

No. 688,275.

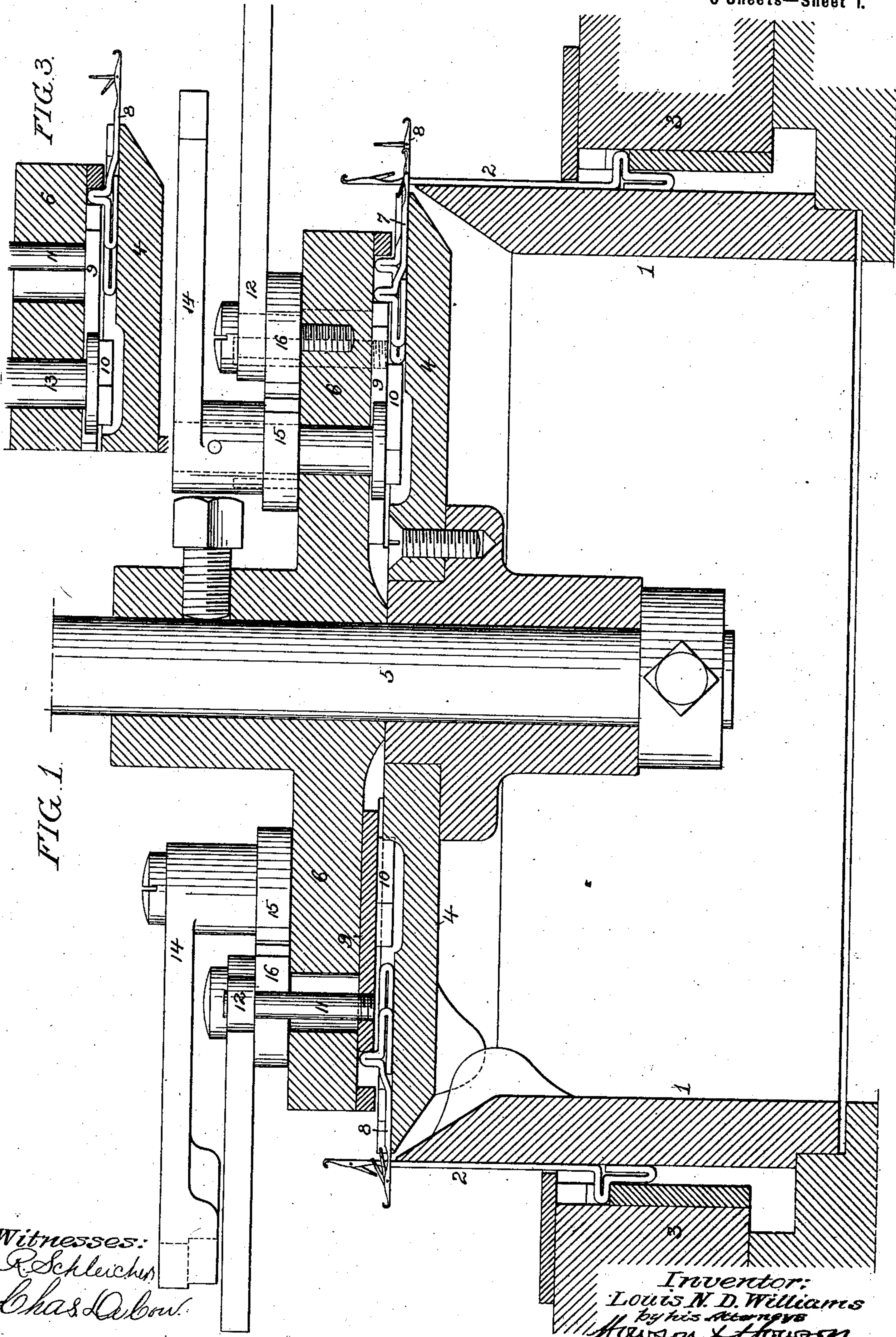
Patented Dec. 3, 1901.

L. N. D. WILLIAMS.
RIB KNITTING MACHINE.

(Application filed Dec. 14, 1895.)

(No Model.)

6 Sheets—Sheet 1.



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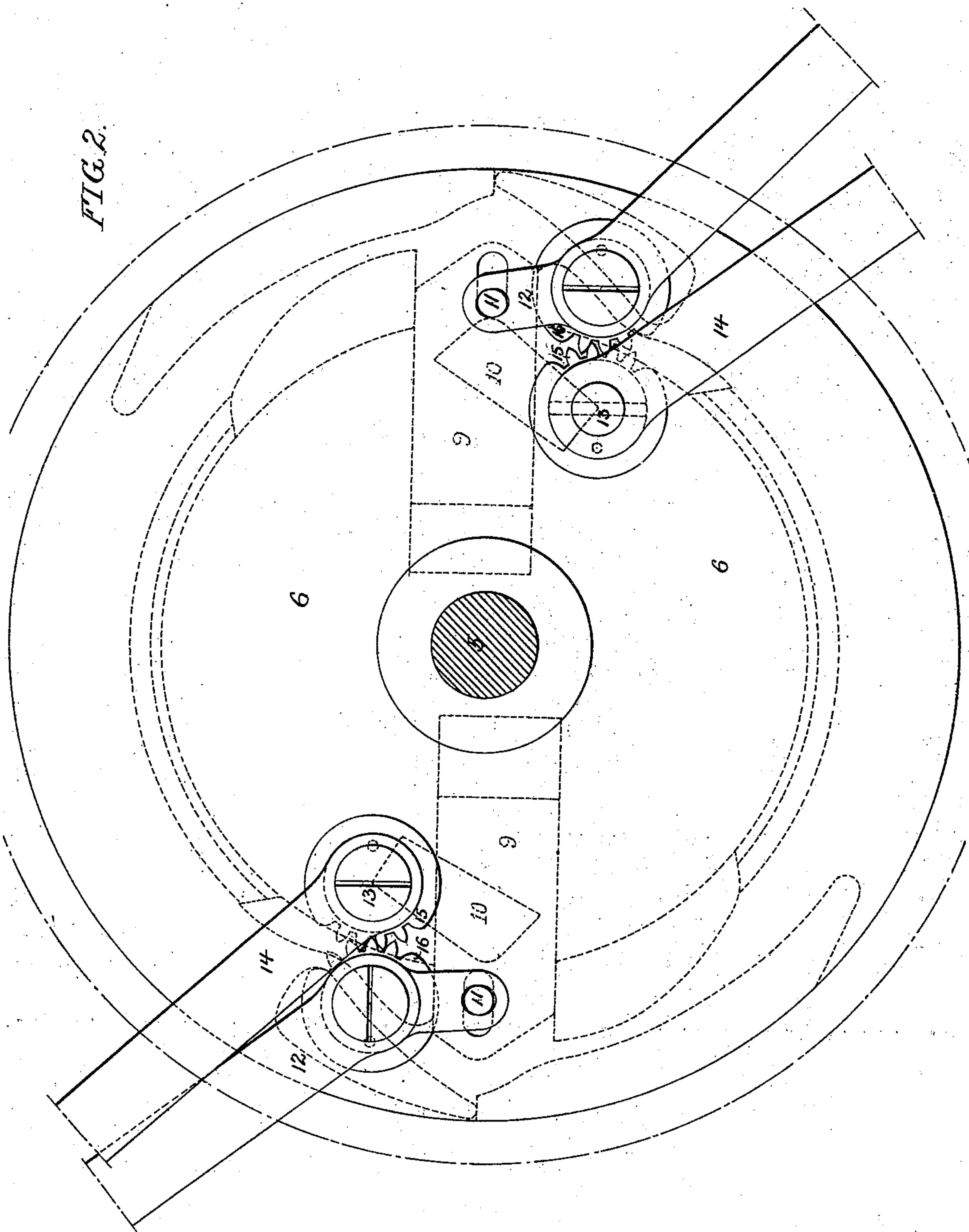
(Application filed Dec. 14, 1895.)

