

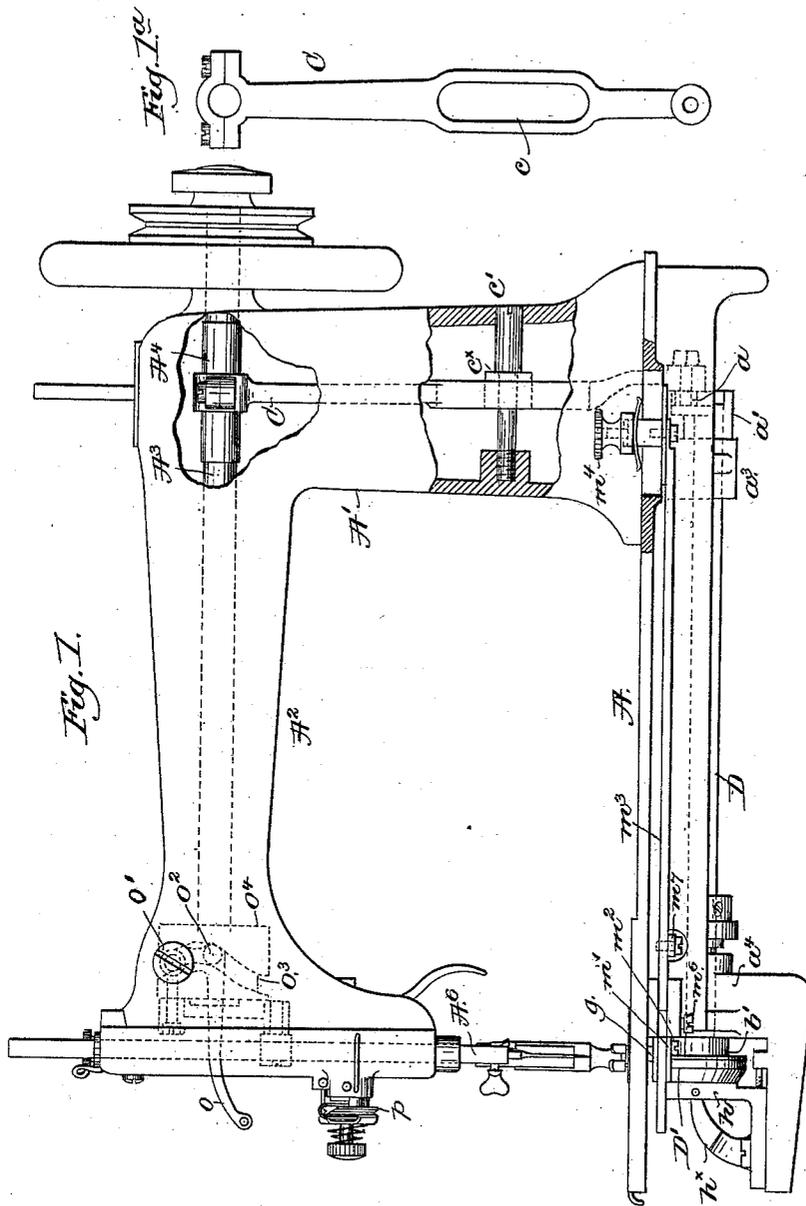
(No Model.)

3 Sheets—Sheet 1.

N. WHEELER.
SEWING MACHINE.

No. 424,237.

Patented Mar. 25, 1890.



Witnesses.

Fred. S. Greenleaf
Fred. A. Emery.

