

W. H. JOSLIN & M. H. BENNETT.

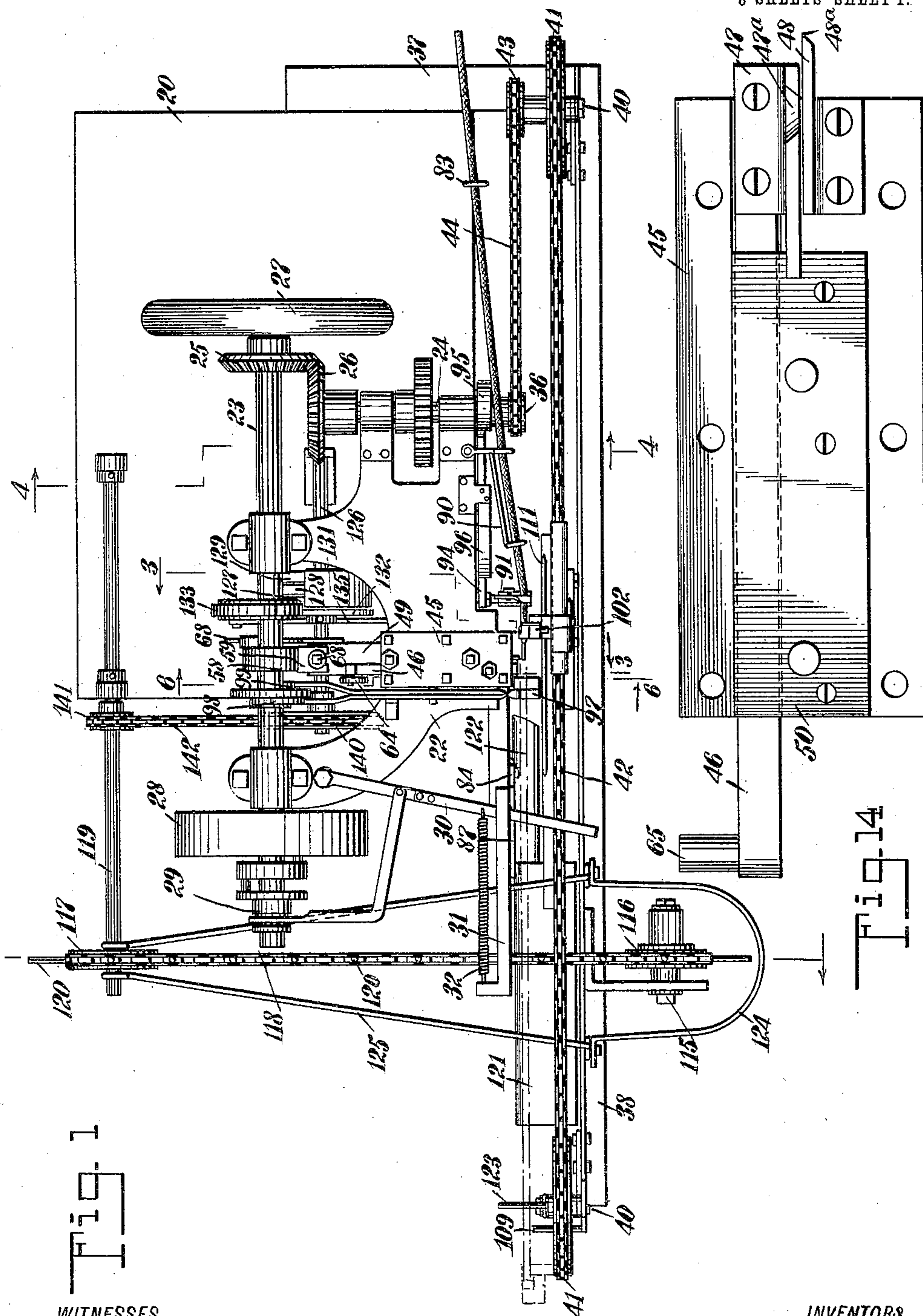
LACE TIPPING MACHINE.

APPLICATION FILED JULY 15, 1909.

Patented Dec. 20, 1910.

979,168.

8 SHEETS-SHEET 1.



WITNESSES

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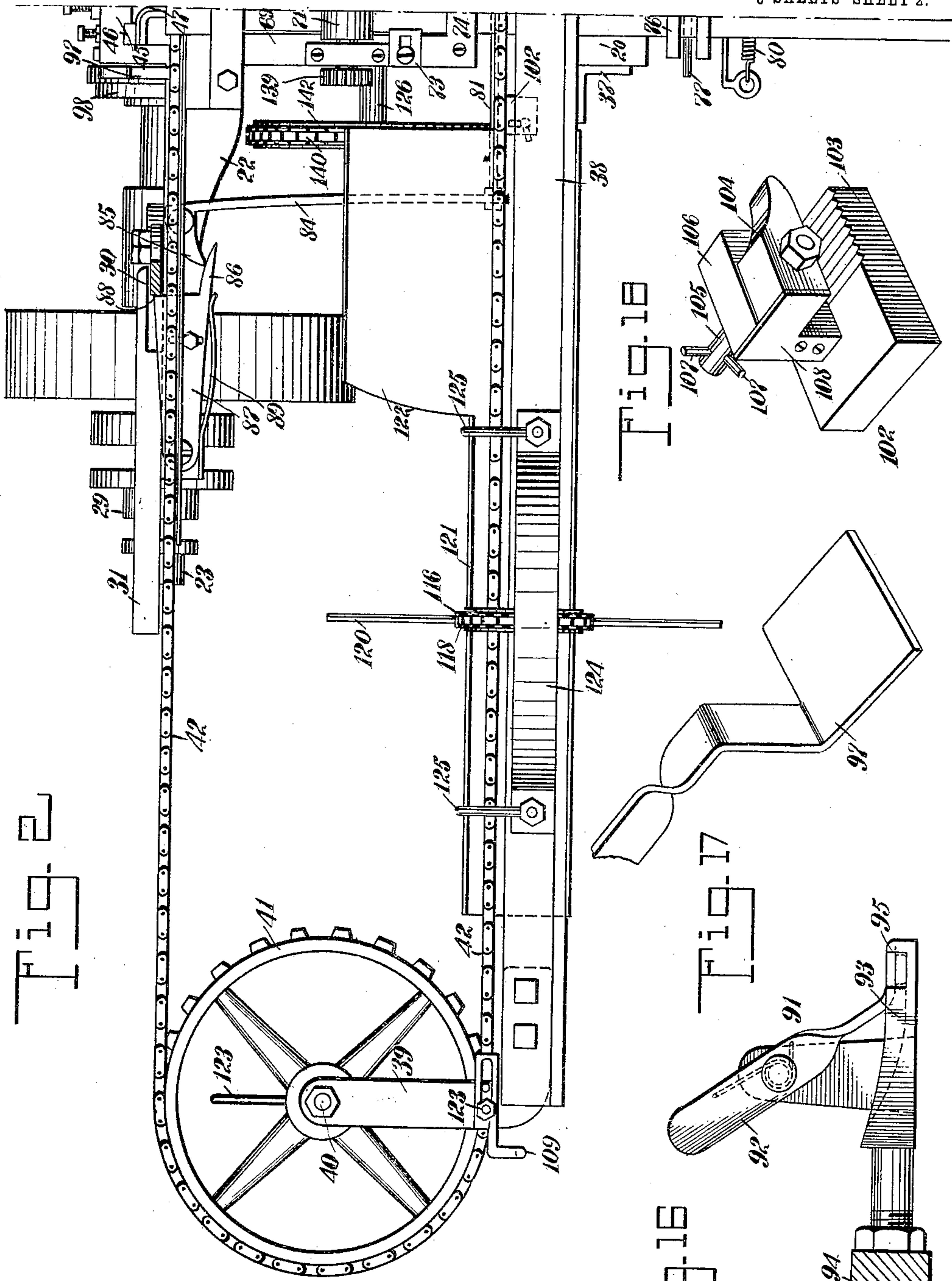
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8 SHEETS—SHEET 2.



