

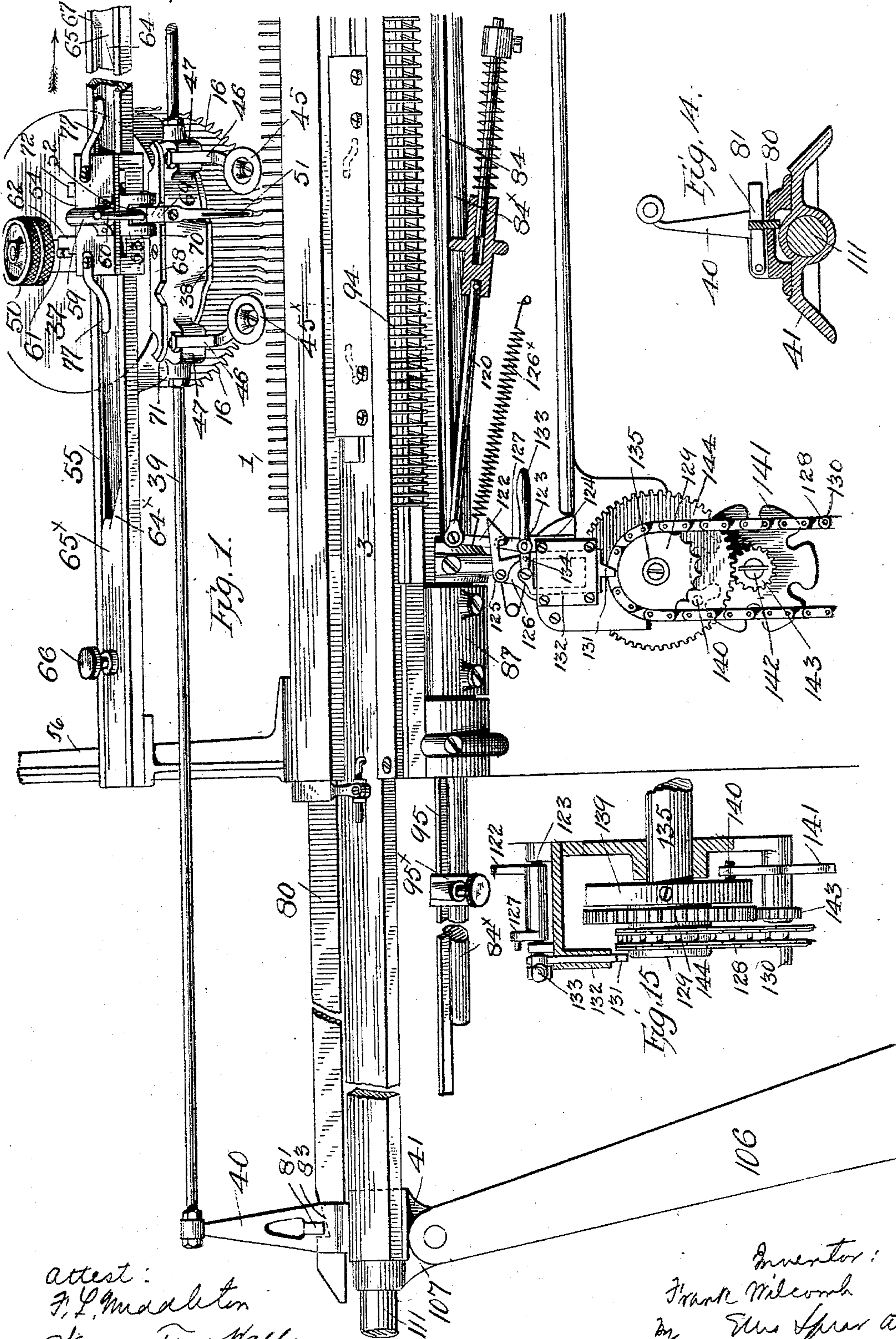
(No Model.)

8 Sheets—Sheet 1.

F. WILCOMB.
KNITTING MACHINE.

No. 559,831.

Patented May 12, 1896.



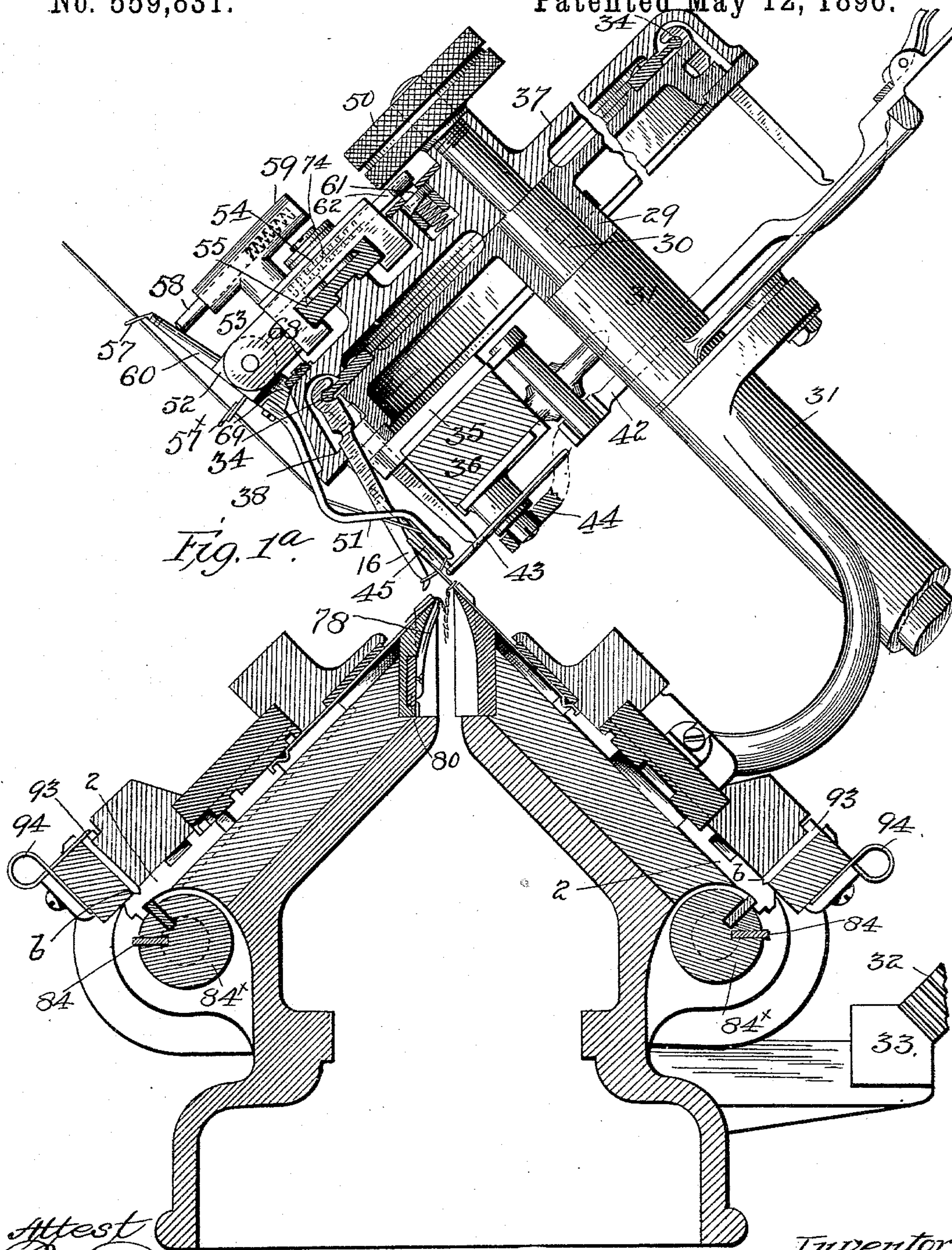
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8 Sheets—Sheet 2.

