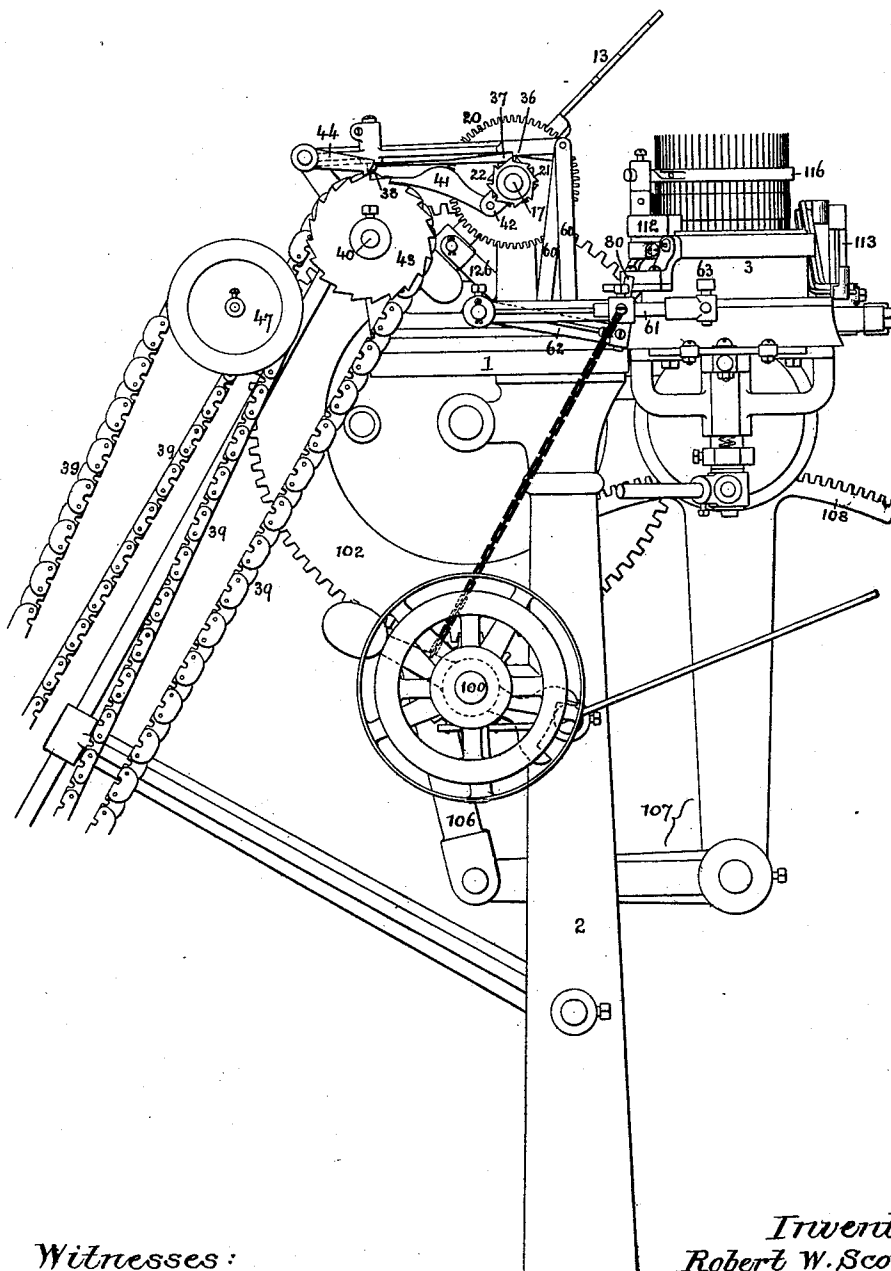


10 Sheets—Sheet 1.

No. 484,610.

Patented Oct. 18, 1892.

FIG. 1.



Witnesses:
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William D. Bonner

Inventors:
Robert W. Scott &
Louis N.D. Williams
by their Attorneys
Hosmer & Hosmer

(No Model.)

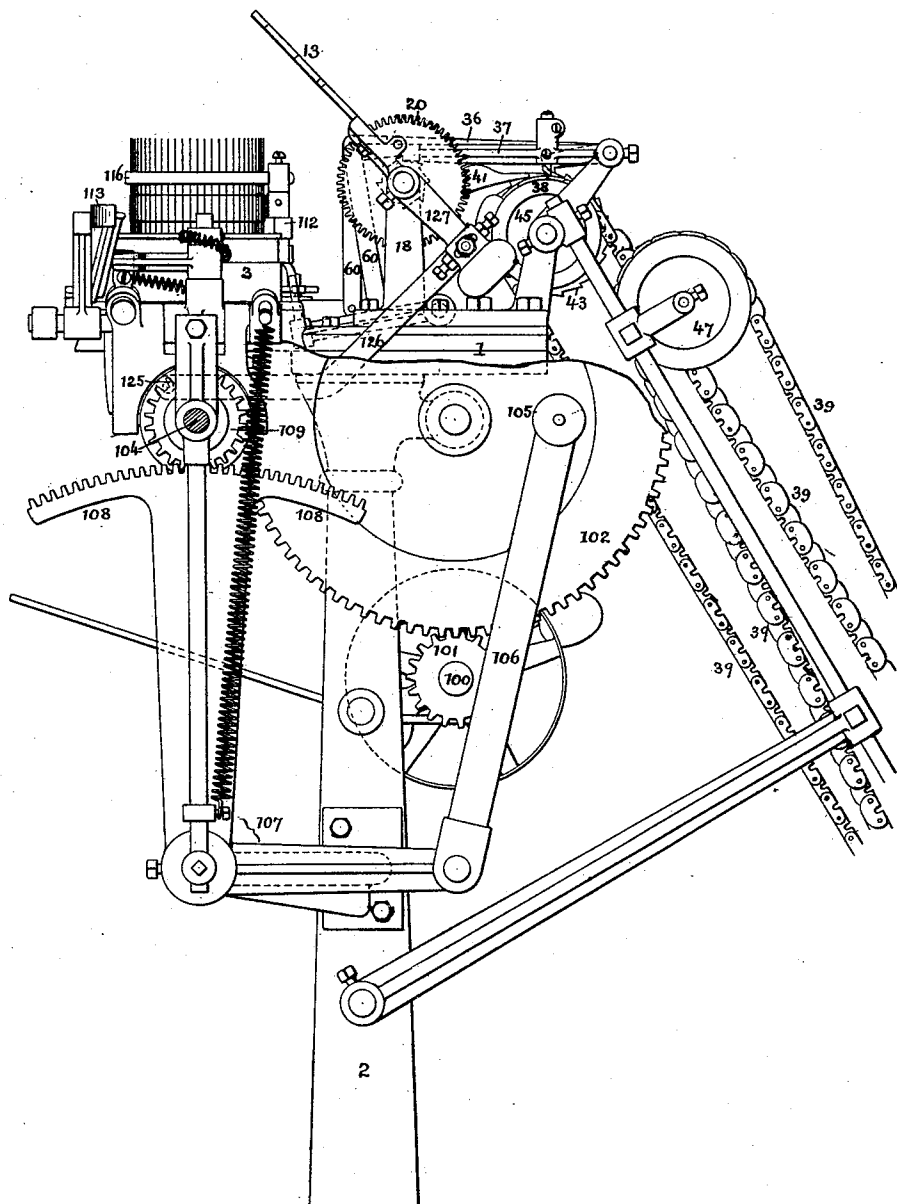
10 Sheets—Sheet 2.

