W. H. CHILDREY.

MACHINE FOR KNITTING FABRIC SECTIONS AND METHOD OF MAKING FABRICS HAVING TRANSFERRED SECTIONS.

APPLICATION FILED JULY 31, 1911.

1,306,523. Patented June 10, 1919.

5 SHEETS—SHEET 1.

Fig. 1.

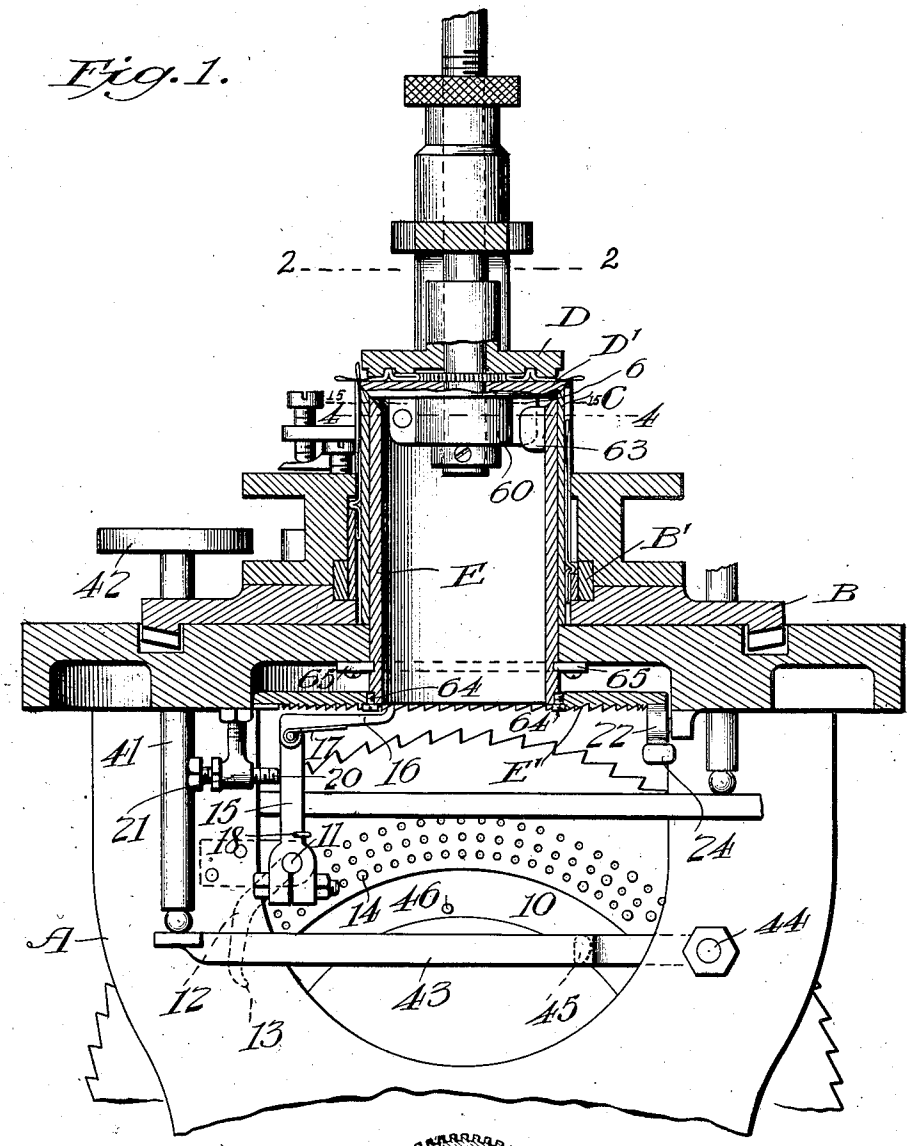
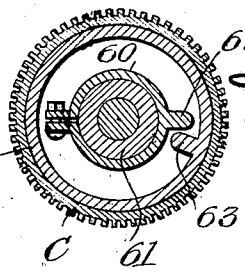


Fig. 4.



Witnesses

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Fig. 2.

