

No. 774,464.

PATENTED NOV. 8, 1904.

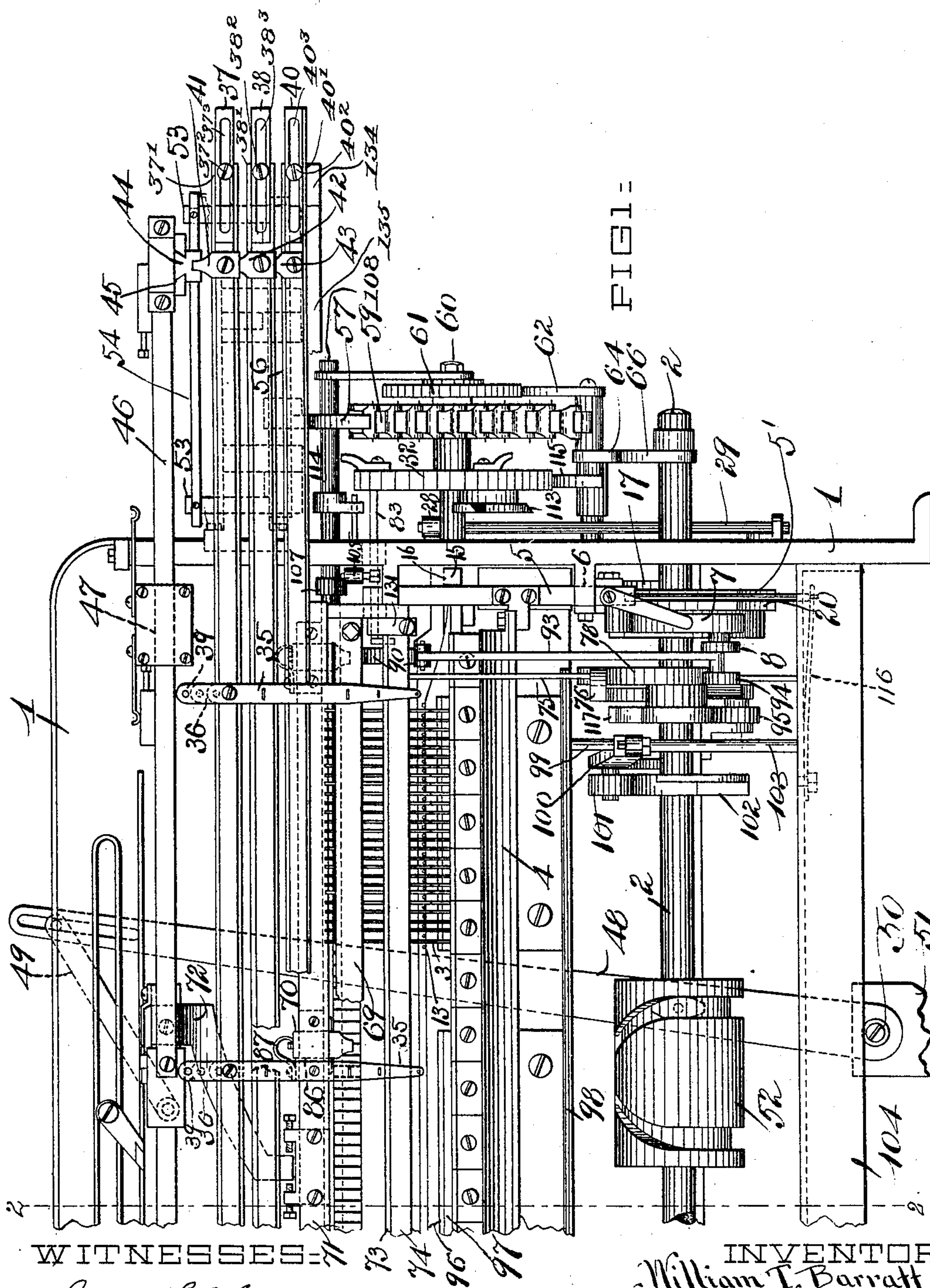
W. T. BARRATT & C. J. SIBBALD.

KNITTING MACHINE.

APPLICATION FILED DEC. 8, 1903.

NO MODEL.

