

F. W. MERRICK.
 LOCK STITCH SEWING MACHINE.
 APPLICATION FILED FEB. 27, 1905.

939,152.

Patented Nov. 2, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

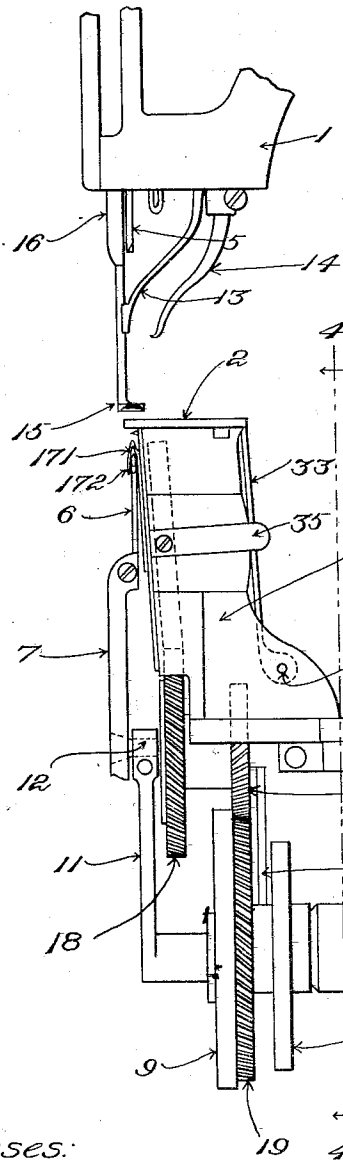


Fig. 2^a.

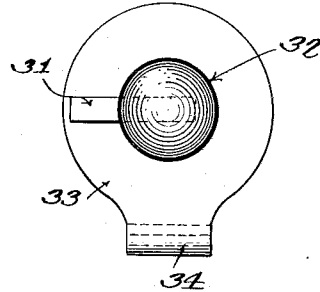
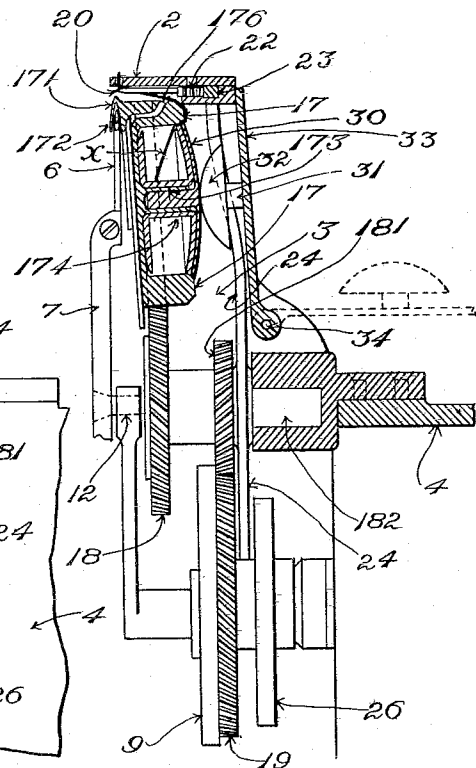


