R. K. HOHMANN.

SEWING MACHINE.

APPLICATION FILED FEB. 26, 1916.

1,343,823.

Patented June 15, 1920.

7 SHEETS—SHEET 1.

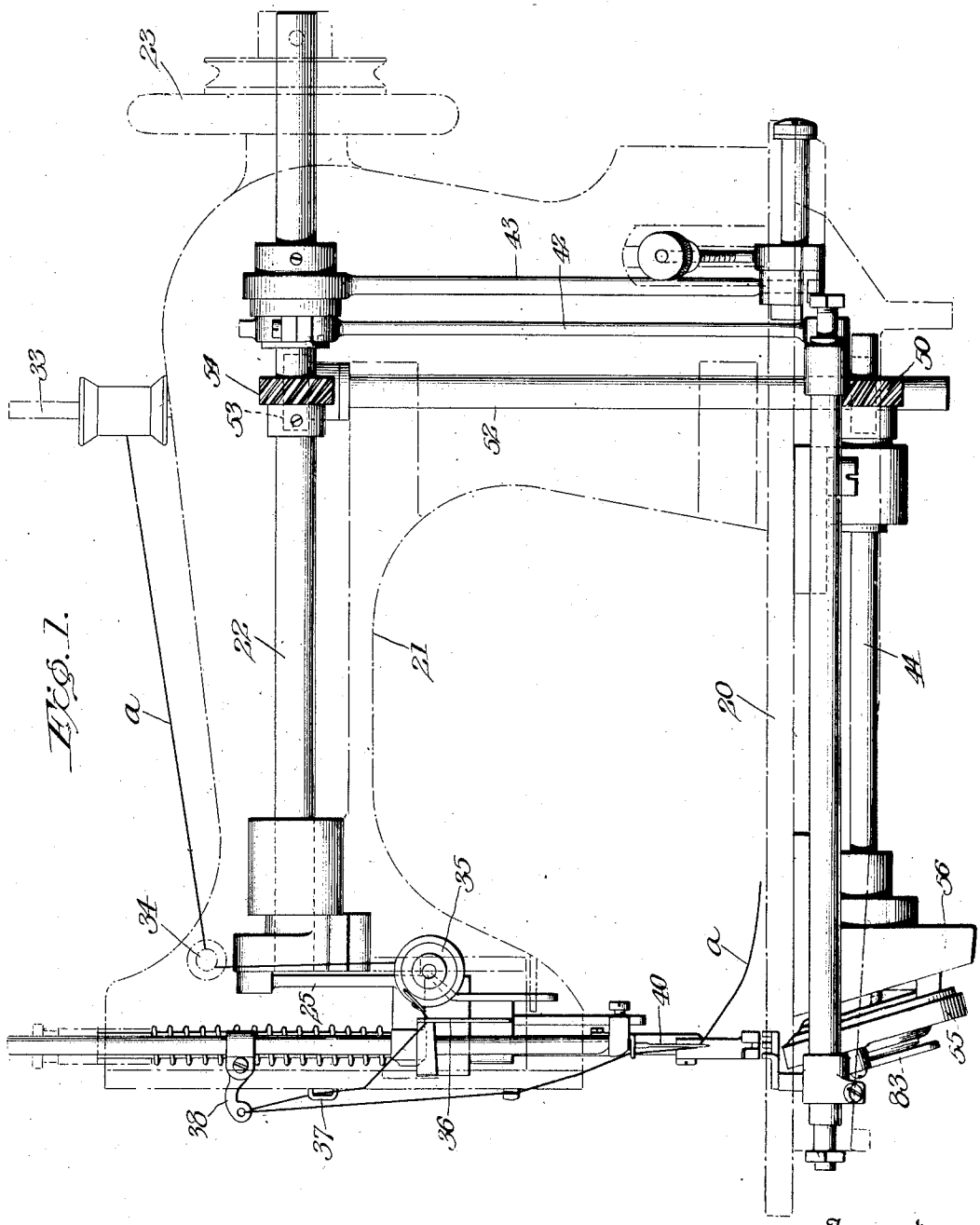


Fig. 1.

Witnesses
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7 SHEETS—SHEET 2.

FIG. 2.

