

(No Model.)

2 Sheets—Sheet 1.

J. BYFIELD.  
KNITTING MACHINE.

No. 252,864.

Patented Jan. 31, 1882.

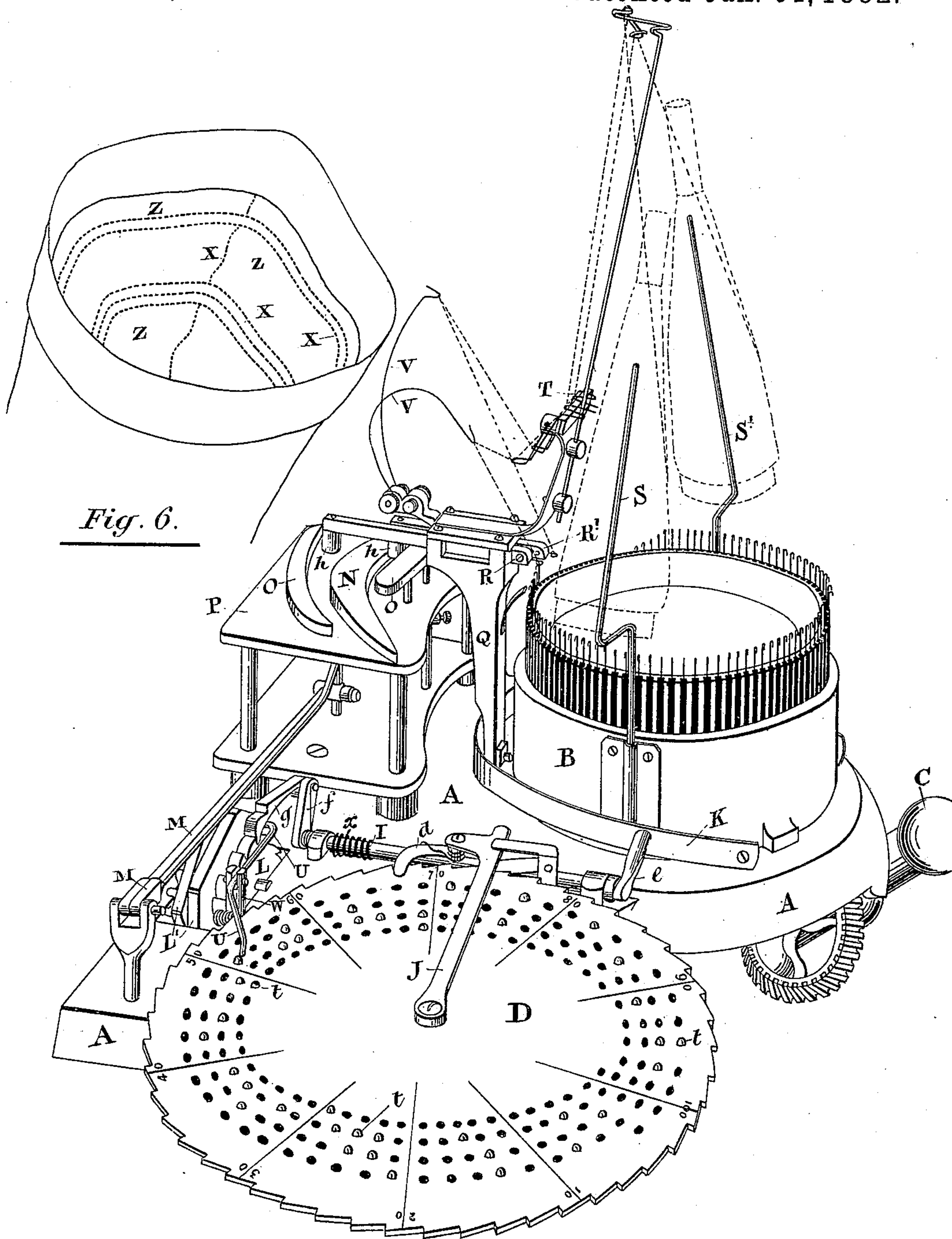


Fig. 6.

