No. 689,578. Patented Dec. 24, 1901.

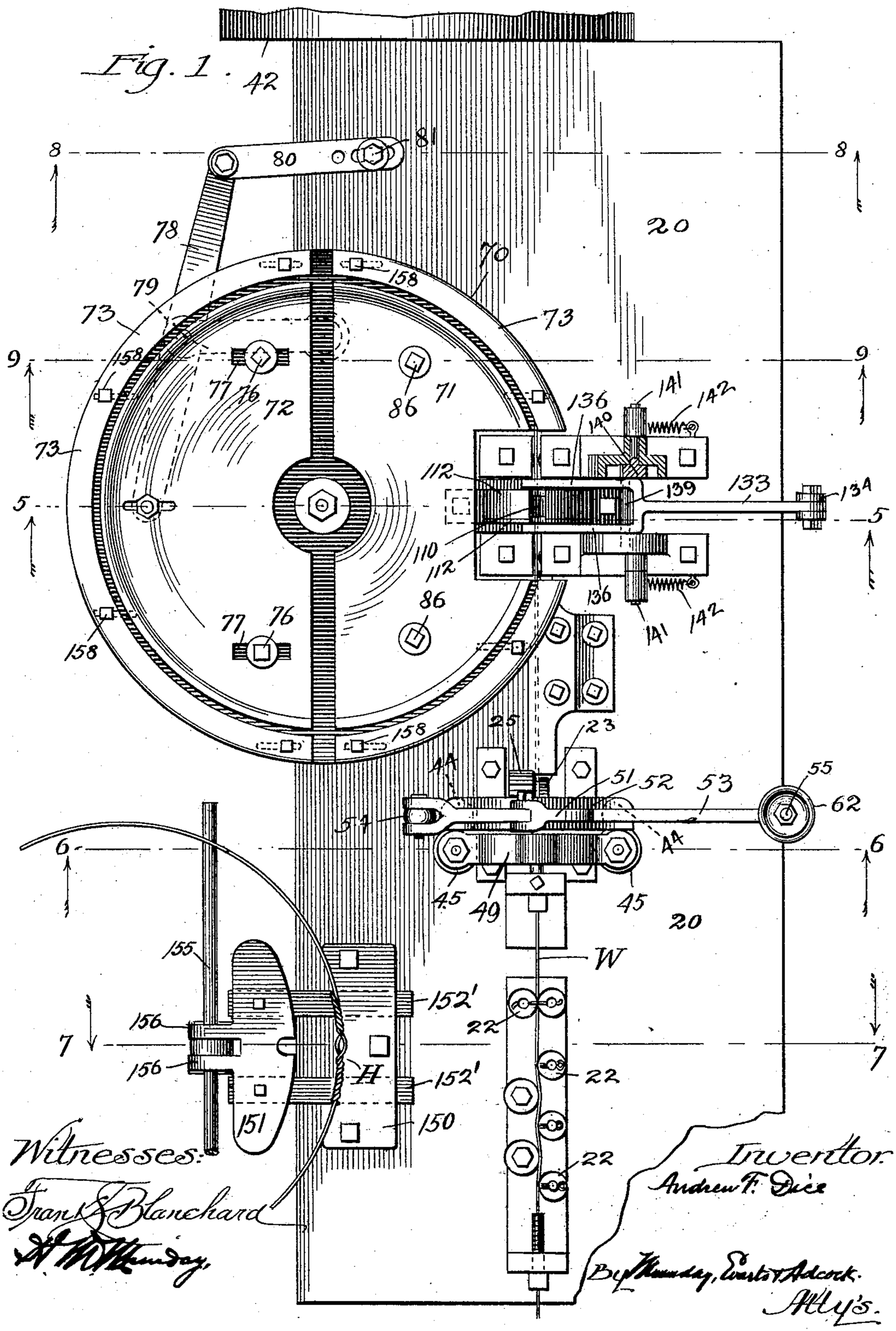
A. F. DICE.

WIRE HOOP MACHINE.

(Application filed Aug. 23, 1901.)

(No Model.) 8 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 8 Sheets—Sheet 2.

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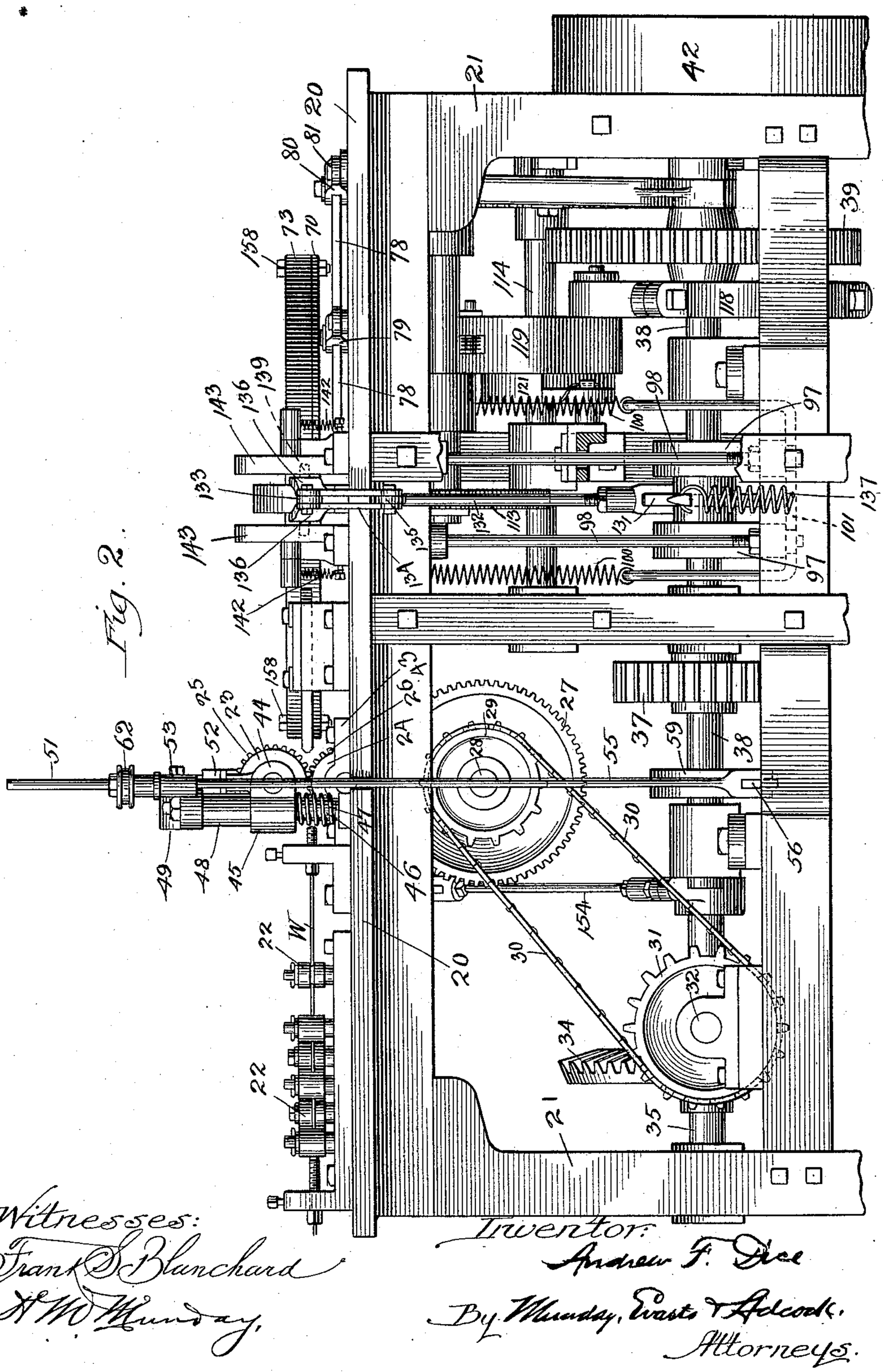

Fig. 2.

