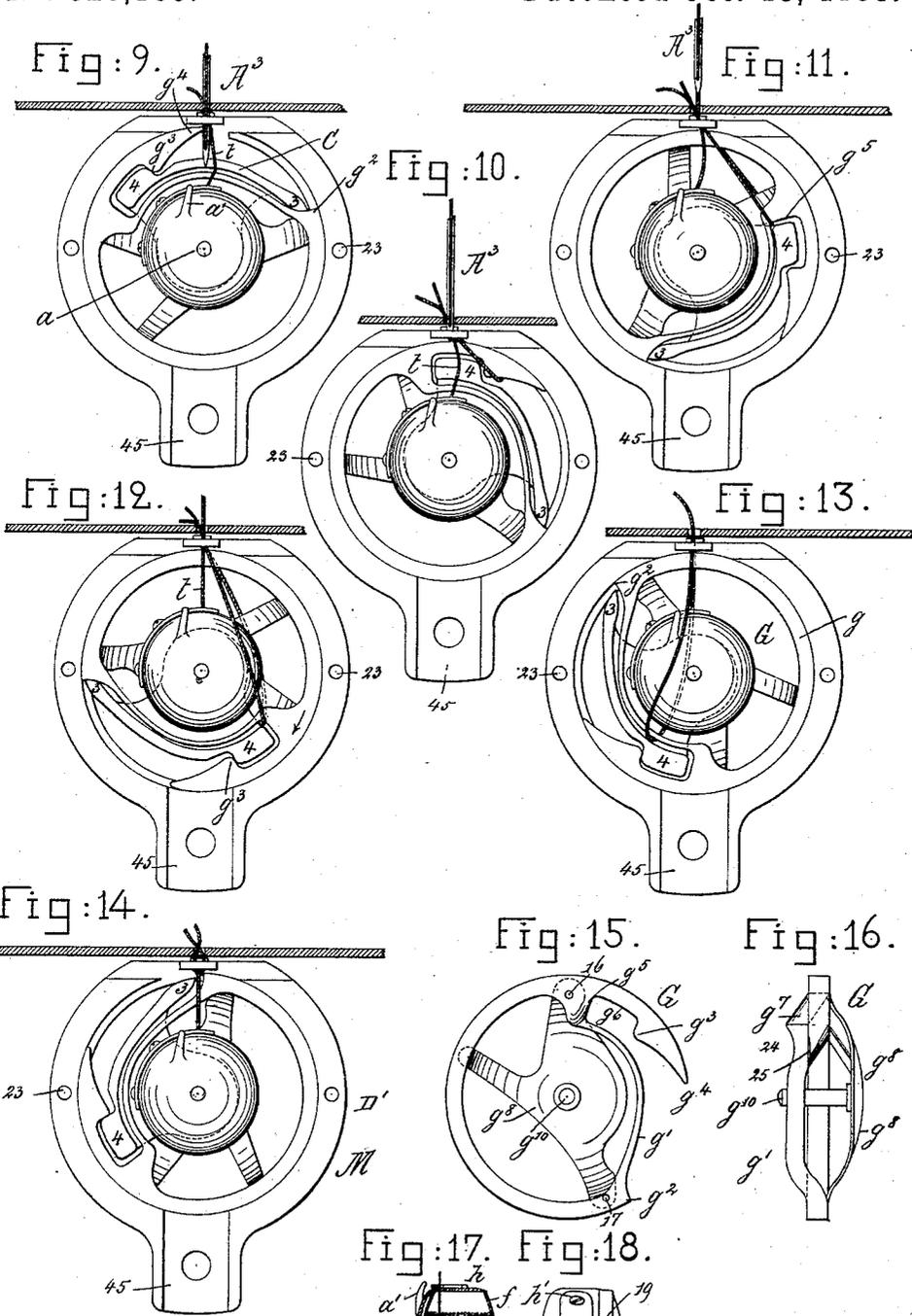




N. WHEELER & W. F. DIAL.  
SEWING MACHINE.

No. 328,165.

Patented Oct. 13, 1885.



