

No. 772,405.

PATENTED OCT. 18, 1904.

J. M. DENNING.  
WIRE FENCE MACHINE.  
APPLICATION FILED OCT. 3, 1903.

NO MODEL.

5 SHEETS—SHEET 1.

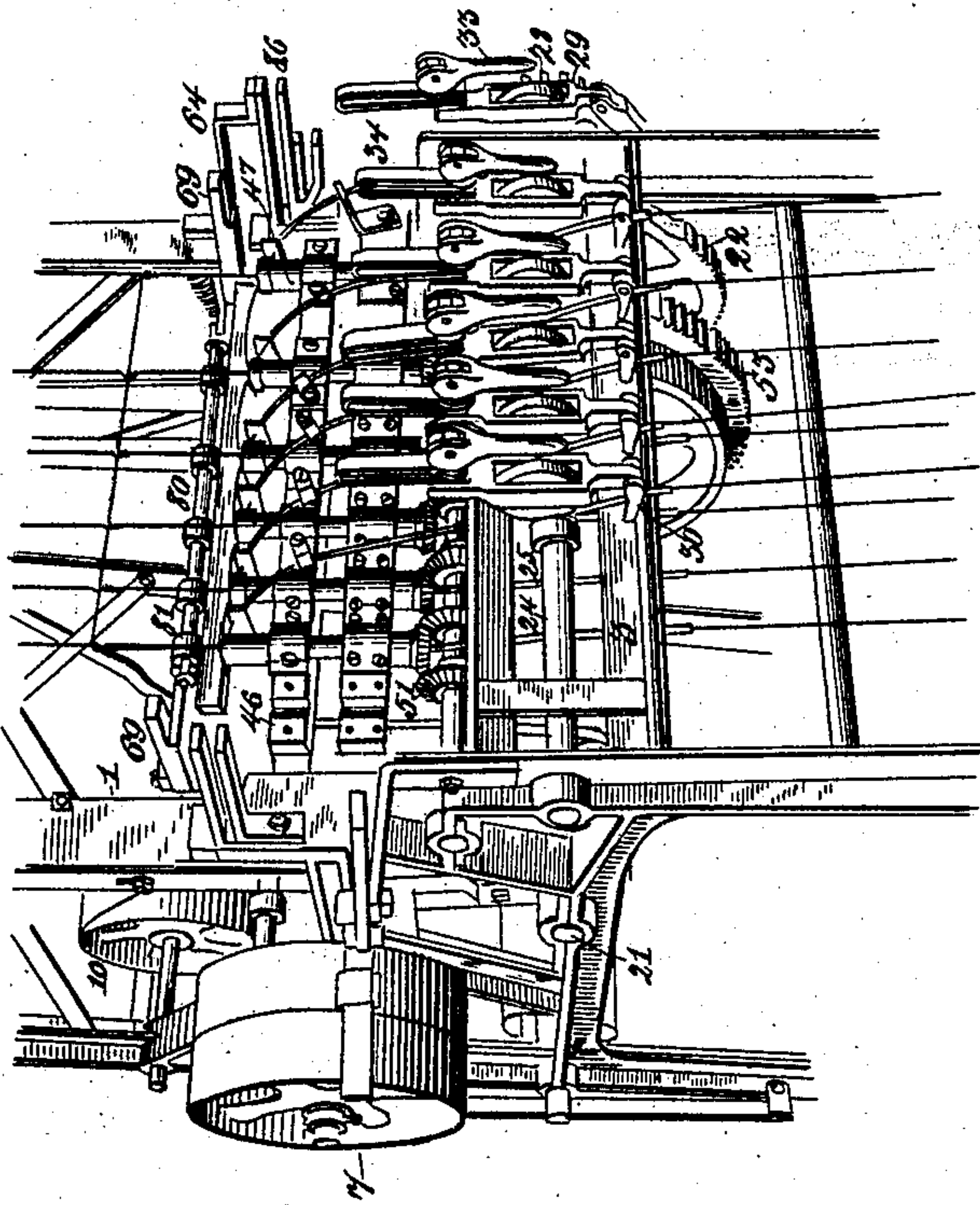


Fig. 2.

