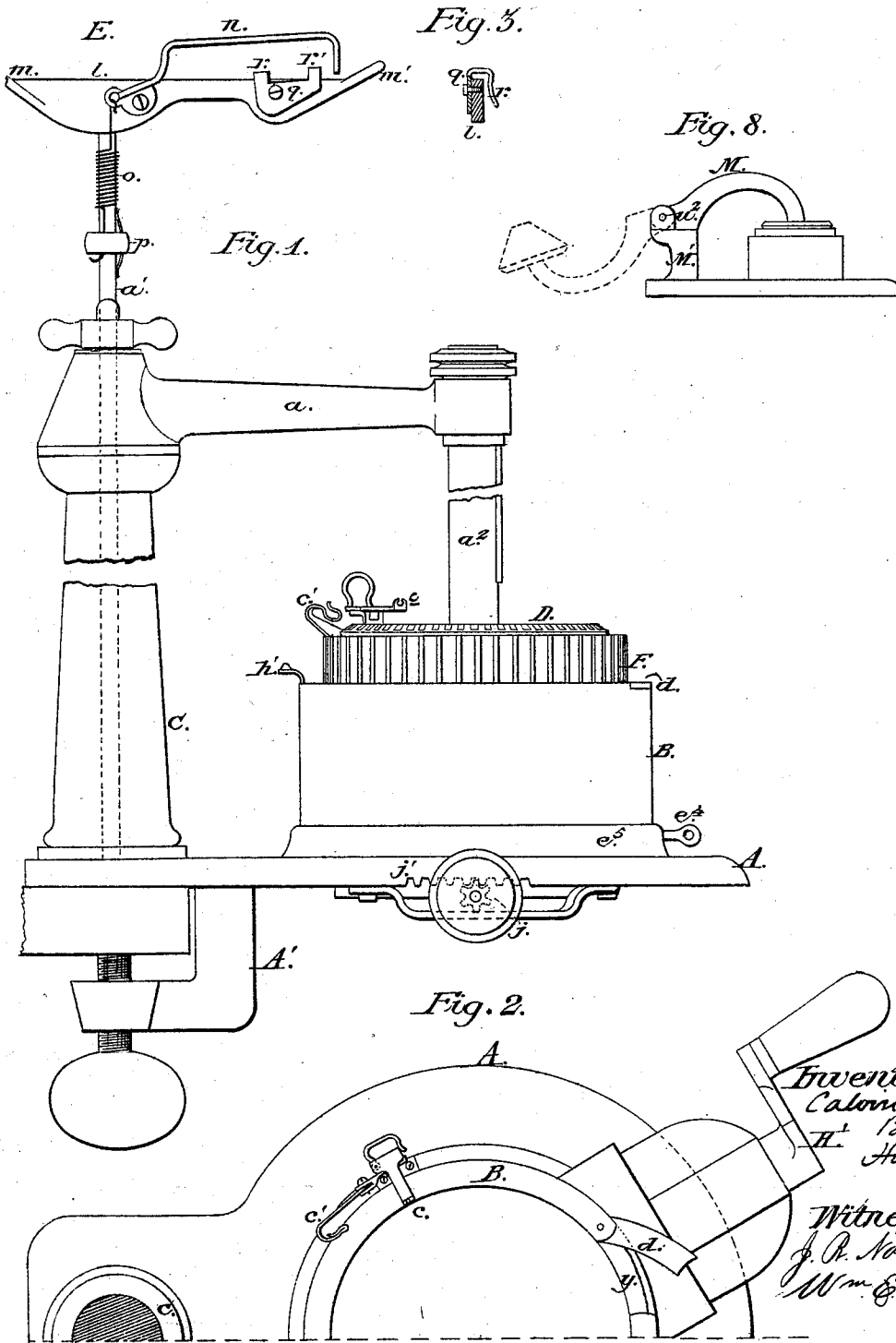


C. R. TUTTLE.
Knitting-Machines.

No. 149,813.

Patented April 14, 1874.



Inventor:
Calvin R. Tuttle
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Witnesses:
J. R. Nottingham
Wm. E. Chaffee

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Fig. 4.

