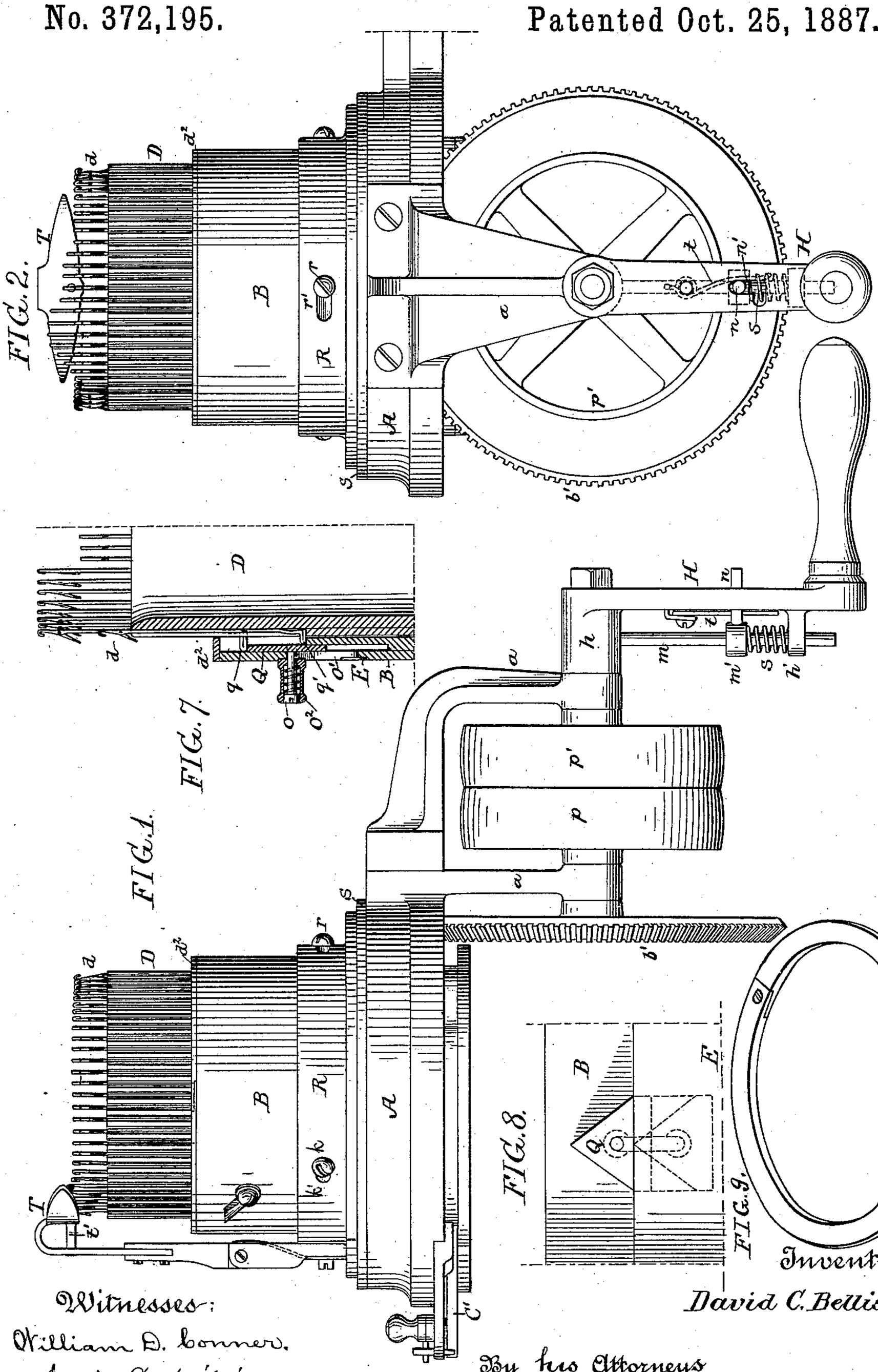
(No Model.) 2 Sheets—Sheet 1.

D. C. BELLIS.

KNITTING MACHINE.

No. 372,195. Patented Oct. 25, 1887.



Witnesses:
William D. Conner.
David S. Williams.

Inventor:
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(No Model.) 2 Sheets—Sheet 2.

