

D. B. KIMES.
KNITTING MACHINE.
APPLICATION FILED JUNE 22, 1912.

1,056,691.

Patented Mar. 18, 1913.

3 SHEETS—SHEET 1.

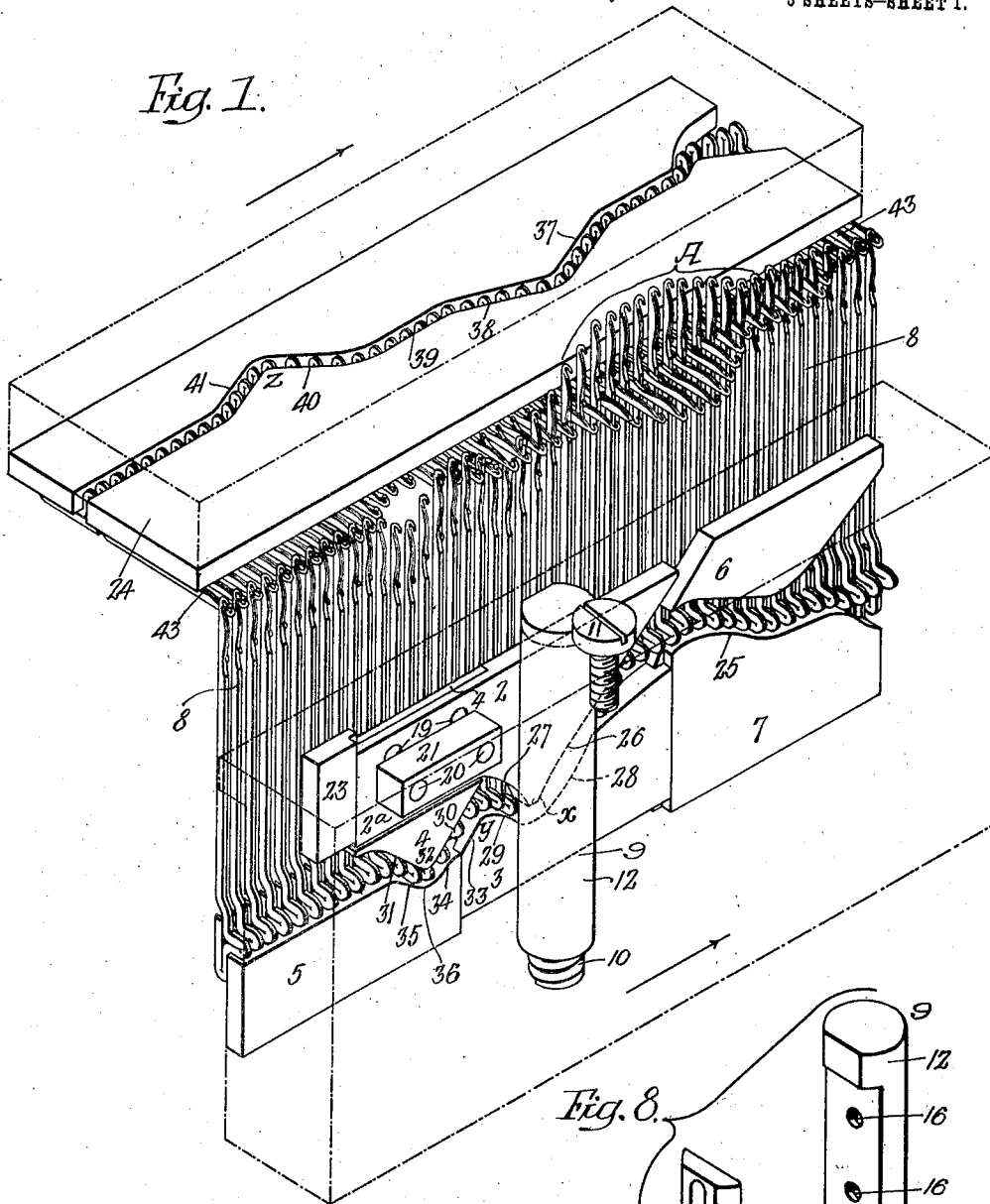
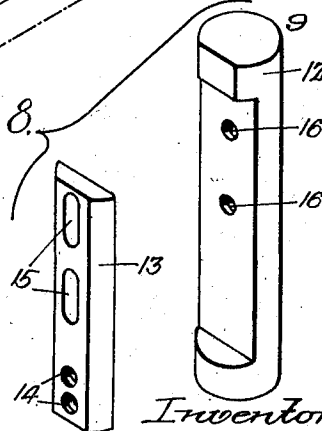


Fig. 8.



