

No. 745,801.

PATENTED DEC. 1, 1903.

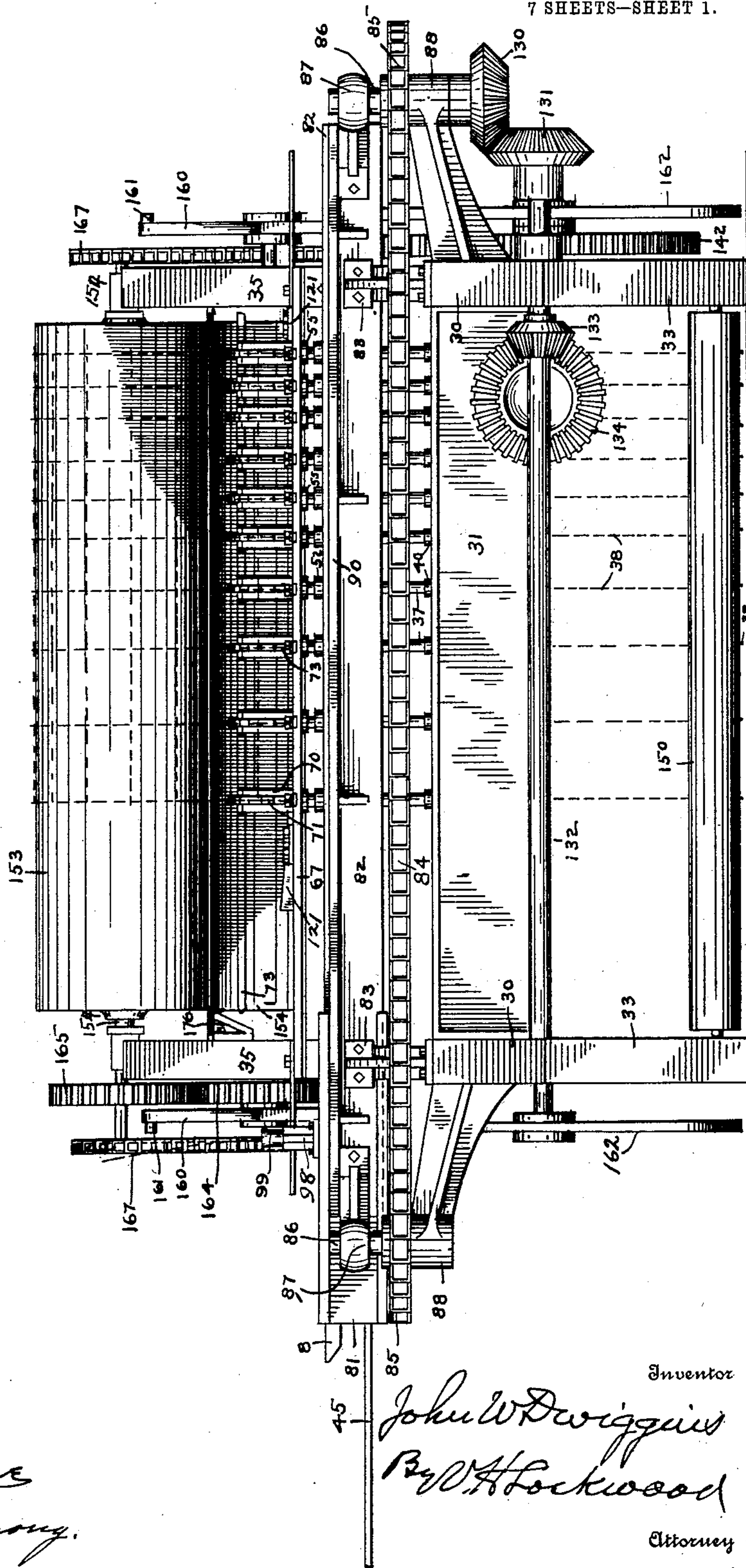
J. W. DWIGGINS.
WIRE FENCE MACHINE.

APPLICATION FILED MAY 27, 1903.

NO MODEL.

7 SHEETS—SHEET 1.

Fig 1.



Witnesses

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7 SHEETS—SHEET 2.

Fig 3.

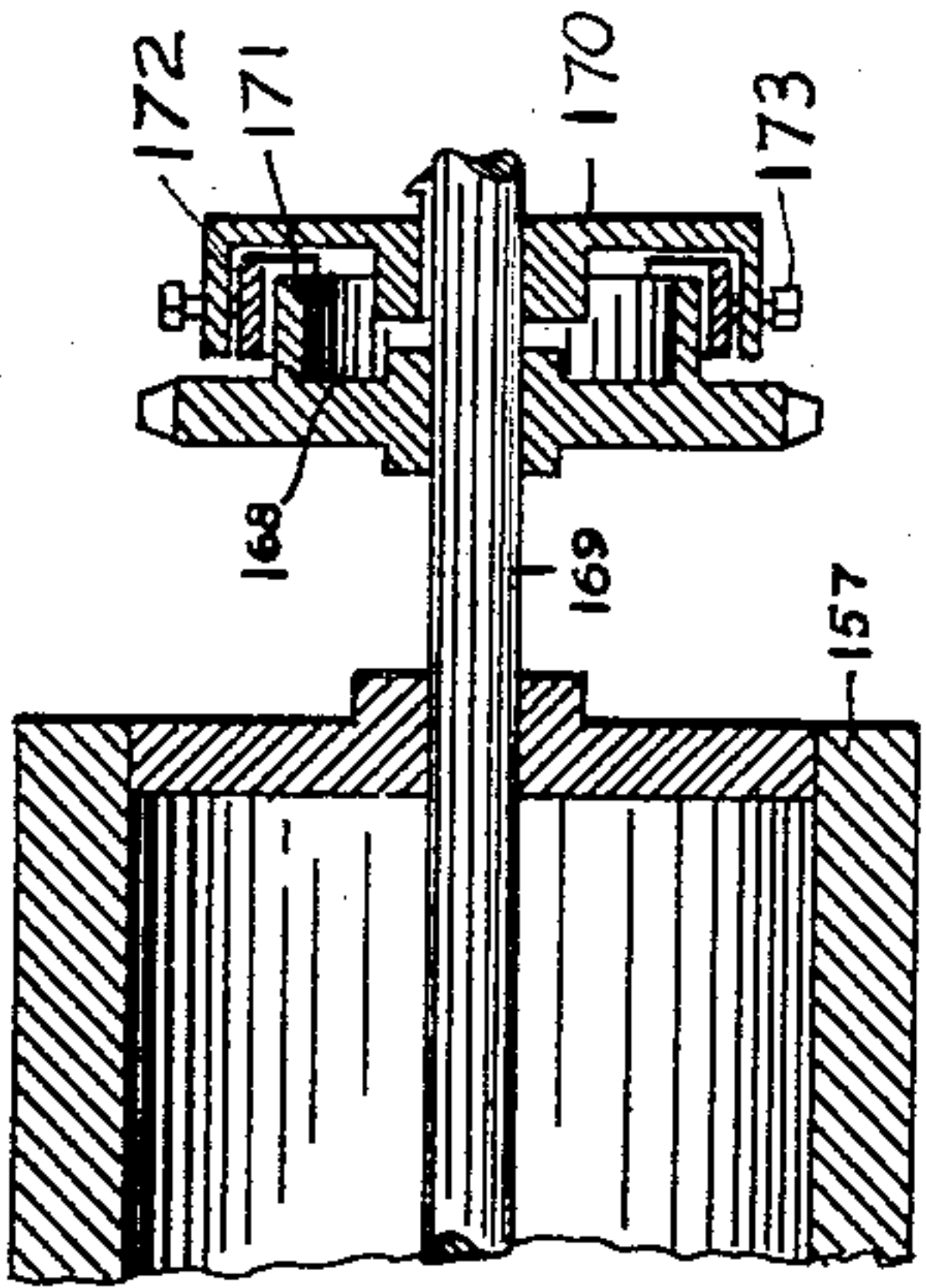
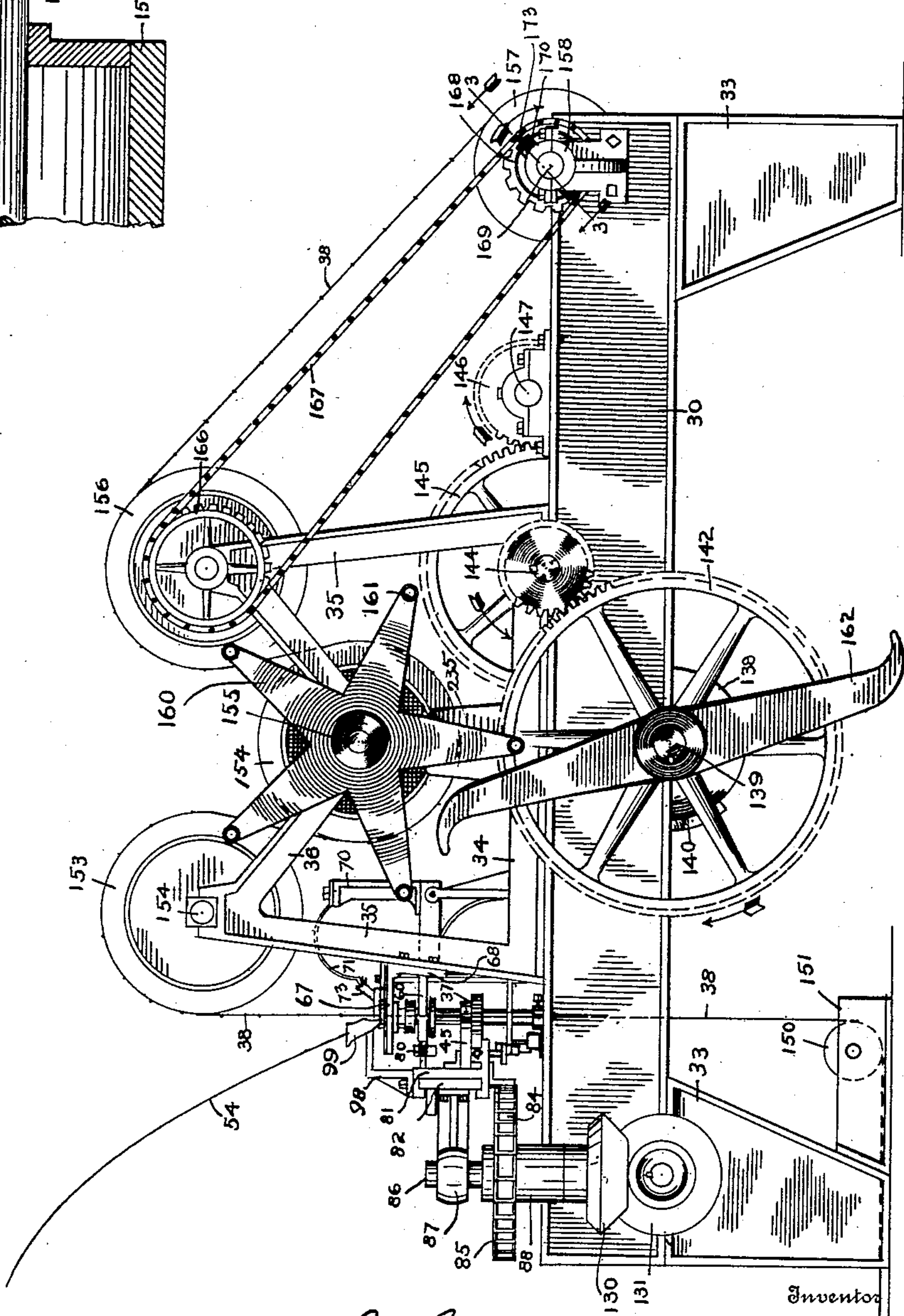


Fig 2.



