T. BAILEY.

KNITTING MACHINE.

No. 13,811. Patented Nov. 20, 1855.

Fig. 1.

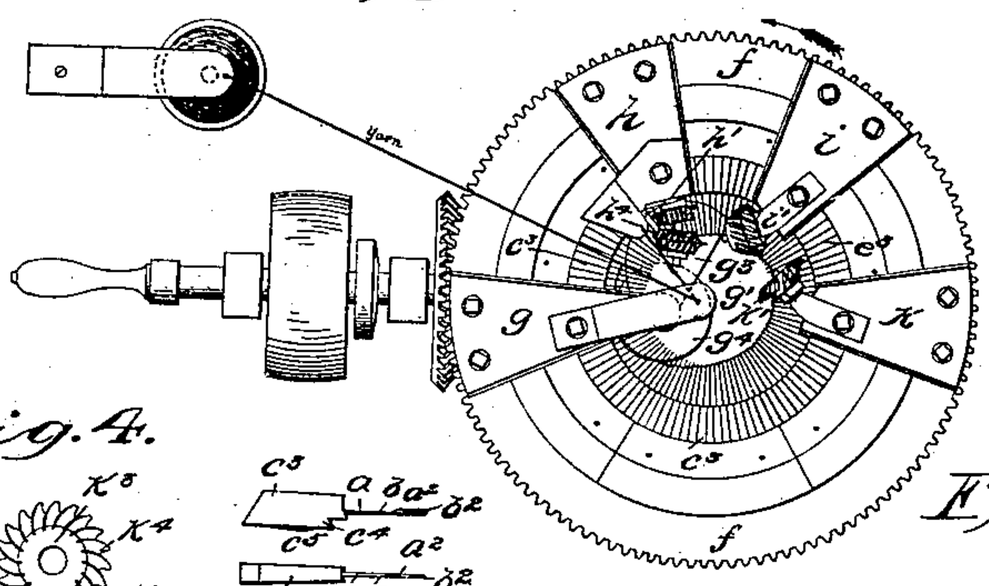


Fig. 8.

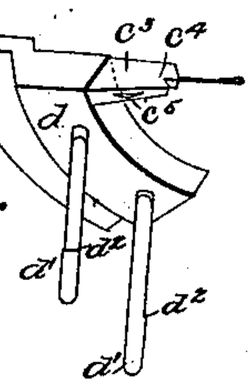


Fig. 9.

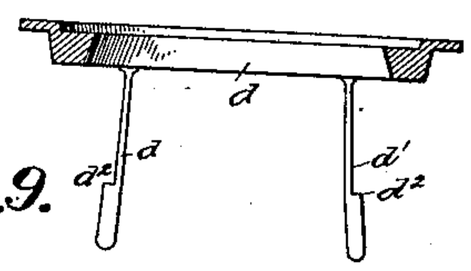


Fig. 4.

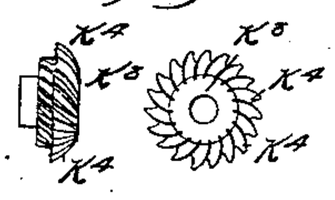


Fig. 7.

Fig. 5

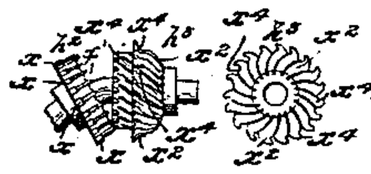


Fig. 6.

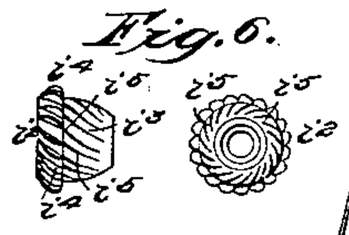


Fig. 2.

Fig. 10.

