

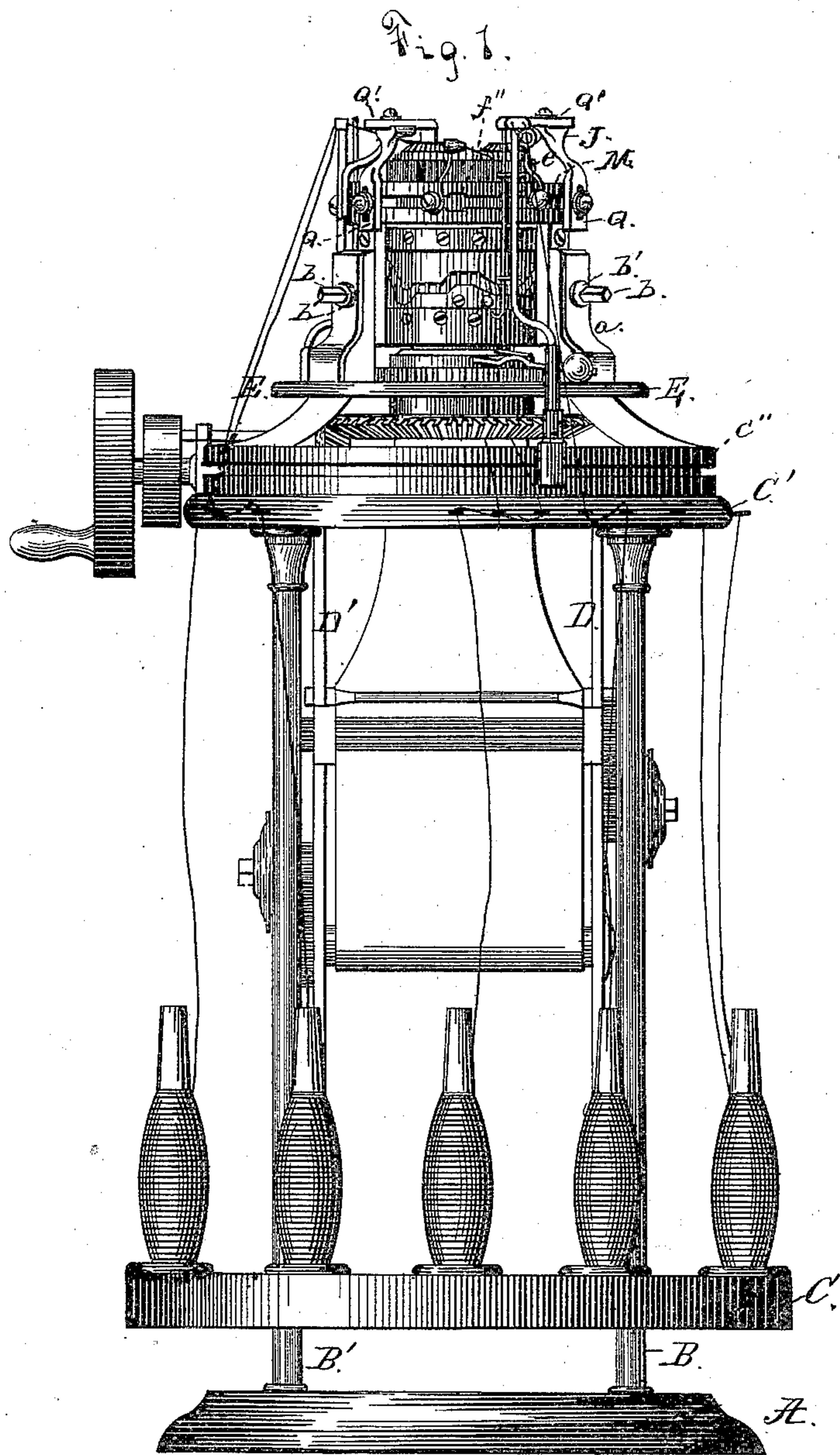
(No Model.)

4 Sheets—Sheet 1.

FAYETTE HARDENBERGH.  
CIRCULAR WEFT THREAD KNITTING MACHINE.

No. 309,301.

Patented Dec. 16, 1884.



Witnesses  
W. A. Volark.  
Geo. H. Cooper.