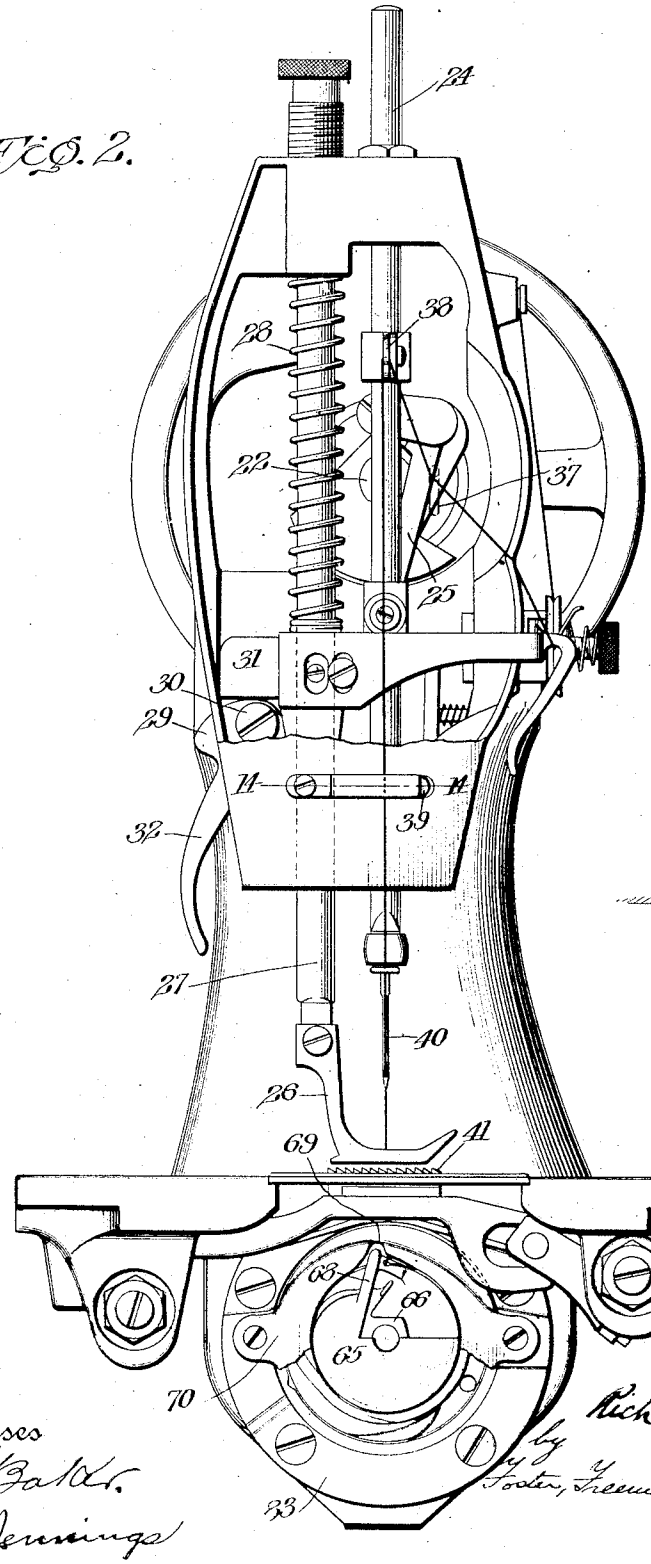


FIG. 4.



Witnesses

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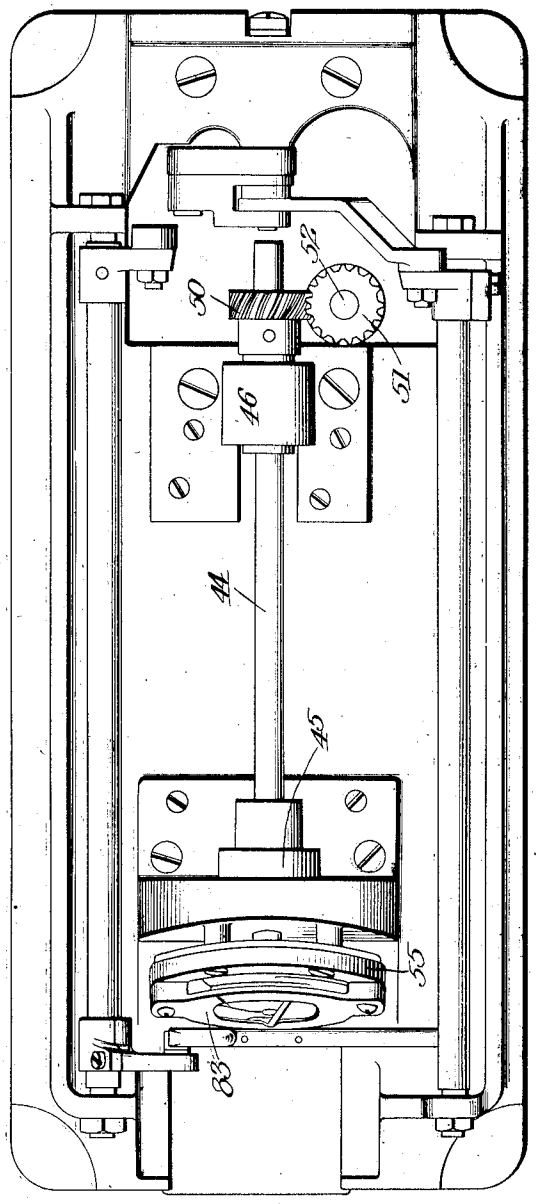


Fig. 3.