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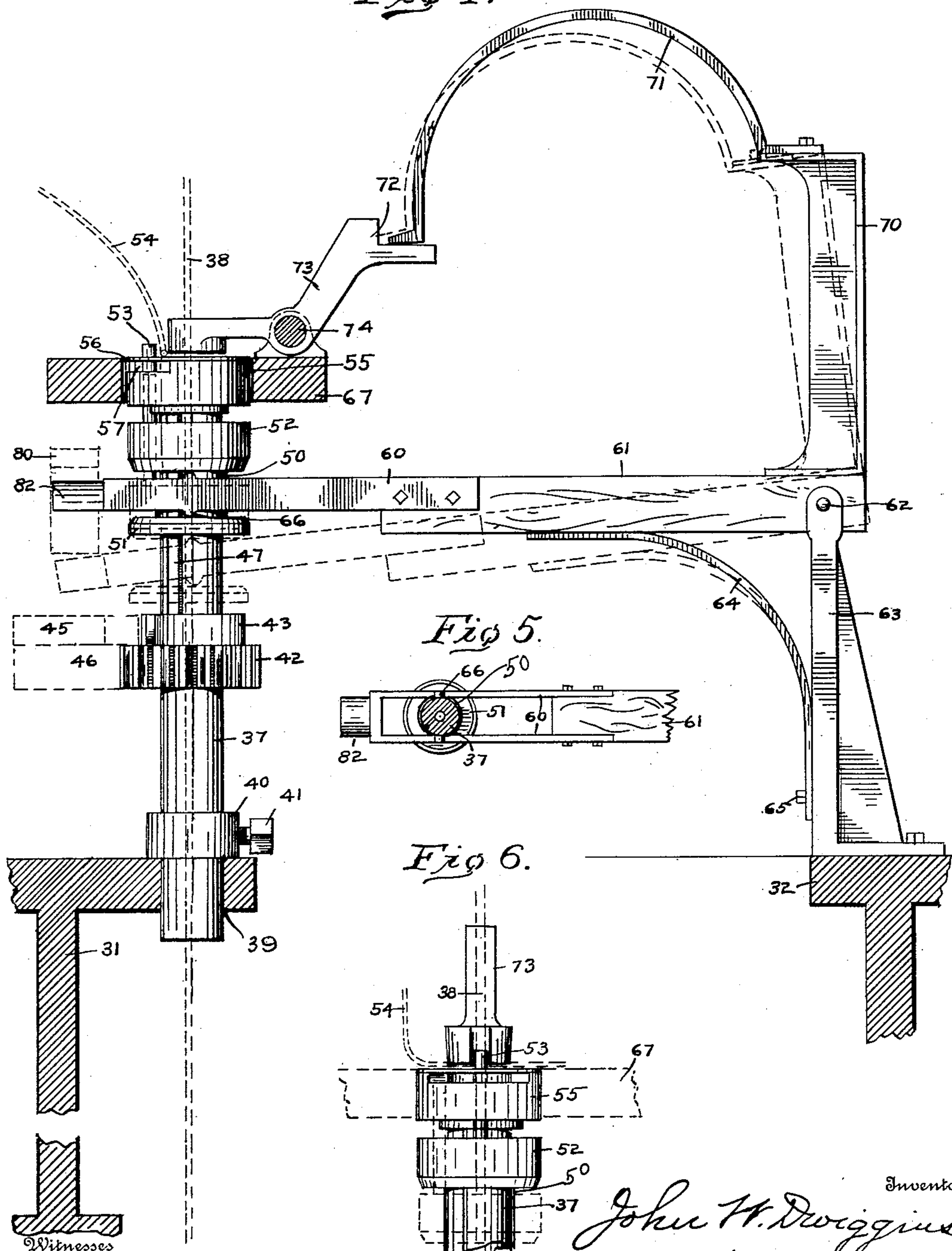
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7 SHEETS--SHEET 3.

Fig 4.

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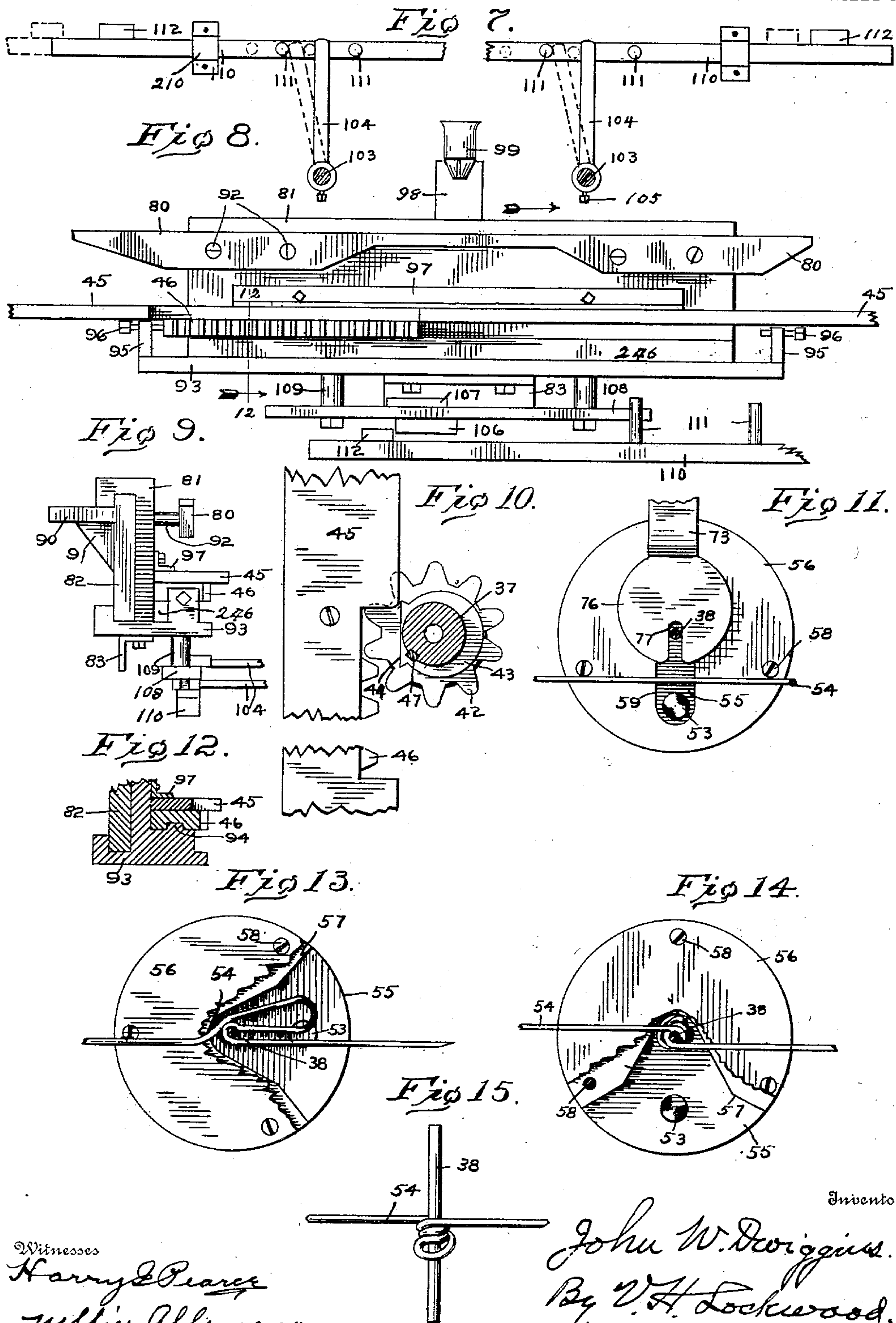
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7 SHEETS—SHEET 5.

Fig 16.