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

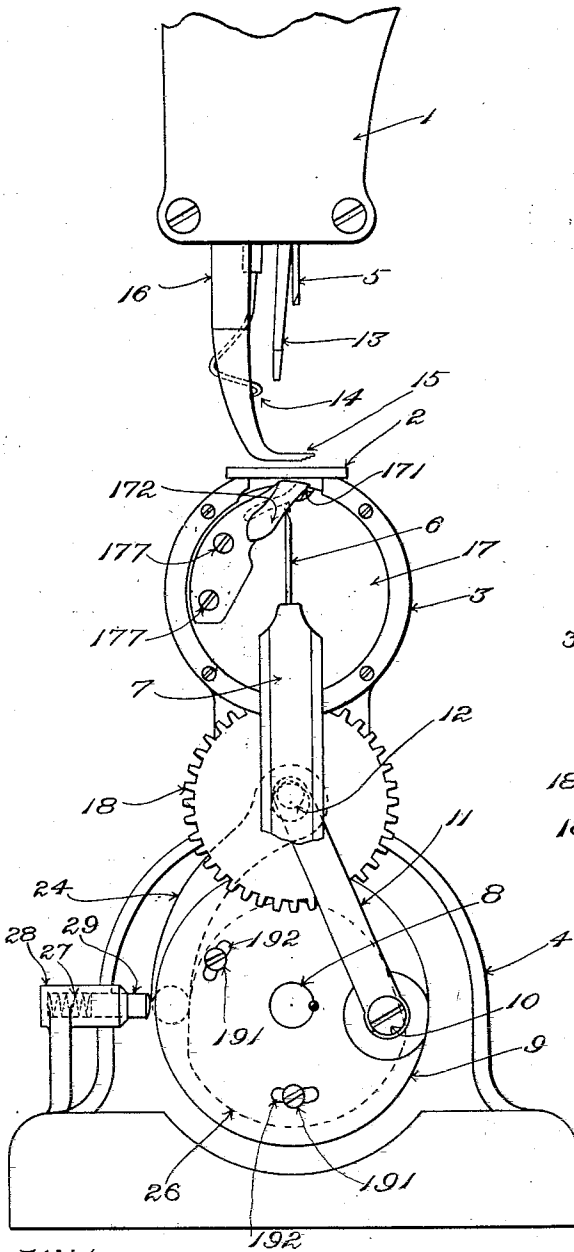
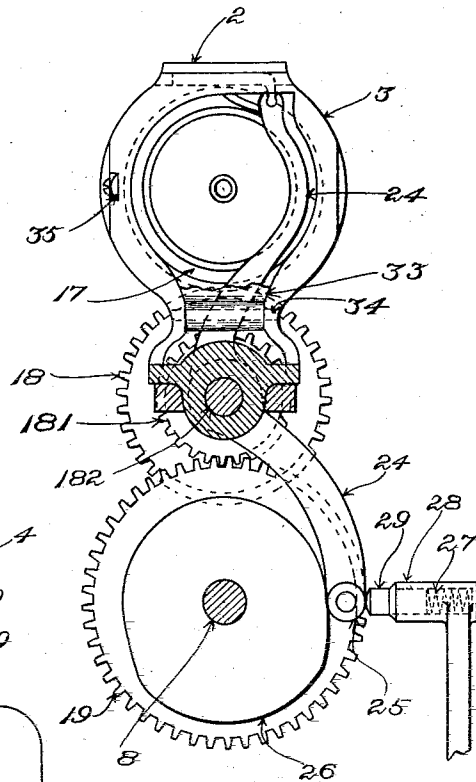


Fig. 4.



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 3 SHEETS—SHEET 3.

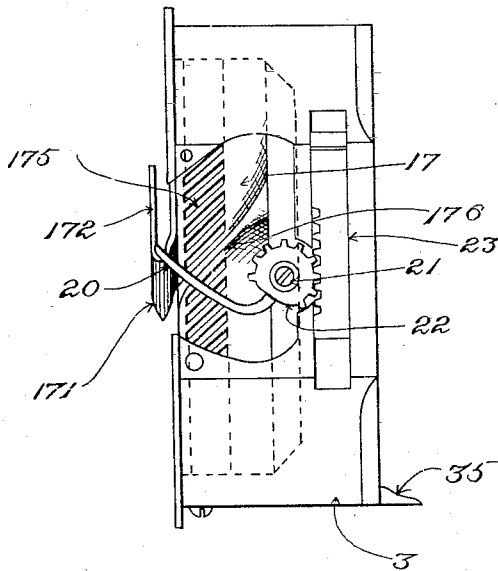


Fig. 5.

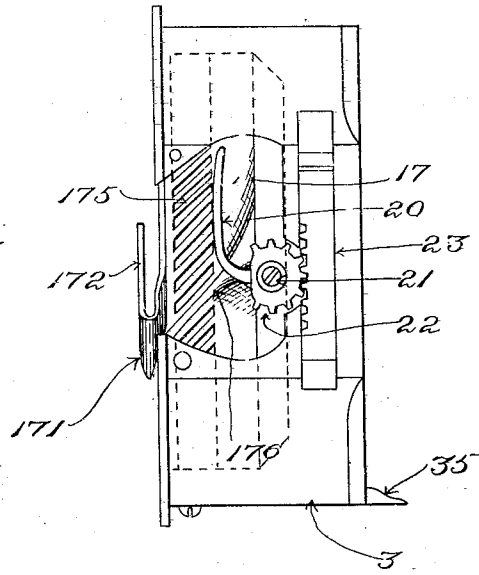


Fig. 6.