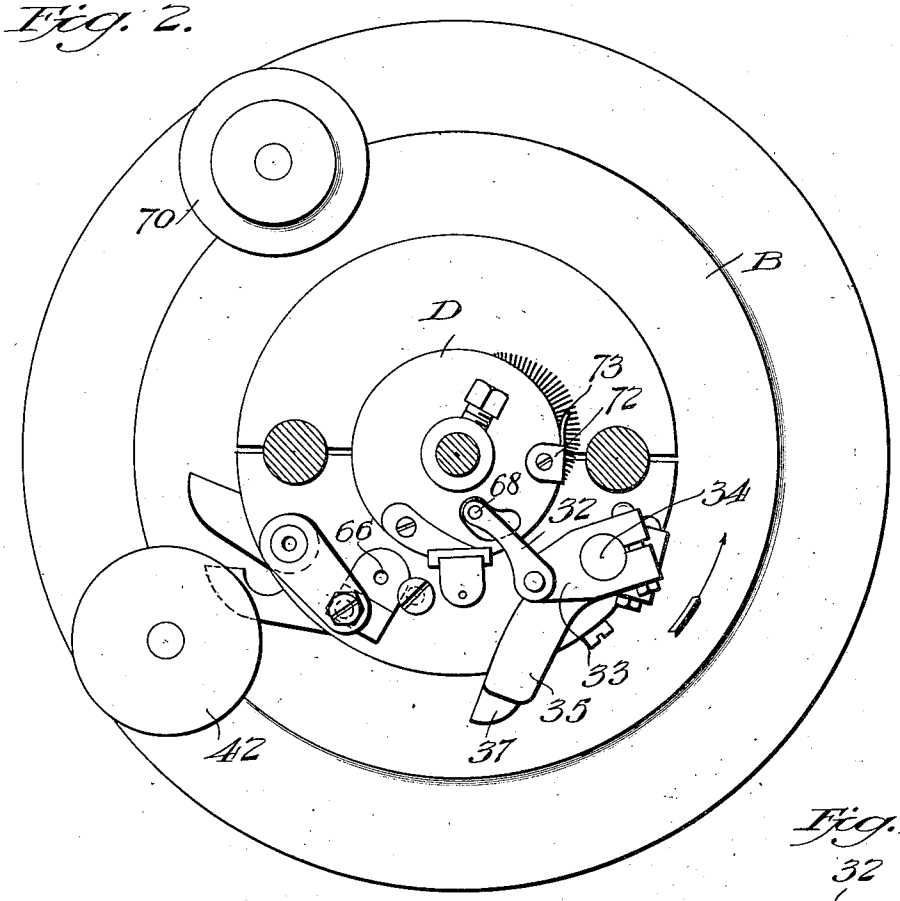


Fig. 13.

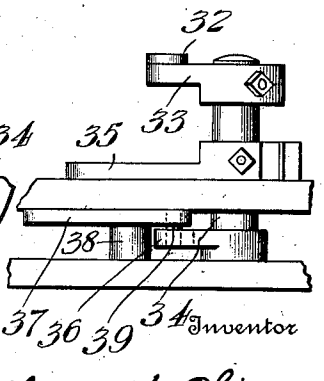
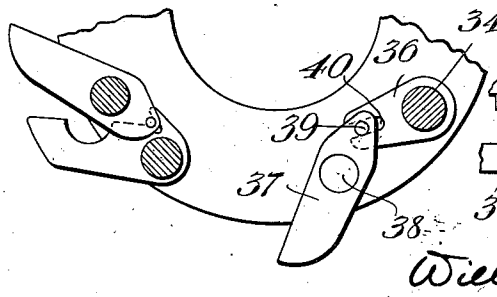


Fig. 12.



Witnesses

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5 SHEETS—SHEET 3.

Fig. 3.

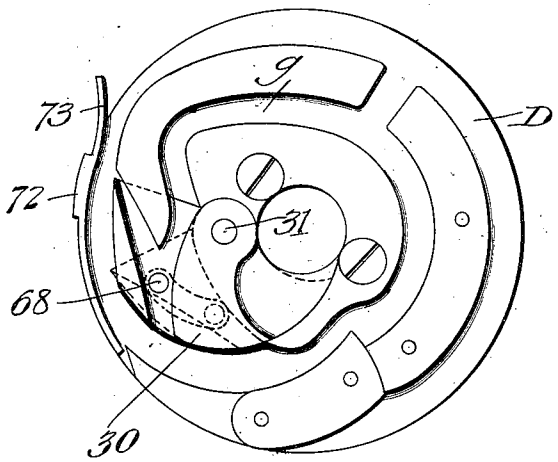


Fig. 5.

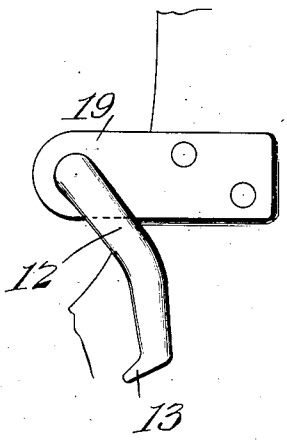


Fig. 6.

