No. 734,670. PATENTED JULY 28, 1903.

E. T. CLEATHERO.

PAPER FEEDING MACHINE.

APPLICATION FILED MAY 20, 1901.

NO MODEL. 12 SHEETS—SHEET 1.

Fig. 2.

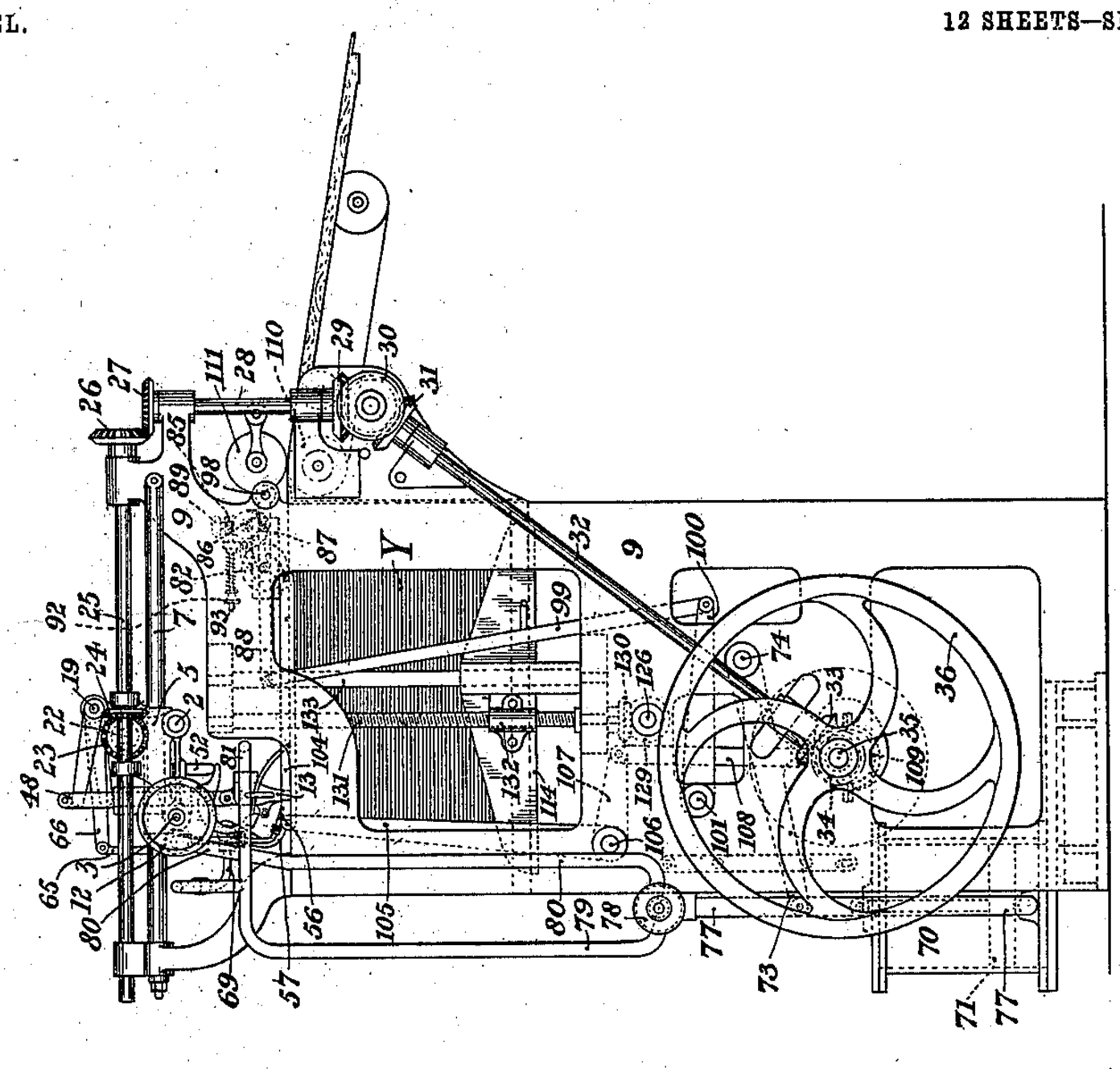

Fig. 1.

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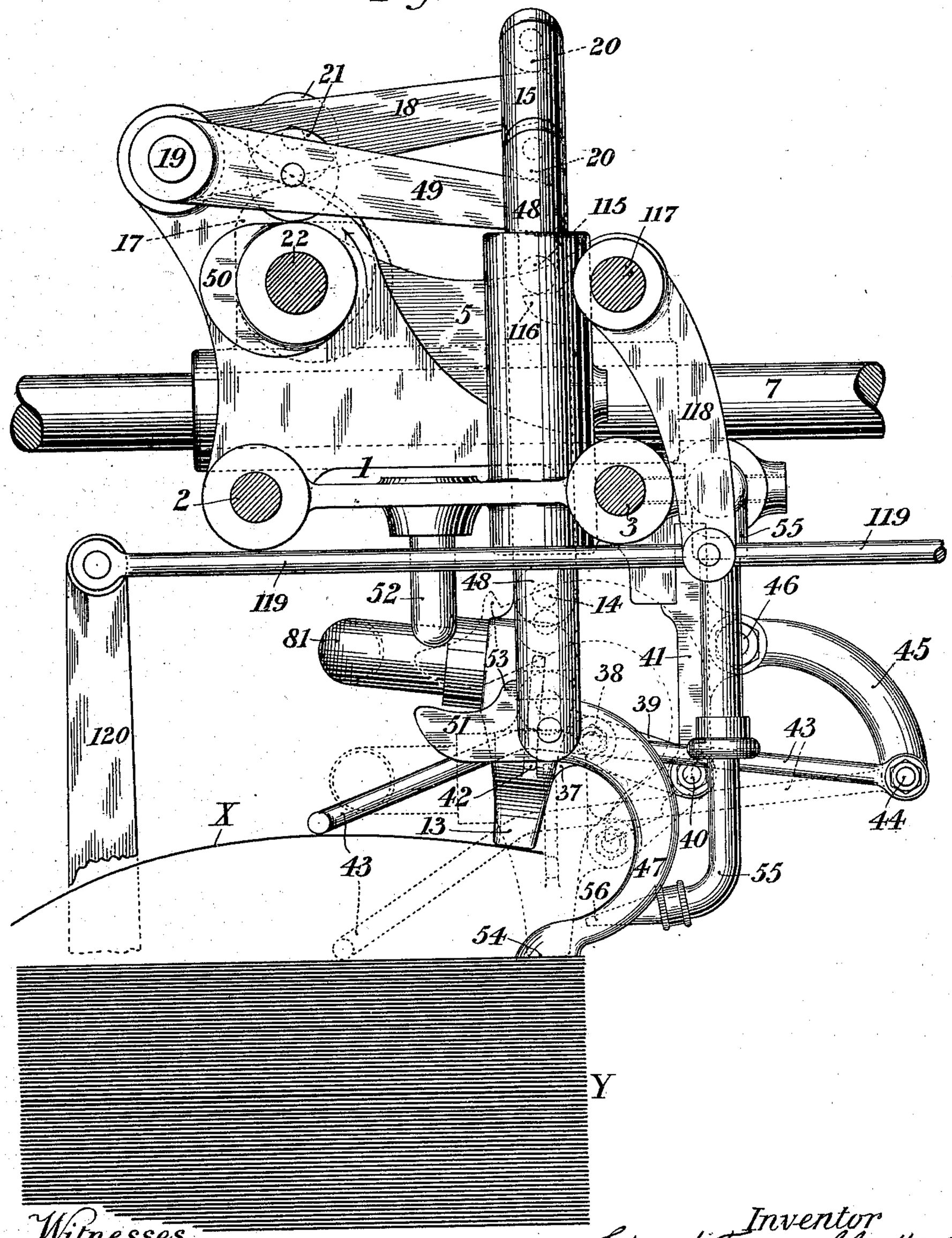
NO MODEL. 12 SHEETS—SHEET 2.

