Sept. 11, 1928. 1,684,004

R. BECKER

CHAIN STITCH SEWING MACHINE

Filed Sept. 27, 1926 5 Sheets-Sheet 1

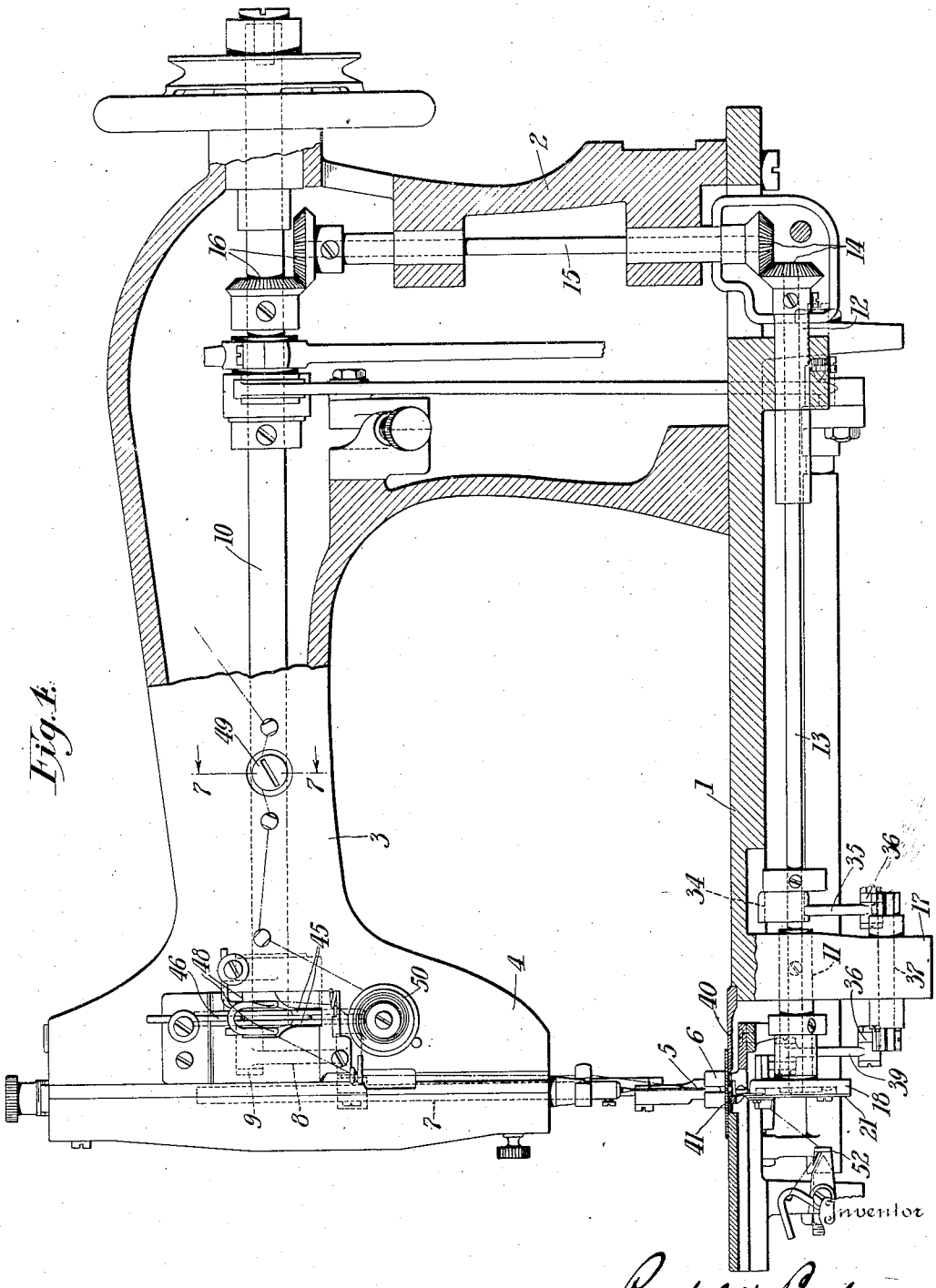


Fig. 1.

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CHAIN STITCH SEWING MACHINE

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Fig. 2.