Inventor.  
Fayette Hardenbergh  
by Geo. W. Lizer.

Att'n

(No Model.)

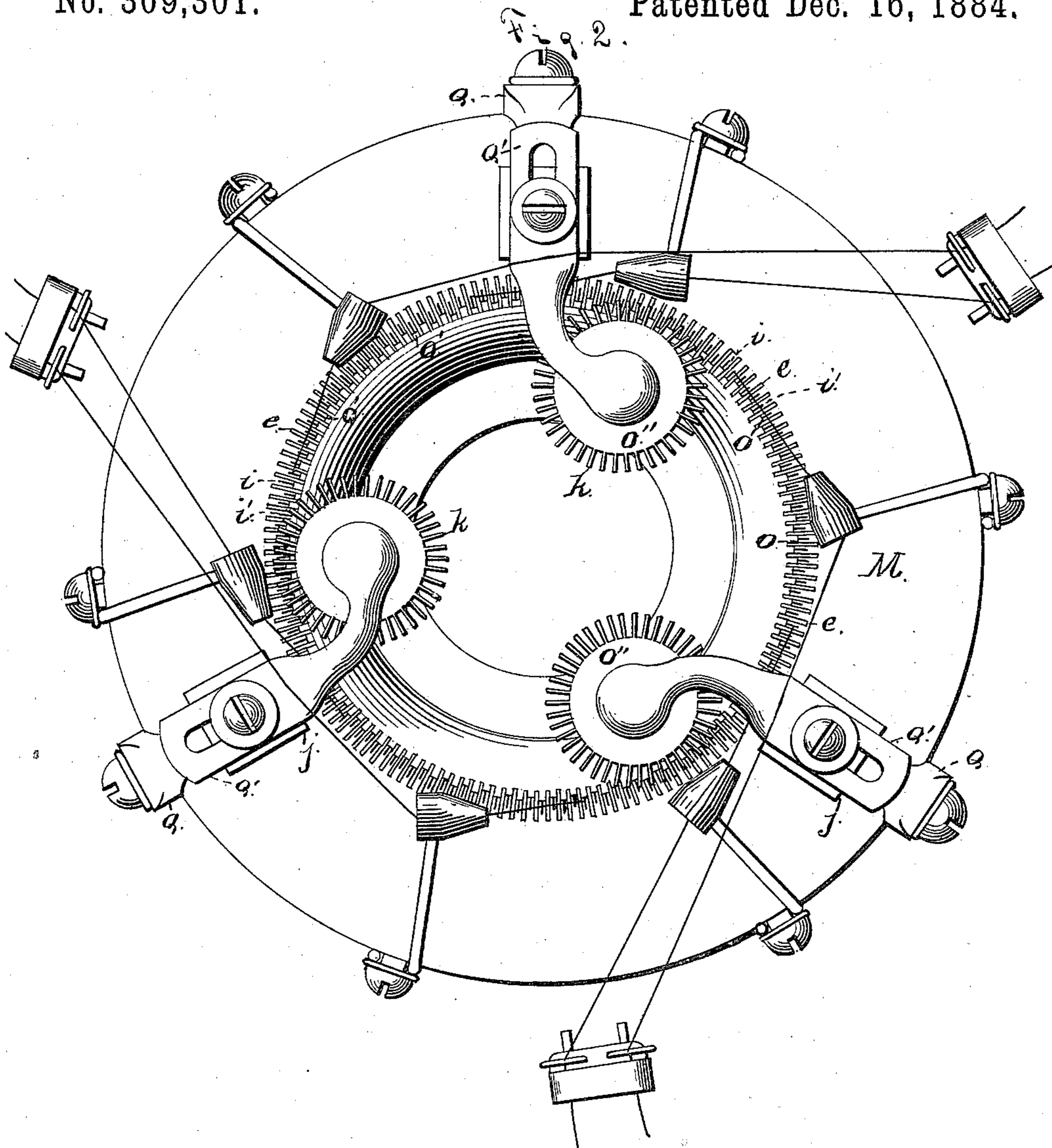