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(No Model.) 8 Sheets—Sheet 3.

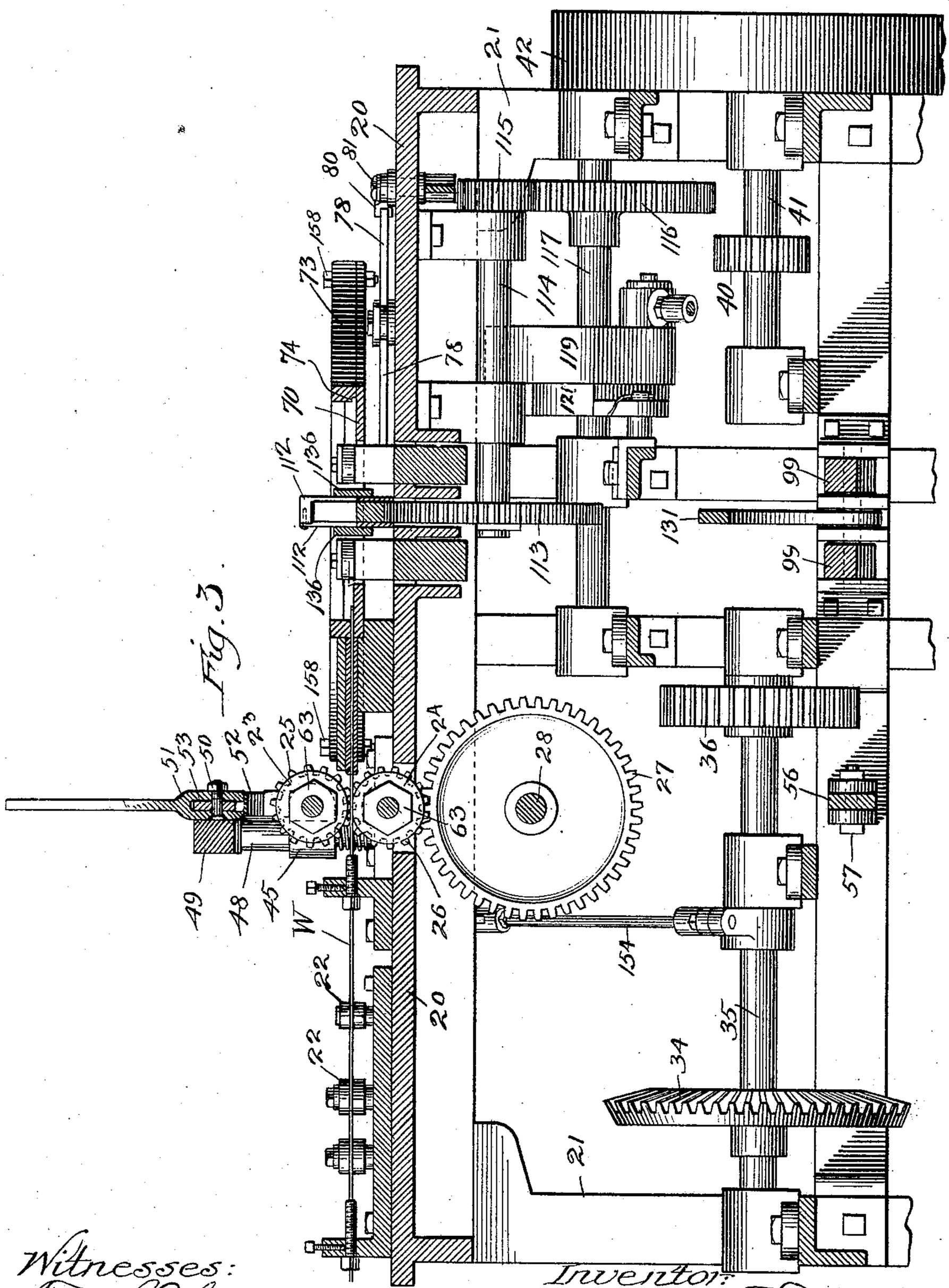

Fig. 3.

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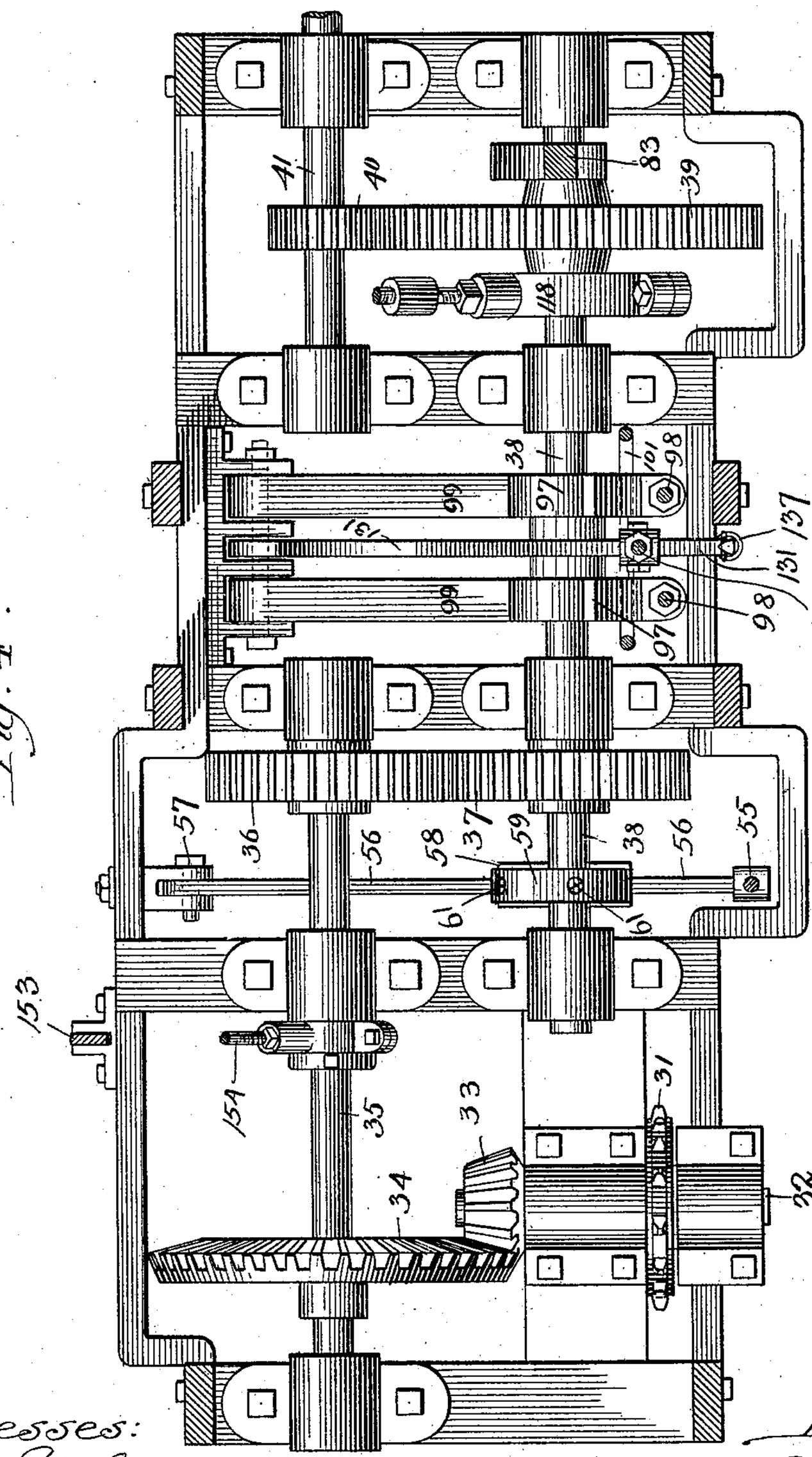
(No Model.) 8 Sheets—Sheet 4.

