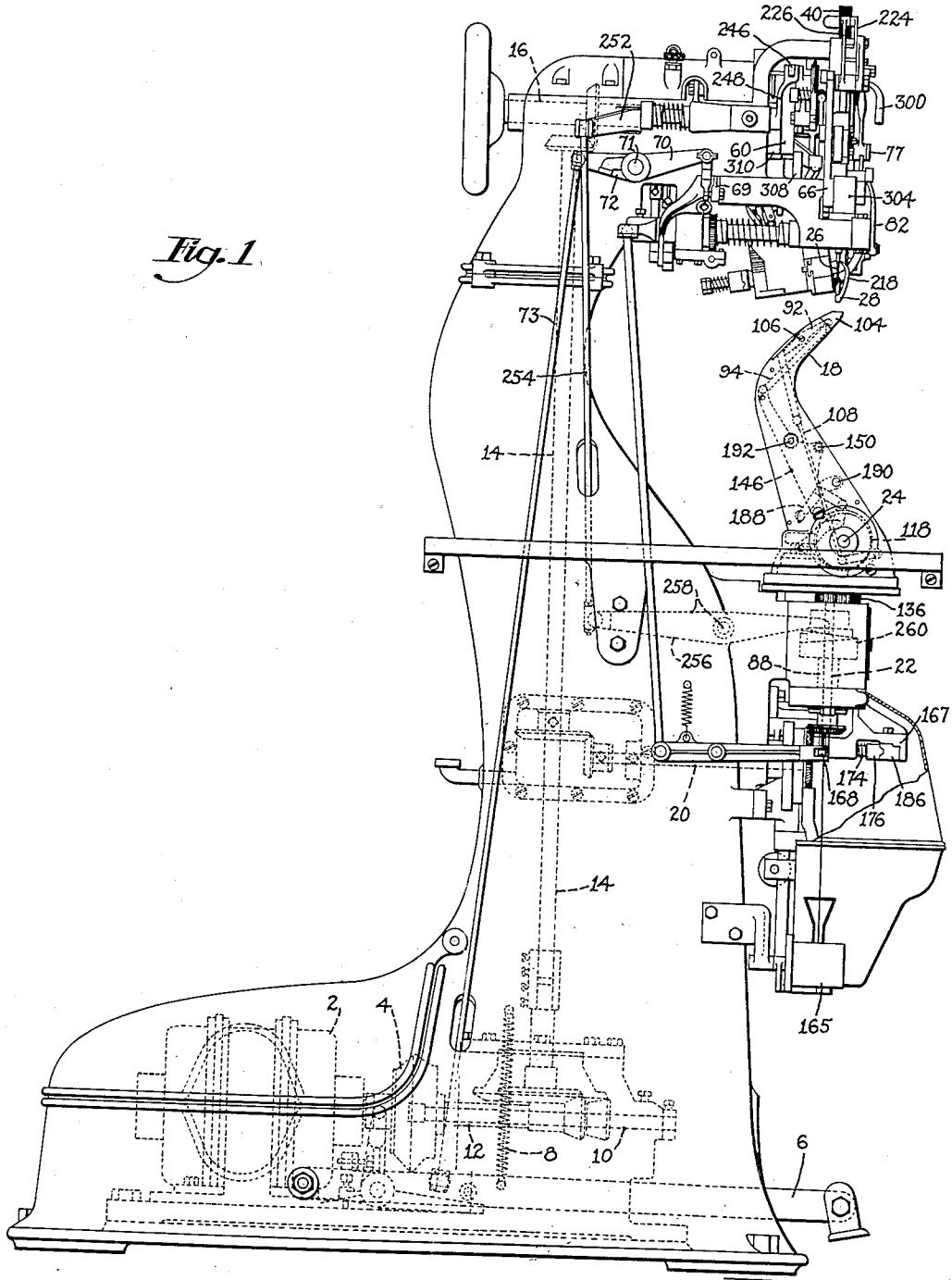
May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

Filed Aug. 14, 1936 15 Sheets-Sheet 1

Fig. 1



Witness
H. E. Van Dine

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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

Filed Aug. 14, 1936 15 Sheets-Sheet 2

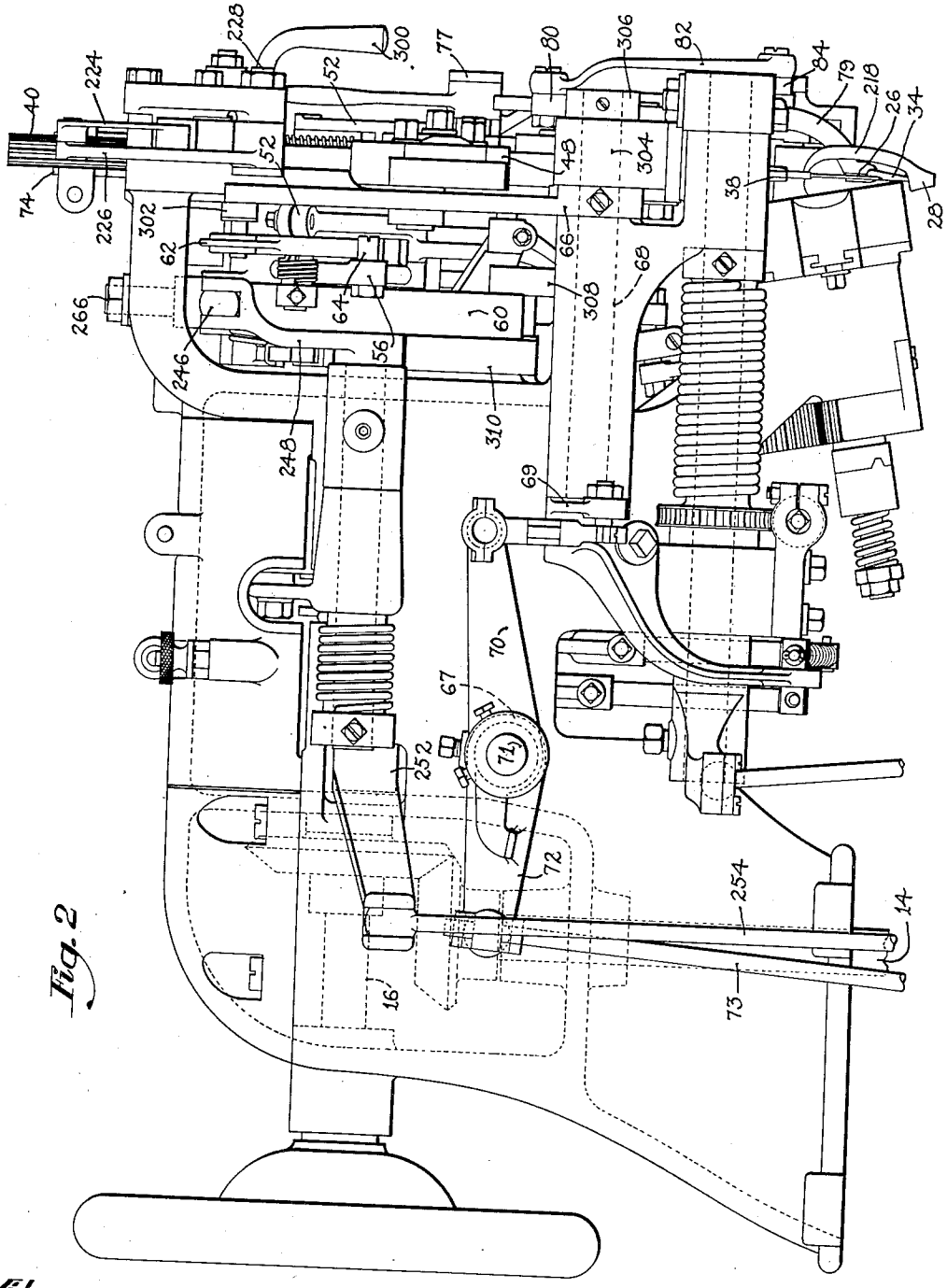

Fig. 2

Witness
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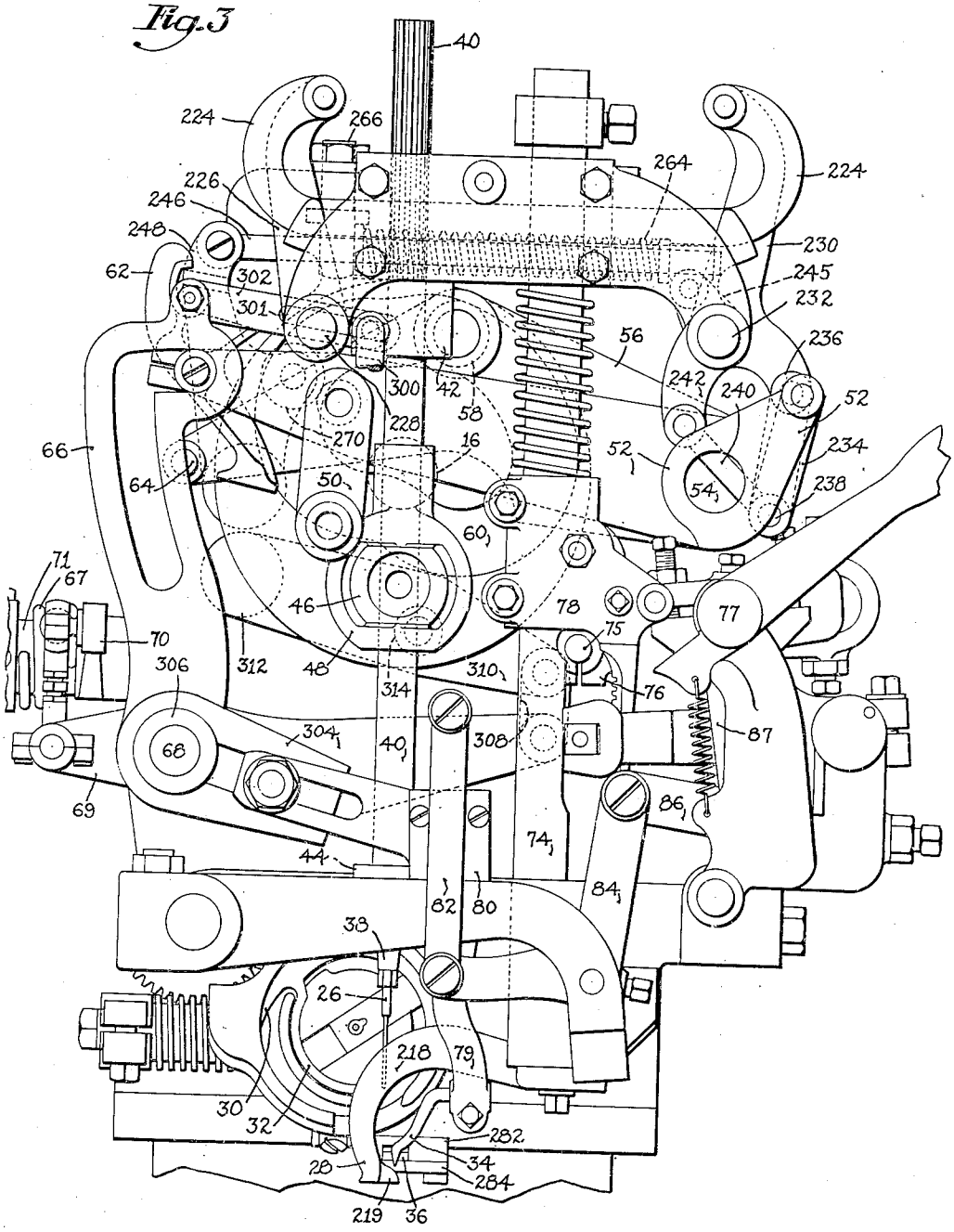
May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

Filed Aug. 14, 1936 15 Sheets-Sheet 3

Fig. 3



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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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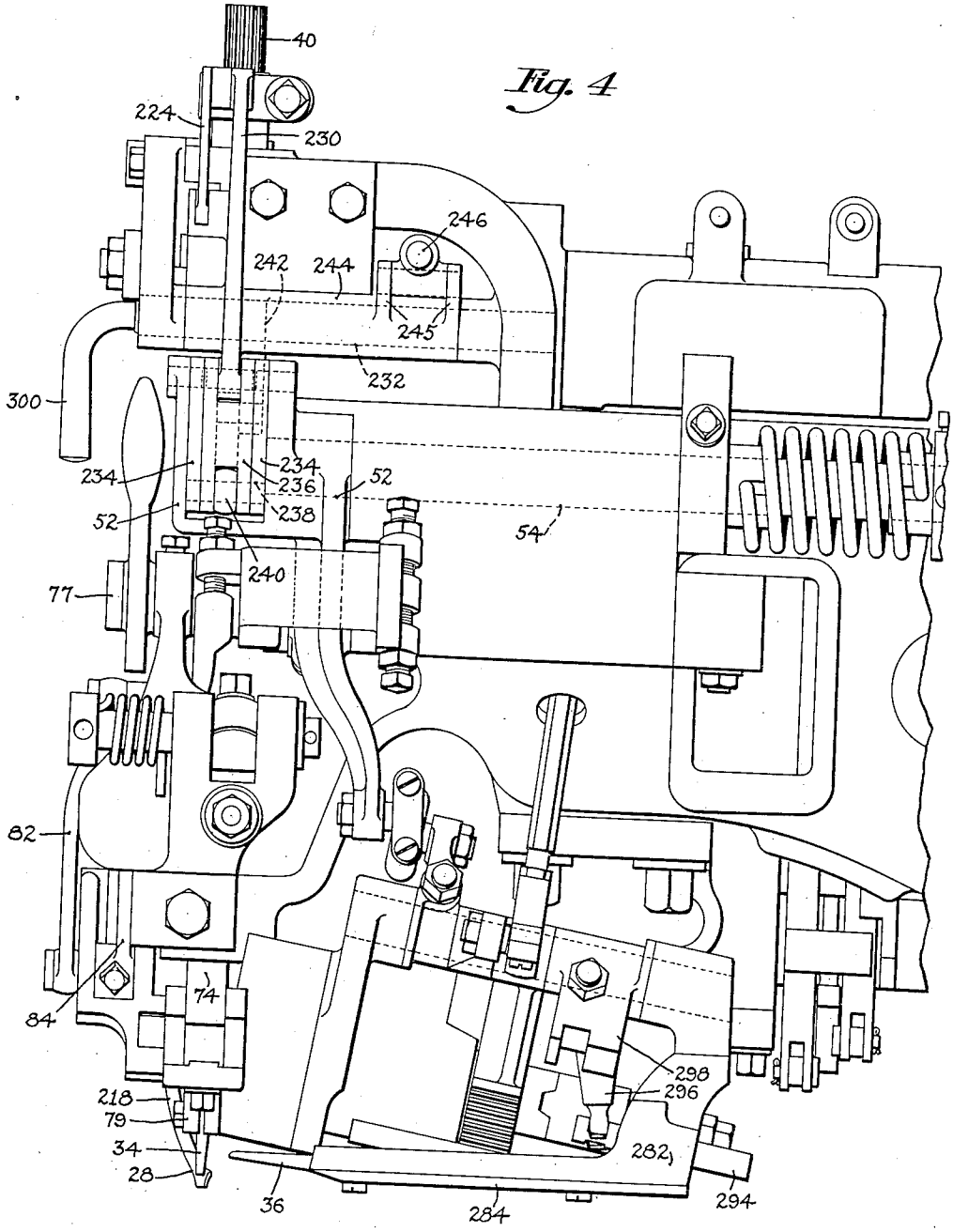
Fig. 4



Witness
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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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Fig. 5