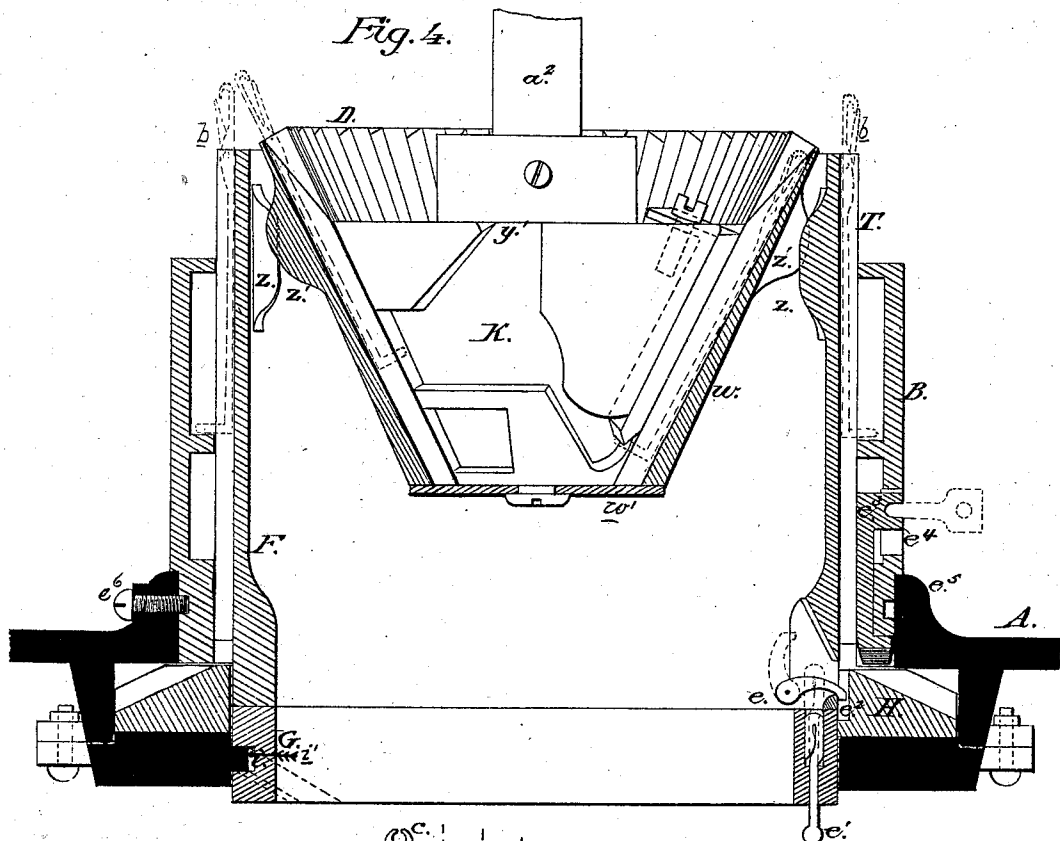


Fig. 5.

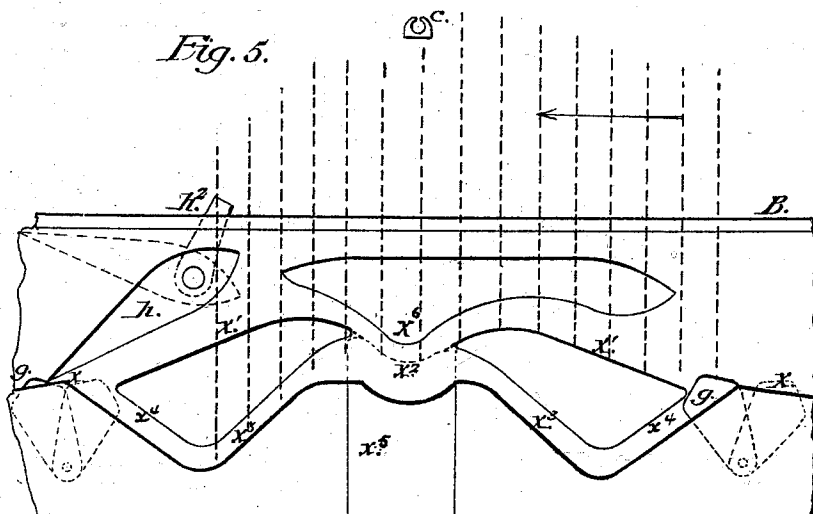


Fig. 6.

