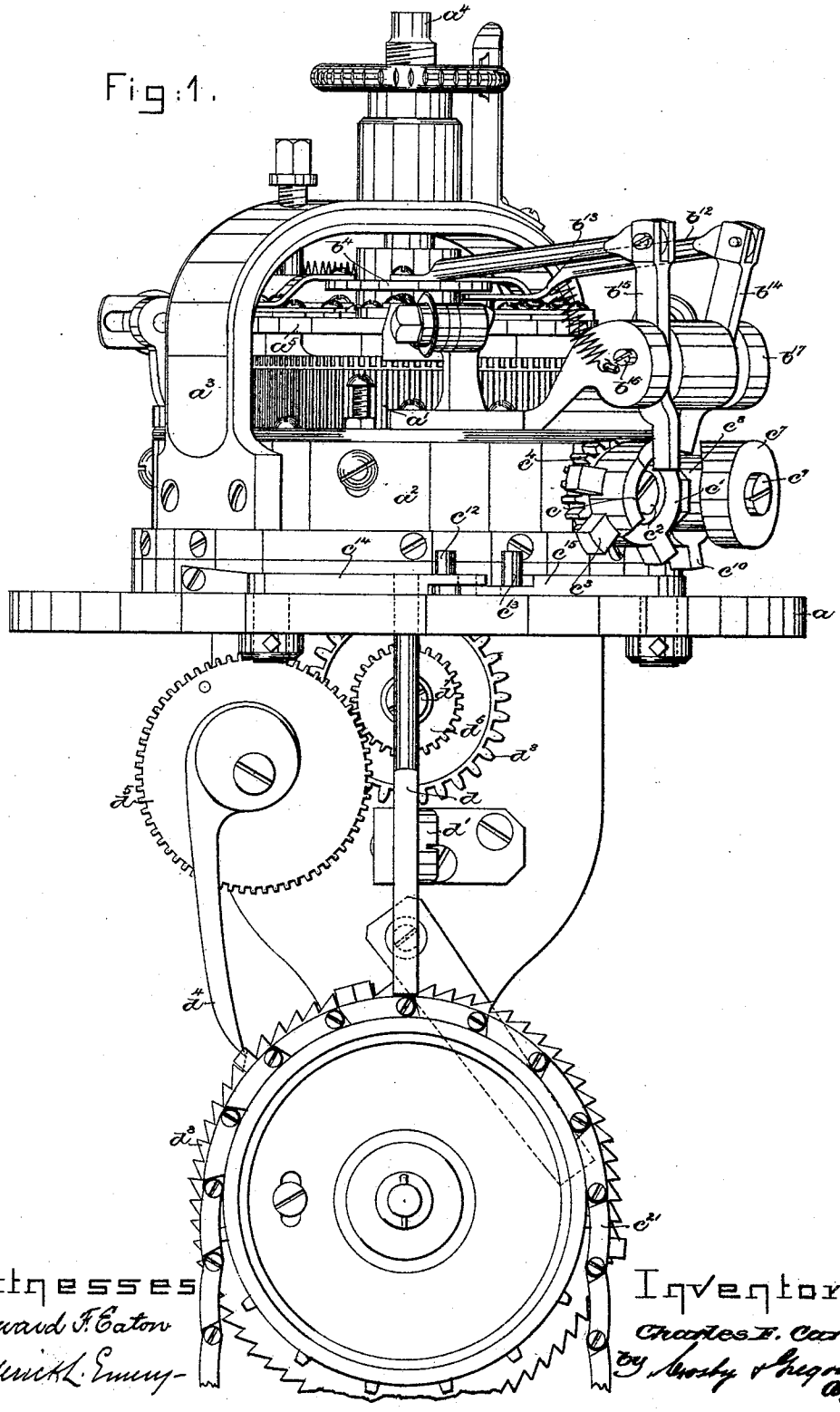
(No Model.) 4 Sheets—Sheet 1.

C. F. CARR.

CIRCULAR KNITTING MACHINE.

No. 435,394. Patented Sept. 2, 1890.

Fig. 1.



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(No Model.)

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CIRCULAR KNITTING MACHINE.

