

(No Model.)

4 Sheets—Sheet 1.

W. H. PEPPER.
CIRCULAR KNITTING MACHINE.

No. 424,497.

Patented Apr. 1, 1890.

Fig. 1.

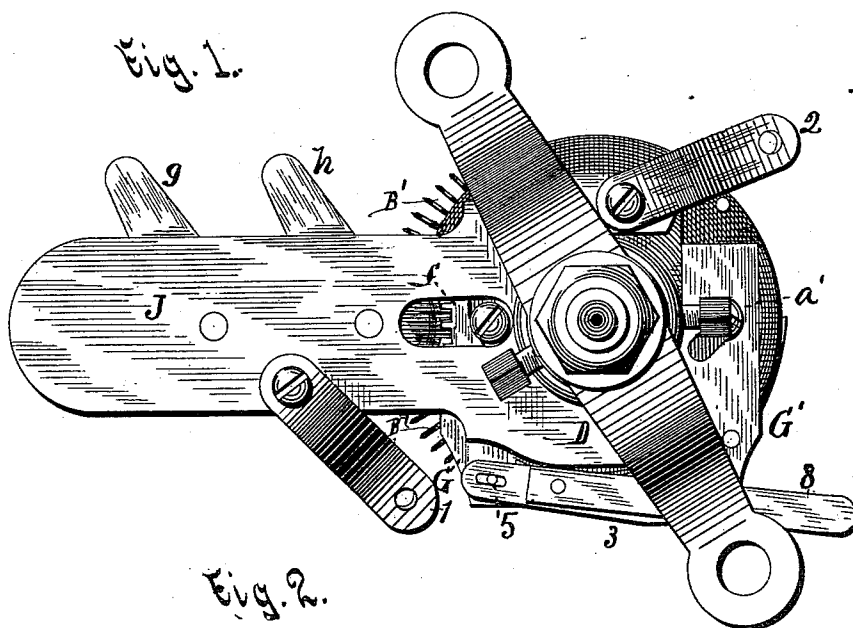


Fig. 2.

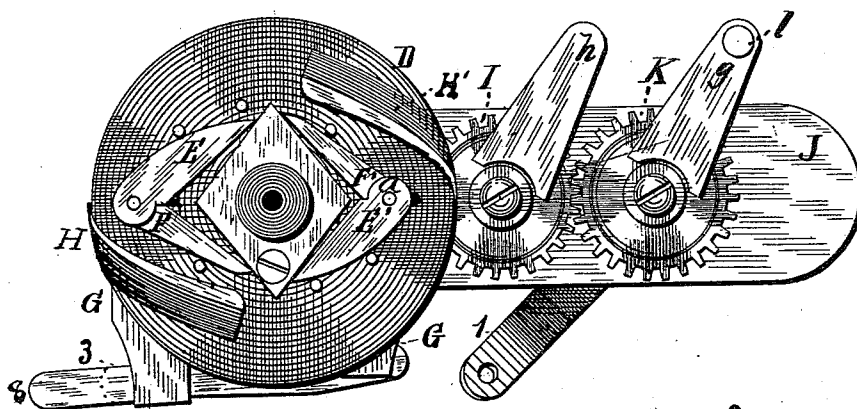
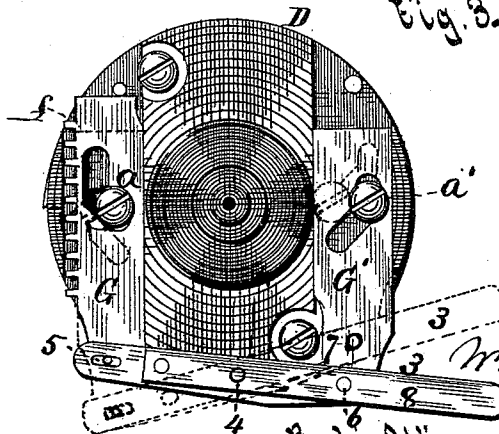


Fig. 3.



Witnesses.

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By his Atty. *L. S. Brown*

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Fig. 4.

