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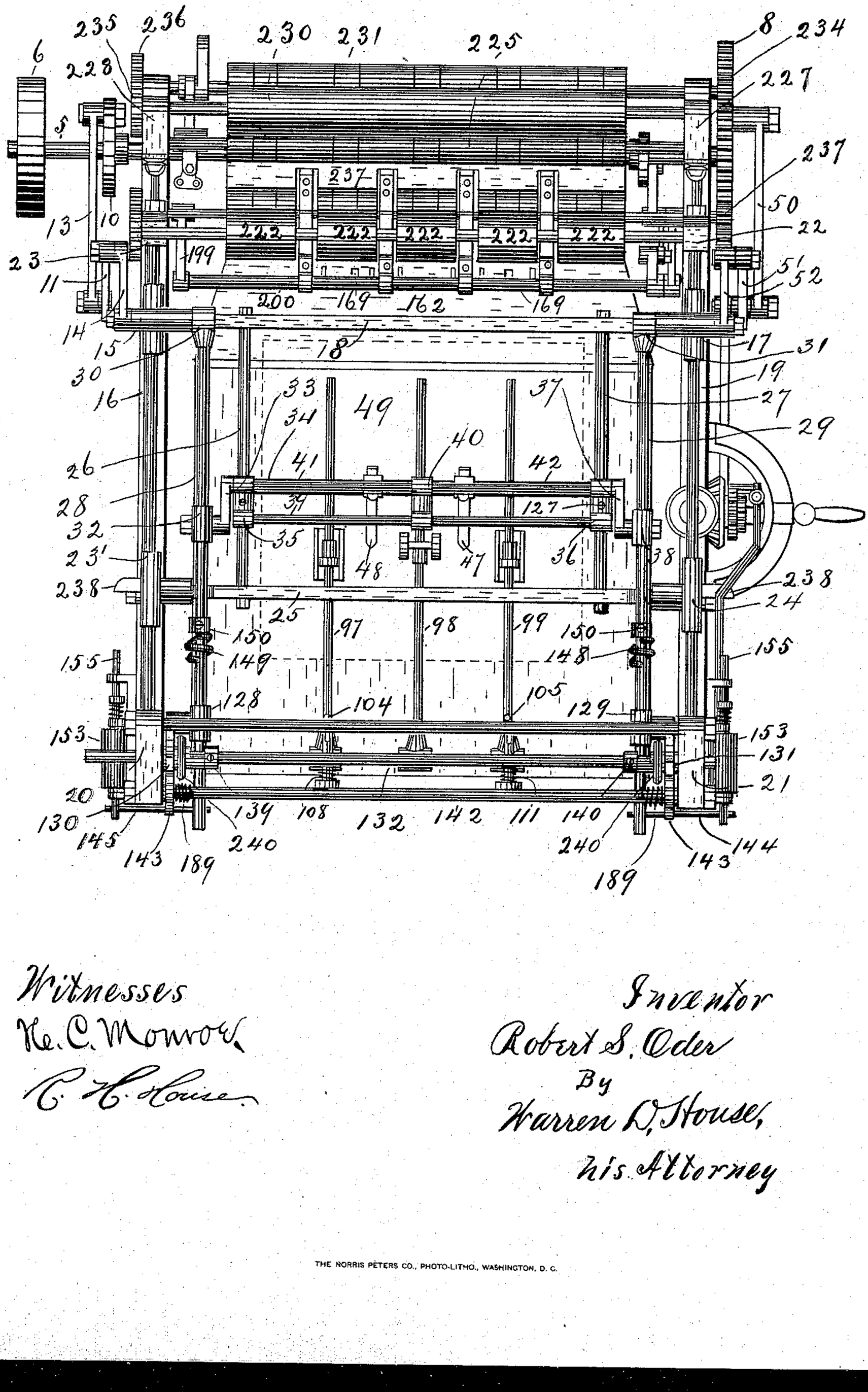
R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig I



Witnesses
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C. H. Howe.

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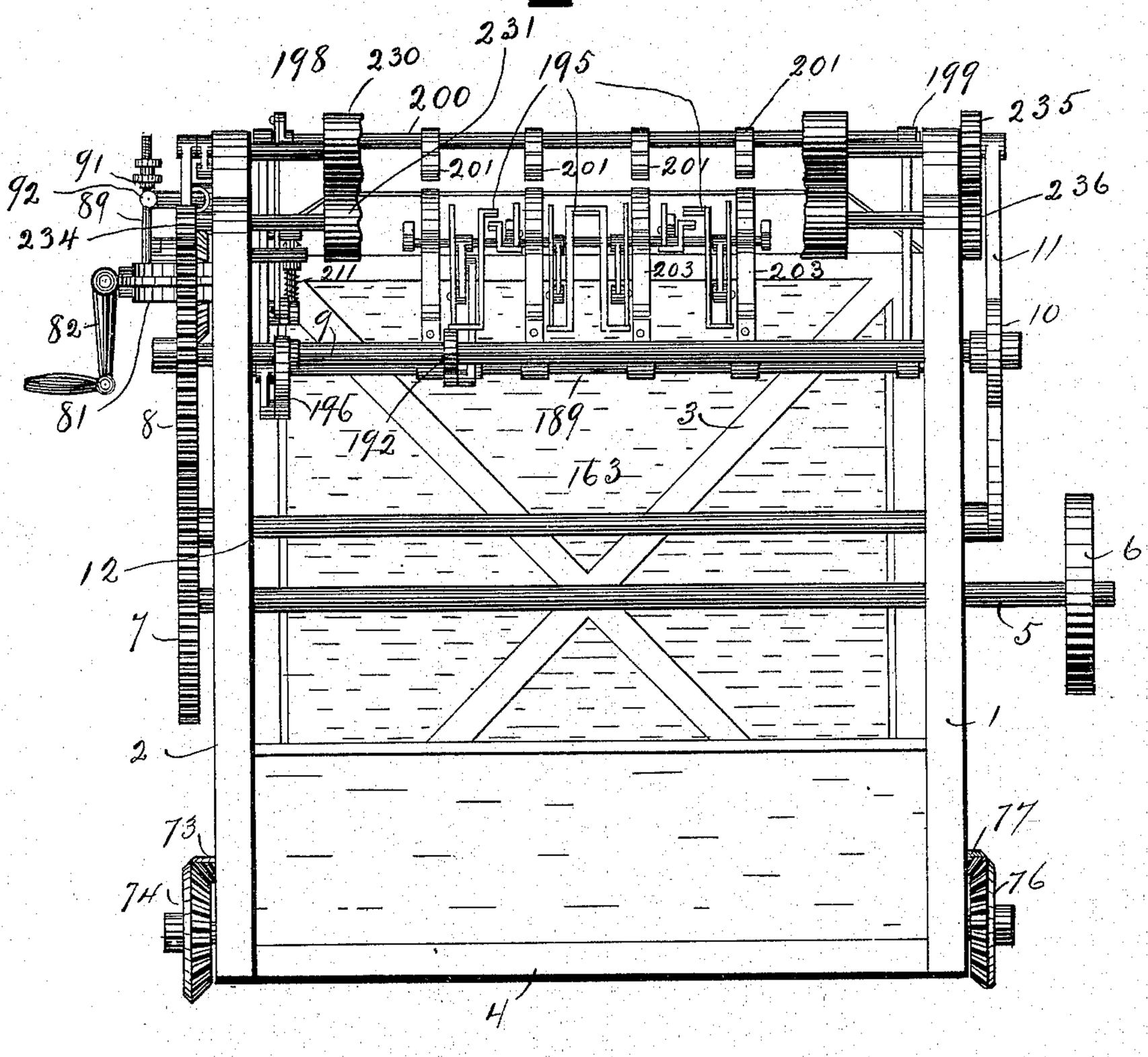
(No Model.) 14 Sheets—Sheet 2.

R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig II



Witnesses
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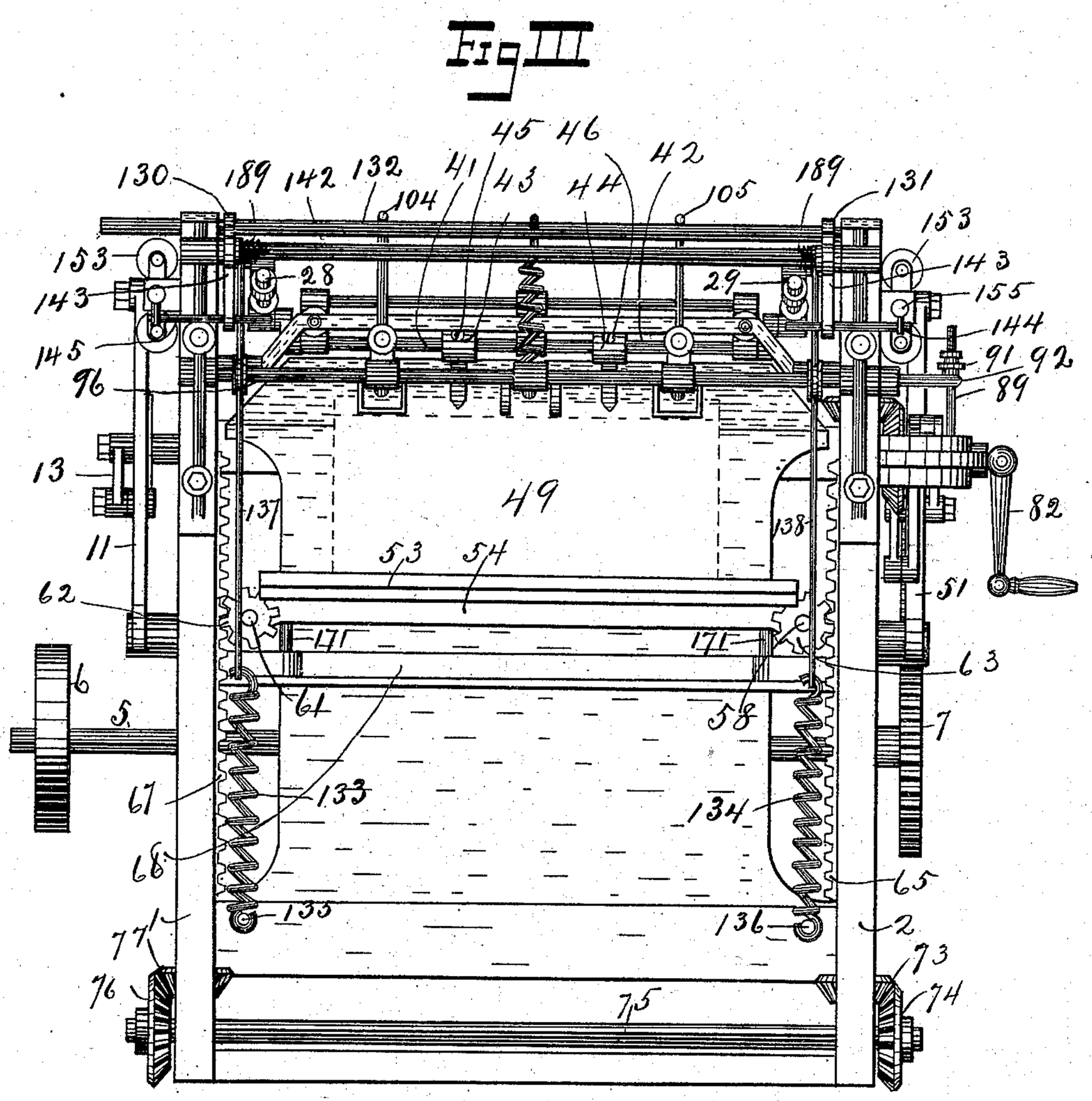
(No Model.) 14 Sheets—Sheet 3.

R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig III



Witnesses
K. C. Morrow,
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(No Model.) 14 Sheets—Sheet 4.

R. S. ODER.

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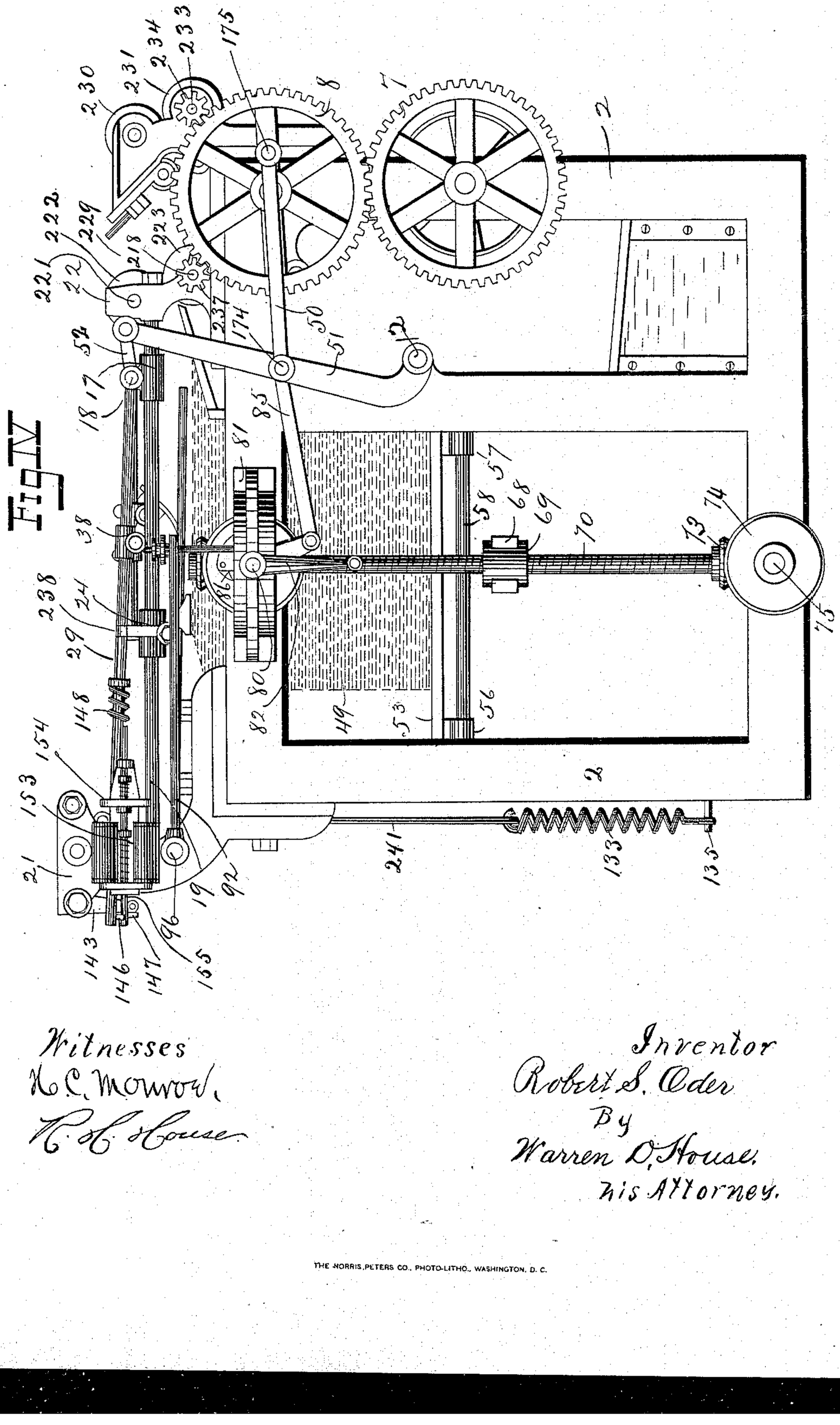
No. 567,994. Patented Sept. 22, 1896.



