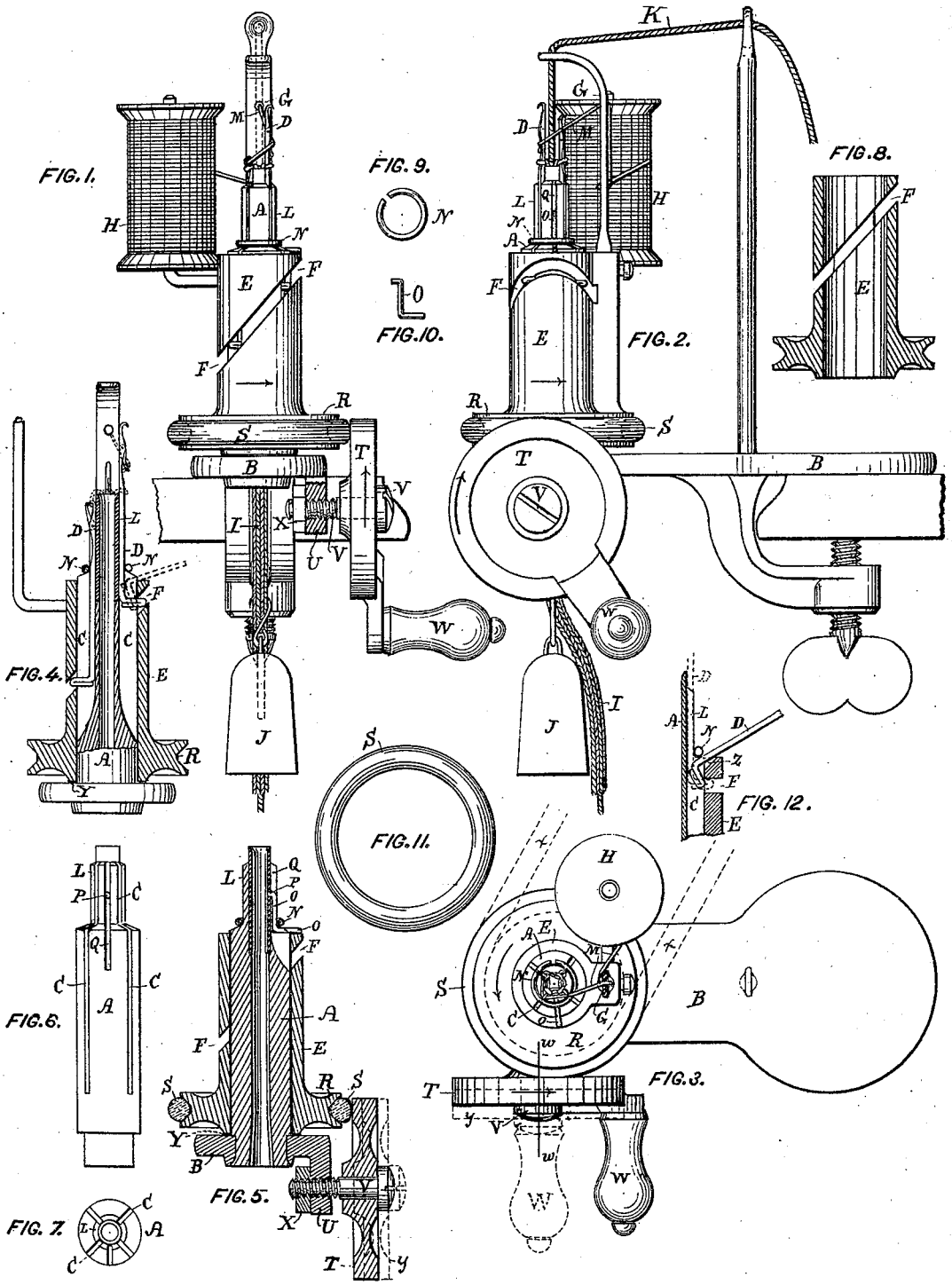
E. TIFFANY.

CIRCULAR KNITTING-MACHINES.

No. 184,483. Patented Nov. 21, 1876.



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IMPROVEMENT IN CIRCULAR-KNITTING MACHINES.

Specification forming part of Letters Patent No. **184,483**, dated November 21, 1876; application filed May 1, 1875.

To all whom it may concern:

Be it known that I, ELI TIFFANY, of the village of Bennington, in the county of Bennington, in the State of Vermont, have invented certain new and useful Improvements in Circular-Knitting Machines, of which the following is a specification, reference being had to the accompanying drawing.

This invention relates to circular-knitting machines in which the needles, in knitting, are separately slid to and fro endwise, in outside longitudinal grooves in a stationary cylinder, by the butts of the needles projecting radially outward into a cam-groove in and around a rotary hollow cylinder immediately surrounding the said fixed needle-cylinder.