Witnesses—

Willet Burrows
Verna P. Pullinger

Inventor—

David B. Kimes,
by his Attorneys—
Howson & Howson

KNITTING MACHINE.

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3 SHEETS--SHEET 2.



Witnesses—
Willst. Burrows
Walter A. Callinger

Inventor—
Daniel B. Kimes.
by his Attorneys—
Howarn & Howarn

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3 SHEETS—SHEET 3.

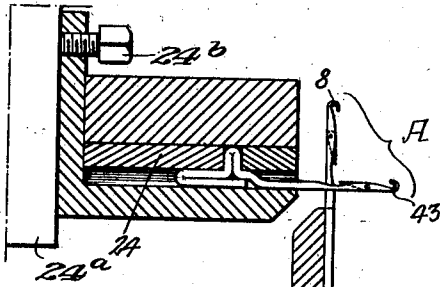


Fig. 3.

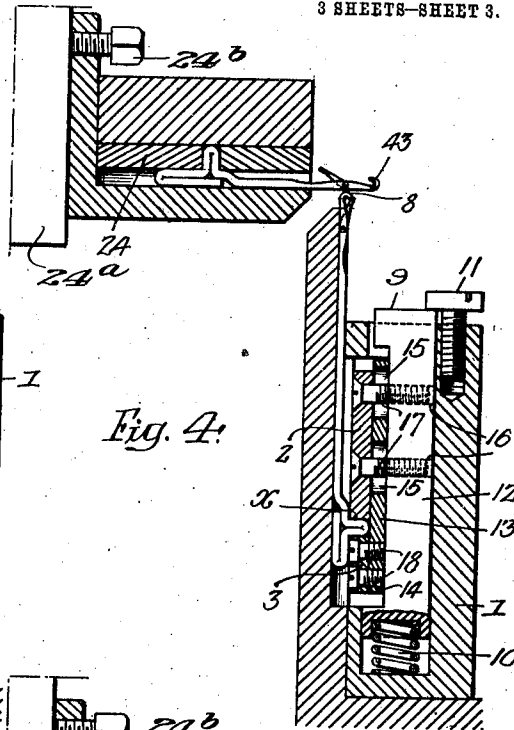


Fig. 4.

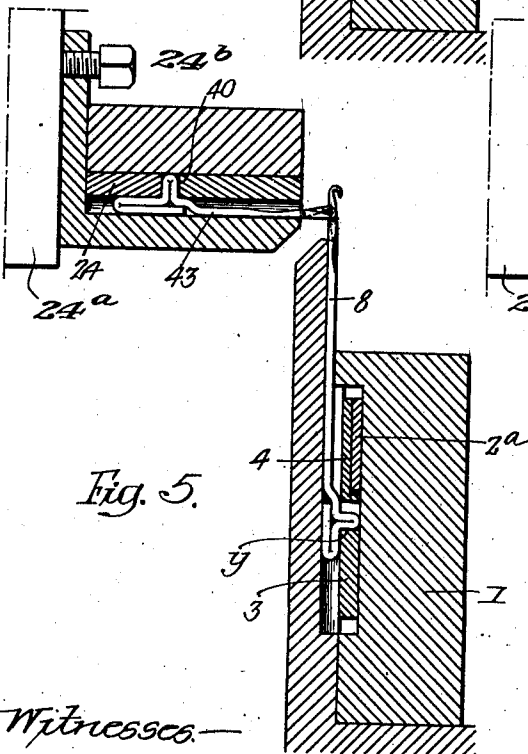


Fig. 5.