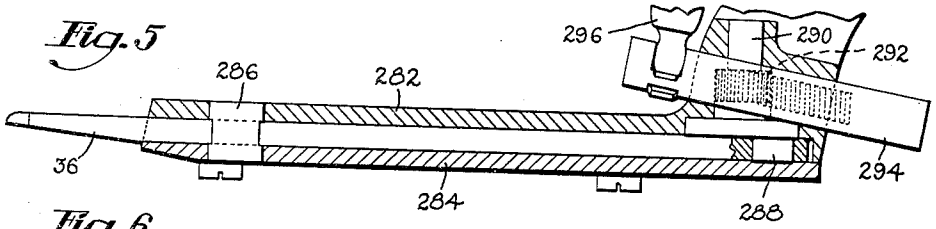


Fig. 6

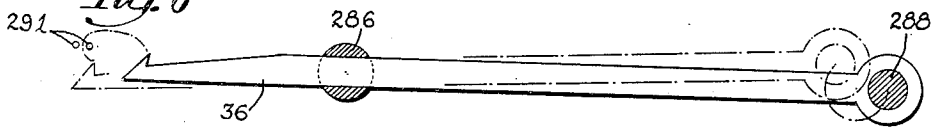
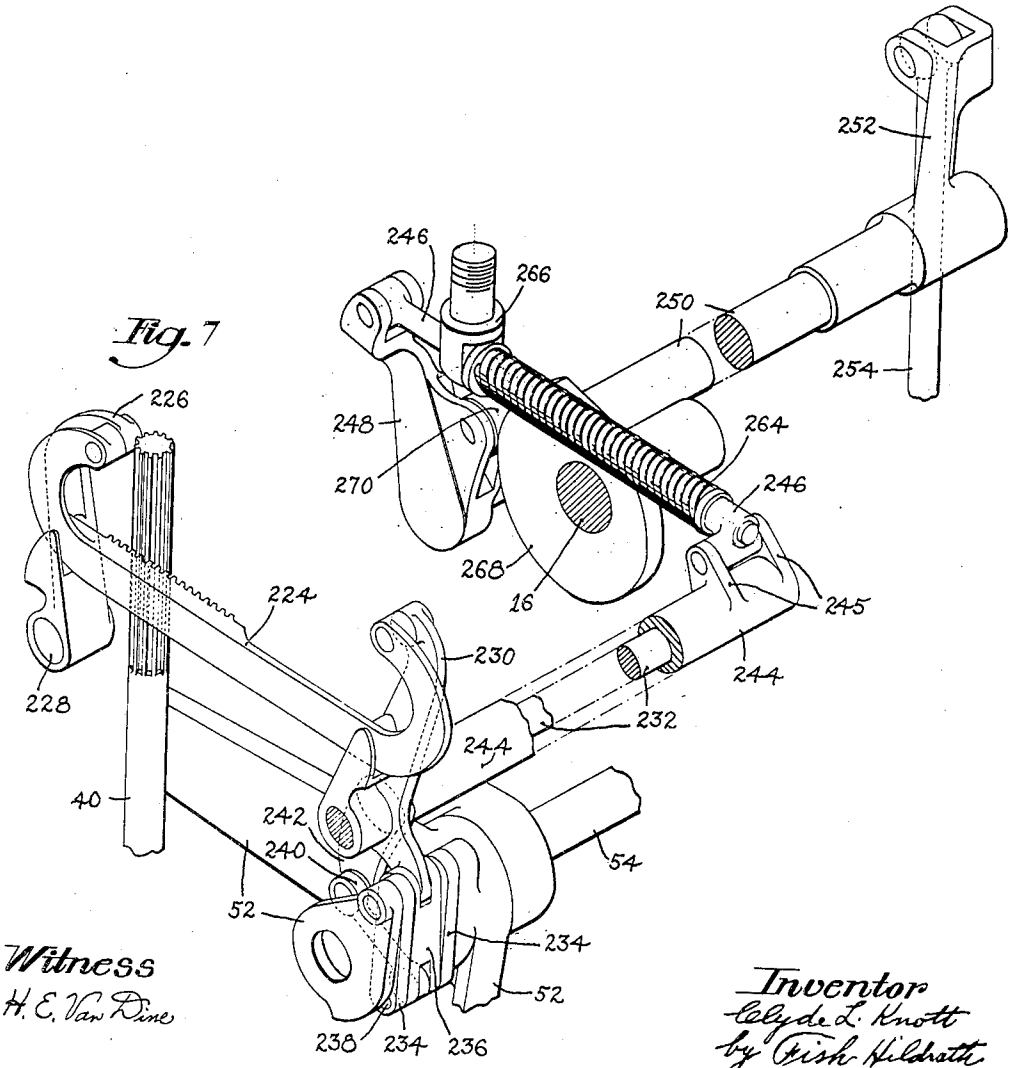


Fig. 7



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LOCK STITCH SHOE SEWING MACHINE

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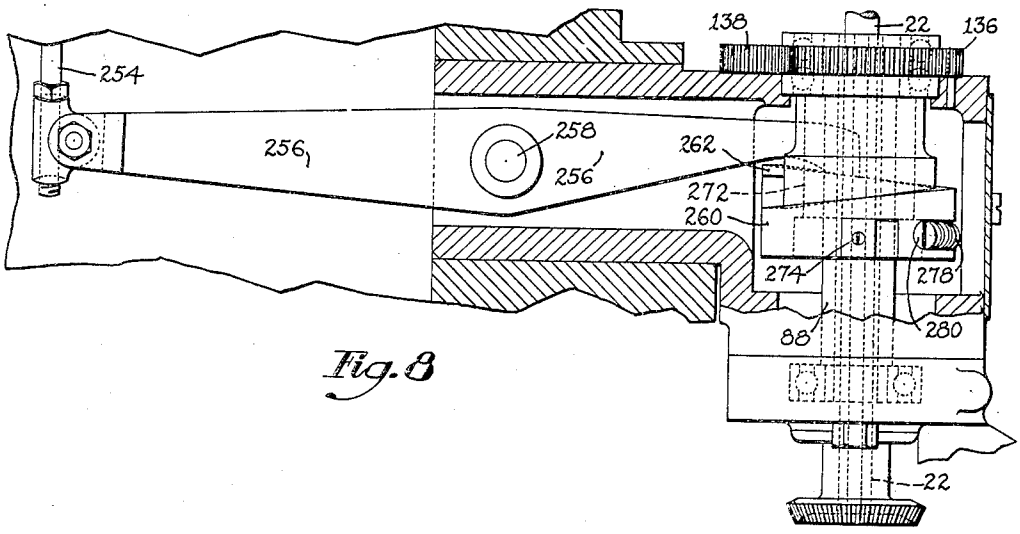


Fig. 8

Fig. 9

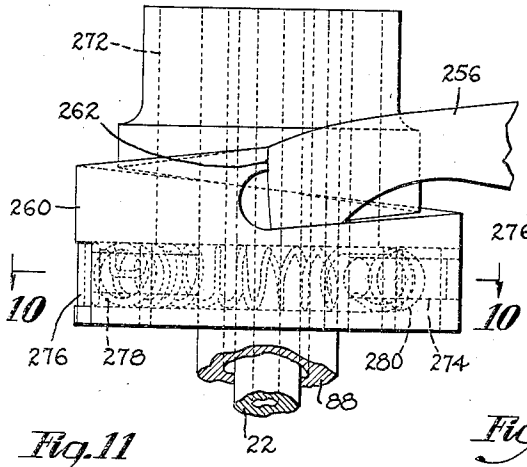


Fig. 10

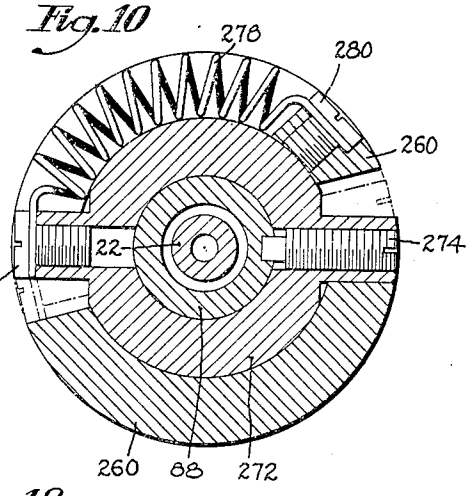


Fig. 11

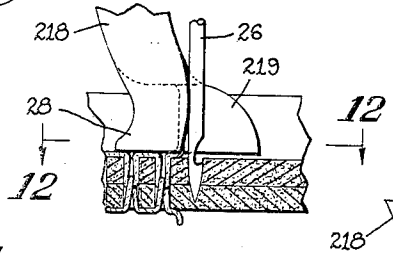


Fig. 12

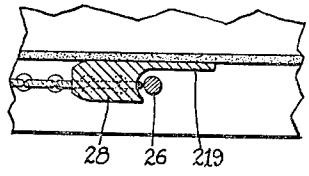
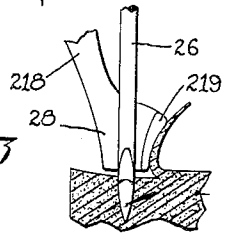


Fig. 13



Witness
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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

Filed Aug. 14, 1936 15 Sheets-Sheet 7

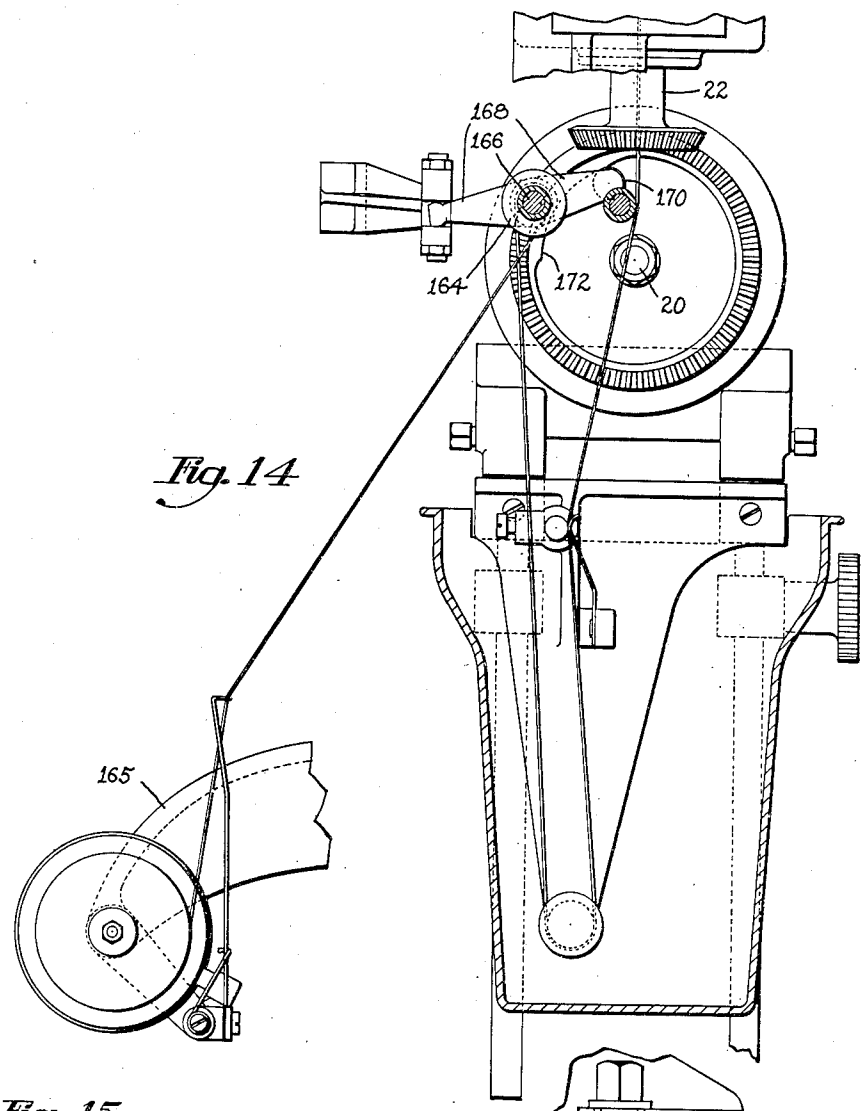

Fig. 14

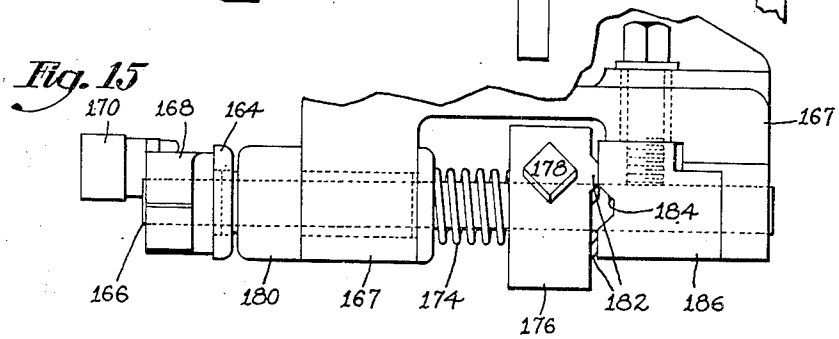

Fig. 15

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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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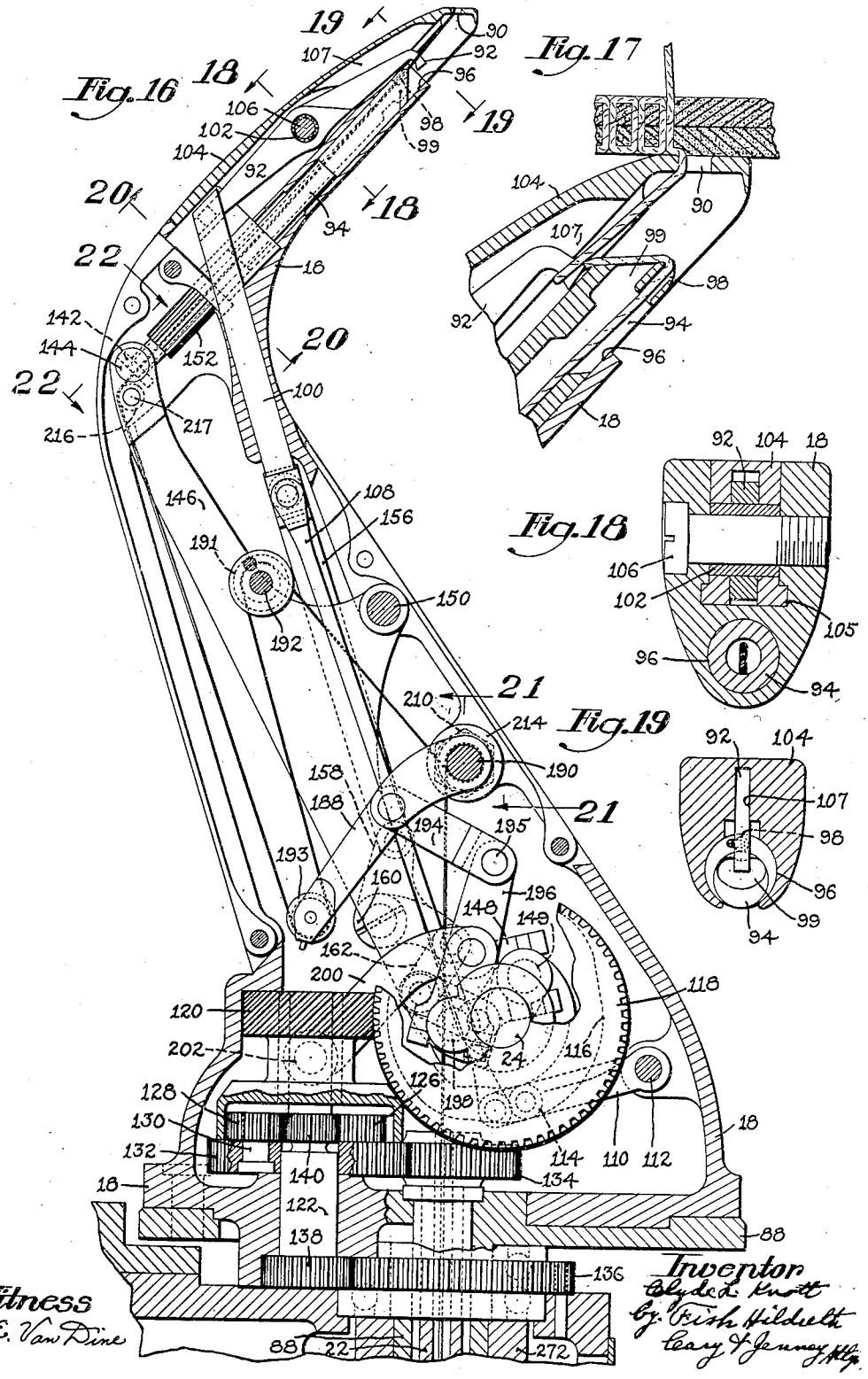

