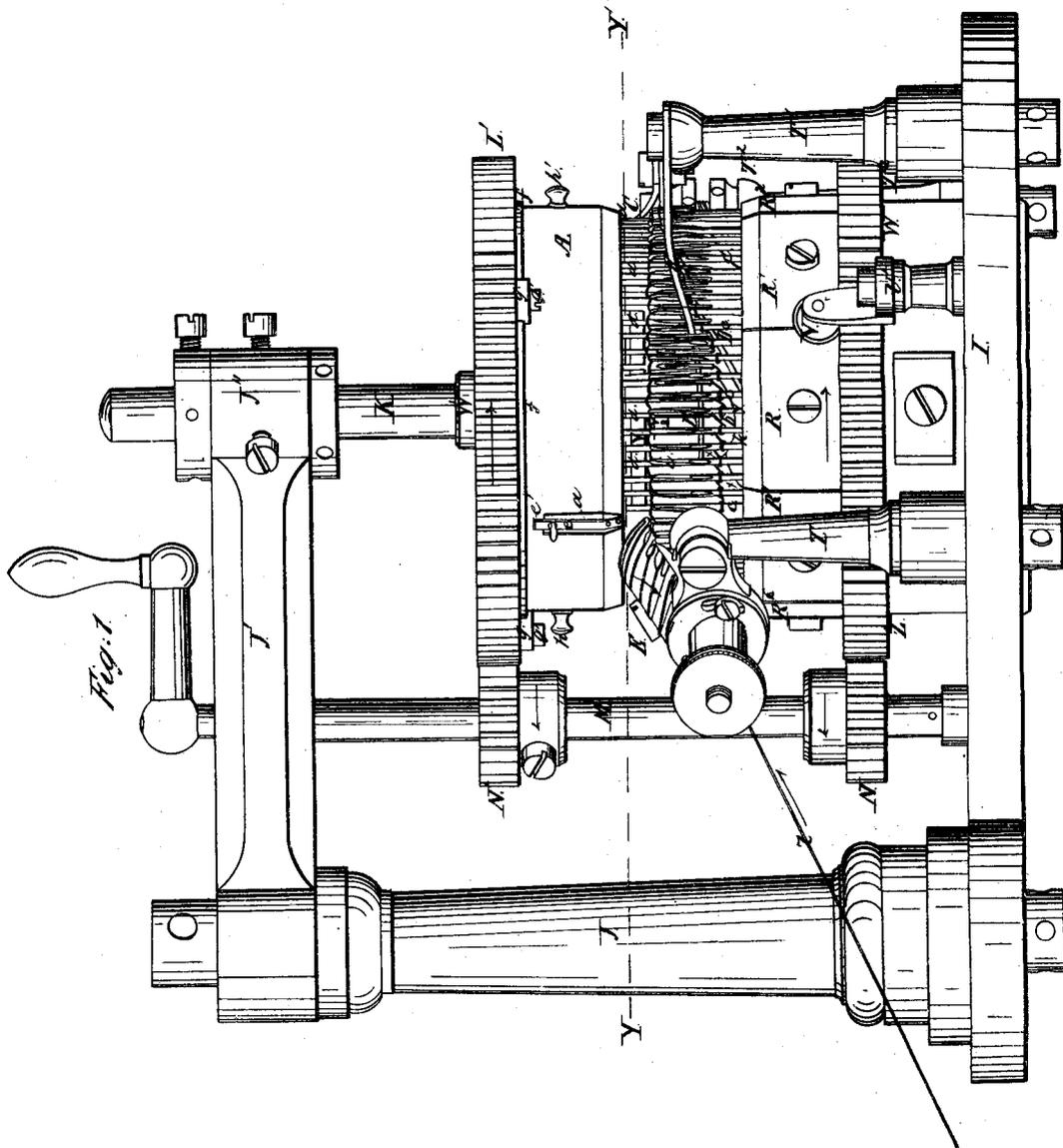


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Knitting Machine.

