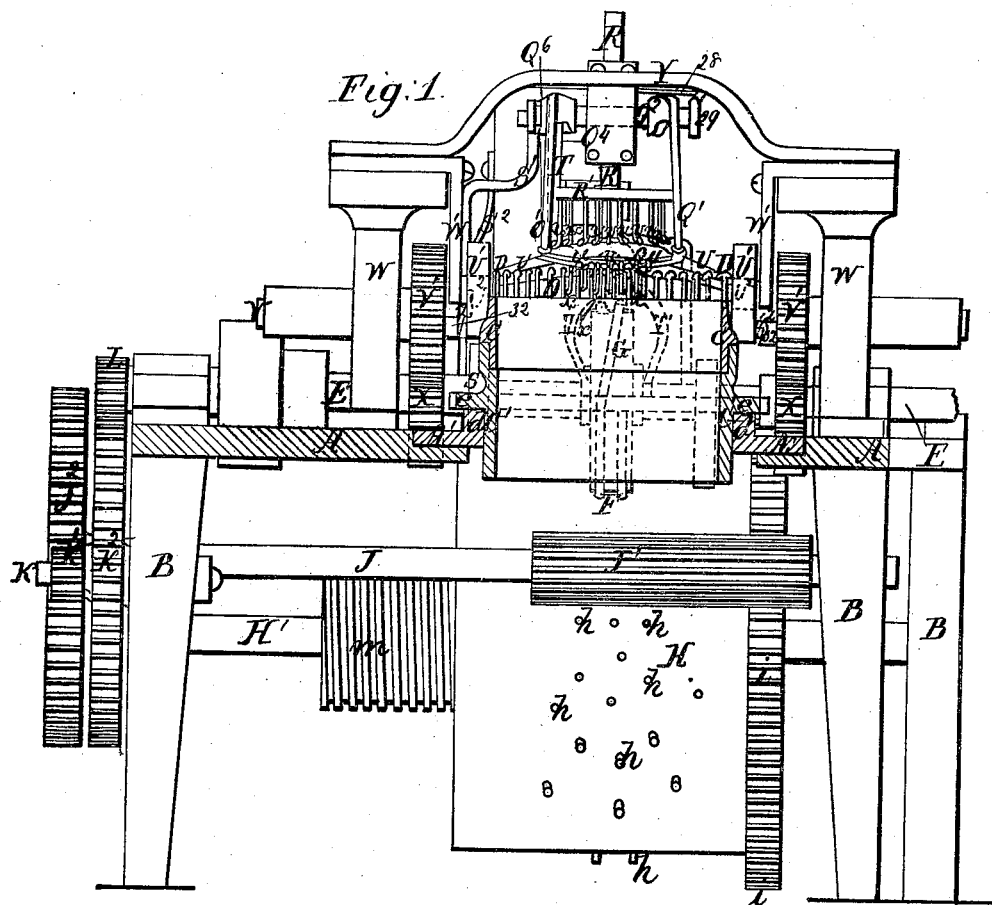


J. C. Wilson.
Knitting Mach.

N^o 55,027.

Patented May 22, 1866.



Witnesses;