May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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Fig. 20

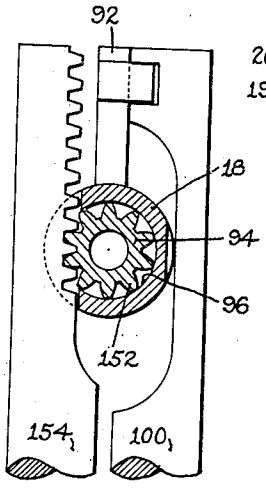


Fig. 21

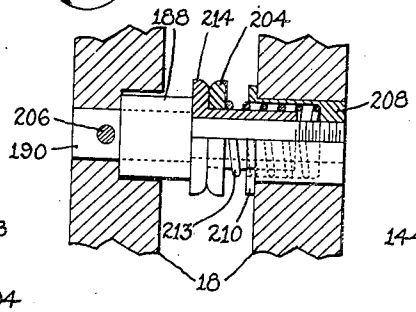


Fig. 22

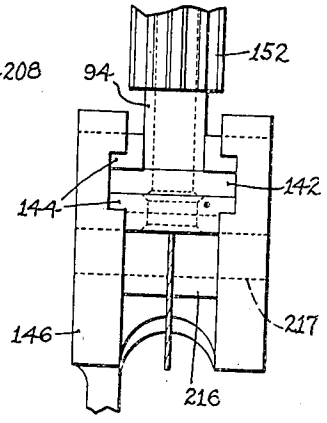
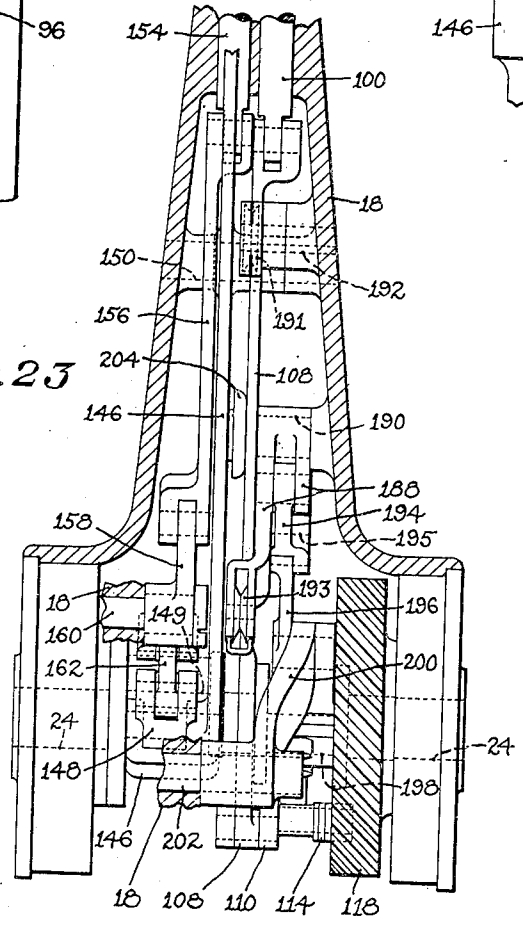


Fig. 23



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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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Fig. 24

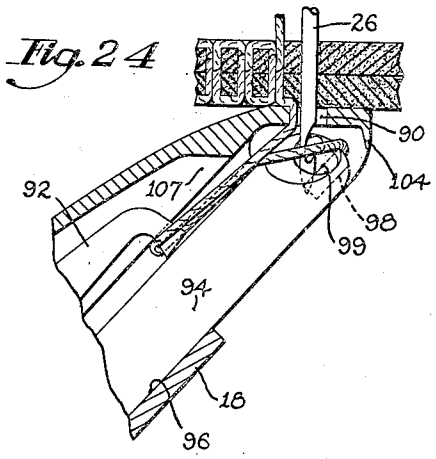
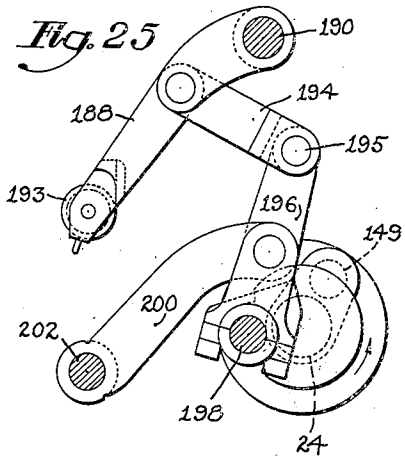


Fig. 25



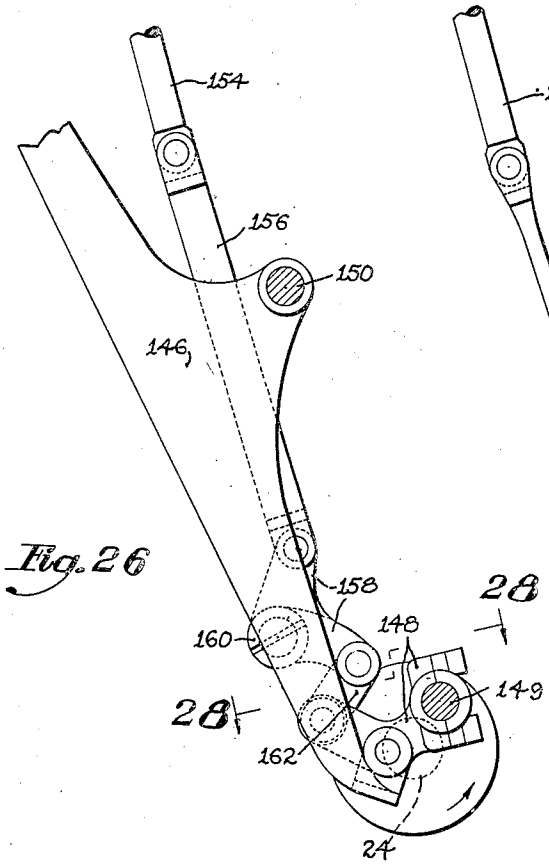
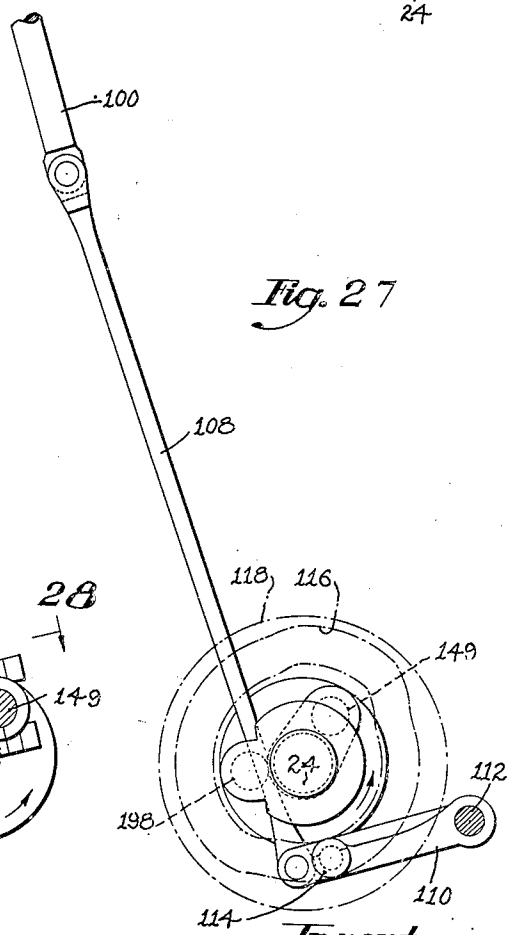


Fig. 26

Fig. 27



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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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Fig. 28

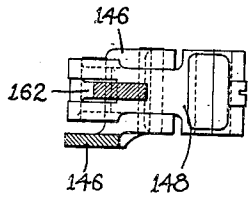

Fig. 29

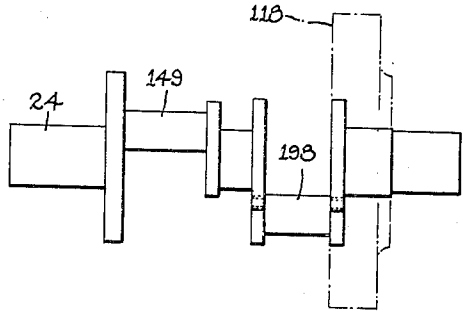

Fig. 30

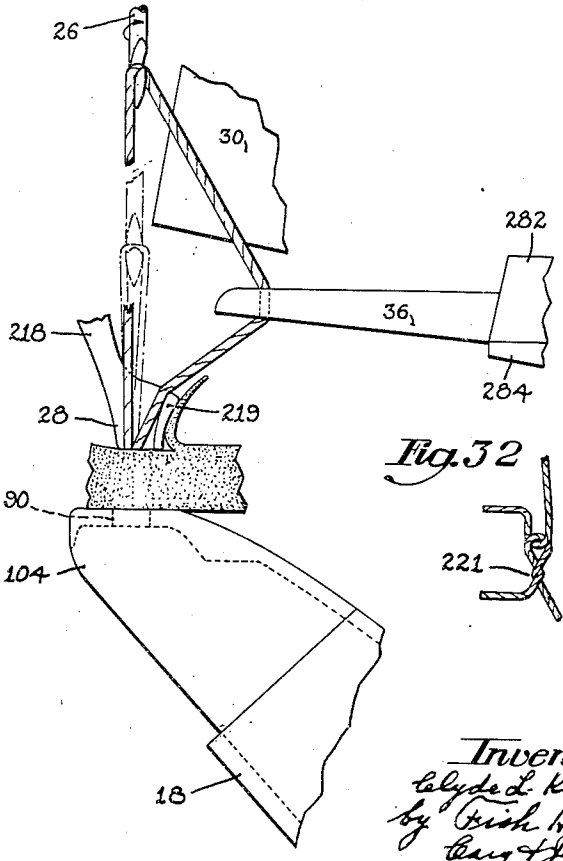

Fig. 31

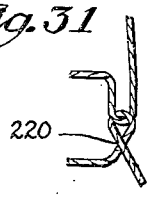

Fig. 32

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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

Filed Aug. 14, 1936 15 Sheets-Sheet 12

Fig. 33

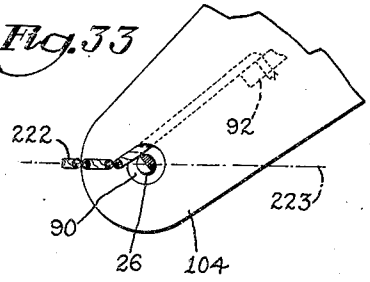


Fig. 34

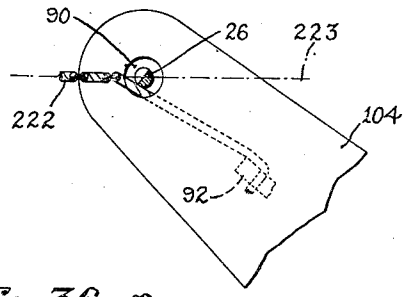


Fig. 35

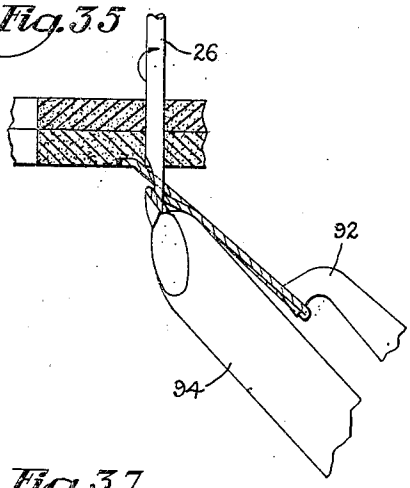


Fig. 36

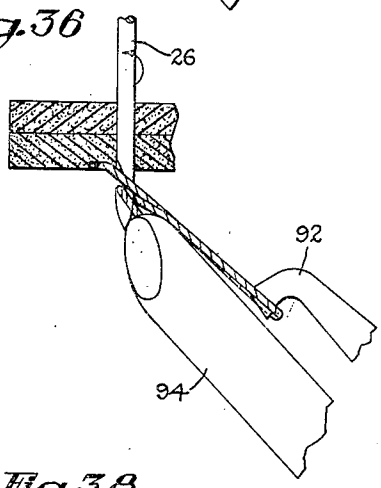


Fig. 37

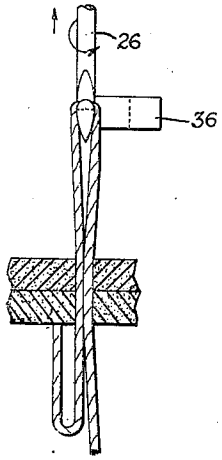
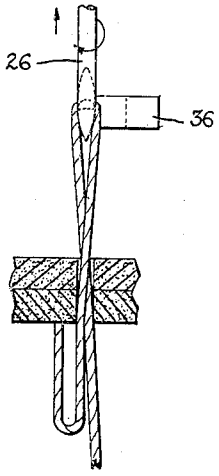


Fig. 38



Witness
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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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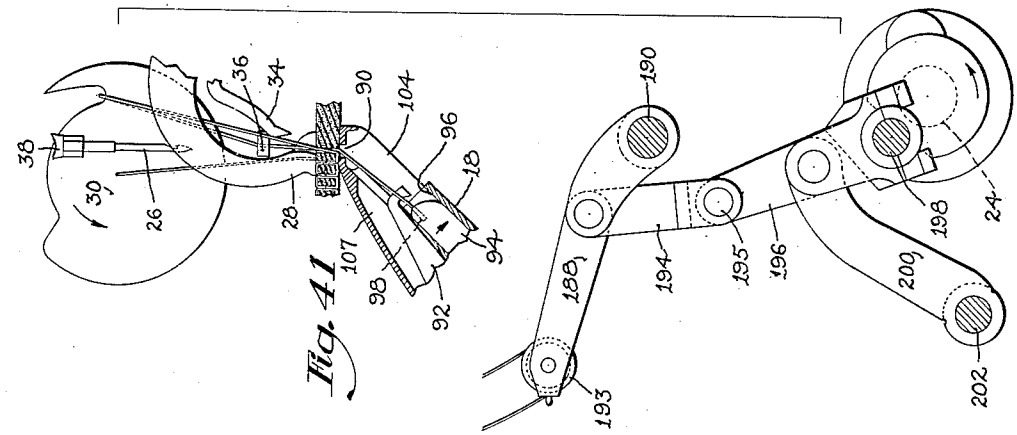