Fig. 1.

Witnesses.

Lewis Tomlinson.

C. W. Baldwin.

Inventor.

J. Byfield  
by Richard Ainslie  
Attys.

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2 Sheets—Sheet 2.

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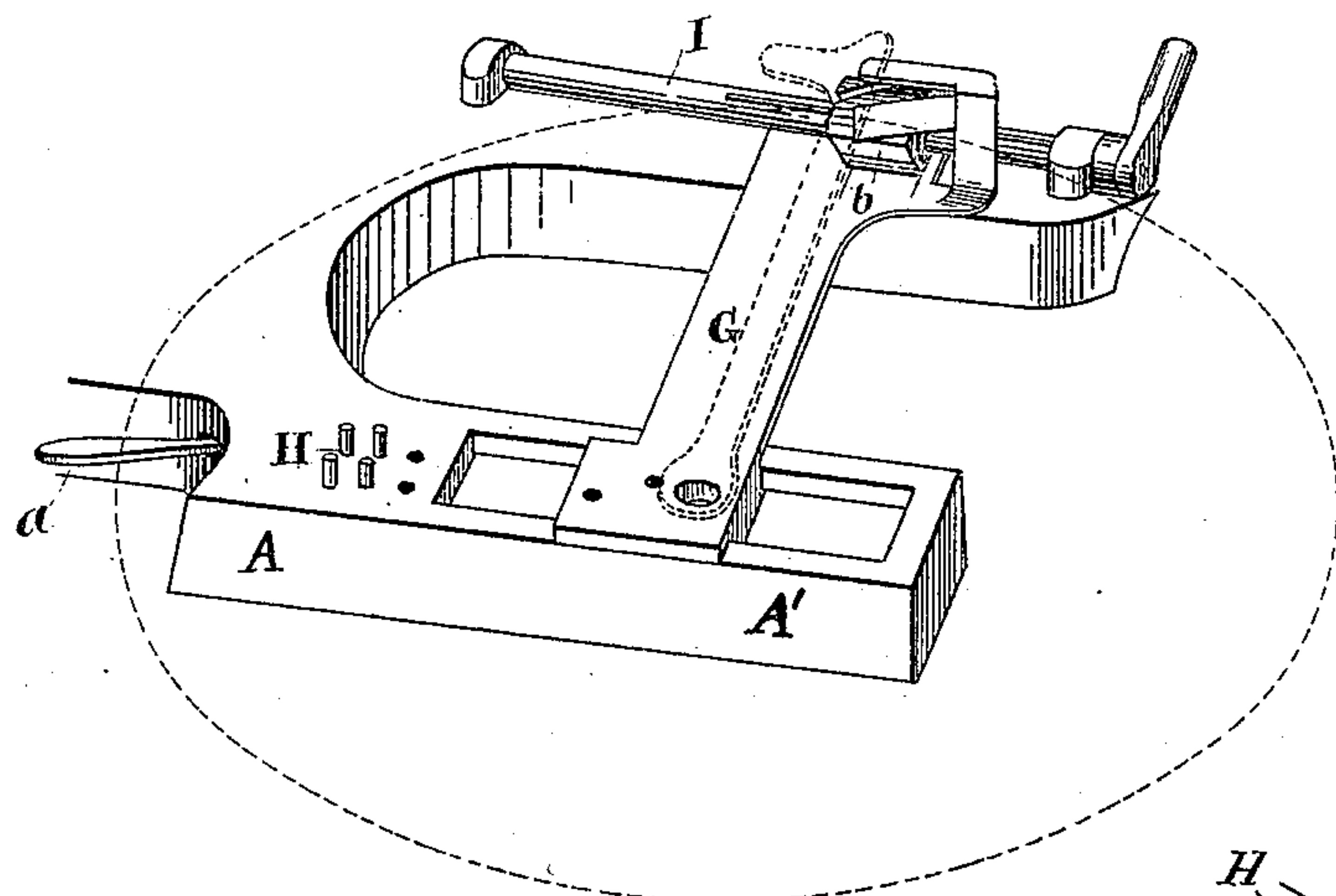


Fig. 2.