One part of this invention consists in the combination of the needle-cylinder, having its lower portion of larger diameter and with deeper needle-holding grooves than its upper portion; a divided ring, secured upon the smaller portion of the needle-cylinder, so as to retain the needles in the grooves thereof, and having an opening between its ends as wide as a needle-groove and made circularly adjustable around and upon the needle-cylinder, so as to be capable of releasing any one of the needles while retaining the others; and the cam-cylinder mounted to turn upon the larger portion of the needle-cylinder without turning the said needle-holding ring, and having the upper side of its cam-groove continuous, so that no needle can be displaced nor drawn out of the needle-cylinder lengthwise of the grooves therein, and one part of the cam-groove being arranged so near to a part of the upper end of the cam-cylinder as to there permit any needle, when released by the circular adjustment of the needle-holding ring, to be separately turned outward, and thereby withdrawn from the cam-groove and needle-cylinder.

Another part consists in the combination, with the needle-cylinder and the removable cam-cylinder, of a removable guard, having its upper end inserted in a perforation in the needle-cylinder and its lower end extended over the even upper end of the cam-cylinder, and its middle part secured in a longitudinal groove in the needle-cylinder, by means of the divided circularly-adjustable needle-retaining ring around the cylinder, so that the said guard shall retain the cam-cylinder in its proper working position on the needle-cylinder in opposition to the pull of the needles in knitting, and can be readily detached, so as to permit the free endwise movement and removal of the cam-cylinder upon and from the needle-cylinder, for convenience in cleaning.

Another part consists in the combination, with the stationary needle-cylinder and the rotary needle-reciprocating cam-cylinder surrounding the needle-cylinder, and having a step or end bearing at its base, of an elastic friction-ring, secured to and projecting concentrically around the said cam-cylinder, and a rotary disk, held with one side against the said elastic ring and mounted on an axis directed to one side of, or away from, the axis of the cam-cylinder, so that the rotation of the said disk shall, by friction, revolve the cam-cylinder, and, at the same time, tend to press the latter downward against its end bearing or step, in opposition to the tendency of the needles in knitting to draw the cam-cylinder in the opposite direction.

Another part consists in the combination, with the stationary needle-cylinder and the cam-cylinder surrounding the needle-cylinder and having a concentric grooved pulley fast thereon, of a removable elastic friction-ring in and projecting beyond the groove of the pulley, and a rotary disk, bearing at one side against the said projecting friction-ring, and mounted on an adjustable stud or axis, by which the said rotary disk can be conveniently adjusted to bear against the said friction-ring with more or less pressure, according to the various degrees of power required to turn the cam-cylinder in knitting, and can be readily removed or adjusted away from the said pulley and friction-ring, so that the latter can be freely removed from the pulley, and so as to permit the cam-cylinder to be revolved by a power-driven belt or band running in and around the pulley-groove of the cam-cylinder.

In the aforesaid drawing, Figure 1 is an elevation of one side, Fig. 2 an elevation of the other side, and Fig. 3 a plan, of a circular-knitting machine which embodies all the aforesaid parts of this invention. Figs. 4 and 5 are partial central sectional elevations

of the same machine. Fig. 6 is a side elevation, and Fig. 7 is a plan, of the tubular needle-cylinder of the same machine; and Fig. 8 is a central section of the needle-reciprocating cam-cylinder thereof. Fig. 9 is a plan of the divided ring for holding the needles in the needle-cylinder. Fig. 10 is a side view of a removable guard for retaining the cam-cylinder upon the needle-cylinder; and Fig. 11 is a plan of the removable elastic friction-ring of the pulley-groove on the cam-cylinder. Fig. 12 is a section of the upper part of one side of a tubular needle-cylinder and cam-cylinder, showing a modification of the first aforesaid part of my invention.

Like parts are marked by like letters in the different figures; and the arrows therein indicate the directions in which the contiguous parts move.

A is the tubular needle-cylinder, which is fast at one end, in the machine, to a base, B, and has outside grooves C, in which are the stems of the latch-needles D, and from which the butts of the needles project into the cam-groove F, in and around the tubular cylinder E, so that by turning the latter the needles are slid to and fro endwise in the cylinder A, and in respect to the upper end of the latter and to a yarn-guide, G, on the cylinder E, so as to knit a tube when the yarn M is delivered to the needles by the guide G from a spool, H, carried by the cam-cylinder.

Figs. 1, 2, and 3 represent the machine in knitting operation, with the knitted tube I drawn off through the cylinder A by a weight, J; and in Fig. 2, a cord, K, is introduced and covered as the knitting progresses.

The slotted upper part L of the needle-cylinder, above the cam-cylinder E, is smaller in diameter than the portion within the cam-cylinder, and has its outer surface nearly even with the outer sides of the stems of the needles in the grooves C, and is tightly surrounded by a divided ring, N, Fig. 9, which retains all the sliding needles in the slots C when the opening between the ends of the divided ring is opposite to a space between two slots. The divided ring N can be turned so as to bring the opening that is between its ends opposite to each of the grooves C; and the radial depth of the grooves C within the cylinder E is so great, and the continuous upper side of the highest part of the groove F is so near to the upper end of the cylinder E, as shown in Fig. 4, or that cylinder is there so notched on top, as indicated at Z in Fig. 12, that when the highest part of the groove F and the opening between the ends of the divided ring N shall both be temporarily adjusted opposite to any one of the slots C, the needle in that slot can then be turned outward through the opening in the ring N, and out of the continuous upper part of the cam-groove F, and then removed from the machine, and reinserted therein, as indicated in Figs. 4 and 12, without removing either the needle-holding ring N or the cam-cylinder E, or any part thereof, and without having any part of the upper side of the cam-groove F removed, either temporarily or permanently.