Fig. 3



Witnesses:
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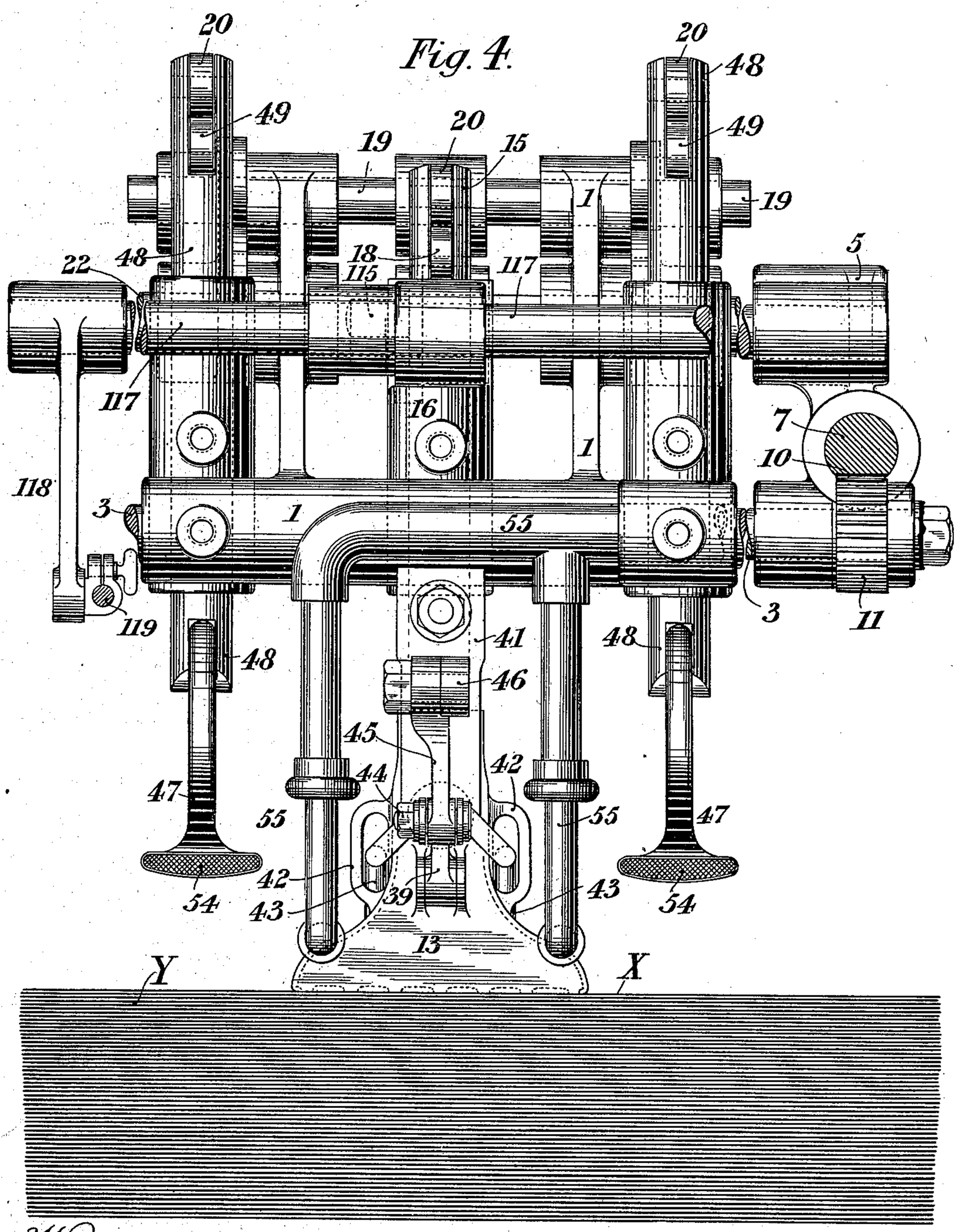
NO MODEL. 12 SHEETS—SHEET 3.

Fig. 4.