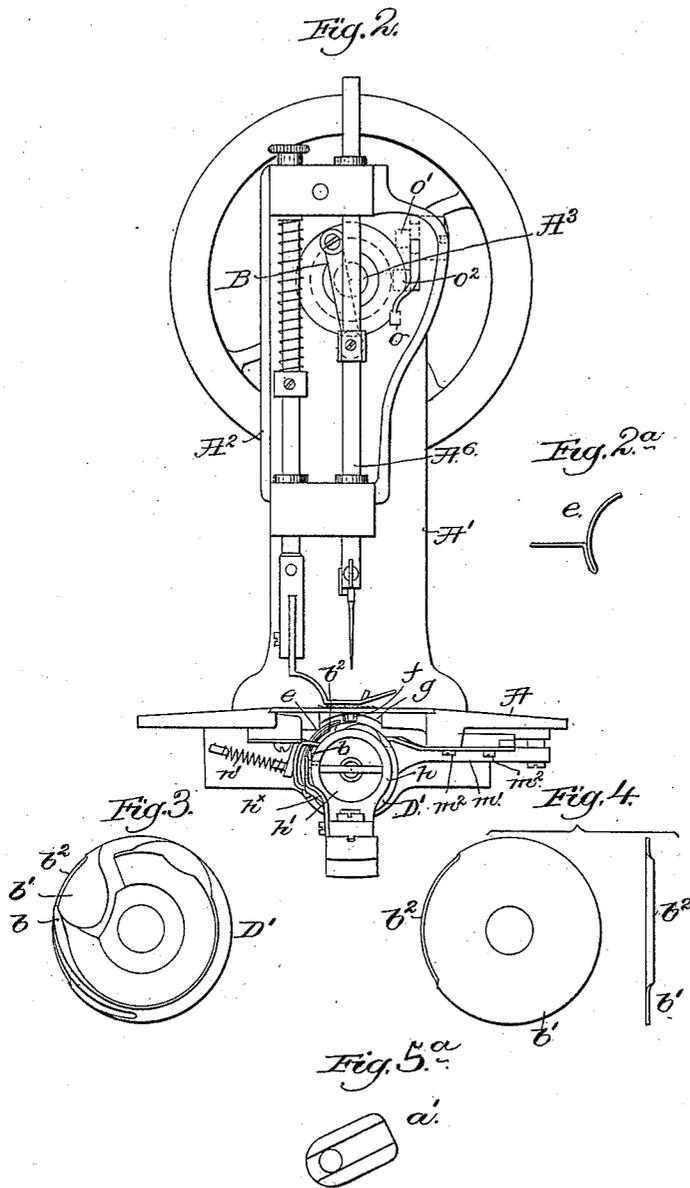
Inventor.

Nathaniel Wheeler
by Crosby & Gregory attys

N. WHEELER.
SEWING MACHINE.

No. 424,237.

Patented Mar. 25, 1890.



Witnesses.
 Fred. S. Greenleaf
 Fred. L. Emery.

Inventor:
 Nathaniel Wheeler
 by Crosby Sturgis
 Attys.

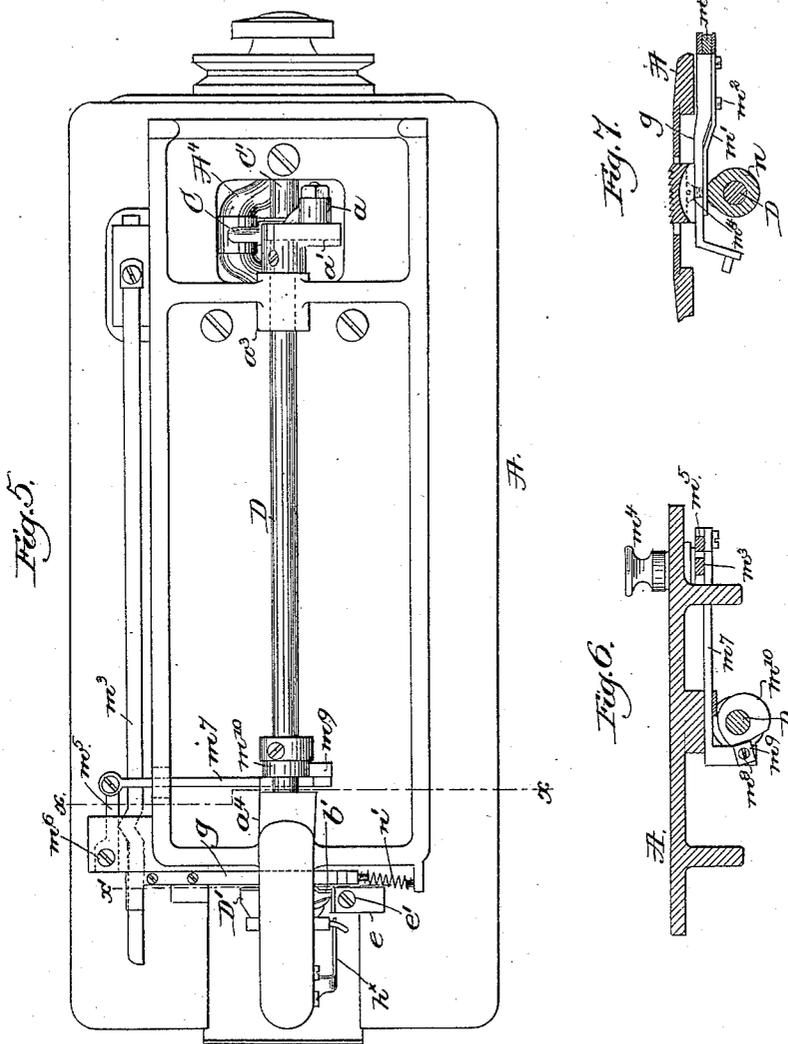
(No Model.)

