No. 667,701. Patented Feb. 12, 1901.

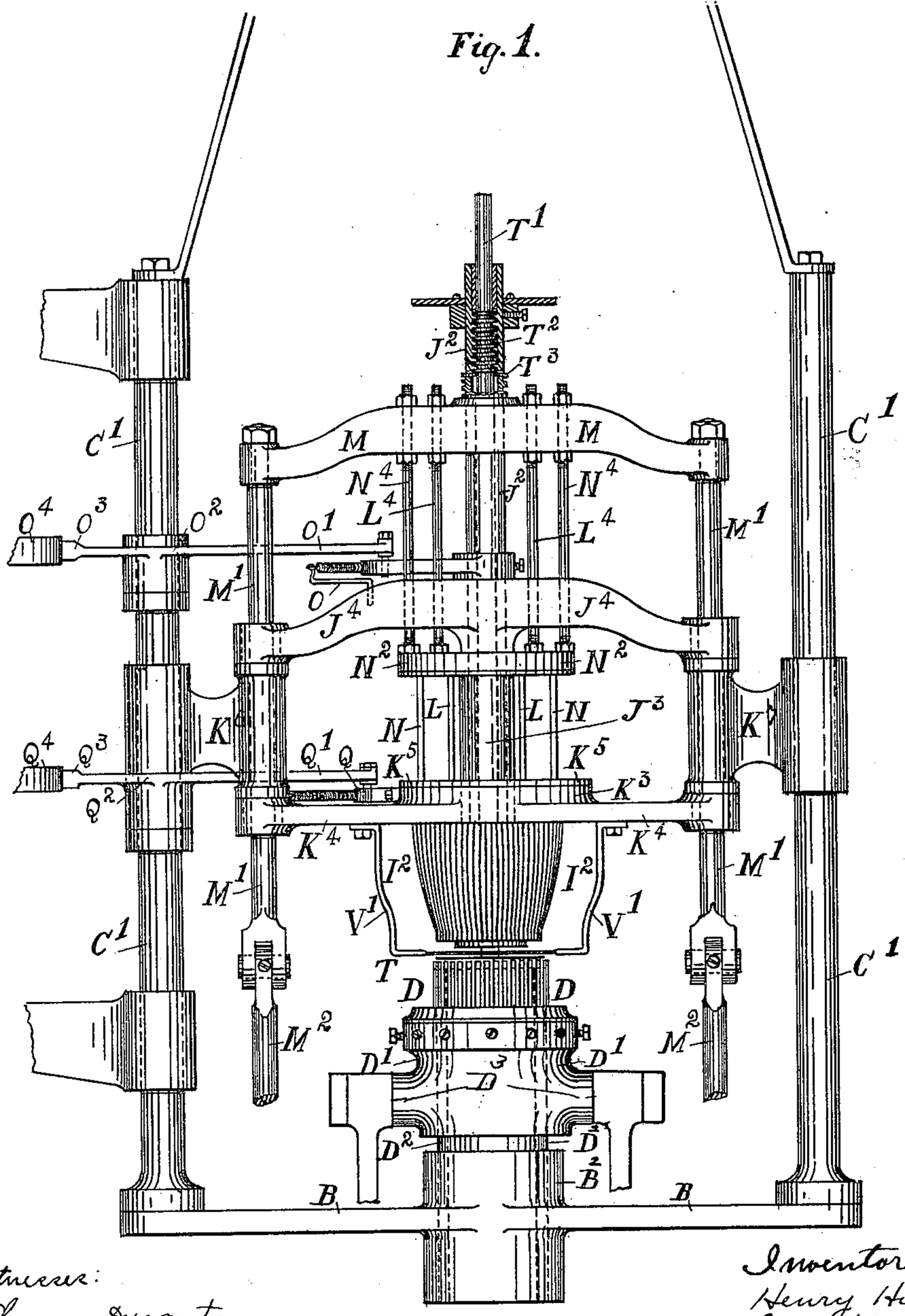
H. HILL.

CIRCULAR WARP MACHINE.

(Application filed Dec. 30, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Thomas Durant
J. M. Fowler Jr.

Inventor.
Henry Hill.
by Church & Church
his Attys

No. 667,701. Patented Feb. 12, 1901.