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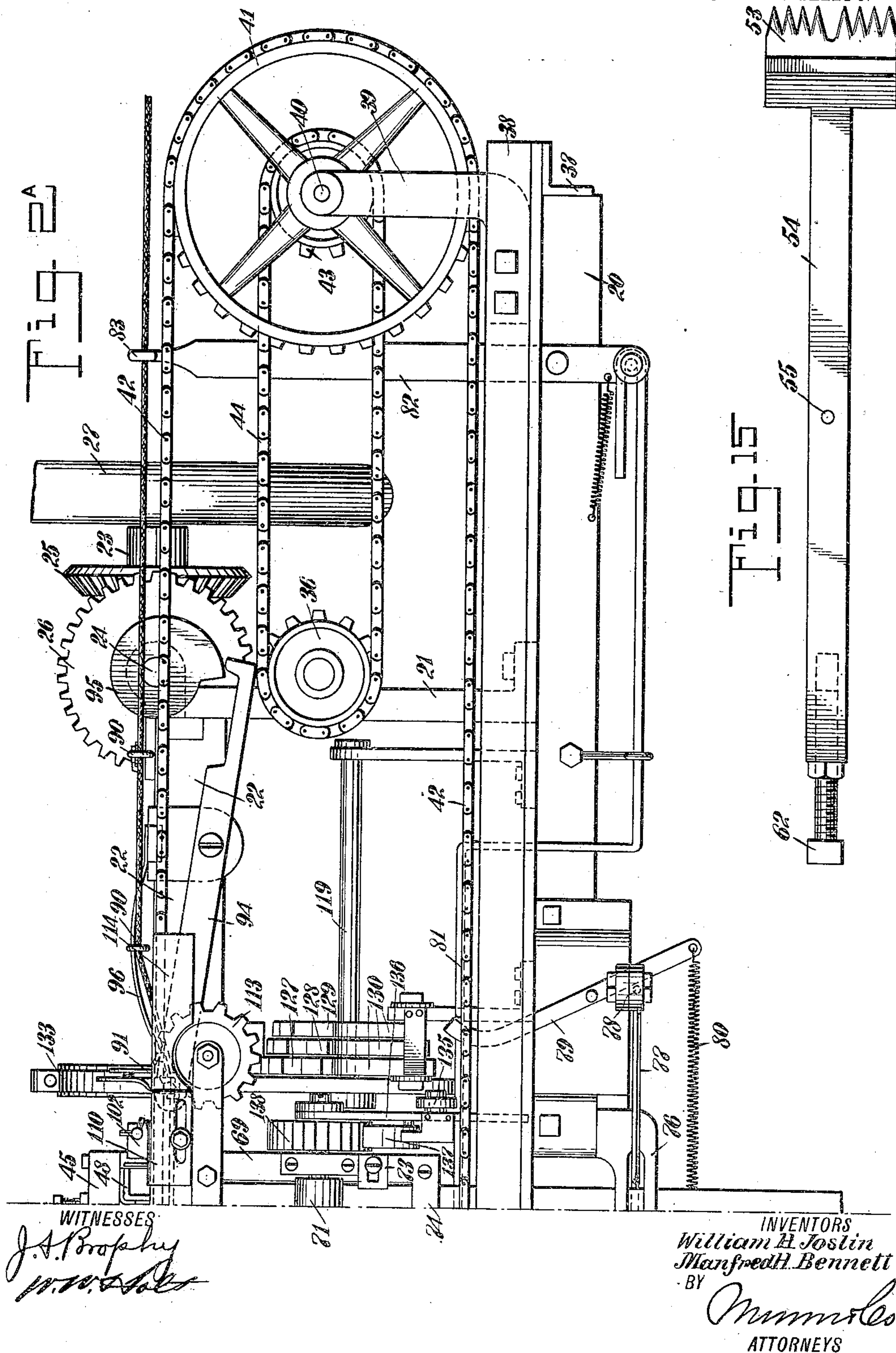
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8 SHEETS—SHEET 3.



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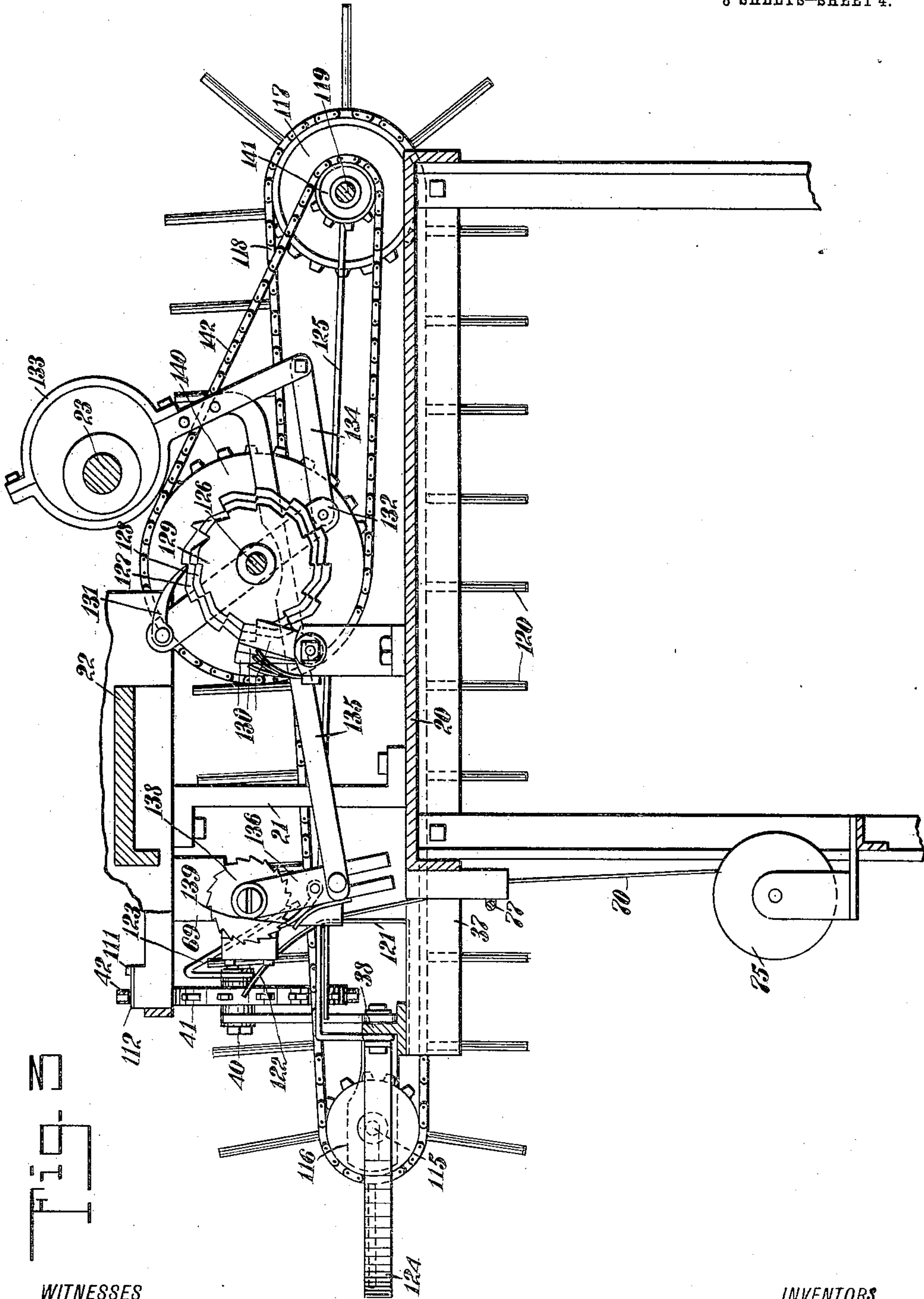
