(No Model.) 2 Sheets—Sheet 1.

L. N. D. WILLIAMS.

RIB KNITTING MACHINE.

No. 561,068. Patented May 26, 1896.

FIG. 4.

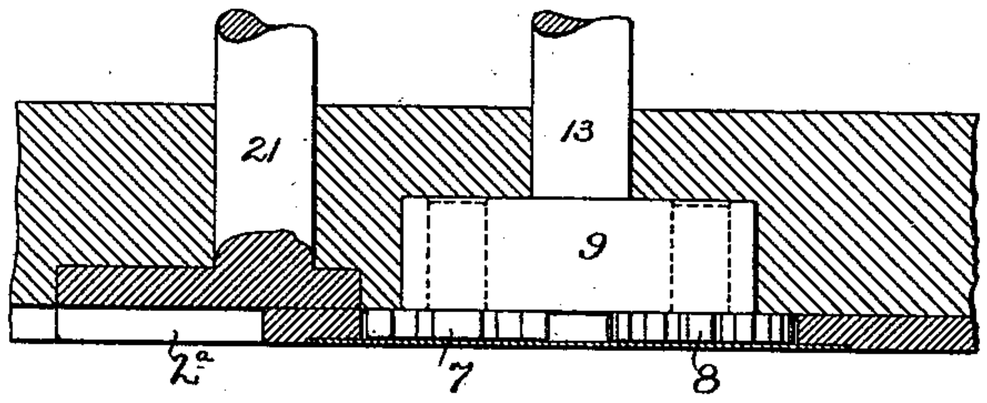


FIG. 5.

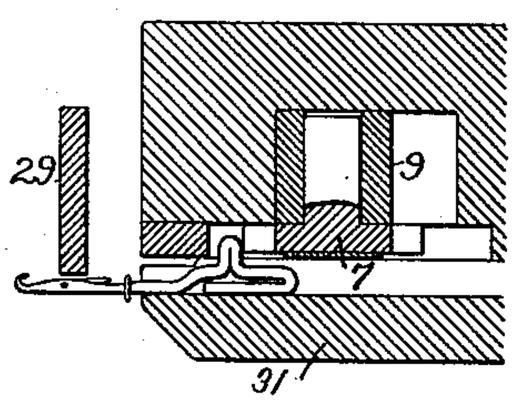


FIG. 6.

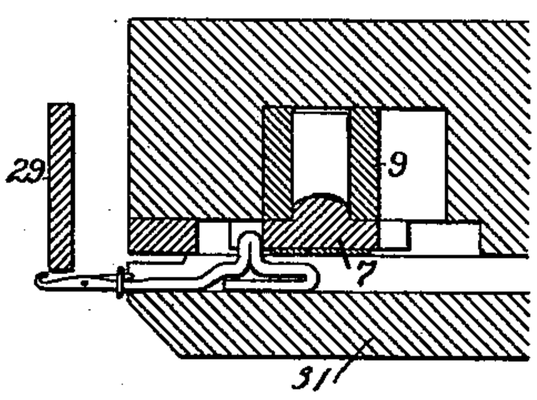


FIG. 7.