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7 SHEETS—SHEET 4.

FIG. 4

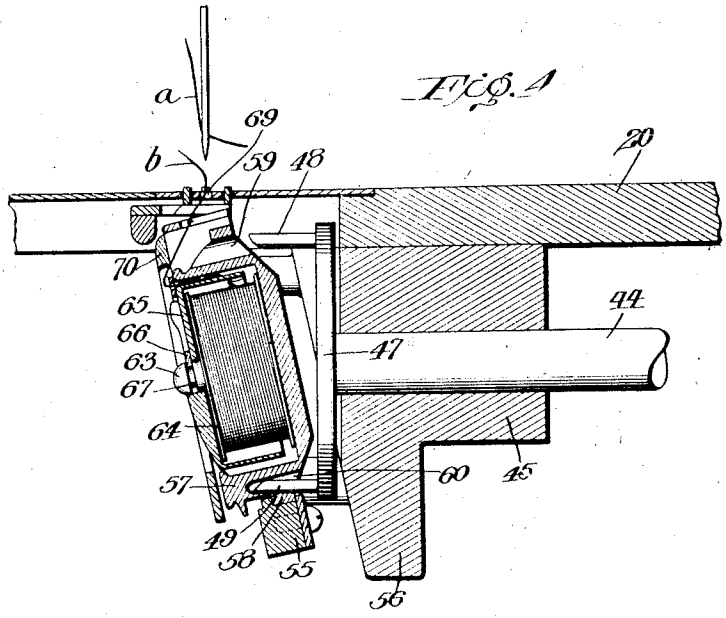


FIG. 5.

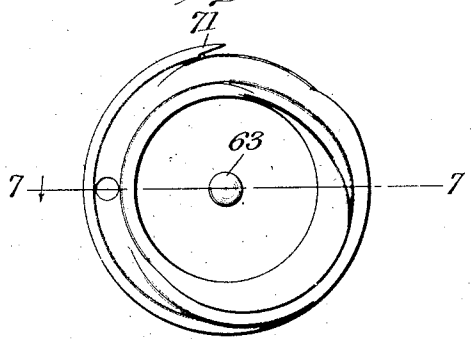


FIG. 6.

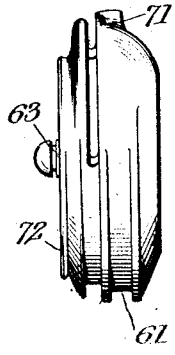
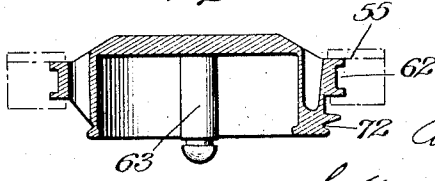


FIG. 7.



Witnesses

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7 SHEETS—SHEET 5.

Fig. 10.

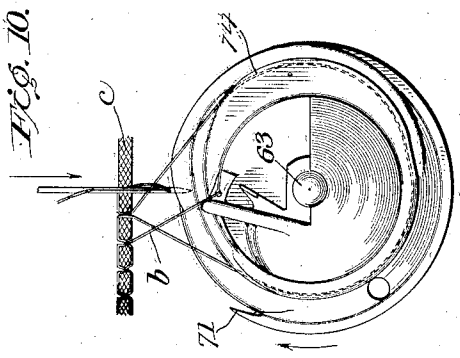


Fig. 13.

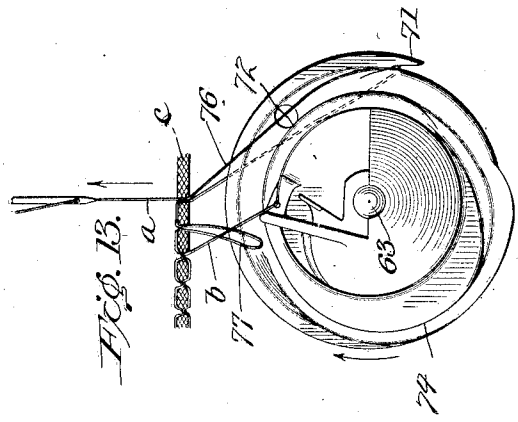


Fig. 9.

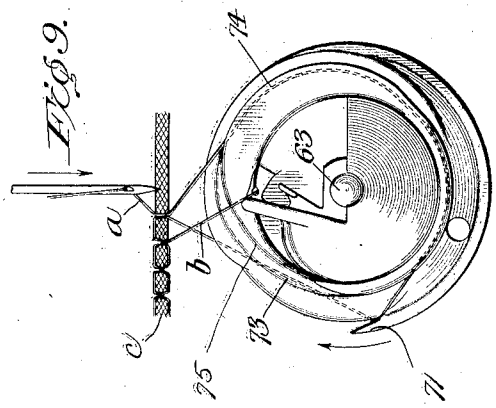


Fig. 12.