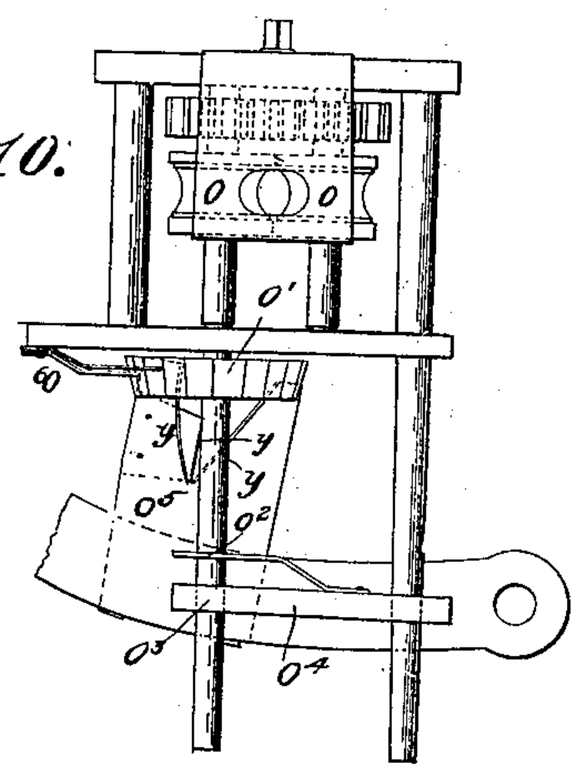


Fig. 11.

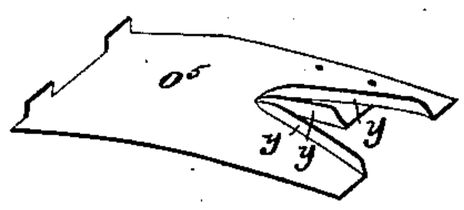
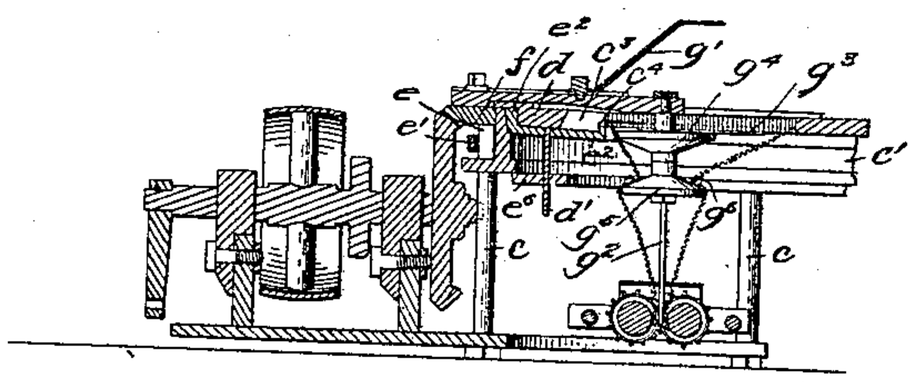


Fig. 3.



UNITED STATES PATENT OFFICE.

TIMOTHY BAILEY, OF BALLSTON SPA, NEW YORK.

KNITTING-MACHINE.

Specification of Letters Patent No. 13,811, dated November 20, 1855.

To all whom it may concern:

Be it known that I, TIMOTHY BAILEY, of Ballston Spa, Saratoga county, State of New York, have invented a new and Improved Rotary Knitting-Machine, and the following specification, taken in connection with the drawings, is a full and sufficient description thereof.

In the drawing Figure 1 is a top view of the machine with the weight not represented. Fig. 2 is a side view thereof the various burs and two of the studs or bearers being omitted or removed. Fig. 3 is a vertical section through the machine with one side broken away and without any representation of the burs. Fig. 4 is a top and end view of the revolving casting off bur. Fig. 5 is a top and end view of the revolving sinking bur and the small gear which drives the same. Fig. 6 is a top and end view of the leveling bur with the pressing down bur attached thereto. Fig. 7 shows the needle in its lead in two different positions. Fig. 8 is a perspective view of one of the needles—lockers and a needle. Fig. 9 is a front view of the same without the needles. Fig. 10 is a detached top view of the self adjusting drawing weight and its drawing racks. Fig. 11 is a perspective view of the drawing rack aforesaid. Figs. 1, 2 and 3 are on a scale of one half—the other figures being full size.

