

No. 697,514.

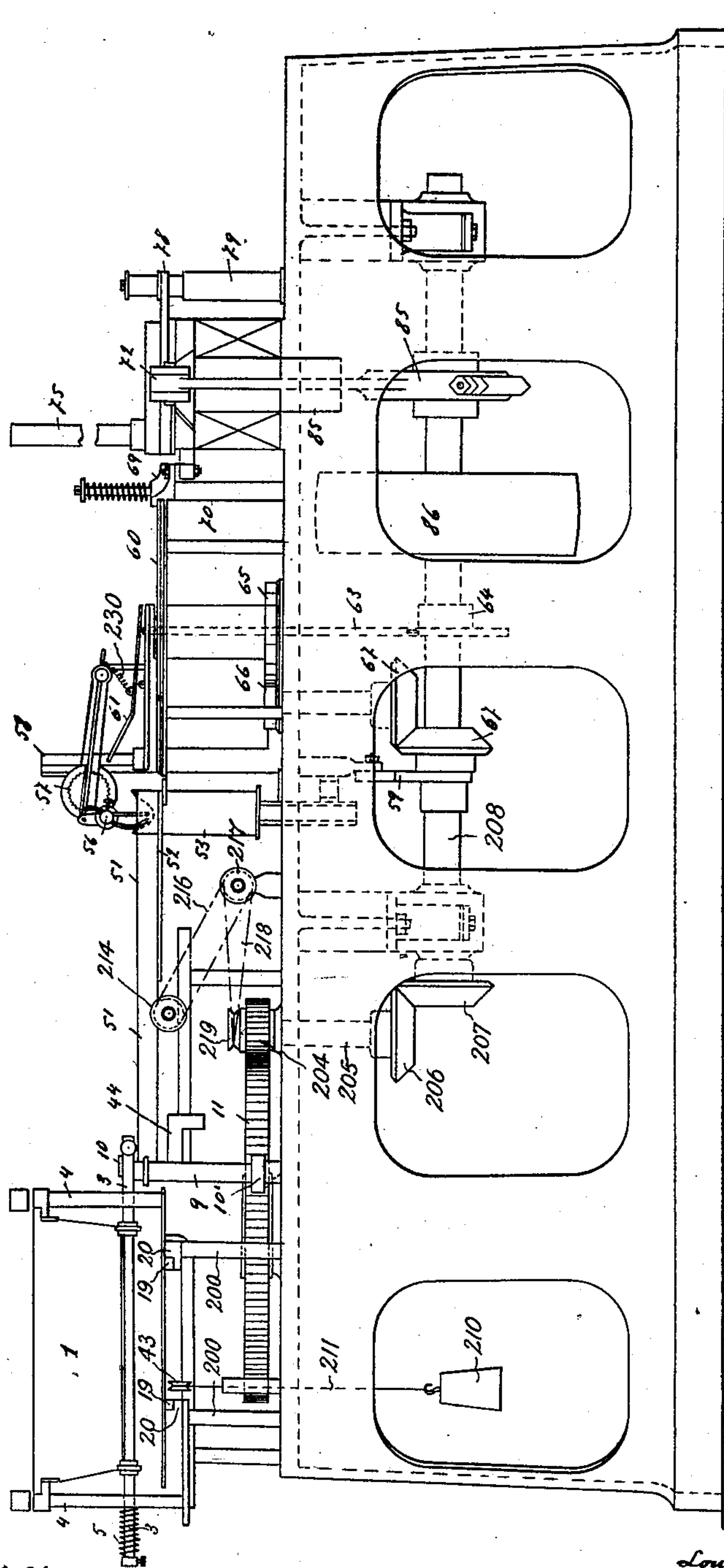
Patented Apr. 15, 1902.

L. METTEWIE, L. ROCHET & A. BEECK.
MATCH BOX FILLING MACHINE.

(Application filed Sept. 11, 1899.)

(No Model.)

13 Sheets—Sheet 1.



Witnesses.
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P. Hadden

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Fig. 4.

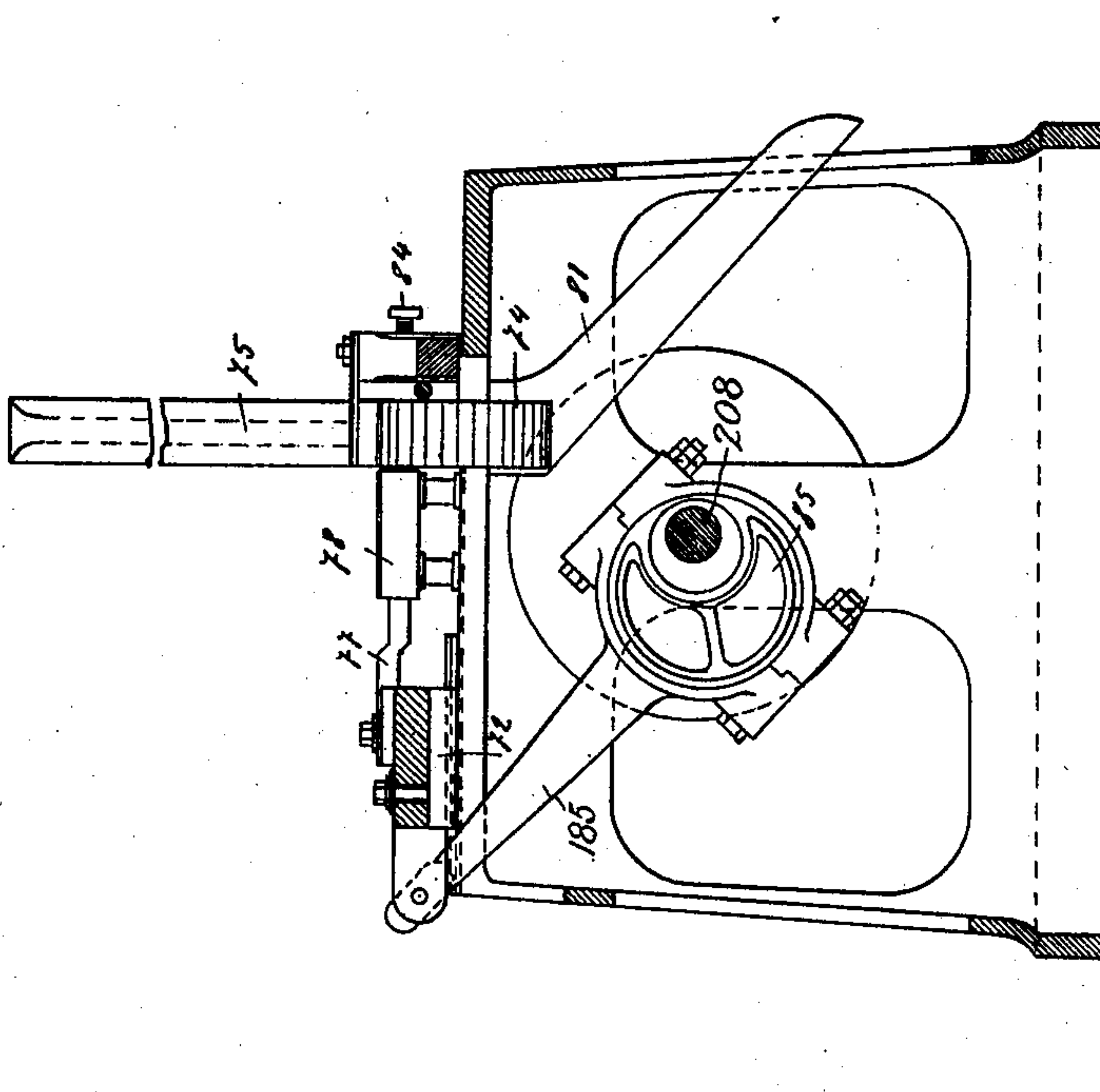
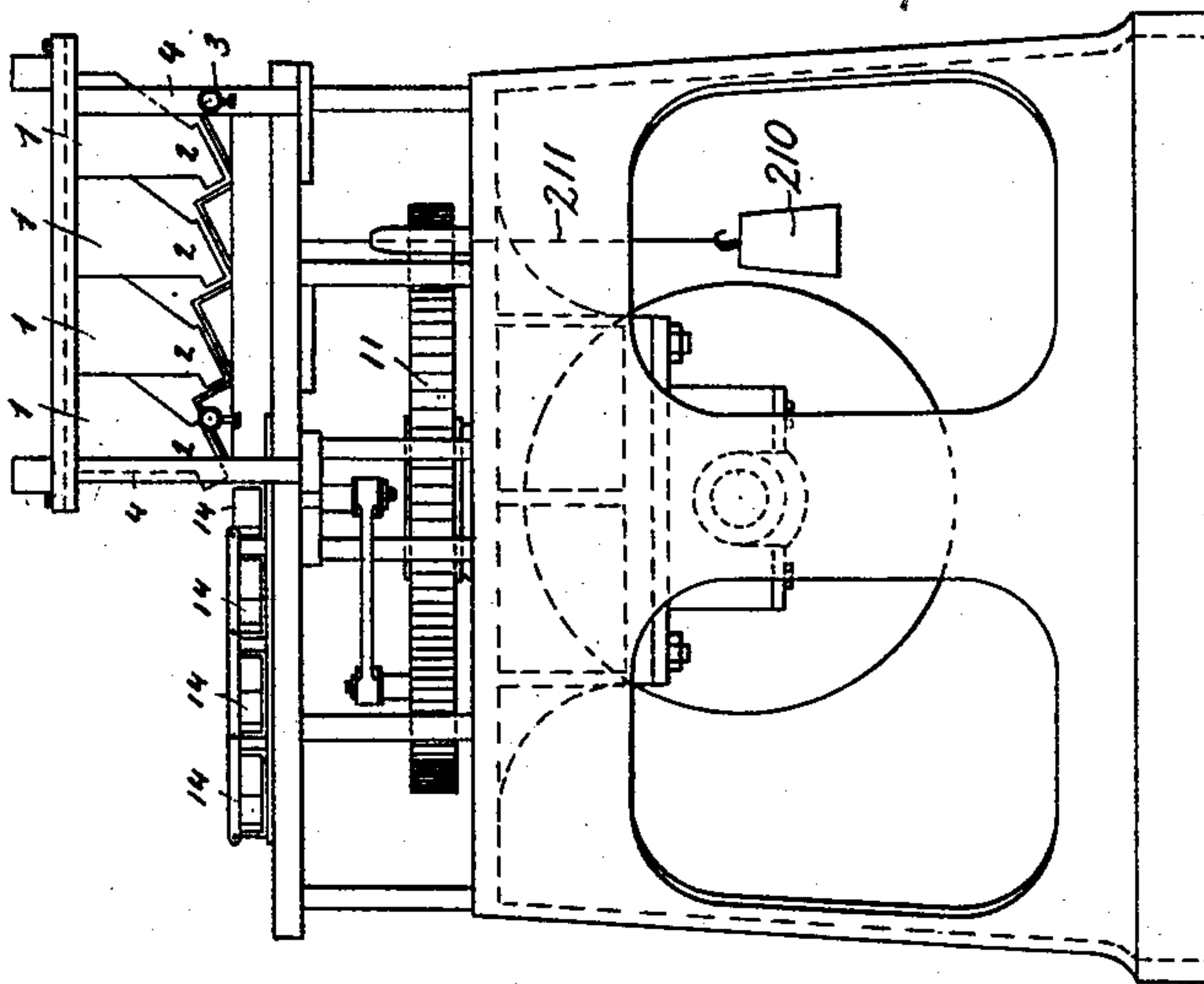


Fig. 2.



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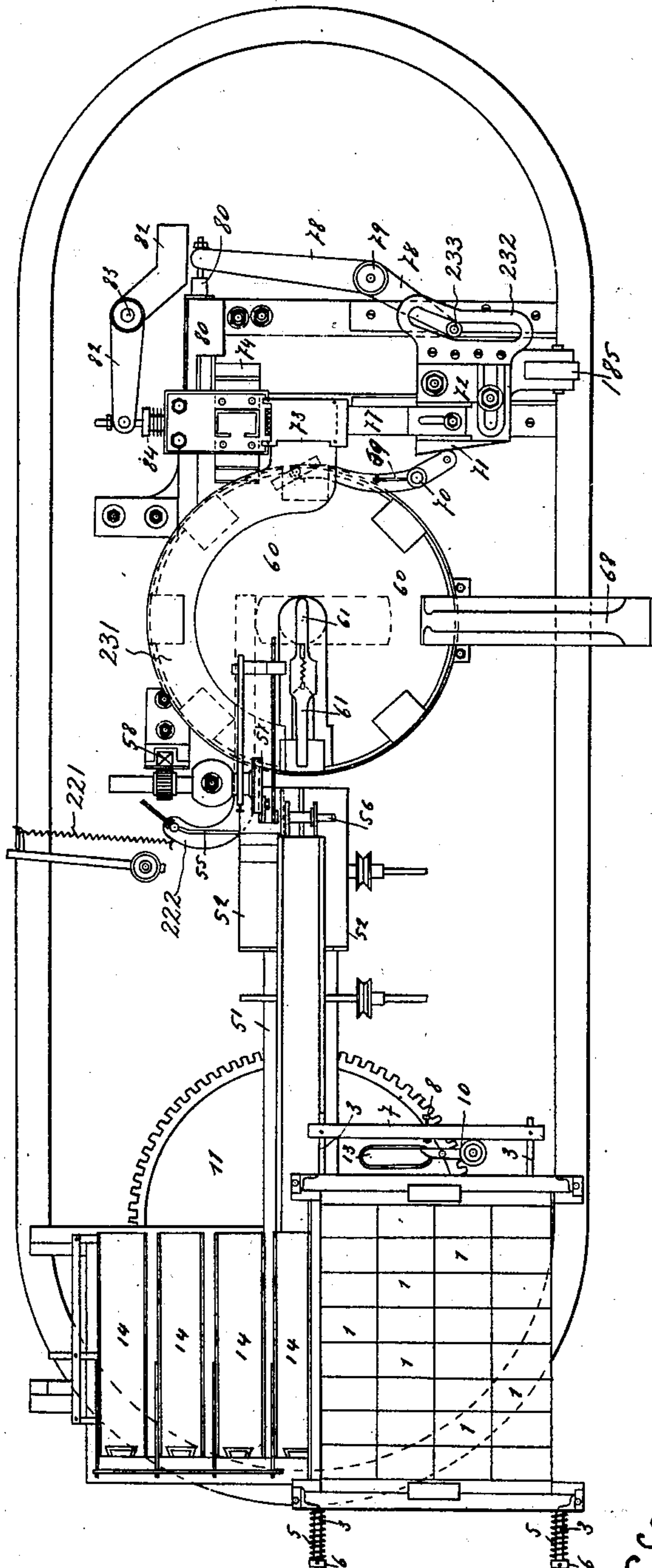
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13 Sheets—Sheet 3.

Fig. 3.



Witnesses.