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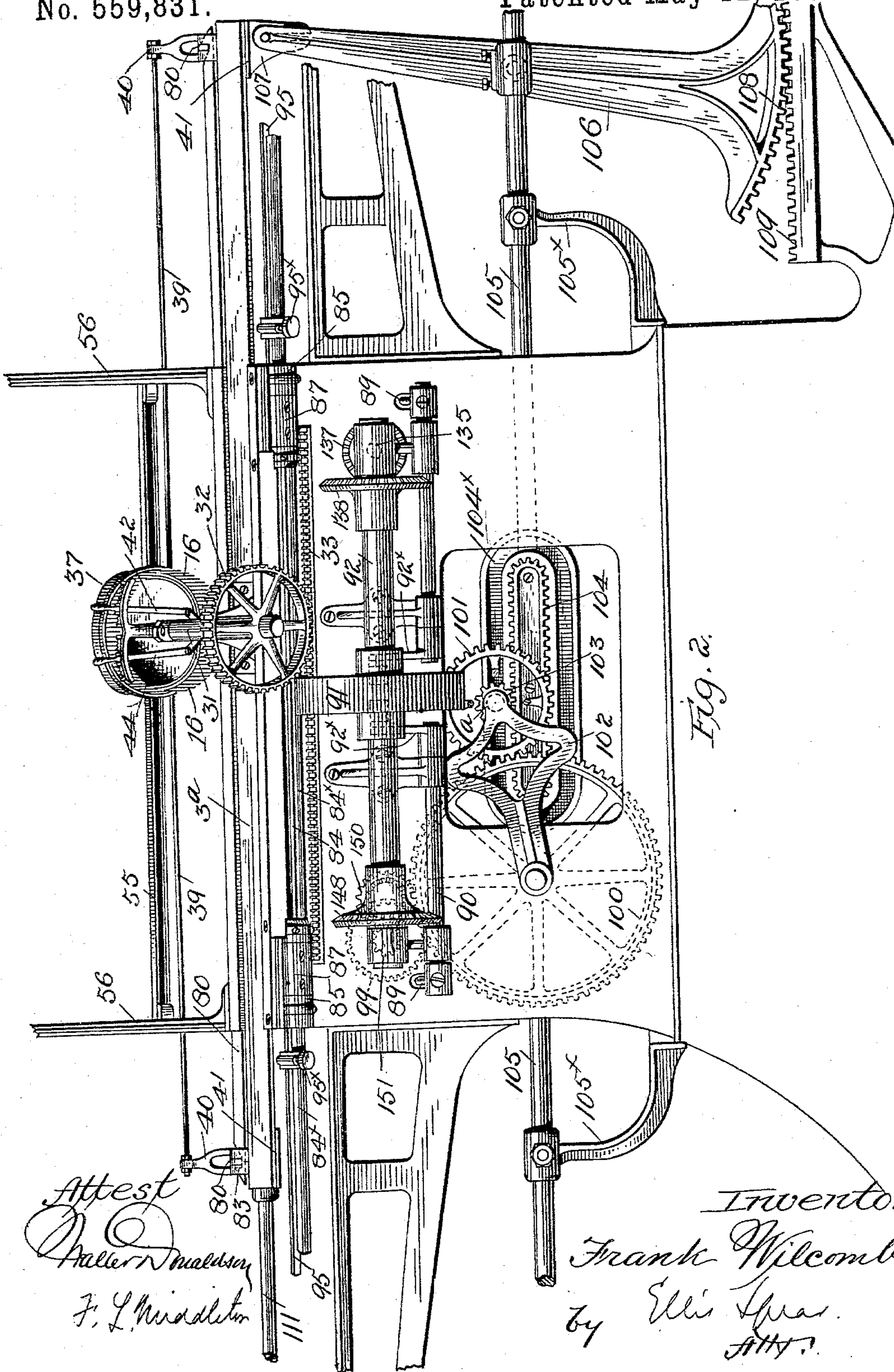


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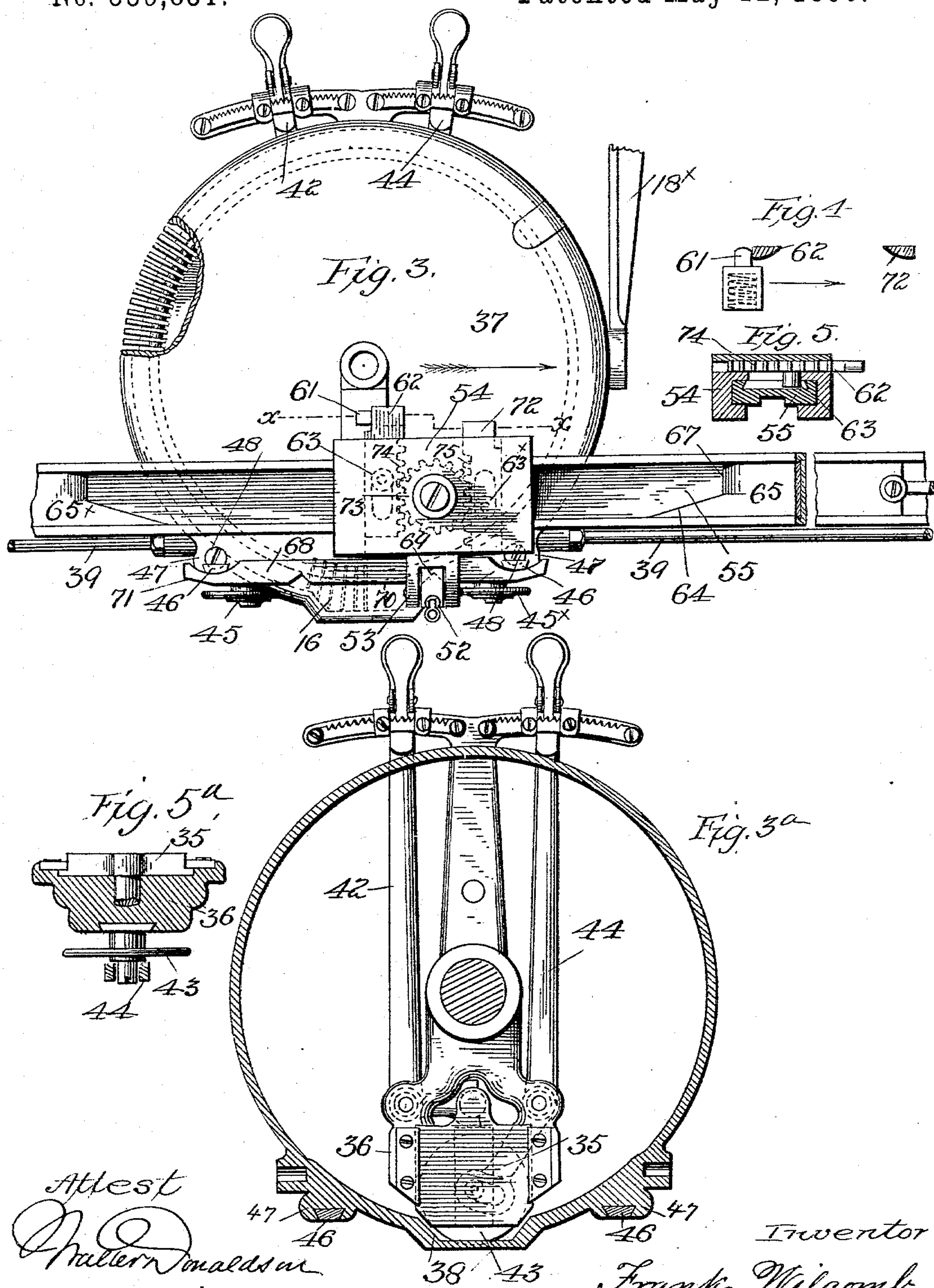
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8 Sheets—Sheet 4.