Fig. 4.



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8 Sheets—Sheet 5.

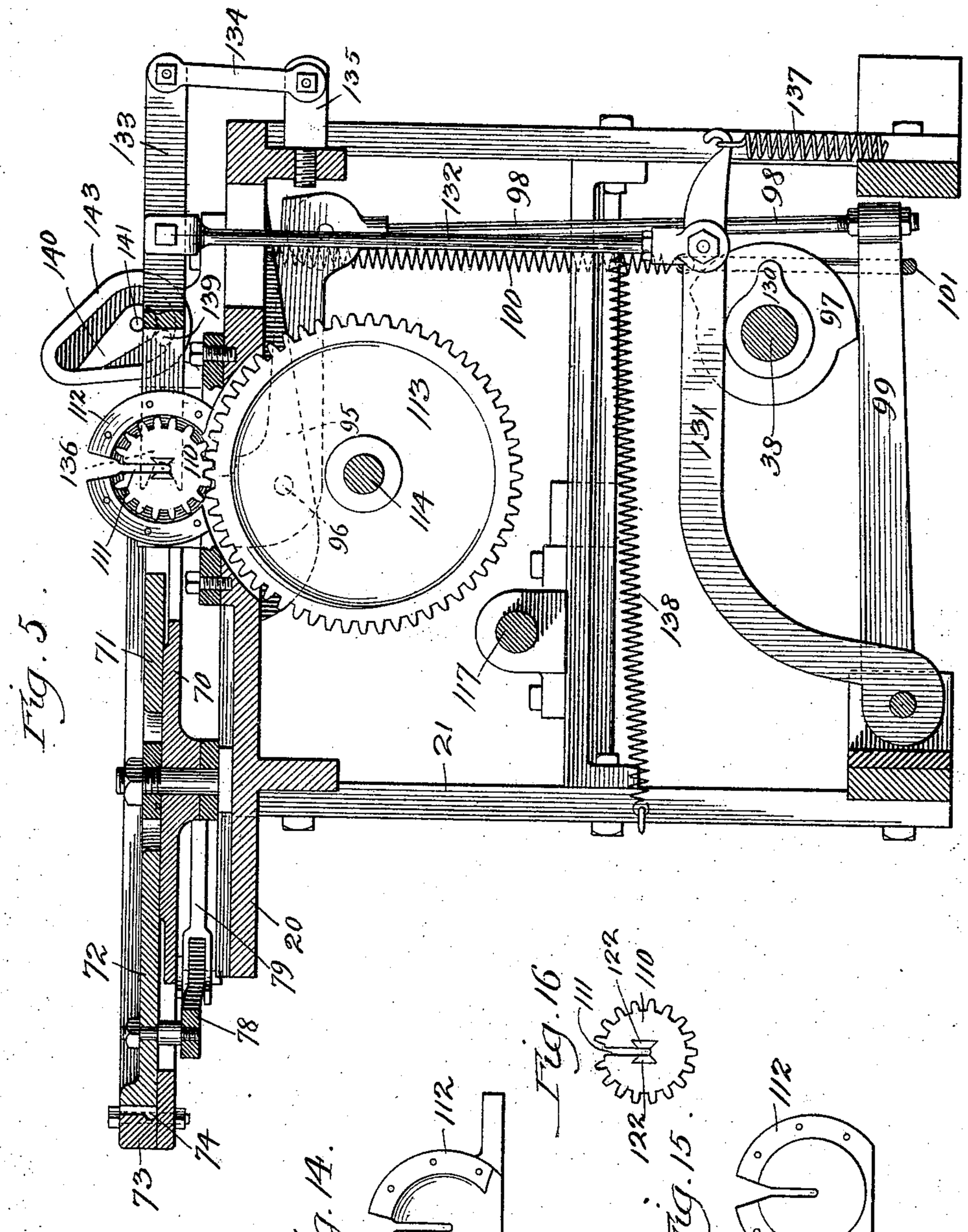

Fig. 5.

Fig. 14.

Fig. 16.

Fig. 15.

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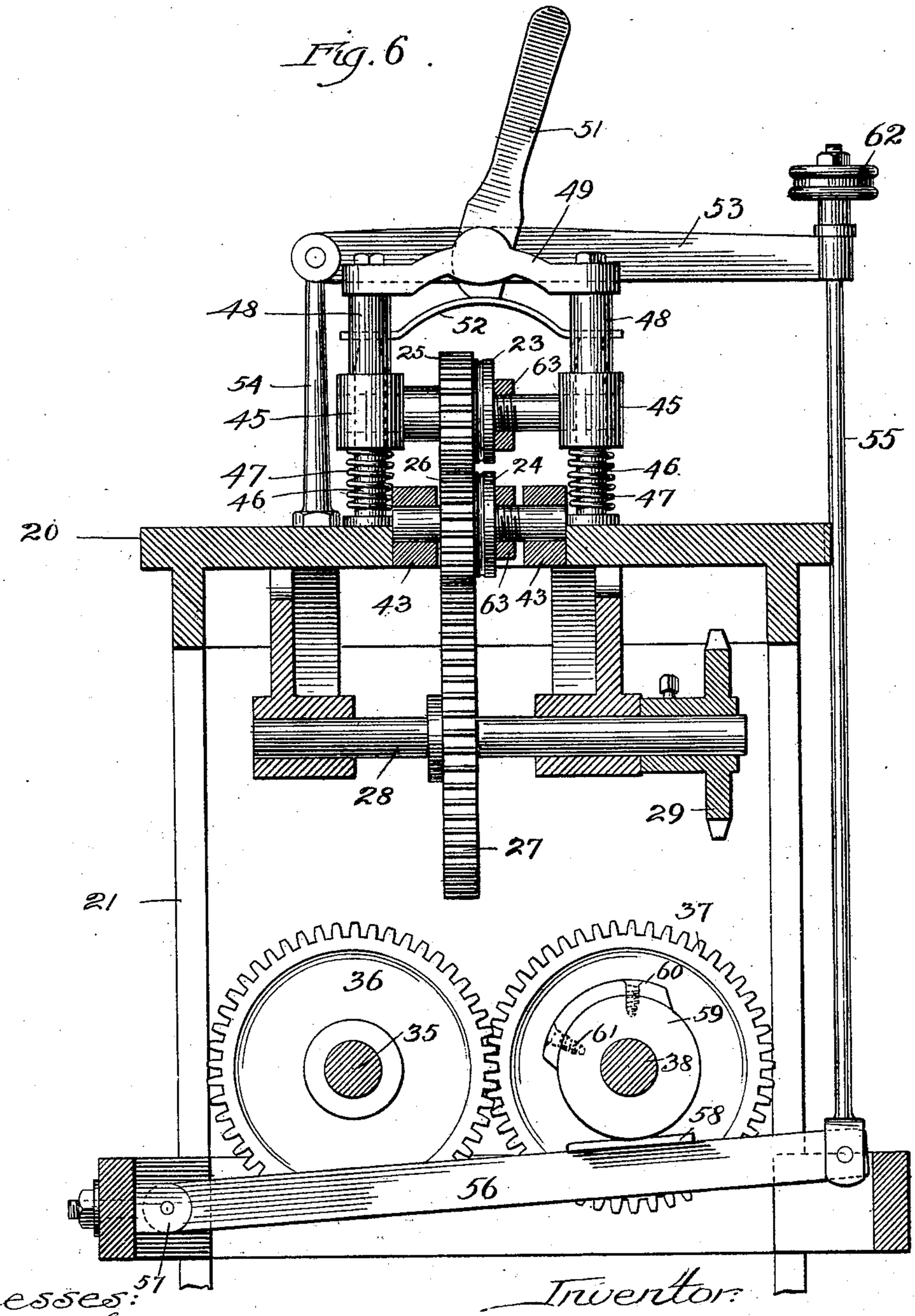
(No Model.) 8 Sheets—Sheet 6.

