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G. Johnstone.

Knitting-Machine.

No 80965 Patented Aug. 11, 1868.

Fig. 1.

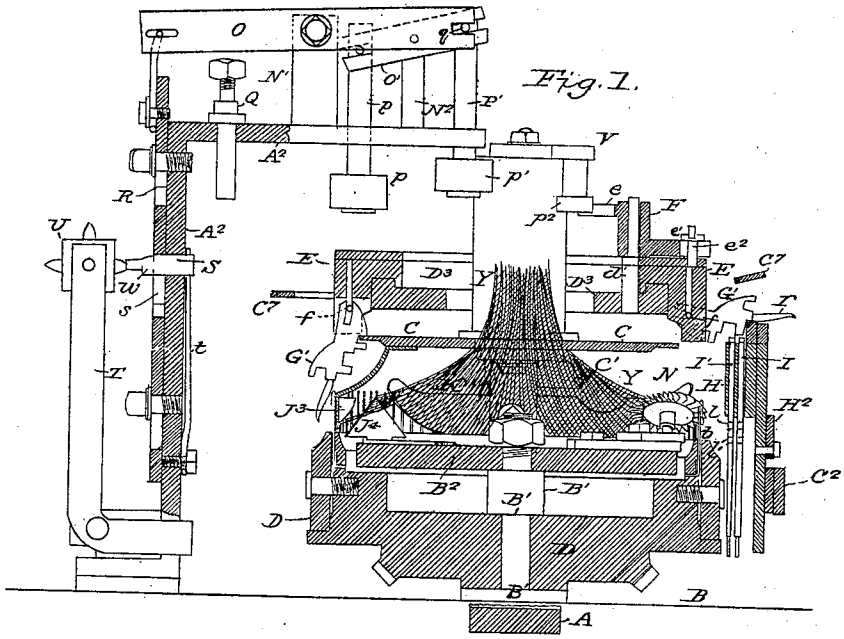
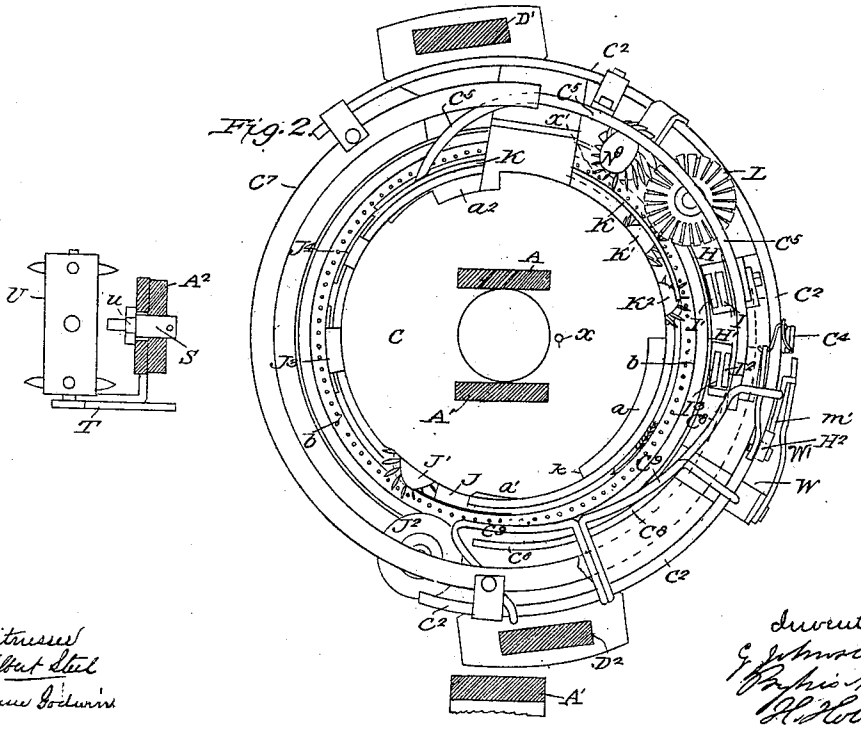


Fig. 2.



Witnesses
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Attys

Sheet 2. 3 Sheets.

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Knitting Machine.

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Fig. 3.