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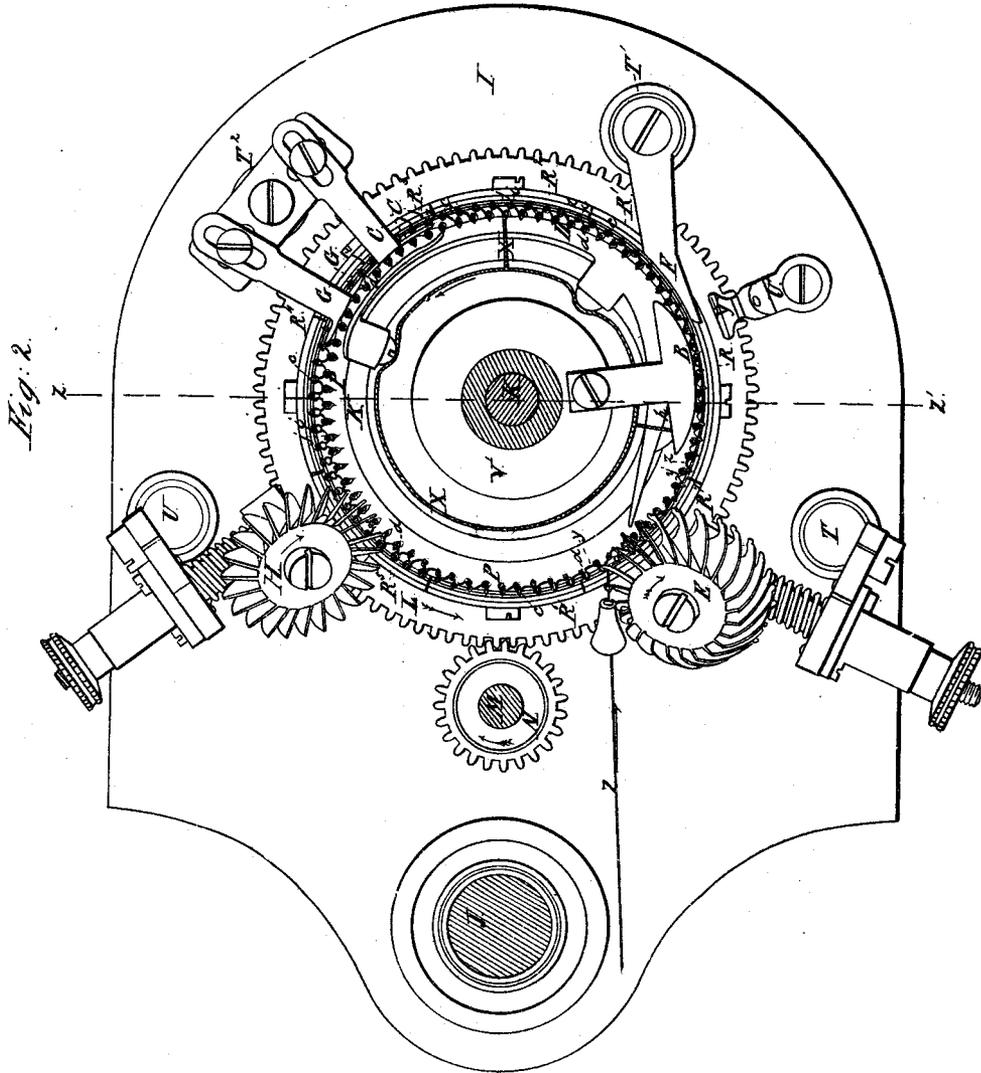
Patented Aug. 5, 1856.



