J. Y. Leslie.

Straight Knitting Mach.

No. 11,731.

Patented Oct. 3, 1854.

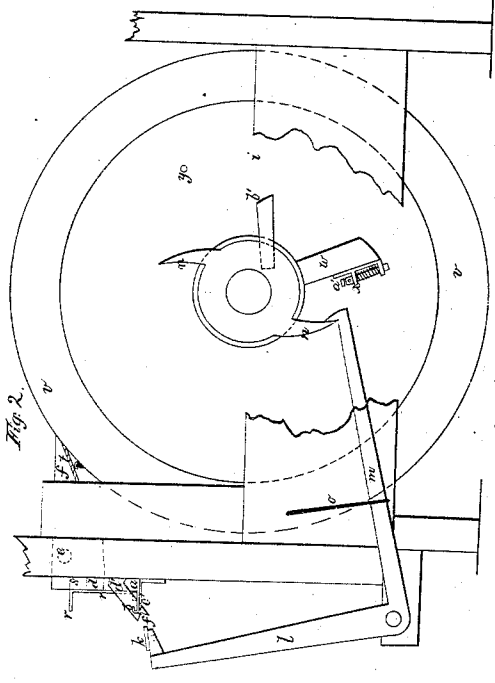

Fig. 2.

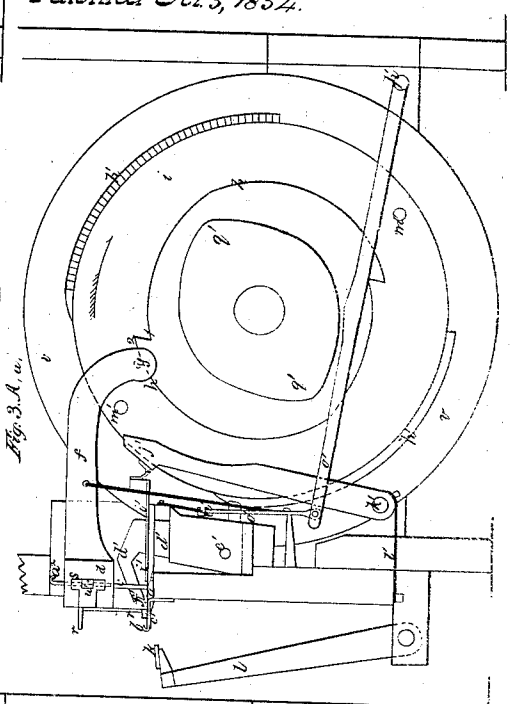

Fig. 3. A. a.

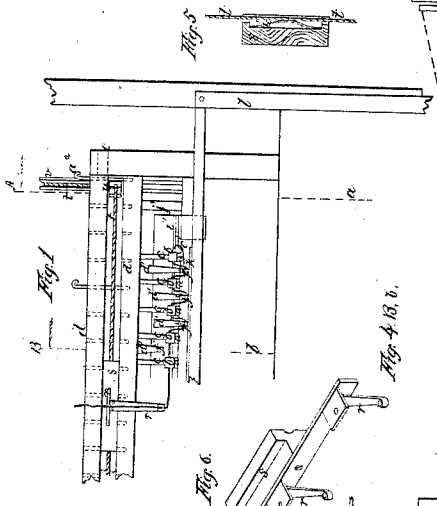

Fig. 1.

Fig. 5.

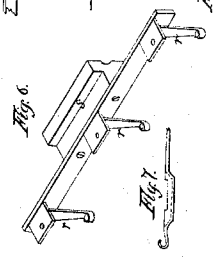

Fig. 6.

Fig. 7.