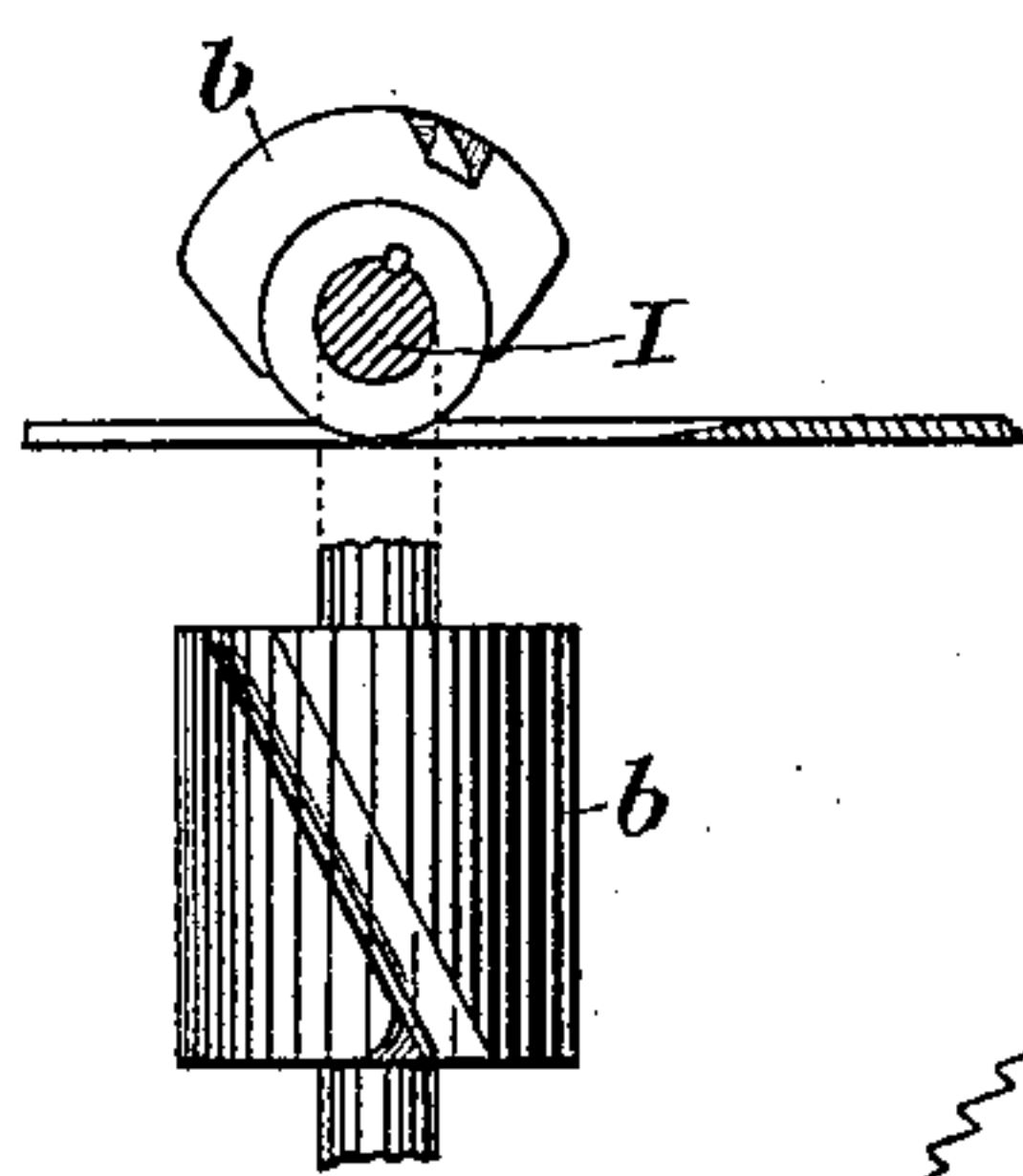