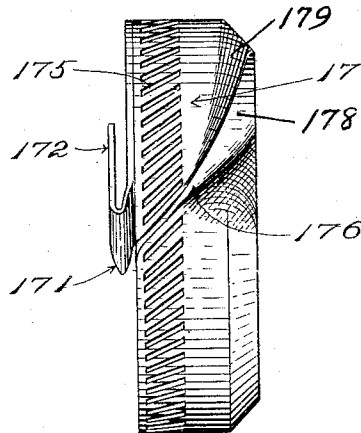


Fig. 7.

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UNITED STATES PATENT OFFICE.

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LOCK-STITCH SEWING-MACHINE.

939,152.

Specification of Letters Patent. - Patented Nov. 2, 1909.

Application filed February 27, 1905. Serial No. 247,420.

To all whom it may concern:

Be it known that I, FRANK W. MERRICK, a citizen of the United States, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Lock-Stitch Sewing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 of the drawings represents in front elevation a portion of a sewing-machine containing one embodiment of the invention, the said figure showing only the parts which are required to be shown in order to clearly indicate the nature and relations of the invention. Fig. 2 is a view showing certain of the devices of Fig. 1, partly in vertical transverse section. Fig. 2^a is a detail plan view of presser 32 and its supporting means. Fig. 3 is an end elevation of the parts which are shown in Fig. 1, looking from left to right in Fig. 1. Fig. 4 is a view in vertical section on the plane indicated by the dotted line 4, 4, Fig. 1, looking in the direction indicated by the arrows at the ends of such line, the presser-support and spring-presser being broken away to show parts which otherwise would be hidden. Figs. 5 and 6 are plan views of the upper end of the post, with the work-support removed, showing chiefly the shuttle or loop-taker and loop-spreader in two different positions. Fig. 7 shows the shuttle, detached, in plan.

Having reference to the drawings,—portion of the fixed overhanging head of the frame of a sewing-machine is represented at 1, Figs. 1 and 3. A work-support is shown at 2, Figs. 1 to 4, the post carrying the said work-support being designated 3, and the lower portion of the fixed frame-work of the machine being indicated at 4, Figs. 1 to 3, the said post being connected with the said portion 4. An awl is partly shown at 5, Figs. 1 and 3. A straight hooked needle is shown at 6, Figs. 1, 2 and 3, a portion of the needle-bar 7 by which the said needle is carried being shown in the said figures. The awl-bar, the actuating connections therefor, and the guides for the awl-bar and needle-bar, have been omitted from the drawings, not being necessary to be shown for an understanding of the invention itself. They may be in practice of

any approved and suitable character and arrangement. The means by which the awl-bar and awl, and the needle-bar and needle, are actuated may vary in practice. Preferably continuously rotating cranks are employed for the purpose, because of the absence of noise and vibration at high speed, and the small amount of wear and tear. A needle-actuating crank-motion is shown in connection with the rotating shaft 8, which latter is mounted in bearings within the lower portion 4 of the fixed frame-work of the machine, the said crank-motion comprising the disk 9 fast upon the said shaft 8, the crank-pin carried by the said disk at 10, Fig. 3, and the connecting-rod, link, or pitman 11, having one extremity thereof applied to the said crank-pin and the other extremity thereof joined to the needle-bar 7 by means of a pin or stud 12. A thread-guide for laying the upper or needle-thread into the open eye of the needle is shown at 13, Figs. 1 and 3, a thread-finger at 14, a presser-foot at 15, and a presser-bar at 16. The devices for operating the thread-guide and thread-finger, and for automatically raising and lowering the presser-bar and presser-foot, may be of any approved and suitable character, as also may be the provisions for effecting the feed.