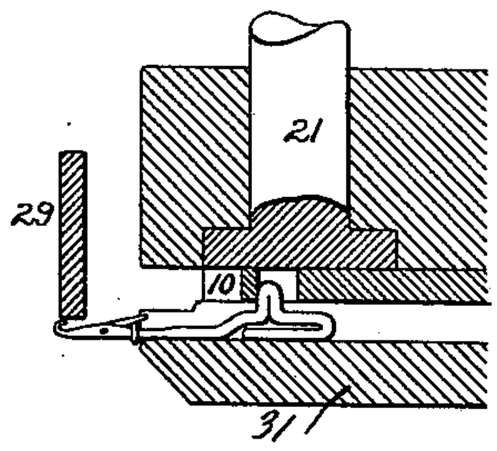
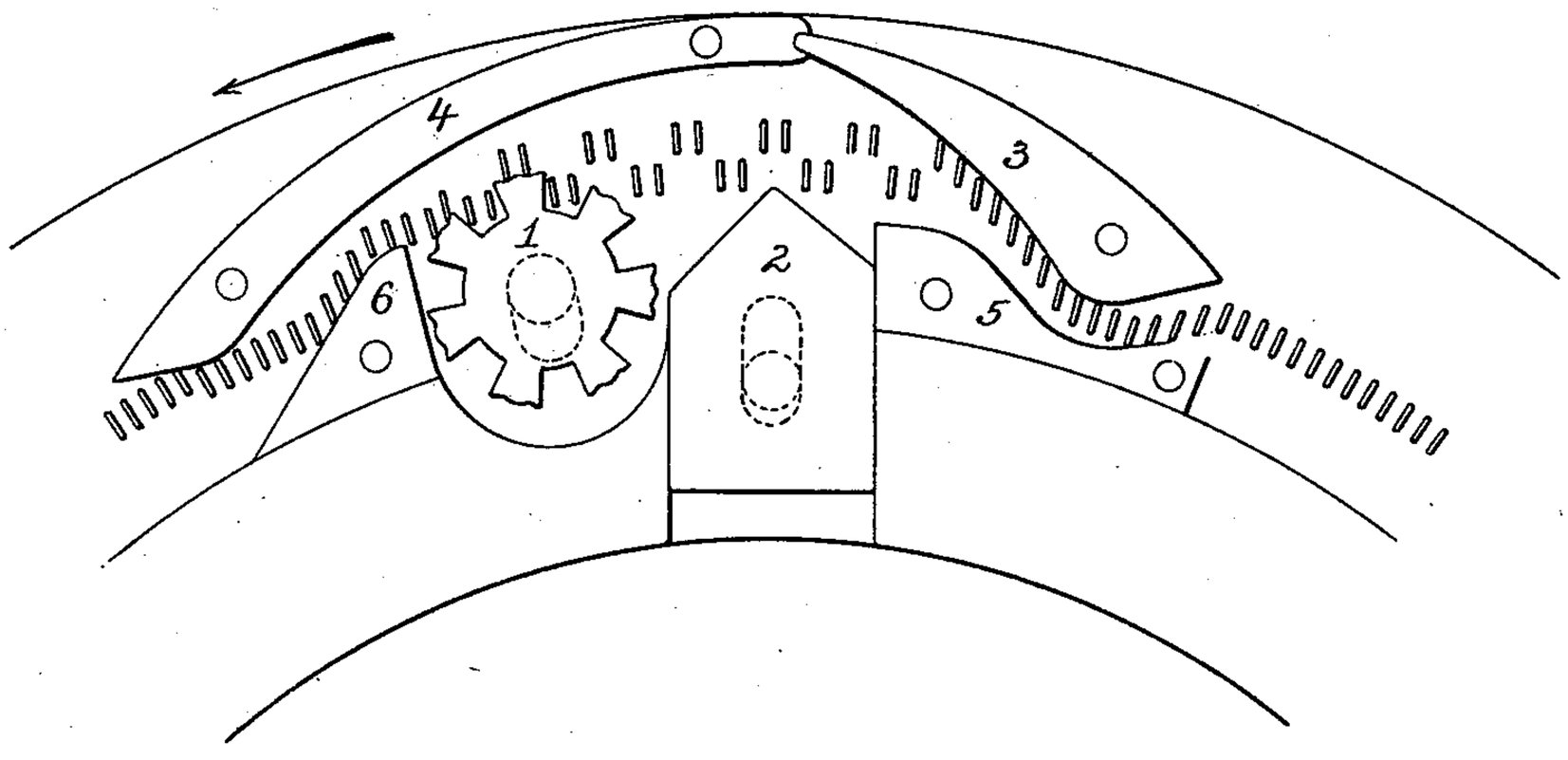


FIG. 1.



Witnesses:
Hamilton D. Turner
Fred C. Benner

Inventor:
Louis N. D. Williams
by his Attorneys
Howson & Howson

(No Model.) 2 Sheets—Sheet 2.

L. N. D. WILLIAMS.

RIB KNITTING MACHINE.

No. 561,068. Patented May 26, 1896.

FIG. 2.