R. W. SCOTT & L. N. D. WILLIAMS.
KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

FIG. 2.



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10 Sheets—Sheet 3.

R. W. SCOTT & L. N. D. WILLIAMS.
KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

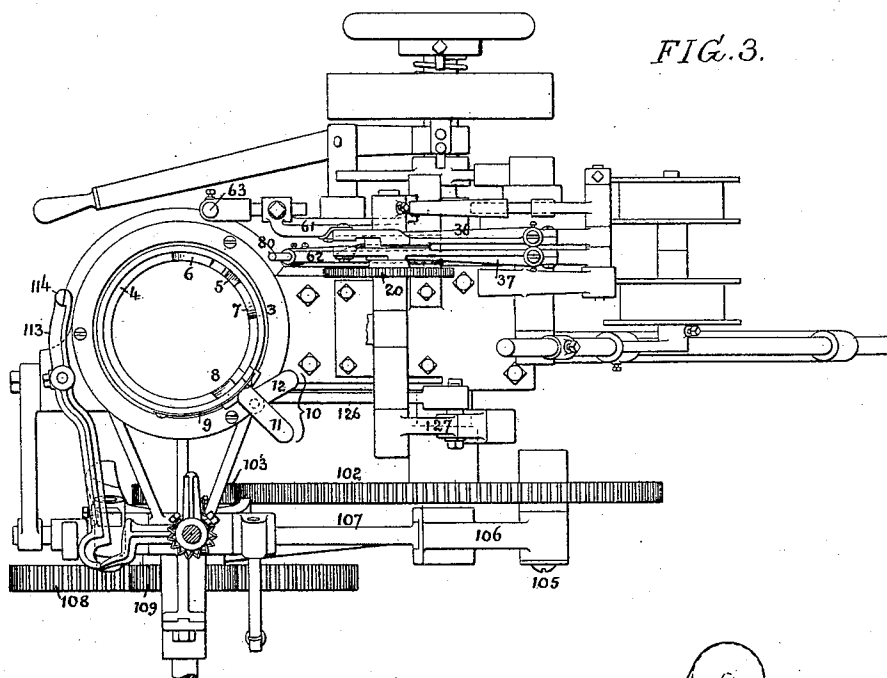


FIG. 3.

FIG. 13.

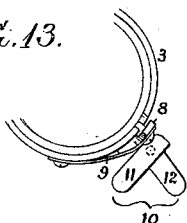


FIG. 17.

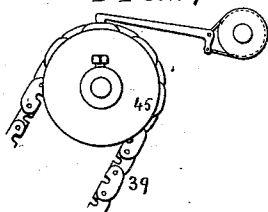


FIG. 14.

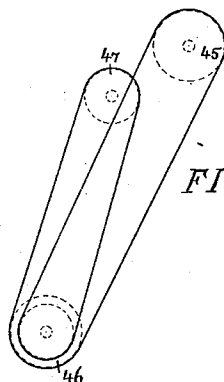


FIG. 18.

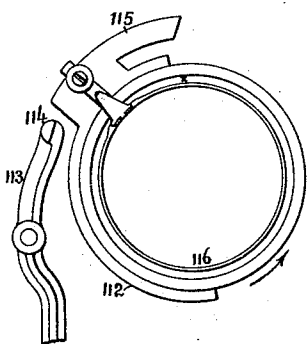


FIG. 19.

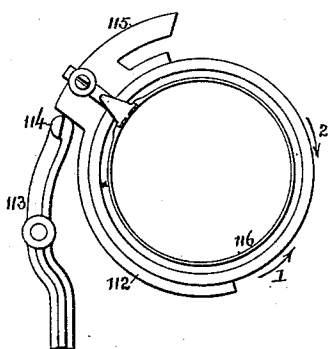
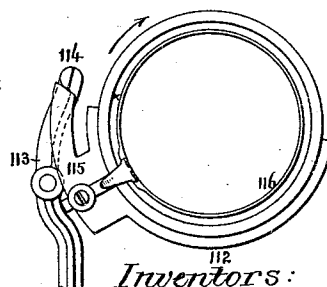


FIG. 20.



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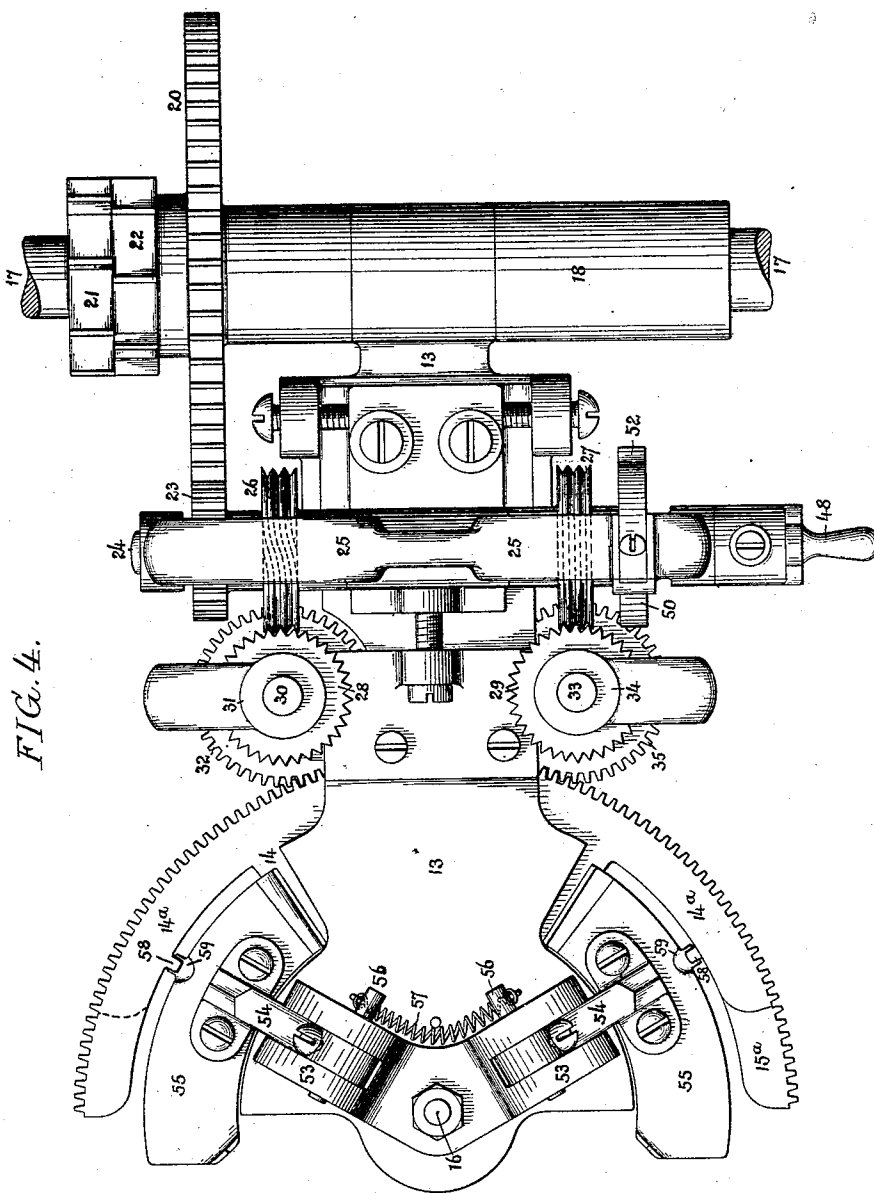
(No Model.)

