2 Sheets—Sheet 1.

W. HALL.

Sewing Machine.

No. 24,870. Patented July 26, 1859.

Fig. 3.

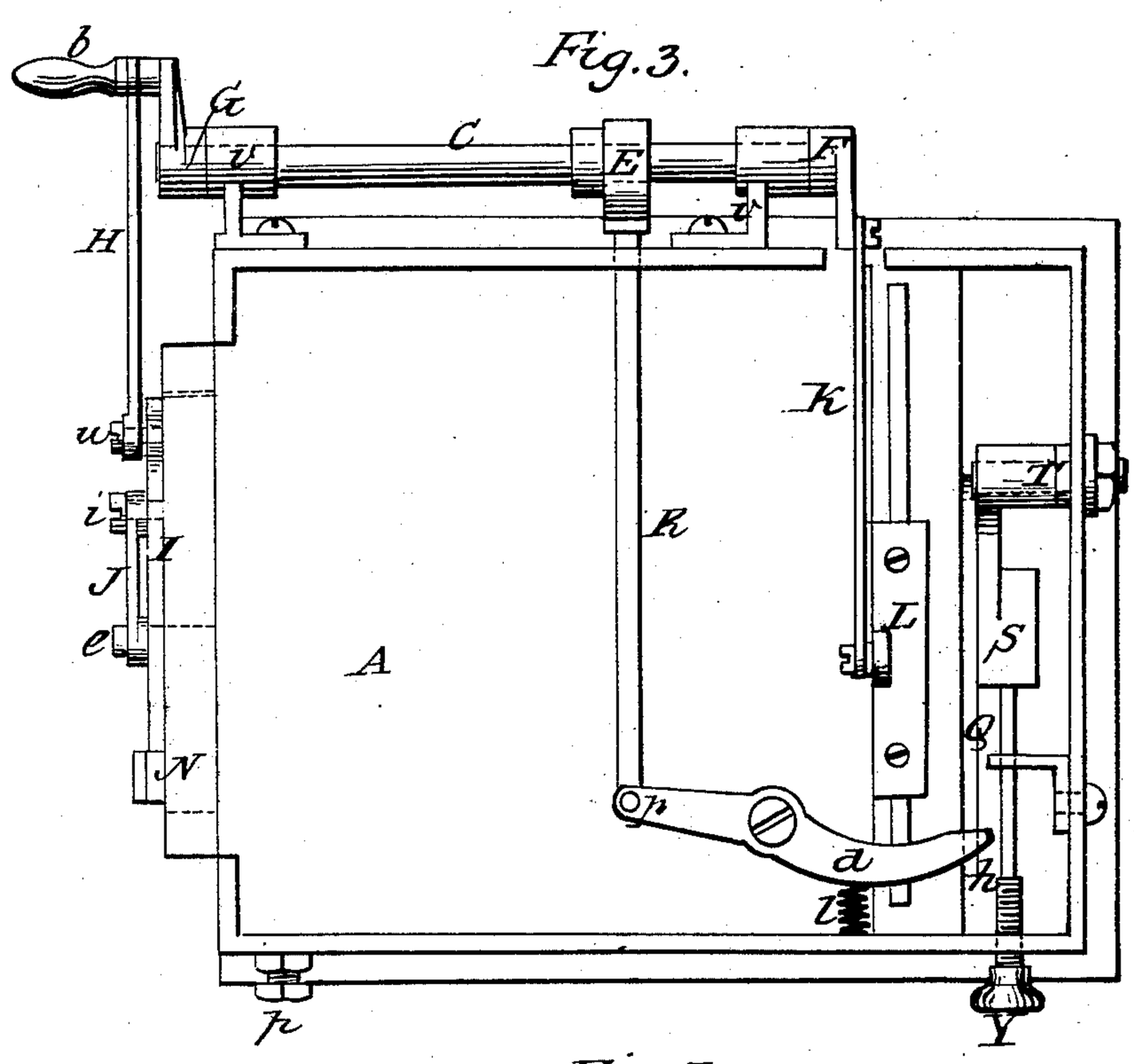


Fig. 5.