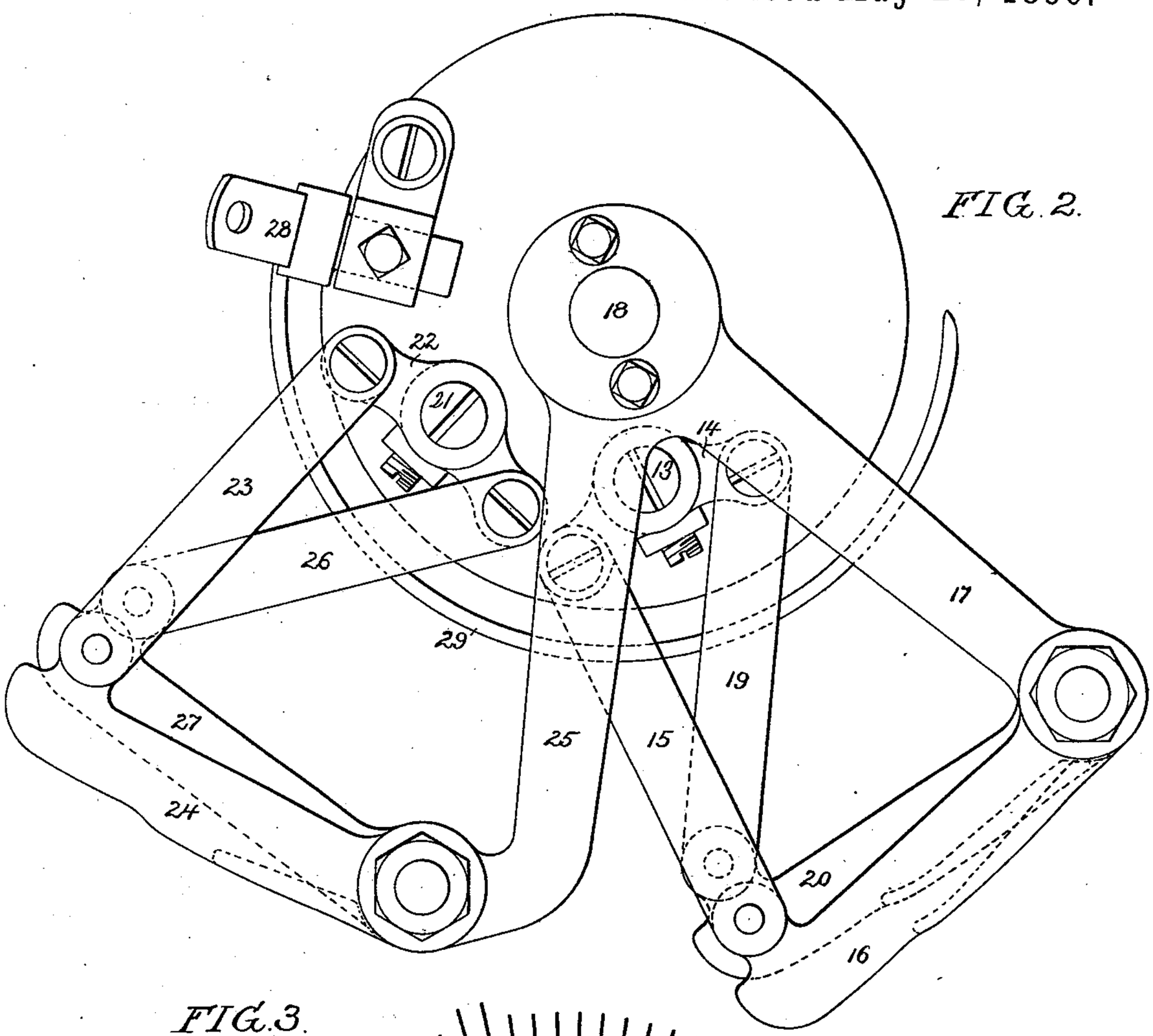