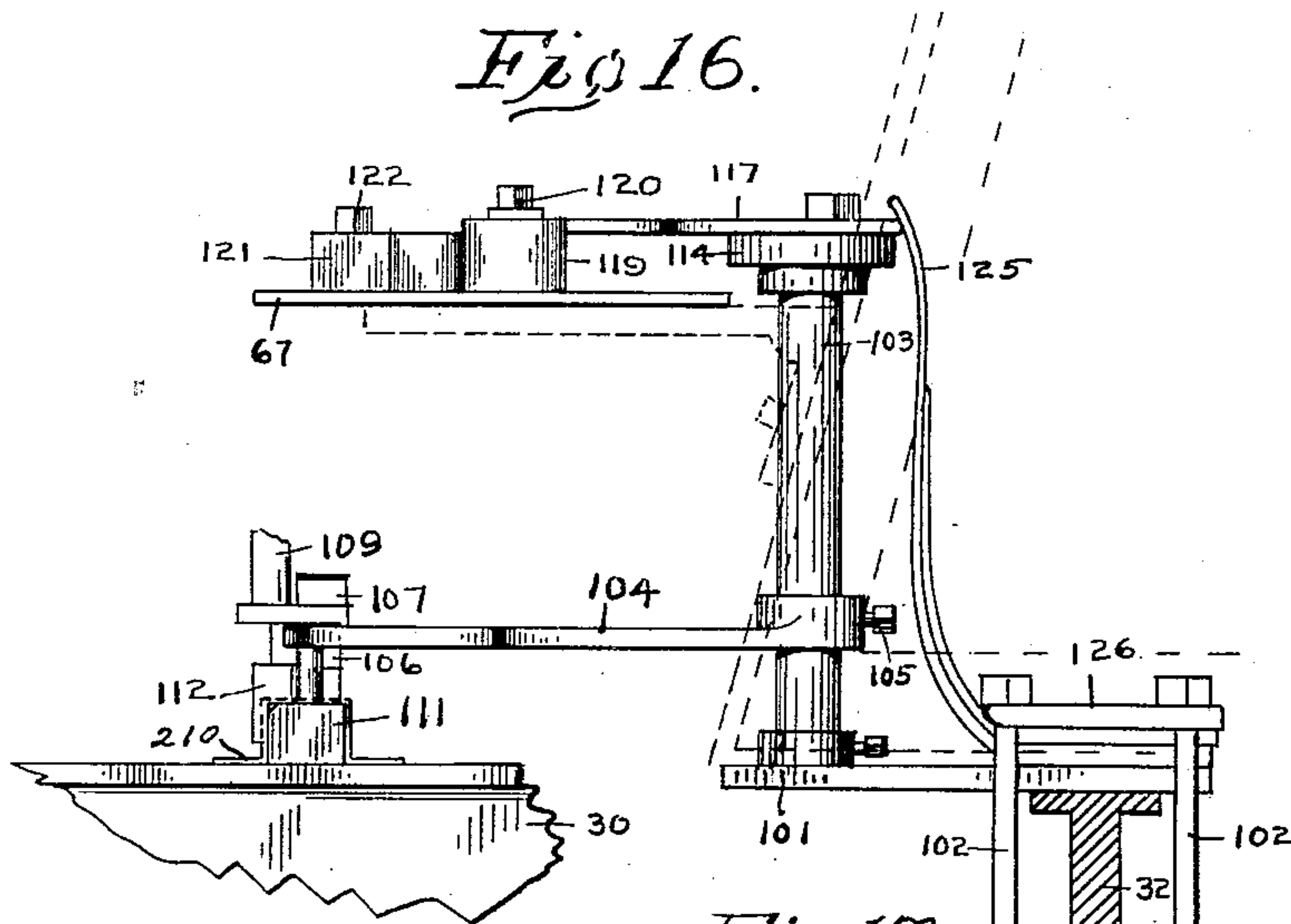


Fig 17

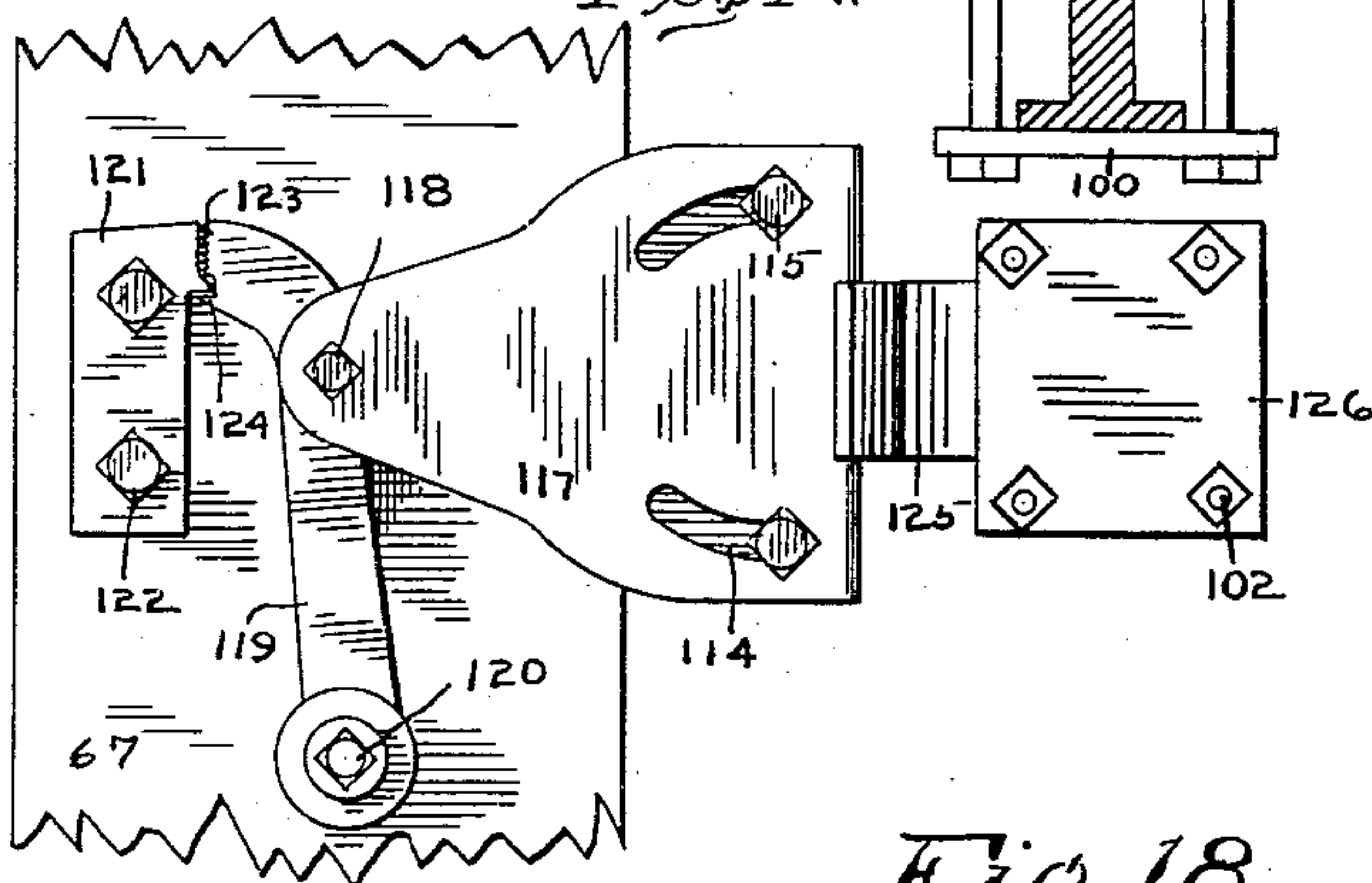


Fig 19

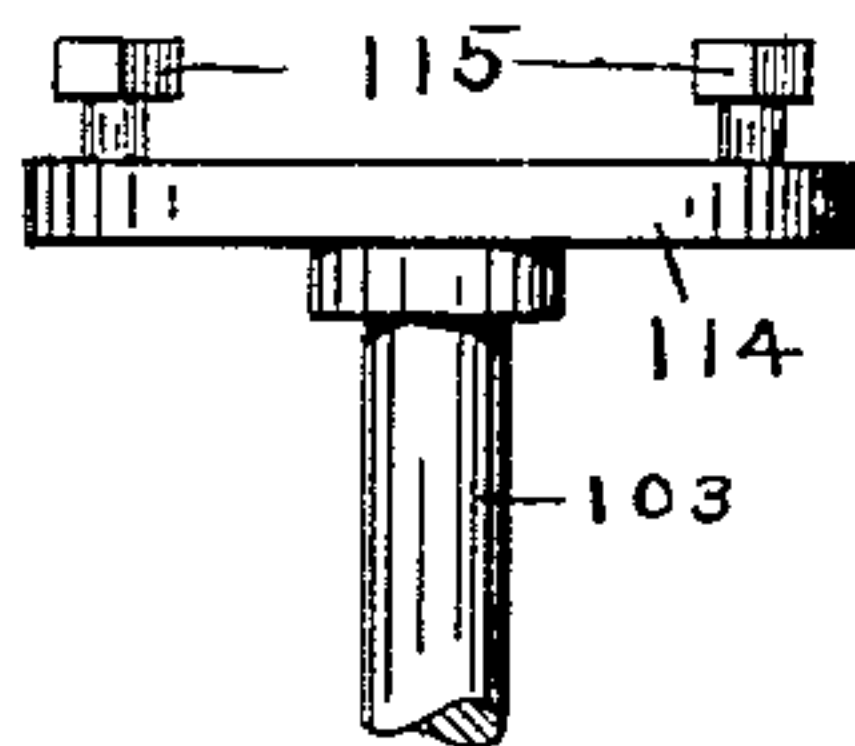
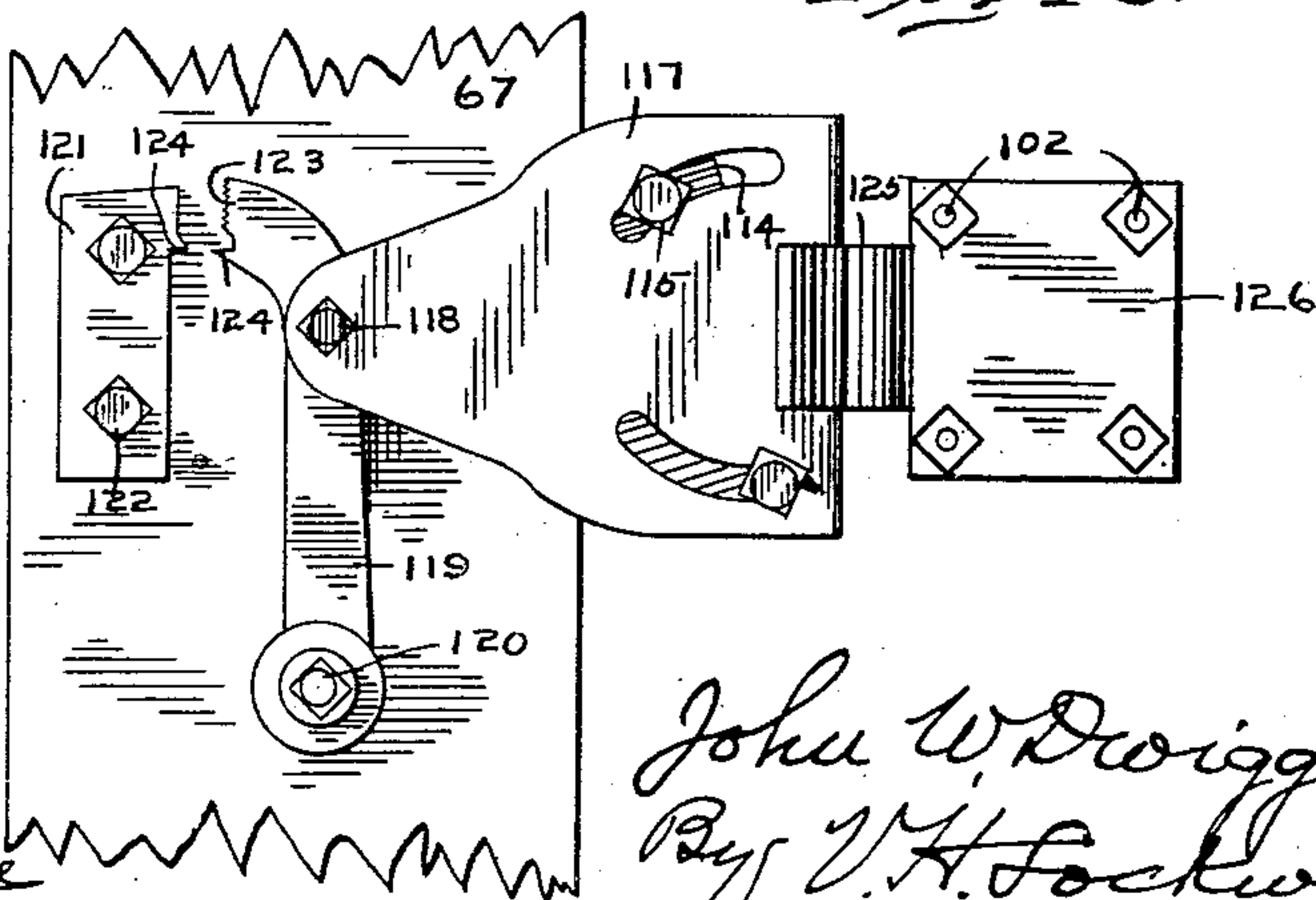


Fig 18.



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7 SHEETS—SHEET 6.

Fig 20.

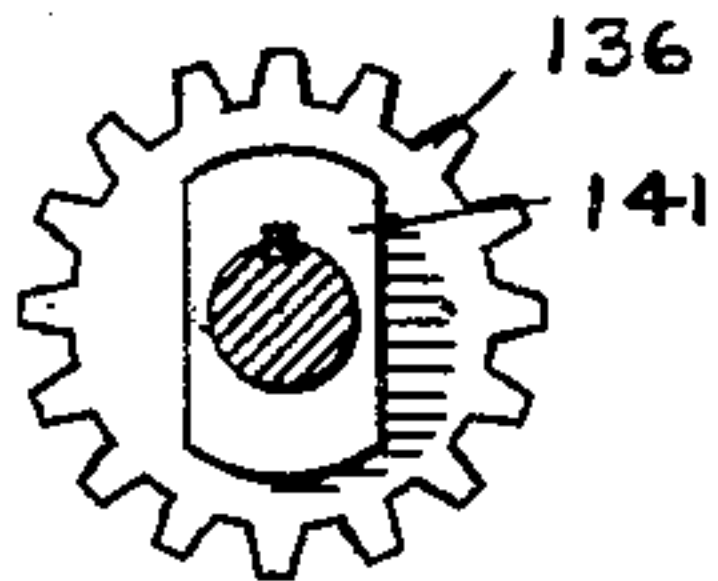


Fig 21.