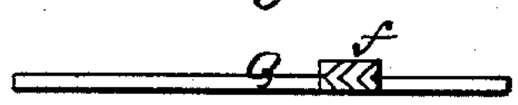
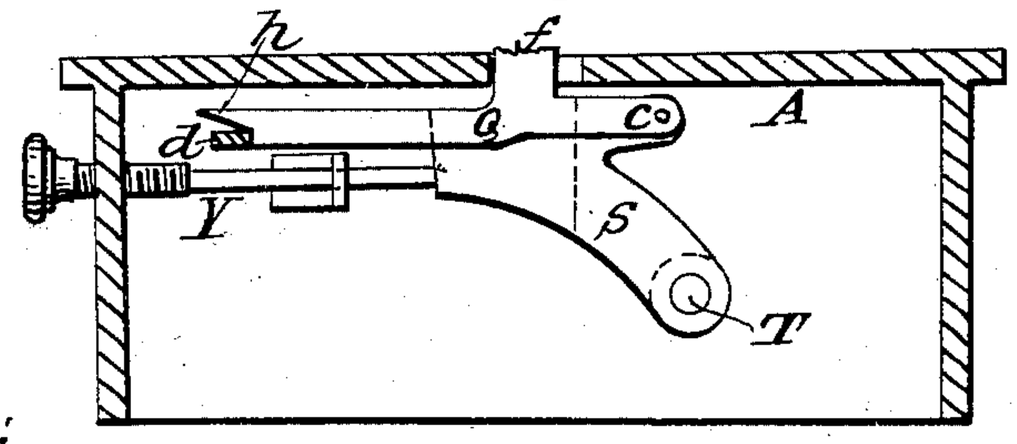


Fig. 4.



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2 Sheets—Sheet 2.