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(No Model.)

6 Sheets—Sheet 2.

FIG. 2.



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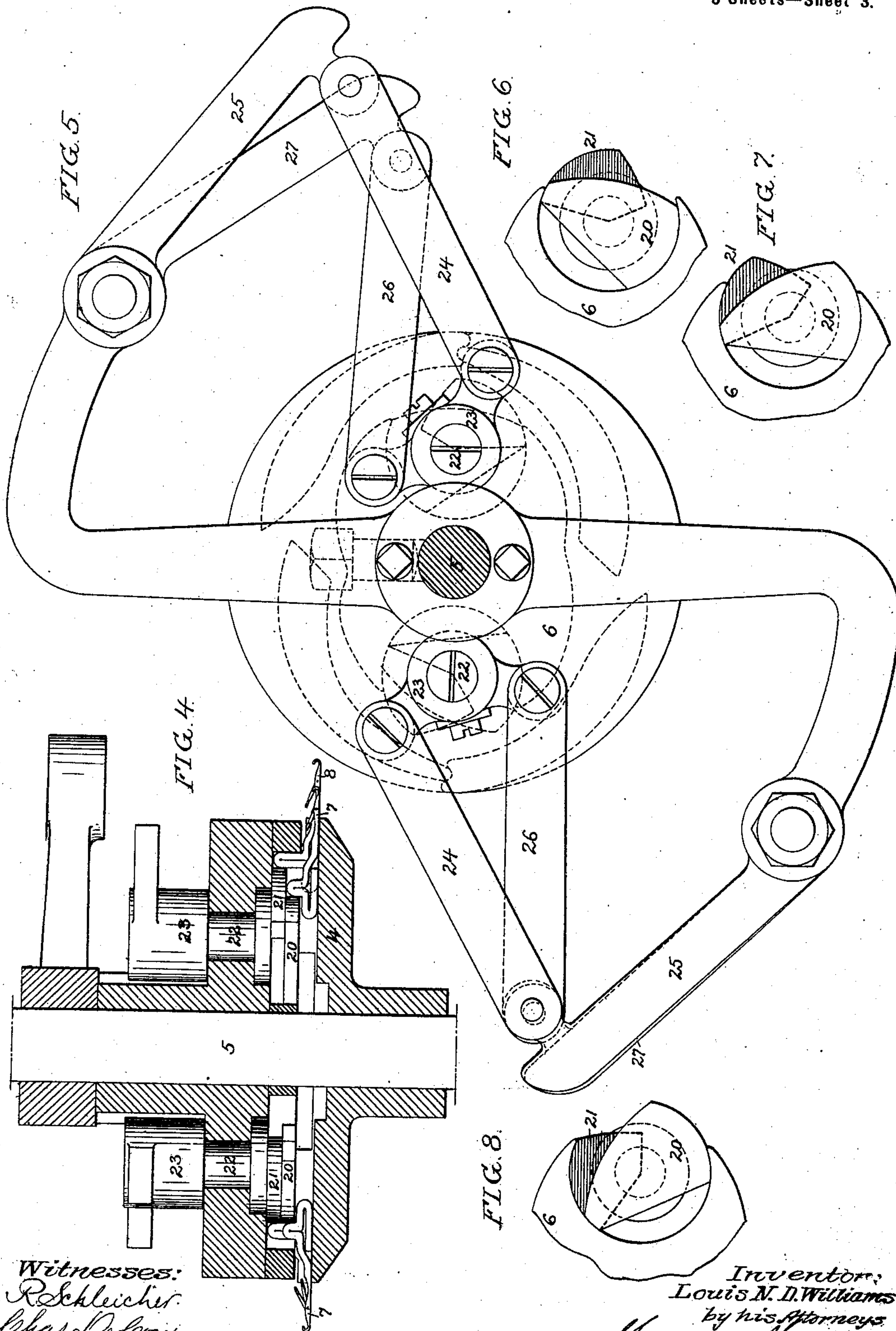
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(No Model.)