Fig. 6.



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(No Model.) 8 Sheets—Sheet 7.

Fig. 7.

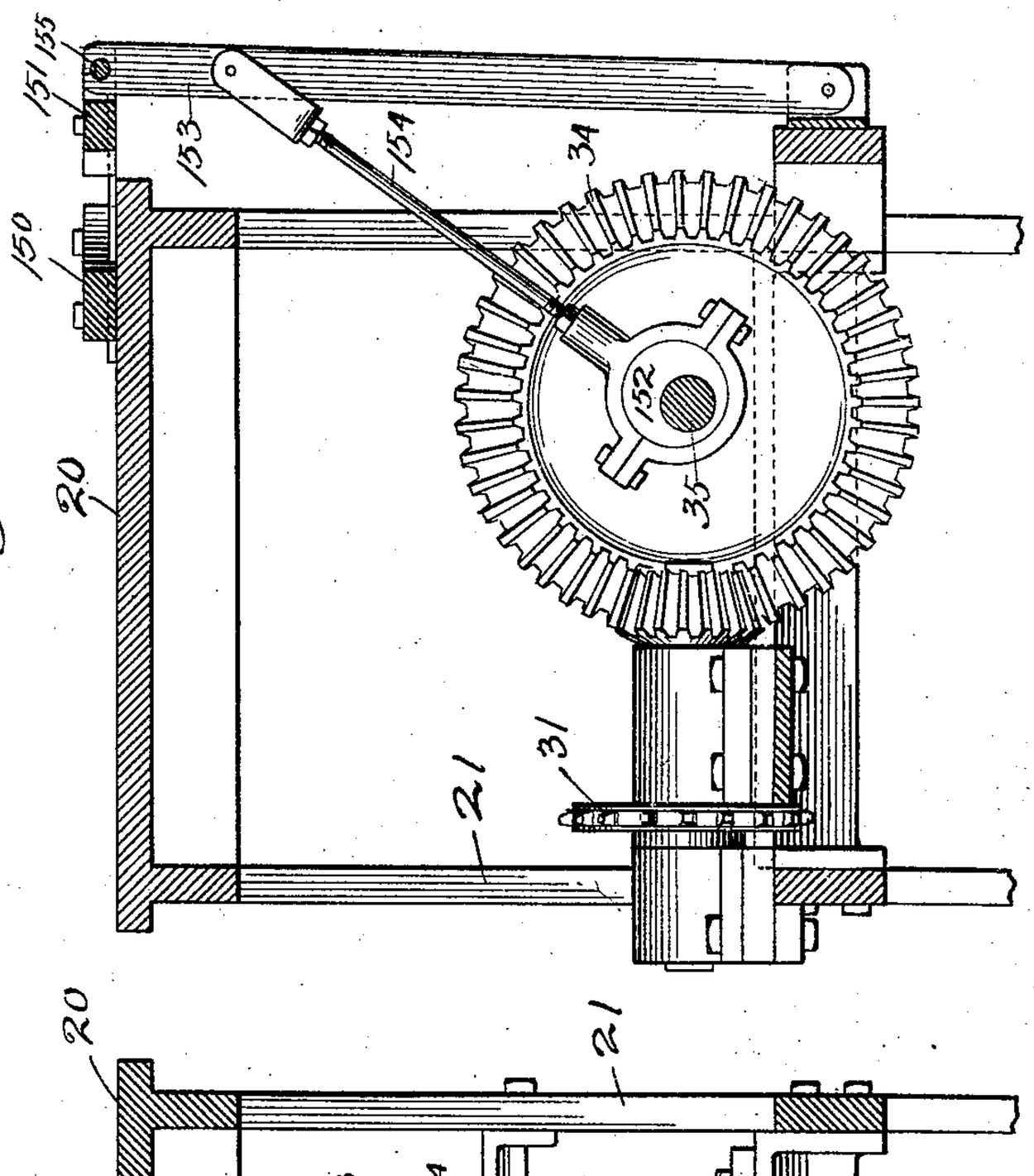
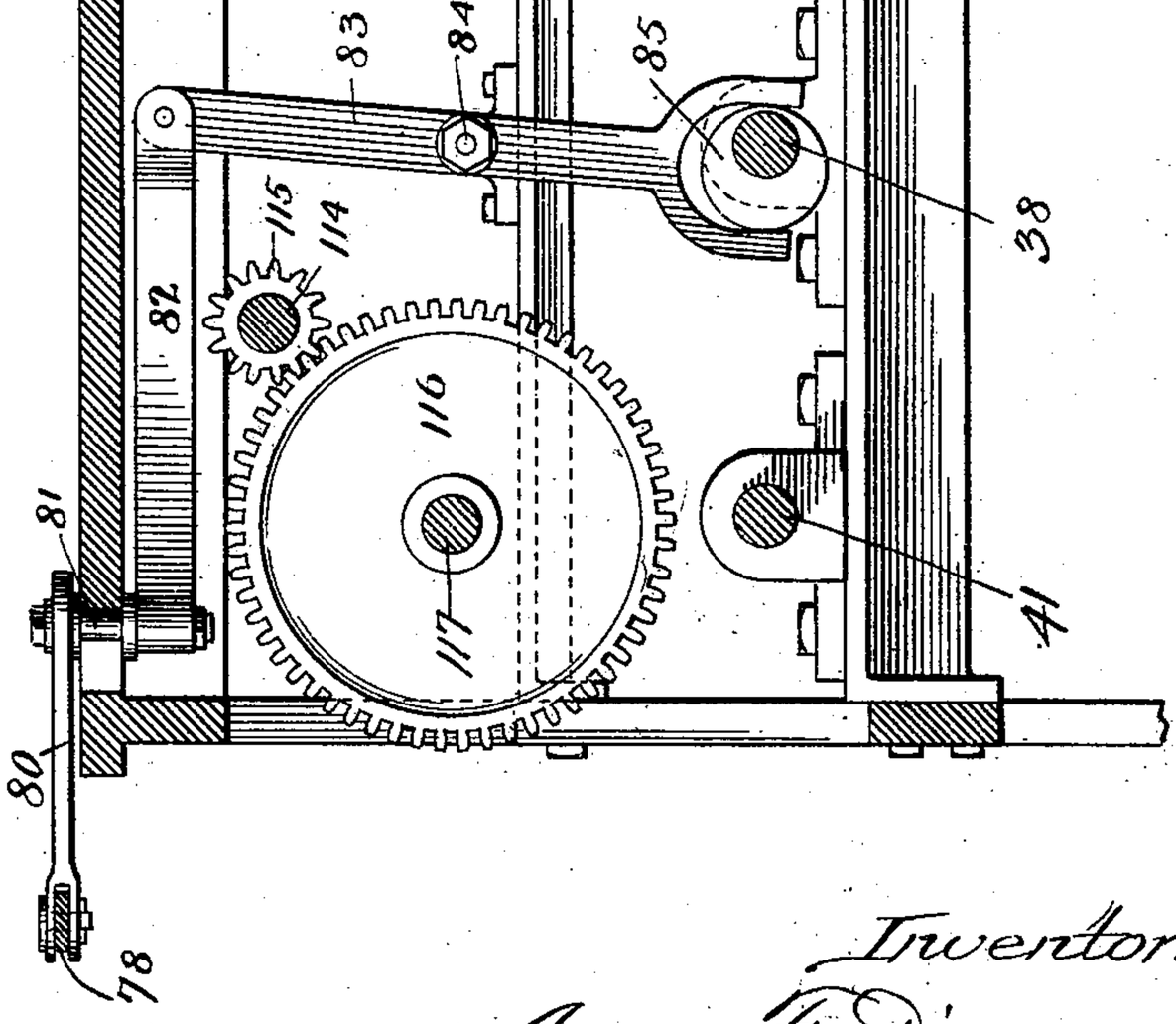