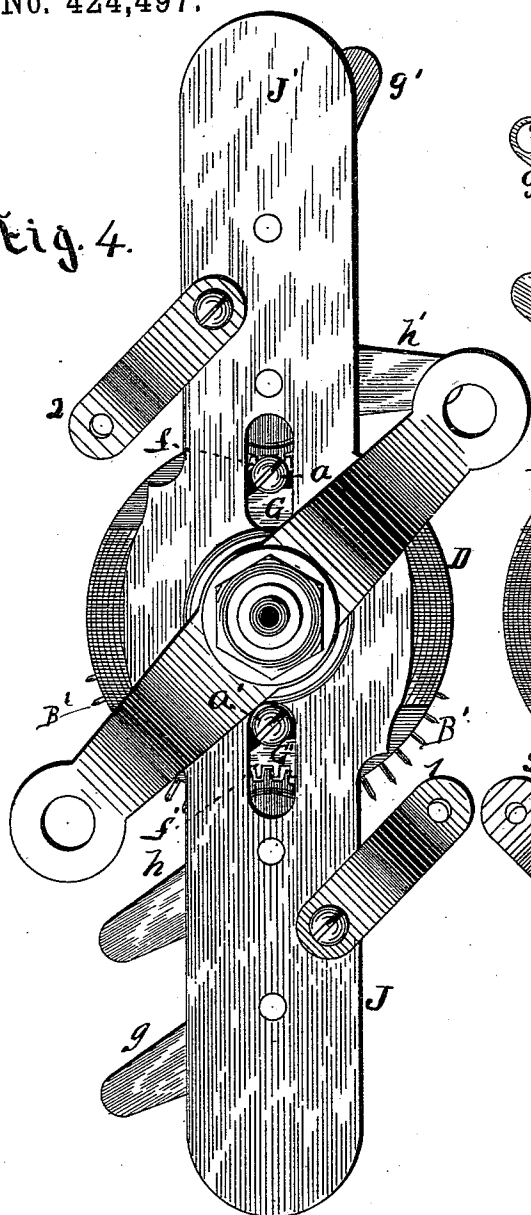
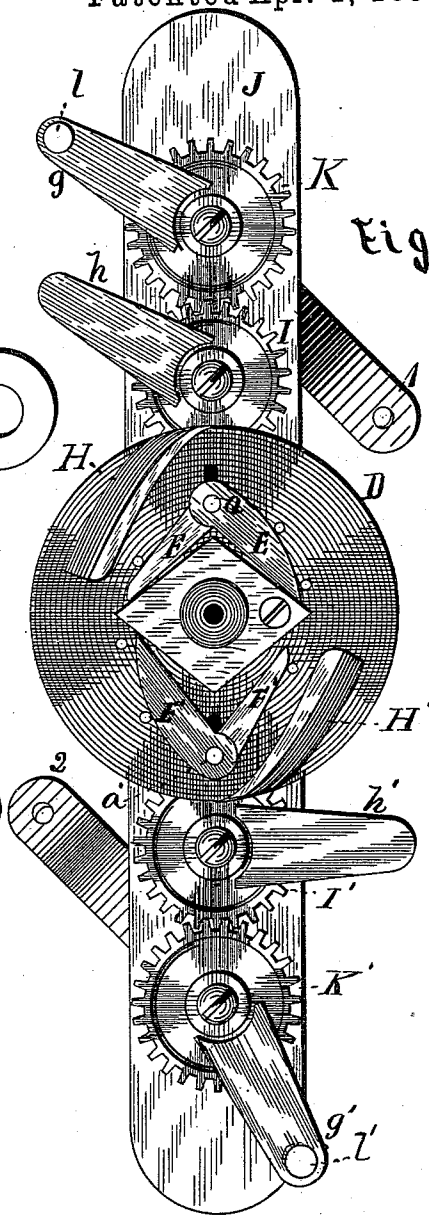


Fig. 5.



Witnesses.