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FIG. 5.

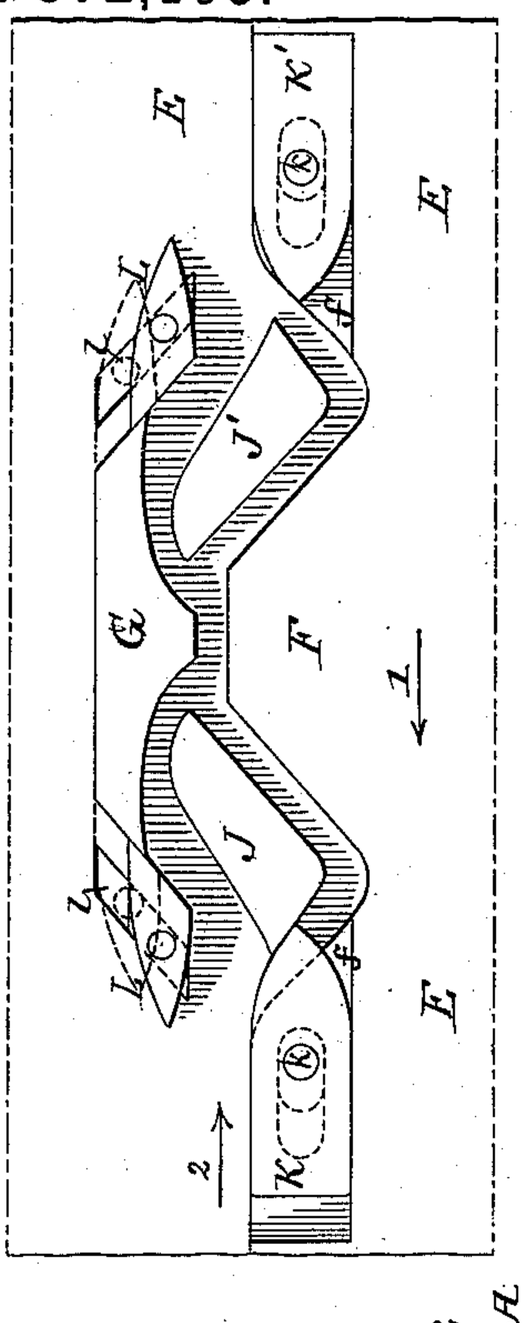


FIG. 6.