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Fig: 2.

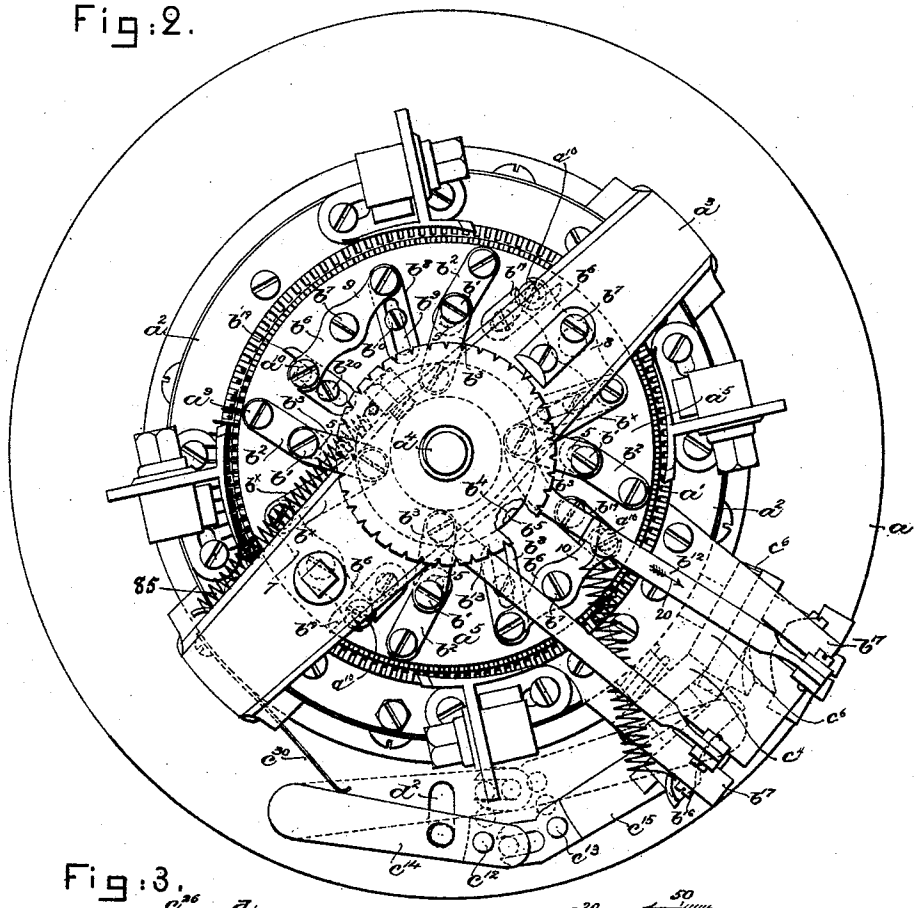


Fig: 3.

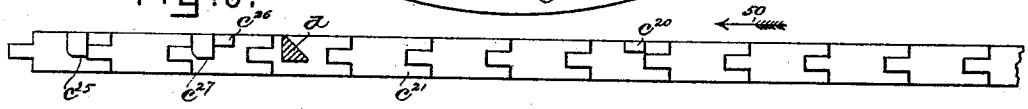


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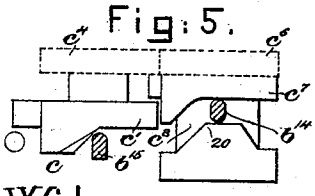


Fig: 7.

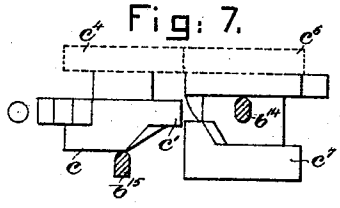
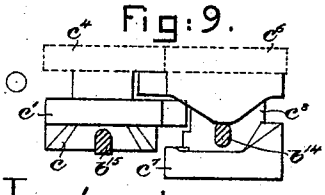


Fig: 9.



Witnesses

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CIRCULAR KNITTING MACHINE.

No. 435,394. Patented Sept. 2, 1890.

Fig: 8.