Fig. 41

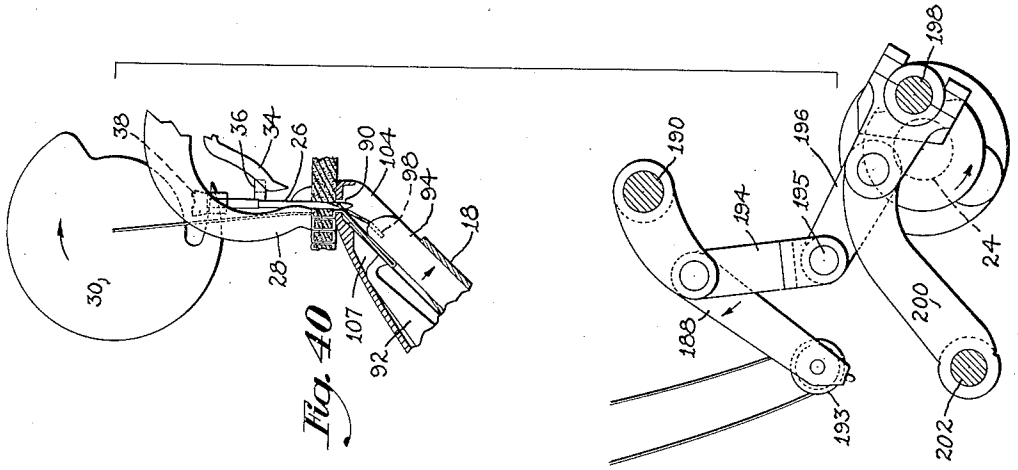

Fig. 40

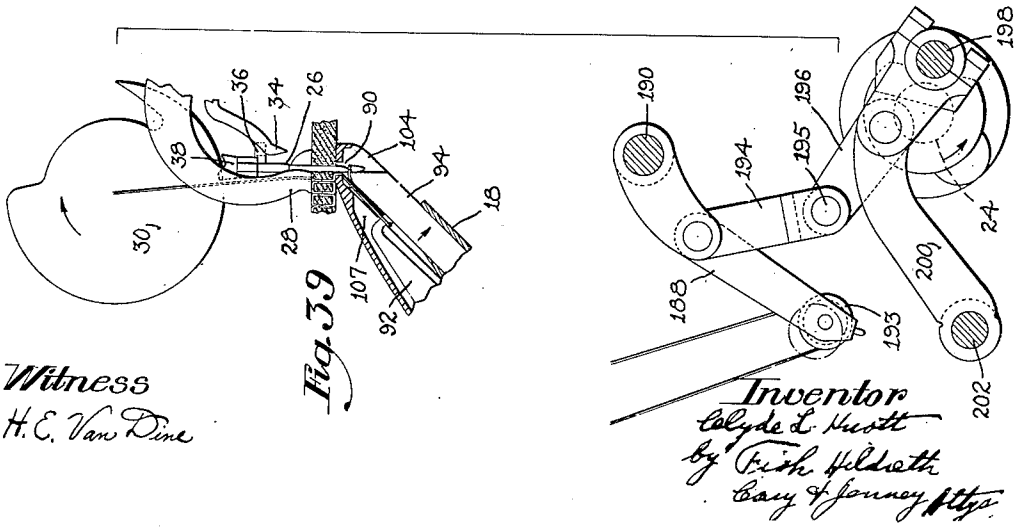

Fig. 39

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LOCK STITCH SHOE SEWING MACHINE

Filed Aug. 14, 1936 15 Sheets-Sheet 14

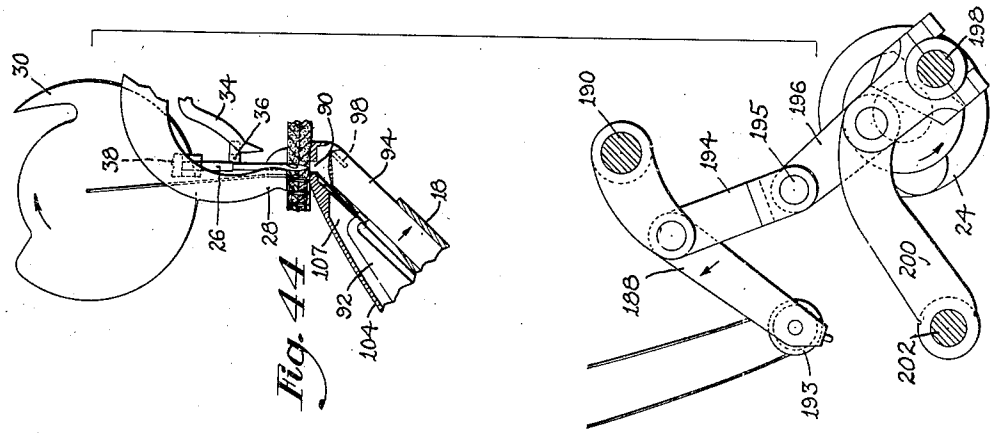

Fig. 44

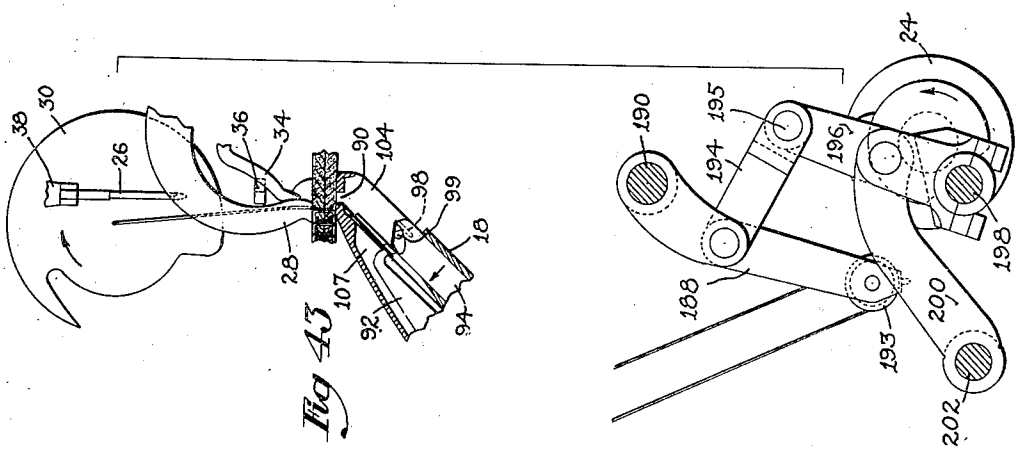

Fig 43

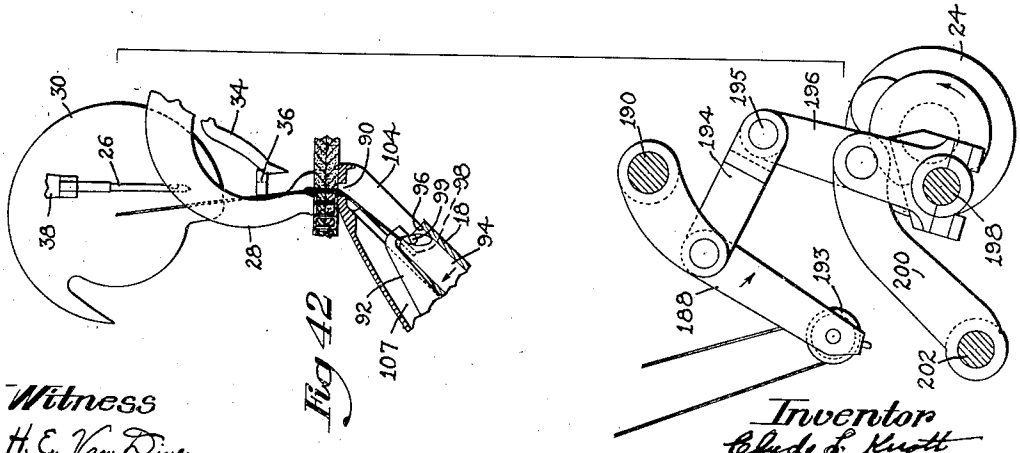

Fig 42

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May 23, 1939. C. L. KNOTT 2,159,166

LOCK STITCH SHOE SEWING MACHINE

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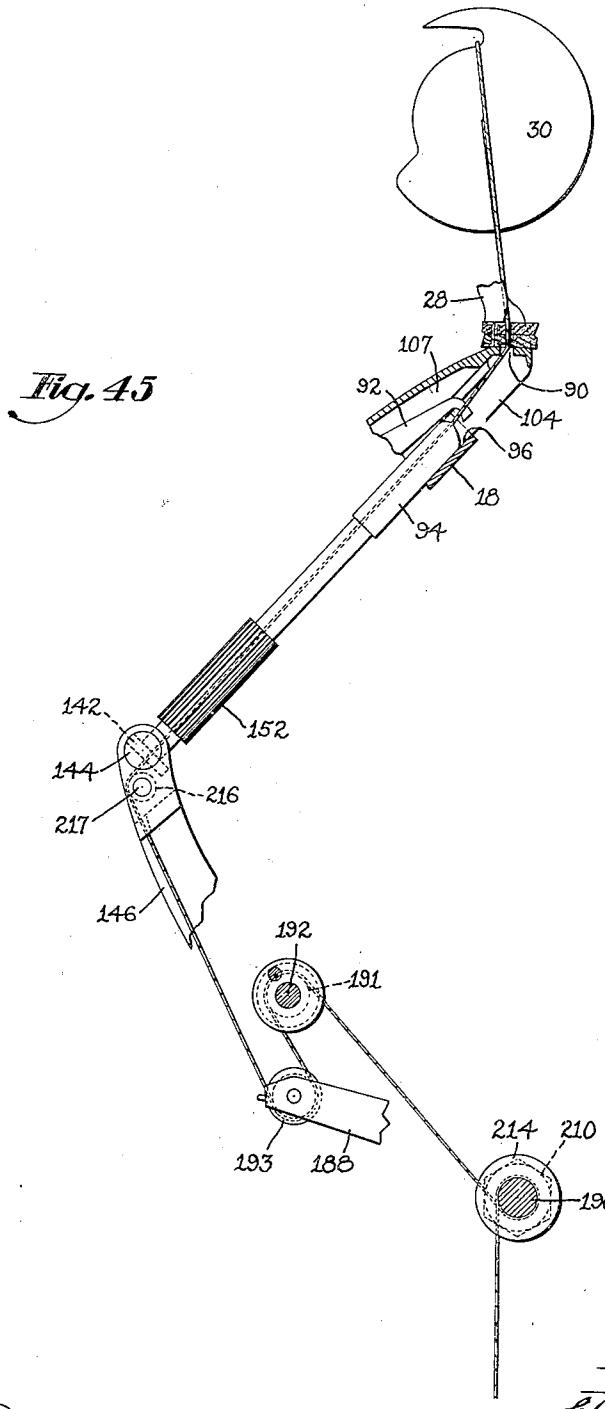
Fig. 45



Witness
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Patented May 23, 1939

2,159,166

UNITED STATES PATENT OFFICE

2,159,166

LOCK STITCH SHOE SEWING MACHINE

Clyde L. Knott, Beverly, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Application August 14, 1936, Serial No. 96,005

58 Claims. (Cl. 112—36)

The present invention relates to improvements in shoe sewing machines of the McKay type which employ a straight hook needle and a rotatable shoe supporting horn, and is intended more particularly as an improvement in a shoe sewing machine similar to that illustrated and described in U. S. Letters Patent No. 2,094,030 of Laurence E. Topham dated September 28, 1937, the rotatable horn of which is provided with a thread finger for measuring a length of thread between the work and the needle during each stitching cycle to insure that the threaded needle may pass easily through the work without causing the thread to slide through the needle hook. However, certain features of the invention are of more general application and may be employed to advantage in sewing machines other than those of the straight needle or McKay types.

The objects of the invention are generally to simplify the construction and improve the mode of operation of McKay type shoe sewing machines so that sewing may be effected more uniformly and with greater reliability at high speeds than heretofore. In order to sew close to the inner surfaces of the upper in shoes having small pointed toes, it is necessary to use a horn of as small outside dimensions as possible. A more definite object of the invention, therefore, is to provide a McKay type shoe sewing machine having a needle looper and thread finger so arranged as to operate effectively within the confines of the rotatable shoe supporting horn, the tip portion of which compares in size with or is even smaller than that of previous machines without a thread finger.

With these objects in view, an important feature of the present invention contemplates the provision in a McKay type shoe sewing machine having a rotatable shoe supporting horn and a thread finger in the horn, of a needle looper movable between looping position at the tip of the horn and the thread finger to carry the thread about the thread finger before the needle is looped. In the illustrated embodiment of this feature of the invention, the looper is given a movement towards and from the horn tip, and the thread is engaged with the thread finger at one end of the movement of the looper and is laid in the needle hook at the other end of the movement. To accomplish this result, as hereinafter described, the looper is rotated at each end of its movement towards and from the horn tip, about an axis extending in the direction of the movement, first in one direction to carry the thread about the thread finger, and then in the other direction to lay the thread in the needle hook. By this construction a looper of extremely small dimensions at its thread engaging portion may be employed while the advantages of mounting the thread finger at a distance from the horn tip, as in the machine of the Topham patent are retained.

The above mentioned feature of the invention is embodied in a McKay type sewing machine, the horn of which has a looper actuating mechanism comprising a single crank driven member so connected that the component motions of rotation in different directions impart, respectively, the rotating movement to the looper and the movement towards and from the tip of the horn. In the illustrated form of this feature of the invention, two separate trains of connections between the looper and the crank driven member are provided, one for each movement.

To shorten the length of thread operated upon by the take-up, in certain previous McKay type sewing machines, the take-up is mounted as close as possible to the work, directly on the rotating horn. To operate the take-up, reciprocating connections are provided extending between the horn and the stationary frame of the machine. The weight of these connections so increases the vibration and wear that proper operation is difficult, if not impossible, at the high speeds desired in present stitching practice. Accordingly, in the machine of the present invention, a continuously rotating drive shaft is provided in the horn so that the connections between the take-up and the drive shaft may be shortened and simplified. To insure exactly the correct relation of timing in the movements of the take-up and the looper, the take-up actuating shaft also carries the looper actuating member.

In McKay type shoe sewing machines in which there is a thread measuring finger mounted in the horn, it has heretofore been impossible to form a seam with uniform stitches throughout its length due to difficulty in looping the needle always in the same relation as the horn is rotated. The presence of a thread finger in the horn prevents the thread from being effectively laid in the hook of the needle until the thread extending from the thread finger is wound about the needle through an angle great enough to draw the thread into the open needle hook. Since the position of the thread finger is changed with the rotation of the horn, the angle through which the looper must wind the thread about the needle is changed correspondingly. After the threaded needle is withdrawn from the work, the sides of

the loop supported by the needle will be twisted about each other to an extent equal to the angle through which the horn is rotated and in certain positions of the horn a 180 degree or even greater twist in the needle loop will result. A stitch formed with a needle loop thus twisted will be irregular and will not be pulled into the work securely. A feature of the present invention, therefore, contemplates the provision of mechanism in a McKay type sewing machine for turning the needle about its lengthwise axis, such that after being looped the needle is turned in the proper direction to prevent stitches being formed with threads twisted regardless of the angular position of the horn. As herein disclosed, this feature of the invention consists in mechanism for turning the needle in one direction when the horn occupies a position with the thread finger at one side of the line of feed, and in the reverse direction with the thread finger at the other side of the line of feed. With this arrangement, when the needle hook is in a neutral position facing in the line of feed, no turning movement is imparted since no twisting of the loop takes place.

According to another feature of the invention, there is provided a novel, improved and simplified mechanism for turning the needle which, while well adapted for turning the needle in the manner just indicated, is not limited to operation in the exact manner referred to, but is useful in turning the needle of a straight needle sewing machine for other purposes and in other relations to the horn or to other parts of the machine during each sewing cycle. As herein illustrated and described, the needle turning mechanism comprises a cam connected to the horn having a surface of gradual pitch with an abruptly inclined portion between the extreme high and low points of the surface and, in order to prevent the cam follower cooperating with the cam from affecting free rotation of the horn, the follower is raised from the cam surface during each stitching cycle to clear the abrupt portion. The operator, therefore, may swing the horn without any perceptible resistance through the angle including this abrupt portion, while the follower moves first from the low point and then to the high point of the cam surface.

In addition to the features above referred to, other features of the invention relate to a loop spreader of improved construction and operation, a novel and improved presser foot arranged to increase the visibility at the point of operation of the stitch forming devices on the work, and the devices, combinations and arrangements of parts hereinafter described and claimed.

The several features of the present invention and the advantages obtained thereby will be readily understood by those skilled in the art from the following description taken in connection with the accompanying drawings which illustrate an embodiment of the invention.

