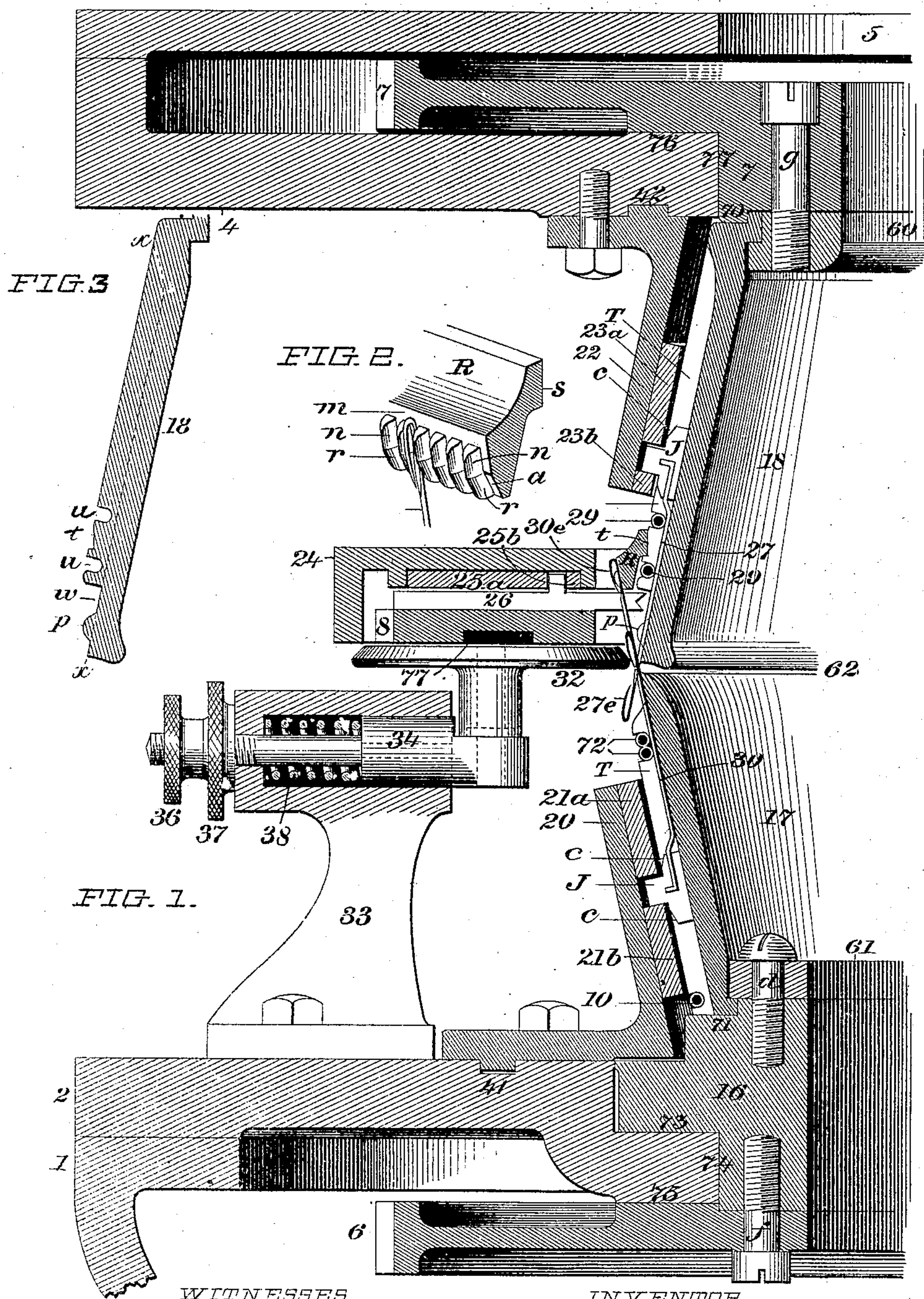


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F. LASHER.
RIB KNITTING MACHINE.
APPLICATION FILED OCT. 1, 1898.

NO MODEL.



WITNESSES.

INVENTOR.

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FRANK LASHER, OF BENNINGTON, VERMONT, ASSIGNOR OF ONE-HALF
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RIB-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 764,607, dated July 12, 1904.

Application filed October 1, 1898. Serial No. 692,377. (No model.)

To all whom it may concern:

Be it known that I, FRANK LASHER, a citizen of the United States of America, and a resident of the village of Bennington, in the county of Bennington and State of Vermont, have invented certain new and useful Improvements in Rib-Knitting Machines, of which the following is a specification.