10 Sheets—Sheet 4.

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10 Sheets—Sheet 5.

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KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

FIG. 5.

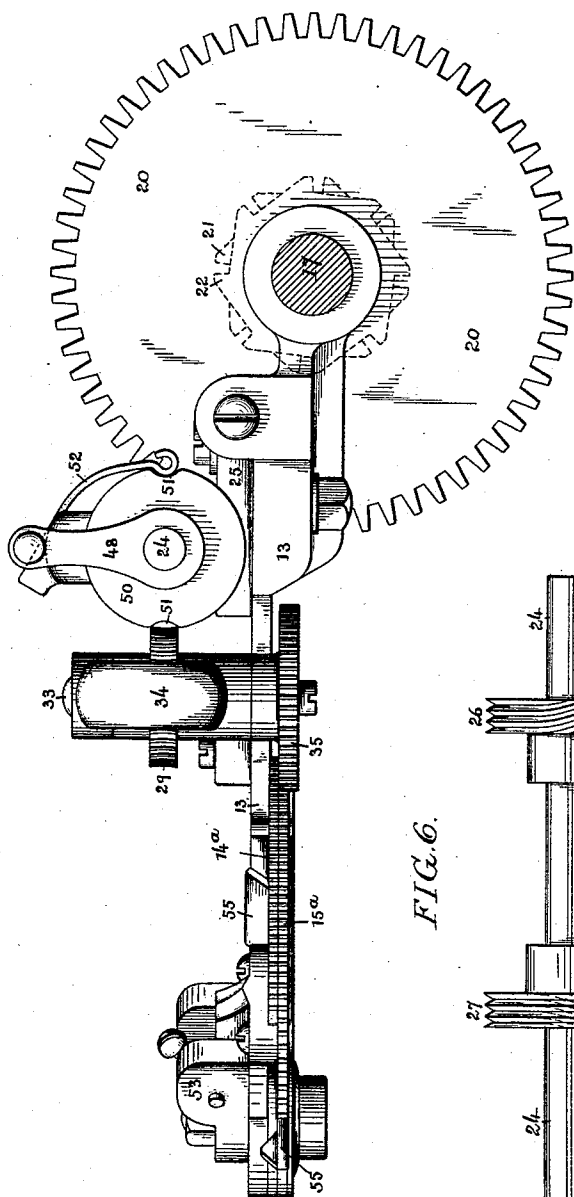
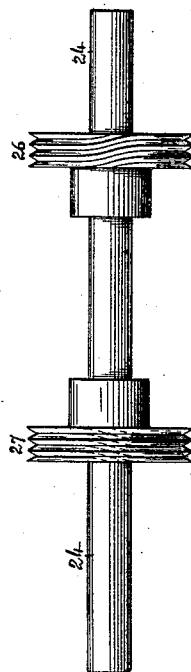


FIG. 6.



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10 Sheets—Sheet 6.

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KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

FIG. 7.

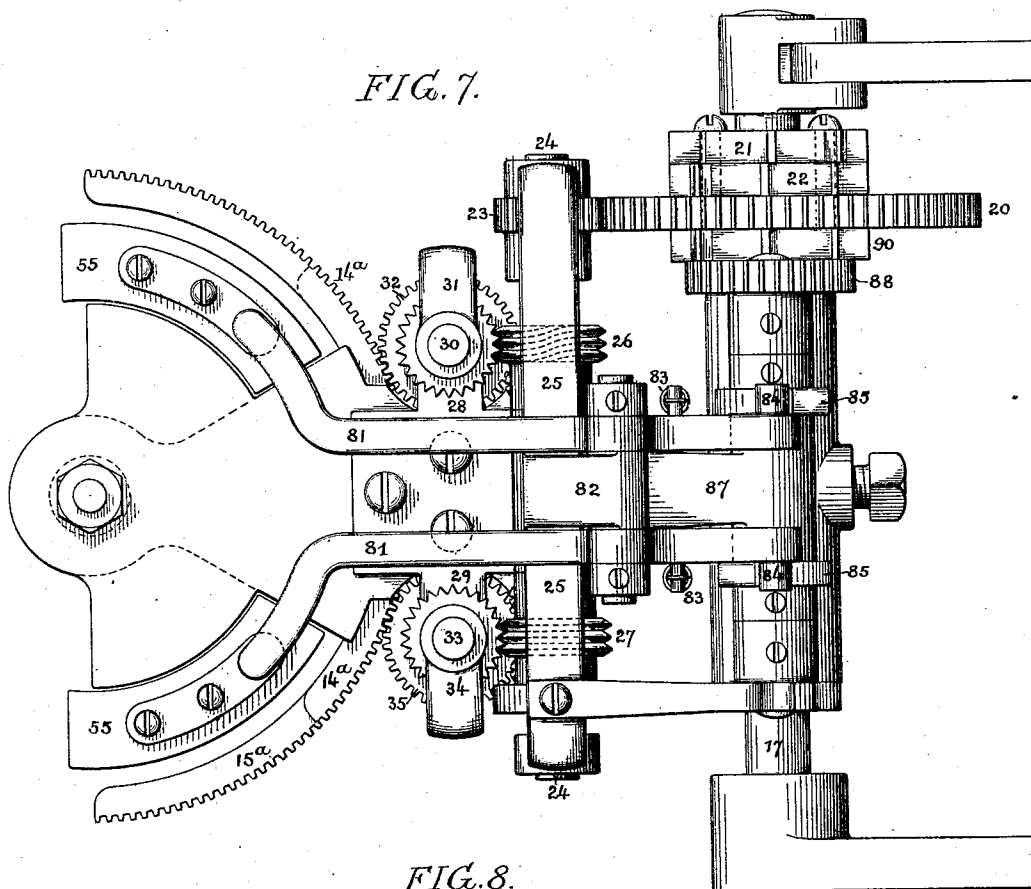
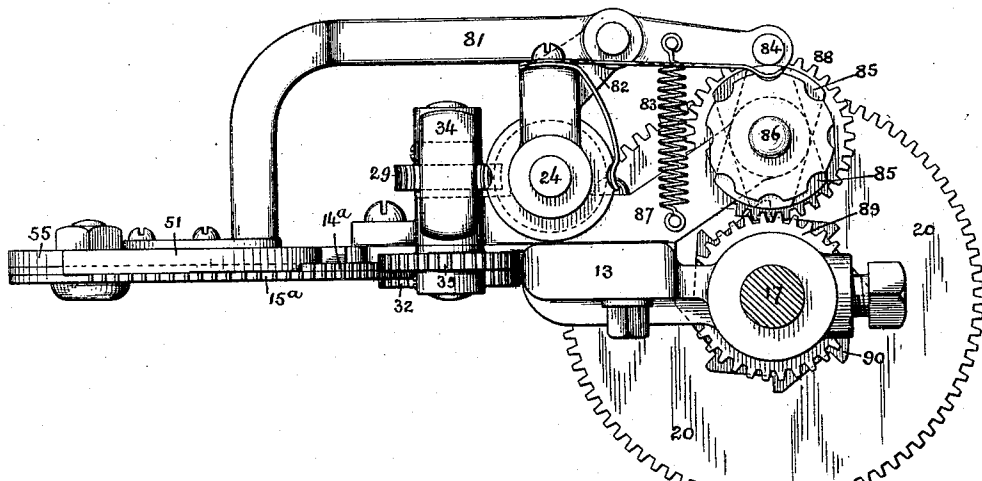


FIG. 8.