Witnesses.
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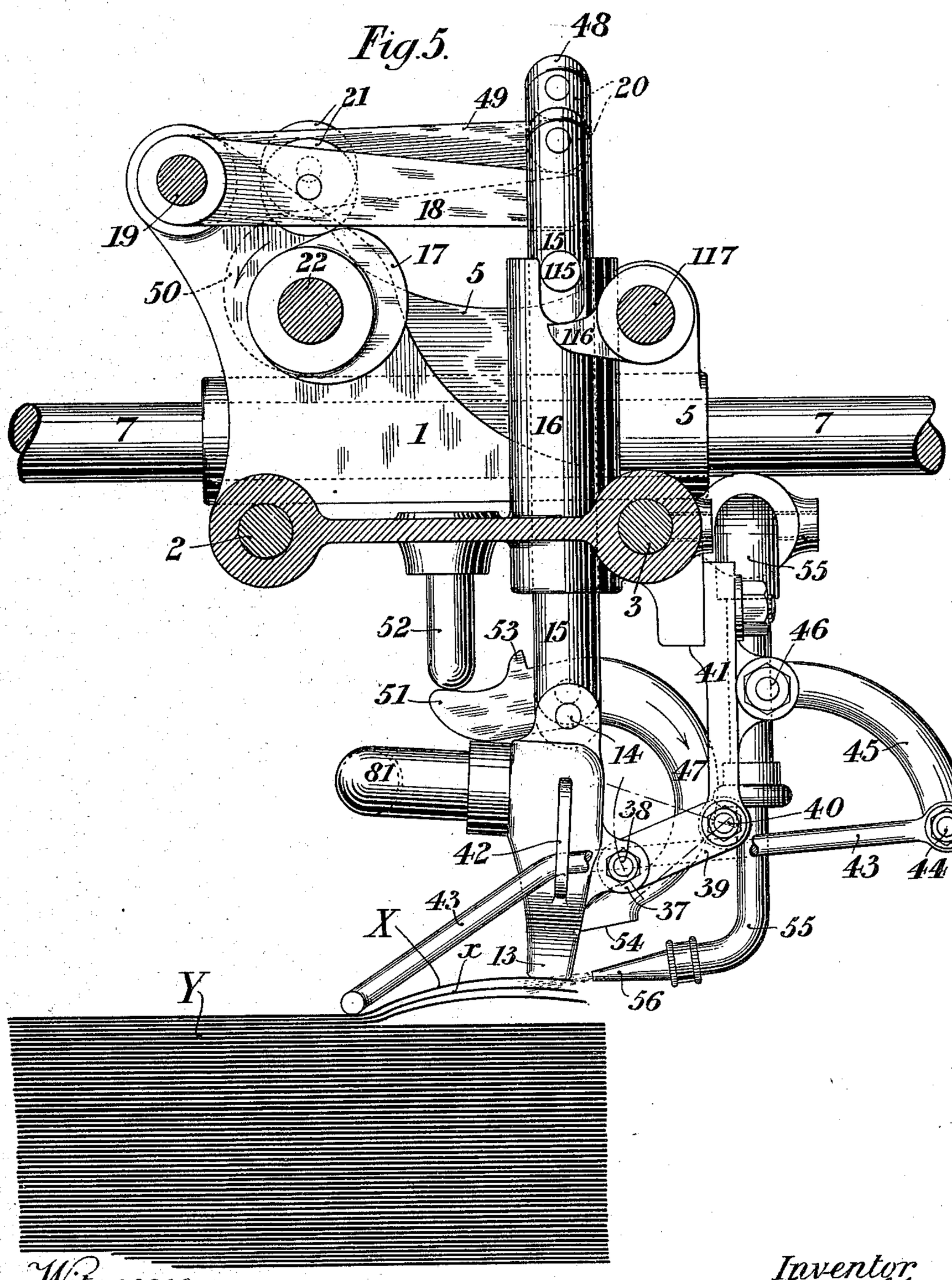
NO MODEL. 12 SHEETS—SHEET 4.

Fig. 5.



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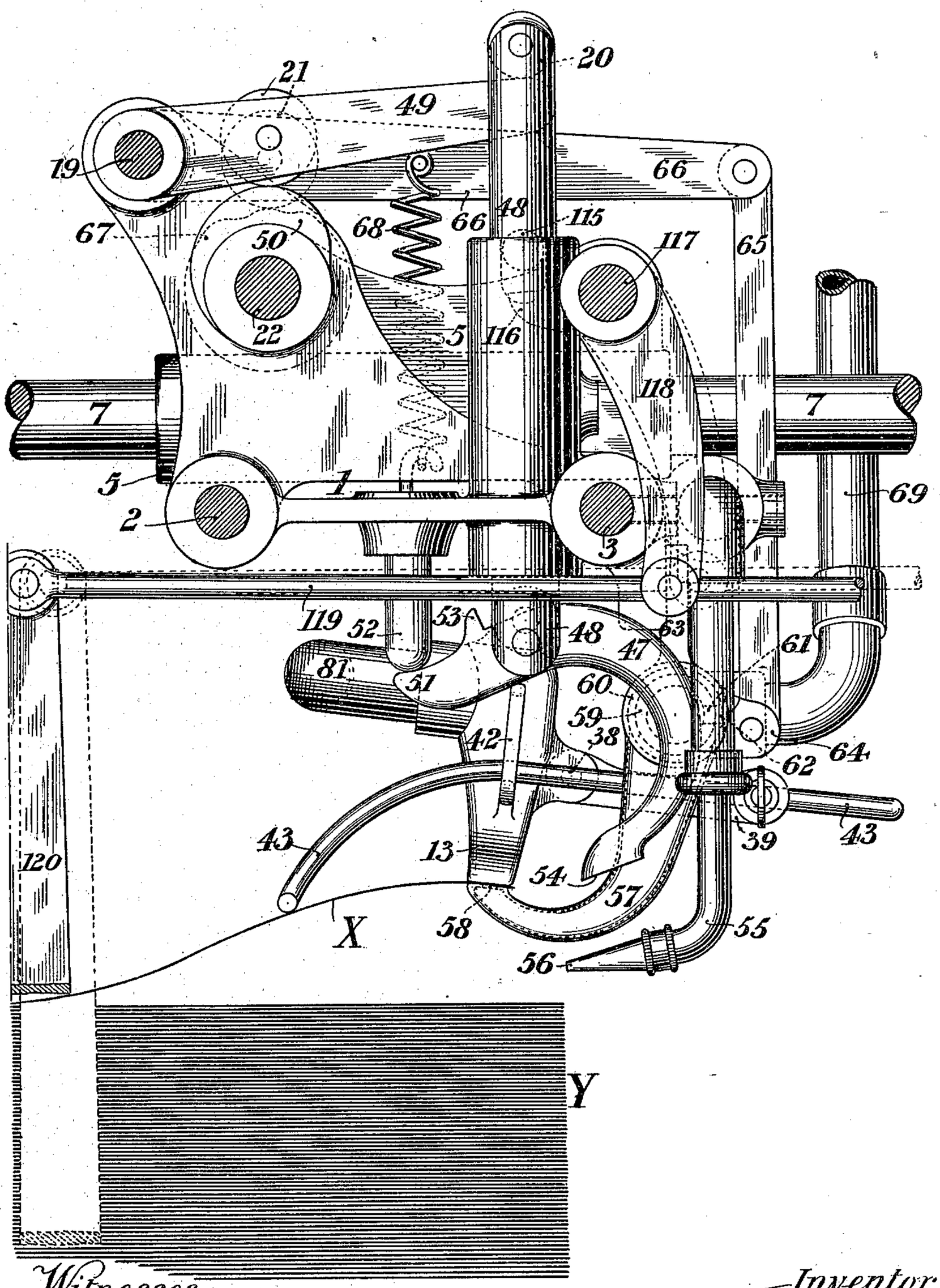
NO MODEL. 12 SHEETS—SHEET 6.

