

No. 705,505.

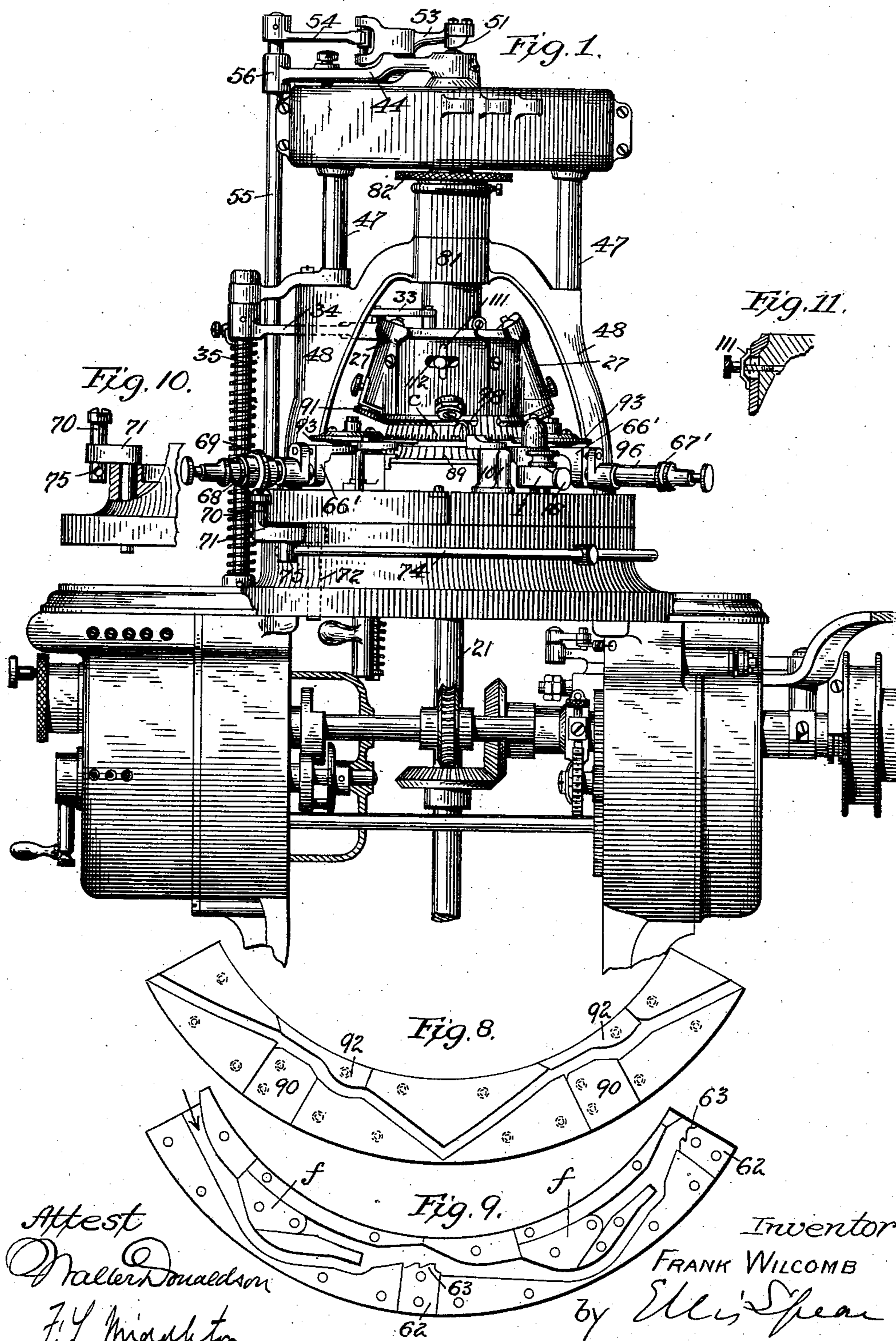
Patented July 22, 1902.

F. WILCOMB.
CIRCULAR SPRING NEEDLE KNITTING MACHINE.

(Application filed Aug. 7, 1900.)

(No Model.)