Witnesses
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(No Model.) 14 Sheets—Sheet 5.

R. S. ODER.

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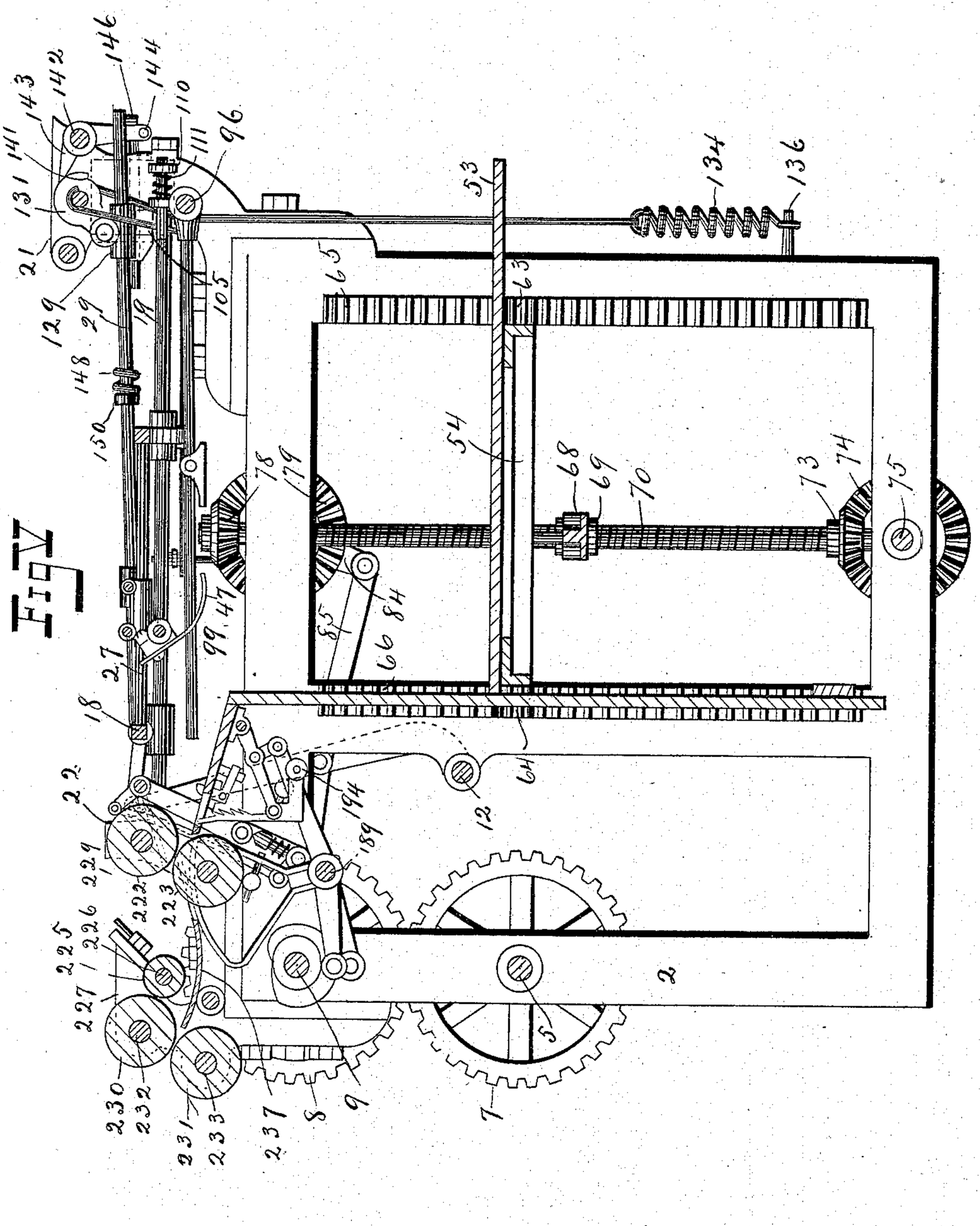
No. 567,994. Patented Sept. 22, 1896.

FIG 7



Witnesses
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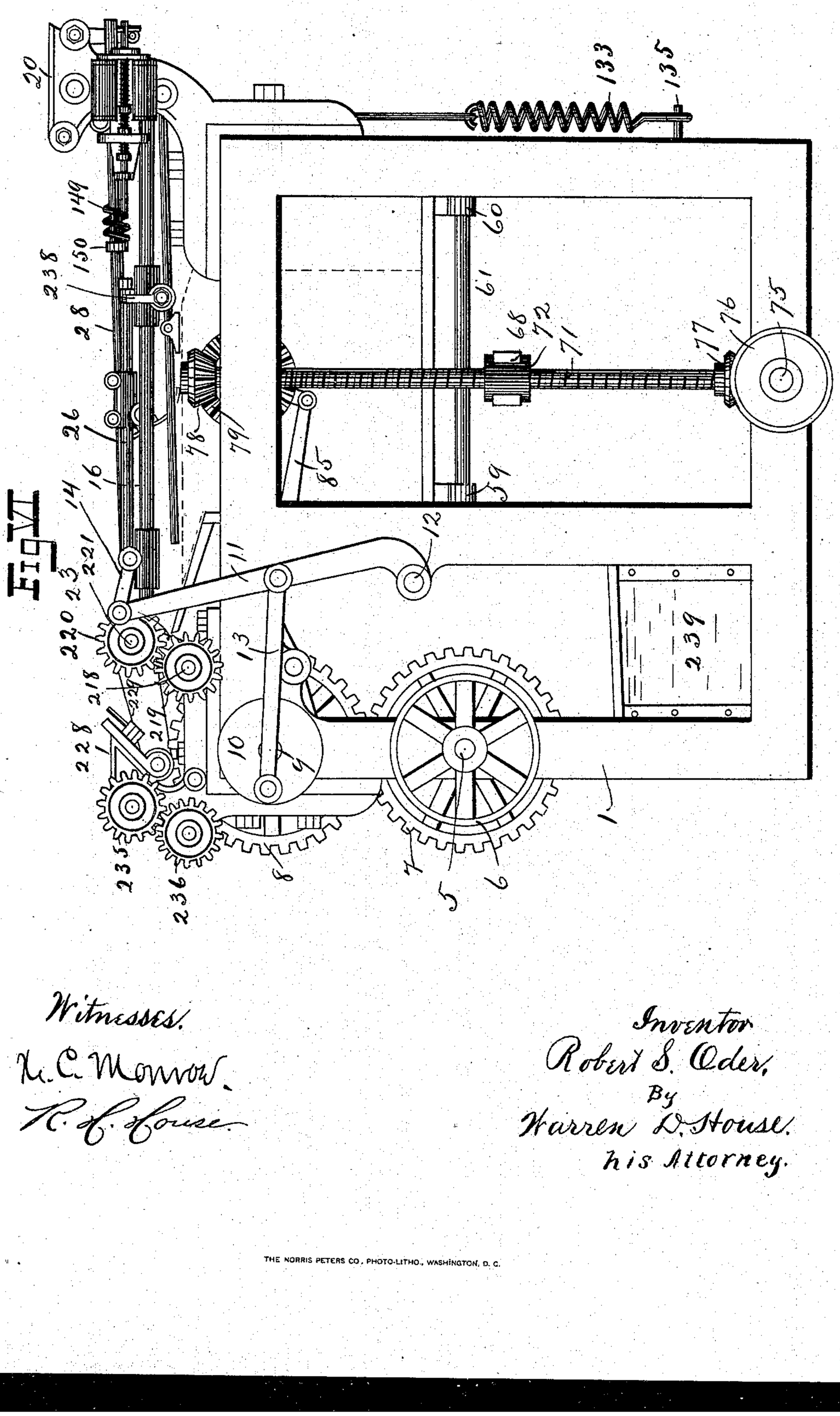
(No Model.) 14 Sheets—Sheet 6.

R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

FIG. VI.



Witnesses.
L. C. Morrow.
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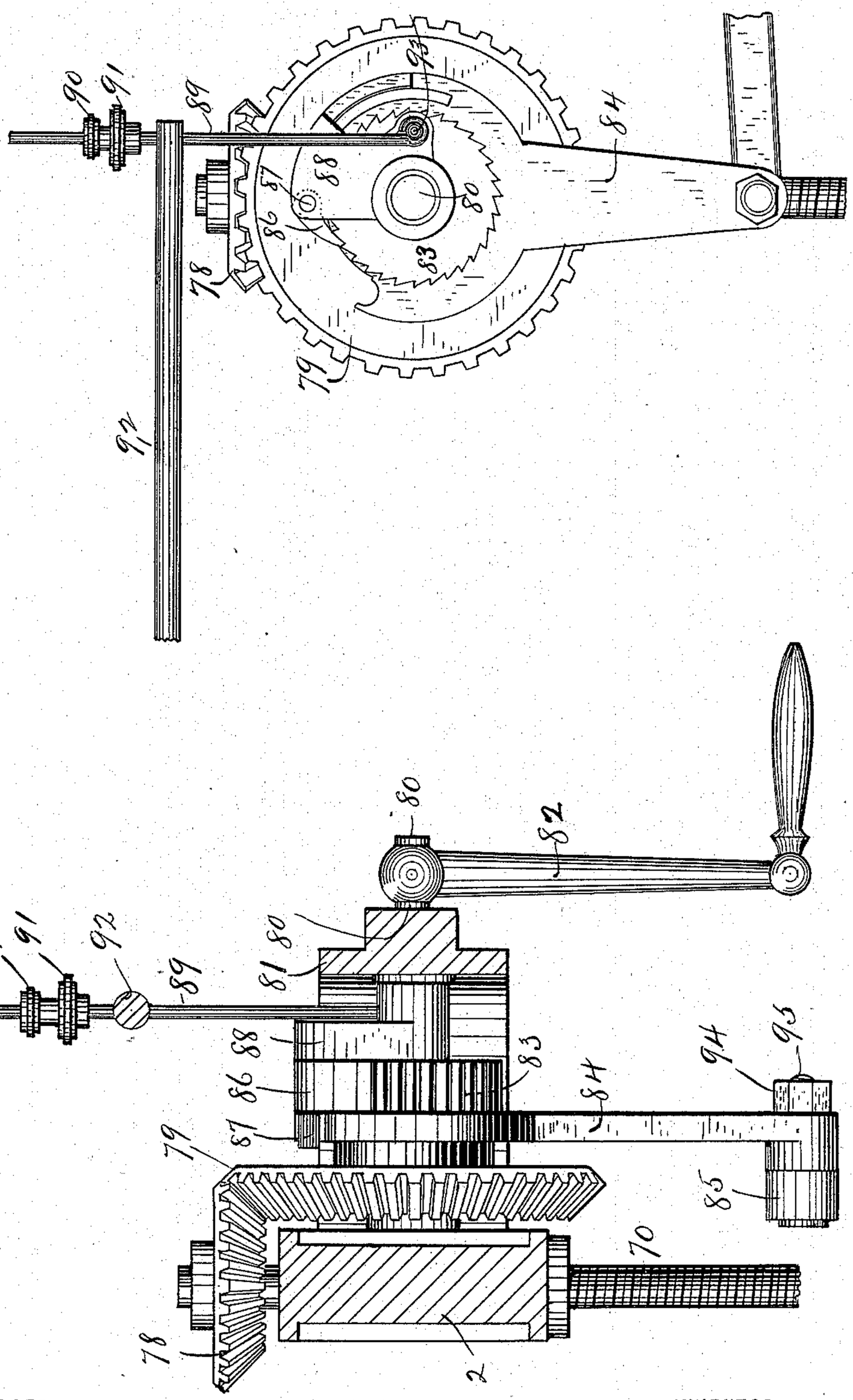
(No Model.) 14 Sheets—Sheet 7.

R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig. VII.