F. WILCOMB.
KNITTING MACHINE.

No. 559,831.

Patented May 12, 1896.



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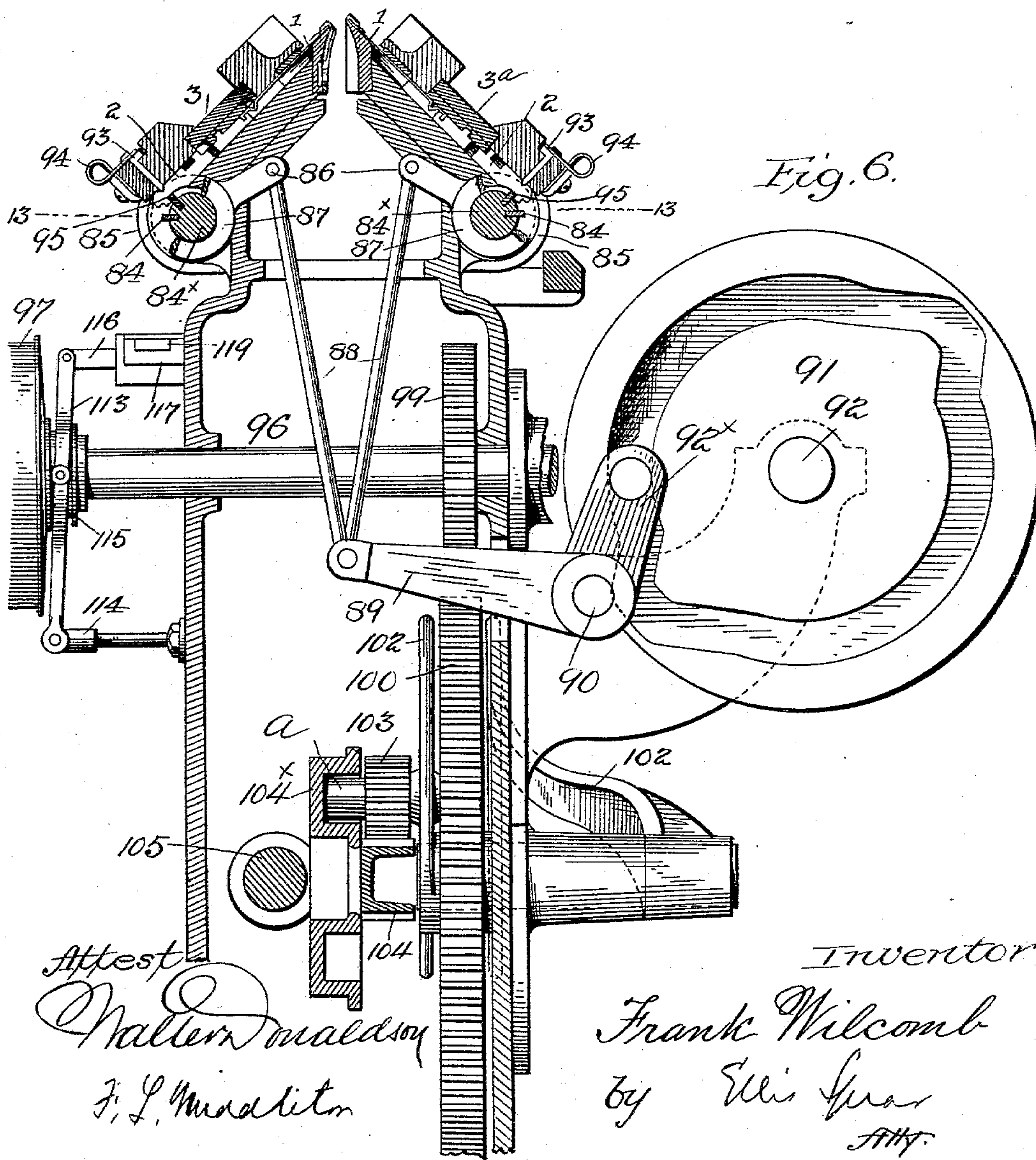
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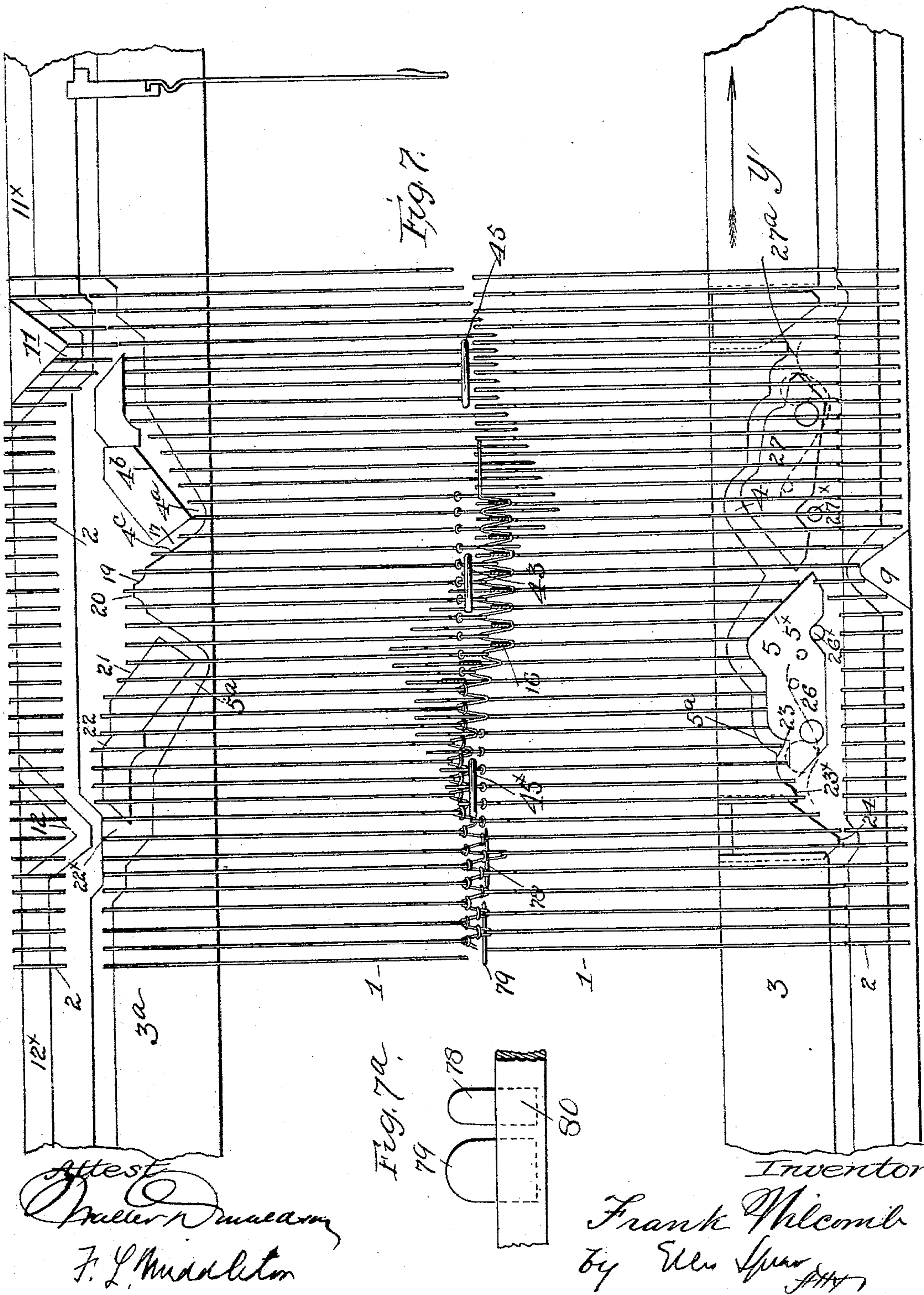
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8 Sheets—Sheet 6.