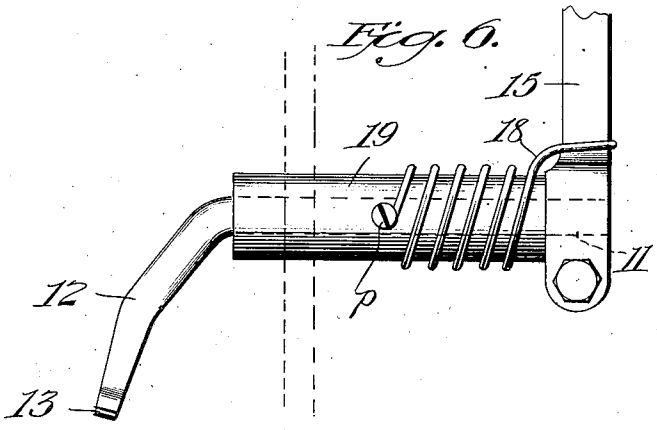
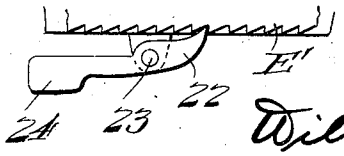


Fig. 7.



Witnesses

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5 SHEETS—SHEET 4.

Fig. 8.

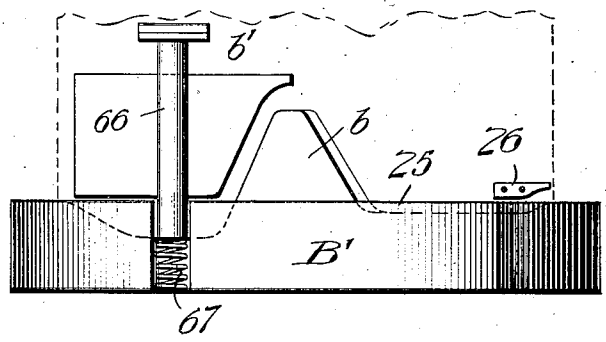


Fig. 11.

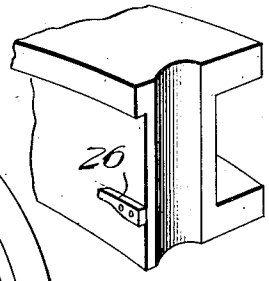


Fig. 9.

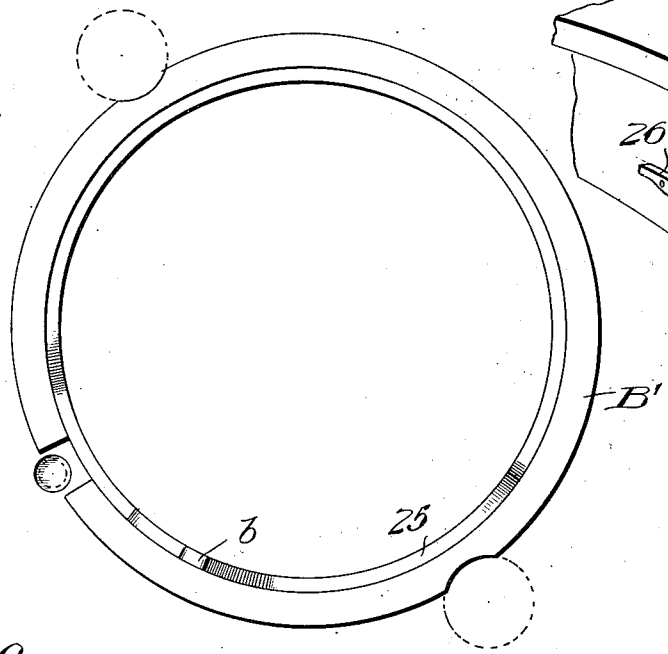
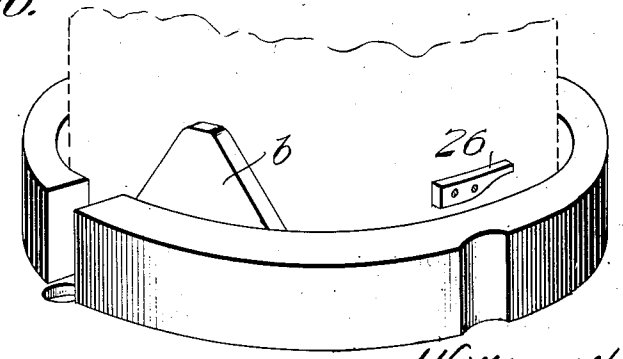


Fig. 10.