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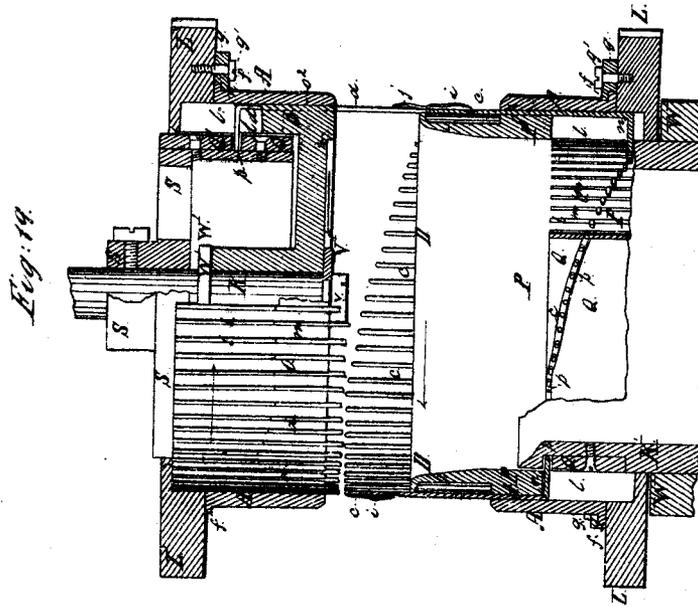
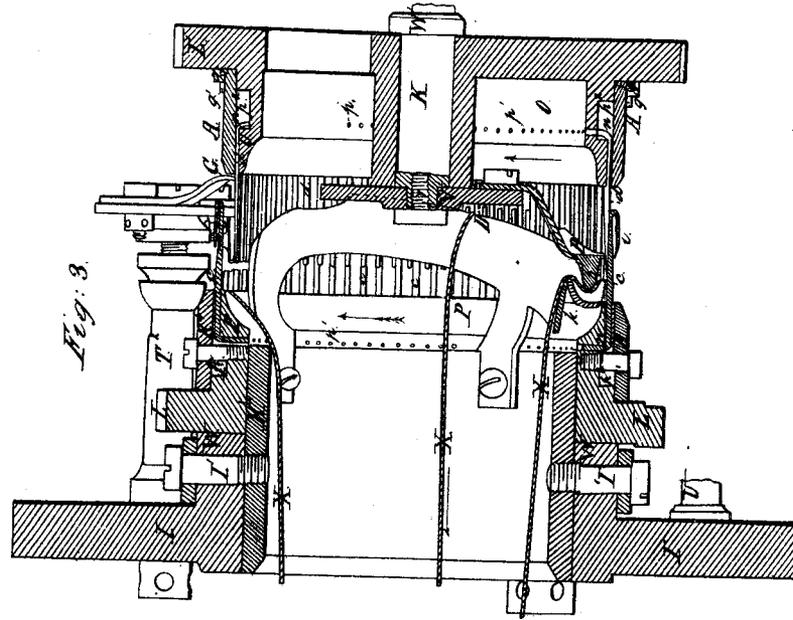
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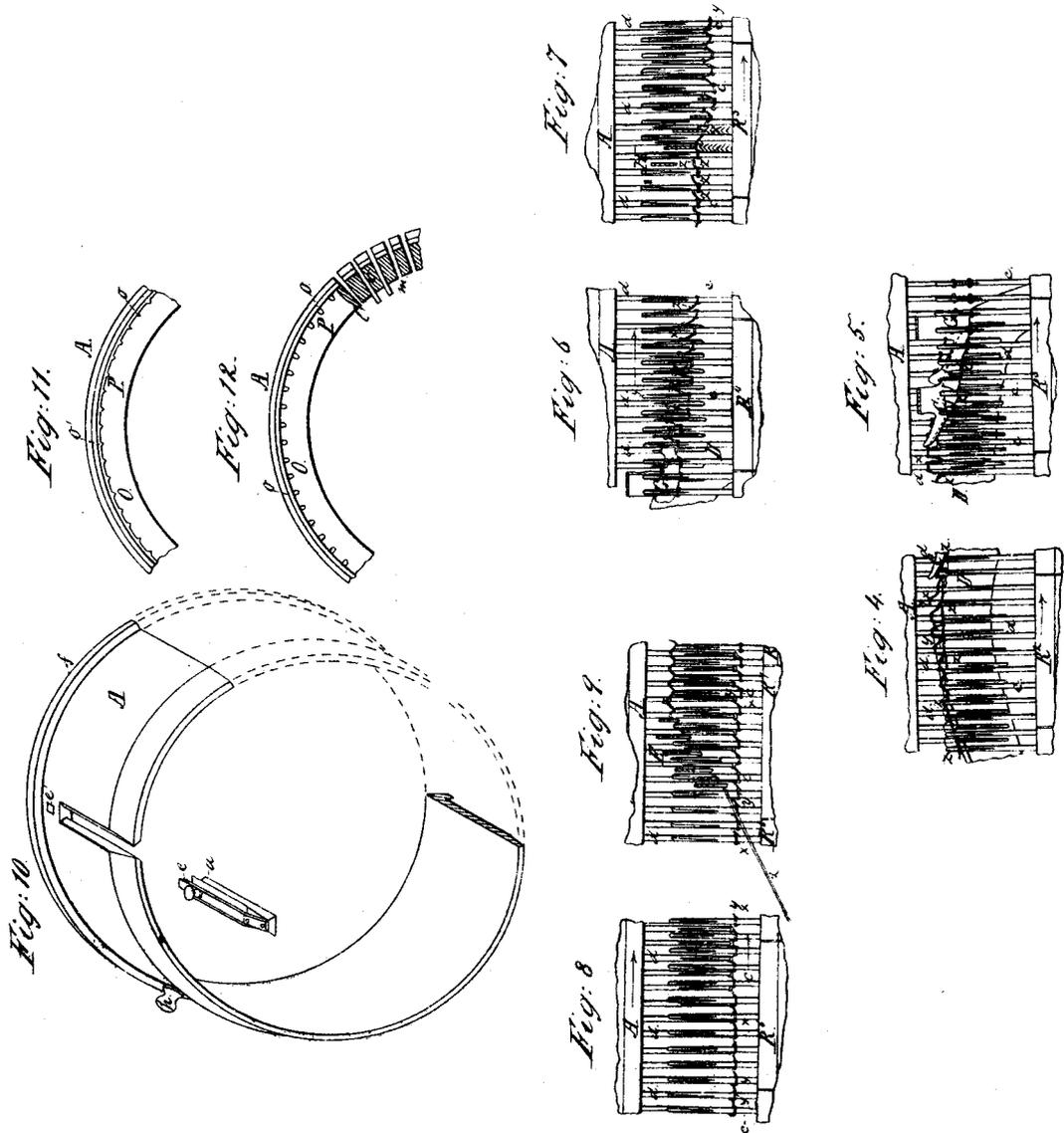
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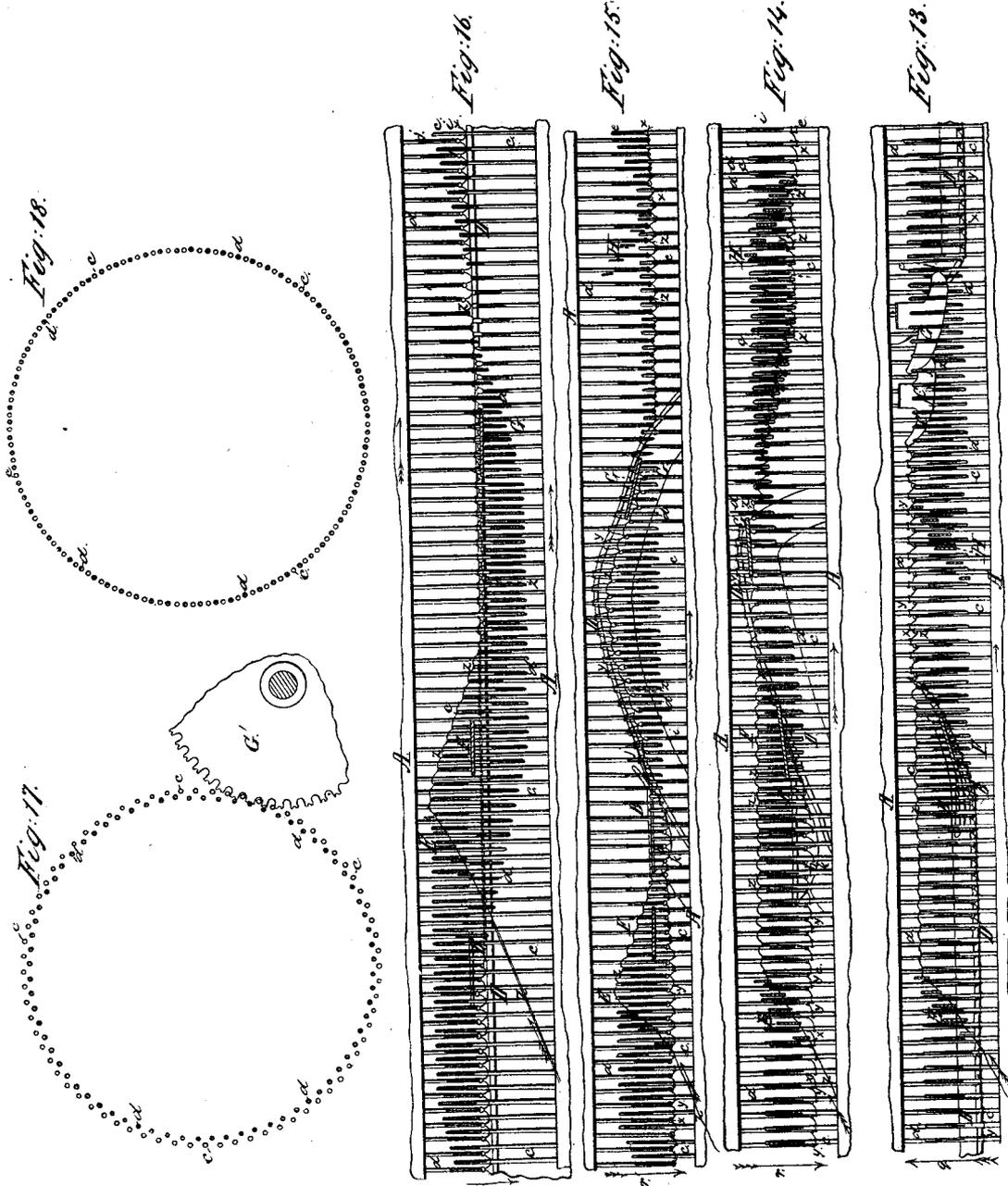
Patented Aug. 5, 1856.



