No. 792,301. PATENTED JUNE 13, 1905.

F. B. WILDMAN.

KNITTING MACHINE.

APPLICATION FILED MAY 14, 1904.

Fig. 1.

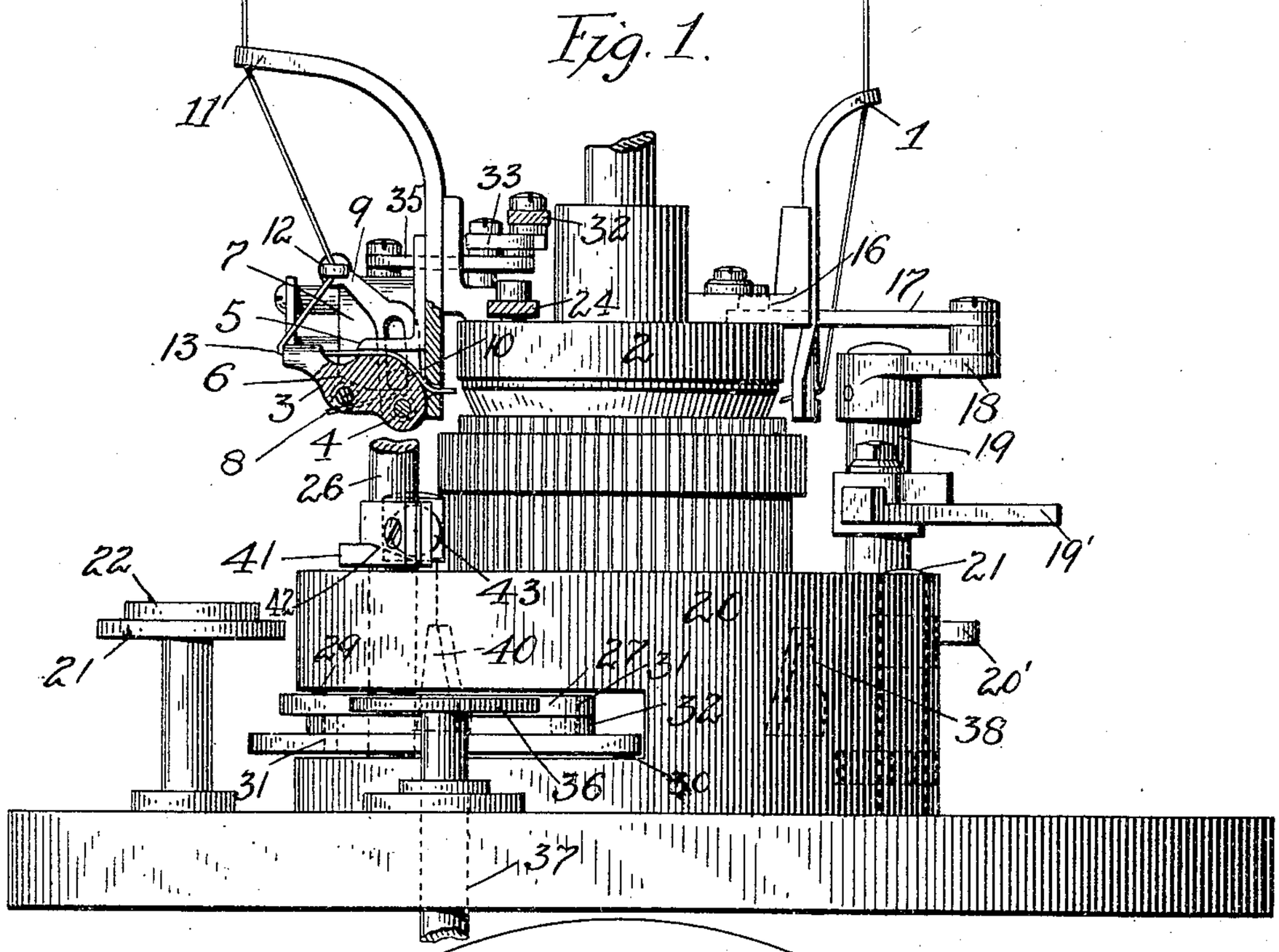


Fig. 2.

