J. B. Aiken.

Knitting Mach.

No. 24,916. Patented Aug. 2, 1859.

Fig. 3.

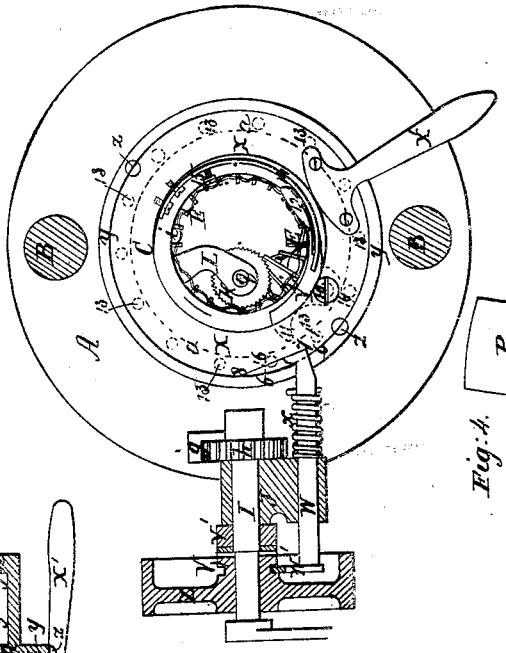


Fig. 4.

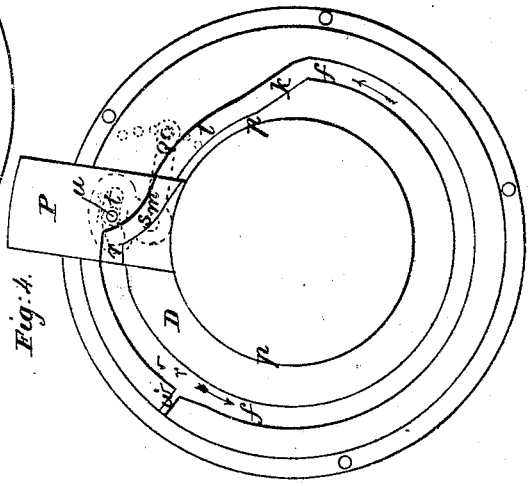


Fig. 2.

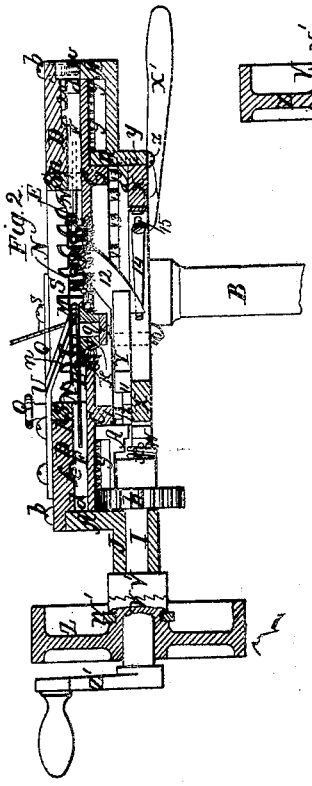


Fig. 5.

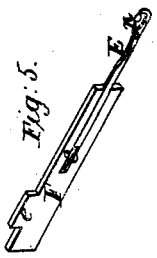
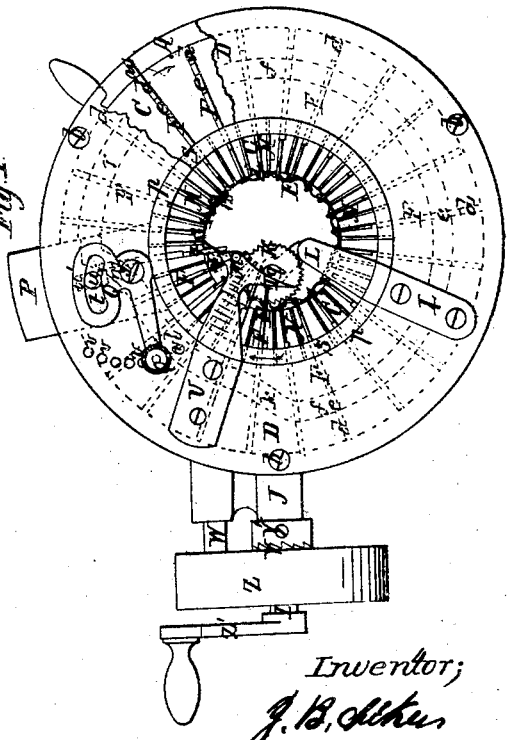


Fig. 1.



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UNITED STATES PATENT OFFICE.