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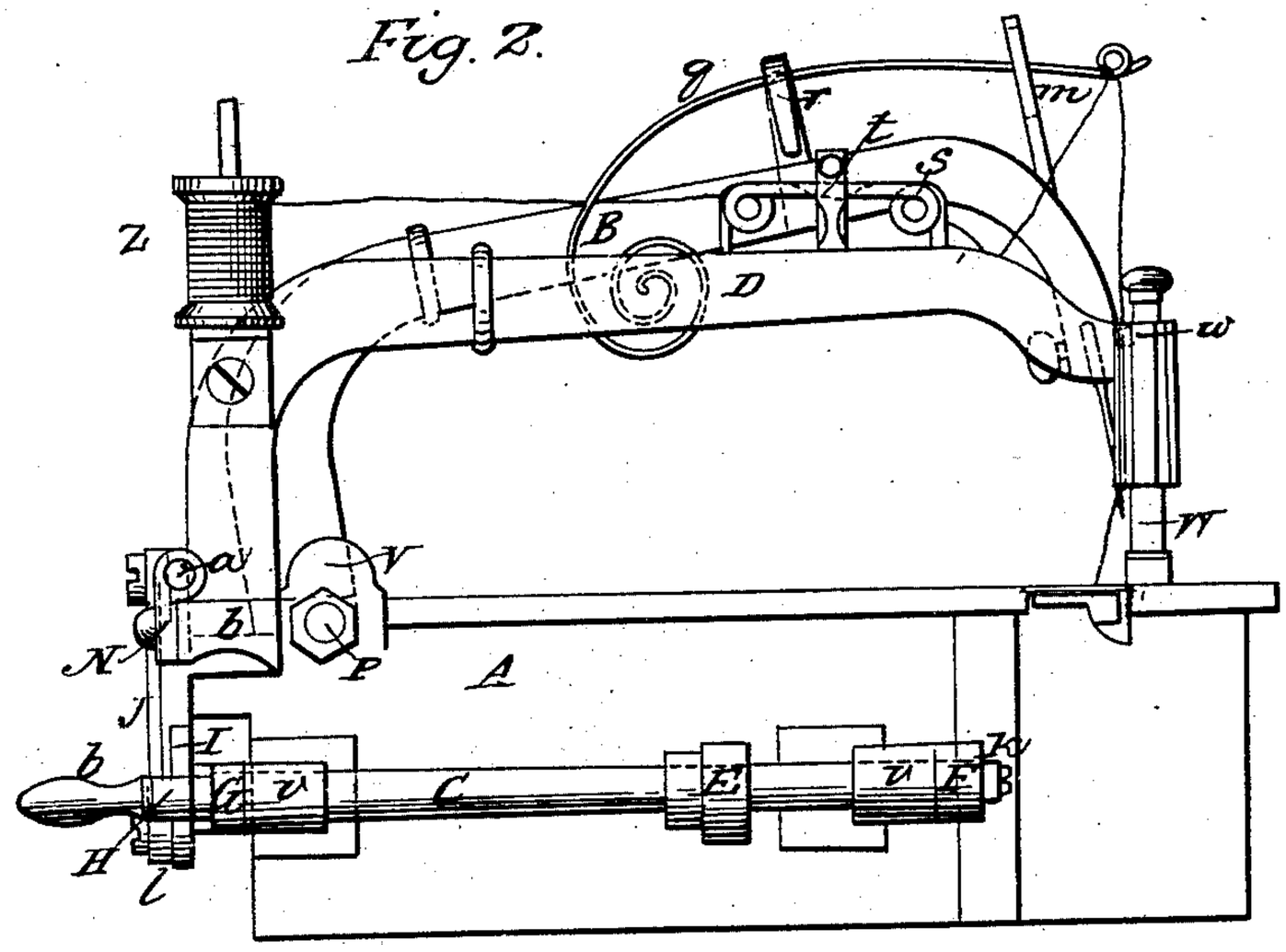
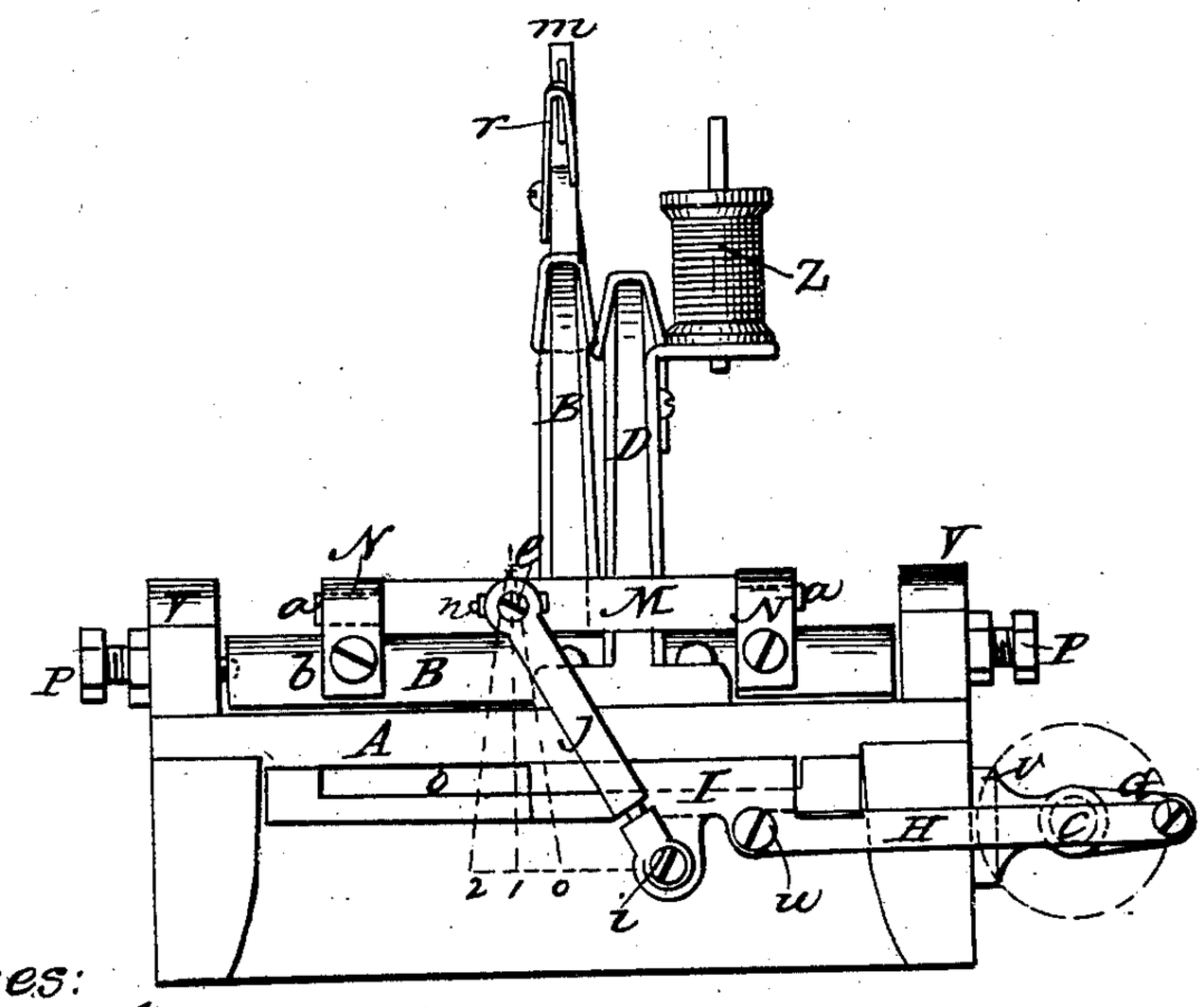
Sewing Machine.

