E. E. RANDALL.

KNITTING MACHINE AND METHOD OF KNITTING.

APPLICATION FILED DEC. 7, 1917.

1,435,736.

Patented Nov. 14, 1922.

3 SHEETS—SHEET 1.

Fig.1.

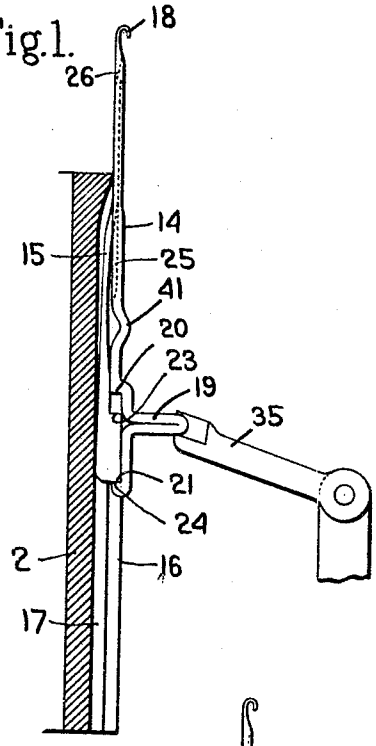


Fig.2.

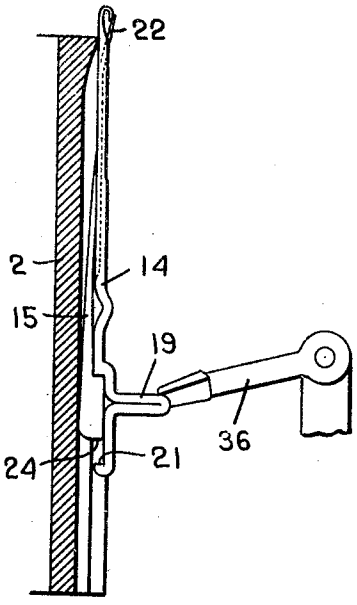


Fig.3.

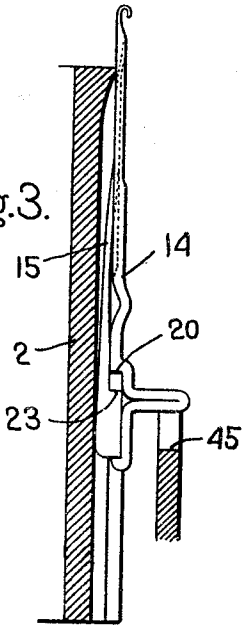
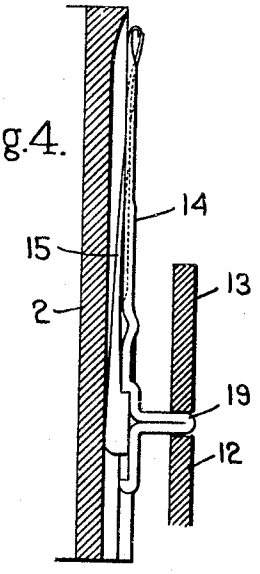


Fig.4.



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3 SHEETS—SHEET 2.

Fig.5.

