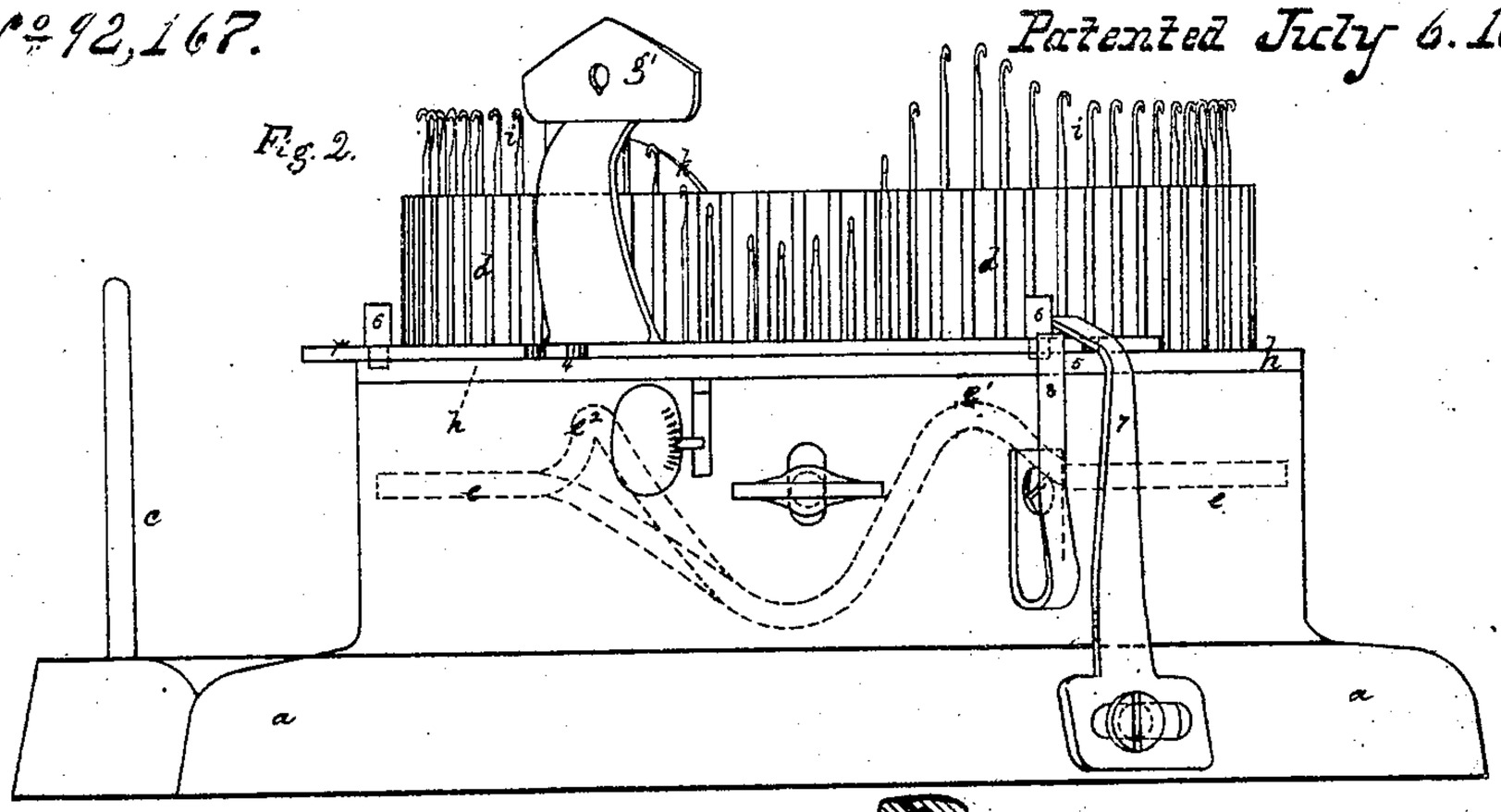
2 Sheets. Sheet. 1.