Fig. 6.



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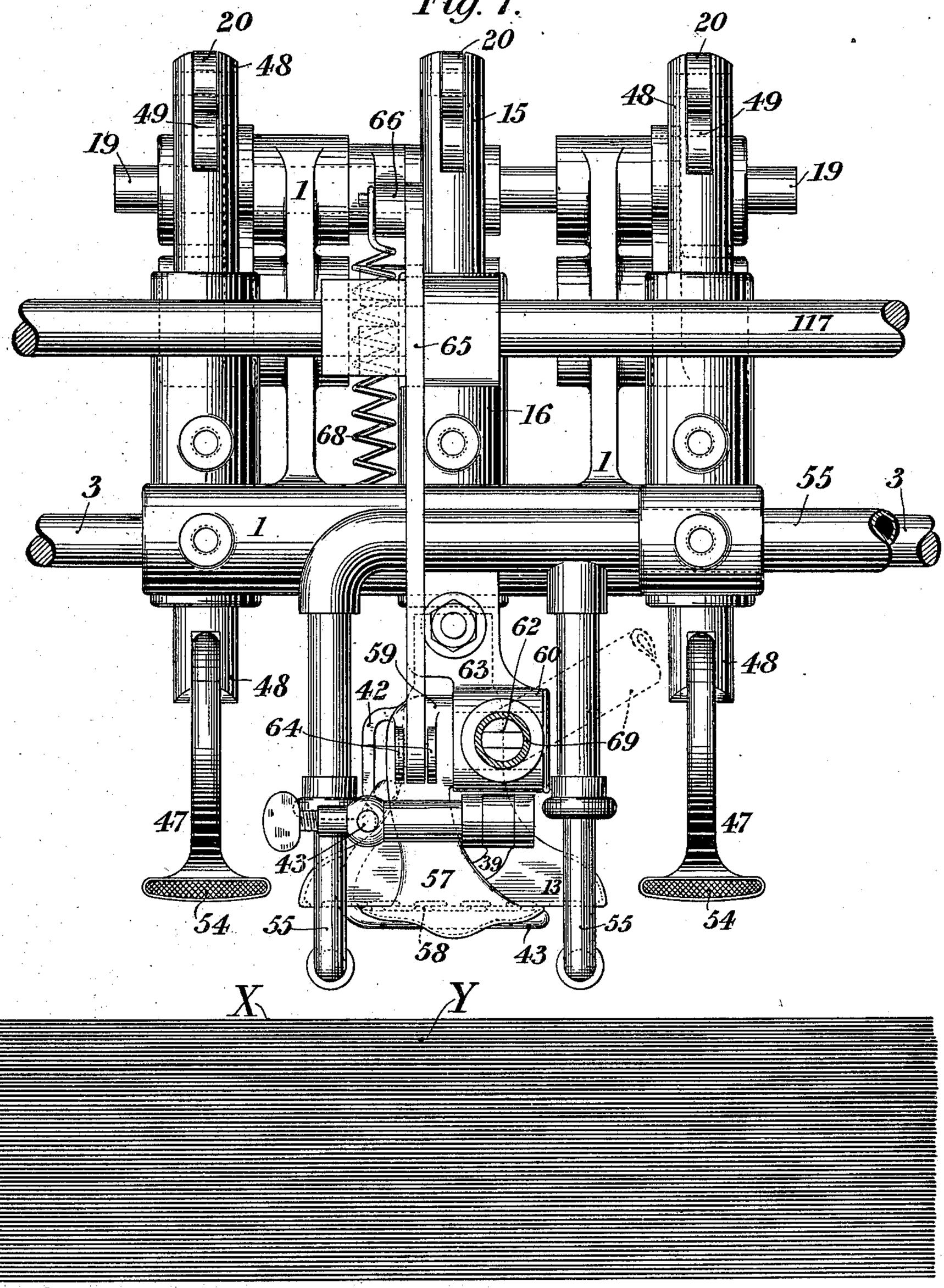
NO MODEL. 12 SHEETS—SHEET 6.

Fig. 7.



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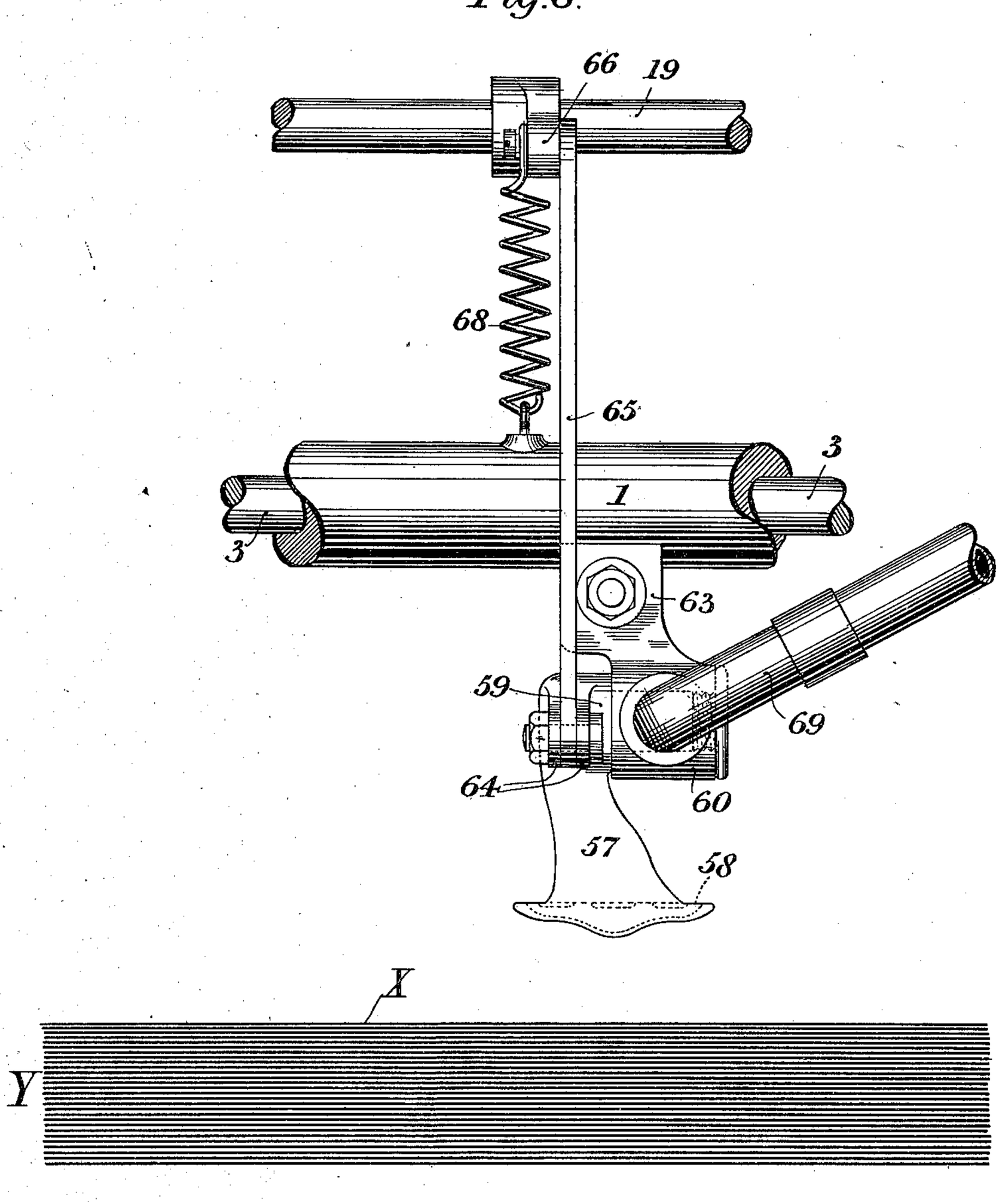
NO MODEL. 12 SHEETS—SHEET 7.

