

April 15, 1941.

H. W. START ET AL

2,238,192

WELT TURNING MECHANISM OF STRAIGHT-BAR KNITTING MACHINES

Filed May 20, 1940

5 Sheets-Sheet 1

Fig. 1.

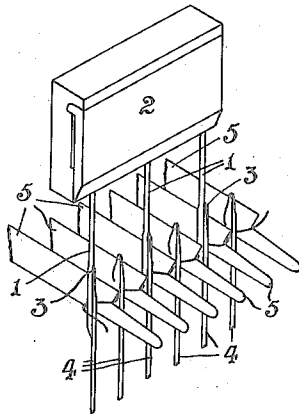


Fig. 2.

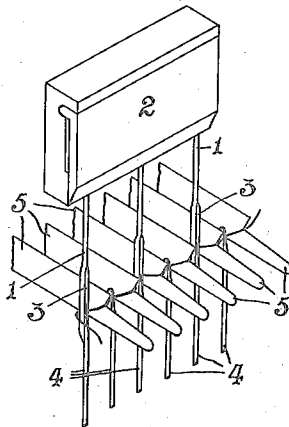


Fig. 3.

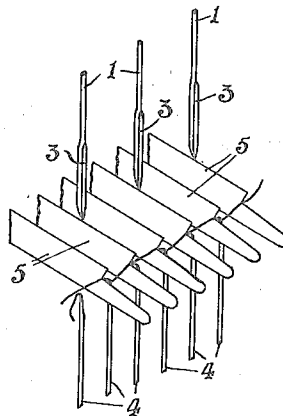


Fig. 4.

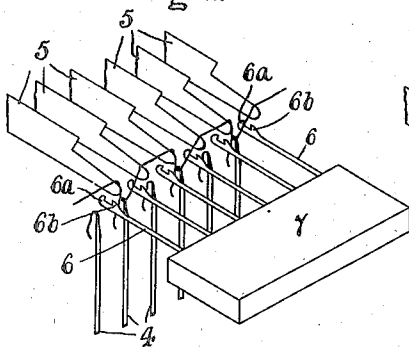


Fig. 5.

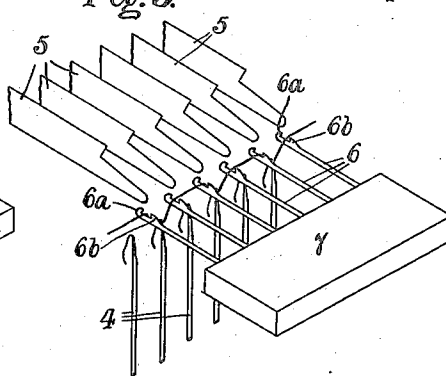


Fig. 6.

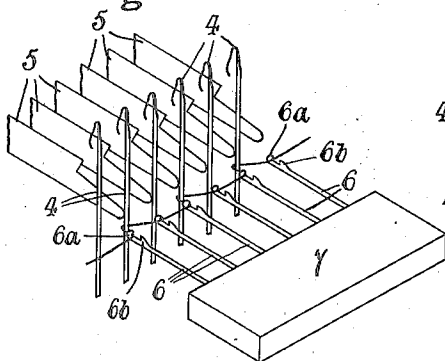


Fig. 7.

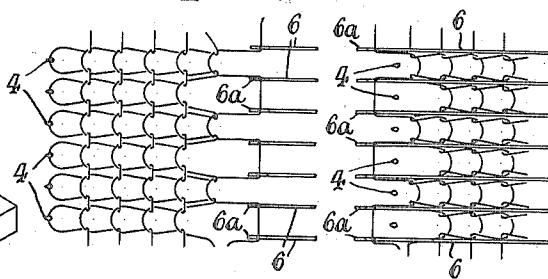
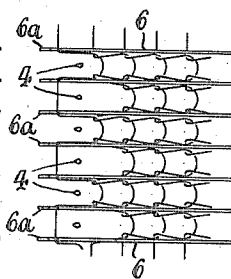


Fig. 8.



Inventors:
 Harry N. Start
 Ernest Start
 By: Mason, Porter
 Attorneys

April 15, 1941.