Wm. Simpson
B. G. Snow

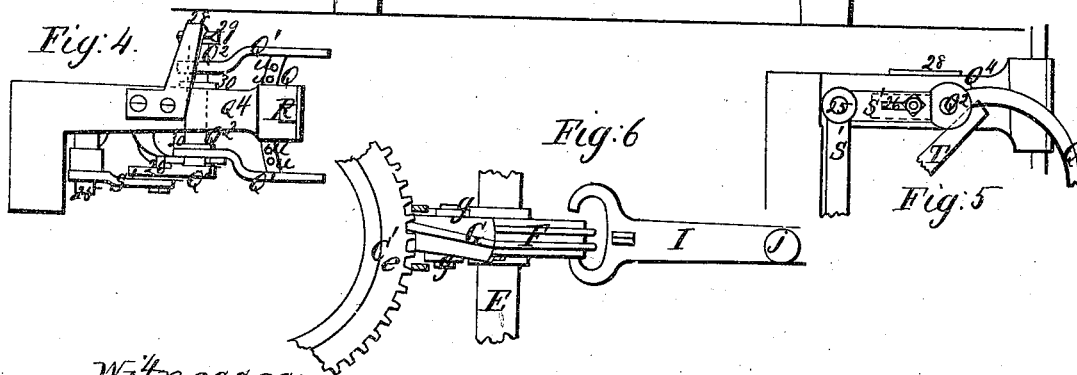
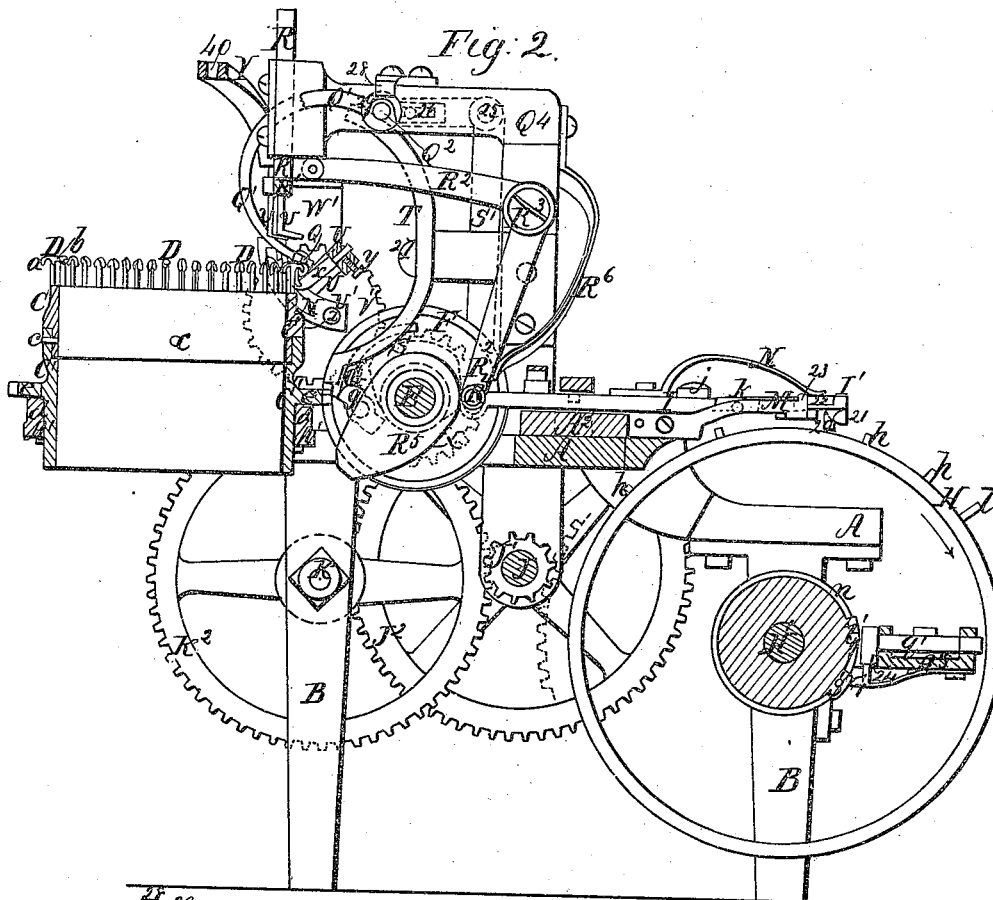
Inventor;

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Witnesses;

Wm. H. Thompson
B. J. Howard

Inventor;

James G. Wilson

UNITED STATES PATENT OFFICE.

JAMES G. WILSON, OF NEW YORK, N. Y., ASSIGNOR TO THE UNION SEAM-
LESS KNITTING MACHINE COMPANY.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 55,027, dated May 22, 1866.

