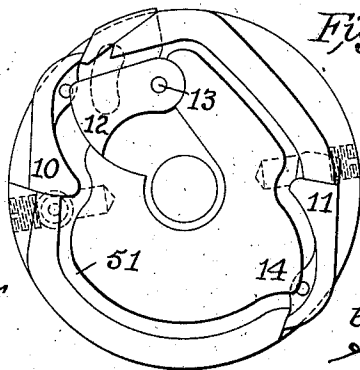
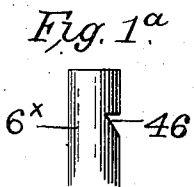
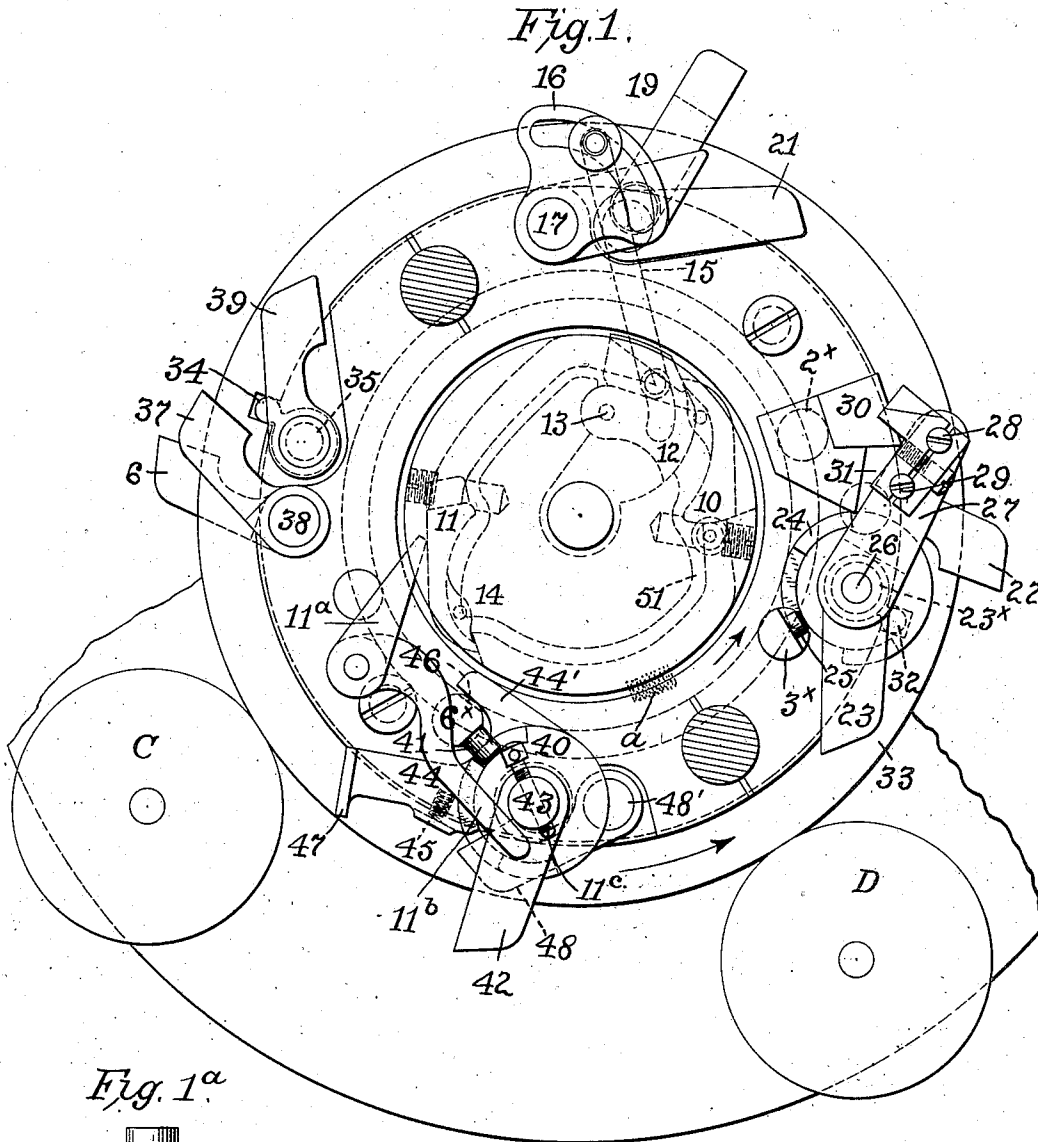


F. B. WILDMAN & G. L. BALLARD.
WELT KNITTING MACHINE.
APPLICATION FILED APR. 25, 1911.

1,047,355.