3 Sheets—Sheet 3.

N. WHEELER.
SEWING MACHINE.

No. 424,237.

Patented Mar. 25, 1890.



Witnesses.
Fred. S. Greenleaf
Fred. L. Emery.

Inventor.
Nathaniel Wheeler
by Leroy & Gregory
attys.

UNITED STATES PATENT OFFICE.

NATHANIEL WHEELER, OF BRIDGEPORT, CONNECTICUT.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 424,237, dated March 25, 1890.

Application filed November 9, 1887. Serial No. 254,723. (No model.)

To all whom it may concern:

Be it known that I, NATHANIEL WHEELER, of Bridgeport, county of Fairfield, and State of Connecticut, have invented an Improvement in Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to improve and simplify the construction of that class of sewing-machines employing a rotary hook of the Wheeler & Wilson class and an eye-pointed needle.

In machines prior to this my invention a rotating hook of the class referred to has been secured to the end of a short shaft arranged under the cloth-plate parallel to the direction of feed, and having a belt-pulley and an eccentric, the latter being embraced by one end of a link connected to and actuating a vibrating arm, the forward end of which was provided with a curved needle. So, also, prior to my invention a hook of the class described has been connected to a short hook-shaft at right angles to the direction of feed, and said shaft has been rotated at a variable speed through a variable-motion device—such as a link connected to the said short shaft and to a main under shaft having a belt-pulley and rotated by power at a uniform speed during each rotation, the said under shaft actuating a link or connecting-rod joined to an arm or to a crank on a needle-bar-actuating shaft in the overhanging arm of the machine, to in one case rock and in the other rotate the needle-bar-actuating shaft.

The first form of machine referred to employing a curved needle is objectionable for many classes of work, and in the second form of machine the introduction of a variable-motion device between the two shafts referred to below the cloth-plate adds to the expense of the machine and to the power required to run it.

Being desirous of simplifying the construction of machines having a rotating hook of the class described, and to simplify and cheapen the same to the lowest practical point, I have dispensed with the usual variable-motion device and have applied the rotating hook directly to the end of a long shaft sup-

ported in bearings below the bed-plate, and I have rotated the latter shaft from a rotating needle-bar-actuating shaft through the intervention of a lever-connection having a constantly-varying leverage, the said connection being provided with a roller or other stud entering a groove in an arm attached to the shaft to which the said hook is secured, the said hook preferably having co-operating with it a loop-positioning plate or device, as will be described, so that while the machine is being run the liability of skipping stitches is obviated.

My invention consists, essentially, in a sewing-machine containing the following instrumentalities, viz: a straight eye-pointed needle; a needle-bar to which it is attached; a rotating needle-bar-actuating shaft having a crank, a crank-pin, and a cam-hub; a link connected to the said crank-pin and to the said needle-bar; a bobbin; a rotating hook, substantially as will be described, having an abrupt heel and a point, the latter to seize a loop of needle-thread and cast it about a bobbin and off its point, as will be described; a hook-shaft, to one end of which the said hook is attached; a grooved arm attached to the other end of the said shaft; a stationary fulcrum nearest the hook-shaft; a lever-connection between the said shafts, the said lever-connection having a constantly-varying leverage, and having a pin or projection to engage the arm at the rear end of the hook-shaft, and being unrestrained to move within the groove of the said arm, to thereby provide for greatly accelerating the rotation of the hook-shaft for about one hundred and eighty degrees and then to decrease its speed of rotation, and a take-up lever actuated positively by the cam on the said needle-bar-actuating shaft, the hook operating to cast the loop of needle-thread about the bobbin and travel at its accelerated speed until the point of the hook arrives in such position as to immediately deliver its loop to the take-up, the latter taking up and finishing the stitch before the point of the hook again enters a loop of needle-thread, the said take-up operating during the diminished speed of rotation of the hook, substantially as will be described.