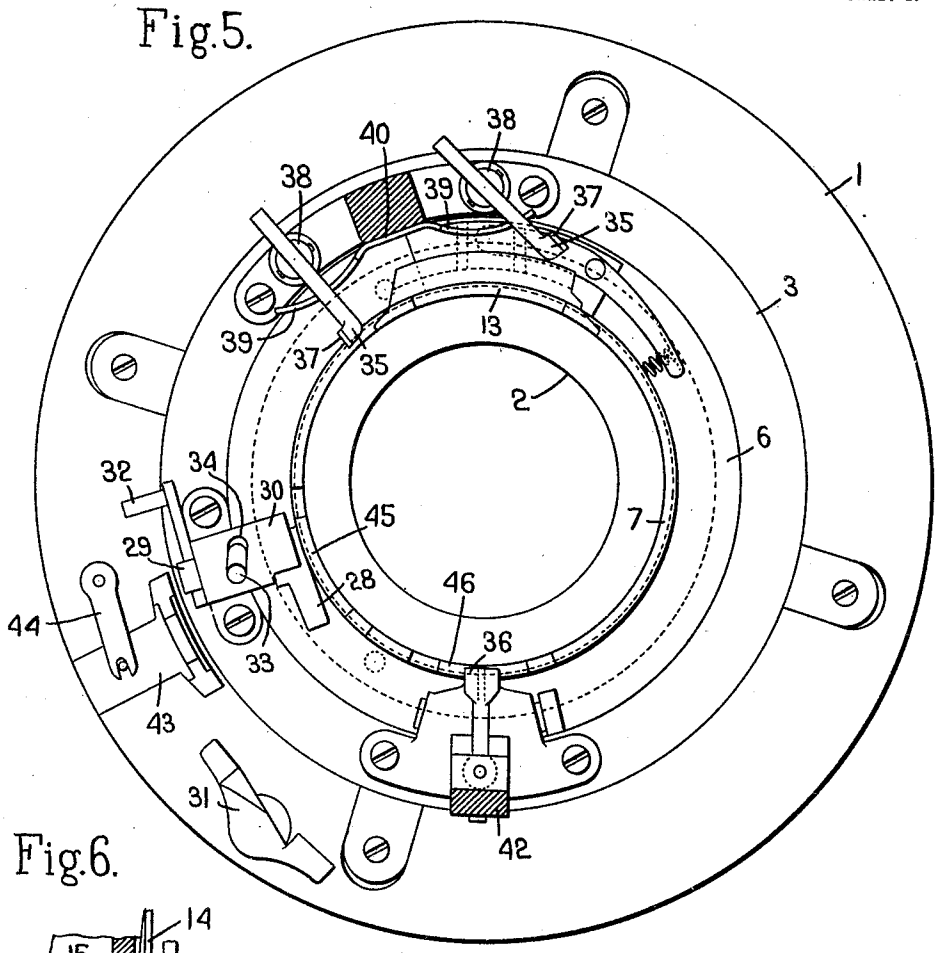
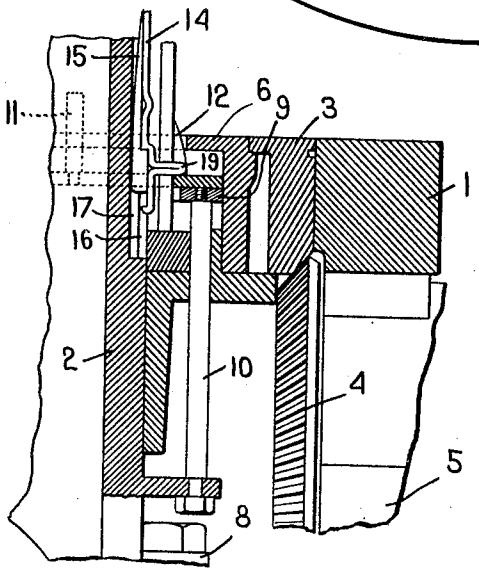


Fig.6.



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3 SHEETS--SHEET 3.