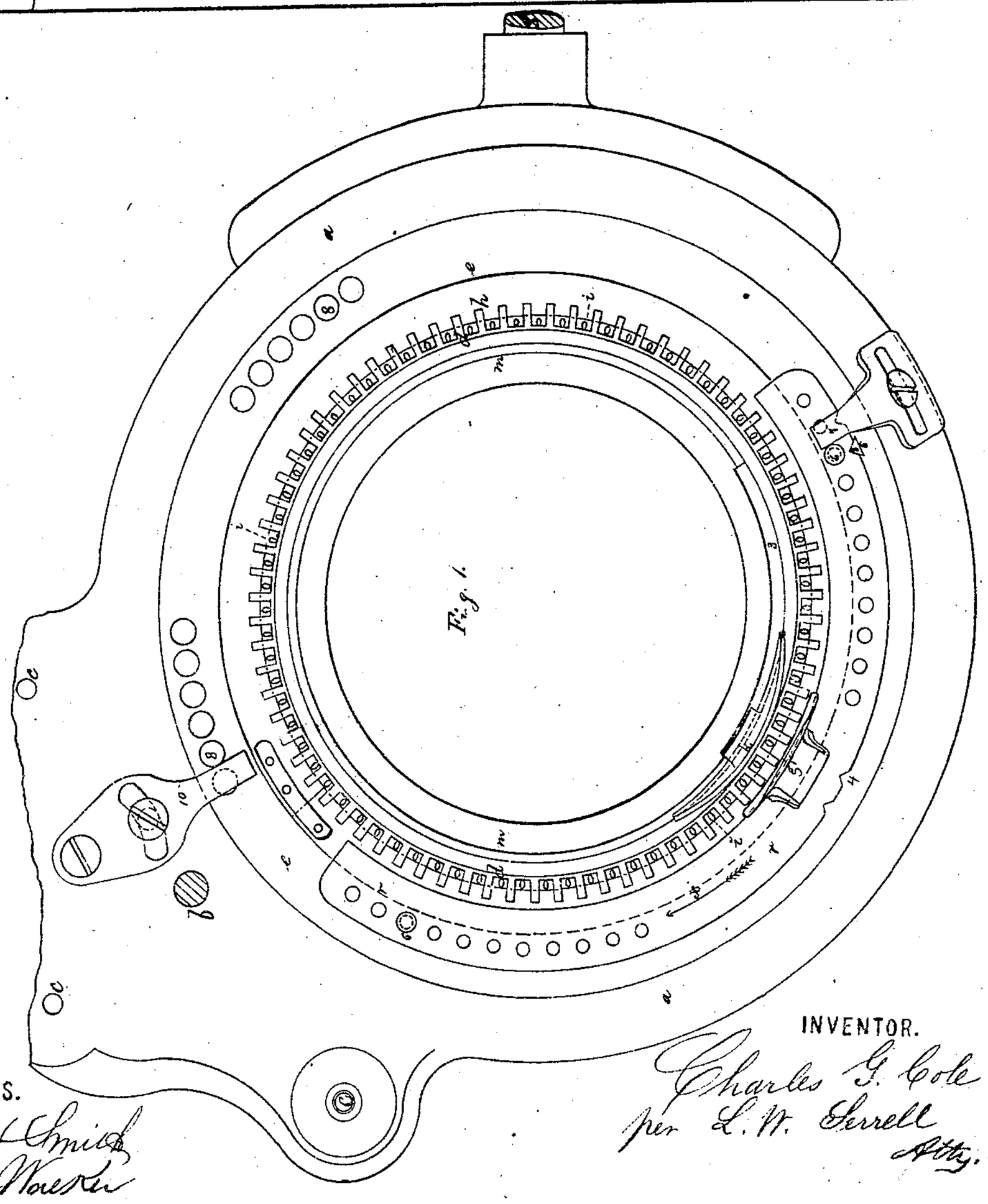
Charles G. Cole.