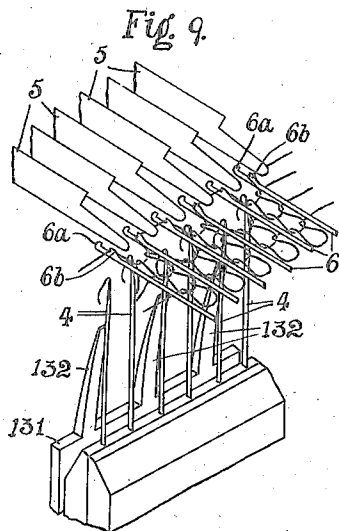
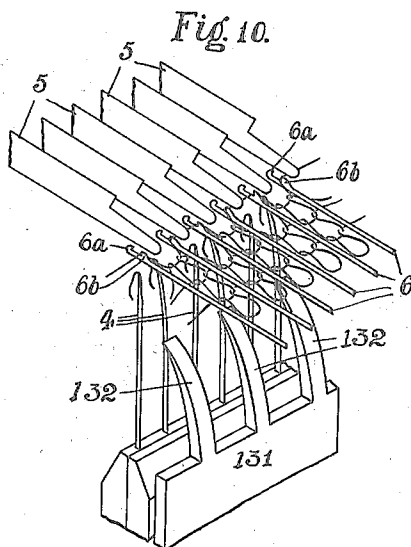
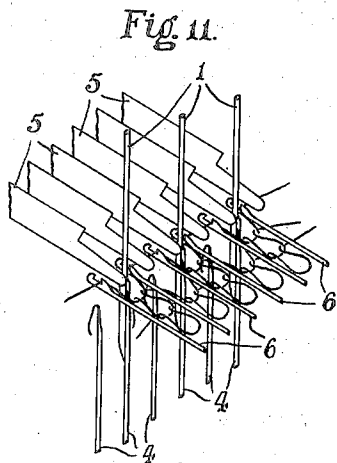
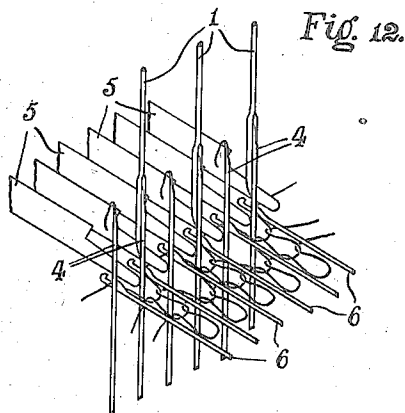
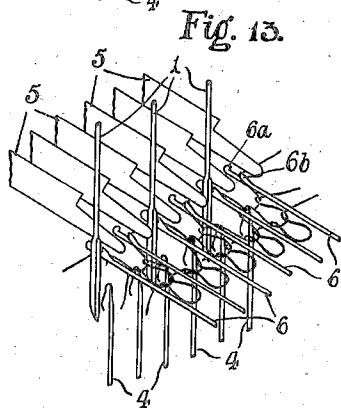
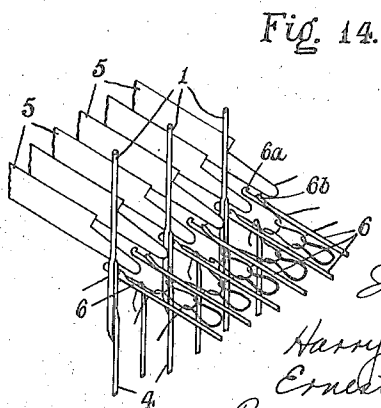
H. W. START ET AL

2,238,192

WELT TURNING MECHANISM OF STRAIGHT-BAR KNITTING MACHINES

Filed May 20, 1940

5 Sheets-Sheet 2



Inventors:
Harry W. Start
Ernest Start
By: Macen & Porter
Attorneys

April 15, 1941.

H. W. START ET AL

2,238,192

WELT TURNING MECHANISM OF STRAIGHT-BAR KNITTING MACHINES

Filed May 20, 1940

5 Sheets-Sheet 3

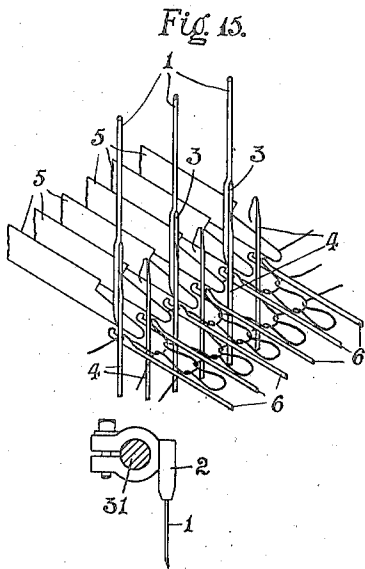
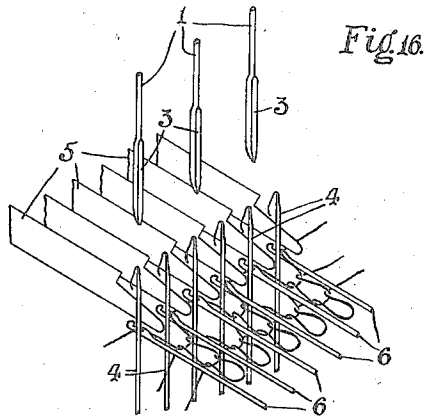
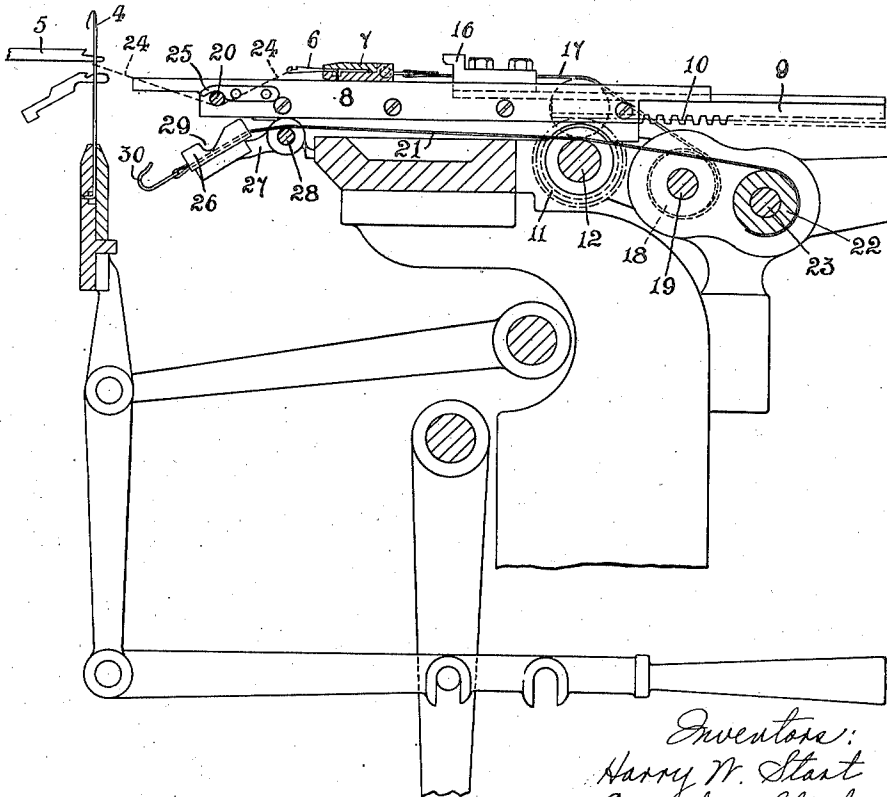