6 Sheets—Sheet 3.



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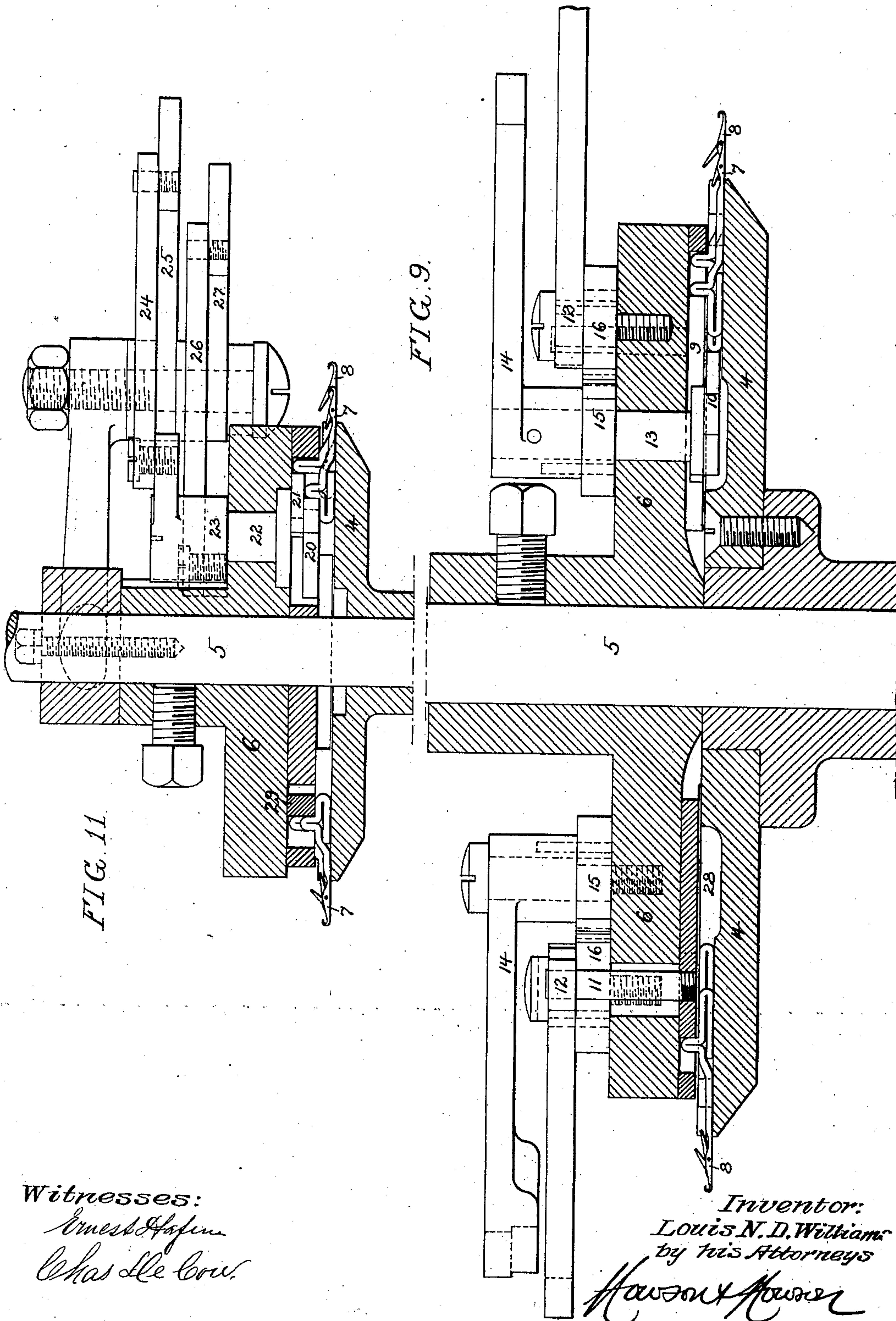
Patented Dec. 3, 1901.

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(Application filed Dec. 14, 1895.)

(No Model.)

6 Sheets—Sheet 4



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No. 688,275.

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(Application filed Dec. 14, 1895.)

(No Model.)

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FIG. 10.