4 Sheets—Sheet I.



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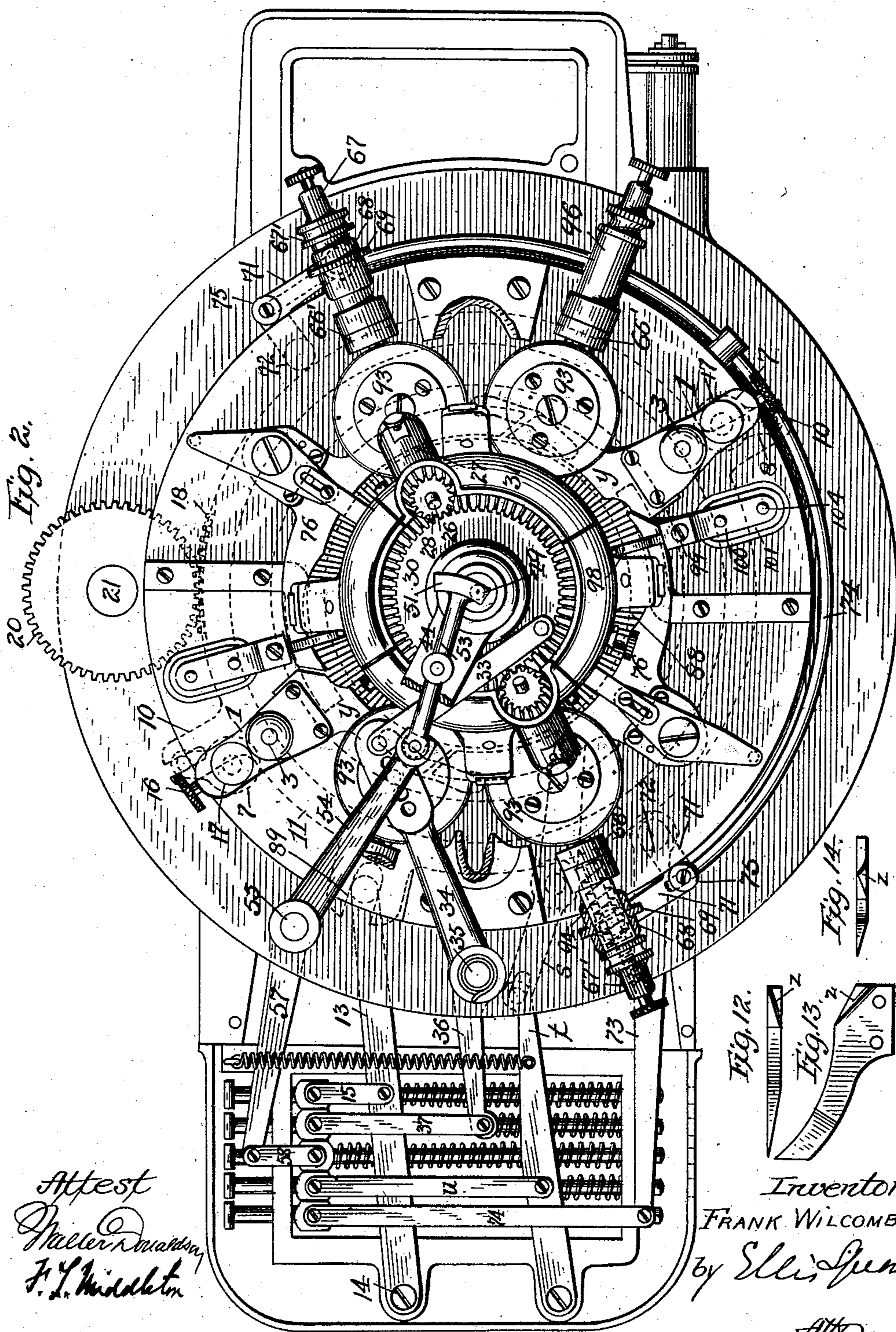
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4 Sheets—Sheet 2.



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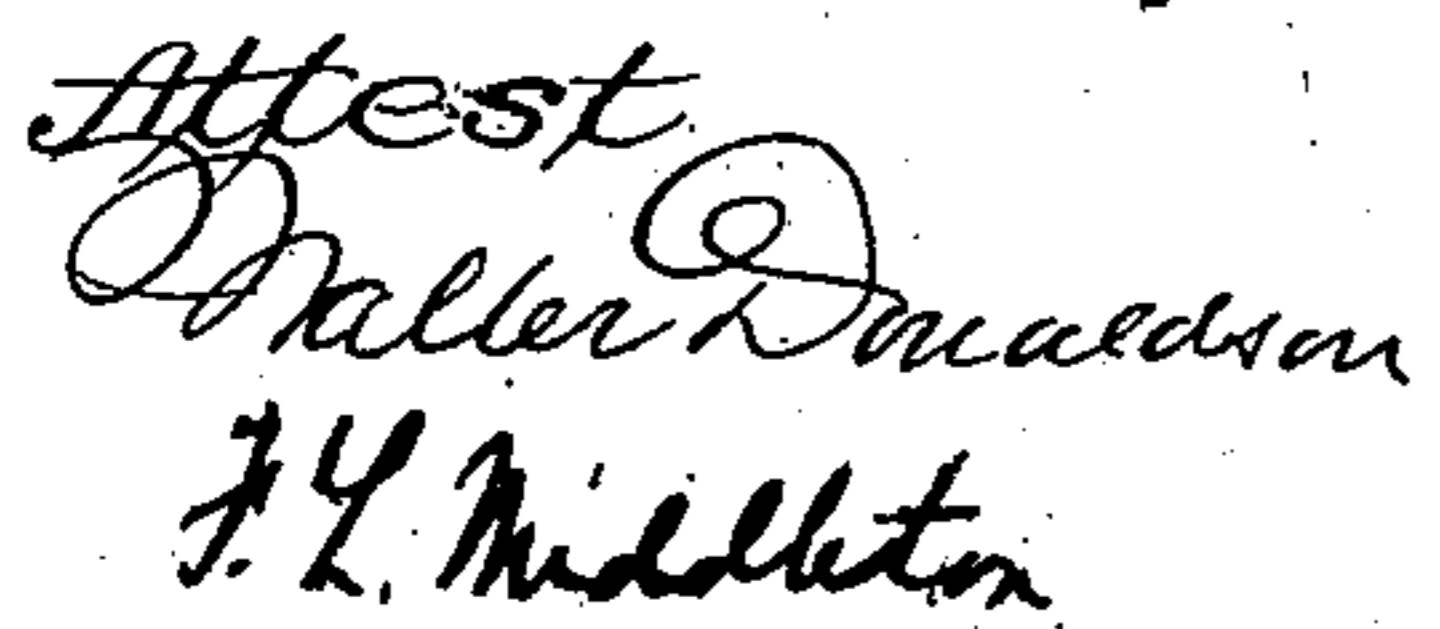
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4 Sheets—Sheet 3.