Park & Ellis. Knitting Machine.

N^o 15,492.

Patented Aug. 5, 1856.



UNITED STATES PATENT OFFICE.

SIDNEY W. PARK AND EDGAR S. ELLS, OF TROY, NEW YORK.

IMPROVEMENT IN ROTARY KNITTING-MACHINES.

Specification forming part of Letters Patent No. 15,492, dated August 5, 1856.

To all whom it may concern:

Be it known that we, SIDNEY W. PARK and EDGAR S. ELLS, both of Troy, in the county of Rensselaer and State of New York, have jointly invented certain new and useful Improvements in Rotary Knitting-Machines for Making Ribbed Work; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification.

Instead of employing together an annular and a radial series of hooked needles in knitting common tubular ribbed work, we employ two annular series of such needles, the barbs of the needles of each series being turned outward and the two series so arranged together that the needles of one set are alongside and parallel and point in the opposite direction to those of the other series; but these two series may be of equal or of slightly different diameters, and may be concentric or a little eccentric to each other, and the needles of either one or of both of the sets may slide endwise or be immovable in their respective cylinders, and the knit fabric may be drawn off through either the large or the small series of needles.

In the annexed drawings, Figure 1 is an elevation of one side of our improved machine, the needles of each series being stationary. The series of different diameters are placed eccentrically together, and the knit fabric drawn off through the large series. Fig. 2 is a horizontal section at and plan of the parts below the line Y Y' of Fig. 1. Fig. 3 is an incomplete vertical section of our improved machine, as shown in Fig. 1 at the line Z Z' in Fig. 2, and an elevation of the interior on the right-hand side of said line. Figs. 4, 5, 6, 7, 8, and 9 are elevations of the outside of such successive portions of the two series of needles of Figs. 1, 2, and 3 as are not shown in Fig. 1. Fig. 10 is a projection of a ring which we employ to hold the needles in place on the cylindrical needle-blocks. Figs. 11 and 12 are plans of a part of the needle-blocks with the ring shown in Fig. 10 applied thereto. Fig. 13 is a straightened elevation of the outside of the two annular series of needles, as if the two needle-cylinders

were opened at one place and then spread out straight, the sets being of different diameters and placed together eccentrically, the needles of both series fixed and the web drawn off through the small series. Fig. 14 is a "straightened" elevation of the outside of the two series of needles, the sets being of different diameters and eccentric, the needles of the small series sliding and those of the large set stationary and the web drawn off through the large series. Fig. 15 is another straightened elevation of the outside of the two series of needles, the two sets being of different diameters and concentric, the needles of the large series sliding and those of the small set fixed, and the web drawn off through the large series. Fig. 16 is also a straightened elevation of the outside of the two series of needles, the two series being of equal diameter and concentric and the needles of both sets sliding. Fig. 17 is a plan of the two series of needles, the sets being of different diameters and concentric. Fig. 18 is also a plan of the two series of needles, they being of equal diameter and concentric; and Fig. 19 is an incomplete sectional elevation of our improved machine, the two series of needles being of equal diameter and concentric, the needles of both sets sliding.

The same letters refer to like parts in all the figures, and the directions of motion of the parts are indicated by the arrows thereon.

We will first particularly describe the construction and operation of our improved machine when the two annular series of needles are of different diameters and placed eccentrically together and the needles of both revolving series stationary, the knit fabric being drawn off through the large series, and in such description shall only refer to Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11.