No. 24,870. Patented July 26, 1859.

Fig. 2.





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UNITED STATES PATENT OFFICE.

WILLIAM HALL, OF NORTH ADAMS, MASSACHUSETTS.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **24,870**, dated July 26, 1859.

To all whom it may concern:

Be it known that I, WILLIAM HALL, of North Adams, in the county of Berkshire and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a back end elevation. Fig. 2 is a side elevation. Fig. 3 is a reversed plan, showing the work attached to the under side of the bed-plate. Fig. 4 is a vertical cross-section, showing the feed motion more clearly. Fig. 5 is a plan of radial segmental arm with double spiral teeth on its upper surface.

My invention consists, first, of the combination of the needle-carrier B, pivoted bar M, connecting-rod J, slide I, pitman H, and crank G in such a manner that while the crank G is making one revolution and forcing slide I once forth and back the needle-carrier shall receive, by means of the connecting-rod J, a double reciprocating vertical motion. The two ends of rod J move in lines at right angles to each other, the upper end performing two vertical motions while the lower end is performing one horizontal one. In this arrangement the rod J is jointed to bar M about one-half inch one side of a perpendicular drawn through the center of pin *i*. When slide I is in a central position, which causes two of the vertical motions to be longer than the other two, one long downward motion to carry the needle through the fabric, a short upward motion to form the loop, a short downward to give extra slack thread to enable the shuttle to pass through easily, and then a long motion up to draw up the stitch, making altogether a very convenient and necessary motion for the needle of a sewing-machine.

The operator, when using stiff silk or twist, can, if necessary, diminish the size of the loop by moving the stud *e* farther from the center of bar M, and, on the other hand, if using soft silk or thread, can enlarge the loop by moving the stud *e* in the opposite direction.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

Like letters of reference indicate corresponding parts in each of the several figures.