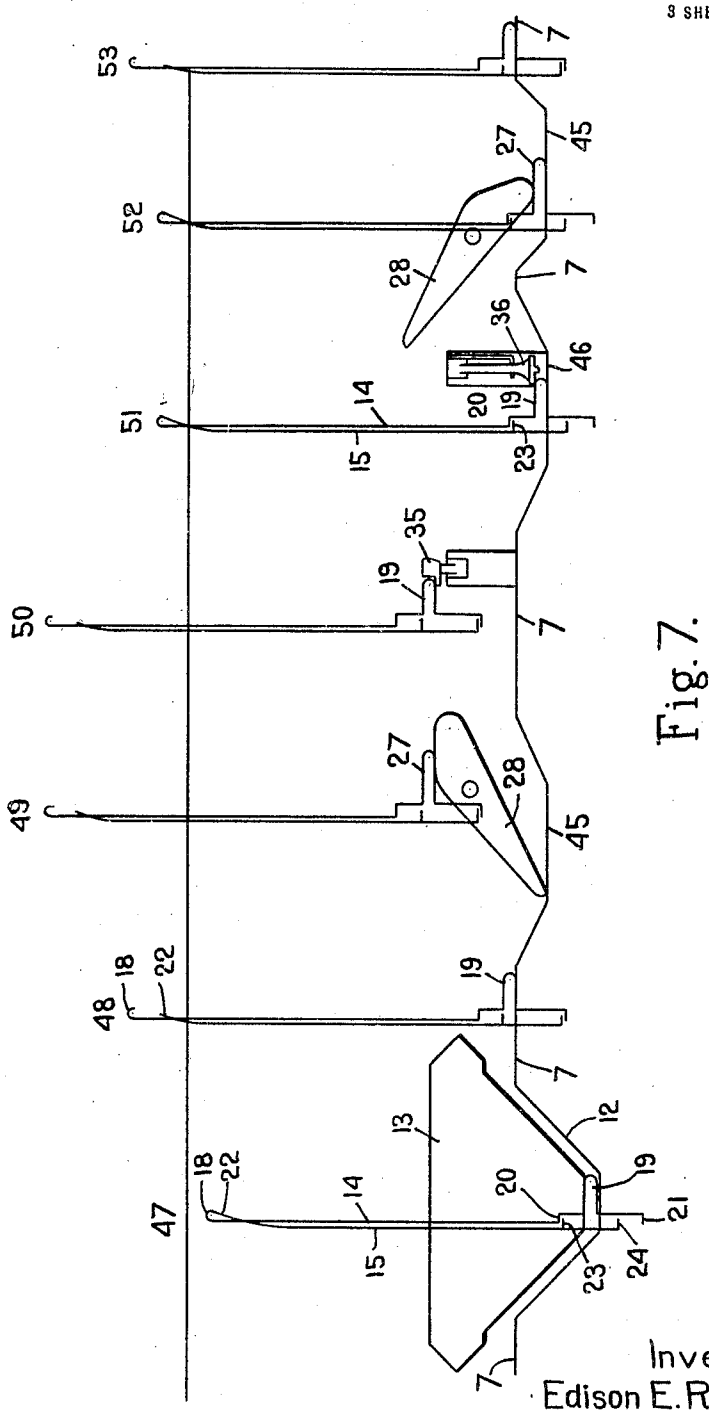


Fig. 7.

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UNITED STATES PATENT OFFICE.

EDISON E. RANDALL, OF KANKAKEE, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO POPE MACHINE COMPANY, OF KANKAKEE, ILLINOIS, A CORPORATION OF ILLINOIS.

KNITTING MACHINE AND METHOD OF KNITTING.

Application filed December 7, 1917. Serial No. 205,935.

To all whom it may concern:

Be it known that I, EDISON E. RANDALL, a citizen of the United States, residing at Kankakee, county of Kankakee, State of Illinois, have invented an Improvement in Knitting Machines and Methods of Knitting, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to a knitting machine in which so-called separate latch needles are employed, that is, needles in which the latch member is physically separate from the hook member and a relative movement takes place between the two needle members in effecting their co-operation; and also to the method of knitting.

In one type of the separate latch needle knitting machine the needle consists of a hook member and a separate latch member each provided with a pair of oppositely disposed shoulders, the separation of the members of the one pair of shoulders being greater than the separation of the members of the other pair and to an extent sufficient to secure the required relative movements of the members, as between the yarn-receiving and casting-off positions of the needle, and as required in the covering and uncovering of the hook by the latch. The co-operating pairs of shoulders upon the two members may be variously located but greater accuracy of operation is secured by forming these shoulders by punching or stamping operations in the shanks of the respective members.

It is frequently necessary in the operation of the machine and in knitting to throw one or more of the needles out of action and then restore such needles into action as, for example, when reciprocating work is performed upon a circular knitting machine. Thus in the case of knitting the heel and toe portions of a stocking it is necessary first to throw out of action the set of needles employed in knitting the instep, then at the end of each reciprocation to throw out of action one or more of the remaining needles in the narrowing operation, then to restore into action at the end of each reciprocation one or more of the needles last thrown out for the widening operation, and then to restore into action the set of needles first thrown out.

It is the principal object of this invention to provide for the required throwing out of action and restoring into action of separate latch needles wherein each member is provided with a pair of oppositely disposed shoulders for the purpose, and having the function, above described. Such a needle is usually operated by cams acting upon a butt projecting from the hook member. A knitting machine needle is customarily thrown out of action by projecting the needle above or beyond its normal yarn-receiving position so that it will be out of the path of the actuating cam and consequently will not be depressed or retracted to take yarn in the further operation of the machine. If both members of a separate latch needle be thus projected the needle cannot be restored to yarn-receiving position simply by depressing or retracting the hook member to the position from which it was projected out of action because by reason of the relative movement which takes place between the hook and latch members the latch member will, when the hook member is restored to normal yarn-receiving position, not itself be in its yarn-receiving position but will be left covering the hook. Consequently if yarn be fed it will at once be cast off and will not be caught by the hook.

This invention provides a construction and a method for throwing the needle out of action and restoring it into action in which, first, the hook member is projected and thereby with it the latch member beyond the normal yarn-receiving position until its butt is out of the path of the operating cams; second, the hook member is retracted until it picks up the latch member and moves the latch member into its own normal yarn-receiving position thus bringing the hook member below its own normal yarn-receiving position, and third, the hook member is then projected without moving the latch member from its yarn-receiving position, in which it remains, until the hook member reaches its yarn-receiving position. Both members of the needle then stand in their normal yarn-receiving positions and the knitting operation may proceed.