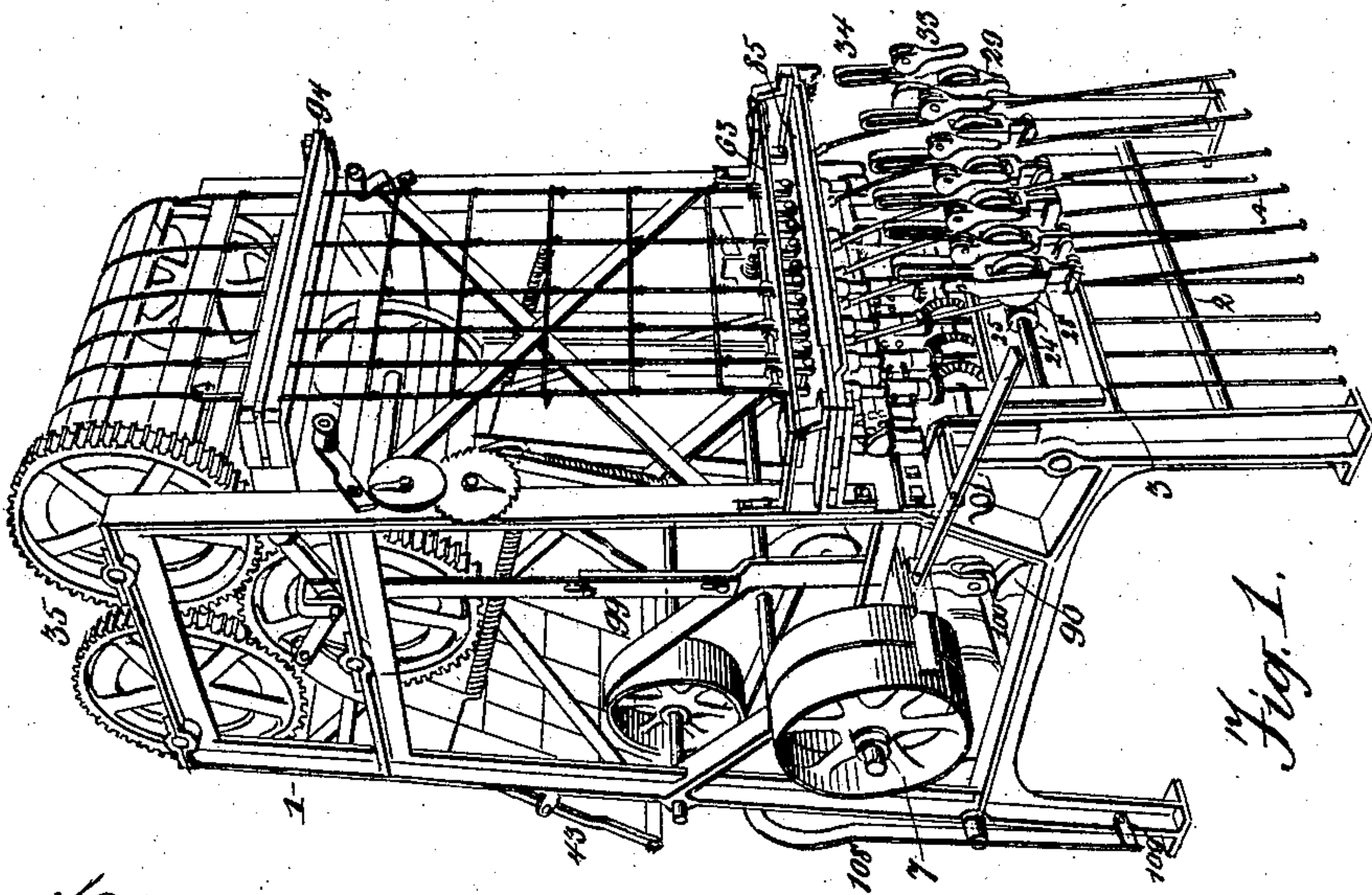


Fig. 1.