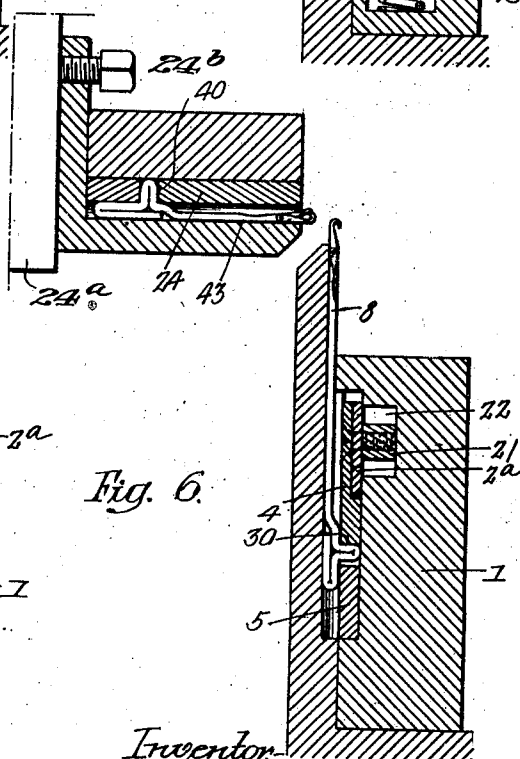


Fig. 6.

Witnesses—
Willst. Burrows
Halter & Pullinger

Inventor—
David B. Kimes
by his Attorneys—
Howe & Howen

UNITED STATES PATENT OFFICE.

DAVID B. KIMES, OF SPRING CITY, PENNSYLVANIA.

KNITTING-MACHINE.

1,056,691.

Specification of Letters Patent.

Patented Mar. 18, 1913.

Application filed June 22, 1912. Serial No. 705,204.

To all whom it may concern:

Be it known that I, DAVID B. KIMES, a citizen of the United States, residing in Spring City, Pennsylvania, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

My invention relates to the knitting of fabrics and consists of an improvement in machinery for knitting "rib" fabrics.

Heretofore in machines for knitting "rib" fabrics where the ribbed effect was produced by one series of similarly operated cylinder needles and one series of dial needles operable in conjunction with the cylinder needles, the cylinder needles owing to the feed of the yarn and their relation to the dial needles prevented the latter from respectively drawing a similar amount of yarn under equal tension. Consequently the ribbed effect was practically only visible on the outer face of the fabric where the wales were produced by the cylinder needles; the inner face having very little indication of a ribbed effect, or projecting wales, because the dial loops being tight and formed under increased tension did not contain as much yarn as the cylinder-knit wales.

Fabrics known as "Swiss ribs" have been produced on two and two dial and cylinder machines in which the ribbed effect is present on both faces of the fabric. However, a fabric knit on this class of machine does not present a compact or even surface owing to the fact that the needle wales are arranged in alternating groups of two wales each or other similar combination; needle widths having been omitted between each group both in the cylinder and dial portions. The chief object of my invention is to quickly and cheaply produce ribbed fabrics which are extremely elastic and which will have a decided rib effect on both surfaces.

Another object of my invention is to prevent "holes" or other defects in the fabric. Other objects and advantages will be described hereinafter, reference being had to the accompanying drawings in which:

Figure 1 is a perspective view of my invention and showing a set of cylinder needles and cams of a circular machine developed in a flat plane and constructed in accordance with the idea of my invention and a dial cam-wave and needles shown in their

respective operative position therewith; the cam-carrying elements being shown in dot-and-dash lines. Fig. 2 is a view of the operable position of the dial and cylinder cams developed in a flat plane and as they appear from their inner face and with the needles omitted. Fig. 3 is a sectional view taken on the line *a-a* Fig. 2 showing the cam-carrying elements in full lines and showing the relative position of the needles therein; Fig. 4 is a sectional view taken on the line *b-b* Fig. 2 showing the cam-carrying elements in full lines and showing the relative position of the needles therein; Fig. 5 is a sectional view taken on the line *c-c* Fig. 2 showing the cam-carrying elements in full lines and showing the relative position of the needles therein; Fig. 6 is a sectional view taken on the line *d-d* Fig. 2 showing the cam-carrying elements in full lines and showing the relative position of the needles therein; Fig. 7 is a sectional view taken on the line *e-e* Fig. 2 showing the cam-carrying elements in full lines and showing the relative position of the needles therein; and Fig. 8 is a detached perspective view of a cam-supporting post which I employ.

Referring to the drawings, 1 is the cam cylinder which may be moved by any well known means in the direction indicated by the arrow Fig. 1 and carries cams 2, 3, 4, 5, 6 and 7 for operating the cylinder needles 8. A cam supporting post 9 is mounted within the cylinder and rests upon one end of a compression spring 10, and is vertically adjusted by means of a screw 11 which is tapped in the top of the cylinder 1. The post 9 is made in two sections 12 and 13 longitudinally adjustable with respect to each other; the section 13 having tapped holes 14 adjacent the bottom thereof and slots 15 adjacent the top. The section 12 has tapped holes 16 in alinement with the slots 15. Screws 17 pass through the slots 15 and engage the tapped holes 16 and thereby secure the cam 2 in fixed relation to the section 12. The cam 3 is secured to the section 13 by screws 18 engaging the holes 14. So if it is desired to adjust the cam 3 in relation to the cam 2 it is only necessary to loosen the screws 17 and slide the section 13 until the cam 3 is in the desired position then to tighten the screws 17 and thereby clamp the section 13 to the section 12.