Fig. 8.



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8 Sheets—Sheet 8.

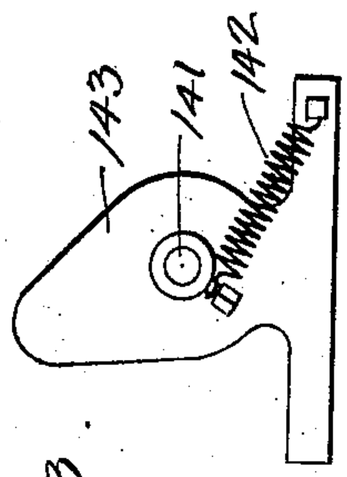

Fig. 13.

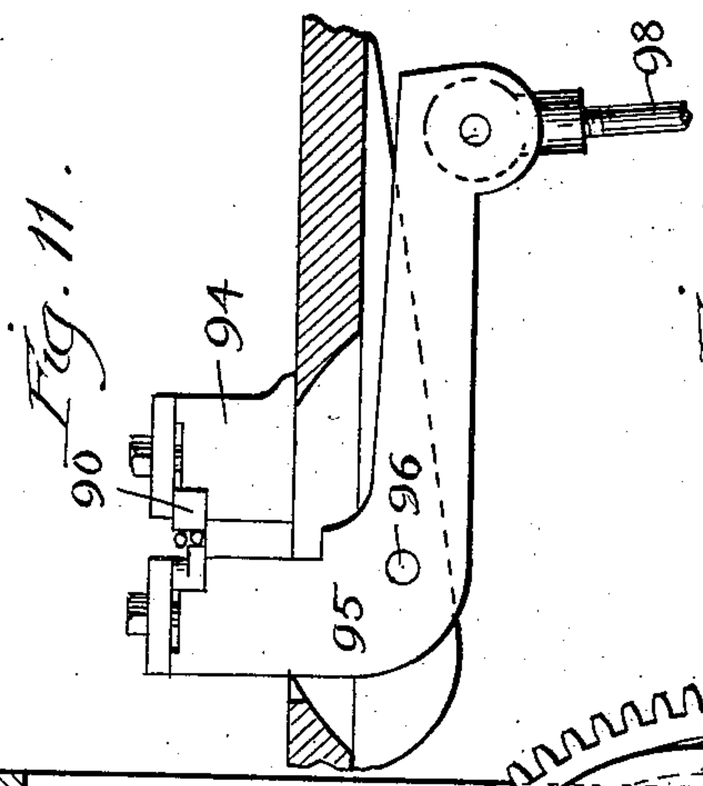

Fig. 11.

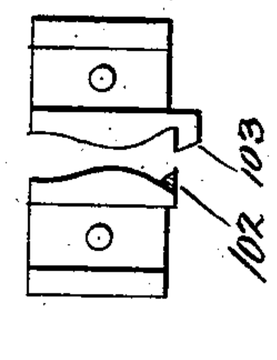

Fig. 12.