A is the bed-plate of the machine.

D is a stationary arm, secured to bed-plate A for the purpose of supporting pressure-pad W. To stand D are also attached the spool Z, which supplies thread to the needle, and the friction apparatus, which is of the ordinary kind for producing the necessary tension on the needle-thread. The needle-carrier B is pivoted on the points of the two screws P P, which are screwed into lugs V V, cast on the bed-plate A. The center of the screws P P is in a horizontal line through the center of the shuttle-box, so that the needle when it is in the shuttle-box may be as nearly vertical as possible.

b b are two arms, which form a part of the needle-carrier B and extend to the rear of the center P, on which it vibrates. To these arms are attached the stands N N, which support the bar M on the journals *a a*.

J is a connecting-rod attached (at its upper end) to the bar M by the stud or joint pin *c*, which pin is adjustable horizontally in a slot, *n*, in bar M, so that it can be moved nearer to or farther from the center of the bar, according to the necessities of the work to be done. The lower end of rod J is attached to the sliding piece I by the joint-pin *i*, and in the center of it horizontally. This rod, as here shown, is made in two parts, but could as well be in one piece. The sliding piece I receives motion from the crank G by means of the connecting-rod H, which is pivoted to the slide I by the pin *u*, the center of which is in a horizontal line through the center of the main shaft C, on which is the crank G. The shaft C, which gives motion to all the working parts of the machine, is, for convenience, placed outside of the bed-plate A and supported by the stands *v v*.

E is a cam on shaft C. R is a rod operated by said cam and connected by pin *p* to lever *d*, to which is attached spring *l* to keep rod R in contact with the face of cam E.

S is a quadrantal rocking arm vibrating on stud T in bed-plate A. This arrangement is shown more clearly in Figs. 3, 4, and 5. To this rocking arm is attached the radial segmental arm Q by the pin *e*.

On a portion of the upper surface of Q is formed the double spiral feed-surface, which projects through the bed-plate, as seen at *f*. This feed-surface is shown in plan in Fig. 5.

On the radial end of Q is formed an inclined plane, *h*, terminating with a shoulder, against which the lever *d* operates.

Y is a thumb-screw which regulates the length of the stitch.

L is a slide which moves the the shuttle, and put in motion by the connecting-rod K, which is connected to crank F on shaft C.

Having now described the construction and position of all the principal parts, I will proceed to describe the operation of the machine.

In the drawings, the crank G is represented on a "dead-center," the slide I being drawn to its extreme position toward shaft C, the top of connecting-rod J being in its lowest position, and therefore the needle at its highest point. Now, if the crank G is revolved in the direction of the arrow, when the center of crank-pin *b* has arrived at the position indicated by the point of the arrow the connecting-rod J will have assumed a perpendicular position, and consequently the top of it will be at its greatest elevation, and therefore the needle in its lowest position. Now, as crank-pin *b* completes its semi-revolution, the center of pin *i* moves from 1 to 2, and the needle receives a short upward motion; then, as crank-pin *b* passes the center, the rod J is brought to a vertical position again, and the needle carried down to its lowest position, and, as the crank continues its revolution and comes back to the position shown in the drawings, the needle is brought up to its highest point again. The object of this peculiar motion is as follows: As the center *i* moves from its position in the drawings to 1, giving the needle a long downward motion, the needle and thread are carried through the cloth, then from 1 to 2, (giving the needle a short upward motion,) forms the loop. Now, when *i* arrives at 2 the center of pin *b* passes the center, and *i* commences to move back toward 1, thereby producing a short downward motion in the needle, which motion delivers extra slack thread, to enable the shuttle (which has already entered the loop) to pass through easily. When *i* arrives at *o* the needle is in the same position as it was when the loop was formed, and the shuttle is almost through it. Moving from *o* to the point of starting, the combined mechanism draws up the stitch. Thus we see that while slide I moves once forth and back it produces four vertical motions on the top of rod J and needle-carrier—one long motion to carry down the needle, a short upward motion to form the loop, a short downward motion to feed extra slack thread to enlarge the loop after the shuttle has entered it, then a long upward motion to draw up the stitch.