In the drawings Fig. 1 is a view in side elevation of a complete machine embodying the features of the present invention; Fig. 2 is a view in side elevation, on an enlarged scale, of the sewing head of the machine, looking from the left; Fig. 3 is a view in front elevation of the sewing head; Fig. 4 is a view in side elevation of a portion of the sewing head on a slightly larger scale, looking from the right; Fig. 5 is a view in right side elevation, and partly in section of the loop spreader and a portion of its actuating mechanism; Fig. 6 is a plan view of the loop spreader, indicating its path of movement; Fig. 7 is a perspective view of a portion of the needle turning mechanism; Fig. 8 is a view in right side elevation partly in section on a further enlarged scale of a portion of the needle turning mechanism of the machine; Fig. 9 is a detail view in elevation on a still further enlarged scale of a part of the mechanism shown in Fig. 8, looking from the opposite side of the machine; Fig. 10 is a sectional plan view taken along the line **10—10** of Fig. 9; Fig. 11 is a view illustrating the relation of the needle and presser-foot on the work as seen from the front of the machine; Fig. 12 is a sectional view, taken along the line **12—12** of Fig. 11; Fig. 13 is a view of the presser-foot and needle in operating relation with the work, looking from the right; Fig. 14 is a view in front elevation, partly in section, showing the main needle thread tension and supply, of the machine shown in Fig. 1; Fig.15 is a detail view of the needle thread tension and its operating mechanism on an enlarged scale; Fig. 16 is a view in vertical section on an enlarged scale of the shoe supporting horn illustrating the mechanism therein; Fig. 17 is a view on a still larger scale of the tip portion of the horn indicating the position of the parts just after the needle thread is carried about the thread finger; Fig. 18 is a sectional view of the horn on a further enlarged scale, taken along the line **18—18** of Fig. 16; Fig. 19 is a similar view taken along the line **19—19** of Fig. 16; Fig. 20 is a detail view of a portion of the looper and thread finger actuating connections shown partly in section as viewed along the line **20—20** of Fig. 16; Fig. 21 is a detail sectional view of a thread tension device, taken along the line **21—21** of Fig. 16; Fig. 22 is a detail view of a portion of the looper actuating connections as seen from the line **22—22** of Fig. 16; Fig. 23 is a partial sectional view of the parts at the lower portion of the horn; Fig. 24 is a view of the horn tip similar to Fig. 17 with the parts shown in positions just as the needle is being looped; Fig. 25 is a view of the take-up and its actuating mechanism; Fig. 26 is a view of a portion of the looper actuating mechanism; Fig. 27 is a view of a portion of the thread finger actuating mechanism; Fig. 28 is a sectional view of the pitman and connections for actuating the looper, taken along the line **28—28** of Fig. 26; Fig. 29 is a detail view of the looper and thread finger actuating crank shaft; Fig. 30 is a detail view illustrating the positions of the needle just before the needle loop is spread, and just before the loop is lifted from the needle hook, respectively; Figs. 31 and 32 are sectional views of portions of a seam illustrating irregular forms of stitches; Figs. 33 and 34 are detail plan views illustrating the relative positions of the thread and the needle when the horn is rotated; Figs. 35 and 36 are detail views in elevation illustrating the relation of the looper and thread while the needle is being looped and while the horn is in the positions shown in Figs. 33 and 34, respectively; Figs. 37 and 38 are detail views in elevation, illustrating the manner of untwisting the needle loop while the needle moves upwardly; Figs. 39 to 44 inclusive are detail views illustrating successive positions of certain of the stitch forming devices during a complete cycle of operation of the machine; and Fig. 45 is a further detail view indicating the path taken by the thread within the horn while the needle loop is passing over the shuttle.

The machine illustrated in the drawings is a lockstitch McKay type shoe sewing machine similar in many respects to that disclosed in the U. S.

patents to Ashworth No. 1,914,936 dated June 20, 1933, and to Leveque No. 1,885,927 dated November 1, 1932. Many of the parts and mechanisms of the machine herein disclosed as embodying the several features of the present invention are the same as those described more in detail in the above mentioned application and patents, and therefore will be referred to only briefly in the following description.

The illustrated machine is driven from an electrical motor 2 through a clutch mechanism 4 controlled from a foot treadle 6 which is normally held in raised position by means of a spring 8. The clutch mechanism acts to connect and disconnect the motor with the shaft 10 and with a sleeve 12 in the base of the machine, from which shaft or sleeve motion is transmitted to a vertical shaft 14 extending upwardly to the sewing head of the machine. Rotation of the shaft 14 imparts a corresponding rotation to the main sewing shaft 16 for operating the needle, shuttle and other related parts.

The rotary horn of the machine, indicated at 18, is of the usual shape common to this type of machine, and is provided with an inclined upper portion enclosing the needle threading devices. To actuate the needle threading devices, the shaft 14 is connected through suitable gears to a horizontal shaft 20 and a hollow vertical shaft 22 mounted for rotation concentrically with the rotary axis of the horn is similarly connected to the shaft 20. The vertical shaft 22 extends from its bearings in the frame of the machine upwardly into the horn where it acts to drive a continuously rotating horizontal shaft 24 from the rotation of which suitable movements are imparted to the needle threading and other devices acting on the needle thread.

The stitch forming devices in the sewing head of the machine, best shown in Figs. 2, 3, and 4, include, in addition to the straight hook needle indicated at 26, a presser-foot 28, a loop taker in the form of a shuttle 30, a bobbin thread case 32 about which the shuttle carries the needle thread, a feed point 34 and a loop spreader 35. The needle 26 is clamped in a needle holder 38 at the lower end of a needle bar 40 mounted in bearings 42 and 44 on the frame of the machine. Between the bearings 42 and 44 on the needle bar is clamped a block 46 surrounding which there is an open frame 48 loosely supported on the needle bar and connected by means of a link 50 with a needle actuating lever 52 secured to the forward end of a rock shaft 54. Loosely mounted on the rock shaft 54 near its forward end is a lever 56, the central part of which carries a cam roll 58 engaging a cam 60 secured to the forward end of the main sewing shaft 16. During sewing operations, the cam actuated lever 56 is connected to the needle actuating lever 52 and at the end of the sewing operations, the two levers are disconnected by connections including a latch 62 pivotally mounted on the lever 52 and arranged with its hook shaped lower end to engage a pin 64 at the end of the lever 56. At its upper end, the latch 62 cooperates with the upper end of a locking lever 66 secured at its lower end to a shaft 68 and arranged when the shaft is rocked in a clockwise direction to permit the levers to be connected, and when rocked in a reverse direction to disconnect the levers. On the rearward end of the shaft 68 is mounted an arm 69 connected to a lever 70 rotating on a shaft 71 and having an arm engaging a lug on an arm 72 secured to the shaft 71, the arm 72 being actuated through a rod 73 connected to the foot treadle 6. Between the lever 70 and shaft 71 there is a spring 67 (see Fig. 3) acting when the treadle is depressed to yieldingly actuate the locking lever 66 and to connect the two levers 52 and 56, as more fully illustrated and described in the Ashworth and Leveque patents above referred to.

The presser foot 28 is secured to the lower end of a vertically movable presser-foot bar 74 which is forced downwardly against the work by suitable springs and is raised by mechanism including a pin 75 extending from an arm 76 secured to a cam actuated shaft 77 and other devices attached to a bracket 78 slidable on the presser-foot bar for causing the pin 75 to raise the presser-foot a uniform amount regardless of the thickness of the work during each stitch forming cycle.

The feed point 34 is clamped in a carrier 79 slidably mounted for vertical movement towards and from the work in a guide frame 80 which is pivotally mounted on the machine frame. To raise and lower the feed point from the work, the upper end of the feed point carrier is connected by a link 82 with a bell crank 84. The bell crank 84 is connected through a link 86 with an arm 87 also secured to the shaft 77 so that the feed point will engage the work when the work is released from the pressure of the presser-foot.

The rotary horn 18 is provided at its lower end with a hollow spindle 88 (see Figs. 8 and 16) of the usual form supported in suitable bearings on which the horn may be rotated without limitation in either direction in the machine frame. At the upper end of the horn there is provided a needle opening 90, the center of which coincides with the axis of rotation of the spindle 88. As in the machine of the Topham patent, the upper end of the horn in the present machine is provided with a hook shaped thread finger 92, hereinafter more fully described, mounted with its thread engaging portion at a distance from the horn tip for holding a bight of thread at one side of the needle opening. The needle looper of the Topham machine is given a simple reciprocating movement towards and from the tip of the horn and is forked at its upper end to surround the needle in laying the thread in the needle hook. In that machine, the thread finger is actuated across the path of thread extending from the work to measure a length sufficient to insure that the thread will not slide through the hook of the needle as the threaded needle passes through the material of the work. In addition to the thread measuring movement of the thread finger in the Topham machine, the thread finger is also actuated at right angles to its measuring movement to release the thread as the threaded needle passes through the work.

An important feature of the present invention consists in so arranging the needle looper and thread finger in the tip of the horn that the measurement and engagement of the thread with the thread finger are accomplished entirely by the operation of the looper, the only movement given the thread finger being to release the measured thread at the proper time. The looper, as indicated at 94 in Figs. 16 to 19 inclusive, and 24 consists of an elongated hollow rod slidably and rotatably mounted within a bearing or guideway 96 formed in the inclined upper part of the horn. The bearing 96 extends parallel to the upper part of the horn so that the center line of the bearing intersects the longitudinal axis of the needle and the coincident rotary axis of the horn at an acute angle. The upper thread engaging end of the

needle looper is formed with an eccentrically arranged thread guiding eye 98 into which the thread is carried after passing through the looper. The edge of the looper opposite the eye 98 is bevelled to provide a surface forming an angle with the center line of the guideway 96 such that when the looper is in its uppermost position, the thread will lie substantially parallel to the work engaging surface of the horn. When the looper is in this position, the needle is surrounded by the hollow end of the looper which is provided with a recess 99 of sufficient size to clear the point of the needle. As the looper is rotated from this position, it is also retracted slightly so as to move the upper edge of the thread eye in substantially a horizontal plane.

To lay the thread in the needle hook, the looper is raised into its highest position and rotated from the angular position, shown in Fig. 24, to the position shown in Fig. 35, thus winding the thread through a bend of substantially 180 degrees about the needle before the needle is retracted from the horn. To present the needle properly to the looper the needle is turned about its longitudinal axis from an angular position at the upper end of its stroke which is fixed with respect to the line of feed to an angular position at the lower end of its stroke, which is fixed with respect to the horn. An advantage of the present looper is that it will act to thread the needle with certainty even if the angular positions to which the needle hook is turned vary considerably, the adjustment of the needle and its actuating needle mechanism being less critical than in the Topham machine.

After winding the thread about the needle, the tension on the thread is increased in a manner more fully described hereinafter, causing the thread to be pulled securely within the hook of the needle. To reinforce the needle when this added tension is applied to the thread, the angular end surfaces of the looper are so arranged that when the looper is rotated, after winding the thread about the needle, the end surfaces engage the needle at the rear of the open needle hook, as shown in Fig. 39.

After looping the needle, the looper is moved away from the tip of the horn until the stitch being formed is set. When the stitch is set, the looper reaches a position in which the thread extending between the thread eye 98 and the work passes at one side without engaging the upper end of the thread finger 92 so as to slide freely past the thread finger in either direction. The needle looper 94 is then rotated in a clockwise direction, as viewed from above (see Fig. 19) to carry the thread beneath the hooked end of the thread finger, as illustrated in Fig. 17. Thereafter, the looper is again moved towards the tip of the horn ready to loop the needle at the end of its next work penetrating stroke, thus forming a bight of thread about the thread finger. After the needle is looped, a single movement only is required of the thread finger to release the bight as the needle begins its upward stroke. The space required by the thread finger is thus much less than in the machine of the Topham patent, in which the thread finger is also moved across the looper to properly engage the thread therewith before the bight is formed. As a result of this construction, the dimensions of the upper end of the horn surrounding the thread finger of the present machine may be made smaller without affecting reliability in sewing.

The thread finger 92 consists of a lever, the hooked end of which is spaced a suitable distance from the needle opening 90 and the lower end of which is formed with an offset portion arranged to be engaged by the slotted upper end of a vertically sliding actuating bar 100. The thread finger lever 92 is fulcrumed on a short sleeve 102 fitted in a passage within a removable tip piece 104 slidably mounted in a guideway 105 at the upper inclined end of the horn. The guideway for the tip piece 104 is so arranged that as the tip piece is slipped into place the lower offset end of the thread finger 92 will slide within the slotted upper end of the actuating bar 100, the slotted sides of the upper end of the rod extending in substantially the same direction as the sides of the guideway 105 for the tip piece. To secure the tip piece in place, a threaded stud 106 passes through one side of the guideway in the upper portion of the horn, through the sleeve 102 and into threaded engagement with an opening in the other side of the guideway.

When the looper is in its lowermost position, shown in Fig. 16, the hooked end of the thread finger 92 extends over the end of the looper so that when the looper is rotated, the thread finger will pick up and form a bight in the thread. As the looper starts moving upwardly towards the tip of the horn, the hooked end of the thread finger is raised slightly to clear the looper without releasing the thread bight (see Fig. 17). After the needle has been looped, the thread bight is finally released from the thread finger by raising the hooked end of the thread finger still further until the side edges of a slot 107 within which the upper part of the thread finger moves brushes the bight of thread therefrom.

To actuate the thread finger, the sliding bar 100 is pivotally connected, as shown in Figs. 16, 23 and 27 with one end of a link 108, the other end of which is pivotally connected with a lever 110 fulcrumed on a stud 112 mounted in the lower part of the horn. The lever 110 carries a cam roll 114 engaging a cam slot 116 formed in one side of a helical gear wheel 118 secured to the horizontal shaft 24. The teeth of the wheel 118 mesh with corresponding teeth on a gear 120 formed at the upper end of a hub rotatably mounted on a vertical shaft 122 supported by the horn. The lower end of the hub of gear 120 is dished and provided with internal gear teeth 126 meshing with a planetary gear 128 rotatable on a stud 130 eccentrically mounted on a spur gear 132. The gear 132 is rotatable about the central part of the shaft 122 and engages a similar gear 134 secured to the upper end of the shaft 22.

To prevent rotation of the horn about its bearings from changing the angular position of the shaft 24, a differential system of gearing is provided comprising a ring gear 136 secured to the machine frame and a spur gear 138 with which the gear 136 meshes, attached to the lower end of the shaft 122. The shaft 122 is provided just above the gear 132 with a gear 140 which engages the planetary gear 128. This system of gearing causes the planetary gear 128 to revolve about the shaft 122 when the horn is held stationary. When the horn is rotated, the gear 132 will change its relation to the gear 134. The position of the gear 140, however, will also change when the horn is turned, thereby causing the helical gear 120 which is driven by the difference in rotation between the gear 132 and the gear 140 to be maintained in its proper rotative position with respect to the horn.

When a rotary needle threading whirl and its driving mechanism, such as employed in the horn of the machine of the Ashworth or Leveque patents, becomes jammed with thread, or the resistance to its rotation increases from insufficient lubrication, the horn of the machine may be thrown suddenly into rotation on its spindle so as to jerk the shoe being operated upon out of the grasp of the operator. Not only is the operator likely to be injured, but damage to the shoe being sewed or to parts of the machine other than the looper may thus result. With the present system of differential gearing, the driving force of the gear 134 on the gear 132 tending to rotate the horn, is exactly equal and opposite to force of the gear 138 on the fixed ring gear 136, so that there is no tendency for the horn to rotate, regardless of the frictional or other driving resistances in the driving mechanism. The driving mechanism for the looper and the takeup may actually be broken with this arrangement without causing rotation to be imparted to the horn.