Fig. 17.



Inventors:
Harry W. Start
Ernest Start
By: Mason & Porter
Attorneys

April 15, 1941.

H. W. START ET AL

2,238,192

WELT TURNING MECHANISM OF STRAIGHT-BAR KNITTING MACHINES

Filed May 20, 1940

5 Sheets-Sheet 4

Fig. 18.

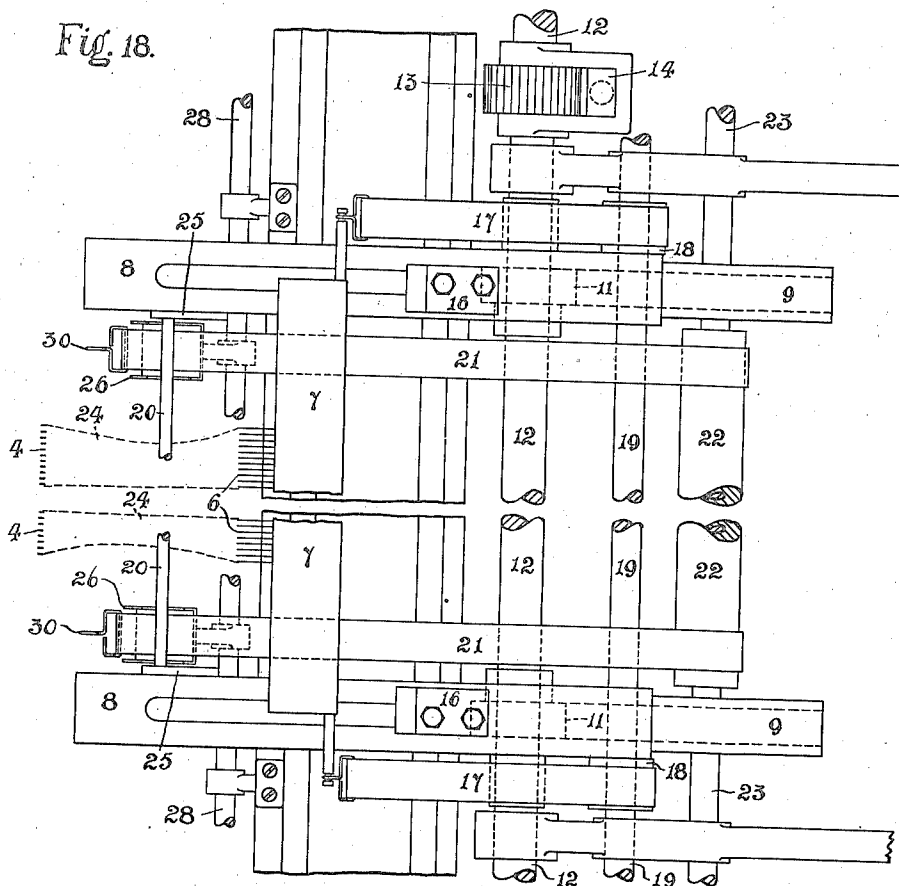
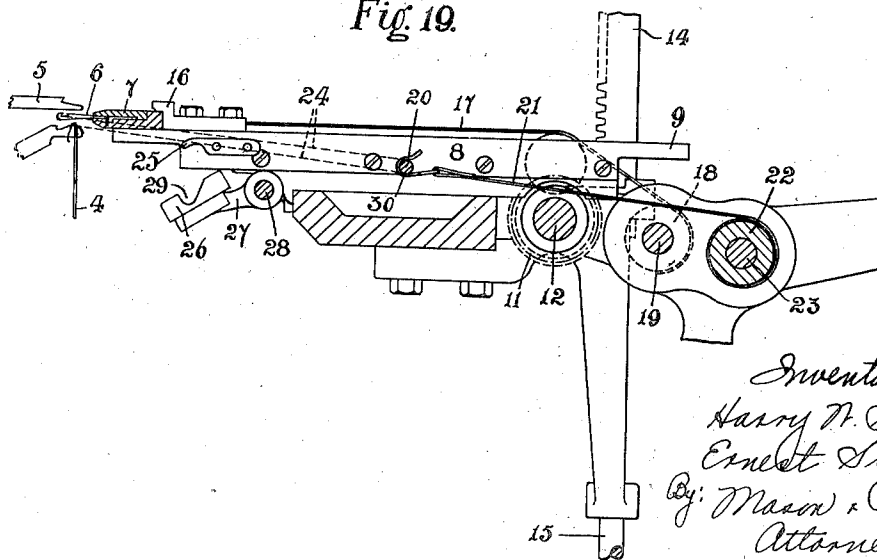