WITNESSES:

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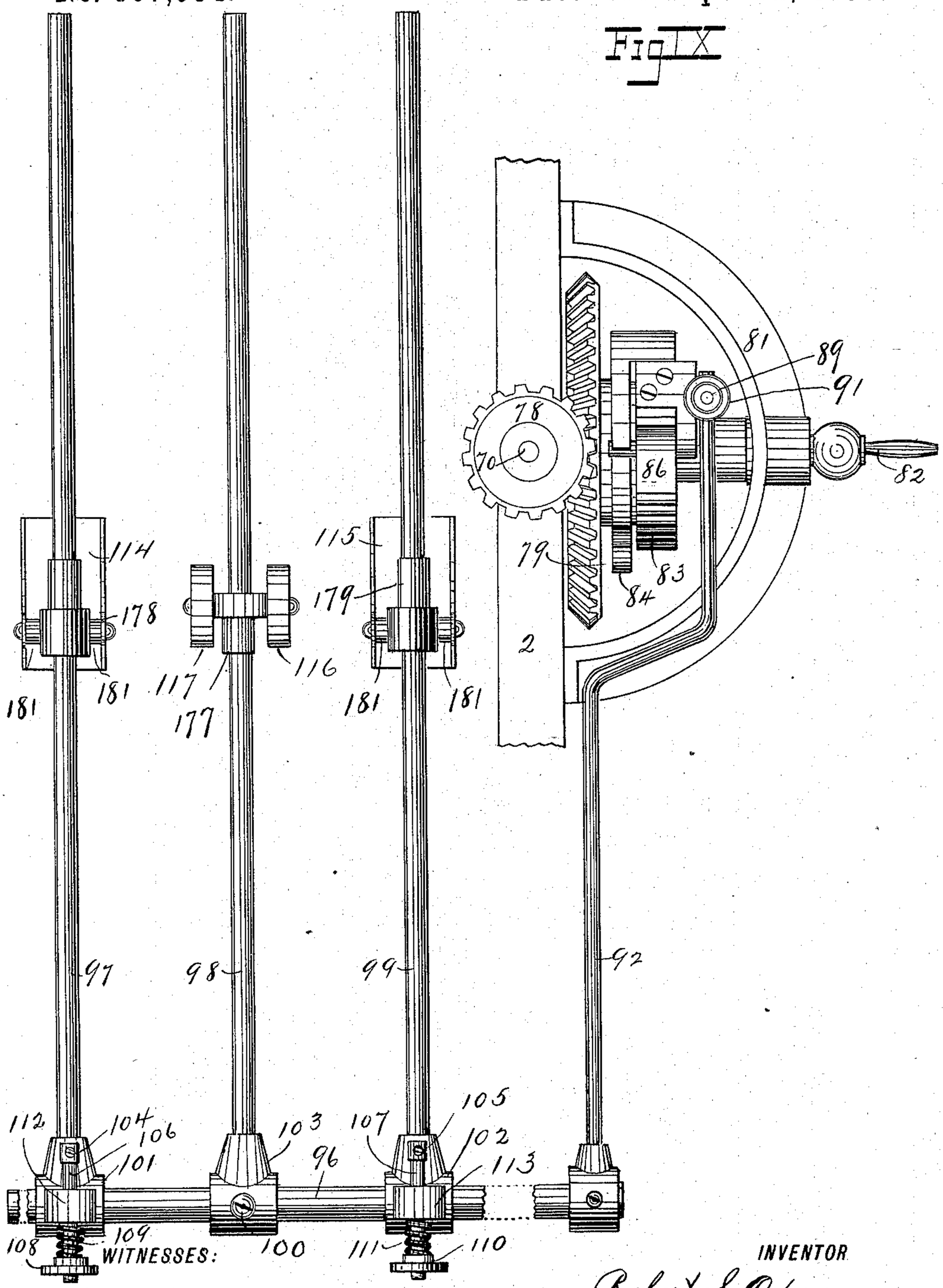
(No Model.) 14 Sheets—Sheet 8.

R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig IX



WITNESSES:

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(No Model.) 14 Sheets—Sheet 9.

R. S. ODER.

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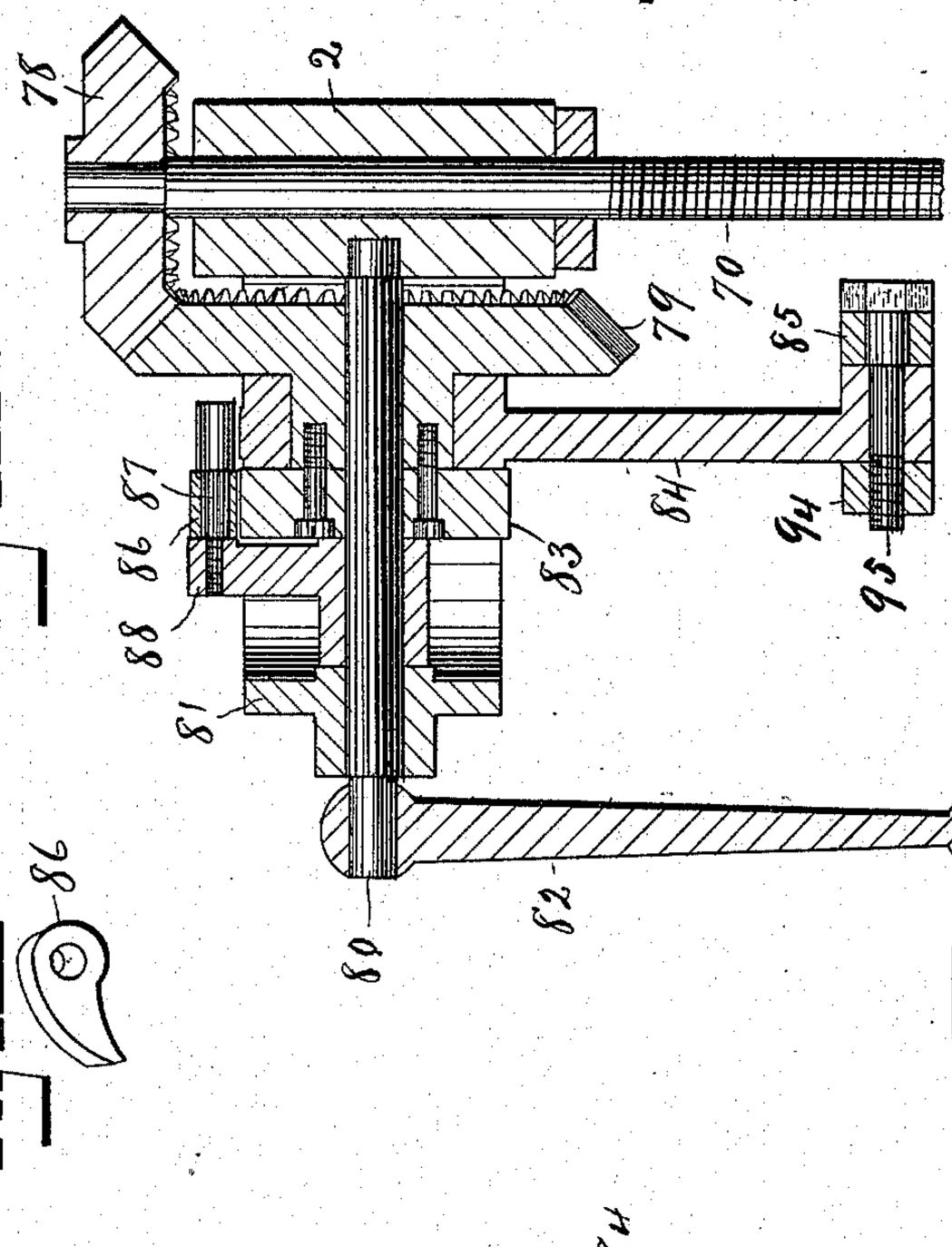


Fig. XI.

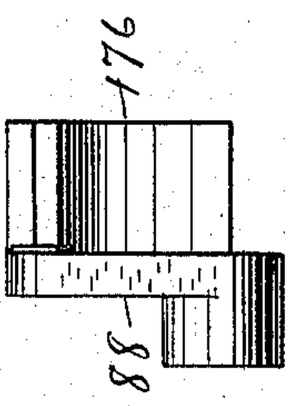


Fig. XII.

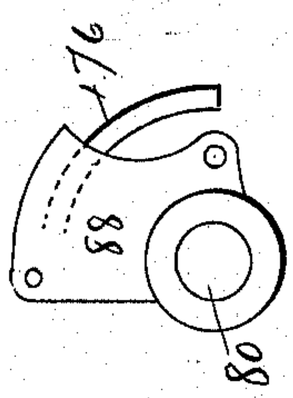


Fig. XIII.

Fig. X.

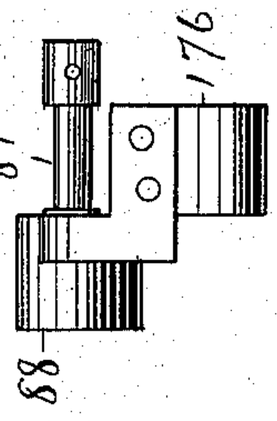


Fig. XIV.

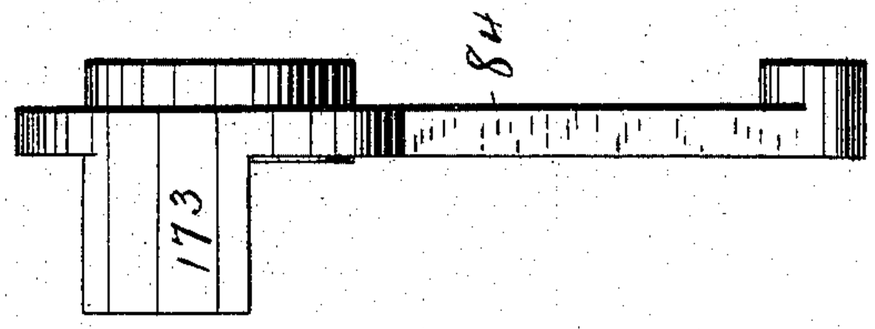
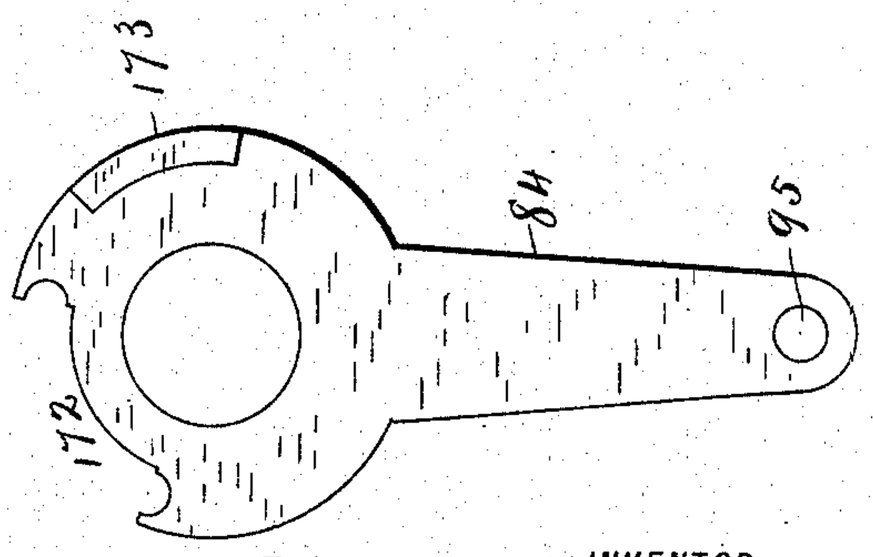


Fig. XV.



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(No Model.) 14 Sheets—Sheet 10.

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PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig XVIII

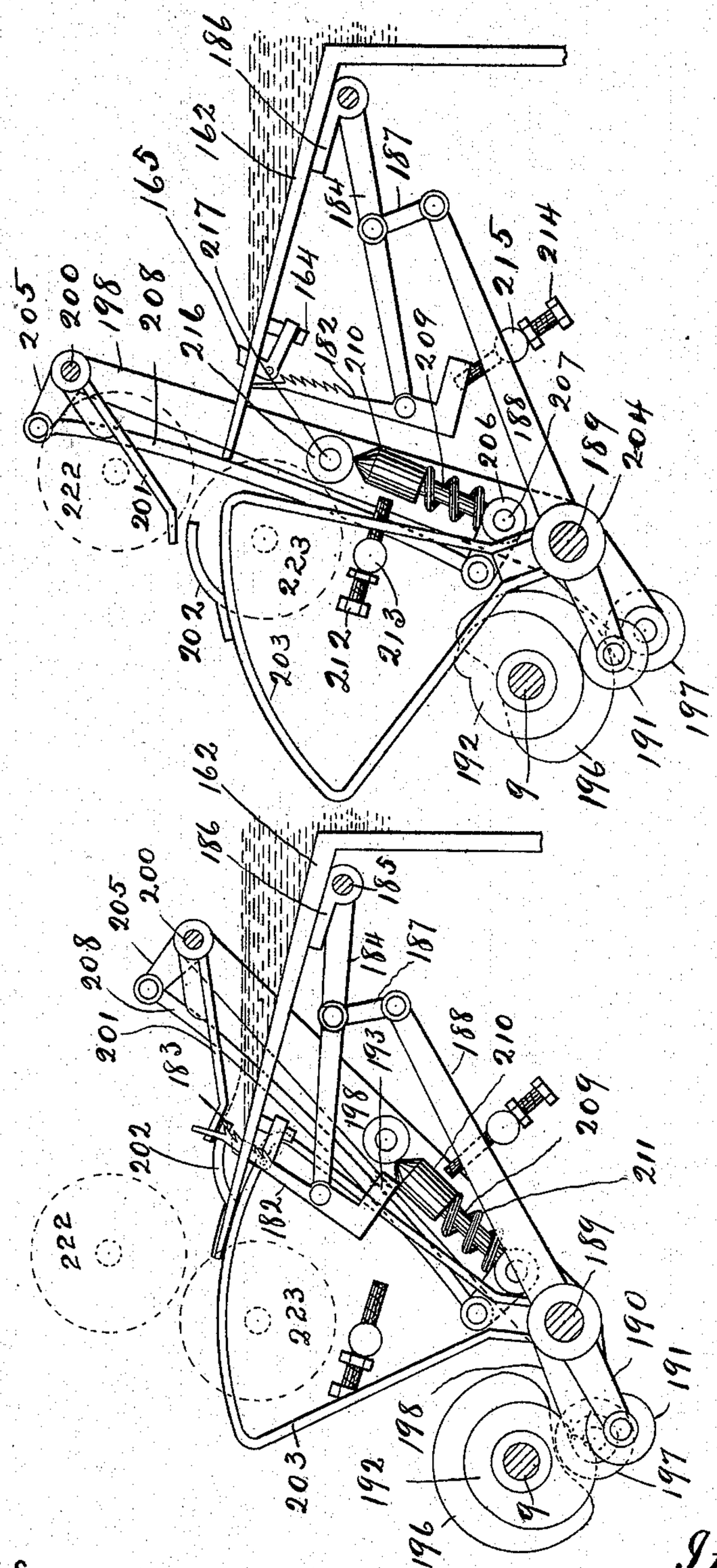

Fig XVII

Witnesses.
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(No Model.) 14 Sheets—Sheet 11.