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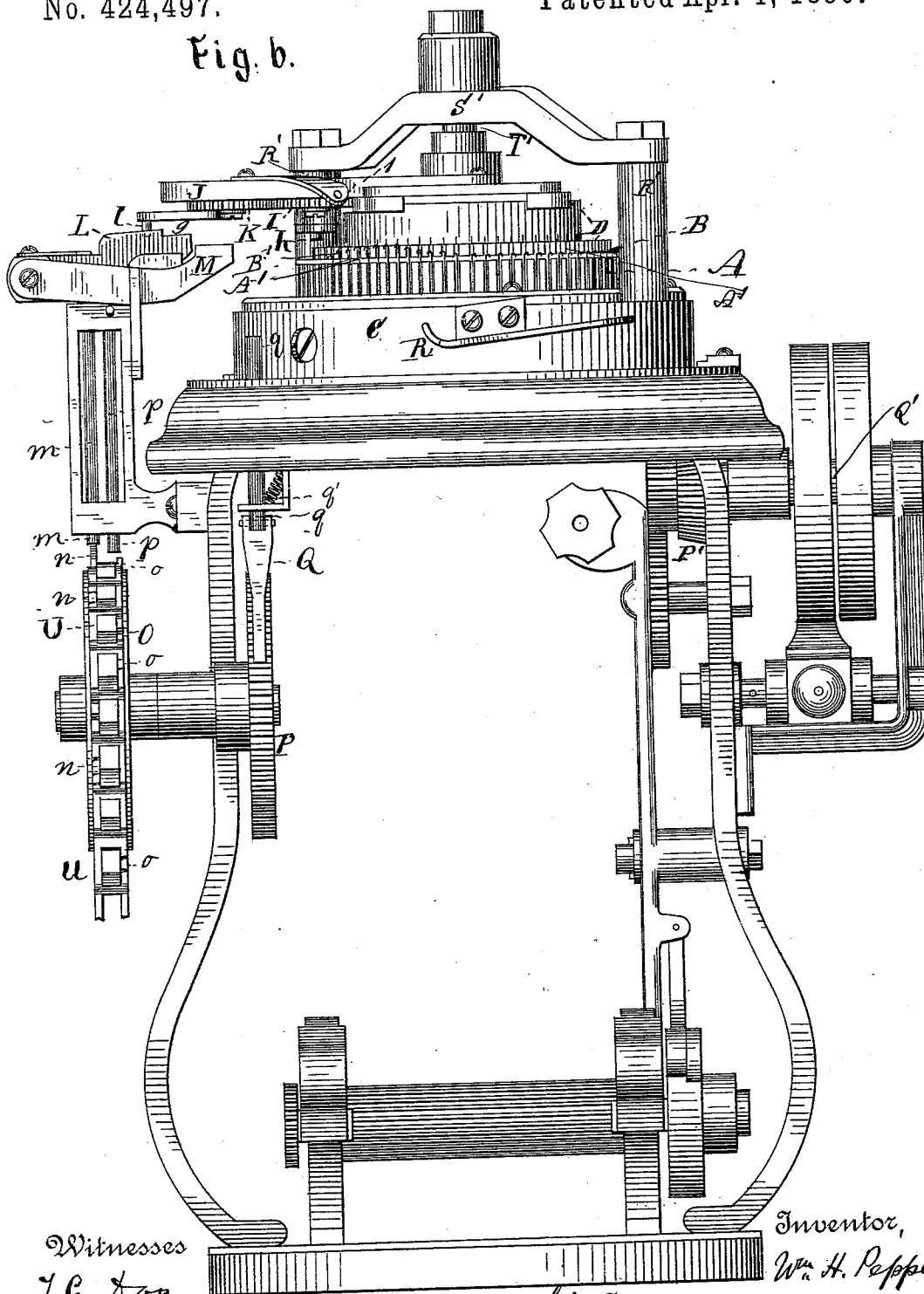
By his Atty, *J. S. Brown*

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Fig. b.



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(No Model.)

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Fig. 7.