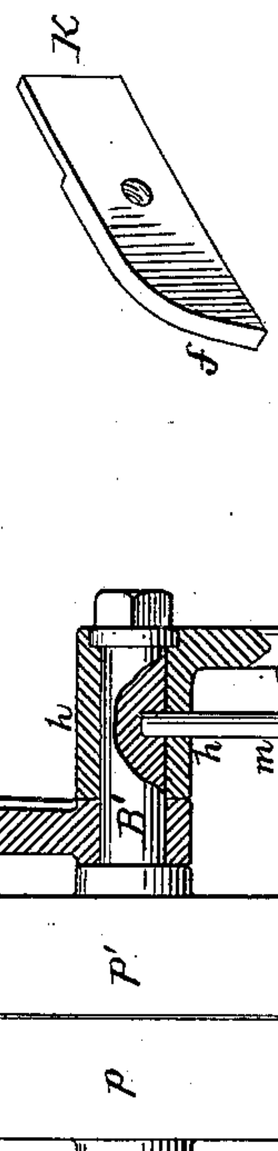
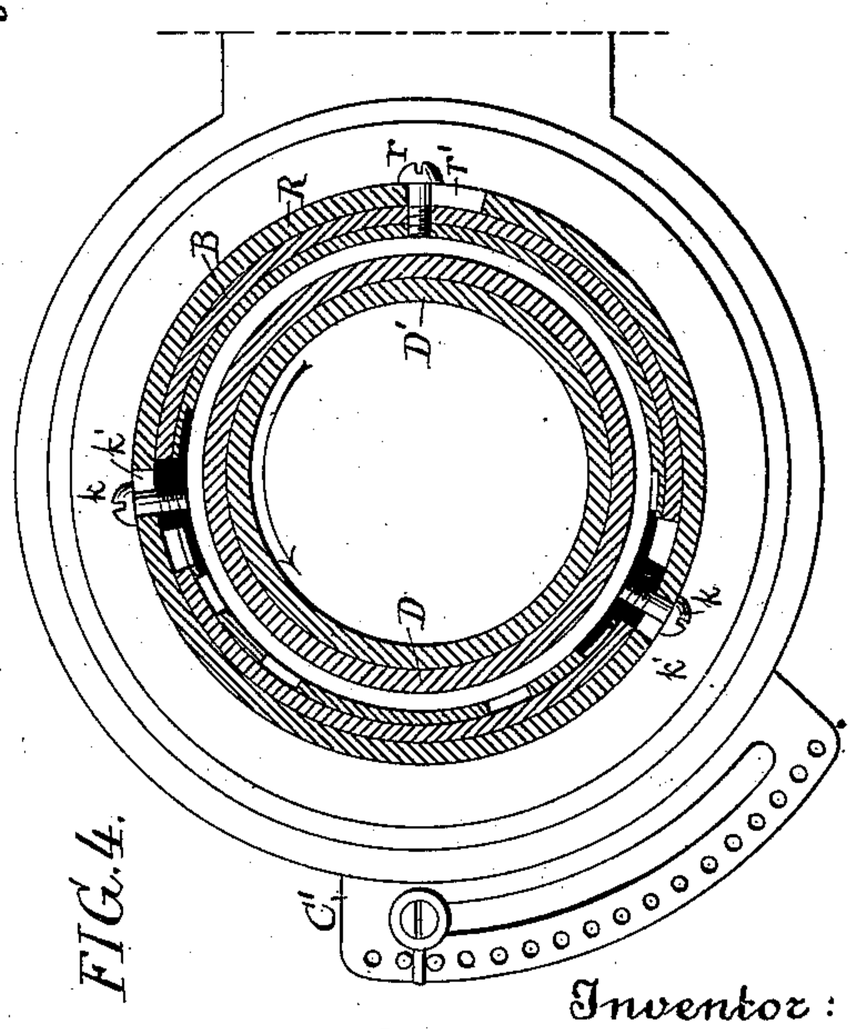


FIG. 3.

FIG. 4.



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UNITED STATES PATENT OFFICE.

DAVID C. BELLIS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO SIGMUND H. WEIHENMAYER, OF SAME PLACE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 372,195, dated October 25, 1887.

Application filed April 29, 1887. Serial No. 236,544. (No model.)

To all whom it may concern:

Be it known that I, DAVID C. BELLIS, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

My invention consists of certain improvements in the construction of latch-needle knitting-machines, more particularly that class of circular-knitting machines which are adapted to be driven either by hand or other power.

In the accompanying drawings, Figure 1 is a side view of a circular-knitting machine provided with my improvements. Fig. 2 is an end view of the same. Fig. 3 is a vertical section. Fig. 4 is a sectional plan on the line 1 2, Fig. 3. Fig. 5 is a diagram of the cams and gates. Fig. 6 is a perspective view of a modified form of gate-cam which may be used. Fig. 7 is a vertical section showing a further improvement, and Fig. 8 is a view illustrating the lifting-cam. Fig. 9 is a perspective view of the two-part retaining-ring for the needles, shown detached from the machine.

A is the bed-plate, which can be fixed to a table or other suitable support in any convenient way. On this bed-plate rotates the cam-cylinder B, which is provided on its lower periphery with bevel-gearing *b*, engaging with a bevel-wheel, *b'*, on the driving-shaft B', which is adapted to bearings in brackets *a* on the bed-plate. This driving shaft B' may be provided with fast and loose pulleys *p* and *p'*, and also with a crank-handle, H, adapted to be engaged with or disengaged from the said shaft by means hereinafter referred to.

D is the needle-cylinder, with the usual exterior grooves for the reception and guidance of the latch-needles *d*, the latter being retained in their several grooves by means of a spiral wire band, *d'*. I also prefer to use, in connection with this retaining-band *d'*, a two-part ring, d^2, Fig. 9, held in notches in the ribs of the cylinder, as illustrated in Fig. 3. By this means the needles are retained at two points, one above the other, so that there will be less danger of their getting out of position than where only one retaining-band is used to keep them in their grooves.

