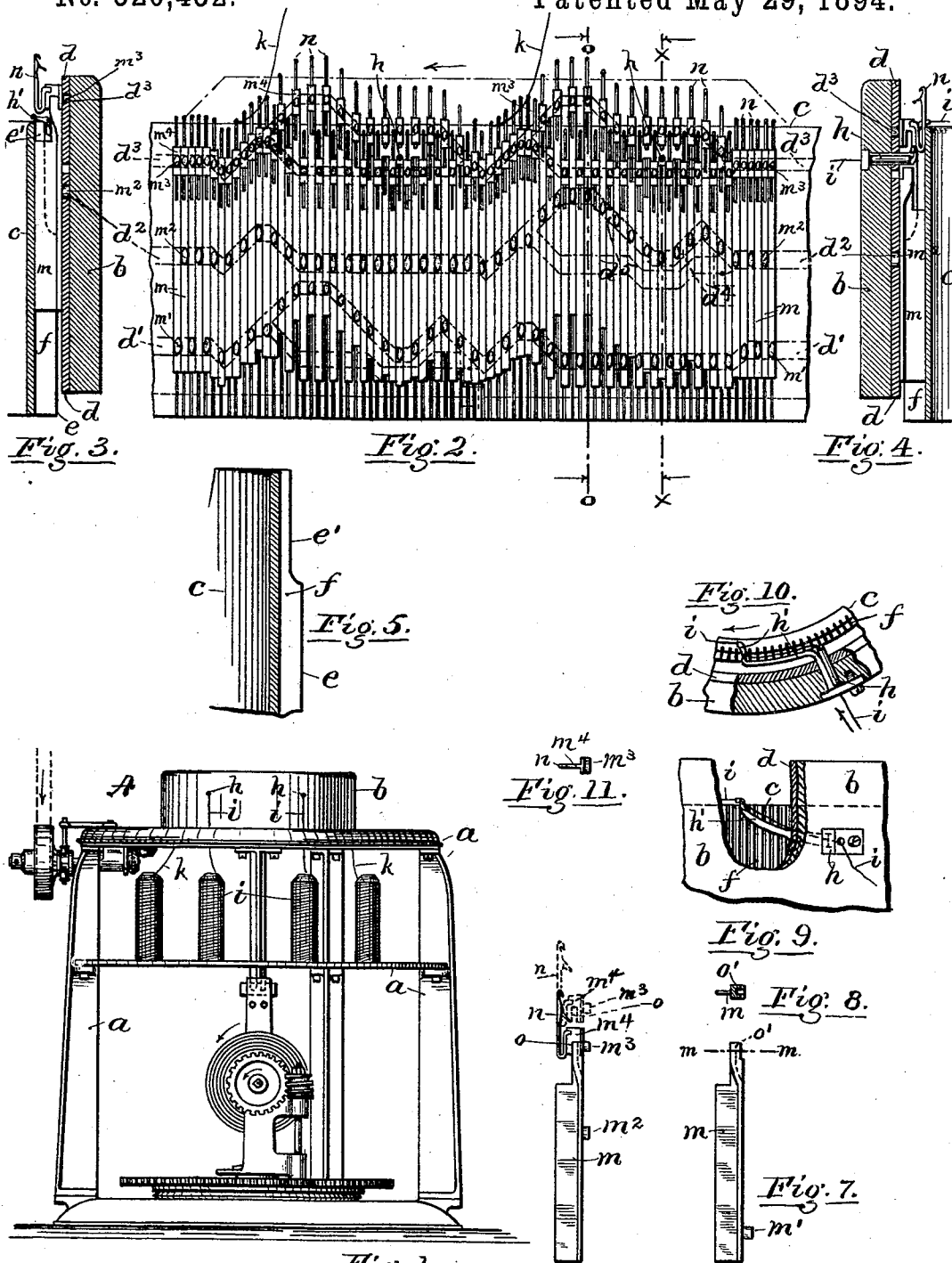


(No Model.)

L. E. SALISBURY.
KNITTING MACHINE.

No. 520,452.

Patented May 29, 1894.



Witnesses:
Charles W. Boardman.
Fred. Arnold

Fig. 6.
Inventor,
Levi E. Salisbury,
by Remington & Henshaw
Attys.

UNITED STATES PATENT OFFICE.

LEVI E. SALISBURY, OF PROVIDENCE, RHODE ISLAND.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 520,452, dated May 29, 1894.

Application filed January 15, 1894. Serial No. 496,948. (No model.)