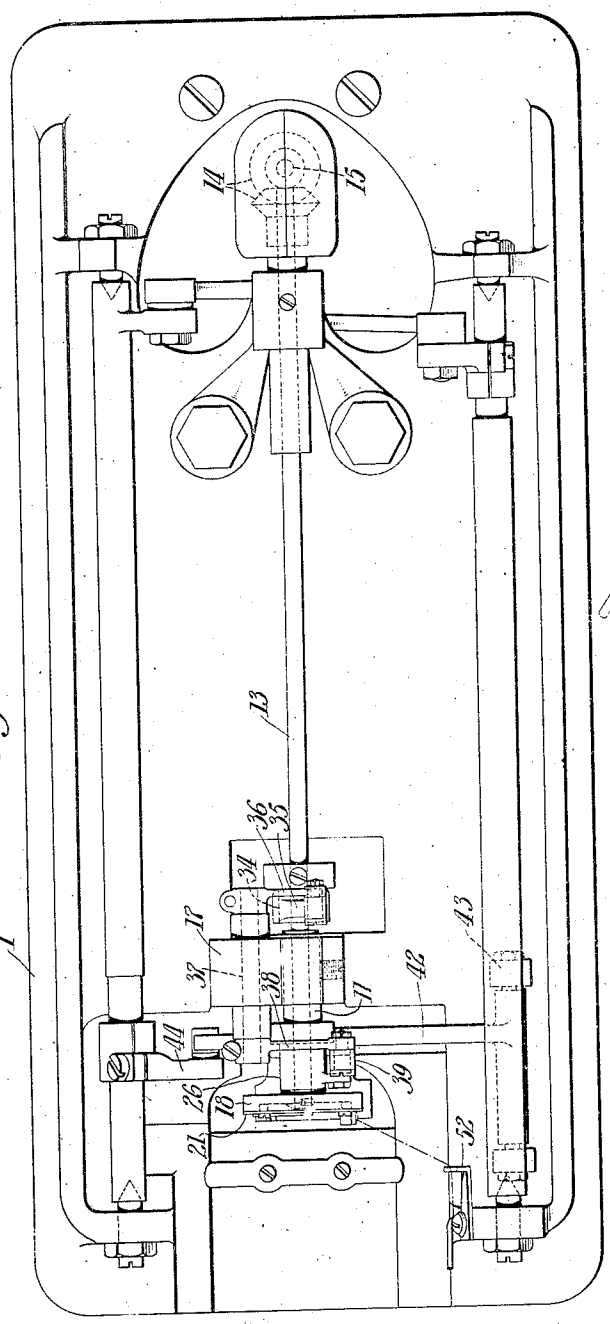


Fig. 15.

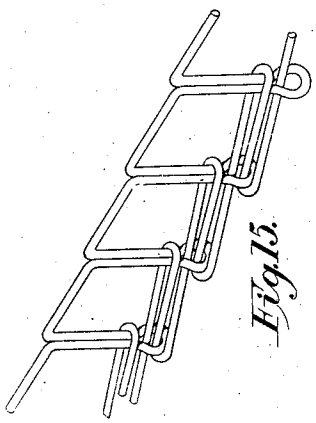
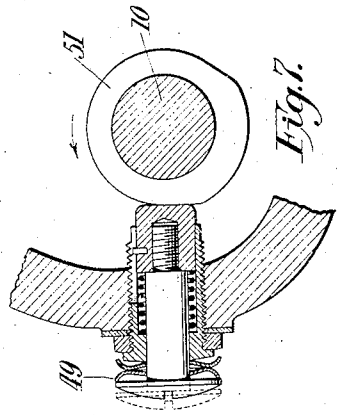


Fig. 7.



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CHAIN STITCH SEWING MACHINE

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Fig. 3.

