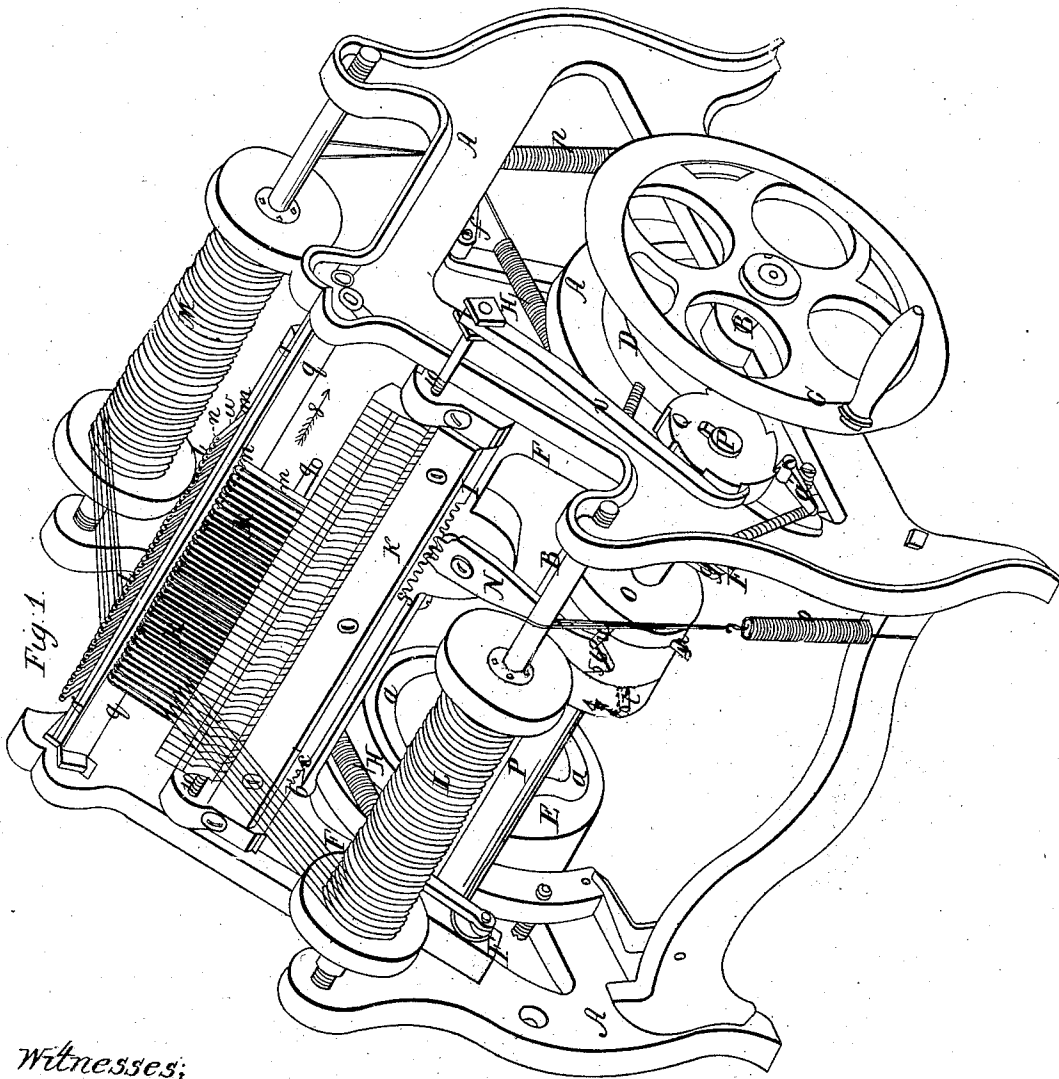
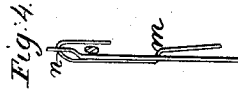
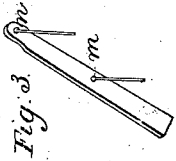


Sheet 1-2, Sheets.