The principles of the invention may be secured in various ways and by various types of mechanism, but the invention is herein exemplified in a familiar circular type of knitting machine in which two sets of needles are employed, the one set having butts longer than the other set, in which a switch cam is employed which when thrown into one position acts to effect the elevation of the set of needles having the longer butts and which when thrown into another position acts to depress the set of needles having the longer butts and also preferably any needles having the shorter butts which have been left projected, in which picker and dropper mechanism is provided, the former acting selectively to project as required needles having the shorter butts and the latter acting selectively to restore such needles. In this type of mechanism the invention provides for such changes in the adjustment and operation of the switch cam, picker mechanism and dropper mechanism as are necessary to effect the movements of the needles in throwing them out of and into action and as are required by the principles of this invention.

These and other objects of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

The drawings show so much of an ordinary type of circular knitting machine and needle as is necessary to a disclosure of the invention.

In the drawings,

Figure 1 is a diagrammatic view in side elevation and partially in vertical cross section showing a portion of the cylinder of a knitting machine, a form of picker and a separate latch needle with the needle in the position to which it has been projected out of action by the picker;

Fig. 2 is a similar view showing instead of the picker a dropper with the needle in the position to which it has been retracted by the dropper to bring the latch into its normal yarn-receiving position;

Fig. 3 is a similar view showing both members of the needle in normal yarn-receiving position and showing the projecting cam by which the needles are projected in the normal knitting operation;

Fig. 4 is a similar view showing both members of the needle in normal casting off position and also showing the cams by which the needle is retracted in the normal knitting operation;

Fig. 5 is a plan view partially in horizontal cross-section showing the general construction of this circular type of knitting machine with the various cams, picker mechanism and dropper mechanism;

Fig. 6 is a view in side elevation and partially in vertical cross section of a portion of the knitting machine principally to show the provision for floating the needle projecting cam with the cylinder;

Fig. 7 is a diagrammatic view showing the different positions of the needle members, cams, picker and dropper occurring in a preferred embodiment of this invention.

The details of the construction and operation of the knitting machine not being involved in the present invention and the general construction and operation of such machines being well known and familiar to those skilled in the art it is unnecessary either to illustrate or describe the entire machine.

It will be sufficient to note that the machine here disclosed as a preferred embodiment of the invention comprises a bed plate 1, a cylinder 2, a concentric gear ring 3 rotatably mounted in the bed plate and driven by a gear 4 from the main shaft 5, a cam carrier 6 concentrically mounted in the bed plate and moving with the gear ring, a cam ring 7 concentrically mounted within the cam carrier and driven thereby but vertically movable with respect thereto. The cylinder is held against rotary movement with respect to the needle bed but is vertically adjustable to vary the length of stitch when the needles are performing the ordinary knitting operation. To enable this to be done without changing the relative projected position of the needle with respect to the top of the cylinder and thus increasing the cross-sectional area of the combined latch and hook members projecting through the loop the lower or projecting cam is arranged to move or be vertically adjustable with the cylinder. For this purpose the cylinder is supported by a suitable support or rod 8. The cam ring 7 is provided with an annular flange at its bottom resting upon a ring support 9. This ring support is connected to move with the cylinder as by the vertical studs 10 and the cam ring is secured to the cam carrier so as to rotate therewith but telescope with respect thereto by means of the studs 11 secured to the flange of the cam ring and projecting through apertures in the cam carrier.

The cam ring has formed therein or connected therewith the usual projecting or elevating cam 12 while the co-operating retracting or depressing cam 13 is mounted upon the cam carrier 6.

The needle comprises a hook member 14 and a separate latch member 15. The hook member 14 slides in a groove 16 in the needle cylinder and the latch member 15 slides in a narrower groove 17 formed in the cylinder back of the groove for the hook member. The hook member presents the usual hook 18 and beneath or in the rear of the hook is longitudinally and transversely slotted. At the opposite end of its shank it is pro-

vided with the usual laterally extending butt 19 and at some suitable point and preferably on the shank it is provided with a pair of oppositely disposed shoulders 20 and 21, these shoulders being preferably formed by a stamping or punching operation so as to be accurately defined with respect to the butt and the hook. The latch member is provided with a pointed head 22 sliding through the slot in the hook member into and out of co-operation with the hook and the shank of the latch member is extended and provided with a pair of oppositely disposed shoulders 23 and 24 located between and co-operating respectively with the shoulders 20 and 21 of the hook member to give the required movements to the latch member from the hook member. The hook member as shown is also recessed or grooved on the face toward the latch at 25 to provide for the operation of the latch member.

The general operation of the needle will be apparent. When the butt of the hook member is projected the hook member is moved alone until its shoulder 21 contacting with the shoulder 24 of the latch member picks up the latch when the two members move together with the hook in uncovered position. When the butt of the hook member is depressed the hook member moves alone until its shoulder 20 comes into contact with the shoulder 23 of the latch member when the two members move together with the latch covering the hook. The point of the latch member is cammed or moved transversely if necessary by engagement with the end wall 26 of the slot in the hook member.