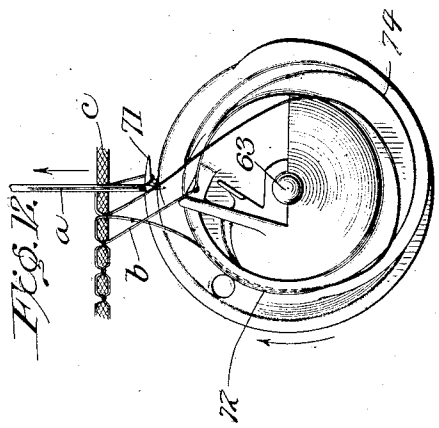


Fig. 8.

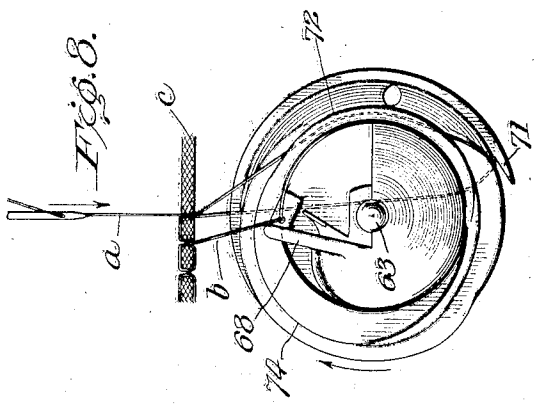
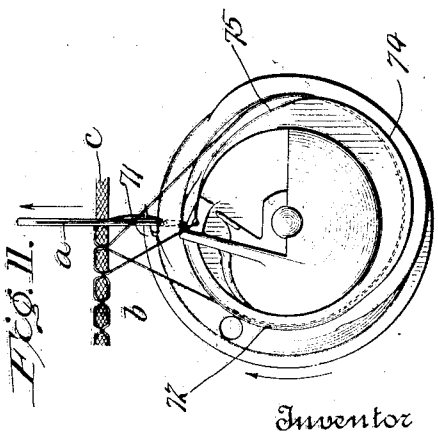


Fig. 11.



Witnesses

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1,343,823. **Patented June 15, 1920.**

7 SHEETS—SHEET 6.

FIG. 15.

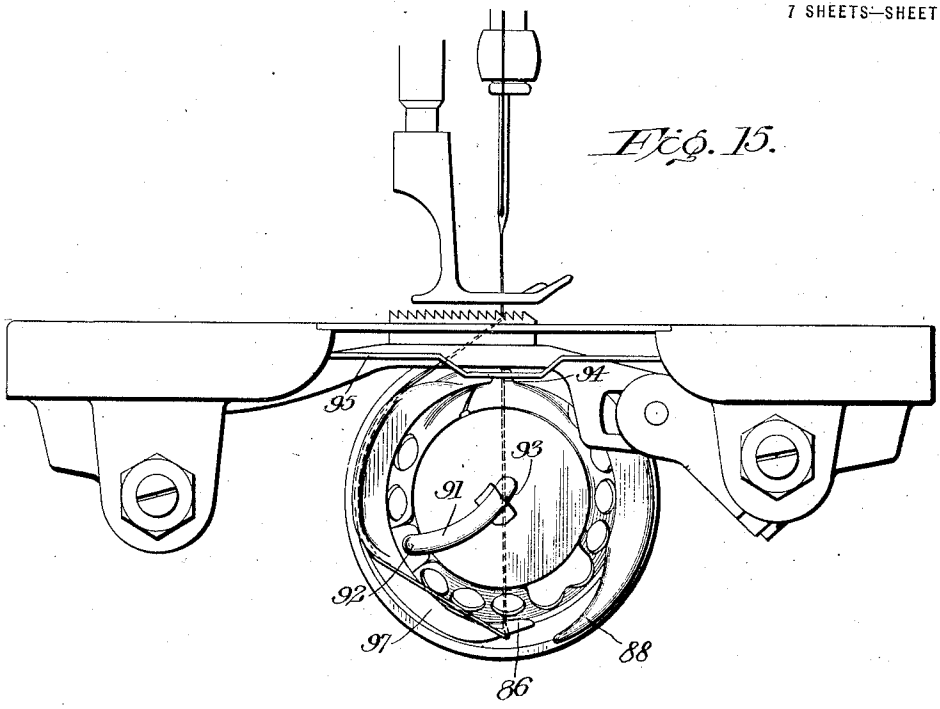


FIG. 16.