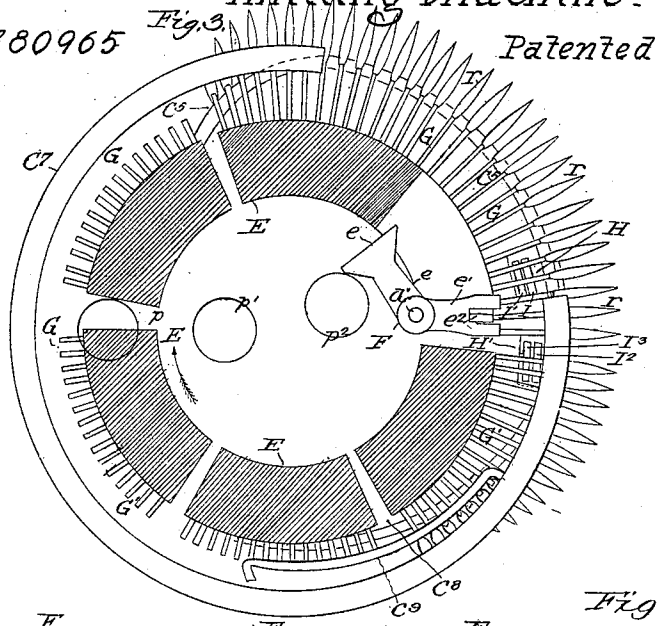


Fig 4.

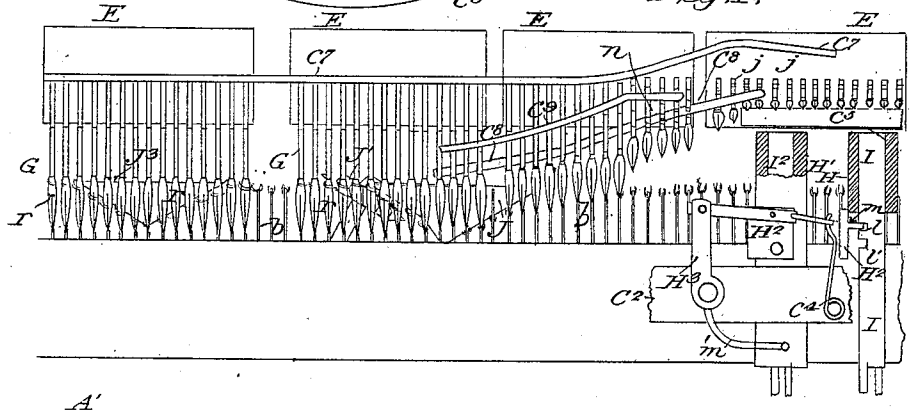
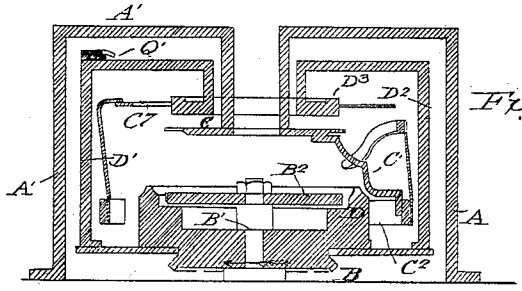


Fig. 5.



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G. Johnstone.

Knitting-Machine.

Sheet 3 - 3 Sheets

No. 80965

Patented Aug. 11, 1868.

Fig. 6.

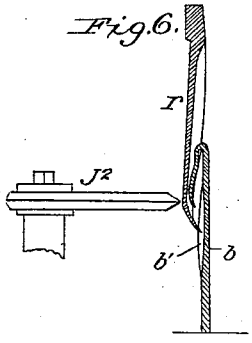


Fig. 7.

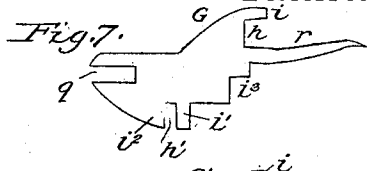


Fig. 8.

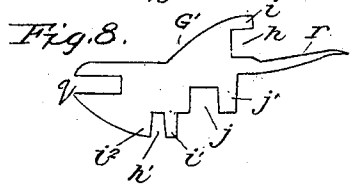


Fig. 10.

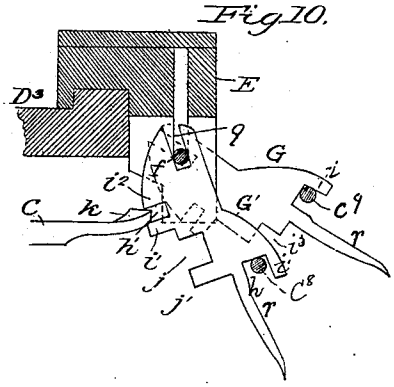


Fig. 11.

