(No Model.) 3 Sheets—Sheet 1.

G. E. NYE.

KNITTING MACHINE.

No. 316,907. Patented Apr. 28, 1885.

Fig. 1.

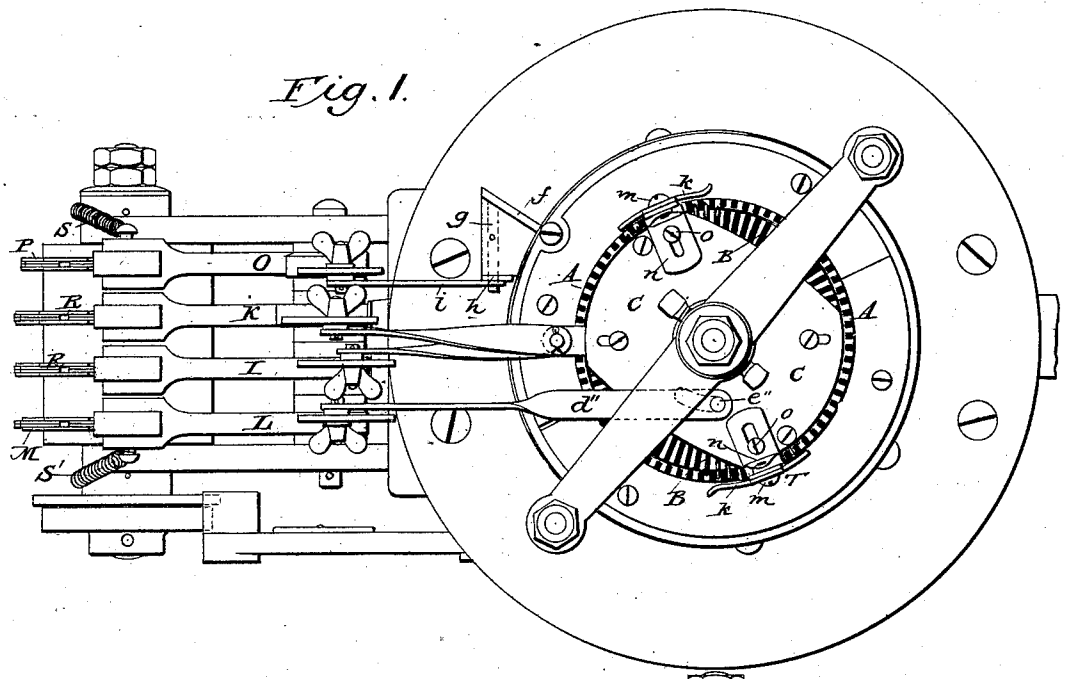
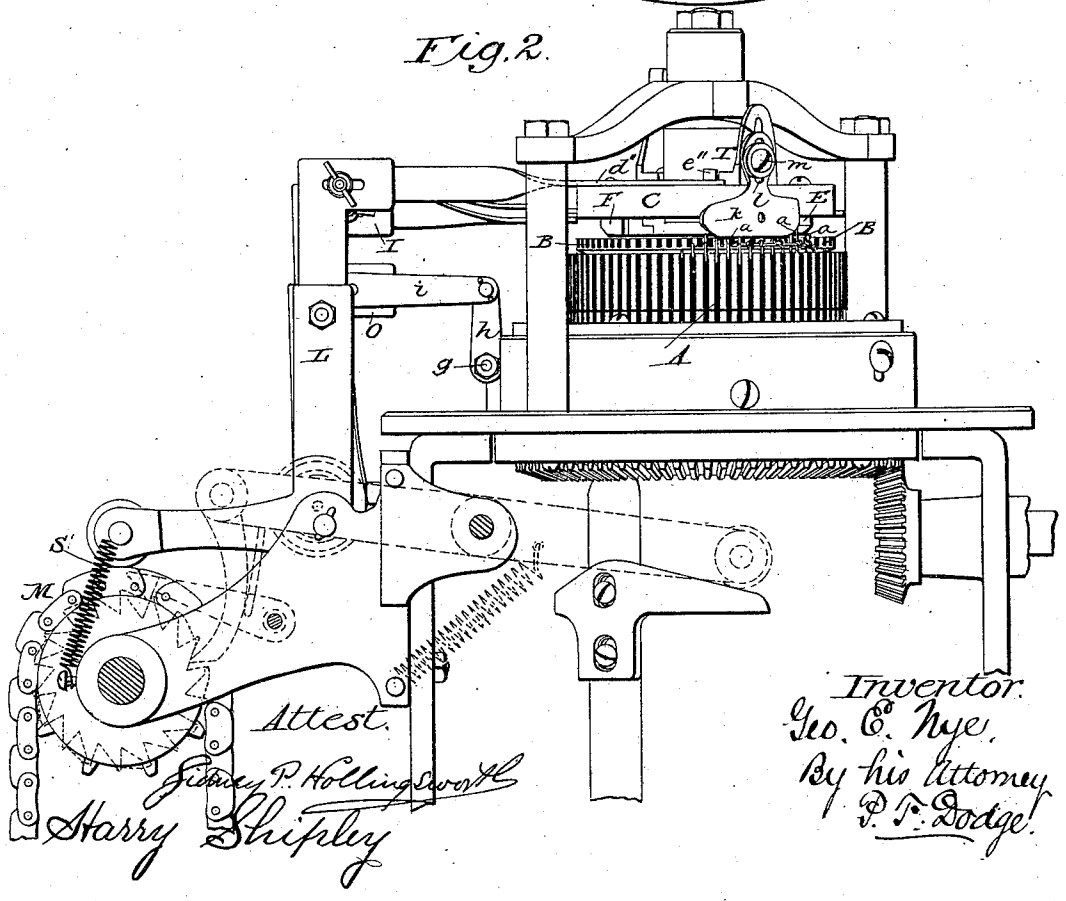