A rotating loop-taker is shown at 17, it operating in a substantially upright plane, and working at the same side of the material which is operated upon as the needle. The loop-taking hook or point of the said loop-taker is designated 171. For convenience in construction, and in making repairs in case of injury to the said hook or point, the latter is made as a separate piece from the body of the loop-taker and is detachably secured to the latter by means of screws 177, 177, Fig. 3. By unscrewing the said screws the said hook or point may be removed and either repaired and again attached, or replaced by a new one. The particular loop-taker shown in the drawings is a shuttle, although this is not essential in the case of the embodiments of some of the features of the invention, and is formed with a central thread-containing cavity, it preferably being provided within the said cavity with a tubular post 173, upon which is or may be fitted a bobbin 174 serving in practice as a carrier for the second or under thread. The loop-taker or

shuttle 17 is directly gear-driven. For driving purposes it is furnished with a series of teeth, 175, Figs. 5, 6, and 7, extending around the same, which are engaged by the teeth of an intermediate or carrier-gear 18, the latter being formed in one with a like gear 181, which last meshes with a driving-gear 19 that is fast upon the shaft 8. The connected pair of intermediate or carrier-gears 18, 181, is supported by being sleeved upon a stationary stud 182, Figs. 2 and 4, which is carried by the portion 4 of the frame-work of the machine. The gearing by which the loop-taker or shuttle is driven is proportioned to cause the same to make a plurality of rotations, two in the present instance, to each complete reciprocation of the needle, in order to enable one stitch to be formed and completed before the needle reenters the material which is being operated upon, preliminary to beginning the formation of the next succeeding stitch.

At one point in the rotation of the loop-taker or shuttle the loop-taking point or hook thereof intersects the path of the needle, as indicated in Figs. 1 and 2, the said point or hook passing the hooked end of the needle as the latter extends the loop of upper thread which has been drawn thereby through the material being stitched. In this manner the tip of the said point or hook is caused to enter the said loop. With the loop-taker or shuttle working at the same side of the material with the vertically-reciprocating straight hooked needle, and with the point or hook of the said loop-taker or shuttle located at the side of the latter at which the needle is situated and intersecting at one point in its rotation the path of movement of the needle as just referred to, for the purpose of entering the loop of thread which has been drawn by the latter, it is necessary to provide against engagement of the loop-taking point or hook of the loop-taker or shuttle with the needle, needle-holder, or needle-bar as the said point or hook is carried around past the latter parts at the opposite point in the rotation of the loop-taker or shuttle. For this purpose, I cause the loop-taker or shuttle to rotate in a position corresponding with a plane that is slightly inclined or oblique with respect to the direction in which the straight hooked needle 6 and its needle-bar 7 reciprocate. This is illustrated by Figs. 1 and 2. Thereby at the said opposite point in the rotation of the loop-taker or shuttle the point or hook passes entirely at one side of the path of the needle, needle-holder, and needle-bar, and thus clears the latter. The loop-taker or shuttle stands at an inclination or obliquity with respect to the intermediate or carrier-gear 18, but this inclination or obliquity is so slight that it does not affect the driving relations between the gear-teeth with which

the loop-taker or shuttle is formed or provided and the teeth of the said intermediate or carrier-gear 18. Securing the above clearance by means of the inclination or obliquity of the rotating loop-taker or shuttle has the especial advantage that it enables the required timing of the shuttle and needle with relation to each other to be secured in convenient manner with a shuttle which is actuated by driving connections rotating the same at a uniform rate of speed, and with a needle which is actuated by means of a crank. The employment of mechanism acting to produce differential or variable speed of the shuttle and needle operates to cut down the speed, especially in machines for heavy work.

The loop-taking point or hook of the loop-taker or shuttle is constructed with an outer flange 172, which passes to the outer side of the hooked end of the needle as the said point or hook enters the loop which is held by the needle. The acting face of the forward portion of the said point or hook, see more particularly Fig. 3, is formed at an incline or angle which, in the continued advancing movement of the loop-taker or shuttle after the said point or hook has entered within the said loop of thread, operates to extend such loop gradually in the direction in which the needle moves while withdrawing from the material being stitched. The said incline or angle is such that in the rotation of the loop-taker or shuttle it gains on the descending needle until it presses or sheds the loop out of the open eye of the moving needle.