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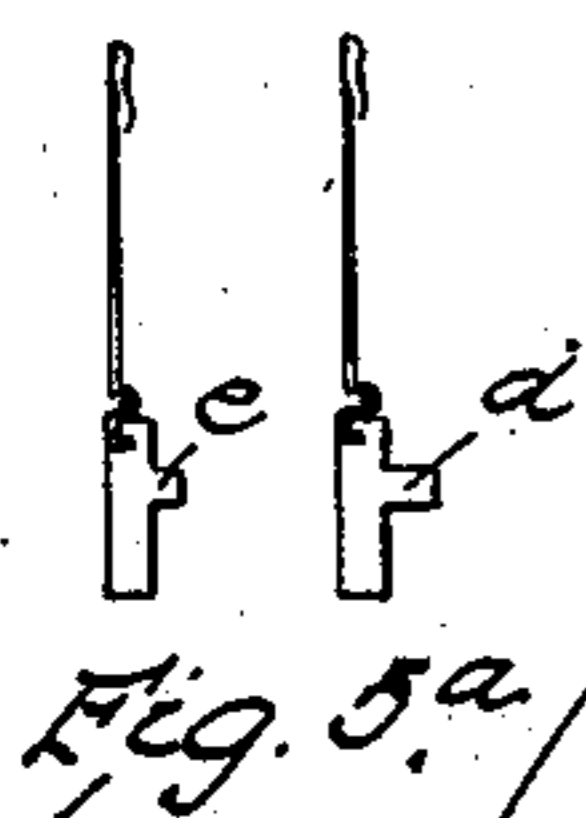
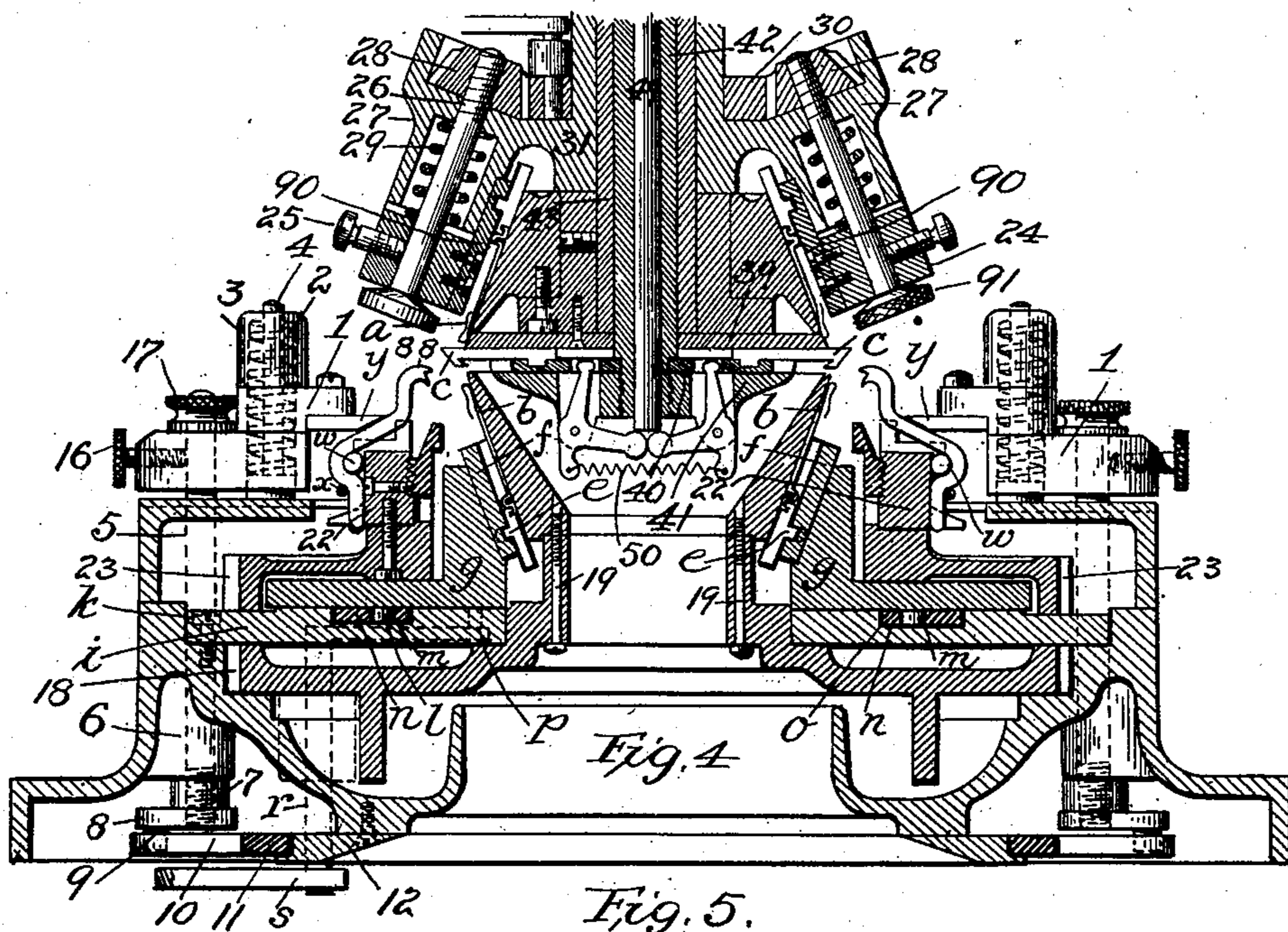
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(Application filed Aug. 7, 1900.)

(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

FRANK WILCOMB, OF NORRISTOWN, PENNSYLVANIA.

CIRCULAR SPRING-NEEDLE KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 705,505, dated July 22, 1902.

Application filed August 7, 1900. Serial No. 26,157. (No model.)

To all whom it may concern:

Be it known that I, FRANK WILCOMB, a citizen of the United States, residing at Norristown, Pennsylvania, have invented certain
5 new and useful Improvements in Circular Spring-Needle Knitting-Machines, of which the following is a specification.

My invention relates to circular spring-needle knitting-machines, and is similar in its
10 general form to that shown in my application for Letters Patent of the United States, renewal No. 58,307, renewed May 1, 1901. (Patent No. 685,075, October 22, 1901.) In my present machine, while I retain some of the general
15 features disclosed in said application, I make provision whereby a welt may be knit onto the ribbed fabric, which welt may be as long as desired and composed of any desired number of courses. This I accomplish by the aid
20 of web-holders which are arranged and operated in a novel manner within the needle circle.