To all whom it may concern:

Be it known that I, JAMES G. WILSON, of the city, county, and State of New York, have invented certain new and useful Improvements in Knitting Machinery; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are vertical sections of a circular-knitting machine with my improvements, taken at right angles to each other through the center of the needle-ring. Fig. 3 is a plan of the same with some of the parts broken away to show the parts below them. Figs. 4, 5, 6, 7, 8, 9, 10, 11, and 12 are views of some of the parts detached from the machine. Figs. 13 and 14 illustrate a mode of knitting a number of stockings in a continuous piece.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists in the devices hereinafter described for operating the pressers which press the work down upon the needles preparatory to the operation of the yarn-guides to deliver the yarn for new loops with a movement of such character that they are removed from between the needles and out of the way of the stitch-hooks at the time the latter operate to throw off the stitches; and my invention further consists in a certain improvement applicable to the machinery which forms the subject of W. H. McNary's Letters Patent No. 28,290, the object of such improvement being to obviate the necessity of giving the needles a curved form.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A B B is the framing of the machine, consisting of a bed-plate, A, supported on standards B B. C is the intermittently-rotating needle-ring, in which the needles D D are secured, said ring being arranged horizontally and fitted and secured, by pins *c* or other suitable means, within a cogged ring, C', which is fitted to rotate freely in a circular opening in a horizontal plate, A', which is secured to the bed-plate A, the said circular opening in the said plate A' having a raised rim, *d*, all around it, upon which rests the cogged flange *e* of the ring C'.

The needles D D represented are made each of a piece of sheet-steel, split at one end to form the two hooks *a* and *b*, before mentioned, and rolled up at the other end nearly into the form of a tube, but in such manner as to leave its edges not quite close together, as shown in Fig. 8, which exhibits a section of the lower part of a stem, in order that it may constitute a spring-socket, and may, by compression to bring its edges closer, be inserted very tightly into one of a number of holes provided in the needle-ring C for the reception of the needles, and may secure itself in the hole by its lateral elasticity. This method of applying the needles in the ring enables them to be pulled out without the application of much force, but yet keeps them secure during the operation of the machine.

The upper part of the exterior of the ring is cut away or otherwise formed in such a manner as to leave parts of the needles exposed below its upper edge, and the whole or the greater portion of the exposed part of the stem of the needle is cut away in a concave form, as shown in Fig. 9, which exhibits a section of a stem just above the needle-ring. This concave portion of the needle-stem resembles the corresponding portion of the stems of the short hooked needles used in connection with stitch-hooks in other machines, the concavity being to admit the points of the stitch-hooks within the loops which are on the needles, for the purpose of enabling the said hooks to take off the said loops. The space left between the two hooks *a* and *b*, formed of the sheet metal, as above described, is filled up with solder or other metal, as shown at *f* in Fig. 7, to make the head of the needle solid and stiffen the hooks. The two hooks *a* and *b* may, however, be formed or constructed in many other ways than that which I have above described.

The pressers *v v*, operating in combination with the double-hooked needles above described, may be a few more in number than the number of needles used at the same time. For instance, in the machine represented six needles are to be used at once, six yarn-conductors *u u*, and six stitch-hooks, *x x*, being provided; but there are nine pressers, making two beyond the last needle at each end of the number which are in operation, the said pressers being arranged to work one between every two immediately-adjacent operating-needles.