Circular-Knitting Machine.

No. 92,167. Patented July 6. 1869.

Fig. 2.





WITNESSES.

Chas. F. Smith

Geo. D. Wooster

INVENTOR.

Charles G. Cole

per L. W. Serrell

Atty.

2 Sheets. Sheet. 2.

Charles G. Cole.

Circular Knitting Machine.

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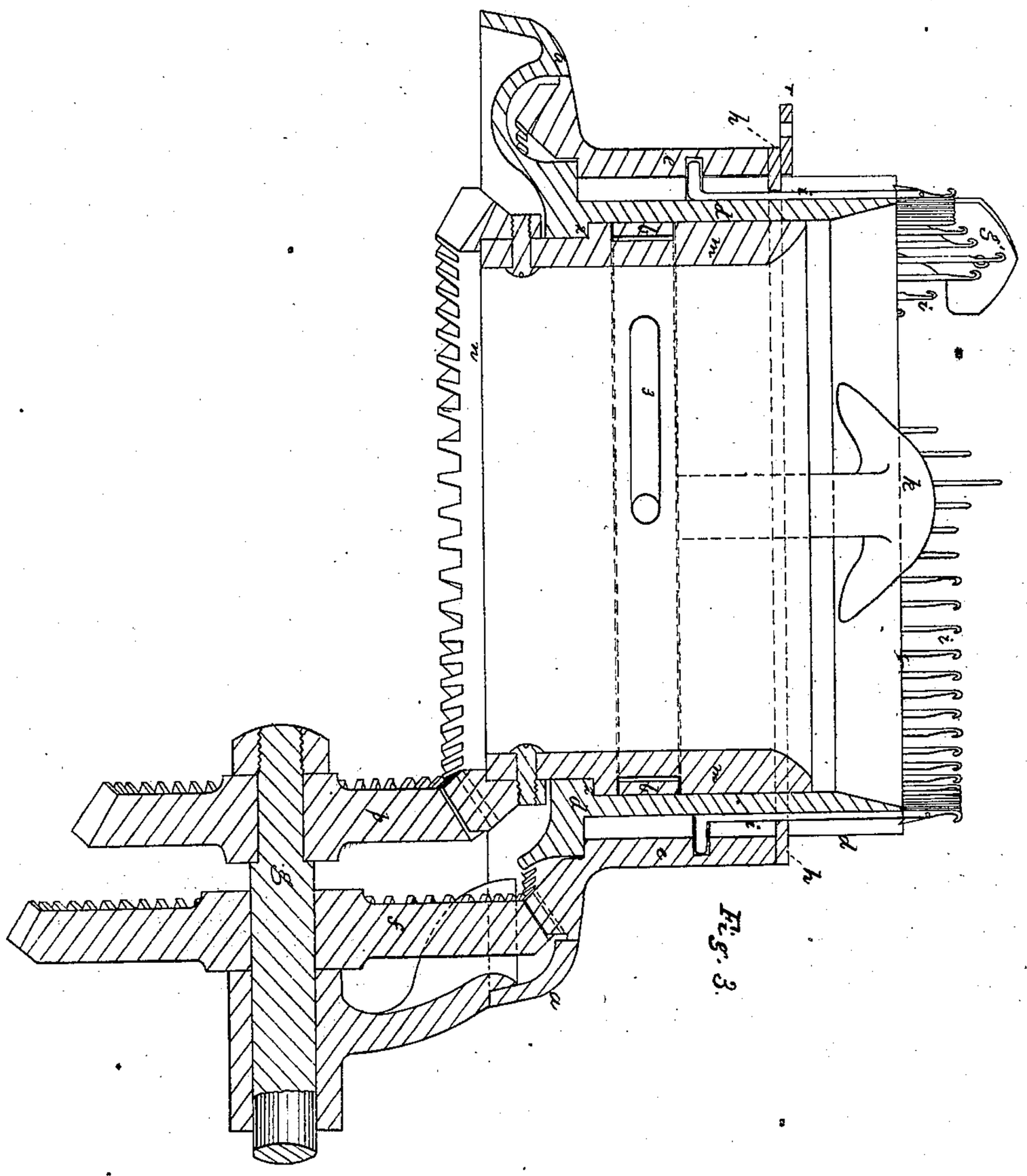

Fig. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

CHARLES G. COLE, OF BENNINGTON, VERMONT, ASSIGNOR TO DANA BICKFORD, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN CIRCULAR-KNITTING MACHINES.