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(No Model.)

10 Sheets—Sheet 7.

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KNITTING MACHINE.

No. 484,610.

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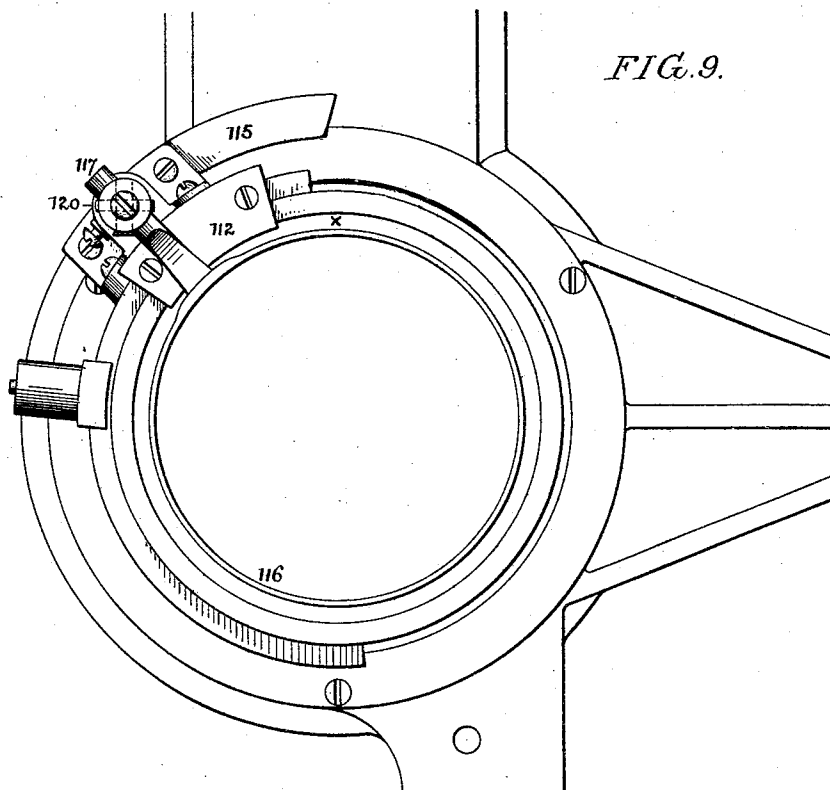


FIG. 9.

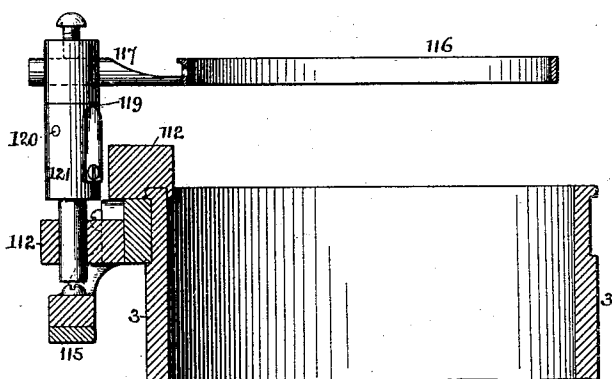


FIG. 10.

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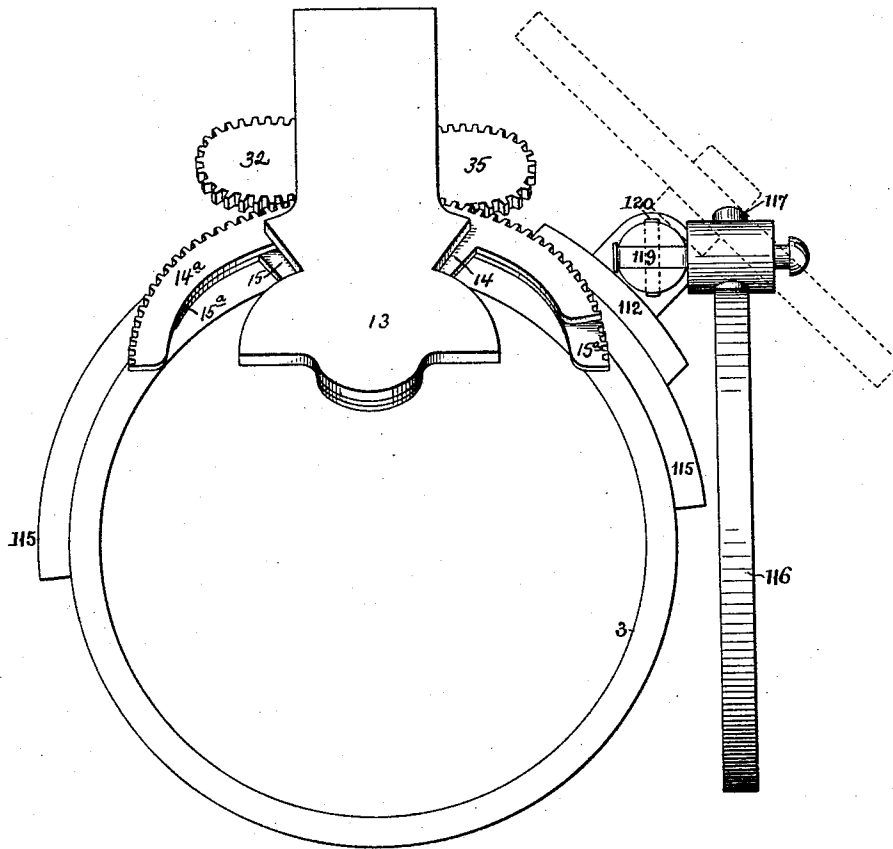
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KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

FIG. 11.



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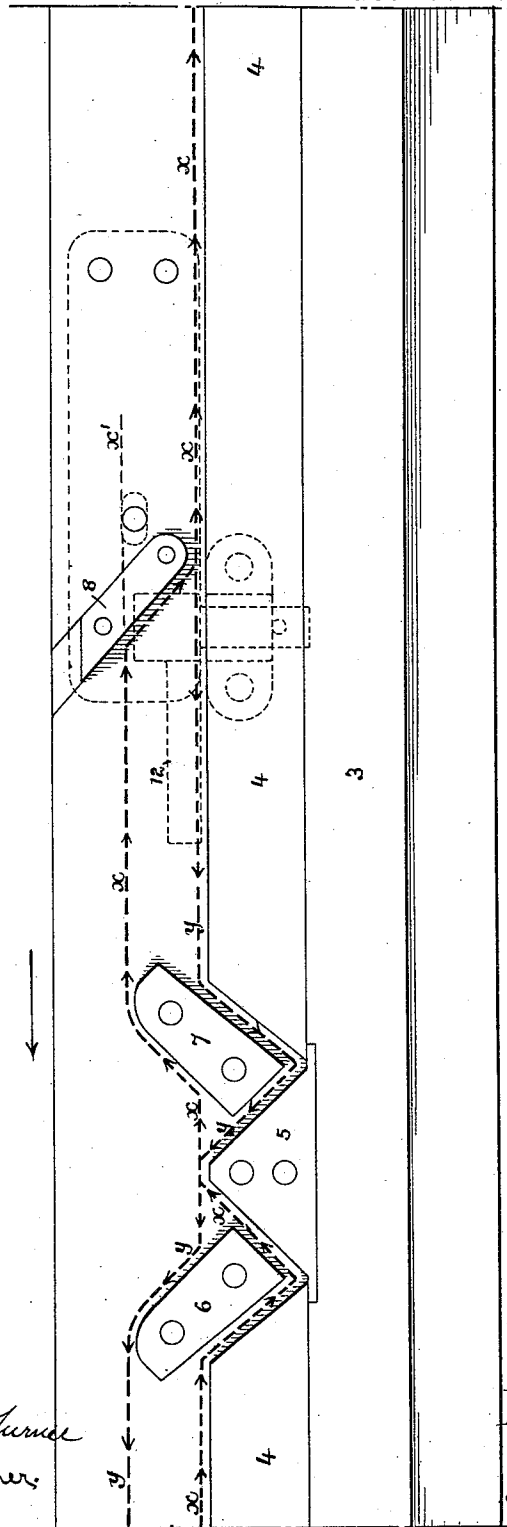
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KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