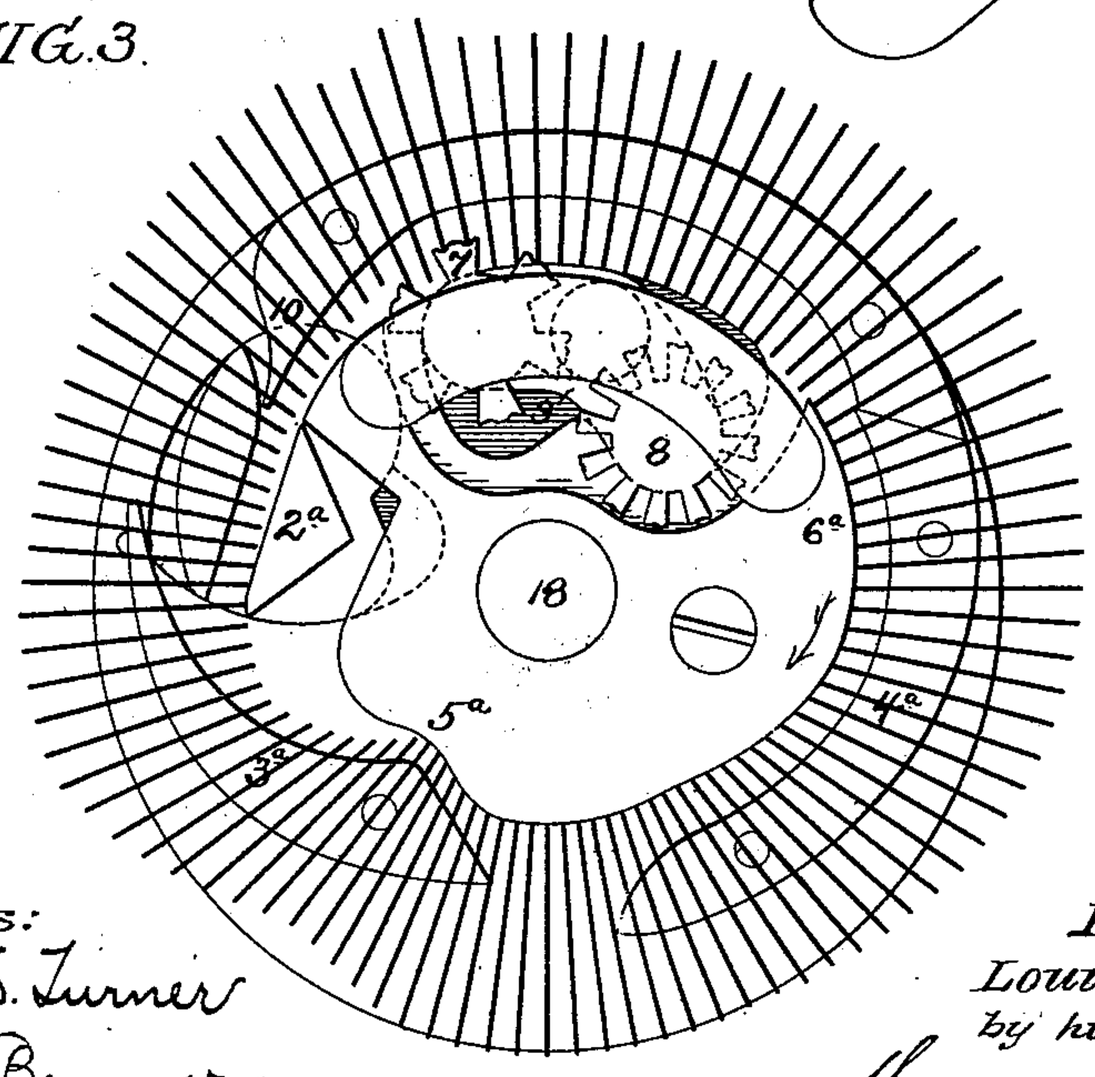