S. Wallis.
Knitting Mach.

N^o 44,568.

Patented Oct. 4, 1864.



Witnesses;
N. W. Stearns
J. C. Fethermaugh

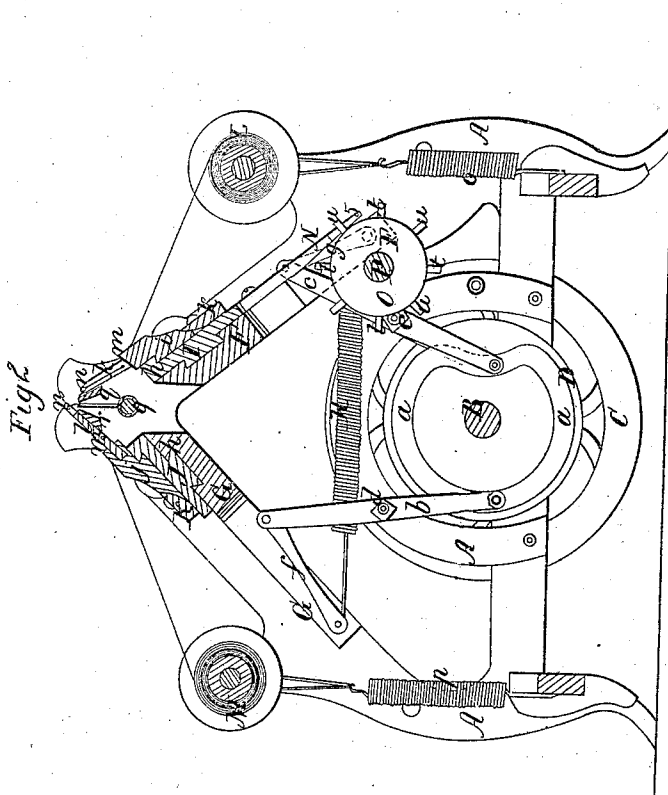
Inventor;
Samuel Wallis

Sheet 2 - 2 Sheets.

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N. W. Stearns.
R. E. Johnson

Inventor;
Samuel Wallis

UNITED STATES PATENT OFFICE.

SAMUEL WALLIS, OF TOWNSEND, MASSACHUSETTS.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 44,568, dated October 4, 1864.

To all whom it may concern:

Be it known that I, SAMUEL WALLIS, of Townsend, in the county of Middlesex and State of Massachusetts, have invented an Improved Knitting-Machine, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of my improved machine. Fig. 2 is a vertical transverse section through the same, looking in the direction of the arrow 8, Fig. 1; Figs. 3 and 4, details to be referred to hereinafter.

My invention has for its object to simplify the construction of knitting-machines, and thereby reduce their cost; and it consists in the employment of a series of double-acting guide-needles, acting alternately as thread-guides and needles, which are secured to needle-bars working on planes inclined to each other at right angles, or nearly so, by the use of which needles I am enabled to dispense with the "jacks," "stakers," "pressers," and "latches" usually employed, and the liability of the needles to break is also greatly reduced.

My invention also consists in drawing the loops off the ends of the needles by means of two stationary draw-bars, running lengthwise of the machine and placed one on each side, between which the finished work passes; and my invention also consists in reciprocating the needle-bars and needles laterally, when said needles act alternately as needles and guides, so as to connect or interlace the work as it progresses.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, (which represent a machine for knitting worsted lace,) A is the frame-work of the machine, in suitable bearings, in which runs the driving-shaft B, which carries at one end the fly-wheel C, and at its opposite ends, within the frame-work, the wheels D and E, in each of which is cut a cam-groove, *a*. (As the wheels D and E, with their cam grooves and connections, are exactly alike, I will describe but one, referring particularly to Fig. 2.)

b c are two levers pivoted to the frame-work at *d e*, and carrying rolls at their lower ex-

tremities, which work in the cam-groove *a* of the wheel D. To the upper ends of these levers are pivoted the arms *f g*, which are also pivoted at their opposite ends to the carriages F G, which slide up and down on inclined ways on the frame-work A, the form of the groove *a* being such that as the wheel D is revolved the carriages F G, through the connections described, will be alternately moved up and down on their ways as required.