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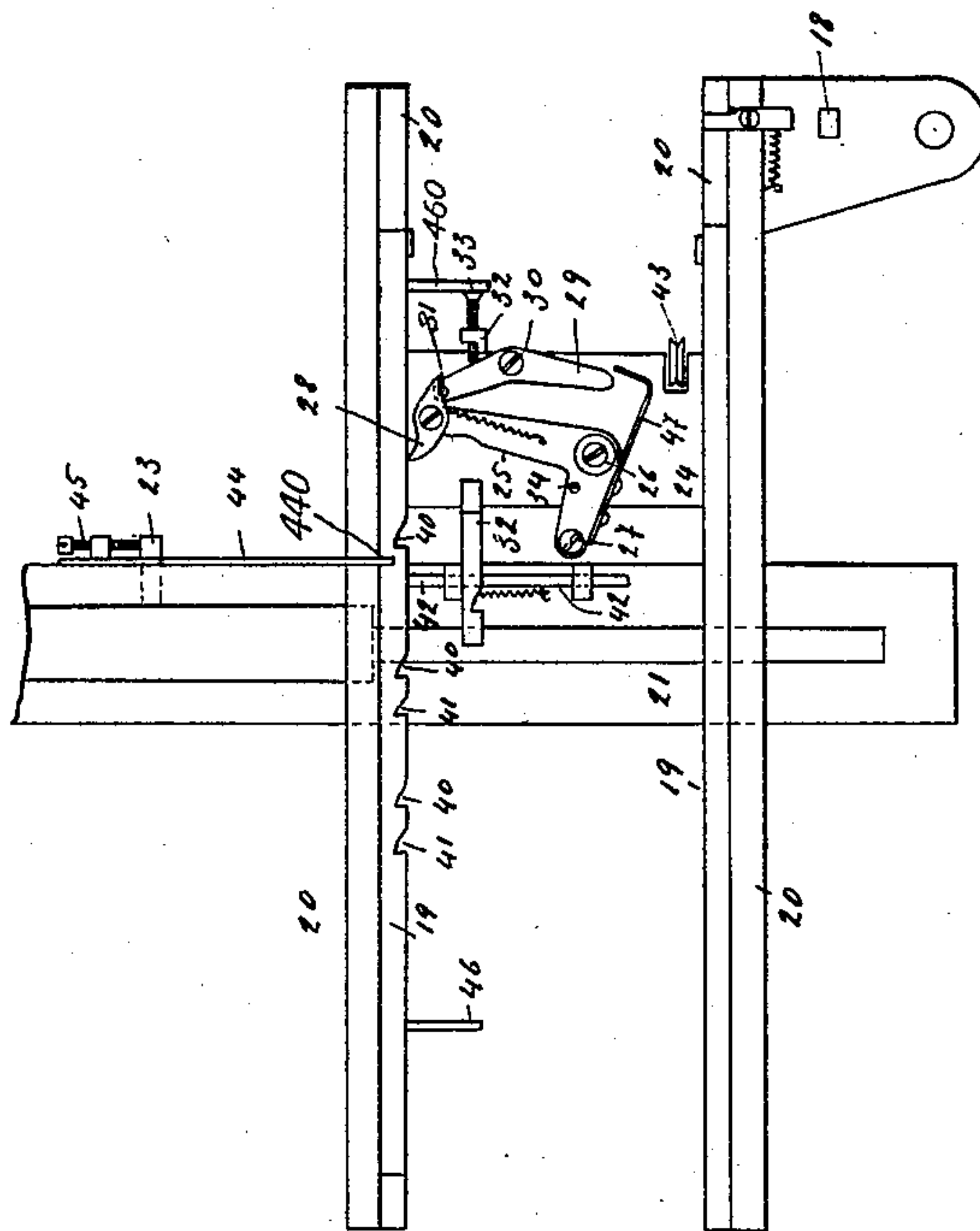
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13 Sheets—Sheet 4.

Fig. 5.



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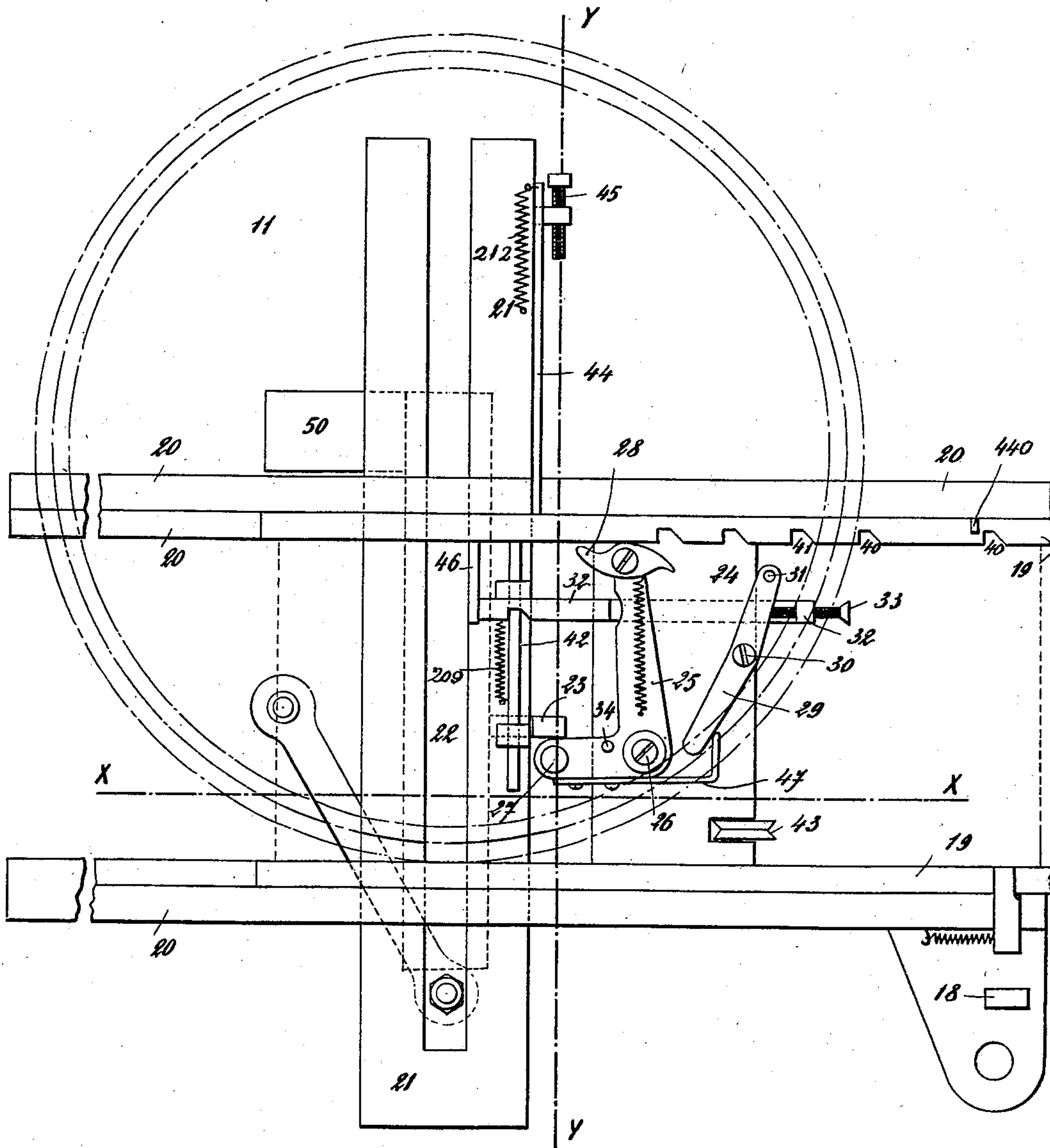
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13 Sheets—Sheet 5.

Fig. 6.



Witnesses

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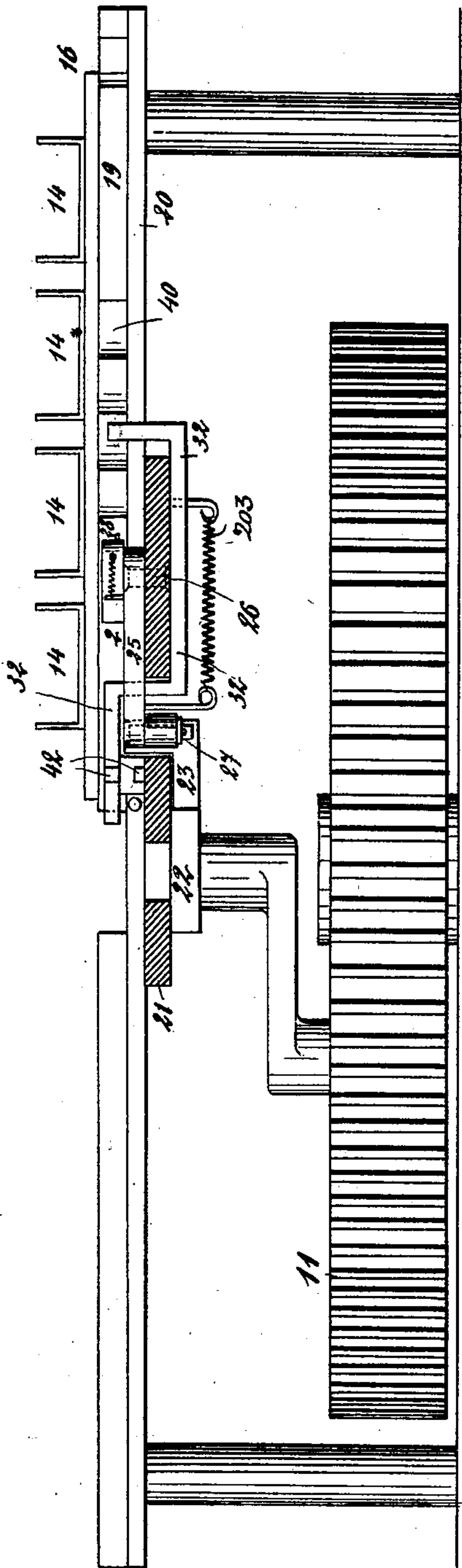
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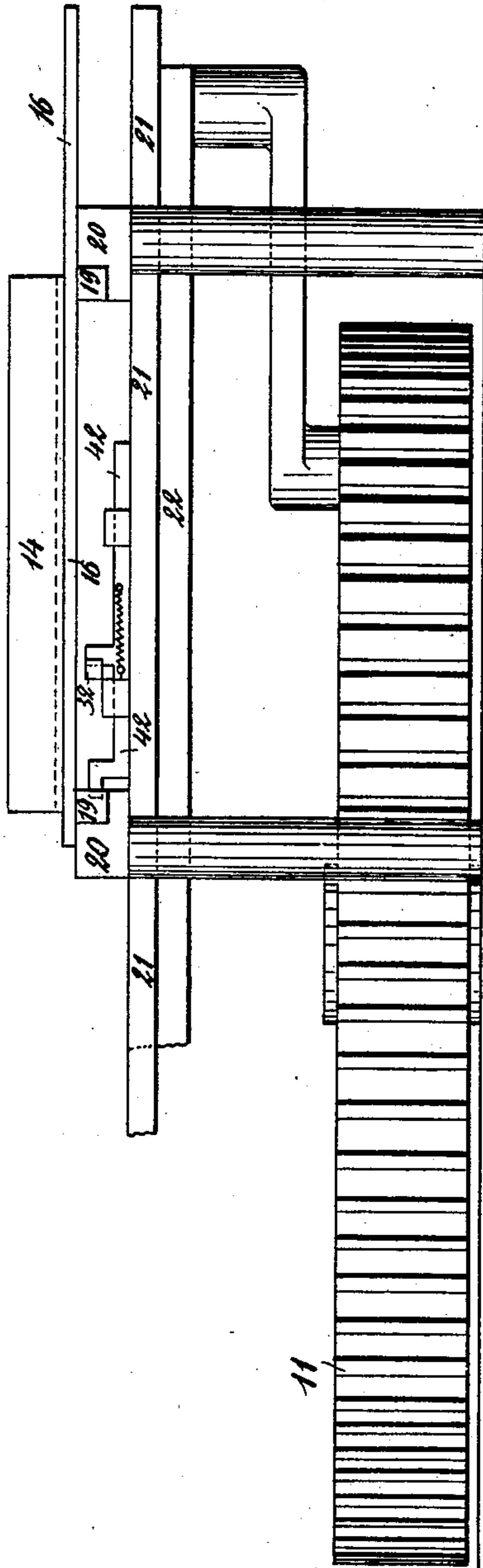
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Fig. 6^a.



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Fig. 6^b.



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13 Sheets—Sheet 7.

Fig. 20.

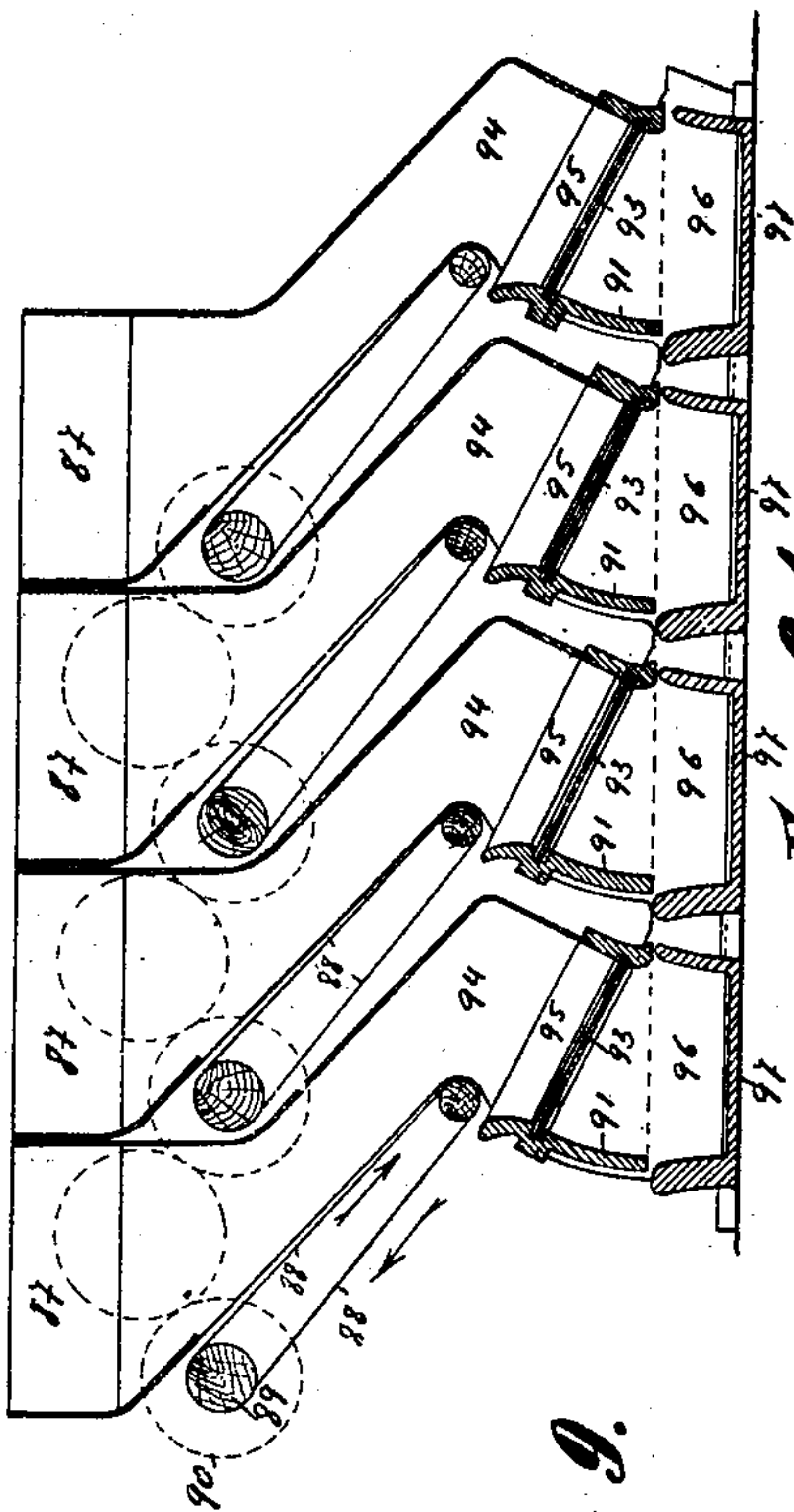


Fig. 21.