In the normal knitting operation the butts of the hook members of the needles rest upon the top of the cam ring 7 and as the cam is rotated with respect to the cylinder the needles are reciprocated by the action of the knitting cams 12 and 13 in the usual manner.

One set of needles preferably has its butts 27 longer than the butts 19 of the other set in order that the set of needles having the longer butts may be thrown out of action independently of the other set as, for example, when reciprocating knitting is to be performed.

The general type of means selected as a preferred embodiment of the invention for throwing the various needles out of action and restoring them into action as required is of a familiar type and need only be described in a general way. It is illustrated as of the general type disclosed in the patent to Mayo No. 726,178 granted April 21, 1903.

For throwing the set of needles having the longer butts out of action and restoring them into action a suitable wedge-shaped switch cam 28 is employed mounted upon a shaft 29 rotatably and longitudinally movable in a bearing 30 radially supported from the gear ring 3. This cam 28 during the ordinary circular knitting operation stands in elevated position and travels in a path above the butts. When the set of needles having the longer butts are to be thrown out of action the shaft 29 is rotated and at the same time moved longitudinally outwardly to bring the point of the cam 28 into its depressed position below the path of the butts 27. This movement of the cam may be effected manually or automatically, in the latter case by some such means as the automatic positioning of the cam 31 in the path of the crank arm 32 extending from the shaft 29. In this depressed position as the gear ring is rotated the upper surface of the cam 28 rides beneath the butts 27 and raises or projects the butts to a position where they are caught by the upper surface of the cam 13 and are further elevated thereby and ride therealong.

When this section of needles is to be restored to knitting position the cam 28 is swung upwardly and at the same time moved inwardly, the latter action being effected as by a stud 33 on the shaft 29 riding in an inclined groove 34 in the bearing 30 to bring the lower surface of the cam 28 above the butts of all the needles, both those having the longer butts 27 and those having the shorter butts 19, so that as the cam ring is rotated the needles are all retracted or restored to a position where they are within the path of the depressing or retracting cam surface of the cam 13. This operation may be performed either manually or by the usual type of automatic mechanism of the machine.

For selectively throwing the shorter butt needles out of action and restoring them into action, as in reciprocating knitting, suitable mechanism such as a well known type of picker mechanism and dropper mechanism may be employed and is herein illustrated. In the type illustrated the picker mechanism and the dropper mechanism are shown as separate instrumentalities. When the reciprocating knitting is taking place the gear ring 3 is given an oscillating or reciprocating motion. Upon this gear ring at one side are mounted the pickers 35 and at an opposite point the dropper 36, and all are constructed and operate in a manner well known to those skilled in the art.

The pickers 35 at their effective ends are notched at 37 sufficiently to receive the butts of one or more needles according to the number to be thrown out of action at each end of each reciprocation. Each picker 35 is mounted to pivot vertically in a post 38 and each post is mounted to pivot hori-

zontally on the gear ring 3. The shanks of the pickers extend through cam slots 39 in a guide plate 40 also secured to the gear ring. The lengths of the pickers are such that when in radial position the pickers will just clear the bodies of the needles and the heads of the pickers will pass above or beneath the butts so that during circular knitting the pickers are idle. The posts 38 are placed apart a distance longer than the amount of lost motion between the gear ring and cam carrier so that at each change of direction of movement the cam carrier operates to carry first one and then the other of the pickers into position in front of the cam section 13 trailing the other picker upon the outside of the said cam, but neither picker can be trailed behind the cam section without causing it to swing horizontally with the post 38 and clear the said cam. This swinging movement in co-operation with the cam surface 39 on the guide plate 40 causes the swinging picker to be depressed into its lowermost position. When the direction of reciprocation is again changed this depressed picker is by the lost motion between the gear ring and cam carrier brought in front of the retracting cam surface of the cam 13 in its lowermost position and its notch 37 will thereupon engage the butt or butts to be elevated or projected. As the rotation of the gear ring continues the butts thus seized hold the picker against rotation and the picker slides up the cam surface 39 on the guide plate 40 and takes with it the engaged butts until the butts are in line with the upper cam surface of the cam 13. The needles are then lifted by this cam surface onto and ride along the top of the cam and are held in this position by the usual spring riding under the offsets 41. The picker then clears itself from the butts as the needles are forced upward by the cam 13 and springs back into its normal radial position. This operation continues reversely with the two pickers and thus at each end of each reciprocation one or more needles are elevated or projected and thus thrown out of action causing the narrowing operation.