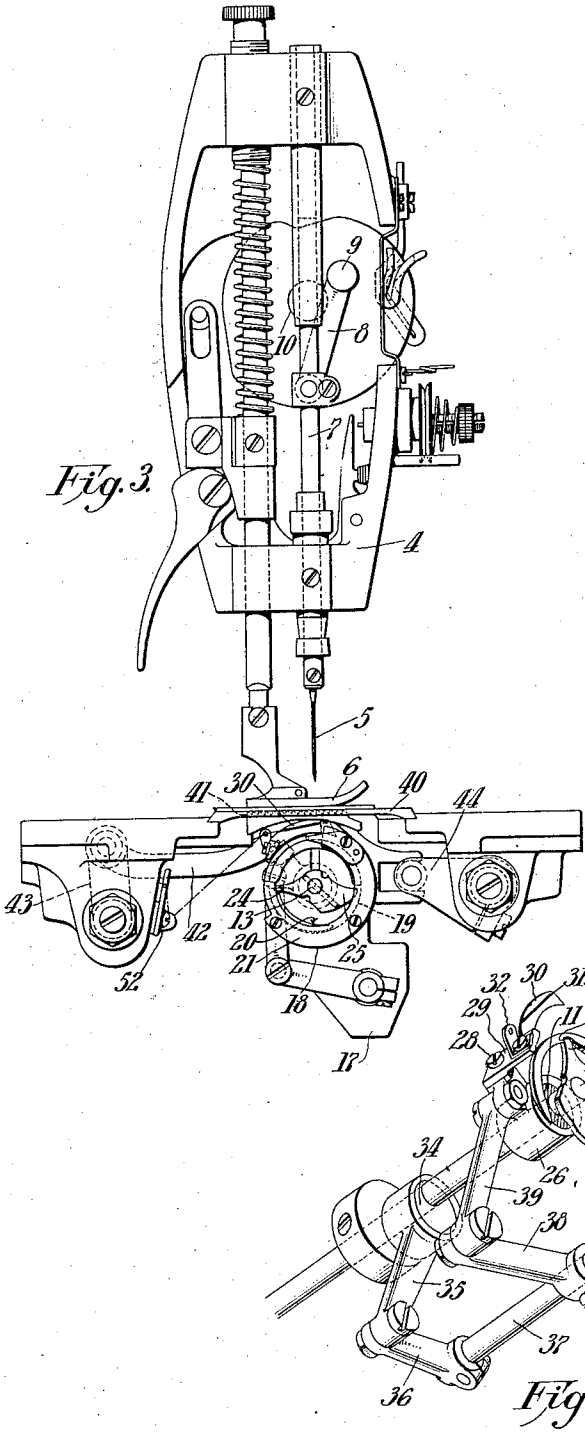
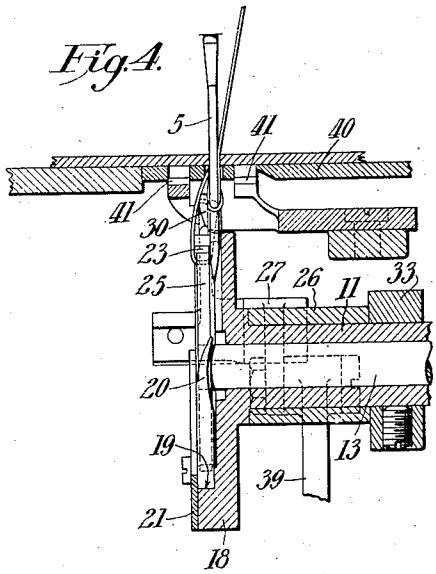


Fig. 4.



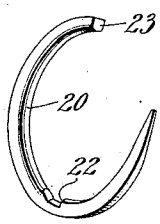


Fig. 6.

Fig. 5.

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CHAIN STITCH SEWING MACHINE

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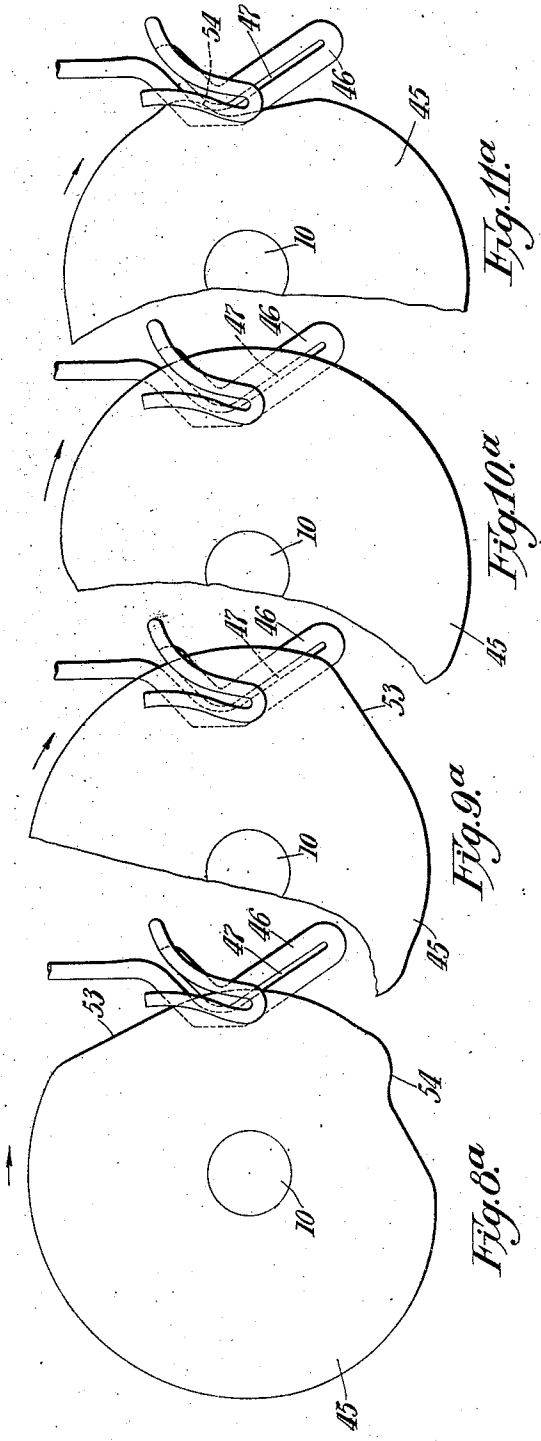