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PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig XIX

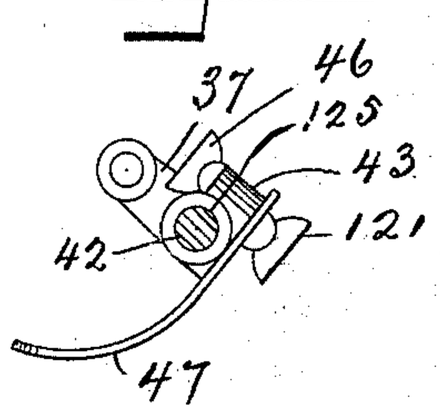


Fig XX

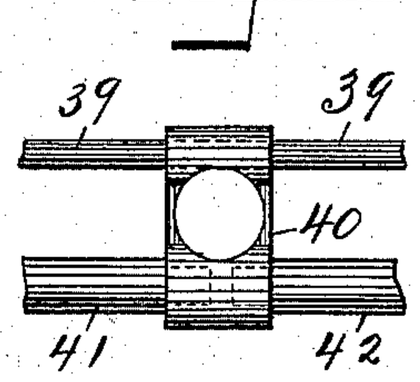


Fig XXI

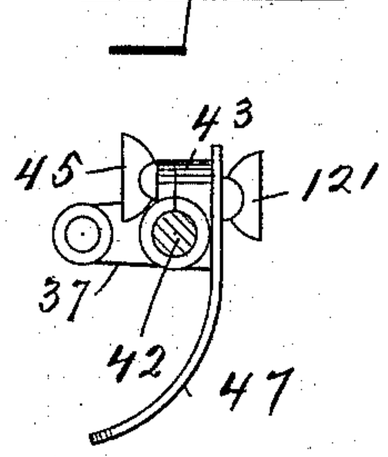


Fig XXII

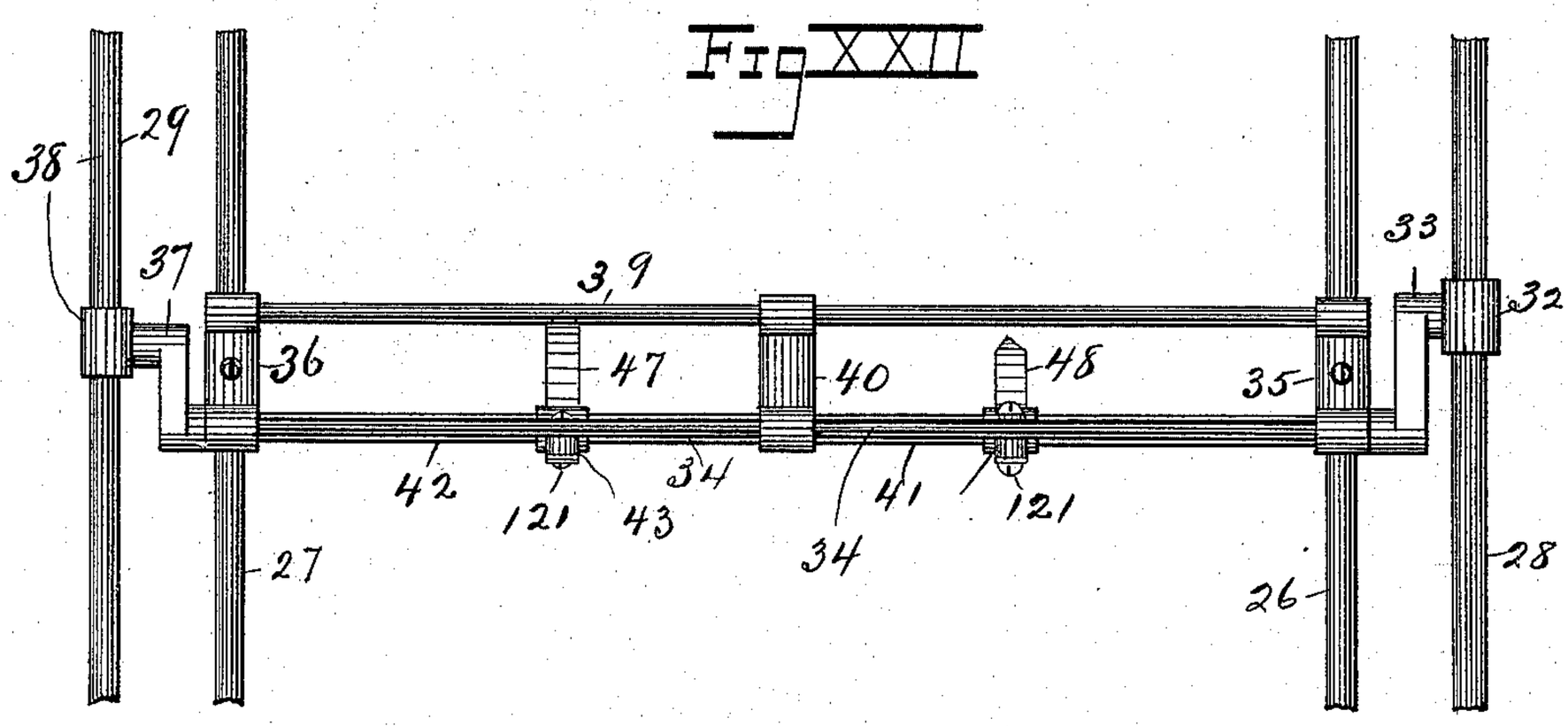
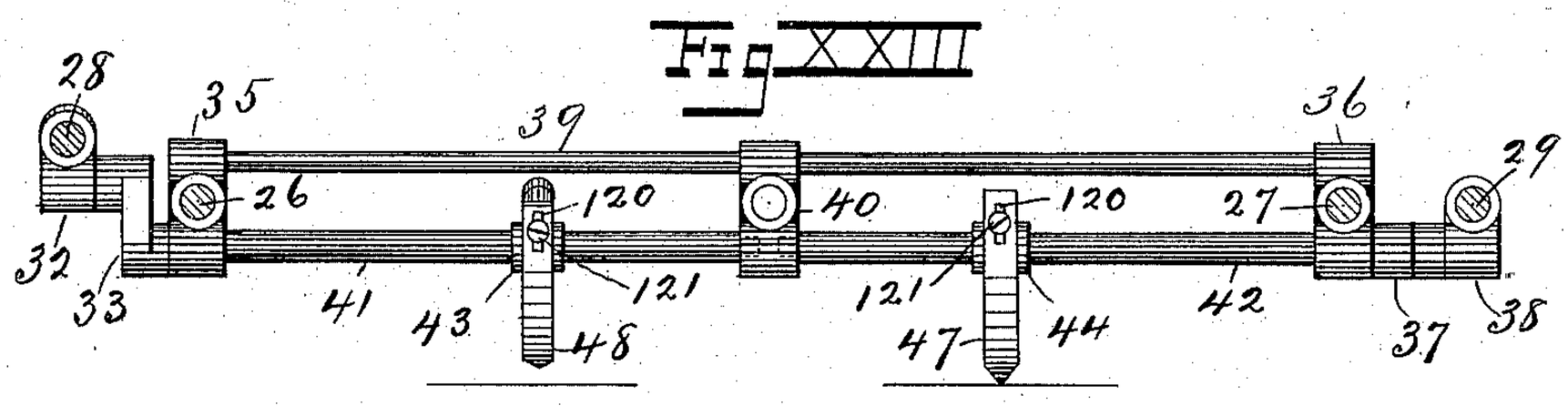


Fig XXIII



Witnesses.
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(No Model.) 14 Sheets—Sheet 12.

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PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig XXIV

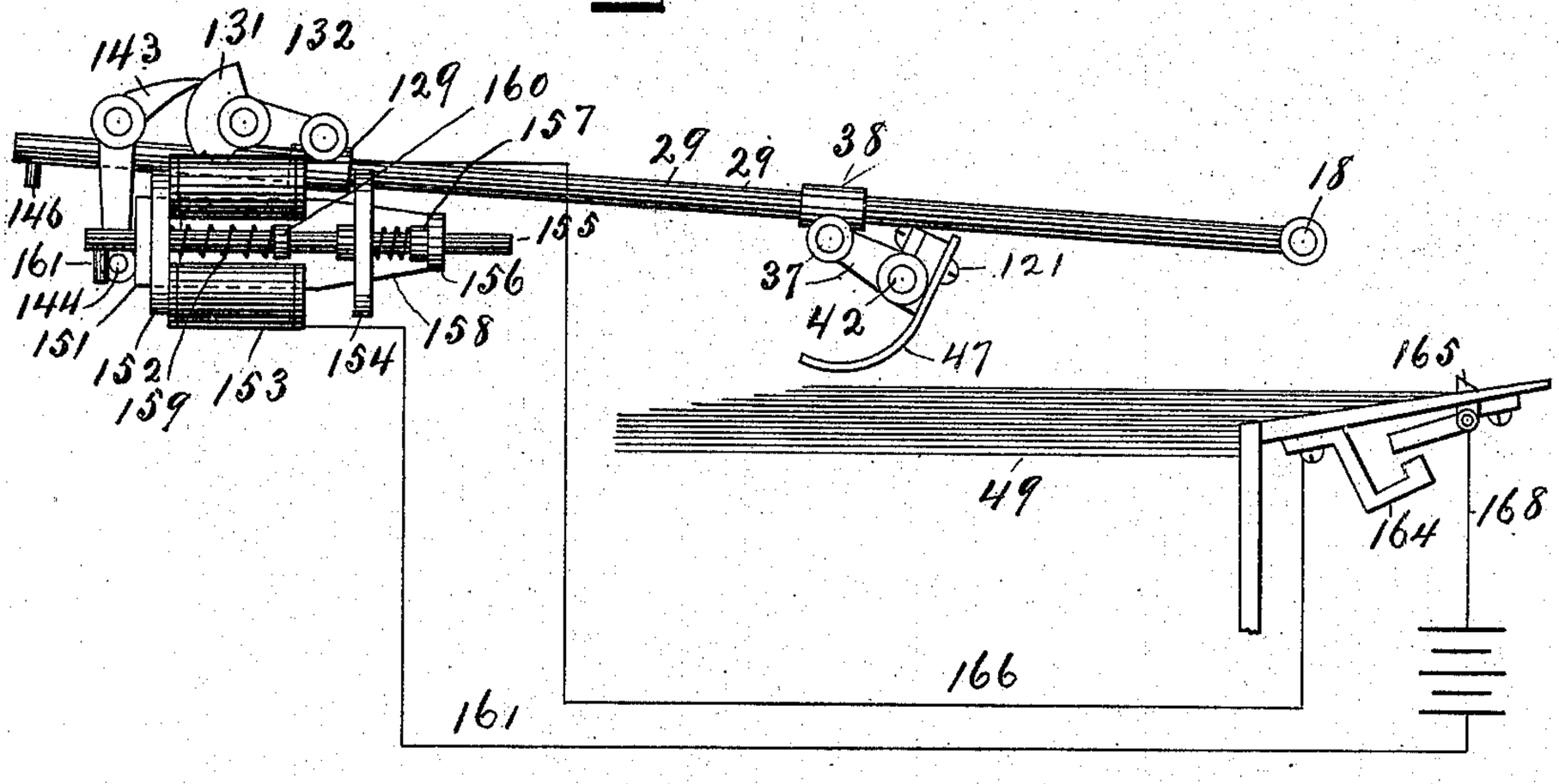
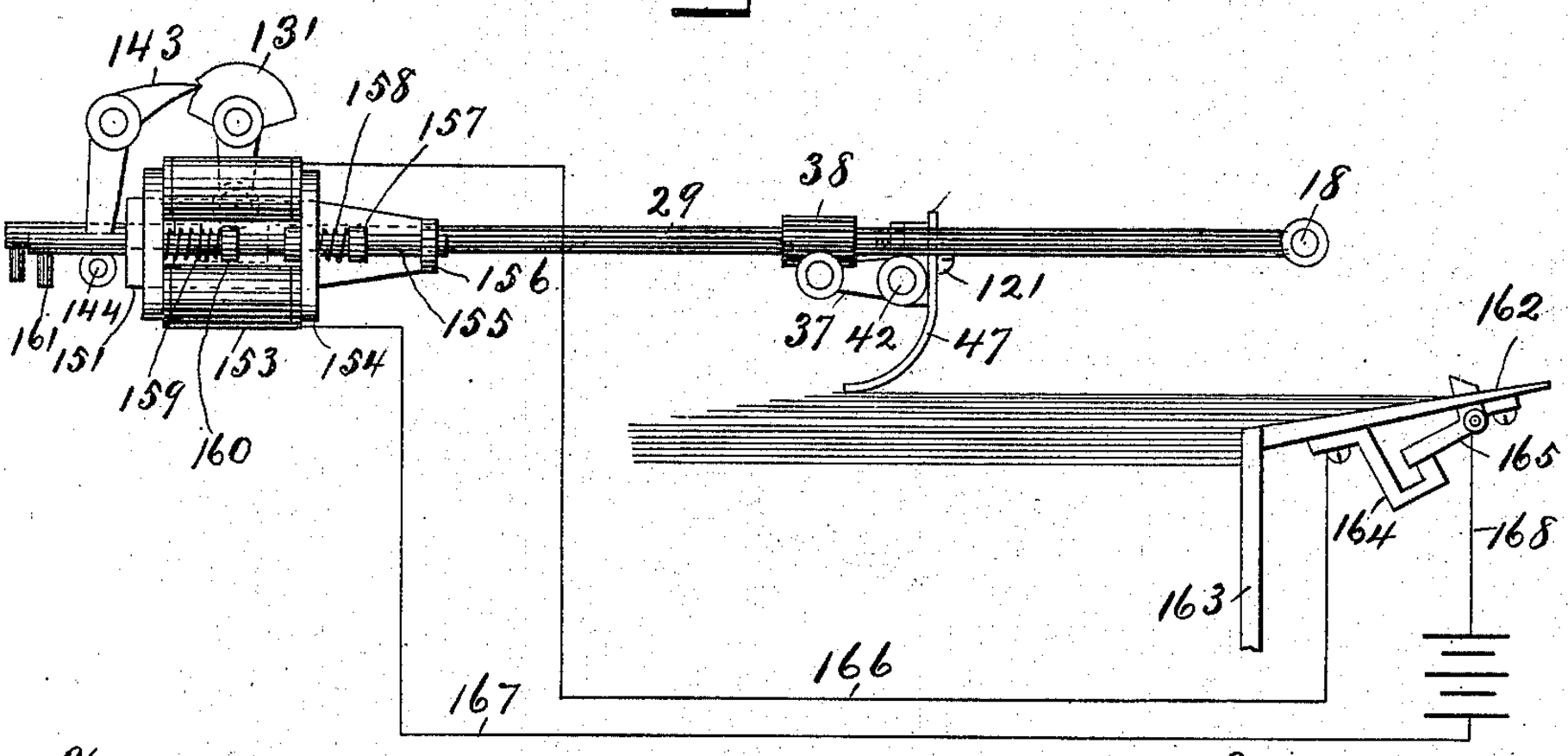