Patented Dec. 17, 1912.

3 SHEETS-SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 6.

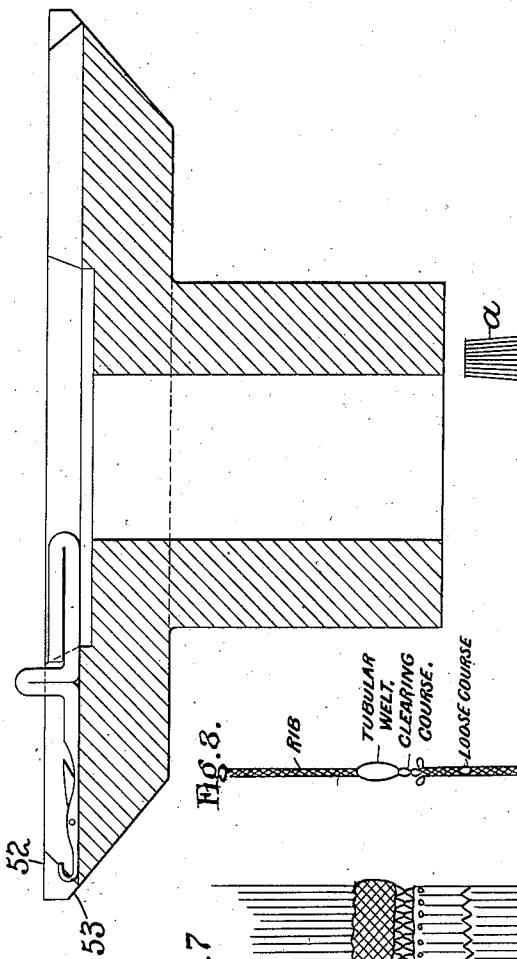


Fig. 8.

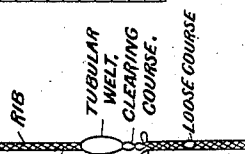


Fig. 7.

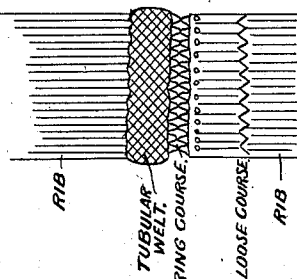
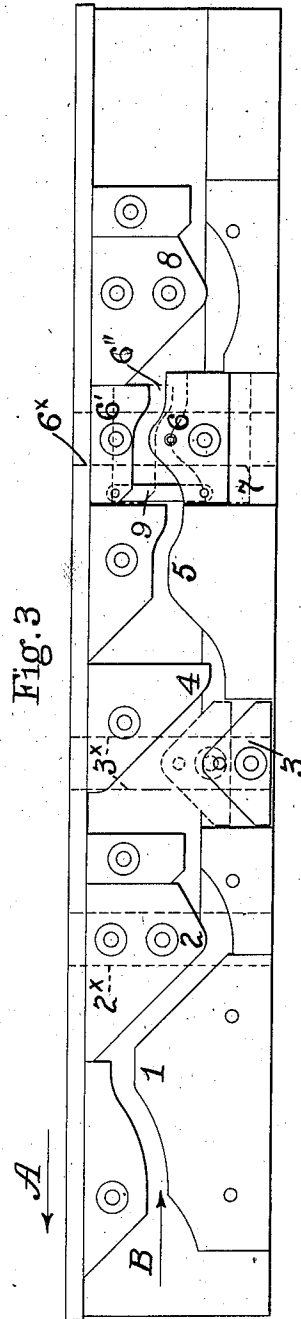


Fig. 3.