Witnesses

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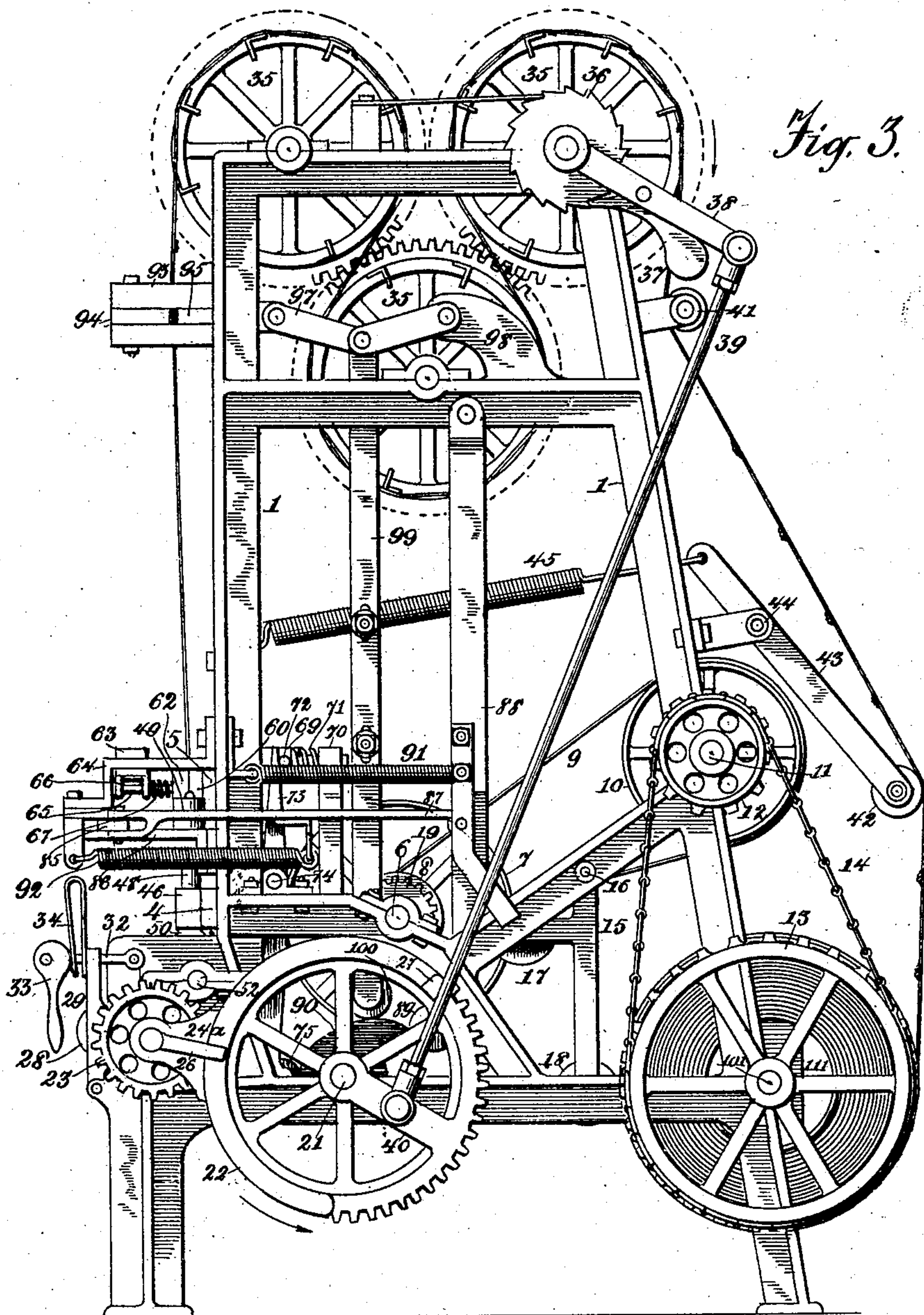
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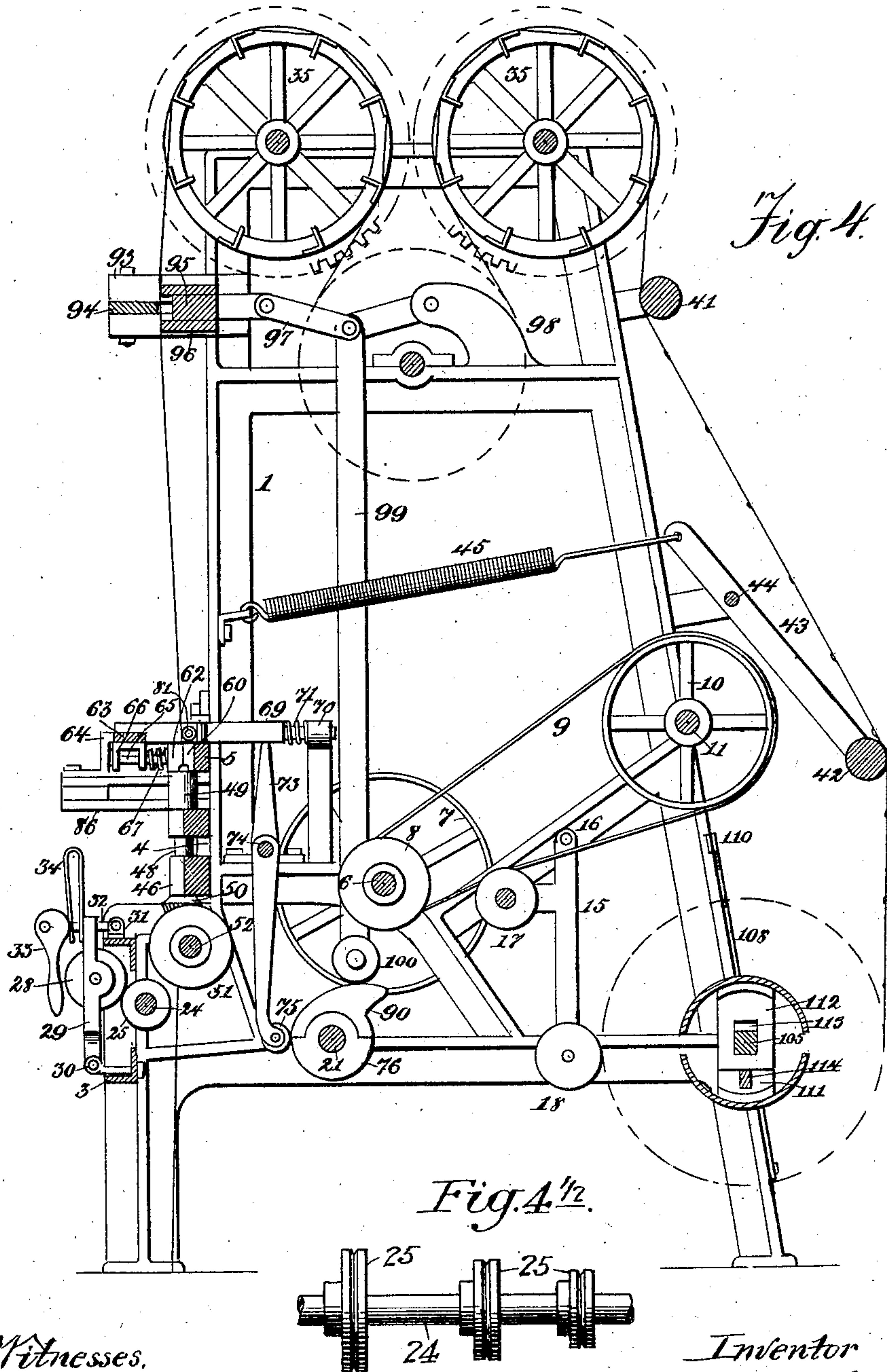
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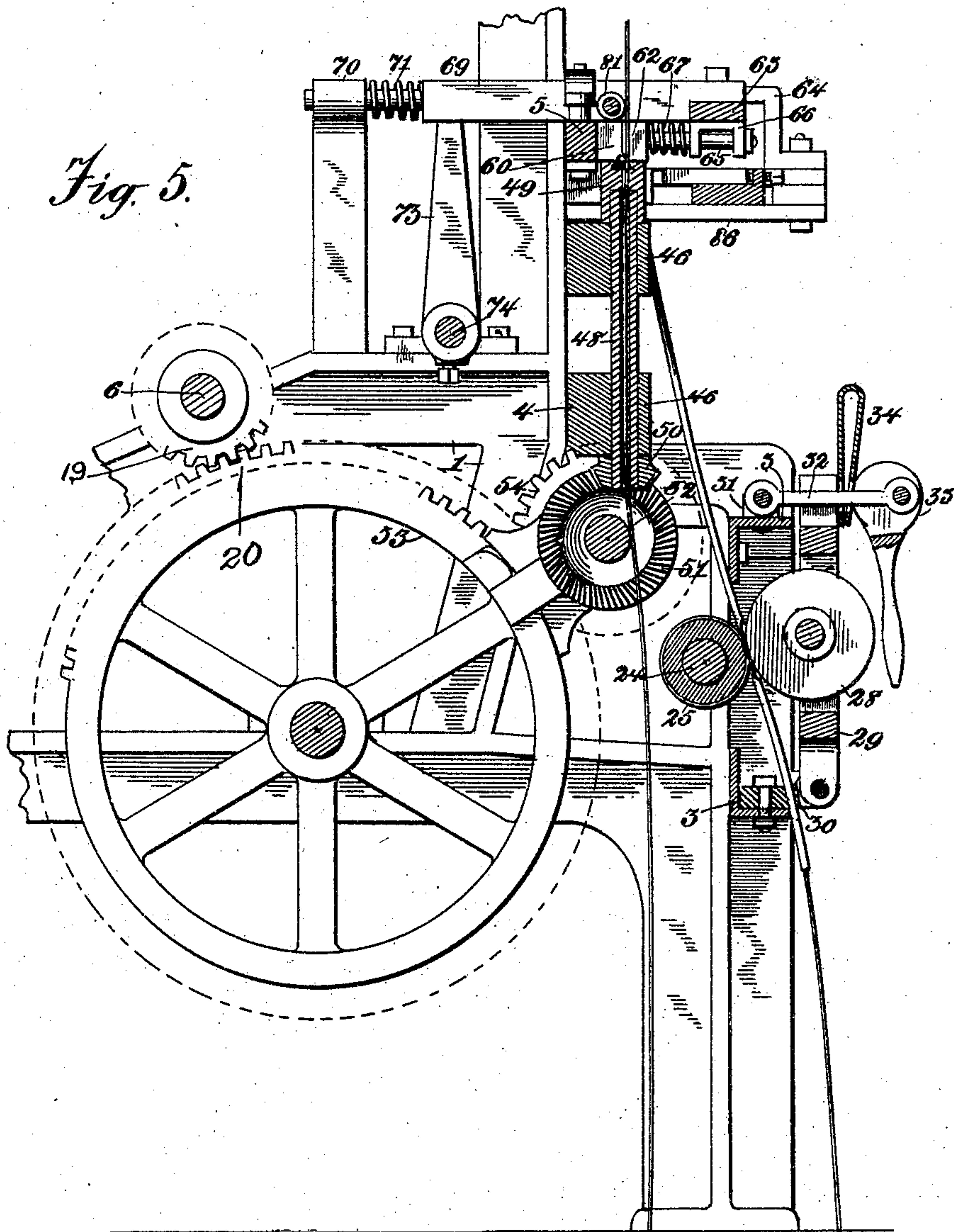
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5 SHEETS—SHEET 4.