The mechanism for actuating the looper towards and from the tip of the horn comprises a swivel in the form of a washer shaped member 142 (see Fig. 22) at the lower end of the looper 94 and a cylindrical block 144 having a diametrically cut T-shaped slot within which the end of the looper and the washer member 142 slide. Supporting the swivel is a lever 146, the upper end of which is forked and forms a bearing for the cylindrical block 144. The lower end of the lever 146 is connected to a pitman 148 (see Fig. 26) carried by a crank 149 on the shaft 24. The lever 146 is fulcrumed on a horizontal shaft 150 and is so arranged that when the shaft 24 is rotated the horizontal component of rotary motion of the crank 149 causes the looper to reciprocate from a looping position to a position where the thread eye 98 passes beneath the hooked end of the thread finger.

The mechanism for rotating the looper is also actuated from the pitman 148, but through a separate train of connections between the looper and the pitman. This mechanism comprises elongated gear teeth 152 on the lower end of the looper 94 engaging rack teeth on a rod 154 (see Figs. 20 and 26) slidingly mounted in a suitable guideway in the horn, a link 156 connected between the lower end of the rack rod 154 and one arm of a bell crank 158 fulcrumed on a screw stud 160 carried by the horn and a link 162 connecting the other arm of the bell crank with an angularly disposed arm of the pitman 148. The connections of the bell crank 158 and the pitman 148 are such that the vertical component of rotary motion causes the looper to be rotated in one direction while looping the needle and in the reverse direction while carrying the thread about the thread finger. The looper reciprocating and rotating connections actuate the looper through a regular sequence of movements to engage the thread alternately with the thread finger and with the needle.

After carrying the thread around the thread finger, the movement of the looper towards the tip of the horn causes the thread to slide rapidly through the thread eye 98 of the looper. On account of the relatively sharp angle through which the thread is bent as it leaves the thread eye, it is desirable to relieve somewhat the tension on the thread at this time. To this end beneath the hollow shaft 22 the thread passes through an intermittently actuated thread gripping device 164 (Figs. 14 and 15) against which the stitches are set. The gripping device is similar in construction to the sewing thread lock against which the stitches are set in the machine of the Topham patent, but is actuated to release the thread at a different time in the sewing cycle. The gripping device releases the thread in the present machine when the looper carries the thread around the thread finger and is held in releasing position until the looping operation of the needle is substantially completed.

The thread gripping device 164 comprises a washer supported near the forward end of the horizontal shaft 20 on a rock shaft 166 rotatable in bearings 167 in the machine frame. At the rear end of the rock shaft is secured a lever 168 having a cam roll 170 arranged to engage a cup-shaped cam 172 secured to the shaft 20. Surrounding the central part of the rock shaft 166 is a spring 174 compressed between one of the bearings 167 and a block 176 clamped by means of a set screw 178 to the rock shaft so that the spring 174 tends to press the hub of the lever 168 against the gripping washer 164 and force it against an enlarged hub 180 between which and the washer 164 the thread extending from a suitable source of supply 165 passes. The hub 180 is secured to said bearing 167 so as to hold the thread when the washer 164 is pressed against it. When the follower 170 is actuated by the cam 172, the shaft 166 is rocked and a pair of diametrically opposite projections 182 of the block 176 are raised from a pair of correspondingly shaped recesses, one of which is shown at 184, in a block 186 mounted on the frame of the machine. When in this position the shaft 166 is moved endwise and the grip on the thread released. The spring 174 is of proper size and strength to cause the gripping washer 164 to impart a stitch setting tension only to the thread, and to permit thread for a new stitch to be pulled past the washer from the supply after the stitch is set. When the grip on the thread is released during movement of the looper towards the tip of the horn, only a sufficient amount of thread is drawn past the washer to relieve the tension in the thread between the gripping device and the work.

Each stitch is set by the main take-up, indicated at 188, in Figs. 16 and 25, rotatably mounted on a shaft 190 passing through the side walls of the horn. The thread passing through the hollow shaft 22 is carried around the take-up shaft 190, about a pulley 191 rotatable on a stud 192 in the horn and about a pulley 193 at the end of the take-up. The actuating mechanism for the take-up is driven by the shaft 24 and is mounted entirely within the confines of the lower part of the horn. The take-up is connected by means of a link 194 to a pivot 195 carried by a pitman 196. The pitman 196 is mounted on a second crank portion 198 on the shaft 24. To guide the movements of the pitman 196 between the pivot 195 and the crank 198, there is connected one end of a radius arm 200, the other end of which oscillates about a pin 202 mounted in the horn frame.

To increase the tension on the thread after the thread is wound about the needle, the center of the pin 202 about which the radius arm 200 oscillates is so located that during the movement of the take-up to give up thread, there is a short reversal. When the needle begins to rise, the take-up again begins to give up thread at the proper rate while maintaining the increased ten-

sion applied to the thread during the short reversal of movement.

To prevent the thread from becoming slack within the horn, after the gripping device **164** has released the thread, the shaft **190** is surrounded by an auxiliary light tension disk **204**, best shown in Fig. 21. The shaft **190** is held in place in the horn by a pin **206** passing diametrically through the shaft at one end. The other end of the shaft is threaded and is surrounded by a hollow thimble **208** having a bearing in the horn. The thimble is provided with a central threaded opening engaging the threads on the end of the shaft and is formed at one end with a hexagonal flange **210** by means of which the thimble may be rotated. Within the thimble is received a spring **213** arranged to press the disk **204** against a collar **214**, the hub portion of which passes loosely through an opening in the disk **204**. The arrangement is such that when the thimble **208** is rotated, the force of the spring **213** may be regulated to suit the conditions, and the size of thread.

To assist the take-up **188** in maintaining an even tension on the thread, particularly during reciprocating movements of the looper towards and from the tip of the horn, the lever **146** which actuates the looper is provided at its upper end with a thread guide roll **216** (Figs. 16 and 45) rotating on a stud **217** extending between the forked portions at the upper end of the lever. The thread required by the looper in moving towards the tip of the horn after having engaged the thread with the thread finger is supplied in part by the movement of the guide roll **216** in the same direction. While setting a stitch, the looper is in its lowermost position away from the end of the horn so that the guide roll **216** assists the take-up in setting the stitch.

After the threaded needle has passed through the work and the needle loop is being carried about the thread case by the shuttle, the take-up **188** has reached the uppermost position of its movement, as shown in Fig. 45, in which position of the take-up slightly less thread is given up to the shuttle than is required to pass the needle loop thereover. As a result, the needle thread on the under surface of the work engaged by the horn between the last completed stitch and the needle hole through which the loop passes, is pulled tight, causing it to be embedded somewhat into the under surface of the work. At this time, the work is clamped against the horn by the presser-foot which engages the upper surface of the work close to the last completed stitch, thus compressing the work at this point. Compressing the work by the presser-foot causes the material of the work to grip the threads of the last stitch, thus holding them from being displaced while the pull exerted by the shuttle is acting on the thread at the under surface of the work.

The sequence of reciprocating and rotating movements imparted to the looper by its actuating mechanism will be clearly understood from an inspection of Figs. 39 to 44 inclusive which illustrate the positions of the looper, the thread finger and other thread handling devices during formation of a stitch. Starting with the position of Figure 39, the needle has just been looped by rotating the looper **94** in the direction of the arrow, and as it begins to ascend through the work, the upper end of the thread finger is raised to release the bight of thread held thereby, the take-up giving up thread simultaneously, as shown in Fig. 40. The upward movement of the take-up is continued until the needle loop is spread and engaged with the shuttle as in Figure 41, the looper having been moved into its lowermost position. After the looper is moved to its lowermost position, the upper end of the thread finger drops over the end of the looper preparatory to forming a new bight in the thread. As the needle loop is being carried by the shuttle over the thread case, the thread extending from the previously formed stitch is pulled tight against the under surface of the work. Thereafter the take-up begins to pull the needle loop from the shuttle into the position of Figure 42, after which the stitch is set by the continued downward movement of the take-up.

Between the positions of Figures 39 to 41 inclusive, the looper is rotated in a counterclockwise direction, as viewed from above and indicated by the arrows on the figures. When the position of Figure 42 is reached, the counterclockwise rotation of the looper is stopped and the looper begins to rotate in a clockwise direction, indicated by the arrow of this figure, to engage the thread with the thread finger. Before the thread is engaged with the thread finger, and before the position of Figure 43 is reached, the stitch is set and the feed point **34** acts to advance the work the length of a stitch while the presser-foot is raised. Figure 43 illustrates the positions of the parts after the presser-foot again engages the work, and the looper has carried the thread around the finger. The take-up is shown in this figure in its lowermost position so that after the stitch is set, a length of thread sufficient for the succeeding stitch has been pulled from the supply. As the looper begins to move towards the tip of the horn, the thread finger **92** is raised slightly to clear the looper, and the thread tension device **164** releases the tension on the thread. During continued upward movement of the looper, the take-up gives up thread required by the looper. When the looper reaches the upper end of its stroke, shown in Figure 44, the needle begins to penetrate the work and the looper begins to rotate in a counterclockwise direction. After the needle has entered the horn, the continued counterclockwise rotation of the looper winds the thread about the needle. The tension device **164** again grips the thread. As soon as this has taken place, the take-up is temporarily stopped and is moved downwardly a short distance from the dot-dash position of Figure 39 to full line position, thereby again increasing the tension on the thread and pulling the thread securely into the needle hook.

The presser-foot **28** is shaped at its lower end to engage the work at the left close to the point of operation of the needle so as to compress the threads of the completed stitches against the upper surface of the work, and is provided with a shank portion **218** extending substantially parallel to the needle at the side of the needle opposite to the feed point in order not to hide the work in advance of the needle from the view of the operator. The shank portion **218** of the presser-foot just above the work extends at the front of and slightly towards the left into substantially parallel relation with the needle. The presser-foot shank **218** is provided with an arcuate section curving into a substantially horizontal portion extending towards the presser-foot bar **74**. When the needle loop is cast off by the shuttle and is being pulled into the work, the curved shank of the presser-foot at the front of

the needle prevents the needle loop from whipping over or marking the edge of the shoe being operated upon. The presser-foot is also provided with a channel raising flange portion 219, as illustrated more clearly in Figs. 11 to 13 inclusive. As this flange extends at the rear of the needle, it does not affect the visibility of the work at the sewing point.

A difficulty common to previous McKay shoe sewing machines of the type having a thread finger in the horn relates to irregularity of successive stitches due to rotation of the horn through a complete 360 degree turn during the formation of a single seam. The use of a thread finger in the horn not only renders it more difficult properly to loop the needle, but tends to produce a twist of varying degree between the sides of each loop formed on the needle as the horn is rotated. A stitch having a 180 degree or greater twist in one of its interlocked loops is undesirable because such a stitch is difficult to pull securely into the material of the work. When forming a seam, having both properly formed stitches and stitches with twisted loops, considerable variation will result in the location of the locks of such stitches. A stitch having twisted threads is illustrated in Fig. 31, the running and standing sides of one of its loops being shown crossed at 220. In Fig. 32, one of the interlocking loops has been rotated at least 360 degrees before the thread of the other loop is passed through, so as to cause the sides of the twisted loop to cross twice at 221. When attempting to pull a stitch thus formed, tightly into the work, the frictional engagement of the sides of the twisted loop presents so much resistance that it is impossible to set the stitch with the same degree of tension and uniformity in lock location as when no twist occurs in the loop of either thread.

To prevent the formation of stitches having twisted loops in the machine of the present invention, the needle is so turned after being looped that any twist produced as a result of the use of the thread finger in the horn will be taken out. This result is obtained by changing the direction in which the rising needle is turned as the horn is rotated past a position where the thread finger is directly beneath the line of the seam. The needle is looped most conveniently when the open needle hook faces away from the thread finger. Accordingly, in the present machine, while the horn and thread finger are beneath the completed portion of the seam, the needle is arranged to face along the seam line opposite to the direction of feed. In this angular position of the threaded needle, the sides of the needle loop are spread most easily by the loop spreader, and accordingly the mechanism for turning the needle is arranged to hold the needle in this angular position without turning while the horn and the thread finger are beneath the completed stitches.

In order to reduce the needle turning movements in either direction to a minimum, the limit of turning movements is approximately 180 degrees from the angular position where no turning is imparted. The needle has reached the limit of turning movements when the open hook faces along the seam line towards the completed portion of the seam. The corresponding position of the horn is with the thread finger directly beneath the line of feed opposite to the completed stitches. The turning movement of the needle, as it approaches the upper end of its stroke, will therefore be reversed whenever the horn is rotated past this position.

Referring to Figures 33 to 38 inclusive, it will readily be seen that the direction in which the needle is turned to take out the twist due to looping has a definite relation to the positions of the thread finger and to the line of feed. The line of feed passing through the completed portion 222 of the seam is indicated by the dot-dash line 223. Figure 33 illustrates the positions of the parts with the thread finger at the rear of the feed line, the turning movement of the needle being substantially at its maximum limit. The thread extending from the previously formed stitch when the thread finger is at the rear of the line of feed engages the rearward edge of the needle opening 90 and the needle, after penetrating the work, passes in front of the thread. After being looped, as shown in Fig. 35, the needle rises and begins to turn in the reverse direction, as indicated by the arrow to straighten out the thread so that it may be presented with the supply side of the needle loop in the proper relation to the loop spreader 36 and shuttle 30. An intermediate angular position of the needle in straightening out the loop thus formed is illustrated in Fig. 37. From this position, the needle continues to rise and to rotate through approximately 90 degrees in the same direction until the needle hook faces opposite to the direction of feed where the thread is engaged by the loop spreader 36 (see Fig. 30). When the horn is rotated with the thread finger moving beneath the feed line 223 to a position shown in Fig. 34, the thread finger is at the forward side of the feed line. The thread extending from the last formed stitch is engaged with the forward side of the needle opening 90 and the needle passes into the horn at the rear of the thread. When the needle is threaded in this relation (Fig. 36) it must be turned in the reverse direction, indicated by the arrow, to untwist the loop. During the upward movement of the threaded needle, the needle is turned substantially 90 degrees beyond the position shown in Fig. 38 until the needle hook faces opposite to the direction of feed, as shown in Fig. 30, before the loop spreader operates.

To enable the needle loop to be opened to best advantage, the needle is turned always to pass through a focus position indicated in the dot-dash lines of Fig. 30, with the needle hook facing along the seam line in a direction opposite to the work feed, while the loop spreader 36 acts. Due to the position of the shuttle at the rear of the needle, the loop of thread may be disengaged by the shuttle from the needle more easily while the needle hook faces more nearly towards the shuttle. Accordingly, after having passed through the dot-dash position of Fig. 30, the needle continues to turn in the direction of the arrow of that figure, approximately 30 degrees towards the rear, regardless of the angular position of the horn. As the beak of the shuttle 30 lifts the needle loop from the needle in this position, the loop is readily pulled loose from the needle hook.

The means for turning the needle into different angular positions as the horn is rotated comprises mechanism illustrated in Figs. 3, 4 and 7 to 10 inclusive.

This mechanism is the same in many respects as that in the Topham machine, but the connections for adjusting it are simplified in construction and operate to impart additional turning movements to the needle not provided for in the Topham machine. The Topham mechanism requires two cams at the lower end of the horn supporting spindle and two trains of adjusting

connections between those cams and the needle turning mechanism. In the present machine a single cam only at the lower end of the horn spindle and a single train of adjusting connections are required. In addition there is provided in the head of the present machine, devices for changing adjustments of the needle turning mechanism to cause control of adjustments by the cam on the horn spindle to be effective only while the needle engages the work. While the needle approaches the upper end of its reciprocating stroke in the Topham machine, it passes through a fixed angular position in which the needle loop is spread, a slight additional needle turning movement being imparted in one direction or the other to either of two angular positions at the highest point of the needle stroke. In the present machine, the additional adjustment changing devices in the head of the machine cause the needle turning mechanism to be so adjusted, as the needle approaches the upper end of its stroke, that it will turn only in one direction from the fixed angular position in which the needle loop is spread to a fixed angular position at the highest point of the stroke.