The cam 2 has an extension 2^a which un-

derlaps the cam 4. This extension is slotted at 19, and screws 20 in the cam 4 extend through the slots 19 and engage a double tapped clamping nut 21. By this construction the cam 4 can be adjusted independently of the movement of the cam 2 or it can be moved therewith. In order to have the cams movable on a plain outer surface of the cam cylinder 1, the latter is cut away at 22 to accommodate the clamp nut 21. A block 23 overlaps the outer end of the extension 2^a and forms a guide for the latter and also the cam 4.

In the drawings I have shown the dial cam 24 made in one piece but it will be understood that this cam may be split up into sections, if desired, for purposes of adjustment in a manner similar to many dial cams now on the market. Also I have shown the dial cam and needle bed adjustably mounted on a central vertical shaft 24^a, by a set screw 24^b, in a well known manner and to allow the vertical adjustment of the dial needles with respect to the cylinder needles to provide for relative changes of position with respect to the cylinder needles as will be more fully described hereinafter.

Considering the action of the cylinder cams: The cams 6 and 7 act upon the butts of the cylinder needles 8 in the usual manner, that is to say, the upwardly extending incline 25 on the cam 7 tends to raise the said cylinder needles to a point sufficiently high to allow the previously formed loops of the knitted fabric to occupy a position back of the opened latches, and also sufficiently high enough to receive a new supply of yarn (see Figs. 1, 2 and 3); the cam 6 acting as a guide cam in the usual manner of knitting. The cam 2 has a downwardly projecting incline 26 which next acts to draw the cylinder needles downwardly a distance sufficient to cast their previously formed loops and together with an incline surface 27 forms a depending angle α on the said cam 2 (see Figs. 1, 2 and 4). The cam 3 has a declined edge 28 and an inclined edge 29. These two edges 28 and 29 intersect to form a substantially V-shaped portion in the said cam 3 which is directly below the said depending angle α of the cam 2. The inclined portion 29 next acts on the butts of the cylinder needles to again raise them but not high enough to place their loops back of the latches (see Figs. 1, 2 and 5). The cam 4 has a downwardly projecting inclined edge 30 which next draws the needles downwardly again. The cam 4 also has an inclined edge 31 which intersects with the said edge 30 to form a depending angle 32. The cam 3 also has an inclined angle 33 which intersects with the inclined edge 29 to form an upwardly projecting angle or needle-raising point Y, and this inclined edge 33 is in alignment with an inclined edge 34 on the cam 5.

The cam 5 also has an inclined edge 35 which intersects with the inclined edge 34 to form a substantially V-shaped portion 36 which is directly below the depending angular portion 32 of the cam 4. The edge 35 next acts to slightly raise the said cylinder needles again at which position they remain until again acted upon by the portion 25 of the cam 7. As before stated, the inclined edge 29 will not elevate the cylinder needles as high as does the inclined portion 25 of the cam 7, this feature forms a very important function in my invention when considered with the action of the dial cam 24 as described hereinafter.

The dial cam 24 has an inclined portion 37 which acts on the butts of the dial needles 43, at the same time that the portion 25 of the cam 7 acts on the butts of the cylinder needles 8, to project the dial needles into intermeshing position with the said cylinder needles in the usual manner as shown at A, Figs. 1 and 3, to place the previously formed dial loops back of the full opened latches. In Fig. 1 of the drawings the yarn and fabric have been omitted for sake of clearness but the latches are shown in their operable positions. An inclined surface 38 of the dial cam next acts to slightly retract the dial needles while the portion 26 of the cam 2 is lowering the cylinder needles to grasp the new feed of yarn and to cast the previously formed loops. However, the portion 38 of the dial cam does not retract the dial needles to a point sufficiently far enough to cast their previously formed loops, but far enough to properly receive the new feed of yarn when fed thereto by the said downward movement of the cylinder needles and until they are affected by a portion of the cam 39 which substantially acts as a dwell for the dial needles and it is while the dial needles are under the control of the cam portion 39 that the cylinder needles are moved downwardly by the edge 26 to the lowest portion α of the cam 2 and cast their previously formed loops. After the cylinder needles cast their loops another inclined portion 40 on the dial cam acts to gradually retract the dial needles to grasp and pull the new feed of yarn into loops at the same time as the inclined portion 29 of the cam 3 again raises the cylinder needles into intermesh with the said dial needles to decrease the tension on the yarn while the dial needles are completing the pulling of their loops. As the inclined portion 40 of the dial cam is of greater length and duration than the portion 29, the dial needles will be retracting while the cylinder needles are being projected by the said portion 29, (as just stated and as shown in Fig. 5), and also while the portion 30 of the cam 4 is retracting the cylinder needles as shown in Fig. 6. When the point portion α of the dial cam