The pressers are attached rigidly to a horizontal bar, R' , which is secured rigidly to the lower end of a vertical slide, R , working longitudinally in a guide provided for it in a standard, Q^4 , erected upon the bed-plate A . This slide is connected with one end of an elbow-lever, R^2 , which works upon a fixed fulcrum, R^3 , secured in the standard Q^4 , and the opposite end of the said lever carries a friction-roller, R^4 , which is kept in contact with a cam, R^5 , on the main shaft E of the machine by means of a spring, R^6 , attached to the standard Q^4 , and the said cam and spring, by their combined action on the said lever, produce a downward movement of the slide R to make the pressers press the work down on the needles preparatory to the operation of the yarn-conductors u , to place the thread round the needles to form a new series of loops, followed instantly by a quick upward movement to carry the pressers out of the way of the conductors. As the hooks $b b$ of the needles prevent the new loops being taken off the needles by the action of the stitch-hooks xx , by which the latter throw off the old loops, the compound or double movement of the pressers described in the before-mentioned Letters Patent of McNary, and used on other knitting-machines of a similar class, is dispensed with, and the above-described simple reciprocating rectilinear movement of the pressers is all that is required of them.

E is the main shaft, extending horizontally across the machine behind the needle-ring, where it is supported in fixed bearings bolted to the bed-plate A .

Directly opposite to the center of the needle-ring there is secured to the main shaft the threaded switch-wheel F , precisely like that described in McNary's Letters Patent, hereinbefore mentioned, gearing with the cogs on the flange e of the ring C' .

The revolving buttons $g g$, by which the switch G of this wheel is shifted to reverse the direction of the rotary motion of the needle-ring, are actuated through the revolving and reciprocating studded cylinder H , which is arranged in rear of the shaft E , by means of a forked lever, $I I'$, (see plan view, Fig. 6,) substantially as in McNary's machine, said lever being arranged to work on a fixed fulcrum, j . The said lever is, however, arranged to work over the top of the cylinder instead of entirely in front of it, as in McNary's machine, and is constructed with a joint, k , in rear of the fulcrum j , to enable its rear end to be raised out of range of the pins $h h$ of the said cylinder, while the latter runs back automatically during the knitting of the leg of a stocking.

The rear portion of the lever—that is to say, the piece I' back of the joint k —is made with a downwardly-projecting tooth, 20, which is of V shape in its horizontal section, as shown in Fig. 12, which is an inverted plan view of the said piece I' , and on one side of this tooth there is an inclined downward projection, 21. (Best shown in Fig. 11, which is an opposite

side view of the piece I' to that exhibited in Fig. 2.)

The opposite side of the piece I' is beveled, as shown at 22 in Fig. 2 and in the transverse section, Fig. 10, and on the same side of the lever as the bevel 22 there is attached to the fixed block A^2 , in which the fulcrum j is secured, a strong spring, M , having on the side next the lever a projection, 23, which is beveled on its under side to correspond with the bevel 22 on the piece I' . The elasticity of this spring tends to force it toward the piece I' when the latter is in a position for its V -shaped tooth 20 to be acted upon by the pins $h h$ of the cylinder in the revolution of the latter, or to force it under the said piece I' when the latter is raised out of the way of the pins.

On the top of the front or principal portion I of the lever, on which is formed the switch-fork, and which is only capable of a horizontal movement on its fulcrum j , there is secured a spring, N , which always presses on the top of the piece I' in such a manner as to force it down toward the cylinder, and this spring, except when the said piece I' is being raised by the action of a pin, l , on the cylinder H , or is held up by the projection 23 on the spring M , either keeps the tooth 20 in contact with the periphery of the cylinder or as near to it as the construction of the joint k will permit, and so near that the tooth 20 will be in range of the pins $h h$, which operate, first on one side and then on the other side of the said pin, to move the lever to produce the shifting of the switch G and the reverse of the rotary motion of the needle-ring.

The lower face of the projection 21 on the piece I' is so much higher than the bottom of the tooth 20 that the pins $h h$ can never touch it in their revolution; but the pin l is considerably longer than $h h$, and when it passes under the said projection 21 while the piece I' is in its depressed condition it comes in contact with the lower face of the said projection, and by its action upon it lifts up the piece I' high enough to pass the projection 23 on the spring M , which, by the action of its bevel 22, it pushes aside; but as soon as the piece I' arrives above the projection 23 the spring M flies toward the lever and brings the said projection under the said piece I' , as shown in red outline in Fig. 10, and so holds it up to such a position that the pins h will not touch the tooth 20.