6 SHEETS—SHEET 1.



WITNESSES:
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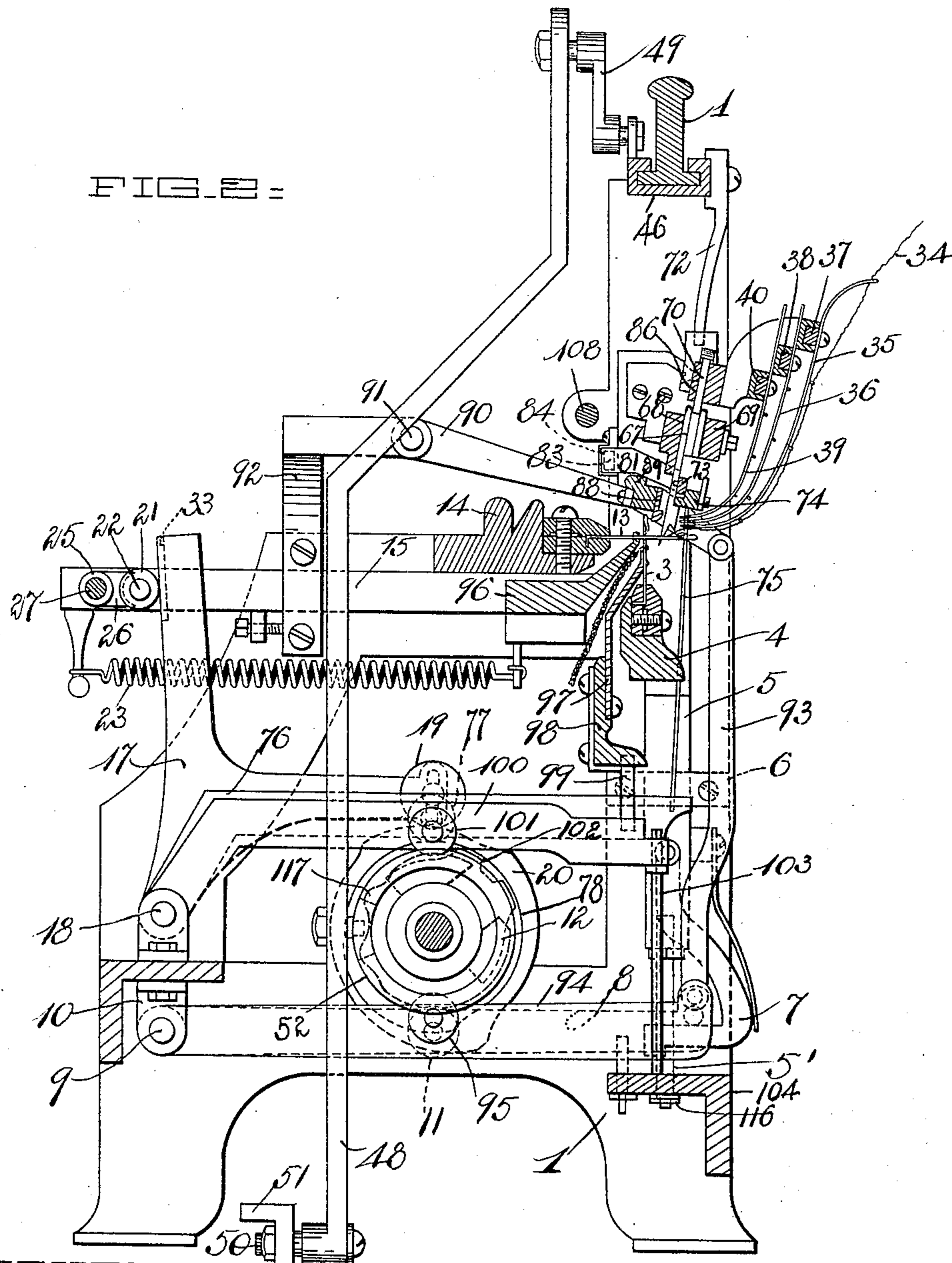
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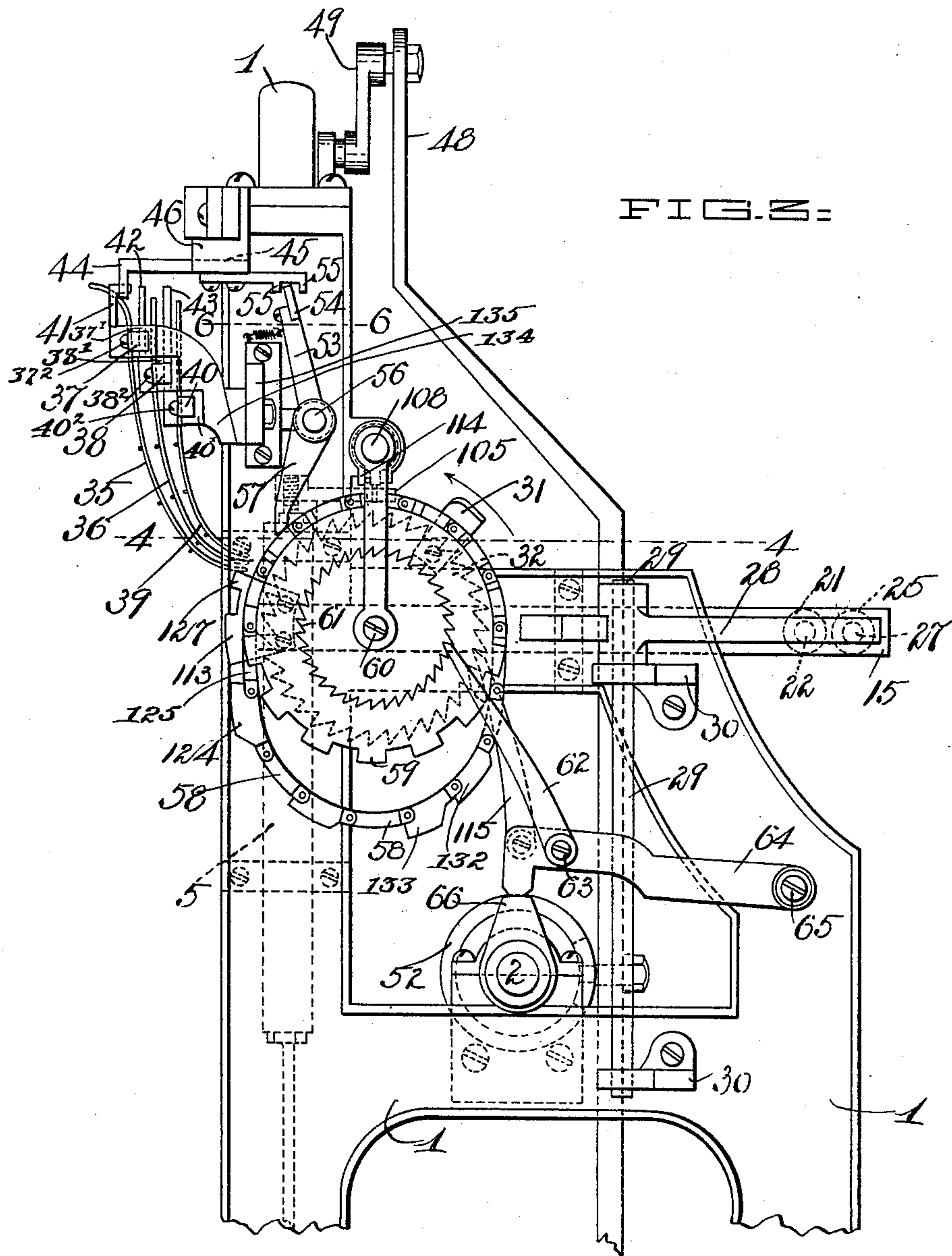
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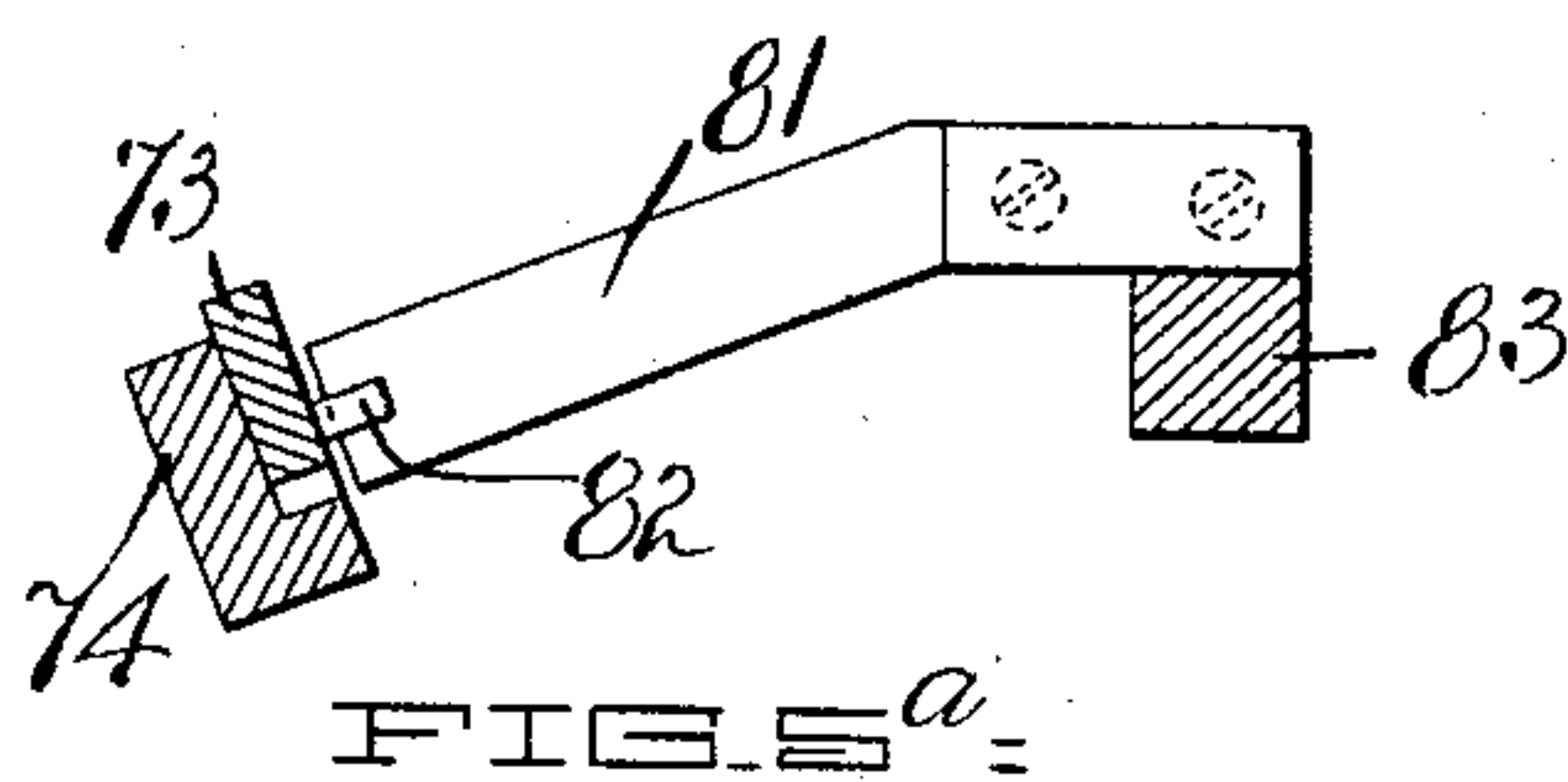
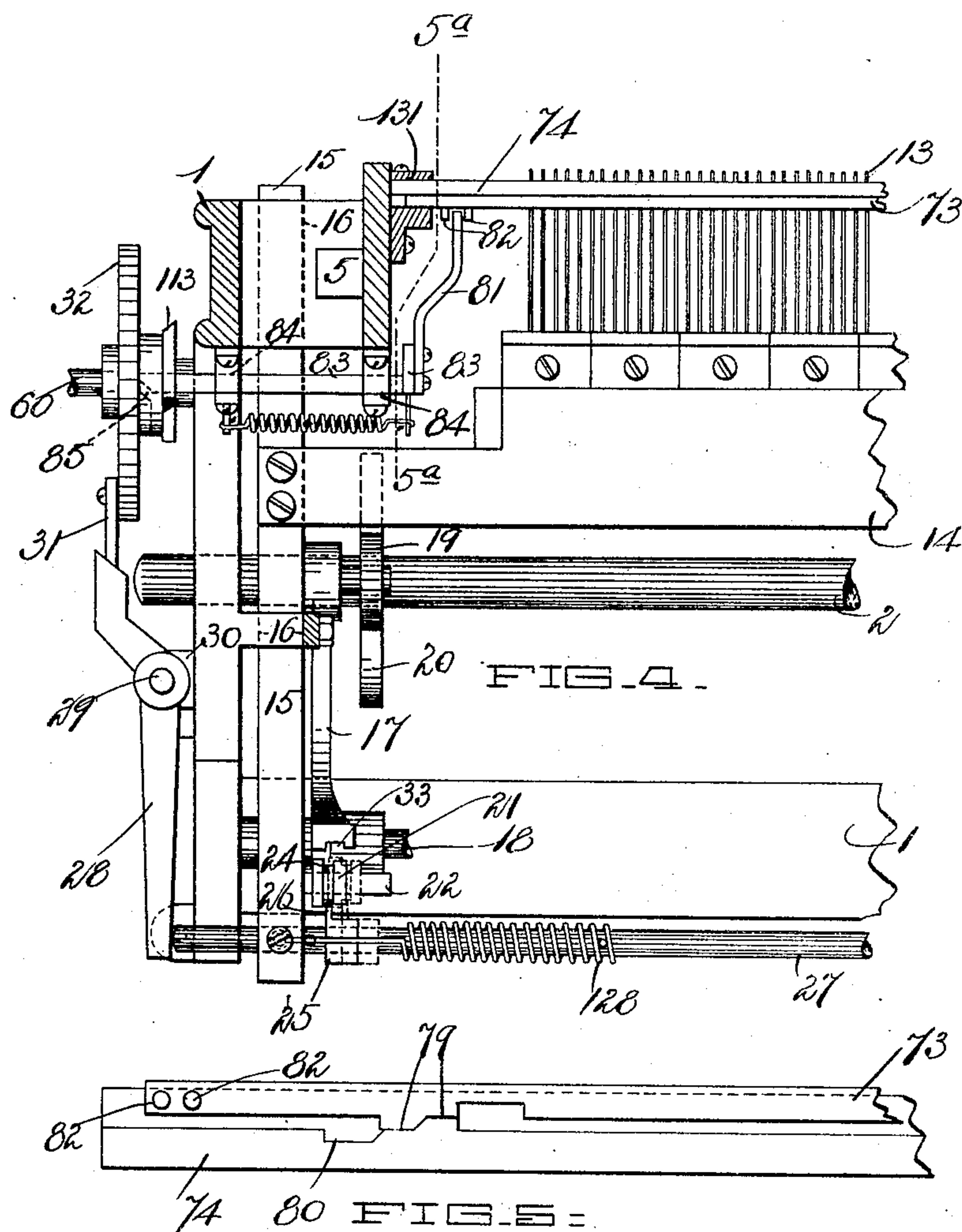
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6 SHEETS—SHEET 4.