Fig.11a. Fig.10a. Fig.9a. Fig.8a.

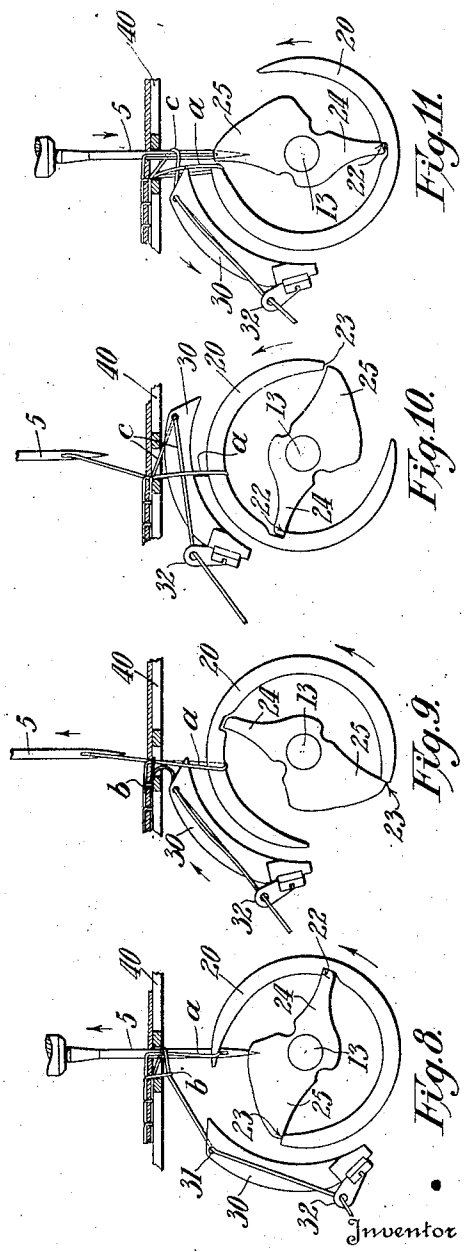


Fig.11. Fig.10. Fig.9. Fig.8.

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CHAIN STITCH SEWING MACHINE

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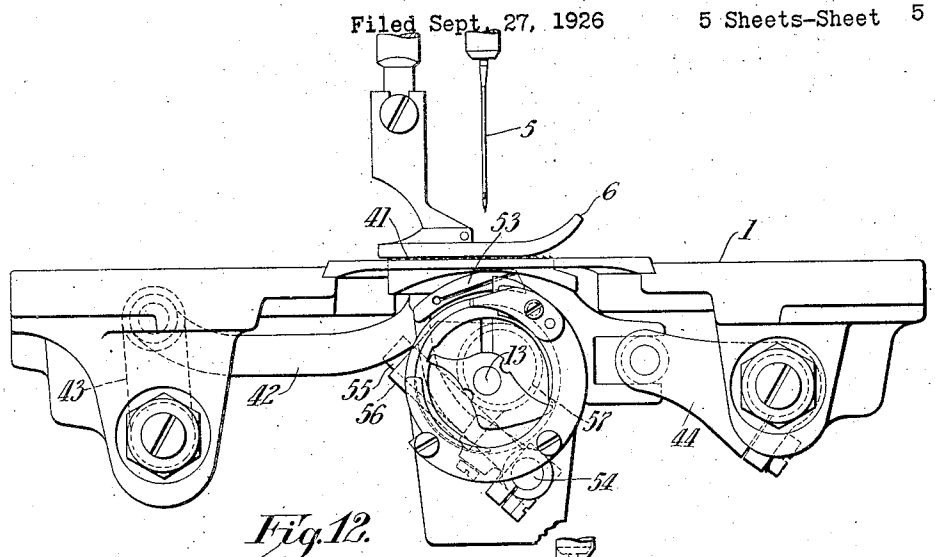


Fig. 12.