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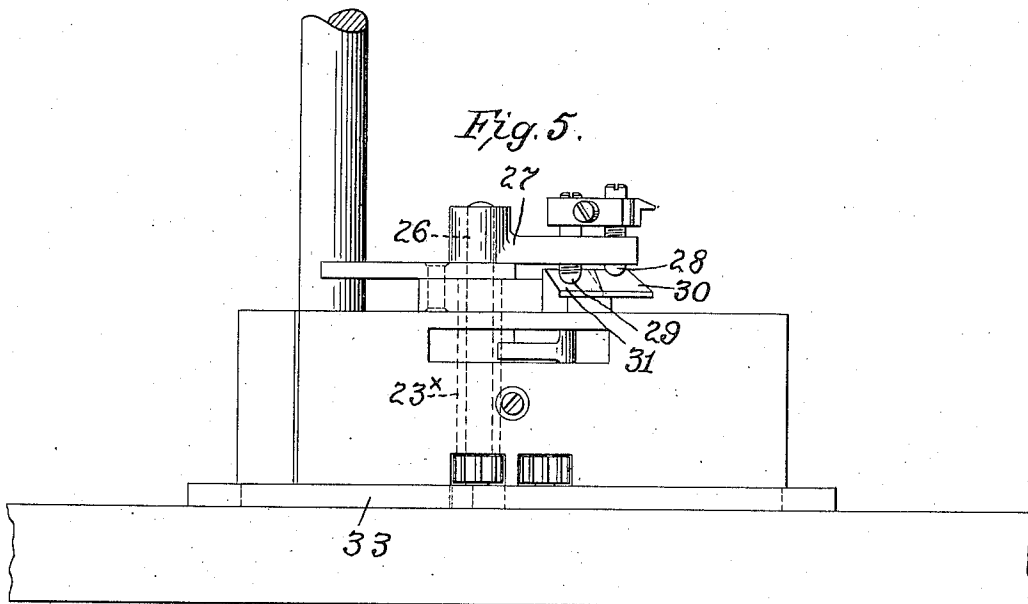
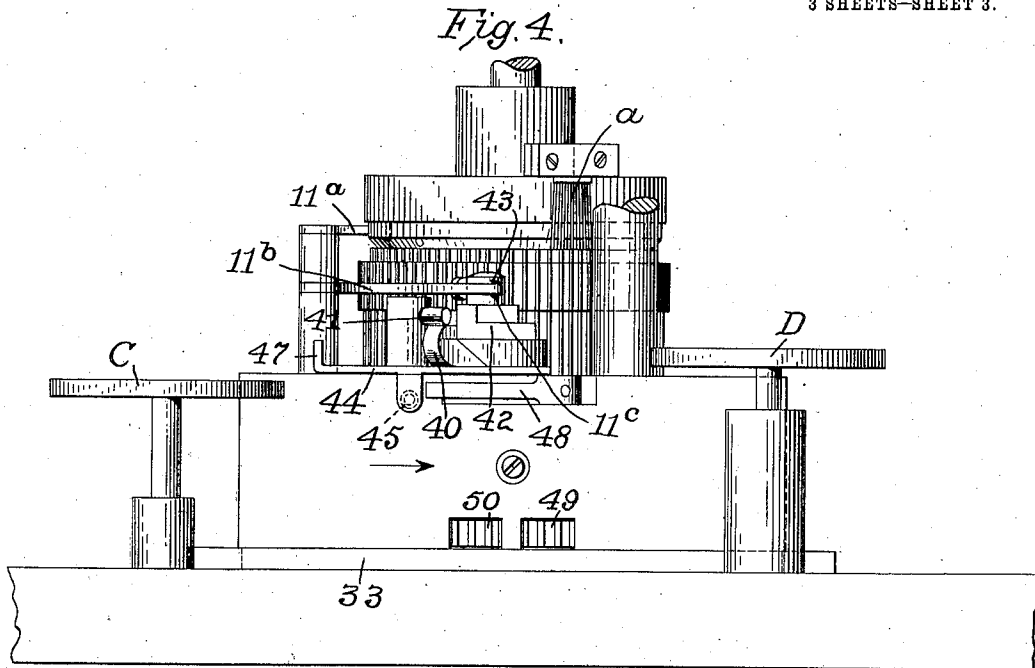
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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WELT-KNITTING MACHINE.