acts upon the butts of the dial needles the latter will be retracted to their farthest inward position (see Fig. 7) and will cast their loops substantially at this point; said casting being aided by the cylinder needles which are also being retracted at this time adjacent the portion 32. The operation of the needles from this point until the time that they are again affected by the portions before mentioned is similar to the operation in any well known machines, that is to say that the dial and cylinder needles are slightly projected from their innermost position by being acted upon by the portions 41 of the dial cam and the inclined edge 35 of respective dial and cylinder cams.

By having the cylinder needles cast their stitches previously to the time when the dial needles cast their stitches and by again raising the cylinder needles, after they have cast their stitches, into intermesh with the dial needles, the dial needles have a free chance to draw sufficient yarn to form loops which would not be the case if the cylinder needles were pulling or drawing down upon the loops when the dial needles are pulling their loops. By this arrangement the dial needles have an equal chance to draw as much yarn and under substantially the same conditions as do the cylinder needles. Also, as both the dial and cylinder needles retract together, after the latter have been raised by the portion 29, to retract their respective needles, the loops will tend to be "evened up" before and up to the time of the dial needles casting their loops. In other words, the applicant is able to produce a ribbed fabric on the machine: first, by casting the cylinder loops previously to the time at which the dial loops are cast during each course of the fabric; secondly, by again raising the cylinder needles while the dial needles are partially projected and sufficiently far to release the tension on the cylinder needle loops and then drawing loops of yarn by the dial needles while the cylinder needles are thus partially raised, then by retracting both the dial and cylinder needles to effect an equalizing of the amount of yarn taken by each dial and cylinder needle.

In constructing the cams I preferably make the depending angle α of the cam 2 with a flat surface, which is sufficiently long to accommodate the width of two of the butts of the cylinder needles although the same can be made rounded if so desired; also instead of having the edges 28 and 29 meeting in an abrupt angle, I preferably slightly fillet or round the same so as to allow a free passage of the cams past the needles. Additional advantages are also obtained by having the upwardly projecting inclined portion 29 following the downwardly projecting inclined portion 26 of the cam 2; first, the release of the tension on the

cylinder needles permit any imperfection such as double yarn or knotted yarn to draw through the needles without severing the yarn; second, in cases where knots of such a size as not to be able to pass through the needles will adjust themselves, owing to the fact that the yarn is sufficiently slack at this point; third, it prevents the cylinder needles from losing their loops in cases where they are tucking as the cylinder needles are sufficiently high to prevent the loops from being slipped off their ends; fourth, it renders the machine serviceable of knitting close, medium and loose fabric without altering the individual cam adjustment; it only being necessary to raise or lower the head which supports the dial. Also, it renders the machine capable of knitting yarns of different thicknesses without altering the individual cam adjustment, as yarns of any thickness may be used simply by slightly raising or lowering the head of the machine.

Any slight adjustment of the cams 2, 3 and 4 can be made to suit particular classes of goods being produced in a manner heretofore described. The entire nest of cams 2, 3 and 4 may be lowered by screwing down on the screw 11 or if it is desired to raise the said cams it is only necessary to loosen the screw 11 as the compression spring 10 will raise the same by acting on the bottom of the cam-supporting post section 12.

While I have shown the principle of my invention as controlled by cams of specific formation and relation to one another, it will be understood that other means may be employed to obtain the same result and without departing from the spirit of my invention, as my invention consists principally of the ideas as heretofore disclosed of casting the cylinder loops previously to the casting of the dial loops and by again raising the cylinder needles to intermesh with the dial needles to release the tension on the yarn before the said dial needles draw the newly fed yarn to their innermost position and to cast the previously formed loops. Also, to retract the cylinder needles and the dial needles simultaneously until the latter cast their stitches.