Fig. 8.



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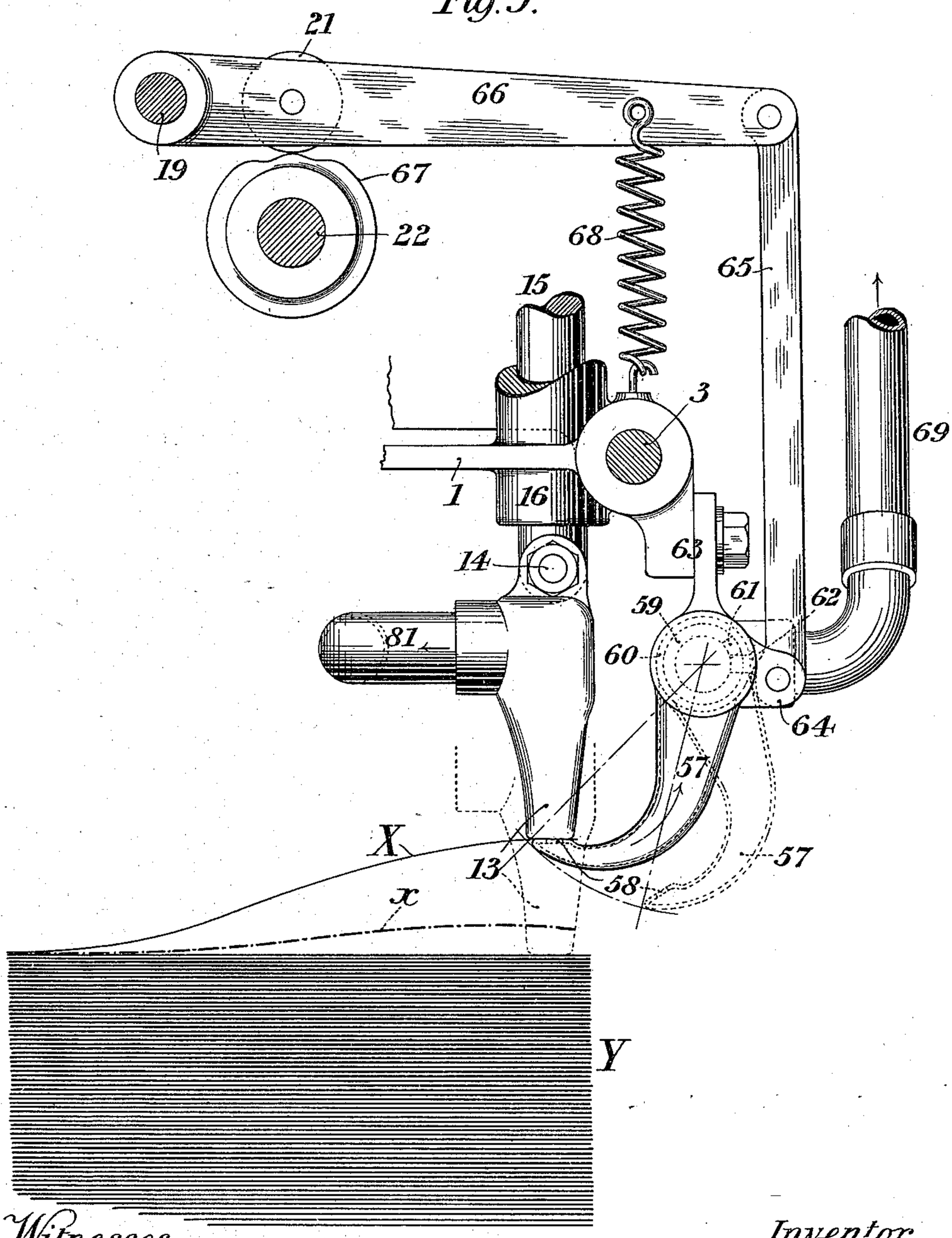
NO MODEL. 12 SHEETS—SHEET 8.

Fig. 9.



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PAPER FEEDING MACHINE.

APPLICATION FILED MAY 20, 1901.

NO MODEL. 12 SHEETS—SHEET 9.