1,047,355.

Specification of Letters Patent.

Patented Dec. 17, 1912.

Application filed April 25, 1911. Serial No. 623,261.

To all whom it may concern:

Be it known that we, FRANK B. WILDMAN and GEORGE LAWSON BALLARD, a citizen of the United States and a subject of the King of Great Britain, respectively, residing at Norristown, Pennsylvania, have invented certain new and useful Improvements in Welt-Knitting Machines, of which the following is a specification.

For making tubular welts, *i. e.*, a welt composed of two distinct fabrics, an inner and an outer, a two feed machine is employed, the two threads being fed at substantially opposite sides of the machine. On one side of the machine the inside welt fabric is knitted on the dial needles, while on the other side of the machine the outer welt fabric is knitted on the cylinder needles. The welt on the cylinder needles is formed in the ordinary way, the dial needles being retracted and holding the stitches while the cylinder needles at this side of the machine continue to knit a plain fabric for the welt. On the other side of the machine from that just mentioned, at which the outer welt layer is being formed on the cylinder needles, the inner welt layer is formed by drawing the cylinder needles down out of action by a special cam, thus allowing plain fabric to be knit on the dial needles for the inner welt layer just mentioned. There are thus two plain fabrics being knitted one at each side of the machine; and these are joined into a tube when rib knitting is resumed.

The invention consists in the features and combination and arrangement of parts for carrying out the purposes above mentioned hereinafter described and particularly pointed out in the claims.

One embodiment of our invention is shown in the accompanying drawings, in which—

Figure 1 is a plan view of a knitting head embodying our invention and in this figure the dial cams are shown in dotted lines; Fig. 1^a is a fragmentary detail of post 6^a showing the notch 46 therein; Fig. 2 is a bottom plan view of the dial cap showing the cams; Fig. 3 is a view of the cylinder cams, in the nature of a diagram; Fig. 4 is a side view of a part of the cylinder showing the means for operating the special cam for throwing the cylinder needles out of operation to permit

the welt to be formed on the dial needles on this side of the machine while the welt on the other side is being formed on the cylinder needles; Fig. 5 is a side view of part of the cylinder with the mechanism for controlling the making of the clearing course and part of the means for controlling the making of the slack course; Fig. 6 is a sectional view of the dial; Figs. 7 and 8 represent conventional face and sectional views of the fabric.

Referring first to Fig. 3, the cam ring rotates in the direction of the arrow A and consequently the needles, in effect, are passed through the cam path in the direction of the arrow B. 1 is the first advancing cam, 2 the first stitch cam, 3 and 4 the members of the clearing course cam, 5 a cam to lift the cylinder needles after the stitches have been dropped therefrom at the clearing cam so that said needles will enter a brush *a*, Figs. 3 and 4, and have their latches opened to receive thread when they arrive at the next feed. 6, 6' is a special cam composed of upper and lower members screwed to the part 7 and adjustable vertically, as will be hereinafter described. This cam, while the machine is knitting regular rib, answers as the advancing cam for the second feed, and following this is the second stitch cam 8, *i. e.*, for the feed on the opposite side of the machine from the first stitch cam. The members of this cam 6, 6', are also connected by a link 9 to hold the member 6 against tipping. The first stitch cam 2 is adjustable automatically, being mounted on the usual post, said cam being operated for producing the loose course and slack course by means hereinafter described.

Dial cams.—These cams comprise the two stitch cams 10 and 11 at diametrically opposite points, one for each feed, and for convenience these will be referred to as the first and second stitch cams, they being located respectively in the usual relation to the first and second stitch cams of the cylinder so called, for convenience of description. In advance of the first stitch cam of the dial and in advance also of the stitch cam of the cylinder is the wing cam 12 pivotally mounted at 13, as usual, to swing inwardly and outwardly in respect to the center of the dial. This wing cam acts to advance the dial needles for taking thread, that is when

it is out in the position shown in Fig. 1, but when it is swung inwardly, then the dial needles are held retracted so as not to take thread but simply to hold the loops. At 14 is shown the advancing cam for the stitch cam 11.