As in the Topham machine, the upper end of the needle bar **40** is provided with a series of elongated gear teeth meshing with a horizontal rack **224** having upwardly curved ends. One end of the rack **224** is pivotally mounted on an arm **226** fulcrumed on a pin **228** secured to the machine frame and the other end of the rack is pivotally mounted on one arm of a bell crank **230** secured to a horizontal rock shaft **232**. The other arm of the bell crank **230** is actuated by means of a set of toggle links **234** and **236** connecting the bell crank **230** and an arm of the needle actuating lever **52**. The links **234** and **236** are joined by a pivot pin **238** which also passes through one end of an adjusting link **240**, the other end of which is pivotally connected to an arm **242** secured to a sleeve **244** surrounding the shaft **232**. The sleeve **244** at its rearward end is provided with a pair of arms **245** connected to the adjustment changing devices. Oscillation of the sleeve **244** causes the pivot pin **238** connecting the links **234** and **236** to be adjusted to different positions with relation to the axis of shaft **54**, thereby causing different turning movements to be imparted to the needle bar as the needle actuating lever **52** is raised and lowered. When the pivot pin **238** is at one side of the axis of shaft **54**, the needle is turned in one direction at the lower end of its stroke. When the pivot pin **238** is at the other side of the axis of shaft **54**, the needle is turned in the other direction at the lower end of its stroke. The pivit pin **238** also may be moved to a position concentric with the axis of shaft **54**, so that no turning movement is imparted to the needle. In the Topham machine the sleeve **244** for shifting the pivot pin **238** is yieldingly connected to one of the cams at the lower end of the horn supporting spindle and another cam is provided at the lower end of the spindle to lock the sleeve at certain times during each cycle of the machine. To adjust the position of pivot pin **238** in the present machine when the horn is rotated, a train of adjusting connections is provided between the sleeve **244** and the horn spindle. These connections comprise a link **246** pivotally connected at one end between the arms **245** and at the other end to an arm **248** secured to the forward end of a horizontal rock shaft **250**. The rearward end of the rock shaft **250** carries an arm **252**, pivotally connected to the upper end of a vertical link **254** and the lower end of the link is similarly connected to a horizontal lever **256** (see Fig. 8) fulcrumed on a shaft **258** at the rear of the horn spindle **88**. The forward end of the lever is formed to act as a follower for a cam surface on a hollow circular cam block **260** surrounding the lower end of the spindle **88** of the horn **18**. The cam surface of the block **260** is formed with a gradual pitch and an abrupt shoulder **262** connecting the high and low points. When the horn is rotated in one direction, the gradual pitch surface of the cam block **260** acts positively to raise the forward end of lever **256** against the force of a spring **264** (see Fig. 7) coiled about the link **246** and compressed between one end of the link and a perforated lug **266** secured to the machine frame. When the horn is rotated in the reverse direction, the force of the spring **264** causes the forward end of the lever **256** to be lowered and the needle turning mechanism to be adjusted accordingly. With the lever **256** engaging the high portion of the cam, the needle is turned in one direction and when engaging the low portion, the needle is turned in the other direction.

In order to prevent the engagement of the forward end of the lever **256** in its lowermost position with the abrupt shoulder **262** on the cam block **260** from stopping rotation of the horn, the lever is raised once during each sewing cycle from engagement with the cam block **260**. In the head of the machine is a continuously rotating cam **268** (see Fig. 7) secured to the main sewing shaft **16** to act against a roll **270** carried by the arm **248**. Through the train of connections including arm **248**, shaft **250**, arm **252**, and link **254**, the lever **256** is raised from the cam when the needle is at the upper end of its stroke. To enable the horn to be rotated a short distance while the abrupt shoulder **262** engages the lever **256**, the cam block **260** is yieldingly connected to the horn spindle **88**. Secured to the spindle **88** is a circular hub **272** (see Fig. 10) having diametrically opposed lugs in one of which is threaded a set screw **274** engaging the horn spindle and in the other of which is a headed screw **276** for securing one end of a spring **278**. The spring **278** is carried around the circular surface of the hub **272** and is connected at its other end by a screw **280** with the cam block **260**. The lug in which the set screw **274** is threaded extends through a slot formed in one side of the cam block **260** so as to limit the relative rotation of the cam block and the horn spindle, the spring **278** tending to maintain the cam block at one limit of its relative rotary movement. If the shoulder **262** on the cam block engages the cam lever **256**, the cam only will be held stationary as the horn is rotated. When the cam **268** raises the lever **256**, the cam block will immediately return to its proper position on the horn spindle.

To turn the needle with greater accuracy into its fixed angular position at the upper end of its stroke and thereafter into an angular position facing somewhat towards the shuttle, regardless of the angular position of the horn, the cam **268** on the sewing shaft **16** acts through additional connections including link **246** and sleeve **244** to change the adjustment of the needle turning mechanism while the needle is at the upper end of its stroke. The cam **268** thus takes the control of the needle turning mechanism away from the connections actuated by the horn and causes said mechanism to turn the needle from the position in which the loop is spread into an angular

position with the needle hook facing more nearly towards the shuttle.

The loop spreader 36, as best shown in Figs. 5 and 6, consists of a horizontal hooked rod slidingly mounted in a guideway 282 having a cover plate 284 on the machine frame. Near the forward end of the loop spreader it passes through a diametrical opening in a rotatably mounted cylindrical block 286 acting as a fulcrum about which the loop spreader swings horizontally in the guideway. The rearward end of the loop spreader is formed with an eye surrounding an eccentric pin 288 carried by a vertical shaft 290 having a bearing in the upper part of the guideway. When the shaft 290 is rotated, the loop spreader rod is given a reciprocating movement towards and from the front of the machine and also a swinging movement. The swinging movement causes the hooked end of the spreader to move substantially in the line of feed to enter between the sides of the needle loop, indicated at 291 in Fig. 6, the hooked end of the loop spreader passing between the threads. When the loop spreader is moved at right angles to the line of feed towards the rear, the rearward side of the needle loop is drawn towards the shuttle in the usual way (see Fig. 30).

To rotate the shaft 290, the shaft carries a spur gear 292 engaging rack teeth on a bar 294 slidingly mounted in a passage formed in the guideway 282. The forward end of the rack bar 294 is slotted to accommodate the forked lower end of a lever 296 pivoted to the machine frame. The lever 296 is provided with a cam follower engaging an oscillating cam block 298 (see Fig. 4) corresponding with the cam block employed in the Topham machine for actuating the loop spreader. The connections for operating the cam block 298 are constructed and arranged in substantially the same manner as in the machine illustrated and described in the U. S. Patent to Ashworth No. 1,905,031 of April 25, 1933, to which reference may be had for a more complete understanding.

The present machine is equipped with connections similar to those described in the Topham patent for preventing the needle bar from being turned when adjustments are being made or when the needle is being replaced in its holder 38, shown in Figs. 2 and 3. These connections comprise a manually operated clamping bolt 300 threaded into the slotted upper needle bar bearing 42 by which the needle bar is clamped at its upper end when adjustments are being made or the needle replaced. To prevent the needle bar in the present machine from being reciprocated through inadvertent contact with the starting treadle 6, the clamp bolt 300 passes through an elongated opening 301 at the end of a link 302 connected with the locking lever 66. When the needle bar is clamped against rotation, the clamp bolt 300 frictionally grips the link 302 to prevent unlocking movement of the locking lever 66. If the treadle is accidentally depressed, the spring 67 between shaft 71 and lever 70 yields without moving the locking lever, so that the needle bar actuating lever 52 may not be operated, even though the main sewing shaft is rotated. When released, the opening 301 in the link 302 is long enough to permit the locking lever 66 to function in the usual way.

In the machine described in the Ashworth patent, the feed point is actuated in the line of feed whenever the needle lever 52 is oscillated. Due to certain limitations in timing of the present machine, cam actuated connections separate from the needle lever 52 are provided for imparting the feeding movements to the feed point. These connections comprise one arm of a lever 304 rotatably mounted on the forward end of the shaft 68 and held from lengthwise displacement by a collar 306 secured to the shaft. The other arm of the lever 304 is curved rearwardly and towards the right, and is connected with the lower end of a link 308, the upper end of which is connected with a cam actuated lever 310. The lever 310 is formed with a forwardly projecting lug of somewhat greater length than the thickness of the needle actuating cam 60, the lever being mounted on a shaft 312 at the rear of the cam 60. Between the ends of the lever 310 is a cam roll 314 engaging a cam slot in the rearward face of the needle actuating cam 60. This arrangement for actuating the feed point does not cause difficulty in stopping the machine because, as explained in somewhat more detail in the Ashworth patents above referred to, the feed point is automatically raised from engagement with the work whenever the foot treadle 6 is released. The feeding movements imparted to the feed point 34 after the feed point is raised and before the sewing shaft 16 comes to rest are, therefore, idle and do not change the position of the work in the machine.

The nature and scope of the invention having been indicated, and a specific embodiment illustrating the several features of the invention having been described, what is claimed is:

1. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a thread finger in the horn with its thread engaging portion at a distance from the tip of the horn, a needle looper movable between the tip of the horn and the thread finger, and mechanism for actuating the looper in each sewing cycle before the needle is looped to carry the thread extending from the last formed stitch about the thread engaging portion of the thread finger.

2. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a thread finger in the horn with its thread engaging portion at a distance from the tip of the horn, a needle looper mounted for movement towards and from the tip of the horn, and mechanism for actuating the looper at one end of the movement to carry a length of thread extending from the last formed stitch about the thread engaging portion of the thread finger, and at the other end of said movement to lay the thread within the needle hook.

3. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a thread finger in the horn with its thread engaging portion at a distance from the tip of the horn, a needle looper mounted for movement towards and from the tip of the horn and for rotation about an axis extending in the direction of movement towards and from the horn tip, and mechanism for rotating the looper at one end of said movement to carry a length of thread extending from the last stitch about the thread engaging portion of the thread finger and for rotating the looper about the same axis at the

other end of said movement to lay the thread within the needle hook.

4. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a thread finger in the horn with its thread engaging portion at a distance from the tip of the horn, a needle looper mounted for reciprocating movement in the horn and mechanism for actuating the looper between the thread finger and the tip of the horn to provide a length of thread extending from the last stitch to the thread finger and for rotating the looper about an axis extending in the direction of reciprocating movement in one direction to carry the length of thread about the thread engaging portion of the thread finger and in the opposite direction to lay the thread within the hook of the needle.

5. A shoe sewing machine having, in combination, stitch forming devices including a hook needle, a needle looper arranged for reciprocating and rotating movements and mechanism for actuating the looper comprising a single crank driven member, the motion in one direction of which imparts the reciprocating movement to the looper and the motion in another direction of which imparts the rotating movement to the looper.

6. A shoe sewing machine having, in combination, stitch forming devices including a hook needle, a needle looper arranged for reciprocating and rotating movements, and means for actuating the looper comprising a single crank driven member and two trains of alternately acting connections between the looper and the crank driven member, one train of said connections being arranged to impart the reciprocating movements, and the other the rotating movements to the looper.

7. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having an angularly disposed upper part formed to extend within the shoe, an elongated looper having gear teeth around its outer surface, a guideway at the upper part of the horn in which the looper is mounted for lengthwise reciprocating movement towards and from the tip of the horn, a swivel member for imparting the reciprocating movement to the looper, and a rack engaging the gear teeth for rotating the looper.

8. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having an angularly disposed upper part formed to extend within the shoe, an elongated looper having gear teeth around its outer surface, a guideway at the upper part of the horn in which the looper is mounted for lengthwise reciprocating movement towards and from the tip of the horn, a thread finger at a distance from the tip of the horn, a swivel member for imparting the reciprocating movement to the looper, a rack engaging the gear teeth for rotating the looper, and mechanism for actuating the swivel member and rack in a regular sequence of movements alternately to carry the thread about the thread finger and to loop the needle.

9. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having an angularly disposed upper part formed to extend within the shoe, an elongated looper having gear teeth around its outer surface, a bearing at the upper part of the horn in which the looper is mounted for reciprocating movements towards and from the tip of the horn, a thread finger at a distance from the tip of the horn, mechanism for actuating the looper in a regular sequence of movements alternately to carry the thread about the thread finger and to loop the needle, and connections for actuating the thread finger after the needle is looped to release the thread.

10. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having an angularly disposed upper part formed with a guideway extending lengthwise thereof, a tip piece provided with a needle opening and arranged to be received within the guideway, a thread measuring finger mounted in the tip piece, and means in the horn for actuating the thread finger.

11. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having an angularly disposed upper part formed with a guideway extending lengthwise thereof, a tip piece provided with a needle opening and arranged to be received within the guideway, a thread measuring finger, a sleeve on which the thread finger is pivotally mounted in the tip piece, means in the horn for actuating the thread finger, and means for securing the tip piece in the guideway comprising a stud passing through the sleeve and the horn.

12. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn formed to extend within the shoe, a bearing at the tip of the horn in which the looper is mounted for rotating and reciprocating movements towards and from the tip of the horn, a thread finger at a distance from the tip of the horn, mechanism for actuating the thread finger in one direction into the path of the looper to receive a bight of thread when the looper is rotated, and for actuating the thread finger in the opposite direction while holding the bight of thread to permit passage of the looper towards the horn tip.

13. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn formed to extend within the shoe, a bearing at the tip of the horn in which the looper is mounted for rotating and reciprocating movements towards and from the tip of the horn, a thread finger at a distance from the tip of the horn, mechanism for actuating the thread finger in one direction into the path of the looper to receive a bight of thread when the looper is rotated, and for actuating the thread finger in the opposite direction while holding the bight of thread to permit passage of the looper towards the horn tip, and after the needle is looped still further in the second-mentioned direction, to release the bight of thread.

14. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for movement towards and from the tip of the horn, a take-up in the horn, a continuously rotating shaft mounted in the horn, and

connections for actuating the looper and take-up from said shaft.

15. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper in the horn, a take-up in the horn, a continuously rotating shaft mounted in the horn, and connections for actuating the take-up from said shaft.

16. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper in the horn, a take-up in the horn, a continuously rotating shaft mounted in the horn for actuating the take-up, differential gearing connected with said shaft, an operating shaft concentric to the axis of horn rotation extending from the machine frame into the horn for driving one portion of the differential gearing, and a gear member on the machine frame connected to another portion of the differential gearing to prevent rotation of the take-up actuating shaft due to relative rotation between the horn and machine frame.

17. A shoe sewing machine having, in combination, stitch forming devices including a hook needle, a looper arranged to wind the thread about the needle and a take-up, and mechanism for actuating the take-up in one direction to give up thread as the looper acts and in the other direction after the looper has acted to pull the thread with certainty into the needle hook.

18. A shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, a take-up and mechanism for actuating the take-up in one direction to give up thread as the looper moves towards the tip of the horn and in the other direction while the looper is moving from the tip of the horn to pull the thread with certainty into the needle hook.

19. A shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, a take-up in the horn, a continuously rotating shaft mounted in the horn, and connections operated by said shaft for actuating the looper and take-up to cause the take-up to give up thread as the looper winds the thread about the needle, and thereafter to pull the thread with certainty into the needle hook.

20. A shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, a take-up in the horn, a continuously rotating shaft mounted in the horn having a pair of cranks, connections operated by one of said cranks for actuating the looper to wind the thread about the needle and towards and from the tip of the horn, and connections operated by the other of said cranks for actuating the take-up.

21. A shoe sewing machine having, in combination, stitch-forming devices including a hook needle, a needle looper and a take-up, and mechanism for actuating the take-up comprising a continuously rotating crank shaft, a pitman connected at one end to the crank shaft, a radius arm pivotally connected between the ends of the pitman to control the movements of the pitman, and a link connected between the other end of the pitman and the take-up.

22. A shoe sewing machine having, in combination, stitch-forming devices including a hook needle, a needle looper and a take-up, and mechanism for actuating the take-up comprising a continuously rotating crank shaft, a pitman connected at one end to the crank shaft and at the other end to the take-up, and a radius arm pivotally connected between the ends of the pitman to control the movements of the pitman and a second crank on said shaft for actuating the looper.