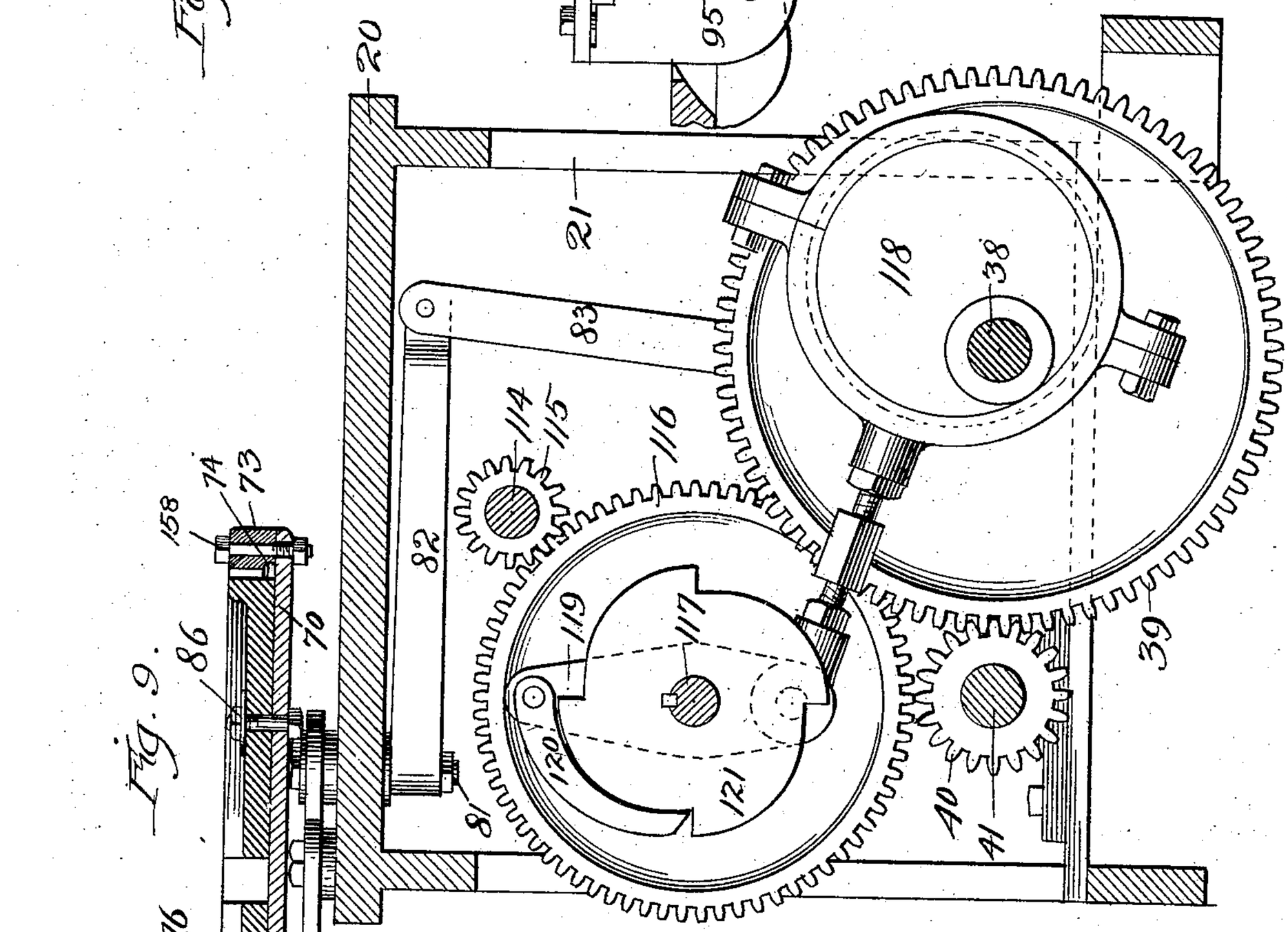

Fig. 9.

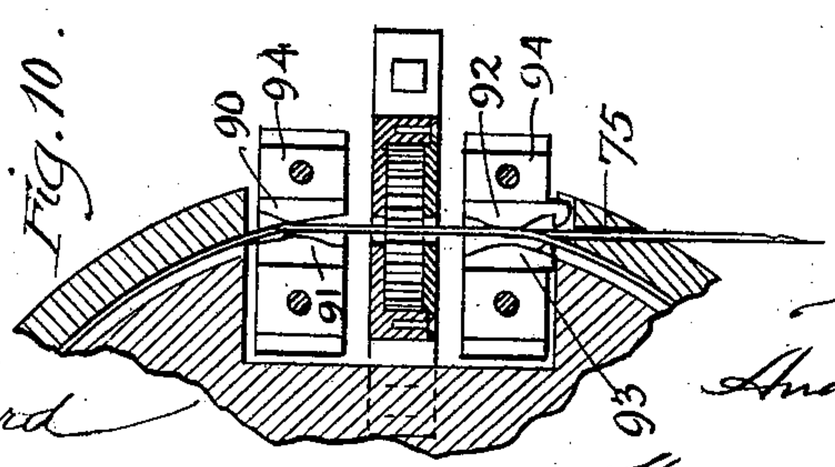

Fig. 10.

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UNITED STATES PATENT OFFICE.

ANDREW F. DICE, OF JOLIET, ILLINOIS.

WIRE-HOOP MACHINE.

SPECIFICATION forming part of Letters Patent No. 689,578, dated December 24, 1901.

Application filed August 23, 1901. Serial No. 73,011. (No model.)

To all whom it may concern:

Be it known that I, ANDREW F. DICE, a citizen of the United States, residing in Joliet, in the county of Will and State of Illinois, have invented a new and useful Improvement in Wire-Hoop Machines, of which the following is a specification.

The machine forming the subject-matter of this invention is adapted to manufacture wire hoops for barrels and other commercial packages. It contains mechanism for feeding the wire from a coil thereof, means for bending the wire into hoop form, means for severing the wire, means for twisting the ends of the severed wire together, and means for discharging the hoop; and the invention consists in the novel construction of parts and devices and in the novel combinations of parts and devices hereinafter set forth, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this invention, Figure 1 is a plan of the invention, partly in section. Fig. 2 is a rear elevation, partly broken away. Fig. 3 is a longitudinal vertical section. Fig. 4 is a horizontal section. Figs. 5, 6, 7, 8, and 9 are transverse vertical sections on the lines 5 5, 6 6, 7 7, 8 8, and 9 9, respectively, of Fig. 1. Fig. 10 is a detail section of the twisting mechanism. Fig. 11 is a partial vertical section showing the cutting and gripping jaws and their operating-levers. Fig. 12 is a plan of said jaws. Fig. 13 is a side elevation of the hollow guide for lifting the arm which raises the hoop from the twister. Figs. 14 and 15 are elevations of the twister-casing, and Fig. 16 shows the twister detached.

In said drawings, 20 represents the table of the machine, and 21 the uprights and other parts of the framing supporting the table. The wire W is drawn into the machine from between a series of straightening-rolls 22 by opposing feed-rolls 23 and 24. The lower of these feed-rolls is stationary as to location and the other rises at intervals to release the wire while the hoop ends are being united. The rolls are driven continuously by intermeshing pinions 25 and 26 on the journals of the rolls and gear 27 of cross-shaft 28, carrying a sprocket-wheel 29, actuated by chain 30, and sprocket-wheel 31 on cross-shaft 32, carrying bevel-pinion 33, meshing with bevel-gear 34 on shaft 35, carrying gear 36, meshing with gear 37 on shaft 38. This shaft 38 receives power through its gear 39 and pinion 40 from shaft 41 and the drive-pulley 42 mounted thereon.

The feed-roll 24 is journaled in stationary boxes 43, Fig. 6, and the journal of roll 23 is supported in boxes 44, carried by slides 45, encircling and vertically movable on uprights 46, located laterally of the journal. Springs 47 are placed around the uprights and exert constant upward pressure on the slides, and except when overcome by a superior power they keep the upper roll out of action, though without destroying the mesh of the driving-pinions 25 and 26. Above and attached to the slides are posts 48, connected at top by a cross-head 49. A cam-lever 51, operable by hand, is supported by the pivot 50, passing through a lever 53. A stiff spring 52, compressed by said lever 51, bears at its ends on the boxes 44, and power to overcome the lifting-springs is communicated to the pivot 50 by said lever 53. Lever 53 is pivoted at one end to a stationary post 54 and attached at the other end to a vertical link 55, which is freely jointed to one end of a lever 56, pivoted at 57. This last-mentioned lever carries a plate 58, which is in constant contact with a rotating cam 59 on shaft 38, the springs 47 acting through the connections described to maintain this contact. The raised portion 60 of the cam acts to depress lever 56 and to keep it depressed for such length of time as may be necessary to feed a sufficient portion of wire to form a hoop, the depressing of lever 56 acting through the link 55, lever 53, and pivot 50 to force the roll 23 down to its acting position. The length of time the roll is kept in action depends on the length of the raised cam-surface 60, and in order to adapt the machine to make hoops of different diameters I make this part of the cam changeable, attaching it to the concentric body of the cam by screws 61, as shown. Small changes in the diameter of the hoops can be provided for in this way; but if the change desired cannot be obtained by changing the cam the sprockets 29 and 31 may be changed or replaced by others of different sizes. The link 55 is also made adjustable in length by means of nut 62, so it may cause greater or less pressure by the roll

23 on the wire and to adapt the feed-rolls to act on different sizes of wire. It will be understood that when the raised portion of the cam passes off of plate 58 the springs 47 will lift roll 23 and stop the feed of the wire and that during the interval prior to the next actuation of lever 56 by the cam the wire will be severed, the ends of the severed portion united, and the hoop thus formed lifted from the forming devices, so it may be removed by the attendant. The feed-rolls are clamped against their respective driving pinions by nuts 63. If for any reason it be desirable to stop the feed of the incoming wire, it may be done instantly by reversing lever 51, by which act lever 53 is allowed to drop sufficiently to prevent contact between the cam-surface 60 and plate 58.