Witnesses

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5 SHEETS—SHEET 5.

Fig. 14.

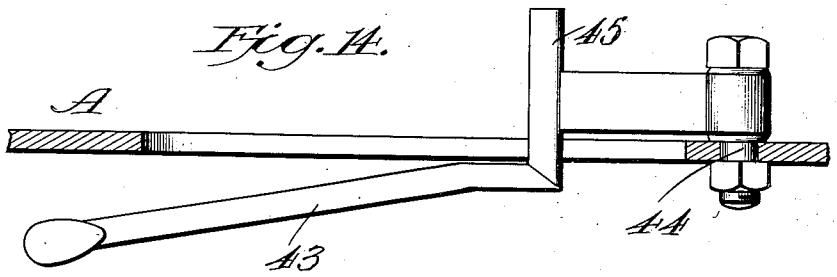


Fig. 15.

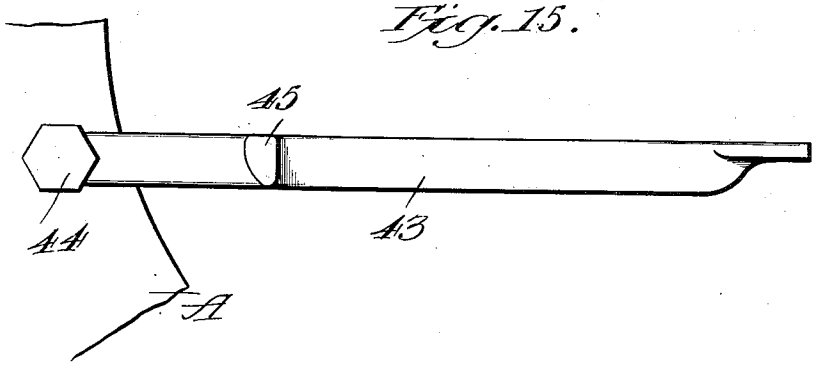


Fig. 16.

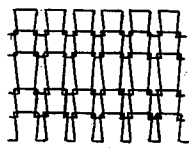
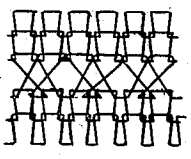


Fig. 17.



Witnesses

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UNITED STATES PATENT OFFICE.

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MACHINE FOR KNITTING FABRIC SECTIONS AND METHOD OF MAKING FABRICS HAVING TRANSFERRED SECTIONS.

1,306,523. Specification of Letters Patent. Patented June 10, 1919.

Application filed July 31, 1911. Serial No. 641,498.

To all whom it may concern:

Be it known that I, WILLIAM H. CHILDREY, a citizen of the United States, residing at Haw River, in the county of Alamance and State of North Carolina, have invented certain new and useful Improvements in Machines for Knitting Fabric Sections and Methods of Making Fabrics Having Transferred Sections, of which the following is a specification.

In knitting goods, such as stockings, where a portion, as the leg, is formed ribbed and a portion, as the foot, formed plain, and the stitches of the plain portion reduced in number, it is necessary to transfer the work from a ribbed work knitting machine to a plain knitting machine. Such work is accomplished by forming a loose or "transfer" course of stitches around the ribbed portion at the point where it is to be joined to the plain portion and transferring the loops in said course to a transfer ring or to the needle points of the plain knitting machine, the loop formed by a cylinder needle and the loop formed by an adjacent dial needle being each placed over a single point of the transfer ring or a needle point of the plain knitting machine. Such work is very difficult and tedious, being done by hand, the loops being placed in position one at a time, the operator first placing one loop on the point and then taking up the adjacent loop and passing it over the same point. Such work is not only difficult, requiring long training and unusual skill, but is also very trying on the eyes and nerves of the operator.

An object of my invention is to improve the mode of knitting a fabric or article containing a portion of ribbed web, and especially to facilitate that part of the operation which includes the doubling of the stitches of a ribbed portion of the web upon the needles of a machine to permit another web to be subsequently knitted in continuation of said ribbed web.

Another object of my invention is to improve the mode of forming fabrics partly ribbed and partly plain as for instance a stocking having a ribbed leg web and a plain foot web knit in continuation thereof.