In order to enable the loop-taker or shuttle to be rotated continuously with smoothness and without rattle by means of a single driver in gear-engagement therewith, I provide the same with a continuous or unbroken circular series of teeth 175, and locate in an interval or space of normal width between two of the said driving teeth the mouth or entrance of the slot 176, extending transversely across the face of the loop-taker or shuttle, within which the loop drawn by the needle is received and held as the loop is carried around the loop-taker or shuttle by the rotation of the latter. The teeth 175 are normally and uniformly spaced at and adjacent the said slot. The use of two or more gear-drivers, as required when a space corresponding to two or more teeth is left adjacent the slot, is obviated, as well as the rattle, etc., which are incident to the action when such space exists.

For the purpose of enabling a close adjustment to be effected of the timing of the movement of the hook or point of the loop-taker or shuttle with relation to that of the needle-bar and needle, provision is made for adjustment of the shuttle-driving gearing with relation to the needle-actuating crank.

This provision is made in the present instance by mounting the gear 19 upon shaft 8 with capacity for fine angular shift with respect to the needle-actuating crank 10, the said gear being fixed in the desired angular position by means of securing screws 191, 191, which pass through segmental slots 192, 192, which are formed in the crank-disk 9 into threaded holes that are tapped in the web of gear 19.

At 20 is a spreader by which the loop of upper thread drawn by the needle is restrained from being carried forward by the rotating shuttle, and also is stretched across the face of the shuttle so as to enter the slot 176. The said spreader is formed, in the present instance, as a bent or elbowed arm working in a horizontal plane between the loop-taker or shuttle and the work-support 2. It is mounted upon the upper portion of the post 3 by means of the pivot 21, which is located adjacent one side of the loop-taker or shuttle. For the purpose of operating the spreader, it is furnished with a gear-segment 22, Figs. 2, 5, and 6, the teeth of which are engaged by those of an endwise reciprocating rack-bar 23. The latter is fitted to ways upon the upper end of the post 3, and is in operative engagement with the upper arm of a lever 24. The said lever is mounted pivotally upon the stud 182, its lower arm being furnished with a roll 25, for engagement with the cam 26 upon the shaft 8. The said roll is held in contact with the periphery of the said cam through the tension of an expanding spiral spring 27 contained within a case 28 with which the fixed frame of the machine is provided, the pressure of the spring being transmitted to the lever by means of a pin or plunger 29 working within the said case. In operation, the spreader is caused to enter the loop of upper thread after the loop-taking point or hook of the loop-taker or shuttle has entered such loop and partially opened the latter. It thereby is caused to engage with one side of the loop so as to restrain the latter from being carried around with the rotating loop-taker or shuttle. By the swinging movement of the spreader the loop is extended transversely across the face of the loop-taker or shuttle within the slot 176. In order to give time for slipping the thread into the slot as the shuttle rotates, as well as facilitate the entrance of the thread, the narrow mouth or entrance of the slot is made with an inclination rearward and transversely from the loop-taking point or hook, as shown in Figs. 5 and 6. To accommodate this inclination of the said mouth or entrance, the driving-teeth of the loop-taker or shuttle are formed inclined or helical, as shown. The teeth of the intermediate or carrier-gear 18 are also inclined or helical to match with those of the loop-taker or shuttle, as shown

by Figs. 1 and 2. To balance the end-thrust in one direction that is occasioned by the intermeshing of the inclined or helical driving-teeth of the loop-taker or shuttle with those of the intermediate or carrier-gear 18, the teeth of the companion intermediate or carrier-gear 181 are inclined in the reverse direction with relation to the teeth of gear 18, those of gear 19 being suitably formed for coaction with the teeth of the gear 181, as shown in Figs. 1 and 2.