Witnesses.  
*Arthur Apperson.*  
*John F. C. Printz*

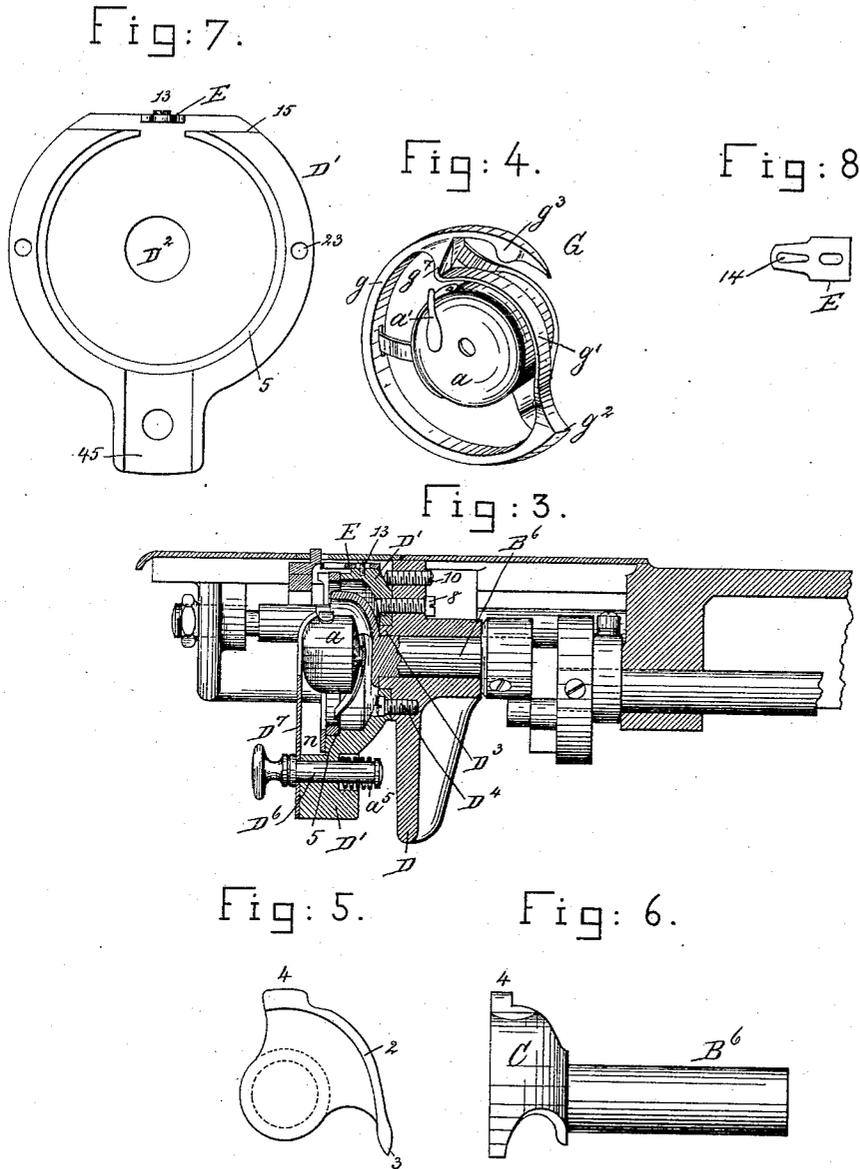
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*by Crosby & Gregory attys.*

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Wilbur F. Dial.  
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# UNITED STATES PATENT OFFICE.

NATHANIEL WHEELER AND WILBUR F. DIAL, OF BRIDGEPORT, CONN.

## SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 328,165, dated October 13, 1885.

Application filed June 22, 1885. Serial No. 169,414. (No model.)

*To all whom it may concern:*

Be it known that we, NATHANIEL WHEELER and WILBUR F. DIAL, both 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.

10 This invention has for its object to improve the construction and simplify the operation of the class of machine wherein a rotating loop-taker enters and opens a loop of needle-thread and carries it around a bobbin, the only movement of which is that about its own axis or center, and the extent of this latter movement is solely that due to the pull of the thread as the latter is consumed in the formation of the stitch.

20 In accordance with the invention herein to be described the loop-taker is composed of a partial hoop of metal extended through more than one hundred and eighty degrees of an arc of a circle, it preferably being made to occupy about two hundred and seventy degrees of such arc, the periphery of the said hoop being circular, one end being pointed to enter the loop of needle-thread, the inner edge of the said hoop back of its point being provided with a shoulder, which, co-operating with a second shoulder forming part of a bridge connecting the hoop back of its shoulder with the heel of the hook, leaves a recess for the entrance of a projecting lug of a saddle-piece, the latter being also provided with a pushing-prong.