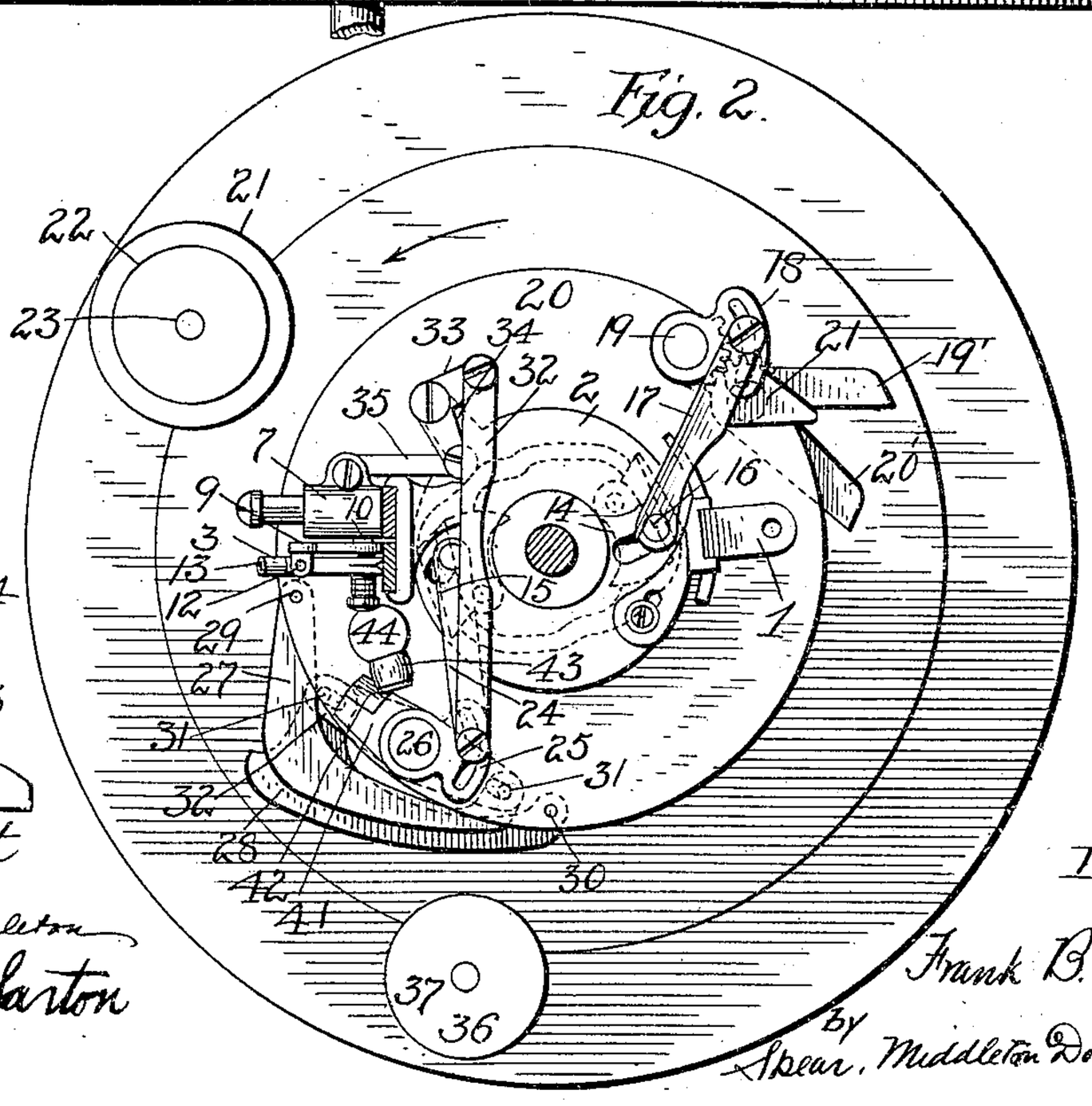
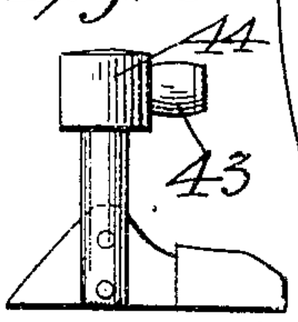


Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANK B. WILDMAN, OF NORRISTOWN, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 792,301, dated June 13, 1905.