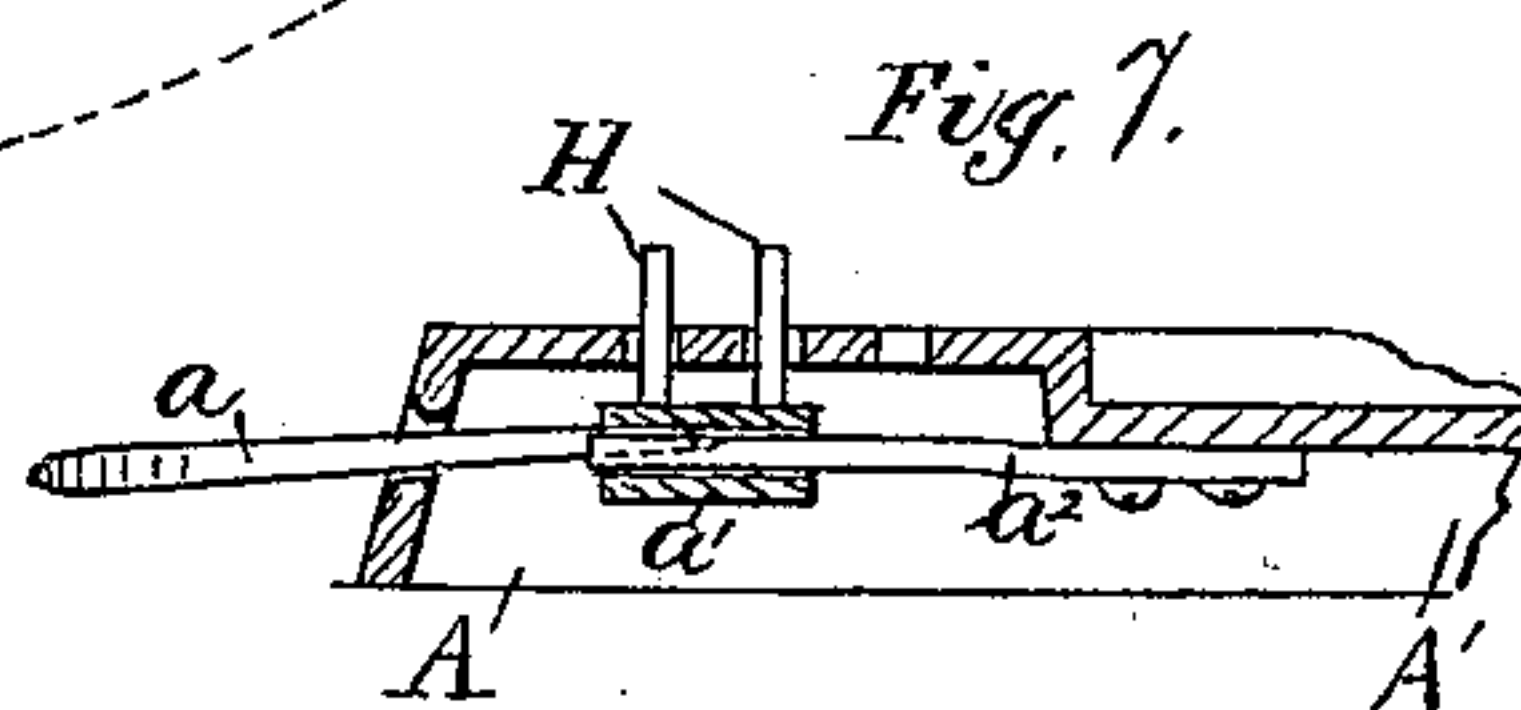