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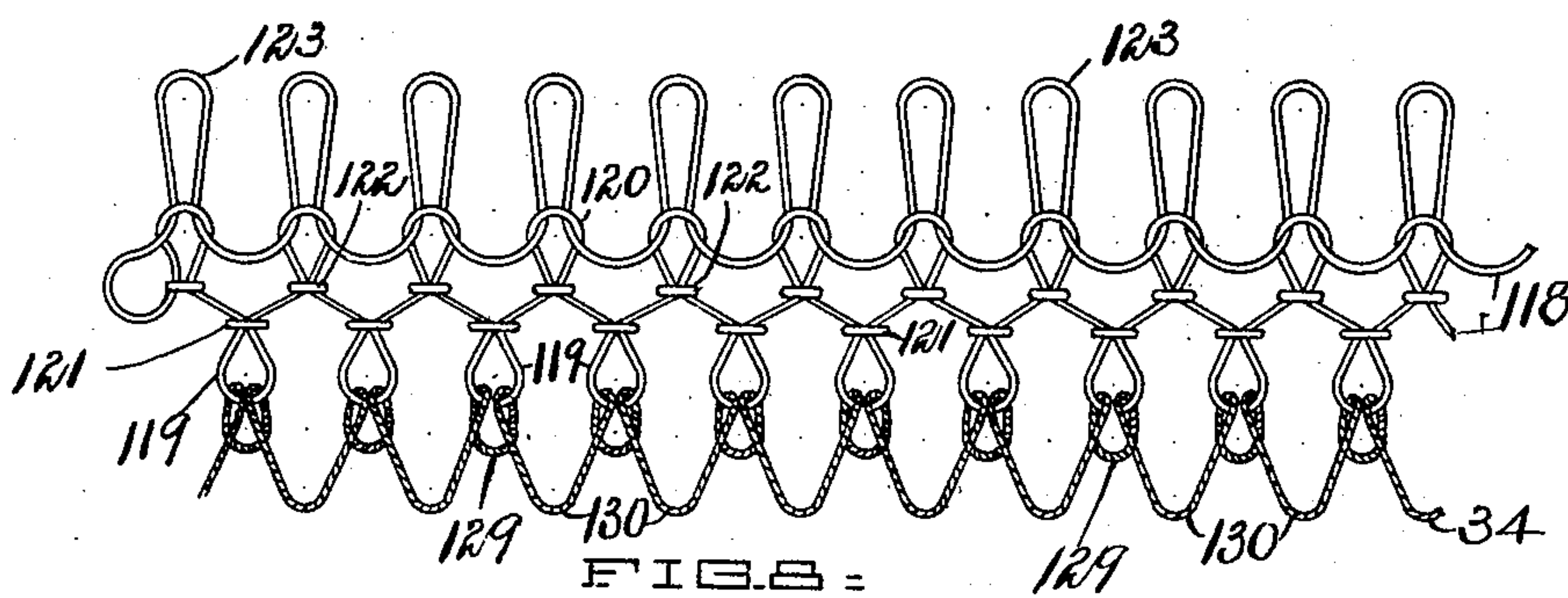
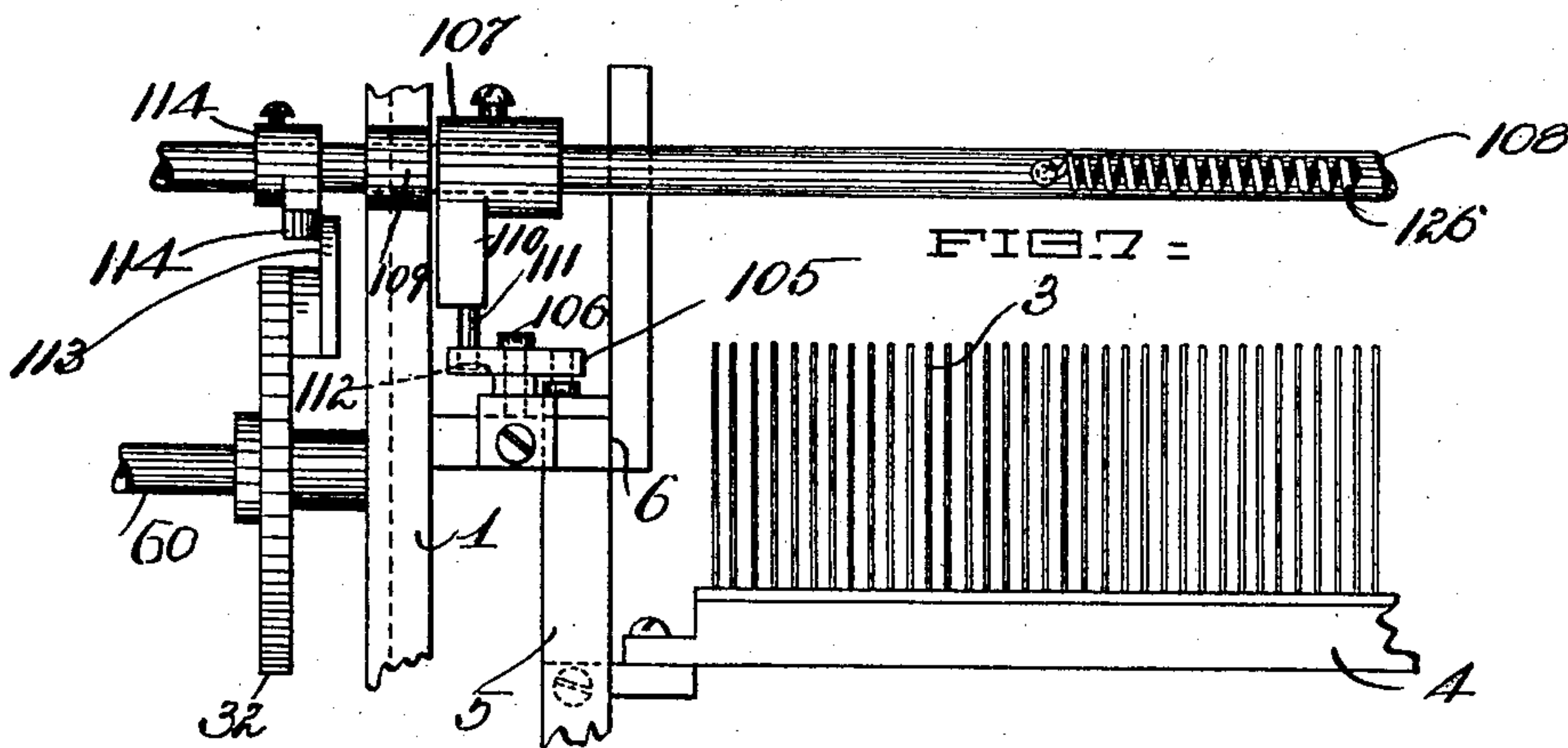
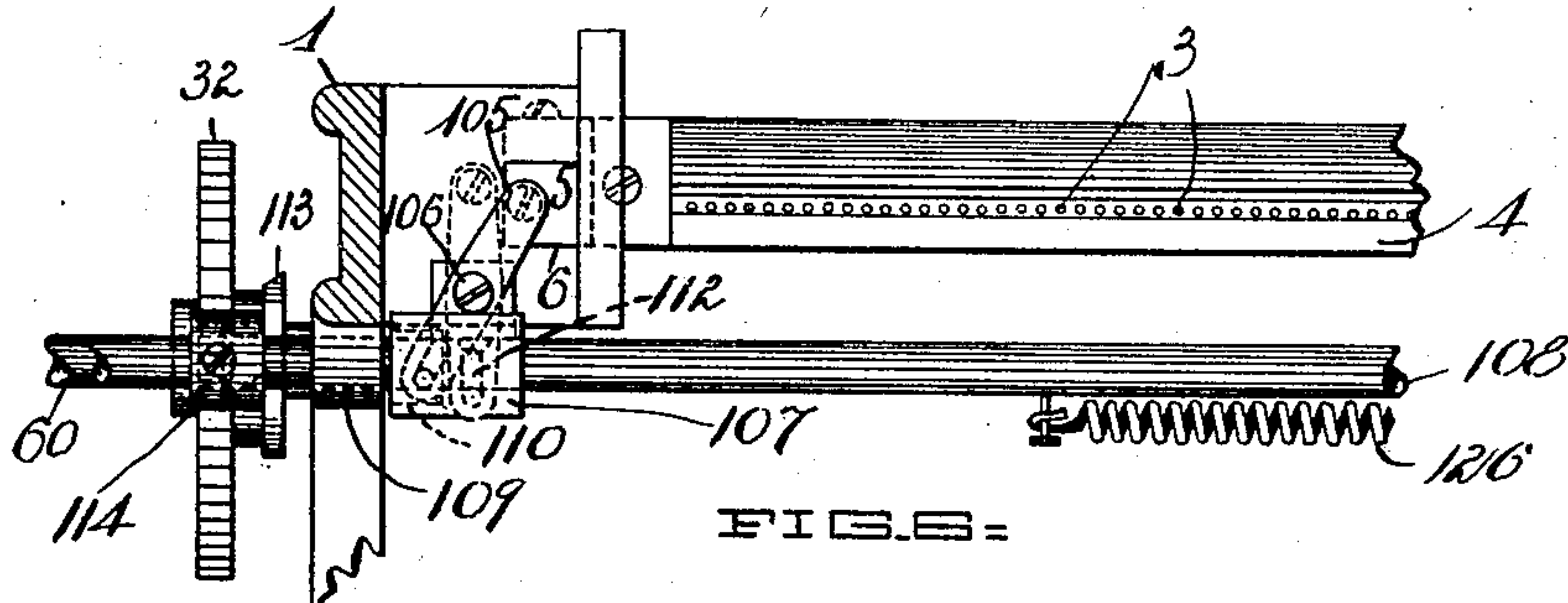
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6 SHEETS—SHEET 5.