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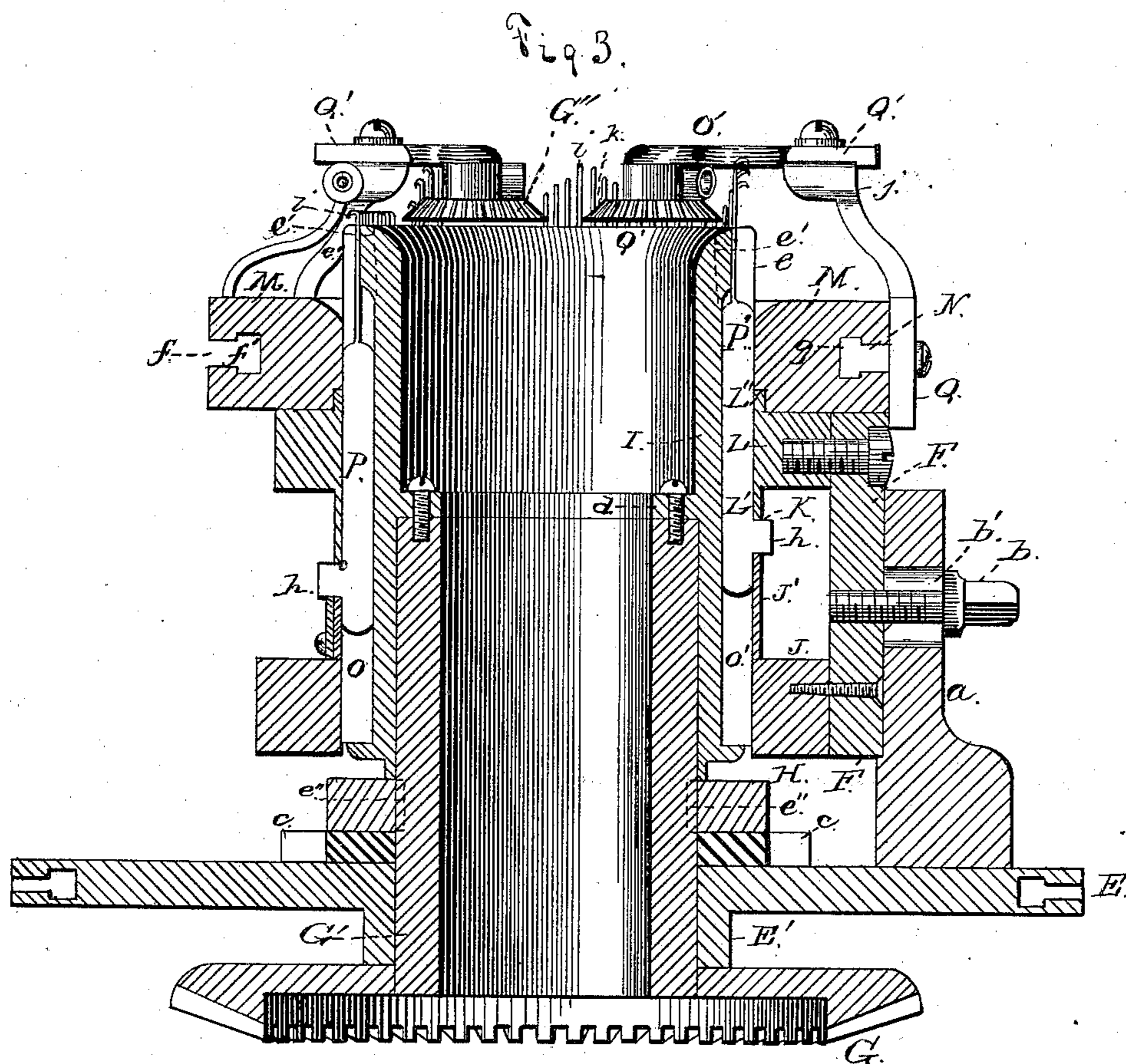
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Geo. H. Cooper.