Fig. 19.



Inventors:

Harry N. Start

Ernest Start

By: Mason & Porter

Attorneys

April 15, 1941.

H. W. START ET AL

2,238,192

WELT TURNING MECHANISM OF STRAIGHT-BAR KNITTING MACHINES

Filed May 20, 1940

5 Sheets-Sheet 5

Fig. 20.

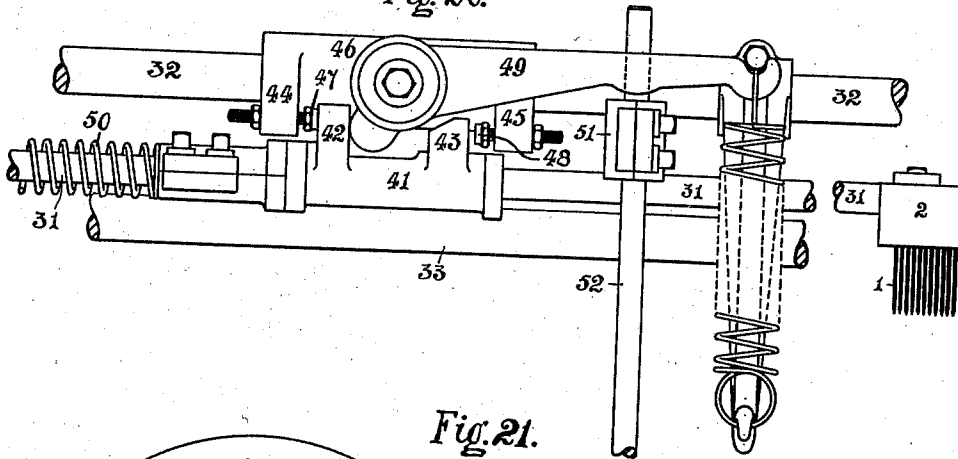
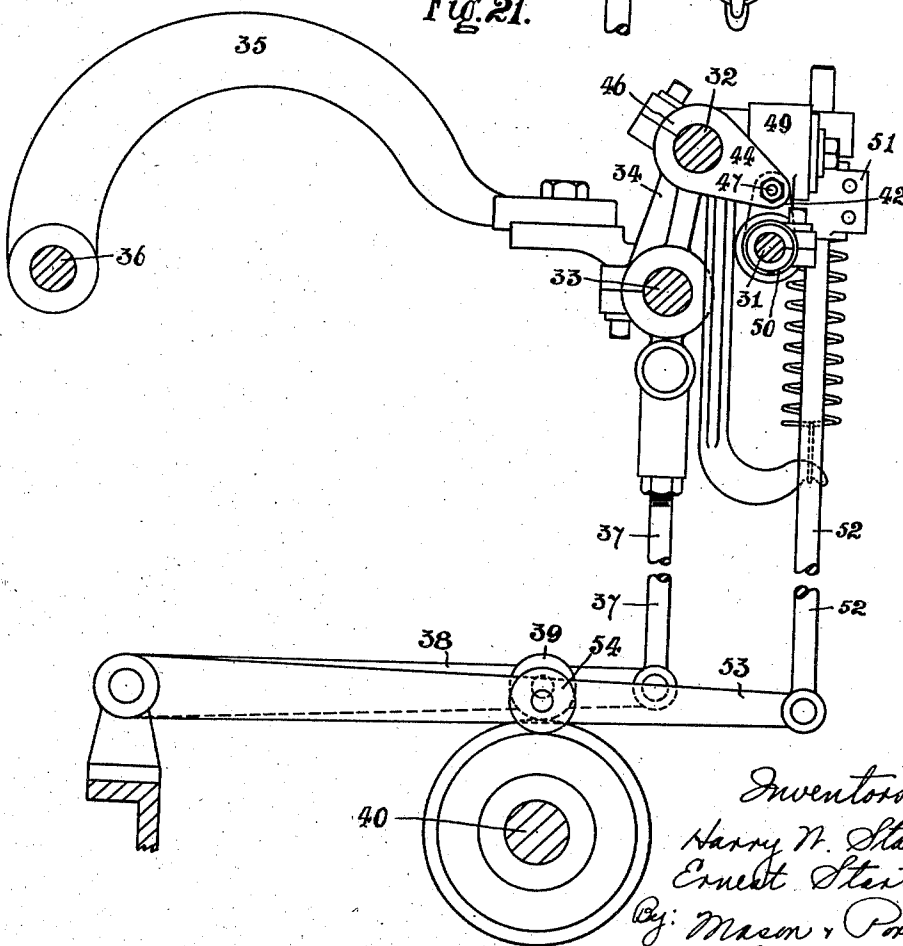