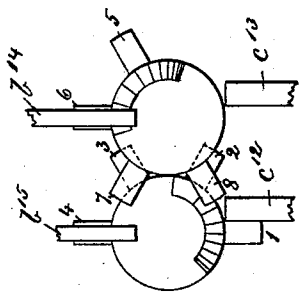


Fig: 6.

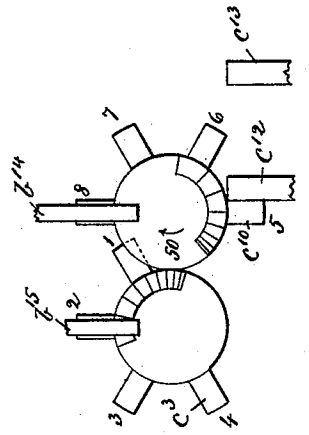
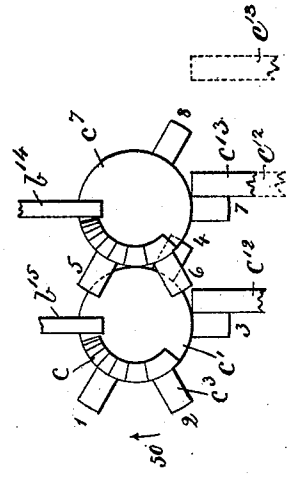


Fig: 4.



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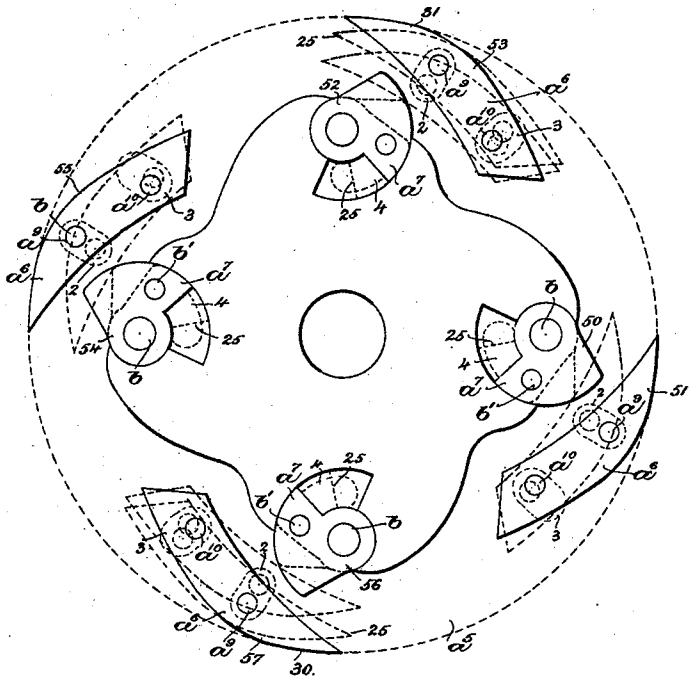
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Fig. 10.



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UNITED STATES PATENT OFFICE.

CHARLES F. CARR, OF LACONIA, NEW HAMPSHIRE, ASSIGNOR TO WARREN D. HUSE, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 435,394, dated September 2, 1890.

Application filed August 23, 1889. Serial No. 321,707. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. CARR, of Laconia, county of Belknap, State of New Hampshire, have invented an Improvement in Circular-Knitting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to knitting-machines of that class in which two sets of needles are employed in the production of circular work, and is an improvement upon the machine shown and described in United States Patent No. 381,963, dated May 1, 1888.

My present invention relates more particularly to the dial-cam plate, its cams, and the mechanism for operating the same, whereby different kinds of knit-work may be made. For instance, the cams on the dial-cam plate when in one position may operate the dial-needles to produce plain rib-work, and in another position operate the said needles to produce a welt, and when in a third position will produce tuck-work.

The particular features in which my invention consists will be pointed out in the claims at the end of this specification.

