyond this curve passes through, first, the toothed feed-bar *tb*, and then through the end of the arm *a'*, directly under the toothed surface. Motion continuing, just before the shuttle reaches the other end of its arc, the curved shoulder at *p* penetrates and positively crowds up the feed-bar *tb* against the cloth and presser-foot, preparatory to the feed motion of the same, with the cloth in charge. From about the time when the shuttle reached the center of its arc slight motion has been going on in the pendent connecting-rod *cr*, carrying its cup *c* into contact with the feed-adjusting screw *t*, which penetrates the end of the feed-lever *fl*. This lever *fl* has a sort of walking-beam action, given by the rod *cr* and the spring *s*, alternately. The absolute movement is given by the rod *cr*, and the opposite end thereof—*i. e.*, of *fl*—being inserted in the end of the arm *a*, this arm is depressed, and its right-angle arm *a'* is carried forward, taking with it the point *p* of the push-rod *pr* and the feed-bar *tb*, which is, as it were, strung thereon, and so arranged as to have endwise motion, as required. The forward feed-step having been made coincidently with the return of the shuttle, the push-rod *pr* withdraws its point *p*, and now the opposite side or curve of this point *p* operates to bring down the feed-bar *tb*, which being done, the rod *cr* and cup *c* release the lever *fl*, and the spring *s*, taking it and the arms *a* and *a'* in charge, the feed-bar and push-rod are carried back to their starting-points, preparatory to a repetition of the movements described.

The backward and forward movements of the rod *pr* depend upon and co-operate with

those of the shuttle-lever where this feed is attached to a machine operating its shuttle in this manner. Manifestly, however, this kind of feed may be attached to machines driving their shuttles by other methods, in which case the part of the shuttle-lever in front of the bearing *b'* may be omitted without other modification. The part *p* of the rod *pr* is so shaped that the elevation and the depression of the feed-bar *tb* are positive.

The adjustment required by the wear of the toothed feed-surface is provided for by the suspension of the arms *a* and *a'*, by a boss or bearing on a pin working perpendicularly in the slot *s'*, wherein it is secured by the stay-nut *s n*. The pendent lever *pl*, which operates the shuttle-lever *sl* and push-rod *pr*, is actuated by a cam on the main shaft and suspended on a pin below the same, has in this pendent part a pendulum-like motion. It is provided on its lower extremity with a ball, *b*, which takes in the jaws or fork *j* of the shuttle-lever *sl*. The requirement of the position is harmony of two parts moving in two distinct planes at right angles with each other and both describing arcs, one giving and the other receiving power, as desired, with only a modicum of friction. The ball *b* touches the smooth sides of the fork or jaw *j* only at one point at a time, operating like a universal joint, and permitting all the play required by the exigencies of the position. As the motion alternates, the pressure and friction is transferred to opposite sides of the fork or jaw and ball.

The ball *b* may be so constructed or attached as to be turned when wear occurs thereon, and so present new surfaces for action.

The operation of another part of my invention is as follows, viz: The pin *i*, fixed in the needle-bar at the proper point, takes on the concave side of the take-up arm *d*, and actuates the same at each end of its motion. Starting, now, with the needle-bar elevated to its highest point and carrying the needle-thread in an eye at its top, the take-up arm *d* is freed from the control of the pin *i* soon after the downward movement of the needle-bar commences—or rather the spring *sp* tends to keep the arm *d* in contact with the pin *i* throughout its motion; but owing to the concaved form thereof the arm *d* and the eye *k*, at its end through which the thread passes, are moved over by the spring *sp*, the last in the slot *s*, thus taking in charge the slack in the thread developed by the descent of the needle-bar and drawing it in through the staple which straddles the slot *s'*. Meantime the eye of the needle is slipping down on the thread to penetrate the cloth. After the needle penetrates the cloth the pin *i* strikes the lower limb of the concave arm *d* and drives its thread-carrying eye up to the staple again, by a positive action at the proper time, to give slack enough to permit the shuttle to pass through the loop. The eye *k* is as near as may be so held until the shuttle has passed and the upward movement of the needle-bar commences, when, the pin *i*, tending to release the arm *d*, the slack left by the shuttle is gently taken up by the force of the spring *sp*, operating to carry the eye *k* to the opposite end of the slot again. The motion of the needle-bar continuing, the tightening of the stitch proceeds. As it (the pin *i*) strikes the upper limb of the take-up arm *d* and overcomes the spring *sp*, it compels the eye *k* to yield up the slack thread without its meeting with any resistance from that spring in ordinary cases, and yet if by any means more slack shall be required than is furnished thereby the spring *sp* will at once yield and prevent the thread from being broken, and supply the amount necessary. According, then, to the strength of the tension-spring, will be the pull of the needle-bar on the stitch, and in so far as that tension is overcome will there be a new supply of thread added to that already unspooled. From this point the movements described are repeated at each stitch.