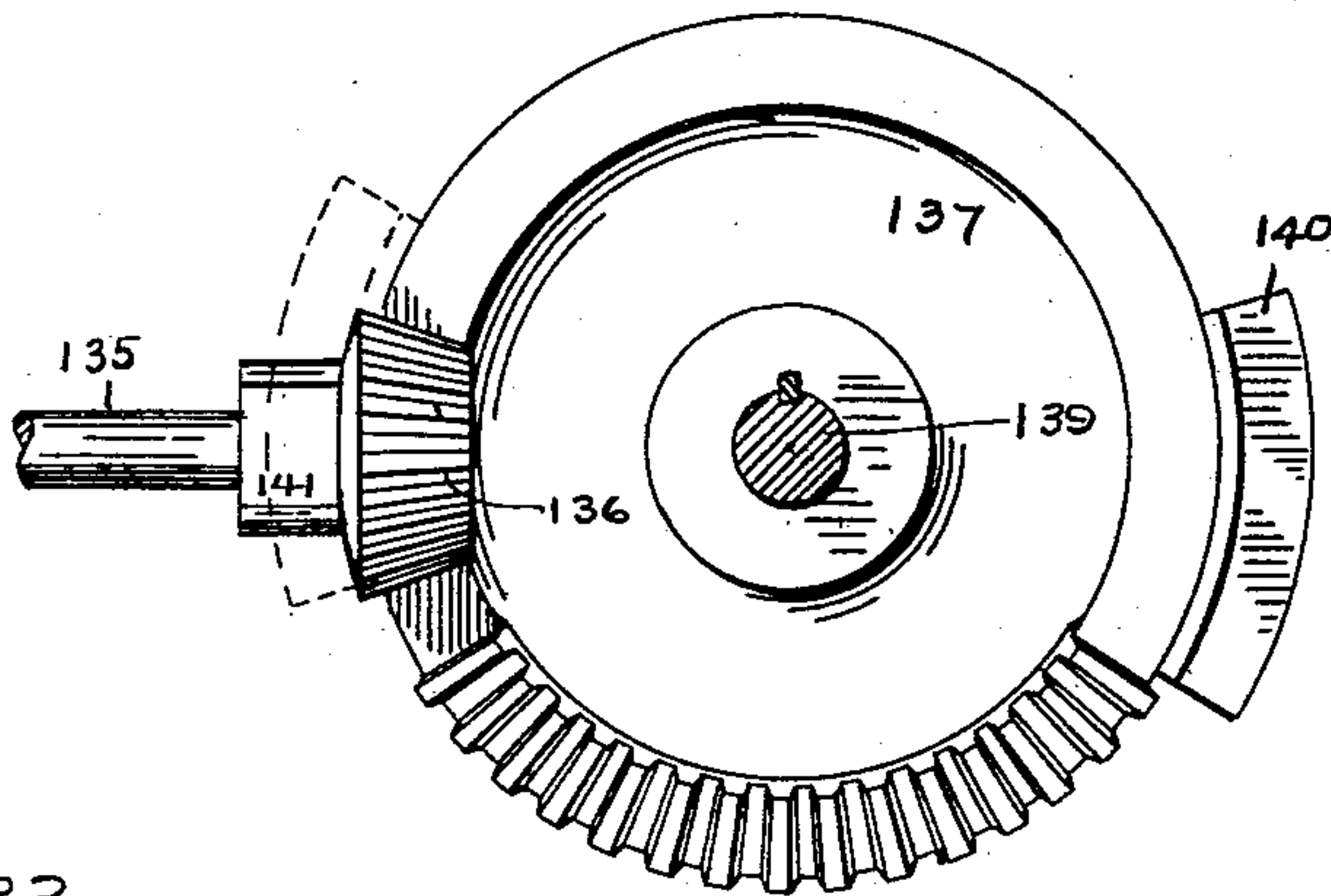


Fig 22.

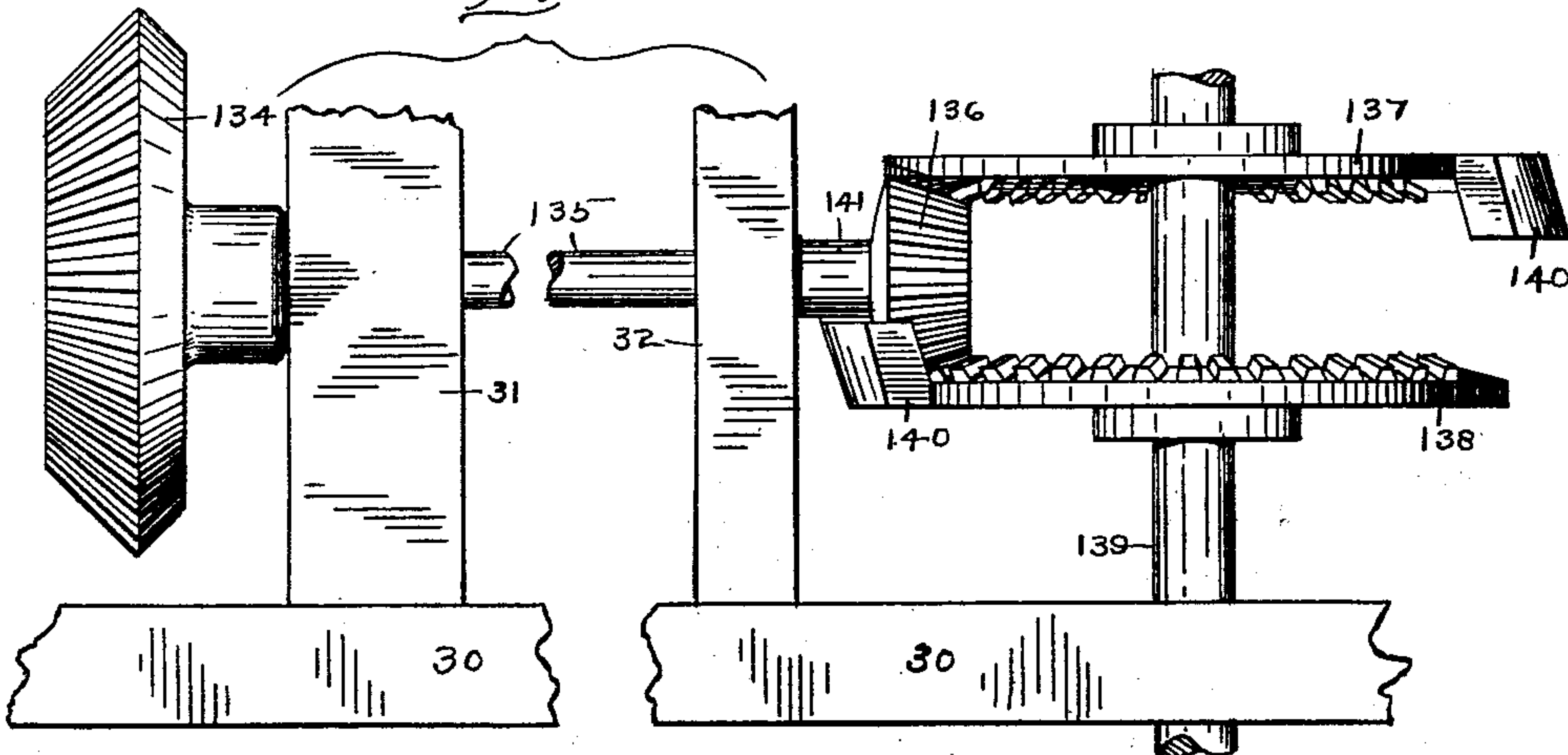
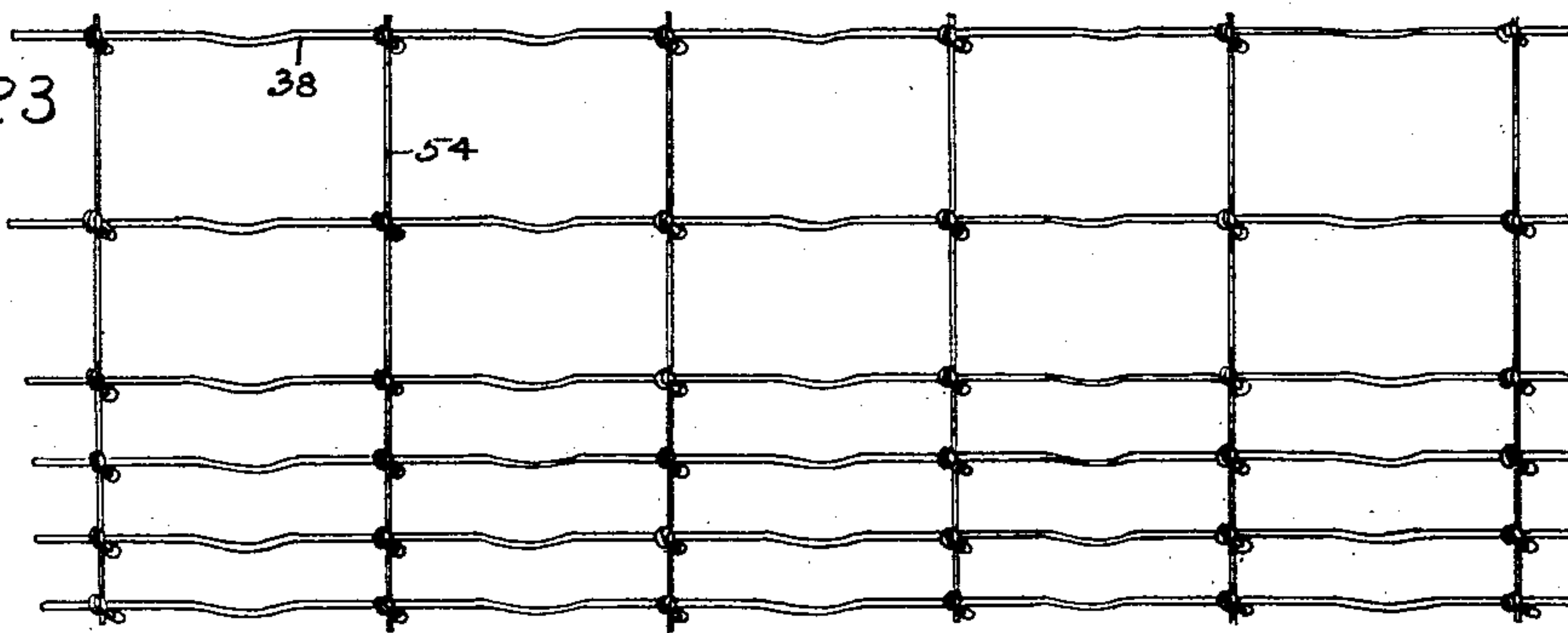


Fig 23.



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7 SHEETS—SHEET 7.

Fig 25.