40 The rear side of the hoop has attached to it a concavo-convex back plate, which carries a stud or pin that receives upon it the central sleeve of a cylindrical bobbin-case, which is thus supported loosely at the center of rotation of the loop-taker, but which is prevented from rotation with the said loop-taker by means of a holder, which co-operates with the bobbin-case in such manner as to prevent its rotation yet permit the loop of needle-thread to pass freely between the holder and the head of the bobbin-case.

50 The bobbin containing the under thread is placed within the open rear side of the said case, with its barrel surrounding the sleeve of

the case, but preferably not touching it, for preferably the peripheries of the heads of the bobbin will rest by gravity against the inner cylindrical wall of the bobbin-case. The bobbin-case is provided with a tension device. 55

The loop-taker is placed in a circular space in a loop-taker guide, and is retained in the said guide loosely by an annular cap, the center of rotation of the loop-taker being coincident with the center of rotation of the bobbin; but the loop-taker guide is set a little to one side of or eccentric with relation to the center of rotation of the shaft actuating the saddle, which causes the rotation of the loop-taker, the periphery of the loop-taker from at or near its heel to or near its point being just enough smaller than the inner diameter of the loop-taker guide to constitute a working fit between them. 60 65 70

In order to enable the loop of needle-thread engaged by the point of the loop-taker to be spread by the said loop-taker, and be passed over the bobbin-case and bobbin therein, and between the loop-taker and the saddle which rotates it in a circular path, the axis or center of rotation of the said loop-taker guide is set a little eccentric with relation to the center of rotation of the shaft carrying the saddle which rotates the loop-taker, such location of the saddle and loop-taker resulting in causing the saddle extended into the loop-taker guide and across the plane of movement of the said loop-taker to revolve in a circle eccentric to that in which the loop-taker is arranged and held to rotate. 75 80 85

The said saddle, rotating about a different center than that of the loop-taker, will be so moved relatively to the loop-taker guide that the lug and prong of the saddle will alternate in their engagement with the loop-taker, the change in relative position of the said parts being such as to place the prong of the saddle in engagement with the heel of the loop-taker just after the point of the loop-taker enters the loop of the needle-thread, the prong pushing the loop-taker through the said loop and continuing to push it until the loop has been expanded over the edge of the bobbin-case, after which the lug of the saddle is made to engage the shoulder of the loop-taker, and thereafter, by a pull, continue the movement 90 95 100

of the loop-taker. While the lug acts to pull the loop-taker there is left between the saddle and the loop-taker a space sufficient for the passage of the loop of needle-thread without being held or injuriously detained by the saddle.

As the lug approaches and passes its lowest point of movement it occupies such position with relation to the loop-taker as to permit the loop of needle-thread to pass freely around the end of the said lug into the space between the said saddle and the bridge of the loop-taker, and the loop thereafter emerges from between the said parts at or near the heel of the loop-taker, after which, the loop of needle-thread having been cast off, the prong of the saddle is again made the mover for the loop-taker, as will be hereinafter more fully described.

The loop-taker herein described is driven at a variable speed, by mechanism commonly employed in the Wheeler and Wilson sewing-machine, to rotate the hook-shaft and hook.

This invention consists, essentially, in a sewing-machine containing the following elements, viz: a needle-bar, means to reciprocate it, an eye-pointed needle therein, a loop-taker composed of a hoop having a point, a shoulder or recess back of its point, a bridge, a back piece, and a stud or pin, and a loop-taker guide to receive and permit the rotation therein of the loop-taker, and a saddle having a prong and a lug which serve alternately to maintain the positive rotation of the loop-taker, a rotating shaft to impart motion to the saddle, and means to rotate the said shaft and the loop-taker at a variable speed during each rotation thereof, the loop-taker guide being set to present the center of rotation of the loop-taker a little to one side of or eccentric with relation to the center of rotation of the saddle and its actuating-shaft, whereby the saddle in its revolution is made to alternately push and pull the loop-taker through the said loop of needle-thread, the change of position of the saddle with relation to the loop-taker, both moving continuously in the same direction, affording space at the proper times for the free passage of the loop of needle-thread between the saddle and the loop-taker, the parts co-operating substantially as will be described.