I is the bed-piece for all the parts. L is a toothed wheel fastened to or forming a part of the hollow needle-block P, to which the needles c c, which compose the large series, are attached. This cylindrical needle-block P bears upon the shoulder W of the bed-piece and turns around the stationary hollow stud or cylinder K', which latter is made hollow for the web X (seen in blue lines) to pass through and is fastened to or forms a part of the bed-piece I. The roller V, held by the

support U' , keeps the needle-cylinder P against the shoulder W . The hooked needles $c c$ are arranged upon the cylinder or ring P parallel to its axis at equal distances apart, with their barbs turned outward and the ends of the needles all projecting equally and about twice the length of their barbs beyond its top edge, so as to form a concentric ring of needles like that most generally employed in rotary machines for knitting plain work. The needles are secured in place on the needle-block P in any suitable manner; as by the common mode of "leading" and holding by clamp-plates, or, better, by inserting the bent butt-ends of the needles into holes p' and the bodies in longitudinal grooves $o' o'$ in the needle-block P , and there securing them by the clamp-plates R , or, more conveniently, by the sliding ring A , the construction and advantageous use of which will be hereinafter fully set forth. This series of needles $c c$ we call the "first" set; and as the web is drawn off through it the rows of stitches which project on the outside of the tubular web are made on this series.

L' is a wheel of the same size and number of teeth as the wheel L , and is fastened to or forms a part of the cylindrical block O , to which the needles $d d$, which compose the smaller series, are fastened. The needle-block O turns smoothly on the lower part of the stationary spindle K , being kept in place thereon by the shoulder W' and a collet V' and screw v , or in some other suitable manner. The needles $d d$ are fastened to the block O with their barbs turned outward and otherwise in the same form and manner as the needles $c c$ to the block P ; and the concentric ring of needles thus formed extends below the lower edge of the block O about the same distance that the needles $c c$ project above the top of the block P . The series of needles $d d$ may be about one-eighth of an inch less in diameter than the series $c c$ in knitting coarse woolen stocking work; but this difference must vary according to the closeness and fineness of the fabric to be made. This series of needles $d d$ we call the "second" series or set, and the rows of stitches which project on the inside of the web are formed thereon. The spindle K is supported at J'' in the arm J' of the post J in such manner that the axis of motion of the second set of needles $d d$ shall be parallel to that of the first set, and so that the second set can be arranged concentric with the first, or eccentric therewith to any desired small extent, the degree of eccentricity allowable being limited by the fineness and closeness of the fabric to be made. In the drawings, Fig. 2, the two series are about as far eccentric as is allowable in knitting coarse woolen stocking work. The second series of needles is also set by sliding the spindle K and clamping it in its socket at J'' at such distance from the first set that the needles of the second set, pointing in the opposite direction to those of the first, lap along-

side those of the first set about one-eighth of an inch more than the length of a needle barb or hook.

M is the driving-shaft arranged parallel to the axes of the needle-cylinders and supported by the bed-piece I and arm J' .

$N N'$ are wheels of equal diameter and number of teeth fastened to the shaft M and geared with the wheels $L L'$, so that the first and second sets of needles are surely revolved simultaneously together with exactness. The wheel N' is made adjustable on M , so that the needles of the second set can be conveniently set between or opposite those of the first set at any desired point. The two sets of needles are arranged properly in this respect in Fig. 2.

We will now proceed to describe the construction and arrangement of the appliances used in connection with these combined sets of needles.

E is a common sinker-wheel supported in an adjustable manner, as usual in rotary knitting-machines, upon the post T . This sinker carries the yarn z (seen in reddish-yellow lines) under the barbs and to the ends of the first series of needles $c c$, leaving enough yarn to form new loops on both sets. (See Figs. 2 and 9.) The sinker E is placed where the needles of the inner series are nearly opposite those of the outer set, so that the blades of the sinker can act with the greatest freedom, and a little before the place where the two series are nearest together.

F is an ordinary fixed cam-presser mounted on the post T' to depress the barbs of the first set of needles $c c$.

G is a thin common cam-presser supported on the post T'' , placed after the presser F and arranged between the two series of needles to depress the barbs of the second set.

D is a web-guide fastened to the bed-piece or to the hollow stud K' and arranged close to the inside of the inner or second set of needles, but outside the web as it is drawn off. This web-guide acts in opposition to the tension on the knitted fabric, and is so formed and arranged as to first so slide the web as to cast off the old loops $y y$ (seen in carmine-red lines) from the outer series of needles $c c$, as seen in Figs. 1 and 4, and then so as to carry the old loops $y y$ of the second set of needles above or past the yarn z , as seen in Figs. 4 and 5, and, finally, so as to keep the old loops of the inner series of needles above the points of the barbs $j j$ of these needles while or at the time the yarn for the new loops is passing under these barbs preparatory to their depression by the cam G .

B is a cam fastened to the plate or collet V' to spring the ends of the second set of needles outward at the time the old loops thereon commence rising, in order to insure the passage of all the old cast-off stitches up on the inside of the inner set of needles. The two series of needles should be near together at the place where the web begins to rise, so that

the web will draw hard on the inner set of needles to also help bring their old cast-off stitches to the inside of their ends before the loops thereof begin to rise. We also generally draw the web tight just before it begins to rise by means of the lobe *b* of *B* in connection with the elevated part *k* of *D*, so that the old loops of the second set of needles shall be surely at the ends of the needles before and at the time these loops begin to rise; also the needles of the second set should not be opposite to but should alternate with those of the first set where the web begins to rise, so that the stitches of the outer set shall certainly not interfere with the needles of the inner series as the web rises.