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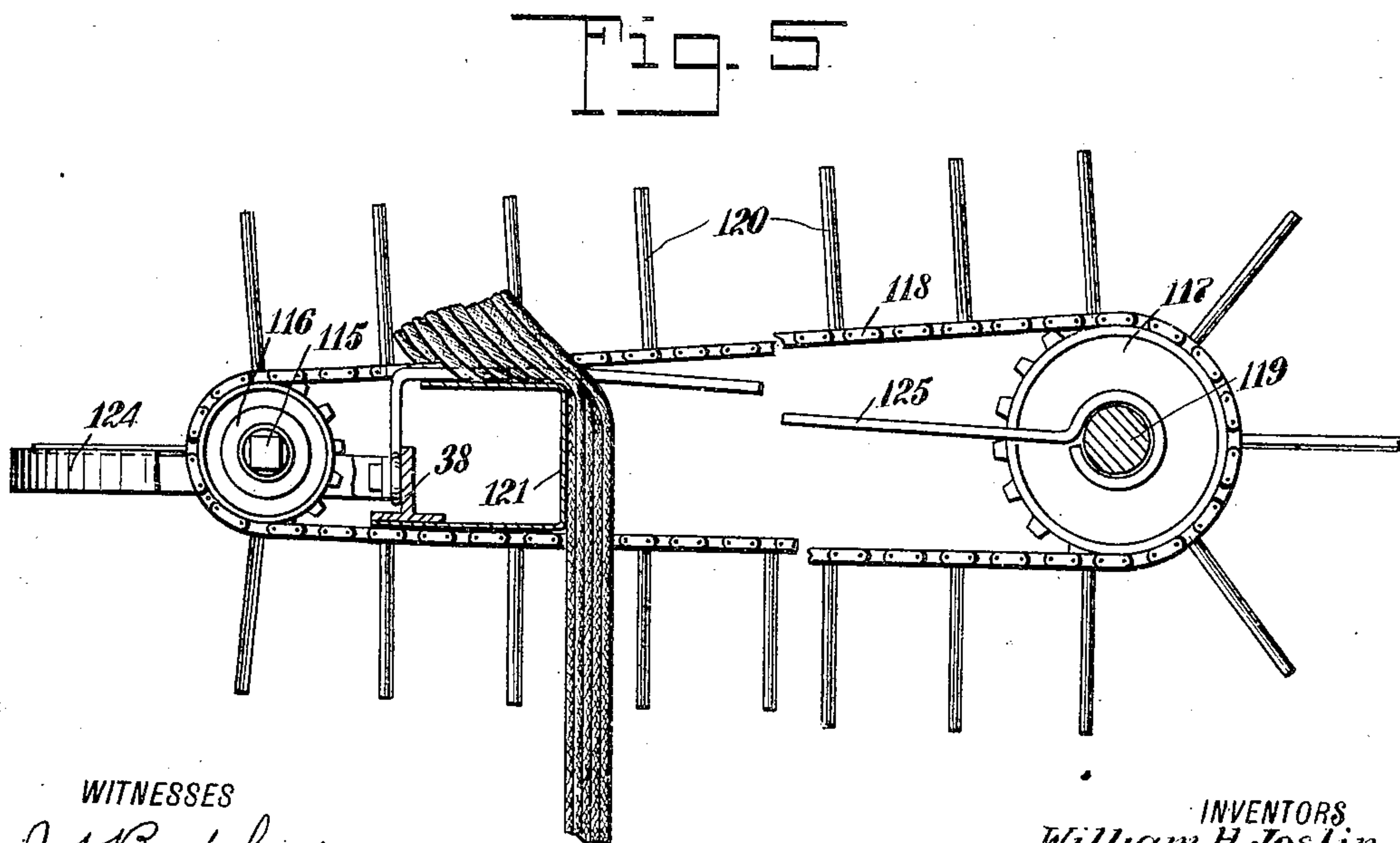
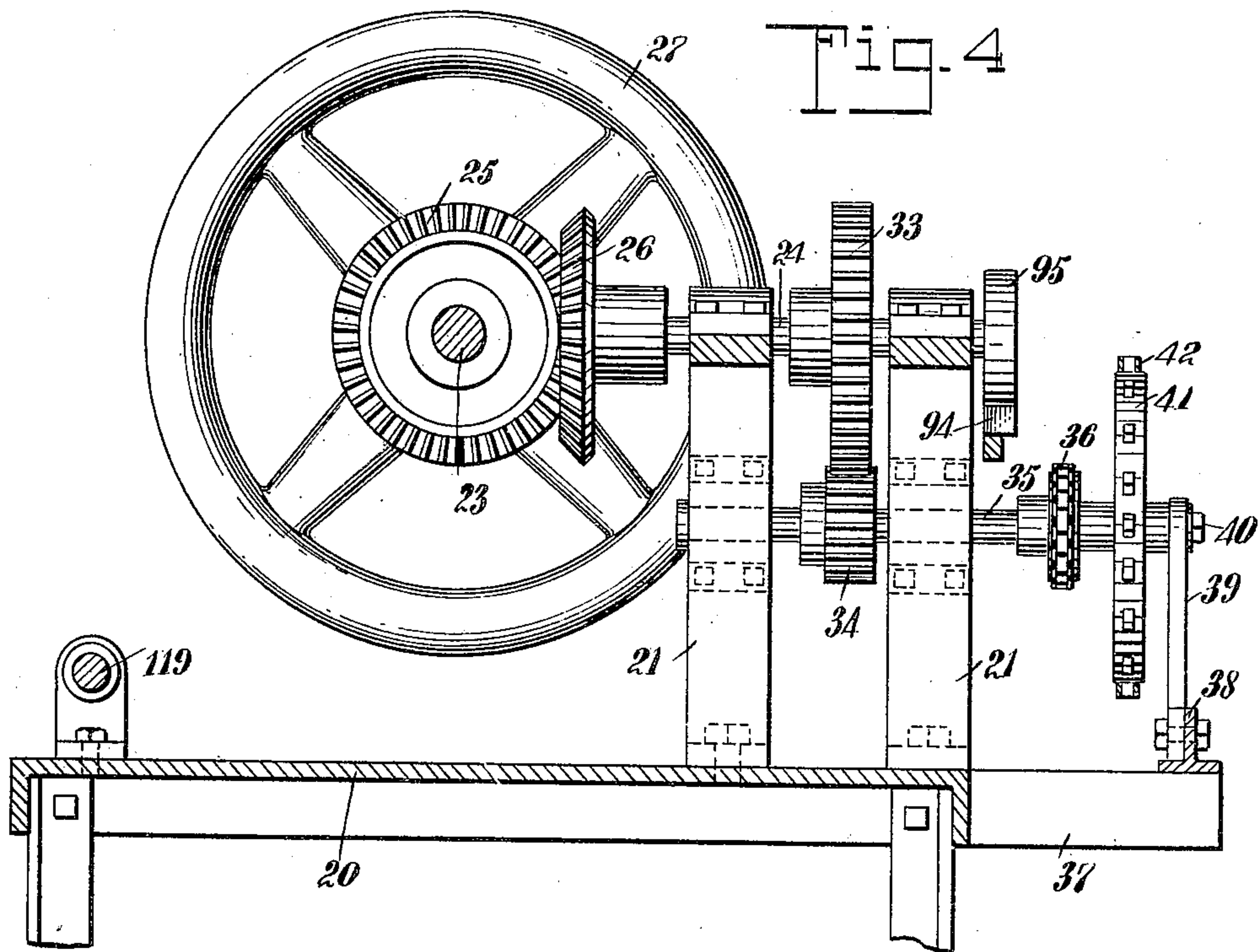
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8 SHEETS—SHEET 5.