Other features of my invention will be

pointed out and claimed at the end of this specification.

Figure 1 in side elevation, partially broken out, represents a sewing-machine embodying my invention. Fig. 1^a shows the lever-connection detached; Fig. 2, a left-hand elevation of the machine shown in Fig. 1, the face-plate of the head being removed. Fig. 2^a shows the loop-guard detached. Fig. 3 is an enlarged detail of the hook and its attached loop-positioning plate. Fig. 4 is a face and edge view of the loop-positioning plate removed from the hook-shaft. Fig. 5 is an under side view of the machine shown in Fig. 1. Fig. 5^a is a detail of the arm *a'* at the rear end of the hook-shaft; Fig. 6, a section of the machine shown in Fig. 5 in the line *x*. Fig. 7 is a sectional detail, to show especially the cam for raising and lowering the feed-dog.

The bed-plate A, upright A', and overhanging arm A² are of usual shape. The overhanging arm has bearings for the rotating shaft A³, employed to reciprocate the needle-bar A⁴ by or through the link B, attached to the crank-pin B^x, and to a pin on a collar B², secured, as usual, to the needle-bar having an eye-pointed needle A¹⁰.

The shaft A³ has a crank A⁴, embraced by the upper end of a lever-connection C, slotted longitudinally, as at *c*, (see Fig. 1^a) to embrace a squared or rectangular block *c'*, loose on a fixed stud *c'*, mounted in the upright A', parallel to the shafts A³ and D, the lower end of the lever-connection C having a stud *a*, provided with a loose follower block or roll, which enters a groove cut in the short arm *a'*, (shown separately in Fig. 5^a.) fast to the rear end of the rotating shaft D, having bearings at *a*³ *a*⁴, the forward end of the said shaft having secured directly to it a rotating hook D' of the Wheeler & Wilson class, it having a point at *b* to enter the loop of needle-thread.

Prior to this invention hooks of the class herein referred to have been made substantially as in United States Patent No. 9,041, dated June 15, 1852, and as in United States Patent No. 38,076, dated March 31, 1863. In the former patent the hook has a point and a tail projecting from the heel toward the point to act as a guard to prevent the point of the hook from engaging the bobbin-thread, and this tail has been in practice varied in length. In the Patent No. 38,076 the heel of the hook is made blunt, yet a slot is cut behind the heel to leave a slot in which the needle descends.

The hook shown in the invention herein contained is made abrupt or blunt at 3, and the space referred to as behind the heel, as in United States Patent No. 38,076, is omitted, leaving the hook solid, and, further, in the hook illustrated in Fig. 3 the needle never gets behind or to the rear side of the heel. The omission of the slot behind the heel is made possible by giving to the hook a variable motion, as described, the said motion being the slowest while the needle is descend-

ing into the space of the hook between its heel and point.

The fulcrum *c'* for the slotted lever-connection C is at such distance from the shaft A³ and the crank A⁴ on the said shaft is of such small throw that the end of the lever-connection between the said fulcrum and the roll *a* is always less than between the said fulcrum and the shaft A³, so that when the crank A⁴ is passing its top center the end of the lever-connection then below the said fulcrum *c'* is so short that the hook-shaft has a very slow movement, the point *b* of the hook at such time rising above the center of the shaft D and approaching the needle, the point of which is descending, the take-up at such time being operated to finish the last stitch, this slow movement of the hook being to enable the take-up to have ample time to finish the stitch before the needle in its descent reaches the goods. As the length of the lever-connection below the fulcrum C' is shortened, as described, the roll *a* carried thereby is moved to occupy a position in the outer end of the slot in the arm *a'*, which also tends to reduce the speed of the shaft D.