FIG. 12.



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(No Model.)

10 Sheets—Sheet 10.

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KNITTING MACHINE.

No. 484,610.

Patented Oct. 18, 1892.

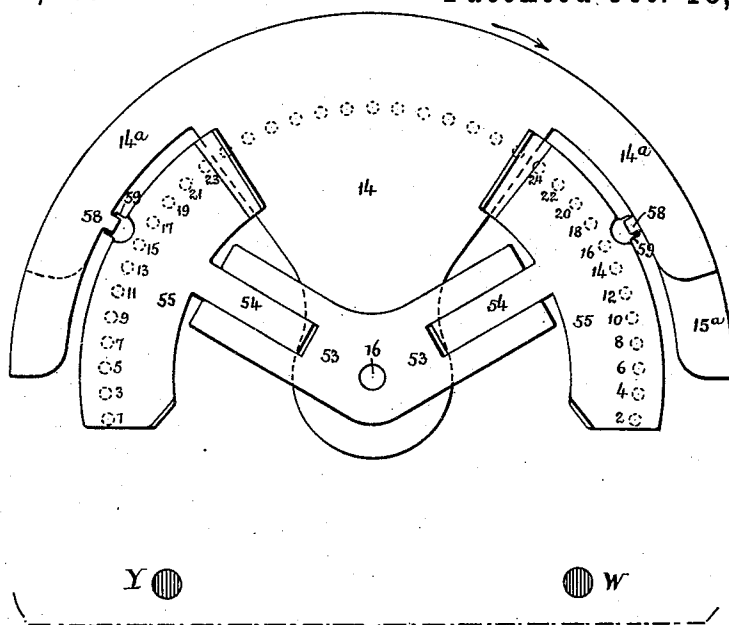
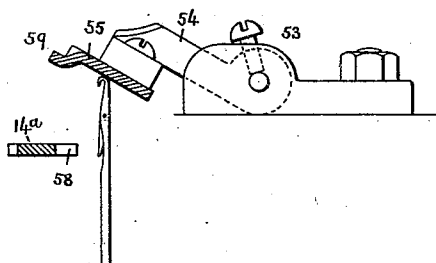


FIG. 16.

FIG. 15



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UNITED STATES PATENT OFFICE.

ROBERT W. SCOTT AND LOUIS N. D. WILLIAMS, OF PHILADELPHIA,
PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 484,610, dated October 18, 1892.

Application filed March 14, 1892. Serial No. 424,872. (No model.)

To all whom it may concern:

Be it known that we, ROBERT W. SCOTT and LOUIS N. D. WILLIAMS, both citizens of the United States, and residents of Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

Our present invention consists of certain improvements in the knitting-machine for which we obtained Letters Patent No. 419,565, dated January 14, 1890, said improvements comprising certain additions to or modifications of parts of the patented machine, with the view of either simplifying the construction of said parts or rendering the machine more efficient in its operation. These improvements and the purposes or objects of the same are set forth at length hereinafter, and the various features forming the subject of our present invention are specifically claimed. In general, however, we may say that the improvements comprise a certain construction and arrangement of the cams in the cam-box, means for moving in and out of operative position the special depressing-cam forming one of the set of cams in said box, means for operating the segmental plates whereby the needles of the fashioning set are moved into operative position during to-and-fro knitting, certain supplementary presser-plates, and the special mounting of a thread-guide and latch-guard ring, so as to provide for the proper lead of the guide in to-and-fro knitting and for getting the guard-ring out of the way when it is desired to detach the needle-cylinder from the machine.

In the accompanying drawings, Figure 1 is a side view of sufficient of the machine to illustrate our present invention. Fig. 2 is a view looking from the opposite side and showing one of the spur-gears of the machine broken away in order to expose the parts behind it. Fig. 3 is a plan view with the needle-cylinder and some of the other parts of the machine removed. Fig. 4 is a plan view, on an enlarged scale, of the needle-presser and the mechanism for operating the same, the supplementary pressers being also shown. Fig. 5 is a side view of the needle-presser and its operating mechanism. Fig. 6 is a detached

view of a shaft and a pair of worm-wheels forming part of said operating mechanism. Figs. 7 and 8 are respectively a plan view and a side view illustrating certain modifications in the supplementary pressers and their operating mechanism. Fig. 9 is a plan view illustrating the manner of mounting upon the cam-cylinder a thread-guide and latch-guard ring used in connection therewith. Fig. 10 is a side view, partly in section, of the device shown in Fig. 9. Fig. 11 is a diagram plan view illustrating the purpose of the peculiar manner of mounting the ring. Fig. 12 is an enlarged diagram illustrating the needle-actuating cams contained within the cam-box of the machine; and Figs. 13 to 20 are views illustrative of the construction or operation of various parts of the machine, with the view of rendering properly explicit the portions of the specification relating thereto.

So far as regards its general construction and operation the machine may be said to be similar to that forming the subject of our Letters Patent hereinbefore referred to—that is to say, the needles after completing the movements necessary to receive the thread and form the stitch are successively elevated to an inoperative position and are then depressed into operative position again. When the machine is producing tubular work by a rotating movement, this depression of the needles is effected by a special cam; but when the machine is producing a bag or pocket by reciprocating or to-and-fro knitting a certain portion of the needles, which may be termed the “fashioning set,” is pressed into action by a vibrating presser, the latter being composed of plates or sections movable in respect to each other, so that the presser may be expanded or contracted to vary the number of needles constituting the fashioning set, and thus provide for the narrowing and widening of the web in a manner which will be readily understood on reference to the former patent and by those skilled in this particular branch of the knitting art.

The fixed frame or head of the machine is mounted upon a stand or column 2, and in said fixed frame or head is seated so as to be free to turn or move back and forth therein

the cam-box 3 of the machine, the needle-cylinder being rigidly supported within this cam-box—that is to say, so supported that it is immovably held when the machine is in operation, but can be detached and removed or applied and secured, as desired.

