

J. H. VINTON.  
KNITTING-MACHINE.

No. 172,940.

Patented Feb. 1, 1876.

Fig. 2.

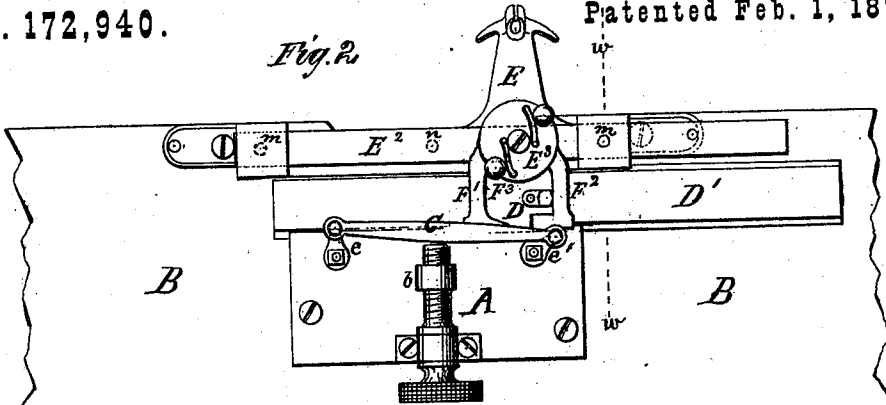


Fig. 3.

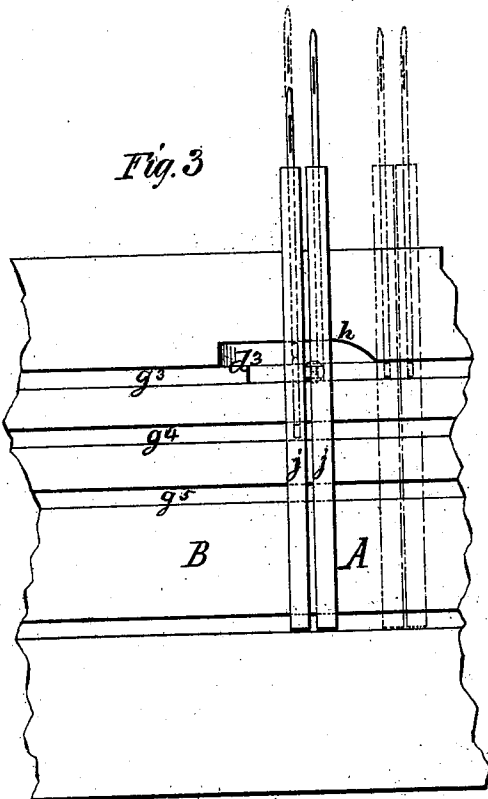


Fig. 4.

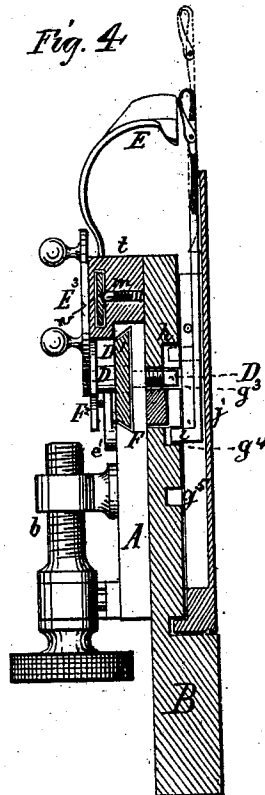
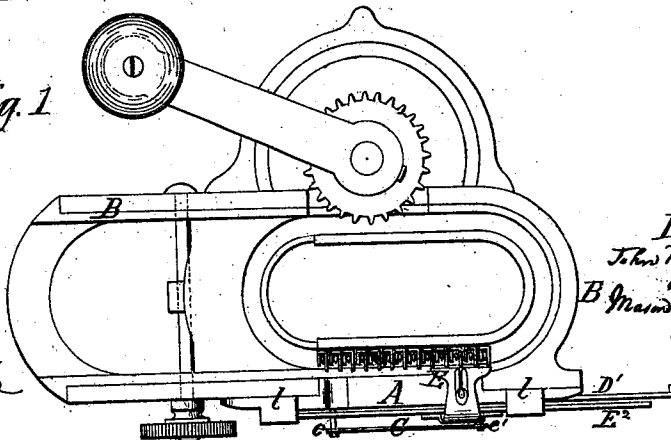


Fig. 1.