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8 SHEETS—SHEET 6.

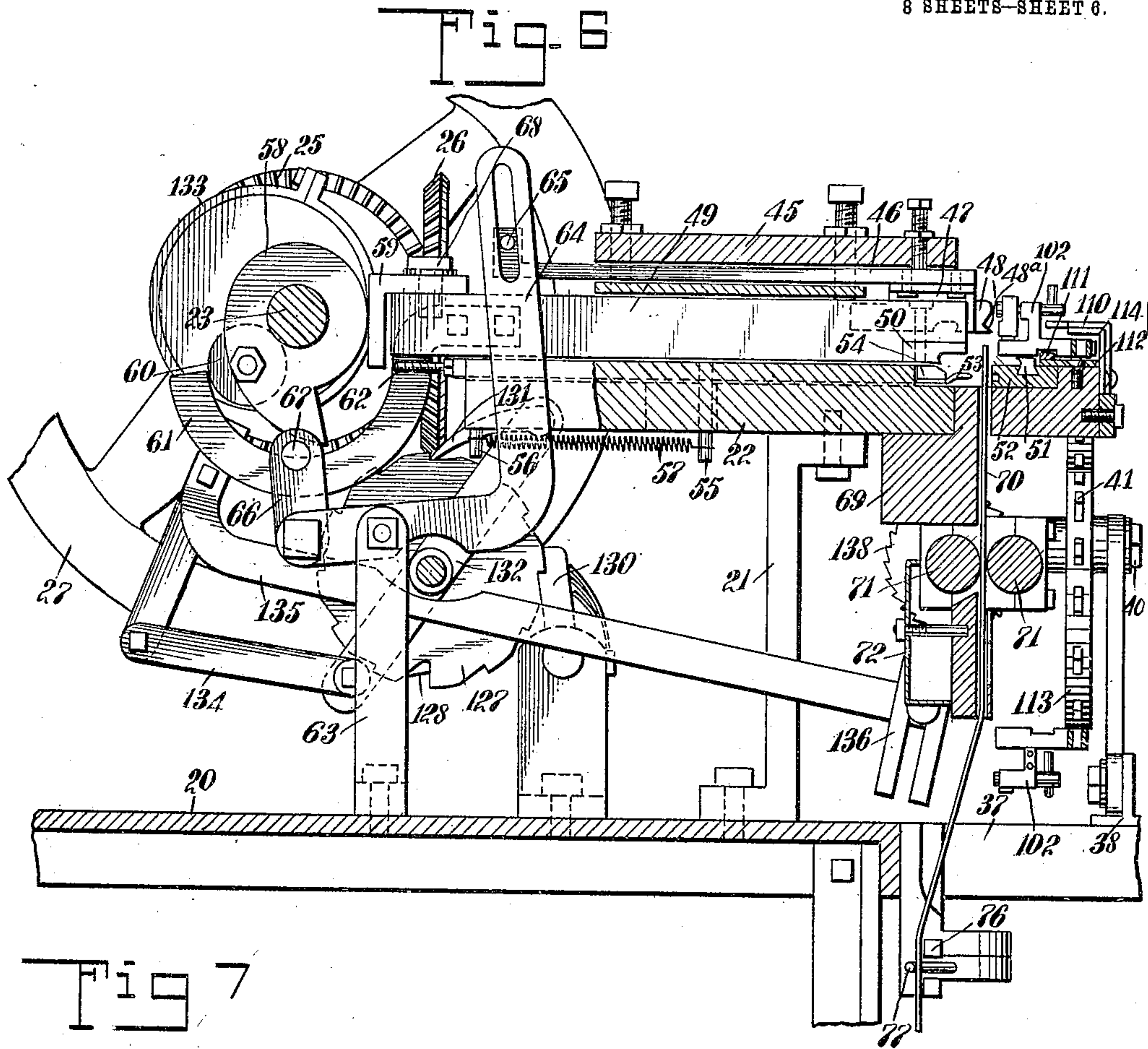
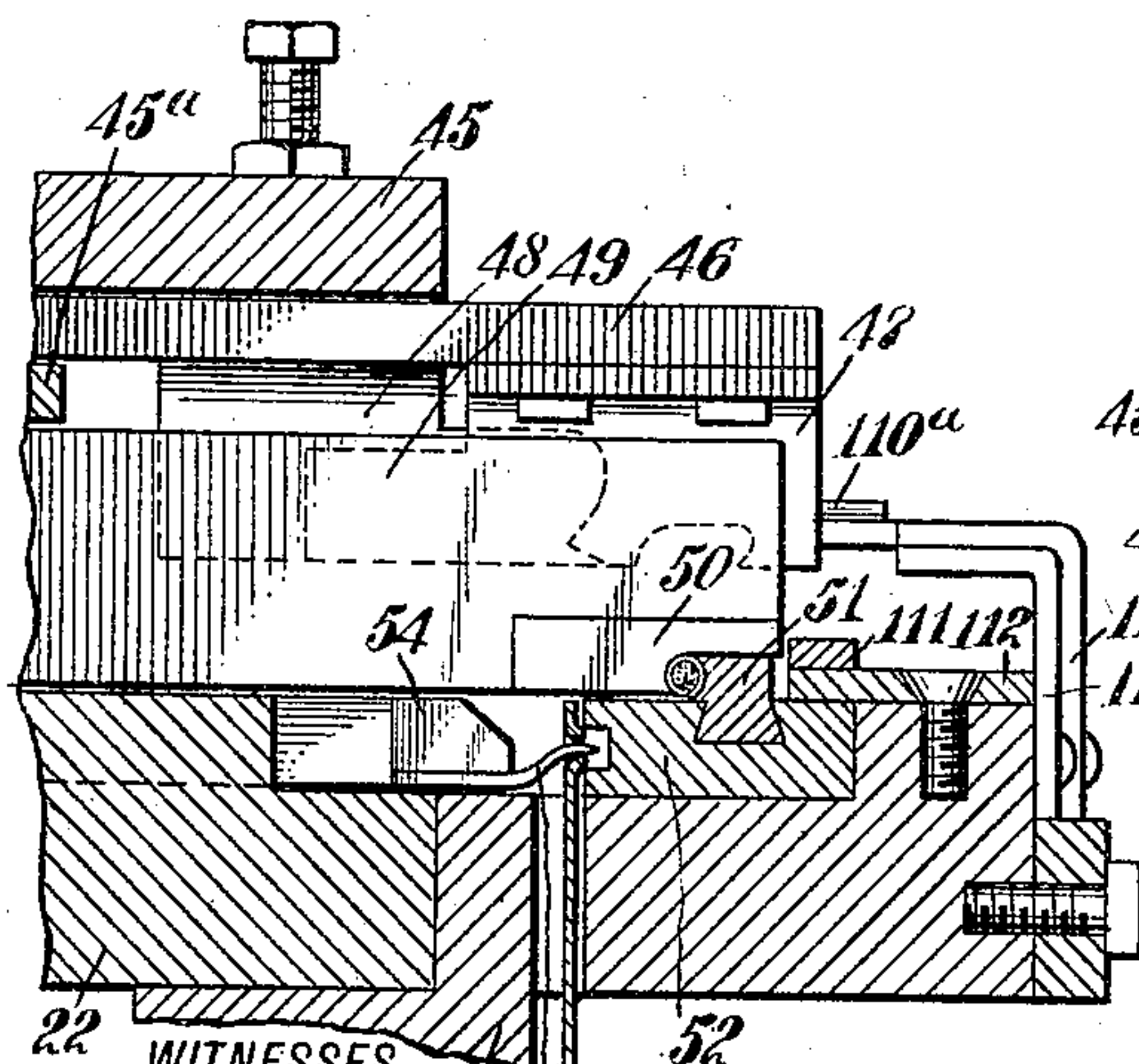
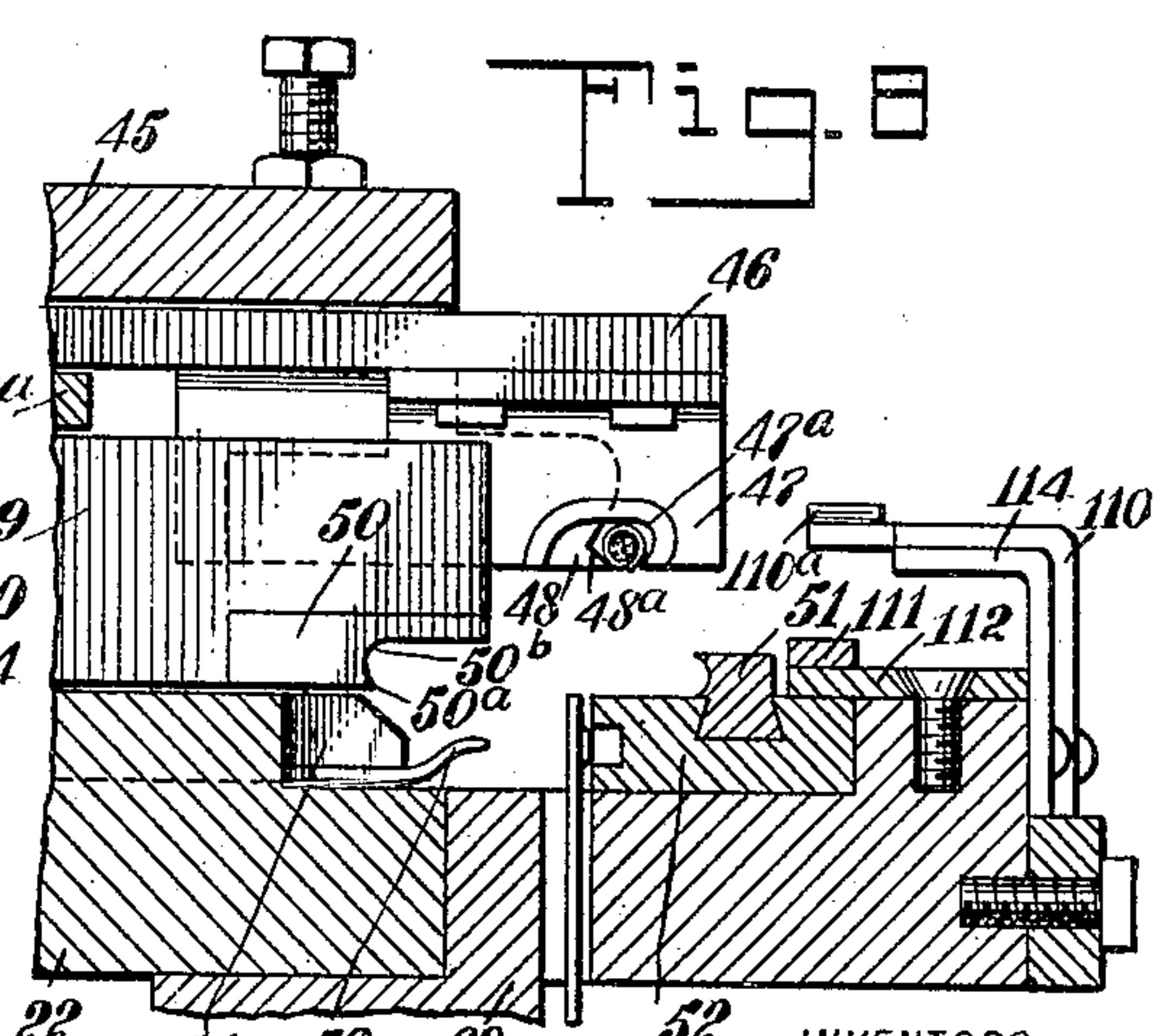