Another object of my said invention is to provide an attachment for rib knitting machines whereby the loops of the dial needles may be lapped or crossed over the loops of the cylinder needles in the "transfer", or loose course of the goods, thus enabling the operator to place both loops over the points of the transfer ring, or needles of the other machine, at the same time, whereby the tedious and difficult part of the operation is wholly obviated and the work accomplished with the exercise of much less skill as well as with greatly increased speed, all as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a central vertical section through the knitting head and adjacent parts of a knitting machine of the ribber type with my attachment thereon,

Fig. 2 a view chiefly in top plan as seen when looking downwardly from the dotted line 2—2 in Fig. 1,

Fig. 3 an underside plan of the cam for operating the dial needles,

Fig. 4 a cross section on the dotted line 4—4 in Fig. 1,

Figs. 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14 detail views illustrating various parts and features of construction separately, as will be more fully described hereinafter,

Fig. 15 a detail cross section on the dotted line 15—15 in Fig. 1,

Fig. 16 a view showing the position of loops in loose course of fabric as formed on machines without attachment, and

Fig. 17 a view showing the loops as they appear in the loose course of fabric as formed on machines with said attachment.

The prior art operation of forming articles of the class to which my method is particularly applicable has included the formation of a section of ribbed web, the subsequent application of said ribbed web to a

second machine capable of knitting the remainder of the garment, and in the particular class of manufacture concerned it has necessitated as an incident of this operation the doubling of certain loops of the ribbed web upon the same needle of the second machine. This operation has usually been performed by transferring the loops of a transfer course of a ribbed portion doubled, or in pairs, to the same implement of a transfer device.

The operation of "doubling" has included first applying to the needles the stitches of one face of the ribbed web, say those produced by the cylinder needles, and then the stitches of the other face of the web, say those produced by the dial needles, some or all of the needles of the machine receiving two stitches. This doubling by hand of the stitches in transferring materially increases the cost of the running-on operation, and my object has therefore been to improve this step in the operation.

My improvements include the production of a ribbed knitted web whose stitches can be transferred to the needles of another or plain web machine with the same facility as in making an ordinary single transfer. This object I attain by shogging stitches in wales of one face of the ribbed web so as to cause them to cross stitches in adjoining wales of the other face of the web, and retaining them in such new relation, whereby stitches of both faces of the ribbed web can be simultaneously transferred to one and the same needle of the secondary knitting machine with the same facility as single stitches.

In said drawings the portions marked A represent the supporting frame of the machine, B the base of the knitting head, C the cylinder, D the dial cam plate, and E an inner cylinder which constitutes a part of my attachment.

The knitting machine shown is in the main of a type in common use and well understood by those skilled in the art and needs no detail description. Such parts will therefore be mentioned only incidentally in describing the construction and operation of the attachment.

The cylinder E is mounted within the cylinder C and at its upper end is connected with the dial plate D to move therewith. Said connection is of the same character as usually employed for securing the dial to the needle cylinder C and comprises a split ring 60 clamped to the depending hub 61 of the dial and having a radial lug 62 on one side adapted to strike a lug 63 on one side of cylinder E. A ratchet crown wheel E′ is secured on the lower end of said cylinder E by means of screws 64. Detents 65 on the bed plate engage a circumferential groove in said cylinder to hold it vertically and permit it to rotate. It is arranged to be operated from the pattern wheel 10 in the following manner: Rock shaft 11 is mounted in suitable bearings on an adjacent part of the frame having an arm 12 rigidly secured on one end with a curved outer end 13 which is normally in the path of a pin 14 projecting from the side of said pattern wheel. The opposite end of said shaft 11 carries an arm 15 to the upper end of which a pawl 16 is pivoted. Said pawl 16 is held with its outer end in engagement with the teeth on ratchet wheel E′ by means of a spring 17. A spring 18 is connected at one end with a pin *p* on the bearing 19 and bears at its other end against one side of arm 15 to normally hold the same in an upright position. An adjustable stop screw 20 is mounted in a depending lug or arm 21 and adapted to limit the rearward movement of said arm 15 as required for the purpose. Thus, when pin 14 of pattern wheel 10 passes under the point 13 of arm 12, it will rock shaft 11 and through the pawl 16 and ratchet wheel E′ will rotate cylinder E one step and throw the dial D and the dial needles carried thereby forward (or backward according to adjustment) sufficiently to lap the loop on the dial needles across the loop on the cylinder needles so that said loops will register.

The knitting continues in the ordinary way until a short section is formed composed of a few closely knitted courses. This section constitutes a means by which the goods may be handled during the transfer operation without destroying the arrangement of the loops in said loose course. The top welt is then formed and the knitting proceeds. When one of the sections so knit has been separated from the remainder, as by cutting it off between the welt and shogged or lapped loose course, and when the lapped loops of the loose course have been transferred to another machine, for instance a machine for making the plain fabric parts of the stocking or other article, the goods are raveled back to said loose course and the knitting proceeds on the other machine in the plain form with a perfect union between the plain and the ribbed portions of the goods.