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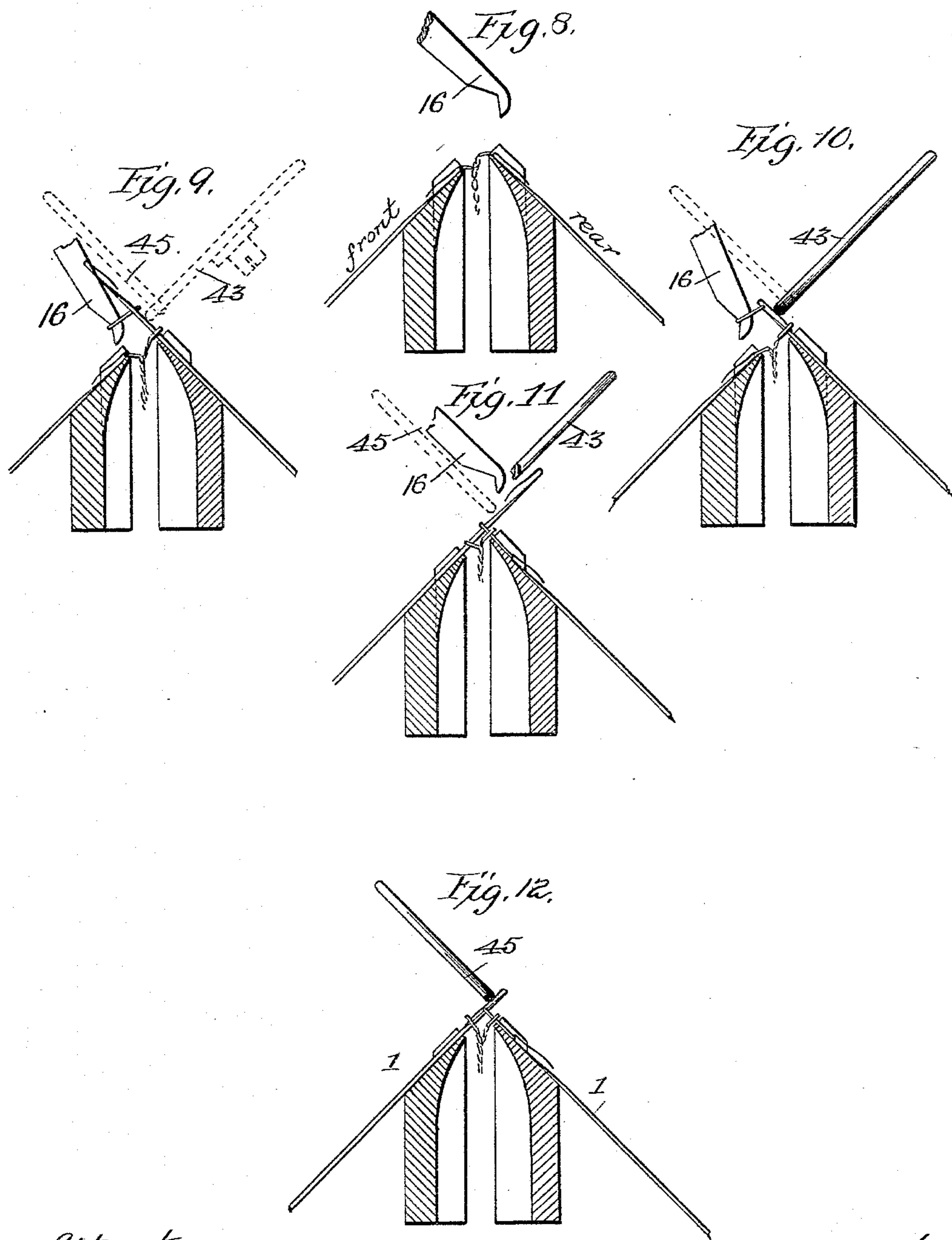
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8 Sheets—Sheet 7.

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No. 559,831.

Patented May 12, 1896.



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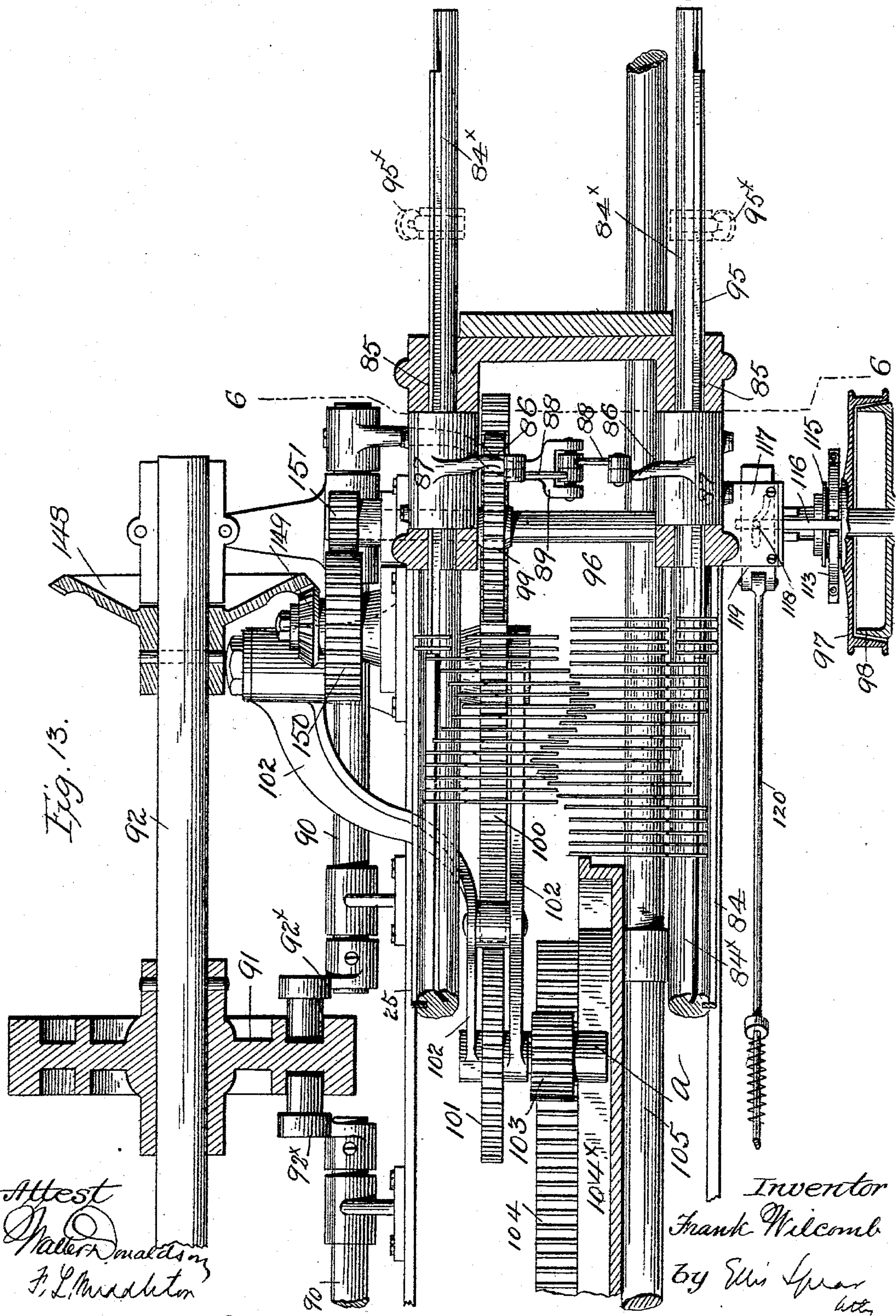
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8 Sheets—Sheet 8.