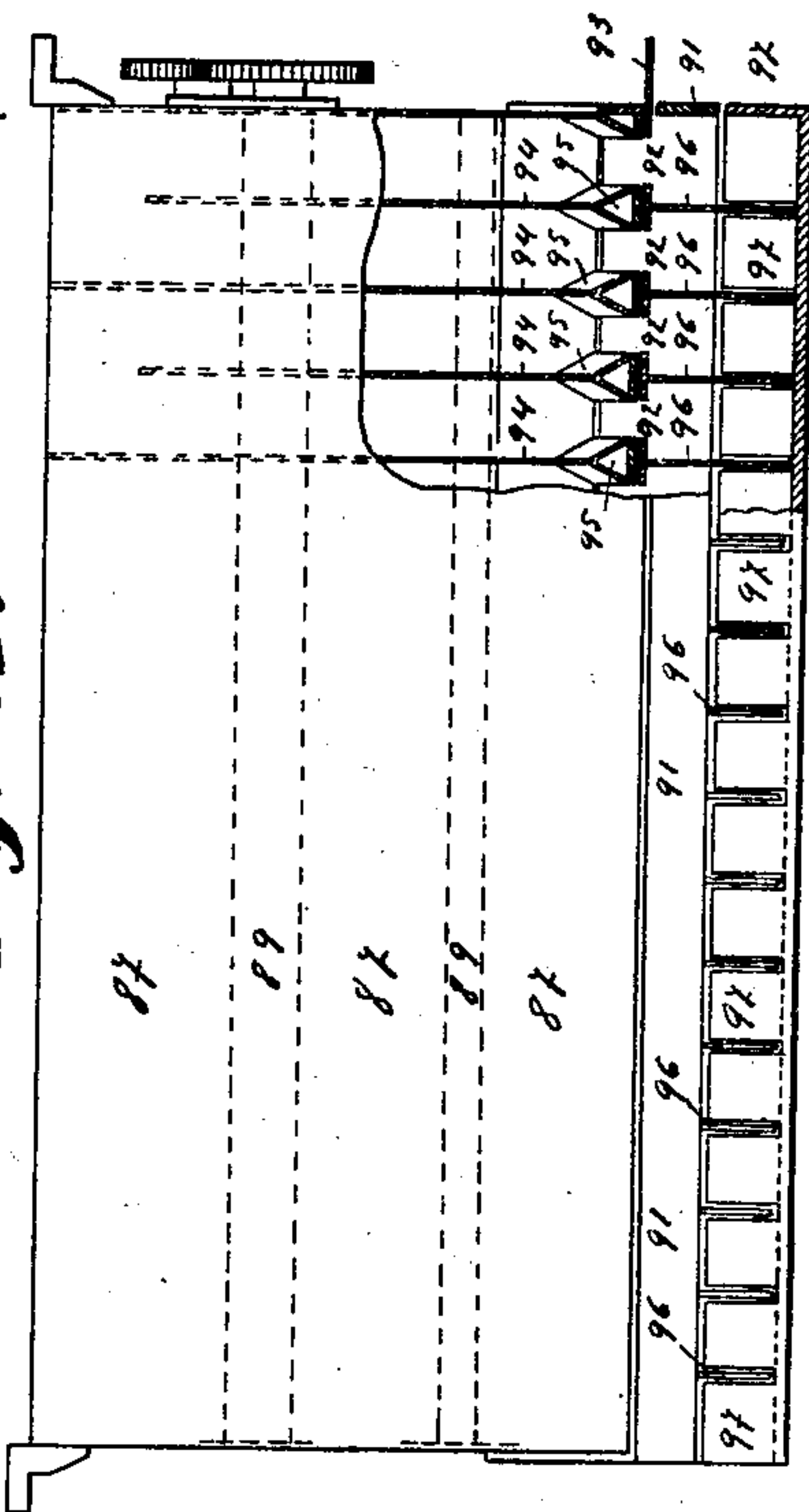


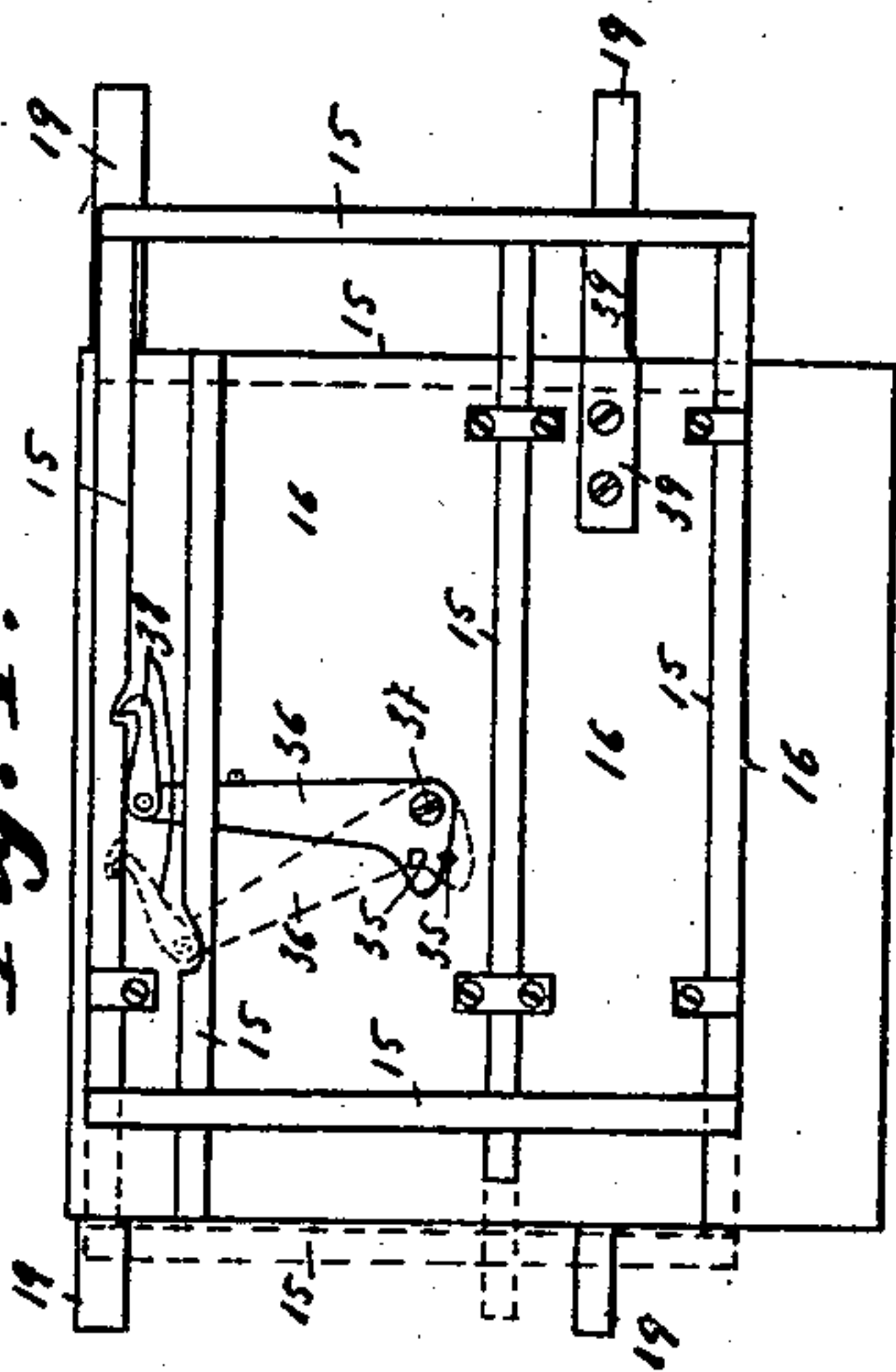
Fig. 8.



Fig. 9.



Fig. 7.



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Fig. 13.

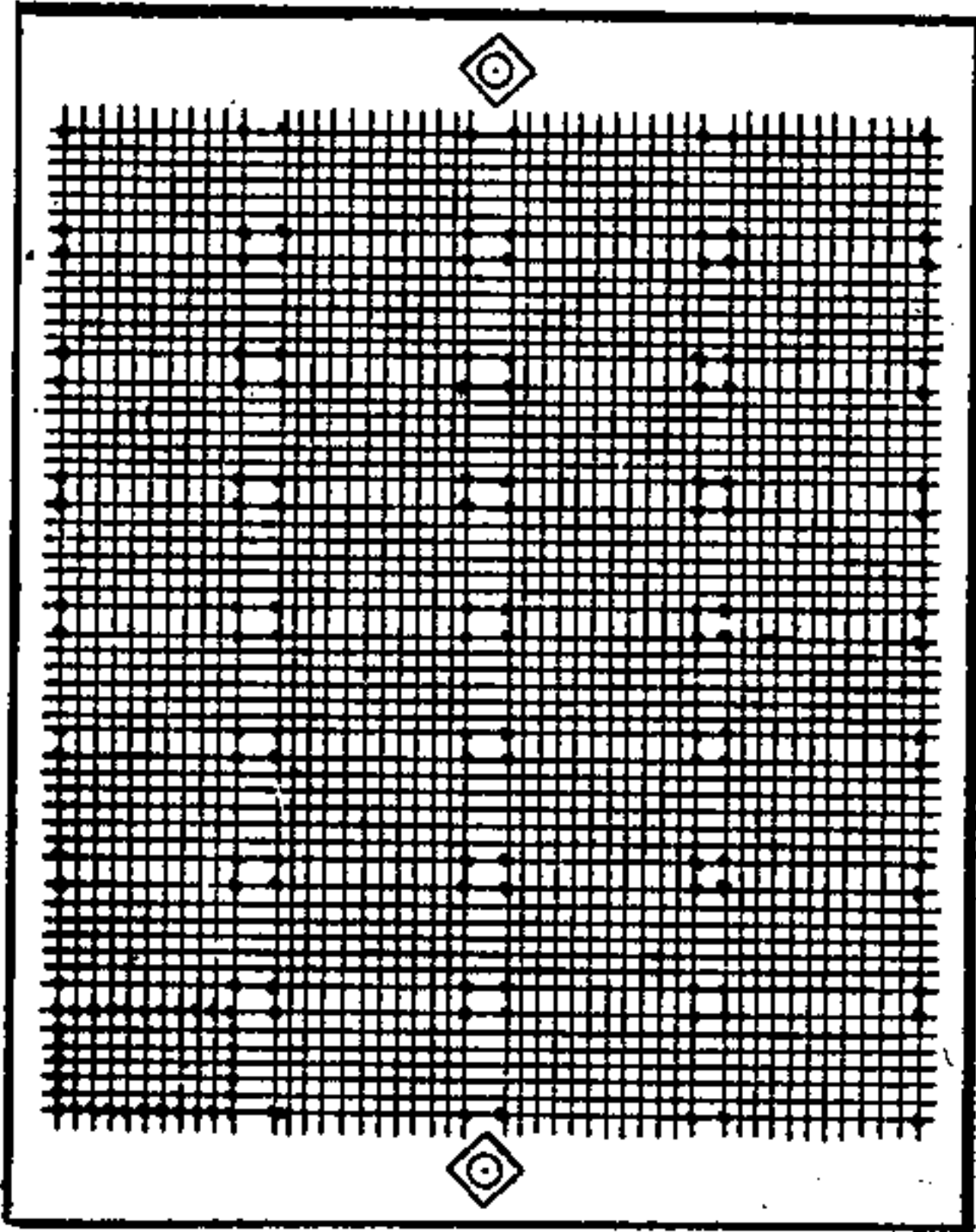


Fig. 14.

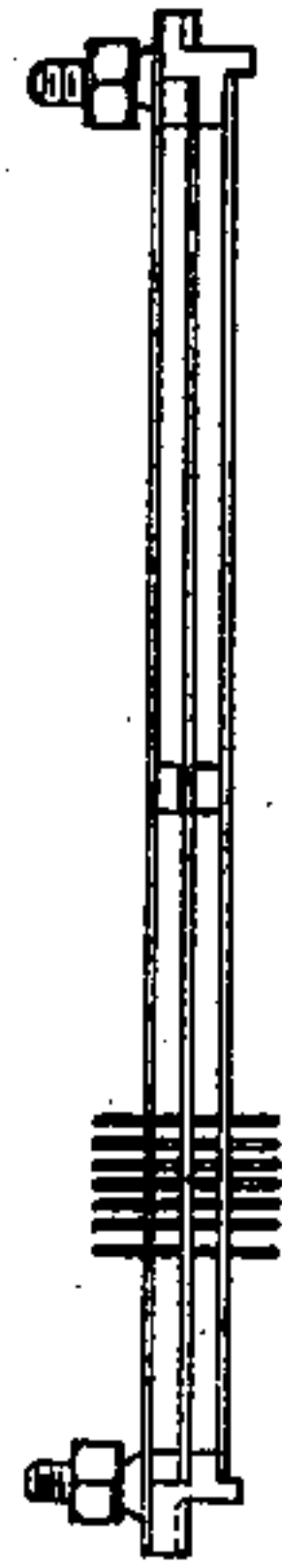


Fig. 15.

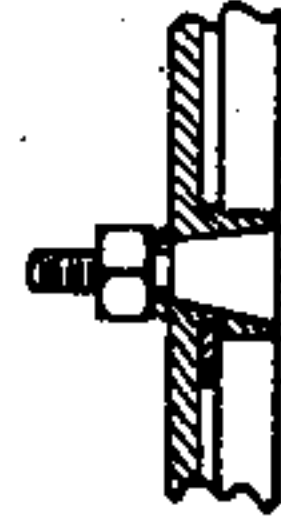


Fig. 16.

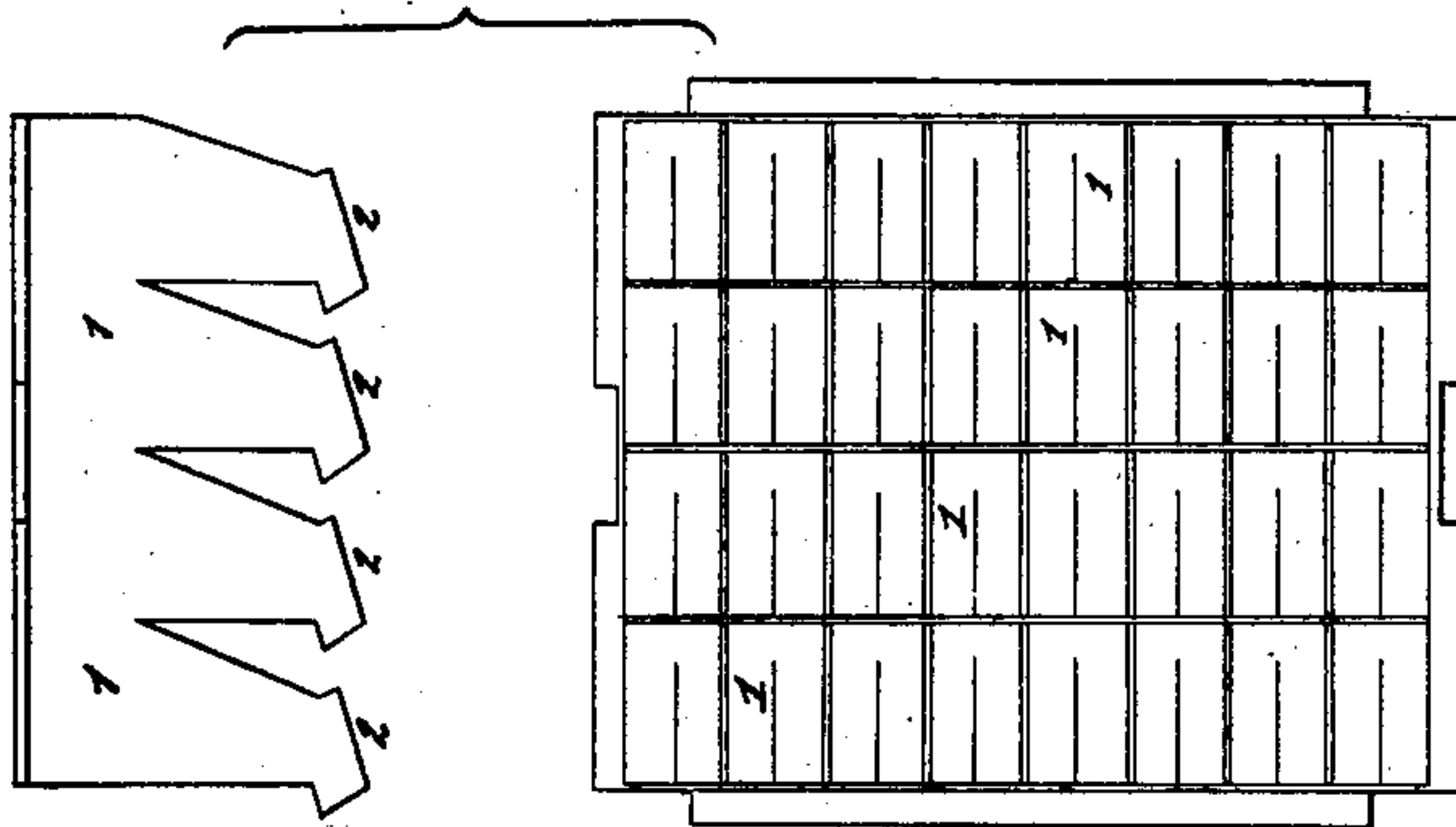
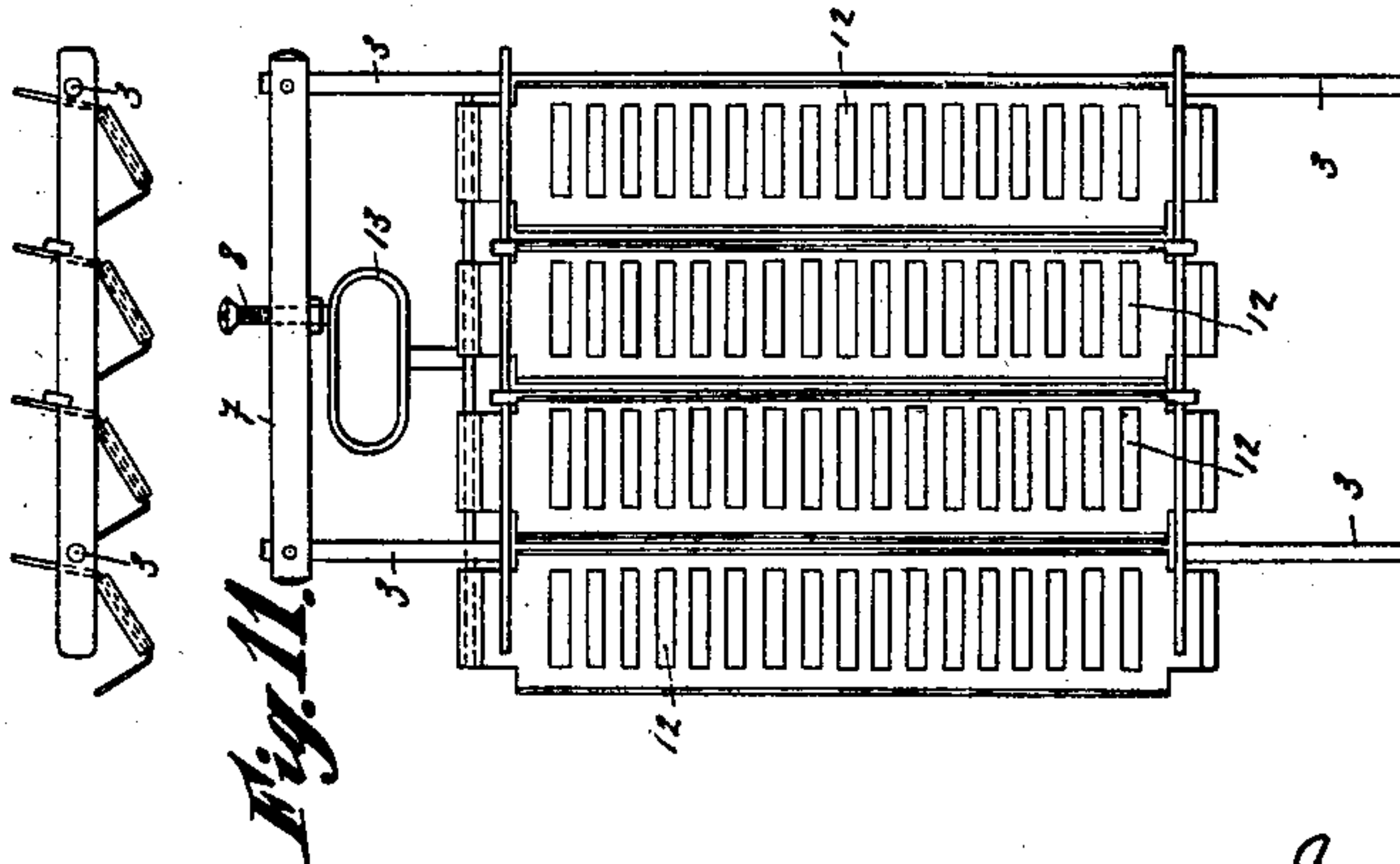