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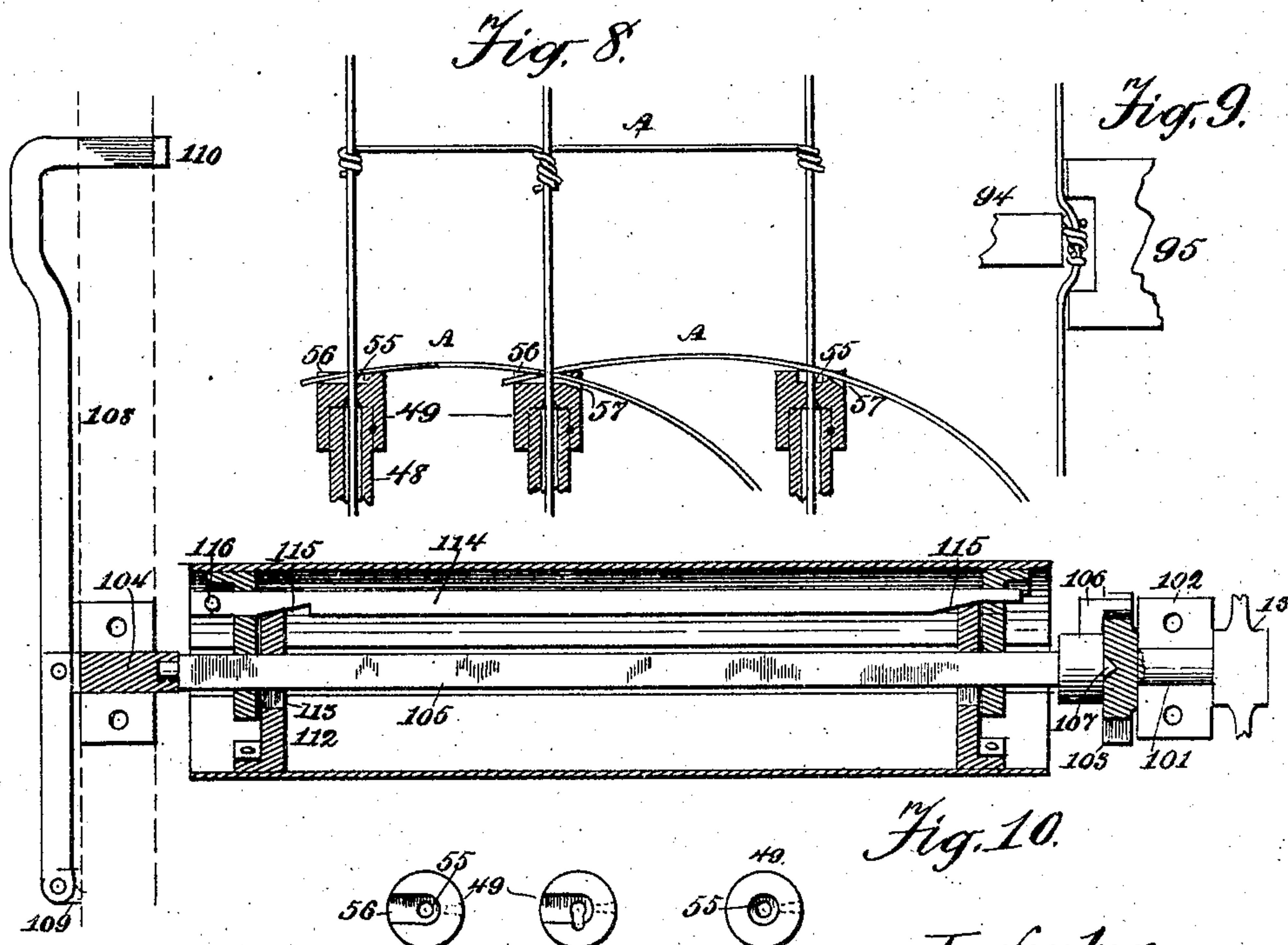
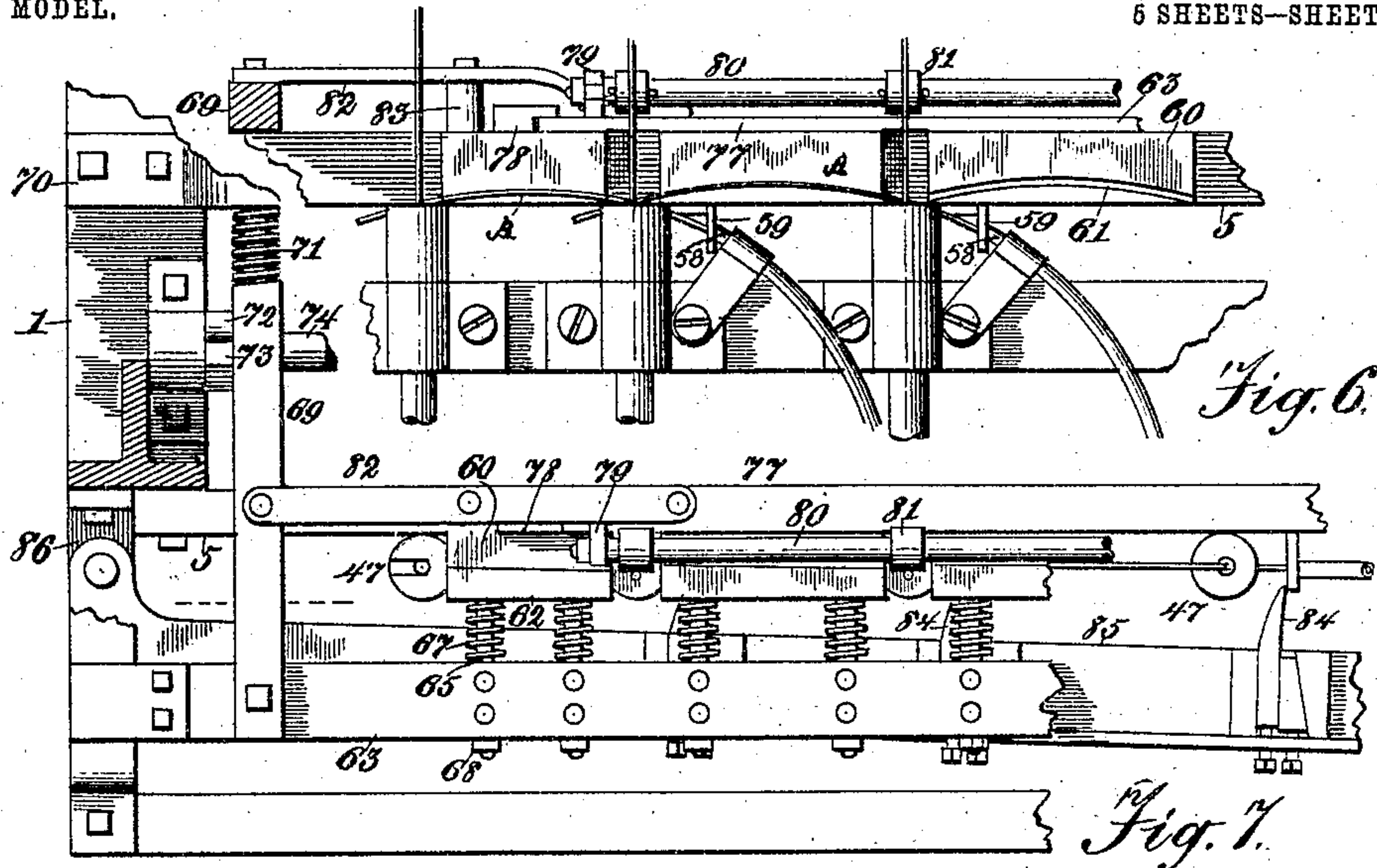
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6 SHEETS—SHEET 5.