F. WILCOMB.
KNITTING MACHINE.

No. 559,831.

Patented May 12, 1896.



UNITED STATES PATENT OFFICE.

FRANK WILCOMB, OF PAWTUCKET, RHODE ISLAND, ASSIGNOR TO THE
NARRAGANSETT KNITTING COMPANY, OF SAME PLACE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 559,831, dated May 12, 1896.

Application filed December 24, 1894. Serial No. 532,813. (No model.)

To all whom it may concern:

Be it known that I, FRANK WILCOMB, a citizen of the United States of America, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a specification.

My invention relates particularly to a machine for producing a ribbed fabric from two sets of needles and a single series of sinkers. I have shown the invention as applied to a spring-needle machine; but I do not wish to limit myself to this use, and, further, while I have shown a flat machine it will be understood that parts of the invention are applicable to the circular type for carrying out the improved method of producing either a ribbed fabric or a plain fabric.

In the drawings, Figure 1 is a front view of the left-hand end of the machine. Fig. 1^a is a transverse sectional view through the needle-beds and sinker-dial. Fig. 2 is a rear view of the machine. Fig. 3 is a plan view of the sinker-dial and thread-carrier. Fig. 3^a is a sectional plan view through the dial-shield, showing the sinker-operating cam in plan. Fig. 4 is a sectional detail on line *xx* of Fig. 3; Fig. 5, a detail sectional view through the carrier-block, and Fig. 5^a a detail view of the cam for the sinkers. Fig. 6 is a sectional view across the machine on line 6-6, Fig. 13, the needle-bars back of the section-line being shown in section for convenience, parts being broken away for the purpose. Fig. 7 is a diagrammatic view of the cam-bars and needles, showing the knitting. Fig. 7^a is a side view of the traveling knock-over and evener fingers. Figs. 8 to 12 show the steps in the knitting. Fig. 13 is a plan view of a section on line 13-13 of Fig. 6 with parts below the section-line also in section. Fig. 14 is a detail view of the cam-bar yoke and guide. Fig. 15 is a detail view of the stop mechanism.

The spring-needles 1 are operated from the front and rear cam-bars 3 3^a, each having two sets of needle-cams 4 5 and 4^a 5^a, Fig. 7. The two sets of cams of each bar are intended to act alternately on each reciprocation of the cam-bars, the forward set in the rear bar—that is, the forward one according to the direction

of the movement of the bar—acting with but in advance of the second set of cams in the front bar to carry on the knitting of the ribbed fabric in connection with a single series of sinkers 16, operated independently of each other, as will be described hereinafter.

Referring to Fig. 7 and supposing the needle-cams, in this instance carried by the sliding cam-bars, to be moving in the direction of the arrow *y*, the needles of the rear row will enter the forward set of cams 4^a and be forced forward independently of each other by the lifting-cam 4^b to take the yarn, enough being sunk by the independently-operated sinkers 16, Fig. 9, for both rows of needles. These needles are then partially retracted independently by the cam 4^c of the forward set of cams before the needles of the front row are advanced, as the advance movement of the rear row of needles has a tendency to drag the fabric forward into the path of the front needles. The partial retraction of the rear needles in advance of the forward movement of the front needles tends to draw the fabric away from the path of the front needles. The front needles are now advanced independently of each other by the lifting-cam 5^x of the second set of cams in the front bar, the forward set of cams of this bar not acting on the front needles on this stroke, and at the limit of their forward movement these needles receive the thread from the sinkers, when the latter are retracted. The beards of the rear needles have during this time been depressed in succession by the centrally-arranged presser-wheel 43 opposite the dwell 19 of the forward set of cams in the rear bar and have been moved in succession by the point 20 to take the old loop on the beard, Fig. 10. The rear needles now pass along the under incline surface 21 of the second set of cams in the rear bar to complete their stitch movement, Fig. 11, casting off the old loops from the ends of the needles independently of each other and then being acted upon by the incline 22 to draw the thread taut across the stems of the needles of the front row, holding it in this position until the front needles are retracted by the cam 5^a of the second set of cams of the front bar and until the beard of the front needle is depressed by the

presser-wheel 45^x at the dwell 23 of the set of cams 5, Fig. 12. The loop is caught by the beard of the front needle when retracted still farther by the point 23^x, while the needles of the rear row are released from their cams at 22^x to move forward slightly, and the front needles are retracted to the limit of their backward movement by the point 24 to knock the stitch over the end of the needle. On the stroke to the left the other sets of cams in the front and rear bars operate the needles, those described above not acting on this stroke. I have shown call-cams 11 and 12 and call-jacks 2 for directing the needles to the forward set of cams on each stroke of the rear bar, the said call-cams acting on the jacks alternately in each reciprocation. For instance, on the stroke described the jacks moving along the groove 11^x will be thrown forward by the call-cam 11 to push the needle forward and then returned to position out of line with the call-cam 12. On the other stroke the call-jacks will be thrown into the groove 12^x by the call-bar 84 hereinafter described and in line with the call-cam 12; but I wish it understood that I do not limit myself to the call cams and jacks for securing the alternate action of the rear sets of needle-cams. For the front bar the two sets of cams include the two pivoted pieces 26 and 27. When either one of these pieces is operated, it opens the cam-groove to the other set of needle-cams, and the needles are directed into the opened cam-groove by the central call-cam 9 in the front bar. The same action takes place on each stroke, the forward set of cams in the rear bar acting with but in advance of the second set of cams in the front bar. These pivoted pieces are returned to normal position against their stop-pins 26^x 27^x by springs, one of which is shown at 27^a.

