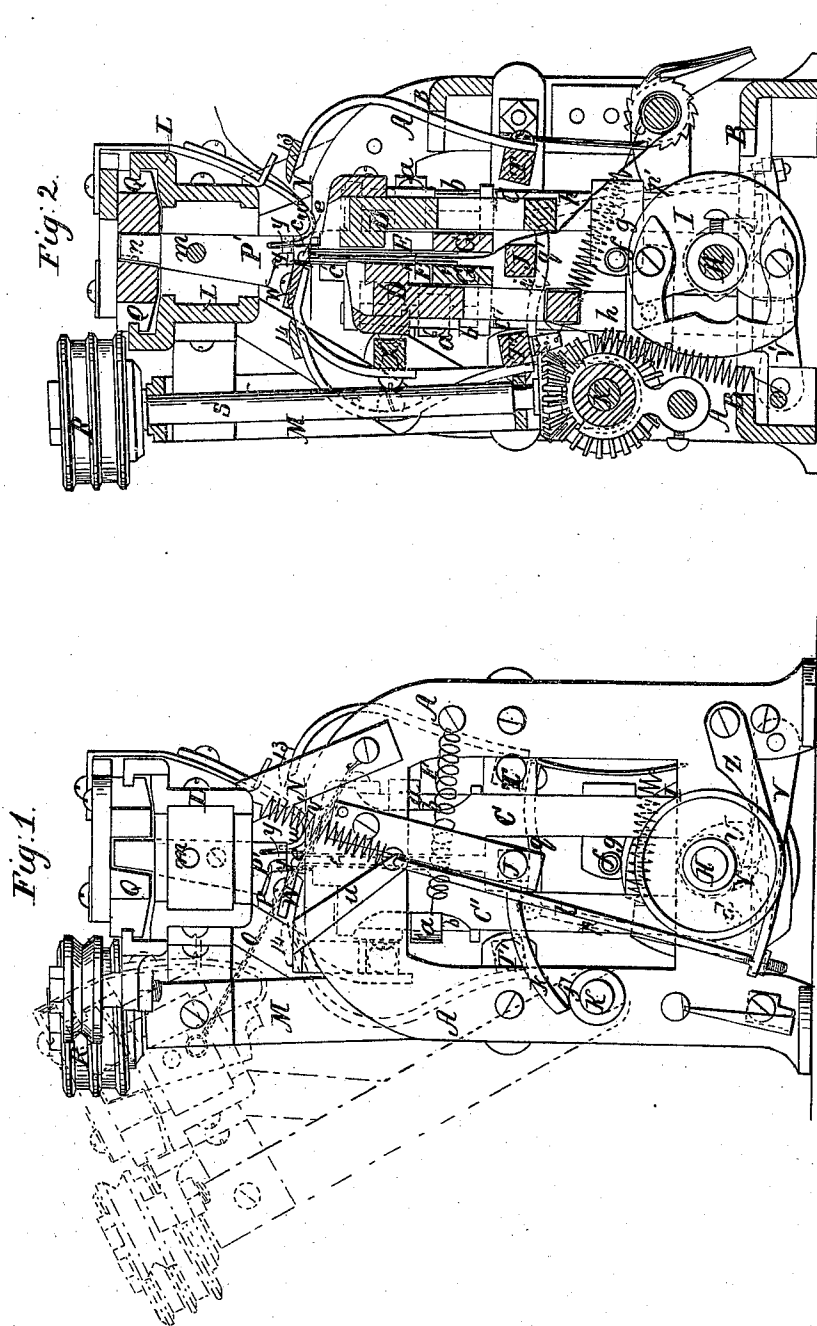


Sheet 1, 3 Sheets.

B. S. Wood.

Straight Knitting Mach.