The cam-box 3 is either rotated or reciprocated, as desired, by driving mechanism, which is as follows: On the driving-shaft 100 is a pinion 101, which meshes with a spur-wheel 102, the latter meshing with a pinion 103 on a short transverse shaft 104, which is geared by the usual bevel-gears to the cam-box. A crank-pin 105 on the wheel 102 is connected by a link 106 to one arm of a bell-crank lever 107, the other arm of which has a segmental rack 108, meshing with a pinion 109 on the shaft 104. A rotating movement is therefore imparted to the pinion 103 and to-and-fro movement to the pinion 109. These pinions are loose on the shaft 104 but; either of them can be caused to drive the shaft through the medium of a clutch located between the pinions. Hence by a proper movement of this clutch the cam-box may be either rotated or reciprocated.

The driving mechanism and the means for automatically operating the reversing-clutch being applicable to knitting-machines generally have been made the subject of a separate application, and hence need not be more fully alluded to in this specification.

The cams for actuating the needles are shown in the enlarged diagram, Fig. 12, the cam-box having a supporting ledge or shelf 4, which is cut away at one point for the reception of the lifting-cam 5 and the drawing-down cams 6 and 7, the lifting-cam having oppositely-inclined sides and the drawing-down cams being arranged one on each side of said lifting-cam and being so arranged in respect thereto and to the beveled ends of the recessed portion of the ring or shelf 4 of the cam-box that grooves for the passage of the needle-bits are formed between said drawing-down cams and the said beveled ends of the shelf, and also between the drawing-down cams and the lifting-cam. The back of each drawing-down cam extends down to a point below the top of the lifting-cam, so that the backs of said drawing-down cams act as raising-cams to move the needles out of operative position after they have completed the movements necessary for knitting. For instance, in round-and-round knitting, when the cam-box is traversing in the direction of the arrow, Fig. 12, the bits of the needles take the course indicated by the dotted line x in said figure—that is to say, they first pass down in advance of the drawing-down cam 6, then up along the advancing side of the lifting-cam 5, and thence to the back of the drawing-down cam 7, whereby they are raised to a position above the line of the drawing-down cams, and will therefore remain in inoperative position unless again pressed downward sufficiently to come within the range of the drawing-down

cams. In knitting round-and-round work this pressing down of the bits of the needles is effected by the cam 8, as shown in Fig. 12; but in to-and-fro knitting, when the cam-box moves first in one direction and then in the other, the depressing-cam 8 is withdrawn from action and the needles are moved into operative position by the presser, the bits of the needles when the cam-box is moved in one direction taking the course indicated by the dotted line x' and when said cam-box is moving in the opposite direction taking the course indicated by the dotted line y . By thus making the backs of the drawing-down cams serve as lifting-cams for moving the needles out of operative position an extremely-simple cam formation is provided without movable parts other than the special or supplementary drawing-down cam 8. This cam is free to move radially in a slot in the cam-cylinder 3 and is carried by a spring 9, secured upon the outside of said cam-cylinder and acted upon by a cam-lever 10, hung to a bracket on said cylinder, said cam-lever having two arms 11 and 12 in different vertical planes, in order that it may be operated in a manner hereinafter set forth, the lever when in one position (that represented in Fig. 3) serving to push inward the cam 8 and cause it to act upon the needles and when in the reverse position, Fig. 13, permitting said cam to move outwardly, so that the needles will be free from its action.

The presser for moving the needles of the fashioning set into operative relation to the knitting-cams consists, as in the former machine, of a plate 13, carrying two segmental slides 14 and 15, each provided with a segmental rack 14^a or 15^a, these slides being hung to an axial stud 16 on the plate 13 and being free to swing upon said stud. The plate 13 is hung to a rock-shaft 17, mounted in a suitable bearing 18 on the head of the machine, and vibrated by means hereinafter described, so as to cause the plate 13 and its presser-slides to rise and fall in the manner necessary for the proper performance of their desired function.

Loosely mounted on the rock-shaft 17 is a spur-wheel 20, upon the hub of which is secured a pair of ratchet-wheels 21 and 22, one of these ratchet-wheels having teeth facing in one direction and the other having teeth facing in the opposite direction, the ratchet-wheels being, in other words, respectively right and left handed. The spur-wheel 20 meshes with a pinion 23, which is secured to a shaft 24, carried by a bearing 25, secured to the plate 13, and secured to this shaft is a pair of worms 26 and 27, which are also respectively right and left handed and engage, respectively, with worm-wheels 28 and 29. The worm-wheel 28 is secured to a vertical shaft 30, adapted to turn in a bearing 31 on the plate 13, said shaft also carrying a spur-wheel 32, which meshes with the segmental rack 14^a of the presser-slide 14. In like man-

ner the worm-wheel 29 is carried by a vertical shaft 33, free to turn in a bearing 34 on the plate 13 and provided with a spur-wheel 35, meshing with the segmental rack 15^a of the presser slide 15. (See Fig. 5.)

The threads of the worms 26 and 27 are peculiarly constructed, as shown in Fig. 6—that is to say, each thread is at right angles to the axis of the shaft 24 throughout almost its entire length, the threads being laterally deflected at one point and the point of deflection of the threads on one worm being diametrically opposite the point of deflection of the threads of the other worm, as clearly shown in said Fig. 6, so that as the shaft 24 is rotated the worm-wheels 28 and 29 will be alternately operated one in one direction and the other in the opposite direction, the movement of each wheel being to the extent of one tooth and the wheels being securely locked in position between their movements, owing to the fact that their teeth are always in engagement with the threads of the worms, quick movement of the wheels being also provided for, so that the slides 14 and 15 can be shifted during the limited time available after the presser has been raised above the tops of the needles and before the presser-slides reach the tops of the needles on the downward movement. As the shaft 24 partakes of the swinging or vibrating movement of the plate 13 and as this movement is from an axis concentric with the axis of the spur-wheel 20, it follows that so long as said spur-wheel is loose on the rock-shaft 17 no movement will be imparted thereby to the pinion 23 of the shaft 24; but if said spur-wheel is held against movement with the pinion 23 on the rise of the presser-plate there will necessarily be a certain movement of said pinion 23 and its shaft 24 around their axis in one direction, while if, on the other hand, the spur-wheel 20 is prevented from moving with the vibrating plate on its downward movement there will be a partial turning of the pinion 23 and shaft 24 in the opposite direction. In order, therefore, to provide for locking the spur-wheel 20 against movement in one direction or the other, we provide pawls 36 and 37, adapted to engage, respectively, with the teeth of the ratchet-wheels 21 and 22, each of these pawls carrying a stud 38, bearing upon a pattern-chain 39, (one for each pawl,) which passes round a chain-drum 45 on a shaft 40, mounted in a suitable bearing on the head of the machine and moved intermittently by means of a pawl 41, which is carried by an arm 42 on the rock-shaft 17, as shown in Fig. 1, and engages with the teeth of a ratchet-wheel 43 on said shaft 40, a detent 44 preventing back movement of said ratchet-wheel, as also shown in said Fig. 1.

In order to provide for the use of pattern-chains 39 of the desired length, each of said chains passes from the drum 45 first down to a guide pulley or sheave 46, near the bottom of the machine, (see diagram Fig. 14,) then

up to a sheave 47, close to the drum, then down again to a base-sheave, and then back to the drum.

The two pattern-chains 39 are provided with high and low links, the high links serving to hold the pawls out of engagement with the ratchet-wheels and the low links permitting the pawls to fall into engagement with said wheels. Hence by properly disposing the links upon the two chains either of the ratchet-wheels may be retained or released, as desired.