My machine knits a tube of indefinite length and of any necessary dimensions or rather diameter, the latter depending upon the number of needles employed, the spaces which separate the one from the other, and the thickness of the yarn used, and in the mere ultimate motion of the thread does not differ materially from other machines now in use. That is to say, in my machine as well as in them, the already made stitch is first carried back on to the solid part of the needle, as at *a*, the new stitch or rather the thread in yarn to form it is then sunk in loops between the needles as at *b*, and these loops are carried forward under the beards until their loops rest at b^2. The beards are then pressed down by the presser and so held while the old stitch is moved or landed by the landing bur toward the head of the needle over the beard, or rather top of the beard and completely surrounding the needle, and the new stitch is completed by casting the old one entirely off the needles by the casting off bur and leaving the new stitch resting in the hook of the beard just at the head, from which position it is carried back to *a* in order to make another new stitch. But in order to perform all these motions with ease, rapidity and by means of simple machinery not liable to get out of order and when out of order admitting of easy adjustment or repair I have invented several important improvements and novelties in various elements of the knitting machine, and my improved knitting machine has therein, first, a new plan for actuating the linking bars; second, a new method of carrying back the old stitch and of giving to the cloth already knit a species of oscillating motion, and in combination with said oscillating motion a self adjusting, continuous acting drag weight which takes the fabric as made and strains those parts, being made in the best possible position for the action of the various working parts of the machines, and, lastly, a new relative motion of the parts, consisting in fixing the needles firmly and causing the various sinkers, depressors, landers and casting off burs to travel around from needle to needle, whereby I avoid all turning of the cloth and all the difficulties usually attending such rotary motion thereof, especially in the taking up of the finished cloth.

In order to describe these improvements it will be necessary to describe the whole frame or machine as follows. Upon any suitable legs as *c c* is supported a circular through or head piece *c′ c′*, on which rests another trough or needle bar c^2, c^2, whose interior has a cross section substantially such as is shown in Fig. 3 (or these troughs may both be on one piece) and in this latter trough or needle bar are arranged side by side the needle leads, which are cast around the needles and shaped substantially as shown in the drawings. These leads c^3 c^3 have formed in them a small hook or catch c^4 which takes under a corresponding notch in the trough c^2, as clearly shown in Fig. 3, and have moreover a slight tongue c^5 in their under side, which fits in a corresponding depression in the trough or needle bar c^2 so as to space the needles accurately if the leads be slightly deformed through shrinkage or otherwise. When all the leads or a certain portion thereof are thus arranged, locking down segments or needle plates *d d* are shoved down behind

the leads, and as the rear ends of the leads incline inward in the upper parts thereof toward the needle, and as the shape of that part of the locking down segment nearest the center of the machine conforms exactly thereto, this shoving down of the segments not only depresses the leads against the bottom of the trough c^2, but also force the leads toward common center against the interior of the inner side of said trough. Each of these segments is provided with spring catches d' d' standing apart at the bottom and notched as at d^2 d^2, and holes are drilled through the bottom of trough c^2 and through a ring c^6 located below said trough, in such position that these catches may pass through them. The catches are entered into the upper holes by springing them together with the fingers, and when the locking down segment or needle plate is shoved home they expand and their notches catch under rings c^6, thus holding the segments or needle plates, and consequently the leads and needles firmly in place.

It is evident that a broken needle is susceptible thereof of easy removal and that a new one may readily be substituted therefor, and also that any other form of catches, button or screw, might be substituted for the catches d' d' and would be the equivalent thereof so long as it held the segments firmly and permitted their easy removal.

It is also evident that the heads of the needles must approach each other when thus arranged much nearer than their butts, and that if the former be in proper spacing for a stitch, there will be between the latter, sufficient room to admit knots or uneven spots in yarn, and also ample room or space for the nearly sunken stitch without its being depressed far below the general level of the needles.

Around the trough or bevel piece c' and resting on a proper projection therefrom are located rollers e e connected each to each by a ring e' and these rollers support another ring f completely surrounding the trough or bevel piece c'. The outer edge of ring f is formed into bevel cogs, by means of which it may be revolved (traveling on the rollers) through the agency of proper driving machinery or mechanism. That shown in the drawings answers well and needs no description, but ring f may be revolved by a belt by friction in any competent and usual manner. This ring f has firmly secured upon its upper surface four bearers or studs g h i and k, the three latter of which carry horizontal axles h' i' and k'.