Nº 10,998. *Patented Jun. 6, 1854.*



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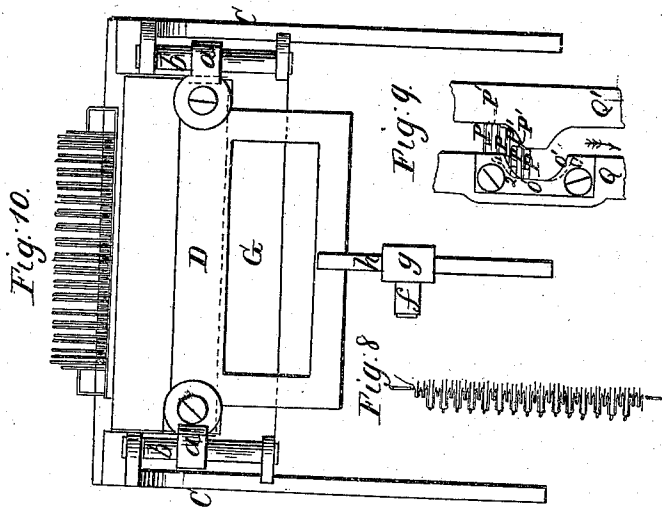
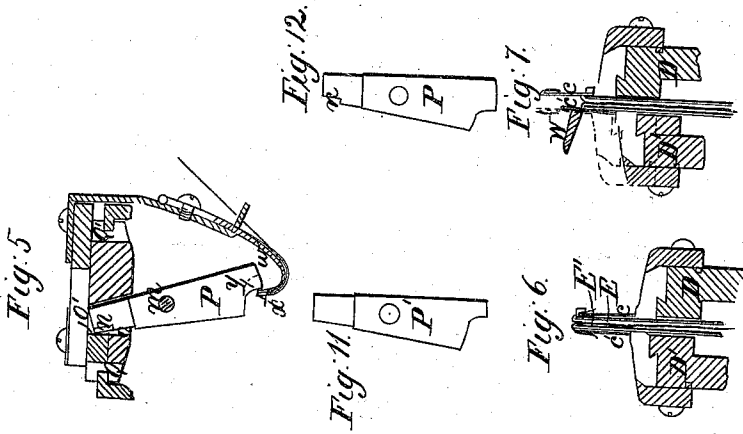
Sheet 3, 3 Sheets.

B. S. Wood.

Straight Knitting Mach.

N^o 10,998.

Patented Jun. 6, 1854.



UNITED STATES PATENT OFFICE.

BROWN S. WOOD, OF BURRILLVILLE, RHODE ISLAND.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 10,998, dated June 10, 1854.

To all whom it may concern:

Be it known that I, BROWN S. WOOD, of Burrillville, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Knitting-Machines; 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—

Figure 1 is a side elevation of a machine constructed according to my invention. Fig. 2 is a transverse vertical section of the same. Fig. 3 is a plan of the same, with the frame which carries the slur, jacks, and thread-carrier removed to show the arrangement of the needles and the manner of forming the loops. Fig. 4 is a plan of the frame which carries the slur, jacks, and thread-carrier. Fig. 5 is a transverse section of the above frame taken through the curve in the slur and passing through the thread-carrier. Figs. 6 and 7 are two transverse sections of the needle-bars, showing different positions occupied by the needles relatively to each other during the operation of the machine. Fig. 8 is a plan view showing the manner in which the loops are formed by the sinkers before being taken hold of by the needles. Fig. 9 is a plan view of the slur, intended to show its operation. Fig. 10 is a front view of the front needle-bar and the frame in which it works. Figs. 11 and 12 are side views of the sinkers.

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

The improvements which constitute my present invention have all for their object the knitting of ribbed goods by power.

My first improvement consists in a certain arrangement of wide and narrow jacks for the purpose of forming a row of long and short loops, which they lay in proper positions to be caught by the needles, the long loops by the set of needles generally known as the "rib-needles," and the short loops by the other set of needles, and drawn through similar loops previously formed in the same manner.

My second improvement consists in operating the jacks by means of a double slur, to which the heads of the jacks are so fitted that the narrow jacks are operated upon in advance of their regular turn, in order to pre-

vent the wide jacks in advance of them from taking up the thread necessary to form the narrow loops, and thus preventing the proper formation of the loops and breakage of the thread.

My third improvement relates to the relative arrangement and movements of the two sets of needles for the purpose of forming and seizing the loops and drawing each row through the preceding one.

My fourth improvement relates to the arrangement of the rib-needles, in combination with a creased presser, by the pressure of which they require to be sprung into the proper position to enter the loops formed by the jacks to receive them, the said arrangement of the needles being such that after they have entered the loops and the pressure of the presser is removed they will spring back and draw the loop tight around them, so that on their descent or retiring motion from the loops the latter will not fail to pass under their points and into their hooks.

My fifth improvement consists in supporting the head which carries the jacks, the slur, and the thread-carrier in a frame which is capable of being swung out of its operative position to allow the quarter to be run on the machine and the needles to be adjusted conveniently, the said capability of swinging also serving for the adjustment of the jacks for regulating the depth of the loops.

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

A A are two standards united by struts B B to form the main framing of the machine.