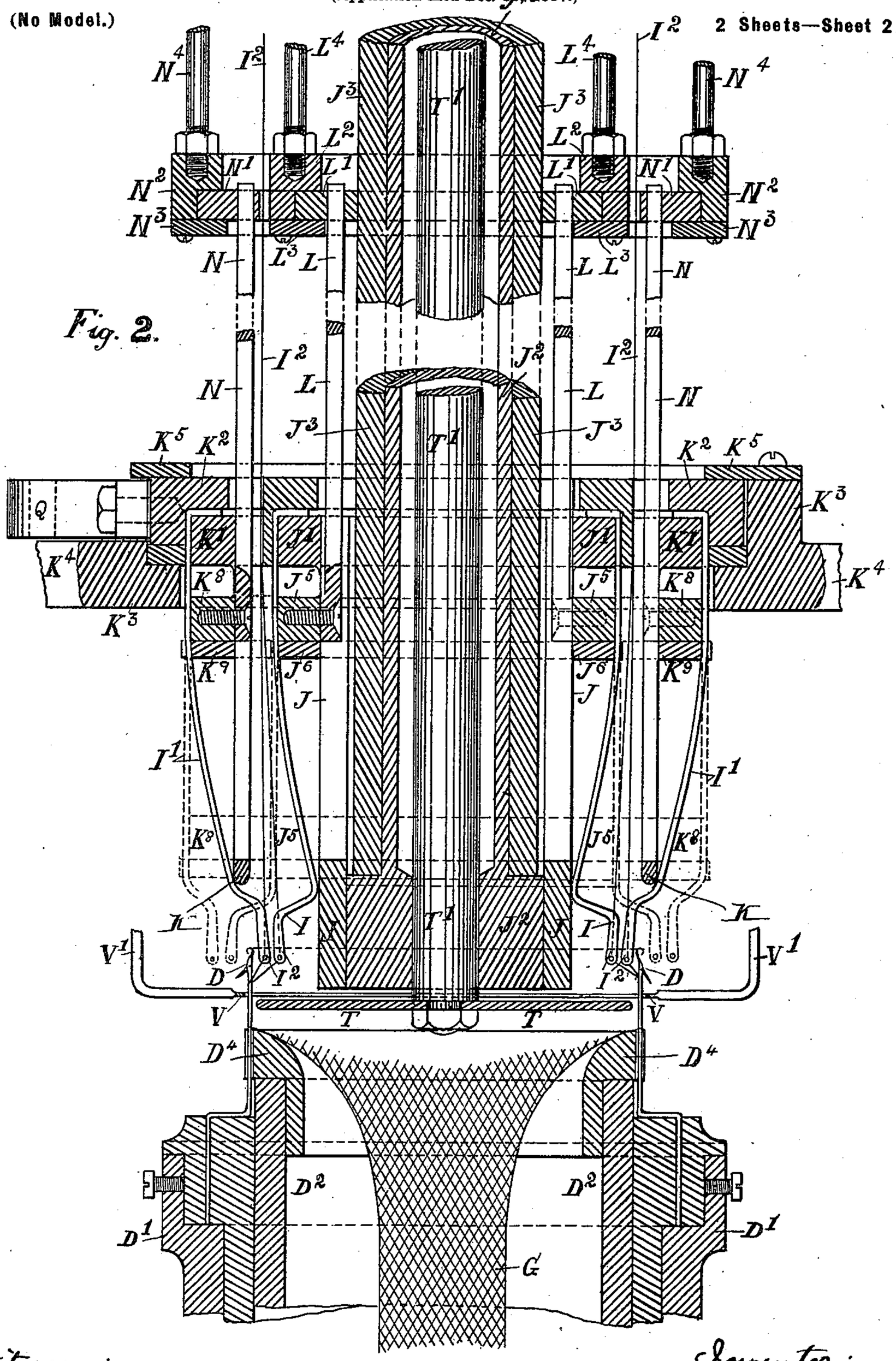
H. HILL.

CIRCULAR WARP MACHINE.

(Application filed Dec. 30, 1897.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2.



Witnesses:
Thomas Durant
J. W. Fowler Jr.

Inventor:
Henry Hill.
by Church & Church
his Attys

UNITED STATES PATENT OFFICE.

HENRY HILL, OF NOTTINGHAM, ENGLAND.

CIRCULAR-WARP MACHINE.

SPECIFICATION forming part of Letters Patent No. 667,701, dated February 12, 1901.

Application filed December 30, 1897. Serial No. 664,586. (No model.)

To all whom it may concern:

Be it known that I, HENRY HILL, a subject of the Queen of England, residing at Nottingham, England, have invented certain new and useful Improvements in Circular-Warp Machines, (for which I have obtained Letters Patent in Austria, No. 47/2,939, dated May 25, 1897,) of which the following is a specification.

This invention relates to improvements in circular-warp machines for producing seamless tubular-warp lace fabrics—such, for example, as foundations for incandescent mantles.

The invention will be best understood by reference to the accompanying drawings, in which—

Figure 1 is a front elevation showing the principal part of a machine constructed according to my invention. Fig. 2 is a vertical section, drawn to a larger scale, of part of the machine.