FIG. 3.



Witnesses:
Hamilton D. Turner
Fred'k. Benner

Inventor:
Louis N. D. Williams
by his Attorneys
Howson & Howson

UNITED STATES PATENT OFFICE.

LOUIS N. D. WILLIAMS, OF ASHBOURNE, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO ROBERT W. SCOTT, OF PHILADELPHIA, PENNSYLVANIA.

RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 561,068, dated May 26, 1896.

Application filed December 3, 1895. Serial No. 570,935. (No model.)

To all whom it may concern:

Be it known that I, LOUIS N. D. WILLIAMS, a citizen of the United States, residing in Ashbourne, Pennsylvania, have invented certain Improvements in Rib-Knitting Machines, of which the following is a specification.

In the Patent No. 368,429, granted to Robert W. Scott on the 16th day of August, 1887, was described a certain notched wheel-cam, whereby some of the needles were projected to the clearing-point, while others were permitted to remain at the tuck-point; and my invention consists of certain improvements in this feature of the invention forming the subject of said Letters Patent, the objects of my said improvements being, first, to insure accuracy in the operation of the notched wheel-cam under all circumstances, and, secondly, to provide for readily varying the character of the work to be produced by changing the style of tuck without stopping the machine. These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is an inverted plan view of sufficient of the dial-cam of a knitting-machine to illustrate the first feature of my invention. Fig. 2 is a plan view of the dial-cam plate of a knitting-machine provided with means for operating cams embodying both of the features of my invention. Fig. 3 is an inverted plan view of a dial-cam plate having cams in accordance with my invention and showing also a diagrammatic representation of the needles of the machine. Fig. 4 is a sectional view, partly in elevation, of part of the dial-cam plate shown in Fig. 3; and Figs. 5, 6, and 7 are sectional diagrams illustrating certain movements of the needles effected by some of the cams shown in Figs. 2, 3, and 4.

In the patent granted to Robert W. Scott, and before alluded to, a notched wheel-cam was employed in connection with the adjustable needle-projecting cam of the dial-cam plate, the notched wheel-cam following said needle-projecting cam in its action upon the bits of the needles, so that when the preceding cam was adjusted to such position as to project the needles only to the tuck-point the notched wheel-cam following the same would allow certain of the needles to remain at the tuck-point, but would project others to the clearing-point. When the cam preceding the notched wheel-cam was projected to its full extent, all of the needles would be cleared and none of the bits would be subjected to the action of said notched wheel-cam. The objection to this construction was the uncertainty of its action. For instance, supposing that the dial had one hundred and two needles and the notched wheel-cam was constructed to tuck and clear on alternate pairs of needles, the pairs of needles which had tuck-stitches formed upon them in the first round would have to be cleared in the second round, while those which were cleared in the first round would have to have tuck-stitches formed on them on the second round, and so on. Thus on the first round the needles 1 and 2 would be tucked and the needles 3 and 4 cleared, the needles 5 and 6 tucked and the needles 7 and 8 cleared, and so on throughout the entire set, the last pair of needles 101 and 102 being tucked so as to provide for clearing the needles 1 and 2 on the second round, the needles 101 and 102 being cleared on this round so as to provide for tucking on the needles 1 and 2 on the third round, and so on. This division of the needles necessitates absolute accuracy in the action of the notched wheel-cam upon the needles, but when the main projecting cam preceded the notched wheel-cam, as in the patented device, there was liability to error when the said preceding cam was moved from the clearing position to the tuck position, as there was no absolute certainty that the bits of the needles would strike the projecting bits of the notched wheel-cam in their proper order. In order to avoid this uncertainty, I now locate the notched wheel-cam in advance of the main needle-directing cam. Thus in Fig. 1 said notched wheel-cam is represented at 1 and the main directing-cam at 2, while 3 shows the drawing-in cam; 4, an outer guard-cam; 5, an inner guard-cam, and 6 an inner cam for moving the bits of all of the needles to the tuck-point and properly directing them to the notched wheel-cam 1, the dial-cam plate being supposed to be moving in the direction of the arrow. As the needles are thus acted upon

by the notched wheel-cam before they can reach the main directing-cam, the division of the needles is dependent wholly upon said notched wheel-cam, which is always certain in its action, the adjustment of the cam 2 from the tuck-point to the clearing-point or from the clearing-point to the tuck-point having no influence whatever upon the proper action of said cam 1. The pin which carries the notched wheel-cam 1 is adapted to a slot in the dial-cam plate, as shown by dotted lines in Fig. 1, so that said notched wheel-cam can be retracted to such position that it will fail to act upon the needles when it is not desired to produce the tuckwork for which said cam is intended.