Specification forming part of Letters Patent No. **92,167**, dated July 6, 1869.

To all whom it may concern:

Be it known that I, CHARLES G. COLE, of Bennington, in the county of Bennington and State of Vermont, have invented, made, and applied to use a certain new and useful Improvement in Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the said invention, reference being had to the annexed drawing, making part of this specification, wherein—

Figure 1 is a plan of said knitting-machine, the standard for the thread-guide being removed. Fig. 2 is a side elevation of the upper part of the machine, the gearing below not being shown; and Fig. 3 is a vertical section of the bed, cylinders, and gearing.

Similar marks of reference denote the same parts.

The object of this invention is to provide means for knitting a straight piece of goods in a circular-knitting machine, so that the heel of a stocking can be knitted as an extension of the cylindrical portion, or a strip of any desired number of stitches knitted with regularity and speed on a circular-knitting machine, by moving that machine so that the yarn-carrier makes a partial revolution first one way and then the other, thereby largely increasing the capacity of the circular-knitting machine at a small cost.

In the drawing, *a* is a bed, formed as a circular ring, with a projection on one side to receive the standard *b*, and its spring-eye to guide the thread or yarn to the machine, as usual, and *c c* are studs, on which the spools or bobbins for the yarn are to be placed; and this ring-bed may be provided with a screw-clamp, by which it is to be fastened to a table. Rising from the inner part of the ring-bed *a* is a grooved needle-cylinder, *d*, containing the needles *i i*, that are formed with a hook on the upper end, a latch on the side, and a foot-piece projecting at the base of the needle, and entering a cam-groove in the ring *e*, that surrounds the cylinder *d*, and is formed with a range of teeth on its under side, acted upon by the wheel *f*, that is driven by a shaft, *g*, and crank-handle or other convenient means. These parts, except as hereafter explained, are of the usual character. The cam-ring *e* is kept down in place by a ring, *h*, that enters a groove in the periphery of the cylinder *d*, and this, at the same time, holds the needles back to their places in the vertical grooves around the cylinder *d*. This has also before been employed. The cam-groove in the ring *e* is shown by dotted lines in Fig. 2, and the plate containing the undulating portion of said groove is adjustable, so as to vary the length of loop and the tightness of the knitting. This adjustment has also been known and used before. The cam-groove, however, has heretofore been commonly made with but one undulation, e^1, to carry the needles up near the yarn-guide *g'*, the groove being of the form shown by red dotted lines. I form said cam-groove with two undulations, e^1 and e^2, so that the machine will work either way, as hereafter specified. The yarn-guide *g'* is moved with the cam-ring *e*, and by it the yarn is laid against the needles and below their hooked ends, so that the yarn is drawn into a series of loops that pass through the previous loops of the fabric as it hangs over the edge of the cylinder *d*, and passes down within the same.

I make use of the cloth-raiser *k*, that is formed as a double incline, (see Fig. 3,) and is connected by an arm with an expansive ring or spring, *l*, setting inside the cylinder *d*, and within a groove around the interior cylinder *m*. This cylinder *m* rests upon a shoulder, 2, or flange around inside the cylinder *d*, and *n* is a gear-wheel screwed upon the lower end of *m*, and receiving the same number of revolutions as the cam-ring *e*, by means of the gear *p* on the inner end of the shaft *g*. A slot, 3, is provided in the cylinder *m*, in which is a pin on the lower part of the cloth-raiser *k*.