Application filed May 14, 1904. Serial No. 208,005.

To all whom it may concern:

Be it known that I, FRANK B. WILDMAN, a citizen of the United States, residing at Norristown, Pennsylvania, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

It is the object of my invention to provide a circular-knitting machine having two or more feeds disposed at different points thereabout, with means whereby the yarn of one feed may be broken out or thrown in automatically, so as to produce different results in the character of the knitting. With the means for breaking out and throwing in the yarn of one I associate mechanism controlling automatically the knitting devices to produce changes in the knitting.

The invention consists in the features and combination and arrangement of parts hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side view of a machine of the two-feed dial-and-cylinder type embodying my invention. Fig. 2 is a plan view of the machine, and Fig. 3 is a detail of the cylinder-cam.

I have shown the invention as applied to the form of machine in which the cylinder and dial cams rotate, while the needles are arranged to slide in fixed beds. The yarn-feed guide 1 is of ordinary construction, consisting of an arm or plate secured to the dial-cam plate 2. The other yarn guiding or feeding device, which, as in ordinary practice, is arranged at a point opposite the guide first mentioned, is adapted to automatically control the feeding in or breaking out of the yarn guided thereby. This feeding device is similar in arrangement to the mechanism disclosed in Letters Patent of the United States No. 691,686, dated January 21, 1902, in which a splicing-thread is fed, together with the main thread, through the same guide, the splicing-thread being broken out or thrown in, as desired. This mechanism includes a clamp-arm 3, pivoted at 4 and adapted when up to clamp the thread belonging to this feed device between itself and a fixed clamp-piece 5, the thread being thus broken out of the work by the continued revolution of the thread-guide in relation to the needles. The arrangement is such that a long loose end of the thread is left to be caught by the needles when the thread is free to feed in by the lowering of the clamping-arm. The clamping-arm is operated by an incline 6 on a block 7, which slides on the guide, said block being operated as hereinafter described. The clamp-arm is raised by a spring 8. The sliding block also operates an arm 9, which is pivotally supported to swing about the axis of the pivot 4, said arm being slotted and receiving a pin 10 on the block, the thread after leaving guide 11 passing through an eye 12, carried by this arm, and through the eye 13 of the clamp-arm. The purpose of this arm is to produce slack in the thread, so that when the clamp-arm falls to free the thread the said slack will facilitate the drawing of the thread into the fabric.

The knitting devices or cams of the dial and those of the cylinder, which belong to the clamp-feeding device, are adjusted automatically, as will now be described, to produce, in connection with the variable feed of the yarn on a machine of the two-feed type, different effects in the knitted fabric. By the adjustment of the feeding device the needles may be made to coöperate with one or a number of thread-guides.

The pivoted needle-cams of the dial are indicated at 14 15. The former is connected by a pin extending up through a slot 16 in the dial-cap with a link 17, connected to an arm 18 on a shaft 19, journaled in the casing 20, rotating with the machine. This shaft is geared at its lower end through any suitable means, as toothed segments, to another shaft or pin 21, also journaled in the casing. This latter pin or stud has an arm 20′ projecting therefrom in such relation to an arm 19′ on the shaft 19 that when one arm is in its outward position the other arm is in its inward position. These arms are adapted to be operated by a disk or roller having a portion 21 of large diameter and a second portion 22 of small diameter, the said disk being carried by a pin 23, passing vertically through the fixed base or ring of the machine and oper-