The widening operation then takes place in a similar but reverse manner through the action of the dropper 36 which is a symmetrically shaped device horizontally and vertically pivoted in a bearing 42 on the gear ring 3. This dropper 36 is notched at each side and at the bottom of its end to receive the butts of one or more of the needles according to the number to be depressed at the end of each reciprocation. It stands out of the path of the needle and when called into operation preferably by automatic mechanism such, for example, as the sliding cam plate 43 automatically actuated by the crank arm 44 in the mechanism of the machine at the required time, it is guided to a position in line with the butts of the elevated or projected needles so that at the end of each reciprocation the butts of the needles at the end of the row of needles out of action ride into one of the notches in the end of the dropper. As the reciprocating movement continues the dropper is forced downwardly in the cam slot of its guide plate, herein not shown for clearness of illustration, carrying with it and thus depressing the butts of the engaged needles and as it is carried downwardly it swings radially and clears itself after depressing the needles. The dropper then springs back into elevated position and is operated upon the reverse reciprocation in a similar manner. In the widening operation the dropper is generally arranged to depress a greater number of needles than the pickers elevated, for example, the pickers may remain in operation each elevating say one needle at the end of each reciprocation and the dropper depressing two needles at each end of each reciprocation so that as a net result one needle is brought back into operation at each end of each reciprocation and thus the widening of the knitting secured. But the particular construction and operation of the picker mechanism and the dropper mechanism is not involved in this invention and this general explanation will be sufficient to those skilled in the art.

In the present invention the needles thrown out of action whether by the switch cam or by the picker mechanism are usually seized when in their normal yarn-receiving or projected position, that is, the position illustrated in Fig. 3. To this position the hook member has been brought by the action of the projecting cam 12 upon its butt and to this position the latch member has been brought by the shoulder 21 of the hook member contacting with the shoulder 24 of the latch member. In this position the point of the latch member is separated from the hook, and lies within the slot in the hook member. When the needle is thrown out of action whether by the switch cam or by the picker mechanism the needle is projected well above its normal yarn-receiving position and to a position such as shown for example in Fig. 1. To this position the two members of the needle are brought without any change in relative position to that last described. In this projected position they stand with the butts out of the path of the depressing cam so that the needles hold the yarn but take no further part in the knitting operation.

When the needles are to be restored into action either by the action of the switch cam or by the action of the dropper mechanism the needle butt is depressed. As the hook member is thus retracted it moves without changing the position of the latch

member until its shoulder 20 comes into contact with the shoulder 23 of the latch member thus causing the point of the latch member to ride over and cover the hook and thereafter the two members move together. If the hook member be now retracted to the position from which it was elevated, that is, to its own normal yarn-receiving position the latch member will not be brought to its own yarn-receiving position but will remain projected and covering the hook so that yarn if fed to the needle would not be caught by the hook but would be cast off by the latch.

In this invention the hook member is carried by the depressing mechanism, whether the switch cam, dropper or other device, in its retracting movement to such a retracted position that the latch member is brought by the hook member into the position which the latch member occupies when the needle is in normal yarn-receiving position. This abnormal retraction of the hook member brings the hook member below its own normal yarn-receiving position. The needle members are then in the position shown in Fig. 2. Accordingly thereafter the hook member is projected until its shoulder 24 comes in contact with the shoulder 21 of the hook member during which movement the latch member is not moved and at the conclusion of which movement the hook member is brought into its normal yarn-receiving position, and in this position, illustrated in Fig. 3, both members of the needle and consequently the entire needle is in its normal yarn-receiving position. From this point the knitting proceeds as usual.

This operation is effected in the case of the mechanism employed for projecting and restoring an entire set of needles such as the switch cam 28 by providing a depression indicated at 45 in the diagrammatic view of Fig. 7, in the top of the cam ring 7 opposite the switch cam. The movement of the switch cam is extended and this depression is of such an extent that when the switch cam is swung into its elevated position the butts of the needles which have been projected out of action riding against the under surface of the switch cam will be carried down thereby to the bottom of the depression 45 and to such an extent that the hook member will be brought into its abnormally retracted position and the latch member into its normal yarn-receiving position, that is, the members of the needle will be in the position indicated in Fig. 2. On the continued movement of the cam ring 7 the butts of the hook members slide up the inclined end of the depression 45 onto the top of the cam ring 7 without moving the latch members and bringing the hook members into their normal yarn-receiving position so that the members of the needle then occupy the position indicated in Fig. 3. This arrangement does not interfere with the projecting action of the switch cam on the needles when they are to be thrown out of action because the butts of the hook members riding along the top of the cam ring 7 will still strike the upper surface of the switch cam and be projected thereby in the regular way.