The spring M is so situated that the pins $h h$ can never touch it, but it is so formed that, by the longer pin l , in its revolution with the cylinder, passing against the side of it next the lever, it (the said spring) may be pushed from under the lever, and thereby allow the piece I' to be forced down again by the spring N . The result produced by this action of the throwing of the lever into and out of range of the pins $h h$ will be better understood after I have explained the manner in which the cylinder H is applied and operated, which I will now proceed to do.

H' is a fixed horizontal shaft secured in the framing in a position parallel with, but some distance below, and in rear of, the main shaft E. To this shaft the cylinder H is fitted in such a manner as to be capable of a rotary and a longitudinal motion. The said cylinder has formed round one end of it a complete circle of cogs, *i i*, which gear with a pinion, J', on a horizontal shaft, J, which is arranged in bearings in hangers dependent from the bed-plate A, and which has also secured to it a spur-wheel, J². This spur-wheel J² gears with a pinion, K', which works loosely on a fixed stud, K, that is secured to the framing, and which has secured to it a spur-wheel, K², that gears with a pinion, L, on the main shaft. This train of gearing between the main shaft and the cylinder causes the latter to derive from the main shaft a slow rotary motion on its fixed shaft H'. The hub of the cylinder, which is longer than the body, has cut or otherwise formed upon one-half of its length a right-hand screw-thread, *m*, and upon the other half a left-hand screw-thread, *n*, and a stationary bar, A³, which is secured to the framing in such a manner as to project into the cylinder between the body and hub, has attached to it by a fulcrum-pin, *p*, a lever, P, of the first class, which has connected with each end one of two horizontal pins, *q q'*, which work longitudinally through guides attached to or formed upon the said bar A³, one of the said pins being for the purpose of entering the right-hand thread *m* and the other for entering the left-hand thread *n*, and the said pins being of such length and so arranged that when either enters its respective screw-thread to any considerable depth the other is just outside of its respective screw-thread, and that by a very slight movement of the lever P one pin may be withdrawn from one thread and the other introduced into the other thread. Each pin has a notch, 24, (see Fig. 2,) in its under side for the reception of one of two spring-stops, *r r'*, which are attached to the bar A³, one below each of the pins *q q'*, said stops being so arranged that either one will enter the notch in its respective pin *q* or *q'* when that pin is in gear with its respective screw-thread, and so lock that pin in gear and the other pin out of gear with the screw-thread. As the screw-threads *m n* revolve with the cylinder a longitudinal movement of the cylinder is produced by the screw-thread working on the pin which is in gear, such longitudinal movement being in one direction or the other according to which pin is in gear, and such direction being changed by throwing one pin into gear and the other out of gear, the cylinder rotating always in one direction, as indicated by the arrow upon it in Fig. 2 and other figures of the drawings.

The screw-thread *m* has projecting from it at contiguous points two cam-like pieces, *s* and *t*, the former for pressing down the stop *r* to unlock the pin *q*, and the latter for driving back the said pin out of gear with the screw-thread as soon as the pin is unlocked, and so

throwing the pin *q'* into gear; and the screw-thread *n* is furnished with two similar cam-like pieces, *s'* and *t'*, for unlocking and throwing out of gear the pin *q'*, and so throwing into gear the pin *q*. When either pin comes into gear its respective stop *r* or *r'* immediately locks it.

It will be understood that while the main shaft E of the machine continues in operation the cylinder H derives, through the means hereinbefore described, a continuous direct rotary and reciprocating longitudinal motion. The longitudinal movement in the direction of the arrow shown on the cylinder in Fig. 3 takes place during the time of knitting the toe, foot, and heel of the stocking, and during this movement the piece I' of the switch-lever is depressed; but at about the same time that this movement is reversed the pin *l* comes into operation on the projection 21 of the piece I' and throws the said piece up out of range of the pins *h h*, where it continues during the whole time the cylinder is moving back and while the knitting of the leg is proceeded with. Just as the longitudinal movement of the cylinder is again reversed the pin *l* acts upon the spring M to remove the stop 23 from under the piece I' and let it drop within range of the pins *h h*, to commence knitting the heel of the same stocking or the toe of a new one. By thus giving the cylinder a reciprocating motion and providing for throwing the switch-lever out of range of the pins *h h* of the cylinder the necessity of stopping the machine to run back the cylinder, it will be readily understood, is obviated.