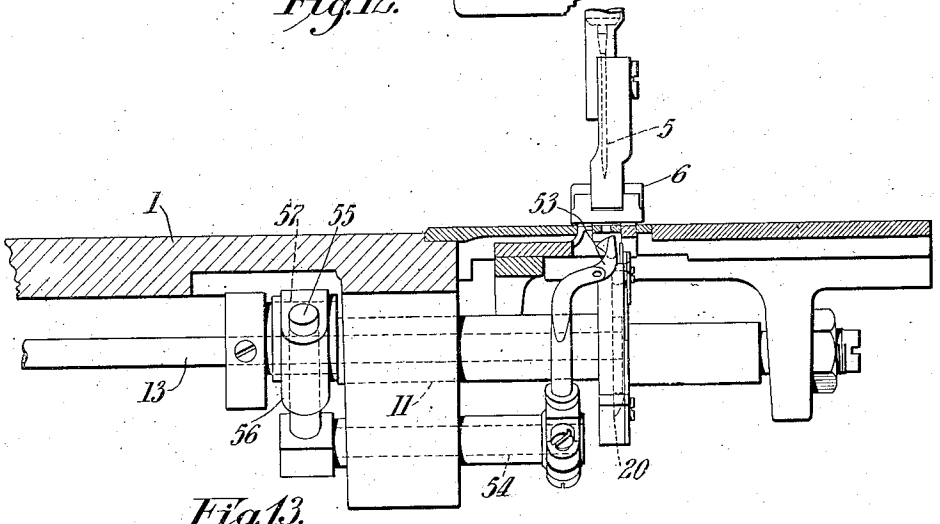


Fig. 13.

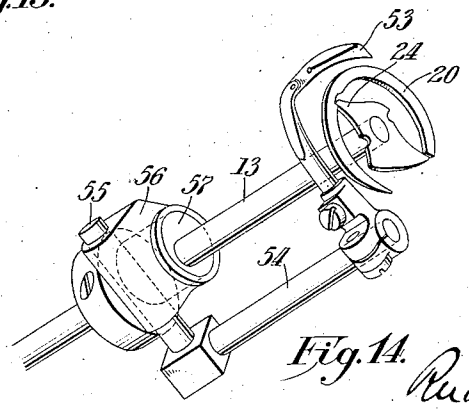


Fig. 14.

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UNITED STATES PATENT OFFICE.

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CHAIN-STITCH SEWING MACHINE.

Application filed September 27, 1926. Serial No. 137,863.

This invention relates to sewing machines and has for an object to provide a simplified mechanism for forming a chain-stitch seam, which mechanism is capable of high-speed operation.

In chain-stitch sewing machines it is usual to provide a reciprocating needle for passing a needle-thread loop through the work and a looper for entering and detaining the needle-loop as the needle rises from the work and for presenting the needle-loop, or a loop of an under thread enchained with a needle-loop, for entry by the descending needle. In one known type of looper mechanism the looper is actuated by two cranks or eccentrics, one of which imparts to the looper loop-seizing and shedding movements and the other of which gives the looper sidewise or so-called "needle-avoiding" movements, whereby the looper passes along one side of the needle, seizes a needle-loop and moves to the end of its stroke,—is then given a sidewise movement, and is retracted along the other side of the needle-path.

It has been proposed to simplify the machine by eliminating the sidewise movement of the looper, but it then becomes necessary to introduce a reciprocating spreader to assist in presenting the thread-loop to the needle, since the needle cannot seize a loop from the looper when the latter retracts along the same side of the needle which it passes on its advancing stroke.

Further, with machines of the above types, where the looper is actuated by one or more simple crank motions, it is necessary to increase the amplitudes of motion of the needle and looper sufficiently to secure the proper relative timing of these implements at two points in the stitch-forming cycle, to wit: *a*, when the looper seizes a needle-loop and *b*, when the needle enters the thread-loop presented by the looper.