Witnesses.  
James Martin Jr.  
J. B. Campbell

Inventor.  
John H. Vinton  
By Martin & Linnick  
Attys.

J. H. VINTON.  
KNITTING-MACHINE.

No. 172,940.

Patented Feb. 1, 1876.

Fig. 5

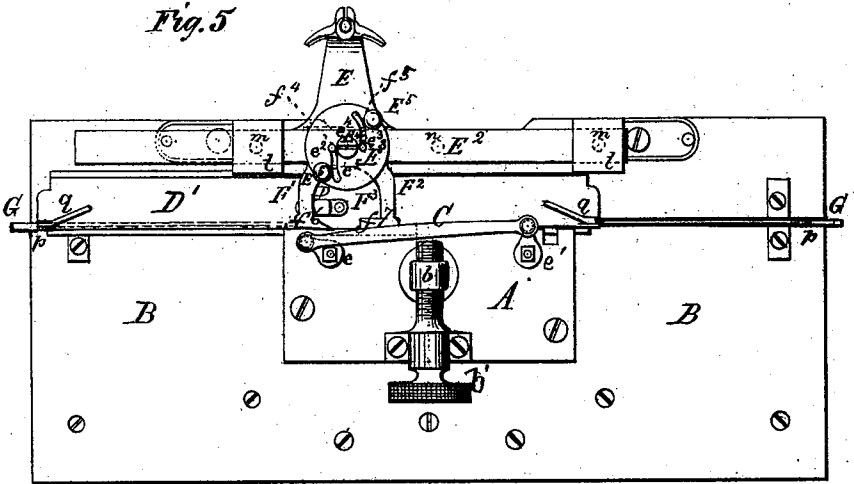


Fig. 6

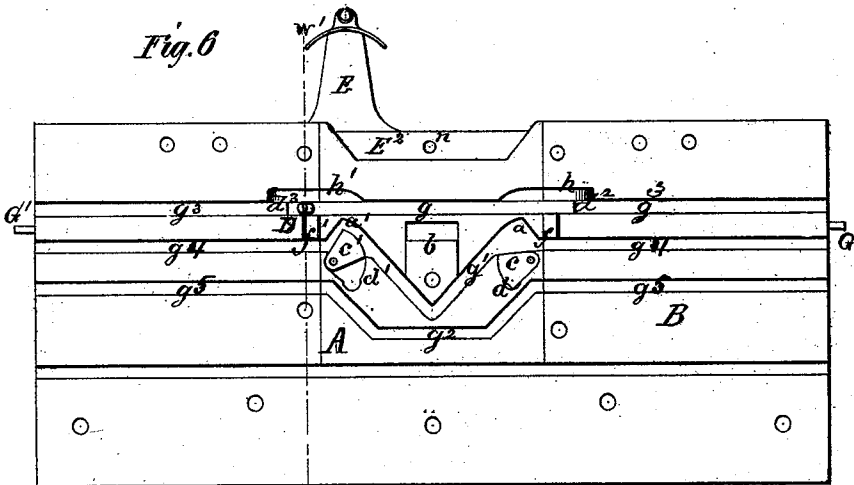


Fig. 8

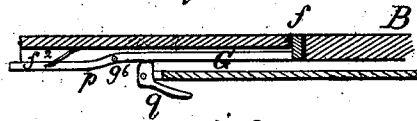


Fig. 9

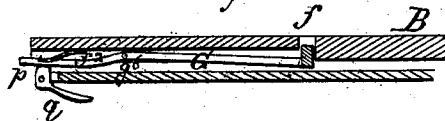
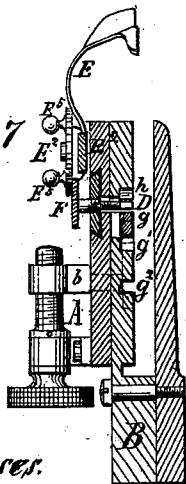


Fig. 7



Witnesses.  
James M. Thompson  
J. H. Campbell

Inventor.  
John H. Vinton  
Mason Fenwick Lawrence  
Atty.

J. H. VINTON.  
KNITTING-MACHINE.

No. 172,940.

Patented Feb. 1, 1876.