Witnesses  
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Fig. 11.

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# UNITED STATES PATENT OFFICE.

JOSEPH M. DENNING, OF CEDAR RAPIDS, IOWA.

## WIRE-FENCE MACHINE.

SPECIFICATION forming part of Letters Patent No. 772,405, dated October 18, 1904.

Application filed October 3, 1903. Serial No. 175,568. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH M. DENNING, a citizen of the United States, residing at Cedar Rapids, in the county of Linn and State of Iowa, have invented certain new and useful Improvements in Wire-Fence Machines, of which the following is a specification.

This invention relates to the manufacture of wire fence in which the main longitudinal strands of wire are connected at regular intervals by cross-wires or "stay-wires," as they are usually called.

The purpose of this invention is to produce a machine organized and arranged to make such fence automatically and rapidly, the product being a netted fence material of strong and durable construction and having a very neat appearance.

The nature of the invention will more fully and clearly appear in the description and claims following, reference being had to the accompanying drawings, in which—

Figure 1 is a view in perspective of what in practice is considered the back of the machine, the reel of finished fence being on the opposite side. This figure being designed mainly to give a general view of the machine as a whole may for the most part be disregarded in the description following, the other figures of the drawings showing the parts in larger and clearer detail. Fig. 2 is a view from nearly the same point of view, showing somewhat more largely and clearly the mechanism for forming the fence-mesh; but as this, too, is shown elsewhere in detail the figure may be referred to mainly as showing a full gang in a completed machine. Fig. 3 is an elevation of the machine as seen from the side at the back and right of Fig. 1 or 2. Fig. 4 is a vertical section of the machine as seen from the same direction, the section-line being supposed to be central, though this is not important. Fig. 4½ is a fragmentary view showing a part of the feed-roll shaft and a number of different-sized rolls thereon. Fig. 5 is a fragmentary section in the same plane, supposedly, showing in larger detail the mesh-forming mechanism. Fig. 6 is a fragmentary elevation showing the inner guides for the stay-wires to carry them from coiler to coiler,

the guides leading said wires to the coilers, a set of coiler-heads, and guides whereby the longitudinal strands are pushed back at the proper time to allow the stay-wires to pass on the inner or front side of them. Fig. 7 is a plan view of the same, the outer guides and their connections being in position. Fig. 8 shows a section of three coilers, stay-wires in position for coiling, and a completed stay. Fig. 9 is a fragmentary view of the crimper and a joint of fence as it is crimped. Fig. 10 is a central longitudinal section of the reel for the finished web. Fig. 11 shows the coiling ends of a set of coiler-heads.

The machine is designed to manufacture the type of fence partially illustrated in Fig. 8, in which the longitudinal strands (the vertical ones) are connected by stay-wires extending from strand to strand and closely wound about the strands. At the outer strands this is a simple coil; but at the intermediate strands the connection is in the form of a peculiar knot, the form of which is due to the fact that prior to coiling the stay-wires are fed across the ends of the coilers both on the same side of the strand-wire. The knot so formed takes a very firm grip on the strand-wire and irrespective of the crimp taken in it tends to hold the stays securely in position. The machine is arranged to feed, cut off, and coil simultaneously as many stay-wires as there are spaces between strand-wires in the fence to be made. It also feeds forward the finished fence, crimps the main strands at each stay-wire intersection, and rolls the completed fence-web on a reel.