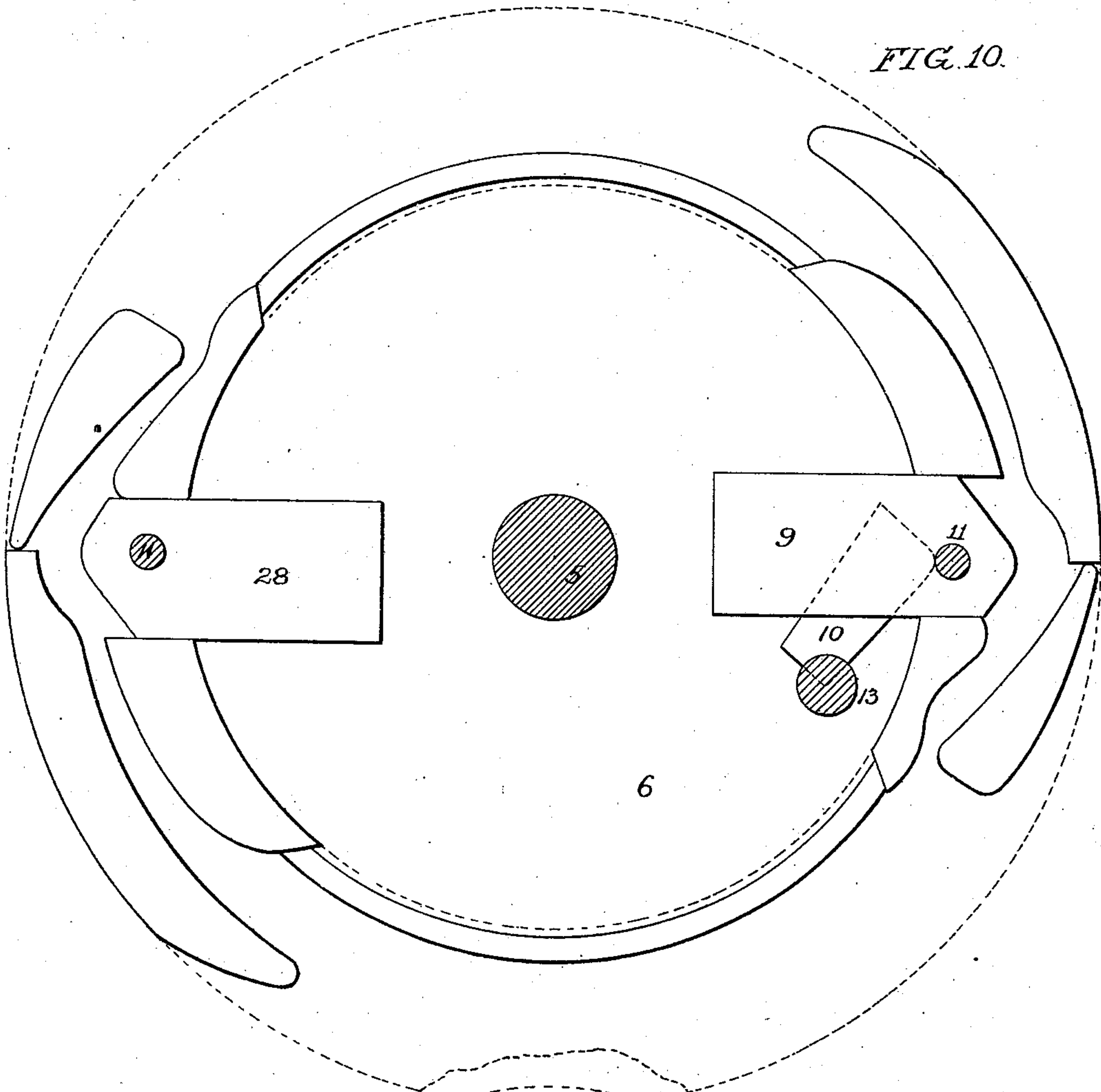
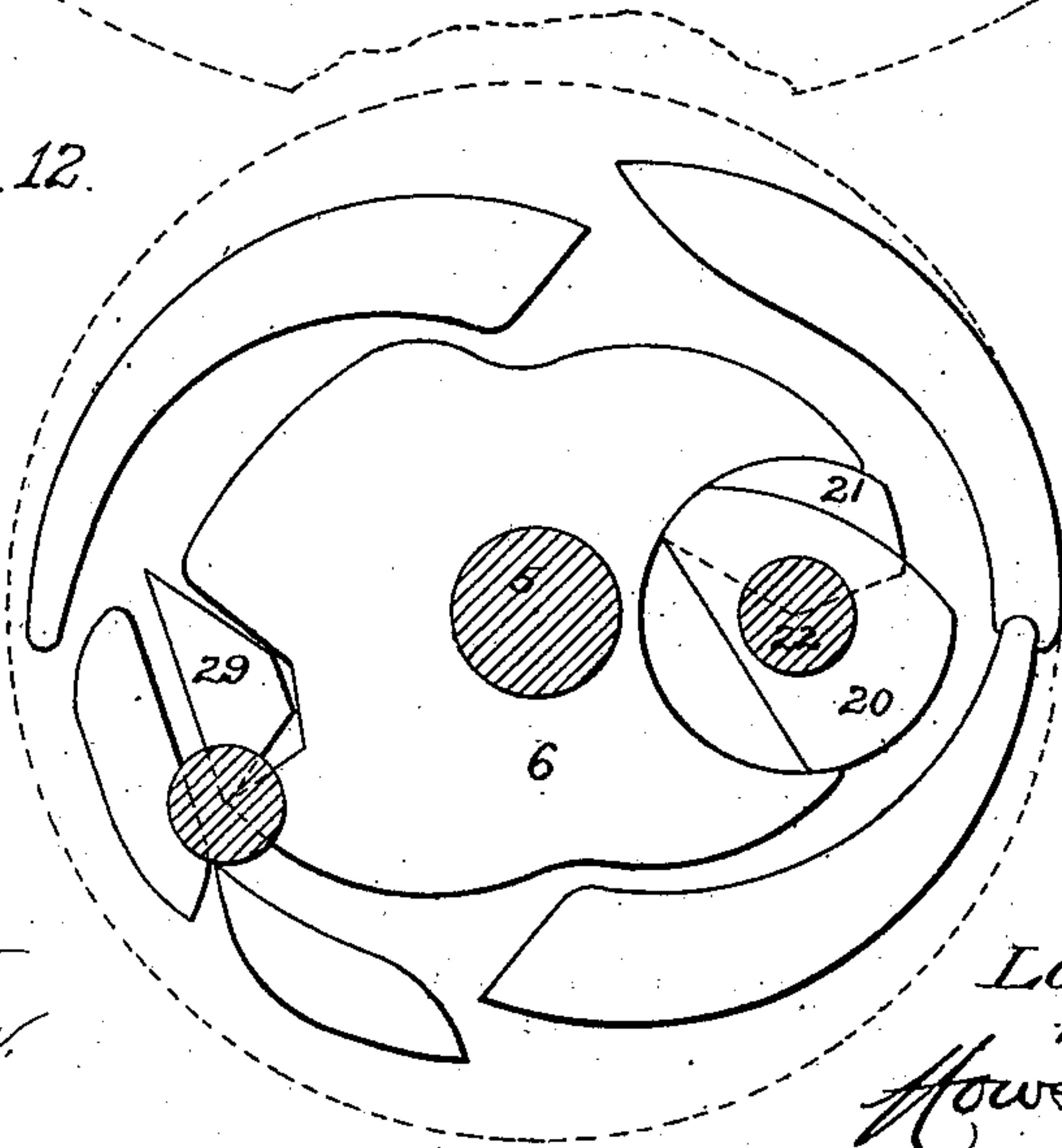


FIG. 12.



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RIB KNITTING MACHINE.

(Application filed Dec. 14, 1895.)

(No Model.)

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FIG. 13.