Fig XXV



Witnesses
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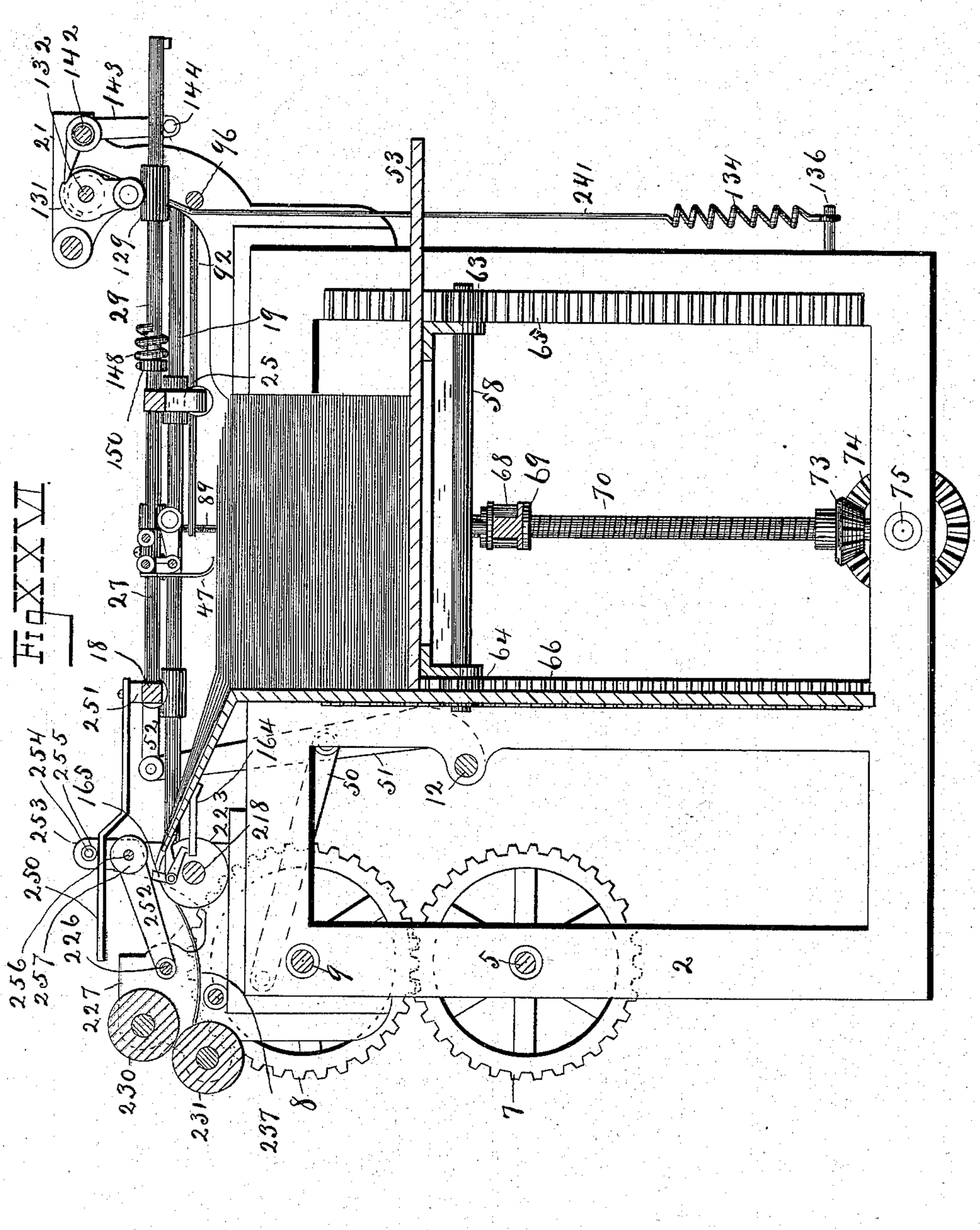
(No Model.) 14 Sheets—Sheet 13.

R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

FIG XXVI



WITNESSES:
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R. S. ODER.

PAPER FEEDING MACHINE.

No. 567,994. Patented Sept. 22, 1896.

Fig XXVII

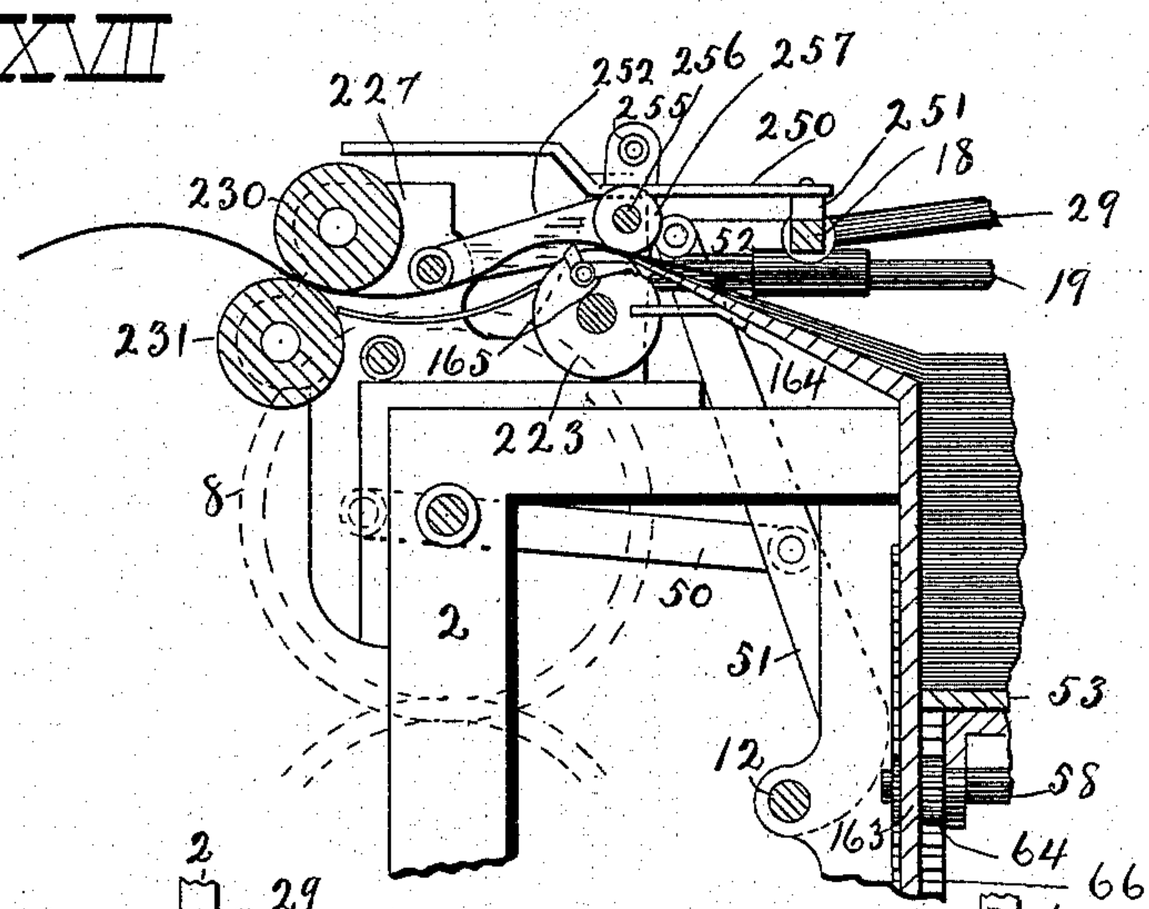
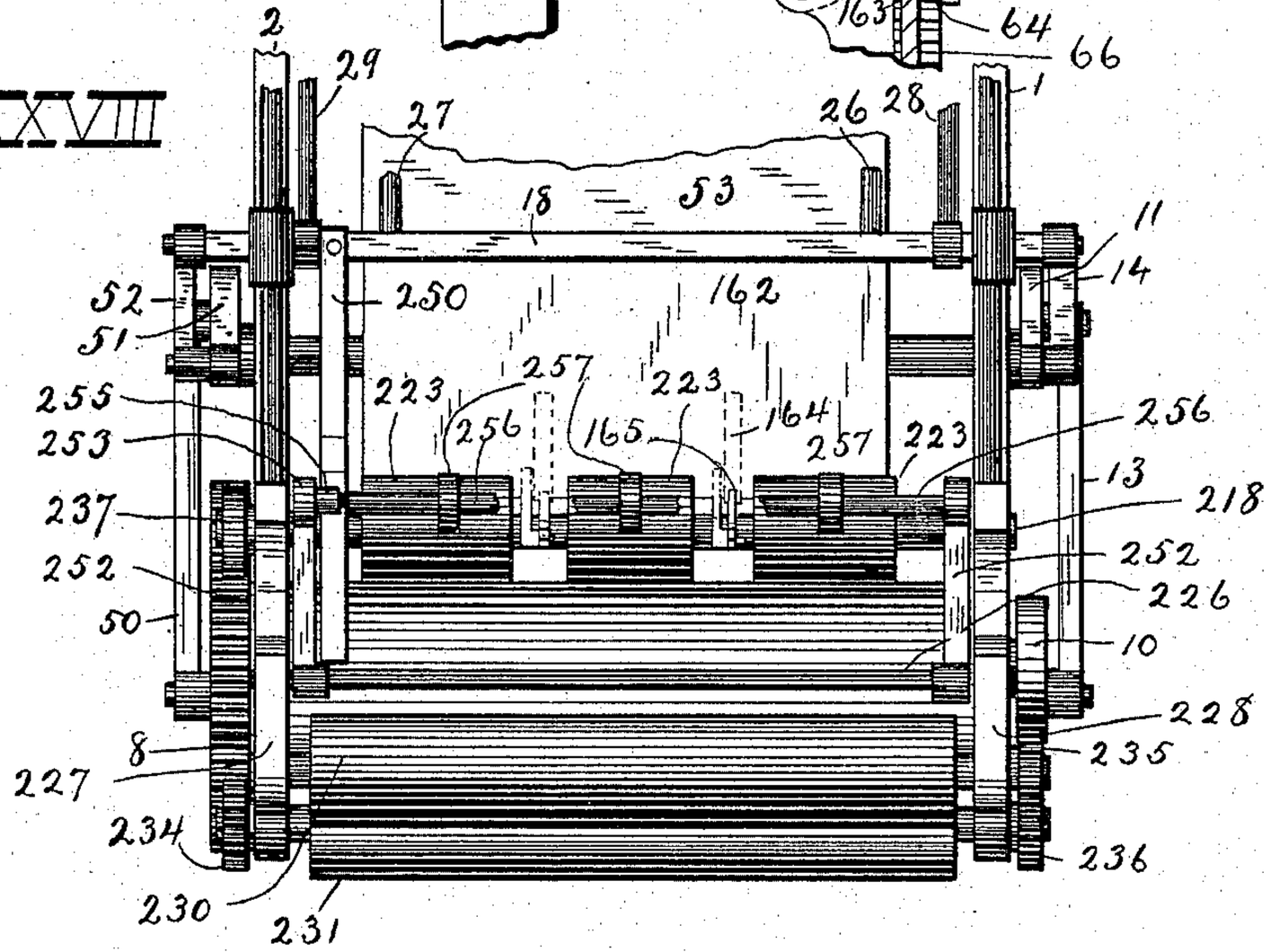


Fig XXVIII



WITNESSES:
H. C. Monroe.
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UNITED STATES PATENT OFFICE.

ROBERT S. ODER, OF KANSAS CITY, MISSOURI.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 567,994, dated September 22, 1896.

Application filed November 26, 1892. Serial No. 453,283. (No model.)

To all whom it may concern:

Be it known that I, ROBERT S. ODER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Paper-Feeding Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in machines for paper-feeding.

The objects of my invention are to provide in such machines, first, means for advancing the top sheet upon the pile, electrically controlling the advance of said top sheet, and raising one edge of the sheet so that it may be withdrawn; second, means for advancing the top sheet by a scraping pressure, causing the said sheet to control its forward movement and bending the freed edge of the sheet so that it may be withdrawn; third, means for advancing the top sheet upon the pile, actuating by means of the said sheet an electric circuit controlling the advancing movement and bending the advanced edge of the sheet so that it may be withdrawn; fourth, means for applying a scraping pressure upon or near the rear edge of the top sheet, causing the top sheet to electrically control and stop the scraping pressure at a given point and bending the front edge of the said sheet so that it may be withdrawn; fifth, means for applying to each side of the top sheet independently a scraping pressure, causing the said sheet to control its forward movement and bending the advanced edge of the sheet so that it may be withdrawn; sixth, means for applying to each side of the top sheet independently a scraping pressure, causing the sheet to electrically control its forward movement and bending the advanced edge of the sheet so that it may be withdrawn; seventh, means for applying a feeding pressure independently to each side of the top sheet, electrically controlling the forward movement of the sheet and bending the advanced edge of the sheet so that it may be withdrawn; eighth, a paper-feeder provided with a reciprocating carrier, a feed-scraper carried thereby, and means controlled by the paper for removing the feed-scraper from the paper at the proper time; ninth, an improved scraper mechanism for advancing the sheet; tenth, an improved electromagnetic mechanism controlling the feeding mechanism operating on each side of the top sheet; eleventh, means for raising the front edge of the advanced sheet; twelfth, means for gripping the advanced sheet.