inventor

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by Geo W. Lizer.

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(No Model.)

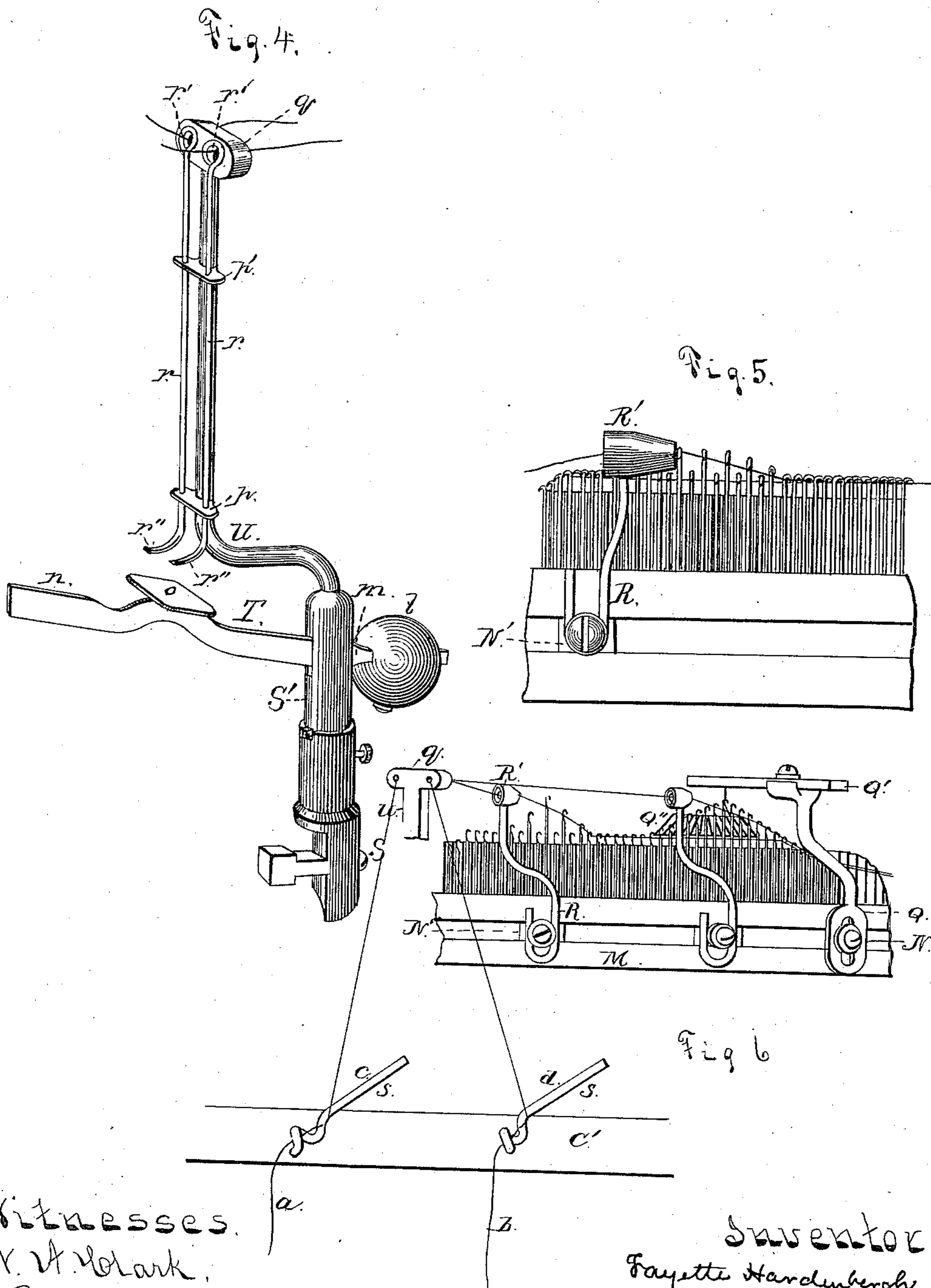
FAYETTE HARDENBERGH.

4 Sheets—Sheet 4.

CIRCULAR WEFT THREAD KNITTING MACHINE.

No. 309,301.

Patented Dec. 16, 1884.



Witnesses.  
W. H. Clark,  
Geo. H. Cooper.

Inventor  
Fayette Hardenbergh  
by Geo. W. Dyer

Att'y

# UNITED STATES PATENT OFFICE.

FAYETTE HARDENBERGH, OF PROVIDENCE, RHODE ISLAND.

## CIRCULAR WEFT-THREAD KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 309,301, dated December 16, 1884.

Application filed August 20, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, FAYETTE HARDENBERGH, of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Circular Weft-Thread Knitting Machines; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The invention hereinafter described embraces improvements upon the circular weft-thread knitting machine for knitting cloth for which an application for Letters Patent, Serial No. 82,234, was filed by me January 18, 1883, such improvements being intended to render the construction more simple and more durable, and insure more rapid, effective, and perfect work, and the novelty in such particulars being hereinafter more particularly pointed out and claimed.