The sinkers are carried by a traveling dial 29, fixed to an inclined shaft 30, journaled in a bearing-bracket 31, connected rigidly to the slide-bar, so that the dial will travel from end to end of the rows of needles, and in this reciprocating movement will be rotated first one way and then the other by a gear 32, Figs. 2 and 1^a, on the inclined shaft engaging a rack 33, fixed to the frame. The sinkers being pivoted by their hooked ends on the ring 34 will be swung forward independently between the needles when the dial brings them in succession against the relatively fixed cam-piece 35, which is supported adjustably in a bracket 36, carried by the bearing-bracket 31, so as to travel with the dial and needle-cams. This cam has double inclines, and thus operates the sinkers in like manner independently on each stroke of the machine. A shield 37, having cam edges 38, covers the dial, and this is held against rotation by the rods 39, connected to the posts 40 on the slide-bar yoke 41 or by a suitable bracket, as 18^x, Fig. 3, attached to the slide-bar and engaging with the shield. The cam-piece is ad-

justed by the lever 42, and the presser-wheel 43 is also carried by the bracket 36 to travel with the dial and keep pace with the knitting-cams, and this also is adjustable by a lever 44, but as these parts are particularly described and claimed in an application of even date herewith, Serial No. 532,812, filed by me in the United States Patent Office, no further detail description is necessary herein. The front needles are pressed on one stroke by the presser-wheel 45 and on the other stroke by the presser-wheel 45^x, both wheels being supported adjustably from the shield by arms 46, held in guides 47 and adjusted by screws 48. These wheels are supported on each side of the center, so that first one and then the other will press the beards of the front needles following the action of the rear presser on the rear needles. All the parts are thus adapted to carry out the same knitting action on both strokes of the machine. The shield is held on the inclined shaft by the nut 50. The thread-guide 51 consists of a bent slotted arm through which the thread passes, the arm being carried by a block 52, Figs. 1, 1^a, and 3, pivoted in ears 53 of the carrier 54, supported on the guide-bar 55, secured to the standards 56 at the ends of the frame. The thread is led to the guide-arm through the eyes 57 57^x, and the thread-guide is pressed into normal position to feed the rear needles by the spring-pin 58, working in the box 59 on the carrier and bearing against the stud 60 on the pivoted block 52.

I have provided means hereinafter described for throwing any desired number of needles out of action when it is desired to knit with a less number of needles than the whole row, and the carrier is adapted to be released and arrested at the end of the active row of needles, and also for feeding first on one side of the series of sinkers advanced by the dial and then on the other, according to the stroke of the machine.

In Fig. 1 the dial is moving to the right and the thread-guide is feeding the rear needles in advance of the operated sinkers and toward the right of the dial, the carrier being moved along its guideway by the spring-pin 61, Figs. 1^a, 3, and 4, in the boss of the dial-shield, engaging the dog 62 on the carrier. This dog retracts transversely of the carrier when the roller 63^x, extending down from a second dog 72, engages the incline 64 of the releasing-piece 65, which is adjustably supported in the channel of the carrier-guide and fixed at any desired point by the set-screw 66, Fig. 1. The two dogs are connected, so that one operates the other by the pinion 73, engaging the teeth 74 and 75 in the dogs. The dog 62 is thus released from the spring-driving pin and the carrier is arrested by the roller coming against the stop-shoulder 67 on the releasing-piece. The dial moves on past the carrier and guide, and to allow this the guide must be swung outward from the dial to permit the advanced sinkers to pass by, and this

is effected by the cam-piece 68 on the dial-
shield having a V-shaped seat, into which the
spur 69 on the pivoted block 52 fits, Figs. 1 and
1^a, so that as the cam-piece passes by the guide
5 the inclined side of the V-shaped notch will
throw the guide out away from the dial, in
which position it will be held by the straight
part 70, the guide passing off of the curved
end of the cam-piece at 71. As the guide must
10 always feed in advance of the sinkers which
are being thrown forward, a second V-shaped
notch is formed in the cam-bar to the left of
the dial and the spur rests in this on the re-
turn stroke of the dial, the carrier being
15 pushed along on the said return stroke to the
left by the spring-pin engaging the second
sliding dog 72 similar to that described. This
dog is thrown into operative position on the
stroke to the right, as above stated, when the
20 dog 62 retracts by its roller 63^x rising, as de-
scribed, along the inclines 64 of the stop-piece,
and as this dog 72 now lies in the path of the
spring-pin provision is made to allow the
spring-pin to pass by the dog 72 without effect
25 as the right-hand stroke is completed, this
consisting of an incline on the under side of
the dog 72, Fig. 4, to depress the spring-pin.
On the return leftward stroke the vertical side
of the dog 72 will be presented to the pin,
30 which will thus move the carrier along, and
from this it will be seen that the carrier on
each stroke lies in advance of the center of
the dial to feed the rear needles, which are
the first to advance. The dog 62 has also an
35 incline and the action of the parts on the
stroke to the left is the same as that described
above, a second releasing-piece 65^x, with an
incline 64^x and stop, being adjustably sup-
ported on the carrier guide-bar. Leaf-springs
40 77 are secured to the carrier and bear on the
guideway to steady the action of the carrier.

In order to insure the knocking off of the
old loops, I provide traveling knock-over and
45 evener fingers 78 79, a pair of these being se-
cured to the bar 80 on each side of the dial,
the knock-over finger being opposite the
knock-over cams of the cam-bars, while the
evener-fingers are slightly in rear to place the
cast-off loop in the proper position and even
50 up the row. The knock-over finger insures
the casting off of the old loops by engaging
the fabric and pushing it aside, so as to draw
or knock off the said loops. The bar 80 is
held removably at its ends by latches 81, piv-
55 oted to the posts 40 on the cam-bar yokes and
fitting in the notches 83 of the bar. The bar
has inclined ends to facilitate its placing in
the machine.

While I have shown the knock-over finger
60 and evener in connection with two rows of
spring-needles for producing a ribbed fabric,
I do not wish to limit myself in this respect,
nor to the combination with spring-needles,
nor do I wish to limit myself to the form of
65 knock-off device shown.

From Fig. 10 it will be noticed that the
thread is laid across the stems of the rear nee-

dles first by the sinkers 16 and at such a dis-
tance from the rear needle-bed as to give room
in which to depress the needle-beards; but 70
the front needles are dependent upon the rear
needles for the placing of the yarn across their
stems, which therefore is effected at a point
much nearer the corresponding needle-bed,
leaving less room in which to depress the 75
beards of the front needles.

In order to get sufficient room, the bed is
lowered, and to avoid an excessive retraction
of the front needles in casting off the old
loops the knocking-off finger is employed for 80
the front needles.

All the call-jacks are thrown into line with
the call-cams of the cam-bars by the call-bars
84, carried by rocking shafts 84^x, which ex-
tend from end to end of the machine through 85
the bearings 85 and projecting beyond them.
These call-bar shafts are rocked at the end
of each stroke to throw the call-jacks in by
the arms 86, secured by the sleeves 87 to the
rock-shafts at each end of the machine and 90
in front and rear, which arms are connected
through the links 88, Figs. 6 and 13, and arms
89 with the rock-shafts 90, operated from the
grooved cam 91 on the main shaft 92 by the
arms 92^x, having rollers moving in the cam- 95
groove. The call-jacks, when thrown forward,
are held in this position by the dogs 93, hav-
ing inclined ends to bear on the inclined ends
of the call-jacks, the dogs being pressed by
springs 94. When back, the jacks are held 100
by the dogs engaging notches *b*. All the call-
jacks of the rear bar must be thrown into line
with the call-cam at each action, as they are
always returned to position out of line with
the call-cams; but on the front bar the active 105
call-jacks, when thrown forward in line with
the call-cam, will remain in this position by
reason of the arrangement of the call-cam 9,
(shown in Fig. 7,) the call-jacks being held in
line with the call-cam by the spring-dogs. 110
On the front cam-bar, therefore, it is only
those call-jacks of the inactive needles which
are thrown in at each rocking of the call-bar.