Fig. 10

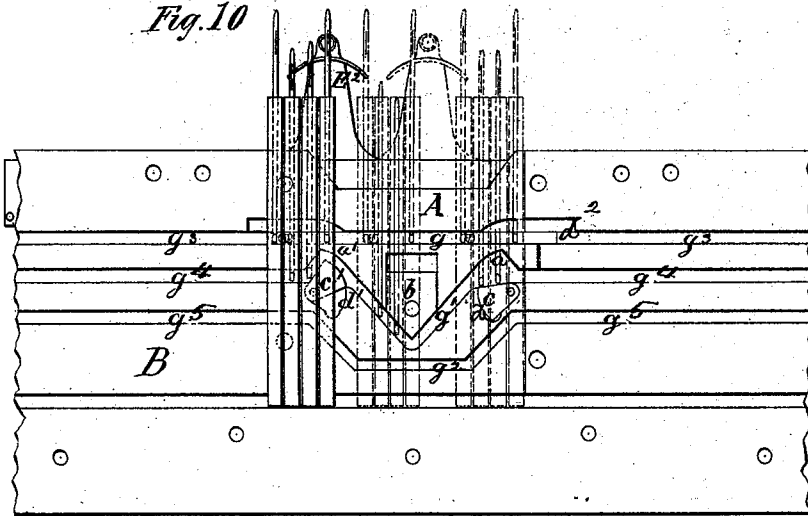


Fig. 12

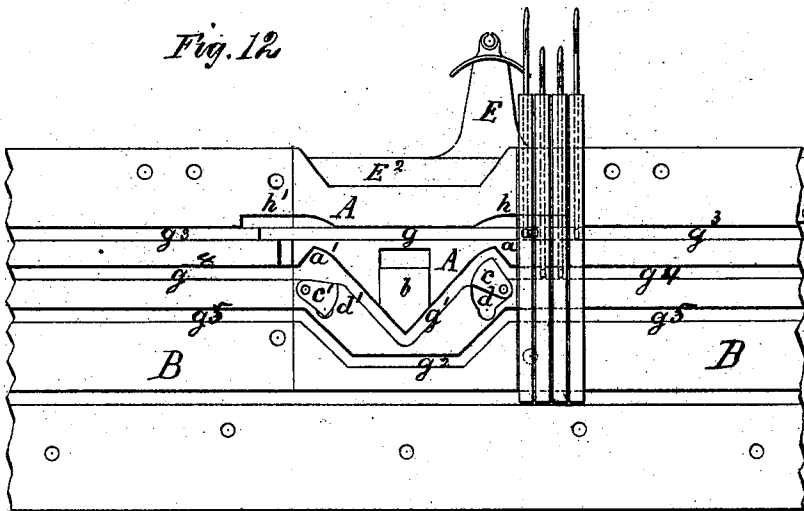
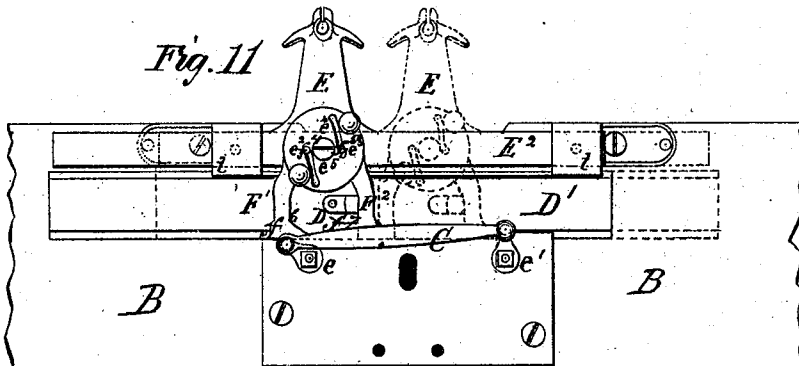


Fig. 11



Witnesses.  
James M. Martin  
J. T. Campbell

Inventor.  
John H. Vinton  
by Masoud & Co. Attorneys

# UNITED STATES PATENT OFFICE.

JOHN H. VINTON, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO FRANK ARMSTRONG, OF SAME PLACE.

## IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **172,940**, dated February 1, 1876; application filed July 28, 1875.