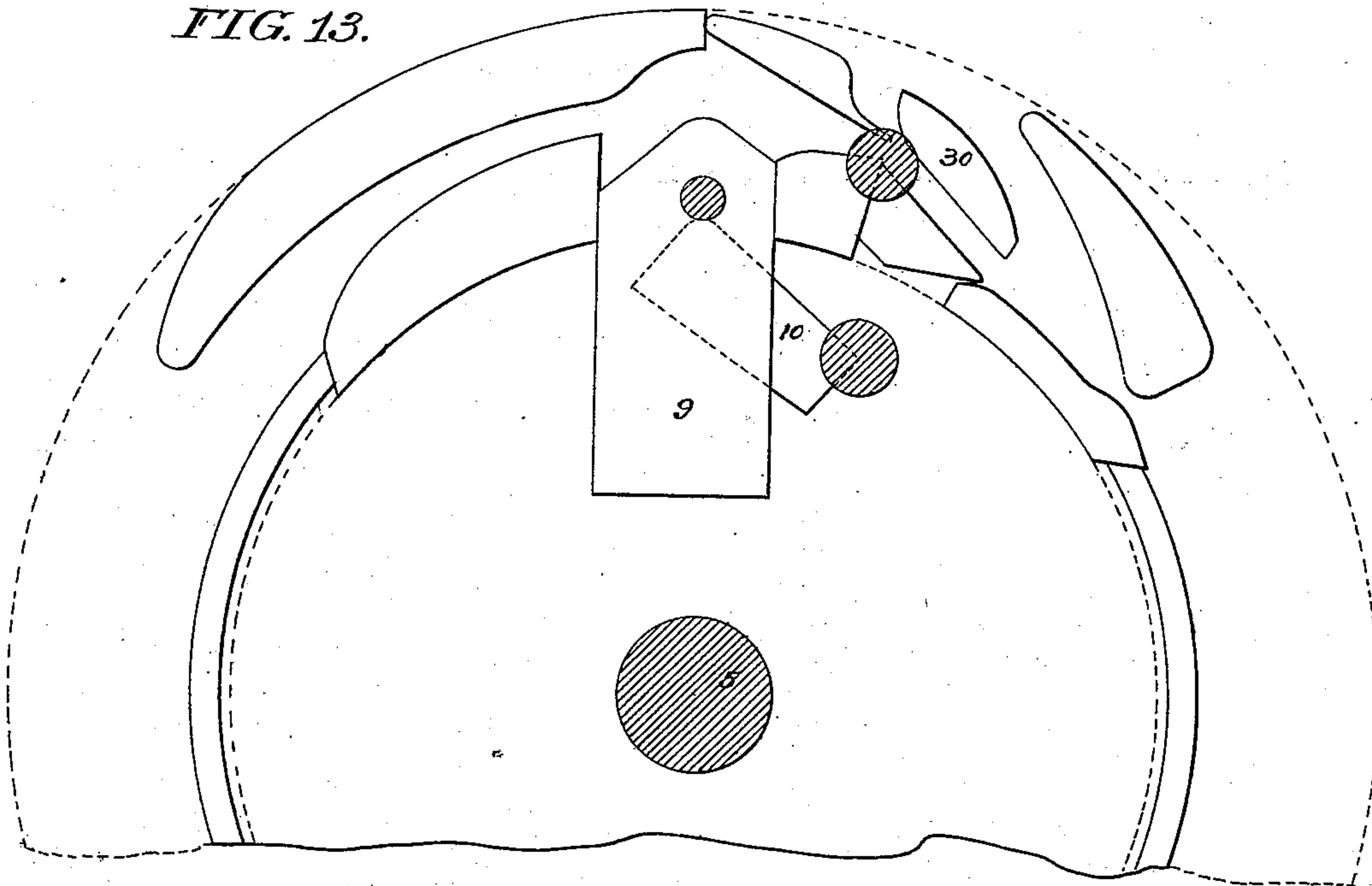
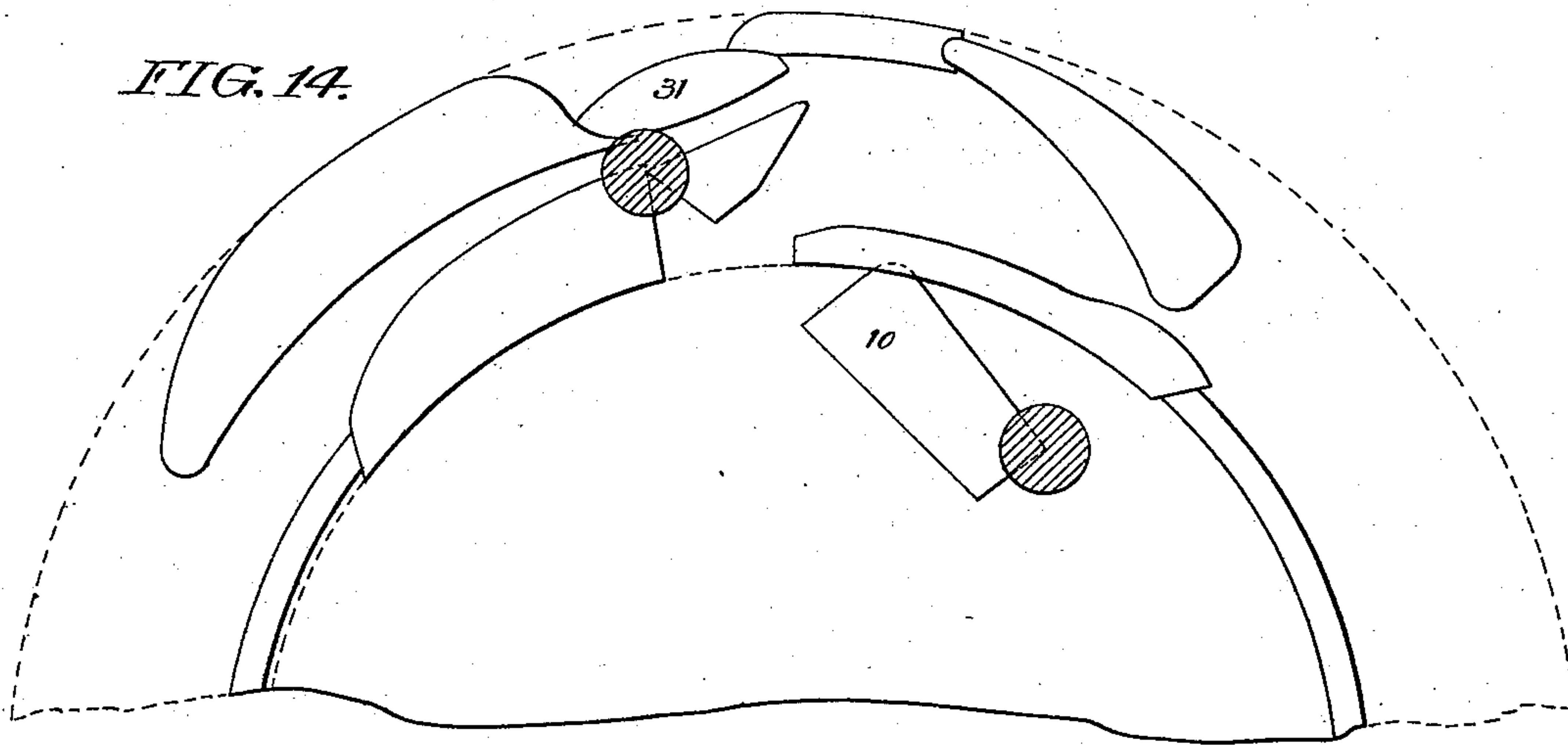


FIG. 14.



