

(No Model.)

W. H. STEWART.
AUTOMATIC STITCH REGULATING MECHANISM FOR KNITTING MACHINES.

No. 529,508.

Patented Nov. 20, 1894.

FIG. 2.

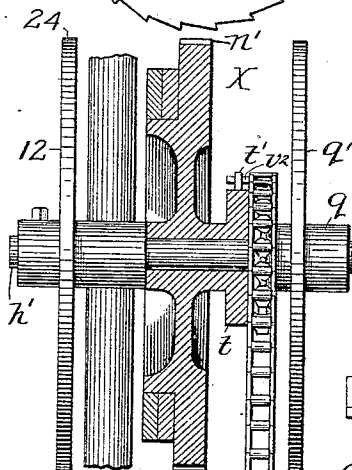
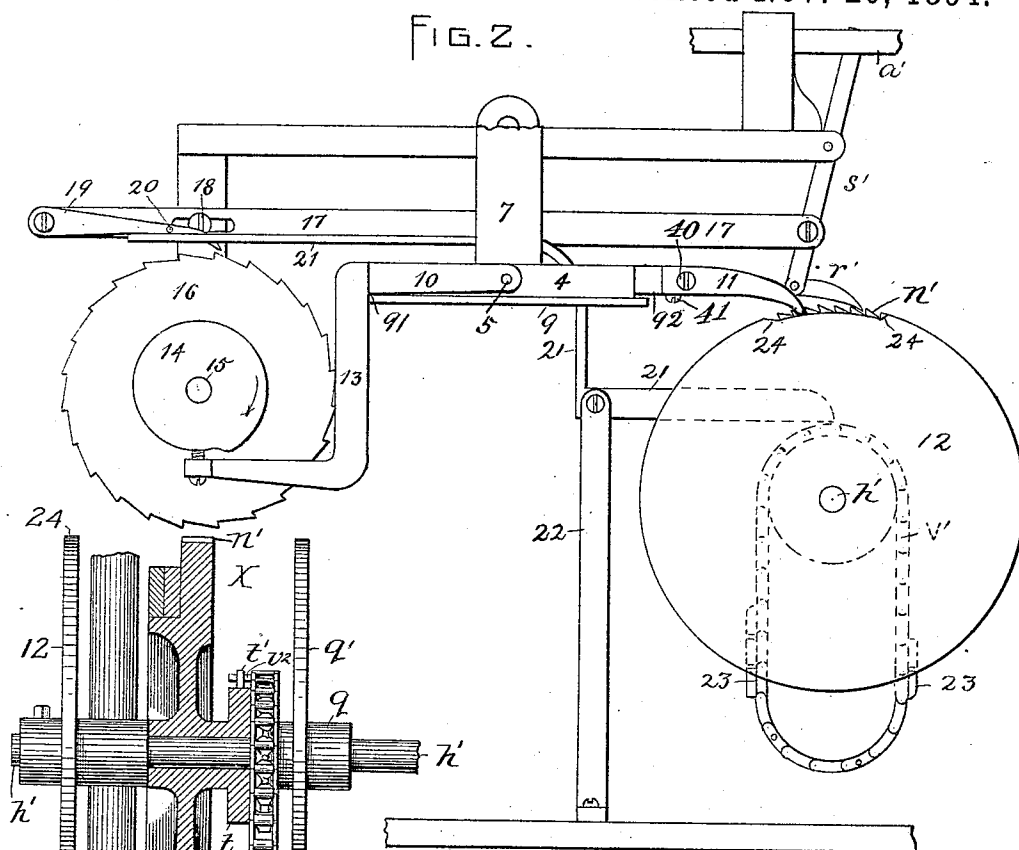
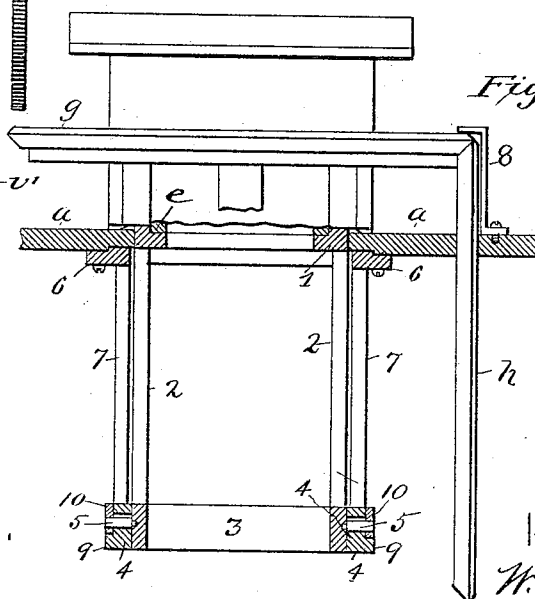


Fig. 3.