For the better comprehension of my invention reference should be had to the accompanying drawings, in which Figure 1 is an elevation of my machine; Fig. 2, a top plan view of the same; Fig. 3, a vertical central section of the upper part of the same, showing the knitting mechanism; Fig. 4, a detail view of the stop-motion device; Fig. 5, a detail view of a portion of the needle-cylinder and of the thread-tube guides; and Fig. 6, a similar view of the needle-cylinder, embracing a presser-wheel, the tubular thread-guides, the tension devices, and a portion of the stop-motion mechanism.

Like letters denote corresponding parts in each figure.

A denotes the circular base of the machine, upon which are placed supports B B', upon which again is mounted the ring C, which supports the spools, and above this the rings C' C'', which support the needle-operating portion of the machine.

D D' are uprights supporting the take-up rolls and the connecting mechanism by which they receive the desired movements, all constructed, arranged, and operating substantially as described in my said application No. 82,234, except the ring C' may be of wood, and the ring C'' may be slotted in a manner hereinafter described with relation to ring M.

Upon the rings C' or C'', or both rings, is

supported in a suitable way the ring E, upon the upper side of which are secured slotted standards *a a*, preferably three in number. Screw-bolts *b* pass through slots *b'* in said standard into a support-piece, F, which is secured at its top to a ring, L, above the cam-slot K, and to another ring, J, at its bottom below the cam-slot, and afford means by which the vertical relation of the outside of the cylinder toward the needles may be adjusted.

The knitting mechanism is supported by and connected with a needle-cylinder composed of several distinct pieces, as follows: A bevel-gear, G, at the bottom is adapted by suitable gear-connection to be revolved as desired, and is a part of or is secured to a tubular shell, G', which constitutes the interior shell of the lower portion of the needle-cylinder. Above this bevel-gear G, and on the outside of the shell G', is placed the ring E, before mentioned, with a dependent flange, E', which rests upon the top of the gear-wheel G. Above this ring E is another ring, H, which may be single or made in two parts, upon the outside of which is placed or formed an annular rack, *c*, upon which the stop-motion, hereinafter described, operates, and this ring H is secured, preferably with a key, *e''*, to the shell G', and turns with it. Above this ring H, and upon the outside of the shell G', is placed another tubular shell, I, preferably of brass, which extends up to the top of the cylinder, with a flange, *d*, extending inwardly and resting upon the top of the shell G', by means of which suitable screw-fastenings passing down through said flange secure the shell I to the shell G', so that both turn together. Into suitable grooves, *e'*, on the outside of this shell I ribs *e* are securely inserted, which form the side guides to the needle-jacks, hereinafter mentioned, and the alternate spaces between these guides or ribs *e* are recessed gradually toward the top, so that the alternate needle-jacks in a machine of about nine inches internal diameter of the ring or circle of needles will incline about one sixty-fourth of an inch toward the center of the cylinder. A ring, J, with a thin inner upward flange, J', forms the outside to the lower part of the needle-jack recesses, and the upper edge of said flange J' constitutes the lower edge of the cam-slot K, which determines the vertical movement of the needle-jacks.

This ring J is secured to the support F by proper known means.

Above the ring J is another ring, L, with an inner dependent flange, L', which forms another portion of the outside of the needle-jack recesses, and the lower edge of the flange L' constitutes the upper edge of the cam-slot K. This ring L is secured to the top of the support F, which thus ties the rings J and L together, and has an upward flange, L''. The flanges J' and L' may be separate pieces or rings inside of the rings J and L, and secured to them.

Above the ring L is placed another ring, M, with a part recessed to fit closely and firmly over the flange L'', and this ring M is of greater diameter than the rings J and L, and extends to the outside of the support F, upon the top of which it rests. The rings M and L may be made conveniently in one piece. The ring M forms the remainder of the outside of the needle-jack recesses, and has cut into its periphery a rectangular groove, *f*, with an enlarged inner end, *f'*, for the purpose of receiving and holding a block, N, with an enlarged head, *g*, which fits into the enlarged end *f'*. In this groove is a larger opening, *f''*, for the purpose of inserting or withdrawing the blocks.