Each of the intermittent movements of the shaft 24 and its worms is to the extent of half a turn, and near one end of the shaft 24 is a disk 50, with diametrically-opposite notches 51, with which is adapted to engage a spring-retainer 52, mounted upon the bearing for the shaft 24, so that the shaft will be prevented from overrunning after the proper half-turn has been imparted to it and will be held in the position where the worms are neutral or inactive. At one end of the shaft 24, however, is a crank-handle 48, by which said shaft may be turned by hand in one direction or the other to provide for moving the presser-slides in either direction, as may be required.

To bearings 53 on the back of the presser-plate 13 is hung a pair of arms 54, each of which carries at its outer end a segmental plate 55, the pivot-pins 56 of the arms being acted upon by a spring 57, which tends to swing the outer ends of said arms downward, but yet permits them to yield to pressure from below. These segmental plates 55 are sufficient in extent to cover the needles upon which the fashioning is done—that is to say, the needles which are first successively left out of action and then successively brought into action again in order to narrow and widen the web, and when the needles are being thus successively left out of action the plates 55 perform no pressing duty, but yield upwardly when brought into contact with the tops of the needles on the descent of the presser-plate 13. (See Fig. 15.) After the last narrowing course on each side has been formed, however, the next movement of the sliding presser on that side brings a lug 58 on the presser directly above a lug 59 on the supplementary presser-plate 55. Hence on the next downward movement of the presser-plate 13 said plate 55 will be locked by the presser-slide and will cause the depression or throwing into action of the entire set of fashioning needles on that side. For instance, on reference to the diagram Fig. 16 the needles from 1 to 21 on one side have been successively lifted out of action and the needles from 2 to 22 on the other side have likewise been successively rendered inoperative. The next movement of the left-hand presser-slide, which would normally leave the needle 23 out of action, instead carries the lug 58 over the lug 59 of the supplementary presser 55 on that side, and consequently on that downward movement of the presser all of the needles from 1 to 23

are thrown into action and a full course is knitted on these needles. On the next movement the right-hand presser-plate, which would normally have left out of action the needle 24, instead brings into action the right-hand supplementary presser-plate 55, and thus causes the formation of a full course of stitches on all of the needles from 24 to 2. The presser-slides 14 and 15 are now directly one over the other, as shown in the diagram Fig. 16, and the next movement of the slide 14 in the direction of the arrow would release the left-hand supplementary presser 55 and cause the forward or advancing end of the said slide 14 to overlap the needle 24. It is advisable at this time, however, to provide for the vibration of the presser without any expanding movements of the plates, for the reason that the thread-guide is in the position indicated by the letter W in Fig. 16, and it should be permitted to move to the position indicated by the letter Y before commencing to expand the presser-slides, so as to throw the needles successively into action, for these needles should be brought into action at the tail end of the acting set instead of at the front end, in order to provide for the proper lapping of the thread around the needle last brought into action. We therefore so construct the pattern-chain 39 that when the parts have reached the position shown in Fig. 16 a high link of the chain is brought under each of the pawls 36 and 37, so that both pawls are lifted out of engagement with their ratchets 21 and 22 and one vibration of the presser-plate is provided for without any operation of the shaft 24, thus permitting the thread-guide to move round to the position represented at Y, thereby forming a full course on all of the fashioning-needles, as the plates 55 are still in action. The plate 14 is then moved so as to release the left-hand supplementary presser 55 and cover the needle 24, which, together with the other needles from 24 to 2, is on the next movement depressed by the action of the right-hand presser-slide 55, and on the next movement the presser-slide 15 releases the said right-hand supplementary presser 55 and brings into action the needle 23, which, as will be observed, is at the tail end of the acting set, the guide being now in the position W.

By the use of the supplementary presser-plates a number of courses of stitches extending completely around the heel or toe is formed at the line of junction between the narrowed and widened portions constituting the heel or toe, the latter being thereby rendered of a more acceptable character than when the narrowed and widened webs are joined directly or without the interposition of these straight courses. It will be readily understood that any desired number of these straight courses can be produced by holding the pawls 36 and 37 out of action while any desired number of reciprocations of the machine are being made or by increasing the

size of the lugs upon the supplementary presser-plates or upon the segmental rack-arms of the presser-slides. It should be understood that one of the pawls 36 or 37—say, for instance, the pawl 37—is in engagement with its ratchet-wheel during the entire time that the formation of the toe or heel pocket by to-and-fro knitting is being effected, with the exception of the time during which the one course is being formed in order to bring the thread-guide back to its proper position, as before set forth. When the machine is changed from to-and-fro knitting to round-and-round knitting, said pawl 37 is raised out of action, and both pawls are permitted to remain out of action during round-and-round knitting, the other pawl 36 being dropped into action when to-and-fro knitting is again resumed, so as to effect further movement of the presser-slides, the movement this time being the reverse of the former movement, but having precisely the same effect upon the needles. While this method of operating the pawls is not absolutely necessary, it is preferable for the reason that the racking of the slides is then always effected during to-and-fro movement of the machine when the latter is running slowly, thus obviating any tendency to overrun, which might result if the pawls were in rack with the ratchet-wheels when the machine was running at high speed, as during round-and-round knitting.

Each of the pawls 36 and 37 is connected by a link 60 to a lever beneath it, the pawl 36 being connected to a lever 61 and the pawl 37 to a lever 62, as shown in Fig. 1. The lever 61 has at the outer end a stud 63, and when it is desired to change from round-and-round to to-and-fro knitting the pawl 36 is raised, so as to lift the lever and bring this stud into the path of the arm 11 of the lever 10, which controls the position of the drawing-down cam 8 of the knitting-cylinder, the stud striking this arm of the lever and moving the same, so as to permit said cam to be retracted, whereupon the lever 61 drops, so as to carry the stud out of the way, and the pawl 36 drops into engagement with its ratchet-wheel. The cam 8 is brought into action again by contact of the arm 12 of the lever 10 with a stud 80 on the lever 62, which is lifted at the proper time by means of a high link on the chain acting upon the pawl 37.

In Figs. 7 and 8 we have shown a modified plan of operating the supplementary pressers 55. In this case each presser 55 is carried by a lever 81, hung to a bracket 82 on the frame of the machine, each of these levers being acted upon by a spring 83, tending to raise the presser-plate, but the inner arm of each lever also having a roller 84, which is acted upon by a cam 85 on a shaft 86, turning in bearings 87 on the frame. The shaft 86 has a spur-wheel 88, meshing with a wheel 89, which is secured to or forms part of a ratchet-wheel 90 on the pivot-shaft 17 of the vibrating presser. This ratchet-wheel is in-

tended to be under control of a pawl on a lever acted upon by a pattern-chain in the same manner as the levers 36 and 37, so that at appropriate intervals the ratchet-wheel can be
 5 locked and movement imparted to the cams 85 sufficient to cause the depression of the plates 55 and the holding of the same in the depressed position for the proper length of time.

10 It will be manifest that instead of the ratchets 21, 22, and 90 and pawls for engaging and holding the same friction-drums might be employed, these drums having clamping-bands, which could be tightened or
 15 released by the movement of a lever under control of the pattern-chain, as shown, for instance, in Fig. 17, the use of the ratchets and pawls being preferred, however, as the simplest and most positive arrangement.

