(No Model.)

W. H. KELLY.

KNITTING MACHINE.

No. 372,374. Patented Nov. 1, 1887.

Fig. 1.

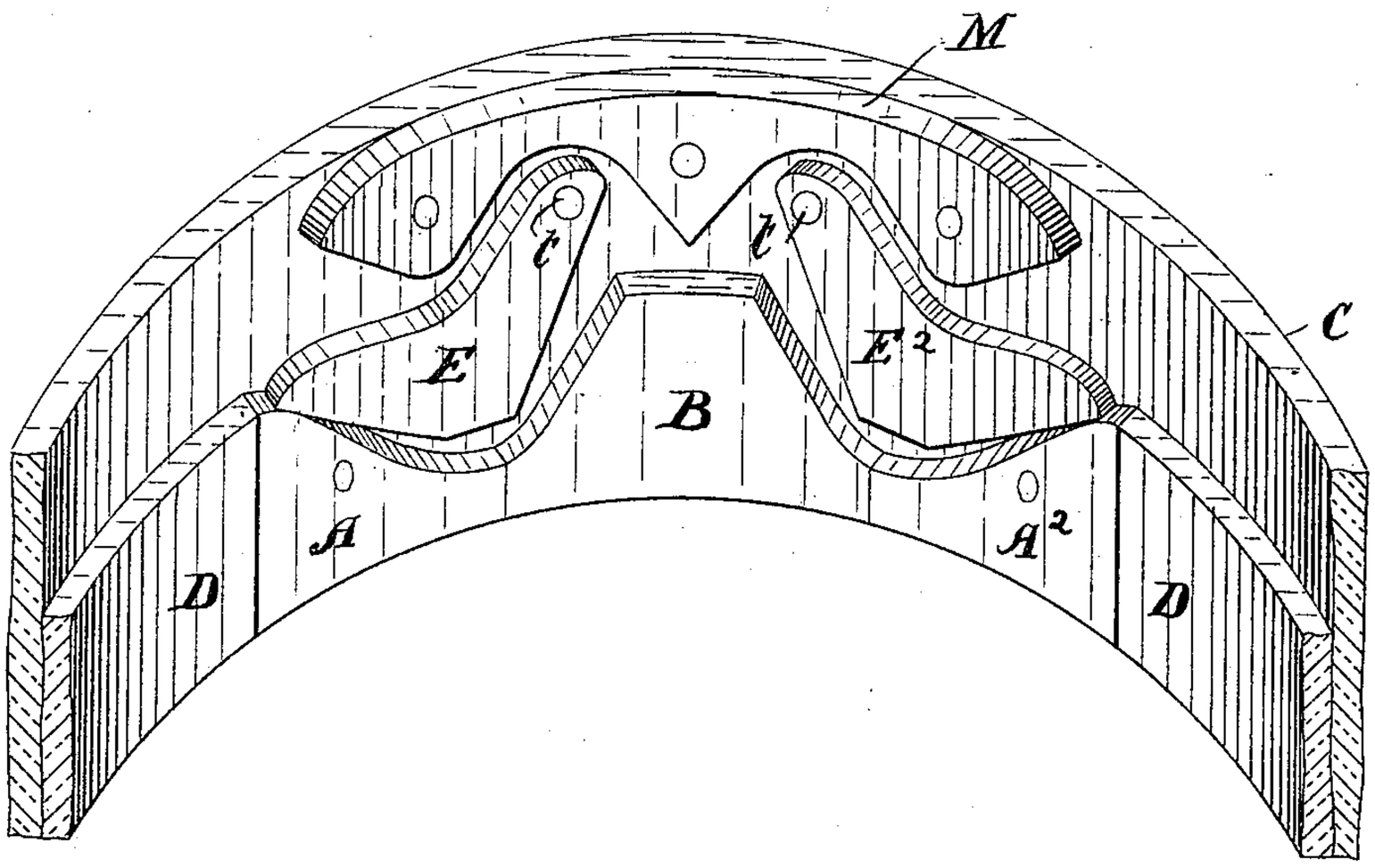

Fig. 2.

Fig. 3.

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KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 372,374, dated November 1, 1887.