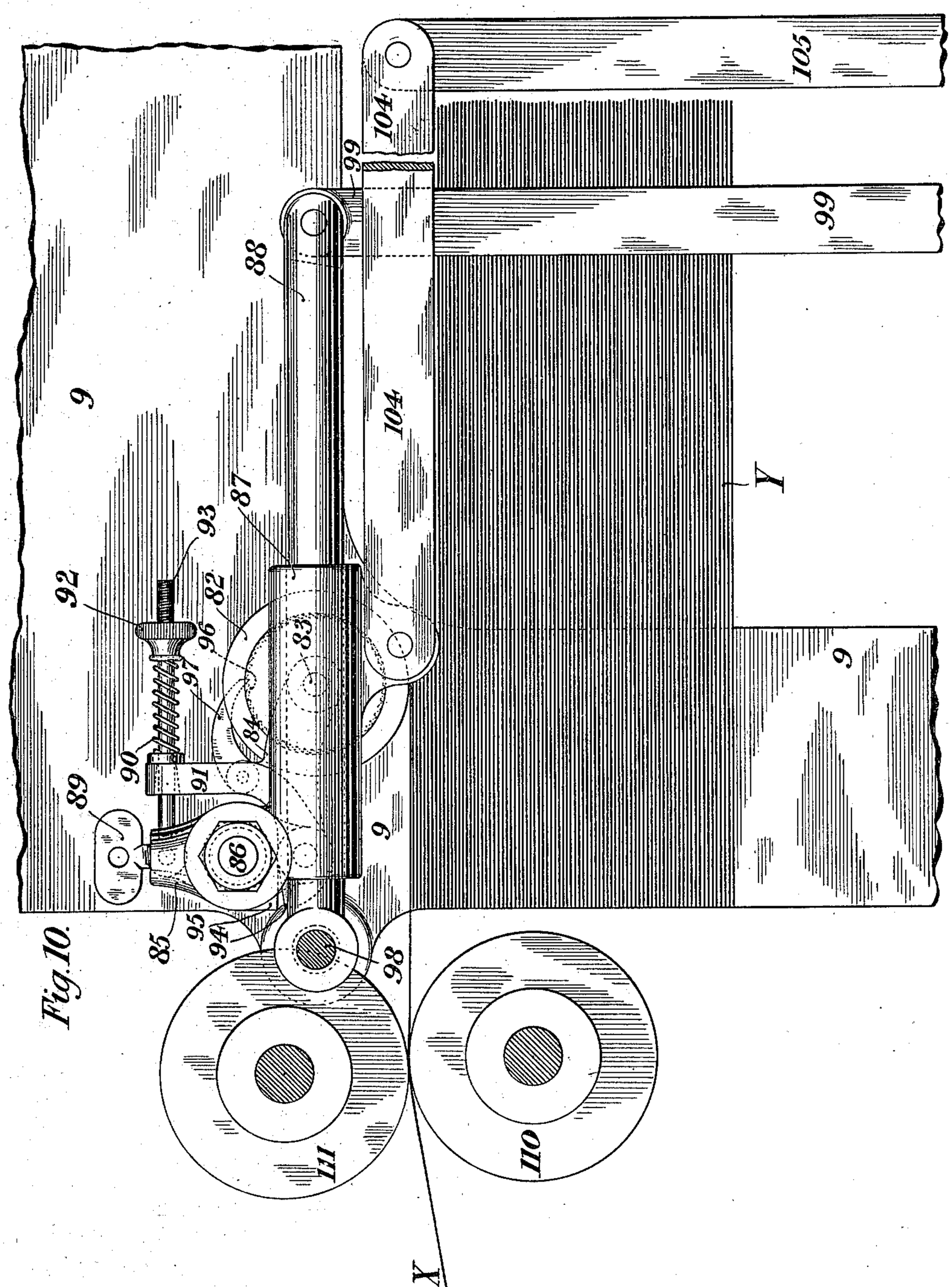

Fig. 10.

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PAPER FEEDING MACHINE.

APPLICATION FILED MAY 20, 1901.

NO MODEL. 12 SHEETS—SHEET 10.

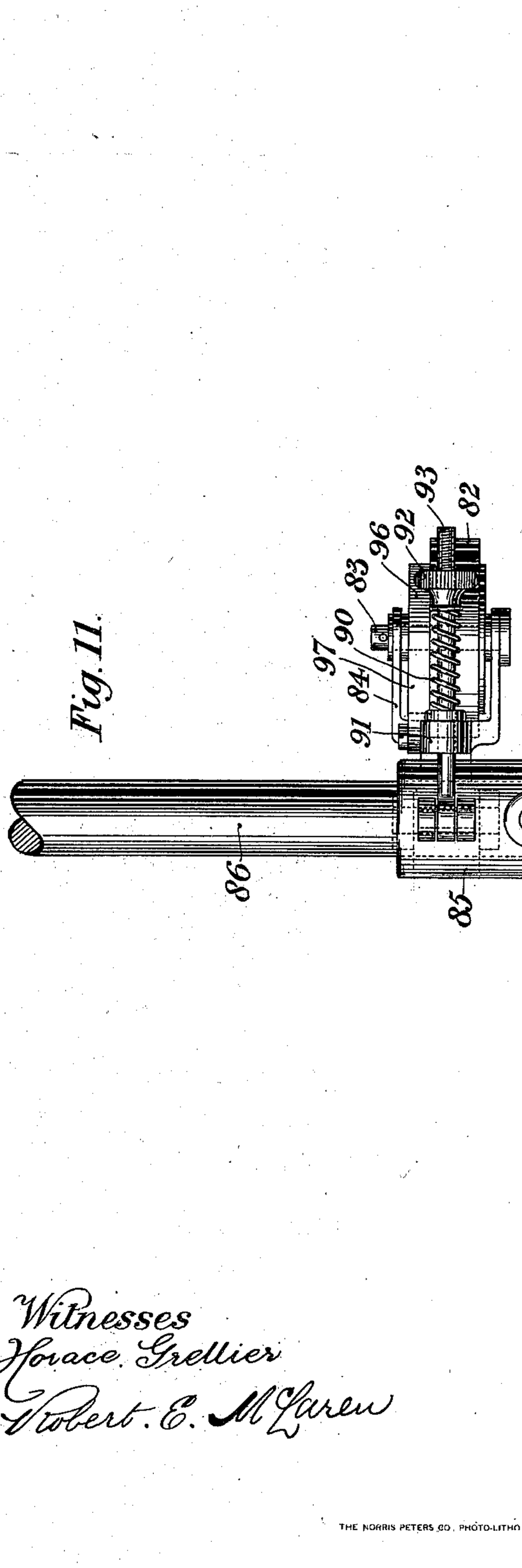

Fig. 11.

Witnesses
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PAPER FEEDING MACHINE.

APPLICATION FILED MAY 20, 1901.

NO MODEL. 12 SHEETS—SHEET 11.