The stud g supports a thread or yarn carrier g' through a small hole in which the yarn passes, and the same stud also has dependent therefrom a vertical axle g^2. This axle extends downward to or below the bed plate of the machine and has attached to its superior end a sector g^3, whose periphery is eccentric, as shown in drawings, to the general contour of the inner sides of the leads. Below this sector shaped disk is placed a wheel g^4 and again and farther below upon the shaft is secured another wheel g^5. The adjoining surfaces of these two wheels and the collar in the axle between them together constitute a contour in shape something like an hour glass, and around the neck of this glass is loosely laid a ring g^6, which is too small to pass over the lower disk, and is therefore slipped onto the neck before the lower wheel is adjusted upon the shaft.

The upper wheel is free to revolve and the finished work on tube shaped piece of knitting passes down between the neck and the ring as shown by red lines in Fig. 3, and thence down around shafts g^2 as to be hereinafter described.

As the shaft g^2 is carried around by the revolution of ring f the wheel g^4 revolves by friction against the finished tube of yarn, and carries back said tube at the points of contact toward the butts of the needles, thus removing an already formed stitch out of the way. As these stitches leave the wheel they are received by the sector g^3 which holds them back until ready to be acted upon by the wings or burs i^2 which lands said old stitches as hereinafter described.

The stud, h, carries upon the bent axle h', first a small toothed wheel h^2 and subsequently the sinking bur h^3. The teeth x on wheel h^2 are equal in face or nearly so to the space between the needles at the points where said wheel travels over the needles, and the teeth therefore mesh between the needles which therefore constitute the rack, which causes said wheel h^2 to revolve upon its own axis, as that axis is carried around by the ring f. Other teeth x' x' upon the same gear wheel take into corresponding teeth upon the sinking bur h^3 and this bur therefore revolves in piece pass u with the gear h^2. Upon h^3 are wings or peculiarly shaped screw threads x^2 x^2, corresponding in number with the teeth x and of sufficient elevation above the general contour of the bur h^3 as to enable them to sink down a loop of yarn between each needle and its neighbor, the yarn being delivered through the hole in g' and through a small aperture in a plate h^4 attached to the stud h. The leaves or wings h^2 are much thinner than the space between two needles but the teeth x cause each wing to enter accurately into the center of the space and do not permit the wing to grind against one side of each needle as would be the case if the bur h^3 was revolved by the direct action of the needles against its wing. The loop is therefore by means of the use of the gear sunk

regularly in the center of the space. There is room for knots and uneven spots of yarn and there is but little danger of cutting the yarn as in a shears by nipping it between the side of each needle and the wing or screw thread. The small depressions at a^4 in each wing receive the thread and pressing it down between the needles is carried by the same, and slid under the beard until it reaches the head of the needle forming it into a loop.

Upon the axle i' attached to stud i revolves a bur i^2 also having wings to which is attached the pressing conoid i^3. The axle i' is inclined at a considerable angle to the radii which the needles represent, and the wings i^4 on bur i^2 enter behind the old stitch and gradually shove it forward over the needle beards and toward the head of the needles. While they are performing this operation each beard is held down by the revolving conoid i^3 which has formed in it helical grooves, so shaped that each groove takes in each beard at its throat and gradually rolls it down toward its points where the landing wings land the old stitch over the beard.

The landing bur and the pressing conoid thereto attached are revolved by the needles acting as a rack against the wings i^4, which also act as cog teeth, but in large machines I intend to apply behind the bur i^2 which must then be provided with proper teeth a gear wheel similar in all respects to h^2 and this latter will then revolve i^2 and center its wings properly between the needles.