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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. 688,275, dated December 3, 1901.

Application filed December 14, 1895. Serial No. 572,113. (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, Montgomery county, Pennsylvania, have invented certain Improvements in Rib-Knitting Machines, of which the following is a specification.

The object of my invention is to so construct a rib-knitting machine as to form blocks, plaids, stripes, or like fancy figures, an especial feature of the invention comprising means whereby such figures are produced in portions of the fabric which are formed throughout in "tuck-stitch."

In the accompanying drawings, Figure 1 is a vertical sectional view of sufficient of a rib-knitting machine to illustrate my invention. Fig. 2 is a plan view of the dial-cam plate, showing the various cams on the under side of the same in dotted lines. Fig. 3 is a sectional view illustrating an adjustment of the cams of the dial-cam plate differing from either of those illustrated in Fig. 1. Fig. 4 is a sectional view of a dial, dial-cam plate, needles, cams, and cam-operating devices of a character somewhat different from those represented in Figs. 1 and 2, but embodying the main features of my invention. Fig. 5 is a plan view of said dial-cam plate with the cams shown in dotted lines. Figs. 6, 7, and 8 are diagrams illustrating the different positions assumed by the cams of the dial-cam plate under different conditions of working. Figs. 9 and 10 are respectively a vertical sectional view and a sectional plan view showing a modified construction of cams for a machine such as illustrated in Figs. 1 and 2. Figs. 11 and 12 are like views showing a modified construction of cams for a machine such as illustrated in Figs. 4 and 5, and Figs. 13 and 14 are views showing constructions of cams which may be used when "welts" are to be made.

In Fig. 1 I have illustrated my invention as applied to an ordinary form of rib-knitting machine having the vertical needle-cylinder 1, with needles 2, and vertical cam-box 3, with cams for actuating said needles, so as to cause them to knit. The circular horizontal plate or dial 4 is mounted, as usual, upon the central depending stem or spindle 5 of the

machine and is locked to the vertical cylinder 1, so as to be prevented from rotating with said depending stem or spindle 5. Above the dial 4 is the dial-cam plate 6, which is secured to the spindle 5, so as to rotate therewith and in unison with the cam-box 3 in such manner that the dial-needles will be projected simultaneously with those of the needle-cylinder to receive the knitting thread or threads. The needles of the dial are divided into groups or sets distinguished from each other by being provided, respectively, with long and short latches. Thus supposing the dial to contain in all, say, two hundred needles, these needles may be divided into twenty sets of ten each, ten of these sets being composed of needles 7, having short latches, while the other ten sets alternate with the first and are composed of needles 8, having long latches—that is to say, the needles of the dial would present first a set of ten short-latched needles 7, then a set of ten long-latched needles 8, then another set of ten short-latched needles 7, then another set of long-latched needles 8, and so on throughout.

The machine is a double-feed machine—that is to say, it is intended for use with two diametrically-opposed thread-guides, one of which feeds to the needles a thread of one color or shade, while the other feeds to said needles a thread of a different and contrasting color or shade. There are consequently two sets of cam mechanism both in cylinder and dial, so as to project the needles at each thread-feeding point. The cams of the cam-box for acting upon the needles of the vertical cylinder and also the draw-in cams and guard-cams of the dial-cam plate may be as usual, and hence need not be further referred to. The needle-projecting cams of the dial-cam plate, however, are of novel construction; but as both sets of cams are precisely alike it will be necessary to describe but one set of them. There are in each set two cams 9 and 10, the cam 9 being a sliding cam and the cam 10 a pivoted and vibrating cam. The cam 9 has a bolt 11 projecting through a slot in the dial-cam plate and engaged at a point above said cam-plate by one arm of a lever 12, which is hung to a suitable pin on said cam-plate. The cam 10 is carried by a pivot, stud,

or shaft 13 of an arm 14, and the hub of said arm 14 has above the dial-cam plate a toothed segment 15, which meshes with a corresponding toothed segment 16 on the hub of the lever 12, so that motion imparted to the lever is transmitted to the arm, and vice versa, these two elements being thereby caused to move in unison, but in opposite directions. Each of the cams 9 and 10 is susceptible of being moved to either of three different positions, such movement being effected by contact of the lever 12 or arm 14 with a stud or disk moved into line with the outer projecting portion of said arm or lever in a manner common in this class of machines, the arm and lever occupying different horizontal planes, as shown in Fig. 1, so as to permit of the ready operation of either of them in this manner. When the cam 9 is fully retracted, as shown at the right-hand side of Figs. 1 and 2, it fails to project either of the needles 7 or 8 to such an extent as to "clear" the same—that is to say, to carry the inner or free end of the latch outwardly beyond the stitch upon the needle; but when the cam 9 is fully retracted the cam 10 is fully projected, and this cam acts upon the inner ends of the stems of the needles 8 so as to project or clear the same, as shown at the right-hand side of Fig. 1, said cam 10 having no effect upon the needles 7, owing to the fact that their stems or shanks are shorter than those of the needles 8. At the right-hand side of the machine, therefore, the needles 8 will be "cleared" or will cast their stitches and receive new ones, while the needles 7 will be "tucked"—that is to say, they will not cast the stitches already upon them, but will receive the thread to form additional stitches. When the cam 9 is partially projected, the cam 10 is partially retracted, as shown at the left-hand side of Figs. 1 and 2. Hence when the needles 7 and 8 are subjected to the action of the cams when thus adjusted the cam 10 will not have any projecting effect upon the needles 8, both sets of needles being projected to the same extent by the cam 9. This extent of projection is sufficient to clear the needles 7, having short latches, but is not enough to clear the needles 8, having long latches. Hence at this point the needles 7 will be cleared and the needles 8 tucked. At the point where one knitting-thread is fed to the machine, therefore, one half of the needles in separated sets or groups will be cleared, while the other half of the needles in alternate sets or groups will be tucked, while at the point where the second knitting-thread is fed to the machine the needles which were cleared at the first feeding-point will be tucked and those which were tucked at the first feeding-point will be cleared.