Fig. 2.



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N. PETERS. Photo-Lithographer, Washington, D. C.

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Fig. 3

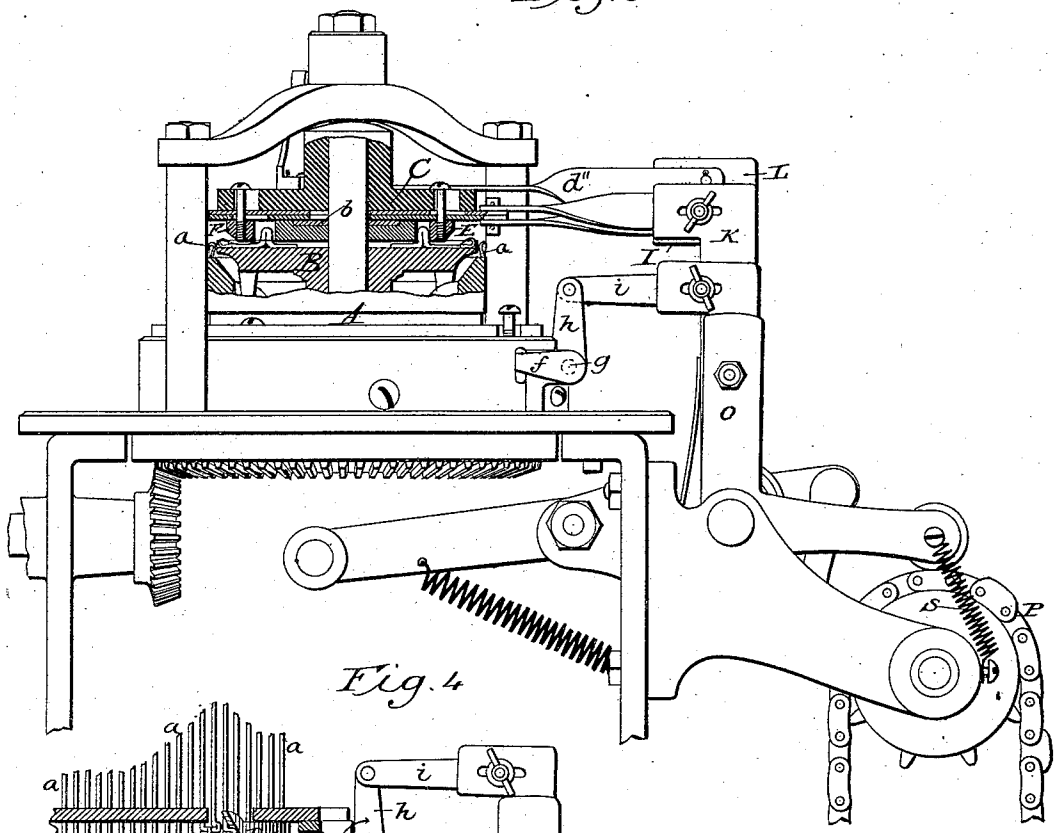
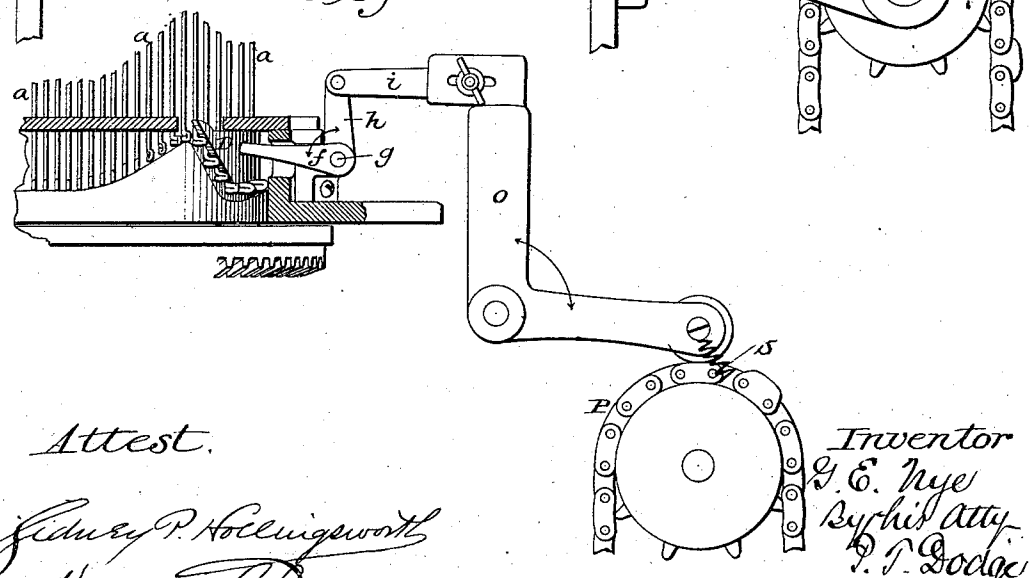


Fig. 4



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Fig. 5.

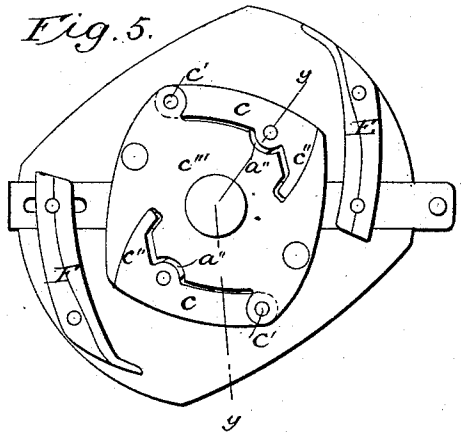


Fig. 6.