In the operation of the machine the inner and outer welts to form the tubular welts are produced as follows: Following the loose course the wing cam 12 of the dial is thrown into welt position to simply hold the loops without forming new stitches, with the result that at this feed, *i. e.*, at the first stitch cam, a series of one course welts will be formed on the cylinder needles. While this is taking place at the first feed, at the second feed on the opposite side of the machine regular rib is being produced, its courses alternating with the welt course formed on the cylinder needles at the first feed.

When a sufficient number of welt courses have been knit to prevent raveling back, the clearing course is then made, and this is done by raising the clearing course cam 3 to the position shown in dotted lines, Fig. 3, to get the loops back of the latches to be thrown off when the needle retracts.

Immediately following the point where the cylinder needles knit off for making the clearing course, there is the brush of bristles *a* supported on the dial cap, Fig. 4, for opening the latches of the cylinder needles so that they will be open to receive the thread when they arrive at the next feed, *i. e.*, the second feed. Immediately following the clearing action, the cylinder needles are empty until they arrive at the next feed, *i. e.*, the cam 6, 6', where they advance and receive yarn which is to form the foundation of the tubular welt. No stitches are formed at this time, however, on the cylinder needles at this second feed, though they are on the dial needles, because there are no old loops on the cylinder needles, but the cylinder needles simply receive the thread and this goes on until all the cylinder needles that have been cleared take on the thread, and when this is done, the cam 6, 6' immediately drops out of action, so that no loops will be formed at this feed on the cylinder needles. The knitting of the plain fabric for one wall of the welt on the cylinder needles begins, however, when the first feed comes around, and the dial needles at the second dial feed begin to knit the other wall of the welt when the cylinder needles are thrown out at the second feed as just described. In other words, the taking on of the thread by the cylinder needles following the clearing course resumes plain knitting on the cylinder needles for one wall of the welt when the first stitch cam comes around owing to the wing cam remaining in welt position, and the dial knitting plain fabric for the

inner wall of the welt begins at the second feed when the cylinder needles are thrown out of operation.

In throwing the cylinder needles out of operation as just described, the special cam 6, 6' is first moved down from the position shown in Fig. 3 to that shown in dotted lines, Fig. 3, *i. e.*, to the point where the cylinder needles would be tucking, and on the continuation of the revolution (for about an inch) the cam is dropped all the way down out of action, and clear of the path of the dial needles, and the welt formation now begins; on the dial needles at this second feed and on the cylinder needles when the first feed comes around. The interval between the two downward movements of the cam 6, 6', is to insure that the needles that have been cleared will pass the second feed before the cam drops all the way.

The means for operating the wing cam of the dial consists of a link 15, dotted lines, Fig. 1, connected with a pin extending through the dial cap from the wing cam, this said link, at its other end, being connected with the segment 16 adjustably. This segment is on a rock shaft 17 having a toothed segment thereon such as is common in this type of machine, the whole being mounted in the cylinder cam ring. This rock shaft has an arm 19 thereon to be struck by one of the disks or rollers C or D mounted on vertical spindles vertically movable in the base of the machine, as is also common in machines of the Wildman type, as in Letters Patent of the United States No. 613,346, November 1, 1898, so that the arm will, at times, strike the disk and be operated thereby, the said disk being controlled by pattern mechanism, not shown. When the arm strikes the disk, the wing cam will be shifted inwardly for forming the welt, while for restoring the wing cam to outward position for knitting on the dial needles, the pattern disk is adjusted vertically to be struck by the arm 21 as this comes around, this arm being on a supplemental rock shaft mounted in the cam ring, and having thereon a toothed segment meshing with that on the shaft, so that this will be turned to move the wing cam outwardly.

Toothed segments similar to those just referred to will be mentioned and pointed out more particularly in connection with the means for controlling the position of the second advancing cam 6, 6'.