JONAS B. AIKEN, OF MANCHESTER, NEW HAMPSHIRE.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **24,916**, dated August 2, 1859.

To all whom it may concern:

Be it known that I, JONAS BRADLEY AIKEN, of Manchester, in the county of Hillsborough and State of New Hampshire, have invented certain new and useful Improvements in Circular-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 plan of a machine with my improvements. Fig. 2 is a vertical central section of the same. Fig. 3 is a horizontal sectional view of the same, taken while it is in an inverted position. Fig. 4 is an inverted plan of the needle-driving plate. Fig. 5 is a perspective view of one of the needles and the slider to which it is attached.

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

A, Figs. 2 and 3, is a circular bed-plate, which supports all the operating parts of the machine, having a central opening *a a* somewhat larger than is necessary to permit the knitted fabric to pass through. This plate may be supported in a horizontal position upon a stand of any suitable character—as, for instance, upon two light columns B B, portions of which are represented in Figs. 2 and 3.

C is the needle-plate, also of circular form, having a central opening *i i*, Figs. 1, 2, and 3, large enough for the knitted fabric to pass through and having teeth *g g*, Fig. 2, all around the marginal portion of its under side and having on the same side a projecting rim *j j*, the said rim being fitted within a circular cavity in the top of the bed-plate A, and when in its place it is covered by the needle-driving plate D, which is secured by screws *b b* to the stationary bed-plate. The said plate C has in its upper surface radial grooves *d d* for the reception of the needles E E, and the sliders or jacks F F, to which they are attached. Some of these grooves are exposed in Fig. 1 by representing part of the driving-plate broken away. The positions of the others are shown dotted.

The needle-sliders F F consist of plates of steel or other metal of the form best exhibited in Fig. 5, having each a groove *c* in one side, in which the stem of the needle is received and secured by soldering or other means. The said sliders F F are set up edgewise in the grooves *d d*, which are just deep enough to receive all of them but the projections *e e* on their upper sides, which enter a groove *f k l m r* in the needle-driving plate D. The said sliders fit the grooves *d d* in such manner as to be capable of sliding freely therein in a longitudinal direction, and the lower surface of the driving-plate D confines them, so as to prevent any vertical movement.

The upper surface of the needle-plate C is represented as being flat, but it may be of the form of the exterior of the frustum of a cone, and in that case the lower surface of the driving-plate must be of corresponding form to fit closely thereto. The driving-plate D has a central opening *p p*. The above-described parts do not, however, constitute any part of my present invention, but are only described to facilitate the explanation of my improvements.

The teeth *g g* of the needle-plate C gear with a pinion *h* on the shaft I, which is the driving-shaft of the machine, and which is fitted to rotate in a stationary box J, that may be either cast with or bolted to the bed-plate A, and the rotary motion of the said shaft I is thus made to produce the revolution of the needle-plate, which carries with it the needle-sliders and needles. As the needle sliders revolve with the needle-plate they severally are caused to derive such a longitudinal motion from their passage through the groove *f k l m r*, that each in its turn is made to perform, first, the office of throwing off the old loops, and, second, that of drawing the yarn through them to form the new ones. The form of this groove *f k l m r* is illustrated in Figs. 1 and 4, in the former of which figures its position is merely shown dotted, but in the latter its interior is shown. The direction of the revolution of the needle-plate is indicated by arrows in both the above-mentioned figures.

The manner in which the operation of the needles is produced by the groove *f k l m r* is as follows: While the projections *e e* of the sliders are passing along the concentric portion *f* of the groove, the needles remain stationary with the loops close in the bends of their hooks; but as the said projections pass into the portion *k*, which advances toward the center of the plate, the needles are caused to

advance preparatory to their receiving the yarn to form the new loops; and in such advance the old loops are forced back from the hooks and caused to open and pass behind the latches *n n* of the needles by coming in contact with a notched horizontal wheel, which is arranged with its upper plane-surface a little below the bottoms of the needles and fitted to an upright pin or axle *q*, occupying a suitable fixed position in a stationary arm L, that is bolted to the top of the plate D, said wheel being free to be rotated on its axis by the revolution of the needles, and the work to allow the loops to free themselves as they pass it in their revolution with the needles. As the projections *e e*, after leaving the straight portion *k* of the groove, pass along the concentric portion *l*, the needles remain stationary, but as they leave the said concentric portion and pass along the curve *m*, the needles are drawn back through the loops, which are thus caused to close the latches and pass over and off the hooks. The closing of the latches does not, however, take place before the yarn for the new loops is under the points or barbs of the needles, which operation is caused to take place as the retreat of the needle commences, by the arrangement of the thread-carrier M in a suitable position to make it conduct the thread under the barbs at such stage of the needle's revolution. The outer extremity of the curve *m* is farther from the center of the driving-plate than the concentric portion of the groove, and when the projections *e e* arrive at this point their respective needles have completed their retreat. In thus completing their retreat they draw the work against the edges of a series of metal plates, N N, which are set up edgewise between the needles, and which serve to hold or arrest the work while the needles are drawn out of the old loops. The portion *r* of the groove forming the junction of the outer extremity of the curve *m* with the concentric portion *f*, is of a slightly eccentric curve, allowing the needles to advance slightly to set the work free of the plates N N.