It is evident that the beards are much more likely to stand if pressed gradually from the head than if pressed only and forcibly upon their points. It is also evident that a screwed conoid as described occupies much less space than a large cylindrical disk as usually employed, and further, that when the presser is secured on the same axis as the lander it not only saves one axis and stud but is forced to travel exactly as the lander does, so that the beard is held firmly down just at the proper instant that the landers so require it to be, therefore preventing derangement in working of the machine and obviating nice adjustment of the parts. This compound bur and carrier therefore holds or presses down the beard and lands the old stitch upon the needle's head. Behind the stud i and last in the service follows the stud k, in whose axle h' is carried a thread bur k^3 having helical wings k^4. These wings by their action against the needles revolve the bur and as each wing enters the space between two needles, it throws the stitch toward the center of the machine and casts it off. This bur may also be driven by a gear wheel behind it, and such arrangement I intend to use in large machines. As the knitted finished tube descends it passes between the ring g^6 and the neck, thence surrounding the axle g^2 and then between a pair of rollers n n and it is clear that said tube must have imparted to it a waving circular motion owing to the planetary motion of shaft g^2 around the center of the whole apparatus.

If any species of weight be attached to the knitted tube it will cause it to descend as fast as new stitches are formed by the machine above, and it is clear that such weight will bring its greatest strain upon the stitches being landed and its least strain on those which are being carried back out of the way of the bur, said effect being produced by the confinement of the cloth to a shaft having a planetary motion. But if a common weight be hung on the tube it will require constant attention, to remove it upward as the tube descends. In order to obviate this difficulty I have invented myself adjusting or winding weight, taking advantage of the planetary motion of shaft g^2 to actuate the same. In order to construct this weight I secure in a proper frame two or more rollers o o, one or both or all of which may be pressed toward the others by springs or they may be fixed at a given distance depending upon the bulk of the knitted tube and the size of the shaft g^2. On the axis of one of these rollers is secured a toothed wheel o' and that axis or some other pins extending from the roller frame is prolonged and passed through a hole o^2 in a plate o^3 pivoted under the apparatus at o^4. This plate therefore may oscillate in a horizontal plane and the hole o^2 is so large that the shaft passing through it can move to and fro easily. The knitted tube passes between these rollers so also does the shaft g^2 (see Fig. 3) and these rollers hug the tube tightly and are supported thereby. Their weights therefore act as a feed-weight to the tube and the rollers descend with it—any one point moreover in the rollers or their frame will describe an egg shaped curve compounded from the planetary motion of the shaft g^2 and the sliding motion of the shaft or pin in the hole o^2; the whole frame and shaft having just such a motion as is imparted to the connecting rod of a steam engine or pitman of a sawmill.

Just below oscillating plate o^3 is secured a species of rack o^5 with three or more teeth y y y. If the rollers with their frame be now supposed to be clasped around the finished tube and around shaft g^2 and rolled upward along said tube as high as the shaft in hole o^2 will permit, they will not be able on account of the dogs o^6 to roll down over the surface of the tube, but they will descend as the tube descends in receiving accession of new stitches at the upper end thereof, but while these new stitches are forming the rollers and their frames and

consequently the toothed wheel o' will describe egg shaped curves, and the paths described by o' will at certain times pass over the rack o^5. When so many rows are completed and the tube and roller frames fall so far that the teeth on o touch the thin rack teeth y, then will these rack teeth cause the wheel o' to rotate, as it passes over them and will consequently force the whole frame to climb along the tube of knitted stuff, and take a new hold. The frame even while climbing is supported by, and consequently weights the tube, and when the frame falls again so that the teeth of wheel and rack are again in contact, the frame climbs as before.

In practice the frame is formed to climb a small distance at each completed row of stitching, and it is obvious that many other mechanical devices might be substituted for the rack and pinion, all of which would rotate one roller by a motion derived from the egg shaped traveling path of the roller frame, or said weight might be raised by means of a worm and gear wheel, said gear coming in contact with the worm thereby rolling it up.