It has been proposed to reduce the amplitudes of motion of the needle and looper by modifying the actuating mechanism so as to give the looper an irregular motion including dwells and periods of rapid motion, but such irregular motion can only be secured by the use of cams, toggle devices, etc., which complicate the actuating mechanism and are mechanically inferior to simple crank-motions.

It has also been proposed to solve the problem of simplicity and high speed by providing two separately timed implements below the work, one a loop-taking implement which carries no thread and is crank operated and properly timed to enter and detain the needle-loop, and the other, a crank operated looper timed to present a loop to the descending needle. But little has been done toward developing machines involving the last above proposed method, and such machines as have been developed are defective for several reasons among which may be mentioned: 1. The needle-loop is unduly expanded or drawn out and causes undue reeving of thread through the needle-eye. 2. The loop-taker is depended upon to drag the looper-thread loop through the needle-loop, which necessitates a harsh or sudden engagement of the loop-taker with the looper-thread, tending to unduly strain the latter when operating at high speed. 3. The loop-taker twists the loops and thus introduces a tendency of such loops to kink or snarl while being drawn up.

According to the present improvement there are provided separately timed crank driven loop-taking and loop-presenting implements. The loop-taker has a slender thread-engaging portion which moves in the direction of its length and seizes a needle-loop without twisting or expanding or shifting such loop laterally. The loop-presenter or looper is preferably a simple two-motion blade which passes a loop of under thread through the needle-loop and is timed to present such loop to the descending needle. The loop-taker may be in the form of a continuously rotating segmental ring which passes bodily through the needle-loop and moves such loop in the direction of feed or away from the needle-path. Thus, the advantages of separately timed loop-taking and under-thread carrying members are retained, while avoiding the disadvantages of known combinations and arrangements of parts for producing the two-thread chain-stitch.

In the accompanying drawings, Fig. 1 is a side elevation, partly in section, of a sewing machine embodying the invention. Fig. 2 is a bottom plan view of the machine. Fig. 3 is a front end elevation of the machine. Fig. 4 is a vertical section in the plane of the needle, taken transversely of the

direction of feed. Fig. 5 is a perspective view of the mechanism for actuating the loop-taker and under-thread looper. Fig. 6 is a perspective view of the loop-taker. Fig. 7 is a sectional view on the line 7—7, Fig. 1. Figs. 8, 9, 10 and 11 are a progressive series of elevations showing the cooperative action of the stitch-forming instrumentalities. Figs. 8ª, 9ª, 10ª and 11ª are a series of views showing the corresponding positions of the needle-thread take-up device. Figs. 12, 13 and 14 illustrate a modified form of looper mechanism; Fig. 12 being an end view, Fig. 13 a rear side view and Fig. 14 a perspective view. Fig. 15 is a perspective view of the stitch as formed by the machine.

In the embodiment of the invention illustrated in Figs. 1 to 11 inclusive, the machine has a frame comprising a flat bed 1 from which rises the standard 2 of the bracket-arm 3 terminating in the head 4 for the usual reciprocating needle and presser devices 5 and 6, respectively. The needle 5, which is carried by the needle-bar 7, is reciprocated by the usual link connection 8 with a crank 9 on the main-shaft 10 journaled within the bracket-arm 3.

Journaled in suitable bearing bushings 11, 12, below the bed 1, is the lower rotary shaft 13 which is geared at 14 to the vertical shaft 15; the latter being geared at 16 to the main-shaft 10. The bearing bushing 11 is fixed at one end in the downwardly extending bed-lug 17 and at its other end is formed with a flat circular head 18 in the outer face of which is cut a raceway 19 for the segmental loop-taker ring 20 which, it will be noted in Fig. 4, is disposed wholly at one side of the needle-path. A retaining ring 21 is applied to the outer face of the head 18 to hold the loop-taker 20 in the raceway 19. The loop-taker ring is formed with diametrically opposed shoulders 22, 23, which are engaged by the ends of the driving crank arms 24, 25, on the end of the shaft 13. The raceway 19 is slightly eccentric to the shaft 13 and, as a consequence, the ring 20 is driven by the arms 24, 25, alternately, so that a gap or space occurs between each driving arm and its respective shoulder on the ring 20 as such arm and shoulder pass the sewing point. These gaps permit the needle-loops to pass between the ring and its driving arms without hindrance. This form of loop-taker drive is well known and is shown, for example, in the patent to Fischer No. 793,127, of June 27, 1905. The Fischer machine is, however, designed to make only a single thread chain-stitch and the loop-taker moves contrary to the direction of feed when seizing a needle-loop. In the present machine the loop-taker is so driven as to move in the direction of feed when seizing and detaining a needle-loop, so as to move the loop away from the needle-path. The center of the raceway 19 should preferably be located slightly above and to the rear (or to the left, Fig. 3) of the center of the shaft 13.