Referring now to the drawings, 1 is the main frame, consisting chiefly of a pair of castings resting on suitable feet and standing parallel to each other. They are connected by suitable ties 2, angle-bars 3, and the coiler-plate 4 and wire-guide 5, to be more fully described hereinafter. Wire for all the strands and cross-wires is taken from a lower story in the building through the floor.

In suitable bearings is mounted a shaft 6, provided at one end with tight and loose pulleys 7, by which the machine is driven or stopped through the medium of a belt. (Not shown.) A short distance from the driving-



pulley is a flanged pulley 8, communicating by a belt 9 with a larger pulley 10 on another cross-shaft 11, similarly mounted at the front side of the machine. At one end of this shaft is a small sprocket 12, communicating with a large sprocket 13 on the spindle of the reel, to be hereinafter described, by a link belt 14. When in operation, the motion of the main belt-pulley is continuous, but that of the reel is intermittent, so the belt running over the flanged pulley must needs slip a part of the time. As the roll of fence on the reel grows large there is a tendency to roll slackly, and to counteract this an automatic belt-tightener is provided. A pair of bell-cranked arms 15 are hung on a cross-shaft 16. On the lateral arms is mounted an idler 17 and at the lower end a roll 18. This travels on the roll of fence as it grows large, and so forces the idler upwardly to tighten the belt.

At the other end of the driving-shaft 6 is a pinion 19, meshing with a large spur-gear 20 inside the main frame and on another parallel shaft 21. On the same shaft, outside the frame, is an interrupted gear 22, meshing intermittently with a pinion 23 on the feed-roll shaft 24 at the back side of the machine. A part of the periphery of this gear 22 is smooth, and on this rides in the interval between the meshing of the gear with the pinion a shoe 24<sup>a</sup>, lateral to the pinion and forming a part of it. From this shoe extends a radial finger 26, which at the proper time engages a lug 27 on the gear and brings the teeth of the gear and pinion into exact register. It will be seen that the feed-roll pinion is at rest about two-thirds of the time. These rolls feed the stay-wires and in practice are made of different sizes, inasmuch as the length of the pieces of stay-wire vary according to the spaces between the strand-wires, these spaces widening as they approach the top of the fence. Opposite each active feed-roll is a companion roll 28, mounted in a yoke 29, pivoted to a hinge-plate 30, secured to one of the angle-bars 3. To the upper angle-bar is secured a gang of hinges 31, to which are pivoted links 32. At the outer ends of these links are pivoted cam-levers 33, just inside of which are mounted stirrup-shaped springs 34. The links are adapted to pass through the forked upper ends of the yokes, and as the cam-levers are depressed the pressure of the springs holds the rolls with sufficient pressure on the stay-wires to insure positive and accurate feeding.

The strand-wires are fed forward a regular predetermined distance by skeleton rolls 35, two of which are mounted at the top of the machine and one lower and midway between them. These rolls are geared together and are driven by a ratchet 36, secured to the shaft of one of them, a pawl 37, pivoted to an arm 38, loosely mounted on the same shaft, and a rod 39, connecting the arm with the

crank-arm 40 of the interrupted gear above described. The staggered position of these rolls, over and under which the finished fence is threaded, tends to make and keep it in alignment until reeled up, a matter requiring careful attention and proper appliances in the manufacture of wire fencing of this sort. It will be noted also that the fence as it is drawn forward over the skeleton rolls is bent somewhat sharply at each angular bar of the roll, which effectually prevents slippage, inasmuch as the fence nearly encircles three rolls in its course to the reel. In its passage from the last one of these cylinders the fence passes under a small roll 41 and thence over a similar roll 42, mounted at the ends of a pair of arms 43, pivoted at 44. To the upper ends of the arms are connected springs 45, the other ends of which are attached to the opposite side of the machine. The take-up so formed is for the purpose of taking up slack in the fence-web, inasmuch as the intermittent feed of the web is quite sudden, and if dependence is placed on the reel alone to take care of the material so drawn forward the web is apt to fold back and run in between two of the cylinders. The tension of the springs 45 is just enough to keep the fence drawn taut.

The mechanism for making the fence, as distinguished from reeling it up, will now be described in detail. Journaled in bearings 46 on the coiler-plate 4 is a gang of coilers 47. These have tubular shafts 48 with heads 49, through which the strand-wires pass, and at the opposite ends are provided with pinions 50, meshing with bevel-gears 51 on a shaft 52. This shaft is driven intermittently by a gear 53 and pinion 54 in the same manner as is the feed-roll shaft, already described. By reference to Fig. 5 it will be seen that the coiler-spindles do not stand radial to the bevel-gears, but at a tangent to their driving-shaft, so as to allow the strand-wires to pass up through the spindles at one side of said shaft. This necessitates the use of skew-gears, as indicated. The coiler-heads are of three sorts, the construction being clearly shown in Figs. 8 and 11. All are provided with a central hole for the passage of the strand-wire and a counterbore 55 to allow the head to turn and form a coil. From this counterbore the left-hand outer head and all the intermediate heads between it and the one at the extreme right (one only being here shown) are channeled at 56 with a dovetailed groove, as shown in Fig. 5, to catch and coil the ends of wire lying in it. Opposite this channel the intermediate heads and the right-hand one are provided each with a tapered hole at 57 to receive a wire, as shown. The separate stay-wires are fed to the heads through guide-tubes 58, terminating at cut-off plates 59. Just above the coilers are guides to direct the curved stay-wires A from head to head, so that when cut off and ready to coil one end



of each will rest in a coiler-head. Each of said guides has two parts fitting closely together when in guiding position, but separating later to allow the web to be drawn forward. The inner set 60 are secured to the fixed bar 5 and are each provided with a curved groove 61 to receive the stay-wire. The outer set 62 may have plane inner faces and are attached to a bar 63, mounted to slide a short distance back and forth on a bracket 64, projecting from the main frame. The connection of each guide-block with this bar is by stems 65, playing in bearings 66, secured to the bar. Between the bearings and the guide-blocks are springs 67, which secure a good contact of each pair of guides, but prevent breakage in case a kink, knot, or other obstruction should come between them. The outer ends of the stems are provided with nuts 68, so that the movement of the bar outwardly positively separates all the guides. To each end of the bar is connected a rod 69, the inner end of which slides in a bearing-bracket 70. Between the bracket and a shoulder on the rod is a spring 71, tending to force it outwardly. At one side of the rod is a stud 72, and on the outward side of this stud is the upper end of a lever 73, secured to a rock-shaft 74. It is to be understood that there is one of these levers at each side of the machine. On one side the lever is extended downwardly and engages by its roller 75 with a cam 76 on the shaft 21. When the cam, as shown in Fig. 4, shall have advanced a little farther, the lever will be relieved of pressure at the lower end and the guides will open by the pressure of the springs 71. They remain in this position during the forward feeding of the fence and its crimping at the stay-wire intersections.