In the machine shown in Figs. 2, 3, and 4 the same idea is embodied in connection with another feature of my invention—namely, that whereby the character of the tuck can be varied without stopping the machine. In this case there is a main draw-in cam 3^a, an outer guard-cam 4^a, an inner guard-cam 5^a, and an inner cam 6^a for directing all of the needles to the tuck-point. Two notched wheel-cams 7 and 8 are mounted upon a swinging bar 9, which, with its cams, is adapted to suitable recesses formed in the under side of the dial-cam plate, as shown in Fig. 4, the notched wheel-cam 7 being constructed so as to clear and tuck on alternate pairs of needles and the notched wheel-cam 8 being constructed so as to clear and tuck on alternate single needles. Besides the main drawing-in cam 3^a of the machine there is a supplementary draw-in cam 10, located in advance of the adjustable directing-cam 2^a, the latter being, like the bar 9 and cams 7 and 8, contained in a recess in the under side of the dial-cam plate and being adapted for adjustment to three different positions—that is to say, to an outer position, so as to direct the needles to the clearing-point, to an intermediate position, as shown in Fig. 3, so as to retain the needles at the tuck-point, or to an inner position, so as to direct the needles to the welt-point. By "clearing-point" is meant that projection of the needles which causes them to slip their stitches back of the latches, so as to cast said stitches on the retraction of the needles. By "tuck-point" is meant that projection of the needles which causes them to receive new thread without slipping the stitches already on them back of the latches, so that two stitches will be formed on these needles, and by "welt-point" is meant that projection of the needles which prevents them from either slipping their stitches back of the latches or receiving the new knitting-thread. When the bit of a needle is acted upon by the projecting bit of one of the notched wheel-cams, said needle will be projected, as shown in Fig. 5, so as to "clear" or slip its stitch back of the latch, but when the bit of a needle enters a notch of the wheel-cam said needle will only be projected to the tuck-point, as shown in Fig. 6, the stitch remaining upon the latch of the needle. All of the needles which were projected by the bits of the notched wheel-cam will be retracted to the tuck-point by the draw-in cam 10, as shown in Fig. 7, and will be retained at this point by the adjustable cam 2^a, so that all of the needles will receive the new thread, but when all of the needles are retracted by the main draw-in cam 3^a the needles which were cleared by the bits of the notched wheel-cam will cast their stitches while the others will retain their stitches.

When it is desired to change the character of the tuck which is being produced, the bar 9 is vibrated so as to draw out of action the notched wheel-cam which was formerly in action and throw into action the notched wheel-cam which was formerly out of action, and it is manifest that this idea may, within the scope of my invention, be extended so as to provide for the use of any desired number of notched wheel-cams, so mounted as to be brought into action successively. It is manifest also that the needles may be permitted to remain in the position to which they are adjusted by the notched wheel-cam, as in Fig. 1, instead of being withdrawn to the tuck-point by a draw-in cam, such as that shown at 10, the latter cam being used only because of the peculiar character of the swinging cam 2^a, which requires that all of the needles shall be adjusted to the tuck-point before being subjected to its action. The swinging bar 9 and its pivot-stem 13 constitute the means whereby the notched wheel-cams are movably mounted upon the dial-cam plate, and said bar 9 is, like the swinging cam 2^a, capable of adjustment to three different positions, so that either of the notched wheel-cams may be thrown into action or both can be withdrawn, so as to fail to act upon the bits of the needles, the latter result being attained when the bar is adjusted to the intermediate position. Substantially similar mechanism may be used for adjusting both the swinging bar 9 and the cam 2^a. Thus, as shown in Fig. 2, the pivot-pin 13 of the swinging bar 9 has a two-armed lever 14, one arm of the same being connected by a link 15 to an arm 16, hung to a projecting arm 17 on the rotating spindle 18 of the machine, the other arm of said lever 14 being connected by a link 19 to an arm 20, likewise hung to said projecting arm 17. The arm 16 is located above the arm 20 and, owing to their connection to opposite arms of the lever 14, inward movement of the arm 16 causes outward movement of the arm 20, and vice versa. Hence as the arms 16 and 20 are carried around by the rotating spindle 18 they can be adjusted to either of the desired positions by contact with studs or disks moved into the path of the same in a manner common in this class of machines.