Fig. 5.

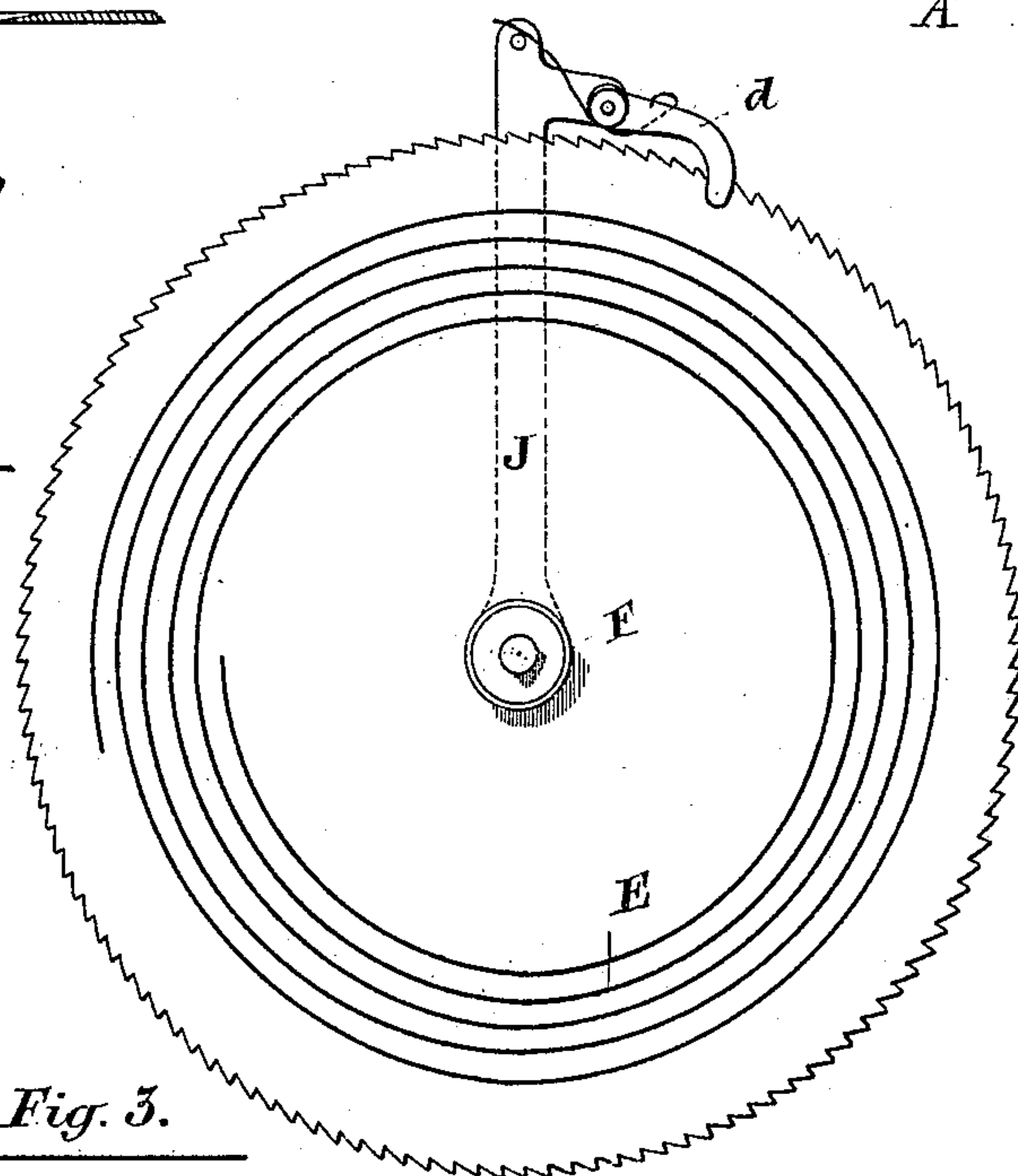


Fig. 3.