In my present machine I have arranged the needle-beds at the most obtuse angle possible, and by this I am enabled to produce a
25 spring-needle machine of extremely small diameter having two rows of needles of fine gage, as the nearer vertical or parallel the two sets of needles are the finer the gage can
30 be. By this arrangement of the needle-beds, in which the needles of the two sets more nearly coincide in direction, I have found that the stitches on the second set of needles or those to which the thread is fed last may be
35 divided for the pressing action without the use of the holding or supporting devices for the fabric described in my application, as the needle of the first set when it retracts draws up the new loop on the stem of the
40 needle of the second set more nearly in direct opposition to the strain of the fabric and the new and old loops are divided without the fabric support.

I provide means for automatically throwing
45 the cylinder or second set of needles out of operation in forming the welt, and automatic means whereby the cams of the first set of needles are adjusted, and also means whereby the sinker-cams are adjusted to sink less
50 thread when the needles of said second set are inoperative. I also provide web-holders

with means for operating them automatically to hold the fabric when the second set of needles are thrown out of action, all of said parts being restored to their former position after
55 the welt is completed and the ribbed knitting is to be continued.

My present improvements also include a new form of sinker-cam, by which the wear is better distributed and the pressure of the
60 cam against the sinker is not directly transverse in respect thereto, which transverse pressure is liable to press the sinker out of proper relation to the needle. A support for the end of the advanced needles is provided by me,
65 so that the same amount of yarn will be fed to the needles at each depression of the sinker regardless of the shape or condition of the needles, whether they are slightly bent or otherwise out of line.

In my present machine I make use of a system of long and short shanked needles in one set operating in conjunction with an adjustable cam operated automatically, whereby the needles are made inoperative, said arrangement insuring that the throwing out and
75 in action will begin with a needle which is in its retracted position, or, in other words, one that has not been either partially or wholly advanced, and also that this action will begin and end with a single needle instead of
80 a number of needles. With this arrangement of the long and short shanks with the adjustable cam any needle which has begun its advancing movement is allowed to complete the same and retract before being
85 thrown out of operation. Thus such imperfections in the work as half-formed loops are avoided. I provide a stepped drawing-down cam for the needles, by which the proper
90 casting off of the loops is aided. A cam controlling the needles of the first set when the knocking-off of the loops from the needles of the second set is performed also forms a part of my invention, and by this cam the yarn
95 will be relieved of strain during the casting-off action on the second row by reason of the fact that the needles of the first set will advance slightly as those of the second set retract to cast off.

My invention also includes a plurality of
100 presser-wheels, which may be thrown out of

work in succession to produce tucked work, those first thrown out being maintained in-operative when the others are thrown out.

Other features of my invention will be described in detail hereinafter, and particularly pointed out in the claims.

In the drawings, Figure 1 is a front view of the machine. Fig. 2 is a plan view with some of the frame and other parts omitted for convenience of illustration. Fig. 3 is a central vertical section of the machine, some of the parts arranged around the machine being displaced for convenience of illustration. Fig. 4 is a view similar to Fig. 3 through the needle-beds, the knitting devices, and operating means therefor. Fig. 5 is a plan view of the cam-ring for the second or cylinder set of needles with means for operating the advancing cam for said set of needles to make the same operative or inoperative. This view for convenience of illustration is slightly distorted to the extent that the cam-plate is shown as standing upright instead of at an angle, as shown in Fig. 4. Fig. 5^a is a view showing the needles with the long and short shanks. Fig. 6 is a detail view of the knock-off cam for the second set of needles. Fig. 7 is a detail view showing the supports for the advanced needles. Fig. 8 is a view of the cam-plate for the first set of needles in extended form. Fig. 9 is a similar view of the cam-plate for the second set of needles. Figs. 10 and 11 are views of details. Fig. 12 is an edge view of the sinker-cam. Fig. 13 is a bottom plan thereof, and Fig. 14 an end view of said cam. Figs. 15 and 16 are views of the thread-carrier. Fig. 17 is a view of a detail arrangement of parts for adjusting the drawing-down cam.

In the drawings the first set of needles is shown at *a* and the second set at *b*. As in my former application, a series of pivoted independently-operated sinkers cooperate with the independently-operated needles of the first and second series. The yarn is fed to the first set of needles, and the sinkers draw sufficient yarn across the stems of these needles for both sets of needles, the yarn being fed to the second set of needles by the first set in a manner similar to that described in my former application. The needle-beds are rotated in a manner hereinafter described.

By my present machine I render it possible to knit a welt onto the ribbed fabric, said welt being of any desired length or, in other words, composed of any desired number of courses. In order to accomplish this, I throw out of action the needles of the second set and throw into action web-holders *c*, which now cooperate with the needles of the first set to produce a welt or plain portion of fabric of any desired length. It is also necessary in making this change to adjust the sinker-cams so as not to feed so much yarn to the set of needles remaining in action and to adjust also the drawing-in cams of this set

of needles, so that they will not have the same amount of movement as when producing a ribbed fabric, said adjustments and the means for effecting the same being hereinafter described. In forming the welt it is necessary to have means for holding the fabric away from the set of needles which remain operative, as the take-up can have no effect on the plain fabric to draw it away from the needles, owing to the fact that the ribbed fabric is being supported by the loops held by the needles of the second or inoperative series. In order, therefore, to support the plain portion of the fabric forming the welt as it is produced and keep it from puckering up and getting in the path of the needles of the operative set, the improved web-holders are provided. Web-holders as formerly employed have been arranged outside the needle-rows; but the sinking mechanism, pressing-wheels, and other devices of a spring-needle-rib machine prevent the use of such form and arrangement of web-holders. I have therefore provided a new arrangement of web-holder, and the devices for holding and operating them are also new. My web-holder has a hook for engaging the fabric extending inwardly toward the shank. These web-holders are arranged in a circular row inside the circle of the needles and are adapted to be slid forward and backward between the needles of the first set when the needles of the second set are made inoperative, and when the needles of the second set are made operative again to resume the rib-knitting the web-holders are held in a retracted position and cease to be operative. The means for operating and controlling the web-holders will be described hereinafter.