The friction of the spring *l* against the cylinder *d* will hold it and the cloth-raiser stationary, when the movement of *m* is reversed, until the end of the slot 3 comes into contact with the pin, and then the cylinder *m* and cloth-raiser *k* move together. The yarn-guide *g'* is on a loose ring that is connected with or supported by the cam-ring *e*. I have shown the ring *h* as formed with a segmental plate, *r*, upon it, which carries the said yarn-guide, and in the edge of the plate *r* are notches 4 and 5, taking a spring-detent, *s*, on the cam-ring *e*, and giving motion to the yarn-guide; but the inclined sides of the detent *s* allow it

to spring out of one notch, 4, if the segment *r* is stopped by one of the pins 6 taking against the stationary arm 7, and when the detent *s* springs into the other notch, 5, the parts are to be turned the other way.

When the machine is used for knitting a complete cylinder, the stop-pins 6 6 and 8 8 are taken out, and the parts are revolved. The cloth-raiser *k*, following the depressed needles and yarn-guide, in the position shown in Fig. 3, the operation of knitting will be performed in the usual manner. The cloth-raiser *k*, however, will lift the cloth at the point where the cam-groove e^2 raises the needles, so as to prevent the stitches slipping down the needles below the ends of the latches, and will hold the stitches above said latches until the needles are again brought down to their normal position, thus preventing the hook being accidentally closed by the latch when the yarn is presented to said hook.

If the knitting is to be of a partial cylinder, so as to form a strip, the pins 6 6 and 8 8 are to be placed in proper holes in the segment *r* and base of the cam-ring *e*, to stop against the stops 7 and 10, respectively, the number of stitches in the fabric being regulated by the positions of said pins 6 and 8, and the operation is as follows:

Starting with the parts in the position shown in Figs. 1 and 2, with the pins against their respective stops, the previous motion is reversed, so that the yarn-guide *g'* is moved in the direction of the arrow *x*, the yarn is laid into the needle-hooks, as usual, and the undulating groove in the cam-ring draws down the needles, forming the loops in the yarn. During this operation, the cloth-raiser has remained stationary, because the slot 3 has been moving along over its pin; but so soon as the yarn-guide *g* has moved sufficiently far from *k* for the latter to be in its proper relative position, the two move together, performing the knitting, as usual, the cloth-raiser lifting the cloth, as the needles are lifted by the part *e'* of the cam-groove, sufficiently to prevent the stitches slipping below the latches of the needle and closing the hooks as the needles are again drawn down.

As the segment *r* comes around, the other pin 6 takes against the stop 7, arresting the movement of the yarn-guide *g'*; but the ring-cam *e* is still moved, the detent *s* springing out of the notch 5, and sliding on the edge of *r* until it falls into the notch 4. At this moment the other stop 8 comes into contact with 10, to check the movement of *e*. During the movement of *e* and *m*, after *g'* has been stopped, the cloth-raiser *k* has been moved to the extreme edge of the fabric, and contiguous to *g'*, so that the parts are in position for the motion to be reversed, by first starting the yarn-guide *g'*, and after it has gone the proper distance for the loops to be formed, then the cloth-raiser *k* is moved, and the knitting is performed as before.

By this construction the knitting-machine is made to operate equally well whether revolved in one direction or the other, and by stopping the revolution at the proper points, a strip of any desired width can be knitted, or narrowed down, or widened, from time to time, by changing the position of the pins.

It will be evident that the holes to take the pins 8 might be in the bed *a*, and the stop 10 placed on the cam-ring *e*.

What I claim, and desire to secure by Letters Patent, is—

1. The cloth-raiser *k*, applied in substantially the manner and for the purposes set forth.

2. The cylinder *m* and slot 3, in combination with the cloth-raiser *k*, and gearing connecting the same with the cam-ring *e*, substantially as and for the purposes set forth.

In witness whereof I have hereunto set my signature this 23d day of April, A. D. 1868.

CHARLES G. COLE.

Witnesses:

JOHN E. PRATT,

J. WHITNEY.