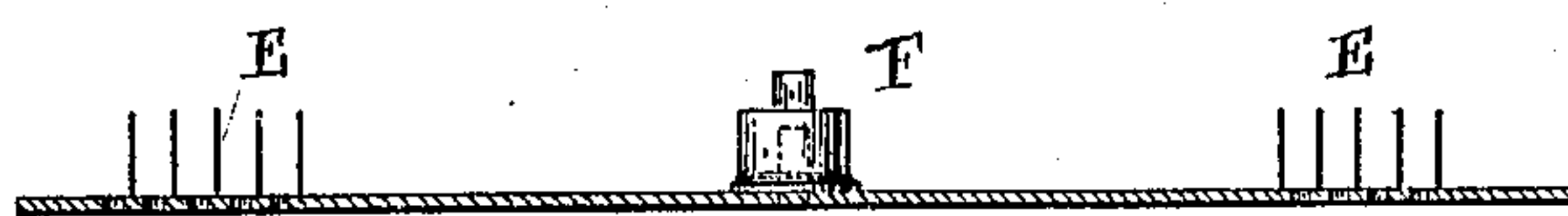


Fig. 4.

Witnesses.

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# UNITED STATES PATENT OFFICE.

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## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 252,864, dated January 31, 1882.

Application filed January 6, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN BYFIELD, a subject of the Queen of Great Britain, of Georgetown, in the county of Halton, in the Province of Ontario, Canada, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

The object of the invention is to provide mechanism capable of producing automatically various patterns of work; and it consists in the peculiar construction, operation, and combination of parts, as more fully hereinafter described, and then pointed out in the claims.

In the drawings, Figure 1 is a perspective view, showing the application of my pattern mechanism to a circular-knitting machine having a stationary needle-cylinder; Fig. 2, a detail view of that portion of the frame which supports and guides the pattern-plate; Fig. 3, a bottom view of the pattern-plate; Fig. 4, a cross-section of same; Fig. 5, detail of cam-block; Fig. 6, detail of work; Fig. 7, a detail sectional view, showing means for operating the adjustable guide.

A is a bed-plate, arranged to carry the knitting-machine proper and my pattern mechanism.

B is the cam-cylinder, operated in the usual way by gearing acted upon by the handle C.

D is the pattern-plate, perforated with a number of holes arranged in scroll form upon its face, for the purpose hereinafter explained. The bottom of this plate is provided with a scroll, E, corresponding with the scroll formed by the perforations referred to. The plate D is provided with the center pin, F, pivoted upon the slide G, which moves in the slotted arm A' of the frame A. At a suitable point in this bed-plate I insert an adjustable guide arranged to gripe the scroll E. This guide can be made as shown in Fig. 7—viz., composed of four pins passing vertically through holes in the bed-plate and fastened to a sliding block, a', which can be depressed by the lever a and caused to slide on the spring a<sup>2</sup> by pulling or pushing the lever, so as to allow the pins to move from one set of holes to another. I do not, however, confine myself to the means above described for adjusting the guide, as the pins might be adjusted in slots in the bed-plate by

a screw, or any other form of adjustable guide that would answer the purpose might be applied in any suitable manner.

The rock shaft I is held in suitable bearings on the bed-plate A, and is provided with a crank at either end, as shown. A lever, J, is pivoted on the center pin of the pattern-plate D and extends beyond its periphery, which has ratchet-teeth cut upon it, as shown. At the outer end of this lever a pin is placed to fit into a cam-groove on the sliding cam-block b. This block is fitted upon the rock-shaft I in such a manner that it will slide longitudinally without revolving, except with the shaft. A pawl, d, is pivoted on the end of the lever J, and is provided with a suitable spring to hold it against the ratchet-teeth on the periphery of the plate D. A cam, K, attached either to the cam-cylinder or the cog-ring of the machine, is provided for the purpose of operating the pattern mechanism, as will be understood as I proceed with this description. A crank, e, on the end of the rock-shaft I is so set that the cam K pushes it back at each revolution, a suitable spring, x, being attached to the rock-shaft I to reverse the motion thus imparted to the shaft by the cam K. As the cam K revolves with the machine and the crank e is pushed back, as described, the cam-groove in the cam-block b draws the lever J back, and with it the pawl d, which passes over the ratchet-teeth. As cam K leaves the crank e the spring x, before referred to, throws the rock-shaft back to its initial position, causing the plate D to revolve by the action of the pawl d, which engages with its ratchet-teeth, as before explained.