*To all whom it may concern:*

Be it known that I, JOHN H. VINTON, of Bridgeport, county of Fairfield and State of Connecticut, have invented a new and useful Improvement in Knitting-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a top view of a portion of an elliptical knitting-machine, to which my improvements are applied. Fig. 2 is a side elevation of that portion of the machine to which the improved mechanism which I have invented for controlling and effecting the adjustment of the needles is attached. In this view the yarn-guide is on the right-hand side of the working-center of the cam, and in its extreme position. Fig. 3 is a side view of a portion of the cam-plate, the covering or face plate of the cam being removed. Fig. 4 is a transverse section, in the line *ww* of Fig. 2, of the cam and attachments thereof. Fig. 5 is a similar view to Fig. 2, but the yarn-guide is on the left-hand side of the working-center of the cam, and in its extreme position. Fig. 6 is a side view of the cam, the face-plate being removed, and the parts in the position shown in Fig. 2, but looking from the opposite direction. Fig. 7 is a transverse section of the cam in the line *w'w'* of Fig. 6, the face-plate in position and the parts in condition shown in Figs. 2 and 6. Figs. 8 and 9 are longitudinal sections showing the gate and devices for operating it, through which the needles are passed in and out of the working-groove, for purposes hereinafter described. Fig. 10 is a side elevation of the cam, with the face-plate removed. In this view the yarn-guide is shown by full black lines in the position it occupies while the needles are passing from the position shown by the black lines to the position shown in the first set of dotted lines, and the said yarn-guide is shown by dotted lines in the position it occupies while the needles are passing to the second position shown by dotted lines. Fig. 11 is a side elevation of the cam in a reversed position from that shown in Fig. 10, with the face-plate replaced. In this view the yarn-guide is shown by full black lines in

the position it occupies while the needles are passing from the position shown in full black lines to the position shown in dotted lines in Fig. 10, and it is also shown in this view by the dotted lines in the position it occupies while the needles are passing to the position shown by the left-hand set of needles in said figure. Fig. 12 is also a side elevation of the cam, with the face-plate removed, showing the needle and yarn carrier in the extreme position shown by Fig. 5, but looking from the opposite side.

The nature of my invention consists, first, in constructing the knitting-cam, which has two or more needle-grooves, and gates between two of the grooves, with needle elevators, which are at the respective ends of an angular knitting cam, whereby a movable yarn-guide, which requires to be stationary at times, according to the work to be knit, may be employed, and the necessity of using a permanent or immovable yarn-guide avoided, and thus the inconvenience arising from using switches for separating the needles, while reversing the direction of their travel on opposite sides of the yarn-guide, is overcome. Second, it consists in a reciprocating yarn-guide slide and a reciprocating reversing-slide, which are moved by the toe of the needles, so constructed and combined that the latter slide moves past the yarn-guide independently of the former slide during the time the last of the series of needles in use for knitting are passing to a position for receiving their supply of yarn from the yarn-guide, and then both move together and carry the yarn-guide to the opposite side of the knitting-cam, whereby all possibility of the yarn-guide being moved before all of the needles are supplied with yarn, and also of the needle-lifters being operated before all the needles have passed beyond the free end of the lifter, is prevented, and thus imperfect knitting avoided, and hanging of the needles upon the lifters at the time the machine is being reversed prevented. Third, it consists in needle-lifters with short crank-arms connected by means of a pitman; in combination with the reciprocating slide of the yarn-guide, whereby one of the needle-lifters is raised and the other lowered simultane-

ously, and one positively locked down and the other locked up until the machine is reversed, and thus any casual elevation of the smallest portion of the free end of the lifters while the machine is knitting in one direction, and until it is reversed for knitting in an opposite direction, is rendered impossible. Fourth, it consists in reversing-dogs made adjustable for the purpose of rendering the machine capable of narrowing and widening the work while knitting a heel, toe, or knee. It consists, fifth, in an idle groove, provided with intersecting turn-out recesses, and with gateways, provided with alternately opening and closing gates, which are placed between said idle groove and the working-groove, whereby a successive turning out of the needles into the idle groove is permitted, for the purpose of narrowing the knit fabric, (as in forming a heel upon a stocking,) in such a manner that the needles, as fast as turned out on the right and left ends of the knitting-cam, are made to serve as means for reversing the movement of the needles which are not turned out as idle needles, (through the recesses,) and of the yarn-guide and needle-lifters, and for effecting the opening of one or the other of the gates at the termination of the back or forward stroke of the working-needles; and whereby, also, such needles as have been turned out for the purpose just stated, save two, are permitted to be passed back again into the lower or working groove, through the gateways, for the purpose of widening the fabric, (as in finishing the heel of a stocking;) and when said widening operation is completed or the heel finished, and it is desired to have all the needles together move in a circle or ellipse in the working-groove, the reversing-needles are also permitted to be passed down through the gates into said groove, and the regular knitting of the leg or foot of a stocking proceeded with until it is again necessary to narrow and widen, when the operations of taking up and turning out and of taking down needles are again repeated. It consists, sixth, in the combination of the levers for operating the gates which close and open the ways between the upper and middle grooves and the reversing-slide of the yarn-guide. This combination is such that the reversing-slide in its reciprocal motion causes the gates to be opened automatically by an impingement of projections of the slide upon the levers. It consists, seventh, in terminating the strokes of the yarn-guide slide and the therewith connected reversing-slide, and also holding the yarn-guide slide against any casual displacement by means of spring-pins and stop-notches—the former on the frame of the machine, and the latter in the yarn-guide slide, or vice versa.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with references to the drawings.