Fig. 10.



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13 Sheets—Sheet 9.

Fig. 18.

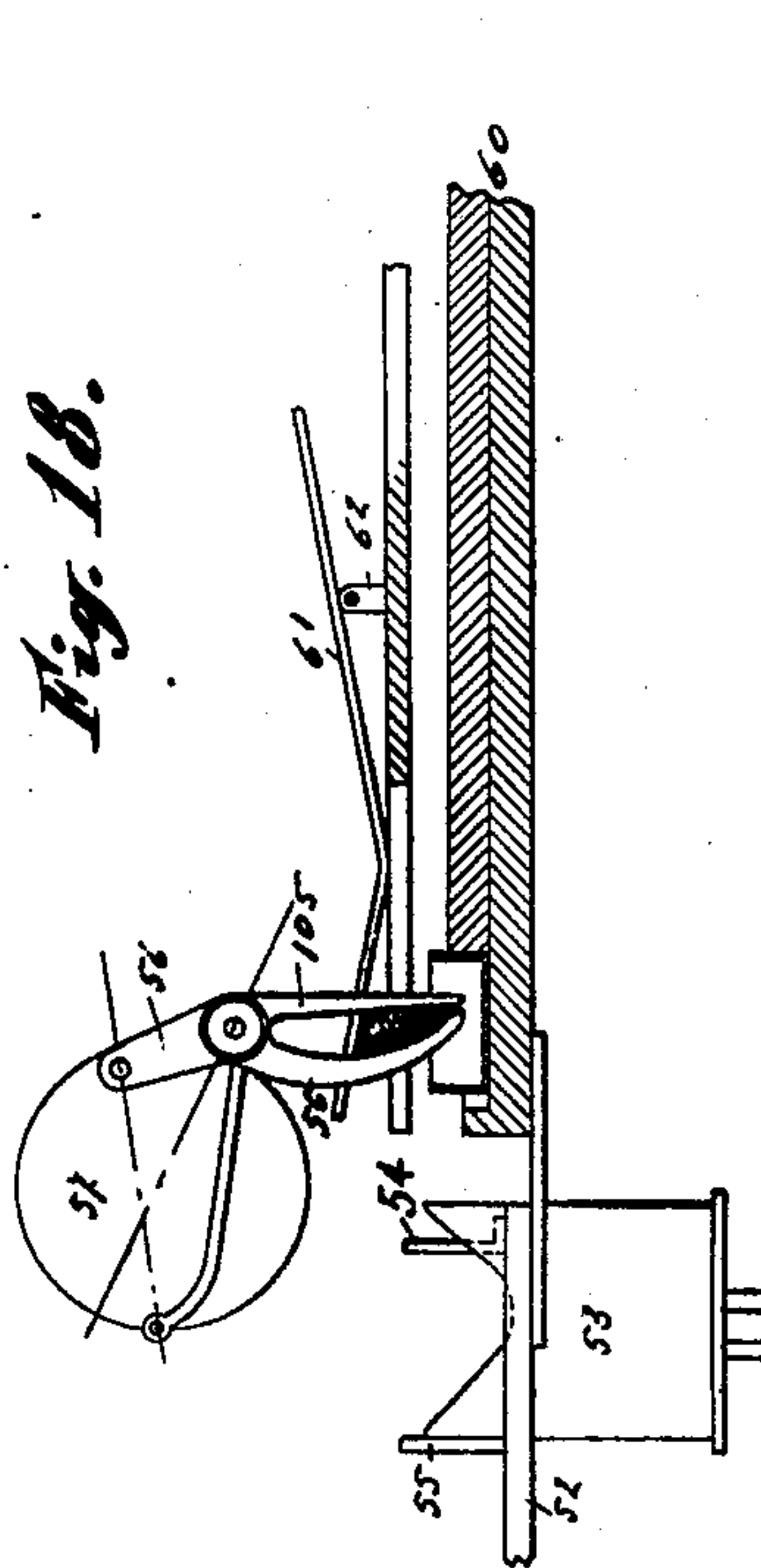


Fig. 19.

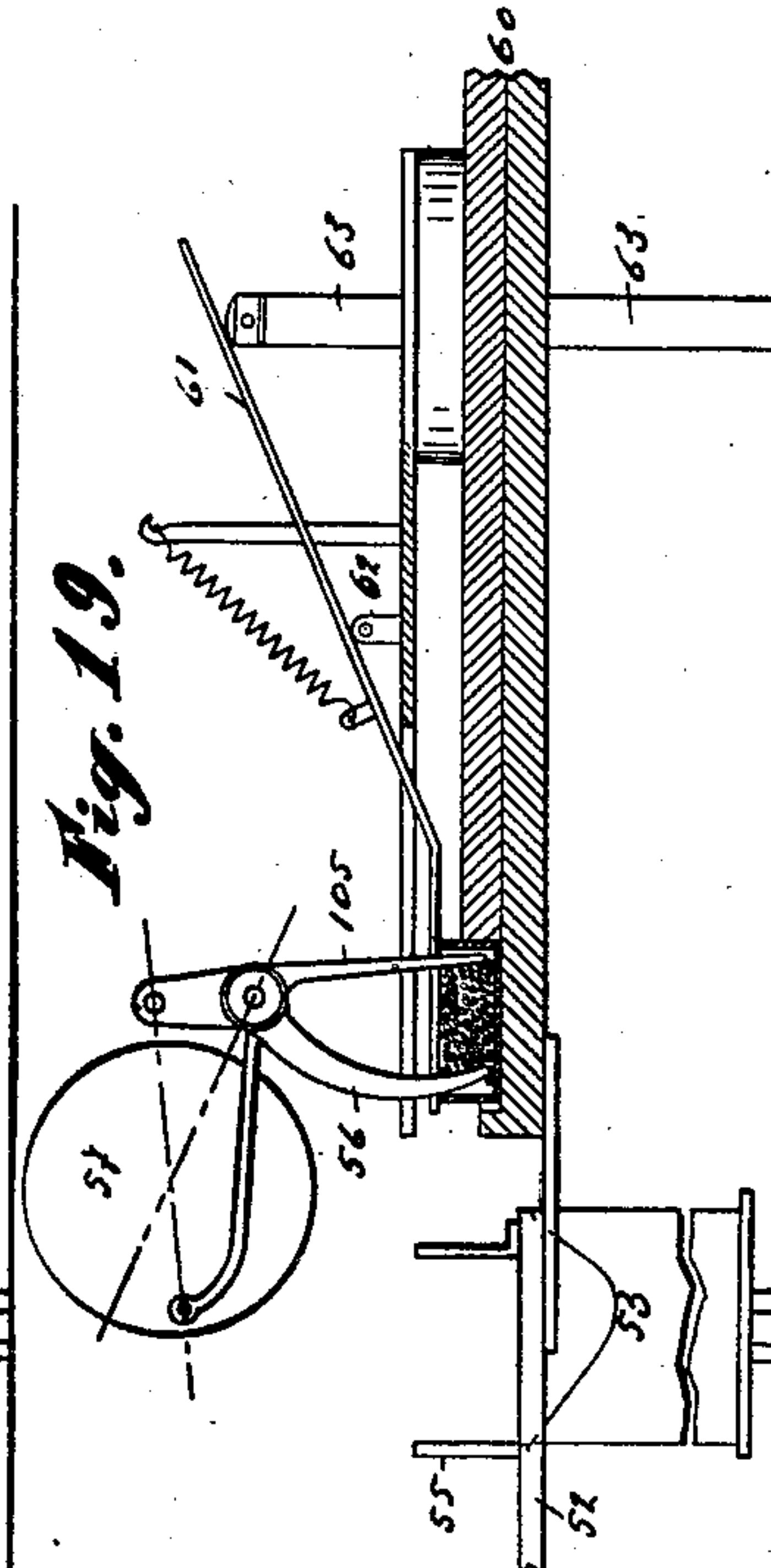


Fig. 16.

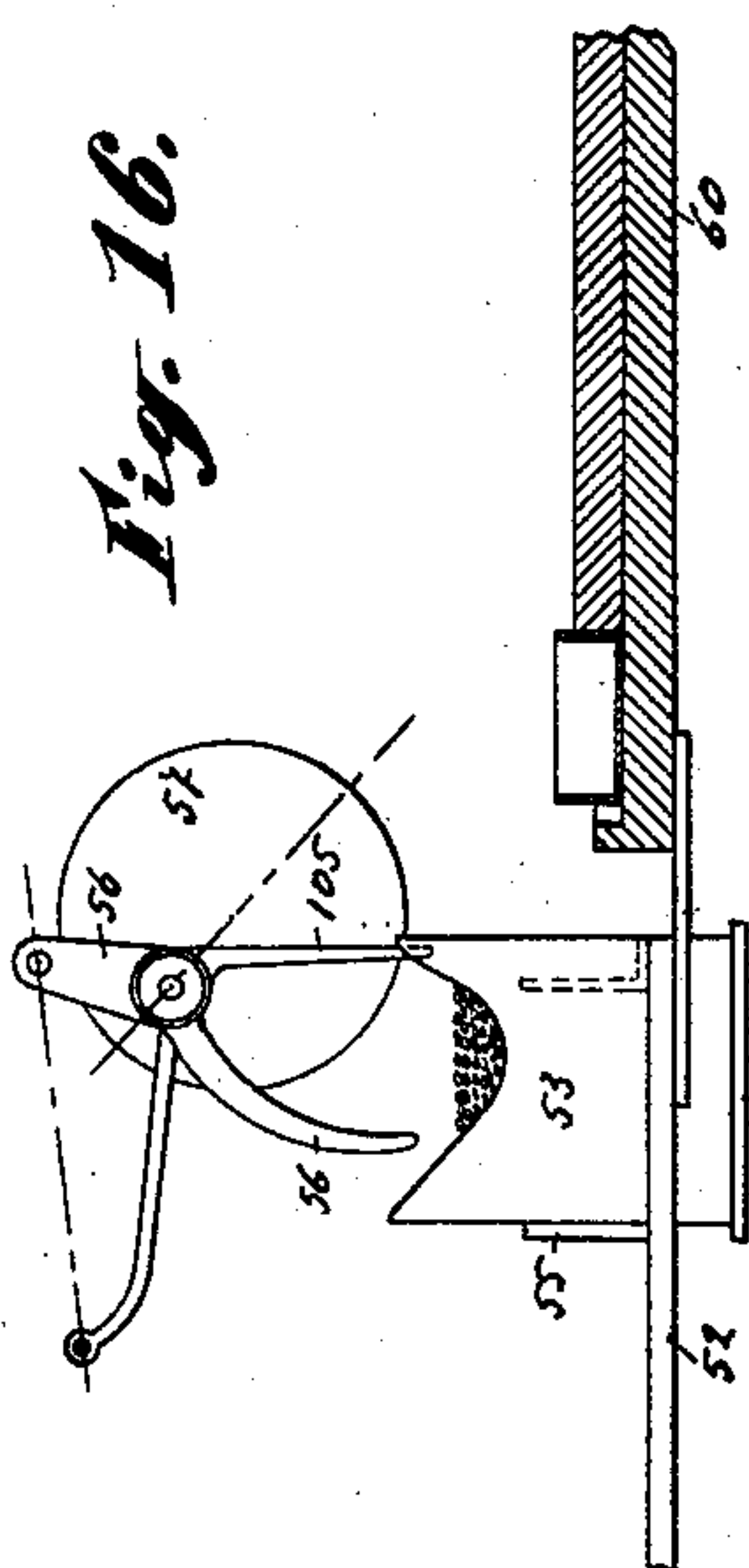
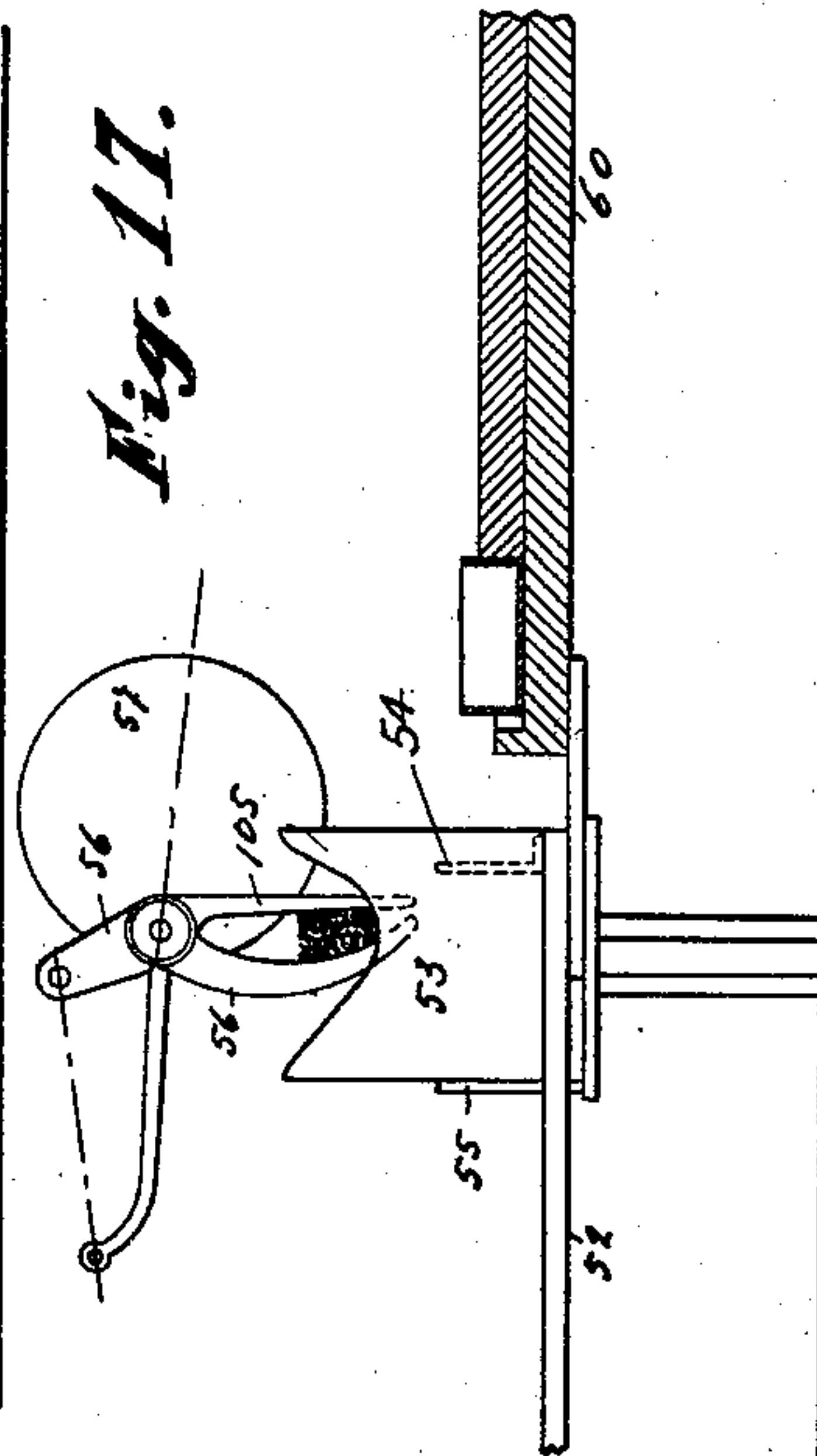


Fig. 17.