C C G is an upright frame composed of two upright side pieces and a cross-piece and having the side pieces C C bolted firmly to the inner sides of the standards. This frame is for the purpose of carrying the upright cloth-plate E and the needle-bar D, which carries the set of needles *c c*, which, to distinguish them from the other set known as "rib-needles," are sometimes called the "frame-needles." The needle-bar D is of the form represented in Figs. 2 and 10, and has two boxes *a a* secured to it, one at each end, to work freely up and down on two vertical rods *b b*, which are secured to the frame C C G for the purpose of serving as guides for the vertical motion of the needle-bar. The needles *c c*

are of the usual construction, and are secured to the needle-bar in the usual manner, standing nearly close to and in a row parallel with the cloth-plate E.

C' C' G' is another frame precisely similar to C C G, but instead of being, like the latter, secured rigidly to the standards A A has its side pieces pivoted to the standards at their lower ends, so that the upper part is capable of swinging to a certain extent. One of the pivots on which it swings is represented by a dotted circle *d* in Fig. 1. This frame C' C' G' carries the other cloth-plate E' and also the other needle-bar D', which carries the rib-needles *c' c'*. This needle-bar is furnished with boxes *a a*, working on guide-rods *b b*, and is otherwise similar to the other needle-bar D, and the needles *c' c'* are similar to *c c*. The cloth-plate E' and the row of needles *c' c'* are parallel longitudinally with the other cloth-plate and row of needles. The frame C' C' G' occupies a nearly vertical position, from which it deviates but slightly, as the swinging movement which the needles and cloth-plate are required to make is a very slight one. It is connected by a spring F (shown in Fig. 1) with one of the standards A. The effect of this spring is to pull the cloth-plate E' and needles *c' c'* as near to the other cloth-plate and needles as is allowed by the two stop-pieces *e e*, placed between the two cloth-plates.

Between the fixed frame C C G and the swinging frame C' C' G' is placed a horizontal shaft J, which extends the whole length of the machine, being supported in bearings attached to the standards A A. This shaft J has an arm *k* attached to it near one end and resting upon a cam *j* on the end of the slur-shaft K, and once during every revolution of the slur-shafts—that is to say, when the prominent portion of the cam passes it—this arm is raised so as to turn the shaft J a little way and bring two studs *i*, which are fast upon it, into contact with the side pieces *c' c'* of the frame C' C' G', and thus force back the said frame to increase the distance between the two cloth-plates and sets of needles; but after the prominent part of the cam passes it the arm *k* falls by its own weight and removes the studs *i* from contact with the frame, which is then returned by the spring F. The object of this swinging movement of the cloth-plate E' and needles *c' c'* will be understood when the operation of knitting is described. The two needle-bars have movements upward and downward, produced by two cams on the main shaft H. One of these cams only is shown in the drawings, (see I, Fig. 2.)—viz., that one which operates the front needle-bar E—and I have not thought it necessary to describe the form of either, as when the operation of the machine shall have been herein-after described and the necessary movements explained the cams may be constructed by any mechanic of ordinary skill. The cams support the needle-bars and act each upon its

respective needle-bar through a friction-roller *f* on a stud at one side of an arm *g*, attached to an upright rod *h*, which forms a part of or is secured to the needle-bar. The rod *h* also serves as a guide for the correct motion of the needle-bars by working in a hole in the lower part of the main framing.

L is the head which carries the jacks, the slur, and the thread-carrier, which is not materially different from the corresponding head in other knitting-machines, excepting that instead of being rigidly attached to the main framing, as is usual, it is attached to a frame M, which is supported in the slur-shaft K, so as to be capable of swinging freely thereon to be thrown back, as shown in red outline in Fig. 1, for the purpose of leaving the needles exposed for adjustment and for affording facility to run on the quarter or repair any damage to the web. When the head L is in position for operation, it is supported only in part by the frame M, two front supporters N N being provided, attached one to each standard A. The head is thus always firm when in operation. When the head is swung back to the position shown in red outline, it is arrested by a chain O, attached to one of the standards in such a position that it can be readily returned to its operative position. It will be readily understood that if the position of the front supporters N N be changed to one a little more backward or forward the head will be prevented coming so far or be allowed to come farther forward, and thus the jacks may be set back or forward to increase or diminish the length of the loops. The moving of the jacks back or forward for this purpose is commonly practiced, and is only described here to show that placing the head L in a swinging frame affords proper facility for this adjustment. The jacks P P' all swing upon the same pin *m*, which extends right through the head L. Their form is shown in Figs. 1, 2, and 5, where it will be found that all are not alike, for that part *y* which operates upon the thread and which may be termed the "tongue," is made narrow in some and wide in others. The object of this is that they may sink a series of long and short loops, such as is represented in red color in Fig. 8, between the needles *c c*.