The grooved needle-cylinder D is usually made of brass, and in order to strengthen it I prefer to mount it on a cylinder, D', preferably of iron or steel, which cylinder D' extends up within the needle-cylinder proper, as illustrated in Fig. 3. These two cylinders are secured together to form what may be termed the "complete needle-cylinder," which is stationary in the machine. Devices are, however, provided for adjusting the needle-cylinder vertically in the well-known manner by providing inclined cams *c* on the bottom of the needle-cylinder, to act in connection with corresponding inclined cams, *c'*, on a ring, C, suitably supported on any portion of the bed-plate. This ring C has an arm, C', by which it may be turned, to thereby raise or lower the needle-cylinder in the well-known way.

The cam-cylinder B has on its inner face the annular needle-rest E, on which the heels of the latch-needles travel as the cam-cylinder rotates. At the desired point the needle-rest E is provided with the usual bottom cams, F and *f f*, and above these are the top cam, G, and side cams, J J'. The gates employed in connection with the side cams, J J', to give the proper traverse to the needles, form one of the features of my invention, and are in the present instance formed of short plates K K', movable horizontally in line with the top of the needle-rest toward and from the side cams, J J'.

In Fig. 5 each sliding gate is shown with a shuttle-shaped nose, which, when the gate is moved up to the side cam, adapts itself to the under side of the latter, so that the needles will then be caused to travel over the top of that side cam, as will be understood on reference to the left-hand side of Fig. 5. When the sliding gate is away from its corresponding side cam, the heels of the needles will pass below the side cam. It will be observed, on reference to Fig. 4, that the acting portions of these gates are not of the entire width of the top of the needle-rest and cams *f f*, so that when said gates are in the position shown at K in Fig. 5 the heels of the needles will be supported by and travel on the said rest as well as on the gate. When the gate is in the position shown at K' in Fig. 5, the heels of the needles will travel on the cams *f* rather than on the edges of the gates.

If desired, I may construct the gates as shown in the modification, Fig. 6. In this construction the front end of the sliding gate is equal in width to the width of the rest E, which is cut away to receive it, and the nose of the gate constitutes the side bottom cam, *f*.

The sliding gates are worked automatically by friction. In the present instance the said gates are carried by a flanged ring, R, connected to the cam-cylinder by means of a pin, *r*, in the cylinder entering a slot, *r'*, in the ring, Figs. 2, 3, and 4, so that while said ring travels with the cam-cylinder, in whichever direction it may be turned, there will be at the beginning of the movement a lost motion between the two about equal to the length of the slot *r'*, Figs. 2 and 4, owing to the frictional contact between the said flanged ring R and a plate, S, which is bolted or otherwise secured to the bed-plate A. The parts are so constructed that the friction between the flanged ring R and the plate S is greater than that between the said ring and the exterior of the cam-cylinder. Thus, supposing the cam-cylinder to be rotated in the direction of the arrow 1, Fig. 5, the ring R will lag behind to about the extent of the slot *r'*, so that the gate K will come into contact with its side cam J, while the gate K' will be moved away from the side cam J'. Consequently the needles traveling in the direction of the arrow 2, Fig. 5, will be caused to ride up over the cam J and under the cam J'. In the present instance I have shown the gates K K' connected to the ring R by means of headed pins or screws *k*, adapted to short slots *k'* in the said ring, to allow of additional play to prevent jamming in reversing the machine, and also to give the friction-ring R the full amount of lost motion required, for a purpose hereinafter explained.

I provide the ends of the top cam, G, with safety yielding cams L, which form an important feature of my invention. These cam ends preferably have the shuttle-shaped noses shown in Fig. 5, and are adapted to travel in inclined grooves *l* in the wall of the cam-cylinder, so that they can have a lateral and upward movement at the same time. Thus if a needle should, through any cause, in being elevated, come into contact with this yielding cam or end piece, *l*, the latter will yield laterally and at the same will be raised vertically, so that the cam will rise up over the heel of the needle and cause the latter then to pass down below the top cam, G, and thus avoid all danger of breakage.