To all whom it may concern:

Be it known that I, LEVI E. SALISBURY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

15 In certain types of knitting machines the mechanically actuated needles are arranged to travel up and down in grooves formed in the main or needle-carrying cylinder. Machines of this class are termed circular knitting machines. I have invented a machine of the kind referred to, the same having been patented to me March 20, 1888, No. 379,819; in said patented machine, however, I use two needle-carrying cylinders revolving in unison, one being mounted above the other so as to form a narrow space between them from which the work extends. There are objections to the use of double cylinders owing to the fact that the grooves or slots of one cylinder do not always coincide with those of the other, so that when in operation one or more of the needles are liable to get "trapped" in passing from one cylinder to the other. Whenever this occurs the shanks of such needles become cut or broken by the cams and the partitions between the slots bent, the result being to wedge pieces of the needles between the cylinders and the cams, thereby not only producing imperfect work but causing a stoppage of the machine and necessarily increasing the cost of maintenance. In order to overcome the objections just referred to and at the same time retain all the advantages resulting from the use of double cylinders I have devised the improvements forming the subject of my present application for Letters Patent. In this device, however, I employ but one needle-cylinder, the same being peculiarly constructed and provided with two series of separable needle-carriers or jacks arranged to travel in and be actuated

by a corresponding series of stationary cams. By means of my improvement the filling-thread is introduced from the front and is carried to the top of the cylinder and at the rear of the needles by a fixed guide; the needle-carriers mounted in the revolving cylinder being automatically separated just before reaching the filling-thread guide and reunited after passing the same, all as will be more fully hereinafter set forth and claimed.

In the accompanying sheet of drawings, Figure 1 is a side elevation of a circular knitting machine provided with my improvement. Figure 2 is a side view, enlarged, showing a portion of the cylinder and the carriers mounted therein, and also showing, by broken lines, the form and arrangement of the cams for actuating the carriers. Figure 3 is a transverse sectional view, taken on line *o o* of Fig. 2. Figure 4 is a similar view, taken on line *x x* of Fig. 2. Figure 5 is a sectional view of the cylinder, the carriers being removed. Figure 6 is a side elevation of one of the carriers and needles. Figure 7 is a similar view of the carrier, without the needle. Figure 8 is a horizontal sectional view, taken on line *m m* of Fig. 7. Figure 9 is a partial side view of the stationary cylindrical cam-frame or holder, a portion being broken away to show the cylinder and filling-thread guide. Figure 10 is a corresponding plan view, and Fig. 11 is a plan view of the needle and holder corresponding with Fig. 6.

In the drawings A, Fig. 1, indicates a knitting machine having my improvement. The frame portion *a* is or may be made substantially as usual and provided with any well known form of driving and take-up mechanisms. The vertical needle-carrying cylinder *c* is mounted to revolve within the fixed circular casing *b*, the latter having cam plates *d* secured to its inner or concave face. The cylinder *c* is provided with vertical grooves or slots *f* in its periphery to receive the needle-jacks *m*. The upper portions *e'* of the partitions *e* between the grooves are reduced in depth transversely thus making the cylinder correspondingly smaller in diameter, as shown in Fig. 5, &c. In these grooves the jacks *m* are fitted to travel up and down; the jacks are substantially T-shaped cross-sectionally

and are reduced at the upper end and also vertically slotted, as at o' , Figs. 7 and 8, to form a seat for the supplemental or short jack m^4 . The latter are provided each with an opening o in its under side to receive the adjacent end of the main jack; by means of this arrangement it will be seen that the parts m and m^4 are detachably secured together, the short jacks carrying the needles n . The main or bottom jacks m are placed side by side, the alternate ones being provided each with a shank or projection m' at or near the lower end and the intermediate ones with shanks m^2 about midway of their length; the short jacks m^4 each having a shank m^3 . These several shanks are adapted to run in suitably shaped cam grooves, soon to be described. The cam-plates d are secured to the casing b and are arranged so as to form upper, intermediate and bottom cam grooves d^3 , d^2 and d' , respectively, adapted to receive the corresponding shanks m^3 , m^2 and m' of the needle-jacks. The upper cam d^3 (Fig. 2) is provided at intervals with two channels adapted to divert some of the needles upwardly above the cylinder while at the same time the remaining or intermediate needles are carried along with their ends substantially flush with the top of the cylinder. The bottom cam d' being so constructed that it is practically parallel with that portion of the upper cam which maintains said intermediate needles in position. All the needles that are thus diverted upwardly have the corresponding supplemental jacks m^4 successively detached or uncoupled for the time being from the main jacks m through the medium of the shanks m^3 during their passage along the downwardly inclined portion d^4 of the middle cam-groove d^2 . This vertical separation of the jacks is effected before they arrive at the point where the filling thread i is introduced through the fixed tubular guide h , thus permitting the jacks to freely pass by the inwardly projecting end of the guide, after which they are reunited by means of the rising portion d^5 of the middle cam. The said filling-thread guide h is removably secured to the casing b , see Figs. 9 and 10, and extends through it and the cam-plates and nearly to the faces of the upper portion e' of the partitions f of the cylinder. The guide is provided with a bent extension h' which carries and actually delivers the thread i to the back of the needles and just above the needle-cylinder. It will be seen that the upper jacks m^4 while passing the guide h are completely detached from the bottom jacks m , or in other words they are separated by a distance exceeding the diameter of the guide, see Fig. 4. When thus detached or disconnected the upper jacks are guided and held in position by the vertical cylinder grooves, the shanks m^3 preventing the jacks from endwise movement by means of their engagement with the upper cam groove d^3 .