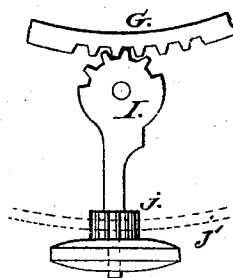


Fig. 7.



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CALVIN R. TUTTLE, OF NEW BRIGHTON, PENNSYLVANIA.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **149,813**, dated April 14, 1874; application filed March 18, 1874.

To all whom it may concern:

Be it known that I, CALVIN RUTTER TUTTLE, of New Brighton, Beaver county, Pennsylvania, have invented Improvements in Knitting-Machines, of which the following is a specification:

The object of my invention is a knitting-machine which will produce in a continuous web both plain and ribbed or ornamental fabric, which may be reversed without the use of a movable thread-guide, in which either the cylinder or shell will revolve, and which embodies other improvements, all fully described hereafter.

One form of machine to which the improvements may be applied is represented in the accompanying drawings, in which—

Figure 1 is a side elevation of the machine; Fig. 2, a partial plan view; Fig. 3, a detached sectional view; Fig. 4, a transverse vertical section, full size; Fig. 5, a diagram illustrating the construction and operation of the cams; Fig. 6, a detached view of one of the adjusting devices; Fig. 7, a view illustrating a portion of an ordinary knitting-machine, and Fig. 8 a modification.

A is the base of the machine, provided with clamps A' for securing it to a bench or table. B is the "shell," and F a cylinder, grooved to receive "latch" or "beard" needles, which are operated by cams on the inner side of the shell, the yarn passing to the needles from a fixed guide, *c*, which may be secured to the shell, and is adjustable both vertically and radially. The shell is cut away to form a recess, *y*, at the upper edge for the passage of needles to or from the grooves of the cylinder, a gate, *d*, pivoted to the shell, being fitted to the recess. The shell B fits and may be turned to any desired position in a recess formed by an annular flange, *e*, of the bed-plate, being secured after adjustment by a pin, *e*¹, or other suitable device. The cylinder F rests upon a ring, G, into inclined grooves *i*, in which extend projections *i*' on the bed-plate; and in a recess beneath the shell is an annular gear-wheel, H, driven by a bevel-wheel on a shaft, H', turning in bearings in any suitable position on the bed-plate, either above or below the annular wheel. A catch, *e*², Fig. 1, sliding in a recess in the shell, may be pushed down-

ward into a recess in the wheel H, which will then carry the shell with it as it revolves, a spring-pin, *e*¹, projecting from the ring G into a recess in the cylinder F, and holding the latter stationary; or the said pin *e*¹ may be drawn down, so as to permit a dog, *e*, hung to the cylinder F, to fall into a recess, *e*², in the annular wheel H, in which case the cylinder will revolve with the said wheel. Thus, by adjusting the pins *e*¹ *e*² and the catch *e*³, the machine may be made to operate either as a stationary or as a revolving cylinder machine, the conversion being effected without stopping the machine or removing the work. By turning the ring G, the cylinder F may be raised or lowered to regulate the length of the stitch, or for any other purpose, this movement of the ring or cylinder being effected, in the present instance, by a toothed segment, I, gearing with a rack on the ring G, and carrying a pinion, *j*, gearing with a rack, *j*', on the bed-plate, Figs. 1 and 6.

In ordinary knitting the yarn passes from the guide to the needles, the latter are raised and depressed by the cams, and the work is carried downward through the cylinder, all in a manner well known to those familiar with this class of machines.

The cams are arranged within the shell B so as to form grooves which communicate with and cross each other, as shown in the diagram, Fig. 5, the needles, as they approach the fixed guide *c* in either direction, gradually rising, and then descending suddenly as they pass and leave the guide.

Heretofore the grooves have been so arranged as to cross each other at a point directly below the guide, and the cams have otherwise been so constructed that automatic switches or movable cams were necessary to direct the needles to their proper channels.

I dispense with such movable devices by separating the side cams, and placing between them a cam having a double inclined edge, *x*⁶, which directs the needles downward to the edge *x*³, as they reach the said cam moving in either direction. On reversing the machine, those needles which have not caught the thread may be elevated, as they pass the guide *c*, to the edge *x*¹, their descent under the edge *x*³, and escape of their loops, being thus prevented.