Fig. 7



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Fig. 8



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8 SHEETS—SHEET 7.

Fig. 8

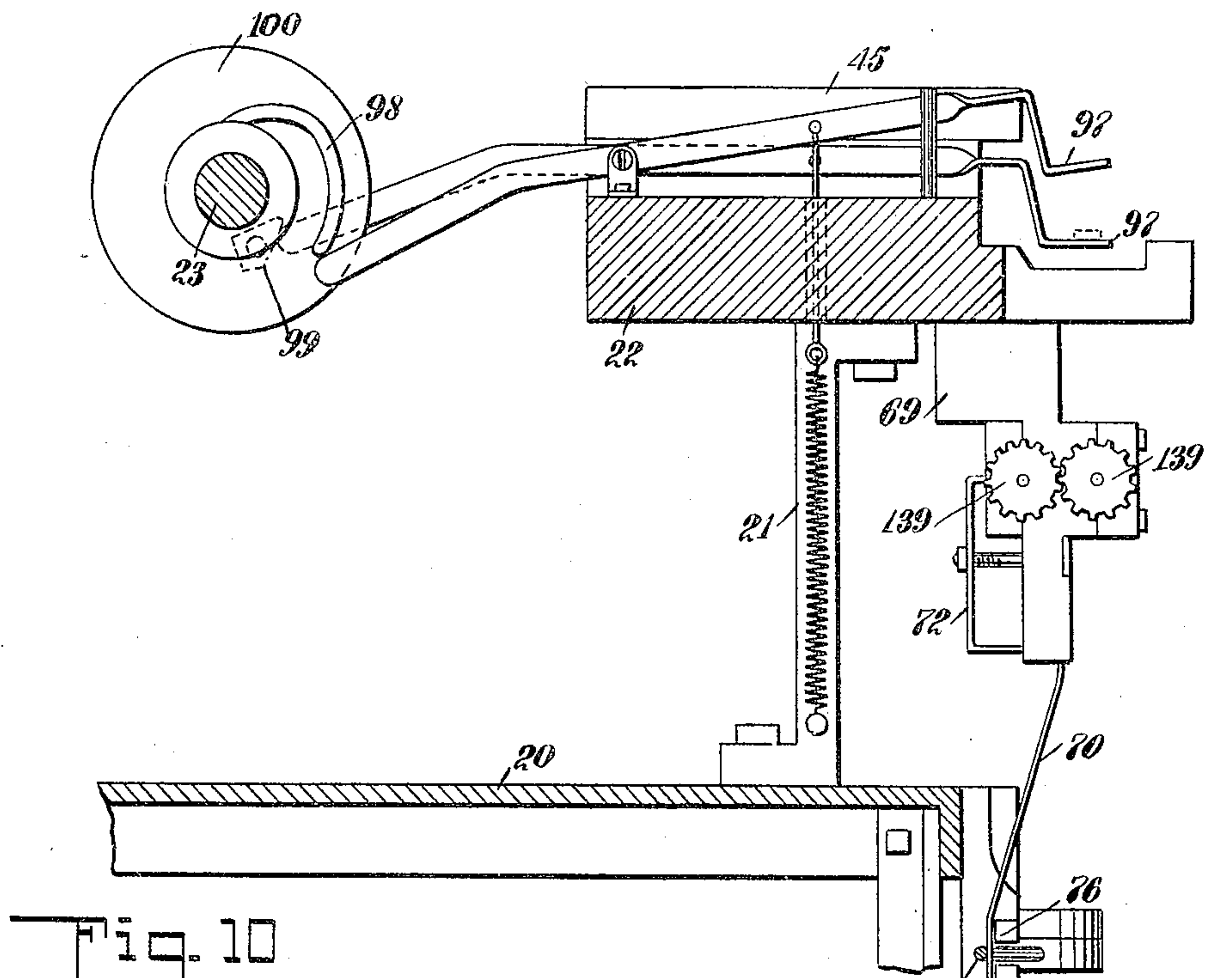


Fig. 10

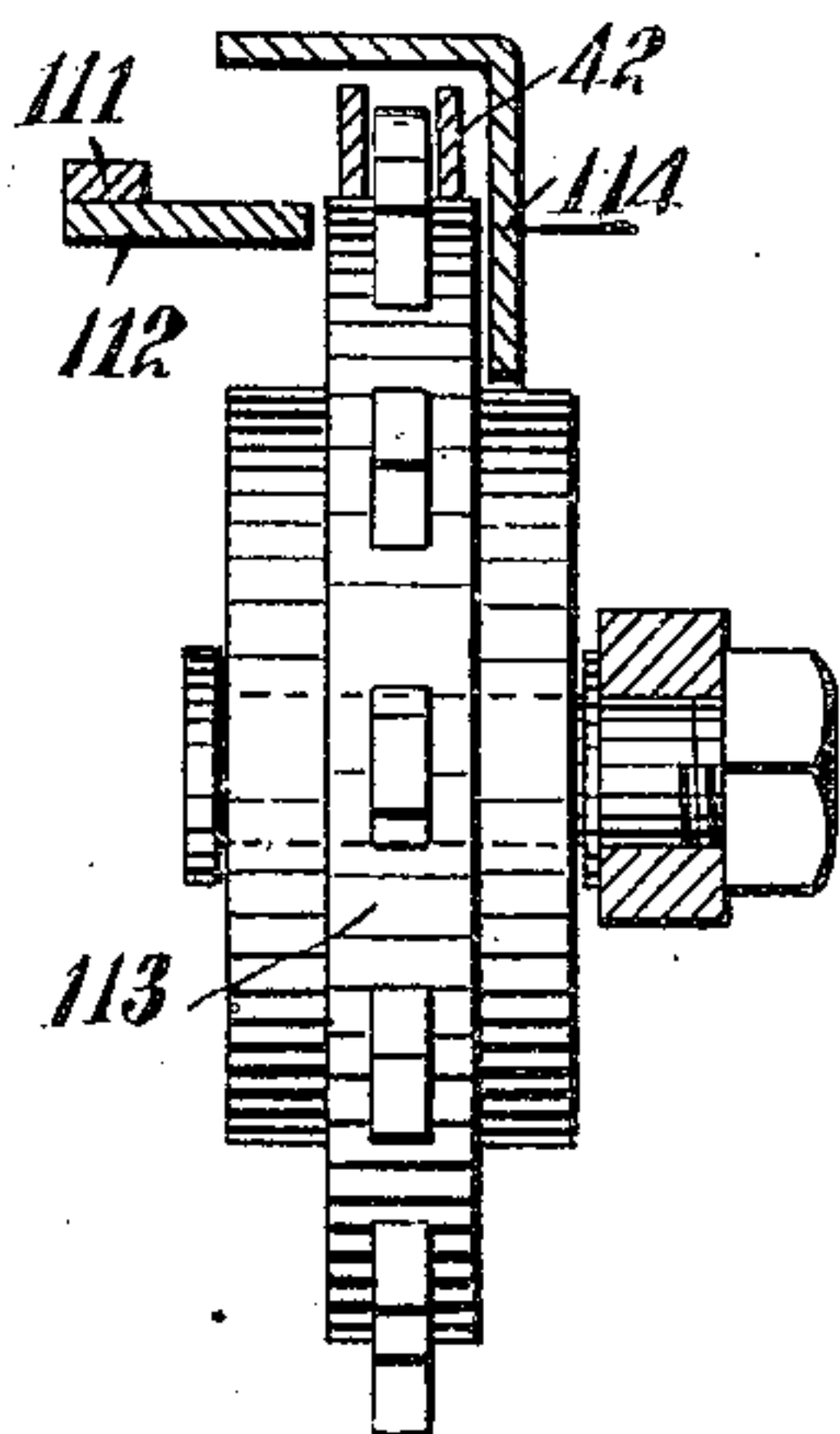
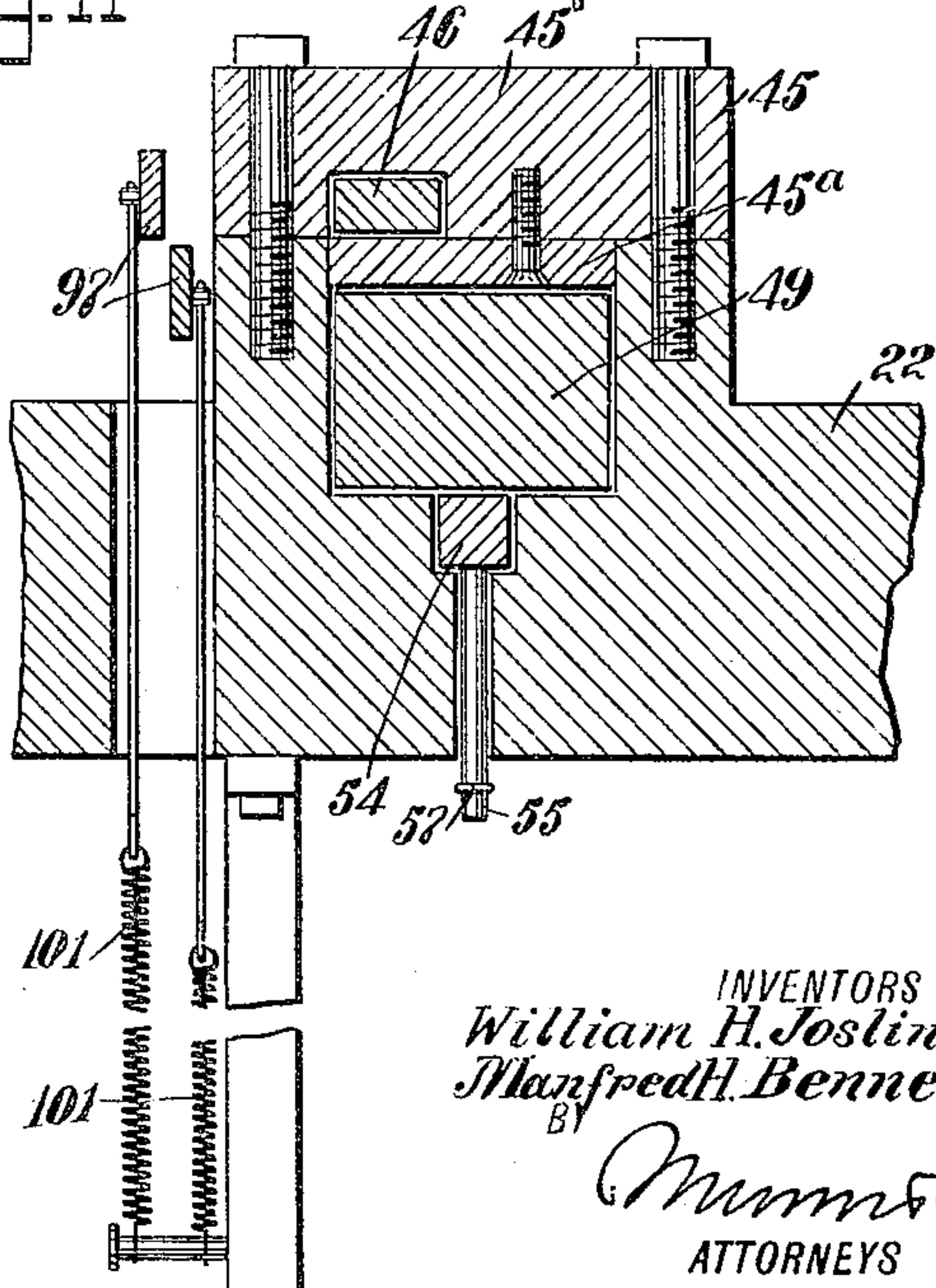


Fig. 11



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UNITED STATES PATENT OFFICE.

WILLIAM HARRY JOSLIN AND MANFRED HENRY BENNETT, OF SCITUATE, RHODE ISLAND, ASSIGNORS TO WILLIAM E. JOSLIN, OF SCITUATE, RHODE ISLAND.

LACE-TIPPING MACHINE.

979,168.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed July 15, 1909. Serial No. 507,729.

To all whom it may concern:

Be it known that we, WILLIAM HARRY JOSLIN and MANFRED HENRY BENNETT, citizens of the United States, and residents of Scituate, in the county of Providence and State of Rhode Island, have invented a new and Improved Lace-Tipping Machine, of which the following is a full, clear, and exact description.

The invention is an improvement in machines for tipping laces, and has in view a machine construction in which the lacing is carried as a continuous length past a tip-applying mechanism, where a metal blank is wrapped about it at successive points spaced apart equal to the length of the lace required and each blank severed to form two laces, the finished laces being bunched into lots of a definite number and each bunch moved to a convenient point for removal, the said tip-applying mechanism embodying punching dies, bending dies and cutters for the ribbon of metal from which the tips are formed, successively arranged one above the other and each operated in proper sequence to perform its proper function, the punching dies in the cycle of operation working on a metal ribbon one or more tips ahead of the bending dies and the ribbon being intermittently fed and operating to retain the driving mechanism of the machine engaged, whereby when the ribbon is exhausted, the said mechanism will be released and the machine brought to a stop.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan of a machine complete constructed in accordance with our invention; Fig. 2 is a left-hand half of the machine in side elevation, showing the shifting lever of the outer clutch in section; Fig. 2^a is a like view of the right-hand half portion of the machine; Fig. 3 is a cross-section of the machine substantially on the line 3—3 of Fig. 1, looking in the direction of the arrow, certain portions of the machine being removed to better disclose the nature and construction of the counting mechanism; Fig. 4 is a cross-section of the ma-

chine on the line 4—4 of Fig. 1, looking in the direction of the arrow; Fig. 5 is a side view, partly in section, of the carrier for the finished laces; Fig. 6 is a cross-section of the machine on the line 6—6 of Fig. 1, looking in the direction of the arrow; Fig. 7 is a vertical section through the housing of the punching and bending dies and the cutter; Fig. 8 is a similar section, showing the parts in a relatively different position; Fig. 9 is a fragmentary cross-sectional view of the machine, showing the gripping fingers for raising the finished side of the lace from the bending dies to the cutters; Fig. 10 is a sectional view, showing the sprocket wheel which supports the upper length of the endless carrier for the lacing at an intermediate point; Fig. 11 is a cross-section of the housing which carries the dies and cutters, also showing the gripping fingers for elevating the lacing into the cutters, in section; Fig. 12 is a fragmentary plan of the tip-applying mechanism, showing one of the gripping fingers of the endless carrier in the position to carry the lacing forward preparatory to the application of another tip, the lacing which has just been completed by severing the metal blank, being shown in dotted outline; Fig. 13 is a longitudinal vertical section through the machine directly at the front of the housing of the tip-applying mechanism; Fig. 14 is an inverted plan of the cover of the housing, showing the cutters for severing the tip; Fig. 15 is a plan of the male punching die; Fig. 16 is a side view of a gripper for raising the unfinished side of the lace to the cutting dies; Fig. 17 is a perspective view of the lower gripping finger for raising the finished side of the lace into the cutting dies; and Fig. 18 is a perspective view of one of the grippers of the endless carrier for feeding the lacing through the machine.