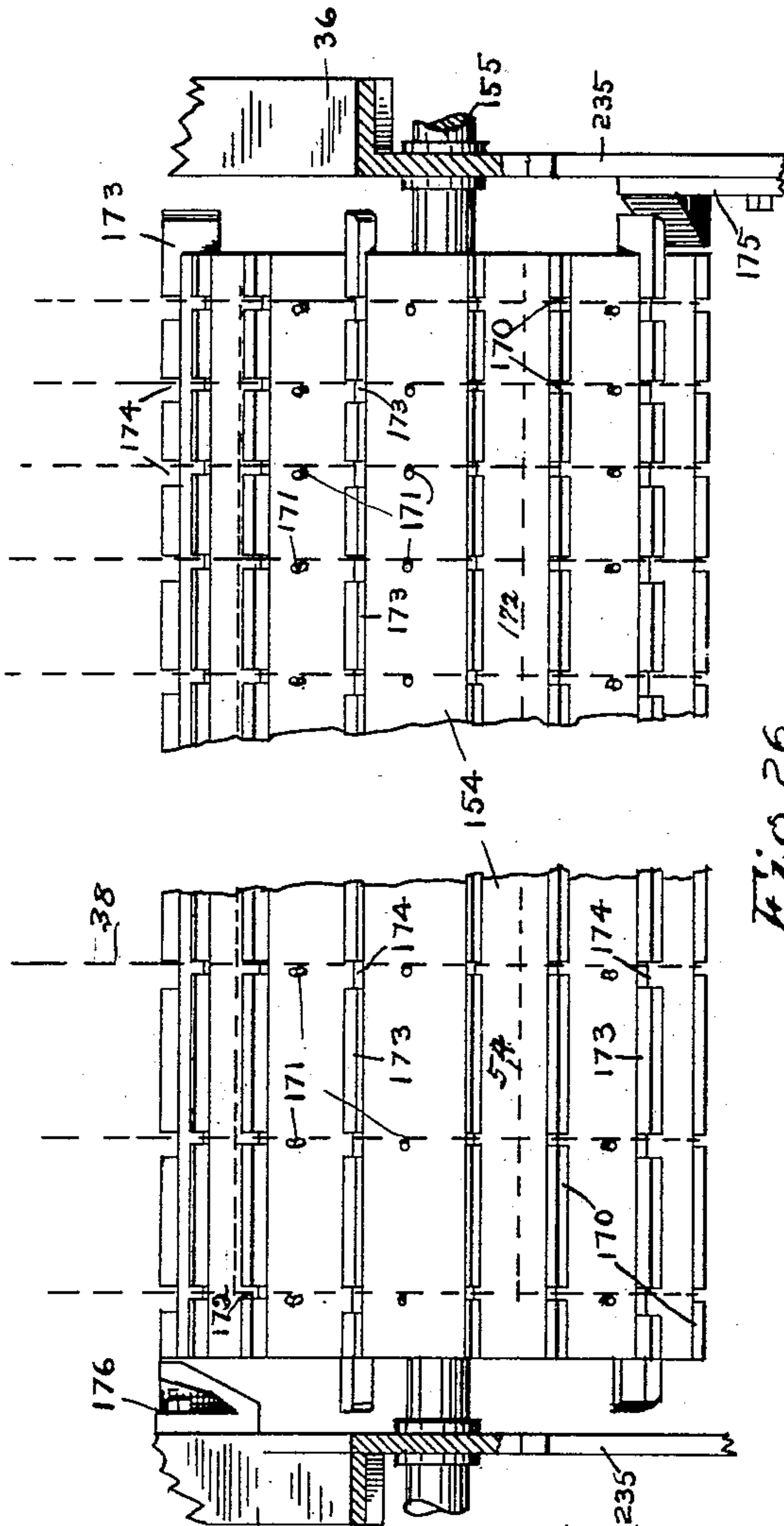


Fig 26.

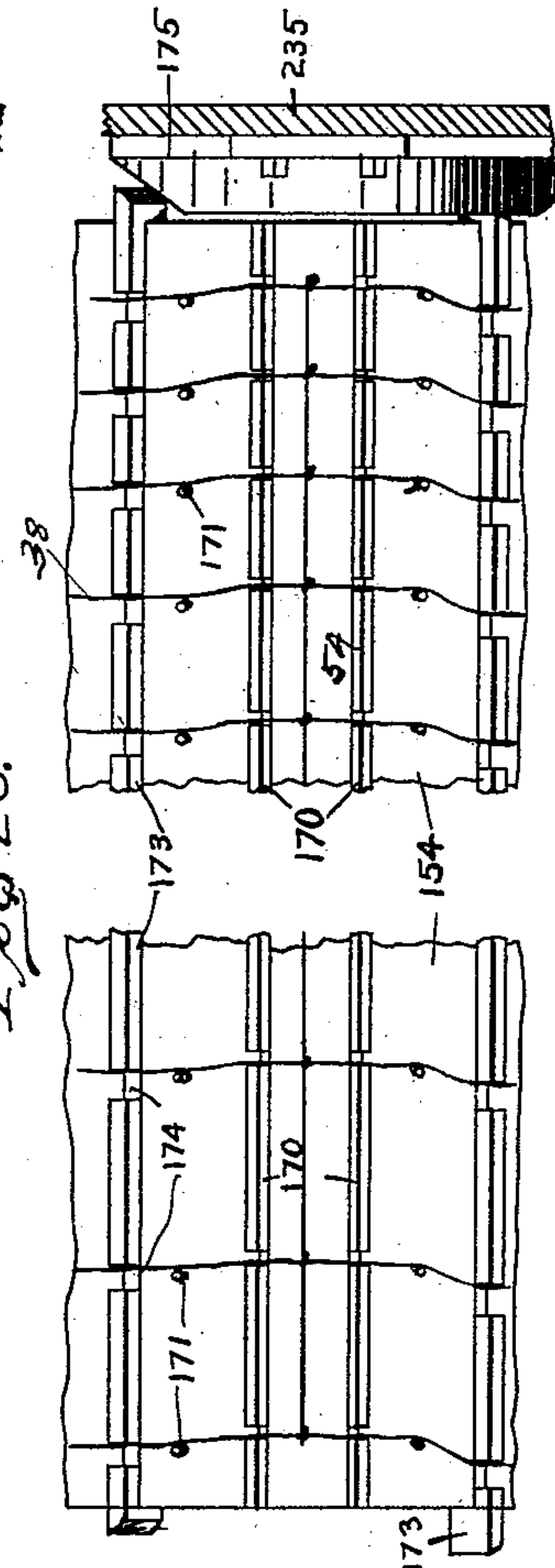
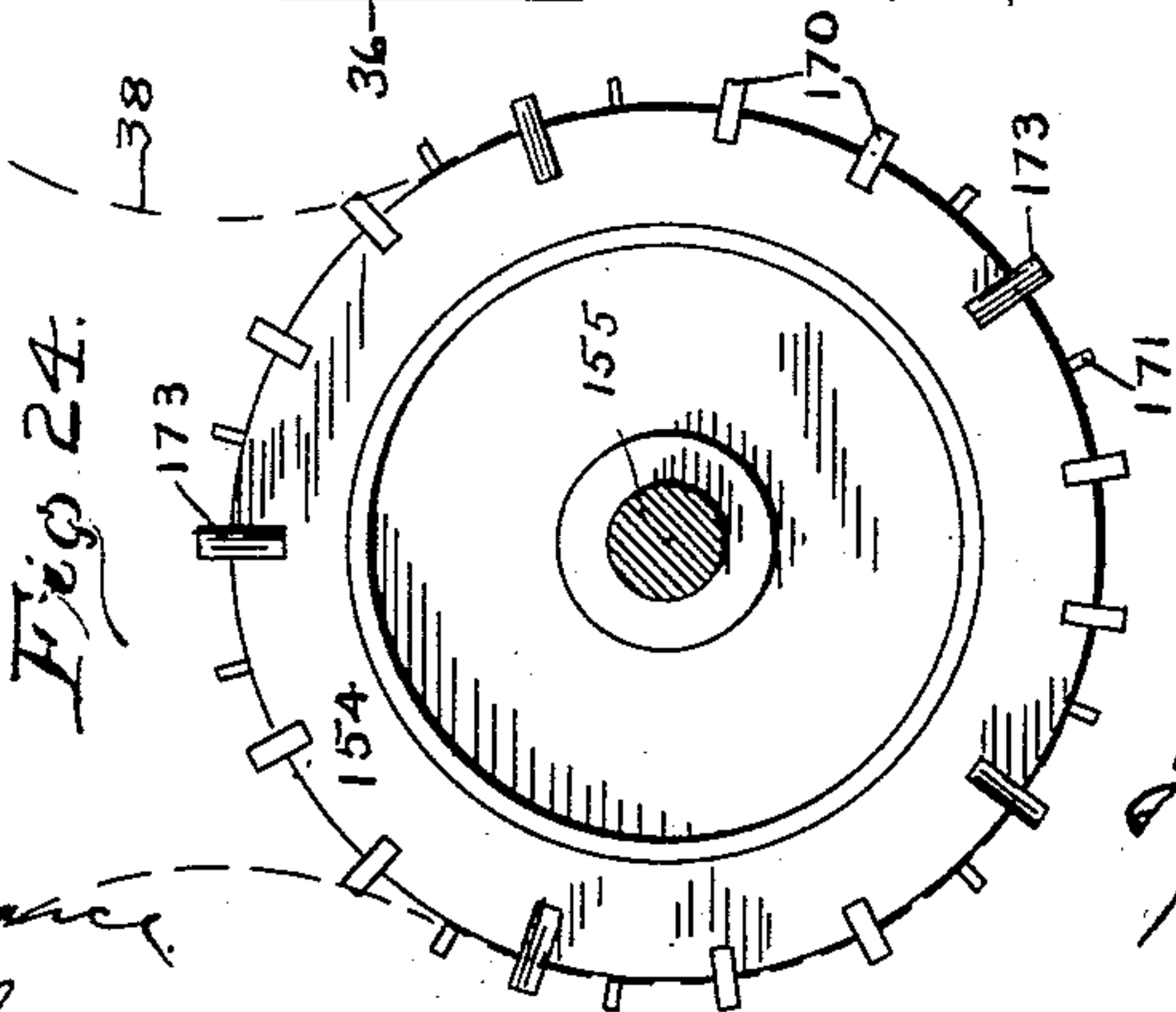


Fig 24.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN W. DWIGGINS, OF KOKOMO, INDIANA.

WIRE-FENCE MACHINE.

SPECIFICATION forming part of Letters Patent No. 745,801, dated December 1, 1903.

Application filed May 27, 1903. Serial No. 158,980. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. DWIGGINS, of Kokomo, county of Howard, and State of Indiana, have invented a certain new and useful Wire-Fence Machine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like figures refer to like parts.

The object of this invention is to provide a machine for making square-mesh wire fence faster and cheaper than said fence has been built heretofore, so far as I am aware.

The fence which this machine makes consists of the combination, with the ordinary running-wires, of vertical stay-wires secured to the running-wires by a loop in the stay-wires being twisted around the running-wires. This particular type of fence is not new, excepting in the fence made by this machine the stay-wires are secured to the top and bottom running-wires by the same kind of fastening or tie as secures the stay-wires to the intermediate running-wires, whereas, so far as I am aware, the fastening for the top and bottom wires of this character has been different from the fastening of the intermediate running-wires.

One novel feature of this machine is that it weaves the fence and forms all the parts and connections automatically and progressively instead of separately forming the loops in the stay-wires and subsequently bringing those stay-wires into place and securing them to the running-wires. In other words, this machine in its operation carries the wire from which the stays are formed across the series of running-wires like a shuttle carrying and placing the woof in ordinary weaving, and as the bobbin-like arrangement carries the wire from which the stays are made across the running-wires like a woof a loop is formed from the stay-wire as the running-wires are successively reached, and the loop is twisted about each running-wire before the stay-wire is carried on to the next running-wire. When the stay-wire has been carried thus across the series of running-wires and the loop successively twisted about the running-wires and the end is reached, the wire is cut off, leaving a stay secured in its final position and condition.

Another feature of this machine is that as the shuttle-like arrangement passes first in one direction and then in the other across the series of running-wires for securing to them a wire out of which the stays are formed it operates in both directions, the stay-wires being fastened to the running-wires as it passes across them, whether it is turning in one direction or the other. The result of this is rapid formation of the fence fabric. This and the other novel features and improvements in this machine will be understood from the accompanying drawings and the following description and claims.