The arrangement of needles and the order of succession of the long and short jacks will require to vary according to the pattern of the ribbing to be produced. The arrangement of needles and jacks shown is to produce a web in which two loops are visible on one side and one on the other side regularly all across, and for that pattern the needles *c c* and *c' c'* are arranged, the former in pairs, with the distance between the pairs equal to twice the distance between the two needles of each pair, and the latter singly opposite the centers of the spaces between the pairs of the former, as shown in Figs. 3 and 8. This arrangement of needles requires two wide-tongued jacks to fall between two pairs of

needles $c c$, and one narrow-tongued one between the two needles of each pair. This is illustrated in Fig. 8, where sections of the tongues of the several jacks are represented each by a strong black line and the thread is represented in red color. The jacks form two short loops round every pair of the needles $c c$, and carry one long loop between every two pairs to be caught at the proper time by the needles $c' c'$. The long loop which is carried back is held open by reason of its being extended round two jacks, and thus is ready to receive the needle c when the latter is sprung forward at the proper time. The jacks all have their heads, or the part which is operated upon by the slur, of similar form, except that the wide-tongued jacks $P P$ have a recess n made in their back edges extending from the top about half-way down. This is done in order that they may receive a motion somewhat different to that of the narrow-tongued ones $P' P'$.

In order to produce the necessary difference in the motions of the wide and narrow tongued jacks, the back of the slur is made in two distinct parts, the lower of which o is formed in the bar itself, and the upper consists of a loose piece o' bolted to the bar. The upper part o' of the back of the slur extending as low down as the recesses n in the jacks is shorter than the lower part o . This is illustrated in Figs. 4 and 9, where the lower part is shown in dotted outline and is supposed to be visible through the upper part, which is shown in bold the line. The front of the slur is of the same form both in the upper and lower parts, only being so much beveled off at the bottom as is necessary to allow of the swinging of the jacks. When the slur moves in either direction, the heads of the jacks are thrown back and the tongues forward by the front part Q' of the slur, and afterward the heads are returned forward and the tongues backward to depress the loops between the needles $c c$ by the back part Q . Whichever way the slur is moving the upper part o' of the operative side of the slur is in advance of the lower part. This may be understood by reference to Fig. 9, where the slur is supposed to be moving in the direction of the arrow and the side 2 is in operation on the jacks, throwing the heads forward and the tongues back. Now if the backs of the heads of the jacks were all like those of the jacks $P' P'$ it is obvious that the upper part o' of the slur would alone operate upon them; but as the jacks $P P$ have recesses n at that part where the upper part o' of the slur would come in contact, that part can only operate upon the jacks $P P'$ and the jacks $P P$ are not operated upon till the lower part o of the slur comes in contact with them. By this means the jacks $P P'$, with the narrow tongues, are made to operate to form their loops before their turn would have arrived if the whole row operated in regular succession. This lead or advance which is

given to the narrow jacks in order to prevent the wide-tongued jacks from taking up the thread which is necessary to form the short loops, which they would otherwise do in consequence of their greater width, bringing them first in contact with the thread, and then the narrow jacks, instead of forming loops behind them, would break the thread. The slur is actuated in the same manner as in other knitting-machines by chains from a wheel R on an upright shaft S , which receives an intermittent alternate circular motion at regular intervals by means of bevel-toothed gearing from the slur-shaft K .

w is the thread-carrier, which is attached to the slur and moves with it in the usual way. It is of well-known form and only differs from other thread-carriers in having an opening at x (see Fig. 5) to deliver the thread opposite or perpendicularly to the needles, which prevents its rolling or kinking. The pressers 13 14 belonging to the two sets of needles are similarly arranged, oscillating on two rock-shafts $T T'$, which work in bearings attached to the standards $A A$, and are actuated at the proper time to act upon the needles by cams $U U'$, (shown dotted in Figs. 1 and 2,) acting on treadles $V V'$, connected by rods $p p'$ with arms $q q'$ attached to them, and are thrown back after the pressing operation by springs $r r$.

The creased presser W , which is provided for the purpose of springing the needles $c' c'$ forward to bring their points within the long loops, resembles in a great measure the other pressers, but has a broader face, in which are a number of creases $s s$, so arranged that each will receive a needle and form a guide for its upward motion while sprung forward. It is attached to a horizontal rock-shaft X , working in bearings attached to the standards $A A$. This rock-shaft receives the necessary motion to bring the presser into operation on the needles through the action of a cam Y on one end of the main shaft outside the framing on a treadle Z , which is connected by a rod t with an arm u on the rock-shaft, and it is thrown back immediately after operation by a spring v connected with the arm u .