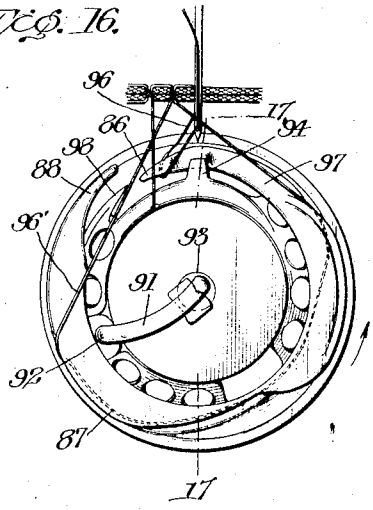
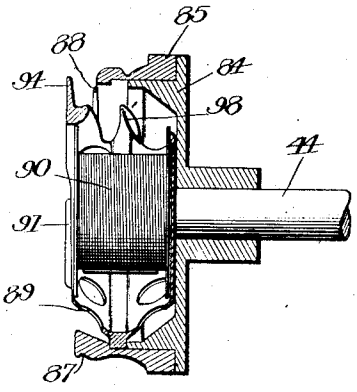


FIG. 17.



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1,343,823. **Patented June 15, 1920.**

7 SHEETS—SHEET 7.

Fig. 18.

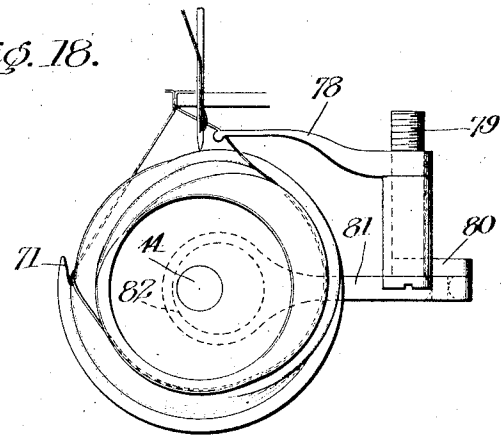
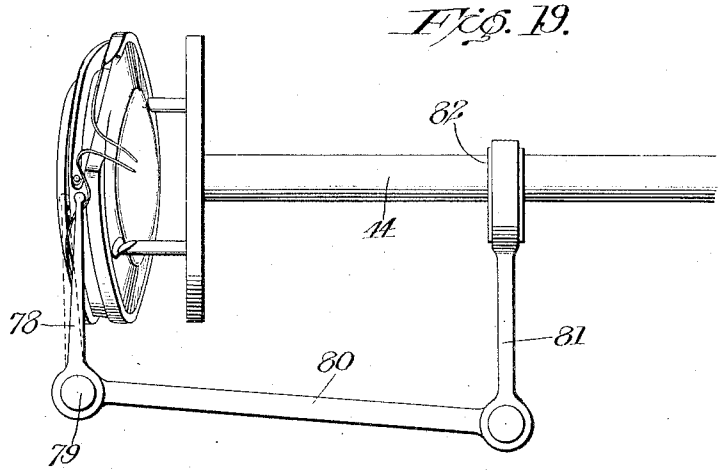


Fig. 19.



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UNITED STATES PATENT OFFICE.

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SEWING-MACHINE.

1,343,823. Specification of Letters Patent. **Patented June 15, 1920.**

Application filed February 26, 1916. Serial No. 80,673.

To all whom it may concern:

Be it known that I, RICHARD K. HOHMANN, a citizen of the United States, and resident of Sioux City, Woodbury county, State of Iowa, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention relates to sewing machines and particularly to machines of the rotary type adapted to operate at extremely high speeds. It is one of the objects of the invention to eliminate the usual differential crank drive which produces a fast and slow movement of the shuttle during each cycle of operations, the slow movement being for the purpose of giving to the take-up time to draw up the needle loop. A further object of the invention is to provide a machine having a rotary stitch forming member which operates at a uniform speed so as to have the minimum wear on the parts and to permit of operation at a maximum speed. A further object of the invention is to provide a rotary stitch forming member which acts as its own take-up and thereby avoids drawing the needle loop back and forth through the needle, thus eliminating the wear on the thread incident to the present machines and permitting the use of an unusually large bobbin and coöperating with the other features to permit of extremely high speed operation. The use of a large bobbin makes it necessary to form a large loop in the thread and if this loop is drawn back and forth through the needle eye the wear and friction become so excessive as to result in frequent breaking of the thread and consequent stoppage of the operation of the machine.

A further object of the invention is to provide a machine embodying the features above referred to and also capable of making either the lock or chain stitch.

With the foregoing and other objects in view, as will appear from the following detailed description, the invention may be embodied in various forms of mechanism some of which are illustrated in the accompanying drawings.