When the crank A⁴ starts from its top center, the length of the lever below the fulcrum *c* is quickly lengthened and the roll *a* is made to approach the center of the shaft D, so that the hook-shaft is turned at a faster and increasing speed until the crank A⁴ passes its lower center. When the speed of the hook begins to decrease, the said speed continually decreases until the crank A⁴ again reaches its top center.

In this class of machine using a rotating hook which does not pass through the loop of needle-thread, but which simply catches the loop of needle-thread and draws it down, spreads it, and casts it over a bobbin, it is essential that the lower shaft D be rotated from the upper shaft A³ by a contrivance capable of imparting to the said shaft D a variable motion, the said shaft D, as the point of the hook arrives almost to the needle after the same has started to rise, commencing to increase its speed at about the point where the loop is expanded and cast upon the bobbin-case.

The shaft D has secured to it at the rear side of the hook a loop-positioning device, shown as a plate *b'*, having a lip *b*², the said plate covering the space between the heel and point of the hook, the said lip projecting slightly into and crossing the said space from the heel to beyond the point of the hook, the positioning-plate or its lip acting on the needle-thread above its eye on the long-groove side to aid in throwing out the loop of needle-thread from the eye at the opposite side of the needle as the needle rises, thus insuring the formation of a well-defined loop, and preventing the liability of skipping stitches, which is liable to occur with wiry or rather stiff thread.

The hook D' has co-operating with it a loop-guard *e*, (shown in Fig. 2 and separately in

Fig. 2^a,) the said loop-guard being attached to the frame-work by a screw *e'*, and having its acting face concaved to almost touch the periphery of the hook and prevent the loop of needle-thread as it is cast off from the hook from flying up and getting in the way of the feed-bar *g*, and of the needle-guiding projection *f'* (see Fig. 2) extended down from the needle-throat plate *f'* through a slot in the said feed-bar. This loop-guard does not act as a loop-detainer to simply hold the old loop while the point of the hook acts to take a new loop, as in the ordinary Wheeler & Wilson machine using a loop-check. The upright portion of the ring-slide *b* is held in position to keep the bobbin *b'* in place by a spring-catch *b^x*. The feed-bar *g*, having usual feed-points at its end next the operator, is provided with a feed-bar-adjusting plate *m'*, attached thereto by screws *m² m²*. The plate *m'* and the feed-bar are so shaped as to receive between them the outer end of the stitch-regulating bar *m³*, provided with a screw *m⁴*, and made adjustable longitudinally, so as to place its cam projection or bend, as shown by dotted lines, Fig. 5, in such position as to form a shifting fulcrum for the link *m⁵*, pivoted at *m⁶* to the frame, the said link being jointed to a cross-bar *m⁷*, having a downturned end, (see Fig. 6,) on which is pivoted at *m⁸* a block *m⁹*, which is acted upon by a cam *m¹⁰* on the shaft D, the said cam by its action on the block moving the cross-bar and its attached link a greater or less distance, according to the position of the bar *m³*, thus providing for a stitch of greater or less length. The downward and backward movement of the feed-bar against the cam *n* on the shaft D and the contact of the block *m⁹* with the cam *m¹⁰* is effected and insured by the spring *n'*.

The take-up *o*, pivoted at *o'*, has an inwardly-extended arm provided with a roller or other stud *o²*, which enters a cam-groove *o³* in a cam-hub *o⁴*, fast on the needle-bar-actuating shaft A³, the said cam being of such shape as to permit the needle-thread to be given up to the hook and to take up the loop of needle-thread cast off from the said hook. The stroke of the take-up is always the same, it being moved sufficiently for the thickest material, and to accommodate for thinner material the needle-thread between the take-up and tension device *p* is acted upon by a thread-controller, shown as a spring *p'*; but herein the said spring and tension device are not claimed specifically, as they are not of my invention.

The cam *n* on the shaft D lifts the feed-bar *g* against the spring *n'*.