The pivot-pin 21 of the swinging cam 2^a has a two-armed lever 22, one arm of which is connected by a lever 23 to an arm 24, hung to the outer end of a projecting arm 25 on the

spindle 18, the other arm of said lever 22 being connected by a link 26 to an arm 27, likewise hung to said arm 25.

The thread-guide 28 of the machine has a segmental bar or plate 29, which extends around the dial-cam plate to a point beyond the notched wheel-cams 7 and 8, this segmental plate serving as a latch-guard to prevent closing of the latches of the needles when the same are cleared by either of said notched wheel-cams.

In Figs. 5, 6, and 7 I have shown part of the dial 31 of the machine which constitutes the needle-carrier and is located beneath the dial-cam plate; but it will be evident that although I have described my invention as applied to the cams of the dial-cam plate the said invention can, with equal advantage, be used in connection with the cams of a cam-cylinder intended to act upon the needles of a vertical needle-cylinder. Hence in the claims I have used the term "cam-carrier" to indicate either a dial-cam plate or a cam-cylinder and the term "needle-carrier" to indicate either a needle-cylinder or a dial.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination in a knitting-machine, of a needle-carrier and its needles, with a cam-carrier having a needle-directing cam adjustable so as to move the needles to the clearing-point or permit them to remain at the tuck-point, and a notched wheel-cam disposed so as to act upon the needles in advance of said directing-cam, the projecting bits of said notched wheel-cam being adapted to move the needles to the clearing-point and the intervening notches permitting the needles to remain at the tuck-point.

2. The combination in a knitting-machine, of a needle-carrier and its needles, with a cam-carrier having a needle-directing cam adjustable so as to project the needles to the clearing-point or permit them to remain at the tuck-point, a notched wheel-cam disposed so as to act upon the needles in advance of said directing-cam and having projecting bits adapted to clear the needles and intervening notches for permitting the needles to remain at the tuck-point, and a fixed cam acting on the needles in advance of said wheel-cam and serving to move all of the needles to the tuck-point.

3. The combination in a knitting-machine, of a needle-carrier and its needles, with a cam-carrier having a series of notched wheel-cams each with bits for projecting the needles to the clearing-point, and intervening notches for permitting the needles to remain at the tuck-point, said wheel-cams being movably mounted on the cam-carrier, whereby either may be adjusted into or out of position for acting upon the needles.

4. The combination in a knitting-machine, of a needle-carrier and its needles, with a cam-carrier having a series of notched wheel-cams each having bits for projecting the needles to the clearing-point, and intervening notches for permitting the needles to remain at the tuck-point, said wheel-cams being movably mounted upon the cam-carrier, whereby either of the cams can be adjusted into or out of position for acting upon the needles or all of said cams can be moved out of operative position.

5. The combination in a knitting-machine, of a needle-carrier and its needles, with a cam-carrier having a swinging bar upon which is mounted a series of notched wheel-cams each with bits for projecting the needles to the clearing-point, and intervening notches for permitting the needles to remain at the tuck-point.

6. The combination in a knitting-machine, of a needle-carrier and its needles, with a cam-carrier having a notched wheel-cam the bits of which are adapted to move the needles to the clearing-point, while the notches permit the needles to remain at the tuck-point, a swinging cam disposed so as to act upon the needles after they have been acted upon by the notched wheel-cam, said swinging cam being adjustable so as to move the needles either to the clearing-point, to the tuck-point or to the welt-point, and a draw-in cam disposed between the notched wheel-cam and the swinging cam, and serving to move all of the needles to the tuck-point.

7. The combination in a knitting-machine, of a needle-dial and its needles, with a dial-cam plate having a cam movable so as to project the needles to the clearing-point or permit them to remain at the tuck-point, a notched wheel-cam disposed so as to act upon the needles before they reach said main needle-governing cam and having bits for projecting the needles to the clearing-point, and intervening notches for permitting the needles to remain at the welt-point, and a latch-guard plate partially surrounding said dial-cam plate.

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

LOUIS N. D. WILLIAMS.

Witnesses:
FRANK E. BECHTOLD,
JOS. H. KLEIN.