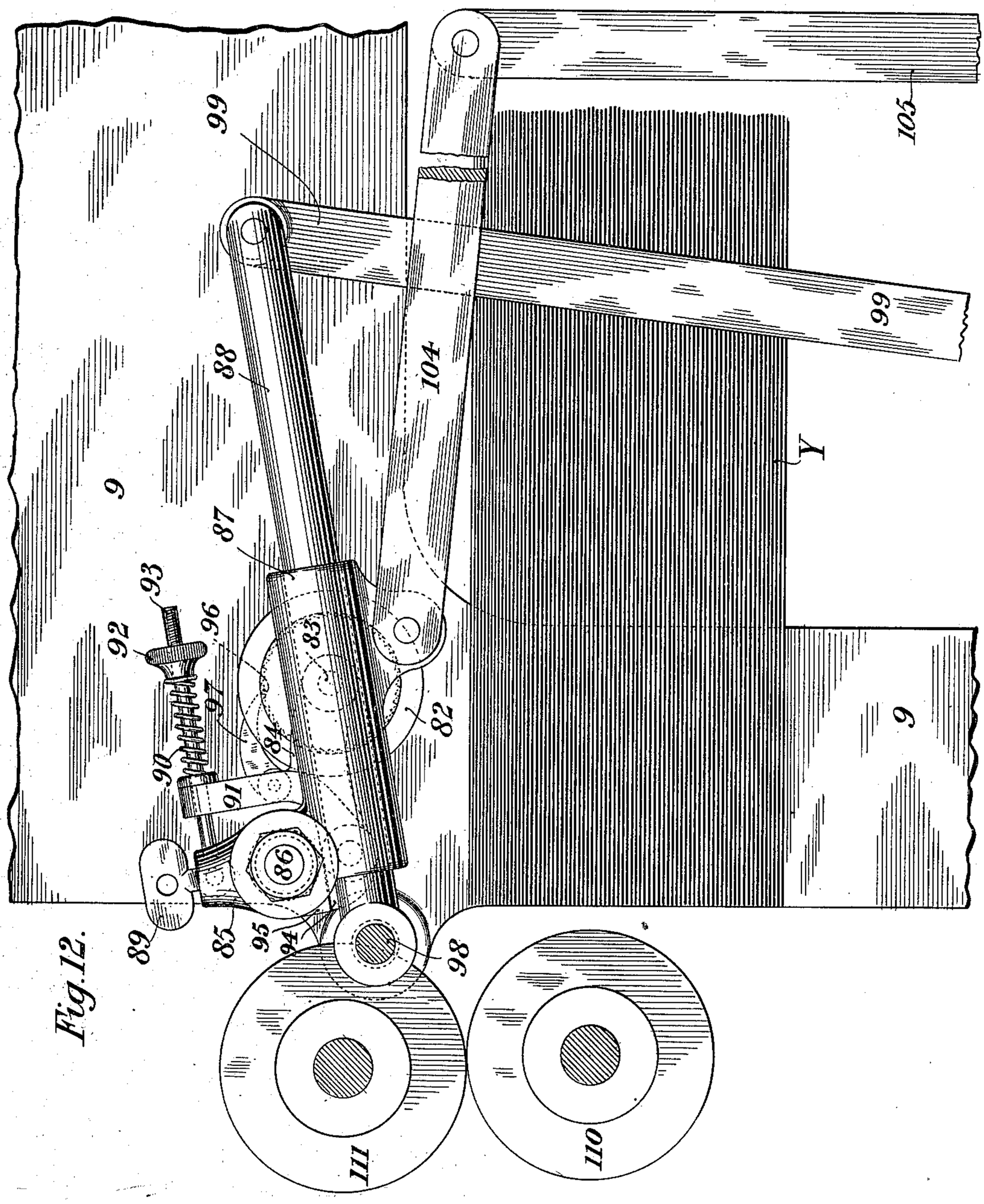

Fig. 12.

Witnesses.
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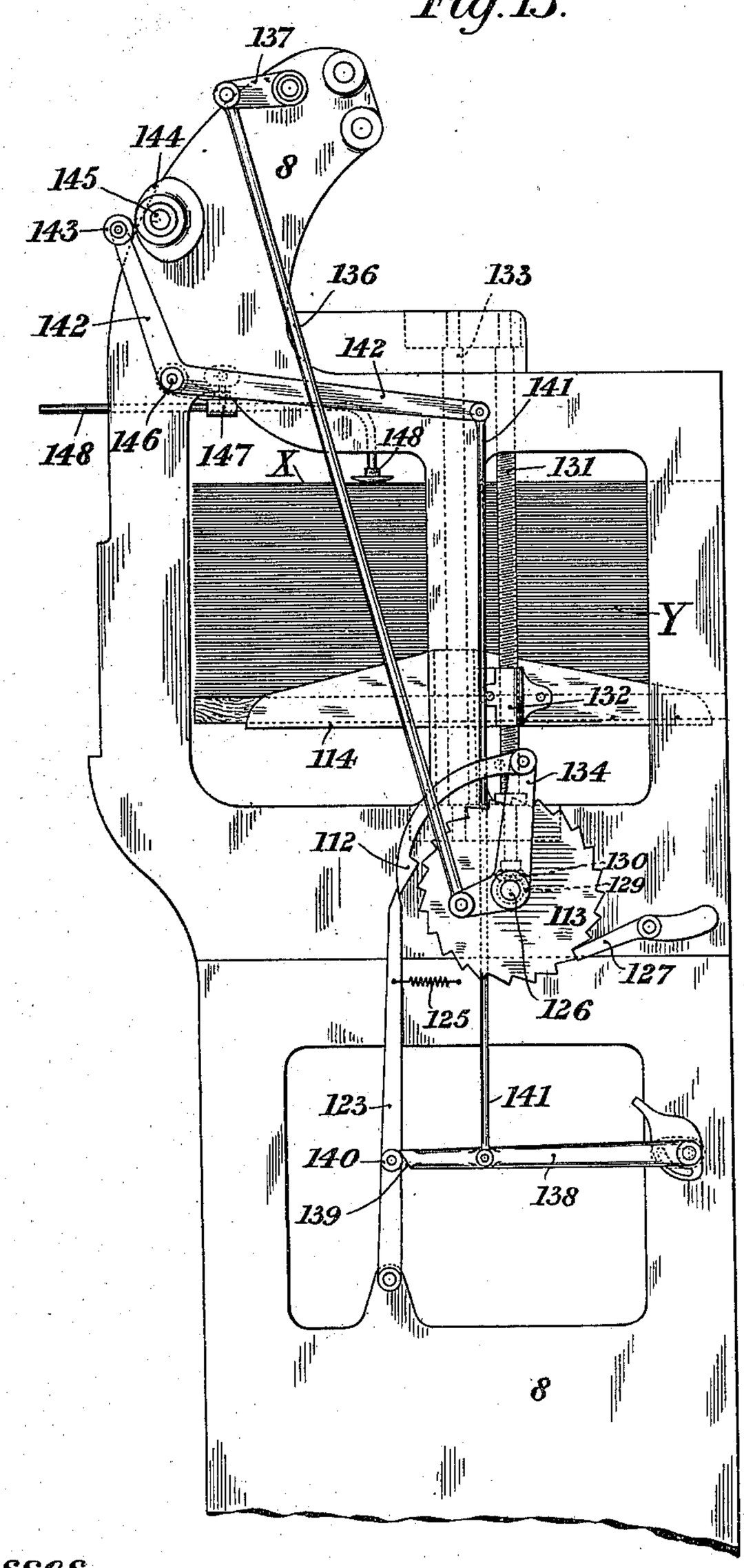
PAPER FEEDING MACHINE.