Application filed January 12, 1887. Serial No. 224,092. (No model.) Patented in England February 7, 1887, No. 1,924; in Belgium February 7, 1887, No. 76,252, and in France June 23, 1887, No. 181,392.

To all whom it may concern:

Be it known that I, WILLIAM H. KELLY, of Woonsocket, in the county of Providence, State of Rhode Island, have invented a certain new and useful Improvement in Circular-Knitting Machines, (for which I have obtained Letters Patent in England, dated February 7, 1887, No. 1,924; in Belgium, dated February 7, 1887, No. 76,252, and in France, dated June 23, 1887, No. 181,392,) of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an isometrical perspective view showing a portion of the cam-cylinder, cam-plates, and switch-cams of an ordinary circular-knitting machine of the class hereinafter mentioned; Fig. 2, a like view showing a portion of the cam-cylinder with the cam-plates, switch-cams, tumblers, and switch-plates of my improved machine; and Fig. 3, a sectional view showing certain details of construction.

Like letters of reference indicate corresponding parts in the different figures of the drawings.

My invention relates more especially to that class of circular-knitting machines which are employed in the manufacture of stockings and other similar articles; and it consists in a novel construction and arrangement of parts, as hereinafter more fully set forth and claimed, by which a more effective device of this character is produced than is now in ordinary use.

In forming the heel or toe of a stocking on the ordinary machine of this kind, after knitting the leg portion, one-half of the needles (those on the back side of the cylinder opposite the cams) are first drawn up until thrown out of action. Narrowing is then performed by pulling up the right-hand needle of those remaining down or in action and revolving the machine from left to right one revolution, then pulling up the left-hand needle of those remaining down or in action and revolving the machine from right to left one revolution, then pulling up the right-hand needle, revolving the machine, and so on until two-thirds of the needles in action are pulled up or thrown out of action, one at a time, the needle on the left being withdrawn last. Widening is then accomplished by pushing down or bringing into action the last needle pulled up on the right-hand side, as described, revolving the machine one revolution, pushing down the last needle pulled up on the left-hand side, revolving the machine, and so on until the needles which are pulled up or thrown out of action, one at a time, as described, are pushed down or brought into action again, one at a time. After the widening the knitting of the foot portion of the stocking proceeds in the ordinary manner.

The pulling up and pushing down of the needles in the manner described, in order to narrow and widen on machines of this character, has heretofore usually been performed by hand, thereby rendering the process very slow, laborious, and costly. To overcome this difficulty or objection is one object of my present invention, and to that end I make use of means which will be readily understood by all conversant with such matters from the following explanation.

In the drawings, C, Fig. 2, represents the cylinder; B D A A^2, the lower cam-plates; J H H^2, upper cam-plates; E E^2, the switch-cams; L L^2, switch-plates, and K K^2 tumblers.

The upper and lower cam-plates, B D A A^2 J H H^2, are rigidly secured to the main cylinder C of the machine by rivets or screws in the usual manner. The switch-cams E E^2 are pivoted at *t* and the tumblers K K^2 at *m* to the cylinder C. The cam-plate J is V-shaped, and is arranged midway between the plates H H^2, with its apex or point downward. The tumblers K K^2 are pivoted between the upper ends of the switch-cams E E^2, and so arranged that when depressed, as shown in Fig. 2, the tumbler K will rest on the upper end of the cam E and the tumbler K^2 on the upper end of the cam E^2, and when elevated to their fullest extent will rest against the inclined sides of the plate J. The tumbler K is provided with a rabbet or shoulder, *x*, which extends across it from front to rear nearest its upper end and adjoining the switch-cam E, the tumbler K^2 being provided with a corresponding shoulder, *x*, on its side adjoining the cam E^2.

Projecting upward from the cylinder C there

are standards Q, to the inner side of one of which a switch-plate, L, is pivoted at *z*, the upper edge of the cylinder being cut out or concaved, as shown at *v*, to receive the lower end of said plate and permit it to swing freely. An arm, *f*, projects downwardly from the inner face of said plate at that side of its center which is nearest the plate H, said arm being adapted to strike the plate H when swung toward the plate J and to strike a stop, *d*, secured to the cylinder C, when swung in the opposite direction. A coiled spring, *g*, is secured at one end to the plate L and at the other to the cylinder C, said spring acting contractively to swing said plate in the direction of the plate J and keep the arm *f* in contact with the plate H. A thumb-screw, N, passes through the standard Q and is adapted to hold the plate L in any desired position. A corresponding switch-plate, L^2, is also disposed at the opposite side of the machine on the other standard Q; but as it is constructed and arranged to operate in substantially the same manner as the plate L a more particular description is deemed unnecessary.