In the drawings, Figure 1 is a front elevation of the machine. Fig. 2 is an elevation of the right-hand side of the mechanism for operating and controlling the action of the means for forming the loop in the stay-wire and twisting it about the running-wire. Fig. 3 is a section on the line 3 3 of Fig. 2, omitting the frame and bracket, parts being broken away. Fig. 4 is a vertical longitudinal section of the front portion of the machine, showing an elevation of the right-hand side of the means for securing the stay-wire to the running-wires, parts being in section and parts being broken away. Fig. 5 is a plan view of the yoke shown in Fig. 4, parts being broken away. Fig. 6 is a front elevation of a part of what is shown in Fig. 4, parts being broken away and parts being shown in dotted lines. Fig. 7 is a plan view of the bar and means for opening the knives after the stay-wire has been secured, parts being broken away and parts in transverse section. Fig. 8 is a rear elevation of the carriage and stay-wire holder and attached parts, parts being broken away, and the relative position of the yoke-depressing bar on the carriage and of the rack being shown while they are moving to the left side of the machine, as shown in Fig. 1. Fig. 9 is an elevation of the left-hand end of what is shown in Fig. 8. Fig. 10 is a plan view of the bar and rack that moves with the carriage shown in Fig. 8 and a horizontal section of the shaft which the rack actuates, parts being broken away. Fig. 11 is a plan view of the wrapper-head or means for forming the loop in the stay-wire and twisting it about the running-wire with a stay-wire thereon and the foot that holds the

loop down on said wrapper-head, parts being broken away, and showing the parts in position as the stay-wire is being laid across the upper surface of the wrapper-head and before the loop has been formed therein. Fig. 12 is a section on the line 12 12 of Fig. 8, parts being broken away. Fig. 13 shows the wrapping-head and stay-wire that is shown in Fig. 11 after the loop has been formed. Fig. 14 shows the same after the loop has been twisted about the running-wire. Fig. 15 shows the completed fastening between the stay-wire and the running-wire. Fig. 16 is an elevation of the right-hand side of the knife mechanism at the right-hand side of the machine, parts being broken away and parts shown by dotted lines. Fig. 17 is a plan view of said knife mechanism, parts being broken away, showing the knife closed. Fig. 18 is the same, showing the knife open. Fig. 19 is a front elevation of the rock-shaft and plate for opening the knife, the shaft being broken away. Fig. 20 is a front elevation of a pinion in the reversing mechanism, the shaft being shown in vertical section. Fig. 21 is an inside elevation of one of the segmental or mutilated gears in the reversing mechanism and of the pinion shown in Fig. 20, a part being in section and a part being broken away. Fig. 22 is a plan view of the reversing mechanism and the mounting thereof, parts being broken away. Fig. 23 is an elevation of a section of a piece of the fastening made by said machine with six running-wires instead of ten, which is the capacity of the machine shown. Fig. 24 is an end elevation of the crimping-drum, the fabric being indicated by dotted lines. Fig. 25 is a plan view of the same, showing the frame of the machine and the running-wires and the fabric shown in dotted lines. Fig. 26 is a bottom view of the crimping-roll to show the position of the parts while the crimping is taking place.

Referring now to the details of the construction of the machine shown to illustrate the principles of my invention, a rectangular main frame is formed of the side bars 30, the front bar 31, and the rear bar 32, as appears in Figs. 1, 2, and 22. This frame is supported at each corner by the legs 33. Upon the main frame, on each side of the machine, there is mounted a frame that has a base-piece 34 secured on the side bars 30 of the main frame, an upright 35 at each end of the bottom bar 34, a shorter upright 235 between the uprights 35, and a pair of inclined bars 36, extending downward at an inclination from the upper ends of the bar 35 to the middle bar 235 and forming a V between said bars 35, as appears in Fig. 2.

In the rear upper edge of the front cross-bar 31 of the main frame there is mounted a series of short vertical shafts 37, as seen in Fig. 4, one for each running-wire 38 of the fence fabric. Said shaft 37 is hollow to permit the running-wire to pass through the same, as shown in Fig. 4. The rearwardly-

extending flange of the cross-bar 31 of the main frame is bored out to furnish a hole 39, in which the lower end of said shaft 37 may have a bearing, and the shaft is supported by a collar 40, held in place by the set-screw 41. On said shaft, somewhat above the collar 40, there is secured a pinion 42, having an upwardly-extending head 43 with a flat face 44 on one side, as appears in Fig. 10, to furnish a bearing for the smooth portions of the rack-bar 45, that has secured beneath it the rack 46. Said shaft 37 has a key or spline 47, that extends through the pinion 42 up to the top of the shaft.

On the splined portion of the shaft 37 there is mounted a sliding sleeve 50, having on its lower end a collar 51 and on its upper end the head 52, and from the upper surface of said head 52, at the front or left as appears in Fig. 4, a pin 53 extends upward. The function of this pin is to catch the stay-wire 54 and form in it the loop and also carry the loop about the running-wire, as will be explained hereinafter. Above the sliding head 52 a wrapper head 55 is rigidly secured to the upper end of the shaft 37 and has a hole through its forward portion for the pin 53 to pass through loosely. The upper surface of the wrapper-head 55 is formed, as shown in Figs. 4 and 13, with a recess at 57, that is substantially V-shaped, with the point of the recess extending somewhat beyond the center of the wrapper-head and being curved, substantially as shown, so that between the running-wire 38 and the wall of the recess, near the center, there will be only sufficient room for the loop in the stay-wire 54 to pass, as appears in Fig. 14. The depth of this recess 57 is shown in Fig. 4 and should be sufficient to admit the stay-wire and the loop thereon, as appears in Figs. 13 and 14. Upon the wrapper-head there is a plate 56, (shown in Figs. 4 and 11,) secured by screws 58 and having in it an opening or slot 59, as shown in Fig. 11, large enough to permit the loop, which appears in Fig. 13, to pass down through it immediately after the loop is formed. The pin 53 passes through this opening 59. The function of these parts will be explained later.

The spring 50 and the collar 51 and head 52 connected therewith are reciprocated on the shaft 37 by a yoke 60. (Shown in side elevation in Fig. 4 and in plan view in Fig. 5.) It at its inner end is secured to the rocker or wooden bar 61, that is pivoted at 62 in the upper end of the stand 63 and is held in its upper position by a flat spring 64, which at 65 is secured to the stand, and its free end rests against the under side of the bar 61. The post 63 is secured to the cross-bar 32 of the main frame. The yoke 60 has on both its upper and lower sides lugs 66, bearing against the collar 51 and the head 52, so as to permit said yoke to rock freely between said parts 51 and 52 as the yoke is moved down to the dotted-line position shown in Fig. 4 and reversed.

The upper ends of the shafts 37 are held in place by reason of the wrapper-heads 55 having bearing in holes through the plate 67, that extends entirely across the front part of the machine and is at each end supported by brackets 68, that are bolted to the front posts 35. The upper surface of this plate 67 is flush with the plate or disk 56 on the wrapper-head; but said wrapper-head fits loosely enough in said plate 67 to freely rotate.

On the rear end of the bar 61 (see Fig. 4) there is a post 70 secured, that has on its upper end a flat semicircular spring 71. The forward and free end of this spring fits in the notch 72 and pushes forward against the upper end of the bell-crank lever 73, that is pivoted on the rod 74, secured at each end on the plate 67. The forward arm of the bell-crank lever 73 has on it a foot 76, (seen in Figs. 4 and 11,) that presses down on the plate 56 on the wrapper-head. Said foot has a slot 77, through which the running-wire 38 passes. The function of this foot is to hold down the stay-wire 54 during the forming and twisting of the loop in the stay-wire, as will be hereinafter explained.

It must be understood that the mechanism shown in Fig. 4 and above described is repeated for each running-wire of the fabric to be made. The yoke 60, as well as the spring 71 and the bell-crank lever 73, (shown in Fig. 4,) are operated—that is, moved to the dotted-line position in said figure—by the beveled portions of the bar 80 on the carriage 81 traveling across the front of the machine and coming into engagement with the rounded portions 82 of the front end of the yoke 60. This rounded end appears in Fig. 4, and the bar 80 is shown there in dotted lines. When the yoke is depressed to the dotted-line position, it is obvious that the free end of the spring 71 will be pushed forward and the front end of the bell-crank lever 73 or foot 76 will be depressed.

In Fig. 8 the rear view of the carriage is shown, and in Fig. 2 there is an end view of the same. As seen in said Fig. 2, the carriage 81 rides on the stationary cross-bar 82, that is supported at each end by the brackets 83, that are mounted on the side bar 30 of the main frame. To the lower end of said carriage 81 there is secured an angle-piece 83, that is secured to a link in the sprocket-chain 84. This sprocket-chain runs horizontally, as seen in Fig. 1, and is mounted at each end on the sprocket-wheels 85, that are secured on the shafts 86, which are mounted in the brackets 88, secured to and extending laterally from the side bars 30 of the main frame, and also bearings 87, secured on and extending forward from the transverse bar 82, as appears in Fig. 2.

The carriage 81 is moved to and fro across the front of the machine by the sprocket-chain 85. A portion of the arrangement just described is illustrated in Fig. 9, where a horizontal plate 90 is integral with the sta-

tionary bar 82 and there are some intervening ribs 91, arranged merely for the purpose of reinforcing or strengthening the bar 82. As there shown, the bar 80 is mounted on the studs 92, so said bar 80 will be held a slight distance rearward from the rear face of the carriage 81. Below the bar 80 on the carriage 81 the bar 45 is placed. It has secured to it the rack 46, which rests and reciprocates upon the bar 246, that is secured to the lower rearwardly-extending flange 93 from the carriage 81. This bar 246 has a longitudinal rib 94, that fits in a groove on the under side of the rack-bar for guiding the movement of the latter. At each end of the flange 93 of the carriage there is an upwardly-extending post 95, carrying a set-screw 96 for stopping and adjusting the movement of the rack, and consequently the bar 45. On the rear face of the carriage 81 there is a long angle-iron 97, that serves as a guide to hold the bar 45 down, as shown in Fig. 9.

On the carriage there is an arm 98, that carries a tube 99, through which a stay-wire feeds to the machine. As the carriage 81 moves across the front of the machine the stay-wire holder 99 moves with the stay-wire projecting down below said holder or tube.

There is a knife mechanism (shown in Fig. 17) mounted in the machine at each side to cut off the stay-wire to form a stay. Surrounding the I-beam 32, that extends across the main frame, there is a small movable frame, as shown in said figure, consisting of a lower bar 100 and an upper longer bar 101, connected and clamped on the I-beam by the bolts 102. In the forward end of the upper bar 101 the lower end of the knife-shaft 103 is mounted, so as to be oscillatory. It is oscillated by the arm 104, which is secured to the shaft between its ends by the set-screw 105 and extends forward far enough to be engaged by the blocks 106 and 107, that are on the bar 108, secured by the pins 109 beneath the flange 93 of the carriage 81, as appears in Figs. 8 and 6. The block 106 extends below and the block 107 extends above the bar 108, so that one of said blocks 106 will actuate the knife-bar 104 on one side of the machine and the other block 107 will actuate the other knife-bar 104 at the other side of the machine. Each knife-actuating bar 104 extends over a bar 110 between two pins 111, extending upwardly therefrom, as appears in Fig. 7. When the bar 110 is moved longitudinally in one direction, some one of the pins 111 at each end of the bar 110 engages the corresponding knife-bar 104 and actuates it to open the knife. When the bar 110 is moved in the opposite direction, the other pins engage the knife-bars to open the knives. The rod 110 is moved by the block 106 on the bar 108, that is connected with the carriage, engaging the block 112 on said bar 110. There is a block 112 at each end of said bar 110. The bar 110 rests upon the side bars 30 and the front bar 31 of the main frame. It is

held and guided by a guiding-block 113 at each end, that is secured on the side bars 30.

On the upper end of each knife-shaft 103 there is a bar or plate 114, (seen in Fig. 19,) which has a bolt 115 extending upward from each end thereof, that works loosely through slots 116 in the plate 117, as seen in Figs. 17 and 18. The forward end of said plate has a screw 118, that screws into the knife member 119, that is pivoted at 120 to the plate 67, which latter is also shown in Fig. 4. The other knife member 121 is secured by the screws 122 on the bar 67. The engaging faces of said knife members 119 and 121 are partially provided with teeth, and at one end of the series of teeth on each member there is a knife 124, said knives passing each other when the members come together like the blades of shears. The toothed portion of said knife members is to hold the wire, while the knife portion is to cut the wire, as will be explained. It is seen, therefore, that the oscillation of the knife-shaft 103 by the bar 104 causes the members of the knives to recede from each other. In accomplishing this result the plate 114 rocks or oscillates from the position shown in Fig. 17 to that shown in Fig. 18. A spring 125 tends to push the plate 117 inward to close the knife, and the spring is held in place at its lower end by the plate 126, which clamps the spring down on the bar 101, so that the tension of the spring may be adjusted by slipping it farther back under the bar 126 or drawing it farther to the front.