Fig. 1.



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AUTOMATIC STITCH-REGULATING MECHANISM FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 529,508, dated November 20, 1894.

Application filed October 5, 1891. Serial No. 407,688. (No model.)

To all whom it may concern:

Be it known that I, WALTER H. STEWART, of Franklin, in the county of Merrimac and State of New Hampshire, have invented certain new and useful Improvements in Automatic Stitch-Regulating Mechanism for Knitting-Machines, of which the following is a specification.

My invention has reference to knitting machines adapted to knit stockings and other webs and fabrics, and is an improvement wrought upon the machine shown and described in an application for a patent filed by me April 25, 1894, Serial No. 508,968.

It is the purpose of the present improvement to provide simple and efficient automatic means for gradually tightening or shortening, and loosening or lengthening the stitch at particular points so that in the case of a circular web the same may be reduced or enlarged in diameter. In the knitting of stockings, for example, I propose by my improvement to gradually tighten the stitch in knitting the lower calf and ankle portion of the leg, loosen the stitch when the heel is being knit and an extra yarn or thread is inserted; tighten it again for the knitting of the foot portion; and finally loosening it for the toe. The upper leg portion will, of course, be knit in loose or long stitch. In the loosening and tightening of the stitch I propose to raise and lower the needle cylinder or other needle support, as also the ring or bed which supports the web holders, thus making the needles draw a longer or shorter stitch.

I have deemed it expedient not to represent in the accompanying drawings, forming a part of this specification, any more of a knitting machine and its operating means than is necessary to a clear understanding of the invention. Reference may be had, however, to the application hereinbefore mentioned for information concerning a machine to which the present improvement is particularly applicable.

Of the annexed drawings, Figure 1 is a side view, partially in section and partially in elevation, showing more particularly the parts which support and are directly concerned in the elevation of the needle cylinder. Fig. 2 is a side view of my improvement taken at a

right angle to Fig. 1. Fig. 3 is a side view of the shaft, *h'*, showing the operative mechanism mounted thereon.

Having reference to Fig. 1, *e* designates the needle cylinder which is fastened to the ring 1 by screws or other suitable means. The ring 1 is so placed in the bed *a* as to be movable vertically, and is connected by means of the bars or standards 2 with the ring 3 below the ring 1. The ring 3 is arranged within the ring or support 4 in such a way as to be moved up and down by studs or pins 5 extending inward from the forked part of the lever 10 which embraces the ring 4. The latter ring or support 4 is connected with the bed *a* by means of bars or arms 7.

6 designates a ring which is securely fastened to the bed *a* by means of screws. The cam ring *g* is held in place upon the bed by the clamps 8. On the lower part of the ring 4 is the rim 9 upon one side of which rests the forked part of the lever 10, as at the point 91. One arm 92 of the forked lever 10 is made longer than the other, as shown in Fig. 2, to which extended arm is pivoted by a screw 40 the arm or extension 11, the outer end of which rests on the periphery of the disk 12 which is fastened to the shaft *h'* so as to rotate with it. An adjusting screw 41 on the under side of the lever 10, has its head projecting in the path of the arm 11, so that the extent of the movement of the latter may be adjusted as desired.

13 designates practically an angular extension of the forked lever 10, the said part extending down and then out so that its free end will be under a cam 14 secured to and rotating with a shaft 15. A set screw in the end of the part 13 rests upon the cam 14.

16 is a ratchet wheel secured to the shaft 15, the latter being supported in suitable bearings. Not shown.

17 is a slide which is held in place on the frame by means of a stud 18, passing through a slot in the slide, so as to permit of a reciprocating movement of the said slide.