Where the machine is to be used more particularly for the knitting of stockings, I provide the following simple means for raising some of the needles out of action for the formation of the heels of the stockings. For instance, those of the needles which are to be raised out of action at the proper time are formed with long heels *q*, while the other needles have short heels *q'*, Fig. 7, and I insert in a groove in the back of the needle-rest, at a point adjacent to the cams, a lifting-cam, Q, which will act on the long-heeled needles, but not on the short ones. This cam Q, Figs. 7 and 8, is carried by a pin, *o*, passing through a slot, *o'*, in the cam-cylinder, and provided on the outside with a spring-sleeve, o^2, by which it is held in either of the extreme positions to which the cam is moved. Normally this lifting cam is in the depressed position indicated by dotted lines in Fig. 8, below the top of the needle-rest E, so that none of the needles will be affected by it in the traverse of the cam-cylinder; but when it is desired to form the heel this cam is raised, as shown in Figs. 7 and 8, so that all the long-heeled needles will be raised out of action, and by the friction of the band *d'* they will remain elevated until depressed by the pressure of the hand on the tops of the needles, or otherwise.

To provide for the feeding of the thread to the circle of needles at the proper tangent, no matter in which direction the cylinder is turned, I mount the thread-guide T upon the friction-ring R. Where the thread-guide is carried directly on the cam-cylinder, the thread will be fed to the circle of needles at such a tangent in one direction of rotation or the other that the latches of the needles will wear on the thread and cut it if it is of a fine number. Attempts have been made to meet this difficulty by making the guide-eye *t'* in the form of a long slot; but this has not proved satisfactory. I provide for the proper feeding of the thread by mounting the thread-guide upon a friction-piece, between which and the cam-cylinder there is a certain amount of lost motion, so that in beginning to turn the cam-cylinder in either direction the thread-guide T will slip back or lag behind to an extent which will give the proper tangent for feeding the thread to the circle of needles. For this purpose I avail myself of the same friction-ring, R, as carries the sliding gates K K', and, as shown in Figs. 1, 2, and 3, I mount the thread-guide on that ring with the result described.

For engaging the crank-handle with and disengaging it from the driving-shaft B', I prefer to use the devices shown in Figs. 1, 2, and 3. A sliding locking-bolt, *m*, passing through an opening in the socket *h* of the handle and into an opening in the shaft, is guided at its opposite end in a lug, *h'*, on the handle. This bolt *m* has a shoulder, *m'*, acted on by a spring, *s*, between the lug *h'* and the said shoulder, so as to normally press the sliding bolt into the opening in the handle-socket and shaft, as shown in Fig. 3. The bolt *m* also carries a lateral guide-pin, *n*, adapted to a right-angled slot, *n'*, Fig. 2, in the crank-handle.

A suitable spring, *t*, on the crank-handle bears against the side of the guide-pin *n* in such a way that when the bolt is pulled back out of the opening in the driving-shaft B' the said guide-pin will be pushed by the spring into the lateral portion of the slot *n'*, where it will be held until released to re-engage the crank-handle with the shaft when the machine is to be driven by hand instead of by a belt.

I claim as my invention—

1. The combination of the needle-cylinder and needles of a knitting-machine with a bed-plate, a cam-cylinder and driving mechanism therefor, a needle-rest and side cams on the cam-cylinder, sliding gates, and a friction-ring carrying the sliding gates, all substantially as set forth.

2. The combination of the needle-cylinder and needles of a knitting-machine with a cam-cylinder having a needle-rest, and a top cam provided with yielding end pieces free to move both upward and laterally with reference to the said top cam, substantially as set forth.

3. The combination of the needle-cylinder and needles of a knitting-machine with a cam-cylinder having a needle-rest, and a top cam provided with yielding end pieces adapted to inclined grooves in the cylinder and free to move both upward and laterally therein, substantially as and for the purpose described.

4. The combination of the needle-cylinder and needles of a knitting-machine, a cam-cylinder, and driving mechanism therefor, with a needle-rest, top, bottom, and side cams, and sliding gates provided with noses the width of the needle-rest to serve at the same time as the bottom side cams, substantially as specified.

5. The combination of the needle-cylinder, cam-cylinder, and needles of a knitting-machine, with a driving-shaft, gearing by which the shaft drives the cam-cylinder, a crank-handle on the shaft, and a sliding spring locking-bolt on the handle to engage with the shaft, substantially as set forth.

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

D. C. BELLIS.

Witnesses:
HENRY HOWSON,
HARRY SMITH.