To facilitate this adjustment of the needles, the central portion x^2 of the lower cam is movable, so that it may be raised to bridge the space between the edges $x^1 x^1$, as shown in dotted lines, Fig. 5.

In ordinary machines the spaces between the edges $x x^1$ are bridged over by latches, of the character shown in Fig. 7, so that, on reversing the motion of the machine, the points of the latches are presented to, and frequently catch, the heels of the needles, which, with the latches, are often thus bent or broken.

By substituting for the latches tumblers g , pivoted to the shell near its lower edge, and beveled or rounded at their upper ends, as shown in Fig. 5, shoulders instead of points are presented to the needles, when the machine is reversed, and the tumblers are readily thrown back without injury to any of the parts, while much friction and wear consequent upon the use of the latches are avoided.

A switch-cam, h , adjustable by means of a lever, h^2 , on the outside of the shell, may be arranged so as to guide any needles that are to be thrown out of operation upward above the operating-cams and away from the thread-guide, thus avoiding the troublesome and tedious operation of raising such needles separately by hand. This cam h , when turned to the position shown in dotted lines, also serves to draw down any needles that have been raised and bring them again under the operation of the working cams. As the cylinder F has no permanent connection with the annular wheel H it may be readily removed at any time by drawing it upward from the shell B . By making the shell B adjustable on the base-plate and around the cylinder F , as described, the cams and thread-guides may be brought to any position which will best suit the convenience and habits of the operator.

In the foregoing description I have referred only to the use of a single cylinder, F , carrying one series of needles, b , and producing merely plain or open work. I will now describe the means employed for converting such single machine, whether it be circular or straight, into a compound machine, in which two series of needles crossing each other are employed.

The principal element of this convertible machine is an adjustable supplementary holder or cylinder, D , for carrying and operating the second series of needles. This supplementary needle-holder, in the present instance, is secured to a bar, a^2 , extending through a recess in the outer end of an arm, a , pivoted to a standard, C , and having a feather, which prevents the bar from turning when depressed, and catches in a notch in the arm a , and holds the bar in its position when elevated. The cylinder D consists of a grooved shell, w , inclosing a conical block, K , secured to the bar a^2 , cut away to form a recess, y' , and having on its face cams for operating needles lying in the grooves of the shell, the latter being supported by a plate, w' , secured to the end

of the bar a^2 . The shell w , when in the position shown in Fig. 5, is revolved upon the fixed cam-block K by the cylinder F , the lugs z on which bear against similar lugs z' upon the shell w . When only the cylinder F is in use the work produced will be similar to that obtained from any ordinary cylinder-machine, the operations of heeling and toeing being effected, as usual, by working with only part of the needles, any number of which may be thrown out of or into operation by the proper manipulation of the cam h . When the two series of needles are to be used the arm a is swung around until a projection upon the same strikes a stop upon the standard C , when the cylinder D will be directly above the cylinder F , within which it is introduced by turning and lowering the bar a^2 . By turning nuts at the upper end of the bar a^2 , and by adjusting the ring G , the edges of the two cylinders are brought to their proper relative position. The work being suspended from the needles b of the cylinder F , and it being desired to produce a fabric having a series of ribs or other figures, the gate d , which occupies a position immediately opposite the opening y' of the holder D , is opened, the cylinder F turned slowly, and a portion of the needles, as they come opposite the opening y , are drawn from their grooves, and without removing the loops are merely turned and introduced into the opposite grooves of the cylinder D through the recess y' .

It will be apparent that the number of needles thus transferred and their arrangement will depend upon the width and character of the ribs or other ornaments to be produced.

The needles being arranged as desired, the simultaneous rotation of the cylinder F and shell w will carry the heels of the needles over the cams in the shell B , and on the block K , the relative arrangement of which is such that the two series of needles will cross each other, and simultaneously catch the yarn which is directed between them by a supplementary adjustable guide, e' , hung adjacent to the guide e . The lugs $z z'$ are so arranged as to prevent the needles of the two series from coming in contact, and are so rounded that the fabric passes over and between them with little or no friction.

In some instances it will be found advantageous for the lugs to be adjustable. One mode of effecting this will be to secure them to an adjustable ring attached to the cylinder F or shell w .