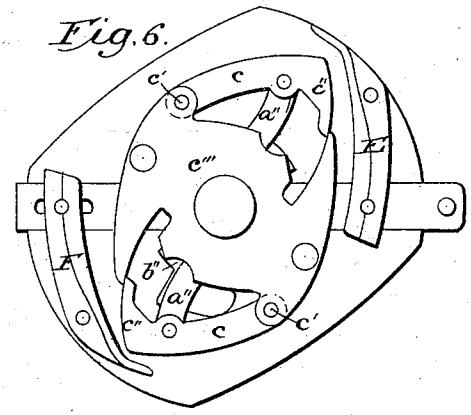


Fig. 7
on x-x

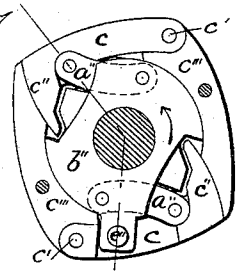


Fig. 8.
on x-x

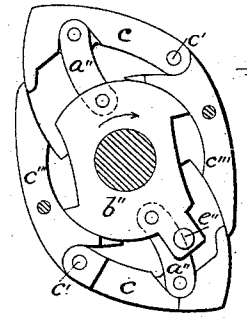


Fig. 9.
on y-y

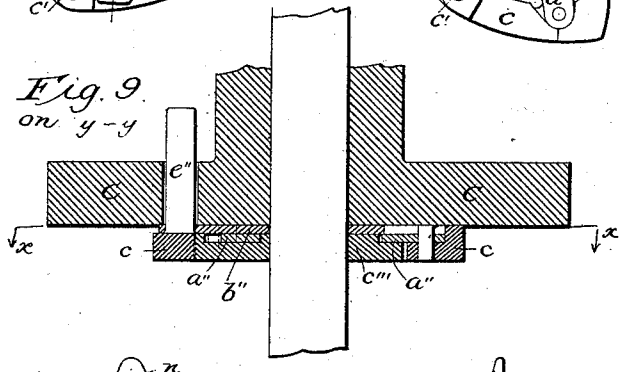


Fig. 10.

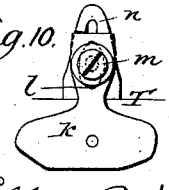
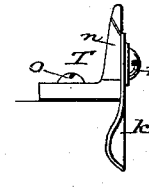


Fig. 11



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By his atty.

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N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

GEORGE E. NYE, OF BRISTOL, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 316,907, dated April 28, 1885.

Application filed January 23, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. NYE, of Bristol, in the county of Bucks and State of Pennsylvania, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

The present invention relates more especially to the knitting-machine represented in the Letters Patent granted to G. E. Nye, No. 253,752, February 14, 1882, and H. P. Ballou, No. 284,591, September 11, 1883, said machine being of the class in which vertically-reciprocating needles mounted in a revolving cylinder co-operate with horizontal needles reciprocating radially in a dial-plate.

The objects of the present improvements are, first, to adapt the machine for the automatic formation of welts; and, second, to adapt the machine to produce a slack course or courses at any predetermined point or points in the fabric. The slack course is intended particularly to adapt the fabric to have additional portions knit thereon by hand or by other machines. The purpose of the welting is to give a finished end to the fabric.

The first part of the invention consists in devices of the peculiar character hereinafter described and claimed, controlled automatically by a pattern-chain whereby throw-out cams, operating on the horizontal or dial needles, are adjusted so that the needles may be drawn backward or inward so as to cease knitting for the time being.

The second part of the invention consists in the combination, with the movable cam by which the cylinder-needles are depressed, of devices, hereinafter described in detail, controlled automatically by a pattern-chain, whereby the cam is caused to carry the needles momentarily below the usual point, thus producing long stitches.

This improvement is applicable alike to single and double feed machines, a single adjustable cam being sufficient in either case, for the reason that the next course is knit into the fabric above without interfering.

Referring to the accompanying drawings, Figure 1 represents a top plan view of my improved machine. Fig. 2 is an elevation of the same, viewed from the side on which the welting mechanism is located. Fig. 3 is an elevation of the machine viewed from the opposite side, the dial-plate, the upper end of the cylinder, and the needle-projecting cams being shown in vertical central section. Fig. 4 is an elevation, partially in section, showing the details of the adjustable depressing-cam for producing the slack course. Fig. 5 is a view looking upward against the under side of the cams by which the horizontal needles are controlled, the cams being in the positions which they occupy when forming the welt. Fig. 6 is a like view of said parts in the positions which they occupy during the ordinary operation of knitting. Figs. 7 and 8 are horizontal sections on the line *x x* of Fig 9, looking downward upon the needle-projecting cam and illustrating the same in its different positions, respectively. Fig. 9 is a vertical section on the line *y y* of Figs. 5 and 7. Figs. 10 and 11 are views illustrating the construction of the yarn-guide.