To make sure that the stay-wires as fed forward shall all pass on the same side of all intermediate strand-wires, provision is made for pushing said strand-wires outwardly during the feeding operation, the holes in these coiler-heads being slotted, as shown, to admit of this action. On the guide-bar 5 is mounted a bar 77 to slide laterally under guides 78. In brackets 79 is secured a shaft 80, provided with short rollers 81 to bear on the inner side of the strand-wires. Pivoted near each end of the roll-carrier bar is a lever 82, swinging on a stud 83 and at the other end pivoted to the rod 69. It is to be understood that the construction shown in Figs. 6 and 7 is duplicated at the other side of the machine. It is evident now that as the wire-guides close to receive the stay-wires as fed forward the strand-wires are pushed outwardly, so that the stay-wires may all pass on the inner side of the strand-wires without missing. As the coilers all turn in the same direction, it is apparent that the outer end of one stay-wire should lie on a side of the strand-wire opposite all the others, as shown in Fig. 8.

Before coiling each stay-wire is cut off a short distance from the second coiler from its free end. The cut-off mechanism comprises a series of perforated plates 59, already referred to, and a gang of cutters 84, attached to a cutter-bar 85, pivoted at one end to a guide-bracket 86. The other end of the cutter-bar is mounted in a similar bracket and connects by a link 87 with a depending lever 88. The lower end of this lever has a roller 89 bearing on a cam 90. Strong springs 91 and 92 hold the roller in contact with the cam and throw back the cutter-bar when the roller passes the high point of the cam.

Before reaching the upper cylinders the fence is crimped at the stay-wire intersections to prevent the possibility of their slipping. The apparatus for this purpose is clearly shown in Figs. 3 and 4. Between a pair of guide-brackets 93 at each side of the machine is secured a flat bar 94. Sliding back and forth in these guides is a bar 95, provided with a pair of projecting plates 96, adapted to straddle the bar 94 when at the outer position. The bar 95 is linked by toggle-levers 97 to a lug 98 at each side of the machine. The middle joint of each toggle connects with the upper end of a depending bar 99, having a roller 100 at the lower end to ride on the cam 90. The depending bar is carried upwardly by the cam and descends by its own gravity.

In Fig. 10 is shown the detail of an improved reeling device. The driving-arbor 101 is mounted in a bearing 102 at one side of the machine. At one end of the arbor is a driver 103, and to the other end is secured the large sprocket already referred to. Opposite this arbor is a tail-spindle 104, socketed to take the cylindrical end of a square shaft 105, having a dog 106 fitted to the other end to engage the driver. The dog has a centering-spur 107 to fit a corresponding socket in the driver. The tail-spindle connects with a lever 108, pivoted at the lower end to a lug 109 and at the upper end having a shoulder 110 to engage the machine-frame and hold the parts in operative position. To disengage them, the upper end of the lever is sprung outwardly, releasing the shoulder from the machine-frame, and is pushed sidewise in a manner that will be readily understood, when the reel and its roll of fence drops a short distance to the floor. To draw out the reel, it is now necessary to reduce its diameter, and it is accordingly made with two main parts semicylindrical and separated at the edges far enough to allow the hooked ends of fence-wires to be connected thereon. Near each end of each such semicylindrical shell is a head-block, each provided with a rectangular hole to take the square shaft. The heads 111 fit the shaft closely; but those of the opposite half of the reel 112 are slotted at 113, as shown. In suitable slots in the heads 111 is mounted a sliding bar 114, having inclined surfaces 115 to bear on the



inner ends of the other heads. The bar is slid in or out by a cross-pin 116. In operative position it is as shown. To collapse the reel, the bar is drawn out a short distance, when it may  
5 be easily slipped out of the roll of finished fence.

The gearing, cams, and other mechanism are so arranged and adjusted as to perform the following cycle of operations: Assuming  
10 that the crank-gear shown in Fig. 3 has moved on until the crank is on the dead-center as respects the long ratchet feed-rod, the crimper and the stay-wire guides are now open, and the fence-web is fed forward during a half-revo-  
15 lution of the crank-wheel. During the first third of this stroke the wire-guides close and at the same time the strand-wires are pushed outwardly to admit the stay-wires behind them. The stay-wires now are fed forward,  
20 the operation consuming about two-fifths of the revolution of the wheel. During the return stroke of the crank while the web is at rest the first operation is to cut off the stay-wires and at the same time crimp the strand-  
25 wires. The final operation of coiling the stay-wires occupies about two-fifths of the wheel's revolution. The reeling mechanism has a continuous motion, but can only reel up so much of the web as is fed out intermit-  
30 tently and necessarily slips more and more as the roll of fence increases in size.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

35 1. In a wire-fence machine, the combination of mechanism for intermittently feeding a plurality of longitudinal strand-wires, mechanism for simultaneously and intermittently feeding a plurality of stay-wires transversely  
40 and so as to cross each other in pairs both lying on the same side of the strand-wires, a cut-off for the several stay-wires, and coilers to knot them around the strand-wires.

2. In a wire-fence machine, the combination  
45 of mechanism for intermittently feeding a plurality of strand-wires, mechanism for similarly feeding a plurality of transverse stay-wires so that a pair crosses each intermediate strand-wire all on the same side, mechanism  
50 for feeding one such stay-wire on the opposite side of one of the outer strands, cut-off mechanism to sever the stay-wires, and coilers adapted to secure their ends to the strand-wires.