The tumbler K is provided with a screw, *l*, which passes through the cylinder C and is adapted to hold said tumbler in any desired position, the tumbler K^2 being also provided with a corresponding screw.

In the use of my improved machine the narrowing is accomplished as follows, to wit: The switch-plates L L^2 are first pushed down until their arms *f* f^2, respectively, strike the stops *d* d^2, in which position they are secured by the set-screws N. One-half of all the needles (those on the back side of the needle-cylinder opposite the cams) are then pulled up or withdrawn from action by hand, after which the cam-cylinder is turned in the direction of the arrow 1, causing the butts of the working-needles to pass upwardly over the switch-cam E^2 and under the plate H^2 until they strike the tumbler K^2, when the butt of the first or advance needle will be caught by the shoulder or notch *x* of said tumbler, and as the cam-cylinder continues to revolve the tumbler will be swung or turned on its pivot *m* and thrown upward against the plate J, thereby pulling up said advance needle and withdrawing it from action. The butts of the other working-needles, as the cam-cylinder continues to revolve, will then pass under the tumbler K^2 and over the cam-plate B until they strike the switch-cam E, which will be raised thereby, the butts passing thence over the plate A onto the plate or ledge D. After the butts of the working-needles have passed onto the plate or ledge D, as stated, the cam-cylinder is reversed, or revolved from right to left, causing the butts to pass upwardly over the switch-cam E and under the plate H until they strike the tumbler K, when the butt of the first or advance needle will be caught by the shoulder or notch *x* of said tumbler, and as the cam-cylinder continues to revolve the tumbler will be swung or turned on its pivot *m* and thrown upward against the plate J, thereby pulling up said advance needle and withdrawing it from action. The butts of the other working-needles, as the cam-cylinder continues to revolve, will then pass under the tumbler K and over the cam-plate B until they strike the switch-cam E^2, which will be raised thereby, the butts passing thence over the plate A^2 onto the plate or ledge D.

It will be understood that the cam-cylinder is to be revolved from right to left and left to right, or its reciprocating rotary movements continued until the desired number of needles have been withdrawn from action or until the narrowing process has been accomplished. As the advance needles of those in action are withdrawn one at a time by the tumblers K K^2, as stated, they are added to the ranks of the needles out of action, including those drawn up by hand on that side of the cylinder opposite the cams at the commencement of the process.

The widening is accomplished on my improved machine as follows, to wit: The screws N are loosened and the tumblers K K^2 are turned up against the cam J and secured in that position by the set-screws *l*. The cam-cylinder is then rotated in the direction of the arrow 1, causing the butt of the first left-hand elevated needle to strike the arm *f* on the switch-plate L, thereby swinging said plate on its pivot *z* until said arm comes into contact with the fixed stop *d*, when the butt will escape from the arm *f*, pass under said stop onto the plate or ledge D, and be brought into action. The cam-cylinder is then reversed or rotated in the opposite direction, as indicated by arrow 2, causing the butt of the first right-hand elevated needle to strike the arm f^2 on the switch-plate L^2, thereby swinging said plate on its pivot *z* until said arm comes into contact with the fixed stop d^2, when the butt will escape from the arm f^2, pass under said stop onto the plate or ledge D, and be brought into action. A shoulder or notch, i^2, is formed in the arm f^2, by which the butt of the advance needle is caught and the needle forced downward and discharged under the fixed stop d^2 onto the plate D, when the plate L^2 is swung on its pivot *z* as the cam-cylinder is revolved in the direction of arrow 2. The arm *f* is also provided with a corresponding notch or shoulder, *i*, for catching the butt of the advance needle, forcing it downward and discharging it under the fixed stop *d* onto the plate D, when the machine is revolved in the direction of the arrow 1. In the movement in the direction of the arrow 1 the left-hand needle of the raised series is caught by the notch *i* of the arm *f* and delivered onto the plate D, as above described, and the said arm *f* is thereby compressed below the plane of the butts of the succeeding raised needles, which needles thus escape the action of said arm, said needles being held up in the usual manner by the ordinary friction-spring for this purpose on the needle-cylinder. In the movement in the direction of the arrow 2 the right-hand needle of the raised series is