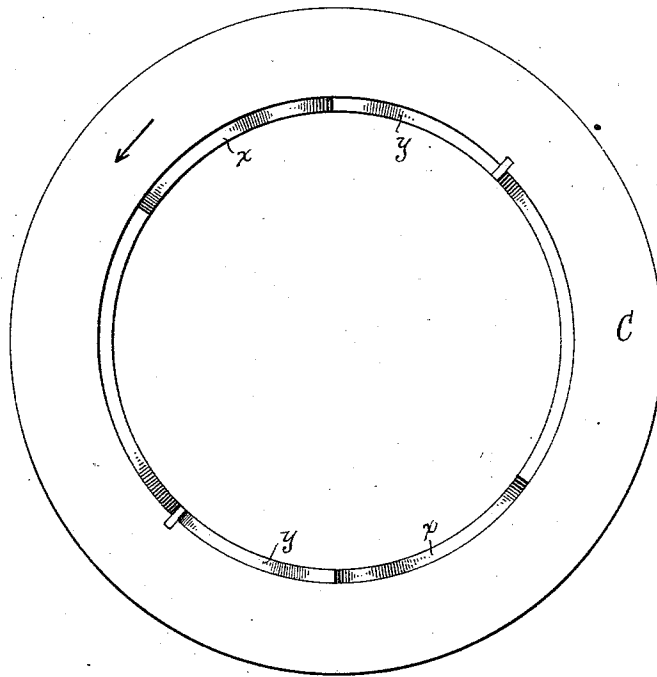
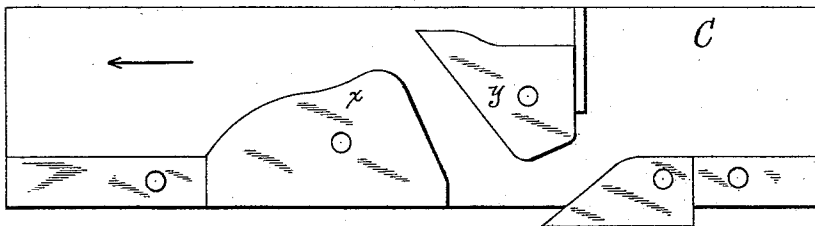


Fig. 8.



Witnesses

Albert B. Blackwood
Joseph Blackwood

Inventor

by *William H. Pepper*
Arthur H. Brown
his Attorney

UNITED STATES PATENT OFFICE.

WILLIAM H. PEPPER, OF LAKE VILLAGE, NEW HAMPSHIRE, ASSIGNOR TO W.
H. PEPPER & CO., OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 424,497, dated April 1, 1890.

Application filed October 2, 1883. Serial No. 107,927. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. PEPPER, of Lake Village, in the county of Belknap and State of New Hampshire, have invented an Improved Circular-Knitting Machine; and I do hereby declare the following to be a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification.

In Letters Patent granted to me on the 5th day of September, 1882, and numbered 263,720, I have represented and described a circular-knitting machine having both cylinder-needles and dial-needles, and organized with movable cams for operating the dial-needles, the movements of said cams being automatically controlled by a pattern-chain and peculiar mechanism connected therewith, the purpose of that improvement being to knit a close welt on knit goods—such as stocking-tops. In my present invention I employ similar cams for operating the dial-needles, the movements of the throw-out cams being preferably controlled by similar pattern mechanism, and I connect therewith two feeds for two colors of thread or yarn, there being two sets of throw-out cams to operate the dial-needles in connection with the two thread-guides, and I make use of a pattern mechanism, the purpose being to produce automatically figured goods in colors. Reference will therefore be made to the said Letters Patent for the specification of parts common to both inventions; but I will represent in the accompanying drawings parts common to both inventions sufficient to show how the new features of the present invention are applied to the mechanism of the former invention.