Figure 1 in perspective represents a sewing-machine embodying the invention to be herein claimed; Fig. 2 an under side perspective view of the machine represented in Fig. 1; Fig. 3 a partial longitudinal section of the machine in the line *x x*, Fig. 1; Fig. 4 a perspective view enlarged of the loop-taker and the bobbin-case. Fig. 5 is a front view of the saddle; Fig. 6 a side elevation of the saddle and the shaft with which it is connected. Fig. 7 is an inner side view of the loop-taker guide, the loop-taker being removed. Fig. 8 is a detail of the needle and loop-guard. Figs. 9 to 14 represent different positions of the loop-taker, the latter in the loop-taker guide, to

show the formation of the stitch. Figs. 15 and 16 are respectively a side elevation and edge view of the loop-taker. Fig. 17 is a section of the bobbin-case and bobbin, and Fig. 18 is a perspective view of the bobbin-case alone.

The bed-plate A, the overhanging arm A', the needle-bar A<sup>2</sup>, the needle A<sup>3</sup>, the rock-shaft A<sup>4</sup>, for moving it, the main shaft B, the link B', embracing an eccentric or crank thereon, the take-up-actuating cam-hub B<sup>2</sup>, the crank B<sup>3</sup>, the link B<sup>4</sup>, the arm B<sup>5</sup> on the short shaft B<sup>6</sup>, the take-up lever B<sup>7</sup>, the presser-foot bar B<sup>8</sup>, and the presser-foot B<sup>9</sup> are all as common to the Wheeler & Wilson sewing-machine, the shaft B<sup>6</sup> having, as it will be understood, a variable movement of rotation.

The shaft B<sup>6</sup>, at its front end, is provided with a saddle, C, shown as a concavo-convex plate, preferably an integral part of the said shaft, the said saddle having a planed face, 2, to act as a needle-guard located in the plane of the point of the loop-taker, the said saddle at one end being shaped to present a prong, 3, and at its convex side, near its opposite end, having a lug, 4.

The bed-plate, at its under side, is provided with a lug, D, which is extended to a point below the lower end of the loop-taker guide D', so as to protect and guard the loop-taker against blows when the machine is removed from the table which supports it.

The loop-taker guide D' is a cup-like piece of metal bored or planed to form a circular guideway, 5. The guide D' is provided with an opening, D<sup>2</sup>, which is bored a little at one side of its center, the said opening fitting a hub, D<sup>3</sup>, projecting from the lug D, and concentric with the short shaft B<sup>6</sup>, the guide D' being thus placed slightly eccentric with relation to the said shaft, so that the loop-taker (to be described) is rotated in a circle eccentric with relation to the shaft B<sup>6</sup> and its attached saddle.

Below the short shaft B<sup>6</sup> (see Fig. 3) the guide D' is bored to receive loosely a screw, D<sup>4</sup>, which enters a tapped-hole in the lug D, and above the said shaft B<sup>6</sup> the guide receives a screw, 8, which is entered loosely through a hole made in the lug D, and at one side of the said screw 8 the lug is provided with a guide-positioning screw, 10, the rotation of the said screws permitting the guide to be adjusted toward or from the path of movement of the needle.

The guide D', at its top, is provided with a needle and loop guard, E, (see Figs. 3 and 8,) which is shown as a plate attached by a screw, 13, and having a slot, 14, which allows the loop of needle-thread to be thrown out from one side of the eye of the needle and prevents it from twisting before the said loop is entered by the point of the loop-taker, and the top of the said guide D' is also shown as recessed at 15 (see Fig. 7) to permit the entrance of the overhanging portion of the feed-point.

The lower end of the guide D' is provided

with a shank, which receives a spring-bolt, D<sup>6</sup>, having a thumb-nut, the said bolt and nut having attached to it an arm, D<sup>7</sup>, preferably rigid, and curved at its upper end to correspond in shape with the head of the bobbin-case *a*, and forked to embrace loosely a projection, *a'*, on the said bobbin-case and prevent it from rotating with the loop-taker, to be described.

10 The loop-taker G is composed of a partial hoop, *g*, connected by means of a bridge-piece, *g'*, extended across the hoop from the rear end or heel *g<sup>2</sup>* to and joining with the hoop at a little distance back of the shoulder *g<sup>3</sup>*, which is just back of the point *g<sup>4</sup>*, the junction of the bridge and hoop leaving a shoulder, *g<sup>5</sup>*, and between it and the shoulder *g<sup>3</sup>* a recess, *g<sup>6</sup>*, for the reception of the lug 4 of the saddle, the said lug being of less length than the said recess from the shoulder *g<sup>3</sup>* to the shoulder *g<sup>5</sup>*.