This operation is effected in the case of the picker mechanism and dropper mechanism illustrated for projecting selected needles out of action and restoring them into action without any material change in the operation of the picker mechanism and simply by adjusting the movement of the dropper mechanism and providing a depression 46 of similar character to the depression 45 in the cam ring opposite the dropper 36. Accordingly when the selected needles are to be restored into action the dropper 36 swinging downwardly seizes the butt of a hook member and carries the hook member down until the shoulder 20 of the hook member engages the shoulder 23 of the latch member and continues its retracting movement carrying the two needle members down until the butt of the hook member is brought to the bottom of the depression 46 when the needle members are in the position illustrated in Fig. 2 with the hook member retracted below its normal yarn-receiving position and the latch member in its normal yarn-receiving position. Thereafter as the rotation of the cam ring 7 continues the butt of the hook member slides up the inclined surface of the depression 46 onto the top of the cam ring 7, without moving the latch member, into its normal yarn-receiving position so that the two members of the needle then occupy the normal yarn-receiving position shown, for example, in Fig. 3.

The entire operation is graphically illustrated in the diagrammatic view, Fig. 7. In position 47 in Fig. 7 one of the short butt needles is shown in retracted position under the control of the cam 13. As the knitting operation continues the projecting cam 12 first projects the hook member 14 until the shoulder 21 comes into contact with the shoulder 24 thus moving the hook away from the latch and then continues the projecting movement of the hook member and with it the latch member until the butt 19 rides onto the top of the cam ring 7 and the needle is then in position 48 or the normal yarn-receiving position. If now a set of needles such as those having the longer butts 27 is to be thrown out of action the butts 27 then ride along the cam ring 7 into contact with the upper surface of the switch cam 28, which is depressed to receive them, and slide up along the cam surface until the entire needle is brought into the projected position 49. In this position the butts 27

are either in line with or slightly below the cam 13 and if below are brought to the top of the cam 13 by the inclined edges thereof and thus the cam 13 moves by without retracting the needles and they remain out of action. As the knitting operation continues and reciprocating work takes place, for example, and selected shorter butt needles are to be thrown out of action the picker 35 acting in the usual manner seizes the butt 19 then resting upon the top of the cam ring 7 and projects the needle to position 50 which corresponds to position 49 and the needle remains out of action. As the knitting operation continues and a selected short butt needle is to be restored into action the dropper 36 swings over the butt 19 and retracts the hook member 14 until its shoulder 20 comes into contact with the shoulder 23 of the hook member thus closing the latch over the hook, and then continues the retracting movement retracting the two members of the needle together until the butt 19 is brought to the bottom of the depression 46 and the members of the needle are in position 51. In this position it will be seen that the latch member 15 occupies its normal yarn-receiving position as in position 48 while the hook member is retracted below its normal yarn-receiving position such as shown in 48. As the cam 7 continues its movement the butt 19 rides up the inclined surface of the depression 46 without moving the latch member and bringing the hook member into the same position as that illustrated in position 48 when the needle is then in normal yarn-receiving position as in position 53 and ready to be acted upon by the cams 13 and 12 in the usual manner. As the knitting operation continues and the set of needles having the longer butts are to be restored to action the switch cam 28 is swung into elevated position and rides past the butts of the projected needles preferably also being moved inwardly so as to catch the butts of the shorter needles if any should remain projected. The butts of the hook members coming in contact with the under surface of the switch cam 28 are given precisely the same movements as last described with respect to the dropper whereby the needle members are brought to position 52 which it will be noted corresponds to position 51 and then the needles sliding up the inclined surfaces of depression 45 come to normal yarn-receiving position 53.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A knitting machine comprising a needle consisting of a hook member and a separate latch member each provided with a pair of oppositely disposed shoulders, the separation of the members of the one pair being greater than that of the other pair to an extent sufficient to secure the required relative movements of the members, means for reciprocating the hook member and therethrough the latch member between yarn-receiving and casting off positions, means for giving the hook member an abnormal movement beyond yarn-receiving position to throw the needle out of action, and means for subsequently giving the hook member a movement below normal yarn-receiving position sufficient to bring the latch member to its yarn-receiving position and for then restoring the hook member to its yarn-receiving position before the yarn is fed.

2. A knitting machine comprising a needle consisting of a hook member provided with a laterally projecting butt and a pair of oppositely disposed spaced shoulders, a separate latch member slidingly mounted adjacent the hook member and provided with a pair of oppositely disposed spaced shoulders located between the shoulders of the hook member and having sufficient lost motion with respect thereto to enable the relative movements of the members to effect the opening and closing of the latch and hook, means acting upon the butt of the hook member for reciprocating the needle members between yarn-receiving and casting off position, means acting upon the butt for projecting the hook member and with it the latch member beyond yarn-receiving position to throw the needle out of action, means for subsequently acting upon the butt to retract the hook member below normal yarn-receiving position to an extent sufficient to bring the latch member to its normal yarn-receiving position, and means for then subsequently acting upon the butt to restore the hook member to its yarn-receiving position and leave the butt in position to be actuated by the means for reciprocating the needle members between yarn-receiving and casting off positions.