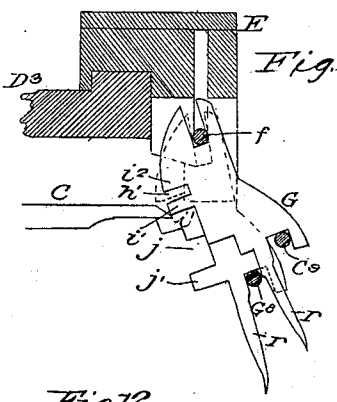


Fig. 9.

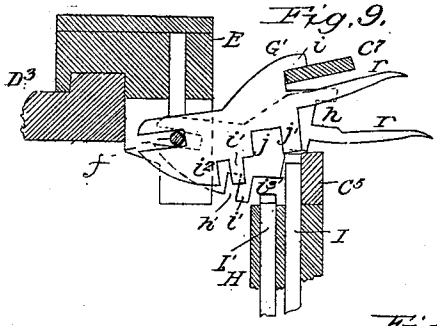


Fig. 12.

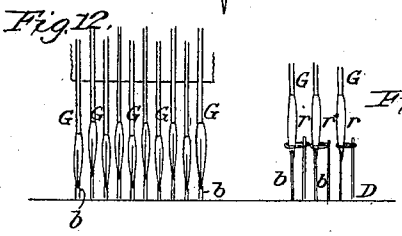


Fig. 16.

Fig. 15.

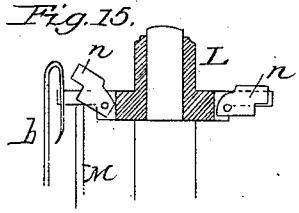


Fig. 13.

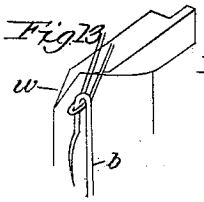


Fig. 14.

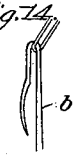
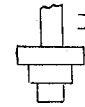


Fig. 17.



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United States Patent Office.

GEORGE JOHNSTONE, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 80,965, *dated August* 11, 1868; *antedated August* 1, 1868.

IMPROVEMENT IN KNITTING-MACHINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, GEORGE JOHNSTONE, of Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in what are known as circular-knitting machines, the said improvements being designed for producing, automatically, a tubular fabric, having any desired pattern, with the same rapidity as a plain fabric is made in an ordinary circular machine; and my invention consists of a series of bearded needles, so arranged and operating, in conjunction with a series of fingers, that the loops of yarn may be transferred from any of the needles to others, the said fingers being capable of such adjustment that any of the loops may be retained upon or discharged from them at any time desired, while any of the fingers may be thrown out of action with the needles at any time, without interfering with the operations of the fingers in action.

My invention further consists of a presser-wheel, so constructed with movable plates, that the beard of any needle may be either depressed or not, as may be desired.

My invention further consists of the combination of the devices above referred to, and pattern-wheels, or chains, or jacquard-apparatus, so connected to the said devices, that the operations of any of the same may be suspended, resumed, or varied, as may be required to produce any desired pattern in the fabric.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 (Sheet No. 1) is a sectional elevation of my improved knitting-machine.

Figure 2, a plan view, partly in section.

Figure 3, (Sheet No. 2,) a plan view of part of the machine.

Figure 4, a diagram showing the operations of part of the machine.

Figure 5, a sectional elevation of the frames of the machine.

Figure 6, (Sheet No. 3,) an enlarged sectional view, representing a needle and a "finger" for receiving loops from the needle.

Figures 7 and 8, detached views of part of the machine, drawn to an enlarged scale.

Figures 9, 10, and 11, detached sectional views, drawn to an enlarged scale, of parts of the machine, showing them in different positions.

Figure 12, a detached side elevation, showing some of the needles, covered by the "fingers."

Figures 13 and 14, views illustrating a device for adjusting the loops upon the needles.

Figure 15, a sectional view, drawn to an enlarged scale, of the presser-wheel, with part of the devices for operating the same; and

Figures 16 and 17, views illustrating modifications of parts of the machine.