23. A shoe sewing machine having, in combination, stitch-forming devices including a hook needle, a needle looper and a take-up, and mechanism for actuating the take-up comprising a continuously rotating crank shaft, a pitman connected at one end to the crank shaft and at the other end to the take-up, and a radius arm pivotally connected between the ends of the pitman to control the movements of the pitman and a fixed pivot for the radius arm arranged to cause the pitman temporarily to reverse the movement of the take-up after the looper has acted.

24. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, tension means against which the stitches are set, and mechanism for releasing the tension as the looper moves towards the tip of the horn.

25. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, a thread finger arranged to provide a supply of thread between the work and the looper, tension means against which the stitches are set, and mechanism for releasing the tension means when the supply is being drawn between the work and the looper.

26. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, tension means against which the stitches are set, mechanism for releasing the stitch setting tension means as the looper moves towards the tip of the horn, and a

light frictional tension device for preventing the thread between the work and the looper from becoming slack when the stitch setting tension means is released.

27. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, a thread finger arranged to provide a supply of thread between the work and the looper, tension means against which the stitches are set, mechanism for releasing the stitch setting tension means when the supply is being drawn between the work and the looper, and a light frictional tension device for preventing the thread between the work and the thread finger from becoming slack when the stitch setting tension means is released.

28. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a shoe supporting horn rotatably mounted in the machine frame and formed with a needle receiving opening at its tip, a needle looper mounted in the horn for winding the thread about the needle and for movement towards and from the tip of the horn, a take-up, frictional tension means against which the stitches are set, mechanism for releasing the tension means as the looper moves towards the tip of the horn, and for rendering the tension means active before the needle is withdrawn from the work, and mechanism for actuating the take-up after the tension means is rendered active to increase the strain on the thread.

29. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a thread finger in the horn arranged with its thread engaging portion at a distance from the tip of the horn, a looper movable between the tip of the horn and the thread finger for engaging a length of thread extending from the work with the thread finger, a take-up, and mechanism for actuating the take-up to set each stitch while the looper is moved away from the horn tip with the thread extending from the last formed stitch free of the thread finger.

30. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a thread finger in the horn arranged with its thread engaging portion at a distance from the tip of the horn, a looper movable between the tip of the horn and the thread finger for engaging a length of thread extending from the work with the thread finger, connections for actuating the looper, a take-up, a thread guide on the looper actuating connections for giving up thread as the looper moves towards the tip of the horn, and mechanism for actuating the take-up to set each stitch before the thread is engaged with the thread finger.

31. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a loop taker, a thread case about which the loop taker passes each needle loop, a thread finger in the horn arranged with its thread engaging portion at a distance from the tip of the horn, a looper movable between the tip of the horn and the thread finger for engaging a length of thread extending from the work with the thread finger, connections for actuating the looper, a take-up, a thread guide on the looper actuating connections for giving up thread as the looper moves towards the tip of the horn and for taking up thread as the looper moves away from the tip of the horn, and mechanism for actuating the take-up to give up thread to the loop taker before the thread is engaged with the thread finger and while the thread guide on the looper actuating connections cooperates with the loop taker in drawing the thread extending from the last formed stitch tightly against the surface of the work supported by the horn.

32. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a loop taker, a thread case about which the loop taker passes each needle loop, a thread finger in the horn arranged with its thread engaging portion at a distance from the tip of the horn, a looper movable between the tip of the horn and the thread finger for engaging a length of thread extending from the work with the thread finger, connections for actuating the looper, a take-up, a thread guide on the looper actuating connections for giving up thread as the looper moves towards the tip of the horn and for taking up thread as the looper moves away from the tip of the horn, and mechanism for actuating the take-up to set each stitch and to give up thread to the loop taker while the looper moves away from the tip of the horn and the thread extending from the last formed stitch is free of the thread finger.

33. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a looper mounted for rotary movement at the tip of the horn about an axis forming an angle with the lengthwise axis of the needle and provided with a surface for supporting the needle against the pull of the thread after being wound about the needle, and means for increasing the pull on the thread to force the thread into the hook of the needle while supported by said surface.

34. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a looper arranged for movement towards and from the tip of the horn and provided with a surface for supporting the needle against the pull of the thread being wound about the needle, a take-up and mechanism for actuating the take-up to give up thread during the looping operation and to exert an increased pull on the thread while the needle remains in engagement with said supporting surface.

35. A shoe sewing machine having, in combination, stitch-forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, and a looper mounted for rotary movement at the tip of the horn about an axis forming an angle with the lengthwise axis of the needle and arranged with an end surface across which the thread is stretched during looping operations and against which the needle is supported as thread is being pulled into the needle hook.

36. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn having a needle receiving opening at its tip, a needle looper within the tip of the horn, and a thread finger in the horn for holding a measured length of thread at one side of the needle opening, and mechanism for turning the needle about its longitudinal axis after being looped to take out the twist formed in the needle loop as a result of laying the thread within the needle hook in substantially any rotary position of the horn.

37. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a loop taker, a rotatable shoe supporting horn having a needle receiving opening at its tip, a needle looper within the tip of the horn, and a thread finger in the horn for holding a measured length of thread at one side of the needle opening, and mechanism for turning the needle after being looped about its longitudinal axis in one direction when the horn occupies a position with the thread finger at one side of the line of feed and for turning the needle in the reverse direction when the horn occupies a position with the thread finger at the opposite side of the line of feed.

38. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a loop taker, a rotatable shoe supporting horn having a needle receiving opening at its tip, a needle looper within the tip of the horn, and a thread finger in the horn for holding a measured length of thread at one side of the needle opening, and mechanism controlled by the angular position of the horn for turning the needle about its longitudinal axis from a looping position fixed with respect to the horn to an angular position fixed with respect to the line of feed and for holding the needle from turning when the horn occupies a position with the thread finger directly beneath the last formed stitch.

39. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a loop taker, a rotatable shoe supporting horn having a needle receiving opening at its tip, a needle looper within the tip of the horn, and a thread finger in the horn for holding a measured length of thread at one side of the needle opening, and mechanism controlled by the angular position of the horn for turning the needle about its longitudinal axis from a looping position in the horn in one direction or the other to a fixed angular position with the open needle hook facing opposite to the direction of feed.

40. A McKay type shoe sewng machine having, in combination, stitch forming devices including a straight hook needle, a loop taker, a rotatable shoe supporting horn having a needle receiving opening at its tip, a needle looper within the tip of the horn, and a thread finger in the horn for holding a measured length of thread at one side of the needle opening, mechanism for turning the needle about its longitudinal axis when the thread finger in the horn is in a position at the side of the line of feed, and connections controlled by the position of the horn for changing the direction of needle turning as the horn is rotated past a position in which the thread finger is directly beneath the line of feed.

41. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn arranged to extend within the shoe, needle threading mechanism mounted in the horn to turn with the horn, a sewing shaft for reciprocating the needle into and out of operative relation with the needle threading mechanism, mechanism for turning the needle about its longitudinal axis to rotate the needle hook from an angular position as the needle moves towards the horn, a block having a cam surface of gradual pitch with an abrupt shoulder rotating with the horn, a follower actuated by the block for varying the second angular position of the needle, and means for raising the follower from the cam surface during each sewing cycle to clear the abrupt shoulder when the horn is rotated.

42. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn arranged to extend within the shoe, needle threading mechanism mounted in the horn to turn with the horn, a sewing shaft for reciprocating the needle into and out of operative relation with the needle threading mechanism, mechanism for turning the needle about its longitudinal axis to rotate the needle hook from a first angular position fixed with respect to the line of feed to a second angular position as the needle moves towards the work, a block having a cam surface of gradual pitch rotating with the horn, a follower and connections actuated by the block for adjusting the second angular position of the needle, the follower acting when engaging the low portion of the cam to turn the needle in one direction and when engaging the high portion of the cam to turn the needle in the other direction, and additional means for actuating said connections uniformly during each sewing cycle to cause the needle in its first angular position to face substantially in the line of feed.

43. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn arranged to extend within the shoe, needle threading mechanism mounted in the horn to turn with the horn, a sewing shaft for reciprocating the needle into and out of operative relation with the needle threading mechanism, mechanism for turning the needle about its longitudinal axis to rotate the needle hook from an angular position fixed with respect to the line of feed to a second angular position as the needle moves towards the horn, a block having a cam surface of gradual pitch with an abrupt shoulder rotating with the horn, a follower actuated by the block for varying the second angular position of the needle, means for raising the follower from the cam surface once during each stitching cycle to clear the abrupt shoulder when the horn is rotated, and a yielding connection between the horn and the block to permit a short angular rotation of the horn before the follower clears the shoulder on the block.

44. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn arranged to extend within the shoe, needle threading mechanism mounted in the horn to turn with the horn, a sewing shaft for reciprocating the needle into and out of operative relation with the needle threading mechanism, mechanism for turning the needle about

its longitudinal axis to rotate the needle hook from a first angular position fixed with respect to the line of feed to a second angular position as the needle moves towards the horn, a block having a cam surface of gradual pitch rotating with the horn, a follower and connections actuated by the block for adjusting the second angular position of the needle, the follower acting when engaging the low portion of the cam to turn the needle in one direction and when engaging the high portion of the cam to turn the needle in the other direction, and additional means for actuating the connections to cause the needle to return to the same first angular position whenever the needle approaches the upper end of its reciprocating stroke.

45. A shoe sewing machine having, in combination, stitch forming devices including a straight hook needle and a loop taker, a sewing shaft for reciprocating the needle towards and from the work and mechanism for turning the needle about its longitudinal axis to rotate the needle hook from a fixed angular position in which each loop of thread withdrawn from the work is spread to another fixed angular position in which the loop taker disengages the loop of thread from the needle hook.

46. A shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a loop taker and a loop spreader movable along the seam line to enter each needle loop, a sewing shaft for reciprocating the needle towards and from the work and mechanism operated from the sewing shaft for turning the needle about its longitudinal axis to rotate the needle hook from one angular position facing along the line of feed as the loop spreader enters the loop to another angular position with the needle hook facing more nearly towards the loop taker as the loop taker disengages the loop of thread from the needle hook.

47. A shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a loop taker and a loop spreader movable along the seam line to enter each needle loop, a sewing shaft for reciprocating the needle towards and from the work and mechanism operated from the sewing shaft for turning the needle about its longitudinal axis to rotate the needle hook from an angular position fixed with respect to the line of feed to an angular position fixed with respect to the angular position of the horn as the needle moves towards the work and for returning the needle during retraction from the work to the angular position fixed with respect to the line of feed as the loop spreader acts and finally for turning the needle to a third angular position with respect to the line of feed to cause the open needle hook to face in a direction more nearly towards the loop taker as the loop taker disengages the loop of thread from the needle hook.

48. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, the open hook of which faces in the line of work feed when disengaged from the work, a rotatable shoe supporting horn, a needle looper in the horn, a loop taker at one side of the line of feed, and a loop spreader actuated in the line of feed to separate the sides of the needle loop and then at right angles to the line of feed to engage one side of the loop with the loop taker.

49. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, the open hook of which faces in the line of work feed when disengaged from the work, a rotatable shoe supporting horn, a needle looper in the horn, a loop taker at one side of the line of feed, a loop spreader for separating the sides of the needle loop and for engaging one side of the loop with the loop taker mounted to move at right angles to the line of feed and along the line of feed, and a crank member connected with the loop spreader to actuate the loop spreader along the line of feed in separating the sides of the loop and at right angles to the line of feed in engaging said one side of the loop with the loop taker.

50. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, the open hook of which faces in the line of work feed when disengaged from the work, a rotatable shoe supporting horn, a needle looper in the horn, a loop taker at one side of the line of feed, a loop spreader, a block in which the loop spreader is slidable at right angles to the line of feed, and means for swinging the thread engaging portion of the loop spreader first about the block as a center to separate the sides of the needle loop and then to slide in the block to engage one side of the loop with the loop taker.

51. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, the open hook of which faces in the line of work feed when disengaged from the work, a rotatable shoe supporting horn, a needle looper in the horn, a loop taker at one side of the line of feed, a loop spreader, a block in which the loop spreader is slidable at right angles to the line of feed, and means for swinging the thread engaging portion of the loop spreader first about the block as a center to separate the sides of the needle loop and then to slide in the block to engage one side of the loop with the loop taker.

52. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, the open hook of which faces in the line of work feed when disengaged from the work, a rotatable shoe supporting horn, a needle looper in the horn, a loop taker at one side of the line of feed, a loop spreader for separating the sides of the needle loop and for engaging one side of the loop with the loop taker, a block in which the loop spreader is slidable at right angles to the line of feed, a rotatable member having a gear portion, a crank on the rotatable member connected with the loop spreader, and a reciprocating rack engaging the gear portion for rotating the crank once during each sewing cycle of the machine to cause the loop spreader first to swing about the block as a center and then to slide in the block.

53. A shoe sewing machine having, in combination, stitch forming devices including a reciprocating needle bar, a needle holder at one end of the needle bar for releasably clamping a needle, a rotatable shoe supporting horn arranged to extend within the shoe, needle threading mechanism mounted in the horn to turn with the horn, mechanism for turning the needle bar about its longitudinal axis to rotate the needle holder from one angular position to another varying with the angular position of the needle looper in the horn, a securing device for holding the needle bar from turning during replacement of the needle in the needle holder, and means for preventing reciprocation of the needle

bar when the securing device is rendered operative.

54. A shoe sewing machine having, in combination, a main sewing shaft, stitch forming devices including a reciprocating needle bar driven from the sewing shaft, a needle holder at one end of the needle bar for releasably clamping a needle, a rotatable shoe supporting horn arranged to extend within the shoe, needle threading mechanism mounted in the horn to turn with the horn, mechanism for turning the needle bar about its longitudinal axis to rotate the needle holder from one angular position to another varying with the angular position of the needle looper in the horn, means for disconnecting the needle bar from the sewing shaft when the machine is stopped, a securing clamp for holding the needle bar from turning during replacement of the needle, and a sliding link connected to the disconnecting means and arranged to lock the disconnecting means in disconnected position when the clamp is actuated to hold the needle bar from turning.

55. A shoe sewing machine having, in combination, stitch forming devices including a hook needle, a sewing shaft, and suitable connections for actuating the stitch forming devices, means for driving the sewing shaft, a treadle, means for disconnecting the sewing shaft from its driving means when the treadle is released, means connected with the treadle for rendering inoperative the actuating connections between the needle and shaft after the treadle is released, and a manually operable device for holding the actuating connections for the needle inoperative when the sewing shaft and its driving means are again connected.

56. A shoe sewing machine having, in combination, stitch forming devices including a hook needle, a sewing shaft and suitable connections for actuating the stitch forming devices, means for driving the sewing shaft, a treadle, means for disconnecting the sewing shaft from its driving means when the treadle is released, means yieldingly connected with the treadle for rendering operative the actuating connections between the needle and shaft when the treadle is depressed, and a manually operable clamp acting on said yieldingly connected means to hold the actuating connections for the needle inoperative when the treadle is depressed.

57. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn arranged to extend within the shoe, a needle looper mounted in the horn, a feed point acting in advance of the needle to feed the work, a reciprocating presser-foot bar at the same side of the needle as the feed point, and a presser-foot on the bar formed with a surface engaging the work at the side of the needle opposite the feed point and with a shank portion extending substantially parallel to the needle from the work engaging surface to provide a clear view of the work in advance of the needle.

58. A McKay type shoe sewing machine having, in combination, stitch forming devices including a straight hook needle, a rotatable shoe supporting horn arranged to extend within the shoe, a needle looper mounted in the horn, a feed point acting in advance of the needle to feed the work, a reciprocating presser-foot bar at the same side of the needle as the feed point, and a presser-foot on the bar formed with a work engaging surface at the side of the needle opposite the feed point and with a shank portion extending substantially parallel to the needle from the work engaging surface to provide a clear view of the work in advance of the needle and a flap turning flange portion extending from the work engaging surface in a direction opposite to the direction of feed at the rear of the needle.

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