C is a thin guide or sinker-blade arranged immediately in front of and in connection with the presser *G* and so near to the needles of the inner series that the points of their barbs *j, j* slide along the outside of it, as seen in Figs. 2 and 5, in order to insure the passage of the yarn which is to form the new loops under the barbs of the needles of the second series before they reach the presser *G*.

H is a common "cast-off" wheel mounted in an adjustable manner, as usual, upon the post *U* to help cast off the old stitches from the second set of needles when the tension on the web is insufficient therefor. The web is drawn off and the proper tension attained thereon for knitting evenly, either by hanging a weight in the common manner to the revolving web as it extends from the machine, or by such combined tension-rollers and take-up mechanisms as are now in use. After the loops of the web have been properly put or formed on the needles by hand and the continuous yarn *z* connected therewith and a weight or a draw-off mechanism attached to the web, on turning the shaft *M* in the direction of the arrow thereon the successive operation of the various parts of the machine is as follows, to wit: As the two series of needles simultaneously revolve together in the direction indicated by their arrows, the yarn *z* is first fed by the sinker *E* under the barbs and to the ends of the needles of the first series, leaving enough yarn between these needles outside the second series to form new loops on both sets. The old loops on the needles of the second set are then drawn tight into the ends of these needles by the joint action on the web of the lobe *b* of the cam *B* and the part *k* of *D*, provided the general tension on the web is not always sufficient to insure this result. Then the web immediately begins to rise on the guide *D*, at which time the cam *B*, if employed, springs out the ends of the needles of the second set to fully insure the passage of all their old cast-off loops upon the inner side of these needles. Next, before the old loops on the first set of needles meet the barbs thereof, these barbs are depressed by the cam *F*, so that as the web rises to the ends of these needles these old loops are slid over the barbs and cast off

around the yarn *z* in the ends of these needles, thus completing the new loops of the first set. After this the looped yarn in the ends of the first set is drawn tight by the web being carried still higher by the guide *D*, in order to draw the yarn close to the needles of the second set, and also to cause the old loops on the second set to slide above or past the yarn before this yarn passes under the barbs of the second set. Next, the points of the barbs of the needles of the second set pass along the outside of the thin sinker *C*, and the looped yarn where it extends from around the needles of the first set through their last cast-off stitches or loops to along the outside of the needles of the second set is pressed down by this sinker, so that the yarn is certainly under the barbs of the needles of the second set when these barbs arrive at the cam-presser *G*, while the old loops of the second set are yet held up above the points of these barbs by the action of the guide *D* on the web, whereupon these barbs are depressed by the cam *G*, and the guide *D* allows the tension on the web to slide these old loops outside the barbs and to cast them off around the yarn now in the ends of the second needles, thus completing the new loops of the second series of needles, the cast-off wheel *H* being used in knitting small tubes when required to insure this casting-off of the old loops. Then the needles are again ready for the yarn.

Instead of causing the needles of the second set to lap alongside those of the first so far that the points of the barbs of the second set are below the ends of the needles of the first set, as shown in the drawings, the needles of the second set may have longer barbs than those of the first, so that the points of these long barbs shall be far enough above the ends of the needles of the first set for a presser placed above the ends of the first set to act thereon at the same time that the ends of the needles of the second set are below the points of the barbs of the first, or the lengths of the barbs of the two sets of needles may be equal, and the points of the barbs of each set extend a little beyond the ends of the other set if the web is drawn down tight and the barbs of the first set are depressed before the web begins to rise. We prefer to thus arrange the points of the barbs of the second set above the ends of the needles of the first when the two series of stationary needles are equal in diameter.

The parts which, according to our invention must necessarily be combined with the two annular sets of hooked needles to knit ribbed work, whether the sets are of equal or different diameters, or are placed concentric or eccentric to each other, or whether the needles of both or of either of the sets slide or are stationary, or whether the knit fabric is drawn off through or the yarn first fed to either set of needles are the sinker *E* or its equivalent, the presser *F* or its equivalent,

the presser G or its equivalent, and the web-guide D or its equivalent.

To avoid misapprehension, we will state that we here consider any device, arrangement of parts, or use of means by which the yarn for the new loops can be carried or left under the barbs of either set at the proper time and place and in suitable quantity as an equivalent of the sinker E. For instance, instead of using a sinker-wheel, a device may generally be employed which continually takes up the yarn within itself and leaves it crimped under the barbs, or, when the needles slide, the yarn may sometimes be sunk between the needles by a wheel, which has thin blades arranged parallel to its axis of motion, the needles being slid endwise to draw the barbs over the yarn while the yarn is sunk by the blades, or sometimes the yarn may be first drawn in front of the barbs close to the bodies of the needles and then "sunk" and carried under the barbs by movable blades, or, if the needles slide, by stationary sinkers or stops; and by equivalents of the pressers F and G and web-guide D, we here mean any devices which shall fulfill the respective offices of these parts.

The arrangements of the sinker C, in connection with the presser of the second set of needles, and the cam B, to spring out the ends of the needles of the second set, as described, are each generally of more or less importance, in securing the very best operation of the machine, according as the needles of the sets slide or are fixed, or as the sets are of equal or different diameters, or are eccentric or concentric with each other.