Similar letters refer to similar parts throughout the several views.

The stationary frame of the machine consists of three arms, A A^1 A^2, which are of the form shown in the drawing, and are secured to the base-plate B; and from the inner ends of the arms A A^1 is suspended an annular plate, C, (figs. 1, 2, and 5,) in the edge of which are recesses *a*, a^1, and a^2, fig. 2.

On a stationary shaft, B^1, projecting from the base B, midway between the arms A A^1, turns a revolving frame, which consists of a cylinder, D, carrying two arms, D^1 D^2, of the form shown in the drawing, and an annular plate, D^3, which is suspended from the inner ends of the arms D^1 D^2, a short distance above the plate C, fig. 5.

To the edge of the cylinder D are secured, in the usual manner, bearded needles, *b*, in the shanks of which are recesses, *b'*, fig. 6, and at the lower side of the cylinder is a bevel-wheel, which gears into a bevel-pinion on an adjacent driving-shaft.

To the upper end of the shaft B^1 is secured a stationary plate, B^2, and to a bracket, C^1, fig. 5, connected to the plate C, is secured a curved bar, C^2, which extends partly round the cylinder D, at a short distance from the same.

At the edge of the plate D^3 slide a number of curved blocks or "sections," E, and from the plate D^3 projects one or more vertical pins, d^1, fig. 1, on the upper part of each of which turns a horizonal lever, F, having two arms, e e^1, figs. 1 and 3, the latter being slotted for the reception of a pin, e^2, on one of the sections, E.

Into recesses in each section E project the ends of plates G G′, figs. 7 to 9, which are the same distance apart as the needles b, a pin or rod, f, extending across each recess, and passing through a slot, q, in each plate, and from the outer ends of the latter project fingers r, recesses in which receive the heads and beards of the needles when the points of the fingers are in the recesses b', as seen in fig. 6, each plate with its finger being hereafter termed a "jack."

At the front and lower edges of each plate are projections i, i^1, and i^2, and recesses h h'; in each plate G is a recess, i^3, and at the lower edge of each plate G′ are a recess, j, and a projection, j'.

In vertical boxes H H^1, secured to the bar C^3, slide plates I I^1 I^2 I^3, fig. 2, each of which is inclined at the upper end, and has at one side a lip, which prevents it from descending below the position shown in fig. 4.

To the side of each box H H^1 is hung a plate, H^2, a rib, m, on which is adapted to recesses l l', in the adjacent edges of the sliding plates, fig. 4, and to each plate H^2 is connected an arm attached to a lever, H^3, hung to the bar C^3, the lower arm, m', of the lever projecting below the bar C^2.

A spring, C^4, secured to the bar C^2, and connected to the plate H^2, tends to maintain the latter in the position shown in fig. 4.

To brackets secured to the boxes H H^1, and to the bar C^2, is connected a curved bar, C^5, one end of which, adjacent to the bracket C^1, is bent inwards and downward, as shown in the drawing, figs. 2, 3, and 5.

To brackets secured to the bar C^2, is attached a curved plate or bar, C^7, which extends from a point above the bracket C^1, fig. 2, and above the bar C^5, to a point above the box H, the end of the plate above the box H being bent as shown in the drawing, fig. 4, for a purpose described hereafter.

A curved bar, C^8, extends from above the end of the bar C^5 to a point a short distance above the tops of the needles b, and opposite the arm A^1, figs. 2 and 4; and a short distance above, and almost parallel to this bar, is another but shorter bar, C^9.

To brackets secured to the plates C and B^2 are secured cam-plates J, J^3, J^4, and k, fig. 2, which are a short distance from the inner sides of the needles, and on pins projecting from the plate B^2 turn lifting-wheels J^1 k^1, and a "knocking-over" wheel, k^2.

From a bracket secured to the bar C^2, opposite the arm A^1, projects a pin, on which turns a plain presser-wheel, J^2, fig. 2.

Opposite the lifting-wheel k^1 revolves a presser-wheel, L, in radial slots in which are hung loosely, plates n, fig. 15, each plate n, when in a position to bear against the beard of a needle, b, being directly above a rod, M, which slides in bearings secured to the stationary frame of the machine.

On a pin secured to the bar C^2, adjacent to the presser-wheel L, turns an ordinary loop-wheel, N, and in the plate C, and in the bracket C^1, are openings, x x, for the passage of the thread X.