Hereinafter I have fully described a machine adapted to carry out the objects of my invention.

In the accompanying drawings illustrative of my invention similar numerals of reference indicate similar parts.

Referring to the drawings, Figure 1 represents a plan view. Fig. 2 represents a front elevation of my invention, having the forwarding-rolls broken away so as to more clearly show the elevating-fingers and circuit-breakers. Fig. 3 represents a rear elevation. Fig. 4 represents a right-side elevation. Fig. 5 represents a vertical section. In this view is best shown the position in the machine of the elevating-fingers, forwarding-rolls, and timing-cams. Fig. 6 represents a left-side elevation. Fig. 7 represents a side elevation of a portion of the table-raising mechanism. Fig. 8 represents a front elevation of the same, shown in Fig. 7. Fig. 9 represents a plan view of the parts shown in Figs. 7 and 8, together with the rods and other mechanism which rest on the top of the pile of paper and regulate the action of the ratchet-dog. Fig. 10 represents the ratchet-dog carrier in rear elevation. Fig. 11 represents the same in side elevation. Fig. 12 represents the same in front elevation. Fig. 13 represents the ratchet-dog in perspective. Fig. 14 represents the lever that actuates the ratchet-dog in front elevation. Fig. 15 represents the same in a side elevation. Fig. 16 represents in vertical section a portion of the table-raising mechanism shown in Figs. 7, 8, and 9. Fig. 17 represents the mechanism for raising the front edge of the sheet, with the grippers having already engaged the sheet. Fig. 18 represents the same mechanism as shown in Fig. 17, with the elevating-fingers depressed and the grippers opened, the sheet having been withdrawn. The last two views show the different positions of the cam during an operation in removing a sheet. Fig. 19 represents in side elevation the scraper-finger raised from the pile. Fig. 20 represents the

same depressed into a position adapted to scrape the top sheet forward. Fig. 21 represents a side view of the bracket within which the shafts upon which the scraper-fingers are mounted is pivoted. Fig. 22 represents a plan view of the reciprocating carrier which carries the scraper-fingers. Fig. 23 represents the same parts shown in Fig. 22 in rear elevation. Fig. 24 is a detail in side elevation of the electromagnetic controlling mechanism, showing the trip as having operated and the scraper-finger raised from the paper. This view also shows the electric circuit opened. Fig. 25 represents the electromagnetic controlling mechanism in side elevation, the trip-armature being in closed magnetic circuit, the electric circuit closed, and the scraper-finger being in contact with the top sheet, the trip not having been as yet released. Fig. 26 represents in vertical section a feeder constructed in accordance with my invention provided with a modified form of detaching mechanism. In this figure the top sheet is represented as having been scraped to a position nearly touching the L-shaped circuit-breaker 165. The shaft 256, movably pivoted in the crank-arms 252, is shown in its elevated position, with the rollers 257 raised from the lower rollers 223. The pivoted arm or rod 29 is shown in the horizontal position, the dog 143 not having been released by the electromagnetic trip mechanism from engagement with the tooth or notch in the pivoted arm 131. Fig. 27 represents in vertical section a fragmentary portion, shown in Fig. 26, illustrating the modified form of detaching mechanism. In this figure the shaft 256 is shown in its lowest position, the rollers 257 mounted thereon being in contact with the top sheet and having partially removed it from the pile. The circuit-breaking electrode 165 is shown raised from the stationary electrode 164. The pivoted arm 29 is shown raised at its outer end, the electromagnetic trip mechanism having operated. Fig. 28 represents a plan view of the fragmentary portion of the machine shown in Fig. 27, the parts being in the same relative positions as shown in Fig. 26. Portions of the pivoted shaft 256 are shown broken away in order to show the top of the circuit-breaking mechanism.

Referring to Figs. 1, 2, 3, 4, 5, and 6, 1 and 2 indicate vertical plates which form the side of the main framework. 3 indicates a vertical brace located between and secured to the sides 1 and 2. 4, Fig. 2, indicates a horizontal brace between the sides and secured to their lower ends. 5 indicates a horizontal driving-shaft pivoted within the vertical plates 1 and 2 and having secured to it at its outer right end a pulley-wheel 6, which connects by means of a belt with the driving or main shaft of the printing-press or other machine with which the paper-feeder is to be operated. 7 indicates a spur gear-wheel secured to the left outer end of the main shaft 5. The gear 7 meshes into a similar spur-gear 8 of like size, which is secured upon a horizontal shaft 9, located above the shaft 5 and pivoted in the sides 1 and 2. A crank-disk 10 is rigidly mounted upon the right outer end of the shaft 9 and imparts, when rotated, a rocking movement to an arm 11, with which it is connected by a rod 13, which is pivoted to the disk 10 and arm 11. The arm or lever 11 is rigidly secured at its lower end to the right outer end of a rock-shaft 12, which is parallel to the shafts 5 and 9, and is also pivoted in the sides 1 and 2. Upon the opposite end of the rock-shaft 12 is a similar rock-lever 51, (best shown in Fig. 4,) which is connected to a crank-pin secured upon the gear 8 by means of a rod 50, pivoted to said crank-pin and to the lever 51. A reciprocating motion is imparted to the scraper-finger carriage through the intermediacy of the rock-levers 11 and 51, with which it is connected by means of rods 14 and 52, pivoted, respectively, to the upper end of the rock-levers 11 and 51.

The following is a description of some of the parts of the reciprocating carriage: A horizontal transverse rod 18 is secured at each end in sliding blocks 15 and 17, respectively. The pivoted arms 14 and 52 are pivoted at their ends to the outer ends, respectively, of the transverse rod 18. The blocks 15 and 17 have openings drilled through them at right angles to the openings within which the transverse rod 18 is secured. Said openings in the blocks 15 and 17 are adapted to longitudinal guide-bars 16 19. The guide-bars 16 19 are rigidly secured at their respective ends to brackets 21 22 and 20 23, secured to the top sides, respectively, and near their ends of the vertical plates 2 and 1. Similar slide-blocks 23′ 24 are provided with longitudinal openings movably fitted to the guides 16 and 19, respectively. A transverse rod 25, paralleling and to the rear of the transverse rod 18, is rigidly secured at either end to the slide-blocks 23′ and 24, respectively. Horizontal longitudinal rods 26 and 27 are rigidly secured to and connect the rods 18 and 25. Thus rods 18 25 26 27 and slide-blocks 15, 17, 23, and 24 form the rigid bed of the reciprocating carriage. Pivoted to one end of the transverse rod 18 is a horizontal longitudinal rod 28, free to move vertically at its rear end. A similar rod 29 is pivoted at its front end to the other end of the transverse rod 18. 30 and 31 indicate blocks provided with openings in which the transverse rod 18 is pivoted. Said blocks 30 31 are secured to the front end of the rods 28 29, respectively, or are formed by enlarging the ends of said rods. Movably mounted upon the rods 26 27 of the carriage-bed are the respective slide-blocks 35 36. Connecting said slide-blocks 35 36 are transverse rods 34 39, secured, respectively, at their opposite ends to said slide-blocks. Secured upon the rods 34 39 is a block 40. (Best shown in Figs.

21, 22, and 23.) Pivotally mounted at either end is a transverse rock-shaft 41, located directly below shaft 34 and having bearings in blocks 35 and 40. A similar transverse rock-shaft 42 is similarly mounted at its ends in blocks 36 and 40, respectively. Scraper-fingers 47 48 are longitudinally and circumferentially adjustably secured upon the rock-shafts 42 and 41, respectively. These scraper-fingers are best shown in Figs. 1, 19, 20, 22, and 23, respectively. Slots 120, Fig. 23, are provided in the upper end of the scraper-fingers 47 48, within each of which is an adjusting clamping-screw 121, having a screw-threaded engagement with collars 43 44, revolubly mounted upon rock-shafts 41 42. Said collars 43 44 are cut through to their central opening by a slot 125, and a clamping-screw 45 46 engages a screw-threaded opening in the collar 43 44 upon each side of the said slot 125. A crank-arm 33 is secured to the outer end of rock-shaft 41 and is pivoted at its outer end to a slide-block 32, longitudinally movable upon the rod 28. A similar crank-arm 37 is secured to the outer end of the rock-shaft 42 and pivoted at its outer end to a slide-block 38, longitudinally movable upon the rod 29. These parts are best shown in Figs. 22 and 23. The blocks 35 and 36 are provided with set-screws 127 for securing said blocks at any desired position upon the rods 26 27. Movably mounted upon the shafts 28 29 are slide-blocks 128 129, having a pivoted connection, respectively, with an arm 130 131, which are pivoted, one at each end, upon a shaft 132, fixed at each end to the vertical plates 1 and 2. Springs 133 134 are connected by a cord 137 138 with the pivoted arms 130 131, respectively, and serve to keep the rear ends of the shafts 28 and 29 normally raised, and consequently keeping the scraper-fingers 47 48 normally free from the pile of paper. The lower ends of the springs 133 134 are secured to pins 135 136, secured to the framework. Fig. 5 best illustrates this portion of the machine. Collars 139 140 are secured to the shaft 132 inside of the pivoted arms 130 131 and prevent said arms from sliding inward upon the shaft. A dog 143 is pivoted to one end of a transverse rod 142, secured to the projections 20 and 21, respectively, and is adapted to engage with a tooth 141 in the pivoted arm 131. A similar dog 143 is pivoted at the other end of said shaft 142, and is also adapted to engage with a tooth in the opposite pivoted arm 131. Coiled springs 189 are secured to the dogs 143 and to the transverse rod 142 and tend to keep the dogs in contact against the curved face of the arms 130 131. Figs. 1, 3, and 5 best show this construction. The dogs 143 are provided with outwardly and inwardly extending horizontal pins 144 145. The inner ends of these said pins 144 145 are adapted to be struck by a pin 146 147, secured to the lower side of each of the rods 28 29 when the said rods are depressed at their rear ends for the purpose of tripping the dogs 143 from engagement with the tooth on the curved faces of the pivoted arms 130 131, thus permitting the rear ends of the rods 28 and 29 to be elevated at their rear ends at the end of their forward stroke. The said pins 144 145 and 146 147, respectively, come in contact with each other only at such times when the dogs 143 have not been electromagnetically actuated. The electromagnetic trip mechanism is hereinafter described. A coil-spring 148 149, Figs. 4, 5, and 6, are mounted, respectively, upon the rods 28 29 and are held in position by collars 150, secured upon said rods. The said springs 148 149 serve as cushions to strike against the slide-blocks 128 129 during the backward reciprocation of the carriage-bed.

The following is a description of the electromagnetic trip mechanism: A knee-shaped brace 151 is secured on one side of each of the rear projections 20 21. One arm of the knee is secured to the projection and the other arm projects outwardly and has secured to it at its end a yoke having mounted thereon electromagnets 153. An armature 154 is secured to a horizontal rod parallel to the axis of the armature and movably pivoted within openings through the yoke centrally located in the yoke 152 and the projecting end of the knee and in a projection from the opposite end of the knee 156. A collar 157 is secured upon the rod 155 at a point outside the armature and a coil-spring 158 is mounted upon said rod between the collar and the armature. Another collar 160 is secured upon the rod 155 on the other side of the armature. Another coil-spring 159 is mounted upon the rod 155, between the collar 160 and the yoke, and tends to hold the armature normally out of contact with the electromagnet. A downwardly-projecting pin 161 is secured to the rear outer end of the rod 155 and is adapted, when the armature is released, to strike against the pin 144, and thus withdrawing the dog 143 from engagement with the tooth in the pivoted arm 131. One side is illustrated in detail in Figs. 24 and 25. The opposite side is constructed in an exactly similar manner. Projections 238 are provided on the outside of each one of the sliding blocks 23 24 of the reciprocating carriage, which are in line and are adapted to strike the armature-carrying rods 155 at each back stroke of the carriage-bed, thus placing at each reciprocation the armature within the field of the electromagnets. If the electric circuit in which the magnets are located is open at the time the armature is placed within the field of the magnets, it will not be held there, but will return to the position shown in Fig. 24. If, on the contrary, the electric circuit is closed when the armature is brought within the field of the magnets, as shown in Fig. 25, the armature will be held against the cores of the magnets and against the resisting pressure of the spring 159. The circuit-breaking mechanism is mounted upon the under side of a

transverse board 162, sloping rearwardly and secured at its rear edge to the top of a vertical transverse board 163, which is placed side by side with a transverse brace 3.

Referring to Figs. 24 and 25, 164 indicates a rigid electrode secured to the under side of the board 162, and 165 indicates a pivoted L-shaped lever having one leg projecting upward through an opening in the board and in a position where the projecting end above the board may be struck by the top sheet of the pile 49. The other leg of the lever 165 is adapted to make, preferably, a rubbing contact upon the rigid electrode 164. Said electrode 164 is connected by means of a wire 166 with one side of the electromagnet and the L-shaped electrode 165 is connected by wire 168 with one pole of the battery, the other pole being connected by wire 167 with the other side of the electromagnet. Two of these circuit-breaking mechanisms are mounted upon the sloping board 162, preferably one on each side of a line drawn lengthwise through the middle of the machine. The feeding mechanism on each side is thus controlled by a separate mechanism, so that each side of the sheet is stopped in its forward movement independently of the other side.

In Fig. 1 opening 169 indicates the location of each of the L-shaped electrodes of the circuit-breaker.