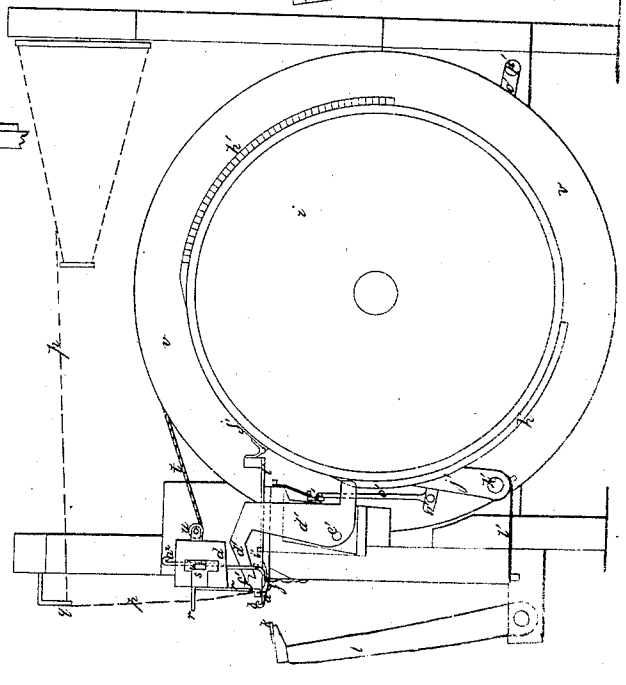

Fig. 4. B. b.

UNITED STATES PATENT OFFICE.

JAMES Y. LESLIE, OF CINCINNATI, OHIO.

KNITTING-MACHINE.

Specification of Letters Patent No. 11,751, dated October 3, 1854.

To all whom it may concern:

Be it known that I, JAMES Y. LESLIE, of Cincinnati, Ohio, have invented certain new and useful Improvements in Knitting-Looms, 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 front elevation of a part of the machine; Fig. 2, a side elevation with part of the side frame removed to exhibit part of the mechanism; Figs. 3 and 4, vertical sections taken at the lines *A*, *a*, and *B*, *b*, of Fig. 1; Figs. 5 and 6, separate views of the thread carrier and carriage; and Fig. 7, separate view of a different form of tooth.

The same letters indicate like parts in all the figures.

My invention relates to improvements in knitting looms for the production of hose and other knitted fabrics by power.

In my said knitting loom the loops are formed on a range of teeth having hooks on their forward ends on which the last formed range of loops hang. And these hooks have grooves made in their upper surfaces and back of the hooks to receive a series of pins, termed lifting pins; the range of loops are pushed back on these pins, and the thread carried across the range of teeth, and gripped between the teeth by a series of thread layers which are forced down in succession onto the thread to carry it down between the teeth, and forward under the hooks at the end of the teeth. The series of lifting pins are then lifted up and moved forward to lift the old range of loops, and carry them forward to lock the stitches—that is, to hold the crimps of the thread in the hooks of the teeth. The thread layers are then thrown back out of the way, and the old range of loops are discharged from the lifting pins by the edge of a bar or discharger which is moved forward for that purpose, so that this previously formed range of loops drop over the hooks of the teeth and hang onto the new range of loops thus formed by the crimps of the thread. After the lifting pins have been carried back and let down into the grooves of the teeth, the range of loops is forced back over these pins by the straight edge of what is termed a presser preparatory to forming a new range of loops. The thread or threads are carried from side to side over the teeth, and just back of the hooks, by means of what I term the thread carrier, or carriers, attached to one or more reciprocating carriages governed by stops to vary and determine the range of motion of the thread carrier or carriers, to correspond with the intended width of the fabric to be knitted. If more than one thread carrier be employed, several widths of fabric can be knitted side by side, at one and the same time, each with selvedges, or one width can be knitted in strips of different colors, and by shifting the threads other figures may be produced.