In order to prevent any possible reverse movement of the cylinder, a pawl 22 is mounted on a pivot 23 on the underside of the frame and by means of a weighted end 24 is held in constant engagement with said wheel, thus locking it against reverse movement and insuring the accurate position of the parts at all times.

In order to accomplish the movement of said dial needles across the cylinder needles, it is essential that means be provided to insure that none of the dial needles be between the cylinder needles when the movement takes place. To accomplish this result I form cylinder needle advancing cam *b*, on

cam ring B′, with a comparatively short base and comparatively sharp angles so that the cylinder needles are held down below the plane of the dial needles for the greater portion of the circumference of the cylinder and only elevated where said dial needles are projected for the short distance represented by the length of said cam. I form a run 25 for the shank of said cylinder needles slightly below the top edge of the ring B′ and mount a cam guide 26 on an adjacent part of the frame which will engage with the top side of said shanks and throw them down into said groove to insure that their upper ends shall at this point be beneath the plane of the dial needles. The depressed portion of the run or cam groove on the rear side of cam *b* is of the common arrangement, the coöperating cam *b′* being mounted on a standard 66 adapted to be depressed on spring 67 for the usual purpose of increasing the stitch length for a loose course and in the usual way.

In the cam for operating the dial needles on the underside of dial D is formed a groove *g* for receiving the needle shanks and guiding the dial needles in and out in their operation, in the usual manner. At one side of said cam a part 30 containing a section of said groove is mounted on a pivot 31. A stud 68 extends up through a slot in the dial and cam plate and is connected by a link 32 with an arm 33 on the upper end of a vertical rock-shaft 34 which is pivoted in the cam-cylinder. Said vertical shaft 34 is provided with an arm 35 rigidly secured thereto at one level and another arm 36 rigidly secured thereto below said arm 35. An arm 37 is mounted on a pivot 38 adjacent to said shaft 34 and is provided with a pin 39 engaging with a slot 40 in the end of said arm 36. A vertically sliding jack 41 is mounted in one side of the frame with a disk top 42 adapted to strike arm 35 when elevated to the proper vertical position. The lower end of said jack rests upon one end of a lever 43, which is pivoted to the opposite side of the machine on a pivot 44. Said lever 43 has a transverse arm 45 of a form best shown in Fig. 15 with which a pin 46 on pattern wheel 10 is adapted to engage during the rotation of said pattern wheel. Said pin 46 comes against the curved side of said arm 45 lifting lever 43 and elevating jack 41 to throw the disk 42 into position to contact with arm 35. This operation takes place just prior to the operation of the cylinder E, as before described, to shift the dial needles in relation to the cylinder needles, pin 46 striking arm 45 just previous to the time when pin 14 strikes the end 13 of arm 12. As the cylinder revolves, disk 42 strikes arm 35 rocking shaft 34, and through the connection described, throws the pivoted part 30 of the cam, and the section of the needle operating groove carried thereby, inward so that the dial needles, which would otherwise be projecting beyond the line of the cylinder needles, are drawn within the line of said cylinder needles, free therefrom, just previous to the operation of cylinder E.

As the table B and parts carried thereby continue their operation a jack 70 contacts with the lever 37 which, through its connection with arm 36, reverses the movement of shaft 34, restoring the pivoted section 30 of the cam to its original position and permitting the dial needles to operate as before until pin 46 in the pattern wheel again comes to position to strike transverse arm 45 of lever 43 and lift jack 41 so that its top 42 will meet arm 35 and again rock shaft 45 to throw the pivoted section 30 of the cam inward and repeat the operation above described. The cylinder advancing cam *b* occupies the interval between the jacks 41 and 70.

On one side of the cam plate D I mount a guide 72 having an extending arm 73 adapted to project across the top of the dial needles for a considerable distance for the purpose of holding the latches open and prevent the throwing of stitches during the operation of the cylinder E.

The other parts of the mechanism shown operate in the same manner as is common for this type of knitting machines and require no special description.

By means of this attachment, as will be readily understood, during the formation of the loose, or "transfer" course, the loops indicated in Fig. 16 are lapped over each other by the movement of cylinder E one step through the mechanism described so that they will occupy the relative position indicated in Fig. 17 so that in transferring the goods from the rib knitting machine to the plain knitting machine, both loops can be dropped over the transfer point at the same operation, enabling the work to be done rapidly and with the exercise of comparatively little care and skill.