Supported on and above a table 20, by standards 21, is a head 22 having a yoke extending to the rear and a yoke extending to one side, in which are respectively journaled a longitudinal main or cam-shaft 23 and a cross-shaft 24, the latter extending toward the front of the table and driven from the main shaft through intermeshing beveled gears 25 and 26, one of said gears being fixed to each of the said shafts. Ad-

5 adjacent to the gear 25 the shaft 23 is provided
 with a balance wheel 27, and at its opposite
 end portion carries a pulley 28 and a clutch
 29, the pulley being journaled on the shaft
 and the clutch slidably splined at the outside
 10 of the pulley and controlled by a shifting
 lever 30 which is fulcrumed at its inner end
 and extends to the front of the machine
 through a guide-bar 31 fixed to and ex-
 tended to one side of the head 22, the lever
 being forced in a direction to disengage the
 clutch, by a spring 32. The cross-shaft 24,
 as best shown in Fig. 4, has a fixed gear 33
 in mesh with a somewhat smaller gear 34,
 15 which in turn is secured to a short shaft 35
 journaled in bearings carried below the
 shaft 24 by certain of the standards 21, and
 having a sprocket wheel 36 secured to its
 outer end.

20 At the front of the table 20 and about the
 same elevation, is carried on supports 37, a
 longitudinally extended bar 38, which, as
 shown in cross-section in Figs. 3 and 4, is
 in the form of an inverted T-iron, the bar
 25 extending a substantial distance beyond the
 left-hand side of the table and at each end
 carrying a vertical support 39, as best shown
 in Figs. 2 and 2^a, in the upper portions of
 which are journaled stub shafts 40, each
 30 shaft having an attached sprocket wheel 41,
 with the sprocket wheels connected by a
 chain 42, constituting an endless chain car-
 rier for the continuous length of lacing, as
 will be hereinafter made apparent. At the
 35 inner end of the shaft 40, at the right of the
 machine, a sprocket wheel 43 is secured and
 driven from the sprocket wheel 36 through
 the intermediary of a chain 44.

The head 22 is constructed with a housing
 40 for the movable dies and the cutters of the
 tip-applying mechanism, the housing ex-
 tending from the front to the rear of the
 head between the rear yoke and having a
 removable cover 45, which, as best shown in
 45 Figs. 11 and 14, is constructed with a slot on
 its under side, in which is slidably mounted
 a plunger 46 having a cutter 47 removably
 secured to its outer end, the cutter movable
 along side of and coacting with a stationary
 50 cutter 48 fixed to the cover 45. The cutter
 47 has a shearing notch 47^a in its lower edge
 and the stationary cutter 48 has a shearing
 notch 48^a at its outer end, (see Fig. 8.) As
 shown in Fig. 11, the plunger 46 is sepa-
 55 rated from a larger plunger 49 by a plate
 45^a fixed to the under side of the cover and
 fitting in the upper portion of the slot or
 way in which the plunger 49 is slidable, the
 plunger 49 having a bending die 50 secured
 60 in a cut-out portion in its forward end, as
 shown in Figs. 7 and 8, the bending die hav-
 ing a shearing edge 50^a and an adjoining
 curved bending shoulder or surface 50^b posi-
 65 tioned some distance inwardly of the front
 of the die. The movable bending die 50 co-

operates with an opposed stationary bending
 die 51 having a similarly curved bending
 face on its inner side and carried on a
 female punch die 52, the latter in turn being
 seated on and secured to the forwardly-ex- 70
 tended portion of the head 22. Coöperating
 with the die 52 is a punch or male punching
 die 53 secured to the outer end of a plunger
 54, which, as shown in Fig. 11, is slidable in
 the housing directly below the plunger 49. 75
 As shown in detail in Fig. 15, the punching
 die 53 has a number of points in order to
 form the metal tip with corresponding per-
 forations, with a bur at the edge of each
 perforation so that the tip will bite into the 80
 lacing, as is well known. A pin 55 extends
 from the bottom of the plunger 54 through
 a slot in the housing and is connected to a
 pin 56 by a spring 57, tending to draw the
 plunger to a retracted position, (see Fig. 6). 85
 Secured to the shaft 23, directly at the rear
 of the plungers, is a cam 58 bearing on an
 adjustable foot 59 carried by the large bend-
 ing die plunger 49 and having a roller 60
 journaled thereon and movable in the path 90
 of an arc 61 also secured to the plunger 49
 and adapted to retract the plunger 49 under
 the action of the roller after the said
 plunger has been forced forwardly under
 the direct influence of the cam. The foot 59 95
 projects downwardly sufficiently to extend
 into the path of an adjusting screw 62
 threaded into and locked to the rear end of
 the punch plunger 54, thus causing the
 plunger 54 to move forwardly with the 100
 plunger 49 against the tension of the spring
 57. On a support 63 carried on the ma-
 chine table is fulcrumed a bell-crank lever
 64 having a slotted upper end portion en-
 gaged with a pin 65 extending from one 105
 side of the cutter plunger 46, the lever hav-
 ing at the opposite side of its fulcrum, a
 rigid arm 66 provided with a pin or roller
 67 arranged in the path of the cam 58, the
 latter in its revolution depressing this end of 110
 the lever and retracting the cutter plunger
 46, the said plunger being forced forwardly
 by a suitable projection carried on the
 plunger 49, which, in the present instance,
 is shown to be the head of the bolt 68 secur- 115
 ing the foot 59.

Between the male and female punching
 dies, the head 22 is vertically slotted and re-
 ceives the upwardly-extended portion of a
 block 69, (see Fig. 6) secured to the under 120
 side of the head, a space being left at the
 front of the block and the forward edge of
 the slot to permit of the passage of a metal
 ribbon 70, from which the tips are cut. The
 ribbon passes between feed rollers 71 which 125
 are journaled in bearings carried by the
 block, the bearings of one of the rollers be-
 ing pressed by a spring 72 toward the bear-
 ings of the other roller in order that the
 rollers may yield to take care of any in- 130

equalities in the thickness of the metal. Below the feed rollers, the ribbon is held to the face of the block by adjustable clips 73 arranged at opposite sides, and by a keeper 5 74 below, extending crosswise of the block, as shown in Figs. 2 and 2^a.

As will be observed in Fig. 3, the metal ribbon passes from a spool 75 revolubly supported below the top of the table, and preparatory to passing through the guideway of the block 69 passes between a slotted arm 76 and a lever 77, the arm being at the front of the ribbon and the lever at the rear. The lever is fulcrumed at one end, at which, as shown in Fig. 2^a, it is provided on its inner side with a projection or pin 78, the pin being arranged in the path of the lower arm of lever 79 which is forced in a direction to swing the lever 77 forwardly by a spring 80. The upper arm of the lever bears against an offset portion of a shifting rod 81 slidably supported and connected at its right-hand end portion with a vertical lever 82 having a guide 83, through which 25 the lacing is led in passing through the machine. The shifting rod 81 is extended to the opposite side of the shoulder with which the lever 79 engages, and, as shown in Fig. 2, is connected with a trip lever 84 having a bill portion 85 engaging with a similar portion 86 of a latch 87, the latch being fulcrumed at its outer end on the guide-bar 31 and having a shoulder 88 arranged to engage the edge of the shifting lever 30 when the latter is moved to a position to throw in the clutch, the latch being normally pressed upwardly to present the shoulder to the lever, by a spring 89. By this construction it will be seen that when the ribbon is about exhausted and the end thereof passes over the lever 77, the latter will be released, which in turn releases the lever 79, which, under the influence of its spring 80, forces the shifting rod in a direction to press the latch 45 87 downwardly through the engagement of the portions 85 and 86 and withdraw the shoulder 88 from the shifting lever, whereby the lever is released and the clutch thrown out, stopping the machine. The shifting bar will also be moved in a like direction and the machine stopped by the engagement of a knot or other enlargement with the guide of the lever 82.