Y is a stationary bar containing a series of holes, 40 40, which constitute yarn-guides, through which the yarn passes to the conductors *u u*, which place the yarn in form of loops round the needles. These yarn-conductors *u u* consist simply of a series of short tubes or thimbles attached to a bar, Q, at distances apart corresponding with the distances between the needles, so that the said guides can pass between immediately-adjacent needles. The bar Q is attached, by two arms, Q' Q', to a horizontal rock-shaft, Q², which works in a bearing in the standard Q⁴. The said rock-shaft derives the oscillating motion necessary to produce the operation of the yarn-conductors from a cam, S, on the main shaft E, said cam operating on the said shaft through a lever, S', which works on a fixed fulcrum, 25, secured to the standard Q⁴, and which is kept in contact with the said cam by a spring, S², and is connected by a slot-and-pin connection, 26, with an arm, Q⁵, of the said rock-shaft. This slot-and-pin connection is best shown in Figs. 4 and 5, the former of which figures is a plan and the latter a side view of the principal parts of the mechanism for operating the yarn-conductors. The lateral movement of these conductors, which is necessary to place them in proper relation to the needles and stitch-hooks every time the switch G is shifted to reverse the rotary motion of the needle-ring, is pro-

duced by means of a lever, T, which works on a fixed fulcrum, 27, secured to the standard Q⁴. The upper part of this lever enters between the arm Q⁵ and one of the arms Q' of the rock-shaft, and the lower part, which is forked, has one prong of its fork on either side of the switch-wheel F.

Every time the switch is shifted it, in passing through the fork of the lever, acts upon one or the other prong, according to its previous position, and so moves the said lever and causes the latter to give the rock-shaft a longitudinal movement, and the rock-shaft carries with it the yarn-conductors. The rock-shaft is prevented moving longitudinally, except at the proper time, by a spring, 28, attached to the standard Q⁴, such spring having a V-shaped projection on its end, which presses against one side or other of a V-shaped collar, 29, on the rock-shaft, and holds the rock-shaft with one or other of two collars, 30, with which it is provided, in contact with its respective side of the standard Q⁴. This spring, though stiff enough to lock the rock-shaft in either position, will yield to the pressure of the collar 29 when the rock-shaft is pressed in one direction or the other by the lever T and slip over the said collar.

U is the stitch-hook bar, into which the stitch-hooks *xx* are fitted and secured by set-screws *yy*, having at each end a curved slotted arm, U', at the lower end of which is a journal-box to receive two crank-pins or wrists, *zz*, carried by two spur-wheels, V' V', which are attached to two short horizontal shafts, V V, which are arranged in line with each other and parallel with the main shaft E in bearings in two standards, W W, erected upon the bed-plate A. The spur-wheels V' V' gear with and derive rotary motion from spur-wheels X X, of similar size, on main shaft E. The curved slots in the arms U U' are fitted each with a block, U², which is bored to receive one of two stationary pins, 31 31, which are held in line with each other and parallel with the main shaft by hangers W' W', dependent from the standards W W. As the crank-pins or wrists *zz* revolve with the spur-wheels V V' the movement of the stitch-hook bar produced by their revolution is so directed by the working of the curved slots in the arms U' U' of the stitch hook-bar U on the blocks U² and pins 31 as to make the stitch-hooks take the loops from the lower parts of the needles and carry them over the hooks *aa* and *bb* thereof. The necessary lateral movement of the stitch-hooks is produced by the face-cams 32 32, which are provided around the crank-pins *zz* for the purpose of acting against the outer faces of the arms U' U'.