As before explained, the rings J, L, and M and the flanges J', L', and L'' constitute the outer wall of the needle-jack recesses or chambers, of which the ribs *e* are the side walls, and the outside of the shell I forms the inner wall. Of these recesses or chambers, one half, O O, have a vertical inner wall or bottom parallel with the axis of the cylinder. The other half, O' O', have an inner wall or bottom inclined inwardly at an angle to said axis, as before explained. In these recesses the needle-jacks P P' have a reciprocal movement effected by the cam-slot K upon the toes *h h* of the needle-jacks. The needle-jacks carry well-known needles, *i i'*, those marked *i* being vertical, and those marked *i'* being inclined.

To the blocks N are attached the slotted arms Q, adjustable vertically by screws upon the outer ends of said blocks. Said arms at their upper ends have a horizontal extension, *j*, upon which is attached a slotted horizontal arm, Q', which, by means of a set-screw passing through its slot, has horizontal adjustment upon said extension *j*, and this arm Q' carries a revolving presser-wheel, Q'', having radial fingers *k* arranged at such distances as to permit the passage of the needles up between them, said presser-wheels Q'' being within the circles of needles, with the outer fingers extending outwardly over them. These wheels revolve with the cylinder, and serve to keep down the weft or filling thread as the needles rise to catch the warp, as clearly illustrated in Fig. 6.

Within the groove *f f'* of the ring M are placed other blocks, N', similar to the blocks N, to which, by means of set-screws, as shown, are secured guide-rods R, carrying tubular guides R', and arranged about the cylinder

so as to direct the thread between the needles *i* and *i'*.

By means of the blocks and screws above mentioned the rods R, with their guides, are adapted to vertical adjustment around the cylinder. Said guides lead the weft and warp threads near enough to the needles to permit the latter, in descending, to catch said threads.

A stop-motion mechanism consists of a socket, S, conveniently secured to one of the rings C'' or E, before mentioned, or in any convenient place, in the same way as explained in regard to the arm Q, in which is placed, so as to be adjusted vertically, a body, S', within a slot in which is pivoted a lever, T, having a weight, *l*, on its outer arm, *m*, just sufficiently heavy to tilt up the other or inner arm, *n*, within the limit of the slot. Upon this inner arm is placed a plate, *o*. From the top of the body S' rises a standard, U, curved inwardly from the body, and then rising in a vertical line, and having secured to it guide-pieces *p p'* and at its top a cross-bar, *q*, with thread-holes. Wires *r r*, having eyes *r' r'* on their upper ends, and toes *r'' r''* at their lower ends, have capacity for vertical movement within the guide-pieces *p p'*. Threads pass through the eyes *r' r'* of the wires and through the holes of the cross-bar *q*, which threads hold the wires in position and above the plate *o*. In case a thread breaks, the wire which it holds up falls with its toe upon the plate *o*, and depresses the arm N so that its inner end engages with the rack *c*, and stops the revolution of the same, and consequently that of the knitting-cylinder. The threads pass up from the spools through and around suitable tension devices, *s s*, secured to ring C'. These devices consist each, preferably, of a straight piece of wire bent near its lower end to form a loop or eye, through which the thread passes, and is then wound around the straight portion once, twice, or more times, as may be found necessary to give the proper tension to the thread. From these devices the threads pass upward through the eyes *r'* of drop-wires *r*, and thence through the guide-tubes to the needles, as clearly shown in Fig. 6.

By arranging the needles alternately a little inclined inwardly filling-wheels and similar contrivances are dispensed with, and the thread is directly, regularly, and certainly inserted between the needles, and no stitches can be dropped, for there is nothing to catch or jam the threads, and the work is not only uniform, but, in consequence of the regularity and certainty of delivery and direction of the threads, a more rapid movement can be given to the needle-cylinder, and consequently more work can be done.

By having the inner walls of the needle-jack chambers regularly inclined alternately the needle-jack may be made of uniform size throughout and strong in its upper portion, and the needles directly and firmly inserted therein in line with the needle-jack, and the inconveniences and trouble connected with

bent needles or needles bending or springing in their work are avoided.