Fig. 21.



Inventors:
Harry W. Start
Ernest Start
By: Mason & Porter
Attorneys

UNITED STATES PATENT OFFICE

2,238,192

WELT TURNING MECHANISM OF STRAIGHT-BAR KNITTING MACHINES

Harry Wilfred Start, Carlton, and Ernest Start,
 Wilford, England, assignors to George Blackburn and Sons Limited, Nottingham, England

Application May 20, 1940, Serial No. 336,260
 In Great Britain March 4, 1939

8 Claims. (Cl. 66—96)

This invention relates to improvements in the welt turning mechanism of straight-bar knitting machines of the type known as "Cottons," and its object is to provide mechanism for this purpose that will perform the required operating without failure when applied to machines of very fine gauge, and is not liable to get out of order.

According to this invention the welt turning mechanism comprises points provided in connection with a predetermined number of needles, and adapted to co-operate with the needles and transfer the loops of the initial course which would be otherwise disposed thereon onto the sinkers when the needle bar is lowered and a set of welt hooks adapted to receive the loops from the sinkers when the latter are withdrawn, retain the loops whilst a predetermined number of courses are being knitted to form the welt and then replace the loops on the appropriate needles to complete the welt.

The welt hooks are adapted to be moved in between the sinkers and the knocking-over bits and are secured on a bar which is disposed at the front of the needle bar, and when the hooks thereon have received the loops, the first part of the welt can be knitted by using the welt hooks to take up the work, until a sufficient length of fabric has been knitted to permit of the use of welt wires, which are carried and actuated in a well known manner, and are with the present arrangement adapted to draw a loop of the work under the welt hook bar.

When the required length of fabric has been knitted to form the welt, the welt hooks are moved up to the needle bar again, and the loops on the said hooks are placed on the needles, the operation of turning the welt is completed, and the knitting of the remaining part of the stocking effected in the usual manner.

In order to facilitate the operation of returning the loops to the needles instruments may be provided to press on the needles so that the upper ends of those needles which are to receive the loops are disposed slightly in front of the remainder so that the latter will not pass through the work. Preferably however the points are brought into action again to co-operate with the needles during the replacing of the loops thereon so that the loops are only placed on those needles from which they were removed during the formation of the initial course.

The invention will now be more particularly described with reference to the accompanying drawings, in which—

Figs. 1 to 6 show diagrammatically the method of transferring the loops on certain of the needles onto the welt hooks.

Fig. 7 is a diagrammatic plan showing the work held by the welt hooks.

Fig. 8 is a diagrammatic plan showing the welt hooks moved into position to replace the loops on the needles.

Figs. 9 to 12 show diagrammatically one method of replacing the loops on the needles.

Figs. 13 to 16 show diagrammatically alternative methods of replacing the loops on the needles.

Fig. 17 is a sectional elevation, and

Fig. 18 a plan of the welt turning mechanism,

Fig. 19 is a sectional elevation showing the welt hooks moved into position to replace the loops on the needles when a sufficient number of courses have been knitted to form the welt,

Fig. 20 is a front elevation, and

Fig. 21 a sectional elevation showing the point bar operating mechanism.

Like numerals indicate like parts throughout the drawings.

In carrying out this invention, the points 1 in each division of the machine depend down from a point bar 2 which is disposed above the needle-bar near to the ordinary narrowing points, and this point bar is carried and operated as will be hereinafter explained by mechanism similar to that of the narrowing mechanism. The points are similar to the ordinary coverer points, but have much longer flutes 3 to receive the needle beards and may be carried by the usual picot bar provided in machines of this type and replace the usual picot points.

When drawing an initial course, as shown in Fig. 1, the needles 4 are in their highest position, and the points which are provided in connection with a predetermined number of needles, and are preferably provided in connection with alternate needles, are disposed on their inner sides and extend down below the point where the course is drawn, so that alternate loops are sunk on alternate needle shanks and the remainder on the lower ends of the points. In order to permit of this action, the flutes 3 in the points extend up to a point which is above the level of the tops of the needles, when the latter and the points are in the course drawing position described and shown in Fig. 1.