The wire is fed by the intermittently-acting feed-rolls into forming devices adapted to bend it into hoop form, and consisting of an outer former 70 and inner formers 71 and 72. The outer former is stationary and is a circular disk with an upstanding flange 73, having an undercut groove 74 around its inner face. The inner formers are semicircular and with flanges opposing the flange 73. The wire approaches the formers tangentially through the passage 75 and after passing the knives and twister enters the groove 74 and follows around the same until its initial end has passed the entering point and lapped by the rear end to the extent indicated at Fig. 10. In this operation the circular bend designed for the hoop is imparted to the main portion of the wire through the lapped ends, which are subsequently twisted together and kept approximately straight until after they are united, as will be understood from said Fig. 10. The inner and outer formers do not come close enough together to interfere with the incoming wire while the latter is entering, but at the same time they form a passage adapted to keep the wire under control while it is being pushed in, and the opening between them is not closed at the top, and thereby full opportunity to take out the hoop after its ends are joined is afforded.

After a sufficient length of wire to form a hoop has been positioned in the former the central portion of the wire between the ends of the hoop is closely confined in groove 74 by moving the inner former 72 close against the flange of the outer former. For this purpose the former 72 is made movable, being attached to disk 70 by screws 76, passing through slots 77 in former 72, and a lever 78, pivoted centrally to an arm 79, rigidly secured to the table, is attached at one end to former 72 and at the other end joined to a link 80, connected by a pin 81, passing through a slot in the table, to a second link 82, which is pivoted to the upper end of a rocking lever 83, pivoted at 84 and having its lower end forked and engaging an eccentric 85 on shaft 38. By this mechanism the former 72 is caused to move to confine that portion of the hoop opposite the ends while the latter are being twisted and prevent any tendency by the confined portion to jump or to spring out from between the formers under the torsion exerted in the twisting. The eccentric is adapted, of course, to move the former in both directions and cause it to move inward and away from the outer former as soon as the twisting operation is concluded, thus giving full opportunity to lift the hoop out of the former. Although I have described the parts 71 and 72 as "formers" it will be understood that the main service in bending the wire is done by the outer former and that the inner formers generally serve only as guards to the outer one. The part 71 is held in position on former 70 by bolts 86.

Simultaneously with the movement described of the inner former, by which a portion of the hoop-blank is confined, is the gripping of the wire at each side of the part which is twisted and the severing of the wire. For the gripping I employ two pairs of opposing jaws 90, 91, 92, and 93. Of these jaws 90 and 92 are each supported in posts 94, stationary on the table, and the other jaws are secured in elbow-levers 95, hinged at 96 and rocked in the direction which causes the gripping by cams 97 on shaft 38, links 98, and hinged levers 99, and rocked in the opposite direction by lifting-springs 100 and the yoke 101, extending under the levers 99. These grippers are adapted to take hold of the overlapping portions of the hoop and to hold them during the twisting, the latter taking place between the grippers and being permitted by the torsion of the intermediate portion of the wire. The grippers do not absolutely prevent longitudinal slipping of the wire through them, but on the contrary allow the contraction in length caused by the twisting.

The pair of grippers at the entering side are also fashioned to serve as knives in cutting of the wire, as particularly shown at 102 and 103, and such knives act when the grippers approach each other, as will be understood from Figs. 10, 11, and 12.

In the space between the two pairs of grippers I locate the twister 110, which consists of a pinion provided with a radial slot 111 extending inward beyond its axis, as plainly seen at Figs. 5 and 16. The pinion at the time the wire is fed into the former is positioned so that the slot will be coincident with the path of the wire, and consequently when the feeding stops both of the overlapping ends of the wire will be in the slot, one on top of the other, and at opposite sides of the pinion-axis. The pinion is a floating one, having no axial support, and is confined in a circular casing 112, open at the sides to admit the wire and at the top to permit the taking out of the hoop, and also open at the bottom to permit the pinion to intermesh with the gear 113 on shaft 114, by which the pinion is rotated. The casing is adapted to confine the pinion sufficiently to insure its proper action

without creating unnecessary friction, so that an axial support may be dispensed with. Shaft 114 receives power from pinion 115 and gear 116 on the intermittently-operated shaft 117. The means employed for giving the intermittent motion consist of the eccentric 118 on shaft 38, the rocking or oscillating lever 119, mounted loosely on shaft 117 and connected to the eccentric-strap, the pawl 120, carried by said lever 119, and the ratchet 121, fast on shaft 117. The ratchet shown is provided with four acting shoulders; but it may be provided with any desired number, depending on the number of revolutions to be imparted to the twisting pinion at each operation. The rotation of the pinion carries the portion of the ends of the wires lying in it around with it, twisting them in opposite directions away from itself and making the joint shown at H in Fig. 1. The pinion at the point where it comes in contact with the wires is preferably provided with hardened steel pieces 122. By the construction shown the motion imparted to the shaft 117 at each actuation by the pawl and ratchet will be sufficient to revolve the twister two or more complete revolutions, imparting that number of complete twists at each side of the twister. As will be understood from Fig. 10, the twisted portions of the wire are not bent to conform to the curvature of the hoop until after the twist has been completed, and this is made a separate operation, which is described later on. The twist being now completed, the grippers separate and the former 72 moves back so that the hoop may be lifted out from between the formers and grippers. This is done, in part at least, by devices now to be described. At 130 is a cam on shaft 38, acting to lift a lever 131, connected by a rod 132 to a horizontal lever 133, pivotally connected at its outer end by a link 134 to a stationary bracket 135. At its inner end lever 133 is forked or divided, forming two arms 136, one at either side of the twister-casing. (See Fig. 1.) Each arm 136 projects inward beyond the plane in which the twisting takes place, and such inner ends are also notched, as shown in dotted lines in Fig. 5, in order that their lower points may be passed under the wire and be thus adapted to lift it. The inner end of lever 133 is given a compound motion in order that it may first lift the united ends of the hoop clear of the formers and twister-casing, so that the attendant may take hold of it and remove it entirely from the formers. Then it is moved backward sufficiently so that the arms 136 shall be back of the plane of the wires, then it is carried downward, and, finally, it is again moved inward to the position of Fig. 5. These movements are due to the cam 130, the spring 137 for returning lever 131, the spring 138, attached to rod 132 and urging it forward, and the guiding device now to be described. Located at each side of the lever 133 is a hollow guide 143 of the form best shown at Fig. 5, and the lever is provided with a pin 139, projecting into both the guides. In each guide is a pivoted switch 140, mounted on a pivot 141 and having a spring 142 for keeping it in its normal position. (Shown at Fig. 5 and also at Figs. 1, 2, and 13.) When the lever begins to move under the power of cam 130, it rises with the pin, traveling upward along one side of the guides. When the pin reaches the top of the guide, it passes over the switches and in moving down is compelled to travel along the other side of the guide, and when it reaches the bottom of the guides spring 138 pulls it over to its starting-point. The feed of the fresh wire may commence as soon as lever 133 has raised the hoop out of its way.