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13 Sheets—Sheet 10.

Fig. 19.¹

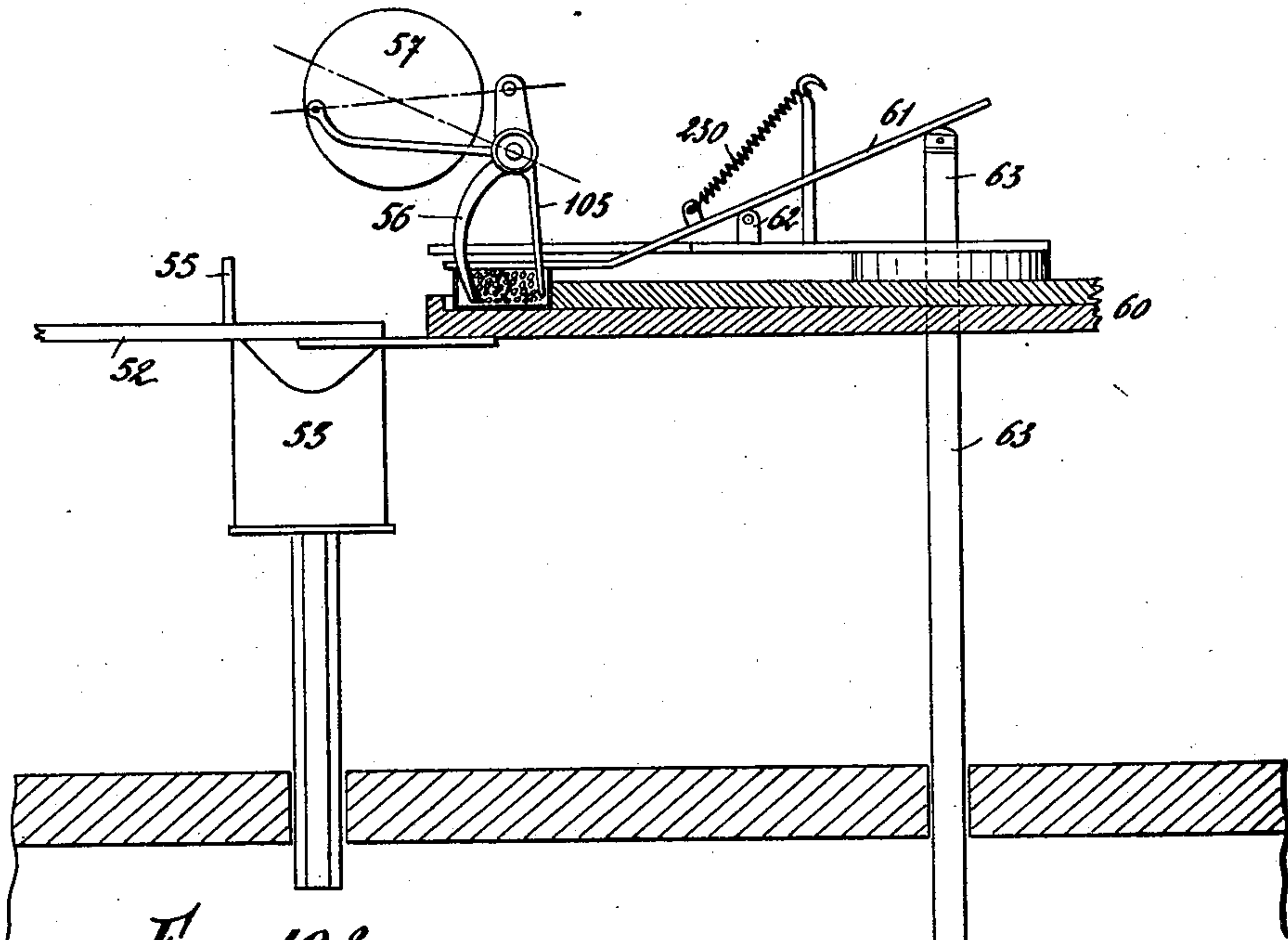
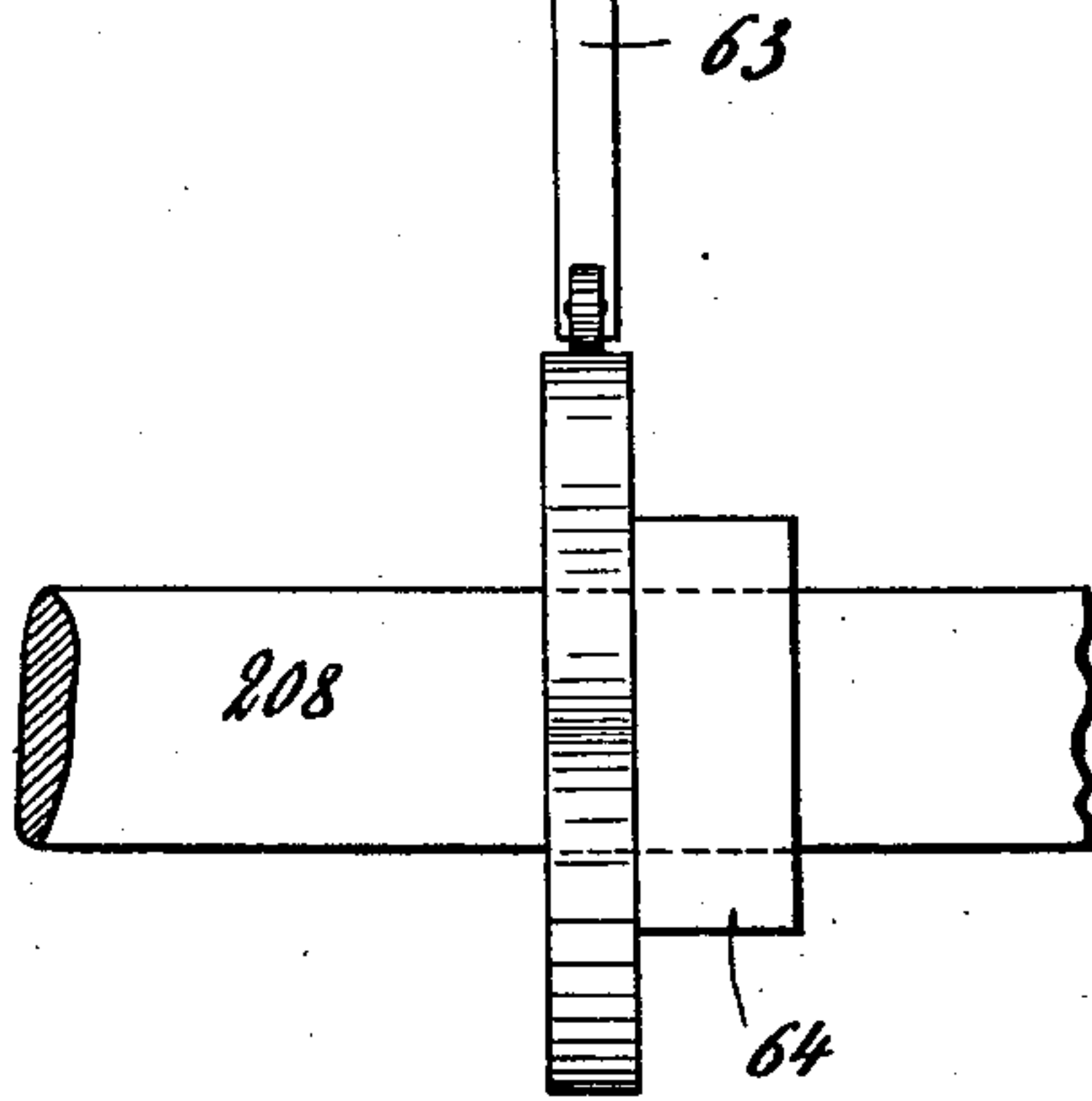
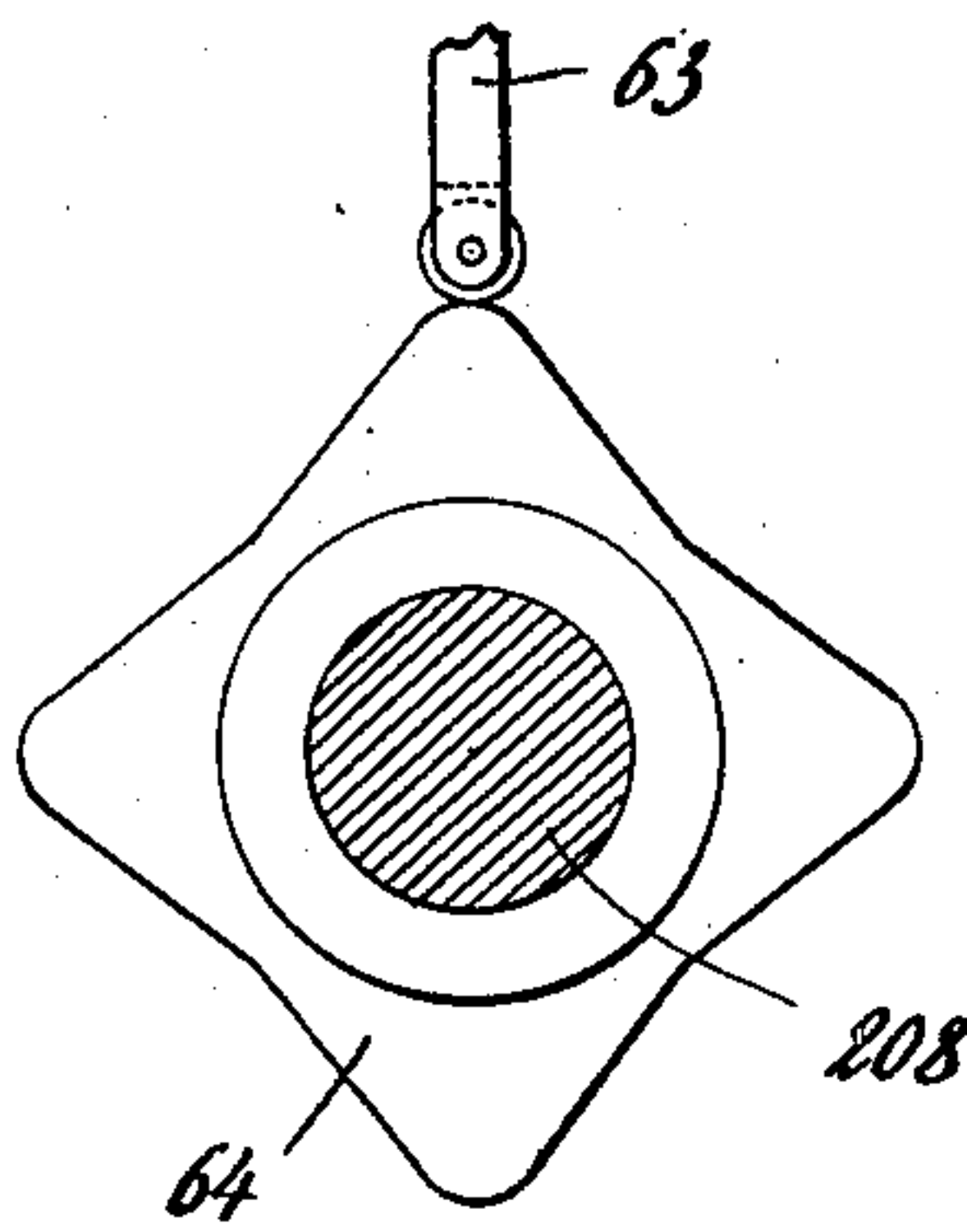


Fig. 19.²



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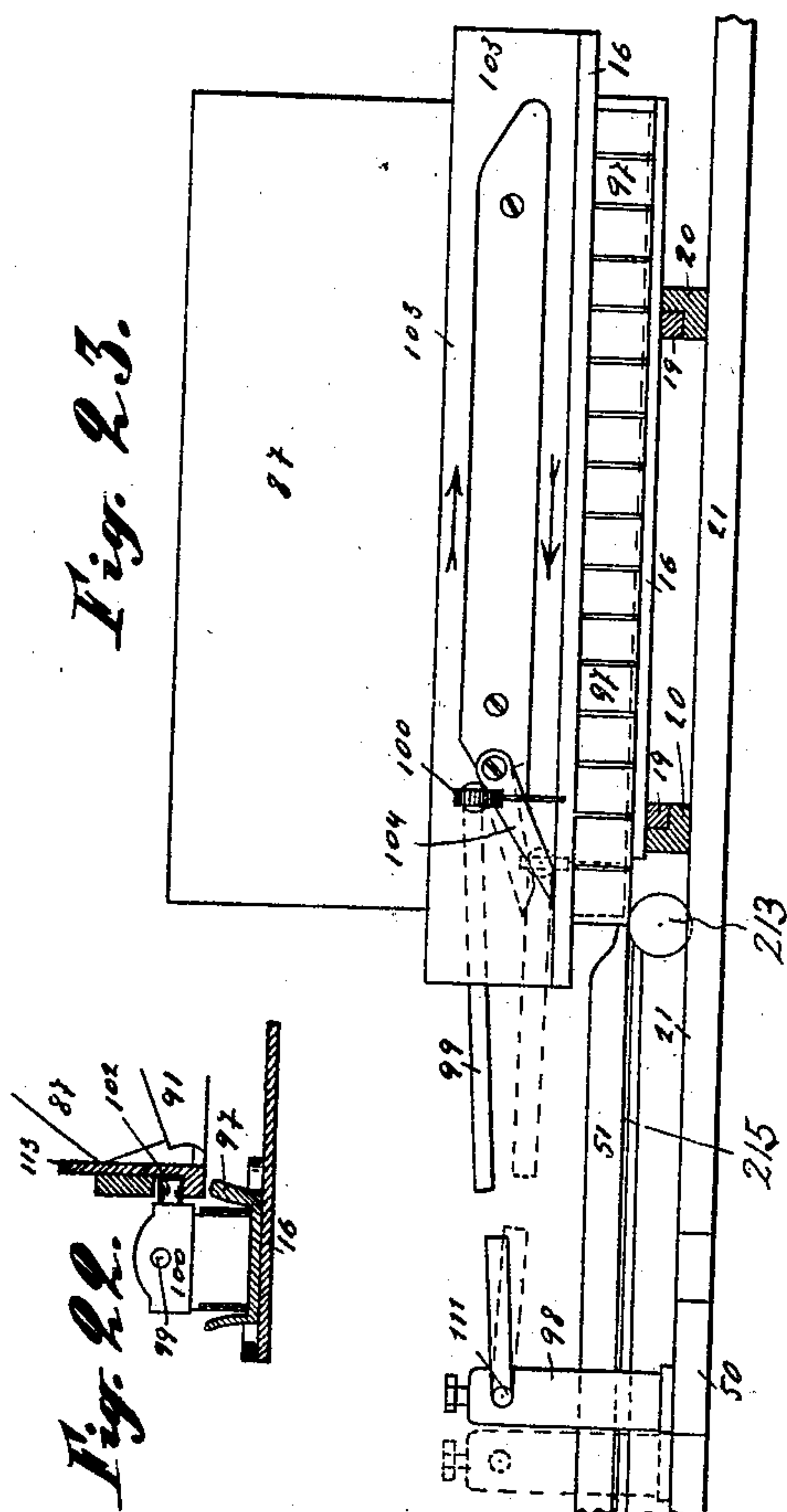
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13 Sheets—Sheet II.