ated vertically into different horizontal planes through pattern mechanism—such, for instance, as that shown in Letters Patent of the United States No. 500,151, June 27, 1893, wherein is also shown the general arrangement of arms, link, and dial-cam above mentioned. In forming a welt, for instance, the disk or roller is adjusted to such a level that its small portion will operate the lever 19′ part way in to adjust the wing-cam 14 to an intermediate position to form the tuck course at the beginning of the welt, and then the disk is adjusted to bring its large diameter into position to operate the said arm all the way in to render the dial-needles for this feed inoperative in forming the welt. The other wing-cam 15 for the other feed is also capable of automatic adjustment through a link 24, an arm 25 on a shaft 26, journaled in the casing 20 and revolving with the rotary parts of the head, said shaft being operated by a pair of levers 27 and 28, pivoted, respectively, at 29 30 to the casing 20 and having their other ends pivotally connected at 31 with the opposite ends of a frame or lever 32 on the said shaft 26. This system of levers is substantially the same as that disclosed in Letters Patent of the United States No. 604,100, dated May 17, 1898. The cylinder-cam for this feed (indicated generally at 40) is also operated from this lever system, for which purpose the shaft 26 is provided with an arm 41, having an incline 42, working under a roller 43 on the post or pin 44, movable vertically through the casing 20, said post being connected at its lower end with cam 40. The block 7 of the automatic-feed device above described is operated from this shaft 26 through a link 32, connected with the arm 25 and with a lever 33, pivoted to an ear 34, extending from the dial-cap, the said lever 33 being connected with the sliding block by a link 35.

The full movement of the wing-cam 15 is only half of that which the wing-cam 14 is capable of having for a purpose as will be hereinafter described. This movement is derived, through the connections stated above, from a disk or roller 36 on a pin 37, adapted to be raised and lowered through suitable pattern mechanism like that disclosed in said patent, the arrangement here also being such that when one of the levers 27 28 is all the way in the other lever is all the way out.

With all the parts in the position shown in the drawings a plain rib fabric will be knit on one feed—*i. e.*, that at the right of Figs. 1 and 2—the wing-cam of this feed being all the way out and performing ordinary rib-knitting in connection with the cylinder-cam, the position of which is indicated at 38 in dotted lines. The thread of the other feed is broken out of work, being held by the clamping-arm 3, and the cams of this feed will be adjusted so that the needles operated thereby will only perform a part of their outward sliding movement, so that the loops do not get back of the latches and the fabric will be held on these needles; but no knitting will be done at this point. This adjustment of the cams is sufficient for the purpose of holding the fabric and renders it possible to throw the needles at this feed into full operation by a movement of the cams, which is only one-half of that necessary at the other feed, and thus damage to the work at this point is avoided, which might result were the cams adjusted as far in as is ordinarily required to render the needles inoperative, necessitating the full outward movement of the cams to render the needles operative and giving rise to liability of dropping stitches. The threads of the two feeds may be of two different colors, two different materials, or differ both as to color and material. With two different colors the machine when the parts are adjusted as shown in the drawings would produce a rib fabric of solid color—suitable, for instance, for the top of a half-hose.

For producing tuck-stitches the dial-cam 14 is adjusted half-way in and the cam 15 is adjusted all the way out, and simultaneously with this latter adjustment the clamping-arm 3 releases the slack yarn, which is then immediately taken by the needles engaging the long loose end of this yarn. The machine now operates as a two-feed machine. By the tucking process the desired color or material of the two feeds can be thrown to the outer side, while the undesirable color or material can be concealed by throwing it to the inner side of the fabric.

By my invention it is possible to produce—automatically, for instance—a garment from a cotton and a wool thread having the appearance of an all-wool garment, the bust and skirt being of a tuck-stitch, with the wool on the outside, and the waist being of plain rib fabric wholly of wool, the cotton thread being entirely broken out.

For producing the welt the yarn of the one feed is broken out, and the cams belonging to this feed are adjusted so that the needles are reciprocated only to a slight degree, so as to hold the fabric without being retracted all the way to inoperative position. The dial-cam 14 of the other feed is adjusted half-way in to produce the tuck course at the beginning of the welt and then all the way in to produce the desired number of welt courses. It will be seen from the above that all the adjustments of the cams are made only to the degree as will insure the production of perfect work, the cam 14 being adjusted step by step and the cam 15 being adjusted only one-half of the ordinary full amount.

The change in the feeding—*i. e.*, breaking out one thread and shifting the cams—may take place at a point in the fabric where one

pattern or garment is completed. This applies, for instance, in knitting hosiery-tops. It will understood that the knitting is continuous. After finishing one garment the opposite end of the next garment is started, and the cutting or separating of the fabric is done at this point, for which purpose a loose course may be knitted into the garment, and this may be produced by breaking out the thread of one feed, adjusting the cams belonging thereto, so that the needles operated thereby will not make their full-stitch movement, and also properly adjusting the cams belonging to the other feed.