55 3. In a wire-fence machine, the combination of intermittent feeding mechanism for a plurality of strand-wires, mechanism for intermittently and simultaneously feeding a plurality of transverse stay-wires so that pairs  
60 of them cross each other and all the intermediate strand-wires all on the same side, a cut-off for the several stay-wires, coilers to secure their ends around the strand-wires which pass through said coilers, and mechanism for  
65 pushing said strand-wires out of the center

line of the coilers so as to allow a pair of stay-wires on one side.

4. In a wire-fence machine, the combination with mechanism for intermittently feeding a plurality of strand-wires and a plurality of  
70 transverse stay-wires, and mechanism for cutting off and coiling the stay-wires, of guides for the stay-wires adapted to carry them to coiling position, and mechanism adapted to positively close said pairs of guides during  
75 the feeding operation, and open them to allow the fence to feed forward.

5. In a wire-fence machine, the combination with strand-wire-feeding mechanism, trans-  
80 verse-stay-wire-feeding mechanism, stay-wire cut-off, and coilers through which the strand-wires pass, of stay-wire guides in separable pairs, grooved to guide the wires to proper coiling position, mechanism adapted to posi-  
85 tively open and close them at the proper times, and springs to bring said pairs of guides into yielding contact.

6. In a wire-fence machine having feed mechanism for a plurality of strand-wires,  
90 guides, cut off mechanism and coilers for a plurality of transverse stay-wires, a gang of positively-driven feed-rolls, and a corresponding number of independently-mounted companion rolls mounted in a suitable yoke or car-  
95 rier, a pivotal connection of each yoke with some fixed support, a link at the other end pivoted to a fixed support, flexible pressure mechanism thereon, and means for bringing said pressure mechanism into engagement with the free end of the yoke.  
100

7. In a wire-fence machine, the combination with feed mechanism for a plurality of strand-wires, stay-wire coilers, through which the strand-wires pass, and a cut-off for a plurality  
105 of stay-wires, of a gang of positively and simultaneously driven stay-wire-feed rolls of varying diameter, and a series of independently-mounted companion rolls, yokes to hold them, a pivotal connection of one end of each yoke with a fixed support, a link hinged to a  
110 fixed support near its other end, a spring thereon, a cam-lever at its free end, and a fork in the free end of the yoke, whereby the link may be quickly engaged therewith.

8. In a fence-machine having feed mechan-  
115 ism for a plurality of strand-wires, a gang of feed-rolls for a plurality of transverse stay-wires fixed to a single shaft, a pinion provided with a holding-shoe, secured to said shaft, and a continuously-driven, interrupted gear, the  
120 teeth of which mesh with said pinion intermittently, and having in the interval between the series of teeth a smooth surface to slide on said shoe, whereby the gears are positively engaged at the proper time, and the roll-  
125 shaft is locked against turning at other times.

9. In a fence-machine having feed mechan-  
ism for a plurality of strand-wires and trans-  
verse stay-wires, and a cut-off for said stay-  
wires, a gang of coilers through which the  
130



strand-wires pass, a shaft transverse thereof and offset from the center, skewed bevel-gearing connecting the coilers with said shaft, and means for driving the shaft intermittently.

5 10. In a fence-machine having feed mechanism for a plurality of strand-wires and transverse stay-wires, and a stay-wire cut-off, a gang of stay-wire coilers, through which the strand-wires pass, a driving-shaft therefor, 10 bevel-gearing connecting said shaft with the coilers, a pinion secured to said shaft and having a lateral shoe, an interrupted gear meshing intermittently therewith, the interrupted portion being provided with a smooth peripheral surface for the shoe to ride on and 15 lock it against turning.

11. In a fence-machine having feed mechanism for a plurality of strand and stay wires, one or more tubular coiler-spindles through 20 which the strand-wires pass, having a head with a laterally-slotted hole for said strand-wire, a counterbore to take the coil, a channel lateral therefrom to take the end of one stay-wire, and a hole opposite thereto to receive another stay-wire. 25

12. In a fence-machine having feed mechanism for a plurality of strand and stay wires, and a stay-wire cut-off, a coiler-head for one of the marginal strand-wires, having a central hole for said wire, a counterbore to take 30 the coil as formed around it, and a hole in the side leading to said counterbore.

13. In a fence-machine having mechanism for feeding a plurality of strand-wires and 35 transverse stay-wires and for coiling the stay-wires about the strand-wires, a cut-off for the stay-wires comprising a cutter-bar pivoted at one end, a gang of cutters secured thereto, a gang of perforated plates coinciding with the cutters, through which the stay- 40 wires pass, and means for intermittently reciprocating the cutter-bar, whereby the stay-wires are severed successively.

14. In a fence-machine having mechanism 45 for forming the fence-web and feeding it forward intermittently, a crimper comprising a

fixed bar, a sliding head, channeled to straddle said bar, guides therefor and a supporting-frame, toggle-levers connecting said head with the frame, and a cam and connecting 50 mechanism adapted to actuate said levers intermittently.

15. In a fence-machine having web-forming mechanism, a web-feed comprising three staggered skeleton cylinders geared together, 55 a ratchet secured to the shaft of one of the cylinders, a pawl mounted on an arm swinging adjacent thereto, and a connection of said arm with a crank-wheel.

16. In a fence-machine, the combination of 60 mechanism to feed the finished web forward intermittently, a reel to roll it up, a friction-belt and pulleys to drive the reel, and an automatic belt-tightener, comprising a pair of bell-crank arms hinged to the machine-frame, 65 an idler-pulley at one terminal to engage the belt, and a roller at the other free terminal to travel on the rolled-up fence.

17. In a fence-machine, the combination of a reel-driving arbor, a reel-drum with a dog 70 at one end of its shaft to engage the driver, a socketed spindle to take the other end of the shaft, a lever hinged to said spindle and to the machine-frame, and having at its free end a shoulder to engage said frame when in 75 operating position.

18. In a wire-fence machine, a reeling-drum comprising a pair of nearly semicylindrical shells, head-blocks near their ends, arranged to shut past each other, a square shaft fitting 80 a similar hole in the heads of one shell, oblong rectangular holes in the other pair to take said shaft, slots in the other pair to take a sliding bar, and a bar mounted therein, having inclined faces bearing on the inner ends 85 of the other pair of heads.

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

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