The cam-plate A is inserted, preferably, into

a flat, or nearly flat, part of a knitting-machine—for instance, into the flat or straight part of the elliptical or extension frame B of the knitting-machine patented by H. A. House April 12, 1870, as shown in Fig. 1. The needles used in my machine are provided with toes *i* and sheaths *j*, and are of the same construction as those used in House's machine. The said plate A has three grooves, *g g' g''*, two of which are angular, the last or lowest of which, *g''*, continues the groove *g'* in said House's machine, into which certain of the needles are lowered through a gate, in order to knit certain kinds of ribbed fabrics, and bears no further relation to my invention.

The cam or working groove *g'* is of V shape, to give the proper motion to the needles after they have passed the yarn-guide. The inverted apex of the said groove *g'* may be made adjustable for tight and loose knitting by a vertically-sliding tension-plate, *b*, with an adjustable thumb-screw, *b'*, attached to the outside of the cam-plate. At the ends of the groove *g'* movable sectors *c c'* are inserted in recesses *d d'* made of a size and shape suitable for the movements of the same, and for the continuation of the leading lines of the grooves *g'* and *g''*, as will be hereafter described. The said sectors *c c'* are connected with levers *e e'* by means of pivots on the outside of the cam-plate, which levers are coupled by a pitman, C, in such a manner that the extreme positions of the sectors are always reversed—i. e., one is up and the other down. The groove *g'* is connected with the groove *g''* at both ends by return lines, forming the recesses *a a'*, into which the sectors *c c'* are alternately moved, for the purpose of forming an ascending passage for the needles in their movement past the yarn-guide for supply.

The levers *e e'* are operated by the adjustable dogs F<sup>1</sup> F<sup>2</sup> during their reciprocating movements received from the reversing-pin D, which plays between the said dogs, and is fastened to the reversing-slide D'. The said reversing-pin D extends through the reversing-slide D' into the groove *g*, which is slotted to allow the necessary room for the stroke of the reversing-pin, the slot being entirely through the cam-plate, and extended for the same purpose into the ends of the groove *g''*, and terminated at *d<sup>2</sup> d<sup>3</sup>*. Between the end *d<sup>2</sup>* of the groove *g''* and the recess *a* a gate, *f*, is inserted, and between the end *d<sup>3</sup>* of the groove *g''* and the recess *a'* a gate, *f'*, is inserted, the said two gates connecting the grooves *g''* and *g'*, and forming a passage for the toes *i* of the needles, which are to be moved from one of the said grooves into the other.

To prevent such toes *i*, when moved up into the groove *g''*, from striking and moving the reversing-pin D with the beginning of the next stroke, they are moved into recesses *h h'* above the said groove, in which they are moved over the reversing-pin, and from which they are then guided into the groove *g* by the curved inner termination of the said recesses.

By this means the reversing-pin is kept between the two sets of needles in the grooves  $g$  and  $g^3$ , and can be operated by them.

The dogs  $F^1 F^2$  are fitted on the yarn-guide slide  $E^2$ , so as to slide with a longitudinal stroke, which stroke is adjustable by means of the plate  $E^3$ , which is pivoted at  $e^4$  in the center of the yarn-guide slide  $E^2$ , directly opposite the yarn-guide  $E$ , of which it forms a part.

The plate  $E^3$  is provided with two eccentric slots,  $e^2 e^3$ , in and by which the pins  $f^4$  of the dog  $F^1$ , and  $f^5$  of the dog  $F^2$ , are moved either apart or toward each other. Between and by the said dogs the reversing-pin  $D$  is operated. The heels  $f^6$  and  $f^7$  of the dogs are elongated so that they may bear alternately on the levers  $e e^1$  after they are moved down, and thus prevent their casual movement, and the disarrangement of the lifters  $e e^1$ , before the feeding of the working-needles is finished.