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(Application filed Sept. 11, 1899.)

(No Model.)

13 Sheets—Sheet 12.

Fig. 25.

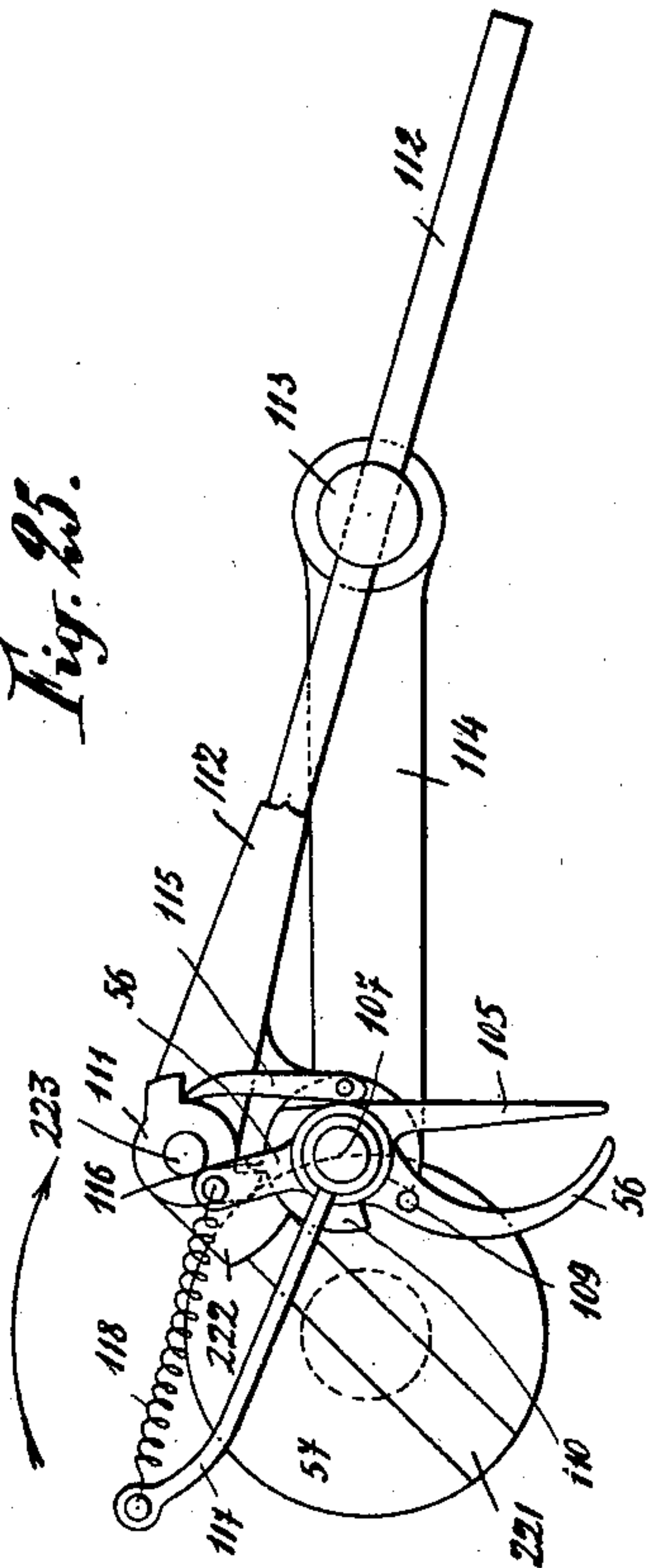


Fig. 26.

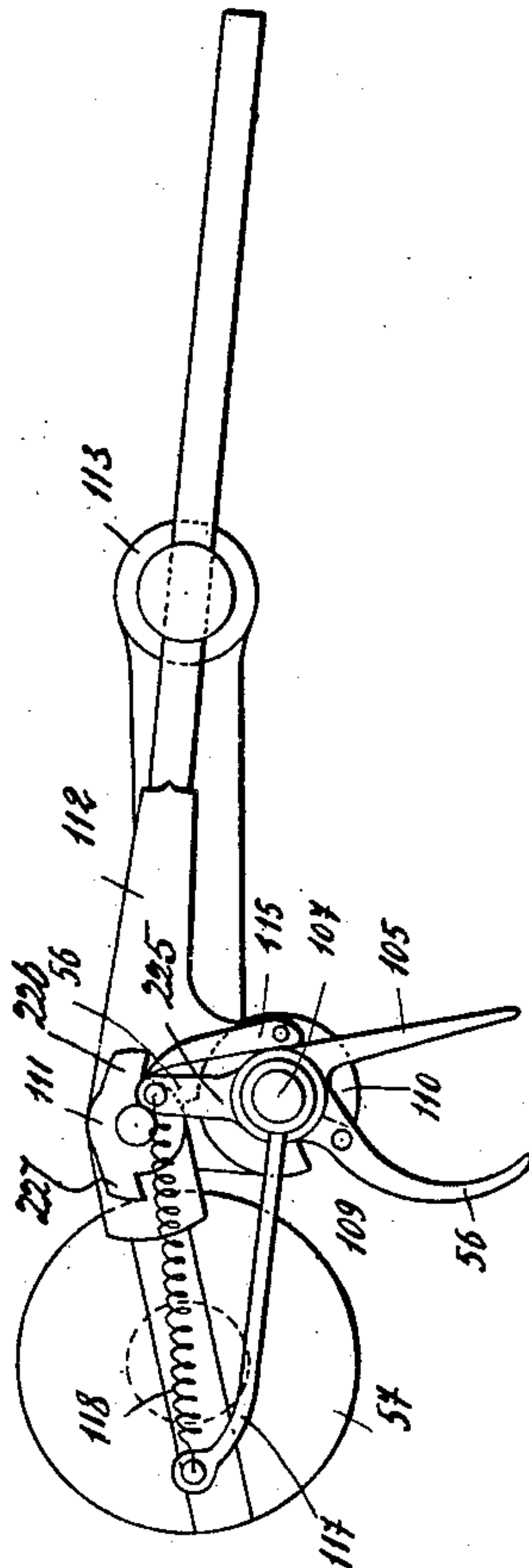
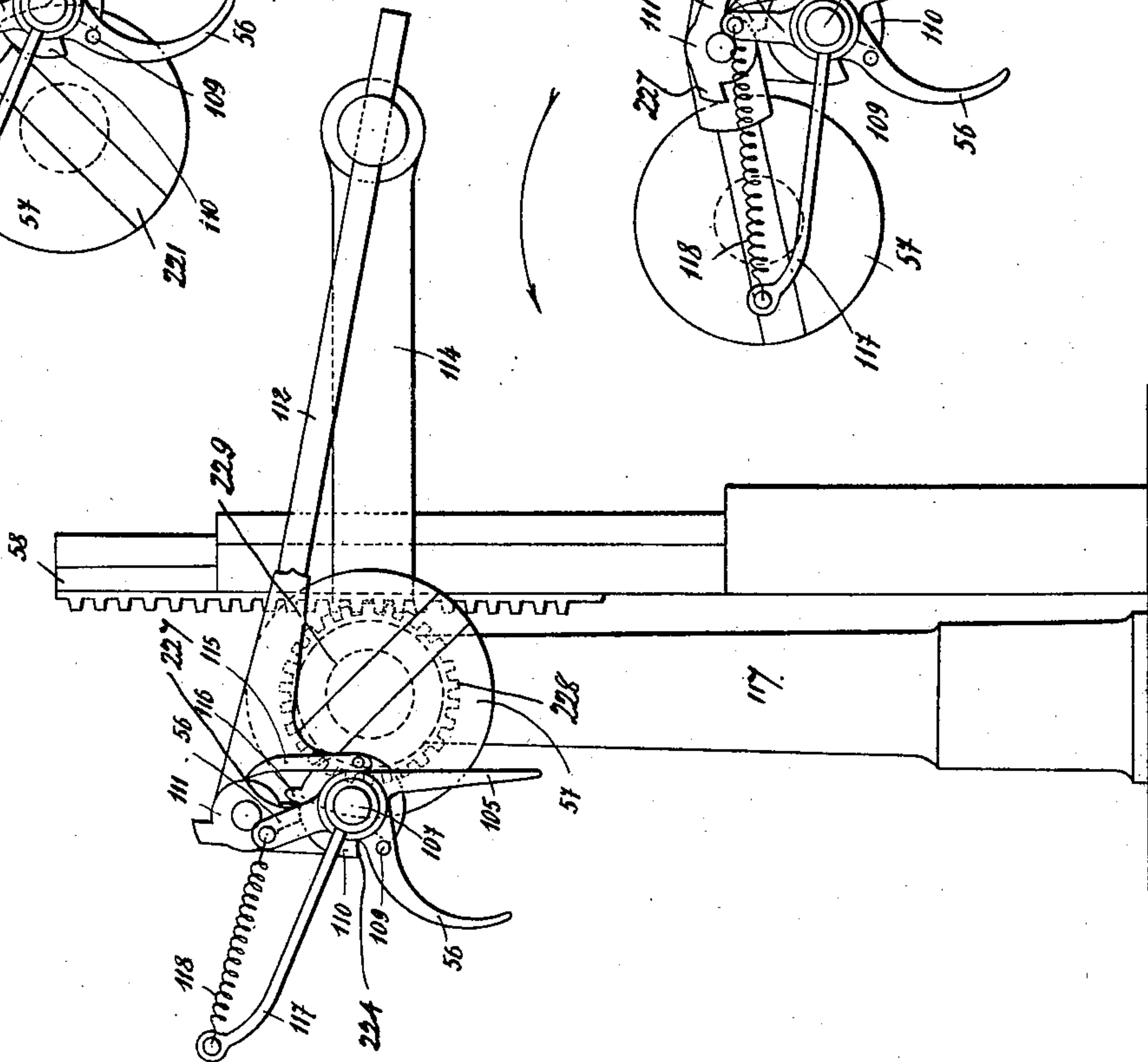


Fig. 27.



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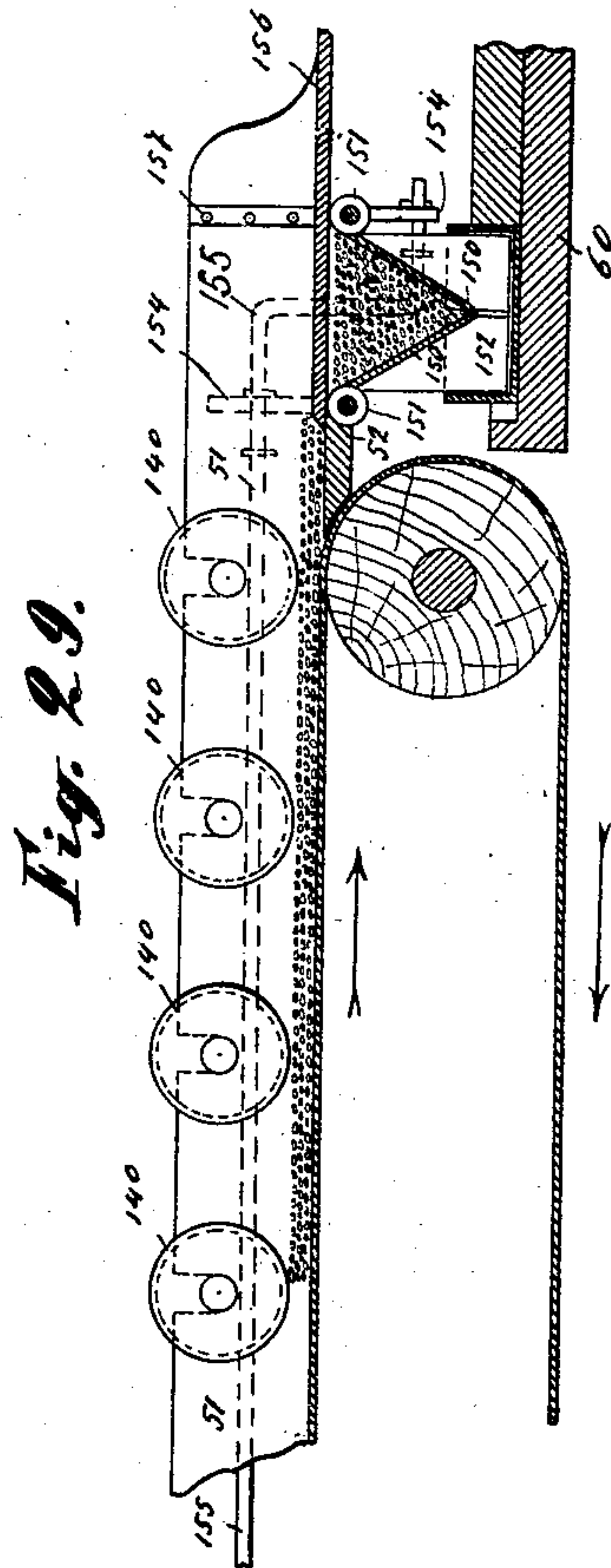
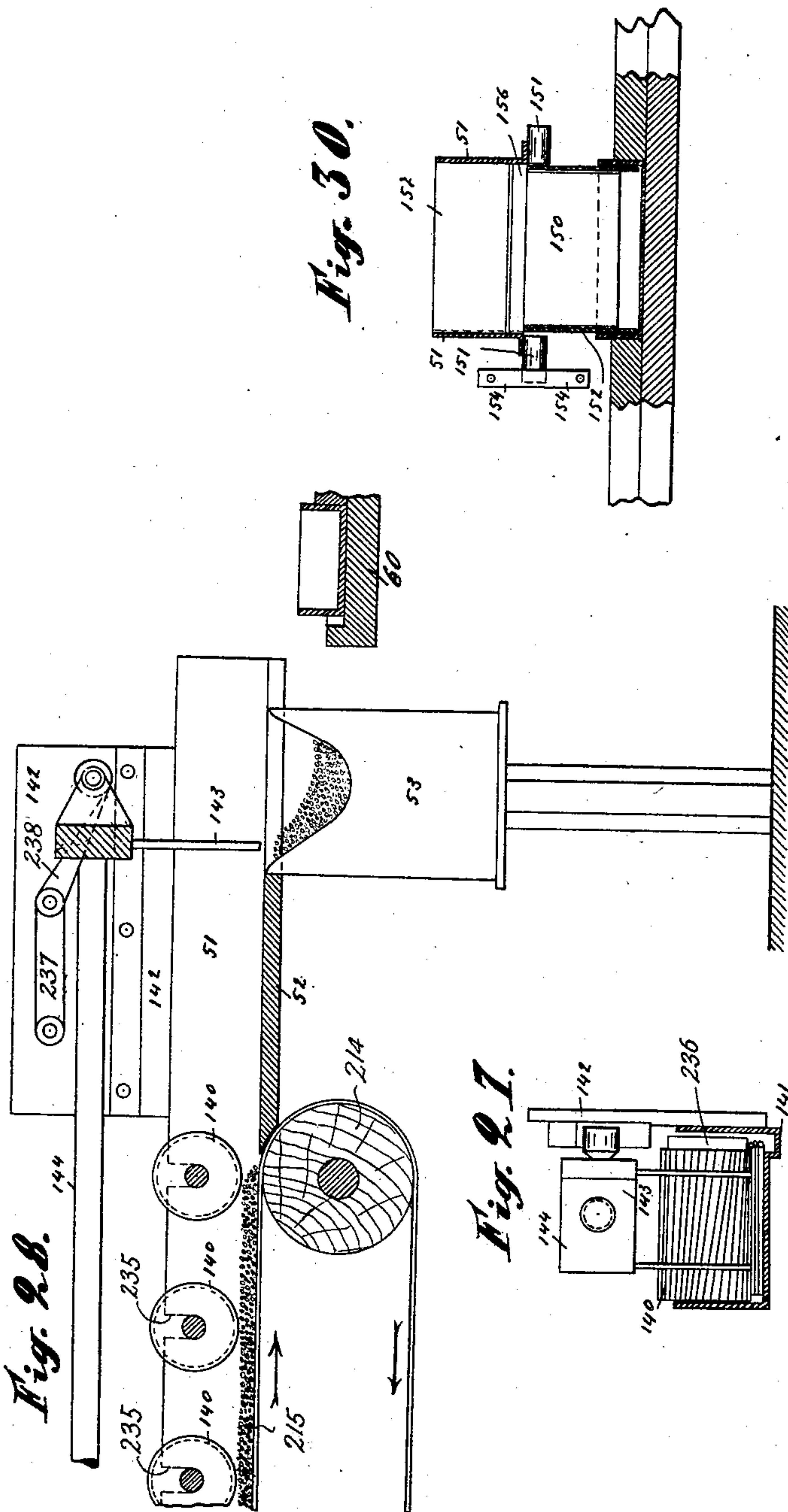
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(No Model.)