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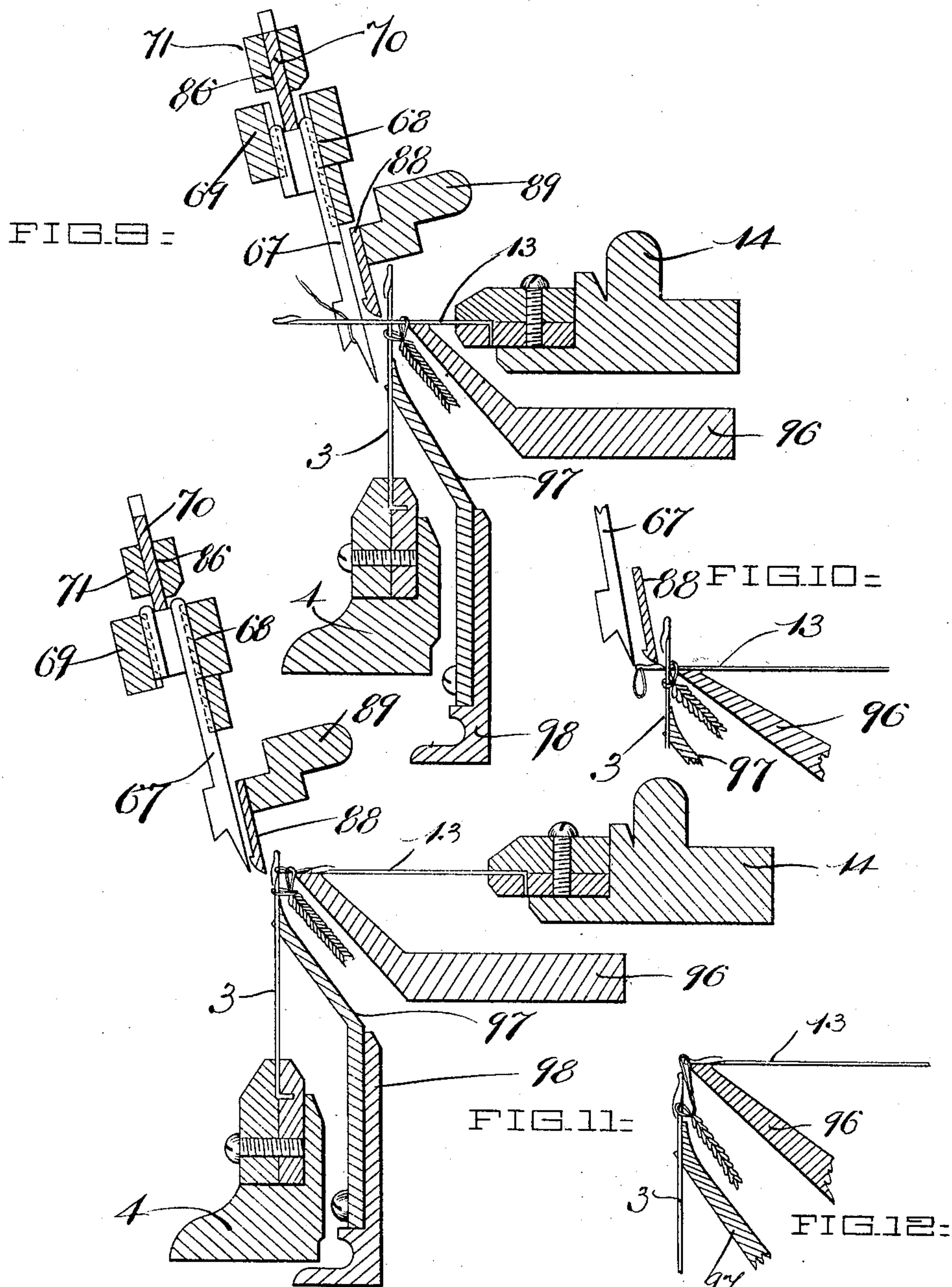
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KNITTING MACHINE.