The parts heretofore described are driven by the following means: As seen in Fig. 1, the shaft 86 at the right-hand side of the machine has a bevel-gear 130 meshing with another bevel-gear, 131, on the horizontal shaft 132, having bearings in the main frame just above the leg 33. On the shaft 132, in front of the machine, a bevel-pinion 133 is secured, that engages a bevel-gear 134 on the forward end of a horizontal and rearwardly-extending shaft 135. This extends at a right angle rearward from the shaft 132 directly behind it and is mounted in the two cross-bars 31 and 32, as seen in Fig. 22. This shaft is driven by a pinion 136, operating between the segmental or mutilated gears 137 and 138 upon a shaft 139, mounted on the under side of the side bars 30 of the main frame. The segmental or mutilated gears have teeth extending about one-third of the way around, as seen in Fig. 21, and reversely placed on the two gears, so that as said gears revolve in the same direction and together the shaft 135 will be alternately operated in opposite directions. Said shaft is prevented from rotation while the pinion 136 is not in engagement with the teeth on the segmental or mutilated gears 137 and 138 by laterally-extending plates 140, that have a plain flat surface which engages the flat surface of the hub of the pinion 137. By this means the driving-shaft 137 causes the reversal of the parts heretofore described, as

well as of the sprocket-chain 84 and the carriage 81.

The shaft 139 is driven by the gear 142 thereon, engaging a pinion 143 on the shaft 144, extending horizontally through the machine and mounted upon the side bars 30. The gear 145 on said shaft 144 meshes with the pinion 146 on the shaft 147, that is the main driving-shaft extending through the machine horizontally and mounted upon the side beams 30 and driven by any suitable source of power.

The wire 54, from which the stay-wires are formed, is wound off a reel or some suitable holder located near the machine. The running-wires 38 wind off suitable reels or other wire-holders located in front of the machine somewhere and pass rearward under the roller 150, that is mounted in the block 151, resting on the floor at each side of the machine, as appears in Fig. 3. Said running-wires thence pass upward through the hollow shafts 37 and the slot in the foot 76, where the stay-wires are secured transversely to said running-wires. The running-wires are drawn upward by the means heretofore explained.

The operation of weaving the fabric will now be explained. The machine being in operation, the carriage 81 will be moved to and fro transversely along the front of the machine and the stay-wire holder 99 will start to the right from the position shown in Fig. 1, and when the stay-wire passes through the left-hand knife mechanism it will be held, and if there is any little end extending to the left from said knife that will be clipped off. The toothed portion of said knife will hold the end of the stay-wire until the stay is completely secured to the running-wires. The stay-wire holder 99 passes on to the first wrapping-head and carries the stay-wire over it, as appears in Fig. 11. In Fig. 8 the carriage and other parts are shown in their position as they are moving from the right-hand side of Fig. 1 toward the left; but assuming them to be moving from the left-hand side toward the right the carriage would move without any corresponding movement of the rack 46 or bar 45 until the set-screw at the right hand in Fig. 8 came into engagement with the right-hand end of the rack as there shown, and then the rack would be under the right-hand end of the bar 80. Then the left-hand end of the rack 46 will extend somewhat to the left of the inclined surface 180 on said bar 80, and therefore as they move to the right, as shown in Fig. 1, or to the left, as shown in Fig. 8, since in Fig. 8 we are looking at the back, the rack will engage the pinion 42 on the shaft 37, carrying the first wrapper-head to the left, as appears in Fig. 1, and rotate with it about three-fourths of the way around from the position shown in Fig. 8 to that shown in Fig. 9 before the inclined surface 180 comes into contact with the forward rounded end 82 of the yoke 60. Then further movement causes the bar 80 to depress

the yoke, and thereby the head 52 and the pin 53. At the same time the foot 76 will be pressed down, as heretofore explained, upon the wire in the position shown in Fig. 13, so as to hold said wire and the loop down as the pin 53 escapes downward from the loop and releases the loop. In Fig. 13 the pin is shown to have just escaped downward from the loop. As the pin 53 moves downward it draws the loop through the slot 59 in the disk 56 into the space 57. (Shown in Fig. 11.) The further movement of the rack and bar 80 holds the foot 76 and the pin 53 down while the flat lower surface of the bar 80 is riding across the rounded end of the yoke 60, and the rack further rotates the wrapping-head to the position shown in Fig. 14, so as to make from beginning, as shown in Fig. 11, to end, as shown in Fig. 14, two complete revolutions of the wrapper-head. The second revolution causes the curved edge of the recess 57 in the wrapper-head to twist the loop around the running-wire. Of course the number of revolutions of the twister-head may be increased, if desired, by increasing the length of the bar 80 and of the rack 46 and the adjacent parts, so as to increase the number of times the loop is wrapped around the running-wire. The further movement of the carriage 81 will cause the bar 80 to move off of the yoke 60 and let it and the pin 53 and the foot 76 move upward to the normal position, as shown in Fig. 4, immediately after the twist has been made, as has been explained, and then the parts will move on to the next wrapper-head, carrying the stay-wire with it from the first wrapper-head to the second and making another twist and continuing until the last twist is made at the right-hand side of the machine, as shown in Fig. 1. Just before the stay-wire reaches the knife the block 107 on the bar 108, (seen in Fig. 8,) that is moved along with the carriage, engages the knife-actuating arm 104 and moves it so as to open the knife or to change the parts from the position shown in Fig. 17 to the position shown in Fig. 18. Then the further movement of the carriage carries the wire between the open members of the knife, and after the block 107 passes the arm 104 and said arm is released the spring 125 will immediately return the knife mechanism from the position shown in Fig. 18 to the position shown in Fig. 17, thus closing the knife and severing the stay-wire. This severing of the stay-wire is done immediately after the stay-wire is carried across the last wrapper-head and the last loop has been formed, but before the loop has been wrapped around the stay-wire. The toothed part of the knife continues to hold the end of the stay-wire until the further movement of the carriage and associated parts causes the block 106 on the bar 108 (seen in Fig. 8) to engage the block 112 on the bar 110 and moves said bar 110 to the right as you face the machine, or to the left, as shown in Fig. 8, to engage the knife-actuating arm 104 and

again open the knife, which releases the stay-wire that has been secured across the running-wires. At the same time the movement of the bar 110 causes the right-hand pin 111, at the other end of the bar 110, to open the other knife, so that both ends of the stay-wire are released by the knives. When the carriage and associated parts have secured the stay-wire to the running-wires and reached the position last described, the teeth on the gear 137 or 138 cease to actuate the pinion 136, and therefore cease to move the carriage, and it comes to a standstill. Then the next step in the operation of the machine as a whole causes the fabric which has been woven to be moved upward from the wrapper-heads or wound up one step, so as to put the running-wires in the proper position for securing the ends of the stay-wire thereto, and when that step in the operation has been completed the gear 136 (shown in Fig. 22) comes in contact with the teeth on the gear 137 or 138 that it was out of contact with in the previously-described operation, so that said pinion 136 is reversed in its revolution and the carriage 81 and all the associated parts start back from the right-hand side of the machine as you face it to the left, and the same process above described for securing the stay-wire is repeated, only in a reverse direction. After each stay-wire is secured the machine feeds the fabric up one step, and the mechanism for accomplishing this result will now be described.

The running-wires 38 come from reels or other wire-supports located in front of the machine somewhere and pass rearwardly under the roller 150, mounted in the block 151 at each end, that rests upon the floor of the machine or is otherwise placed, and thence the running-wires pass upward through the hollow shaft 37 and the twister-heads and over a roller 153, mounted by spindles 154 in the upper front part of the side frames, mounted on the main frame, as shown in Fig. 2. From said roller 153 the running-wires or fabric, as the stay-wires are secured to the running-wires before they pass over the roller 153, pass under the crimping-roll 154, that has spindles 155 in its end, mounted in the middle portion of said frame, as seen in Fig. 3, and from the crimping-roll the fabric passes over another roll, 156, mounted in the upper rear corner of said frames, and from the roll 156 the fabric passes to the reel 157, mounted in the bearings 158, secured upon the rear of the main frame. The crimping-roll has on the spindle 155 at each end a star-wheel 160, like what is shown in Fig. 2, having five arms, with a removable roller 161 extending outwardly from the end of each arm. These pins are engaged by the curved ends of a pair of radial and oppositely-extending arms 162, secured on the shaft 139. The shaft 139 constantly rotates and through the arms 162 on the star-wheel 160 causes the crimping-roll 154 to be intermittently moved.

The arms 162 are so located on the shaft 139 with reference to the toothed portion of the segmental or mutilated gears 137 and 138 on the same shaft that said arms will actuate the star-wheel 160 until after said gear 137 or 138 ceases to actuate the pinion 136, and thereby the carriage and mechanism for securing the stay-wire in place. In other words, the star-wheel is not actuated by the arms 162 until after the stay has been secured to the running-wires and the ends released by the knives. Then a one-fifth revolution of the crimping-roll takes place. Said crimping-roll has on its spindle at the left-hand side of the machine a gear 164, (seen in Fig. 1,) that meshes with a corresponding gear 165 on the spindle of the roll 156, and thereby said latter roll is driven. On the spindle at the right-hand end of the roll 156, as seen in Fig. 2, a sprocket-wheel 166 is secured, over which a sprocket-chain 167 runs to the sprocket-wheel 168 on the spindle of the reel 157, and thereby said reel is actuated. By the actuation of the reel and the intermediate rolls 154 and 156 the fabric and the running-wires are drawn through the machine. The sprocket-wheel 168 is loosely mounted on the spindle 169 at the right-hand end of the reel and is held by a friction-clutch, (shown in Figs. 1 and 2,) consisting of a plate 170, secured on the spindle 169 and extending to the flange or hub 171 of the sprocket-wheel and having on each end a brake-shoe 172, made of leather or like material, adapted to engage the surface of the flange or hub 171, said brake-shoe being mounted on the inner ends of the set-screws 173, that pass through the laterally-extending end flanges from the plate 170. This prevents the return movement of the reel and also enables it to give some when required by the tension of the fabric, and this yielding or giving can be regulated by the set-screws 173.

It is considered desirable in the manufacture of wire fence to crimp the running-wires somewhat to provide for expansion and contraction after being set up. To do this I have provided the crimping-roll 154. Its construction appears in Figs. 24, 25, and 26. Said roll has a number of stationary longitudinally-extending blocks 170 secured in the surface, with notches 172 in said blocks 170 at the proper place to receive the running-wires of the fabric as the same pass under and about said roll. There are also rows of pins 171 placed on the surface of said roll. There is one of these pins on each side of each notch in the bar 170 and coöperating therewith to bring the running-wire into the notch. The purpose of this mechanism and pins is to hold the running-wires from lateral movement while they are being crimped by the crimping-bars 173. These crimping-bars have notches 174, like the notches 172, only wider and in line with them, and said bars are longitudinally movable in slots in the roll 154. They are moved longitudinally by

the cam-like block 175, secured to the part 235 of the frame-plate upon the side bars of the main frame, as appears in the figures. This block pushes the bars to the left from the position shown in Fig. 16, and the right-hand faces of the notches in said bars push the running-wires to the left, and since the running-wires are held by the pins 171 and the notches in the bar 170 crimps may be formed in them at intervals, depending upon the distance the crimping-bars 173 are placed apart. The cam-like block 175 is long enough to always engage one of said bars 173 and keep it pushed over until it comes in contact with and pushes over the next bar. Therefore there will always be one of said bars 173 to the left of the crimping position, which gives the crimping-roll a hold on the fabric or running-wires to assist in drawing the same through the machine. The crimping-bars 173 are pushed from the left to the right or returned to their normal position by another cam-like block, 176, at the other end of the crimping-roll and secured to the inclined bar 36 of the frame that is built on the main frame on the left-hand side of the machine. There are shown here two stationary bars 170 between each pair of crimping-rolls 173, so the stay-wire will come midway between said bars.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for making wire-fence fabric, means for holding the running-wires in a row, a stay-wire holder movable alternately in both directions for carrying the stay-wire across the series of running-wires, and means for forming a loop in the stay-wire as it crosses each running-wire in either direction and twisting said loop around the running-wire.