caught in the notch i^2 of the arm f^2 and delivered onto the plate D, said arm f^2 being thereby depressed below the plane of the butts of the succeeding raised needles, which needles thus escape the action of said arm. In the movement in the direction of the arrow 1 the butts of all the raised needles strike on the inclined top of the arm f^2 and slide over it onto the upper cam-plate, H^2, and in the movement in the direction of the arrow 2 the butts of all the raised needles ride over the inclined top of the arm f onto the upper cam-plate, H. The arms f f^2, respectively, project below the plates H H^2 a sufficient distance to readily engage the butts of the advance needles when the machine is revolved or moved back and forth, as described.

It will be understood that when the butt of the advance needle strikes the arm f or f^2, as the case may be, the spring g of the switch-plate to which said arm is attached will be overcome, and that when the butt has passed the arm and been forced downward beneath the stop d or d^2 onto the plate D said spring will return the switch-plate to its normal position.

It will be obvious that in my improved machine the advance working-needles are withdrawn from action and brought into action again automatically in narrowing and widening to form the heel or toe of the stocking instead of by hand, as in the ordinary machines of this character, thereby enabling the work to be performed more perfectly and with a great saving in time and labor.

It will be observed that the ordinary machine, as shown in Fig. 1, is provided with a cylinder, C, cam-plates A A^2 B D, and pivoted switch-cams E E^2, these parts, when in and of themselves considered, being old and not claimed, broadly, by me. There is also a superposed cam-plate, N, attached to the cylinder of the ordinary machine above the switch-plates E E^2, which I do not claim, broadly, the same being in common use. In place of said last-named plate I employ the separate plates H H^2 J and pivoted tumblers K K^2, which, although they perform some of the functions accomplished by the plate M, also serve other and very important purposes for which the plate M is not adapted.

From the foregoing it will be obvious that the principal features of my improvement consist in the cam-plates H H^2 J, pivoted tumblers K K^2, and switch-plates L L^2.

I do not confine myself to the use of the screws l for securing the tumblers K K^2, or the screws N for securing the plates L L^2, as any equivalent means may be employed for that purpose; neither do I confine myself to the use of the coiled spring g for returning the switch-plates L L^2 to their normal positions, as any equivalent means may also be employed for that purpose, nor to the use of the stops d d^2, constructed and arranged as described, as stops of any other suitable construction may be employed, and they may also be arranged in any convenient position. The switch-plates L L^2 may also be constructed and arranged differently and still perform the same functions.

Having thus explained my invention, what I claim is—

1. The combination of the pivoted switch-cams, the V-shaped fixed cam between said switch-cams, the pivoted tumblers oscillating between said switch-cams and the intermediate fixed cam, cam-plates below said tumblers and switch-cams, and ledges adjacent to said cam-plates, substantially as described.

2. The combination, with the cam-cylinder, of the fixed upper cam-plates, the V-shaped fixed cam between said cam-plates, the pivoted switch-cams below said fixed cam-plates, the tumblers pivoted at their inner ends below said V-shaped cam, the cam-plates below said tumblers and switch-cams, and ledges adjacent to said cam-plates, said tumblers being adapted to swing between and into contact with said switch-cams and the intermediate cam, substantially as described.

3. The combination, with the cam-cylinder provided with a recess and with a standard opposite said recess, of a switch-plate pivoted to said standard and swinging in said recess, a fixed cam on said cylinder adjacent to said switch-plate, an arm, f, on said switch-plate, having a notch, i, a stop on said cylinder with which said arm comes in contact for arresting the movement of the switch-plate, and a spring for returning said switch-plate to its normal position, substantially as described.

4. The cylinder C, fixed cam-plates A A^2 B D H H^2 J, pivoted switch-cams E E^2, pivoted tumblers K K^2, provided with shoulders x, the screws N N, stops d d^2, springs g, standards Q, pivoted switch-plates L L^2, and arms f f^2, provided with the shoulders i, constructed, combined, and arranged to operate substantially as described.

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