19 is a pawl pivoted upon the end of the slide 17 and provided with a laterally projecting pin 20, which is adapted normally to rest upon an arm or rod 21, so as to hold the pawl 19 out of engagement with the ratchet wheel

16. The opposite end of the arm or lever 21 is of angular form, and is pivoted at its angle point upon the upper end of the bracket 22. The free inner end of the lever 21 bears, by means of its gravity, upon a chain v' which is provided with rises or cams 23 which are adapted as the said chain is moved to be brought into contact with the weighted end of the lever 21. As shown in the drawings 10 this lever 21 is composed of a long and short arm. The long arm is a small wire rod and hence light. The short arm is as represented, sufficiently thick and heavy to overbalance the other arm.

15 a' designates a reciprocating bar, which engages and actuates a lever s' pivotally connected with the slide 17 so as to move the latter. To the lower end of the lever s' is pivoted a pawl r' which actuates the ratchet 20 wheel q' .

I have now sufficiently described my improvement to make clear its operation, and will proceed to do so, first explaining the tightening of the stitch in what may be considered as the lower part of the calf and ankle portion of the leg of a stocking web.

The chain v' is adapted to make one revolution in the knitting of a complete stocking, and in so doing the cams 23 raise the weighted end of the said lever or arm 21, lowering the other end, and permitting pawl 19 to engage the ratchet wheel 16, rotating it and cam 14, the pawl 19 being actuated by the slide 17. As the cam 14 is rotated and supposing the screw in the end of the angular lever resting thereon to ride from a high part of the cam to a lower, the ends of the forked lever 10 connected by the pins 5 with the ring 3, will be lowered, lowering the needle cylinder e 40 through the medium of bars 2, and shortening or tightening the stitch, the cams 23 on the chain v' being sufficiently long to allow the pawl 19 to remain in engagement with the ratchet wheel 16 so as to move the cam 14 to 45 the necessary extent.

The arm 11 being fastened to the long arm 92 of the forked lever 10, and said arm 11 being adapted to be engaged by cams 24 of the disk 12, it follows that when the cams 24 act 50 upon the arm 11 they will raise the same, the lever 10 using the rim 9 at the point 91, (see Fig. 2,) as a fulcrum and consequently the needle cylinder, lengthening the stitch for the heel. The disk 12 is contrived to make 55 one revolution during the time of knitting one heel or toe.

Upon the shaft, h' , there is rigidly mounted a wheel, n' , having an extended hub, t , provided with a pin, t' . The periphery of this 60 wheel, n' , is provided with ratchet teeth, one of said teeth being removed or mutilated, leaving a blank space. A pawl, not shown, operated by the main shaft, plays in the teeth of wheel n' . When this pawl reaches the mutilated tooth on the wheel, n' , the wheel, n' , will remain stationary until some extraneous means moves said wheel in order to

bring the next tooth into engagement with the pawl. Upon this shaft, h' , there is a ratchet wheel, q' , whose hub, q , is loosely 70 mounted upon the shaft and provided with a suitable hub for carrying the pattern chain, v' . This pattern chain, v' , is provided with a pin, v^2 , to engage the pin, t' , upon the hub of the wheel, n' . The wheel, q' , is continuously driven by the pawl, r' . The parts are 75 so arranged that the pawl driving the wheel, n' , is in the mutilated portion of the wheel during the leg portion of the stocking, at the completion of which the pin, v^2 , is timed to 80 engage the pin, t' , and move the wheel, n' , to bring another tooth on the wheel, n' , into engagement with the pawl. This movement starts the cam, 12, and operates the end, 11, of the lever, and keeps it raised during the 85 rotation of the shaft, h' , that is, during the heel and toe portions of the stocking. This rotation of the shaft, h' , continues until the pawl which operates the wheel, n' , comes into the mutilated space on said wheel, n' . The 90 mutilated portion on the wheel, n' , and the depression on the cam, 12, are in alignment so that when the pawl comes to said mutilated portion of the wheel, n' , the end of the lever, 11, is dropped into said depression between the inclines, 24, on the cam, 12. The 95 end of the lever 11 rests in the depression between the two cams 24 while the wheel 16 is rotated. The distance around the disk 12 is arranged to correspond to the time of knitting a heel or toe of the stocking, at the completion of which the end of the arm 11 falls into the depression between the two cams 24 and the pawl above mentioned as actuating the wheel n' reaches the mutilated part of the 105 wheel n' at the same time, thus stopping the shaft h' and the disk 12. So far as the operation of the stitch tightening mechanism is concerned, the cams 24 might be separated by a notch, but it is necessary to provide some 110 distance between the cams to give time for other parts of the machine to work, in changing from one operation to another. It is essential that the stitch tightening mechanism should be operated gradually in the leg or 115 straight knitting, while in the heel and toe portions this mechanism should be operated suddenly. To this end the cam controlling the stitch tightening mechanism for the leg is constructed and arranged to give the gradual 120 fall to the cylinder, while the heel and toe cams 24 are constructed to raise and lower the said cylinder suddenly.