To make the needles inactive for different
widths of fabric, jack racking bars 95 are 115
used, two at each end of the machine, adjust-
able in ways in the rock-shafts 84^x and ar-
ranged to be set at any desired point by the
set-screws 95^x, carried by collars fixed on the
rock-shafts 84^x. These jack-bars normally 120
stand at an angle of forty-five degrees while
the cam-bars are operating, and any call-jacks
engaged by this jack racking bar will be held
out of the path of the call-cams, and although
the jacks will be thrown into line by the call- 125
bar at the end of each stroke the jack racking
bar will immediately return those to be ren-
dered inactive to inactive position when the
shaft rocks back to normal position, the throw-
ing in and out of the inactive call-jacks be- 130
ing done while the machine is reversing its
stroke and before the call-cams begin to act.
The jack racking bars are moved endwise
step by step to engage or render additional

jacks inactive when the shafts are at the inward limit of their movement. The releasing-pieces of the carrier are adjusted along the carrier-guide to correspond with the end of the jack racking bar. The driving mechanism, Figs. 2, 6, and 13, comprises the transverse shaft 96, having a loose pulley 97 thereon controlled by a clutch 98 and a stop motion hereinafter described. A gear 99 on the shaft 96 meshes with the larger gear 100, journaled in the frame and engaging a smaller gear 101, journaled in an oscillating frame 102, which turns on the axis of the larger gear. The frame is composed of two sides secured together, between which the small gear is journaled. A pinion 103, secured to the shaft of the smaller gear outside the frame, engages a continuous rack 104, which is double-sided, with segmental ends, and is connected to a grooved cam-plate 104^x, the groove of which is continuous and corresponds in form to the rack. An antifriction-roller *a* on the shaft of the small gear moves in this groove and controls the rising and falling of the frame, keeping the pinion in mesh with the rack. The cam plate or rack is connected to the drive-rod 105, sliding through the brackets 105^x and connected to the cam-bars, and the rotation of the large gear continued in one direction will turn the small gear and pinion, causing the rack to be reciprocated and with it the drive-rod and cam-bars, the pinion engaging first one side of the rack and then the other.

The drive-rod is pivotally connected to the oscillating segment-lever 106, having a pin in its upper end engaging a fork 107, depending from the yoke of the cam-bar, and its lower end provided with a segmental rack 108, meshing with a rack 109 on the frame of the machine. As the drive-rod reciprocates the segmental rack will travel back and forth over the stationary rack, and as its fulcrum-point is thus constantly following the movement of the drive-rod a multiplied and substantially uniform motion will be imparted to the cam-bar. The cam-bars are connected by yokes 41 and these yokes move on the guide-rods 111, projecting from the ends of the machine. The clutch comprises the loose shifting-pulley, the friction-disk 98, secured on the transverse shaft, and the means for shifting the pulley, consisting of the lever 113, pivoted to the arm 114 on the frame and having studs entering the groove 115 of the pulley-hub, the bar 116, connected to the lever and sliding in a box 117 on the frame and having a pin 118, entering a cam-slot in the plate 119, which is operated in the box by the shipper-rod 120, connected to the arm 122, journaled on the pin 123, Fig. 1, supported by the bracket 124. A catch 125, pivoted to the stud 126 of the bracket, engages a pin on the arm 127, which is connected to the arm 122 to move therewith. The catch engages the pin when the shipper-rod is moved to throw in the clutch and thus holds the same

in action. For releasing this catch automatically, and thus stopping the machine, a timing-chain 128, carried by the tooth-wheel 129, is operated step by step to bring the stud 130 on the chain to engage the inclined tooth 131 of the plate 132 and thus lift the same and with it the lever 133, connected thereto and pivoted loosely in the pin 123, so that a pin 134 on the lever will lift the catch 125 and thus release the shipper-rod, which is then operated by the spring 126^x, Fig. 1, to release the clutch. The lever 133 has a handle and may thus be operated at any time to stop the machine. The chain-wheel turns loosely on the shaft 135, Figs. 1 and 2, extending transversely of the frame and driven from the shaft 92 by the beveled gears 137 and 138, and the chain-wheel is operated step by step from the shaft 135 through the disk 139, fixed thereon, carrying a pin 140, which at each revolution moves the slotted wheel 141 one step. This wheel is journaled on a pin 142 of the frame and has a sleeve carrying a pinion 143, meshing with the gear-wheel 144, secured to the chain-wheel, so that at the end of each stroke the chain is advanced one step.

The main shaft 92 is driven from the transverse shaft 96 through bevel-gears 148 149 and the gear and pinion 150 151.

I am aware that it is old to produce ribbed fabrics on two rows of bearded needles with independently-operated sinkers—as, for instance, in the Tiffany machine shown in United States Patent No. 28,133; but in machines of this type the needles of each row are all operated simultaneously, the yarn being fed to one entire row of needles, which in turn draw the thread across the stems of the needles of the second row and each row knocking over its stitches independently of the other row and the sinkers being retracted after sinking the thread altogether and at one operation.

One of the serious objections to this type of machine is that the machine is slow in operation, in consequence of operating the rows of needles backward and forward while the thread-feeding mechanism is idle at either end of the stroke, and I am also aware that machines have been constructed with two rows of spring-needles, one row being fixed and the needles of the other row being independently operated to produce a ribbed fabric and in which the knocking over of the stitches is performed simultaneously with the feeding of the thread to other needles of the same row, this being effected by working the fabric forward and back on a stationary needle; but this method is only applicable to circular machines knitting in one direction only. It is also old to knit ribbed fabrics with two sets of latch-needles, the needles of each set working independently of each other and independent of the other row, but machines of this type cannot produce the quality of fabric or fineness of gage that can be produced on machines of the spring-needle type. I have

aimed to produce a machine of the spring-needle type having all the excellent qualities of both types of machines and capable of producing the fabric at a greatly-increased speed and consequently lower cost than has been possible heretofore; and, further, I aim to produce such a machine as will allow of automatic fashioning of the fabric simultaneously with the knitting, which has heretofore never been accomplished in machines of the spring-needle type.

I claim—

1. In combination in a knitting-machine, the two sets of spring-needles, a single series of sinkers, means for advancing and retracting the needles of each set independently of each other and means for operating the sinkers independently of each other, to sink enough yarn on one set of needles for both sets and the presser-wheels for the two rows of needles to act on the needles of each set independently and successively.

2. In combination in a knitting-machine, the two sets of needles, the sinkers and the cam-bars for the needles having each two sets of knitting-cams, the cams of each set being arranged to act alternately on each reciprocation of the cam-bars, substantially as described.

3. In combination in a knitting-machine, the two sets of sliding spring-needles, the sinkers and the front and rear cam-bars having two sets of knitting-cams, means for causing the needles to advance along the lifting-cam of the first set of cams of the rear bar to receive the yarn, and along the under surface of the second set of lifting-cams of the rear bar to lay the yarn across the stems of the needles of the front row and to cast off the stitches of the rear row, and means to direct the needles of the front row along the lifting-cam of the second set of cams in the front bar and for retracting the needles to cast off their loops after the needles of the rear row have completed their knitting movement, substantially as described.

4. In combination in a rib-knitting machine, with two sets of spring-needles, the cam-bars therefor each having two sets of cams, comprising the cam-surfaces for advancing and partially retracting the needles of the rear row on each stroke in advance of the forward movement of the front needles, and cam-surfaces completing the retraction of the said rear needles in advance of the complete retraction of the needles of the front row, substantially as described.

5. In combination in a knitting-machine, the two sets of needles, the sinkers, the cam-bars, the two sets of needle-cams, and the call-jacks and call-cams for causing the cams of each set to act alternately for knitting on each reciprocation of the cam-bars, substantially as described.