3. A knitting machiue comprising a needle bed, a needle consisting of a hook member and a separate latch member mounted to reciprocate in said bed and each provided with a pair of oppositely disposed shoulders, the separation of the members of the one pair being greater than that of the other pair to an extent sufficient to secure the required relative movement of the members, an operating cam relatively and transversely movable with respect to said needle bed, cam surfaces on said cam for reciprocating the hook member and therethrough the latch member between yarn-receiving and casting off positions, means for giving the hook member an abnormal movement beyond yarn-receiving position to throw the needle out of action, a depression in said cam, and means located opposite said depression for subsequently giving the hook member a

movement to carry the butt thereof into said depression and below normal yarn-receiving position to bring the latch member to its yarn-receiving position, and means for then restoring the hook member to its yarn-receiving position before the yarn is fed.

4. A knitting machine comprising the combination defined in claim 3 in which the latter means consists of an inclined surface at the end of the said depression.

5. The steps of throwing the needle out of, and restoring it into, action in the method of knitting with a separate latch needle comprising a hook member and a separate latch member receiving its movements from the hook member which steps consist in, first, projecting the hook member and therewith the latch member beyond knitting position, second, retracting the hook member until it picks up the latch member and brings the latch member to its yarn-receiving position, and third, projecting the hook member to its yarn-receiving position without moving the latch member out of its yarn-receiving position.

6. The steps of throwing the needle out of and restoring it into action in the method of knitting with a separate latch needle comprising a hook member and a separate latch member receiving its movements from the hook member which movements consist in, first, projecting the hook member and thereby the latch member beyond knitting position leaving the hook uncovered by the latch, second, retracting the hook member but without moving the latch member until the hook is covered by the latch, third, continuing the retraction of the hook member and with it the latch member until the latch member reaches its normal yarn-receiving position, and, fourth, projecting the hook member sufficiently to uncover the hook and bring the hook member to its normal yarn-receiving position

7. A knitting machine comprising separate latch knitting machine needles comprising hook and latch members having relative bodily movements in performing the knitting function and means for throwing a needle out of and restoring it into action acting, first, to project the hook member and therewith the latch member beyond knitting position, second, to retract the hook member until it picks up the latch member and brings the latch member to its yarn receiving position, and third, to project the hook member to its yarn receiving position without moving the latch member out of its yarn receiving position.

8. A knitting machine comprising separate latch knitting machine needles comprising hook and latch members having relative bodily movements in performing the knitting function and means for throwing a needle out of and restoring it into action acting, first, to project the hook member and therewith the latch member beyond knitting position leaving the hook uncovered by the latch, second, to retract the hook member without moving the latch member until the hook is covered by the latch, third, to continue the retraction of the hook member and with it the latch member until the latch member reaches its normal yarn receiving position, and fourth, to project the hook member sufficiently to uncover the hook and bring the hook member to its normal yarn receiving position.

9. A knitting machine comprising a separate latch needle having relatively bodily movable hook and latch members, means for moving the needle to effect the knitting function, means for moving the needle to an abnormal position to throw it out of action while retaining thereon a stitch ready for casting off over yarn next fed to the needle, and means to restore the needle into action acting independently on the needle members before restoration into action is completed to bring the latch and hook members in relation to receive the said next yarn fed before the said retained stitch is cast off.

10. A knitting machine comprising separate latch needles having relatively bodily movable hook and latch members, each member having a normal reciprocating stroke for the knitting operation, means for adjusting the hook member beyond the limits of its normal stroke to render the needle inactive in the knitting operation while retaining thereon a stitch ready for casting off over yarn next fed to the needle, mechanism for effecting resumption of the said normal stroke and changing the relation between such members to bring them into relation to receive the said next yarn fed before the said retained stitch is cast off, said mechanism including means independent of the hook member for controlling the positioning of the latch member independently of the hook member for such relation-changing operation.

11. A knitting machine comprising a separate latch needle having relatively bodily movable hook and latch members, means for moving the needle to effect the knitting function, and means for throwing the needle out of and restoring it into action and for disturbing and restoring the yarn-receiving relation of said members while a stitch is retained ready for casting off over yarn next fed to the needle whereby a continuous plain web will be knit by the needle when restored into action.

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

EDISON E. RANDALL.