APPLICATION FILED DEC. 8, 1903.

NO MODEL.

6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

WILLIAM T. BARRATT, OF BENNINGTON, VERMONT, AND CHARLES J. SIBBALD, OF TROY, NEW YORK, ASSIGNORS TO CHARLES COOPER, OF BENNINGTON, VERMONT.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 774,464, dated November 8, 1904.

Application filed December 8, 1903. Serial No. 184,255. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM T. BARRATT, residing at Bennington, in the county of Bennington and State of Vermont, and CHARLES J. SIBBALD, residing at Troy, in the county of Rensselaer and State of New York, citizens of the United States, have invented new and useful Improvements in Knitting-Machines, of which the following is a specification.

This invention relates to a straight or flat rib knitting machine, the object of the invention being to knit in a connecting-thread between two sections of fabric in such a manner that said connecting-thread may be withdrawn by pulling upon the same and leave the ends of the sections of knitted material adjacent to said connecting-thread with a smooth neat edge. In practice the ribbed goods are knit in a series of sections, each two adjacent sections being joined together, as hereinafter described, by a connecting-thread which is automatically knit into the fabric, joining two sections thereof by improved mechanism which substitutes a connecting-thread for the regular thread and knits the same into the goods in such a manner that it may be easily withdrawn after the goods have been removed from the machine, and after the connecting-threads have been withdrawn a number of flat-rib sections will be obtained, each having a smooth neat edge at the opposite ends thereof, said sections of knitted material being ordinarily used for cuffs of underclothing and the like.

The invention consists in the improved mechanism hereinafter described, and particularly pointed out in the claims, whereby two sections of ribbed fabric are joined together by a connecting-thread in such a manner that said connecting-thread may be readily detached by pulling upon the same transversely of the fabric, as hereinafter shown and described.

Referring to the drawings, Figure 1 is a front elevation of the right-hand portion of our improved flat-rib-knitting machine, the same being broken away at the left-hand side of the figure to save space in the drawings.

Fig. 2 is an enlarged transverse detail section, partly in elevation, taken on line 2 2 of Fig. 1. Fig. 3 is a right-hand detail side elevation, the frame being partly broken away to save space in the drawings. Fig. 4 is a detail plan section, partly in elevation, taken on line 4 4 of Fig. 3 and broken away to save space in the drawings. Fig. 5 is a detail rear elevation of a portion of the falling bar and inside falling bar. Fig. 5^a is a detail section taken on line 5^a 5^a, Fig. 4. Fig. 6 is a detail plan section taken on line 6 6 of Fig. 3, partly in elevation and broken away to save space in the drawings. Fig. 7 is a detail rear elevation of the parts illustrated in Fig. 6. Fig. 8 represents an enlarged diagram view of the connecting-stitch and a portion of the fabric knitted in this machine. Figs. 9, 10, 11, and 12 are detail transverse sections of the front and back bars and knocking-over bar, illustrating the manner in which the regular stitch is formed. Figs. 13 and 14 are front and right-hand side elevations, respectively, of the dog 41. Figs. 15 and 16 are front and right-hand side elevations, respectively, of the dog 42. Figs. 17 and 18 are front and right-hand side elevations, respectively, of the dog 43.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 1 is the frame of the machine, and 2 the main driving-shaft journaled to rotate in bearings fast to said frame. The vertical or front-bar needles 3 are fastened to a front needle-bar 4. The front needle-bar 4 is fastened at opposite ends thereof, respectively, to slides 5, constructed to slide in ways 6, formed upon the inside of each of the standards of the frame 1, and connected by links 7 to the front needle-bar levers 8, pivoted at 9 to a bracket 10, fast to the frame 1. A cam-roll 11 is rotatably attached to the lever 8 and bears against the periphery of a cam 12, fast to the main driving-shaft 2. It will be seen that as the cams 12 are rotated by the shaft 2 the levers 8 will be lowered by said cams and raised by a spring, (not shown,) and the slides 5, together with the front needle-bar 4, will be given a vertical reciprocatory motion, said

slides being connected to the levers 8 by the links 7 7. The slides 5 are provided with a downwardly-extending rod 5', the lower end of which bears against a spring 116, fast to the cross-bar 104, said cross-bar 104 being fast to the side standards of the frame 1, Figs. 1 and 2. The horizontal back-bar needles 13 are clamped to a back needle-bar 14. The back needle-bar 14 is fastened at opposite ends thereof, respectively, to slides 15 15, constructed to slide in ways 16 upon the inside of the standards of the frame 1, Figs. 2 and 4. A horizontal reciprocatory motion is imparted to the slides 15 and to the back needle-bar 14, together with the horizontal needles 13, by a lever 17 and spring 23. Said lever 17 is pivoted to a stud 18, fast to the frame, and has journaled thereon a cam-roll 19, to which motion is imparted by a cam 20, fast to the shaft 2.

A roll 21 is journaled to rotate upon a stud 22, fast to the slide 15. Said roll is provided with a groove 24 in the periphery thereof and is constructed to be moved longitudinally of the stud 22 by a shipper 25, having a flange 26 thereon, which enters the groove 24, said shipper being fastened to a horizontal reciprocatory bar 27, constructed to slide longitudinally thereof in the slides 15 and to which a reciprocatory motion is imparted by a spring 128 and a lever 28, pivoted at 29 to a bracket 30, fast to the frame 1 of the machine. A horizontal rocking motion is imparted to the lever 28 by a cam-plate 31, fast to the inside end tackle-wheel 32. A groove 33 is provided in the rear face of the vertical arm of the lever 17, Figs. 2 and 4, and when in the operation of the machine, hereinafter described, the shipper 25 carries the periphery of the roll 21 in line with the groove 33 the slides 15 and back needle-bar 14, together with the needles 13, will not be carried toward the left, Fig. 2, to so great a distance as when the periphery of said roll 21 is out of line with the groove 33 and in line with the portion of the lever adjacent to said groove, and thus the needles 13 may be drawn back to a greater or less extent, as may be desired, giving a greater or less length to the loops drawn by said horizontal needles.

The object of the hereinbefore-described construction by which the back-bar needles are enabled to take short or long stitches, as may be desired, is that the first few courses of each section of fabric are preferably knit in a shorter stitch, forming the ordinary plain fabric on the edge of each section of fabric, and subsequently a one-and-one rib is knit which requires a longer loop. When, therefore, it is desired to knit the short stitches upon the edge of the fabric hereinbefore referred to, the roll 21 is brought in line with the groove 33, and when a longer loop is knit the roll 21 is carried out of line with the groove 33 and into line with the portion of the lever adjacent to said groove, thus draw-

ing the needles 13 back to a greater distance to take up the longer loops, which are made while the machine is making a one-and-one-rib fabric.