On account of the location of the substantially upright rotating loop-taker or shuttle side by side with respect to the needle and needle-bar, I arrange the opening of the thread-containing cavity of the said loop-taker or shuttle at the side of the latter opposite that at which the needle-bar, needle, and loop-taking point or hook, are located, in order that free access to the said cavity, unobstructed by the needle-bar and needle, may be had for the purpose of taking-out an empty bobbin, inserting a filled one, threading-up, etc. This arrangement of the said opening enables the said operations to be performed without removal of the loop-taker or shuttle from its working position in the machine. The under thread issues from the said cavity at the side of the loop-taker or shuttle farthest from the needle-bar and needle, and after bending around the edge or rim of such cavity passes transversely across the loop-taker or shuttle to the last stitch in the work, as shown in Fig. 2. The said edge or rim is continuous and constitutes an annular thread-guiding surface around which the under thread renders in passing from the source of supply to the stitch-forming point in the machine. The portion of the under thread extending from the source of supply to the work is wholly clear of the path of rotation of the loop-taking point or hook of the loop-taker or shuttle, and cannot become caught by the said point or hook. Thereby the employment of a supplemental device for preventing the under thread from being picked up by the point or hook and sewed in is rendered unnecessary.

The required tension of the under thread is secured by means of a tension disk 30, the circular rim of which compresses the said thread against the continuous or annular margin of the thread-containing cavity. The said tension-disk is conveniently supported in working position, as, for instance, by means of a central pin or spindle projecting therefrom and fitting within the bore of the central spindle 173. It is subjected to the tension of a suitable spring by means of which its rim is pressed toward the margin of the thread-containing cavity. Herein the said spring is shown at 31, Figs. 2 and 2^a, it being a flat or leaf-spring and having connected therewith a presser 32, the

convex face of which bears against the outer face of the tension disk at the center of the latter, which in this case coincides with the center of rotation of the loop-taker or shuttle. The support 33, Figs. 1, 2 and 2^a to which the spring-presser is attached is hinged at 34 to the portion 3 of the fixed frame-work of the machine, and is capable of being swung with the spring-presser into a position which, as indicated by dotted lines in Fig. 2, permits free access to the tension-disk, bobbin, and thread-containing cavity. The said hinged support is mainly broken away in Fig. 4. It is held in its closed normal working position, with the spring-presser in contact with the tension-disk, by means of a spring-latch 35 which is applied to the portion 3 of the frame-work.

The portion of under thread which extends above the loop-taker or shuttle on its way to the work is engaged by the spreader, and occupies normally a position within the elbow thereof. Thus both threads are held from being carried around by the rotation of the loop-taker or shuttle.

For the purpose of permitting the under thread to slacken or relax as the take-up acts to set the stitch, so as to allow the said thread to be drawn up into the hole in the material which is being stitched, the heel or butt 178, Fig. 7, of the shuttle is rounded away at the forward side of slot 176. The rounded swell 179 immediately following the said slot as it passes under the under thread acts to reinstate the tension thereof just previous to the extreme of the take-up action, thereby holding the under thread against the final pull on the upper thread in setting the stitch. Thereby the machine is enabled to set a tighter stitch without causing the under thread to cut into the lower surface of the material being stitched, and a tighter tension may be carried without causing the material to be cut into or either thread to be broken. I do not claim these features of the shuttle herein, as they will form the subject of a separate application.

I claim as my invention:—

1. In a sewing-machine, the combination with a straight hooked needle, and a rotating crank in positive connection therewith and operating the same, of a uniformly rotating loop-taker working alongside the said needle at the same side of the material as the latter, in a plane inclined at a slight angle to the line of reciprocation of the needle, and driving devices operating to cause a plurality of continuous rotations of the loop-taker in one direction to each reciprocation of the needle.

2. In a sewing machine, the combination with a needle, of a loop-taker having an unbroken circular series of gear-teeth all disposed in the same plane extending at right angles to the axis of the loop-taker, the said

loop-taker being formed with a transversely-extending slot for the loop of needle-thread the entrance to which is wholly contained in the transverse interval between two of such teeth, and driving gearing engaging with the said series of teeth and thereby rotating the loop-taker.

3. In a sewing-machine, the combination with a needle, of a loop-taker having an unbroken circular series of gear-teeth, and having a transversely-extending slot for the loop of needle-thread, the entrance to which is wholly contained within the transverse interval of normal width between two of such gear-teeth, and a single rotating gear-wheel engaging with the said series of teeth to rotate the loop-taker.