In its fundamental features the machine represented in the drawings is substantially identical with those represented in the patents before referred to. The vertical needles *a* are arranged in the ordinary manner in grooves in the outer periphery of a rotary cylindrical tube, A, while the horizontal needles are disposed in radial grooves around a horizontal rotating plate, B, usually termed the "dial." The dial is supported so as to revolve on the lower end of a vertical shaft which is secured at its upper end to a stationary cross-bar or bridge-tree secured to the top of the main frame.

To the supporting-shaft immediately above the dial-plate there is rigidly secured a stationary plate, C, bearing on its under side the cams by which the dial-needles are projected and retracted, as hereinafter explained in detail.

Two radially-movable cams, E and F, engage with the heels of the needles for the purpose of drawing them inward. These cams are pivoted to swing inward and outward, and are connected through intermediate devices with elbow-levers I and K, the positions of which are controlled by means of pattern-chains R.

The foregoing parts are all constructed in the same manner as in Patent No. 284,591, and constitute no part of my invention.

Between the retracting-cams E and F are located the push-out or projecting cams *c*, and

it is to these cams that the first part of my invention relates. In the original patent these cams were formed by the edges of a fixed plate, so that the dial-needles were always projected the same distance or to the same point.

In order to produce what is known in the art as a "welt," it is necessary that the dial-needles shall be permitted to move back—that is to say, inward—so as to retain their stitches until one or more courses are knit on the cylinder-needles. To this end I construct the push-out cams so that they may be moved inward in order to prevent them from projecting the needles the usual distance. The details of construction are plainly represented in Figs. 5 to 9. Each of the cams *c* is mounted at one end on a vertical pivot, *c'*, so that it may swing inward and outward. The opposite end, *c''*, is curved concentrically with the pivot and arranged to close within a fixed recessed plate, *c'''*. The parts are so shaped and proportioned that when the cams are moved outward to the normal position their ends remain slightly in engagement with the edge of the plate, as shown in Fig. 6, the edge of the plate and the end of the cam forming a practically-continuous surface, thus avoiding the danger which would otherwise exist of the heels of the needles passing behind the cam. When the cams are expanded, as in Fig. 6, the dial-needles perform the knitting action. When the cams are drawn inward, as in Fig. 5, the needles, after being retracted by the cams E and F, are permitted to remain in their inner or backward position so as to cease their knitting action and retain the stitches which are for the time being upon them. In order to secure the simultaneous and automatic adjustment of the two cams *c* at the proper times, I connect them, respectively, by links *a''* with a centrally-pivoted plate, *b''*. One edge of this plate bears a stud, *e''*, which projects upward through a slot in the stationary plate, and is connected at its upper end with a link, *d''*. This link is connected at its outer end to one arm of an elbow-lever, L, which is pivoted to the frame and provided at the opposite end with a roller arranged to bear on the edge of a pattern-chain, M, mounted on the drum by which the other pattern-chains are carried. At suitable points in its length this chain is provided with links of less height than the others. Whenever one of these links passes beneath the roller, the elbow-lever is permitted to fall backward, whereby its link is caused to turn the plate *b''* in the direction indicated by the arrow in Fig 8, the effect being to retract the cams to the position represented in Fig. 7, and stop the knitting action of the dial-needles, as before mentioned. As the next link of greater height is brought into action upon the lever the motion of the parts is reversed and the plate *b''* turned in the direction indicated by the arrow in Fig. 7, and the cams again expanded to the original position.

Passing next to the means for producing the slack course, attention is directed to Figs. 1, 3, and 4. D represents a cam fixed in position adjacent to the side of the revolving needle ring or cylinder in position to act upon the heels of the needles and effect their depression. The form of this cam and its ordinary mode of action are the same as in existing machines. Instead, however, of fixing the cam rigidly in position, I arrange the same so that it may slide downward below its ordinary operative position and connect thereto one end of an arm, *f*, mounted on a rock-shaft, *g*, the opposite end of which is provided with a crank-arm, *h*, by moving which the elevation and depression of the cam may be effected. The arm *h* is connected by a link, *i*, or otherwise, to the upper end of an elbow-lever, O, pivoted to the main frame and provided at the opposite end with a roller arranged to bear on the edge of a pattern-chain, P, which is provided at suitable points in its length with links higher than the remainder. Whenever one of these links acts upon the lever it is caused through the intervening parts to depress the cam D below its normal position, the cam thus depressed serving to carry the needles below their ordinary operative positions, so that they produce a course of stitches of increased length, the stitches thus formed constituting what is commonly known as a "slack course." The chain may contain any desired number of elevated links, and they may be arranged at equal or unequal distances apart, according to the frequency with which it is required to have the slack courses produced. After the action of the elevated links, the depressing-cam is immediately elevated and the connecting parts returned to their normal positions by means of a spring, S, which acts to urge the lever O backward.