The yarn 34 used in making the plain rib fabric is carried into the back-bar needles 13 by either one of the thread-carriers 35 or 36, these thread-carriers being fastened, respectively, to thread-carrier bars 37 and 38. The connecting-thread is carried to the needles by a thread-carrier 39, fast to a thread-carrier bar 40. The thread-carrier bars 37, 38, and 40 slide in ways formed in guide-bars 37', 38', and 40', respectively, being held in said guide-bars by screws 37², 38², and 40², which pass through slots 37³, 38³, and 40³, respectively, formed in the thread-carrier bars 37, 38, and 40, respectively. The screws 37², 38², and 40² not only serve to hold the thread-carrier bars in their respective guide-bars 37', 38', and 40', but also serve as a means for attaching said guide-bars 37', 38', and 40' to a bracket 134, fast to another bracket, 135, said last-named bracket being fastened to the frame 1 of the machine. The thread-carrier bars 37, 38, and 40 have fast thereto dogs 41, 42, and 43, respectively, constructed to be engaged by a slide 44, adapted to slide in ways 45, provided in the under side of a slide 46, arranged to slide in ways 47, fast to the frame 1. A longitudinal reciprocatory motion is imparted to the slide 46 by a lever 48, to which said slide is connected by a link 49. The lever 48 is pivoted at 50 to a bracket 51, and a rocking motion is imparted to said lever by a cam 52, fast to the main driving-shaft 2.

It will be seen that by moving the slide 44 longitudinally thereof and transversely of the slide 46 said slide 44 may be brought into line with either one of the dogs 41, 42, or 43, as may be desired, and this longitudinal movement of the slide 44 is obtained by means of levers 53, fast to a rock-shaft 56, said levers 53 being connected by a plate 54, which engages projections 55 55 upon the lower side of the slide 44. The shaft 56 has a rocking motion imparted thereto by an arm 57, fast thereto and projecting downwardly therefrom in contact with a pattern-wheel chain 58. The pattern-chain 58 is driven by a pattern-wheel 59, journaled to rotate upon a stud 60, fast to the frame 1. A rotary motion is imparted to the pattern-wheel 59 by a ratchet 61, fast thereto, and by a pawl 62, pivoted at 63 to a cam-lever 64. The cam-lever 64 is pivoted at 65 to the frame 1 of the machine and is raised and lowered by a cam 66, fast to the main driving-shaft, Fig. 3.

When the arm 57, levers 53, and slide 44 are in the position indicated in Fig. 3, with said arm 57 in contact with the links 125 of the pattern-chain 58, said slide 44 will engage the dog 41, and as the slide 46 is moved longitudinally thereof, as hereinbefore described,

said slide 44, dog 41, thread-carrier bar 37, and thread-carrier 35 will be moved longitudinally of said thread-carrier bar and across the fabric. When, however, the pattern-chain has been rotated, as hereinafter described, until the chain-block 132 engages the arm 57, then said arm will be lifted sufficiently to rock the levers 53 toward the right in said Fig. 3 and move the slide 44 toward the right until it is in line with the dog 42. Then upon a reciprocatory movement of the slide 46 said slide 46, together with the slide 44, dog 42, thread-carrier bar 38, and thread-carrier 36, will be moved across the fabric. When the chain-block 133 engages the arm 57, said arm will be lifted still higher, the levers 53 will be moved still farther toward the right, together with the slide 44, and thus bring said slide 44 in line with the dog 43, so that upon the next reciprocatory movement of the slide 46 said slide 46, together with the slide 44, dog 43, thread-carrier bar 40, and thread-carrier 39, will be moved across the fabric. Thus it will be seen that by the rotation of the pattern-chain with the different blocks thereon the arm 57 is moved to different positions, thus moving the levers 53 and setting the slide 44 in line with the dogs 41, 42, and 43, respectively, so that upon a reciprocatory movement of the slide 46 the thread-carrier bars 37, 38, and 40, respectively, will be given a reciprocatory movement, together with their respective thread-carriers.

The yarn is pushed down between the horizontal needles 13 by sinkers 67, arranged to slide in ways 68, formed in the sinker-bar 69, fast to the frame of the machine, a downward longitudinal motion being imparted to the sinkers 67 by a slur-cock 70, carried by a slur-cock bar 71, to which motion is imparted by an arm 72, fast to the slide 46. The distance to which the sinkers can be pushed downwardly by the slur-cock 70 is regulated by the inside falling bar 73, which rests upon the falling bar 74. The falling bar 74 slides in ways 131 and is raised and lowered by means of the rods 75, fast at their lower ends to levers 76, each of which levers is pivoted upon a stud 18, fast to the frame 1 of the machine, and has rotatably mounted thereon a cam-roll 77, constructed to bear against the periphery of a cam 78, fast to the main driving-shaft 2. The inside falling bar 73 acts as a gage to determine the distance to which the sinkers may be pushed between the needles 13 by the slur-cock 70, and this inside falling bar is adjustable as to height, thus varying the distance to which the sinkers are pushed between the needles 13, and consequently the length of the loop of yarn, by the construction shown in Figs. 4 and 5, in which it will be seen that the inside falling bar 73 is provided with a cam-surface 79 upon its under side, adapted to ride upon a cam-surface 80, provided upon the falling bar 74. Longitudinal motion is

imparted to the inside falling bar 73 by an arm 81, which projects between two pins 82 82, fast to the rear face of the inside falling bar 73. Said arm 81, Figs. 4 and 5^a, is fastened to a slide 83, constructed to slide in ways 84, provided upon the frame 1. Longitudinal motion is imparted to the slide 83 by a cam 85, fast to the inside tackle-wheel 32, the outer end of said slide 83 being beveled to facilitate engagement with said cam.

It will be seen that by pushing the inside falling bar 73 toward the right, Fig. 5, the upper edge of said inside falling bar will stand at different heights according to the relative positions of the cam-surfaces 79 and 80, and thus regulate the distance to which the sinkers can be pushed by the slur-cock 70. The slur-cock 70 is arranged to slide vertically in the slur-cock bar 71 in ways 86 provided thereon and is held downwardly by a spring 87.

The beards of the needles 13 and 3 are pressed at the proper time to allow the stitches previously made to be knocked off said needles in a manner well known to those skilled in this art, as hereinafter more fully described, by a presser-blade 88, fast to a presser-bar 89. The presser-bar 89 is fast at opposite ends thereof, respectively, to presser-bar levers 90, and these levers are pivoted to studs 91, fast to brackets 92, said brackets being fastened to the frame 1 of the machine. The levers 90 and the presser and presser-bar connected thereto are raised and lowered by links 93, pivotally connected to levers 94, said levers 94 pivoted at 9 and actuated by a cam-roll 95, which in turn is actuated by a cam 117.

The knock-over bar 96 for the back-bar needles is stationary and fixed to the frame of the machine. The knock-over bar 97 for the front-bar needles has a vertical reciprocatory motion imparted thereto, said knock-over bar being fastened to a slide 98, constructed to slide in ways on the frame of the machine and connected by rods 99 to a lever 100, pivoted at 18 to the frame of the machine and having a rocking motion imparted thereto by a cam-roll 101, which bears against the periphery of the cam 102. The downward motion of the levers 100 is limited by stop-bars 103, fast at their upper ends to the levers 100 and abutting at their lower ends against the cross-tie 104, fast to the frame of the machine.

During the operation of knitting the connecting-thread between two sections of knit fabric it is necessary, as hereinafter described, to hold the front needles down out of operation, and when thus held down said front needles hold loops 119 of the connecting-thread 118 thereon, Fig. 8, while the back-bar needles 13 take one course of said connecting-thread and form the loops 120 in said figure. Said front bar is still held down while the machine takes another course and lays the loops 123 in the needles 13. The machine

then takes two courses without any yarn under the sinkers, and the loops 123 are thus pressed entirely off the back needle-bar.

The operation hereinbefore described of holding down the front needles is accomplished by a lever 105, pivoted at 106 to the frame of the machine and constructed to be rocked upon said pivot from the position shown in dotted lines, Fig. 6, to that shown in full lines in said figure by a collar 107, fast to a reciprocatory shipping-rod 108, constructed to slide in ways 109, formed upon the frame of the machine. The collar 107 has a downwardly-projecting arm 110, to which is fastened a pin 111, which engages a slot 112, provided in the shipping-lever 105. A longitudinal reciprocatory motion is imparted to the shipping-rod 108 by a cam-plate 113, fast to the inside end tackle-wheel 32 and constructed to engage a dog 114, fast to the shipping-rod 108.