As already stated, the twisted portions of the wire come from the twister without being bent to conform to the curvature of the hoop, and in order that this curvature may be given in the same machine I provide in close proximity to the forming and twisting mechanisms two curved-faced bending-jaws 150 and 151, one concave and the other convex. Of these the first is stationary and bolted to the table and the second is supported on slides 152′, supported on the table and moving in grooves cut in the under side of jaw 150. The jaw 151 is given motion to and from jaw 150 at proper times by means of an eccentric 152, a lever 153, pivoted at its lower end and connected to the eccentric by rod 154 and also joined to jaw 151 by a pivot 155 entering between pierced projections 156, integral with the jaw. The pivot is preferably extended on each side far enough to enable it to support the hoop as soon as the jaws begin to take hold of it, so the operator may then let go of the hoop. The jaw 151 is carried far enough toward jaw 150 to insure the imparting of the proper curvature to the twist, and as soon as the jaws again open the hoop tips on the support 155, the outer portion being the heavier, so that it automatically discharges itself. This operation of curving the twist is timed relative to the release of the hoop from the twisting and forming devices, so that the operator may have sufficient time to transfer the freshly-twisted hoop from those devices to the bending devices 150 and 151 before the latter begin to close.

The machine is adapted to make hoops varying quite largely in diameter, and one feature by which I obtain this adaptability is by making the rim 73 of former 70 separate from the former and in segments, so it can be adjusted on the former. These segments are bolted to the body of the former by bolts 158, passing through elongated openings in the former. The inner former being also adjustable, I am enabled by this feature to contract the outer former so as to reduce its size materially. Although the hoop bent in the contracted former will not be truly circular, yet its irregularity in that respect may be largely cured by the jaws 150 and 151, and in any event does no harm.

While the construction of the various parts of the machine illustrated and described herein is the best now known to me, it should be understood that I do not wish to be limited thereto, except in cases where my claims expressly require such limitation, as, obviously, the construction in many respects may be changed without departing from the spirit of the invention and claims.

I claim—

1. In a wire-hoop machine, the combination with devices for feeding the wire from a supply-coil, of means for severing the proper amount of wire for a hoop from the supply-wire, and means for uniting the ends of the severed length by twisting them together, substantially as specified.

2. In a wire-hoop machine, the combination of wire-feeding mechanism, devices for bending the wire into hoop form, wire-severing devices, and mechanism for twisting the ends of the severed wire together, substantially as specified.

3. In a wire-hoop machine, the combination with means for bending the wire into hoop form, of means for feeding the wire acting to feed it until the initial end overlaps the incoming wire, means for severing the wire, and means for twisting the ends of the severed length, substantially as specified.

4. In a wire-hoop machine, the combination with means for bending the wire into hoop form, of means for feeding the wire, acting to feed it until the initial end overlaps the incoming wire, means for severing the wire, means for twisting the ends of the severed length, and means for clamping the lapped portion of the wire during the twisting, substantially as specified.

5. In a wire-hoop machine, the combination with means for bending the wire into hoop form, of means for feeding the wire, acting to feed it until the initial end overlaps the incoming wire, means for severing the wire, means for twisting the ends of the severed length, and means for clamping the lapped portion of the wire during the twisting at each side of the twisting-point, substantially as specified.

6. In a wire-hoop machine, the combination with the wire-feeding and hoop-forming devices of twisting devices consisting of a floating twister, means inclosing and confining the twister and open at the sides to admit and at the top to discharge the wire, and means for rotating the twister, substantially as specified.

7. In a wire-hoop machine, the combination of a floating pinion slotted radially and receiving the wire at its side, a casing inclosing and confining the pinion and open at its sides, top and bottom, and a gear driving the pinion, substantially as specified.

8. The wire-hoop machine provided with means for feeding the wire, forming devices receiving the wire from the feeding means and bending it into hoop form as it is fed, and means for twisting the ends of the hoop together, substantially as specified.

9. The wire-hoop machine provided with means for twisting the ends of the hoop together, and means for holding the opposite side of the hoop during the twisting operation, substantially as specified.

10. The combination with the twisting mechanism of means for bending the wire into hoop form and also adapted to hold the side of the hoop opposite the twisting mechanism during the operation of said mechanism, substantially as specified.

11. The combination with the twisting mechanism of the outer former and inner movable former 72, and means actuating the inner former to confine the side of the hoop opposite the twisting mechanism during the operation of the latter, substantially as specified.

12. The wire-hoop mechanism embodying means for bending the wire into hoop form as it is fed into the machine, such means consisting of outer former 70 and inner formers or guards 71 and 72, substantially as specified.

13. The wire-hoop mechanism embodying means for bending the wire into hoop form as it is fed into the machine, such means consisting of outer former 70 and inner formers or guards 71 and 72, the outer former having an internally-grooved rim, and the inner formers opposing said rim, substantially as specified.

14. The wire-hoop machine, embodying formers open at the top for bending the wire into hoop form and means for lifting the hoop, substantially as specified.

15. The combination with twisting mechanism the formers for bending the wire into form and the devices acting to hold the hoop during the twisting, of means for lifting the hoop after it has been twisted, substantially as specified.

16. The combination with the twisting mechanism, of forming devices in which the wire is bent into hoop form, said mechanism and devices being open all around the top to permit the removal of the hoop upward, and means for lifting one side of the hoop so it can be taken hold of by the attendant and wholly removed, substantially as specified.

17. The combination with the wire-hoop machine, having means for bending the body of the hoop, and also having means for twisting the ends of the hoop together, of means for bending the twisted portions of the hoop, substantially as specified.

18. The combination with a wire-hoop machine in which the ends of the hoop are intertwisted, of means for giving the curvature of the hoop to the twisted portion thereof, substantially as specified.

19. The wire-hoop machine having inner and outer forming devices receiving the wire between them and bending it into hoop form, such devices being adjustable as to size, substantially as specified.

20. The wire-hoop machine having an outer former with an adjustable rim, and inner formers 71 and 72, one of the latter being also adjustable, substantially as specified.

21. A wire-hoop machine embodying wire-feeding mechanism and wire-forming means having an annular groove or inclosed space into which the wire is forced by the feed mechanism and in which it is bent into hoop form, substantially as specified.

22. A wire-hoop machine embodying wire-feeding mechanism and wire-forming means having an annular groove or inclosed space into which the wire is forced by the feed mechanism and in which it is bent into hoop form, said groove or space being adapted to avoid interference between the initial end of the blank and the incoming wire as the initial end moves by the latter, substantially as specified.

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