This invention relates to improvements in knitting-machines by the use whereof it is rendered practicable to use much finer needles than have hitherto been used; to construct machines of much finer gage; to knit much coarser yarn on fine needles or on a fine-gage machine than has hitherto been feasible; to protect the needles against breakage, thereby reducing defects in the fabric caused by broken needles; to greatly increase the range of capacity of the machine for handling all varieties of yarn from the finest and most even and uniform to the coarsest and most rotten, and to run the machine containing these improvements at a much higher rate of speed than otherwise would be practicable, thereby increasing the production. These improvements are specially adapted for use on circular rib-knitting machines, but are capable of other applications. They embrace devices for supporting the heads of the needles when advanced to receive the feed-thread against both rearward and lateral deflection caused by the thrust or wedging action of the sinker-blade in the process of inserting the feed-thread between two adjacent needles. This support is preferably in the form of an annulus or ring which in rib-knitting circular machines is carried on some concentric member of the machine which rotates in unison with the needle-cylinder to the needles of which the feed-thread is supplied, which member in this case is the opposite cylinder, and it may be designed and constructed as an attachable or integral part of such member.

My invention is especially applicable to all machines in which each needle is individually reciprocated, and while the needles are elevated or advanced to the forward limit of their respective strokes the sinker-blades insert the yarn between them to form the loops. It is

well known among users of knitting-machines of this class that when the needles are forced forward or upward to the limit of their stroke while the yarn is being sunk between them they are unsupported except by their attachment in some cases to a driving-jack and by the retaining-bands, by which they are confined in their respective grooves in the needle-cylinder and, their tops being unsupported, are liable to be pushed over backwardly by the sinker-blades forcing and straining the yarn around and against them, and if the sinkers carry a feed-thread which is large or lumpy, so as to crowd the needles apart or to one side while sinking the loops, the tops of the needles are liable to be spread apart sideways to such an extent as to produce long loops or stitches of unequal lengths and otherwise defective.

The main object of this invention is to provide a remedy for these evils, to correct this erratic conduct of the needles, and to enable coarse heavy yarn to be knit upon a fine-gage machine.

Straight smooth rods have been long in use in straight knitting-machines to support the heads or tops of the advanced needles while the feed-thread is being sunk by the sinkers; but the application of such a support to the needles of circular machines has hitherto remained in abeyance on account, among other things, of the diverse nature of the two classes of machines. As the motions of straight knitting-machines are intermittent and successive, while the motions of the circular machines are concurrent and continuous, it has not been so easy to adapt characteristic features of straight machines to circular ones as to adapt circular devices to straight machines. Such straight supporting-bars in straight machines, however, only supported the ends of the advanced needles against the direct thrust of the sinkers, but did not afford any protection against side spreading of the needles, while my improvement not only furnishes a perfect equivalent in a circular machine for the old smooth supporting-bar of the straight machines, but also combines therewith in the same device the means for preventing side

spreading or lateral deflection of the needles while the sinker-blades are sinking the loops. To support the needles for the purposes aforesaid, I have provided sockets or matrices for the needles, into which their tops are forced and where they remain while the sinkers are sinking the yarn to form the stitches or loops. These matrices in circular machines are preferably formed on a hoop or ring by grooving its periphery vertically in line with the needle-grooves of the cylinder with which it coöperates and by making the openings of these grooves toward the tops of the needles which enter them flaring or trumpet-shaped, so that if a needle in its ascent or forward stroke happens to be bent or sprung a little out of line this funnel-shaped mouth will guide its head into the matrix with certainty and without damage to the needle itself or to the yarn. The bottoms of these grooves act to support the needles against the direct thrust of the sinkers in feeding the yarn and the drag or strain of the yarn around the needle-stems after the loops are formed, while the side walls of the grooves resist the tendency of the sinkers loaded with the yarn, if coarse or lumpy, to spread the needles apart sidewise. These matrices are applicable to any kind of knitting-machine in which sinkers are employed, and the piece upon which they are constructed is called a "matrix-ring" or, if straight, a "matrix-bar."

The invention is fully illustrated in the drawings, wherein—

Figure 1 shows a vertical semidiametrical section of a circular rib-knitting machine, taken through the axis of the needle-cylinders. Fig. 2 is a perspective sectional detail of a portion of the matrix-ring drawn to an enlarged scale. Fig. 3 is a longitudinal section of the needle-cylinder which carries the matrix-ring before the grooves are cut.