H is a spiral spring, (there being one on each side of the machine,) secured at its opposite ends to the carriages F and G, which serves to lessen the friction of the operating parts.

I J are two needle-bars, which are furnished with tenons which are adapted to and slide in dovetailed grooves in the carriages F and G, for a purpose that will be hereinafter described. To these needle-bars are secured the needle-holders *i j*, which are formed of soft metal, with a notch, *h*, which fits into a groove in the needle-bars, their lower ends being beveled and held in place by a plate, K, screwed down firmly to the carriage, and they are confined in place laterally by means of screws 10. From these needle-holders project the needles *k l*, each of which is formed of a flat piece of steel with a hole, *m*, a little below the center of its length, and a hole or eye, *n*, at its upper end, which is bent so as to form a shoulder, as seen in Figs. 1, 3, and 4. A groove, *w*, for the yarn to lie in, is made in each needle from the hole *m* to the eye *n*, as seen in Fig. 1.

L M are two spools or yarn beams, the shafts of which run in bearings in the frame-work and have the necessary amount of friction applied to them by means of springs *o p* in a well-known manner. The ends of the yarn are led from these spools to the needles and passed through the holes *m n*, as seen in Fig. 4, and then passed down between the draw-bars *q r* and secured to a weighted roll, 9, so as to give the requisite amount of tension to the work. These draw-bars are of a triangular form in cross-section, with their upper edges beveled off and extend lengthwise of the machine, being made adjustable by means of screws and inclined slots in the frame-work, so that their distance apart may be varied as desired. As the needles *k l* are operated past each other, a series of loops will be formed alternately on each row *k* and *l*, which are drawn

off, as the needles descend, by means of the draw-bars *q r* passing down between them, and forming a round braid or fringe.

To connect the work and form it into lace, the needle-bars and needles are reciprocated laterally independent of their up and down motion, so as to interlace and connect the loops with each other throughout the whole length of the work, which is accomplished in the following manner:

N is a lever pivoted to a projection on the lower side of the carriage *F*, and furnished at its upper end with teeth, which engage with a rack, *s*, on the lower side of the needle-bar *I*. The lower end of this lever *N* is flattened out, as seen in Fig. 1, and is formed with two inclined sides, 5 and 6, which strike alternately against a series of pins, *t u*, projecting from a drum, *O*, on a shaft, *P*, having its bearings in the frame-work *A*. These pins *t u* are set into the drum at equal distances apart, the former being placed opposite to the center of the spaces between the latter. To one end of the shaft *P* is secured a ratchet-wheel, *Q*, which is revolved at intervals by means of a pawl, *r*, pivoted to the rod 10, projecting from the needle-bar *I*, so that at each upward motion of the carriage *F* the shaft *P* and drum *O* will be revolved a distance equal to that between the teeth of the ratchet-wheel, so as to bring a different pin of the series *t* or *u* into a position to be struck by the inclined side 5 or 6 of the traversing lever *N* on the descent of the carriage *F*, the drum *O* being held from revolving in a direction contrary to the arrow 7 by a retaining pawl, *a'*, which engages with the ratchet-wheel *Q*. The traversing lever *N* is thus vibrated in one direction on the descent of the carriage *F* and in the opposite direction on its next descent, causing the needle-bar *I*, with its needles, to be reciprocated back and forth in a lateral direction at the required intervals, so as to interlace and connect the loops with each other, the needle bar being steadied and held firmly in place after each vibration by means of a spring-catch, *b'*, attached to the carriage *F*, which falls into one of a series of notches, *c*, in the needle-bar *I*, the form of the notches being such that the catch will be drawn out of them when the needle-bar is vibrated.