The above-described mechanism differs from that described in the specification of McNary's before-mentioned Letters Patent in having the crank-pins *zz* carried by separate shafts geared with the main shaft instead of having the main shaft itself cranked; also, in having the slotted arms U' U' curved instead of

straight. The object of this first change is to enable the switch-wheel on the main shaft to be geared directly with the needle-ring or with a toothed ring attached to and concentric with the needle-ring, which cannot be done when the stitch-hook bar is operated by cranks on the main shaft itself, and the object of the second change is to make the movements of the stitch-hooks conform to needles with straight stems, which are stronger and easier to construct than the curved needles heretofore commonly used in knitting-machines of this class.

Stockings may be knitted singly in this machine, or a number may be knitted together in a continuous piece, as illustrated in Figs. 13 and 14. In knitting them singly they may, by a proper arrangement of the pins *hh* in the cylinder H and by properly controlling the operation of the said cylinder to suit either case, be commenced at the toe and finished at the heel, or commenced at the heel and finished at the toe. To knit a number together in a continuous piece, as illustrated in Figs. 13 and 14, the knitting is commenced in each stocking at the toe, and after one stocking has been completed the machine is stopped for the removal of the loops from one half of the circumference of the circular series of needles, after which the machine is started again to commence operating on the other half, with a reciprocating rotary movement to knit a bag to form the toe of the next.

Fig. 13 shows one stocking completed and the bag B* for the toe of the next one knitted onto half of the loops of the upper margin of the leg of the first. This bag, when it has been completed by knitting on half the circle of needles, hangs down along with the completed stocking within the needle-ring of the machine, the complete stocking hanging from the half 1 2 3, Fig. 13, of the margin of said bag, which was commenced upon it, and only the half 1 4 3 of said margin remaining on the needles.

On the completion of the bag the machine is again stopped and the half 1 2 3 of its margin is placed on the half of the needles from which the half 1 5 3 of the upper margin of the leg of the completed stocking was removed before the commencement of the bag B*, and after this has been done the machine is again started with a continuous rotary motion of the needles to knit the foot all round the toe, and the stocking is completed by the uninterrupted operation of the needles, their motion changing automatically from continuous to a reciprocating rotary to knit the heel, and again from reciprocating to continuous rotary to knit the leg, in the same manner when knitting the stockings separately. In this way any number of stockings may be knitted in a continuous piece, as shown in Fig. 14, and separated by cutting the attached portion of the leg of each close to the margin. The legs then require to be finished round their margins by forming a selvage by hand, by sewing or

other means, to prevent the dropping of the stitches.

I am aware that the use in knitting-machines of needles with two hooks or beards has been described in the English Patent No. 1,725, for the year 1856; but such needles are for knitting-machines of an entirely different class to that to which my invention relates, and the needles are of an entirely different kind, and the second hooks or beards operate in an entirely different manner and for a different purpose. In view, however, of such use of needles with two hooks or beards, I will not claim the use of needles with two hooks operating in any other way than substantially as herein described; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. Providing the needles of that class of knitting-machines in which stitch-hooks are used to throw off the stitches without any longitudinal movement of the needles or closing of their beards with additional hooks or projections *b b* at their backs, so constructed,

arranged, and operating, in combination with the stitch-hooks, as to confine the last-formed loops on the needles while the previously-formed loops are being taken off from the needles by the stitch-hooks, substantially as herein described, whereby I am enabled to dispense with the operation of the pressers at the time of taking off the loops and to take off the loops simultaneously from many immediately-adjacent needles.

2. Giving the pressers *v v* a movement in a vertical line only, but of such character that they are removed from between the needles and out of the way of the yarn-guides and stitch-hooks at the time the latter operate to throw off the loops.

3. Making the slots in the arms *U' U'* of the stitch-hook bar *U* of curved form, substantially as herein described.

JAMES G. WILSON.

Witnesses:

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