In the accompanying drawings the mechanism is represented as mounted in a suitable frame which may be varied to suit the judgment of the constructor. The loops are formed on a range of teeth *a*, which take the place of the ordinary needles in knitting looms. These needles project horizontally from a permanent part of the frame to which they are to be so attached as to admit of being removed and replaced as needles are in the common knitting loom. These teeth have hooks *b* on their forward end, and back of the hooks they are grooved on their upper surface, the said grooves being for the reception of a series of lifting points *c*, equal in number to the number of teeth and directly above them. These lifting points have their shanks attached to a bar *d*, which rocks on journals *e*, at each end, mounted in the frame. And the said bar is provided with an arm *f*, which runs back and has near its back end, a wrist pin *g*, that runs on a cam *h*, on the end of the main barrel *i*. The form of this cam is represented in the section Fig. 3, from which it will be seen that as the cam moves under the wrist pin from 1 to 2, the lifting points are drawn back in the position represented in Fig. 4, so that their points lie in the grooves of the teeth, and just under the upper surface of the teeth, so that in that position the range of loops *j*, can be pushed back over the points of the lifters which is done by means of what I denominate the presser *k*. This presser is a flat metal bar with its inner edge straight and placed just below the range of teeth. It is attached by the ends to two arms *l*, *l*, that rock on journals at their lower ends, and provided with arms *m* that are acted upon by cams *n*, *n*, on the shaft of the main barrel. Springs *o*, are employed to keep the presser in its forward position, and

as the arms m, are acted upon by the passage of either of the cams n, the presser is forced against the range of loops, and pushes them back over and onto the points of the lifters. The presser then retires leaving the loops on the points to await the other operations.

The thread p, from a bobbin suitably mounted passes through a guide q, attached to the frame, and thence through what I denominate the thread carrier r, attached to and moved by a carriage s, fitted to slide from end to end in a groove or between ways on the front face of the rocking bar d, to which the lifting pins are secured, so that this bar as it vibrates to operate the lifters also moves the thread carrier or carriers back and forth to be back of the hooks when the thread is to be carried across, and to be out of the way when the discharger is moved forward. The carrier is a metallic stem extending down nearly in contact with the upper surface of the range of teeth, and with an eye at its lower end through which the thread passes.

The carriage s, of the carrier is operated by a cord t, which passes through a groove in the back face of the said carriage, and under a spring u', attached to the said carriage, which spring makes sufficient friction on the cord to carry the carriage and carrier except when the carriage is arrested by any impediment and then the cord may continue to move without the carriage. This cord passes either way around a pulley u, at each end and thence around and attached to two wheels v, v, mounted, one at each end on the shaft of the barrel, but free to turn thereon. They are alternately clutched and unclutched in the following manner:—

On the shaft, and by the side of each wheel, there is a radial arm w, which carries a spring bolt x. As the shaft turns, one of the spring bolts on one side strikes against a pin or stop y, on the face of one of the wheels, and thus locks or clutches it so that it will be turned in one direction with the shaft, and hence draw the carriage with its carrier across the machine from one side to the other laying the thread on the teeth, and as the other end of the cord is attached to the other wheel, which is then unclutched it will turn freely in the opposite direction. So soon as the carrier reaches the end of its motion, a shoulder or lip a', of the spring bolt comes in contact with a fixed cam or inclined plane b', on the frame, by which it is drawn in to liberate the wheel, so that the cord will then remain at rest for the required space of time, at the end of which the same operation takes place on the other side to clutch the other wheel, to reverse the movements and draw the carrier across the machine in the opposite direction; the two arms w, w, with their spring bolts being on opposite sides of the axis. In this way the carrier is moved across from side to side of the machine, and alternately brought to a state of rest to await the other parts of the operation. The range of motion of the thread carrier is greater than the space occupied by the range of teeth so that at each motion it is carried just beyond the last tooth. On each side of the range of teeth there is a tooth c', without a hook and as the carrier starts it laps the thread around one of these teeth, and then continues to carry the thread along over the surface of the range of teeth and just back of the hooks; and, as it passes along, the thread is crimped between the teeth to take up the quantity of thread required to form a new range of loops, as will be presently described.