The clearing course cam is operated by a pair of arms 22, 23, the former for lifting the cam and the latter for lowering it, these arms being on rock shafts geared together as above described, said arms being operated by the pattern disk. A cam disk 24 is arranged on the shaft 23* of the arm 23 and when the arm 22 is operated, this cam operates under a pin or roller 25 of the post 3* 13c

of the clearing course cam 3 to lift it, and then when the arm 23 is operated by the disk the cam disk will be turned to allow the clearing cam to assume its low position.

5 The shaft 23^x is hollow, Fig. 5, for the purpose of receiving a shaft 26 which carries an arm 27 having two studs 28 and 29 thereon adapted to engage inclines 30, 31 on the post 2^x of the first stitch cam of the cylinder for adjusting the cam different distances downward for making either slack fabric or a loose course. This inner shaft 26 is operated by a projection 32 thereon at or near its lower end engaging a notch in a ring 33 extending around the cam cylinder and connected at or near the opposite side of the machine through a projection and notch at 34 with the shaft 35 mounted in the cam ring and geared to another shaft 38 having the two arms 36 and 37 thereon, the one being for the loose course and the other for the slack, a return arm 39 being mounted on the shaft 35. By this arrangement the controlling mechanism for the stitch cam for making the slack fabric and loose course may be located at a convenient point distant from the shaft 26 and arm 27.

Operating mechanism for the shiftable advancing cam.—This cam 6, 6' is raised and held in its upper position shown in Fig. 3 by a circular or disk cam 40, Figs. 1 and 4, the flange or cam surface of which rides under a pin 41 on the post 6^x of the said cam 6, 6'. Now, when the pattern roller D is struck by the arm 42 on the shaft 43 carrying the disk cam 40, the said cam will be turned to remove its high part from under the pin 41, allowing this cam to drop until the arm 44' of a spring latch 44 pivotally mounted to turn about the shaft 43 and pressed by a spring 45 engages a notch 46 in the cam post. This will arrest and set the cam 6, 6', in its intermediate position or part way down until the arm of the latch at 47 strikes the pattern roller, which takes place on the same revolution that the arm 42 strikes said roller, when the latch will be withdrawn from the post, and this will drop all the way down to set the cam 6, 6' in its lowermost position so that at this side of the machine the cylinder needles will be out of operation for forming the welt on the dial needles.

When regular rib knitting is to be resumed, the return arm 48 will operate through its shaft 48' and gear segments 49, 50, Figs. 1 and 4, to turn the cam disk or plate 40, and thus elevate the cam, where it will be held by said cam for regular rib knitting. The notch 46 in the post 6^x has a beveled lower side so that although the latch will snap into this notch, the post with the cam can continue their movement upward to their limit.

65 Reverting to the relative arrangement of

the two pattern controlled rollers or disks C and D, these are arranged at separated points, the purpose being to separate the function of returning the wing cam 12 and the cylinder advancing cam 6, 6' to position for knitting regular rib, the wing cam being operated by the disk or roller C and the cam 6, 6', by the disk D. This prevents the changes in the knitting taking place at the same point in the fabric which would result in forming an imperfection or lump at this point.

Referring to the step by step downward movement of the cylinder advancing cam 6, 6', by dropping the cam half way down and adjusting the pattern roll to miss the trigger, a cylinder tuck can be made. The machine is thus adapted, by using this cam, for forming the welt on the dial needles as above described, i. e., by dropping said cam all the way down or by dropping it only halfway down we get the cylinder tuck. When the step by step cam 6, 6' is adjusted all the way down, the welt, at this point, is formed entirely upon the dial needles, the cylinder needles holding out.

Immediately following the first stitch cam of the dial, we employ a dial cam 51 concentric with the center of a dial cap, the purpose of which is: It covers the point where the cylinder clearing course cam is raised and thus makes the dial needles act as a web holder, while the clearing course cam is in action. It further insures the dial latches being thrown back in a resting position while the bristle brush mentioned is opening the cylinder latches. When the clearing course cam is acting, it tends to push up the cylinder welt into the path of the dial needles, but with the concentric cam mentioned this effect is avoided.

We have also provided an improved form of dial for use in a machine of the type described above for forming welts, this being shown in Fig. 6 and consisting in beveling the knocking over bits 52 at their lower corners, as shown at 53.