Figure 1 is a side elevation of a sufficient portion of a knitting-machine embodying my invention to enable it to be understood; Fig. 2, a top or plan view of the machine shown in Fig. 1, slightly broken away; Fig. 3, a detail of a portion of the pattern-chain; Figs. 4, 6, and 8, detail views showing three different positions of the hubs and their cams for operating the levers to produce change of position of the dial-cams; Figs. 5, 7, and 9, top or plan views of the cam-gears shown in Figs. 4, 6, and 8, respectively; and Fig. 10, a top view in detail to more clearly show the position of the dial-cams, the dial-cam plate being indicated by dotted lines.

The bed-plate a, vertical needle-cylinder a', cam-cylinder a^2, yoke a^3, secured thereto, shaft a^4, to which the dial-cam plate a^5 is secured, may be of any usual or well-known construction.

The dial-cam plate a^5 has secured to its under side preferably two or more sets of movable drawing-in cams a^6 and movable throwing-out cams a^7, there being four sets of cams shown in Fig. 10. The drawing-in cam a^6 of each set is herein shown as provided with two studs or pins a^9 a^{10}, extended up through slots 2 3 in the dial-cam plate, (shown only in dotted lines, Fig. 10,) and the movable throwing-out cam a^7, pivoted as at b, is provided with a stud or pin b', extended up through a slot 4 in the dial cam-plate.

As shown in the drawings, all the drawing-in cams and throwing-out cams are made movable, and the stud a^9 of each drawing-in cam is connected by link b^2 to the stud b' of its co-operating throwing-out cam, the said stud being extended up through a slot 5 in said link, (see dotted lines, Fig. 2,) and the stud b' is jointed by a link b^3 to the lower one b^5 of two rings b^4 b^5, mounted on the dial-cam plate a^5, substantially as shown and described in another application, Serial No. 280,013, filed July 16, 1888, by Warren D. Huse and myself.

The stud a^{10} of each drawing-in cam has secured to it on the upper side of the dial-plate one end of a lever b^6, pivoted as at b^7, and, as shown in Fig. 2, two of the said levers (marked 7 8) have their opposite ends joined by links $b^\times$ to the upper ring b^4, while the remaining two levers (marked 9 10) are connected to links or bars b^8, provided with slots b^9, through which a stud or pin b^{10} is extended. The slot 5 permits the ring b^5 to be moved a slight distance without moving the drawing-in cams. The pivot a^{10} of each drawing-in cam is limited in its forward or inward movement by a stop (shown as a bar b^{19}) secured to the dial-cam plate by screw b^{20}. The rings b^5 b^4 have connected to them rods b^{12} b^{13}, jointed to levers b^{14} b^{15}, (see Fig. 1,) pivotally mounted on a rod b^{16}, inserted through lugs or ears b^{17}, secured to the cam-cylinder a^2. The lower end of the lever b^{15} is adapted to be operated upon by a cam c on a hub c', mounted on a stud c^2 and provided with projections c^3, the said hub having secured to or forming part of it a gear c^4 in mesh with a similar gear c^6, (see dotted lines, Fig. 2,) secured to or forming part of a hub c^7, mounted on a stud c^9 and provided, as herein shown, with a cam-groove c^8, which is engaged by the

lower end of the lever b^{14}, the said hub having projections c^{10}, substantially as shown and described in another application. (See Serial No. 299,479, filed February 11, 1889, by Warren D. Huse and myself.) The lower ends of the levers b^{14} b^{15} are kept in engagement with the cams c' c^8 by springs 85, (see Fig. 2,) only one of which is shown, the said springs having one end secured to the frame of the machine and their other ends connected to the rings b^4 b^5.

The studs c^3 c^{10} are adapted to be struck, as herein shown, by two upright studs or posts c^{12} c^{13} on levers c^{14} c^{15}, pivoted to the bed-plate, the said levers being herein shown as joined together by the forked end of the lever c^{15} engaging a pin or stud on the lever c^{14}. The levers c^{14} c^{15} normally occupy the full-line position shown in Fig. 2, being forced into said position, as shown, by a spring c^{30}, and the said levers may be moved inward into their dotted-line positions by suitable cams or projections on a pattern-chain c^{21}, acting on the preferably-beveled lower end of a lever or pivoted rod d, fulcrumed as at d', and having its upper end extended up through a slot d^2 in the bed-plate a and engaging the lever c^{14}, the said levers in their dotted-line positions placing the studs c^{12} c^{13} in positions to strike the projections c^3 c^{10} and rotate the hubs c' c^7 through the gears c^4 c^6, so as to operate the levers b^{15} b^{14} and move the drawing-in cams and throwing-out cams to produce different kinds of work, as will be described. The pattern-chain c^{21} may be driven by any usual mechanism (herein shown as consisting of a ratchet-wheel d^3, a pawl d^4, eccentrically mounted on a gear-wheel d^5 in mesh with a pinion d^6 on a shaft d^7, provided with a gear d^8, by which the cam-cylinder is rotated in usual manner.)