For the purpose of changing the width of the fabric in the process of knitting it is necessary to vary the range of motion of the thread carrier, for, it will be seen, so long as the thread is laid on the teeth the thread layers will crimp it between the teeth, and, if there be a range of loops on the teeth at the time, the knitting will be produced, but unless the thread be carried over the teeth, the other operations of the machine will not knit, and therefore the range of motion of the thread carrier is an important element in determining the width of the fabric. I employ two movable or adjustable stops which may be made of any suitable construction, say two pins a^2, made of wire, and fitted each to a range of holes in the bar d (see dotted lines, Fig. 1), in which the carriage of the thread carrier slides. Now it will be seen that when the carriage, moving in one direction strikes against the stop pin a^2, on that side, it will be stopped, and there remain determining the extent of the range of motion of the thread carrier. The cord t, continues its motion slipping under the friction of the spring u', before described. On the return motion of the cord it moves the carriage and carrier in the opposite direction until it strikes the other stop pin, shown in the vertical sections. In this way, by shifting the position of either or both stop pins, the width of the knitting operation may be determined and varied at pleasure; but, it should be observed that in widening and narrowing, the same shifting of stitches or loops must be made as in the hand knitting loom. Instead of one thread carrier, several may be simultaneously used all of them attached to the same carriage, as represented in the separate Fig. 6, or each may be on a separate carriage, and each carrying its appropriate thread which may be of any desired color.

In this way striped or plaid fabrics may be knitted. Or a series of narrow and independent fabrics may be knitted at the same time on the same range of teeth. As, for

instance, in knitting a series of narrow strips of goods, not united, the distance between the thread carriers must be greater than their range of motion that the thread of one may not extend over and become knitted in with the thread of the next carrier. But to produce striped goods the range of motion must be greater than the distance between the carriers, that the thread of one may be interlocked with the thread of the next. All that is necessary to produce plaids is to shift the different colored threads in the carrier. As, for instance, after knitting a given length with a white thread in the first carrier, and a red thread in the second carrier, and so on throughout the series, the threads are to be shifted, that is, the white thread transferred to the carriers that had the red ones, and *vice versa*. The next length will have the colors alternated, thus producing the plaid. In this way by shifting the threads and changing the number and range of motion of the thread carriers, a great variety of figures can be produced. Instead of the pin stops, slides may be used, and in fact any kind of stop which will admit of shifting and adjusting the range of motion of the carrier or carriers.

It has already been stated that at each end of the range of teeth there is an extra tooth c', to insure the making of a good selvage, for as the thread is laid around this extra tooth, when the thread layers crimp it for the second range of loops the last loop of the previous range might be drawn out. This is prevented by the extra tooth c'. In knitting variable widths these extra teeth have no effect in insuring a good selvage, except when the greatest width is knitted. To insure a good selvage for all widths, instead of using the two extra teeth c', all the teeth may be notched on their upper surface as at Fig. 7, so that the shoulder of the notch will hold back the old range of loops whilst the thread is being crimped. The lifting points in discharging the loops will lift them over the shoulder of the notches without difficulty. In this way a good selvage can be obtained for all widths.