6. In combination the needles, and the cam-bars each having two sets of cams, those of the front bar including the pivoted pieces

adapted to open the needle-path at the center of the sets of cams, the means for operating the said pivoted pieces, comprising the call-jacks and call-cam for directing the needles into the opened cam-path, substantially as described.

7. In combination in a knitting-machine, the needles, the sinkers, the cam-bars having two sets of cams, those of the front bar including the pivoted pieces, the call-jacks and central call-cam for the front bar and the pair of call-cams and call-jacks for the rear bar, substantially as described.

8. In combination in a knitting-machine, the needles, the knitting-cams, the call-jacks, the call-cam and detent means for holding the jacks in either forward or backward position, substantially as described.

9. In combination, in a knitting-machine, the needles, the stitch-cam, the jack having the notch and the inclined end and the holding-dog adapted to engage the inclines to hold the jack in either position, substantially as described.

10. In combination with the two sets of spring-needles, the single series of sinkers, the means for operating the sinkers, the single presser-wheel for one row of needles, the two presser-wheels, for the second row of needles, and the cams in the cam-bars adapted to operate the needles of the second row after those of the first row, substantially as described.

11. In combination, in a knitting-machine, the independently-operated needles, the needle-cams, the sinkers, the rotary dial and means for operating the sinkers, the thread-guide and carrier and a detachable driving connection for the carrier arranged to shift the same to locate the guide in advance of the sinkers and of the needle-cams and means for releasing the said connection, substantially as described.

12. In combination in a knitting-machine, the independently-operated needles, the needle-cams, the sinkers with means for operating them independently, the thread-guide carrier, the thread-guide arranged to move to and from its point of work, a detachable driving connection, operating means therefor and means for retracting the thread-guide from its point of work to permit the sinkers to pass, substantially as described.

13. In combination in a knitting-machine, the independently-operated needles, the needle-cams, the sinkers with operating means therefor, the thread-carrier, the thread-guide having movement thereon to and from the point of work, the detachable driving connections for the carrier adapted to shift and drive it in advance of the sinkers on each stroke, and means for retracting the thread-guide to allow the sinkers to pass and for returning the guide to the working point on the opposite side of the sinkers, substantially as described.

14. In combination, the needles, the cams therefor, the thread-carrier and guideway,

the thread-guide on the carrier, the two sliding dogs arranged to move transversely of the carrier, the projections on the dogs extending into the guideway and the inclines on the guideway for operating the dogs through the said projections.

15. In combination, the needles, the cams, the thread-carrier, the guideway therefor, the thread-guide, the driving means comprising the spring-pin, the two dogs on the carrier and the means for operating the dogs reversely, said spring-pin being arranged to pass by one of the dogs on each stroke, substantially as described.

16. In combination the needles, the cams, the thread-carrier, the guideway, the driving means, the two sliding dogs movable transversely of the carrier to engage the same, the said dogs having rack-teeth and the intermediate pinion engaging the racks and the means for operating one of the dogs on each stroke, including the inclines on the guideway and the projections on the sliding dogs to engage the same substantially as described.

17. In combination, the needles, the cams, the series of sinkers with operating means therefor, the shifting thread-carrier, the guideway therefor, the driving means for the thread-carrier, the thread-guide pivoted to the carrier and the cam-bar having the inclines and adapted to engage and retract the thread-guide to pass the sinkers, substantially as described.

18. In combination, the call-bar extending lengthwise of the needle-row, the racking bar also extending lengthwise thereof and means for operating the bars, substantially as described.

19. In combination the needles, the cams, the sinkers, the traveling dial, means for rotating the same and means for operating the sinkers, the non-rotating shield, the thread-carrier, the guide therefor, the detachable connection between the carrier and the shield, the pivoted thread-guide and the cam-bar on the shield for operating the thread-guide, substantially as described.

20. In combination, the knitting-needles, their cams and the traveling knock-over device moving transversely of the needles, and acting on the under side of the fabric and under the needles as the same are retracted to cast off the stitches, substantially as described.

21. In combination the needles, their cams, the traveling knock-off finger and the traveling evener-finger in rear of the knock-over finger, said fingers moving transversely of the needles and below the same and fabric, substantially as described.

22. In combination the needles, the cam-bars, the knock-off finger moving transversely of and below the needles, and the bar carrying the same connected to the cam-bars, substantially as described.

23. In combination the needles, the cam-

bar, the knock-off finger movable transversely of and below the needles, the bar carrying the same, and the detachable connection between the same and the cam-bar, substantially as described.

24. In combination with two needle-beds and two sets of needles, one bed being in a lower plane than the other, means for operating the needles to produce a ribbed fabric, and a traveling knock-over finger and means for operating the same to act in conjunction with the needles of the lower bed, substantially as described.

25. In combination with the needles operating independently of each other, the movable knock-off means arranged below the needles, to move the fabric from the ends of the needles to aid in the knocking-off action, said knock-off means operating below the fabric and in conjunction with the retracted needles, substantially as described.

26. In combination the needles, their cams, the call-jacks and their cams, the rocking call-bar for throwing the needles into action through their jacks, and the means for operating the bar comprising the arms, the links, the cam on the main shaft and the rock-shaft operated thereby and connected to the links, substantially as described.

27. In combination in a knitting-machine, the needles, the call-jacks, the needle-cam, the call-cam, and the call-bar for throwing the needles into action through the call-jacks, substantially as described.

28. In combination the needles, the needle-cam, the call-jacks and the jack racking bar with means for operating the same to retract the call-jacks, substantially as described.

29. In combination the needles, their cams, the rock-shaft, the call-bar carried thereby for throwing the needles into action and the racking bar also carried by the rock-shaft, substantially as described.

30. In combination the needles, their cams, the call-jacks and call-cam, the jack racking bar extending lengthwise of the machine, and means for reciprocating the racking bar laterally to throw the call-jacks out of action, substantially as described.

31. In combination, in a knitting-machine, the needles, their sliding cams, and the driving mechanism therefor comprising a drive-gear with means for operating it, the transmitting-gear meshing therewith and arranged to oscillate, the pinion carried on the axis of the oscillating gear, the reciprocating continuous rack meshing with the pinion the cam-track, the projection engaging the same and controlling the oscillation of the transmitting-gear and the connection from the reciprocating rack to the sliding cams, substantially as described.

32. In combination in a knitting-machine, the needles, the sliding cams and the driving mechanism comprising the drive-gear with operating means therefor, the oscillating

frame journaled on the axis of the drive-gear, the transmitting-gear journaled in said frame, the pinion on the axis of the said transmitting-gear, the continuous rack, the cam-track, 5 the roller on the axis of the pinion engaging therewith and the drive-rod connected with the slide-bars and connected to the continuous rack, substantially as described.

33. In combination in a knitting-machine, 10 the needles, the sliding cams, the drive-rod, the driving mechanism for the same for imparting a uniform movement thereto and a multiplying-lever connected to the sliding cams and drive-rod and having a shifting- 15 fulcrum to impart a uniform motion to the sliding cams and moving parallel with the

movement of the drive-rod, substantially as described.

34. In combination in a knitting-machine, the needles, their sliding cams, a drive-rod, 20 its actuating mechanism adapted to give said rod a uniform motion, a multiplying-lever with its loose end provided with a rocker, a bed for that rocker, and means to connect the rocker and bed, substantially as described. 25

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

FRANK WILCOMB.

Witnesses:

GEORGE O. EVERETT,
DANIEL MCNIVEN.