As there is no opening nor removable part in the upper side of the cam-groove F at the place where the needles are taken out and inserted, the needles cannot there be displaced, withdrawn, nor introduced in the lengthwise direction of the grooves in the needle-cylinder; and as the divided needle-holding ring N is made stationary, but adjustable, on the needle-cylinder A, and is not connected with the cam-cylinder E, the latter revolves without turning the needle-holding ring or causing any friction or wear of the latter against the needle-cylinder.

O, Fig. 10, is a removable guard, having its upper part inserted in a perforation, P, Figs. 5 and 6, in the cylinder A, and having its middle part held in a slot, Q, in that cylinder by the divided ring N, and having its lower part extended outward over the even top end of the cam-cylinder E, so as to surely retain the latter upon the needle-cylinder in opposition to the upward pull of the needles thereon in knitting; and yet so that by turning the ring N, so that the opening between its ends shall be opposite to the slot Q, the guard O can then be readily removed from the cylinder A, so as to permit the cam-cylinder to be raised upon and removed from the needle-cylinder in cleaning the machine without removing or detaching the said divided needle-holding ring.

S is a friction-ring of india-rubber or other suitable elastic material, which is secured to, and projects concentrically around and from, the cam-cylinder E; and T is a metallic or other suitable disk, having a handle, W, and mounted to be turned by hand on a stud, V, and with one side against the friction-ring S, so that by turning the disk T the cam-cylinder E will be revolved by the frictional adhesion of the disk T against the ring S. The stud V is arranged so that the line of the axis of rotation of the driving-disk T, indicated by the line *w w* in Fig. 3, is directed away to one side of the axis of the ring S and cylinder E, in order that, in turning the disk T in the direction required in knitting, as indicated by the arrow thereon, that disk shall not only turn the cam-cylinder E, but shall at the same time press that cylinder down against its end bearing or step Y, Figs. 4 and 5, in opposition to the tendency of the needles in knitting to raise the cylinder E off from its said step or end bearing.

In order that the driving-disk T may be pressed against the elastic ring S with the proper greater or less force, according to the power required to properly revolve the cylinder E in knitting various grades and kinds of yarn and fabrics, and to permit the cam-cylinder E to be conveniently revolved by power, instead of by hand, whenever that shall be desirable or necessary, the stud V is made with a screw extending through a lug-nut, U, Figs. 1 and 5, fast on the bed B, and with a jam-nut, X, whereby that stud can be adjusted so

as to press the disk T against the elastic ring S with greater or less force, and so as to let the disk T be away from the ring S, as indicated by dotted lines at *y* in Figs. 3 and 5, or be removed entirely therefrom; and the ring S is in a grooved pulley, R, on the cylinder E, and can be readily sprung out of and removed from that pulley when the disk T is away; and then a driving-band can be passed around the pulley R, as indicated by dotted lines at *x* in Fig. 3, and the machine thereby driven by power.

What I claim as my invention is—

1. The combination of the grooved needle-cylinder A, having a part, L, of smaller diameter than the other part, the divided needle-holding ring N, secured to and circularly adjustable upon the smaller part of the needle-cylinder, and the cam-cylinder E, mounted to turn on the larger part of the needle-cylinder without turning the needle-holding ring, and having the upper side of its cam-groove F continuous and at one point formed and arranged in respect to the end of the cam-cylinder, as described, so as to permit a needle to be turned outward, and thereby withdrawn when released by the adjustment of the divided ring, as described.

2. In combination with the needle-cylinder A, provided with the perforation P and groove Q, and the removable cam-cylinder E, the detachable guard O, and the divided ring N, the guard having one end part in the said perforation, and the other end part over the end of the cam-cylinder, and the middle part secured in the said groove by the divided ring, substantially as described.

3. In combination with the fixed needle-cylinder A and rotary cam-cylinder E, having the elastic friction-ring S thereon, and the fixed step or end bearing Y, the rotary driving-disk T, having one side pressed against the said friction-ring, and its axis arranged at one side of the axis of the cam-cylinder, substantially as shown and described.

4. In combination with the fixed needle-cylinder A and rotary cam-cylinder E, having the grooved pulley R thereon, the removable elastic friction-ring S in the groove of the pulley, and the removable rotary driving-disk T, mounted on the adjustable stud V, substantially as described.

In testimony whereof I hereunto set my hand this 28th day of April, 1875.

ELI TIFFANY.

Witnesses:

JOHN V. HALL,

FRANK W. POOLER.