The operation of knitting is performed in the following manner: After the formation of every row of loops both sets of needles are depressed to their lowest position, as shown in Fig. 6. The first movement in forming a new row is the elevation of the needle-bar D and needles $c c$ by the cam I to the position shown in Figs. 2 and 7, in which position they remain during by far the greater portion of the time occupied in working the next row of loops. As soon as the needles $c c$ have risen, the slur and thread-carrier traverse and the thread is laid in front of and depressed between the needles in the form represented in red color in Fig. 8. After this the needles $c' c'$ commence to rise, and simultaneously with the rising of these needles the creased presser W moves forward to meet them, which it does

when they arrive at the position shown in Fig. 2, and then springs them forward until they reach such a position that they will pass between the pairs of wide jacks and into the long loops formed round them, which they would not do if not thus sprung back. The upward motion of these needles continues with the presser in contact till the needles *c' c'* have moved to about the height represented in black outline in Fig. 7, when the presser recedes. The needles are kept from moving laterally when sprung by the creases *s s* in the presser, which serve as guides to them. After the presser leaves them they spring forward to such a position as to tighten the loops so much that on the descent of the needles they will not slip over them. The needles continue rising until they arrive in a position corresponding with the front needles *c c*, when both sets of needles suddenly and simultaneously commence their descent, the pressers 13 and 14 coming simultaneously into operation upon them and closing their barbs. The descent of the needles draws the loops through the row which is supposed to have been previously formed and to have been at the bottom of the needles, the needles *c c* drawing the short loops in twos through similar loops on the front, and the needles *c' c'* drawing the long loops singly through similar loops at the back between the front loops. As soon as the needles have descended to the position shown in Fig. 6 and drawn the loops through the previous row, the needles *c c* again commence to form another row. The motions given to the two sets of needles are simple. The ascent of the front needles *c c* is effected quickly, and they then remain stationary in their upward position until the proper time for their descent, when they descend quickly. The ascent of the back needles is also effected quickly, and is followed immediately by their rapid descent, after which they remain stationary in their lowest position until after the operation of the jacks. Just before the needles *c' c'* have reached their greatest elevation the cam *j* comes into operation and turns the rock-shaft *J*, so as to throw the studs *i* against the frame *C' C' G'* and force it back to separate the needles farther from each other and pull the loops together. This cam keeps the needles forced away from each other during the whole of their descent, so that the loops are kept tight and prevented slipping over the points of the needles.

By different arrangement of needles different patterns of ribbing may be made. For instance, by arranging the needles *c c* in

threes instead of in twos and employing two narrow jacks, three loops will be formed on one side and one on the other alternately. Other variations in the pattern may also be made which it is not necessary to describe, but which would suggest themselves to any person practically acquainted with knitting.

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

1. The employment of a series of wide and narrow tongued jacks *P P* and *P' P'*, arranged in any desired order of succession to form short loops upon the frame-needles *c c* and lay long loops between certain of the said needles in such a manner that they may be entered and caught by a set of rib-needles *c' c'* working parallel, or nearly so, with the frame-needles, substantially as herein described.

2. The method of giving a lead or advanced motion to the narrow jacks *P' P'* by means of the double slur *O O'*, having one part wider than the other, and the recess *n* made in the heads of the wide jacks to prevent their being operated upon until the wide part of the slur comes in contact with them and allow only the narrow jacks to be operated upon by the narrow part, substantially as herein set forth.

3. The movements of the two sets of needles relatively to each other, as described—that is to say, the front needles *c c*, rising first and then remaining stationary to receive the loops upon and between them, the rib-needles being in the meantime stationary, but rising after the loops are formed and entering the loops intended for them, and then both sets of needles descending together to carry the loops through those previously formed.

4. Arranging the rib-needles *c' c'* at such a distance from the front needles *c c* that their upward motion will not carry them through the loops, and springing their ends forward to the requisite position for that purpose by means of a presser *W*, constructed, arranged, and operated substantially as herein described, for the purpose set forth.

5. Attaching the head *Q*, which carries the jacks, the slur, and the thread-carrier, to a frame *M*, which is capable of swinging back, substantially as described, to expose the needles and afford greater facility for their adjustment for the running on of the quarter and for the repair of any damage to the machine or to the web.

BROWN S. WOOD.

Witnesses:

WHIPPLE WALLING,
JOHN WALLING, Jr.