13 Sheets—Sheet 13.



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UNITED STATES PATENT OFFICE.

LOUIS METTEWIE, LOUIS ROCHET, AND ARTHUR BEECK, OF BRUSSELS, BELGIUM, ASSIGNORS TO LA SOCIETE ANONYME DE MACHINES INDUSTRIELLES, OF BRUSSELS, BELGIUM.

MATCH-BOX-FILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 697,514, dated April 15, 1902.

Application filed September 11, 1899. Serial No. 730,138. (No model.)

To all whom it may concern:

Be it known that we, LOUIS METTEWIE, a citizen of the Kingdom of Belgium, LOUIS ROCHET, a citizen of the French Republic, and ARTHUR BEECK, a subject of the German Emperor, all residents of Brussels, Belgium, have invented a certain new and useful Improved Match-Box-Filling Machine, of which the following is a specification.

This invention is for the purpose of mechanically stripping the frames carrying the matches which come out of the drying-stove in a continuous and regular manner and packing the matches into boxes in equal quantities, by which means the packing is done in a cheap manner and a good marketable product is produced consisting of equally-filled boxes which do not contain matches with broken or headless sticks.

The invention consists, essentially, of a machine for removing the matches from the frame, so that the matches pass with their heads in the same direction into parallel receivers corresponding with a determined number of rows of the matches which fill the frame, leading these receivers successively into alinement with a collector, raking the matches out of the receiver onto the collector, separating the determined quantities from the body of the matches which advance in this collector, releasing these quantities from the body of matches, so that they can be gripped by an articulated oscillating gripper or mechanical hand, placing them in empty box-drawers which are guided successively toward this mechanical hand, forwarding the filled box-drawers in front of empty box-covers and putting them into the same, and finally ejecting the filled boxes from the apparatus.

This machine is represented in the annexed drawings, in which—

Figure 1 is a side elevation of the whole machine. Fig. 2 is a view in elevation of the front end. Fig. 3 is a plan view of the whole. Fig. 4 is a view in elevation and partial section of the rear end of the machine. Figs. 5 and 7 are details in enlarged plan view of the mechanism for moving the parallel receivers, the receivers being removed. Fig. 6 is a plan

view of the mechanism shown in Fig. 5 in a different position and on a larger scale. Fig. 6^a is a cross-section on line *xx* of Fig. 6. Fig. 6^b is a longitudinal section on line *yy* of Fig. 6. Figs. 8 and 9 are enlarged end views of the receivers on the same scale of Fig. 7, showing them in different positions. Figs. 10 and 11 are side and plan views, respectively, of the bottom of the hopper; Fig. 12, an exterior view of the hopper from the side and in plan. Figs. 13, 14, and 15 show, respectively, a plan view of a match-frame and a vertical section and a detail of said frame as used, for instance, in the Durand frames. Figs. 16, 17, 18, 19, 19', and 19² represent in detail on a larger scale and in several successive positions the separating mechanism of the determined quantities of matches to be packed, the packing-gripper or mechanical hand, and a settling mechanism for finishing the packing—that is to say, to settle the matches in the boxes. Figs. 20 and 21 represent in vertical section and in front view, partly in section, a modification of the construction of the hopper. Figs. 22 and 23 represent a vertical section and front view of the mechanism for unloading the receivers into the collector. Figs. 24 to 26 show in detail the mechanism working the gripper or mechanical hand. Figs. 27 and 28 show in cross and longitudinal section the construction of the collector, partly modified, and the separating arrangement. Figs. 29 and 30 show in longitudinal and cross section a packing arrangement for replacing the mechanical hand.

The matches as they come from the drying-stove are on special frames composed ordinarily of several perforated sheets, the perforations of which correspond. In Figs. 13 to 15 is shown as an example and to demonstrate the action of the stripper a frame, such as is known as "Durand's." In this frame the middle sheet is movable and can be displaced laterally by means of two screw-bolts in order to slightly press or release the matches. These frames filled with matches are put on the hopper 1, Figs. 1, 2, 3, and 12. This latter is divided in one direction into a number of principal compartments, each correspond-

ing with a determined number of rows of matches on the frame. In the example shown (Fig. 12) there are four different compartments, each corresponding to eleven long rows of matches on the frame. Each compartment is divided by partitions into a great number of chutes, all ending below in an inclined chamber 2, closed by a bottom perforated with rectangular openings 12, Fig. 11. Under this bottom a movable slide is arranged with corresponding openings, and by the displacement of this slide by means of a handle 13 the openings 12 are cleared or masked. The hopper is provided with two bars 3, Figs. 1, 2, 3, 10, and 11, which project beyond the side frames 4, which support the hopper. The bars are each provided at one end with a spiral spring 5, bearing at one end against the side frame and at the other end against a screw-nut 6 on the bar. The springs 5 are for the purpose of making the hopper bear firmly with one of its sides against the side frame 4. The opposite ends of the bars 3 are connected by a cross-piece 7, Figs. 3 and 11, carrying in the center a regulating-screw 8, with set-nut, against which screw there abuts a nose 10, fastened on the upper end of a vertical shaft 9, provided at its lower end with another nose 10', gearing in the teeth of the horizontal toothed wheel 11, so that the passage of the teeth of this wheel, together with the help of the springs 5, give shocks or sudden movements to the hopper which are of sufficient power to release the matches from the frame, the frame-bolts having been loosened. The matches fall into the hopper, where they take a parallel position one upon the other on the bottoms of the four inclined chambers 2. The said bottoms are inclined, so that the matches may not be so liable to fall out of parallelism as if they had to fall through the whole angle from vertical to horizontal.

When the grating at the bottom is opened, the matches drop into the four receivers 14, Figs. 1, 2, 3, 8, and 9, previously led underneath the hopper 1 and each corresponding with a principal compartment of the latter. These receivers are hinged, Fig. 8, at one of their inner sides on a frame 15, Figs. 7, 8, and 9, which can slide on a carriage or table 16. Further, they are connected together at one of their upper edges by a connecting-rod 17. An inclined plane 18, against which, Fig. 8, the last receiver 14 abuts, causes all the receivers to take an inclined position when they are in position for loading underneath the hopper in order that the matches when falling from the inclined bottoms of the hopper may better preserve their parallelism. The back walls of the receivers are preferably pivotally arranged (see Fig. 8) by means of hinges and springs, (not shown in detail,) so that they fit perfectly against the back wall of each chamber 2. The receivers thus occupy a position parallel to that of the bottom grating of the chambers 2 in such a manner that

the height of the fall of the matches is reduced as much as possible, so that they cannot get out of parallelism when falling together on the opening of the slide which closes the hopper-compartments. The receivers having thus received their load of matches (which lie parallel in them, heads foremost) are brought to the horizontal position and are successively advanced toward a collector 51, arranged in the middle of the machine, Figs. 1 and 3, so that they are brought each in its turn into alinement with this collector. This is effected by the following mechanism: The carriage 16 has fixed to its under side two slides 19, Figs. 5, 6, 6^a, 6^b, and 9, by means of which it can slide in the stationary guides 20, provided on standards 200, across the frame of the machine. Under these guides and lying longitudinally of the machine is a stationary table 21, Figs. 5 and 6, in a longitudinal groove of which a shoe 22 is adapted to slide, receiving a to-and-fro movement from a connecting-rod 201, operated by a crank-pin 202 on the toothed wheel 11, Figs. 6, 6^a, and 6^b. The shoe 22 carries a laterally-projecting lug 23, destined to come into contact with a roller 27, fastened on one of the arms of a horizontal bell-crank lever 25, pivoted at 26 on a stationary cross-piece 24, and carrying on the end of the other arm a dog 28, governed by a spring, so that it will bear against the surface of one of the slides 19 of the carriage, Figs. 5 and 6, sufficiently to engage in a recess in said surface, as hereinafter described. The whole lever 25 is drawn by a spring 203 (see Fig. 6^a) in the direction opposite to the action of the nose 23. According as this lever 25 is in one or other of its end positions it engages either by a spring-finger 47 with one of the arms of lever 29, pivoted at 30, or by its pawl 28 with a pin 31, fixed on the other arm of this lever 29. This lever 29 can be displaced by a bar 32, having sliding movement on the cross-piece 24 and carrying a regulating-screw forming an abutment 33. The rearward longitudinal movement of the piece 32 is limited by a bolt 42, which can work in a notch near the end of the piece 32. The lever 25 carries on its upper face a pin 34, Figs. 5 and 6, which is adapted to operate against an abutment 35, Fig. 7, attached to a lever 36, pivoted at 37 on the carriage 16, and carrying a hook 38, working in a notch arranged in the movable frame 15, carrying the receivers 14. The toothed wheel 11 gears with the pinion 204, Fig. 1, on the shaft 205, driven by beveled gear 206 207 from the main shaft 208. The operation of these parts is as follows: The shoe 22 in its forward movement gives, by the nose 23, an oscillatory movement to the bell-crank lever 25, Fig. 6, which by means of its pin 34 rocks the lever 36, Fig. 7, which draws with it the movable frame 15 by means of the hook 38. The frame comes in frictional contact with a spring 39, fastened on the carriage 16, which stops undesired movement of the frame 15 on the table 16 and causes the

latter to partake of the last part of the movement of the frame 15. These movements of the lever 36 and frame 15 cause sufficient advance movement of the receivers 14 to cause them to leave the inclined plane 18, Fig. 8, and fall by their own weight back into the horizontal position, Fig. 9, and to bring also the first receiver into alinement with the collector in order to be discharged. The other three receivers have to be afterward led successively into the same position, which is done not by the displacement of the frame 15, as above, but by the movement of the whole carriage 16, carrying this frame. The first oscillation of the bell-crank lever 25, produced by the nose 23, has no direct effect upon the carriage 16, because (see Fig. 6) the dog 28 has moved idly against a smooth part of the slide 19. When the nose 23 in the backward movement of the shoe 22 quits the roller 27, the freed lever 25 is influenced by its spring 203, Fig. 6^a, and rocking backward up to its limit is ready to engage with its dog 28 in one of the notches 40 of the slide 19 at the next advance movement of the nose 23. When this next movement takes place, the lever causes the carriage 16 to advance with its receivers 14 a distance equal to the distance between the center lines of two of these receivers, and at the same time the bolt 42, drawn by a spiral spring 209, engages in one of the notches 41 (one of which precedes each of the two first notches 40 for the dog 28) of the slide 19, and thus prevents, during the disengagement of the dog 28, the backward movement of the carriage 16, which is under the action of a counterweight 210, Figs. 1 and 2, the cord 211 of which is fastened on the carriage 16 and passes over a roller 43, carried by the stationary cross-piece 24. The advancement of the carriage takes place twice more. At the occasion of the last advancement the carriage is no longer retained by the bolt 42, (see Fig. 5,) since no notch 41 is there provided to receive the bolt 42; but another bolt 44, Figs. 5 and 6, which can be governed by a spring 212, slides along the table 21 and engages, Fig. 5, in a corresponding opening 440, Fig. 6, of the slide 19 of the carriage 16. At the moment the last receiver arrives at the center of the machine an abutment 460, Fig. 5, arranged on the end of the slide 19, pushes the bar 32 forward, and the latter by means of the screw 33 causes the lever 29 to advance, so that when the dog 28 comes back it is turned by the pin 31 (see Fig. 5) and can no longer engage in the notches 40 or 41 or stop the carriage in its backward movement. This backward movement is initiated by the nose 23, Fig. 5, meeting an abutment-screw 45 of the bolt 44 and withdraws the latter from the corresponding notch 440 of the slide 19, so that the carriage is free to return under the action of its counterweight 210 to bring the four receivers 14 again into the inclined position underneath the four compartments of the hopper 1. During the backward movement

of the carriage a pin 46, fastened on the slide 19, Figs. 5 and 6, pushes back the bar 32, whose screw 33 quits the lever 29. When the above-mentioned movements recommence, the spring-finger 47 on the lever 25 causes the lever 29 to rock, so that it disengages the pin 31 from the dog 28 in order to allow the dog to again engage at the correct moment in the notches 40 of the slide 19. When each receiver reaches the center of the machine, it is unloaded into a channel which forms the collector 51, and of which the receiver forms a prolongation when in this position. (See Figs. 3 and 23.) This unloading is done by a rake 100, fastened on the rod 99, pivoted at 111 on a small pillar 98, arranged on a lateral enlargement 50, Figs. 6 and 23, of the slide-bar 22, and participating in the to-and-fro movement of the same. The extremity of the rake is lifted and guided by a roller 102, Fig. 22, traveling on a guide-rail 103, arranged on the longitudinal face of the hopper and of such form that the rake passes over the matches which are lying in the receiver parallel to one another and falls at the end of its course with its prong behind the said matches, then, moving backward with the slide-bar 22, draws the matches with it (these remaining in their parallel positions) into the collector 51, and so on after each advancement of a receiver into the path of the rake. (See the arrows, Fig. 23, which show the course of the roller 102.) When the roller 102, traveling on the lower part of the guide-rail 103 as the rake goes back, arrives at the commencement of this rail 103, it lifts a pivoted pawl, as shown in dotted lines, Fig. 23, and after the passage of the roller this pawl falls back by its own weight into the position shown in full lines in order to block the lower track and to constitute an inclined plane, forcing the roller 102 to take the upper track of the rail 103 when the rake advances over the receiver.

The bottom of the collector 51 is formed for some distance by an endless band 215, of caoutchouc, running over rollers 213, Fig. 23, and 214, Fig. 1, the movement of which band transmits the matches toward the end of the collector, where the bottom is formed by a plate 52. The band 215 is moved by the roller 214, Fig. 1, to which power is applied by a belt 216 from pulley 217, driven by belt 218 from pulley 219 on the shaft 205.

When the matches pass onto plate 52, a special mechanism separates from the body of matches the necessary quantity for filling a box and removes this quantity out of the body of advancing matches, (this quantity being removed without disturbing the remainder,) and a gripper or mechanical hand seizes this quantity of matches and forwards it into an empty box-drawer brought opposite the collector.

The mechanism is as follows, (see Figs. 1, 3, 16, 17, 18, and 19:) At the end of the bottom plate 52 of the collector 51 parallel openings or slots are arranged parallel to the lon-

longitudinal axis of the collector. One of these is shown in Fig. 28. In these openings thin plates 53, Figs. 1 and 16, can have vertical movement, which are shaped at their upper ends in order to form a fork. Between these plates 53 small uprights 54 are fixed on the bottom 52. The plates 53 have an up-and-down reciprocating movement. In their lowest position, Fig. 19, they descend some millimeters below the upper surface of 52. When they occupy this position, the advancing matches can move over them and are stopped against the uprights 54, Fig. 16. At this moment a blade 55, Figs. 3 and 16, articulated to a pivoted arm 220, drawn by a spring 221, Fig. 3, and arranged so that it can move vertically on a line with the hind edges of the plates 53, intersects the matches and incloses a given quantity between it and the uprights 54. At this moment the forked plates 53 commence to rise above the plate 52 and lift up therefrom the quantity of matches between the blade 53 and the uprights 54, Fig. 16. A mechanical hand with forked branches 56 105, Figs. 1, 3, 16 to 19, articulated to an oscillating plate 57, Fig. 3, governed by a rack 58, actuating also the forked plates 53, penetrates in the open position between the forked plates 53, Fig. 16, closes under the action of a lever system, and retires in order to remove the matches previously contained in the fork of the plates 53, Fig. 17. The oscillating movement of the plate 57 then brings the closed gripper 56 above the empty box-drawer, Fig. 18, which has been led to it by a horizontal rotary plate 60. A settling-rod 61, Figs. 1, 2, 18, and 19, governed by a spring and pivoted on a stationary point 62, comes between the two fingers of the mechanical hand 56 105, which open, Fig. 19, while the settling-rod 61 gives slight strokes on the matches in the drawer until they are level with the walls of the latter in order to equalize the matches. It remains on the drawer while the hand comes out of the box, thus preventing the matches from dropping outside. By the oscillation of the plate 57 backward the mechanical hand is led backward into the higher and open position, Fig. 10, in order to recommence the above-described movements.

The mechanical hand 56 105 is given the above-described movement by the mechanism hereinafter described. (Shown in Figs. 24, 25, and 26, corresponding to the positions Figs. 16, 18, and 19.)