In the drawings: —

Figure 1 is a skeleton side elevation of a sewing machine head of the rotary shuttle type;

Fig. 2 is an end elevation of the same;

Fig. 3 is a bottom plan view;

Fig. 4 is a longitudinal section through the shuttle mechanism;

Fig. 5 is a side elevation of a modified form of shuttle;

Fig. 6 is an edge view of the same;

Fig. 7 is a transverse section on the line 7—7 of Fig. 5;

Figs. 8 to 13 are side elevations of the shuttle in the various positions of forming a stitch;

Fig. 14 is a section on the line 14—14 of Fig. 2;

Fig. 15 is an end elevation of the stitch forming mechanism of a machine of the revolving hook type embodying the invention;

Fig. 16 is an elevation of the shuttle mechanism of Fig. 15 but shown in a different position to illustrate the formation of the stitch;

Fig. 17 is a section substantially on the line 17—17 of Fig. 16;

Fig. 18 is an elevation of the shuttle shown in Figs. 8 to 13 but without the bobbin thread and in combination with means for forming the chain stitch; and

Fig. 19 is a plan view of the mechanism shown in Fig. 18.

Referring to the drawings it will be seen that the sewing machines illustrated are improvements in the type of machine illustrated in the Richards Patent No. 669,327, in which patent the revolving shuttle is provided with three hooks each of which takes the needle thread once for every two revolutions, the loop formed by one of the shuttle hooks being drawn up by the second following hook which is angularly spaced 240° therefrom. I have found from actual experience that it is commercially impracticable to have a multiplicity of hooks upon a shuttle because the variations and inaccuracies incident to the commercial production of machines result in the hooks being slightly out of alinement so that stitches are occasionally omitted due to the failure of a particular hook to catch the needle thread when it should. I have overcome this difficulty by providing a machine in which the shuttle or revolving part carrying the hook makes one complete revolution for each reciprocation of the needle and therefore carries but a single hook and the slight variations in the different shuttles as manufactured commercially are of no consequence because it is possible to adjust the shuttle in an axial direction so that its hook will always take the needle loop. This is not possible with a

shuttle having a multiplicity of hooks because, as above stated, the hooks are not in alinement and in adjusting the shuttle to suit one hook another or others will be thrown out of adjustment.

Referring particularly to Figs. 1 to 14 it will be seen that the machine illustrated comprises the usual base or work support 20 on which is arranged an arm 21. A main drive shaft 22 is supported in suitable bearings in the arm 21 and carries at its outer end a driving pulley or wheel 23. A needle bar 24 is slidably mounted in the enlarged end of the arm 21 in the usual manner and is operatively connected with the shaft 22 by means of the pitman 25 or any other suitable mechanism, many forms which are well known to those skilled in this art. The usual presser-foot 26 is arranged on the lower end of the rod 27 and is yieldingly held in its different positions by means of the spring 28. A cam 29 mounted on a pivot 30 and coöperating with the arm 31 on the rod 27 is provided for the purpose of raising or lowering the foot 26 as desired, the cam being conveniently operated by means of the hand lever 32. This part of the mechanism may also be of any well known and suitable form.

The arm 21 has the usual spool spindle 33 and the thread *a* extends from the spool around a guide 34 and through a tension device 35 whence it passes under a hook 36. From the hook 36 the thread passes through a guide 37 to an arm 38 which is carried by the needle bar 24. From the arm 38 the thread passes under a leaf spring tension device 39 and thence through the eye of the needle 40 on the lower end of the needle bar. The usual cloth feed 41 is provided under the pressure foot 26 and may be actuated by any well known or preferred mechanism and in Fig. 2 the eccentric rods 42 and 43, actuated by suitable eccentrics on the shaft 22 are provided for this purpose. A shaft 44 is journaled in the bearings 45 and 46 on the under side of the support 20 and carries at one end a disk 47 having pins 48 and 49 projecting from diametrically opposite points thereon. The other end of the shaft 44 carries a gear wheel 50, preferably a spiral gear, which meshes with and is driven by a corresponding gear 51 on the vertical shaft 52, the upper end of which carries a similar gear 53 which meshes with the gear 54 on the main shaft 22. The gears 51, 52, 53 and 54 are so proportioned that the shaft 44 rotates at exactly the same speed as the shaft 22 or in synchronism with the latter and in synchronism with the reciprocations of the needle bar 24. A shuttle housing or frame 55 is secured on the bracket 56 which projects from the bearing member 45. A shuttle 57 is rotatably mounted in the frame 55 and supported by the latter in an inclined position relatively to the disk 47 as clearly illustrated in Fig. 4. The shuttle 57 has a peripheral flange 58 which runs in a groove in the frame 55 and thus holds the shuttle in position. The shuttle is provided with openings 59 and 60 arranged to receive the pins 48 and 49 respectively so that the shuttle may be driven from the shaft 44.