In the accompanying drawings, Figure 1 represents a top view of the cap of my improved knitting-machine, for the purpose above set forth, showing the dial cam-plate and parts connected therewith, the construction being adapted to the use of a single connecting mechanism between the throw-out cams and the pattern mechanism, such as described in my former Letters Patent above referred to, the view corresponding to Fig. 4 of the said patent; Fig. 2, a view of the under side of the dial cam-plate and parts connected therewith, with the same construction as in Fig. 1, the view corresponding to Fig. 5

of the said patent; Fig. 3, a top view of the cam-plate and some parts connected therewith, showing clearly the improved means for operating the throw-out cams for the purpose of this invention; Fig. 4, a top view of the cap, corresponding to the view in Fig. 1, adapted to the use of two separate and distinct connecting mechanisms between the throw-out cams and the pattern mechanism; Fig. 5, a view of the under side of the dial cam-plate, corresponding to the view in Fig. 2, with the same construction as in Fig. 4; Fig. 6, a front view of a circular-knitting machine provided with my present improvements; Fig. 7, a detail plan view of the cylindrical part of the rotary cam-ring which carries the knitting-cams for actuating the cylinder-needles; and Fig. 8, a plane projection of one-half of the inner face of the cam-ring, showing the knitting-cams on that half of the cam-ring.

Like letters designate corresponding parts in all the figures.

In the accompanying drawings, A represents the needle-cylinder; A', the needles of the same; B, the dial-plate; B', the needles of the same; C, the cam-ring for actuating the cylinder-needles, and D the cam-plate for actuating the dial-needles.

1 and 2 are the two yarn-guides.

The cam-ring C is rotated in the usual way by a cog-wheel P' on the driving-shaft Q', gearing into a cog-gear (not shown) on the lower end of the said cam-ring.

The pattern mechanism herein shown consists of a pattern-chain U, which is mounted on a sprocket-wheel O, actuated by a ratchet-wheel P on its shaft, a pawl Q on a sliding rod *q* taking into the ratchet-wheel, and a cam R on the revolving cam-ring C, and adapted to depress the rod *q* and its pawl at each revolution of the cam-ring, the rod and pawl being raised again by spring *q'*, and the said pattern-chain having two sets of projections *n n* and *o o* at the proper intervals on the chain and striking, respectively, two sliding rods *m p*, which thereby are made to lift alternately two arms or levers L M and bring them into position to move the throw-out cams of the dial cam-plate through the connecting mechanism hereinafter described. The dial cam-plate is rotated by means of studs R' R',

mounted on the revolving cam-ring C, yoke S' on the said studs, and a downwardly-projecting spindle T, attached to the said yoke and to the dial cam-plate.

- 5 In knitting ribbed work with two colors of yarn or thread—one fed in on one side and another fed in on another side of the machine—when the dial-needles take the yarns from both thread-guides and knit off the stitches
10 after passing each thread-guide the rounds of stitches in the knit goods (being formed thereby alternately of one yarn or thread and then of the other) show alternately one color and then the other; but if the dial-needles are
15 adapted to be actuated to knit off the stitches only after passing one of the thread-guides then the ribs of the knit-work formed thereby show principally one color and the other ribs of the work show both colors; that one of the
20 threads which are thus put together on the needles, (namely, the thread laid on the dial-needles at the point where the latter are not actuated to knit,) in addition to the loops previously on the needles, lies outside of the
25 other thread on the needles, and the loops formed thereby will underlie those formed by the inner thread, and the latter shows principally on the ribs of the fabric formed by such needles. Therefore if the stitches are
30 knit off from the dial-needles on one side of the machine a particular color of yarn will show principally on the ribs formed by such needles; but if the stitches are knit off from the needles on the other side the other color
35 will appear predominantly outside. The cylinder-needles are constant in their action and take two threads alternately, but have no varying effect on the colors of the right side of the fabric; hence by alternating the sides
40 on which the stitches are knit off by the dial-needles the color of the goods is alternately one color and then the other, so that varied ornamental effects are produced in this simple manner. The above effects are well known
45 to those skilled in the art. Also, when, as in the first instance named above, the dial-needles knit off the stitches after passing each thread-guide, the fabric is knit more closely and consequently makes the tubular web narrower
50 and more elastic than when the dial-needles knit off the stitches only once at each revolution, this work being required for the tops of stockings, wrists of mittens, gloves, and undershirts and similar uses.
- 55 By my present additions to my former patented machine, herein referred to, I am enabled to automatically change the knitting operation, so as to knit off stitches on either one side or the other only of the machine or on
60 both sides to produce the effects above set forth, the movements of the throw-out cams of the dial-needles to effect these changes being controlled by the pattern mechanism, as described in the said Letters Patent. First,
65 by the construction shown in Figs. 1, 2, and 3, with very simple means I automatically change the knitting off from one side to the