The inside end tackle-wheel 32 is rotated by a pawl 115, pivoted to the cam-lever 64. It will be evident that as the inside end tackle-wheel 32 is rotated by the pawl 115 and pawl-lever 64 the cam 113, coming in contact with the dog 114, will move the shipping-rod 108 toward the left, Figs. 6 and 7, and rock the shipping-lever 105 from the position shown in dotted lines to that shown in full lines therein, bringing the outer end of said lever over the top of the slide 5 and preventing the same from being raised by the spring 116, thus holding the front needles down out of action for the purpose hereinafter described.

The operation of our improved knitting-machine is as follows: A section of ordinary one-and-one-rib fabric is first knitted, then a connecting-thread introduced, and another section of one-and-one-rib fabric is then knit, the two sections of knitted fabric being joined together by the connecting-thread in a manner hereinafter fully described. The one-and-one-rib fabric is knit in a manner well known to those skilled in the art. The yarn 34 is carried into the horizontal needles 13 by either one of the thread-carriers 35 or 36, said thread-carriers 35 and 36 being carried across the needles by the thread-carrier bars 37 and 38, respectively, longitudinal motion being imparted to the thread-carrier bars 37 and 38 by the dogs 41 and 42, respectively. The dog 41 or 42, as the case may be, engages the slide 44, the position of the slide 44 being determined by the carrier-chain 58, arm 57, and levers 53. The slide 44 is carried by the slide 46, and the slide 46 has a longitudinal motion imparted thereto by the link 49, lever 48, and cam 52. The slide 46 also imparts motion to the slur-cock bar 71 and slur-cock 70 through the arm 72. The yarn-carriers are a little in advance of the slur-cock, and after the yarn is carried across the needles 13 it is pushed down between said needles by the sinkers 67, forming a series of loops between the hori-

zontal needles, as shown in Fig. 9. The length of these loops may be varied, as will be hereinafter explained. The yarn having been carried across the needles 13 and the loops formed between said needles by the sinkers, said sinkers are lifted out from between the needles 13 by the action of the inside falling bar 73 and falling bar 74. The falling bar 74 is raised and lowered by the rods 75, levers 76, cam-roll 77, and cam 78. The loops are now formed between the horizontal needles 13, as shown in Fig. 10, and the sinkers 67 are withdrawn from between the needles. The needles 13 are now drawn back into position for the presser 88 to act on the beards of said needles, and this is accomplished by the presser-bar 89, which is drawn down by the presser-bar levers 90, presser-bar links 93, levers 94, cam-roll 95, and cam 117. As the needles 13 are drawn back and the presser 88 presses downwardly upon the beards of said needles the loops hereinbefore referred to are drawn through the loops previously formed upon the needles 13, as shown in Fig. 11. The needles 3 now descend, being carried downwardly by the front needle-bar 4, as shown in Fig. 11, so that the beards of the needles 3 are brought midway between the stitches on the needles 13. The needles 3 and needle-bar 4 are carried downwardly by the front needle-slides 5, links 7, levers 8, cam-rolls 11, and cams 12, the thread being fed to the vertical needles 3 by the horizontal needles 13, which as they are drawn toward the right between said needles 3 lay the thread along the front of said needles, so that when the needles 3 descend from the position shown in Fig. 9 to that shown in Figs. 10 and 11, respectively, the thread will be carried into the beards of the needles 3. The presser 88 is now again drawn downwardly in the same manner as hereinbefore described and presses the beards of the needles 3 down, so that the thread which has just been fed to said needles may be drawn in the form of loops through the loop previously formed upon said needles. The loops are cast off the needles 13 by the back knock-over bar 96, which is stationary, the backward motion of the needles 13 acting to throw off the switch, as shown in Fig. 11. The loops are cast off the needles 3 by the action of the front knock-over bar 97, which has a vertical reciprocatory movement, as shown in Fig. 11, said knock-over bar 97 being moved vertically by the slide 98, to which is attached, said slide receiving vertical movement through the rods 99, levers 100, cam-rolls 101, and cam 102. After the required length of one-and-one rib fabric has been knit the connecting-thread 118 is carried across the fronts of the needles by the thread-carrier 39, said thread-carrier being fast to the thread-carrier bar 40 and having motion imparted thereto by the mechanism hereinbefore described in relation to the

thread-carrier bars 37 and 38. The connecting-thread is thus delivered to the needles 13 and 3, and the regular stitch illustrated in Fig. 8 is formed during the progress of the thread-carrier across said needles in one direction, the loops 119 being formed by the vertical needles 3 and the loops 120 by the horizontal needles 13, the loops 121 and 122 in said figure representing the loops of yarn previously held upon the vertical and horizontal needles, respectively. It will thus be seen that one course of the regular one-and-one-rib stitch is formed in the connecting-thread, the same being knit into the yarn of the fabric previously knit. As the front needle-bar 4 is carried down to the lowest point and casts off the loops 121 the end tackle-wheel 32 carries the cam-plate 113 into contact with the dog 114, moving the shipping-bar 108 toward the left, Figs. 6 and 7, and thus through the downwardly-projecting arm 110 and pin 111 the forward end of the lever 105 is brought over the front needle-bar slide 5 and holds the same downwardly and out of operation. The needles 13 are now returned to the position for taking the connecting-thread 118 upon its return movement toward the right, Fig. 8. The sinkers are moved downwardly, forming loops between the horizontal needles, as hereinbefore described. The needles 13 are then drawn backwardly and pressed, as hereinbefore described, forming the loops 123 on the needles 13 only. The loops 123 are pressed off the back-bar needles in the following manner: The chain-wheel 59 is revolved and brings the chain-block 124, Fig. 3, in contact with the arm 57 and through its connections draws the back-bar slide 44 out of line with the carrier-bar dogs and allows the machine to make two courses after fitting the connecting-thread into the horizontal needles without feeding any thread to the needles. The back needle-bar 14 now draws back and the presser, acting as hereinbefore described, presses the stitches entirely off the back-bar needles 13 and makes a longer loop 123, Fig. 8. It will be understood that the front-bar needles 3 still retain the loops 119. The chain-wheel 59 and the inside end tackle-wheel 32 are again revolved, allowing the dog 57 to pass off the chain-block 124 to the chain-block 125, which brings the carrier-bar slide 44, through its connections, in line to engage the dog 41 and thread-carrier 35 and at the same time the cam-plate 113, which is fast to the inside tackle-wheel 32, is moved so as to disengage the dog 114, which allows the shipping-bar 108 to be moved toward the right, Figs. 6 and 7, by its actuating-spring 126, rocking the lever 105 upon its pivot and moving it to the position shown in dotted lines, Fig. 6, thus allowing the front-bar needles to again move upwardly into position to receive a new stitch. At the same time the falling-bar slide 83 is moved toward the right, Fig. 4, by the