It will be observed that the thread is delivered by the carrier just over the top surface of the teeth and just back of the hooks of the teeth, and it will also be observed, that the carrier is made no wider than is necessary to let the thread pass through its eye freely, because during the operation of crimping the thread the carrier lies between two thread layers, as will more clearly appear in describing the next operation. As the thread is carried across by the carrier it is crimped by what are termed thread layers d', one for every space between the teeth. Each thread layer is a lever of the form represented in the section, and all of them turning on the same fulcrum rod e'. The forward end is forked, as shown at f', and the rear arm of the lever is of sufficient weight to carry it back to the position represented in the drawing, with the forward end forked above the teeth, so that when the rear arm is elevated, the forked end moves forward and downward, catching the thread and crimping it between the teeth, and, at the same time, carrying it forward under the hooks of the teeth. The series of thread layers are operated, to perform this operation on the thread, by means of a series of tappets h', one for each thread layer. These tappets are arranged in the line of a helix on the periphery of the main barrel, so as to act in succession that the thread layers may, in succession act upon the thread and crimp it as the carrier moves along in advance. And these tappets are, on their outer surface, concentric, each one in succession longer, and all ending in a line parallel or nearly so with the shaft, so that all the thread layers are held down until the whole range of crimps is completed. So soon as this is completed, the range of lifting points is carried forward, and slightly upward by the rocking motion of the bar to which they are attached, so as to carry the previously formed range of loops forward of, and above the hooks on the end of the teeth. At this movement, the tappets pass by, liberating all the thread layers, which leave the new range of loops hanging on the ends of the teeth, and the old range of loops behind them, and pressing them forward, so that they cannot become unhooked by reason of the cockling of the thread. The moment the thread layers are liberated the old loops are thrown off from the points of the lifters, and drop over the ends of the teeth and hang onto the new range of loops suspended from the teeth. The throwing of the old range of loops from the points of the lifters is effected by a bar called the discharger i', which is a metal plate very similar to the presser, and placed just over the top of the range of teeth, and connected at the ends to two arms j', that extend up from a rock shaft k'. The tension of a spring l', keeps the clearer in its back position, and when the loops are to be discharged cams or rollers m', on the ends of the barrel strike the arms j' and push forward the discharger which moves forward between the range of teeth and the range of lifting points in their elevated positions, and thus push the range of loops off the points. The mechanism is then in a condition to form another range of loops, by the return motion of the thread carrier, and for this purpose, the helical line of the second range of tappets is the reverse of the first.

After the tappets have passed from the

rear arms of the thread layers, they fall back by the preponderance of the weight back of the axis of vibration, but to ensure this, there is an horizontal bar n', extending over their rear arms. This bar is connected at each end with arms o', of a rock shaft p', which are operated in one direction by springs to keep the bar in its elevated position not to impede the operation of the thread layers, and, in the opposite direction by cams q', one on each end of the barrel to depress the bar that it may act on all the thread layers simultaneously and thus carry them back to their proper position if not previously carried back by their weight.

I have thus particularly described and represented the mode of construction which I have tried with success, and which I deem the best, but I do not wish to be understood as limiting myself to this special construction and arrangement, as it will be obvious that the mode of operation, which distinguishes my invention, and every branch of it, from all other things before known, may be applied under various modes of construction by the substitution of equivalents.

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

1. The combination of the lifting pins with the teeth provided with grooves for receiving the lifting pins, that the range of loops may be pushed over the pins, and with hooks to hold the crimped thread whilst the range of loops are lifted up and discharged over the said hooks the said lifting pins and teeth being constructed and operated substantially as and for the purpose specified.

2. I also claim the bar termed the presser operated, substantially as specified, in combination with the range of teeth and lifting pins, substantially as specified, and for the purpose of forcing the range of loops over the said lifting pins, after they have been let down into the grooves of the teeth, as specified.

3. And I also claim in combination with the hooked teeth and the lifting pins, substantially as described, the discharging bar, substantially as described, for discharging the range of loops from the lifting pins after they have been lifted up over the hooks on the teeth, as specified.

4. And I also claim in combination with the hooked teeth, the employment of the thread layers having a motion downwards and forwards, substantially as described, for the purpose of crimping the thread between the teeth, and forcing it under the hooks by one and the same motion as specified.

5. And I also claim the employment of movable and adjustable stops in combination with the thread carrier or carriers, substantially as specified, for the purpose of determining the width of fabric to be knitted and narrowing and widening the same as specified.

JAMES Y. LESLIE.

Witnesses:
WM. H. BISHOP,
CHAS. W. BAMBURGH.