In carrying out my invention I employ two conical cylindrical needle-beds 17 and 18. The upper cylinder 18 is attached to a gear 7 by means of a flanged clamping-ring 60 and bolts *g*. The upper end of this cylinder, the lower end of the hub of gear 7, and the ring 60 are fitted with shoulders and flanges, as at 70, so as to secure a rigid structure of solidity and concentricity. The hub of gear 7 is turned to fit a circular opening or bearing in the middle of table 4, in which it rotates. The lower cylinder 17 is attached to the gear 6 by means of a separable hub 16 and the clamping-ring 61, the four parts being held together by means of the bolts *d* and *f*, the ring 61 binding the needle-cylinder to hub 16 by means of the concentric flange-joint shown at 71. In the center of the lower table 2 is a central offset or depression, which is centrally bored for a bearing for the hub 16, so that when all the parts are assembled they will form the running joint 73 74 75. The sinker-bed is shown at 8 and is a toothed annulus which runs be-

neath a stationary cover 24 upon a suitable track, the concentric groove 77 resting upon said track. The gears 6 and 7 and the sinker-bed 8 are all of the same pitch diameter and are all driven by pinion-gears on a common shaft, which is not here shown, but is well understood by those conversant with this class of machines. Thus the needle-cylinders and sinker-bed move in unison.

In this development of my invention the matrix-ring is preferably attached to the upper needle-cylinder and coöperates with the lower set of needles; but it may be carried by any concentric member of the machine which revolves in unison with the needles with which said ring coöperates. The upper cylinder is first turned to the shape shown in cross-section in Fig. 3 and is then grooved for the reception of the needles to the depth shown by the dotted line *x x*, Fig. 3. Annular spring-bands *u u* are provided, in which the spring-bands 29 29 are seated. Just enough space exists under these bands for the needles to play freely. The jacks *J J* and needles 27 27 occupy the needle-grooves and are reciprocated by means of actuating-cams 23^a and 23^b in the usual way. Near the extreme lower edge of the upper cylinder is a row of tricks *p p*, which serve to guide the lower ends of the upper set of needles. The conical surfaces of the two cylinders are inclined away from each other sufficiently to permit the introduction of the matrix-ring between the upwardly-projected needles of the lower cylinder and the surface of the upper cylinder. At this point an annular seat *t* is provided, over which the matrix-ring *R* is shrunk or otherwise fitted. The outer edge of this ring is transversely indented or grooved to correspond with the needle-grooves of the lower cylinder, and the lower portion of these grooves is cut back, as at *a*, Fig. 2, to impart the flaring or funnel shaped characteristic previously referred to. By using a tool which leaves the front edges of the tricks thinner than the roots a flare is imparted to the sides of the grooves, as at *v*. These intervals between the tricks constitute the "matrices," and when the needles of the lower cylinder are pushed up by the lower set of cams their heads or tops enter these matrices, as shown at Figs. 1 and 2. As the cloth is drawn out through the gap 62 between the cylinders its drag on the needles tends to draw the needles backwardly down against the bottom of the matrices and needle-grooves of the cylinder, so that there can be no possible movement of the head of the needle while the sinkers are inserting the yarn to form the loops. These matrices may be formed in a variety of ways, and I do not restrict myself to the particular form of detail here shown as applied to circular knitting-machines, but claim all equivalents for that here shown, including any kind of a needle-support located in the relation

hereinbefore described which confines and supports the elevated or advanced tops of the needles against the thrust of the sinkers in the formation of the stitch-loops.

5 The flaring-mouthed matrices, as before shown, for supporting the tops of the needles when advanced to receive the feed-thread are equally as well adapted for straight knitting where all the needles are attached to a com-
 10 mon needle-bar and are reciprocated simultaneously as to cylinder-machines and independently-movable needles, and I claim all such applications of these improvements. As the bottoms of the indentations in the support-
 15 ing-ring, against which the backs of the needles rest when forced backwardly by the thrust of the sinker-blades, collectively considered, are analogous to and perform the same supporting function as a smooth ring
 20 would furnish in the same relation, said smooth or unindented ring is herein regarded as the equivalent of the matrix-ring to that extent.

Having thus described my invention, what I claim as new, and desire to secure by Letters
 25 Patent, is—

1. A needle-head-supporting matrix attached to one of a pair of rotating needle cylinders or beds and located in the longitudinal path of a needle connected with the other
 30 needle-cylinder and outside of the field of action of the sinker-blades in combination with said needle-cylinders, needles and means for reciprocating said needles and actuating said cylinders in unison.