In operation the drawing-in cams and the throwing-out cams may be moved, as will be described, into their outermost position to produce ordinary ribbed work, and into their innermost position to produce the welt, and into an intermediate position to produce tuck-work. As herein represented, the links $b^\times$ are connected to the upper ring b^4 and the links b^3 to the lower ring b^5.

Referring to Figs. 4 and 5, the cam-hubs c' c^7 are in the position for producing ribbed work, the levers c^{14} c^{15} being in their normal or full-line position, (shown in Fig. 2,) and all the throwing-out cams and the outer point or toe of all the drawing-in cams are in their outermost position, and the heels of all the said drawing-in cams are in their innermost position. Let it be supposed that the pattern-chain is traveling in the direction indicated by arrow 50, Fig. 3. The machine will continue to produce ribbed work until the cam c^{20} strikes the rod d and moves the levers c^{14} c^{15} into a position intermediate of the full-line and the inner dotted-line positions shown in Fig. 2. When the levers c^{14} c^{15} are in the intermediate position referred to, the projection c^3 (marked 3) on the hub c' strikes the post c^{12} and turns the said hub in the direction of arrow 50 and brings the cam c behind the lever b^{15}, the projection c^3 (marked 4) being brought into the position previously occupied by the projection 3, so as to engage the post c^{13} and turn the hub c' still further in the direction of arrow 50 and bring the cam c behind the lever into the position shown in Fig. 6. The cam c moves the lower end of the lever b^{15} outward, and thus moves the drawing-in cams connected to the upper ring b^4, (and which are marked 53 57 in Fig. 10,) so as to place the heels of the said cams in their outermost position and the toe of the said cams in their intermediate position. (Indicated at 25.) The lever b^{14} is not acted upon by the cam-hub c^7, as the latter is moved into the position shown in Figs. 6 and 7, and therefore all the throwing-out cams and those drawing-in cams connected to the ring b^5 (and marked 51 55 in Fig. 10) are not moved. With the cams in the position just described the machine will produce tuck-work—that is, as the needle passes by the movable throwing-out cam a^7 (marked 56 in Fig. 10) it takes a loop and casts the loop already in the eye of the needle behind the latch, and as the said needle passes by the drawing-in cam a^6 (marked 30) with its heel in its outermost position the said needle is not moved in far enough to cast off the loop behind the latch. The needle has now one loop in its eye and another loop behind the latch, and as it passes by the throwing-out cam (marked 54, Fig. 10,) the loop in the eye of the needle is slipped behind the latch and a new thread laid in the eye, and as the needle passes by the movable drawing-in cam (marked 55) in its innermost position the two loops behind the latch are cast off, forming single tuck-work, and as the needle then passes by the movable throwing-out cam 52 the loop in the eye of the needle is slipped behind the latch and a new thread laid in the eye, and the heel of the drawing-in cam 53 being in its outermost position does not cast off the loop behind the latch, and as the needle passes by the throwing-out cam 50 the loop in the eye is slipped behind the latch and a new thread laid in the eye, and the two loops behind the latch are cast over the loop in the eye of the needle as the said needle passes by the drawing-in cam 51 in its innermost position. As soon as the cam c^{20} is moved out of engagement with the rod d the levers c^{14} c^{15} are moved into their full-line position by the spring c^{30}, out of position to be struck by the projections c^3 c^{10}. The machine will thus continue to form tuck-work until in the travel of the pattern-chain another cam, as c^{25}, of the said chain strikes the rod d and moves the levers c^{14} c^{15} into their innermost position to be engaged by the studs c^{10} on the cam-hub c^7, as the projections c^3 are at such time not in position to engage the posts c^{12} c^{13}. When the posts c^{12} c^{13} are moved in so as to be engaged by the studs c^{10}, the