In forming a stitch with this mechanism it is necessary for the needle thread to be carried around the shuttle or to have the shuttle, in effect, passed through the loop in the needle thread, and in order to permit this the shuttle is arranged at an incline relatively to the disk 47 and when the pins 48 and 49 are in the position shown in Fig. 4 only the pin 49 is connected with the shuttle, the pin 48 being spaced from the shuttle to permit the thread loop to be passed beween the end of the pin and the shuttle. As the shaft 44 rotates from the position shown in Fig. 4 the pin 48 will gradually enter the opening 59 and the pin 49 gradually leave the opening 60, so that upon the completion of a half revolution of the shaft the positions of the pins will be reversed and the pin 49 disconnected from the shuttle. The form of drive for the shuttle just described is well known and not an essential part of the present invention.

In Figs. 5, 6 and 7 there is illustrated a modification of the shuttle structure shown in Fig. 4 and instead of a single flange 58 on the shuttle a groove 61 is provided in which a tongue 62 on the frame 55 projects, this construction being merely a reversal of that shown in Fig. 4. The shuttle shown in Figs. 5, 6 and 7 is otherwise the same as that illustrated in Fig. 4.

At the center of the shuttle a post 63 is provided for the bobbin 64 and a holder 65 for the shuttle extends over the outer end thereof and is secured in position on the post 63 by means of the latch 66 which engages the groove 67 in the post. The bobbin holder 65 has an arm 68 which projects into a notch 69 in a stationary plate 70 for the purpose of securing the bobbin holder against rotation. The thread *b* extends from the bobbin 64 through the holder 65 and thence upwardly through the opening 69 in the needle plate 70, suitable tension means, (not shown) being provided on the holder 65 for giving the proper tension to the thread *b*.

Referring more particularly to Figs. 8 to 13 the details of construction and operation of the shuttle will be made apparent. It will be seen that the shuttle is provided with a single hook 71 and a circumferential groove 72 (see also Figs. 6 and 7) for the needle thread. The shuttle rotates in the direction of the arrows in Figs. 8 to 13 and in the position of the shuttle in Fig. 8 the

loop in the needle thread *a* extends around the shuttle in an axial direction from the hook 71 so that one side of the loop is arranged across the back of the shuttle and the other side is laid in the groove 72. The needle is descending and provides the necessary slack in the thread to permit the shuttle to continue its rotation to the position shown in Fig. 9, where the needle is about to puncture the cloth *c*. In this position all of the needle loop with the exception of the small portion 73 is arranged on the front of the shuttle and as the latter rotates from this position the eccentrically arranged portion 74 of the thread groove takes up the slack in the loop which results from the portion 73 jumping over to the front of the shuttle to the position shown in Fig. 10. In the latter position the bobbin thread *b* extends up to the cloth and the needle is approaching the limit of its downward movement. This position of the different threads is maintained until the hook 71 enters the loop in the needle thread which is formed when the needle starts upward, this occurring just before the hook reaches the position indicated in Fig. 11. The portion 75 of the shuttle has no groove for the thread loop and as a consequence the rotation of the shuttle from the position shown in Fig. 11 to the position shown in Fig. 12 results in casting the loop from the shuttle so that it incloses the bobbin thread *b*. Further rotation of the shuttle from the position shown in Fig. 12 results in the hook forming the new loop 76 by drawing the cast-off loop through the cloth. In Fig. 13 the cast-off loop is indicated at 77 and as the shuttle rotates to the position shown in Fig. 8 the loop 77 is drawn into the cloth, carrying with it the thread *b* and thus forming the lock stitch, the loop 76, shown in Fig. 13 being at the same time carried to the position of the loop indicated in Fig. 8.

From the foregoing it will be evident that the hook 71 takes the needle thread and carries it around the shuttle, in effect passing the bobbin through the loop and then draws or takes up the slack by catching the needle thread and forming a new loop therein, the shuttle thus acts as its own take-up and it is unnecessary to draw the thread back and forth through the needle eye as in the more common forms of take-ups. The hook 71 takes the needle thread on each revolution and therefore the needle is reciprocated in synchronism with the rotations of the shuttle.

Referring to Figs. 18 and 19 it will be seen that I have illustrated means whereby the mechanism above described may be employed for also forming a chain stitch, in which case the bobbin thread is omitted. In order to form the chain stitch with this mechanism a finger 78 is provided, this finger being adapted to rock on the pivot 79 and having rigidly connected therewith an arm 80 the outer end of which is moved to and fro by an eccentric rod 81 which is operated by an eccentric 82 on the shaft 44. As shown in Fig. 19 the finger 78 deflects one side of the loop in the needle thread to the rear of the needle so that the needle passes into the loop and when the loop is cast off from the shuttle it will be around the needle, the hook 71 drawing the new loop through and below the cast-off loop and thus producing the well known chain stitch.