By the construction and arrangement of the groove in the ring M the thread-guides and the presser-wheel supports can be readily adjusted in various directions or removed and replaced.

By the construction and arrangement of the several parts of the needle-cylinder the same can be most readily taken apart and put together, and various desirable adjustments can be made.

By the construction of the stop-motion a delicate and certain action is assured under all circumstances.

I am aware that prior to my invention knitting-machine needles had been described in patents which were bent at different angles in two concentric series, to permit a thread or yarn to be laid between them; and I disclaim any such invention, as such needles were liable to be broken, and required such care in using them, and such low speed in the revolution of the cylinder, that the machine to which they were connected was practically of little or no value.

I am also aware that prior to my invention needle-cylinders having recesses had been described in patents. By the reciprocation in such recesses of the needle jacks the needles assumed two concentric series, to permit a thread or yarn to be laid between them; but in such patents the bottoms of the recesses were in irregular planes, and the first upward movements of the jacks were in one plane, and then they were suddenly thrown into another plane by contact with a shoulder. I disclaim any such invention, as not only the thread or yarn, but the needles also, were liable to be broken, and from the resistance by the shoulder greater driving-power was required, and such machines were incapable of great speed in operation and difficult to keep in order.

I am also aware that prior to my invention straight-knitting machines were described in patents where the needle-bed had a slot in which needle-shifters were placed, each of which carried a loose needle upon its upper surface, arranged so that alternate needle-shifters could be tilted by a cam upon a shaft, and by such shifting permit the needles to be reciprocated, so as to assume two parallel series. I disclaim any such invention, as the shaft and cam and tilting needle-shifter are inapplicable to a circular machine.

Having thus described my invention, what I claim as new therein is—

1. The combination, with the needle-cylinder provided with two series of needle-recesses, O O', the former, O, having bottoms uniformly parallel with the axis of the cylinder, and the latter, O', having bottoms uniformly inclined at an angle therewith, of the needles *i i'*, provided with the jacks P P', and

mechanism for reciprocating the same, whereby in the operation of the machine the needles are separated in two concentric series, to permit a thread or yarn to be laid between them, substantially as described.

2. The combination, with the needle-cylinder provided with two series of needle-recesses, O O', the former, O, having bottoms uniformly parallel with the axis of the cylinder, and the latter, O', having bottoms uniformly inclined at an angle therewith, of the needles *i i'*, provided with the jacks P P' and mechanism for reciprocating the same, and the tubular guides R R', adjustable vertically and circumferentially on said cylinder, substantially as described.

3. The combination, with the cam-cylinder, of the presser-wheels Q Q' Q'', the tubular guides R R', the needle-cylinder provided with two series of needle-recesses, O O', the former having bottoms uniformly parallel with the axis of the needle-cylinder, and the latter having bottoms uniformly inclined at an angle therewith, the needles *i i'*, provided with the jacks P P', and mechanism for reciprocating the same, substantially as described.

4. The combination, with the ring E, of the slotted standard *a*, the adjustable support-pieces F, the rings J and L, provided with flanges J' and L', and the ring M, arranged substantially as and for the purposes described.

5. The combination, with the ring E, of the slotted standard *a*, the adjustable support-pieces F, the removable rings J and L, having flanges J' and L', the needle-cylinder having inclined and vertical recesses, the needle-jacks having toes *h* and needles *i i* and *i' i'*, and means for rotating the needle-cylinder, arranged substantially as and for the purposes described.

6. The combination, with the ring E, of the socket S, body S', means whereby it may be adjusted vertically, lever T, provided with weight *l* and plate *o*, standard U, provided with perforated guide-pieces *p p'* and cross-bar *q*, and the rods *r r*, arranged in the perforations of said guide-pieces, and provided with eyes *r' r'* and toes *r'' r''*, substantially as and for the purposes described.

7. The combination, with the ring E, of the socket S and body S', means whereby it may be adjusted vertically, lever T, provided with weight *l* and plate *o*, standard U, provided with perforated guide-pieces *p p'* and cross-bar *q*, the rods *r r*, arranged in the perforations of said guide-pieces, and provided with eyes *r' r'* and toes *r'' r''*, and the rack *c*, as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

FAYETTE HARDENBERGH.

Witnesses:

ROBERT JACKSON,  
D. R. STANFORD.