The thread which is fed to the needles when the tuck-stitches are being formed upon them appears more prominently on the face of the fabric than the thread which is fed to the needles which are being cleared. Hence so long as the cams retain the positions shown in

Figs. 1 and 2 one thread will appear prominently upon the surface of the fabric throughout all portions of the same represented by the groups of needles 7, while the other thread will appear prominently upon the face of the fabric throughout all portions of the same represented by the groups of needles 8, the effect being to produce stripes in the fabric, owing to the different or contrasting colors or shades of the knitting-threads.

When the cam 9 is projected to its full extent, it acts upon the bits of all of the needles so as to project them to the clearing-point, and thus produce plain ribbed work, as shown in Fig. 3. In order to produce blocks or plaids, the dial-cams are shifted at intervals—that is to say, a certain number of courses are knitted with the cams in the position shown in Figs. 1 and 2, and the position of the cams is then reversed, the cams which were before adjusted to the position shown at the right-hand side of Fig. 1 being adjusted to the position shown at the left-hand side of said figure and those cams which were before adjusted to the position shown at the left-hand side of Fig. 1 being adjusted to the position shown at the right-hand side of said figure. The needles 7, which were before tucked at the right-hand side of the machine, will now clear, and the needles 8, which were before cleared at that point, will now tuck, and in like manner the needles 7, which were before cleared at the left-hand side of the machine, will now tuck, and the needles 8, which were before tucked at that point, will now clear. Hence there will be a change in the character of the threads appearing most prominently on the face of the fabric.

In the modified construction shown in Figs. 4 to 8 both cams and needles are somewhat changed, two vibrating cams 20 and 21, located one above the other, taking the place of the sliding cam 9 and vibrating cam 10 before described, and the short-latched needles 7, having bits intended to be acted upon by the lower cam 20 only, while the long-latched needles 8 have longer bits intended to be acted upon by the upper cam 21 and also under certain circumstances by the lower cam 20. Both cams 20 and 21 are carried by a single stem 22, which has above the dial-cam plate a two-armed hub 23, one of the arms being connected by a link 24 to a pivoted arm 25, hung to a stud which rotates with the dial-cam plate, and the other arm of the hub being connected by a similar link 26 to an arm 27, likewise pivoted to said stud. Hence by proper contact of an actuating lug or disk with the arm 25 or 27 the cams 20 and 21 can be adjusted to either of the positions shown in Figs. 6, 7, or 8. When adjusted to the position shown in Fig. 6 and at the right-hand side of Figs. 4 and 5, the upper cam 21 projects the long-latched needles 8 to the clearing-point and the lower cam 20 only projects the short-latched needles 7 to the tuck-point. When adjusted to the intermediate

position shown in Fig. 7 and at the left in Figs. 4 and 5, the two cams have about the same throw, and the short-latched needles 7 will be projected to the clearing-point, while the long-latched needles 8 will only be projected to the tuck-point. When the cams are adjusted to the position shown in Fig. 8, the lower cam 20 projects all of the needles to the clearing-point. Hence provision is afforded by this construction for all of the various operations possible with the construction shown in Figs. 1, 2, and 3.

Either arrangement of cams described provides for the production of block or plaid patterns in fabric knitted in tuck-stitch throughout; but when it is desired to produce tucked stripes of the same color throughout or to produce blocked stripes of tuckwork alternating with stripes having plain portions alternating with the tucked portions it is not necessary to have the same construction of cams at both sides of the dial-cam plate, a single cam being used at one side of said plate and said cam being adjustable to two positions and serving when in the inner position to project the long-latched needles to the tuck-point and the short-latched needles to the clearing-point and when in the outermost position projecting both sets of needles to the clearing-point. Such constructions are illustrated in Figs. 9, 10, 11, and 12, Figs. 9 and 10 showing a sliding cam 28, intended for use in conjunction with cams of the character shown in Figs. 1 and 2, while Figs. 11 and 12 show a swinging cam 29, adapted to be used in connection with cams of the character shown in Figs. 4 and 5.

When it is desired to construct the machine so as to produce a welt by knitting on the cylinder-needles while all of the dial-needles are retracted so as to retain their stitches, but form no new ones, the cams 9 and 10 may be combined with a swinging slotted cam 30 of a character similar to that set forth in Robert W. Scott's patent, No. 368,429, dated August 16, 1887, such cam following the cams 9 and 10, as shown in Fig. 13, and being carried by a stem pivotally mounted in the dial-cam plate, whereby it is adjustable so as to direct the needles either to the clearing, tuck, or welt points, all of the cams being so hung and actuated as to be independent one of another, or such a cam may be used in advance of a cam 10, as shown at 31 in Fig. 14, said cam 10 serving to project certain of the needles to the clearing-point when the cam 31 is at the tuck-point and being moved entirely out of the way when the cam 31 is adjusted to the welt-point. The stem which carries the cam 30 or 31 is acted upon by mechanism of a character similar to that which acts upon the stem 22 of Figs. 4 and 5, so that said cams can be moved to either of three positions—that is to say, to an innermost or welt position, as in Fig. 13, to an outmost or clearing position, as in Fig. 14, or to an intermediate or tuck position. When in the po-

sition shown in Fig. 13, it acts upon all of the needles to retract the same to such an extent that they will not receive thread from the guide at that side of the machine. Hence stitches will be formed on the cylinder-needles only, and this may be continued for as many courses as desired. In the construction shown in Fig. 14 the cam 31 is adjusted so as to move all of the needles to the clearing-point; but when it is moved inward to the tuck-point the cam 10 can also be moved inward so that the needles will remain at the tuck-point. When the cam 31 is adjusted to the intermediate or tuck position, the cam 10 can be adjusted so as to either permit the needles to remain in this position or move them outward to the clearing position.