action of the cam 85, fast to the inside of the end tackle-wheel 32, which engages the beveled left-hand end of said falling-bar slide 83 and, moving it toward the right, carries the arm 81 in the same direction, and the outer end of said arm lying between the pins 82 82 this movement carries the inside falling bar 73 toward the right, sliding said inside falling bar 73 longitudinally upon the falling bar 74, as shown in Fig. 5. The cams 79 and 80 upon the under and upper surfaces, respectively, of the inside falling bar 73 and falling bar 74 cause the inside falling bar to be raised by this longitudinal movement toward the right, and thus shortens the distance to which the sinkers 67 can be pushed downwardly by the slur-cock 70 between the needles 13. It will be understood that the bar 73 controls the distance through which the sinkers are moved downwardly between the needles 13, and when the bar 73 has been moved from the position shown in Fig. 5 (in which figure it is shown in position for the one-and-one-rib fabric) toward the right it will then be in position for short stitches to be taken by the back-bar needles. At the beginning of each section of fabric short stitches, forming a welt or smooth edge, are preferably taken, and to prevent these short stitches from being broken when the back needle-bar is drawn back the distance to which the back-bar needles are moved by the back bar 14, slide 15, and lever 17 is reduced by moving the roll 21 longitudinally of the stud 22, Fig. 4, until the outside periphery of said roll comes in line with the groove 33 in the lever 17. It will be seen that by thus moving the roll 21 until its periphery comes in line with the groove 33 a certain amount of movement of the lever 17 as imparted thereto by the cam 20 will be lost, and therefore the slide 15, back bar 14, and the needles 13 attached thereto will be moved through a shorter distance, taking shorter stitches than would be the case when the outside periphery of the roll 21 is in line with the left-hand portion of the lever 17 and out of line with the groove 33, Fig. 4. The roll 21 is moved longitudinally of the stud 22 by the shipper-bar 27 and shipper 25, fast thereto, and having its flange 26 projecting into the groove 24 in the roll 21. The shipper-bar 27 is moved toward the right by the lever 28, said lever being rocked upon its pivot 29 by the cam-plate 31, fast to the outside of the end tackle-wheel 32. As soon as the cam-plate 31 has passed upwardly and disengaged the lever 28 the spring 128 will return the shipper-bar 27 and its connecting parts to the position shown in Fig. 4. The carrier-bar 37 and carrier 35 have now carried the yarn 34, as hereinbefore described, in front of the needles 3 and 13. The presser acts on the front-bar needles 3, as hereinbefore described, and presses the loops 119, which have been retained through the several motions hereinbe-

fore described, by the front-bar needles over the loops 129, Fig. 8, just formed by the vertical needles from the yarn 34, the back-bar needles 13 forming the loops 130 from said yarn, as shown in said Fig. 8. As the front-bar needles are drawn down to cast off the loops 119 the inside end tackle-wheel 32 brings the cam-plate 127, Fig. 3, into contact with the dog 114 and again moves the lever 105 over the slide 5 through the shipping-rod 108 and collar 107. The front-bar needles are now held down for one or more courses, as desired, while the needles 13 knit a plain fabric for a welt, and upon the end tackle-wheel being again revolved the dog 114 is released and the lever 105 moved to the position shown in dotted lines, Fig. 6, thus releasing the slide 5 and front-bar needles and allowing said needles to come in proper position for making the regular one-and-one-rib stitches, which is continued until another section of one-and-one rib fabric is knit of the desired length, and the operation of knitting the connecting-thread into the one-and-one-rib fabric is again repeated.

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

1. A knitting-machine comprising in its construction two sets of needles, two thread-carriers, viz, a yarn-carrier and a connecting-thread carrier, mechanism to impart a reciprocatory movement to each set of needles, respectively, mechanism to move said yarn-carrier and deliver yarn to said sets of needles, mechanism to move said connecting-thread carrier across said two sets of needles and deliver connecting-thread thereto, mechanism to hold one set of needles out of operation while a reciprocatory motion is imparted to the second set of needles and while said connecting-thread carrier is delivering connecting-thread to said second set of needles, and mechanism to hold said yarn and connecting-thread carriers out of action while another forward and back reciprocatory motion is imparted to said second set of needles without any yarn being fed to either set, whereby the loops are cast off of said second set of needles.

2. A knitting-machine comprising in its construction, two sets of needles, a set of sinkers, a yarn-carrier, a connecting-thread carrier, a presser and knock-over bar for each of said sets of needles, mechanism to impart a reciprocatory motion to each of said sets of needles, mechanism to move said yarn-carrier across said needles and deliver yarn thereto, mechanism to move said connecting-thread carrier across said needles forward and back and deliver said connecting-thread to both sets of needles in its first motion thereacross, and mechanism to hold one of said sets of needles out of action while said connecting-thread carrier is making its return movement and de-

livering thread to the second of said sets of needles.

3. A knitting-machine comprising in its construction two sets of needles, a set of sinkers, a yarn-carrier, a connecting-thread carrier, a presser and knock-over bar for each of said sets of needles, mechanism to impart a reciprocatory motion to each of said sets of needles, mechanism to move said yarn-carrier across said needles and deliver yarn thereto, mechanism to move said connecting-thread carrier across said needles forward and back and deliver said connecting-thread to both sets of needles in its first motion thereacross, mechanism to hold one of said sets of needles out of action while said connecting-thread carrier is making its return movement and delivering thread to the second of said sets of needles, and mechanism to hold said thread-carriers out of action while the second of said sets of needles makes a forward and back reciprocatory movement, without any yarn being fed to either set of needles, whereby said connecting-thread is cast off of said second set of needles.

4. A flat-rib-knitting machine comprising in its construction a vertical and a horizontal set of needles, a set of sinkers, a yarn-carrier, a connecting-thread carrier, a presser and knock-over bar for each of said sets of needles, mechanism to impart a reciprocatory movement to each of said sets of needles, mechanism to move said yarn-carrier across said needles and deliver yarn thereto, mechanism to move said connecting-thread carrier across said needles and deliver connecting-thread to both sets of needles in its first motion thereacross, mechanism to hold said vertical set of needles out of action while said connecting-thread carrier is making its return movement and delivering thread to said horizontal set of needles, and mechanism to hold said thread-carriers out of action while said horizontal set of needles makes a forward and back reciprocatory movement and casts off the connecting-thread.

5. A knitting-machine comprising in its construction a horizontal and a vertical set of needles, a slide to which said vertical needles are fastened, mechanism to raise and lower said slide, a lever, and mechanism to move said lever into and out of engagement with said slide.

6. A knitting-machine comprising in its construction a horizontal and a vertical set of needles, a slide to which said vertical needles are fastened, mechanism to move said slide downwardly, a spring to raise said slide, and mechanism constructed to engage said slide at its lowermost position and prevent the raising thereof.

7. A knitting-machine comprising in its construction a horizontal and a vertical set of needles, a slide to which said vertical needles

are fastened, mechanism to move said slide downwardly, a spring to raise said slide, a lever constructed to engage and hold said slide stationary against the action of said spring, a
 5 reciprocatory rod, a projection fast thereto constructed to engage said lever, a dog fast to said rod, and a rotary cam constructed to engage said dog and impart a longitudinal movement to said rod.

10 8. A knitting-machine comprising in its construction a vertical and a horizontal set of needles, a slide to which said horizontal set of needles is fastened, a roll journaled to rotate upon said slide, a cam, a cam-lever construct-
 15 ed with a groove therein, and mechanism to move said roll transversely of said slide into and out of line with said groove.

9. A knitting-machine comprising in its construction two sets of needles, a yarn-car-
 20 rier, a connecting-thread carrier, mechanism to reciprocate said yarn-carrier, mechanism to impart a reciprocatory motion to said needles, mechanism to cast off the loops from said needles, mechanism to throw said yarn-carrier
 25 out of action, mechanism to reciprocate said connecting-thread carrier, and mechanism to hold one of said sets of needles out of action while a reciprocatory motion is imparted to the other of said sets of needles, whereby two
 30 sections of knitted fabric are formed joined together by a detachable connecting thread

extending laterally thereacross and engaging the final loops of one of said sections and the primary loops of the other of said sections of knitted fabric.

35 10. A knitting-machine comprising in its construction two sets of needles, a yarn-carrier, a connecting-thread carrier, mechanism to reciprocate said yarn-carrier, mechanism to impart a reciprocatory motion to said needles, 40 mechanism to cast off the loops from said needles, mechanism to throw said yarn-carrier out of action, mechanism to reciprocate said connecting-thread carrier, and mechanism to hold one of said sets of needles out of action 45 while a reciprocatory motion is imparted to the other of said sets of needles, whereby two sections of knitted fabric are joined together by a detachable connecting-thread extending laterally thereacross and engaging the final 50 and primary loops, respectively, of said sections of knitted fabric in one direction and returning in the opposite direction through loops of its own formation.

In testimony whereof we have hereunto set 55 our hands in presence of two subscribing witnesses.

WILLIAM T. BARRATT.
 CHARLES J. SIBBALD.

Witnesses:

CHARLES S. KEHOE,
 EARL A. SMITH.