By connecting the links *i* to the operating-lever through the medium of a slot and thumb-screw, as shown in the drawings, the ordinary elevation of the cam may be varied, as desired, to produce stitches of greater or less length. The lever L and the parts connected therewith are also caused to assume their normal positions after the action of the pattern-chain M, by means of a spring, S', connected with the lever, as in Fig. 2.

Motion is communicated to the cylinder-roll by which the pattern-chains are carried by mechanism constructed and arranged in the same manner as in the patents before alluded to.

While I have represented in the drawings a double-feed machine—that is to say, a machine receiving yarn on two sides simultaneously, and requiring, therefore, the employment of the two projecting-cams *c c*—it is to be understood that the improvements may be applied in the same manner to single-feed machines, in which the needles are operated but once during each revolution of the cylinder, and which receive yarn at one point only. In such case one of the cams *c* and one of the usual depressing-cams will be omitted, the action of the other cams and the attendant parts remaining unchanged.

For the purpose of delivering the yarn to the needles, I employ on the two sides of the frame stationary yarn-guides T, perforated to admit of the yarn passing through them. As it is frequently necessary to effect the adjustment of these guides in different directions, to secure the desired presentation of the yarn, I adopt the construction represented in Figs. 10 and 11. A vertical guide-plate, *k*, is made of substantially the usual form, so far as its lower or guiding portion proper is concerned. At its upper end it is provided with an opening, *l*, through which a screw, *m*, is passed to secure it to a bracket-plate, *n*. This plate is slotted in a horizontal direction and secured to the frame by a screw, *o*, so that it may be moved and secured both radially and laterally. The opening in the upper end of the guide-plate is made of such size and form as to admit of its being moved both vertically and laterally with respect to the bracket. Thus it will be seen that provision is made for the adjustment of the guide in all directions.

Having thus described my invention, what I claim is—

1. The dial-needles and the retracting-cam therefor, in combination with the push-out cam to project said needles, the rotary plate b^2, the link connecting said cam and plate, the actuating-lever, the link connecting the lever and plate, the spring to move the lever in one direction, the pattern-chain to move the lever in the opposite direction, and devices, substantially as shown, to actuate the chain, whereby the needles are automatically projected at intervals beyond the normal limit to assist in the formation of a welt, substantially as described.

2. In combination with the revolving dial and its needles, the cams acting to retract said needles, the central adjustable push-out cams, *c c*, to project the needles, the rotary plate connected with and controlling said cams, the actuating-lever L, the link connecting the lever with the plate, the pattern-chain actuating the lever, and the means for actuating the chain.

3. The two pivoted needle-projecting cams *c c*, in combination with the fixed cams c''' c''', the intermediate rotary plate, b'', and the connecting-links a'', substantially as described.

4. The combination, substantially as hereinbefore described and shown, of the needle-cylinder, its needles, the vertically-adjustable cam to depress the needles, the rock-shaft provided with the arm engaging said cam and also with the second arm, the lever O, the link connecting the last-named arm with the lever, the spring to move the lever in one direction, the pattern-chain to move the same in the opposite direction, and the means to actuate said chain.

5. In combination with the frame, the bracket-plate *n*, having the horizontal slotted base, the screw uniting the same with the frame, the guide-plate *k*, shaped and slotted vertically, as described, and the screw uniting the same with the bracket-plate, substantially as described.

GEORGE E. NYE.

Witnesses:
JESSE O. THOMAS,
EDWARD TREDICK.