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

1. A knitting machine having therein needles and circular coöperating needle-carriers, one of which is adapted to be turned with respect to the other, in combination with means for turning one of said carriers with respect to the other step by step in the same direction at predetermined intervals in the knitting.

2. A knitting machine having therein circular needle-carriers, means for normally holding the carriers relatively fixed in respect to each other, and means for knitting rib fabric by coöperation of the needles in the respective carriers, in combination with

means repeatedly acting to withdraw the needles from inter-engaging relation, and means for turning one of said carriers with respect to the other in the same direction on successive occasions when the needles are so withdrawn.

3. An attachment for knitting machines for at predetermined intervals lapping the loops formed by the dial needles across the loops formed by the cylinder needles, comprising a dial mounted to be rotated in a continuous direction in relation to the cylinder step by step, and means for rotating said dial, substantially as set forth.

4. In a knitting machine, the combination with the knitting head, of a dial carrying the dial needles mounted on a part adapted to be rotated in a continuous direction, means for rotating said part step by step, and means for withdrawing the respective sets of needles from inter-locking relation just prior to the movement of said part at predetermined intervals, substantially as set forth.

5. An attachment for knitting machines comprising a cylinder mounted within the cylinder of the knitting head and connected at its upper end with the dial, a ratchet wheel on the lower end of said cylinder, a pivoted pawl for operating said ratchet wheel step by step, an operating arm on the pivot of said pawl, a pattern wheel, and a pin mounted in the pattern wheel of the machine in the path of said arm for operating it, substantially as set forth.

6. An attachment for knitting machines, comprising a cylinder mounted within the cylinder of the knitting head, a dial plate connected with the top of said cylinder, a ratchet wheel on the lower end of said cylinder, a pivoted pawl mounted on a rock-shaft for operating said ratchet wheel, an arm on one end of said rock-shaft, a pin in the pattern wheel arranged to contact with said arm for operating said pawl, and means for limiting the motion of said pawl, substantially as set forth.

7. An attachment for knitting machines for lapping the stitches, comprising a dial plate carrying the dial needles, a rotary part connected with said dial plate, a ratchet wheel connected with said rotary part, a pawl for operating said ratchet wheel, and means for operating said pawl at a predetermined point, whereby the loop of each cylinder needle is lapped across the loop of an adjacent dial needle at said point, substantially as set forth.

8. In a knitting machine, the combination of a dial carrying the dial needles, a cam plate containing the groove for operating said dial needles, a part pivoted on said plate containing a section of said groove, means for throwing said part on its pivot to change the position of said groove, and means for rotating said dial step by step in a continuous direction at predetermined intervals, substantially as set forth.

9. In a knitting machine, the combination of a dial carrying the dial needles, a cam plate containing the groove for operating said dial needles, a pivoted part on said cam plate containing a section of said groove, a connection between said pivoted part and rock-shaft, an arm on said rock-shaft extending out into the path of an operating jack, said operating jack mounted to slide vertically in the frame of the machine, a lever connected with the lower end of said jack for elevating it, said lever being provided with a transverse arm extending into the path of a pin on the pattern wheel, said pattern wheel, another lever arranged for operating said rock-shaft reversely, pins on said pattern wheel for actuating said levers, and means for rotating said dial step by step, substantially as set forth.

10. In a knitting machine, the combination with the knitting head, of a dial carrying the dial needles, a cam containing the groove for operating said dial needles, a part of said groove being formed in a pivoted section, means for operating said pivoted section connected with the pattern wheel, said pattern wheel, and means for rotating the dial in a continuous direction at predetermined intervals step by step, substantially as set forth.

11. The process of knitting combined ribbed and plain fabric which consists in first knitting one of said portions of said fabric, then lapping the loops of one set of needles over the loops of the other set of needles, then continuing the knitting for a distance beyond the stitch thus formed, then transferring the fabric from a machine adapted to form the first part of the fabric to a machine adapted to form the second part of the fabric by passing the lapped loops thus formed over the points in the transfer ring, substantially as set forth.

12. The process of knitting combined ribbed and plain fabric consisting of knitting one of said parts of the fabric to the point where it is to be joined to the other part, then lapping the loops of the dial needles across the loops of the cylinder needles, then continuing the knitting operation for a distance, then transferring the fabric to the machine for knitting the other part of the fabric by placing the lapped loops over the needles thereof, then unraveling the portion of the fabric beyond said loops and continuing the knitting with said other machine, substantially as set forth.