It will be observed on reference to Figs. 1, 3, and 9 that the cam 10 is located at or close to the base-line of the needles or bottom of the grooves in which said needles work, so that its presence adds nothing to the thickness of the dial-cam plate, while its action upon the needles is most direct.

Although I have described the peculiar needles and cams constituting the subject of my invention as applied to the dial and dial-cam plate, it will be evident that needles and cams of a substantially similar character can be employed in connection with the needle-cylinder and its cam-box when it is desired to produce the peculiar character of work described upon the cylinder-needles. Hence in the claims I have used the term "needle-carrier" to indicate either the dial or cylinder and the term "cam-carrier" to indicate either the dial-cam plate or cylinder cam-box.

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 provided with needles arranged in alternating groups, and having respectively long latches and short latches, with a cam-carrier having cams acting independently, one upon the short-latched needles and the other upon the long-latched needles, these cams being adjustable to vary the extent of projection of the needles whereby either set of needles may be caused to tuck and the other set to clear.

2. The combination in a knitting-machine, of a needle-carrier provided with needles arranged in alternating groups, and having respectively long latches and short latches, with a cam-carrier having cams acting independently, one upon the short-latched needles and the other upon the long-latched needles, one of the cams being also adapted to act upon both sets of needles, and these cams being adjustable to vary the extent of projection of the needles whereby either set of needles may be caused to tuck and the other set to clear or both sets of needles may be caused to clear.

3. The combination in a knitting-machine, of a needle-carrier provided with needles arranged in alternating groups, and having re-

• spectively long latches and short latches, with a cam-carrier having two cam structures, one effecting such adjustment of the needles that the long-latched needles will be cleared and
 5 the short-latched needles tucked and the other effecting such adjustment of the needles as to clear on the short-latched needles and tuck on the long-latched needles.

4. The combination in a knitting-machine,
 10 of a needle-carrier provided with needles arranged in alternating groups and having respectively long latches and short latches, with a cam-carrier having two cam structures one actuating the needles so as to clear on the
 15 long-latched needles and tuck on the short-latched needles, and the other acting to clear on the short-latched needles and tuck on the long-latched needles, the latter cam structure being adjustable to vary the extent of
 20 projection of the needles thereby so as to clear on both sets of needles.

5. The combination in a knitting-machine, of a needle-carrier provided with needles arranged in alternating groups and having re-
 25 spectively long latches and short latches, with a cam-carrier having two cam structures one actuating the needles so as to clear on the long-latched needles and tuck on the short-latched needles, and the other acting to clear
 30 on the short-latched needles and tuck on the long-latched needles, both cam structures being adjustable to vary the extent of projection of the needles thereby so as to clear on both sets of needles.

35 6. The combination in a knitting-machine, of a needle-carrier provided with needles arranged in alternating groups and having respectively long latches and short latches, with a cam-carrier having two sets of cams, each
 40 set comprising independent cams, one for acting upon the short-latched needles and the other for acting upon the long-latched needles, each set of cams being adjustable to vary the extent of projection of the needles
 45 thereby so as to provide for tucking upon either set of needles, and clearing upon the other.

7. The combination in a knitting-machine, of a needle-carrier provided with needles ar-
 50 ranged in alternating groups and having respectively long latches and short latches, with a cam-carrier having two sets of cams, each set comprising independent cams, one for acting on the long-latched needles only, and the
 55 other for acting upon either the short-latched needles only or upon both sets of needles, said cams being adjustable so that either set of needles may be cleared and the others tucked, or both sets may be cleared.

60 8. The combination in a knitting-machine, of a needle-carrier provided with needles arranged in alternating groups and having respectively long latches and short latches with a cam-carrier having a sliding cam adapted
 65 to act either upon the bits of the short-latched

needles or upon the bits of the long-latched needles, and a pivoted and vibratable cam acting upon the ends of the stems of the long-latched needles.

9. The combination in a knitting-machine, 70 of a needle-carrier provided with needles arranged in alternating groups and having respectively long latches and short latches, with a cam-carrier having a cam adapted to act upon the bits of the needles, and another cam 75 for acting upon the needle-stems, the latter cam occupying a position at or close to the base-line of the needles.

10. The combination in a knitting-machine, of a needle-carrier provided with needles ar- 80 ranged in alternating groups and having respectively long latches and short latches, with a cam-carrier having cams for acting independently upon the long-latched needles and short-latched needles, a pair of cam-actuating 85 arms and connections between the same and the cams whereby movement of either arm will effect adjustment of the cams.

11. The combination in a knitting-machine, of a needle-carrier provided with needles ar- 90 ranged in alternating groups and having respectively long latches and short latches, with a cam-carrier having a sliding cam for acting on the bits of the short-latched needles, a piv- 95 oted and vibratable cam for acting upon the stems of the long-latched needles, a lever for operating the sliding cam, an arm for operating the pivoted cam, and gearing connecting said arm and lever so as to cause them to move in unison but in opposite directions. 100

12. The combination in a knitting-machine, of a needle-carrier provided with needles ar- ranged in alternating groups and having re- spectively long latches and short latches, with a cam-carrier having a cam adapted to move 105 the needles to the welt-point, and a cam adapted to move certain of the needles to the clearing-point, both of said cams being ad- justable to vary the extent of projection of the needles and throw them into and out of 110 action.

13. The combination in a knitting-machine, of a needle-carrier provided with needles ar- ranged in alternating groups and having re- spectively long latches and short latches, with 115 a cam-carrier having a slotted cam movable so as to direct the needles either to the clearing-point, the tuck-point or the welt-point, and a projecting cam as 10 for acting upon certain of the needles independently of said 120 slotted cam, said second cam being also adjustable to vary the extent of projection of the needles thereby.

In testimony whereof I have signed my name to this specification in the presence of 125 two subscribing witnesses.

LOUIS N. D. WILLIAMS.

Witnesses:

WILL. A. BARR,
 JOS. H. KLEIN.