It will be understood that the loops are formed by the operation of the curve *m*. To provide for the variation of the length of the loops, I construct this curve and the commencement of the portion *m* of the groove in a sliding plate P, which, with its appendages, I term the "loop-regulator," said plate being fitted to a groove in the lower surface of the driving-plate, with which surface the bottom of said plate is flush and being capable of sliding in the said groove toward or from the center of the machine. By shifting this plate P farther from the center of the machine the needle is caused to move farther back, and consequently to make a larger loop; and by shifting it nearer to the center the opposite effect is produced. The plate P is shifted by means of an eccentrically-slotted lever Q, arranged to work on a fulcrum-pin *s* on the top of the driving-plate, the eccentric slot *t* of said lever receiving a pin *u*, which is secured in the plate P, and projects through a radial slot *u'* in the driving-plate. This lever Q, when the plate P is adjusted for the desired length of loop, is secured by the dropping of a pin attached to the said lever into one of a series of holes *v v* in the plate D. The entrance to the groove in the loop-regulator is widened, and so is the entrance to the stationary portion of the curve *r* in order to provide room for the entry of the projections *e e* of the needle-sliders in all positions of the loop-regulator.

The stationary plates N N, whose functions correspond in some particulars with the sinkers of other machines, are all secured to a ring S, which is fitted easily into the central opening *p p* of the driving-plate, and which merely rests on the top of the needle-plate, and the extremities of the said plates are flush with the margin of the opening. This ring S, with its attached plates N N, is caused to revolve along with the needle-plate by the pressure of the work against the said plates.

The equivalents of the plates N N have been before patented by Walter Aiken, and it is only their attachment to the ring S to adapt them to this kind of circular machine in which there is any novelty.

T is what I term the "needle-latch regulator," whose duty it is to insure the barbs or hooks of the needles being open at the proper time to receive the yarn for the formation of the loops.

In the knitting-machines heretofore used with latched needles it frequently occurs that the latches, after having been thrown back over the shank by the slipping back of the loops on the needles, rebound and thus close the hooks or barbs at a time when they should be open, and cause the dropping of the stitches. The needle-latch regulator T is to prevent this closing of the barbs. It consists of a stationary thin tongue of metal of the form shown in Figs. 1 and 2, occupying such a position just above the plane in which the barbs of the needles revolve, that the latches in rebounding would fall over upon it, and as the revolution of the needles continued accompanied by their forward movement, they (the latches) would in passing along its outer edge be gradually thrown back. The needle-latch regulator and thread-carrier may be made in separate pieces; but as a matter of convenience and for their greater efficiency I prefer to make them of a single piece of metal, as shown in the drawings, the thread-carrier being merely an eye in the plate T, and the said plate being attached to an arm U, which is screwed to the top of the plate D.

To afford facility for the insertion of the needles in the machine or for their removal for any purpose, I provide a slot *w*, Figs. 1 and 2, in one side of the cavity in the bed-plate A, which receives the needle-plate, and in that part of the driving-plate which is

situated outside of the driving-groove *f k l m r*, I provide a groove *w'*, Figs. 2 and 4, opposite to the said opening *w*, said slot and groove being of such size as to permit the needle-slides and needles to pass through one at a time. By turning the needle plate C to bring any one of the grooves *d d* opposite to this slot *w* and groove *w'*, a needle and its attached slider can be pushed into such groove from the outside of the plate A, or the needles and sliders can be pushed outward from the central opening of the machine far enough to be laid hold of at the outside to be drawn out entirely. This mode of providing for the insertion and removal of the needles and their slides does not constitute part of my present invention. Neither does the combination of the needle-latch regulator and thread-carrier in one piece; but these features are only described as parts of the machine, represented to illustrate my said invention.

Z is the driving-pulley, to which the power is applied to operate the machine, said pulley being fitted to turn freely and also to slide longitudinally to some extent on the shaft I, before described, and having permanently attached to it one portion V of a clutch, the other portion V' of which is fast on the said shaft. The pulley Z is connected with a stop-motion of a novel character, which I will proceed to describe.