post c^{12} is first struck by the stud c^{10} (marked 5) and the cam-hub c^7 is moved in the direction of arrow 50, and the stud c^{10} (marked 6) brought down into the position previously occupied by the stud 5 and into position to strike the post c^{13}, thus completing the movement of the cam-hub c^7 in the direction of arrow 50 and bringing the cam-hubs back into the position shown in Figs. 4 and 5, in which position the machine will produce ribbed work. If it is desired to form the welt, another cam c^{27} on the pattern-chain will strike the rod d and move the levers c^{14} c^{15} again into their innermost position (indicated by dotted lines, Fig. 2) to be engaged by the stud c^{10}, (marked 7,) which first strikes the post c^{12} and moves the cam-hub c^7 in the direction of arrow 50, bringing the stud c^{10} (marked 8) into position to engage the post c^{13}, which it strikes, and continues the movement of the cam-hub c^7 in the direction of arrow 50, thus bringing the cam-hubs into the position shown in Fig. 8, with the cam on the hub c^7 behind the lever b^{14}. When in this position, the lower end of the lever b^{14} is moved outward and all the throwing-out cams and the outer points or toes of the movable drawing-in cams are brought into their innermost position, and when in this position the dial-needles in the rotation of the cam-plate are moved in a sufficient distance to render them inoperative—that is, so they will not knit—leaving the cylinder-needles alone to perform the work for one or more courses, as desired, and as a result forming a welt. As soon as the cam c^{27} is withdrawn from the rod d the latter is engaged by the cam c^{26} and the levers c^{14} c^{15} are moved into their intermediate position, thus placing the posts c^{12} c^{13} in the path of movement of the projections c^3, (marked 1 2,) and the said posts, striking the projections c^3, turn the hubs into the position shown in Figs. 4 and 5 to produce ribbed work. As herein shown, the heels of two of the drawing-in cams are connected to the ring b^4 to produce a single tuck, as described; but, if desired, all of the said drawing-in cams may be so connected or all of the throwing-out cams may be connected to the ring b^5 to produce tuck-work, substantially as described in United States Patent No. 413,142, granted October 15, 1889, to Warren D. Huse and myself. By employing two levers c^{14} c^{15}, each provided with a post, I am enabled to make the cams on the hubs c' c^7 longer, and thus obtain a slower movement, and as a result the liability of skipping threads is reduced and a firmer and better knitted fabric obtained; but I do not desire to limit myself to two levers, as only one may be employed with a shorter cam.

I claim—

1. In a circular-knitting machine, the combination, with the dial-cam plate provided with a drawing-in cam and throwing-out cam, of rings on the dial-cam plate, to which said cams may be connected, levers connected to said rings, cam-hubs to move said levers, provided with projections, a lever provided with a post to act on said projections and rotate said cam-hubs, a pattern-surface, and means acted on by the said pattern-surface to move the lever into position to actuate the cam-hubs, substantially as described.

2. In a circular-knitting machine, the combination, with the dial-cam plate provided with drawing-in cams and movable throwing-out cams, of rings on said dial-cam plate, to which said cams may be connected, levers connected to said rings, cam-hubs provided with projections, a lever c^{14}, provided with a post to act on the said projections, a lever d, connected to the lever c^{14}, and a pattern-surface to operate said lever, substantially as described.

3. In a circular-knitting machine, the combination, with the dial-cam plate provided with drawing-in cams and movable throwing-out cams, of rings on said dial-cam plate, to which said cams may be connected, levers connected to said rings, cam-hubs provided with projections, levers c^{14} c^{15}, joined together and provided with posts c^{12} c^{13}, a lever d, connected to one of the said levers, and a pattern-surface to actuate said lever, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES F. CARR.

Witnesses:
GEO. R. LEAVITT,
A. C. LEAVITT.