The construction and operation of another improvement is as follows, viz: Fig. 5, consisting of two parts, the largest showing the shuttle with the spring and tension piece *tp* in place, and the smaller showing an end view or a view of the head-piece *h* with the hook of the spring *tp* engaging the same, indicates the construction of my invention.

In my invention patented November 15, 1864, the flat spring was slightly bent at each end—at the front end, so as to barely slip into the opening in the shuttle and engage the further side of the same, and at the rear end so as to slip into a groove in the shuttle-head, which screwed into the shuttle and thus covered this end. The defects of this shuttle, as above described, are, first, that the ends of the flat spring being only caught or covered, and not securely fastened, it would give and so furnish uneven tension; second, the screw-head took up valuable space, and would sometimes partially unscrew and catch the needle-thread between it and the shuttle, when it was surely broken.

In my present invention the flat spring is hooked at each end, and when in place cannot lift up or change the pressure on the thread. The hook bent over and hooked into the head not only firmly holds it in place, but furnishes a sort of guide, which conducts the thread safely off from the shuttle. The head *h* is a somewhat triangular piece, having a pin at the small end, intended to fit into a corresponding hole in the shuttle and detain that end of the head absolutely. Near its center is a hole for the bobbin-bearing on the inside. One side of the large end is cut or notched, and this notch is terminated by a rounded recess for the hook of the spring *tp*. This end has also a shoulder, which drops into or under the shuttle and prevents it from lifting up and out in the direction of the spring *tp*. Above the shoulder projects a piece or stem, rounded a trifle on the outer side and shaped to fit a notch made in the shuttle. This notch is extended to one side, in order to let the hook

engaged at its other end slip one side while the bobbin or head is being put in place. When the head reaches its place the hook of the spring *tp* is slid over it, or rather into the recess in its upper end, over which it curves and secures the head in place during use, acting also as a slide or guide to lead the needle-thread free and off from the shuttle.

In use, the bobbin being inserted in the shuttle, the head *h*, which furnishes one bearing for the bobbin, is inserted, by first placing its pin in the hole made for it in the shuttle case or wall and pressing the other end up into its place, thereby engaging the bobbin-bearing of the outer end. When thus in place, the end opposite the pin projects through a recess prepared and fitting the same, and comes flush with the flat wall of the shuttle, on which the tension-spring lies. This spring *tp* is a long and narrow piece of metal, more than two-thirds as long as the shuttle, and is provided with holes for the thread, the tension upon which is increased by the number of holes through which it passes, and the consequent increase of pressure upon the multiplied parts pressed between the spring and the shuttle. It is also hook-shaped at each end. At that end toward the point of the shuttle it hooks into a square hole in the wall of the shuttle beyond the bobbin. At the other end provision is made to enable the hook to slip one side into a recess or nick in the wall of the shuttle while the end or head piece is being inserted. The thread from the bobbin is of course passed through the desired number of holes in the spring *tp* before the spring is slid over the head and set in place. The thread from the bobbin leading through the tension-holes, after passing the slit made for it, receives pressure in proportion to the size and strength, as well as in proportion to the number of holes and spaces, thus giving full control over the tension of the shuttle-thread. By these means a very even tension is obtained, and space for a long bobbin.

The feed devices herein described are associated more particularly with machines operating their shuttles by a horizontal lever describing part of a circle. Manifestly it relates to the class of machines actuated by a raised driving-shaft, from which the power and means of manipulation are derived, and may be applied to any of them, omitting the shuttle-carrying part where that is unsuited.

I claim—

1. The combination of the double-armed device *a a'* with the double-shouldered rod *pr* and the feed-bar *tb*.

2. The shuttle-lever *sl* and pushing lever or rod *pr*, arranged and operating as described.

3. The combination of the pendent rod *cr* and the walking-beam lever *fl*, for the purpose of operating the feed-bar *tb*.

4. The combination of the adjusting thumb-screw *ts*, pendent lever *cr*, and walking-beam lever *fl*, for the purpose of controlling the length of the step or stitch.

5. The combination of the walking-beam lever *fl* and double-armed feeding and retreating device *a a'*, for the purpose of giving motion to the feed-bar *tb*.

6. The shuttle-lever *sl* and pushing-rod *pr*, combined and operated by the pendent lever *pl*, as described.

7. The arm *d*, constructed as shown, and its spring *sp*, operated by a pin on the needle-bar, in the manner and for the purpose described.

8. The shuttle provided with the removable head *h* and hooked spring *tp*, all constructed as described.

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Witnesses:
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