In the form of the invention illustrated in Figs. 1 to 14 a guard plate 83 is arranged in front of the shuttle and coöperates with the plate 70 to guide the thread loop after it has been cast off from the shuttle.

In Figs. 15, 16 and 17 a machine of the revolving hook type, embodying the invention, is illustrated and in this machine the shaft 44 carries a frame 84 on which the hook ring 85 is secured. This hook ring has a hook 86 to take the thread from the needle, and is also provided with a circumferential thread groove 87 and a horn 88, the latter being located in proximity to the hook 86 and pointing toward the latter. Within the hook ring 85 is arranged the bobbin case 89 which carries the bobbin 90, the latter being held in the bobbin case in any preferred manner as by means of the arm 91 which is pivoted to the bobbin case at 92 and has its free end arranged to coöperate with the bobbin stud 93. The bobbin case has an upwardly projecting lug 94 which coöperates with a stationary bar 95 so as to be held by the latter against rotation.

In Fig. 16 the parts are shown in the position which they take immediately after the hook 86 has caught the loop 96 in the needle thread. The hook ring rotates in the direction of the arrow and after making substantially a half revolution from the position shown in Fig. 16 the parts assume the positions shown in Fig. 15, one side of the loop in the needle thread being then in the rear of the bobbin case and the other side of the loop being laid in the groove 87. As the hook ring revolves from the position shown in Fig. 15 the thread will pass from behind the bobbin case and assume the position shown in Fig. 16, in which position the hook 86 will have again caught the needle thread. As the hook ring revolves from the position shown in Fig. 16 the horn 88, being deflected forwardly from the bobbin case, will act as a take-up for any slack in the loop 96′ so as to retain the latter in the groove 87 until the proper instant when the horn 88 will coöperate with the smooth surface 97 to cast the loop 96′ off the forward side of the hook ring so that it will be drawn into the cloth by the enlargement of the new loop 96 which has been taken by the hook

86. The bobbin case has a hook 98 which catches the loop 96, as the hook 86 advances from the position shown in Fig. 16 and thus causes the loop to be carried around the rear face of the bobbin case and through the space between this face and the frame 84 (see Fig. 17).

I have illustrated and described what I now consider to be the preferred forms of my invention but it will be understood that the forms illustrated are susceptible of material changes without departing from the spirit of the invention which is defined in the appended claims.

Having thus described the invention, what is claimed is:

1. In a sewing machine, the combination of a needle, mechanism for reciprocating the needle, a rotary member having a hook thereon coöperating with the needle to take the thread therefrom on every revolution of the member, rotary means for forming the thread taken by said hook into a loop the plane of which is substantially parallel to the plane of rotation of said member, means for casting said thread loop free from said member and hook, and means for giving to said member complete revolutions in synchronism with the reciprocations of said needle.

2. In a sewing machine, the combination of a needle, mechanism for reciprocating the needle, a rotary member having a hook thereon coöperating with the needle to take the thread therefrom on every revolution of the member, means on said member for forming and retaining the thread taken by said hook in a loop the plane of which is substantially parallel to the plane of rotation of the member, means adapted to cast said thread loop free from said member, and means for giving to said member complete revolutions in synchronism with the reciprocations of said needle.

3. In a sewing machine, the combination of a needle, mechanism for reciprocating the needle, a rotary member having a hook thereon and a circumferential thread groove, the hook coöperating with the needle to take the thread therefrom on every revolution of the member, means adapted to position the thread loop taken by the hook in said groove as said member rotates, means for casting said thread loop free from said member after the hook returns to the position where it caught the thread from the needle and means for giving to said member complete revolutions in synchronism with the reciprocations of said needle.

4. In a sewing machine, the combination of a needle mechanism for reciprocating the needle, a bobbin, a rotary member surrounding said bobbin and having a hook coöperating with the needle to take the thread therefrom on every revolution of the member, said member having a circumferential groove in which the thread loop is arranged as the member rotates and means for casting the thread loop from said groove after said hook has taken the succeeding loop from said needle and means for giving to said member complete revolutions in synchronism with the reciprocations of said needle.

5. In a sewing machine, the combination of a needle, mechanism for reciprocating the needle, a rotary member having a hook thereon coöperating with the needle to take the thread therefrom on every revolution of the member, a bobbin arranged within the member, said member having a circumferential groove in which the thread loop is arranged as the member rotates, a portion of said groove being eccentric to the axis of rotation of the member, means on the member adapted to cast the loop free therefrom after said hook has caught the next loop from the needle and means for giving to the member complete revolutions in synchronism with the reciprocations of said needle.

In testimony whereof I affix my signature.

RICHARD K. HOHMANN.