20 The periphery of the hoop is supposed to be in the arc of a true circle for about two hundred and seventy degrees, and the said hoop has a working fit in the loop-taker guide D<sup>7</sup>, the inner wall of which is supposed to be a true circle, but the center of which is a little at one side of or eccentric with relation to the center of the short shaft B<sup>6</sup> carrying the saddle.

30 In order that the loop-taker may be moved continuously forward or be rotated rapidly and be made to pass through the loop of needle-thread in a positive manner or without slipping backward, and so not to strain and thus break the loop of thread, it is necessary that space be made at the proper time for the passage of the loop of needle-thread between the saddle and loop-taker, and to do this it is necessary that the prong and the lug of the saddle be alternately made effective in producing the forward rotation of the loop-taker.

40 When the prong 3 of the saddle is in contact with the heel *g<sup>2</sup>* of the loop-taker, the latter is pushed, but when the lug 4 engages the shoulder *g<sup>3</sup>* the loop-taker is pulled, by the saddle.

45 When the prong 3 is effective as the mover for the loop-taker, the lug 4 is kept sufficiently at the rear of the shoulder *g<sup>3</sup>* as not to pull the loop-taker, but as soon as the lug 4 becomes effective as the mover of the loop-taker, the contact between the prong 3 and the heel *g<sup>2</sup>* is broken.

55 This make and break of contact between the continuously-rotating loop-taker and the prong and lug of the saddle is effected by placing the center of rotation of the loop-taker in the loop-taker guide eccentric with relation to the center of rotation of the saddle and its actuating-shaft B<sup>6</sup>, such differences in center resulting in such a relative change of position of the parts during each cycle of their movement and during the formation of each stitch as to cause the seeming oscillation of the saddle, or such a movement thereof with relation to the heel *g<sup>2</sup>* and shoulder *g<sup>3</sup>* of the loop-taker as to cause the lug 4 to occupy at times a substantially central position in the recess

*g<sup>6</sup>*, and at other times to bear against the shoulder *g<sup>3</sup>*, and at other times against the shoulder *g<sup>5</sup>*, and when in this latter position, the prong being then effective to move the loop-taker, the lug acts to sustain the loop-taker at a distance of one hundred and eighty degrees beyond the point at which the prong is pushing, thus preventing the cramping of the loop-taker in the circular space in the loop-taker guide.

70 The hoop *g* has attached to it, as herein shown, by screws 16 17, a back plate, *g<sup>8</sup>*, of concavo-convex shape, as represented in Figs. 15 and 16, the said back plate holding a stud, *g<sup>9</sup>*, upon which is placed the sleeve *a<sup>2</sup>* of the bobbin-case *a*, the shape of the latter being best shown in Figs. 4, 17, and 18. This bobbin-case, closed at its outer end by a head, has a lug or projection, *a'*, which is engaged by a notched holder, D<sup>7</sup>, connected at its lower end to a fulcrum-pin, D<sup>6</sup>, preferably surrounded by a spring, *a<sup>5</sup>*, the latter acting normally to keep the lower end of the holder in a vertical groove, 45, of the loop-taker guide.

85 The bobbin-case receives within it the bobbin *f*, the peripheries of the heads of the bobbin resting against the inner side wall of the cylindrical part of the bobbin-case, the barrel of the said bobbin preferably not touching the said sleeve.

90 The holder co-operates with and prevents the rotation of the bobbin-case with the loop-taker, and the only rotation of the bobbin in the bobbin-case is that due to the pull of the thread on the bobbin as the said thread is required for the stitch; and to enable the holder to so restrain the rotation of the bobbin-case it is obvious that a lug on the holder might enter a notch of the case which is the converse of the construction shown in the drawings. The holder also acts as the device to retain the bobbin-case on the stud of the loop-taker, the force of contact between the holder and bobbin-case being so little as to allow the ready passage of the loop of needle-thread over the bobbin-case.

100 The bobbin-case, at its outer side, is slotted, as shown at 19, Fig. 18, to permit the introduction of the thread under the tension spring *h*, which is held in position by a screw, *h<sup>1</sup>*, and is provided with a screw, *h<sup>2</sup>*, to regulate the pressure of the spring on the under thread, passing between it and the bobbin-case, the spring *h* thus regulating the tension on the under thread.