The needle bar subsequently descends the loops on the alternate needles are drawn into the beards of the latter, whilst those on the points are retained thereby as shown in Fig. 2 until the

points of the beards are below the loops, when the points 1 are raised and by the continued downward movement of the needle bar the loops released by the points are delivered on to the noses of the sinkers as shown in Fig. 3. A further result of this action is that the loops on the alternate needles will be above the normal length, as they will take yarn from the loops drawn on the points.

If preferred the initial course may be drawn on all the needles and the points then lowered into engagement with the needles so that the loops thereon are taken by the points in well known manner, when the needles and points are lowered, instead of entering the beards. When the loops have been taken on the points the latter stand until the needles have moved clear of the points when the latter are raised so that the loops thereon are taken on the sinker noses as in the previous arrangement.

If the loops are taken off the needles as described special points with long flutes are not required and the ordinary picot points which are provided in connection with every alternate needle, can be used for the purpose.

The subsequent downward movement of the needles 4, and the retiring movements of the sinkers 5, will effect the delivery of the loops on to the inner ends of the welt hooks 6, which are at this time disposed just below the sinker noses as shown in Figs. 4 and 5. The needles are then raised as shown in Fig. 6 and knitting continued in the usual manner on all the needles, the loops on the welt hooks being retained as shown in Fig. 7, until a sufficient number of courses to form the welt have been knitted when the loops on the welt hooks are replaced on the needles as will be hereinafter described.

The welt hooks 6 in each division of the machine are carried on a horizontal bar 7 which is disposed in front of the needle bar, and the welt hooks project from this bar in a horizontal direction towards the needle bar at a level which is just below the sinker noses. This welt hook bar is not fixed but is movable in a horizontal plane bodily to and from the needle bar. For this purpose the bar 7 slides on transverse bearers or brackets 8 (see Figs. 17 to 19), and it is moved towards the needles by a positive arrangement and withdrawn therefrom by a non-positive arrangement.

In order to maintain the welt hooks in their correct position as they are moved up to and away from the needles, two ribs or plates are provided on the underside of the welt hook bar and the edges of the ribs or plates engage with the sides of the brackets 8 and prevent movement of the bar in the direction of its length.

In the preferred arrangement the welt bars in each division of the machine are moved up to the needles by positively actuated slides. These slides comprise members 9 which are preferably disposed inside the brackets 8 and provided on their undersides with teeth 10 which engage with pinions 11 secured on an angularly adjustable shaft 12. The shaft 12 is angularly adjusted by a pinion 13 engaging with a toothed rack 14 which is connected by the link 15, see Fig. 19, to a lever actuated at the appropriate time by a cam on the main shaft of the machine. In order to move the welt hook bar up to the needles when the slides are actuated the members 9 are provided at their inner ends with abutments 16 to engage with the ends of the welt hook bar as shown in Fig. 19.

The non-positive return movements of each welt hook bar is preferably effected, by connecting each end of the bar by straps 17 to take-up rollers 18 secured on a shaft 19 which extends the whole length of the machine and is actuated in the usual manner by a weight attached by a cord to a pulley secured on the shaft.

A full set of welt hooks is provided on each bar, they are each formed with a hook 6a at their inner extremities, and also with a shoulder 6b a short distance from the hook. This shoulder forms a stop which prevents the loops from sliding along the stems of the hooks.

In order to take the loops from the sinker noses, the welt hooks are moved in until their extremities are just below the sinker noses as shown in Fig. 4, and as there are a full set of hooks or one between each pair of needles, the loops transferred from the points onto the sinkers are each taken on two hooks as shown in Fig. 5, which not only facilitates this operation, but greatly assists in the process of returning the loops to the needles again, in order to complete the turning of the welt.

The first portion of the welt is now knitted, the work being taken up by the retiring movement of the welt hook bar 7 which is effected by the take up arrangement previously described. When the welt hook bar has retired to the full extent of its movement, that is moved back into engagement with the abutments 16, shown in their normal position in Fig. 17, the work is further taken up by welt wires 20 which are inserted before the bar 7 has completed its full movement and which are operated in the usual manner by straps 21 connected to the take up roller 22 actuated in the usual manner by a weight attached by a cord to a pulley secured on the shaft 23 which extends along the whole length of the machine.

When the welt hook bar 7 has been withdrawn to approximately the position shown in Fig. 17 the welt wires are pressed down on the work 24 and engaged under the catches 25 secured to the sides of the brackets 8, the take up weight on the shaft 23 having been previously removed and the take up straps 21 placed in the channel shaped guides 26 as shown in Fig. 17. When the welt wires 20 have been placed in position in all the divisions the guides 26 which are carried by arms 27 secured to a shaft 28 are moved by angularly adjusting the shaft 28 by a suitable hand lever until the openings 29 in the sides of the guides engage with the welt wires 20. The take up weight is then gradually applied to the shaft 23 when the take up straps 21 are withdrawn until the hooks 30 attached to the ends thereof engage with the welt wires.