13. The method of knitting an article having ribbed parts and plain parts comprising first knitting ribbed fabric having at intervals a course of loops of one face each crossing a loop of the other face, then

removing from said fabric a portion containing a course of the said crossing loops, and impaling each pair of crossed loops of said portion on the needles of a knitting machine and then knitting the remainder of the fabric on said needles, substantially as set forth.

14. The method of knitting an article having ribbed parts and plain parts comprising first knitting ribbed fabric having at intervals a course of elongated loops of one face each crossing a loop of the other face, then removing from said fabric a portion containing a course of the said elongated loops, and impaling each pair of elongated loops of said portion on the needles of a knitting machine and then knitting the remainder of the fabric on said needles, substantially as set forth.

15. The method of knitting an article having ribbed parts and plain parts comprising first knitting continuous ribbed fabric having throughout at like intervals a series of loops of one face shogged across loops in the same course of the other face, then removing from said fabric a portion containing one series of the said shogged loops and impaling each pair of shogged loops of said portion on the needles of a knitting machine and then knitting the remainder of the fabric on said needles, substantially as set forth.

16. The method of knitting an article having ribbed parts and plain parts comprising first knitting a section of ribbed fabric, shogging loops of one face thereof into crossing relation with respect to loops of the other face, then knitting another section of ribbed fabric and thereafter severing from the length of the ribbed fabric a portion containing the shogged loops; thereafter, impaling each crossing pair of loops on the needles of a second machine, and then knitting the remainder of the fabric on said needles, substantially as set forth.

17. The method of knitting an article having ribbed parts and plain parts comprising first knitting a section of ribbed fabric, shogging the loops of one face thereof into crossing relation with respect to the loops of the other face, then knitting another section of ribbed fabric and thereafter severing from the length of ribbed fabric a portion containing the shogged loops; then impaling each crossing pair of loops on the same point or quill of a transfer implement, thereafter transferring the said portion to the needles of a second machine, and then knitting the remainder of the fabric on said needles, substantially as set forth.

18. The method of knitting an article having ribbed parts and plain parts comprising first knitting ribbed fabric having at intervals a course of loops of one face shogged across the loops of the same course in the other face, then separating from said fabric a portion containing one course of the shogged loops, then impaling the shogged loops of said portion where they cross in pairs upon the same point or quill of a transfer implement, then raveling so much of the ribbed fabric as extends beyond the impaled courses on one side, and then transferring the impaled course to the needles of a knitting machine to knit the remainder of the fabric, substantially as set forth.

19. The method of knitting an article having ribbed parts and plain parts which comprises the formation of a succession of united webs wholly of rib knitting of a uniform number of wales each web having therein stitches of one face shogged across stitches of the other face in at least one course, in thereafter severing said web at points near each shogged course; and thereafter applying the shogged stitches together in pairs to a transfer implement for transfer to the needles of a knitting machine capable of knitting plain fabric, substantially as set forth.

20. The method of knitting an article having ribbed parts and plain parts, which comprises the formation of a succession of united webs of rib knitting each having therein one or more loose courses of stitches shogged into overlying relation in pairs, thereafter separating said webs at points near the shogged courses; and thereafter applying each pair of overlying stitches of a shogged course to a needle of a knitting machine capable of knitting plain fabric, and then knitting a continuing plain web upon said machine, substantially as set forth.

21. The method of knitting an article having ribbed parts and plain parts, which comprises the formation of a succession of united webs of a uniform number of wales of rib knitting throughout having in each web one or more courses including stitches of one face and stitches of the other face shogged into overlying relation in pairs, thereafter severing said web into sections ending near a shogged course, and thereafter applying the overlying stitches of a shogged course of a section to the needles of a knitting machine capable of knitting plain fabric, and then knitting a continuing plain web upon said machine, substantially as set forth.

22. The method of knitting comprising first forming a length of tubular ribbed web having in integral succession sufficient sections of fabric for a top or border for a garment, joined together by a loose course for transfer to the needles of another machine in doubled relation, the operation including shogging the face wales of one section of fabric into a different relation with

respect to the back wales at the loose course and maintaining the wales in their new relation throughout the next section of fabric, thereafter separating the fabric into portions each containing a loose course and some of the fabric of each ribbed section, and thereafter transferring the loose course to the needles of a knitting machine, substantially as set forth.

In witness whereof, I have hereunto set my hand and seal at Haw River, North Carolina, this 22nd day of July, A. D. nineteen hundred and eleven.

WILLIAM H. CHILDREY. [L. S.]

Witnesses:
J. W. JOHNSTON,
J. A. LONG.