When knitting regular rib, the stitches draw over the bevel at the bottom of the sinker. When knitting a dial welt, the thread climbs up and runs over the front of the sinker or knock over bit, which provides for drawing a longer stitch for the welt without any adjustment or movement of the stitch cams.

When the welt is to be formed, the cam 6, 6', is dropped all the way down as above described, and in order to draw a longer stitch by the dial needles supplementing the effect of the dial construction as above described, we employed a lever 11^a for operating the stitch cam 11, this lever having one arm 11^b to be operated by a screw 11^c on the post 43 when this is turned to drop the post 6^x of the cam 6, 6'; thus at the same

time the cylinder needles are thrown out of operation the dial cam is adjusted to draw a longer stitch for the welt.

The special cam 6, 6' has its groove depressed or curved downward at 6'' following the portion adjacent the numeral 6 for elevating the needles. By this construction the vertical movement of the cam necessary to lower the needles is less than would be the case without this drop in the cam groove. In other words, a part of the downward movement of the needles is due to the drop in the cam at 6'' while the rest of the downward movement of the needles is due to the downward movement of the cam. By the use of this drop in the cam 6 6' and its relation to the stitch, cam 8, needles having the regular length of butts and a regular length of cylinder may be used. The drop at 6'' when the cam is at its lowest position carries the needles below the line of the dial needles. It will be noticed that this drop in the cam has a straight portion which causes the needles to run in a straight line for a short distance to correspond with the position of the holes in the carrier for guiding the yarn.

We claim as our invention:—

1. In combination in a rib knitting machine, a cylinder and dial, needles therefor, dial cams including a pair of substantially oppositely arranged stitch cams, advancing cams one of which is in the form of an adjustable wing cam to permit holding the dial needles retracted for the formation of plain fabric for a welt on the cylinder needles at one side of the machine, and cylinder cams including a pair of oppositely arranged stitch cams, an advancing cam for one stitch cam and a two-part adjustable switch cam answering as the advancing cam for the other stitch cam, means for adjusting said cam down out of operation for the formation of plain fabric for a welt on the dial needles, and a cylinder clearing course cam between the first stitch cam of the cylinder and the adjustable advancing cam.

2. In combination in a rib knitting machine, a cylinder and dial, needles therefor, dial cams including a pair of substantially oppositely arranged stitch cams, advancing cams one of which is in the form of an adjustable wing cam to permit holding the dial needles retracted for the formation of plain fabric for a welt on the cylinder needles at one side of the machine, and cylinder cams including a pair of oppositely arranged stitch cams, an advancing cam for one stitch cam and a two-part adjustable switch cam answering as the advancing cam for the other stitch cam, means for adjusting said cam down out of operation for the formation of plain fabric for a welt on the dial needles, a cylinder clearing course cam between the first stitch cam of the cylinder

and the adjustable advancing cam, a lifting cam following the clearing course cam and a device for opening the latches of the empty cylinder needles when raised by the lifting cam, substantially as described.

3. In combination in a rib knitting machine, a dial, a cylinder, needles therefor, dial cams including two stitch cams and two advancing cams one of which is adjustable to hold the loops for formation of the welt on the cylinder needles, cylinder cams including two stitch cams and two advancing cams one of which latter is vertically adjustable step by step to switch the cylinder needles out of operation, a clearing course cam in advance of the said switching cam and means for adjusting the switching cam downwardly step by step on the same revolution of the machine following the taking on of the thread at said cam.

4. In a knitting machine for making a double or tubular welt, a cylinder, a dial, needles, dial cams one of which is adjustable for holding the needles retracted for the formation of the welt on the cylinder needles, cylinder cams including a step by step adjustable switch cam to advance the needles or to hold them inoperative, and operating means for the said switch cam comprising a rotary cam for supporting the post of the switch cam and a latch for engaging a notch in said post, and means for turning the rotary cam and for operating the latch to give the step by step downward movement to the switch cam, substantially as described.