The guides 26 are then returned to their normal position and further application of the take up weight draws the welt wires towards the take up roller 22 and draws the work 24 into a loop beneath the welt hook bar 7. It will be understood that with the arrangement described the welt wires in each division of the machine are simultaneously connected to the take up straps and that the welt wires then continue to take up the work when the welt hook bar has reached the limit of its backward movement.

When a sufficient length of fabric has been knitted to form the welt, and the needles are in their lowest position, the welt hook bar is moved in by the arrangement previously described so as to place the loops held thereby over the needles as shown in Figs. 8 and 19 so that the latter can

rise up and take them. Although the loops held by the welt hooks are extended by the tension applied to the work by the welt wires and are readily placed on the correct needles there is considerable risk in a fine gauge machine of the other needles catching the yarn so that a faulty join is made. In order to obviate this any of the following arrangements may be adopted. In one method the operation of returning the loops to the needles is facilitated by moving the needle bar away from the sinkers and at the same time bringing the following mechanism into action.

On the inner side of the needle bar in each division of the machine, is a bar 131 with instruments 132 which work in between the knocking-over bits and are adapted to act on alternate needles. This bar is actuated so that the instruments press the upper ends of those needles on which the loops are to be placed towards the welt hook bar, as shown in Fig. 9, and hold them in this position while the needles are raised and the transfer of the loops is being effected. The upper ends of the needles on which the loops are to be placed are thus disposed clear of the upper ends of the remainder which are thus out of the way during the operation described and are prevented from passing through the work.

Alternatively the instruments 132 described are disposed on a bar at the front of the needles as shown in Fig. 10, and in this case, the instruments are arranged to press back the upper ends of the alternate needles which are not to receive the loops from the welt hooks.

The welt hooks when they have placed the loops on the needles, may remain in engagement with the fabric until a further length has been knitted, and they can then be disconnected without any difficulty and without stopping the machine.

In the preferred method of replacing the loops held by the welt hooks on the needles the points are brought into action again. The points may either be moved one needle space and moved down to shield the needles which are not to receive the loops, whilst the needles are down between the knocking over bits, and then moved up with the needles after the loops on the welt hooks have been placed over the needles so that only the remaining needles pass up through the work as shown in Figs. 11 and 12. Alternatively, the loops on the welt hooks are moved in so as to be below the points with the needles in their lowest position and the points then lowered to pierce the loops as shown in Fig. 13. The needles are then moved forward so that the alternate needles move into engagement with the flutes in the points as shown in Fig. 14 and the needles and points raised together as shown in Fig. 15 so that the loops pierced by the points are placed on the needles. By pressing the needles into engagement with the points the needles engaging therewith are pressed back slightly out of line with the remaining needles so that there is no danger of these latter needles passing up through the work when the needles are raised. After the needles have been raised high enough for the loops to be positioned on the stems of the needles the points are raised out of action as shown in Fig. 16 and knitting of the remainder of the stocking can then be continued in the usual manner. The welt hooks can be removed from the work subsequently without stopping the machine.

The points 1 are carried by a bar 2 attached by suitable brackets to a shaft 31. This shaft 31 is carried in suitable brackets carried by the

shafts 32, 33, which latter are secured in bearings in brackets 34. In order to raise and lower the points into and out of action the shaft 33 is carried by the outer ends of arms 35 (see Fig. 21) pivoted on a shaft 36 disposed at the rear of the machine and is also connected by a link 37 to the end of a cam operated lever 38. The latter is provided with a truck 39 which normally rides on a disc on the main cam shaft 40 and holds the shafts 32, 33 in their inoperative position and provision is made in well known manner for adjusting the position of the truck 39 laterally by studs on the pattern chain of the machine so that it can be moved into engagement with a cam on the main shaft 40 at the appropriate time so that the points are lowered into their operative position and raised out of action again when they have completed the operation which they were brought into action to perform.

When it is desired to shield the needles which are not to receive the loops by means of the points as previously described, when the loops on the welt hooks are being returned to the needles to complete the turning of the welt, the points must be moved laterally one needle space. In order to effect this movement the following arrangement is provided.

Secured on the shaft 31 is a member 41 provided with two abutments 42, 43 which are disposed between two extensions 44, 45, on a member 46 secured on the shaft 32. The extensions 44, 45, are provided with adjustable stops 47, 48, and the abutment 42 is normally held in engagement with the stop 47 by a spring actuated lever 49 pivoted on the member 46 as shown in Fig. 20. When it is necessary to move the points laterally the lever 49 is raised and the shaft 31 which carries the points is moved by the spring 50 until the abutment 43 engages with the stop 48 which is set to permit of the required movement. The spring 50 is disposed between the member 42 and a fixed part of the machine framing which is not shown in the drawings. The lever 49 is raised at the appropriate time by a collar 51 which is secured on a rod 52 and engages the underside of the lever when the rod 52 is raised by means of the cam actuated lever 53 which is provided with a truck 54 movable into engagement with a cam on the main shaft 40 in the well known manner previously referred to.