If desired, the arrangement of cams described in connection with the outer cylinder may be used on the inner one, so as to make the ribbing-machine reversible; and, instead of securing the inner cylinder to the adjusting devices described, it may be arranged in any suitable manner, as in Fig. 8, when it is shown as hung to an arm, M , pivoted, at u^2 , to a pedestal, M' , on the bed-plate, so as to be turned back to the position shown in dotted lines.

The transfer of the needles from one cylinder to the other without removing the loops is of much importance, as a continuous web consisting of both plain and ribbed or ornamental fabric may thus be produced without transferring the work from one series of needles to another, or to an independent machine, and without the tedious manipulation, loss of time, and defective work that result from such operations; while the capacity of the machine to produce ornamental work in great variety is much increased.

It will, of course, be understood, that when the character of the fabric to be produced requires it, additional needles may be placed in the inner cylinder without removing any of those in the cylinder F.

The recess *y* affords special facility for removing and replacing the needles at any desired point without the necessity of adjusting any part of the machine, and with but little delay in the production of the fabric.

Inasmuch as the operations described render it necessary to vary the tension to a more than usual extent, I have found it advisable to employ a peculiar tension and take-up device, E, Fig. 1, which, under the varying conditions, will regulate the delivery of the yarn. This device consists of a plate, *l*, a take-up lever, *n*, and a brake, *q*, both the lever and brake being hung to one side of the plate, which has split eyes *m m'* at its opposite ends. The tension upon the take-up lever is regulated by a spiral spring, *o*, attached, at the upper end, to the lever *n*, and, at the lower end, to an adjusting-ring, *p*, sliding and turning on a standard, *a'*, which supports the device, and around which the spring is coiled to protect it from injury, and to prevent it from becoming entangled with the yarn, the tension being regulated by sliding and turning the sleeve. The lever *n* has an open eye at its outer end, and projections *rr'* extend from the brake-lever *q* over the upper edge of the plate *l*, and downward, as shown in Fig. 3, so that the yarn may be passed through the brake without the threading usually required.

The lever *n* will take up the slack of the yarn, carrying it upward, and tilting the brake-lever *q*, so as to clamp the yarn between the projection *r* and the plate *l*. When the "pull" upon the yarn increases, the lever *n* is drawn down to the position shown in Fig. 1, the front end of the brake is depressed, and the yarn passes onward.

By regulating the tension and adjusting the cylinder F vertically, the length of the stitch and density of the fabric may be varied to any desired extent.

It will be apparent that the supplemental

needle-holder, the adjustable holder F, the crossed cam-grooves, and other of the improvements above described, may be used in connection with straight as well as circular machines. It will further be apparent that other means than those described may be employed for throwing the cylinder and shell in and out of gear with the driving-wheel; for imparting the vertical adjustment to the ring G and cylinder F, and for retaining the adjustable shell on the bed-plate.

Without, therefore, limiting myself to the construction and arrangement of parts described, I claim—

1. A knitting-machine having two needle-holders, two cams for operating two series of needles, and openings *y y'*, arranged substantially as described, so that the needles may be transferred from one holder to the other, for the purpose set forth.

2. The cylinder F, connected with the wheel H so as to be detachable therefrom and removable through the shell, as specified.

3. The combination of the annular wheel H and rotating cylinder F, adjustable vertically independently of, and driven by, the wheel, as and for the purpose set forth.

4. The combination of the cylinder F, driving-wheel H, and an adjustable dog for connecting the two, as specified.

5. The shell B, adjustable on the base-plate, around the cylinder F, as set forth.

6. The combination of the movable cylinder F, movable shell B, and independent driving-wheel H, all arranged so that both the shell and the cylinder may be connected to the wheel, substantially as set forth.

7. The combination, with the shell B, of the fixed guide *c* and cams having duplicate inclined edges $x^1 x^3 x^4$ and intermediate double inclined edge x^6 , the whole being arranged as set forth.

8. The combination of the cams of a knitting-machine and a tumbler, *g*, having a beveled or rounded end, and arranged to swing across the opening between the cams, as described.

9. The spring *o* of the tension device, coiled around the standard *a'*, and connected to the sliding and turning sleeve *p*, as set forth.

10. The cam x^6 , arranged between the inclines $x^1 x^3$, and adjustable, as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CALVIN R. TUTTLE.

Witnesses:

CHARLES E. FOSTER,
G. J. FERRISS.