My machine may be driven by hand or by power and in practice the position shown in drawings is formed convenient for the spindles of yarn which is led therefrom through the standard g' thence through the delivering hole in h^4 which holds the yarn ready for the action of the sinking bur. As the ring f is caused to revolve axle g^2 takes its planetary motion the wheel g^4 carries back the old stitch, and sector g^3 holds it back axle h' revolves over the needles and bur h^3 revolves on its own axis, sinking the new stitch or rather the loops from which it is to be formed axle i^1 revolves and burs i^2 and i^3 press down the beards and land the stitch, while axle k, the last in the train follows the same course, with its revolving bur k^3, which casts off the stitch, leaving it ready for the action of the wheel g^4. All these motions are repeated in succession, and at each revolution of f a complete row of stitches is formed one stitch for every needle in the series.

In large machines, where several hundred needles are employed I intend to have several sets of backing wheels, sectors, burs and presses all attached in proper succession to the same revolving ring, and mean to supply each set with its appropriate thread. Each single revolution of a ring like f will then knit as many rows of stitches as there are sets of apparatus and it is clear that the efficiency of one set of needles may thereby be multiplied several times.

Now I wish it to be distinctly understood that some of my improvements may be used without the others. For instance, the old disk shaped presser might be used in my machine in place of my conoid presser, or my presser might occupy an independent shaft, or part of my improvement might be used under a different arrangement of needles or with the same arrangement when the needles are otherwise secured, or my self adjusting weight might be dispensed with and an ordinary weight employed, or that weight and the shaft which actuates it might depend upon a separate stud or upon one of the bur studs for their planetary and egg shaped motion: further the shape of the needle leads, if the trough in which they rest, and if the locking down sector may be raised materially, so long as they hold the needles as described and permit of their easy removal, and I wish it to be understood that I lay no claim to the ultimate motion of the yarn in respect to the needle, nor do I claim burs for sinking, landing, pressing and throwing off which rotate on their axes and act on different needles in succession, except when these burs travel from stationary needles to stationary needles as contrasted with burs acting on a moving series of needles.

I claim as my invention—

1. I claim the actuation of the sinking or other burs by means of a gear wheel whose teeth are actuated or rather acted upon by the needles as a rack whereby the wings in said burs are freed from contact with the needles and do not nip the yarn tightly between said wings and the needles substantially in the manner and for the purposes described.

2. I claim carrying back the old stitch and holding it back by means of a disk wheel and segment having a planetary motion as herein set forth and also the leading of the finished cloth through a ring or its equivalent surrounding a shaft having a planetary motion whereby the action of the drag weights is properly adjusted upon different portions of that circuit of the cloth which is being acted upon by the needles and burs substantially as herein specified and in combination with a cloth or knitted tube to which is imparted substantially such a revolving motion as is herein described.

3. I claim a self adjusting climbing drag weight constructed substantially in the manner herein set forth.

4. I claim a stationary series of needles in circuit when constructed and arranged substantially in the manner described in combination with revolving burs driven by independent gearing and traveling from needle to needle whereby the turning of the finished cloth on its own axis is avoided and all difficulties incident thereto obviated.

TIMOTHY BAILEY.

Witnesses:

A. H. Moor,

Charles Lord.

Disclaimer.

To the Hon. Commissioner of Patents:

SIR: Your petitioner, TIMOTHY BAILEY, of Ballston Spa, New York, respectfully represents that Letters Patent of the United States were duly granted to him November 20, 1855, for Improvements in Knitting-Machines; that he has reason to believe that through inadvertence and mistake the specification and claim of said Letters Patent are too broad, including that of which your petitioner was not the first inventor. Your petitioner therefore hereby enters his disclaimer to that part of the claim in said specification which is in the following words, to wit:

"1. I claim actuating the sinking or other burs by means of a gear wheel whose teeth are actuated or rather acted upon by the needles as a rack whereby the rings in said burs are freed from contact with the needles and do not nip the yarn tightly between said rings and the needles, substantially in the manner and for the purpose described.

"2. I claim a stationary series of needles in circuit when constituted and arranged substantially in the manner described, in combination with revolving burs driven by independent gearing and traveling from needle to needle whereby the turning of the finished cloth on its own axis is avoided and all difficulties incident thereto obviated."

Ballston Spa, N. Y., Nov. 6, 1869.

TIMOTHY BAILEY.

In presence of—

J. O. LEACH,

C. O. MCCREEDY.