The mechanism just described is not brought into action when the points are used to first pierce the loops held by the welt hooks and then place them on the needles as the loops are put back on the needles from which they were removed when the initial course was made and no lateral movement of the points is required, but if the points used for the welt turning operation described are the picot points provided in the machine the mechanism can be used for adjusting the position of the points when they are carrying out their normal functions.

What we claim as our invention is:

1. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of points to co-operate with a predetermined number of needles, means to lower the points into engagement with the needles to take and transfer the loops of the initial course drawn thereon onto the sinkers, a set of welt hooks carried by a bar and means for moving the welt hooks into position beneath the sinkers to receive the loops therefrom, retain them during the knitting of a sufficient number of courses to form the welt and

then return them to a position to be taken by the needles from which they were removed to complete the turning of the welt, substantially as described.

2. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of points to co-operate with a predetermined number of needles, means to lower the points into engagement with the needles to cause the loops of the initial course drawn thereon to be cast off, a set of welt hooks carried by a bar, brackets to support the bar, slides engaging with the bar, means to actuate the slides to move the welt hooks into position just below the sinkers to receive the loops cast off from the needles and to return the loops to the needles when a sufficient number of courses have been knitted to form the welt and straps connected between the bar and a take-up roller to take up the work during the knitting of the welt, substantially as described.

3. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of points to co-operate with a predetermined number of the needles, means to lower the points into engagement with the needles to cause the loops of the initial course drawn thereon to be cast off, a set of welt hooks carried by a bar, brackets to support the bar, slides to engage with the bar, teeth on the undersides of the slides, a shaft, pinions on the shaft to engage with the teeth on the slides, means to angularly adjust the shaft to move the welt hooks into position just beneath the sinkers at the required times, straps connected to the welt hook bar, and a take up roller to withdraw the welt hooks and take up the work during the knitting of a predetermined number of courses of the welt, a welt wire, catches on the brackets for holding the welt wire, straps connected to a main take up roller and provided with hooks to engage with the welt wire, and means for moving the hooks into engagement with the welt wire to take up the work after a predetermined number of courses have been knitted, substantially as described.

4. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of points to co-operate with a predetermined number of needles, means to lower the points into engagement with the needles to cause loops of the initial course drawn thereon to be cast off, a set of welt hooks, means to move the welt hooks into position to receive the loops cast off the needles, retain them during the knitting of the welt and then move them into position to be taken by the needles to complete the turning of the welt, stops on the welt hooks and instruments to press back the needles from which the loops were cast off so that the remaining needles do not penetrate the loops held by the welt hooks, substantially as described.

5. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of points to co-operate with a predetermined number of needles, means to lower the points into engagement with the needles to cause loops of the

initial course drawn thereon to be cast off, a set of welt hooks carried by a bar, means to actuate the bar to move the welt hooks into position to receive the loops cast off the needles, hold them during the knitting of the welt and return them into position to be taken by the needles from which they were cast off to complete the welt and instruments to press forward the needles which are not to receive the loops so that they will not penetrate the loops held by the welt hooks, substantially as described.

6. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of welt hooks carried by a bar, means to actuate the bar to move the welt hooks into position beneath the sinkers to receive loops of the initial course cast off the needles, retain the loops during the knitting of the welt and then return them to a position beneath the sinkers, a set of points to co-operate with alternate needles, means to lower the points into engagement with the needles to cause the latter to cast off the loops of the initial course drawn thereon and to penetrate the loops held by the welt hooks when they are moved into position again beneath the sinkers in order to place them on the needles and complete the formation of the welt, substantially as described.

7. Welt turning mechanism for a straight-bar knitting machine comprising in combination, a set of needles, sinkers, a presser, a set of welt hooks carried by a bar, means for actuating the bar to move the welt hooks into position beneath the sinkers to receive loops of the initial course cast off the needles, retain them during the knitting of the welt and then return them to a position beneath the sinkers, a set of points to co-operate with alternate needles, means to lower the points into engagement with the needles, and means for moving the points laterally one needle space to shield alternate needles so that the loops held by the welt hooks are only replaced on the needles from which they were originally cast off, substantially as described.

8. Welt turning mechanism for straight-bar knitting machines comprising in combination, a set of needles, sinkers, a presser, a set of welt hooks carried on a bar, means for actuating the bar to move the welt hooks into position beneath the sinkers to receive loops of the initial course cast off the needles, retain them during the knitting of the welt and then return them to a position beneath the sinkers to be taken by the needles from which they were cast off, a set of points to co-operate with alternate needles and carried by a bar mounted on a shaft, a bracket on the shaft provided with two abutments disposed between fixed stops, a spring actuated lever which normally holds one abutment in engagement with one of the stops, a spring to move the other abutment into engagement with the other stop when the lever is moved against the action of its spring to permit the points to move one needle space to shield alternate needles, substantially as described.

HARRY WILFRED START.
ERNEST START.