4. In a sewing-machine, the combination with a needle, of a loop-taker having a circular series of inclined gear-teeth, and receiving in a space between two of the said teeth the transversely-extending portion of a loop formed by the needle, and driving means engaging with said inclined gear-teeth to rotate the loop-taker.

5. In a sewing-machine, the combination with a needle, of a loop-taker having a circular series of inclined gear-teeth, and receiving in an inclined space between two of the said teeth the transversely-extending portion of a loop formed by the needle, of a driving gear-wheel also having inclined gear-teeth.

6. In a sewing-machine, the combination with a needle, and the gear-driven toothed loop-taker having between two of the teeth thereof a thread-receiving depression located within the diameter of the toothed periphery of the loop-taker, of the loop-spreader operating to pass the loop of thread formed by the needle into the said depression.

7. In a sewing-machine, the combination with a needle, and the gear-driven toothed loop-taker provided at one side thereof with a point which enters the loop of thread formed by the needle, and having between two of the teeth thereof a thread-receiving depression located within the diameter of the toothed periphery of the loop-taker, of the loop-spreader operating to pass the loop of thread formed by the needle into the said depression.

8. In a sewing-machine, the combination with a needle, the loop-taker having a circular series of inclined gear-teeth, and driving means engaging with said gear-teeth to rotate the loop-taker, of a spreader operating to cause the loop of thread formed by the needle to extend through the inclined slot between two of the said gear-teeth.

9. In a sewing-machine, the combination with a needle, and a rotary loop-taker having a point which enters the loop formed by the needle and partially opens the same, of a spreader entering the loop after having been thus partially opened and extending it

across the peripheral rim of the loop-taker and into the throat of the latter.

10. In a sewing-machine, the combination with a needle, and a rotary loop-taker having a thread-receiving depression across the width thereof, and having also a point which enters the loop formed by the needle and partially opens the same, of a spreader entering the loop after having been thus partially opened and extending it within the said depression.

11. In a sewing-machine, the combination with a needle, and a rotary loop-taker having a point which enters the loop formed by the needle and partially opens the same, of a spreader entering the loop after having been thus partially opened, restraining the same from forward movement, and spreading the same across the peripheral face of the loop-taker and into the throat of the latter.

12. In a sewing-machine, the combination with a needle, and a loop-taker, of a spreader for the loop drawn by the needle, restraining the said loop and the interlocking thread from forward movement.

13. In a sewing-machine, the combination with a needle, and a loop-taker, of the elbowed spreader engaging with the loop drawn by the needle and spreading such loop across the face of the loop-taker, and also operating to restrain the said loop and the interlocking thread from forward movement.

14. In a sewing-machine, the combination with a needle, and a rotary loop-taker having a point which enters the loop drawn by the needle and partially opens the same, of a spreader for the said loop, extending the latter across the peripheral face of the shuttle, and restraining the said loop and the interlocking thread from forward movement.

15. In a sewing-machine, the combination with a hooked needle, of a rotating loop-taker provided with a flanged loop-taking portion passing over the end of the needle,

and having an incline which presses the loop from the open eye of the needle.

16. In a sewing-machine, the combination with a hooked needle, of a rotating loop-taker provided with a flanged loop-taking portion passing over the end of the receding needle to shed the loop past the eye of the needle, and having an incline which presses the loop from the open eye of the moving needle by gaining on the latter.

17. In a sewing-machine, the combination with the needle, and the reciprocating needle-bar, of the rotating shuttle at the same side of the work therewith, having its loop-taking point or hook next the needle-bar and needle, and its thread-containing cavity and thread-delivery-opening on the side remote therefrom and laterally remote from the line of stitching, the peripheral rim of the shuttle operating upon the portion of thread extending by the same laterally to the stitch-making point to deflect such portion out of the path of the said loop-taking point or hook.

18. In a sewing-machine, the combination with the needle, and the reciprocating needle-bar, of the rotating shuttle arranged side by side with respect to the needle and needle-bar, the said shuttle having its thread-delivery opening at the side thereof opposite that at which the needle and needle-bar are located and having at such side around the said opening an annular thread-guiding surface around which the under thread renders in passing from the source of supply to the stitch-forming point in the machine, the thread extending from the said surface across the top of the shuttle to the stitch-making point.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK W. MERRICK.

Witnesses:

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