The following is a description of the table-elevating mechanism: A feed-board 53 is mounted upon a rectangular framework 54, located horizontally between the sides 1 and 2 of the framework and provided at each corner with a downward projection 56, 57, 59, and 60, within which are pivoted the ends of a horizontal pinion-shaft 58 and 61. (Best shown in Figs. 4 and 6.) At each end of shaft 58 is secured a pinion 63 and 64, adapted to operate in racks 65 and 66, respectively. Pinions 62 are secured upon the ends of the shaft 61 and mesh into corresponding racks 67, vertically secured upon the inner side of plate 1, one to the right and one to the left of the feed-table. Racks 65 and 66 are similarly located and vertically secured upon the inner side of plate 2. A horizontal transverse bar 68, having bifurcated ends, is provided near each end with vertical openings, into which fit pins 171, projecting one from each end downward from the rectangular framework 54. A vertical screw-threaded bar 70, Figs. 4 and 5, is pivoted within bearings located in the upper and lower part of plate 2. A bevel-gear 73 is secured to the threaded bar 70 near its lower end and meshes into a gear 74, located upon a horizontal transverse shaft 75 and rigidly secured thereto. Said shaft 75 is mounted in bearings in the sides 1 and 2 of the framework near the bottom. Upon the other end of shaft 75 is secured a bevel-gear 76, meshing into a bevel-gear 77, secured upon the lower end of a bar 71, oppositely threaded to bar 70. The threaded bar 71 is mounted in vertical bearings in plate 1 of the frame. Each of said bars 70 71 is preferably located near the middle of the feed-table and are directly opposite one another.

Upon the bar 70 is a block 69, provided with a vertical opening internally screw-threaded to fit the vertical bar. The block 69 is provided with side notches, into which are fitted the projections of one of the bifurcated ends of the bar 68. A similar block 72 is screw-threaded to fit the vertical threaded bar 71, and is provided with similar notches to the block 69, into which are fitted the projections of the other bifurcated end of the bar 68. When the bars 70 and 71 are revolved, the threaded blocks 69 and 72 are given a vertical movement, and thus through their connection with the bar 68 raise or lower the table, according to the direction in which the vertical threaded bars are revolved. Upon the extreme upper end of the threaded bar 70 is secured a bevel gear-wheel 78, which meshes into a bevel gear-wheel 79, which in turn is rigidly mounted upon a horizontal revoluble shaft 80, extending at right angles to the side 2 of the framework, and which is provided with a bearing at one end in said side 2, the outer end being provided with a bearing in a semicircular brace 81, secured to the outside of plate 2. A crank-handle 82 is rigidly secured to the outer end of the horizontal shaft 80 and serves as a means of raising or lowering the feed-table by hand. This portion of the mechanism is best illustrated in Figs. 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16. Rigidly secured upon said shaft 80 is a ratchet-wheel 83, which has operating within its teeth a ratchet-dog 86, loosely pivoted upon a pin 87, which is rigidly secured to a crank-arm 88. Figs. 10, 11, and 12 are detail views of the said crank-arm 88. Said crank-arm is loosely pivoted upon the shaft 80, between the ratchet-wheel 83 and the brace 81. (See Fig. 7.) A forward motion is imparted to the said movable crank-arm 88 and the dog 86 by means of a pivoted lever 84, movably mounted upon the shaft 80, between the ratchet-wheel 83 and the gear 79. A section is cut out of the upper part of lever 84, (indicated by 172, Fig. 14,) which forms a pathway for the pin 87. An outwardly-extending projection (indicated by 173, Fig. 15) on the side of the pivoted lever 84 serves as a shoulder to strike against the rear of the arm 88. A connecting-arm 85 (shown in Fig. 4) is pivoted to the lower end of the lever 84 by means of a shouldered pin provided with screw-threaded end 95, having a nut 94 mounted thereon, Fig. 7. The other end of the connecting-rod 85 is pivoted to a pin 174, secured to the outside of a vertical rock-lever 51. This pin 174 serves as a bearing also for one end of the connecting-rod 50, which is pivoted at its other end to a pin 175, secured upon the gear 8. During the backward and forward movements of the rock-lever 51 the pivoted push-lever 84 is imparted a rocking motion thereby.

A curved weight 176 is secured to the arm

88, Figs. 10, 11, and 12, and serves to draw the dog 86 back over the ratchet-teeth when it is free so to act. A vertical rod 89 is pivoted to the arm 88 at a point to the right of its support by means of a loop in the rod at its lower end, through which a pin 93, rigidly secured to the arm 88, passes. The upper end of the rod 89 is screw-threaded and is provided with thumb-nuts 90 91, located upon the rod above a bent arm 92, through which the rod 89 passes. The thumb-nuts 90 91, being drawn down by the weight upon the arm 88 until they come in contact with the bent arm 92, limit the position of the ratchet-dog 86 in the ratchet-wheel 83. Figs. 7, 8, and 9 best illustrate this portion of the feed mechanism, Fig. 1 showing the relative position of the parts in a general way. A rock-shaft 96 (shown in Fig. 3) is movably mounted in bearings in the projections 20 and 21 and has secured to one end outside of the plate 2 a horizontal bent arm 92, Fig. 9. Rigidly secured at a point near the center of said rock-shaft 96, by means of a set-screw 100, is a block 103, provided with a horizontal longitudinal rod 98, secured thereto. Upon said rod 98 is a movable sleeve 177, provided with two friction-rollers 116 117, movably secured to its sides and adapted to rest upon the top sheet of the pile of paper, as indicated in Fig. 1. Any raising or lowering of the pile raises or lowers said rollers and tends to rock the shaft 96 and connected arm 92, and thus regulating through the intermediacy of thumb-nut 91 and rod 89 the position of the ratchet-dog 86 on the ratchet-wheel 83. Openings are provided through blocks 101 102, through which passes the rock-shaft 96, upon which said blocks are movably mounted, one on each side of the block 103. Rods 97 and 99 are secured, respectively, to the blocks 101 102 and extend horizontally over the paper. Slotted sleeves 178 179 are movably mounted upon the respective rods 97 99 and are each provided with a pivoted shoe 114 115, mounted upon pin projections 181, extending from each side of the slotted sleeves. These shoes serve as sheet-retainers. Proper pressure is applied to the shoes 114 115 upon the paper as follows: Spring-rods 104 105, secured in a vertical position upon the blocks 101 102, have their upper ends bear against the front side of the shaft 132, located immediately above the rock-shaft 96. Secured to said vertical spring-rods 104 105 are rearwardly-projecting horizontal rods 106 and 107. These rods pass through openings provided in vertical projections 112 and 113, located, respectively, upon the upper side of blocks 101 102. The outer ends of rods 106 107 are screw-threaded and are provided, respectively, with thumb-nuts 108 110. Between the thumb-nuts and the vertical projections 112 113 and mounted upon the rods 106 107 are coiled springs 109 111, respectively. When the thumb-nuts 108 110 are screwed up, tension is given to the coil-springs 108 109 and the shoes 114 115 have imparted to them a corresponding pressure upon the pile of paper.

The following is a description of the timing mechanism, the gripping mechanism, and the sheet-bending mechanism. (See Figs. 1, 2, 5, 17, and 18.) Bending-fingers 182, provided with teeth 183, facing toward the pile of paper, are pivoted to crank-arms 184, which are secured to a transverse rock-shaft 185, mounted in bearings 186, secured to the under side of the inclined board 162. One of said crank-arms 184 is connected by a rod 187, having pivoted connection therewith and to a lever 188, pivoted upon a rock-shaft 189, extending transversely from one side of the frame to the other and having bearings in the vertical plates 1 and 2 and provided with an extension 190, and mounted upon said extension a friction-roller 191, upon which the cam 192, secured upon the shaft 9, has a bearing. When the roller end of the lever 188 is depressed, the crank-arms 184 are elevated, carrying with them the toothed bending-fingers 182, and thus raising the front edge of the top sheet when it is against the said bending-fingers. These bending-fingers are provided with a right-angled extension 193, provided with a weight 194, which tends to keep the bending-fingers inclined toward the paper. Downwardly-projecting bent arms 195 are secured to the under side of the board 162, and are so located to the weighted end of the bending-fingers as to be struck by them when the crank-arms 184 are lowered, thus throwing the upper ends of the bending-fingers forward and out of the path of the detached sheet when it is removed by the grippers. Fig. 2 best illustrates the downwardly-projecting bent arms 195.

Figs. 17 and 18 illustrate the positions of a sheet-bending mechanism at the upward and the downward position of the lever 188.

Secured upon the shaft 9 to the left of cam 192 is another cam 196, which is adapted to press upon the friction-roller 197, pivoted upon a rock-lever 198, which is secured upon the shaft 189. A similar rock-lever 199 is secured to the opposite end of the rock-shaft 189, just inside the plate 1. A transverse rock-shaft 200 has its ends pivoted in horizontal openings in the upper ends of the rock-levers 198 199. (See Figs. 2, 17, and 18.) Secured upon said rock-shaft 200 are a series of upper gripper-arms 201, which extend forward and are adapted, when properly moved, to clamp against curved projections 202, secured upon the upper side of the curved gripper-arms 203, respectively. The gripper-arms 203 have the shape of the segment of a circle and are secured at their lower ends to a series of collars 204, secured upon the rock-shaft 189 at points directly below the upper gripper-arms 201. A crank-arm 205 is secured to the left end of the rock-shaft 200 and has its outer end connected to the outer end of a pivoted arm 206, mounted upon a pin 207, secured upon the inner side

of the rock-lever 198 by means of connecting-rod 208, pivoted to the crank-arm 205 and the pivoted arm 206. A vertical pin 209, having at its upper end a roller 210, is movably fitted within an opening in the upper side of the pivoted arm 206. A coiled spring 211 is mounted upon the pin 209 and bears against the roller 210 and the pivoted arm 206. A set-screw 212 has a screw-thread connection with a horizontal projection 213, extending inwardly from the plate 2. A similar set-screw 214 has a similar screw-thread connection through a pin projection 215, extending inwardly from said plate 2. These adjustable set-screws 212 and 214 are located in the arc of the circle described by the friction-roller 210 when the rock-lever 198 is operated by the cam 196. A friction-roller 216 is mounted upon a pin 217, secured to the inner side of the rock-lever 198 in a position to be struck by the friction-roller 210 and depress said roller against the pressure of the spring 211.

Referring to Figs. 1, 4, 5, and 6, 218 indicates a horizontal transverse shaft provided with bearings at its ends in the projections 22 23, secured upon the top sides of the plates 2 and 1, respectively. Secured upon the end outside of projection 22 is a pinion 237, which meshes into gear 8, Fig. 4. At the other end of the shaft 218, outside of the projection 23, is secured a gear 219, which meshes into the gear 220, Fig. 6, secured upon a shaft 221, revolubly mounted at its ends in the projections 22 23 above and parallel to the shaft 218. A series of wooden rollers 222 are secured upon the shaft 221, and a series of wooden rollers 223 are secured upon the shaft 218. A wooden roller 225 is secured upon a shaft 226, provided with bearings at the ends in brackets 227 228, located, respectively, upon the front upper corners of the plates 2 and 1. Cords 229 pass around the rollers 222 and the roller 225 and serve to communicate a rotary motion to roller 225 and also to advance the top detached sheet to the forwarding-rolls 230 231, which are located, respectively, upon the revoluble shafts 232 233. Said revoluble shafts 232 233 have their ends mounted in the brackets 227 228. Upon the left end of the shaft 233 is secured a pinion 234, which gears into the spur-gear 8, Fig. 4. The opposite ends of the shafts 232 233 are provided with pinions 235 and 236, which are firmly secured thereon and mesh together. A transverse metallic plate 237 is secured at its end in a horizontal position to the sides of the framework directly below the roller 225 and to the left of the rollers 223, as shown in Fig. 5. Spaces are left between each of the rollers 222 and 223 to permit the passage of the gripper-fingers, as indicated in Fig. 1.

239, Fig. 6, indicates a box in which the battery-jars are located.

In operating my invention the pile of paper, 49, which is to be fed is placed upon the feed-board 53, the ratchet-dog 86 is thrown out of engagement with the ratchet-teeth, and the crank-handle 82 is then revolved in the proper direction for raising the feed-table to the proper height. This will be at a point where a number of the top sheets are above the top edge of the vertical board 163. The scraper-fingers 47 48 are then revolved upon their rock-shafts 42 41 until they are in such a position that their lower edges press firmly upon the top of the pile of paper when the arms 28 and 29 are depressed at their rear ends. The set-screws 45 and 46 are then tightened, thus clamping the collars 43 and 44 upon their respective shafts. The slide-blocks 35 36 are then moved forward or backward upon the rods 26 and 27 to the proper position on the paper and the set-screws 127 are then tightened. The sleeve 177, together with its rollers 116 117, is moved preferably to a position upon the rod 98 near the rear edge of the top sheets. However, the rollers 116 and 117 may occupy a position forward of the rear edge upon the sheet, as illustrated in Fig. 1. The slotted sleeves 181 are then moved, together with the pivoted shoes 114 115 upon the rods 97 99, to a position where they bear upon the rear edges of the top sheets. Proper pressure is now brought upon the pile of paper through the rods 97 99 and the shoes 114 115 by adjusting the thumb-nuts 108 110 so that the coiled springs 109 111 have the proper tension. The thumb-nuts 90 and 91 are moved up or down upon the rod 89 to a position proper, which is determined by trial. The ratchet-dog 86 is now dropped into engagement with the ratchet-teeth 83. The electromagnets on either side of the machine are connected up with their respective batteries, as shown in Figs. 24 and 25. The pulley-wheel 6 is now turned in the proper direction, which is toward the left, as shown in Fig. 6, revolving the shaft 5, and, through the intermediate gearing 7 and 8, the shaft 9 and the crank-disk 10. A reciprocating movement is thus imparted to the carriage-bed, which is mounted upon the rods 16 and 19, Fig. 1, through the intermediacy of connecting-rods 14 and 52, rock-levers 11 and 51, and connecting-rods 13 and 50. As the carriage moves forward on its first reciprocation, the rear ends of rods 28 and 29 being elevated, and consequently the scraper-fingers 48 and 47 being also elevated, none of the sheets are scraped forward. As soon, however, as the springs 148 149 strike against the slide-blocks 129 128 the pivoted arms 130 131 are moved backward at their lower ends, thus forcing down the rear end of the pivoted rods 28 and 29, and through the intermediacy of the slide-blocks 32 and 38, mounted thereon, and the crank-arms 33 and 37, connected therewith and with the rock-shafts 41 and 42, respectively, the scraper-fingers 48 and 47 are depressed so that in the next forward movement they will scrape against the top of the pile of paper. When the pivoted arms 130 131 are partially re-