The needle-bar *J*, on the opposite side of the machine, may be reciprocated laterally in the same manner as the needle-bar *I*, in which case the work will be connected at every loop instead of at every two loops, as is the case when one needle-bar only is reciprocated, as above described; or the needle-bar *J* may receive no lateral motion and a portion of the pins may be removed from the drum *O* and the intervals between the lateral movements of the bar *I* be increased, so as to cause a number of loops to be formed before the work is connected, thus varying the size of the meshes and the pattern as may be desired; or either needle-bar may be reciprocated laterally without the other, or they may be reciprocated alternately, and

it will be seen that a great variety of patterns may thus be produced by varying the lateral movements of one or both of the needle-bars.

When a fringe is required at the end of the article being knit, the pawl *r* is disconnected from the ratchet-wheel *Q*, and the needles are operated without any lateral movement, which causes each needle with its thread to knit a separate chain, the whole series forming a fringe.

Operation: The parts being in the position shown in Figs. 1 and 2, the yarn from the spools *L M* is first passed through the lower holes, *m*, in the needles *k* and *l*, and thence along the grooves *w* in the needles and through the eyes *n* in their upper extremities, after which it is passed down between the draw-bars *q r* and secured to a weighted roller, 9, so as to give the proper degree of tension to the work, as in ordinary knitting-machines. The machine being now put in operation, the needle-bar *I* commences to move upward and the points of the needles *k* pass in between the shoulder or "cramp" of the needles *l* on the opposite side and the yarn, as seen in Fig. 4, the needles *k* thus acting as guides. The needles are now drawn down, leaving a row of loops on the needles *k*. The needles *l* then commence to ascend and pass in the same manner as above described between the cramp of the needle *k* and the yarn to form a second row of loops. The needles *k* are now drawn down, leaving a row of loops on the needles *l*, and the row of loops left on the needles *k* by the needles *l* is drawn off by the draw-bar *q* and the tension on the work, and the operation is continued alternately in the same manner. This forms a round braid composed of two strands, the whole series of which forms a fringe. To connect this work and form it into lace, the needles are reciprocated laterally, as before described, the reciprocation taking place as soon as the needles are clear of each other, which causes each needle *k* to take a loop from a different one of the needles *l* from that which it did in making the fringe, thus interlocking the loops with each other.

For the proper operation of the machine it is necessary that the number of threaded needles *l* be one less than the number of threaded needles *k*, so as to prevent the dropping of loops at the edges of the work, when the needles are reciprocated laterally.

Where both sets of needles *k* and *l* are reciprocated laterally, a different stitch is made and the work is knit closer.

Instead of the needle-bars *I J* being inclined at an angle of forty-five degrees, as shown, they may be inclined at any desired angle; or one may work in a vertical and the other in a horizontal plane, and the needles *k l* may pass each other at a different angle from that shown without departing from the spirit of my invention.

I am aware that bars carrying ordinary hooked needles have been reciprocated later-

ally. In my invention I use a peculiar instrument, which acts alternately as a needle and a guide, and when the bar containing these instruments in my case reciprocates it becomes a guide-bar, and it is for this additional function of the reciprocating bar that I desire to make claim.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The double-acting guide-needles *k l*, acting alternately as thread-guides and needles, substantially as set forth.

2. The draw-bars *q r*, for the purpose of drawing off the loops from the needles, operating substantially as described.

3. In combination with needles which act alternately as needles and guides, reciprocating one or both of the needle-bars *I J* laterally by any suitable device, for the purpose of interlacing or connecting the work, substantially as set forth.

4. The wheels *D* and *E* with their cam-grooves *a*, for operating the carriages *F* and *G* and the needle-bars *I J*, substantially as set forth.

SAMUEL WALLIS.

Witnesses:

E. G. FARNHAM,
EMMA M. DONGER.