It will be seen that through the mechanism thus described each revolution of the cam-cylinder causes the pattern-plate D to revolve the distance produced by the pitch of its teeth. At the opposite end to E, on the rock-shaft I, will be noticed another crank, f, to which is pivoted the pawl g, arranged to operate the ratchet-wheel L, as hereinafter explained.

The cams L' form part of or are keyed to the same axle as the ratchet-wheel L, which axle is supported in suitable bearings on the bed-plate A, as shown. The rods M are pivoted to a suitable bracket supported on the bed-



plate A and resting upon the cams L'. These cams, which might properly be described as a double cam, are shaped so as to hold one rod higher than the other, their relative position being changed as the cam revolves. On the opposite ends of these rods M are secured vertical spindles, which carry respectively the cam-plates N and O, which will of course assume a corresponding position with the rods to which they are attached. These latter are operated by the cam L', and, as shown in the drawings, a table is provided to support the cam-plates N and O, and to serve as guides for their respective spindles. This table is, however, not necessarily of the form shown in the drawings, its only object being to provide suitable guides for the spindles supporting these cam-plates.

The yarn-carrier spindle Q is either fastened to the cog-ring or cam-cylinder B. The sliding yarn-carriers R and R' are supported, as represented, by the standard Q. The outer ends of these yarn-carriers are provided with friction-rollers h, which come in contact with the cam-plates N and O, which operate the yarn-carriers R and R', substantially as and for the purpose hereinafter explained. The bobbin-carriers S S' are attached to the cam-cylinder B, as represented. A separate bobbin is provided for every color of yarn it is desired to introduce into the pattern about to be knitted. The yarn from the bobbins so carried passes through loops in the top of the yarn-standard Q, and then down through the guides T, and after passing over the take-up springs V is carried through loops on the end of the yarn-carriers R R' in position for knitting. As shown in the drawings, the machine is constructed to knit with two colors, there being two bobbins supported by the cam-ring, as described, and also two yarn-carriers, R R'—one for each color. As it is necessary to hold the yarn on the outside of the needles in order to knit, it follows that if the yarn be thrown inside, away from the needles, the knitting of the yarns so held ceases.

We will assume, for the purpose of describing the operation of the machine, that the yarn-carrier R is threaded with white yarn, R' with blue, and, further, that the cam-plate N is arranged to operate the yarn-carrier R and the cam-plate O to operate the yarn-carrier R'. We will further assume that the yarn-carriers are set so that the white yarn shall be knitted. When the yarn carriers are in this position the cam-plate N is down, while the cam-plate O is held up, as represented in the drawings. To reverse this action and to cause the machine to knit a blue stripe, the cam-plates O are dropped down, while the cam-plate N ascends.

Having now described the general construction of the machine and the location of the various parts, I shall proceed to explain briefly the operation of the pattern-plate D and its connection with the mechanism herein described.

I stated in the commencement of the specification that the pattern-plate D is perforated

with a series of holes arranged in the form of a scroll on its face. These holes, in connection with the pins t, which fit them, form the pattern in the following way: It will be noticed that a lever, U, is pivoted upon a post, W, and is shaped so that one end of it projects beneath the pawl g and the other end is turned down and rests upon the plate D. So long as this end of the lever U rests upon the plate D the pawl g is held clear of the ratchet-teeth in the wheel L. Consequently the cams L' remain stationary, notwithstanding the revolution of the cam-cylinder B, and therefore as the yarn-carriers are operated by the movement of these cams, as before explained, they remain in the position in which they are set until by movement of the cams L' the rods M are made to operate the cam plates N and O, changing the position of the yarn-carriers. The required movement of the lever U is effected by the pins t, which fit into the holes in the pattern-plate D. This plate, as before explained, is moved the distance of one ratchet-tooth every revolution of the cam-cylinder B, the holes in the plate corresponding with the ratchet-teeth in number and in radial lines from the center of the plate D. It therefore follows that every revolution of the cam-cylinder B causes the pattern-plate D to revolve on its center the distance represented by one of its ratchet-teeth and the distance between two of the holes. In order, then, to produce a pattern in the work being knitted, it is merely necessary to decide upon the number of stitches it is desired to make in any particular color. When, by arranging the pins t in the holes on the pattern-plate D so that they will come in contact with the lever U, the desired number of rounds have been made in the work, the pin t raises the lever U and permits the pawl g to engage with the ratchet-wheel L, when the cams L' are moved the required distance and the position of the yarn-carriers altered by the action of the cams N and O, in the manner before explained. By means of the scroll on the bottom of the plate D, the guide H, and the slide G, the plate D is moved laterally as it revolves, so as to always keep the spiral line of holes under the end of the lever U.