To standards N^1 N^2, on the arm A^2, are hung levers O O′, fig. 1, and to the lever O′ are connected sliding bars P P′, at the lower ends of which are friction-rollers p p^1, a pin, g', projecting from the lever O′ into a slot in the lever O. A friction-roller, p^2, turns on a pin projecting from the under side of a bracket, V, secured to the arm A.

In the arm A^2, below the outer end of the lever O, slides a rod, Q, which is in a position to be struck, and raised into contact with the arm O by a cam, Q′, secured to the arm D^2 of the movable frame, fig. 5.

At the side of the arm A^2 slides a plate, R, which is connected to the outer end of the lever O, and through an opening, s, in the plate R, and through the arm A^2 passes a sliding pin, S, which is maintained at the limit of its outward motion by a spring, t. Near the outer end of the pin S is an enlargement, w, which is adapted to an enlarged portion of the opening s, and on a pin projecting from a bell-crank lever, T, hung to the side of the arm A^2, turns a jacquard-cylinder U.

The edge of the plate C adjacent to the recess a^1 is inclined, as shown in figs. 2 and 11, and a part of the plate, near one end of the recess a, is bent upward, so as to form an inclined lip, k, fig. 10, for a purpose described hereafter.

To an arm, W, projecting from the cylinder D, is hung a lever, W′, fig. 2, which, as the cylinder revolves, is brought beneath the arm m' of the lever H^3.

A jacquard-apparatus, pattern-wheel, or chain, is connected in any suitable manner to the slides in the boxes H H^1, so that any of the said slides may be elevated or depressed when necessary by the action of the jacquard, the lever W′, during the time that the said slides are being moved, passing in contact with the arm m' of the lever H^3, turning the latter so as to draw back the plate H^2, and passing from contact with the said arm, after the adjustment of the slides, so that the latter will be locked in their positions by the rib m, which, as the plate H^2 resumes its first position, is introduced into the slots l and l'.

A jacquard-apparatus, pattern-wheel, or chain, is connected to the rod M, so as to adjust the latter vertically, and a reciprocating motion is imparted, in any suitable manner, to the lever T, the cylinder U revolving one-quarter of a revolution at every movement of the lever.

When the cam Q′ raises the pin Q, and with it the lever O and slide R, the roller p is raised, and the roller p^1 lowered, and if, while the slide R is elevated, the pin S is moved inward by the action of the jacquard-apparatus, the enlargement w will be introduced into the opening s, where it is confined by the weight of the

slide which rests on the same after the cam Q′ passes from contact with the pin Q, the slide-levers and rollers being thus retained in the positions to which they have been adjusted.

When the pin Q is again raised, the pin S will be relieved of the weight of the slide R, and will be moved outward by the spring *t*, unless the card on the cylinder U retains it in its position, when the slide-levers and rollers will resume their first positions.

Inasmuch as the construction and operation of jacquard-apparatus, pattern-wheels, or chains, are well known, it has not been thought necessary to particularly describe or illustrate the manner in which they are connected with and regulate the movements of the various parts of the machine.

The thread passes from the opening x' to the needles, between the latter and looper N, and the fabric Y, as it is knitted, is drawn upward through the openings in the disks C D^3.

Operation.

The different parts being in the positions shown in figs. 1, 2, and 3, a rotary motion in the direction of its arrow is imparted to the moving frame of the machine, and a reciprocating motion to the lever T, when the operation of the machine will be as follows:

The loops of thread, formed on the needles by the looper N, are elevated by the latter beneath the beards, which are pressed against the shanks by the presser-wheel L, while the old loops on the shanks are raised by the lifting-wheel K^1 above the points of the beards, and are "knocked off" the ends of the needles and on to the new loops by the knocking-over wheel K^2.

As the plate D^3 and its sections, E, are carried round in the direction of the arrow, the fingers *r*, which bear and slide on the bar C^5, will pass off the end of the latter, and the projections *i* will bear and slide on the bar C^8, figs. 4 and 10, until the jacks assume a vertical position, fig. 4.

When the jacks begin to turn downward, they are opposite the recess *a* in the plate C, fig. 2. As, however, the recess h^1 in each plate is brought opposite the edge of the plate C, fig. 10, the lip *k* will enter the said recess, so that after the fingers pass from the rod C^8 the jacks will slide on, and be supported vertically by the plate C, on the edge of which the projections i^2 bear, as shown in figs. 1 and 10.