The knitting-thread k is introduced to the needles in advance of the filling-thread, the latter being delivered under the needle when it is wholly out of the cylinder, although coupled to its lower jack or carrier m . Fig. 3 shows the corresponding relation of the needle to the cylinder. I would further state in explanation of the manner of introducing the filling-thread i that the rear end of the tube or fixed guide h extends through the circular casing b and cam-plates d and just clears the face of the reduced portion e' of the cylinder, as clearly shown in Fig. 10, for the purpose of delivering the yarn i to the rear of the reduced portion of the upper end of the main jacks m while the latter are separated from the short jacks m^4 (see Fig. 4) and before they are reunited. Now, in order to guide the thus delivered portion of the yarn to the top of the cylinder and above the hooks of the alternate, or for the time being non-separated or depressed advancing needles, the guide h is provided with a lateral arm h' (Figs. 9 and 10), the same extending upwardly and partly around the cylinder, in the space formed between the cylinder and cams, and terminating in an eye located above and extending practically to the inner face of the cylinder. Thus it will be seen that the yarn is actually delivered to the top of the cylinder there to be combined with the knitting threads, thereby avoiding the said depressed advancing needles which apparently are in the path of the guide.

It will be apparent from the foregoing that the filling-thread is laid to the backs of all the needles. It is trapped into the fabric by reason of the fact that the loops or stitches of those needles which are projected entirely out of the cylinder are held in the bent lower ends of said needles, the loops thereof being correspondingly elongated or stretched. The filling-thread is delivered by the end h' of the guide between and across the front of the elongated loop of the adjacent lifted needle and the corresponding side of the loop held in the hook of the adjacent alternate or depressed needle. Now, in order to trap the filling-thread into the fabric the combined action of the revolving cylinder and the needle-actuating cams causes the raised needles to descend in front of the filling-thread and the lower needles to rise in front of said thread, thereby inclosing the thread between and to the front and rear alternately of the two series of loops. In this position the filling-thread is ready to be locked into the fabric by the knitting-thread in the usual manner. Thus it will be seen that by projecting the needles entirely out of the cylinder I am enabled to introduce the filling-thread to the front and rear of the stitches or loops alternately so that it will appear on both sides of the fabric. While the cams as drawn are arranged to change the direction of the needles alternately at certain points, it is obvious

that different effects may be produced in the knitted goods by changing the form of the cams, the location of the jack-shank being changed correspondingly.

5 I claim as my invention—

1. In a knitting machine, the combination with a rotatable cylinder having vertical grooves in its peripheral surface, and a fixed thread guide, of lower or main jacks mounted in said grooves, upper jacks also mounted in the grooves and interlocking with the lower jacks, needles secured to the upper jacks, and a series of combined fixed cams and guides in engagement with the jacks, arranged
15 whereby the upper jacks are separated from the lower jacks and reunited therewith contiguous to said thread-guide and having the needles projected entirely out of the cylinder and returned thereto, substantially as described.
20

2. In a knitting machine, the combination with a rotatable cylinder having vertical grooves formed in its peripheral surface, of a series of separable interlocking jacks or needle-carriers mounted in said grooves, a stationary thread-guide mounted in the path of the carriers, and means for separating and reuniting the jacks automatically during the rotation of the cylinder, substantially as described.
25 30

3. In a knitting machine, the combination

with a rotatable cylinder having parallel grooves formed in its periphery longitudinally and a stationary filling-thread guide having its inner or delivery end located contiguous to the grooved portion of said cylinder, of separable needle-carrying jacks or carriers movable in said grooves and stationary cams and guides in engagement with the jacks for both moving the latter endwise in the grooves of the revolving cylinder and for separating them so as to pass said filling-thread guide and reuniting them after passing the same, substantially as described. 35 40

4. In a knitting machine, the combination with a rotatable cylinder provided with vertical grooves, and a fixed thread-guide, of combined interlocking main and upper jacks mounted in said grooves, needles secured to the upper jacks, means for separating and reuniting the main and upper jacks so as to pass said thread-guide and means for projecting the needles completely out of the cylinder and retracting them into the cylinder again automatically, substantially as described and for the purpose set forth. 45 50 55

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

LEVI E. SALISBURY.

Witnesses:

GEO. H. REMINGTON,
JOHN T. HENTHORN.