In beginning to knit the welt the first action is to render inoperative the needles of the second set. For this purpose I provide a portion of the needles of the second set with long shanks or nibs *d*, Fig. 5, on their jacks and the remaining portion with short shanks or nibs *e* on their jacks. The advancing cam *f* for this series of needles is adjustable radially of the machine, being carried by a block *g*, arranged to slide in a way *h* of the ring *i*, which carries the cam-plate *j*. This cam-supporting ring is secured to the stationary base-ring of the machine, as at *k*, Fig. 4. The block *g* has a pin *l* depending from its shank into a cam-groove *m*, formed in a ring *n*, which is arranged to be moved circumferentially in a way or groove *o* of the cam-supporting ring, as in Fig. 4. An arm *p*, working in an opening *q* of the cam-supporting ring, Fig. 5, is connected with a rock-shaft *r*, journaled in a bearing formed on the base-ring, and this rock-shaft is operated by an arm *s*, which is connected with a lever *t*, Fig. 2, in turn connected by a link *u*, which connects with suitable means controlled by pattern mechanism, whereby the connections are operated at the proper time. The advancing

cam f is retracted radially or laterally to render the needles of the second set inoperative by two separate actions, said step-by-step movement being effected through the connections controlled by the pattern mechanism. When the cam f is retracted half-way, (a space v , Fig. 5, being provided in the cam-supporting ring to allow this action,) it is out of the path of the short nibs or shanks e of the one portion of the needles, so that as these needles come around in the arrow direction, Fig. 9, they will be rendered inoperative, as they will not be advanced by this cam. The cam remains in this half-way position long enough to give any of the long-shanked needles which have begun to advance their complete upward movement and then when this has been accomplished and the short-shanked needles are passing by the cam, but not engaging it, the cam is moved all the way back, and thus out of the path of the long-shanked needles, which now come around and also remain inoperative. The reverse action takes place when the needles are to be rendered operative—that is, the cam is moved back to operative position step by step, engaging first the long-shanked needles and then the short-shanked ones. By this arrangement the throwing in or out of operation of the needles will begin and end with a single needle and any needle which may be partially advanced will complete its advancing movement. In other words, the action of throwing into operation either the long or the short shank needles will begin with the first needle of the set, the others of the series being thrown in one by one as they come into contact with the cam, and in throwing the needles out of action they are retracted one by one by their cam, and after the last needle of the series has been retracted the cam is withdrawn to cause the needles to remain inoperative. The throwing in or out of the needles does not take place, therefore, in groups. The next action in the adjustment of the knitting devices to form the welt is the raising of the sinker-cams, so as to feed less yarn to the needles of the first set a , which remain operative to form the plain fabric of the welt. The sinkers 88 are pivotally supported at w and are held normally raised by a spring-band x encircling them. The sinkers are depressed to sink the yarn by the cams y , Figs. 2, 4, 12 to 14. These cams are of special construction, designed to reduce wear on the sinkers, to avoid a steep cam-surface, and to prevent excessive pressure transversely of the sinker-stem. The cam-surface z extends at an acute angle in relation to the stem of the sinker, Figs. 12 and 13, so that different portions of the upper edge of the sinker come in contact with the cam, and thus the cam has a draw cut or slanting action against the said upper edge, engaging first a point on the sinker nearer its pivot, and then this point of contact slides longitudinally of the sinker toward its free end. There is thus provided

a long wearing edge on the sinker along which the cam-surface works. This reduces the wear at any one point, and thus prevents irregularities in the feed of the yarn. It also avoids the use of a steep cam and prevents direct side pressure on the sinker. By raising and lowering this cam the sinker is operated to sink a lesser or greater amount of yarn, and when the welt is to be made the sinker-cam is raised automatically to feed less yarn, and also if a loose course were to be made it would be depressed to sink more yarn than in the ordinary rib-knitting. The cam is carried by a stand or block 1, Figs. 2 and 4. This stand is pressed upwardly by a spring 2, arranged in a barrel or socket 3, carried by the stand, and it is guided in its vertical adjustment by a post 4, extending up from the base-ring of the machine. A spindle 5 extends down through the stand and through a bearing 6 on the base-ring. Its lower end is threaded into a nut 7, which has an arm 8, connected by a pin 9 with the slotted or forked arm 10 of a movable ring 11, which is supported on a bearing-ring 12, secured to the base-ring of the machine. The ring 11 is moved by a lever 13, Fig. 2, engaging a forked projection 89 of the ring and pivoted at 14 to the frame. This lever is operated through a link 15 from driving connections controlled by pattern mechanism of any suitable kind, but preferably like that shown in my application of even date herewith, Serial No. 26,159. When the ring 11 is moved circumferentially through these connections, the nut 7 is turned, thus raising or lowering the spindle 5 and the stand, carrying with it the sinker-cam y , the raising being done by turning the nut down on the spindle, thus allowing the spring 2 to raise the stand, and the lowering being done by the nut drawing the spindle down against the pressure of said spring. In order to adjust the sinker-cam by hand, a set-screw 16 is turned to allow the spindle to be turned by the finger-piece 17, and the spindle is thus adjusted by being screwed more or less into the nut.

The needle-bed of the second set of needles is rotated through the gear 18, connected therewith by screws 19, said gear being driven from a pinion, such as indicated at 20, Fig. 2, on an upright shaft 21. The sinker-bed 22 is likewise driven through a gear 23, Fig. 4.