Like letters indicate like parts throughout the drawings.

The needles D (see Fig. 2) are arranged in a circumferential line, with their length parallel to the axis of the machine, as shown, or nearly so. They are secured to one common needle cylinder or sleeve D′, which is mounted loosely on a hollow cylindrical casing D^2, which latter is preferably arranged with its axis vertical, as shown, and is secured in a boss or seat B^2 in the cross-stay B of the framing. The needles D are also supported in a circular slay D^4, secured to the upper end of the casing D^2.

The needle-cylinder D′ (see Fig. 1) is reciprocated vertically on the casing D^2 by one or more cams on a main shaft which is placed below the needle-cylinder and is not shown. The movement of this cam or these cams is communicated to the needle-cylinder by a lever and a forked connecting-rod jointed to the lugs D^3 of the needle-cylinder. If preferred, an eccentric or crank may be employed instead of the cams.

The whole of the needles D are raised and lowered simultaneously, and the fabric G (see Fig. 2) as it is produced is carried down the interior of the cylindrical casing D^2 to a take-up roller, from which it may be delivered onto a work-roller in a well-known manner.

The thread-guides, which supply the threads to the needles, are dependent and may be formed of spring-wire. They are subdivided into two sets—an inner set I and an outer set I′—both arranged in concentric circumferential lines, one set being within the other. Those in the inner set I are cranked outward at their lower ends, while those in the outer set I′ are cranked inward, so that the eyes at their lower ends, through which the threads I^2 pass, are brought together, as shown. The inner set I is arranged around a cylindrical casing or sleeve *j*, and their upper ends are secured to a raised rib or flange J′ at the upper end of the said casing. The cylindrical casing J is mounted on the lower end of a hollow shaft J^2, which latter is mounted in a sleeve-bearing J^3, secured to or formed on a cross-stay J^4. The outer set I′ is arranged around a cylindrical casing K, surrounding the inner set of needles, and their upper ends are secured to a raised rib or flange K′ at the upper end of the said casing in the same manner as the inner set. The casing K is provided with an extended flange K^2, which fits loosely in a seating K^3, formed in the cross-stay K^4, and is held in this seating by a ring K^5, secured to the seating K^3. The ends of the cross-stays J^4 and K^4 (see Fig. 1) are connected to bracket-bearings K^6 K^7, mounted on the pillars C C′, respectively.

The lower cranked parts of the two dependent sets of thread-guides I I′ (see Fig. 2) are held by their own elasticity normally on the surfaces of the corresponding cylinders J and K; but the said ends are opened out into the positions shown in dotted lines by collars or rings J^5 K^8, mounted on and sliding on the casings J and K, respectively. As these collars or rings J^5 and K^8 are moved from the position shown at the top of their corresponding casings J and K to the position shown in dotted lines at the bottom of said casings the lower ends of the whole of the thread-guides I I′ will be forced outward radially into the position shown in dotted lines, and they will again return to their normal position when the collars or rings J^5 K^8 are raised again. In addition to imparting a radial motion to the guides I I′ the rings J^5 K^8 are provided with slay-rings J^6 K^9, respectively, and these slay-rings are provided with recesses in their peripheries to receive the guides, and the latter

are thus by this means held in their relative positions.

Vertical reciprocating movement may be imparted to the two collars J^5 K^8 by the following arrangement: The collar or ring J^5 (see Fig. 2) is connected by two bars L, working in slots or recesses in the cylindrical casing J, to a ring L′, which is held loosely and may thus rotate in a seating in a ring L^2 by means of a ring L^3, secured to the ring L^2, as shown. The ring L^2 (see Fig. 1) is mounted on the sleeve-bearing J^3 and is connected by adjustable rods L^4 to a cross-head M. The collar or ring K^8 (see Fig. 2) is connected to the cross-head M by a similar arrangement. The collar or ring K^8 is connected by two bars N, working in slots or recesses in the casing K, to a ring N′, which is held loosely in a seating in a ring N^2 by a ring N^3, secured to the ring N^2, as shown. The ring N^2 is connected by adjustable rods N^4 to the cross-head M. The cross-head M (see Fig. 1) is mounted on the upper ends of two shafts M′, which are carried in the bracket-bearings K^6 K^7. The lower ends of the two shafts M′ are connected by connecting-rods M^2 to two levers provided with antifriction-rollers which are in peripheral coutact with cams on the main shaft, hereinbefore referred to. In addition to their radial movement the thread-guides are reciprocated angularly. This is effected by rotating the cylindrical casings J and K, to which the guides are secured, and the mechanism immediately connected therewith bodily. The cylindrical casing J, which is secured to the hollow shaft J^2, is reciprocated angularly by an arm O, (see Fig. 1,) secured to the latter. This arm O engages with the inner end O′ of a lever O^2, mounted on the pillar C, and the outer end O^3 of the lever O^2 engages with and is actuated by a pattern-wheel O^4, secured to a vertical shaft, which is connected to the main shaft by suitable gearing. The casing K, which is reciprocated in its seating K^3, is provided with an arm Q, which engages with the inner end Q′ of the second lever Q^2, mounted on the pillar C. The outer end Q^3 of the lever engages with a second pattern-wheel Q^4 on the vertical shaft.