Preparatory to passing by the tip-applying mechanism the lacing passes through suitable guiding eyes 90, thence between the fingers of a lifting device 91, the upper finger 92 of said device, as shown in detail in Fig. 16, being spring-pressed to the lower 60 finger 93 which is adjustably secured to and extends outwardly from the side of a lever 94, and has a guide slot 95 through which the lacing is led, the outer end portion of the lower finger being slotted out to receive the 65 finger 92. The lever 94, as best shown in

Fig. 2^a, is fulcrumed intermediate its length to the head 22, with its opposite end extending under and in the path of a cam 95 secured to the transverse shaft 24, the lever being pressed against the cam by a spring 96. 70

At the opposite and left-hand side of the tip-applying mechanism the lacing passes between lifting fingers 97, best shown in Fig. 9, the said fingers being in the nature 75 of a pair of tongs, the members of which are pivotally supported on the head 22 and respectively extend into the paths of cams 98 and 99 carried on a cam disk 100 fixed to the main shaft 23, each member being forced 80 in a direction to hold it against its respective cam by a spring 101. The cams 98 and 99 are arranged on the disk 100 so that the upper finger will be forced against the lower finger by its respective spring when the 85 fingers are in an elevated position, and the fingers will be spread apart when the lower finger is in a depressed position, thus intermittently clamping the lace when elevated and permitting it to freely pass between 90 them when lowered. The chain 42 of the endless carrier for the continuous length of lacing is provided with a number of grippers 102 spaced apart distances suitable for the length of lacings which are to be made, 95 each gripper, as shown in detail in Fig. 18, comprising a base block 103 and a gripping finger 104, the base block having a serrated gripping surface and the finger having a short shaft 105 journaled in a lug 106 rigid 100 with the base block and provided with radiating tripping pins 107, the gripping finger 104 being pressed to the base block and held in a retracted position by a spring 108, the spring being attached to the lug and 105 having a laterally-extended portion adapted to bear against the flat end of the gripping finger or against its lower edge. The base block 103 of each gripper is suitably secured to the inner side of the chain 42, with 110 one of the tripping pins, when the gripping finger 104 is in clamping position, arranged to strike a tripper 109, and with the other tripping pin, when the gripping finger is raised, arranged to strike a tripper 110, the 115 tripper 109, as best shown in Figs. 1 and 2, being adjustably carried on the left-hand support 39 adjacent to and extending under the sprocket wheel 41 at this end of the machine, and the tripper 110, as best shown 120 in Fig. 12, being in the nature of an angle-plate secured to the forward extended portion of the head 22 and arranged slightly to the right of the tip-applying mechanism, the particular portion of the plate which en- 125 gages with the tripping pin being in the nature of an upwardly-turned lip 110^a.

For guiding and additionally supporting the fingers as they pass in front of the tip-applying mechanism, as shown in Fig. 6, a 130

rib or guide 111 is carried on a plate 112 and engages in a groove on the under side of the base block 103 of each gripper. The upper length of the chain 42 is additionally supported about this point by a third sprocket 113, the upper portion of which is covered over, as also the chain, by a guard 114.

To the front of the T-iron 38, at the left-hand end portion of the machine, is suitably supported a short shaft 115 carrying a sprocket wheel 116 driven from a sprocket wheel 117 by a chain 118, the sprocket wheel 117 being secured to a shaft 119 longitudinally arranged and supported on the machine table at the rear. The chain 118 which constitutes a carrier for the bunches of finished laces of definite number is provided at intervals with outwardly-projecting pins 120, forming lace-receiving pockets. The laces as they are received in the pockets are prevented from becoming entangled in the lower length of the chain 42 by a box guard 121 having a downwardly and inwardly inclined chute 122 at its inner right-hand edge. To the left of the box guard a similar chute or slide 123 is carried at the inner end of the bearing pin or shaft of the adjacent sprocket 41.

Around the outer side of the sprocket wheel 116 a guard 124 extends, the ends of the guard being secured to the T-bar 38 by bolts or other suitable devices, which in the embodiment of the invention disclosed, are shown to also connect the outer ends of lace-supporting bars 125, the bars being arranged at opposite sides of the chain 118 and converging rearwardly, where they are supported on the shaft 119.

Journaled at a convenient point in bearings carried by the machine table is a longitudinal shaft 126 carrying a number of ratchet wheels 127, 128 and 129, all of which have an equal number of teeth and successively increase and decrease in diameter, with the largest and the intermediate ratchet wheels each having one tooth of a depth equal to the depth of the teeth of the smallest ratchet wheel, the teeth of each wheel being engaged by a spring-pressed pawl 130 which operates to prevent the ratchet wheels from turning backwardly. The smallest ratchet wheel is fixed to the shaft, with the remaining wheels journaled thereon, the largest wheel being at all times engaged by a pawl 131 carried on one arm of a lever 132 which is operatively connected with the arm of an eccentric 133 by a link 134, the eccentric being arranged on the main shaft 23 and having an offset arm 135 adjustably connected to an arm 136 journaled on the extended end of one of the ribbon feed rollers 71 and carrying a pawl 137 engaging a ratchet wheel 138 fixed to the said extended portion of the feed roller, the rollers being geared together to move in

unison by intermeshing gears 139 secured to their opposite ends, as shown in Figs. 2 and 9.

The shaft 126 has an attached sprocket wheel 140 connected with a relatively smaller sprocket 141 by a chain 142. From the construction just described it will be seen that as the eccentric arm rocks back and forth, the metal ribbon will be intermittently fed by the feed rollers, the length of the metal fed at each movement of the rollers being controlled by the adjustable connections between the two arms 135 and 136, the rocking action of the eccentric also revolves the large ratchet wheel 127 tooth by tooth until a complete revolution is made, when the pawl 131 drops into the deep tooth of the ratchet wheel and also engages the intermediate ratchet wheel, moving the latter one tooth. When the intermediate ratchet wheel has been revolved a complete revolution its deep tooth and the deep tooth of the larger ratchet wheel register so that the pawl engages all three wheels, turning them one tooth, and since the smaller wheel is secured to the shaft 126, the latter is also turned, which drives the carrier for the finished laces, the shafts 126 and 119 being geared together so that the chain 118 will be moved a distance equal to the distance between the pins 120 for each engagement of the pawl 131 with the small ratchet wheel 129. In this way when a definite number of laces have been dropped into the pocket at the foot of the chutes 122 and 123, depending on the number of teeth in the ratchet wheels, the carrier will be moved to bring the next adjacent pocket in position to receive the laces. In practice, and as shown in the drawings, each ratchet wheel of the counting mechanism will contain twelve teeth, which will cause the laces to be counted out in grosses.

In the operation of the machine, the metal ribbon is passed between the feed rollers between and slightly above the punching dies and the machine given one stroke to trim and punch the ribbon in readiness to make one of the tips. The lacing is then led through the guide eyes 83 and 90 and between the fingers of the gripper 91 and the fingers 97 of the gripper at the opposite side of the tip-applying mechanism. On then starting the machine all of the plungers are moved forward, the punching dies punching the metal for the next successive tip and the bending dies cutting off and wrapping the previously punched blank around the extended lace. The plunger of the movable punch and that of the movable bending die are then retracted, and about the same time the lace with the blank applied is lifted vertically by the gripping fingers into the shearing notches of the cutters, as shown in Fig. 8. Immediately after, the movable cutter

is retracted and the blank severed, forming two tips. The grippers then drop with the fingers 97 opening so that the free end of the lacing falls. While the gripper 91 is holding the lacing in its lower position one of the grippers 102 of the endless carrier, with the finger 104 lifted from the base-plate, moves over the outer end portion of the gripper 91, with the base-plate 103 below and the finger 104 above, and picks up the lace end with the finished tip and is clamped thereto as one of the pins 107 strikes the lip 110^a of the tripper. The continuous length of lacing now travels forward with the gripper 102, the latter sliding the lacing between the fingers of the gripper 91. As the gripper 102 reaches the extreme outer portion of the left-hand sprocket wheel 41, the lace momentarily stops and on further movement of the gripper 102 its finger 104 is lifted by the other tripping pin 107 engaging the tripper 109, thus releasing this end of the lace. At the instant the travel of the lace ceases, the punching plunger and the bending plunger which have been moving forward, having respectively punched the ribbon for another blank and cut off the previously punched blank, wrap the latter tightly about the lacing, as shown in Fig. 7. The punching plunger and the bending plunger are then instantly retracted, when the lifting grippers again raise the lacing with the applied blank into the shearing cutters, at which time the blank is cut in half with the lacing, the weight of the finished lace drawing its inner end from between the gripping fingers 97 and the lace sliding at opposite sides of the finished lace carrier on the chutes 122 and 123 into the registering pocket. This operation is continued until a gross has been received into one pocket, when the carrier is advanced to place the next pocket in register with the lower portions of the slides or chutes. The bunches of counted laces are removed from the pockets at periods, the chain 118 of the carrier being sufficiently long to carry several bunches of laces at one time.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. The combination in a lace-tipping machine, of an endless lace carrier having means for drawing a length of lacing through the machine, means for applying a blank about the lacing at intervals and severing it to form two tips, an endless chain carrier arranged to receive the finished laces, and means for advancing the last-named carrier a step after each completion of a definite number of laces.

2. The combination in a lace-tipping machine, of an endless flexible lace carrier having means for drawing a length of lacing through the machine, means for applying a

blank about the lacing at intervals and severing it to form two tips, an endless flexible carrier arranged to receive the finished laces, having pockets, and means for advancing the last-named carrier step by step as a definite number of lacings are deposited in each pocket.

3. The combination in a lace-tipping machine, of a lace tip-applying mechanism having cutters to sever the blank applied to form two tips, means for intermittently feeding a continuous length of lacing past the tip applying mechanism, and means for lifting the lacings with the applied tip to the cutters.

4. The combination in a lace-tipping machine, of an endless lace carrier, a tip-applying mechanism having cutters to sever an applied blank to the lacing to form two tips, grippers to draw a continuous length of lacing through the machine past the tip-applying mechanism, carried by the carrier, each gripper having a base member and a finger, and grippers arranged at opposite sides of the tip-applying mechanism to raise the lacing into the cutters.

5. The combination in a lace-tipping machine, of an endless lace carrier, a tip-applying mechanism having cutters, grippers arranged at each side of the tip-applying mechanism to elevate the lacing to the cutters and having gripping fingers, a gripper for drawing a continuous length of lacing through the machine past the tip-applying mechanism, carried by the carrier, each gripper having a base-plate and a gripping finger, with the base-plate and finger movable past one of the first-named grippers at opposite sides of the fingers thereof.