As the motion of the jacks is continued, they will be forced outwards by the action of the plate C until the fingers *r* are lifted from contact with the needles *b*, as shown in fig. 1, for a purpose described hereafter.

As the loops on the needles are brought against the cam J, they are depressed by the latter until they are below the fingers *r*, the points of which are pressed into the recesses *b′* in the needles by the action of the wheel J^3, figs. 2, 4, and 6.

The lifting-wheel J^1 now raises the loops until they are on the fingers *r*, above the tops of the needles.

The fingers are now moved outwards from the needles, as before described, when the roller *p* will be struck by the arm *e* of the lever F, and the latter will be turned so as to move the adjacent section E in the direction of its arrow, fig. 3, until the fingers hung to this section are moved to a position opposite other needles than those in front of which they were first situated, the extent of the motion imparted to the section and its jacks depending upon the extent to which the lever is moved.

As the needles pass the cams J^3 J^4, the loops will be moved first downwards nearly to the points of the fingers, and then upwards on to the shanks of the fingers, above the needles, this motion, in the present instance, having no effect on the character of the work.

As the needles pass the cam K, the loops will be moved downward by this cam on to those needles above which they have been carried by the lateral motion of the fingers, the downward motion being sufficient to carry the loops entirely off the fingers, which then strike the inclined portion of the bar C^5, when the jacks will be gradually carried to a horizontal position, fig. 3.

As the arm *e* of the lever F strikes the roller p^2, the lever will be turned sufficiently to move the section E back to its first position, fig. 3.

As the needles pass opposite the looper N, new loops will be made upon the same, and the operations above described will be repeated.

When both the slides I I^1 in the box H have been elevated by the action of the jacquard to the position occupied by the slide I, fig. 9, the jacks, as they strike the inclined ends of the slides, will be elevated to such a position that the projections *i* will pass above the plate or bar C^7, and will bear and slide on the latter, the jacks being thus retained in an elevated position so that the fingers cannot operate on the loops, and an ordinary plain fabric is produced in the usual manner.

Should the slide I alone be elevated, only the plates G^1 will be raised, as the recesses i^3 in the plates G receive the end of the elevated slide without the jack being brought in contact with the same, fig. 9. In this case, one-half the jacks will operate in connection with alternate needles, while the remainder are carried round in a horizontal position, and have no effect.

By depressing the slide I and elevating the slide I^1, the plates G will be raised so as to be supported by the bar C^7, while the plates G^1 will pass over, but not in contact with the end of the slide I^1, which projects into the openings *j*, these plates, therefore, being brought to such a position that their fingers will cover alternate needles.

If one of the slides I^2 I^3 in the box H^1 is raised, the jacks which are brought against the ends of the slides will be so elevated that their fingers (instead of the projections *i*, as before described,) will pass on to the bar C^8, and will slide on the latter until the projections *i* pass over and on to the bar C^9, which is so curved that the jacks are pushed back a short distance into the recesses in the section.

As the jacks, after being thus moved back by the bar C^9, are turned downward, and pass opposite the recess a^1 in the plate C, the projections i^4 will be brought to bear on the inclined edge of the plate C as the

jacks are carried round, so that they occupy a more elevated position than when the projections i^2 rested upon the plate C. As the points of the fingers of the jacks, which have been adjusted as above described, are now a greater distance from the lower ends of the needles than the fingers of the jacks which passed on to the bar C^8, when they have received the loops, as before stated, the cam J^3, after the jacks have been moved laterally, will depress the loops from the points of the elevated jacks on to the needles, while the loops on the fingers of the remaining jacks will not be lowered to a sufficient extent to be thrown from the fingers.

Both the loops on the fingers and those on the needles will now be raised by the cam J^4, when the section and its jacks will be again shifted until the fingers are opposite other needles, on to which the remaining loops are caused to descend, by the action of the cam K.

As the jacks are brought opposite the recess a^2, they will pass from contact with the edge of the plate C, and will descend until the front edges of the plates G G^1 bear upon the bar C^5, upon which the jacks slide until they are again brought above the slides I I^1.