The next adjustment for the formation of the welt is the lowering of the drawing-in or dividing cams for the first set of needles, so that they will not retract so far beyond the edge of their needle-bed as when forming a ribbed fabric. This takes place simultaneously with the adjustment of the sinker-cam. The drawing-in cam 90 for these needles is connected by screws to a block 24, which is fixed by a set-screw 25 to a spindle 26, passing through a barrel 27 and screw-threaded into a nut 28 in the form of a pinion resting

on the top of the barrel. The barrel is carried by or forms a part of the cap or cover 31 for the first set of needles, and a spring 29 in the barrel bearing on the block 24 forces the block and spindle downwardly and keeps the pinion-nut bearing on the barrel. The pinion meshes with a geared ring 30, which rests upon the top of the cap or cover 31 of the first set of needles and surrounds the hollow stem 32 of said cap. The geared ring is moved circumferentially by a link 33, pivoted thereto and to an arm 34, fixed to an upright rock-shaft 35, which extends down through a bearing in the base-ring, and is connected with an arm 36, which is connected by the link 37 with connections controlled by the pattern mechanism. When the geared ring 30 is turned, the pinion-nut 28 will raise or lower the drawing-in cam of the first row of needles. This action takes place at the same time the sinker-cam is adjusted. The spindle may be adjusted by hand for setting the drawing-in cam by turning the finger-piece 91, attached to the spindle.

The next adjustment for forming the welt is that of throwing into action the web-holders *c*. These web-holders, it will be noticed, are arranged to work inside of the circle of the needles, and they work radially in and out between the needles. They have their hooks pointing inwardly toward their shanks. They are carried by a bed 39, screwed to the needle-bed of the first set of needles, and they are reciprocated by cams 40, carried by a depending cam-ring or head 41, fixed to a stationary sleeve 42, which is arranged within the hollow rotary shaft 43 of the needle-bed of the first set of needles. This fixed sleeve is supported at its upper end by a bracket 44, a set-screw 45 securing the sleeve to the bracket adjustably. The bracket is supported by the upper gear-case 46, which in turn is supported by the posts 47 from the standards 48. A rod 49 extends through the fixed sleeve, and at its lower end it bears upon bell-crank levers 50, connected to the web-holder cams 40 and pivoted to the fixed cam-ring or head 41. When ribbed fabric is being knit and the web-holders are to be out of use, the rod 49 is pressed and held down, so as to retract the cams of the web-holders, and for this purpose a cam-lever block 51 is made to bear on the upper end of the rod 49 and press the same downwardly; but when the welt is to be knit the presser-block is removed to allow the rod to rise, and a spring 52, connected with the bell-crank levers, pushes the cams outwardly, and thus the web-holders will be thrown into position to cooperate with the needles of the first row to make the plain fabric for the welt. The cam-lever 53 is pivoted to the bracket 44 and operated by an arm 54, fixed on a rock-shaft 55, which extends through a bearing at 56 and through a bearing in the base-ring of the machine, its lower end being connected by an arm 57, Fig. 2,

and link 58 with the driving means controlled by the pattern mechanism. To return the parts to position for forming a ribbed fabric, it will simply be necessary to reverse the actions above described.

At 59, Figs. 2 and 7, I show a support for the hook end of the needles when advanced to take the thread. This support will prevent the needles from being sprung out of their normal plane when the yarn is fed thereto. This is liable to occur with the finer gages of needles; but by employing the support as devised by me this action will be prevented and the same amount of yarn will be fed to the needles at each action of the sinkers. This will be true also even should the needles be slightly bent or be otherwise out of line, as the support will hold the stem where the feeding takes place in a definite position when the sinkers feed the yarn thereto. As shown in Fig. 7, this support can be applied to either row of needles.

As shown at 62, Figs. 3, 6, and 9, I provide a stepped drawing-down cam for the needles of the second row. This drawing-down cam has the steps 63 for the purpose of insuring proper knocking off of the loops when the needle is retracted. A single knock-over point on the cam is not always effective, owing to some irregularity in the lengths of the loops or small obstructions to the free rendering of the yarn from needle to needle, and thus the needles going to the limit of their downward movement may not always cast off their loops completely, and I have found that a series of steps give an effective knock-off action by causing the thread to render slightly from one needle to the next if necessary and even up any irregularity in the loop lengths causing the fabric to be more uniform in appearance. These steps can be of the same depth or of different depths. This cam 62 is adjusted in a special manner upon the conical surface upon which it is supported. The cam is inclined corresponding to the incline of the needles, and it is provided with a loose connection with a vertically-adjustable part or standard 64, arranged in an opening in the fixed cam-ring. The post is pressed upwardly by a spring 65, and it is adjusted vertically by a screw 66, passing through the base of the post and having its head bearing on the cam-ring. The loose connection between the cam and the vertically-adjustable post consists of the pins 67, projecting from the post into openings in the cam-piece. By this arrangement the cam-piece will move up and down along the inclined surface of the cam-ring, while at the same time the post will be moved vertically.

In order to prevent straining or breaking of the yarn which extends from one row of needles to the other when the needles of the second row retract for knocking off the loops, I make the needles of the first row advance during this knocking-off action. For this

purpose a cam 92, Fig. 8, is provided, which will cause the needles of the first row to advance as those of the second row retract to knock off their loops. This will relieve the strain on the yarn during the knocking-off action and the needles of the second set can retract as low as desired without damage to the yarn. This arrangement can only be effective when the two rows of needles are arranged in relation to each other at a very obtuse angle or more nearly parallel to each other than shown in my application referred to. This is so because the needles of the first row are more nearly parallel with those of the second row which they have to follow, and thus the advance of the needles of the first set will be more nearly in line with the retracting movement of the needles of the second set.