20 Forming part of the reversing-gear of the machine described in the separate application before alluded to is a lever 113, having a toe 114, and when the machine is knitting round and round the lever is held in such a
 25 position that its toe 114 is out of range of a depending portion 115 of the thread-guide slide 112, Figs. 9 and 10; but when the machine is changed to to-and-fro knitting the lever 113 is moved so as to bring its toe 114
 30 into range with said depending portion of the slide 112. The slide is mounted frictionally upon the cam-box of the machine, so that it can have movement independently of said cam-box, and as the latter reciprocates first
 35 one end and then the opposite end of the depending portion 115 of the thread-guide slide comes into contact with the toe 114 and the position of the slide on the cam-box is changed so as to cause it to assume its proper position
 40 in respect to the needle-actuating cams. For instance, in reciprocating to the right, as in Fig. 18, the thread-guide is in advance of the actuating-cams, the center of said set of cams being in the position indicated by the star in
 45 said figure. After the guide has passed the end of the fashioning set of needles, however, the movement of the slide 112 is arrested by contact of its stop 115 with the toe 114, the movement of the cam-box continuing, how-
 50 ever, in the direction of the arrow 1, so as to carry the cams beyond the thread-guide, as shown by the star in Fig. 19. Hence when the movement of the cam-box is changed to the reverse direction, as indicated by the arrow 2, the thread-guide will act in advance of
 55 the cams in the same manner as before, the same arrest in the movement of the thread-guide slide taking place at the opposite end of the movement, as shown in Fig. 20, so that
 60 the thread-guide always has a proper lead of the cams.

In connection with the thread-guide we employ a latch-guarding ring 116, the stem 117 of which is secured to the head of a shank
 65 119, pivoted by a pin 120 in a stud 121, carried by the friction-slide 112 of the thread-guide. This pivot-pin 120, however, is not

at right angles to the diametral line of the cam-box, but is at an acute angle thereto, the angle in the present instance being one
 70 of about one hundred and forty-five degrees. Hence in swinging the ring 116 upward, so as to carry it out of the way of the needles, said ring occupies a position considerably in the rear of the position which it would oc-
 75 cupy if hung to a pin at right angles to the diametral line of the cam-box, as indicated, respectively, by the full and dotted lines in Fig. 11. The object of this construction is to permit such movement of the cam-box as will
 80 free the cams from engagement with the bits of the needles when it is desired to remove the cylinder from the machine after the knitting of a stocking has been completed, for if the latch-guarding ring when thrown up
 85 occupied the position shown by dotted lines in Fig. 11 the vibrating frame and gearing for operating the pressers would prevent such forward movement of the cam-box as to effect the desired freeing of the bits of the needles
 90 from the influence of the cams. After to-and-fro knitting has been completed the lever 62 is raised, so as to bring its stud into position to engage with the lower arm 12 of the lever
 95 10 just as the cam-box commences its last reciprocation, and the lever 10 is thereby so operated as to throw the cam 8 into operative position.

The vibrating movement of the rock-shaft 17, carrying the presser, is effected by means
 100 of a crank-pin 125 on the rotating pinion 103, said pin acting through the medium of a link 126 upon an arm 127, projecting from the end of said rock-shaft.

Having thus described our invention, we
 105 claim and desire to secure by Letters Patent—

1. The combination of the double-inclined lift-cam with the right and left drawing-down cams so located in respect to said lift-cam that their backs act upon the bits of the
 110 needles as the latter leave the central lift-cam, and thereby further lift said needles, substantially as specified.

2. The combination of the supplementary drawing-down cam mounted so as to move
 115 radially in the cam-box with a lever for actuating said cam, said lever having two arms, stops for engaging said arms in order to move the lever in one direction or the other, and means for alternately operating said stops,
 120 substantially as specified.

3. The combination of the presser-plate and its presser-slides, shafts geared to said slides and carrying worm-wheels, a shaft having
 125 worms for engaging with said worm-wheels, and means for intermittently moving said shaft and for vibrating the presser, substantially as specified.

4. The combination of the presser-plate and its presser-slides, shafts geared to said slides
 130 and carrying worm-wheels, a shaft having worms meshing with said worm-wheels, and means for intermittently moving said shaft and for vibrating the presser, each of the

worm-wheels having threads straight throughout the greater part of their length, but deflected at one point, and the deflection in the threads of one worm being diametrically opposite that of the threads of the other worm, substantially as specified.

5. The combination of the presser-plate and its slides, the shafts geared to said slides and carrying worm-wheels, a shaft having worms engaging with said wheels and carrying a notched disk, a spring-retainer engaging with said notched disk, and means for intermittently moving said worm-shaft and for vibrating the presser, substantially as specified.

6. The combination of the presser-plate and its slides, means for vibrating the said presser-plate, gearing for operating the slides, having as its primary element a spur-wheel mounted concentric with the axis of vibration of the presser-plate, and means for locking said spur-wheel during either the rising or falling movement of the presser-plate, substantially as specified.

7. The combination of the presser-plate and its slides, means for vibrating said presser-plate, gearing for operating the slides, having as its primary element a spur-wheel mounted concentric with the axis of vibration of the presser-plate, right and left ratchet-wheels secured to said spur-wheel, pawls for engaging with said ratchet-wheels, and pattern mechanism for moving said pawls, substantially as specified.

8. The combination of the presser-plate and its slides, means for vibrating said plate, gearing for operating the slides, having as its primary element a spur-wheel mounted concentric with the axis of vibration of the plate, means for locking the said spur-wheel in position during either the upward or downward movement of the vibrating presser-plate, and means for releasing the spur-wheel during both movements, substantially as specified.

9. The combination of the presser-plate and its adjustable slides, means for vibrating said plate, and supplementary plates for bringing all of the fashioning-needles into operation when the narrowing of the web has been completed, substantially as specified.

10. The combination of the presser-plate and its adjustable slides, means for vibrating said plate and moving the slides, and the supplementary presser-plates hung to the vibrating plate and normally free to rise on contact with the needles, said supplementary presser-

plates having portions for engaging with the adjustable presser-slides at certain points in the movements of the latter, whereby the supplementary presser-plates are locked to the slides and caused to act upon the needles, substantially as specified.

11. The combination of the cam-box, reciprocating devices therefor, a supplementary drawing-down cam, the two-armed lever for acting upon said cam, the presser-plate and its vibrating devices, the adjustable presser-slides, gearing for moving the same, levers for controlling the operation of said gearing, pattern mechanism for actuating said levers, and secondary levers connected thereto and adapted to act, respectively, upon the two arms of the lever which controls the drawing-down cam of the cam-box, substantially as specified.

12. The combination of the cam-box of the machine, reciprocating devices therefor, a thread-guide frictionally mounted upon the cam-box, and a lever movable into and out of range of a portion of said thread-guide, whereby when in range it strikes said portion of the thread-guide before each limit of reciprocation of the cam-box is reached, and thereby effects the proper shifting of the guide in respect to the cams, substantially as specified.

13. The combination of the cam-box, rotating and reciprocating devices therefor, the thread-guide frictionally mounted upon the cam-box, a lever having a portion for engaging with the thread-guide, and means for moving said lever so as to cause it to serve as a stop for the movement of the thread-guide during to-and-fro knitting, but free it from engagement with the guide during round-and-round knitting, substantially as specified.

14. The combination of the cam-box of the machine with the latch-guarding ring hung to the cam-box on an axis occupying an acute angle in respect to the diametral line of the box, whereby when thrown upward it is at the same time caused to swing rearward, substantially as specified.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ROBERT W. SCOTT.
LOUIS N. D. WILLIAMS.

Witnesses:

WILLIAM D. CONNER,
HARRY SMITH.