volved by the forcing back of the slide-blocks 128 129, pulley-wheels 240 (shown in Fig. 1 and secured side by side against the pivoted arms 130 131, respectively) are also partially revolved, drawing up the cords 137 138, connected to the spiral springs 133 134. When the pivoted arms 130 131 have been revolved sufficiently, the springs 189, secured to the shaft 142 and to the dogs 143, force the dogs into engagement with the teeth 141 on the pivoted arms 130 131, thus preventing the springs 133 134 from revolving the pivoted arms in a direction tending to raise the rear ends of rods 28 29. On the backward stroke of the carriage-bed projections 238 on the slide-blocks 23 24 strike the armature-rod 155, forcing them back and bringing the armatures 154 into contact with the electromagnetic cores until such time as they may be released, as hereinafter described. Upon its forward movement the carriage-bed carries the scraper-fingers 47 48 depressed. When the said scraper-fingers strike the rear edge of the pile of paper, they scrape several of the top sheets forward in the manner shown in Fig. 25. This scraping movement upon the rear edges of the paper causes the top sheet to travel more rapidly than the one beneath, and the one beneath to travel more rapidly than the third sheet, and so on for several sheets from the top. As the top sheets advance through this scraping pressure the forward edge of the uppermost sheet being in advance of the one beneath strikes the projecting end of the L-shaped pivoted electrode-lever 165 on one side or other of the board, thus breaking the electric circuit upon that side, demagnetizing the electromagnets 153 on that side of the machine. The coiled spring 159 now forces the released armature, together with the armature-rod 155, forward. The pin 161 now strikes the projecting pin 144 of the dog 143, withdrawing it from the tooth or notch in the pivoted arm 131. The coiled spring 134 pulls down now upon the released pivoted arm 131, and, through the intermediacy of said arm and slide-block 129, raises the pivoted rod 29, thus revolving the rock-shaft 42 and raising the scraper-finger 47 from the sheet. During the remainder of the movement forward of the scraper-finger 47 it does not touch the sheet, and thus that side of the sheet remains with its front edge gaged against the upwardly-projecting end of the circuit-breaker lever 165. Figs. 24 and 25 best illustrate the positions of the mechanism on this side of the machine during a single reciprocation. As the scraper-finger 48 advances depressed upon the paper it brings the front edge of the other side of the top sheet against the other pivoted lever 165, breaking the circuit on that side and repeating the operation just described. It will be seen from this explanation that each side of the sheet is provided with means for feeding the said side forward independently of the other side. If only one scraper-finger were used, it is found extremely difficult to make the top sheet advance in a straight line. One side or the other of the top sheets will advance ahead of the other side, and as the work progresses this difficulty will increase. However, in my machine it is immaterial whether one side advances more rapidly than the other side, for the reason that when the forward side arrives at a certain point; which is against the lever 165, it must wait there until the opposide side has arrived at the opposite contact-breaker. The sheet is now ready to be bent upward at its front edge into a position that it may be seized by the grippers 201 202, as illustrated in Fig. 17.

I will now proceed to describe how this part of the operation of detaching the sheet is accomplished. The cam 192 is so shaped and so fixed upon the shaft 9 that at the time the front edge of the top sheet has touched the levers 165 it will depress the roller 191, secured upon the lever 188, and thus rock the said lever upon the shaft 189, raising its rear end, thus carrying the crank-arms 184 upward and raising the toothed bender-fingers 182 upward through the slots. In its movement upward the weight 194 on the rearward projection of the bender-fingers (shown in Fig. 5) causes the toothed end of the bender-fingers to come into contact with the front edge of the top sheet, carrying it upward and holding it detached from the sheet below until such time as the gripper-arms 201 202 have seized it. When the gripper-arms have seized the sheet, the cam 192 has revolved into a position which permits the pivoted lever 188 to lower at its rear end and, through the intermediacy of the connecting-rod 187, crank-shaft 185, and crank-arms 184, bring the toothed fingers 182 below the path taken by the top sheet as it is withdrawn from the pile.

Figs. 17 and 18 show the position of the mechanism during the two extremes of movement.

I will now describe the operation of the gripper-arms and other detaching mechanism. Referring again to Figs. 5, 17, and 18, at about the time the bender-fingers 182 have raised the front edge of the top sheet, as shown in Fig. 17, the gripper-arms are in the positions shown in Fig. 18. The cam 196 is so shaped and so placed upon the shaft 9 as to permit by its bearing upon friction-roller 197 the pivoted shaft 189 to revolve in such a manner as to carry the several attached gripper-arms 203 rearward or to the right, as shown in Figs. 17 and 18. The projections 202, secured to the said gripper-arms 203, pass below the raised edge of the sheet, as shown in Fig. 17. The rock-levers 198 and 199, being secured to said shaft 189, move backward and downward, carrying with them the rock-shaft 200 with their attached upper gripper-arms 201. These upper gripper-arms 201 are so mounted upon the rocker-shaft 200 as to pass above the front edge of the raised sheet. The gripper-arms 201 and the gripper pro-

jections 202 are caused to close upon the sheet as follows: the friction-roller 210, which has heretofore been upon the right side of the friction-roller 216, as shown in Fig. 18, and thus has held the gripper-arms apart for the admission between them of the sheet. When the gripper-arms have arrived at the position that the sheet is between them, said friction-roller 210 strikes against the adjustable set-screw 214, forcing it to the left side of the friction-roller 216 against the pressure of the spring 211, which holds it against the friction-roller 216, holding the parts in position. When the friction-roller 210 is forced to the other side of the friction-roller 216, it rocks the pivoted arm 206 upon the pin 207 downward, and drawing, through the intermediacy of the connecting-rod 208, the outer end of the crank-arm 205 downward, also thus rocking the shaft 200 and bringing the ends of the upper gripper-arms 201 against the top sheet and holding it against the gripper-projections 202, as shown in Fig. 17. The shaft now, during its revolution, brings the cam 196 into such a position as to depress the forward end of the pivoted lever 198, and thus causing the shaft 189 to rock, carrying forward the gripper-arms into the position shown in Fig 18. The sheet is now at its front edge between the rollers 222 and 223. At this point the friction-roller 210 strikes against the adjustable set-screw 212, thus rocking the pivoted arm 206, and through the intermediacy of the connecting-rod 208 raising the outer end of the crank-arm 205, rocking the shaft 200, and raises the upper gripper-arm 201 from contact with the sheet and permitting the rollers 222 223 to carry the sheet forward under the cords 229 and roller 225 and upon the metallic strip 237 to the forwarding-rollers 230 231. Motion is imparted to the forwarding-rollers as follows: The pinion 237 receives motion from the spur-gear 8, revolving the shaft 218 and the spur-gear 219 upon its opposite end, together with the rollers 223, secured upon the shaft 218. Motion is imparted to the rollers 222 by means of the gear 220, which meshes into the gear 219. The cords 229 serve as driving-belts for the roller 225. The spur-gear 234, meshing with the spur-gear 8, receives motion therefrom and imparts it to the shaft 233 and the roller 231, and also to the roller 230, through the intermediacy of the gears 235 236.

Referring to Figs. 26, 27, and 28, which illustrate the modified style of detaching mechanism, the shaft 226 is provided at each end with a crank-arm 252, rigidly secured to said shaft and provided at their outer ends with openings which serve as bearings for the ends of a transverse revoluble shaft 256, which has rigidly secured to it disk rollers 257, arranged, respectively, above a series of rollers 223, mounted upon the shaft 218. Spaces are provided between the wooden rollers 223, in which operate the circuit-breaking mechanism 165. Secured rigidly to the transverse rod 18 is a block 251, upon which is mounted a bent cam-bar 250. A projection 253 upon one of the crank-arms 252 is provided with an inwardly-extending pin 254, secured thereto, and which has movably mounted upon it a friction-roller 255. The bent cam-bar 250 and the block 251 are so located upon the transverse rod 18 as to bring the said cam-bar into a position in which it acts upon the lower side of roller 255. As the reciprocating carriage, together with the transverse rod 18, moves backward and forward the cam-bar 250 also moves backward and forward. During this backward-and-forward movement of the cam-bar 250 the roller 255 travels along the upper surface of the cam-bar and permits the crank-arms 252 to rock upward or downward, according to the position of said roller 255 upon the cam-bar. As the reciprocating carriage moves forward, carrying with it the scraper-fingers 47 and 48, they scrape the top sheets forward in the manner hereinbefore described. During the first part of this forward movement of the carriage the roller 255 is moving along the highest surface of the cam-bar 250, holding the rollers 257 aloof and permitting the top sheets to be scraped forward and under them against the contact-breaker levers 165. When the two levers 165, or one, as the case may be, have been operated by the top sheet, the trip mechanism also operates, causing the throwing off from the sheet of the scraper-fingers, leaving the top sheet with its front edge in register against the circuit-breaking lever or levers 165. In its continual movement forward the reciprocating carriage carries the cam-bar 250 forward along under the roller 255. When the roller 255 runs off from the elevated part of the cam-bar 250, the crank-arms 252, together with the pivoted shaft 256, rock downward until the rollers 257 rest upon the top sheets, holding it against the rollers 223, which having the proper rotary motion carry the sheet forward over the plate 237 to between the rollers 230 231, thus detaching it from the pile. After the sheet has been detached and the reciprocating carriage is upon its backward movement the lever or levers 165 drop down through gravity into contact with electrode or electrodes 164, reëstablishing the continuity of the electric circuit or circuits. The trip mechanisms and the dogs 143 are reset during this backward movement of the reciprocating carriage, as hereinbefore described in the description of the operation of said mechanism.

It will be observed that in the modification of my invention just described the sheet-bending mechanism and the gripper mechanism is done away with, the only addition to the machine heretofore described being the cam-bar 250, the crank-arms 252, revoluble shaft and rollers 256 and 257, respectively, projection 253, and friction-roller 255.

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

1. Means for feeding a single sheet from a pile of paper, which consists in the combination of mechanism for advancing the top sheet upon the pile, electrical devices for controlling the advance of said top sheet, and mechanism for raising one edge of said sheet so that it may be withdrawn, substantially as described.

2. Means for feeding a single sheet from a pile, which consists in the combination of mechanism for advancing the top sheet by a scraping pressure, mechanism for causing the said sheet to control its forward movement, and mechanism for bending upward the freed edge of the sheet so that it may be withdrawn, substantially as described.

3. Means for feeding a single sheet from a pile, which consists in the combination of mechanism for advancing the top sheet upon the pile, mechanism for actuating by means of said top sheet an electric circuit controlling the advancing movement, and mechanism for bending upward the front edge of said sheet so that it may be withdrawn, substantially as described.

4. Means for feeding a single sheet from a pile, which consists in the combination of mechanism for applying a scraping pressure upon or near the rear edge of the top sheet, mechanism for causing the top sheet to electrically control and stop the scraping pressure at a given point, and mechanism for bending upward the front edge of said sheet so that it may be seized and withdrawn, substantially as described.

5. Means for feeding a single sheet from a pile, which consists in the combination of mechanism for applying to each side of the top sheet, independently, a scraping pressure, mechanism for causing the said sheet to control its forward movement, and mechanism for bending the advanced edge of the sheet so that it may be withdrawn; substantially as described.

6. Means for feeding a single sheet from a pile, which consists in the combination of mechanism for applying to each side of the top sheet, independently, a scraping pressure, mechanism for causing the said sheet to electrically control its forward movement, and mechanism for bending the advanced edge of the sheet so that it may be withdrawn, substantially as described.

7. Means for feeding a single sheet from a pile, which consists in the combination of mechanism for applying a feeding pressure independently to each side of the top sheet, mechanism for electrically controlling the forward movement of the sheet, and mechanism for bending the advanced edge of the sheet so that it may be withdrawn, substantially as described.

8. A paper-feeder provided with means for scraping forward the top sheet, an electromagnetic trip mechanism controlling said scraping mechanism, said electromagnetic trip mechanism being controlled by the top sheet, and means for bending upward the front edge of the sheet, substantially as described.

9. A paper-feeder provided with means for advancing the top sheet upon the pile, an electromagnetic trip mechanism controlled by the sheet for stopping the advancing movement, and means for bending the advanced edge of the sheet so that it may be withdrawn, substantially as described.

10. A paper-feeder provided with means for advancing one or more of the sheets, an electromagnetic trip mechanism connected therewith and provided with a normally-closed electric circuit, the armature of the electromagnetic trip mechanism controlling the said advancing means, and means for bringing the armature within the field of the magnet, substantially as described.

11. A paper-feeder provided with a reciprocating feed-scraper, an electromagnetic trip mechanism controlling said feed-scraper and having an armature normally in the magnetic field, means for bringing the armature within the magnetic field at each reciprocation, said electromagnetic trip mechanism being controlled by the paper to be fed, substantially as described.

12. A paper-feeder, provided with a reciprocating feed-scraper, mechanism connecting the feed-scraper with the driving-shaft, means for bending the front edge of the top sheet, and an electromagnetic trip mechanism connected with the feed-scraper and controlled by the top sheet, substantially as described.

13. A paper-feeder, provided with one or more reciprocating feed-scrapers, mechanism connecting the feed-scrapers with the driving-shaft, means for lifting the advanced edge of the top sheet, and an electromagnetic trip mechanism controlling the feed-scrapers and being controlled by the paper to be fed, substantially as described.

14. In a paper-feeding machine, the combination of combers shifting a plurality of sheets of the top portion of the pile in one direction and projecting each sheet beyond the next underlying sheet, separate mechanism for operating each comber, separate electric circuits, magnets in said circuits controlling said mechanisms independent of each other, and separate circuit-controllers for the respective magnets actuated by the advanced edge of the top sheet at different points in the length of said edge.

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

ROBERT S. ODER.

Witnesses:
A. MIDDLESWORTH,
ED. S. ARMITAGE.