other side of the machine alternately, while the change from two-side knitting off to one-side knitting off, or vice versa, is made by hand. 70 I mark the parts in the accompanying drawings with the same letters of reference as in the said Letters Patent, wherever corresponding parts are shown, so that reference to the patent may be easy and unmistakable. Thus 75 one pair of throw-out cams E F in the present machine on the under side of the dial cam-plate D are operated by the pattern mechanism through similar connecting mechanism—namely, the cam-slotted slide-plate G, operat- 80 ing on the pin *a* of the cams, rack *f* on the slide-plate, pinion I, with its projecting arm *h*, pinion K, with its projecting arm *g*, and finger *l* on the latter arm. Also, one thread or yarn guide *l* is situated similarly to the thread- 85 guide shown in the former patent, where it is represented as mounted on the arm J of the cam-plate D, but not lettered or numbered. This mechanism, common to both machines, serves to throw out the dial-needles at one 90 side of the machine for the purpose now contemplated, and one similar drawing-in cam H is used for drawing in the dial-needles at one side of the machine.

The following-noted slight changes are 95 made, since for the present purpose the dial-needles are to be entirely pushed out or partly drawn in. In order to do this at one movement, no intermediate position of the cam-slotted slide-plate G is required, so that its 100 cam-slot has the simple bend shown in the accompanying drawings, and the stop marked L in the former patent has no double projection, as therein described, to make a double action on the arm *g*, and of course the cam 105 marked *n* in the said patent is simply formed to lift the said stop at one motion. Then, to throw out the dial-needles at the other side of the machine I add, simply, the following parts: In addition to a second thread or yarn 110 guide 2, I add another pair of needle-operating cams E' F' on the cam-plate D, preferably opposite to the first pair, to be actuated by a similar cam-slotted plate G', operating on a similar pin *a'*; but in the present case, 115 for purposes where close-web knitting is not often required, I simply provide for automatically controlling this slide-plate by the same connecting mechanism between the throw-out cams and the pattern mechanism as that for 120 controlling the other slide-plate G. For this purpose I connect the two slide-plates G and G' by a lever 3, pivoted at its center 4 on the cam-plate D, and connected with the respective slide-plates by pivot-pins 5 and 6. The 125 connection is such that as one pair of cams is thrown out by the pattern mechanism, causing the dial-needles to take the yarn over their latches, so as to knit off the stitches, the other pair of cams will thereby be drawn in, 130 so as not to allow the dial-needles to knit off the stitches, though they take the yarn from the yarn-guide on that side of the machine. Then, when the first pair of cam-plates are

moved in by their slide-plate, the other pair of cams are thereby moved out to cause the needles to make and knit off stitches on that side. An additional drawing-in cam H' , opposite to the single cam, for the same purpose as above mentioned, and as shown in the former Letters Patent above referred to, serves to complete the mechanism for throwing out and in the dial-needles on two sides of the machine. It is here to be understood that if a single throw-out cam, as E or E' , should be used, instead of cams in pairs, as above described, the invention will apply just the same thereto.