One or more of the presser-wheels may be thrown out of action to make a tucked fabric, and for this purpose the presser-wheels 93 are carried by brackets 66', secured to plungers 67, passing through barrels 96, supported on the base-ring of the machine. These barrels contain springs 94, which force the plungers, with the brackets and presser-wheels, toward the needles. The plungers are threaded, and by turning the nuts 67' the plungers and presser-wheels may be set in proper position. To withdraw the presser-wheels out of action automatically, a sleeve 68 is arranged loosely on the barrel of each presser which is to be withdrawn, and this sleeve connects by a flange 69 with the grooved head of a stud 70, carried by a lever 71, Figs. 1, 2, and 10, on a rock-shaft 72, which bears in the base-ring of the machine and is operated by an arm 73, Fig. 2, through a link 74, which is connected with the driving mechanism controlled by the pattern mechanism before mentioned. When these connections are operated to withdraw the presser-wheels, the levers 71 are operated and the sleeve 68 will be pressed against the nut 67' and the plunger will be withdrawn against the tension of the spring 94. I have shown a two-feed machine, and I connect two of the presser-wheels so that they may be both operated through the same connections, and for this purpose a curved bar 74 extends around the outside of the base of the machine, and this is connected with depending studs 75 on the levers 71, so that the movement will be imparted from one lever 71 to the other. The sleeve on one of the presser-barrels bears directly against the adjusting-nut 67', while on the other barrel, as shown in Fig. 2, the sleeve is normally at a slight distance from the nut, and by this arrangement when one presser is withdrawn the sleeve at the other presser will be brought against the nut, so that when the connections are given a full movement the second presser will be withdrawn, the first being simply drawn farther away from the nee-

dles. By this connection I provide a construction which enables me to make one presser-wheel or more inoperative, as desired. The purpose of this arrangement of presser-wheels may now be referred to. In the case of a two-feed machine, for instance, it might be necessary to make one tucked course preceding the formation of the welt, and as the needles of the second series are made inoperative in one-half revolution of the machine it is necessary to make both presser-wheels inoperative, so that there may be one complete course tucked previous to making the welt, one presser tucking half-way around and the other tucking the other half and in this case the connections leading to the controlling mechanism would operate to throw both presser-wheels out of action approximately at the same time. In case of ordinary tucked work only one presser is made inoperative, in which case the operating connections would be given only part of their full movement to throw one-half the distance above referred to. I show guards 76 arranged over the sinkers to press them down slightly in order to pass below the presser-wheels.

As in my previous application the cover or cap 31 for the first series of needles is supported by its hollow stem passing up through a boss or bearing 81 on the standards 48, a nut 82 engaging a screw-thread on this stem and resting on the bearing. The hollow shaft of the rotary needle-bed passes through this hollow stem and is connected with the upper gear 97, Fig. 3, which is driven in a manner similar to that disclosed in my prior application. A ball-bearing 85 is interposed between the hub of the gear and a wearing-plate 86, resting on the upper nut. The thread-carrier consists of a finger 98, connected adjustably by a set-screw 99, with one arm 100 pivoted to the stand 101 by a pin passing through a barrel 102, formed in the stand and pressed down by a spring 103 in the barrel bearing on the head of the pin. A pin 104, Figs. 2 and 3, projects from the stand into the arm 100 to hold the thread-carrier in proper position for feeding the yarn. In order to thread the carrier or for other purposes, the arm is lifted, the spring yielding for this purpose, and the carrier may then be turned away from the needles.

In Figs. 15 and 16 I show a different form of carrier, in which the feeding-finger 105 is pivoted to the arm 106 to swing in a vertical plane, a handle-piece 107 being provided for this purpose. This finger can be swung up and back for threading, or the whole supporting-arm can be swung aside, as in the form previously described. I show in Fig. 15 two feeding-fingers arranged side by side, so that two threads may be fed to the needles, if desired, and either may be moved to or from the needles, as desired. The fingers may be retained in position by springs, such as 108, engaging notches 109 in the fingers. The

spring-arms 108 are adjustably held by screws 110, and they may be set to hold the thread-guiding fingers in any desired position.

In Figs. 1 and 11 I show a removable section of the cover for the needles of the first set. This is held in place by a spring-pressed clip 111, which when turned into vertical position, as shown in Figs. 1 and 11, will bear against the outer face of the removable section and hold the same in place; but by turning the clip into a horizontal position it will register with the elongated opening 112 in the removable section, which will permit the removable section to be taken off to expose the needles.

I do not claim herein the subject-matter relating to the means for supporting the hook ends of the needles when advanced to take the thread as this feature is the subject of divisional applications filed June 5, 1902, Serial Nos. 110,373 and 110,374.

I claim—

1. In a circular-rib-knitting machine, in combination the two rows of needles, means for making one row inoperative automatically, a series of web-holders and automatic means for making them operative and inoperative, substantially as described.

2. In a circular spring-needle, rib-knitting machine, with the two rows of needles, means for making one row inoperative automatically, web-holders arranged within the needle-row and having hooks pointing toward their stems and automatic means for making the web-holders inoperative.

3. In combination in a circular-knitting machine, a series of needles having sets of long and short shanks, an advancing-cam for operating the needles for the formation of the loops with means for operating the same out of the path of both sets of needles to make the whole series inoperative, said cam having a step-by-step action, first out of line with the short-shanked needle and then out of line with all the needles.

4. In combination, in a circular-knitting machine, the long and short shanked needles, the cam for operating them for the formation of the loops and means for adjusting the cam laterally automatically step by step, substantially as described.

5. In combination in a circular-rib-knitting machine adapted to make a welt and comprising the two rows of needles, one row of needles being arranged in two sets with long and short laterally-projecting shanks, the laterally-movable cam with means for operating the same laterally step by step for throwing the circle of needles into and out of operation beginning and leaving off with one needle, the entire circle being out of operation when the throwing-out action is completed, substantially as described.

6. In combination, in a circular-knitting machine, the long and short shanked needles, the cam adjustable laterally in respect to the

set of needles, the block carrying the cam, the cam-ring in which the block is guided, the ring having the stepped cam-slots and the connections for operating the ring.

7. In combination in a circular-rib-knitting machine with the two rows of needles, means for throwing one set of needles out of action automatically, the sinkers for feeding yarn to the operative set of needles, means for automatically adjusting the sinker-cam when one set of needles is thrown out of action to form the welt and means for adjusting the drawing-in cam of the operative needles, substantially as described.

8. In combination in a circular-rib-knitting machine, with the two rows of needles, sinkers or thread-measurers with operating means therefor for sinking the yarn across the stems of the needles, means for throwing one set of needles out of operation automatically and means for adjusting automatically the cam of the operative needles to take up the slack thread measured off by the sinkers or thread-measurers; substantially as described.