105 Figs. 9 to 14, inclusive, show the action of the loop-taker on the loop of needle-thread. In Fig. 9 the lug 4 of the saddle is in contact with the shoulder *g<sup>3</sup>* of the loop-taker just as the point of the hoop of the loop-taker is to enter the loop of needle-thread, and then the prong 3 of the saddle almost touches the heel *g<sup>2</sup>* of the loop-taker. In this position the lug acts to push the point *g<sup>4</sup>* into the loop of needle-thread; and immediately thereafter the prong comes in contact with the heel *g<sup>2</sup>* of the loop-taker and continues the entrance of the

point of the loop-taker into the said loop of needle-thread, so that by the time that the shoulder  $g^3$  in opening the loop arrives at the position Fig. 10 the lug 4 is removed from contact with the said shoulder  $g^3$  and stands in a substantially central position in the recess  $g^4$ , thus affording a space between the lug and shoulder  $g^3$  and entirely about the said lug in the said recess in which the loop of needle-thread may pass and be caught by the shoulder  $g^5$  at its junction with the hoop, and the loop of needle-thread rests in the corner between the said shoulder  $g^5$  and the hoop until in the further rotation of the loop-taker it reaches the position Fig. 11, the loop of needle-thread in the meantime approaching the center of rotation of the loop-taker and being expanded by its passage over the said shoulder  $g^3$  and bridge within the periphery of the loop-taker, the shoulder  $g^3$  being shaped to present an inclined wedge,  $g^7$ , shown best in Figs. 4 and 16.

The loop of needle-thread having reached the position Fig. 11, the continued rotation of the loop-taker by the action against it of the prong 3 of the saddle causes the loop of needle-thread in its expanded condition to be drawn down, and by the time the loop-taker arrives in its position Fig. 12 the change of the relative position of the loop taker and saddle is such as to throw the lug 4 in contact with the shoulder  $g^3$ , and immediately thereafter in the further movement of the parts in the direction denoted by the arrow the prong 3 is removed from contact with the heel  $g^2$  of the loop-taker, as in Fig. 13, and is kept out of contact therewith, and the lug 4 acts to pull the loop-taker through the loop of needle-thread, the loop of needle-thread passing freely in the curved space between the bridge and the interior of the saddle, and emerging from between the prong and heel while the parts are in the position Fig. 14, the lug continuing the movement of the loop-taker until the point of the same has entered the next loop of needle-thread, at which time the prong of the saddle is again thrown in contact with the heel of the loop-taker, and immediately thereafter the lug is removed from the shoulder  $g^3$ , as before stated.

The shaft  $B^6$ , having attached to it the saddle described, has a variable movement, or a movement such that the hook of the loop-taker travels through different arcs at different rates of speed, and this variable movement is essential to good sewing at high speed with a rotating loop-taker of the kind described, for the speed of the loop-taker when entering and expanding the loop of needle-thread must be very quick, for the loop of needle-thread should be drawn down to its longest position, and a little beyond, in order to afford the take-up ample time to complete the stitch before the needle in its next descent meets the goods. The loop-taker is held in the loop-taker guide by means of a cap,  $n$ , attached by screws in the holes 23.

The bridge  $g'$ , shaped substantially as shown

in Fig. 16, serves to keep the under thread,  $t$ , Figs. 9 and 10, at one side of the path of movement of the point of the loop-taker. The bridge  $g'$  is cut out to form an incline, 24, (see Fig. 16,) which as the loop-taker arrives at about the position Fig. 13 acts to allow the loop of needle-thread to slip forward more rapidly than it would be carried by the loop-taker, thus affording slack and permitting the taking up of the loop to be commenced at the earliest possible moment.

The outer side of the point of the loop-taker (see Fig. 16) is cut out or concave at 25 to enable the point of the loop-taker to run as close as possible to the rear side of the needle when the point enters the loop, the recess just back of the point preventing the thread from being cut between the point and the needle as the latter rises, the point of the loop-taker holding the loop and advancing while the needle rises at one side of the said point, the said space affording clearance for the thread where it emerges from the eye of the needle next the point of the loop-taker.

The take-up  $B^7$ , pivoted at 26, has one of its arms provided with a swivel-block, which runs in a cam-groove in the cam-hub  $B^2$ , the said take-up operating as usual in the Wheeler and Wilson machines, the shape of the cam, however, being slightly changed to enable the take-up to give up thread to the requirements of the rotating loop-taker and to take up the loop elongated by the said loop-taker.