There are several things to be noticed in relation to the working of the above combination of parts which produce the loop and the stitch. First, the bar M, being supported by the journals *a a*, there is no cramping on the pin *e* by the rod J; secondly, the motion which rod J has on its joint-pins is only about one-tenth part of a circle, therefore there is but little friction, noise, or wear; thirdly, if from any cause it should be necessary to enlarge the loop, it can be done by moving the stud *e* nearer to the center of bar M, and, on the other hand, if it should be necessary to make it smaller, the stud must be moved in the opposite direction; fourthly, when the needle is being forced down through the fabric, it is with gradually-increasing power, and when drawn up for the stitch, with gradually-increasing speed; fifthly, it is very simple and easy of application, and the working-parts help to balance the needle-carrier.

I may also state that a sewing-machine built on this plan can be got up very reasonably—so much so as to put them within the reach of almost every family—and it does it work with less extent of motion, less wear, less friction, and less concussion. With this needle-motion the shuttle may be operated by a crank in the common manner. I have represented it as operated by a shuttle-carrier, L, of a well-known form, receiving motion through the rod K from a crank, F, on the main driving-shaft C.

The operation of the feed-motion is as follows: When the shaft C is put in motion, the cam E operates the rod R, and through that the lever *d*, moving the end of *d* along the inclined plane *h* on the end of Q, thereby raising it up until its teeth project through the bed-plate, as seen at *f*, Fig. 4. After raising the arm Q the lever *d* comes in contact with the shoulder, which terminates the inclined plane *h*, and moves Q horizontally in the direction of the arrow and feeds the cloth. When Q moves horizontally, S is raised by pin *c* from screw Y. Now, the cam E, having produced the necessary feed as it revolves, commences to recede from the rod R, thereby allowing the lever *d* to be drawn back by spring *l*, and the arm Q falls back automatically (by means of the weight S) to its proper place, the end of S resting against the screw Y, which regulates the length of the stitch. This feed-motion is very simple, having but a few parts, and is operated by a lever in this instance; but a cam with a little different arrangement would do equally as well.

The tension arrangement for the thread is of the usual construction.

m is a prong on the needle-carrier, in which is a mortise to receive the spring-wire *q*, which is made fast to the arm D, at one end.

r is a hook attached to the needle-carrier, and through which the spring *q* passes.

s is the tension-wire, and *t* is the clamp, which winds the thread round it to give the proper tension to the needle-thread. The thread passes from the spool *z* through the two eyes in the tension-wire *s*, then through a small guide in end of arm D, then up through the twirl-spring *q*, down through the eye *w* to the eye of the needle.

The stitch is represented as being drawn up, and the end of spring *q* is at the bottom of the mortise. If the needle should be started down, the spring *q* would remain stationary and keep

the thread so till the eye of the needle got into the cloth. Then the hook *r* would strike spring *q* and feed down the thread as far as the needle required it. When the needle starts back to form the loop, the spring rises with it. As soon as the point of the shuttle has entered the loop the needle starts down. Then the hook *r* forces down the spring *q*, which gives extra slack-thread to enlarge the loop.

Now, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the needle-carrier B, pivoted bar M, connecting-rod J, slide I, pitman H, and crank G, when arranged and operating in the manner and for the purpose substantially as above set forth.

2. The combination of slide I and rod J (or its equivalent) with a vibrating needle-carrier in such a manner as to produce two vertical motions on the needle during each single horizontal motion of the slide I, substantially in the manner fully set forth in my description.

WILLIAM HALL.

Witnesses:

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A. B. DARLING.