9. In combination, in a circular-knitting machine with the pivoted sinkers, the cam having its face extending at an acute angle to the stem of the sinker to have a contact movable longitudinally of the sinker.

10. In combination, in a circular-knitting machine, the sinkers with the adjustable cam and means for adjusting the sinker-cam automatically, comprising the screwed spindle, the nut thereon, a ring movable circumferentially for operating the nut and means for operating the ring, substantially as described.

11. In combination, in a circular-knitting machine, the sinkers, the cam therefor, the screwed spindle, the nut engaging the same, means for operating the nut automatically, means for turning the spindle by hand and a support for the sinker-cam carried by the screwed spindle, substantially as described.

12. In combination in a circular-rib-knitting machine, means for throwing out of action one set of needles, and means for adjusting the drawing-in cam of the other set, said means comprising the screwed spindle connected with the cam, the pinion on the screwed spindle, the geared ring meshing with the pinion and means for moving the geared ring circumferentially, substantially as described.

13. In combination, in a circular-rib-knitting machine, two rows of independently-operated needles, a single row of pivoted sinkers cooperating with the two rows of needles, a series of web-holders, the sinker-cam, means for throwing out of operation the second set of needles, means for adjusting in unison the sinker-cam and the drawing-in cam of the operating set of needles and means for automatically throwing the web-holders into operation, substantially as described.

14. In combination, in a circular-knitting machine, a rotary bed for the needles, a cap

or cover for said bed, having a hollow stem through which the shaft of the bed passes, the ring surrounding the stem and supported by the cover, a nut operated by said ring, the drawing-in cam and the spindle connected therewith and with the nut, substantially as described.

15. In combination, with the drawing-in cam, the spindle connected therewith, a nut screwed on the spindle with means for operating the nut automatically and means whereby the spindle may be adjusted by hand, substantially as described.

16. In combination, in a rib-knitting machine, means for throwing one set of needles into and out of operation, web-holders arranged within the circle of the other set of needles, and means for throwing the said web-holders into and out of operation, said means extending down through the needle-bed of the operative set of needles, substantially as described.

17. In combination, the two rows of needles, of a rib-knitting machine, means for throwing one set of needles out of operation, a series of web-holders arranged within the circle of the operative needles, the needle-bed of said needles having a hollow shaft, the fixed sleeve extending down within the hollow shaft, the bed for the web-holders supported on the lower end of said sleeve, the cam for operating the web-holders and the rod extending down through the fixed sleeve and connected with the cam for operating the same, substantially as described.

18. In combination, the two rows of needles, the web-holders arranged within the needle-circle, the fixed bed for the web-holders within the needle-circle, the needle-bed, the hollow shaft, the rod extending down through the same, the cam for the web-holders and the bell-crank levers between the rod and the cam, substantially as described.

19. In combination, the needles, the web-holders arranged within the circle of the needles, the rod extending down through the needle-bed to operate the web-holders and the cam for pressing the rod down with connections for operating the cam, substantially as described.

20. In combination, the inclined adjustable cam, the cam-ring having an inclined surface for guiding the cam in its adjustment, means for adjusting the same and the loose connection between the adjusting means and the cam.

21. In combination, the inclined adjustable cam, the cam-ring having an inclined surface for guiding the cam in its adjustment, the vertically-movable part for adjusting the same and the loose connection between said part and the inclined cam.

22. In combination, the two rows of needles, the knock-off cam for one row of needles and a cam operating upon the needles of the

other row for advancing them during the knock-off movement.

23. In combination, a plurality of presser-wheels adapted to be thrown out of action, and means for automatically moving them in succession out of operation, the one first thrown out being maintained inoperative when the other or others are rendered inoperative.

24. In combination, a plurality of presser-wheels and means for throwing them out of operation, said means being arranged to have either entire or partial or full movement to throw one or more presser-wheels out, substantially as described.

25. In combination, the plurality of presser-wheels, the supports therefor, connections for throwing the presser-wheels out of action, said connections including means for providing lost motion at one or more of the presser-wheels whereby the presser-wheels will be rendered inoperative in succession, substantially as described.

26. In combination, the presser-wheels, the supports therefor, the sleeves on the supports adapted to make contact and move the different presser-wheels at different times and means for operating the sleeves, substantially as described.

27. In combination, the thread-carrier finger pivotally supported to be moved in a vertical plane and an arm pivoted to swing horizontally and carrying the finger.

28. In combination, the two rows of needles, the knock-off cam for one row of needles, and a cam operating upon the needles of the other row for advancing them during the knock-off movement, said rows of needles being at an obtuse angle to each other, substantially as described.

29. In combination, the two rows of needles, the web-holders arranged within the needle-circle, the fixed bed for the web-holders within the needle-circle, the needle-bed, the hollow shaft, the rod extending down through the same, the cam for the web-holders and operating means between the rod and the cam, substantially as described.

30. In combination, the adjustable cam and means for adjusting the same having a loose connection therewith, said cam and means being arranged at different angles and moving in different planes, substantially as described.

31. In combination in a circular-rib-knitting machine, the two rows of needles and means for throwing the entire circle of needles into and out of operation beginning and leaving off with a single needle, the throwing-in of the needles taking place only from the retracted position of the needles and the needles being thrown out of action only after they have been returned to their retracted position, substantially as described.

32. In a circular-rib-knitting machine, in combination the two rows of needles, means

for making one row inoperative automatically, a series of web-holders arranged within the needle-circle and means for making them operative and inoperative, substantially as described.

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33. In a circular-rib-knitting machine, in combination, the two rows of needles, means for making one row inoperative, a series of web-holders within the needle-circle, means

for making them operative and inoperative and a row of sinkers encircling the needles, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK WILCOMB.

Witnesses:

F. B. WILDMAN,
OLGA M. RAKERD.