By reference to Figs. 2, 3, and 4 the method by which the center line of the holes in the pattern-plate D is kept below the end of the lever U, which rests upon the plate, will be seen. As before explained, the scroll E on the bottom of the plate D corresponds with the scroll described by the holes in its plate. By pivoting the plate D, as I do, in the slide G, and fitting the scroll E between the guide-pins H, which are fixed to the bed-plate A, the plate D, as it is rotated, will be moved along the bed-plate and caused to revolve in a circle corresponding with that formed by the scroll E.

It will be seen that the pattern-plate D can be utilized for the purpose of recording the number of stitches in the work being knitted, and may be used independently of the mechanism for producing the pattern, as described.



I shall now proceed to explain briefly the style of work I am enabled to produce.

As the different-colored yarns are automatically introduced into the pattern without cutting the threads, the stocking or other work produced is made without seam and from yarn unbroken from the commencement to the finish.

By reference to Fig. 6, which represents a piece of the work produced, in which X represents the blue thread and Z the white, it will be noticed that the thread which forms the two stripes of blue simply forms a loop between the two stripes, and, passing over the white stripe between them, is ready for work when the yarn-carrier draws it over the needles.

It might perhaps be well to draw attention to the fact that by attaching the bobbin-carriers to the cam-cylinder as many bobbins as required can be arranged thereon without fear of the threads becoming entangled.

What I claim as my invention is—

1. The combination of the cam-cylinder B, standard Q, and sliding yarn carriers R with the vertically-moving cams N O for operating said carriers, cam K on the cylinder B, and connecting mechanism, substantially as described, between the cam K and cams N O, as and for the purpose specified.

2. The standard Q, cam-cylinder B, cam K on said cylinder, sliding yarn-carriers R, vertically-moving cams N O, and connecting mechanism, substantially as described, between the cam K and the cams N O, in combination with the bobbin-carriers S, attached to and revolving with the cylinder B, and the guides T, secured to the standard Q, as and for the purpose specified.

3. The cam-cylinder B, cam K on said cylinder, standard Q, sliding yarn-carriers R, and

cams N O, in combination with the rods M, cams L', and connecting mechanism, substantially as described, between the cam K and the cams L', as and for the purpose specified.

4. The cam-cylinder B, cam K on said cylinder, rock-shaft I, spring *x*, cranks *e f* on said rock-shaft, and pawl *g*, in combination with the cams L' and the ratchet-wheel L for operating said cams L', substantially as described.

5. The combination of the cam cylinder B, cam K on said cylinder, rock-shaft I, spring *x*, crank *e f*, and cam-block *b* on said rock-shaft, lever J, pawls *d g*, ratchet-wheel L, and pattern-plate D, substantially as and for the purpose specified.

6. The cam-cylinder B, cam K on said cylinder, rock-shaft I, and crank *e* and cam-block *b* on said rock-shaft, in combination with the lever J, pawl *d*, and the pattern-plate D, substantially as and for the purpose specified.

7. The pattern-plate D and slide G, in combination with positive mechanism, substantially as described, for intermittently operating said pattern-plate, substantially as specified.

8. The perforated pattern-plate D, provided with a spiral series of perforations for receiving removable pins, and with a scroll, E, on its under side, and with a peripheral series of ratchet-teeth, in combination with the slide G and mechanism, substantially as described, for giving the pattern-plate an intermittent rotary and lateral movement, substantially as specified.

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Witnesses:

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