It is obvious that in using two thread-guides for feeding in threads at different sides of the machine the cam-ring C must necessarily be provided with two sets of knitting-cams to move the vertical or cylinder-needles, as is usual and common where two thread-guides are employed. Such duplicate knitting-cams on the cam-ring consequently are not in themselves novel, and constitute no part of the present invention except in so far as they enter as necessary co-operative elements into the novel combinations in which the present invention resides. In Figs. 7 and 8 is shown a cam-ring having well-known duplicate knitting-cams for actuating the cylinder-needles, such as may be conveniently used in the machine provided with the present improvements. In Fig. 8 are represented the cams on one-half of the inner periphery of the cam-ring C , x being the elevating-cam, and y the depressing-cam. The inner periphery of the other half of the cam-ring C is provided with an exact duplicate of the cams shown in Fig. 8, the cams on the two halves of the cam-ring being diametrically opposite to each other. The relative arrangement of the duplicate cams is indicated in Fig. 7.

If it is desired at any time to knit a close web, I here provide for throwing out both pairs of cams at the same time for the purpose, by having an additional pivot-hole 7 in one of the slide-plates, as G' , in such a position that by transferring one pivot-pin 6 thereto, as shown by dotted lines in Fig. 3, both slide-plates will be in position to hold both sets of throw-out cams in their outermost positions. When thus coupled, the slide-plate G will occupy the position shown by dotted lines and the slide-plate G' will occupy the position shown by full lines in Fig. 3. The shift-pin 6 may be mounted on a spring-holder 8 for convenience in shifting from one hole to the other. Any equivalent of the device shown for effecting this change of the slide-plates may of course be used instead thereof. In cases, however, wherein a close web is to be frequently knit—as, for instance, in knitting continuous tubular stocking-webs where the close tops are to come in at regular intervals—I provide for automatically making all the changes which this invention is designed to effect. I then employ a construction which is represented in Figs. 4 and 5. Here I employ two pairs of throw-out cams $E F$ and E'

F' and two cam-slotted slide-plates $G G'$, connecting-pins $a a'$, and two connecting-pinions $I I'$, gearing, respectively, into racks f and f' , and provided, respectively, with pinion-arms $h h'$, and two pinions K and K' , provided, respectively, with arms g and g' and fingers l and l' . It is obvious that by thus duplicating these movement-controlling parts each pair of throw-out cams can be controlled separately, so that the two may be moved out alternately or both together, and thus effect all the movements herein specified automatically.

What I claim as my invention is—

1. The combination of the needle-cylinder and its needles, the cam-ring actuating the cylinder-needles, means for rotating the said cam-ring, the dial, and its needles, two thread-guides, the dial-plate, two drawing-in and two throw-out cams or pairs of cams thereon, the said throw-out cams being adapted to be moved alternately out and in, means for rotating the said dial-plate, pattern mechanism for moving the said cams or pairs of cams, and the devices intermediate between the pattern mechanism and the dial-throw-out cams, substantially as and for the purpose herein specified.

2. The combination of the needle-cylinder and its needles, the cam-ring actuating the cylinder-needles, means for rotating the said cam-ring, two thread-guides, the dial and its needles, the dial-plate, means for rotating the dial-plate, two movable throw-out cams or pairs of cams, a pattern mechanism for throwing the said cams out and in, and two sets of similar mechanisms for connecting the respective throw-out cams separately with the pattern mechanism, substantially as and for the purpose herein specified.

3. The combination of the needle-cylinder A and its needles, cam-ring C , actuating the cylinder-needles, means for rotating the said cam-ring, two thread-guides 1 and 2, the dial B and its needles, the dial-plate D , means for rotating the dial-plate, two throw-out cams or pairs of cams $E F$ and $E' F'$, stationary drawing-in cams $H H'$, two cam-moving slides $G G'$, pattern mechanism, and two sets of mechanism $I K g h l$ and $I' K' g' h' l'$, connecting the slides $G G'$, respectively, with the said pattern mechanism.

4. The combination, with a needle-cylinder and a dial and cylinder-needles and dial-needles therein, of two thread-guides, a cam-ring provided with two sets of knitting-cams to move the cylinder-needles, and a dial-plate provided with two throw-out and two drawing-in cams to move the dial-needles, and means to move one of the throw-out cams of the said dial-plate, substantially as set forth.

In testimony whereof I have signed my name in presence of two witnesses.

W. H. PEPPER.

Witnesses:

JACOB M. COOK,
THOS. HAM.