My invention may be applied to single or multiple feed machines using one or more banks of cams, and it can be used with equal advantage in a one feed circular machine or where the fabric is produced entirely from the succession of courses made from the same feed. My invention may also be applied to other machines in which the two series of needles are disposed substantially at right angles to each other or at angles other than 90°.

I claim:—

1. The combination in a knitting machine of two series of needles, each of said needles being capable of knitting loops of yarn;

and means for actuating the needles of one of the series to decrease and increase the tension on the yarn while the needles of the other series are drawing their respective loops.

2. The combination in a knitting machine of two series of needles, each of said needles being capable of knitting loops of yarn; and means for actuating the needles of one of the series to decrease and increase the tension on the yarn while the needles of the other series are drawing their respective loops in the same course.

3. The combination in a knitting machine of two series of needles; means for moving the needles of one of said series to receive a new feed of yarn; means for moving the needles of the second series to receive a new feed of yarn and into mesh with the needles of the first series; means for again moving the needles of the second series out of mesh with the needles of the first series before the latter have drawn their respective loops; and means for again moving the needles of the second series into mesh with the needles of the first series before the latter have drawn their said respective loops.

4. The combination in a knitting machine of two series of needles; means for moving the needles of one of said series to receive a new feed of yarn; means for moving the needles of the second series to receive a new feed of yarn and into mesh with the needles of the first series; means for moving the first series of needles to draw their respective loops from the said new feed of yarn and to cast their previously formed loops; means for moving the needles of the second series out of mesh with the needles of the first series and to cast their previously formed loops before the needles of the first series have drawn their respective loops from the said new feed of yarn; and means for again moving the needles of the second series into mesh with the needles of the first series before the latter have completed the drawing of their said respective loops from the new feed of yarn.

5. The combination in a knitting machine of two series of needles; means for moving the needles of one of said series to receive a new feed of yarn; means for moving the said one series of needles to form loops from the said new feed of yarn and to cast their previously formed loops; means for moving the needles of the second series to receive a new feed of yarn and into mesh with the needles of the first series; means for moving the needles of the second series out of mesh with the needles of the first series and to cast their respective previously formed loops before the needles of the first series draw their loops from the new feed of yarn; means for again moving the needles of the second series into mesh with the needles of the

first series before the latter have completed their drawing of the loops of the said new feed of yarn; and means for simultaneously moving the needles of the second series out of mesh with the needles of the first series and while the latter are being moved to form their said loops and to cast their previously formed loops.

6. The combination in a knitting machine of two series of latch needles; means for moving the needles of one of said series to receive a new feed of yarn; means for moving the said one series of needles to form loops from the said new feed of yarn and to cast their previously formed loops; means for moving the needles of the second series into mesh with the needles of the first series and sufficient for the previously formed loops thereon to open their respective latches and to occupy a position between the ends of the opened latches and the inner ends of their respective needles; means for moving the needles of the second series out of mesh with the needles of the first series to cast their previously formed loops and before the needles of the first series have drawn their loops from the new feed of yarn; and means for again moving the needles of the second series into mesh with the needles of the first series before the latter have completed the drawing of their loops, said latter movement of the needles of the second series being sufficient to release the tension on their new feed of yarn but not sufficient for the latter to occupy a position between the ends of the open latches and the butts of the respective needles.

7. The combination in a knitting machine of two series of needles; means for moving the needles of one of said series to place their previously formed loops back of the latches; means for moving the needles of the other series sufficiently to place their previously formed loops back of the latches and into mesh with the needles of the first mentioned series; means for moving the needles of the second series sufficiently to cast their previously formed loops and out of mesh with the needles of the first series; means for slightly retracting the needles of the first series into a position to receive the new feed of yarn from the needles of the second series during the said latter movement of the needles of the second series; means for moving the needles of the second series to release the tension of the new feed of yarn held thereby and while the needles of the first series are in their said slightly retracted state; means for moving the needles of the first series to form loops while the said latter movement of the needles of the second series takes place and to cast their previously formed loops; and means for again moving the needles of the second series out of mesh with the needles of the first series,

said latter movement of the needles of the second series being simultaneous with the latter part of the latter movement of the needles of the said first series.