6. The combination in a lace-tipping machine, of an endless lace carrier having means for drawing a length of lacing through the machine, a tip-applying mechanism having means for wrapping a blank around the lacing at intervals of its length and severing it to form two tips, an endless carrier for the finished laces, arranged at approximately right-angles to and below the first mentioned carrier and having pockets, slides for directing the finished lacings into the pockets of the last-named carrier, and means for advancing the last-named carrier after a definite number of lacings have been slid into one pocket to bring another pocket into operative position to said slides.

7. The combination in a lace-tipping machine, of a tip-applying mechanism, means for feeding a ribbon to the said mechanism to form the tips, means to stop the machine, having a shifting rod, a lever having means to force the rod in a direction to operate the stopping means, a slotted arm arranged to extend over one side of the ribbon, and a lever arranged to extend over the opposite side of the ribbon, having a projection to

engage the first-named lever and hold it against movement.

8. The combination in a lace-tipping machine, of punching dies, bending dies to
5 wrap a blank about the lace to form two tips, arranged above the punching dies, and cutters to sever the applied blank, arranged above the bending dies.

9. The combination in a lace-tipping machine, of a shaft having a cam, punching
10 dies, bending dies, cutters, said dies and cutters each having an operating plunger, and means for actuating all of said plungers from said cam.

10. The combination in a lace-tipping machine, of a shaft having a cam, punching
15 dies, bending dies, cutters, said dies and cutters each having an operating plunger, means for advancing and retracting the plungers of the bending dies and cutters
20 and advancing the plunger of the punching dies by the cam, and independent means for returning the plunger of the punching dies.

11. The combination in a lace-tipping machine, of punching dies, bending dies, cut-
25 ters, means for vertically feeding a ribbon between the punching dies, means operating the punching dies and bending dies to re-
30 spectively punch the ribbon and cut off a previously punched blank from the ribbon and bend it about the lace to form two tips, means for elevating the lacing with the
35 blank applied into the cutters, and means for retracting one of said cutters to sever the blank and lacing.

12. The combination in a lace-tipping machine, of means for applying a blank about
40 the lacing, cutters, one of which is movable and the other stationary, means to elevate the applied blank to the cutters, and means for retracting the movable cutter to sever the blank and lacing to form two tips.

13. The combination in a lace-tipping machine, punching dies, bending dies, cutters,
45 each set of dies and cutters having a reciprocating plunger, means to advance the bending die plunger, and means carried by said plunger to contact with and move the other plungers forward when it is advanced.

14. The combination in a lace-tipping machine, of bending dies to wrap a blank about
50 the lacing, with one of said dies having a reciprocating plunger, an arc attached to said plunger, a cam arranged to engage and advance the plunger, and a roller carried by
55 the cam, arranged to engage the arc and retract the plunger.

15. The combination in a lace-tipping machine, of means for applying a blank about
60 the lacing sufficient in length to form two tips, a coacting stationary and movable cutter, with the movable cutter having a shearing notch in its lower edge, and the stationary
65 cutter having a shearing edge at its end, means to elevate the lace with the applied

blank between the shearing edges of the cutters, and means to retract the movable cutter to sever the blank and lacing.

16. The combination in a lace-tipping machine, of bending dies having means to sever
70 and wrap a blank about a length of lacing, cutters to sever the lacing, one of the bending dies and one of the cutters having an operating plunger, an arc attached to the plunger of the bending die, a lever engaged
75 with the plunger of the cutter, and a cam arranged to engage the plunger of the bending die and the lever to respectively force the bending die plunger forward and re-
80 tract the plunger of the cutting die, and having a roller arranged to engage the arc and retract the plunger of the bending die.

17. The combination in a lace-tipping machine, of punching dies, bending dies, cut-
85 ters, one of each set of dies and one of said cutters each having an operating plunger, means carried by the plunger of the bending die arranged to engage the other plungers and move them forward when the said
90 bending die plunger is advanced, and means to vary the effective length of the punching die plunger.

18. The combination in a lace-tipping machine, of means to intermittently draw a
95 length of lacing through the machine, a tip-applying mechanism having cutters, and grippers to elevate the lacing to the cutters, arranged at opposite sides of the tip-applying mechanism, with one of said grippers
100 having fingers separated in a depressed position and clamping the lacing in an elevated position.

19. The combination in a lace-tipping machine, of a tip-applying mechanism having
105 cutters, gripping fingers arranged at one side of the mechanism to elevate the lacing to the cutters, and means to raise and lower the fingers respectively in a closed and open position.

20. The combination in a lace-tipping machine, of an endless carrier to draw a con-
110 tinuous length of lacing through the machine, of a tip-applying mechanism having cutters, a longitudinal shaft having means to actuate the cutters, a transverse shaft
115 driven from the longitudinal shaft, means driving the endless carrier from the transverse shaft, grippers arranged at the opposite sides of the tip-applying mechanism, and means carried by the respective shafts
120 to raise the grippers to carry the lacing to the cutters.

21. The combination in a lace-tipping machine, of a tip-applying mechanism, means
125 for feeding a ribbon to the said mechanism to form the tips, a carrier to draw a continuous length of lacing through the machine past the tip-applying mechanism, a carrier arranged to receive the finished laces, means
130 to advance the carrier a step after the com-

pletion of a predetermined number of laces, and an oscillatory arm operatively connected to the last-mentioned means and to the ribbon-feeding means.

5 22. The combination in a lace-tipping machine, of a tip-applying mechanism, means for feeding a ribbon to the said mechanism to form the tips, a carrier to draw a continuous length of lacing through the machine past the tip-applying mechanism, a carrier arranged to receive the finished laces, means to advance the last-named carrier a step after the completion of a predetermined number of laces, a driving shaft, and an eccentric carried by the driving shaft operatively connected to the means for advancing the finished lace carrier and operatively connected to the ribbon-feeding means.

23. The combination in a lace-tipping machine, of means for feeding a length of lacing through the machine, means to apply a blank at intervals of the length of the lacing and sever it to form the finished lacings, an endless carrier arranged to receive the finished lacings, a shaft, a series of wheels arranged on the shaft successively increasing in diameter, with the smallest wheel secured to the shaft and the larger wheels journaled thereon, each wheel having an equal number of teeth, with one tooth of each of the larger wheels cut to approximately the depth of the teeth of the smaller wheel, oscillatory means in engagement with the teeth of the larger wheel and adapted to drop into the deep tooth thereof and engage the smaller wheels, and means for driving the carrier from the said shaft.

24. The combination in a lace-tipping machine, of a tip-applying mechanism, a gripper to frictionally hold the lacing preparatory to the passage of the lacing to the tip-applying mechanism, an endless carrier, a gripper carried by the carrier and having opposed gripping members, and means to actuate the last-named gripper to cause one of said members to move over and the other beneath the first mentioned gripper and pick up the end of the lacing in advance of the first mentioned gripper preparatory to drawing the lacing past the tip-applying mechanism.

25. The combination in a lace-tipping machine, of a tip-applying mechanism, means to intermittently feed a length of lacing past the tip-applying mechanism, a shaft, means for operating the tip-applying mechanism from the shaft, cams carried by the shaft, and a gripper to engage the lace as the feeding movement of the latter stops, having fingers pivoted together, each operated by one of said cams.

26. The combination in a lace-tipping machine, of a tip-applying mechanism having cutters, means to draw a length of lacing through the machine past the cutters, a

gripper frictionally and constantly binding the lacing preparatory to the passage of the latter by said mechanism, a gripper arranged at the opposite side of the said mechanism, and means to actuate the last-mentioned gripper to engage the lacing and raise both of the grippers to elevate the lacing to the cutters.

27. The combination in a lace-tipping machine, of a tip-applying mechanism, a gripper arranged at one side of the mechanism, a carrier, a gripper to draw a length of lacing through the first-mentioned gripper past the tipping mechanism, having two gripping members and provided with means for separating and moving said members together, a tripper arranged to operate the last mentioned means to separate said members when a length of lacing has been drawn past the tip-applying mechanism equal to the length of the finished lacing, and a tripper to actuate the said means to move the members together when the gripper passes the first mentioned gripper.

28. The combination in a lace-tipping machine, of an endless lace carrier, a tip-applying mechanism, and a gripper to draw a length of lacing through the machine past said mechanism, carried by the carrier and having a base-plate and a pivoted finger, with a spring to hold the finger both in a retracted and projected position.

29. The combination in a lace-tipping machine, of a carrier for the lacing, a base-member secured to the carrier, a gripping finger coacting with the base member to grip the lacing, having a flattened end, and a spring arranged to bear on said end of the finger and hold it in a retracted position.

30. The combination in a lace-tipping machine, of an endless carrier for the lacing, a base member secured to the carrier, a shaft having a gripping finger secured thereto and arranged to bind the lacing to the base member, a spring carried on the finger and arranged to hold the latter in retracted and depressed positions, and tripping pins projecting from the shaft.

31. The combination in a lace-tipping machine, of an endless lace carrier, a tip-applying mechanism having cutters, grippers arranged at opposite sides of said mechanism, grippers to draw a continuous length of lacing through the last-mentioned grippers in successive portions, means to release one of the grippers after the feeding of each portion of the lacing, and means to simultaneously elevate the grippers at the opposite sides of the tipping mechanism to carry the lacing to the cutters.

32. The combination in a lace-tipping machine, of a head having a housing, punching dies, bending dies and cutters respectively arranged one above the other, one die of each set and one of said cutters having

a plunger slidable in the housing, an endless lace carrier arranged at the front of the dies and cutters having grippers to draw successive portions of a continuous length of 5 of lacing between the bending dies, and means to actuate the plungers to apply a severed blank about the lacing after the feeding of each portion, to form the finished laces.

In testimony whereof we have signed our 10 names to this specification in the presence of two subscribing witnesses.

WILLIAM HARRY JOSLIN.
MANFRED HENRY BENNETT.

2 Witnesses:

GEORGE PARKER HALL,
WILLIAM HENRY BROWN.