While I have shown the automatic thread-feed as operated from the same mechanism which operates the set of cams belonging to this feed, I do not wish to limit myself in this respect, as separate connections may be used.

I have for convenience described the invention as applied to a two-feed machine; but it will be obvious that the basic principle of the invention may be extended and used on a machine having four, six, eight, or other numbers of feeds, the desired numbers of such feeds being provided with the automatic means for controlling the thread fed to the needles. One of each pair of feeds where a plurality of pairs are used may be provided with the clamping device for automatically throwing the thread into and out of work. Again, each feed of a number of feeds may be provided with such a clamping device, so that the threads of different colors or materials may be thrown out and in at will to produce different effects in the knitting, and the machine might thus be adapted to produce plain rib fabric without having the movement shown at the right of the drawings to produce welt or tuck stitches. In this instance the clamp device and the cam-operating devices at the right of the figure would be the same as those devices at the left of the figure, the operating-arms being in a different plane and the pattern mechanism being such as to throw in either one or the other feed, or both, at will.

I claim as my invention—

1. In a circular-knitting machine, a plurality of thread-feeds, a plurality of sets of needle-cams for the dial, each set coöperating with cylinder-cams for producing rib fabric, means for throwing one of the thread-feeds out of operation and simultaneously adjusting the dial-cam belonging thereto to a point to cause the operation of the dial-needles only part way, in order to hold the fabric, and means for adjusting the other dial-cam automatically step by step to produce tuck and welt knitting, substantially as described.

2. In a circular-knitting machine with a dial and cylinder, two sets of dial-cams coöperating with cylinder-cams, a thread-feed for each set of dial-cams and their coöperating cylinder-cams, means for throwing out of operation one thread-feed and simultaneously adjusting the needle-cam of the dial part way in to cause the needles to hold the fabric, and means for adjusting the other dial-cam inwardly for making tuck-stitches, substantially as described.

3. In a circular-knitting machine, the combination of thread-feeds, means for controlling one of said feeds to throw the thread thereof out of or into the work, and means for automatically adjusting the needle-cams of this feed to a point to cause the operation of the needles only part way of their full stroke in order to hold the fabric while the thread is thrown out, said automatic action taking place simultaneously with throwing the thread out substantially as described.

4. In a circular-knitting machine, the combination of thread-feeds, means for controlling one of said feeds to throw the thread thereof out of or into the work, and means for automatically adjusting the needle-cams of this feed to a point to cause the operation of the needles only part way of their full stroke in order to hold the fabric while the thread is thrown out, said automatic action taking place simultaneously with throwing the thread out and means for adjusting one of the needle-cams of the set belonging to the other feed to change the character of the knitting, substantially as described.

5. In combination, in a circular-knitting machine, thread-feeds, one of which is adapted to throw its thread into and out of work, a set of needle-cams for each feed, a rock-shaft, arms connected thereto, a disk for operating the arms, connections from the said rock-shaft to the cams and connections between the said shaft and the automatic thread-feed to control the same, substantially as described.

6. In combination, in a circular-knitting machine, a plurality of thread-feeds, a set of needle-cams for each feed to knit rib fabric simultaneously, and means for controlling one feed to supply the thread to the needles or remove it therefrom, and for automatically and simultaneously adjusting a needle-cam to produce different effects in the character of the fabric.

7. In combination, in a circular-rib-knitting machine, thread-feeds, a set of needle-cams for each feed, each set containing a cylinder-cam adapted to produce ribbed fabric and a dial-cam, means for controlling one of the feeds to throw the thread thereof into and out of work, means for adjusting the set of cams of this feed simultaneously with the throwing in or out of the thread, and means for adjusting one of the ribbing-cams belonging to the set of cams associated with the other feed for the production of the welt with the other ribbing-cam, substantially as described.

8. In a circular-rib-knitting machine, a plu-

rality of feeds, a set of needle-cams for each feed including a dial and a cylinder-cam, and means for automatically operating the feeds intermittingly and simultaneously operating a needle-cam of the feed thrown out to cause the operation of the needles only part way in order to hold the fabric, the other feed or feeds continuing to knit rib fabric.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK B. WILDMAN.

Witnesses:
MARGARET POTTER,
MAY C. RODENBAUGH.