2. In a machine for making wire-fence fabric, means for holding the running-wires in a row, a movable stay-wire holder for carrying the stay-wire across the series of running-wires, means for forming a loop in the stay-wire as it passes each running-wire and twisting said loop around the running-wire, and means operative after the stay-wire holder has moved across the series of running-wires for moving the fabric through the machine for the attachment of the next stay-wire.

3. In a machine for making wire-fence fabric, means for holding the running-wires in a row, a stay-wire holder movable alternately in both directions for carrying the stay-wire across the series of running-wires as it moves in either direction, means for forming a loop in the stay-wire as it passes each running-wire when drawn in either direction and twisting said loop around the running-wire, and means operative after the stay-wire has moved across the series of running-wires in each direction for moving the fabric through the machine for the attachment of the next stay-wire.

4. In a machine for making wire-fence fab-

ric, means for holding the running-wires in a row, a movable stay-wire holder for carrying the stay-wire across the series of running-wires, means for forming a loop in the stay-wire at each running-wire and twisting said loop around the running-wire, and a knife mechanism on each side of the series of running-wires through which the stay-wire passes for cutting it into sections and holding the cut ends.

5. In a machine for making wire-fence fabric, a row of rotary wrapper-heads with an opening through each for the running-wires to pass, a stay-wire holder movable across the row of wrapper-heads, and means operated by each wrapper-head for catching the stay-wire when it reaches said wrapper-head and forming a loop and wrapping the loop about the running-wire as the wrapper-head rotates.

6. In a machine for making wire-fence fabric, a row of tubular shafts through which the running-wires of fabric may pass, a wrapping-head secured to the upper end of each shaft, a stay-wire holder movable across the series of wrapper-heads, means operated by each wrapper-head for catching the stay-wire when it reaches said wrapper-head and forming a loop and wrapping the loop about the running-wire as the wrapper-head rotates, and means for rotating said shafts.

7. In a machine for making wire-fence fabric, rotary wrapper-heads arranged in a row with an opening through each for the running-wires to pass, a carriage movable across the machine near the series of wrapper-heads, a stay-wire holder on said carriage arranged to draw the stay-wire across the wrapper-heads, means operated by each wrapper-head for catching the stay-wire when it reaches said wrapper-head and forming a loop and wrapping the loop about the running-wire as the wrapper-head rotates, and means actuated by said carriage for rotating the wrapper-heads.

8. In a machine for making wire-fence fabric, a row of tubular shafts through which the running-wires of the fabric may pass, a wrapper-head secured on the upper end of each shaft, a carriage movable across the machine near the series of wrapper-heads, a stay-wire holder on said carriage arranged to draw the stay-wire across the wrapper-heads, means operated by each wrapper-head for catching the stay-wire when it reaches said wrapper-head and forming a loop and wrapping the loop about the running-wire as the wrapper-head rotates, a pinion on each of said shafts in line with each other, and a rack-bar movable by said carriage that engages said pinions and rotates the wrapper-heads.

9. In a machine for making wire-fence fabric, means for holding the running-wire, a pin, means for carrying the stay-wire between the running-wire and pin, and means for revolving the pin about the running-wire for forming

a loop in the stay-wire and so wrapping the same about the running-wire.

10. In a machine for making wire-fence fabric, means for holding the running-wire, a rotary wrapper-head, a pin carried by said head around said running-wire, and means for placing the stay-wire between the running-wire and said pin so that when said pin is revolved it will form a loop in the stay-wire and twist the loop about the running-wire.

11. In a machine for making wire-fence fabric, a rotary wrapper-head through which the running-wire passes, a pin extending above the wrapper-head, means for carrying the stay-wire across the wrapper-head between the running-wire and said pin so that when said wrapper-head is rotated the pin will engage the stay-wire and form a loop in it and carry the loop around the running-wire, and means for disengaging the pin from the loop.

12. In a machine for making wire-fence fabric, means for holding the running-wire, a pin, means for carrying the stay-wire between the running-wire and pin, means for revolving the pin about the running-wire for forming a loop in the stay-wire, means for disengaging the pin from the loop after the same has been formed, and means for further twisting the loop about the running-wire to complete the attachment.

13. In a machine for making wire-fence fabric, a rotary wrapper-head through which the running-wire passes provided with a wall around the running-wire and some distance therefrom, a pin extending above the wrapper-head, means for carrying the stay-wire across the wrapper-head between the running-wire and said pin so that when the wrapper-head is rotated the pin will engage the stay-wire and form a loop in it and carry the same around the running-wire, means for disengaging the pin from the loop before the wrapper-head has ceased rotating so that the wall on the wrapper-head will complete the twisting of the stay-wire around the running-wire.

14. In a machine for making wire-fence fabric, a rotary wrapper-head through which the running-wire passes recessed on its upper surface to form a wall about the running-wire and some distance therefrom, a pin extending through the wrapper-head at said recess, a plate secured on said wrapper-head with an opening over the recess in the wrapper-head that surrounds the running-wire and said pin, means for carrying the stay-wire across said plate between said running-wire and said pin so that when the wrapper-head is rotated a loop will be formed in the stay-wire and wrapped about the running-wire, and means for depressing said pin before the rotation of the wrapper-head has ceased so that the loop will be drawn down through the opening in said plate into the recess in the wrapper-head, and the pin be disengaged therefrom.

15. In a machine for making wire-fence fab-

ric, a rotary wrapper-head through which the running-wire passes, a pin extending above the wrapper-head, means for carrying the stay-wire across the wrapper-head between the running-wire and said pin so that as the wrapper-head is rotated, the pin will form a loop in the stay-wire around the running-wire, and a depressible foot for holding the stay-wire down on the wrapper-head while it is being secured to the running-wire.

16. In a machine for making wire-fence fabric, a rotary wrapping-head through which the running-wire passes, a pin extending above the wrapper-head, means for carrying the stay-wire across the wrapper-head between the running-wire and said pin so that as the wrapper-head is rotated the pin will form a loop in the stay-wire around the running-wire, a depressible foot surrounding the running-wire and normally held slightly away from the wrapper-head, and means for depressing said foot after the stay-wire has been drawn by said pin between the wrapper-head and foot during the formation of the loop for holding the stay-wire and loop down.

17. In a machine for making wire-fence fabric, a hollow shaft thereon through which a running-wire passes, a wrapper-head secured thereon, means slidably mounted on said shaft on one side of said wrapper-head, a pin extending from said slidable means to a point above said wrapper-head, means for rotating said shaft, and a carriage for moving the stay-wire across the wrapper-head between the running-wire and said pin and subsequently moving the means that carries the pin to disengage it from the stay-wire.

18. In a machine for making wire-fence fabric, a wrapper-head through which the running-wire passes, means for moving the running-wire across the wrapper-head, a removable pin that revolves with the wrapper-head for forming a loop in the stay-wire and twisting the same about the running-wire, a depressible foot for holding the stay-wire and loop down, and a single means for depressing said foot and removing said pin.

19. In a machine for making wire-fence fabric, a rotary wrapper-head through which the running-wire passes, means for moving the running-wire across the wrapper-head, a removable pin that revolves with the wrapper-head for forming a loop in the stay-wire and twisting the same about the running-wire, a depressible foot for holding the stay-wire and loop down, and means for depressing said foot and removing said pin simultaneously.

20. In a machine for making wire-fence fabric, means for holding the running-wires in a row, means for looping the stay-wire around the running-wires, and a carriage movable across the running-wires that carries the stay-wire and actuates the means for securing the stay-wire to the running-wires.

21. In a machine for making wire-fence fabric, means for holding a series of running-

wires in a row, means for looping the stay-wires around the running-wires, and a carriage for carrying the stay-wire and actuating the means for securing the same to the running-wires with the two ends thereof formed substantially in the same way so that the stay-wire will be secured to the running-wires while the carriage is moving in either direction.

22. In a machine for making wire-fence fabric, means for holding the series of running-wires in a row, means for looping the stay-wire around the running-wires, and a carriage for carrying the stay-wire and actuating the means for securing the same to the running-wires, a horizontally-operating sprocket-chain for moving said carriage, and means for reversing the movement of said sprocket-chain.

23. In a machine for making wire-fence fabric, means for holding the series of running-wires in a row, means for carrying the stay-wire across the series of running-wires, means for looping the stay-wire around the running-wires as the stay-wire is carried along, a knife mechanism on each side of the series of running-wires for cutting the stay-wire and holding the cut end thereof, and means for simultaneously opening both knives after the stay-wire has been secured in place.

24. In a machine for making wire-fence fabric, a knife mechanism for cutting a wire and holding the cut end thereof consisting of a stationary and a movable member, a spring-actuating means for holding said knife closed, and means for opening said knife to admit the wire between them.

25. In a machine for making wire-fence fabric, means for holding the series of running-wires in a row, a carriage for carrying the stay-wire across the running-wires, means for securing the stay-wire to the running-wires, and a knife mechanism in the path of the stay-wire consisting of two members, one stationary and the other movable, a spring-actuated means for closing the knife, and means actuated by the stay-wire carriage for opening said knife.

26. In a machine for making wire-fence fabric, a roll about which the fabric passes after it is made, means on the surface of the roll for preventing the lateral movement of the running-wires of the fabric, and means movable on the surface of the roll for engaging the running-wires at intervals and crimping the same.

27. In a machine for making wire-fence fabric, a roll about which the fabric passes after it has been made, means on the surface of the roll for preventing the lateral movement of the running-wires of the fabric, means slidable on the surface of the roll for engaging the running-wires at intervals and crimping the same, and means for intermittently rotating said roll equal fractional parts of a revolution each time.

28. In a machine for making wire-fence fab-

ric, a roll about which the fabric passes after
it has been made, means on the surface of the
roll for preventing the lateral movement of
the running-wires of the fabric, means slid-
5 able on the surface thereof for engaging the
running-wires at intervals and crimping the
same, a star-wheel on the spindle of the roll,
and a revolving bar that engages the arms of
the star-wheel successively to rotate the roll
10 a part of a revolution each time.

29. In a machine for making wire-fence fab-
ric, a roll about which the fabric passes after
it has been made, means on the surface of the
roll for preventing the lateral movement of
15 the running-wires of the fabric, bars slidable
on the surface of the roll for engaging the

running-wires at intervals and crimping the
same, a stationary cam-surface secured to the
framework at one end of the roll for engag-
ing said bars and actuating the same, said 20
cam-surface being long enough to always be
actuating at least one of said bars, and a cam-
surface on the framework at the other end of
the roll for returning said crimping-bars.

In witness whereof I have hereunto affixed 25
my signature in the presence of the witnesses
herein named.

JOHN W. DWIGGINS.

Witnesses:

V. H. LOCKWOOD,
NELLIE ALLEMONY.