The yarn-guide slide  $E^2$  moves back and forth in bracket-loops  $t t$  attached to the frame of the machine, each of said loops being provided with a spring-pin,  $m$ , which alternately engages with one of two shallow sockets,  $n$ , on the yarn-guide slide,  $E^2$ , thereby terminating the stroke of the said slide and keeping the yarn-guide steady and firm against casual movements.

The reversing-slide  $D'$  moves in dovetail bearings on the cam-plate  $A$ , and has a cam-lever,  $q$ , pivoted to each end, whereby the cam surfaces may be turned down or up. Directly beneath the said cam-levers  $q$  the gate-levers  $G G'$  are pivoted to the frame of the machine at  $g^6 g^6$ . The opposing ends of the said gate-levers form gates, and are turned into the gateways  $f f^1$ , and fill them completely. The free ends are provided with springs  $f^2 f^2$  to keep the gates closed, and with cam-surfaces  $p$ , which are alternately operated by the cam-surfaces of the cam-levers  $q$ , when turned down, thereby opening the gate next to the reversing-pin, while the opposite gate is closed by means of its closing-spring.

In Fig. 3 two needles are represented, the one in the groove  $g^4$ , and the other in the groove  $g^3$  pushing the reversing-pin  $D$  before it previous to the entering of the one needle into the groove  $g^3$ . The dotted lines represent the same needles at the return stroke, and both in the upper groove  $g^3$ .

In Fig. 10 four needles are represented by full lines in the act of passing the yarn-guide, the two middle ones entering the recess  $a'$  by means of the raised needle-lifter  $c'$ . The two extreme needles are in the groove  $g^3$ , and the one farthest from the cam-plate is pushing the reversing-pin  $D$  before it. The dotted lines near the center of the cam-plate represent the position of the same needles, when the yarn-guide is ready to be moved along.

The second set of dotted lines represent the same middle working-needles as they pass over the other needle-lifter  $c$  into the groove  $g^4$ .

In Fig. 12 the said needles are represented

after their stroke has been finished, the needle-lifters being reversed and the machine ready for the return stroke.

By having a knitting-cam with lifters and turn-out recesses and gates of my improved construction the necessity of having a stationary yarn-guide is avoided; and by the use of a movable yarn-guide with my cam the needles do not require a cam on both the right and left sides of the yarn-guide to do their work, when worked to the right and left, and as this is the case there is no longer a necessity for making the working-groove of the cam so long, and of a form which requires switch-grooves and switches to separate the needles when the machine is reversed, and thus the hanging of the needles at the switches during the act of reversing the motion of the machine, caused by the friction created between the spring-switches and the toes of the needles while the needles are being separated in order to pass into different grooves, is avoided.

The above-mentioned difficulties have frequently been encountered in the operation of the knitting-machine patented by H. A. House April 12, 1870, and to overcome the same is the object of my invention.

Operation: When the plain or common part of the fabric is completed by knitting continuously in one direction, and the narrowing is to begin, the operator stops the machine. Supposing the movement of the needles in the former operation to have been from the right to the left of the cam-plate  $A$ , adjusted as in Figs. 2, 5, and 11, the yarn-guide is on the right side of the  $V$  or working groove, the reversing-pin  $D$  at the right termination of its working-slot in the groove  $g$ , the right cam  $q$  above the cam-surface  $p$  of the gate-lever  $G^1$ , and the needle-lifter  $c'$  up, as described, the needle with which the narrowing is to commence is moved opposite the gate  $f^1$ ; the cams  $q$  are then set ready for operation by turning their handles down upon the surface of the reversing-slide  $D'$ , whereby the gate  $f^1$  is opened. The needle opposite the said gate is moved up, causing its toe to move through the gateway into the recess  $h'$ . The dogs  $F^1 F^2$  are moved as near together as the turning of the plate  $E^3$  will permit, thereby shortening the stroke of the reversing-slide  $D'$  and the stroke of the needles, and by means of the outer end of the reversing-pin  $D$  and the spring-pins  $m$  and socket  $n$  on the yarn-guide slide, the adjustment will be always of a length equal to the thickness of a needle-sheath on each side.