Journaled on the bushing or sleeve 11, is the hub 26 of the looper-carrier 27 to which is secured by the screw 28, Fig. 5, the lateral extension 29 at the rear end of the looper-blade 30. The looper-blade 30 is formed at its forward end with a thread-eye 31 and a thread-guide 32 is screwed to the rear end of the looper-blade. A collar 33 on the bushing 11 prevents the hub 26 of the looper-carrier from moving lengthwise of the bushing.

The looper 30 is actuated by means of an eccentric 34 on the main-shaft 13. The eccentric 34 is connected by the pitman 35 to the arm 36 fixed to the rock-shaft 37 journaled in the frame lug 17. The rock-shaft 37 also has fixed thereto an arm 38 which is connected by a link 39 to the looper-carrier 27. A simple crank motion is thus employed to actuate the looper and the eccentric 34 is timed on the shaft 13 so that the descending needle will enter the looper-loop on the retraction of the looper. The looper-blade 30 is a thin slender member and operates substantially in the plane of the loop-taker ring 20 and between the latter and the throat-plate 40, so as not to distend the needle-loop. It will also be observed that the looper moves contrary to the direction of feed in passing into the needle-loop.

The machine is provided with the usual four-motion feed-dog 41, Fig. 3, which is carried by the feed-bar 42 to which endwise feeding movements are imparted by the feed-rocker 43 and rising and falling movements by the feed-lift 44.

The needle-thread is preferably controlled by a rotary take-up comprising the usual spaced disks 45, 45, fixed on the main-shaft 10. A wire thread-guide 46 having a stripper slot 47 is disposed between the disks 45, and spaced thread-guides 48 are disposed at the opposite or outer sides of such disks. An intermittent tension 49 is preferably provided for the needle-thread in addition to the usual constant tension device 50. The intermittent tension is actuated by a cam 51 on the main-shaft 10 and applies an increased tension to the thread as the take-up 45 is drawing up or tightening the stitch. No take-up is used for the under thread which runs from the supply to a fixed thread-guide 52 and thence through the thread-guide 32 to the looper 30.

The stitch-formation is as follows. As the needle rises from its lowest point, Fig. 8, the looper 30 is retracted and the loop-taker is timed to seize the loop *a* of needle-thread. As the needle continues to rise the looper 30 advances and the incline or rise 53 on the take-up 45 draws up or tightens the previous needle-loop *b*. The loop-taker 20 continues its excursion through the needle-loop *a* with-

out materially drawing out such loop; the loop-taker merely holding the loop *a* in position for entry by the advancing looper 30, Fig. 9. As soon as the needle is out of the work the feed commences and the feed of the work together with the motion of the loop-taker 20 carries the loop *a* wholly to the rear of the needle-path, Fig. 10, so that the descending needle will not engage such loop, but will pass down beside such loop with safety and into the loop *c* of looper-thread which is presented by the looper 30. As the looper 30 retracts, it leaves its loop *c* around the needle and as the loop-taker 20 completes its excursion the needle-loop *a* escapes from the loop-taker, Fig. 11, and is partially drawn up as the loop *b*, Fig. 8, by the cam rise 54 on the take-up 45. The depression immediately preceding the cam rise 54 effects a momentary slackening of the needle-thread as the loop *a* escapes from the heel of the loop-taker and thus avoids a harsh snapping of such loop over the loop-taker heel.

In the modified form of the invention illustrated in Figs. 12, 13 and 14, the threaded looper 53 does not oscillate about an axis concentric with the loop-taker driving shaft 13 but is mounted on a shaft 54 disposed below and parallel to the shaft 13. The shaft 54 has fixed thereto an upwardly inclined pin 55 which enters a socket in the follower block 56 embracing the crank or eccentric 57 on the shaft 13. The timing of the looper 53 relative to the needle 5 and loop-taker 20 is substantially the same as that of the looper 31 first described. The modified form of looper drive is structurally somewhat simpler than the first described looper drive, as the arm 38 and link 39 are eliminated.

It will be observed that the operating mechanisms for the looper and loop-taker members are extremely simple; comprising merely a rotary shaft and one simple crank-motion. The needle-bar stroke can be reduced to a minimum, as the loop-taker and looper can be independently timed relative to the needle, regardless of the length of the needle-stroke. The mounting of the loop-taker and looper to move about parallel or coincident axes also makes for simplicity and favorable cooperation of the parts.