5. In combination in a two-feed knitting machine, a cylinder, a dial, needles, a pair of stitch cams for the dial, a pair of advancing cams including a movable wing cam for holding the needles retracted for making fabric for a welt on the cylinder needles, cams for the cylinder needles including a pair of stitch cams and advancing cams one of which latter is adjustable to switch the needles to inoperative position, connections for adjusting the dial wing cam, connections for adjusting the cylinder switch cam, and disks C and D disposed at separated points about the machine for operating the said connections in succession to prevent the changes in the knitting taking place at the same point in the fabric.

6. In combination in a circular knitting machine, a cylinder and dial, needles and cams, and means for adjusting the cylinder cams for the formation of a dial welt, said dial having the ends of its sinker walls inclining outwardly to a point above the bottom of the groove, said ends extending substantially vertically from the upper end of the incline, substantially as described.

7. In combination in a knitting machine, a stitch cam, a clearing course cam, a hollow shaft mounted in the frame of the machine,

a rotary cam thereon for operating the clearing course cam, arms for operating the rotary cam, a shaft extending down through said hollow shaft, a ring encircling the machine and connected with said inner shaft to turn the same, a shaft at another point in the circuit of the machine from the shafts first mentioned, and connected with the ring to operate the same, arms for operating the said shaft, and means to adjust the stitch cam from the said inner shaft, substantially as described.

8. In combination in a rib knitting machine, a dial, a cylinder, needles, dial cams including two stitch cams and two advancing cams one of which is adjustable to hold the dial needles retracted for the formation of the welt on the cylinder needles, cylinder cams including two stitch cams and two advancing cams one of which latter is vertically adjustable step by step to switch the cylinder needles out of operation, means for adjusting the said cam, and a clearing course cam in the cylinder, substantially as described.

9. In combination in a rib knitting machine, a dial, a cylinder, needles, dial cams including two stitch cams and two advancing cams one of which is adjustable to hold the dial needles retracted for the formation of the welt on the cylinder needles, cylinder cams including two stitch cams and two advancing cams one of which latter is vertically adjustable step by step to switch the cylinder needles out of operation, and means for adjusting the said cam, said adjustable cam having a drop in its groove, substantially as described.

10. In combination in a rib knitting machine, a cylinder, a dial, a pair of stitch cams and a pair of advancing cams for each of the cylinder and dial, means for throwing one of the advancing cams of the cylinder out of operation for the formation of the welt on the dial needles, and connections between said operating means and one of the stitch cams of the dial for adjusting the same to draw longer stitches for the dial welt, substantially as described.

11. In combination in a rib knitting machine, a cylinder, a dial, a pair of stitch cams for the cylinder, a pair of stitch cams

for the dial, a pair of advancing cams for each of the cylinder and dial, means for throwing one of the advancing cams of the cylinder out of operation for the formation of the welt on the dial needles, and means for simultaneously operating the active stitch cam of the dial to draw longer stitches for the dial welt, substantially as described.

12. In a knitting machine for making a double or tubular welt, a cylinder, a dial, needles, dial cams one of which is adjustable for holding the needles retracted for the formation of the welt on the cylinder needles, cylinder cams including an adjustable switch cam to advance the needles or to hold them inoperative for the formation of fabric for the welt on the dial needles, operating means for the said switch cam comprising a rotary cam for supporting the post of the switch cam, means for turning the rotary cam, and a connection extending to the active stitch cam of the dial and operated when the said cam is rotated to adjust the stitch cam for drawing longer stitches when the cylinder switch cam is thrown into inoperative position by the movement of the said rotary cam, substantially as described.

13. In a rib knitting machine, the combination of a stitch cam and a grooved cam, with means for adjusting the grooved cam for three positions for knitting, tucking or welting, said cam having a point to elevate the needles followed by a drop in its groove adjacent the stitch cam, substantially as described.

14. In combination in a rib knitting machine, an advancing cam adjustable step by step to inoperative position, means for giving the cam its first step adjustment including a latch for holding the cam in its intermediate position, and means for operating the latch for the further movement of the cam to inoperative position, substantially as described.

In testimony whereof, we affix our signatures in presence of two witnesses.

FRANK B. WILDMAN.
GEORGE LAWSON BALLARD.

Witnesses:

I. F. TEANY,
OWEN BALLARD.