8. The combination in a knitting machine of dial latch needles; cylinder latch needles; means for projecting the dial needles to place the previously formed loops to the rear of their open latches; means for projecting the cylinder needles into mesh with the said projecting dial needles to receive a new feed of yarn and to place the previously formed loops back of the respective open latches; means for slightly retracting the dial needles to receive a new feed of yarn; means for moving the cylinder needles out of mesh with the dial needles and to form loops out of the new feed of yarn and to cast the previously formed loops from off the said cylinder needles and place the new feed of yarn on the dial needles while the latter are in their said retracted state; means for again moving the cylinder needles into mesh with the dial needles to release the tension on the newly formed cylinder needle loops; means for retracting the dial needles to form loops from their new feed of yarn and to cast their previously formed loops, said latter movement of the dial needles being simultaneous with the latter movement of the cylinder needles; and means for again moving the cylinder needles out of mesh with the dial needles, said latter movement of the cylinder needles being simultaneous with the said latter movement of the dial needles.

9. The combination in a knitting machine of a series of dial latch needles; a series of cylinder latch needles; means for projecting the dial needles sufficiently to place the previously formed loops back of the latches; means for projecting the cylinder needles into mesh with the dial needles to receive a new feed of yarn and to place their previously formed loops back of the latches; means for moving the cylinder needles out of mesh with the dial needles to cast their previously formed loops and to place the new feed of yarn on the dial needles; means for moving the cylinder needles to again mesh with the said projected dial needles and to release the tension formed by the pull of the cylinder needles on the new feed of yarn; means for retracting the dial needles during the said latter movement of the cylinder needles and to draw new loops and to cast previously formed loops; and means for again retracting the cylinder needles and during the said latter movement of the dial needles.

10. The combination in a knitting machine of dial needles; cylinder needles; means for projecting the dial needles to receive a new feed of yarn; means for projecting the cylinder needles into mesh with the dial needles; means for moving the cylinder needles

out of mesh with the dial needles while the latter are in their said projected state; means for again moving the cylinder needles into mesh with the dial needles while the said dial needles are still in their projected state; means for retracting the dial needles; and means for again moving the cylinder needles out of mesh with the dial needles during their said latter retracting movement.

11. The combination in a knitting machine of a series of dial needles; a series of cylinder needles; a dial cam; and a cylinder cam, said dial cam having a portion for engagement with the dial needles to project the latter sufficiently to place their previously formed loops back of the latches, said cylinder cam having a portion operable upon the cylinder needles to project the latter to receive a new feed of yarn and to mesh with the said projected dial needles; said dial cam having a portion operable on and to slightly retract the dial needles; said cylinder cam having a portion operable to retract the cylinder needles out of mesh with the dial needles to cast their previously formed loops and place the new feed of yarn on the dial needles, said cylinder cam having a portion operable to project the cylinder needles to again mesh with the dial needles; said dial cam having a portion operable to further retract the dial needles until the latter cast their previously formed loops and during the second projection of the cylinder needles; said cylinder cam having a portion operable to retract the cylinder needles, said latter portion of the cylinder cam acting simultaneously with the said latter portion of the dial cam to retract the cylinder needles during the said latter retraction of the dial needles.

12. The combination in a knitting machine of a series of dial needles; a series of cylinder needles; a dial cam; and a cylinder cam, said dial cam having a portion for engagement with the dial needles to project the latter sufficiently to place their previously formed loops back of the latches, said cylinder cam having a portion operable upon the cylinder needles to project the latter to receive a new feed of yarn and to mesh with the said projected dial needles, said dial cam having a portion operable on and to slightly retract the dial needles; said cylinder cam having a portion operable to move the cylinder needles to cast their previously formed loops and out of mesh with the dial needles, said cylinder cam having a portion operable to project the cylinder needles to again mesh with the dial needles, said dial cam having a portion operable to further retract the dial needles until the latter cast their previously formed loops and during the second projection of the cylinder needles; said cylinder cam having a portion operable to retract the cylinder needles, said

latter portion of the cylinder cam acting simultaneously with the said latter portion of the dial cam to retract the cylinder needles; means for adjusting the position of the dial cam; and means for adjusting the said portions of the cylinder cam.

In testimony whereof, I have signed my

name to this specification, in the presence of two subscribing witnesses.

DAVID B. KIMES.

Witnesses:

AUGUSTUS B. COPPES,
JOS. H. KLEIN.