The invention is not to be understood as limited to the form and arrangement of parts shown and described as it is obvious that the mechanism shown is susceptible of considerable modification within the spirit and scope of the invention.

Having thus set forth the nature of the invention, what I claim herein is:

1. In a sewing machine, in combination, feeding mechanism, a reciprocating needle, a loop-taker adapted to seize and detain a needle-loop and to cooperate with the feeding mechanism to move the detained needle-loop out of the needle-path, and means separate from said loop-taker for passing a loop of under thread through the detained needle-loop for entry by the descending needle.

2. In a sewing machine, in combination, feeding mechanism, a reciprocating needle, a loop-taker in the form of a segmental ring rotating in the direction of feed and adapted to seize and detain a needle-loop and to cooperate with the feed to move the detained needle-loop out of the needle-path, an under thread looper, and means for moving said looper into the seized needle-loop contrary to the direction of feed to carry a loop of under thread through the needle-loop for entry by the descending needle.

3. In a sewing machine, in combination, a reciprocating needle, a loop-taker comprising a segmental ring, and a loop presenter, said loop-taker and loop-presenter being separately timed and movable about axes extending in the same direction.

4. In a sewing machine, in combination, a reciprocating needle, a rotary loop-taker in the form of a segmental ring, a loop-taker raceway, a loop-taker driving shaft, a loop-taker driver carried by said shaft, a two-motion oscillatory looper, and a crank on said shaft and connections for oscillating said looper.

5. In a sewing machine, in combination, a reciprocating needle, a rotary loop-taker in the form of a segmental ring, a loop-taker raceway, a loop-taker driving shaft, a loop-taker driver carried by said shaft, and a reciprocating looper having a blade operating in a plane substantially coincident with the plane of said loop-taker.

6. In a sewing machine, in combination, a reciprocating needle, a loop-taker comprising a segmental ring, a loop-taker supporting raceway, a loop-taker driving shaft, a looper, a looper-supporting shaft mounted below and substantially parallel with the loop-taker driving shaft, and a crank on said loop-taker driving shaft and connections for oscillating said looper-supporting shaft.

7. In a sewing machine, in combination, a reciprocating needle, a loop-taker having a slender loop-engaging portion adapted to enter and detain a needle-loop until the needle has risen from the work, without expanding or laterally shifting such loop, a reciprocating looper, and means for moving said looper into the detained needle-loop, said looper operating to present a thread-loop for entry by the descending needle.

8. In a sewing machine, in combination, a reciprocating needle, a loop-taker having a slender loop-engaging portion in the form of a segmental ring adapted to enter and detain a needle-loop until the needle has risen from the work, without expanding or laterally shifting such loop, a reciprocating looper, and means for moving said looper into the detained needle-loop, said looper operating to

present a thread-loop for entry by the descending needle.

9. In a sewing machine, in combination, a reciprocating needle, a loop-taker having a slender loop-engaging portion in the form of a segmental ring, means for continuously rotating said ring, a reciprocating looper, and means for moving said looper into a needle-loop detained by said ring, said looper operating to present a thread-loop for entry by the descending needle.

10. In a sewing machine, in combination, a reciprocating needle, a loop-taker having a slender loop-engaging portion disposed wholly at one side of the needle-path and adapted to enter and detain a needle-loop until the needle has risen from the work, without expanding or laterally shifting such loop, a reciprocating looper, and means for moving said looper into the detained needle-loop, said looper operating to present a thread-loop for entry by the descending needle.

11. In a sewing machine, in combination, a reciprocating needle, a loop-taker having a slender loop-engaging portion adapted to enter and detain a needle-loop until the needle has risen from the work, without expanding or laterally shifting such loop, and a looper in the form of a reciprocating eye-pointed blade with means for projecting it into the detained needle-loop without increasing the size of such needle-loop, said looper operating to pass a loop of under thread through the needle-loop and present such under thread loop for entry by the descending needle.

12. In a sewing machine, in combination, feed mechanism, a reciprocating needle, a loop-taker having a pointed slender-bodied thread-engaging portion moving in the direction of feed to seize a needle-loop, a loop presenter, and means for moving said loop-presenter into the needle-loop contrary to the direction of feed, said loop-presenter operating to present a thread-loop for entry by the descending needle.

In testimony whereof, I have signed my name to this specification.

RUDOLPH BECKER.