In the machine herein described the loop-taker is actuated positively, and has a working-fit in its guide; and it is due to the difference in centers, as stated, that the openings are made at the proper time between the loop-taker and the variably, rotating saddle, which moves it continuously in a circle; and this method of rotating the loop-taker has decided advantage over a shuttle driven in a circular race by a driver, the space for the passage of the thread between the shuttle and the driver being due to centrifugal action of the shuttle in the race and to momentum and change of speed of the driver.

Instead of the particular devices herein shown by which to reciprocate the needle-bar, and instead of the particular take-up, any other common and well-known needle-bar-actuating mechanism and take-up might be employed.

The bridge  $g'$ , connecting the hoop  $g$  at two points, and extending across the same in a curved path at one side of the center of rotation of the loop-taker, is of value in strengthening the loop-taker, in holding the loop of needle-thread from contact with the bobbin-case, and in keeping the under thread from being caught by the point of the hook of the loop-taker; but it is possible to modify the shape of the said bridge, and, in fact, by a different shaping of the parts of the loop-taker, to do away with a part if not all of it; but its use is preferred in the manner shown in the drawings.

The feeding mechanism shown is not herein claimed specifically, for that forms the subject-matter of another application, Serial No. 170,466, filed July 2, 1885.

5 I claim—

1. A sewing-machine containing the following instrumentalities, viz: a needle-bar, an eye-pointed needle, means to operate it, a variably-rotating shaft, and the saddle attached thereto, and having at one end the prong 3 and at its other end the lug 4, a rotating loop-taker composed, essentially, of a hook having a point, shoulders  $g^3$  and  $g^5$ , and a heel, a loop-taker guide adjusted to place the center of rotation of the loop-taker out of line or eccentric with relation to the center of rotation of the shaft carrying the saddle, and a bobbin and bobbin-case, the saddle acting alternately to push and to pull the loop-taker in its continuous circular movement, substantially as described.

2. A sewing-machine containing the following instrumentalities, viz: a needle-bar, an eye-pointed needle, means to operate it, a variably-rotating shaft, and a saddle attached thereto, a rotating loop-taker composed, essentially, of a hook having a point, shoulders  $g^3$  and  $g^5$ , a heel and a bridge, a loop-taker guide adjusted to place the center of rotation of the loop taker out of line or eccentric with relation to the center of rotation of the shaft carrying the saddle, and a bobbin and bobbin-case, the saddle acting alternately to push and to pull the loop-taker in its continuous circular movement, substantially as described.

3. A sewing-machine containing the following instrumentalities, viz: a needle-bar, an eye-pointed needle, means to operate it, a rotating shaft, and the saddle attached thereto and provided with the prong 3 and lug 4, a rotating loop-taker composed of the hoop-like piece of metal having a heel, and a point re-

cessed at  $g^6$ , and provided with shoulders  $g^3$   $g^5$ , a bridge connecting the hoop at two points, a back plate provided with a stud, and a bobbin-case having a closed outer end or head, a tension-regulating spring, a bobbin, and the loop-taker guide adjusted to place the center of rotation of the loop-taker eccentric with relation to the center of rotation of the shaft carrying the saddle, to operate substantially as described.

4. A sewing-machine containing the following instrumentalities, viz: a needle-bar, an eye-pointed needle, means to operate it, a variably-rotating shaft, and a saddle attached thereto, a rotating loop-taker composed, essentially, of a hook having a point, shoulders  $g^3$  and  $g^5$ , a heel and a bridge, a loop-taker guide adjusted to place the center of rotation of the loop-taker out of line or eccentric with relation to the center of rotation of the shaft carrying the saddle, and a bobbin and bobbin-case, and a take-up, and means to operate it, the saddle acting alternately to push and to pull the loop-taker in its continuous circular movement, substantially as described.

5. The bed-plate, the lug D, and its attached hub D<sup>3</sup>, combined with the loop-taker guide-board eccentrically and mounted on the said hub, substantially as described.

6. The bed-plate, the lug D, the loop-taker guide connected therewith, and the adjustable needle and loop-guide E, attached thereto, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

NATHANIEL WHEELER.  
WILBUR F. DIAL.

Witnesses:

ISAAC HOLDEN,  
A. R. LACEY.