The operation of our improved machine, when the needles *d d* of the second set slide and those of the first set are stationary, is shown by Fig. 14, the web being drawn off through the first set of needles *c c* in the direction pointed by the arrow *r*. The yarn is fed by the sinker E under the barbs of the first set of needles. The web is drawn tight by the parts *b* and *k*. The ends of the needles *d d* are pressed outward by the cam B. The barbs of the outer set of needles are depressed by the cam F, and the web is raised by the guide D, so as to cast off the old loops of the first set and to carry the old loops of the second set above the yarn, all as when the needles of both sets are stationary. When the old loops of the second set of needles have passed above the yarn, the needles of the second set rise, so as to keep the points of their barbs opposite the space which is between the old loops and the yarn until this space is as large as it can well be made, when the barbs of the second set are pressed by the cam G, acting on the points of the barbs where they extend above the ends of the needles of the first set, whereupon the guide D allows the tension on the web to draw down and cast off the old loops of the second set, a cast-off wheel H being used, when necessary, to insure this result, and the needles *d d* slide

down until the points of their barbs are about one-eighth of an inch below the ends of the needles *c c*, when the needles are ready for the yarn again.

In Fig. 14 the two sets of needles are placed eccentrically together; but the operation is substantially the same, whether the series are of different diameters and concentric or eccentric, or are of equal diameters.

The operation, when the needles of the first set slide and those of the second are fixed, is shown by Fig. 15, the web being drawn off through the first set in the direction pointed by the arrow *r'*. In this case the yarn is fed, as usual, upon the first set of needles *c c*, when the web hangs at the ends of the needles of the second set. Then the barbs of the first set are depressed by the cam F, and these needles slide down until the points of their barbs have passed under and beyond the old loops thereon. Then the web is drawn tight, if beneficial, and the second set of needles sprung outward, and the cam D raises the web so as to cast off the old loops of the first set and to carry the old loops of the second set above the yarn, all in the same manner as when the needles of both sets are fixed. Then the cam D raises the web still higher and the first set of needles slide up with but a little below the web, until the yarn is drawn tight and passes above the points of the barbs of the second set. Then the presser G acts on the points of the barbs of the second set, where they extend above the ends of the needles of the first, and the guide D allows the tension of the web to slide down and cast off the old loops of the second set, the needles of the first also sliding down in advance of the web, and the cast-off wheel H being employed whenever beneficial in casting off the old loops of the second set, whereupon the needles of the first set assume their position for receiving the yarn again.

Fig. 16 shows the operation when the needles of both sets slide, the web being drawn off in the direction pointed by the arrow *r*². In such case the yarn is first fed under the barbs of the needles *c c* of the first set when the old loops are below the points of their barbs. Then the barbs of the needles *c c* are pressed and these needles slide down, while the guide D sustains the web until their old loops are cast off and the yarn is drawn down tight below the old loops of the second set; the needles *d d* being then slid down, so that the points of their barbs are below the yarn. Then the needles of the second set rise until the points of their barbs are opposite the space which is between the old loops thereof and the new yarn, when these barbs are pressed by the cam G. Then the needles *d d* of the second set rise until their old loops are cast off and then descend before the yarn is again fed to the needles. When both sets of needles slide, the guide D may be made of a continuous, uniform height, and may be fastened to or form a part of the needle-block P,

as in Fig. 19, the guide D being notched on its edge to allow the needles of the second set to pass through, if the sets are of different diameters or are eccentric with each other.

We contemplate the use of other forms of sinker than the wheel E, and other pressers than the cans F G, (as the rotary-toothed presser G', Fig. 17,) whenever such other kind of sinker or pressers shall be best adapted to any desired particular arrangement of the two annular series of needles. When the two series of needles are arranged concentric with each other, as many sets of appliances, each set consisting of a sinker, two pressers, and a web-guide D, can be employed as there is room for in the circumference of the needle-cylinders, so that according to the size of these cylinders, two, three, four, or more threads of yarn can be fed to the needles at the same time, thereby proportionately increasing the productiveness of the machine. Since the guide D always acts to slide or retain the web in opposition to the tension of the web, when the knit fabric is drawn off through the second series of needles the tension of the web will do what was done by the web-guide, and the web-guide will fulfill the part which the tension of the web performed when the web was drawn off through the first series. This converse action of the tension of the web and the web-guide D is shown by Fig. 13, where the needles of both sets are fixed and the web is drawn off through the second series of needles *d d* in the direction pointed by the arrow *g*. In this case the web-guide D is of course fastened to the hollow support which the needle-block for the second series of needles *d d* must now have. In operation the guide D first holds the web down to the lower ends of the needles *d d* while the yarn is fed under the barbs of the first set *c c*. Then the barbs of the needles of the first set are pressed by the cam F, and the guide D allows the tension of the web to slide their old loops over these barbs and off the needles, a cast-off wheel H being employed, if desirable, to insure this result. Then the yarn *z* is pushed down by the sinker C to insure the separation of the yarn from the old loops of the second, and thereby the passage of the yarn under the barbs of this second set, while these old loops remain above the points of these barbs, whereupon these barbs are pressed by the cam G, and the guide D presses down on the web, causing the old loops of the second set to slide over the barbs and off the needles. Then the needles are again ready for the yarn. The yarn can, though sometimes with much difficulty, be at first fed under the barbs of the second set of needles, the yarn surrounding the first set; but we generally prefer to first feed the yarn under the barbs of the needles *c c* of the first set, as shown in the drawings. When the yarn is at first fed to the second set of needles, the form of the guide D and the movements of the sliding

needles must of course be varied to meet the requirements of the machine in such case.