35 2. A pair of needle-cylinders each of which is equipped with a series of independently-reciprocating needles, a corresponding series of devices connected with one of said cylinders adapted to receive and support against lateral
 40 and rearward deflection the heads of the needles of the other cylinder when the same are advanced to receive the feed-thread from the yarn-sinking devices, in combination with a yarn-sinking device or devices adapted to sink
 45 the stitches between said needles and beneath said supports and above the latter cylinder and means for reciprocating the needles and means for supplying the yarn to the sinking devices.

50 3. The described needle-head-supporting matrix adapted for use in the relation to the cylinders and stitch-sinking devices substantially as described, and having a funnel-shaped mouth for facilitating the ready entrance of
 55 the needle-head.

4. The combination with the needle-cylinders 17 and 18 and their respective sets of needles of the matrix-ring R having the tricks
 60 "r", "r", the intervals between which constitute matrices for the support of the heads of the needles of the cylinder 17.

5. The combination of the series of needle-head supports connected with one cylinder, with both cylinders and their needles the
 65 sinker-ring and sinkers and means for actuat-

ing said cylinders, needles, sinker-ring and sinkers, so that the sinkers shall act in a plane between the needle-head supports and the rim of the other cylinder.

6. The combination in a knitting-machine 70 with a grooved needle-bed, a series of independent needles and means for actuating the same of a rigid device for receiving and supporting the heads of the needles against rearward deflection and side spreading due to the
 75 action of the yarn-sinking blades or the loading up of the needles with superfluous yarn, said device consisting of a bar transversely grooved to receive the needle-heads, said grooves being sunk to a depth sufficient to
 80 form partitions which present practically parallel side walls to the needles and project outwardly beyond the axes of the needles sufficiently to positively prevent lateral displacement of the needles in the emergencies inci-
 85 dental to the ordinary conditions of operation.

7. In knitting-machines employing independent needles and stitch-sinking blades, the combination with the needle-bed and needles of a series of fixed matrices or sockets which
 90 receive the heads of the needles above the sinkers, said matrices being open on the side toward the sinkers but recessed to such a depth as absolutely to prevent, by means of the partitions intervening between the needles, any
 95 possible lateral displacement of the needles when entered therein in the normal process of knitting.

8. A matrix-ring for use in circular-knitting machines employing independent needles to re-
 100 ceive and support the heads of the needles during the yarn-sinking operation, indented to receive the needle-heads, substantially as shown, to a depth to have the division-tricks between the needles projecting beyond the bodies of
 105 the needles, constructed and arranged to operate substantially as specified.

9. In a knitting-machine, the combination with a grooved-needle bed, of independent needles to slide therein, and means for actuating
 110 said needles, of a notched bar located in the path of the needles when advanced to receive the feed-thread, adapted to receive the heads of the needles and support them individually against side spreading during the yarn-sink-
 115 ing process, the mouth of each notch being outwardly flared in funnel shape to guide distorted or bent needles into their respectively correct positions, substantially as specified.

10. In combination in a circular spring-needle knitting-machine, a row of independently-
 120 operated spring-needles, a row of independently-operated sinkers encircling the needle row, a supporting-ring encircling the needle row for the hook ends of the needles when the
 125 said needles are advanced to receive the thread from the said sinkers, the independently-operated sinkers being arranged to feed the yarn to the needles intermediate of the support and the needle-bed, substantially as described. 130

11. In combination in a circular spring-needle knitting-machine, a row of independently-operated spring-needles, a row of independently-operated sinkers encircling the needle row, means encircling the needle row for supporting the hook ends of the needles when the said needles are advanced to receive the thread from the sinkers; the independently-operated sinkers being arranged to feed the yarn to the needles intermediate of the hook-end supports and the needle-bed, substantially as specified.

12. The combination in a circular knitting-machine, of a row of independently-operated needles, a row of independently-operated sinkers encircling the needle row, means encircling the needle row for supporting the hook ends of the needles when advanced to receive the thread from the sinkers, said needle-supporting means being carried on a concentric member of the machine which rotates in unison with the needles, the said sinkers being ar-

ranged to feed the yarn to the needles intermediate the hook-end supports and the needle-bed with which they are connected, substantially as specified.

13. The combination in a circular knitting-machine of a needle-bed and independent needles, a concentric sinker-bed and independent sinkers, and a concentric supporting device connected with one of said beds adapted to support the needles by their heads when advanced to receive the feed-thread from the sinkers, with means for actuating said needle-bed and needles, and sinker-bed and sinkers, substantially as specified.

Signed by me at Bennington, Vermont, this 10th day of September, 1898.

FRANK LASHER.

Witnesses:

FRANKLIN SCOTT,
EMILY SCOTT.