W, Figs. 2 and 3, is a sliding bolt fitted to slide parallel with the shaft I in a suitable guide attached to the box J and having at its outer end a fork W', which enters a groove in the hub of the pulley Z. The inner end of this bolt W is held by a spiral spring *x*, in contact with a ring X, which is fitted to turn easily in a circular cavity within a circular projecting rim *y y*, formed upon the bottom of the bed-plate A, but prevented from dropping out of the said cavity by the heads of two screws *z z*, screwing into the bottom of said rim. An opening 6 6 is provided in the said rim for the bolt W to enter to bear upon the ring X. In one part of the outer periphery of the said ring X there is a recess 7 8, which has an abrupt angle 7 at one end, but meets the peripherical surface at its outer end 8 with an easy curve, and to continue the machine in operation the deepest portion of this recess must remain opposite to the bolt W, that the bolt entering it may hold the portion V of the clutch which is attached to the pulley Z in gear with the portion V, which is attached to the shaft. The said ring has attached to its upper surface by a fulcrum-pin 10 a horizontally-moving lever Y, on one end of which is formed a dog 11, and the other end of which is made broad and of a suitable curved form to lie snugly against the exterior of the circular web of knitting that hangs suspended from the needles. The curved portion 12 of the said lever stands up within the central opening *i i* of the needle-plate; and the web, while it is perfect, bearing against the surface of the said covered portion, keeps the dog 11 so far toward the center of the machine as to prevent its entering a recess 16 16, Figs. 2 and 3, in the central opening *a a* of the bed-plate A and coming in contact with a circular series of pins or teeth 13 13, which project from the bottom of the needle-plate at regular distances apart all around.

The lever Y has applied to it a spring 14, which exerts a constant tendency to throw the dog 11 outward to a position for the pins or teeth 13 13 to come in contact with it in their revolution; but this spring, being properly adjusted by a screw 15, Figs. 2 and 3, is made to produce so light a pressure that such tendency is overcome by the outward pressure of the web against the curved portion 12 of the lever, while the work remains perfect. When, however, a break occurs in the yarn, or the supply of yarn to the machine from any cause ceases and the work begins to drop from the needles, the dropped portion of the work, arriving at the curved portion 12 of the stop-lever Y, fails to press it outward and leaves the said lever under the uncontrolled influence of the spring 14, which causes the dog 11 to be thrown outward to a position to come in contact with the first pin 13 that comes around with the needle-plate, and the said pin, driving forward the said dog, carries with it the ring X, and so carries the recess 7 8 past the bolt W, and causes the bolt W to be driven outward, and the part V of the clutch and the pulley Z to be thrown out of gear, thus causing the stoppage of the machine. As the curved portion 12 of the lever Y is arranged a short distance in advance of the thread-carrier M and the pins 13 13 are but a short distance apart, the stoppage of the machine is effected before more than a very few loops can have been dropped. When the pulley Z remains out of gear, which it must be until the loops are taken up and the fabric is made perfect again, the machine is free to be turned, as may be desired, by the handle Z', which is fast on the shaft I, and the dog 11 is prevented interfering with the the pins 13 13 in this operation, by reason of its having been carried past the end of the recess 16 16, by the momentum imparted to the ring X when the dog was struck by the pins 13, as above described. The dog, when thus carried past the recess 16 16, rests against the circular portion of the central opening *a a* on one side of the said recess, and within the circle of the sweep of the said pins 13 13. It is this action of the stop-motion to permit the machine to be at once turned by hand after it is thrown out of gear that distinguishes it from all others known to me, and which entitles it to the name of "self-adjusting stop-motion."

To start the machine again by the pulley Z when the loops shall have been taken up again, the ring is turned back by hand in the opposite direction to that in which the needle-plate revolves by means of the handle X',

attached to it for the purpose, until it is stopped by the angular end 7 of the recess 7 8, coming in contact with the sliding bolt W, which, by dropping back into the said recess, throws the pulley Z into gear again.

I do not claim the use of stationary plates between the needles, as such plates are described in the patent of Walter Aiken, dated December 1, 1857; but

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

1. The lever Q, grooved eccentrically to its fulcrum, applied, in combination with the sliding-loop regulator, to adjust the same for different lengths of loop, substantially as herein specified.

2. The stop-motion consisting of the lever Y and its self-adjusting dog 11, the ring X, with its pins 13 13 or their equivalents, and the sliding bolt W, or its equivalent, carrying the slipper W′, the whole combined, applied, and operating substantially as herein described.

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