By the said shortening of the stroke of the reversing slide the connection of the needles with the yarn-guide on the right and left of the narrowing-row of needles is broken, and the needles of the narrowing-row are presented opposite their respective gateways in the proper order of succession, thus greatly simplifying the labor of the operator. The operator now moves all the needles to the left of the cam, causing the needle in the recess  $h'$  to

pass over the reversing-pin D on the other side of it, and by means of the inclined termination of the said recess into the idle groove *g* of the cam-plate. The operator counts from such idle needle toward the right of the cam as many needles as he intends for the narrowing-row, and moves them to the left of the cam until the last one of the said needles is opposite the gate *f*. He then moves the reversing-slide D' to the left to the termination of its stroke, thereby opening the gate *f* and reversing the position of the sectors *c c'*, and the yarn-guide E and its slide E<sup>2</sup>. The toe of the needle left opposite the said gate is now moved up through the open gateway *f* into the recess *h*. This makes the second idle needle. The needles are now moved to the right of the cam, the second idle needle passed over the reversing-pin D into the groove *g*, and the first idle needle now comes in contact with and pushes the reversing-pin D to the right of the cam to the end of its stroke, thereby reversing the positions of the sectors *c c'* and the yarn-guide E and the slide E<sup>2</sup>, and placing the working-needle to the right of the first idle needle opposite the open gateway *f*. The said last-named working-needle is now passed up in the above-described manner into the recess *h'*, thus making the third idle needle. After reversing the stroke the fourth idle needle will be made in a similar manner on the left of the second idle needle, and thus the operation is carried on—for instance, until there are only two working-needles left, which must remain as working-needles, in order to prevent the machine from becoming inoperative.

The widening operation is preceded by the reversing of the plate E<sup>3</sup>, whereby the dogs F F<sup>2</sup> are moved apart, and the stroke of the reversing-slide is lengthened again, so that the idle needles are placed opposite their respective gates in the reversed order or succession—i. e., the last idle needle is moved into the working-groove first, and the idle needle next to the last is moved into the working-groove second, and so on until they all have become working-needles, at which moment the operator closes the gateways *f f'* permanently by turning the handles of the cams over toward the surface of the machine, thereby making the said cams inactive, and the ordinary knitting may now be resumed by continuing the movement of all the needles in the direction of the last stroke.

The shape of the so narrowed and also that of the so widened fabric is that of a V or isosceles triangle. The said widened and narrowed parts may be made of a one-sided shape, or that of a right-angled triangle, by closing one of the gateways permanently af-

ter the first working needle has passed through it into the recess above, and continuing the narrowing operation on the opposite side in a manner similar to that above described.

The one-sided narrow part may be made a right or left handed one, according to the position of the first idle needle, and the successive widening can only be performed on the same side on which the preceding narrowing was performed.

The operator may also move after each stroke several working-needles successively through the open gateway into the respective recesses and idle groove *g*, and thereby give the narrowed part of the fabric a quicker or more obtuse angle.

A similar result may be effected in the widened part by passing after each stroke several of the idle needles successively through the respective open gateways into the working-groove *g'*.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The cam-plate A, having grooves *g g'*, and gates *f f'*, provided with the needle-lifters *c c'*, which are at opposite ends of the cam-groove *g'*, substantially as and for the purpose described.

2. The combination of a reciprocating yarn-guide slide, E, and a reciprocating reversing-slide, D', moved by the toes of the needles, said slides being constructed to move one in advance of the other, and then together, substantially as and for the purpose described.

3. The needle-lifters *c c'*, connected together by a pitman, C, and operated together, in combination with the locking-extensions of the yarn-guide slide, whereby the lifters are locked in position, and held so until required to be reversed, substantially as and for the purpose described.

4. The adjustable reversing-dogs F<sup>1</sup> F<sup>2</sup>, in combination with the yarn-guide slide, substantially as and for the purpose described.

5. A knitting-machine, provided with turn-out recesses *h h'*, substantially as and for the purpose described.

6. The levers G G', for opening the gates *f f'*, in combination with the slide D', substantially as and for the purpose described.

7. The combination of the yarn-guide slide E<sup>2</sup>, having stop-sockets *n* in its face, spring-pins *m*, and the reversing-slide D', substantially as and for the purpose described.

Witness my hand in the matter of my application for a patent on a knitting-machine.

JOHN H. VINTON.

Witnesses:

J. N. CAMPBELL,  
J. TYLER POWELL.