I am aware prior to my invention that a shuttle sewing-machine having a rotating needle-bar-actuating shaft has been made to rotate an under shaft by or through a lever having a block or pin to enter a slot in a disk at the end of the said under shaft, as in United States Patent No. 251,195; but in the machine described in the said patent the ful-

crum of the said lever moves with the lever, so that its leverage is always the same, and the only variation in speed of the under shaft, which is very slight, is due to the movement of the block or pin in the slot in the said disk; but with such form of connecting-lever having its fulcrum attached to it it is not possible to accelerate the rotation of the under shaft through one hundred and eighty degrees, as required in the machine herein described, having a rotating hook to cast a loop about a bobbin, and to gain this extra extent of accelerated motion the connecting-lever *c* herein shown is made movable longitudinally over a fixed fulcrum *c'*.

I am also aware in shuttle sewing-machines that a slotted connecting-lever having a stationary fulcrum has been employed between a rotating needle-bar-actuating shaft and an under shaft employed to actuate the shuttle, and to enable these two shafts to be moved substantially isochronously the lower end of the said lever has been pivoted upon a block, the extent of motion of which in a groove of a disk has been limited by a pin in a slot of the said slide, as fully described in United States Patent No. 335,017, the movement of the lower end of the said connecting-lever in the said patent toward and from the center of the lower shaft to be rotated by it being purposely restrained to make the rotation of the two shafts as nearly uniform as possible, whereas in the invention herein described and claimed the projection at the lower end of the lever-connection is given free play in the slot in the arm *a'*, and is made to travel from the end of the said slot to nearly the center of the shaft D. If the pin at the lower end of the lever-connection C herein shown should be restricted, as described in the Patent No. 335,017, then it would be impossible to practically use the rotating hook applied directly to the end of the shaft D, for the said shaft would not have imparted to it sufficient acceleration in speed to enable it to cast the loop of needle-thread about the bobbin and off the point of the hook in time for the take-up to operate.

I am also aware that United States Patent No. 281,296 shows two shafts rotated at uniform speed by a sliding lever-connection, the construction of the lever-connection and connection with the driving and driven shaft being such as to "be free from irregular motion."

I claim—

1. A sewing-machine containing the following instrumentalities, viz: a straight eye-pointed needle; a needle-bar to which it is attached; a rotating needle-bar-actuating shaft having a crank, a crank-pin, and a cam-hub; a link connected to the said crank-pin and to the said needle-bar; a bobbin; a rotating hook, substantially as described, having an abrupt heel and a point *d*, the latter to seize a loop of needle-thread and cast it about a bobbin and off the said point, as described; a hook-

shaft, to one end of which the said hook is attached; a grooved arm attached to the other end of the said shaft; a stationary fulcrum nearest the hook-shaft; a lever-connection between the said shafts, the said lever-connection having a constantly-varying leverage, and having a pin or projection to engage the arm at the rear end of the hook-shaft, and being unrestrained to move within the groove of the said arm, to thereby provide for greatly accelerating the rotation of the hook-shaft for about one hundred and eighty degrees and then to decrease its speed of rotation, and a take-up lever actuated positively by the cam on the said needle-bar-actuating shaft, the hook operating to cast the loop of needle-thread about the bobbin and travel at its accelerated speed until the point of the hook arrives in such position as to immediately deliver its loop to the take-up, the latter taking up and finishing the stitch before the point of the hook again enters a loop of needle-thread, the said take-up operating during the diminished speed of rotation of the hook, substantially as described.

2. The straight eye-pointed needle, a needle-

bar to which it is attached, a rotating needle-bar-actuating shaft, connecting devices between the said shaft and needle-bar, a rotating hook, a long shaft to which the said hook is attached, the said shaft being provided with a grooved arm, a sliding and rocking link or lever provided with a roller or other stud and connected with a crank on the needle-bar-actuating shaft, the said roller or other stud entering in the arm referred to, and a loop-positioning device to act upon the active side of the loop of needle-thread or that part of the loop at the long-groove side of the needle between the take-up lever and the eye of the needle, and a take-up located at the front of the overhanging arm of the machine, and a cam carried by the rotating needle-bar-actuating shaft to operate the said take-up, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NATHANIEL WHEELER.

Witnesses:

ISAAC HOLDEN,
A. R. LACEY.