The plate 57 carries a transverse or diametrical guiding-bar 221, in which slides a block 222, pivoted at 223 to an angularly-bent rod 112. The downwardly-directed bent end of the rod 112 carries a shaft 107, whereon the hind finger 105 of the mechanical hand is fixed. The forefinger 56 is movable around the shaft 107 and can oscillate in order to thus produce the opening and closing of the hand. The rod 112, carrying the pivot 107 of the mechanical hand, is thus guided at one end on the oscillating plate 57 and at the other end can

slide in a pivoted guide 113, attached to the end of a stationary arm 114. A double cam 111, pivoted on this rod and moving integrally with the block 222, can bear with its finger 226 against a pawl 115, articulated on a loose sleeve 110, Fig. 25, surrounding the shaft 107 of the hand. This sleeve has a notch 224, in which a pin 109 can engage, which is fastened on the movable finger 56 of the hand. In the movement of the direction of the arrow, Fig. 25, the cam 111 turns the sleeve 110 by means of the pawl 115. The sleeve 110 moves the pin 109, engaged in the notch 224 of the sleeve 110, and draws the finger 56 with it, so as to cause it to move apart from the finger 105, so that the hand is opened. This opening is produced at the end of the course of the rod 112, as shown in Fig. 26, corresponding to its position when it is releasing the matches in the box-drawer. At this moment the matches drop in the box-drawer presented by the rotary plate 60. When the movement of the plate 57 takes place in the reverse direction, as indicated by the arrow, Fig. 26, the finger 226 of cam 111 leaves the pawl 115, which acts no longer on the sleeve 110. This latter is brought back to its original position by the spring 118, acting upon its upper projection 225. When the plate 57 has reached the position shown in Fig. 24, the second projection 227 of the cam 111 bears on a finger 116 on the sleeve 110, so that the latter is again turned for the purpose of opening the mechanical hand in order to allow it to penetrate into the body of matches brought up by the forked plates 53. As soon as the projection 227 of the cam quits the finger 116 the sleeve no longer acts on the finger 56. The latter, drawn by the spiral spring 118 on the arm 117, moves toward the finger 105, and the mechanical hand thus closing seizes the quantity of matches necessary for charging a box. At the reverse movement of the plate 57 the above movements recommence. The shaft of the plate 57 is carried by an arm 117 and reciprocates by the vertical reciprocating movement of the rack 58, operating on a pinion 228, attached to the shaft 229 of plate 57. The rack is moved by a cam 59, keyed on the main shaft 208 of the machine. (See Fig. 1.)

The settler consists of a rod 61, pivoted on a post 62.

The oscillating movements of the settler 61 are obtained by means of a rod 63, operated by a cam 64, keyed on the main shaft 208, (see Figs. 1 and 19,) and by a return-spring 230.

The horizontal rotary plate 60 has in its edge a number of notches or openings for receiving box-drawers, Figs. 3 and 16 to 19. These drawers are supplied to the plate from a slightly-curved feed-chute 68, Fig. 3. The drawers are placed in the chute with their sides touching and slide forward under the action of their own weight, one drawer being removed each time an empty notch of the plate 60 passes underneath the lower end of

the feeder 68. The plate 60 receives an intermittent rotary movement. For this purpose it has on its lower face a wheel 65, with as many teeth as there are drawer-receiving notches, Fig. 1, actuated by a rotary finger 66, receiving its movement of rotation from the beveled gear 67, actuated by the main shaft of the machine. The finger 66 at each revolution moves the plate 60 through one notch distance, bringing at each movement a fresh empty drawer before the mechanical hand. When in consequence of the rotating movements of the plate 60 the drawer filled with matches passing underneath a protecting-plate 231, Fig. 3, arrives diametrically opposite the mechanical hand 56, Fig. 3, a lever 69, having a horizontal movement and pivoted at 70, (actuated by the movement of an inclined plane 71, fastened to a sliding piece 72,) removes the drawer from the plate 60 and causes it to slide along into a chamber 73, Figs. 3 and 4. Laterally of this chamber 73 a wheel 74 is horizontally journaled, provided with peripheral notches which come successively in prolongation of the transverse axis of the chamber 73. These notches to the number, for example, of eight are for receiving the outer covers of the boxes or drawers, the said covers being supplied by a feed-chute, Figs. 3 and 4, arranged above the wheel 74 and in which chute they descend under the action of their own weight. A pusher 77, Figs. 3 and 4, attached to the sliding piece 72, pushes the filled drawer out of the chamber 73 into the outer cover lying in the notch now opposite the chamber 73. The sliding piece 72 is provided laterally with a slotted plate 232, Fig. 3, in the slot of which there moves a roller 233 on the end of a lever 78, pivoted at 79 and joined at the other end to a bar 80, which by its movement gives the wheel 74 the intermittent rotating movement whereby the covers after the filled drawers are inserted are moved downward in such a manner that arriving one after the other at the lower side of the wheel they fall into a chute 81. The end of the lever 78 forms a cam which communicates an oscillating movement to a lever 82, pivoted at 83 and actuating a plug 84, assuring the perfect centering in the wheel 74 of the cover in which a drawer is about to be inserted.

The sliding piece 72, actuating the whole mechanism of inserting the drawers into the covers described hereinbefore, is actuated by a rod 185 and eccentric 85, Figs. 1 and 4, keyed on the main shaft 208, which receives its movement from the pulley 86.

The construction of the hopper specified in the commencement of the description can be modified so as to allow the suppression of the shaking movement. Under these conditions the sides of the compartments of the hopper are constituted partly by endless straps, the movement of which favors the regular settling of the matches on the bottom of the hopper.

The tilting movement of the receivers can be dispensed with, so that they have only the advance movement to the discharging position and the immediate return movement into the loading position, as hereinbefore described. Figs. 20 and 21 represent, respectively, in vertical cross-section and in plan, partly in section, a hopper with these modifications.

The hopper comprises the four principal inclined compartments 87, whose sides are formed partly by endless straps 88, traveling in the direction indicated by the arrows on rollers 89, actuated by toothed gearing 90, operated by means of any convenient gear. The lower part of each compartment 87 ends in a rectangular box 91, the bottom of which is provided with openings 92, which can be closed or opened by means of a grating 93, having corresponding openings. A certain number of partitions 94, having the same shape as the compartments 87 and ending at the lower end in opposed inclined planes 95, Fig. 21, divide the compartments 87 into a number of smaller compartments, each of which diminishes in size, ending in openings 92. In the chambers 91 under the partitions 94 plates 96 are arranged, which extend into the receivers 97, provided with corresponding slits, so that the receivers can be advanced and are guided on the said plates 96, which have preferably such a length, Fig. 20, that when the last receiver 97 is in the advanced discharging position the plate is still engaged in the slit of the back wall of this last receiver. The frames are placed on this hopper in the same manner as on the one previously described. When the matches fall, the movement of the straps 86 transfers them to the grating 93 of the boxes 91. When the grating 93 is opened, the matches fall into the receivers 97, always remaining parallel on account of the plates 96. The movement of the receivers 97, fastened on the carriage 16, is done by the same means as before described for the receivers 14, and they are discharged in the same manner into the collector 51 by a rake having a to-and-fro movement.

Figs. 27 and 28 illustrate a partial modification in the construction of the collector 51, the latter being provided with a settling device for giving a determined height to the body of matches advancing in the collector and to maintain them strictly parallel with regard to one another. The same figures represent a separating mechanism replacing the blade 55, described before, this separating mechanism being constituted by a second rake arranged on the rear end of the collector, so that it transports a determined quantity of matches to the forked plates 53.

The body of matches transported in the collector 51 by the endless band of caoutchouc passes under a series of horizontal rollers 140, which can, if required, each be composed of a certain number of disks mounted on the same axle and being independent the one

from the other. The axles of these rollers or disks are mounted free in grooves or slots 235 in the walls of the collector. These rollers are given by the movement of the body of matches a rotary motion and exercise by their weight a slight elastic pressure upon the matches. The latter are thus leveled to a certain height, the excess of matches being prevented from passing by the rollers. The rollers have a smooth part 236, Fig. 27, the diameter of which is less than that of the body, which is roughened or ribbed or coated with material. This smooth part comes over a groove 141, arranged in the bottom of the collector. By this means the stems of the matches are in contact with the collector and the covered or roughened part of the rollers, the sections of the stems being approximately equal. Their heads, the diameters of which are greater than those of the stems, are free in the space between the groove 141 and the smooth part of the rollers 140. The heads therefore undergo no pressure which might lead to a disturbance of the indispensable parallelism of the matches constituting the advancing body. The rake 143, actuated by a rod 144, connected with the shoe 22 and guided by a roller 142, running on a fixed track 237 and a pivoted switch 238, pushes the matches into the threefold fork 53 when the latter is in the lowest position. This device has the purpose of preventing the edges of the fork 53 when the same is ascending from meeting the mass of matches and destroying the parallel arrangement of the same. The course and rapidity of movement of the rake 143 are such as not to push into the fork 53 more than the number of matches necessary to fill one box.

Figs. 29 and 30 represent measuring and filling mechanism replacing, if required, the mechanical hand and the fork before described. This filling mechanism consists of a measuring box or receiver comprising two movable walls 150, which can approach to or go apart from each other. The matches coming from the collector 51 fall into this measuring-receiver, whose movable walls form in the closed position a V, open toward the top and closed below. The partitions on opening allow the escape of the matches, which drop into a "box-drawer" led underneath this receiver by the rotary plate 60. This device is operated as follows: The matches having passed under the rollers 140 are projected into an opening arranged in the bottom of the collector 53. This opening is framed at its lower part by four metal plates, two of which, 150, placed transversely to the axis of the collector, can turn or are hinged at 151. The two others, 152, are stationary. The axles of the hinges 151 are provided with arms 154, wherein a bent bar 155 is engaged. In the normal position the two walls 150 are inclined, so as to touch each other at their lower ends and form, with the walls 152, a box in form of a V, whose

capacity is exactly the same as the match-box to be filled. The matches traveling on the bottom 52 exactly fill the space between the walls 150. At this moment a knife 156, moving horizontally, separates the matches contained in the V-shaped box from those traveling in the collector. At the same moment the rotary plate 60, carrying the empty drawers, brings a drawer underneath the V-shaped box and at this moment is given an ascending movement, which brings it close under the V-shaped box in order to limit the fall of the matches into the drawer. For this effect a special roller-way arranged on the lower part of the plate meets a cam which forces the plate to rise. The box 150 152 could have vertical movement, the rotating plate 60 remaining stationary, if desired. For this purpose it is sufficient to arrange the axles in movable supports, which can be displaced vertically under the action of a rack or the like in suitable guides. The arms 154 form vertical slides, which allow them to move vertically to the bar 155. When the box composed of the four walls 150 152 is engaged in the drawer, the bent bar 155 is struck by the shoe 22 and by means of the arms 154 forces the walls 150 to take a vertical position, which allows the matches to fall into the empty drawer. The roller-way of the plate 60 then leaves the cam, the plate descends again, and the same movements are repeated.

The end stop 157, placed across the knife, is for the purpose of dislodging any matches that may be drawn back by it in its backward movement.

We claim as our invention—

1. In a machine for filling match-boxes the combination of frames carrying the matches, a hopper divided into longitudinal compartments each corresponding to a fixed number of rows of matches and a collector of the frame, a plurality of receivers, means for moving said receivers underneath the hopper and successively into alinement with the collector, and the rake for discharging the contents of each receiver onto a collector, means for operating the collector to forward the matches from these receivers, means adapted to separate from the entire body of matches on the collector a determined quantity, a mechanical hand adapted to place these quantities into box-drawers, a rotating plate for advancing the drawers successively to this hand, and an inserting mechanism adapted to remove the filled drawers from the plate and place them into the box-covers.

2. In a match-box-filling machine the combination of a collector and a divided hopper with a plurality of receivers and means for moving the receivers successively into axial line with the collector and means having movement longitudinally of said receivers for discharging the matches from the receiver into the collector.

3. In a match-box-filling machine the com-

ination of a divided hopper terminating in chambers with inclined bottoms in combination with a frame adapted to be reciprocated under said hopper, a plurality of receivers 5 hinged to said frame, a connecting-rod articulated to said receivers so as to cause them to tilt simultaneously and an inclined plane adapted to form a tilting abutment to one of said receivers.

10 4. In a match-box-filling machine, a divided hopper 87 in combination with a plurality of receivers 97 having slotted walls, means for reciprocating said receivers under said hopper and stationary plates 96 parallel with the 15 line of motion of the receivers extending from the lower chambers 91 of the divided hopper into the slots of the walls of the receivers.

5. In a match-box-filling machine the combination of a divided hopper, a plurality of 20 receivers, a frame to which said receivers are hinged, a second frame in which the aforesaid frame has limited sliding movement and carrying an inclined plane for lifting said receivers, and means for reciprocating the second 25 frame substantially as set forth.

6. In a match-box-filling machine the combination of a hopper, a plurality of parallel receivers, and a collector, parallel to said receivers, a frame to which said receivers are 30 hinged, a table having guides for said frame and means for limiting the sliding movement of the frame on the table, guides for said table, a notched sliding bar fixed to said table, a lever, means for vibrating said lever, a dog 35 pivoted on said lever and adapted to engage the notched sliding bar in order to intermittently feed the table to bring the receivers successively into alinement with the collector, pawls adapted to engage the sliding bar 40 to prevent its return movement, means set in operation at the end of the travel of the table for disengaging said pawls to permit of the return of the table under the hopper, and means for returning the table to its initial 45 position.

7. In a match-box-filling machine the combination of a hopper, a plurality of receivers, a collector, means for advancing the receivers successively from under the hopper into 50 alinement with the collector, a rake, means for moving the rake with to-and-fro movement and a guide-track having a hinged switch on the side of the hopper, adapted to guide the rake so that it falls with its prongs behind 55 the row of matches in the receiver, draws the matches into the collector and then rises in order to pass back over and engage the row of matches of the next following receiver.

8. In a match-box-filling machine the combination with a collector, consisting of two 60 slotted side walls and a movable floor, of rollers loosely mounted in the slots of the said side walls above the bottom of the same adapted to bear with slight pressure on the body of 65 matches when advancing along on the movable floor the said rollers having a grooved

or roughened part and a smooth part of less diameter than the grooved part, and the floor of the collector having a longitudinal groove so that the rollers do not exercise pressure 70 upon the heads of the matches.

9. In a match-box-filling machine the combination with a collector having slots in the bottom thereof, and solid portions intermediate of said slots adapted to uphold matches 75 from falling therein, of a device for removing determined quantities from the body of matches advancing over said slots, the said device comprising fork-shaped plates and means for moving the same vertically in the 80 slots in the bottom of the collector so as to raise from the floor of the collector the matches lying across said slots.

10. In a match-box-filling machine, the combination of separated supports adapted to 85 hold a body of parallel matches bridging the spaces between them, of a gripping device comprising two fingers adapted when closed to inclose a space, means for operating said fingers to open, move toward said supports, 90 close around said body of matches, and move from the supports in order to remove the body of matches without compression.

11. In a match-box-filling machine the combination of an oscillatory plate, a diametrical 95 guide-bar thereon, a rod, a block adapted to slide on said guide-bar and pivoted to said rod, a cam integral with said block, a gripper comprising two articulated fingers, a shaft eccentric of said oscillatory plate carrying said 100 gripper, a sleeve on said shaft having a projection and a recess, a pawl pivoted to said sleeve and adapted to coact with said cam, a pin on one of the gripper-fingers adapted to engage the recess and means for vibrating the 105 oscillatory disk for the purpose set forth.

12. In a match-box-filling machine for causing the regular settlement of the matches in the box or drawer, the combination with a 110 drawer feed-plate, of a pivoted rod, and means for vibrating the same to strike upon the upper open part of the drawer.

13. In a match-box-filling machine for inserting the boxes into their covers, the combination with a rotary notched feed-plate of 115 a lever adapted to remove the filled drawers from the notches of the feed-plate, a chamber to receive the same, said chamber having a lateral opening, a notched wheel horizontally journaled by the side of said chamber and 120 adapted to receive the outer covers of the match-boxes, and present them to the lateral opening of said chamber and a chute above the said wheel for supplying the covers to said 125 wheel.

14. In a match-box-filling machine a drawer-inserting device comprising in combination a rotary notched feed-plate, a lever adapted to 130 remove the drawers consecutively from the feed-plate, a chamber for receiving said drawer, a notched wheel laterally of said chamber for bringing the covers opposite the

drawer therein, a plug for assuring the perfect centering of the cover during the insertion of the drawer, in combination with a sliding bar and a cam thereon for the displacement of the said lever and lever systems connecting the same with the notched wheel and the centering-stop, for simultaneous action, substantially as set forth.

In witness whereof we have signed this specification in the presence of two witnesses. 10

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