The threads I^2 are carried from a warp beam or spool, which may be placed above the machine, through the space between the two cylindrical casings J and K, to the eyes in the lower ends of the thread-guides I I′, and thence to the needles D.

The operation of the machine is as follows: The needles D rise until their upper ends are above the lower ends of the guides I I′ while the latter are in their normal position, as shown. The lower ends of the guides I I′ are then moved radially outward into the position shown in dotted lines in Fig. 2, passing and carrying the threads between the needles. The guides are then moved angularly one or more needles, both sets in the same direction or the set I in the reverse direction to the set I′, and return through the needles to their normal position again, thus lapping the threads on the needles. The needles are then lowered to draw the loops through the preceding loops and the above process again repeated. It will be understood that in order to form a continuous fabric the thread-guides must be moved angularly more than one needle either every course or at intervals of every two or more courses, which is determined by the character of the fabric which is being produced. The work is held down by a circular plate T, (see Fig. 2,) placed within the line of the needles. This plate is connected to the lower end of a spindle T′, placed within the hollow shaft J^2. It is normally held down by a spring T^2, (see Fig. 1,) but is raised each course by the cross-head M engaging with a striking part or pin T^3 in the spindle T′. The mesh of the work may be changed by shogging the vertical shaft which carries the pattern-wheels O^4 Q^4 longitudinally, so as to throw the pattern-wheels O^4 Q^4 out of action or bring other pattern-wheels into engagement with the ends O^3 Q^3 of the levers O^2 Q^2. The vertical shaft P may be shogged by any well-known arrangement controlled by the attendant or by a pattern-chain or other convenient arrangement.

The latches of the needles D are prevented from rebounding onto the hooks when the loops have passed over and relieved them by a circular ring or plate V, which is connected by brackets V′ to the cross-stay K^4.

I claim—

1. In a circular-warp machine, the combination with the needles, of a set of dependent elastic guides provided with warp-eyes at their lower ends for the passage of the warp-threads, a cylindrical casing which may be reciprocated angularly and around which the warp-guides are secured, and a collar arranged to slide up and down on the cylindrical casing for moving the lower ends of the guides radially outward, said guides being returned to normal position by their own elasticity when released by the collar; substantially as described.

2. In a circular-warp machine, the combination with the needles, of a set of dependent elastic guides provided at their lower ends with warp-eyes for the passage of the warp-threads, a cylindrical casing which may be reciprocated angularly and around which the warp-guides are secured, means for reciprocating the casing, a collar arranged to slide up and down on the cylindrical casing for moving the lower ends radially outward, said guides returning automatically to normal position when released by the collar, and means for operating the collar; substantially as described.

3. In a circular-warp machine, the combination with the needles of dependent warp-guides provided at their lower ends with warp-eyes for the passage of the warp-threads, a cylindrical casing which may be reciprocated angularly and around which said guides are

secured, means for reciprocating the casing, a collar sliding up and down on the cylindrical casing, a rotatable ring connected to the said collar, a seating-ring for the rotatable ring, a cross-head connected to the seating-ring, and means for reciprocating the cross-head; substantially as described.

4. In a circular-warp machine, the combination with the needles, of an inner and outer set of dependent warp-guides provided at their lower ends with warp-eyes for the passage of the warp-threads, a cylindrical casing mounted on the central shaft around which the inner guides are secured, a second outer concentric cylindrical casing around which the outer guides are secured, a seating in which said cylinder is mounted, means for reciprocating both the said casings angularly, a collar sliding up and down on each cylindrical casing for moving the lower ends of the guides outward, and means for operating both collars; substantially as described.

5. In a circular-warp machine, the combination of the needles, of an inner and outer set of dependent warp-guides formed of spring-wire, arranged in concentric circumferential lines, one within the other, the inner set being cranked outward at their lower ends, and the outer set being cranked inward, whereby the eyes formed in these lower ends through which the threads pass, will be brought together and means for actuating said guides; substantially as described.

In testimony whereof I have hereto set my hand in the presence of the two subscribing witnesses.

HENRY HILL.

Witnesses:
MARK SHAW,
ALFRED CLARKE.