The needles may be made to slide in the needle-blocks endwise in any suitable manner. The construction which we prefer is to cut radial slots *l l* through the lower part of the block P and through the upper part of the block O, and longitudinal grooves *o o*, equal in depth to the diameter of a needle or the width of a slot *l*, from the slots *l l* to the rim of the needle-blocks, (see Figs. 12 and 19,) then bend down the butt-ends of the needles at right angles to the bodies, and place the bodies within the grooves *o o* and the bent ends through the slots *l l*, so as to project on the inside of the hollow needle-blocks within the stationary cam-grooves *p p*, which latter are shaped to give the desired sliding movements to the needles as the needle-blocks revolve, the needles being held in place so as to slide freely and accurately in the grooves *o o* and slots *l l* by external clamp-plates, or more conveniently by the sliding ring A, having a part *a* movable, the construction and advantageous arrangement of which ring we will now describe.

By the common mode of holding needles on cylindrical blocks by clamp-plates when a single needle breaks in knitting, several other needles must be loosened so as to become more or less displaced in removing the old and inserting a new needle, thereby occasioning vexatious delay. To avoid this inconvenience, we provide a circular ring A, smooth on the inside and of such diameter as will just allow the ring to surround the needles when arranged on the needle-block. We secure this ring so that it can be slid around, back or forward on the needles by forming a flange *f* on the ring to slide within guides *g g*, fastened to the needle-block, or in any other suitable manner. We also make a part *a* of the ring easily removable by making longitudinal grooves in the sides of this part to fit tongues in the ring and arranging a spring-catch *e* upon the part *a* to hook into the notch *e'*; or this piece may be nicely fitted and secured to the ring in any other suitable manner. Now when a needle breaks the operative slides the ring A so that the part *a* is over that needle, then slips out the piece *a*, which liberates only the broken needle, which needle he displaces by a new one and replaces the part *a*. It is not essential to the successful application of the ring A that the needles should be kept in place by the grooves *o o'* and holes *p' p'*, or slots *l l* for the needles may be properly retained in place by other known means; but we prefer to employ the grooved and drilled or slotted needle-blocks.

We are aware that in some rotary knitting-machines heretofore made a part of a stationary cam-ring which holds and slides the needles of a radial series in a revolving needle-block is made adjustable, so that while any

needle of the series is removed the rest will be held in place, and we know that in other knitting-machines a part of a stationary cam-ring which is employed to slide and keep in place the needles of a revolving annular series is also made movable for a like purpose; but our mode of holding the needles of an annular series in place so that any one needle can be removed without in any manner disturbing any other needles of the series, is distinct from such devices. It is essential to our mode that the ring A shall revolve with the set of needles if the set revolves in knitting or remain stationary with the series of needles if applied to a non-revolving set, and hence the ring A cannot form a part of or be fixed to any cam-ring which may be employed to slide the needles; and it will be observed that by our mode we not only avoid the great friction which must exist between a revolving annular series of needles and a stationary holding-ring, but that on breaking or bending a needle in knitting, no matter in what position the machine is stopped, the ring A, as arranged by us, can at once be slid around so that the movable part *a* shall be over the needle which must be removed without, in thus turning the ring on the needles, moving any of them in any manner whatever, whereas when a stationary ring encircles and holds a revolving series of needles in place, if the machine is stopped, as usual, only that one needle which happens to be opposite to the movable part of the holding-ring can be removed, and as the needle which must be removed will not generally be opposite to this movable part, the whole series of needles must be again turned until the defective needle is brought under this adjustable portion, and this additional movement of the needles may be inconvenient and often increase the damage occasioned by the defective needle. Even if the holding cam-ring hitherto employed could be unfixed and slid around on the needles, yet this turning of the cam-ring would slide the needles endwise in places where they should not be slid, and would perhaps do as much damage as would be occasioned by turning the whole set of needles.

In forming the annular sets of needles it is not essential that the needles of either set should be arranged exactly parallel with their

axes, for the hooked ends of the needles of either of the sets or of both sets may generally either converge toward or diverge from the lines of the axes of the series a few degrees and yet operate as herein described.

Instead of revolving the two annular sets of needles and having all the appliances used therewith stationary, as hereinbefore described, the two sets of needles may be stationary while these appliances, with the bobbin, travel along the needles, the second set being supported on a revolving eccentric shaft when the two sets are not concentric; but we prefer to have the two sets of needles revolve and their appurtenances stationary.

By employing together two annular series of hooked needles smaller-ribbed work-tubes can be knit than when a radial and an annular series of hooked needles are used together.

We claim as our invention, and desire to secure by Letters Patent—

1. Combining together two annular series of hooked needles with a sinker, two pressers, and a web-guide D or its equivalent, substantially as herein set forth, for use in the production of ribbed work, as specified.
2. The manner of arranging the two annular sets of needles in relation to each other—that is, arranging them together so that the hooked ends of the needles of one set are parallel or nearly parallel with, alongside of, and pointed in the opposite direction to those of the other series, as herein set forth.
3. The improvement of arranging the sinker C, substantially as herein described, to increase the distance between the yarn and the old loops of the second set of needles just before the barbs of these needles are pressed.
4. The improvement of arranging the cam B so as to spring out the ends of the second set of needles, substantially as described, for the purpose specified.
5. The improvement of holding the needles of an annular series in place on the grooved needle-block or its equivalent by the ring A, constructed, arranged and operating as set forth.

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EDGAR S. ELLS.

Witnesses:

JOHN MORAN,
A. F. PARK.