The cams 23 on the chain v' are so constructed as to control the actuating means of the cam 14, so that the latter will make one revolution during the knitting of a single stocking. The cam 14 is first moved so as to carry the engaging end of lever 13 from a raised to a lowered part of the cam, where it remains until the heel, foot, and toe are knit, 130 when the next set of cams 23 will permit the cam 14 to move far enough to complete the revolution and carry the adjacent end of the

lever 13 to a raised point on the cam so as to knit long, loose stitches for the upper leg part of the stocking.

At the beginning of the knitting of a stocking, the screw in the end of the lever 13 rests on the highest point of cam 14 and it remains there during the knitting of the long loose stitches of the upper part of the leg. When the lower calf and ankle portions of the leg are to be stitched, a cam 23 acts on arm or lever 21, so as to permit pawl 19 to descend and gradually rotate cam 14 to bring the lower portion opposite the screw, thus lowering the needle cylinder and tightening the stitches. At this time cam 23 passes arm 21, which drops, raising pawl 19, and stopping the rotation of cam 14, leaving the needle cylinder in its lowest position. This brings arm 11 of lever 10 into position to be affected by the cams 24 on disk 12 which, as above stated, revolves once during the knitting of one heel or toe. These cams 24 raise the lever and the needle cylinder to loosen the stitch when the heel is being knit, lower the cylinder to tighten the stitch for the foot portion, and again raise it to loosen the stitch for the toe.

When the toe has been finished, the second cam 23 acts on arm or lever 21 to permit a slight further operation of pawl 19 to complete the rotation of cam 14, so as to bring its highest part again opposite the end of lever 13, which thus lifts the cylinder for the beginning of a new leg portion, and also lifts the arm 11 out of position to be affected by the cams 24.

It is obvious that changes may be made in the form and arrangement of parts of my improvement without departing from the nature or spirit thereof.

Having thus described the nature of my invention and set forth a way of constructing and using the same, though without attempting to explain all the forms in which it may be made or all of its modes of use, I declare that what I claim is—

1. In an automatic stitch-tightening mechanism,

in combination, a vertically movable needle cylinder, a support, a lever mounted upon said support, connections between said lever and needle cylinder, and cams, 12 and 14, to act upon opposite ends of said lever to move it to raise and lower the needle cylinder, substantially as and for the purpose described.

2. In an automatic stitch-tightening mechanism, for leg or straight knitting, in combination, a vertically movable needle cylinder, a horizontal ring suspended from the machine frame and having the flange 9, a lever mounted upon said flange, connections between said cylinder and lever, and a cam having a gradual incline arranged to act upon said lever to lower said cylinder gradually, substantially as and for the purpose described.

3. In an automatic stitch-tightening mechanism for heel and toe work, in combination, a vertically movable needle cylinder, a support, a lever mounted upon said support, connections between said cylinder and lever, and a cam having steep inclines to act upon said lever to raise and lower said cylinder suddenly, substantially as and for the purpose described.

4. In an automatic stitch-tightening mechanism, in combination, a vertically movable needle cylinder, a support, a lever mounted upon said support, connections between the lever and the needle cylinder, a cam having sharp inclines to act upon one end of said lever and a cam having a gradual incline to act upon the other end of said lever, said cams being arranged to act upon said lever alternately, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 24th day of September, A. D. 1891.

WALTER H. STEWART.

Witnesses:

F. N. PARSONS,
CHAS. S. SLEEPER.