Every section E which is to be adjusted should be connected to a lever similar to the lever F, and several rollers of different diameters, or a conical pulley, fig. 17, may be secured to each rod, P P^1, so that the extent to which the lever or levers F and sections are moved, may be regulated by bringing different rollers or different portions of the conical pulley, to a position to be struck by the arm of the lever F, the adjustment of the lever to which the rollers are hung being effected by the jacquard on the cylinder U, or in any other manner.

When the sections are to be shifted in an opposite direction to that pointed out by the arrow, the lever O^1 should be so adjusted that the roller p^1 may be struck by the lever F; and if it is required to shift the sections more frequently, additional adjusting-rollers, p p^1, constructed and operating in the same manner as those described, may be used.

By increasing the number of slides I I^1, &c., or by operating them more frequently, each jack, as it is brought opposite the ends of the bars C^7 C^8 C^9, may be transferred to either one of the same.

When the rod M is elevated by the action of the jacquard, the plate n above the rod will be raised, and will not bear on the needle, the loop, which is then elevated, passing beneath instead of over the beard of the needle, as will be readily understood by those familiar with knitting-machines.

In some instances, needles of different lengths may be used, fig. 16, the loops, when elevated, instead of being entirely withdrawn from the longer needles, being, in this case, stretched laterally by the fingers to a position over the tops of the lower needles, on to which they are transferred from the fingers, by the action of a suitable cam.

It will be seen that by the use of the fingers and loop-raisers and depressers, in connection with a circular row of needles, as above described, each loop may be transferred laterally in either direction and to any extent from one needle to another; that owing to the peculiar construction of the presser-wheel, any loop may be thrown off its needle or retained upon the same, as desired; that by using needles of different lengths, one loop may be carried round two or more needles; that all these operations may be effected without its being necessary to reduce the speed of the machine; and that by the combination of the devices above referred to, and jacquard-apparatus, pattern-chains or wheels, the operations of any of the said devices may be suspended automatically, resumed, or varied, as may be required, to produce any desired pattern in the fabric.

If fabrics of certain patterns only are to be produced, jacks, having fingers of different lengths, may be employed instead of adjustable jacks; and the devices for adjusting the jacks, in order that some of the needles may be covered by fingers to a greater extent than others, may be dispensed with.

A plate, w^1, fig. 13, having an inclined edge, and extending over the tops of the needles, may be used for turning back the loops on to the stems of the needles, fig. 14, should they catch on the beards, as shown in fig. 13.

Although I have described the aforesaid jacks as operating and moving with needles secured to a revolving cylinder, stationary jacks may be employed in connection with that class of circular machines in which the cylinder and needles are stationary, and the various cams and presser and other wheels are carried past the needles. In this instance, a movement past the jacks is imparted to the bars and other devices for operating those parts of the machine which have been referred to as stationary.

Without confining myself to the particular construction and arrangement of the devices herein described, I claim as my invention, and desire to secure by Letters Patent—

1. In a circular-knitting machine, a series of bearded needles, arranged and operating in conjunction with a series of fingers, substantially as and for the purpose described.

2. Fingers, substantially such as described, hung to sections admitting of separate and independent movements in the arc of a circle, substantially as set forth for the purpose specified.

3. Fingers, substantially such as described, projecting from or forming a part of jacks, to which movements may be imparted by the devices herein described, or any equivalent to the same, that some of the needles may be covered by the fingers to a greater extent than others, for the purpose set forth.

4. The adjustable jacks, in combination with the guide-bars C^8 C^9, the plate C, and the slides I^2 I^3, or equivalent devices, whereby the jacks may be brought under the control of one or other of the said bars, the whole being constructed and operating substantially as and for the purpose described.

5. The combination of the jacks, a bar or plate, C^7, and the slides I I^1, or their equivalents.

6. Jacks, substantially such as described, in combination with a jacquard-apparatus, pattern-chain or pattern-wheel by which the jacks are controlled through the medium of the devices herein described, or any equivalent to the same.

7. The sections E, with their jacks, in combination with a jacquard-apparatus, pattern-wheel, or chain operating on the said sections through the medium of the levers F and adjustable rollers p p^1 p^2, or their equivalents.

8. A presser-wheel, having movable plates, secured to or forming a part of the same, so that the said plates may be controlled, in the manner and for the purpose described.

9. The fingers *r*, operating in combination with needles of different lengths, substantially as described and for the purpose set forth.

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

GEORGE JOHNSTONE.

Witnesses:

CHARLES E. FOSTER,

CHAS. B. PRICE.