APPLICATION FILED MAY 20, 1901.

NO MODEL. 12 SHEETS—SHEET 12.

Fig. 13.



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No. 734,670. Patented July 28, 1903.

UNITED STATES PATENT OFFICE.

EDWARD THOMAS CLEATHERO, OF ALTRINCHAM, ENGLAND.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 734,670, dated July 28, 1903.

Application filed May 20, 1901. Serial No. 61,125. (No model.)

To all whom it may concern:

Be it known that I, EDWARD THOMAS CLEATHERO, of The Hollies, Barrington road, Altrincham, in the county of Chester, England, have invented a certain new and useful Paper-Feeding Machine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in apparatus for feeding sheets to the tape-drums or their equivalent of printing and other machines dealing therewith, and includes improved means for, first, separating the top sheet from the pile and holding the other sheets down; second, transferring the said sheet to the tape-drums, and, third, maintaining the top of the pile at the proper level by automatically raising the feed-board on which the said pile stands from time to time as the feeder takes the sheets off it.

Referring to the accompanying drawings, which are to be taken as part of this specification and read therewith, Figure 1 is an elevation of the right-hand and Fig. 2 an elevation of the left-hand side of the complete machine; Fig. 3, a right-hand side elevation of the sheet separating and lifting apparatus in two different positions, one representing in full lines and the other in dotted lines; Fig. 4, a rear elevation of the said apparatus in the same position as that in which it is shown in dotted lines in Fig. 3; Fig. 5, a sectional side elevation showing the sheet separating and lifting apparatus in another position; Fig. 6, a right-hand side elevation, and Fig. 7 a rear elevation, of the sheet separating and lifting apparatus fitted with a pneumatic suction-feeler for detaching therefrom a second sheet adhering to the top one raised by the lifter; Fig. 8, a rear elevation of the pneumatic suction-feeler apart from the various other devices shown in Figs. 6 and 7; Fig. 9, a sectional side elevation of Fig. 8, together with the lifter; Fig. 10, a side elevation, and Fig. 11 a plan, of the apparatus for transferring the sheets to the tape-drums; Fig. 12, a view similar to Fig. 10, but showing the apparatus in a different position; and Fig. 13, a right-hand side elevation of part of the apparatus, showing the preferred arrangement of mechanism for automatically raising the feed-board. Fig. 13 is drawn to a scale larger than that to which Figs. 1 and 2 are drawn, and Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 are drawn to a still larger scale.

In carrying the first part of the invention into effect there are provided one or more feeder-heads 1 to carry each feeder. The number of these heads, and consequently of the feeders, is varied according to the number of piles to be fed from at one time or according to the width of the sheets, it being obvious that whereas a single feeder may, as in the example shown in the drawings, suffice to deal properly with a comparatively narrow sheet a comparatively wide sheet will be dealt with most advantageously by more than one feeder—say two. As many feeder-heads 1 as there may be are adjustably secured on two shafts 2 3, extending transversely across the upper part of the apparatus, these shafts being supported at their ends in two frames 4 5, Figs. 1 and 2, adjustably secured on bars 6 and 7, extending perpendicularly to the shafts 2 3, and rigidly secured to the two side frames 8 and 9, Figs. 1 and 2, of the principal machine. At their under sides the bars 6 and 7 are provided with rack-teeth 10, Fig. 4, with which engage spur-pinions 11, secured on the above-mentioned shaft 3, which by means of a hand-wheel 12, fixed thereon, may be rotated within the bearings provided for the said shaft in the frames 4 and 5. By these means the attendant or operator may adjust the feeder-heads 1 transversely (directly by hand) and longitudinally by turning the wheel 12, so that they may be brought to any desired working position between the side frames 8 and 9. They are secured in any such position by pinching-screws or equivalent devices. (Not shown in the drawings.)

Each sheet-lifter 13 acts pneumatically and by suction on the rear portion of the top sheet X near the middle of the rear edge thereof. It is pivoted at 14 to the bottom end of a lifter-rod 15, capable of a vertical reciprocating motion in a suitable guide 16 in the feeder-head 1 under the action of a cam 17 and a lever 18. The lever 18 at its forward end is pivoted on a rod or shaft 19, supported in the feeder-head 1, and at its rear end it engages

with an antifriction-roller 20, pivoted in the forked upper end of the lifter-rod 15, the said lever being provided with an antifriction-roller 21, which is retained in contact with the cam 17 under the weight of the lifter-rod 15 and its direct attachments, assisted, if desired, by a spring. The cam 17 is "feathered" on a transverse shaft 22, supported at its ends in bearings in the two frames 4 and 5, and at the outer side of the frame 5 the shaft 22 has secured on it a miter-toothed wheel 23. This wheel 23, as shown in Fig. 2, gears with a similar wheel 24, feathered on a horizontal shaft 25, which through bevel-toothed wheels 26 27, vertical shaft 28, bevel-toothed wheels 29 30 31, inclined shaft 32, and bevel-toothed wheels 33 34 is continuously rotated from the main or first driven shaft 35. The shafts 25, 28, and 32 are supported in suitable bearings secured to or formed in part with the side frame 9, and the main shaft 35 and various other operative shafts of the machine are supported in bearings provided in or on the two side frames 8 and 9. The shaft 35 has secured on it a fly-wheel 36, and it is rotated from any outside source of rotary motion by any convenient means, which, however, are not shown in the drawings. The lifter 13 at its rear side is provided with lugs 37, by which it is pivoted at 38 to the front end of a link 39, the rear end of which is pivoted at 40 to the lower end of a bracket or arm 41, depending from and rigidly secured to the lifter-head 1. The pivot 40 is at such a height that the pivot 38 when in its lowest position is at a lower and when in its highest position is at a higher level than the said pivot 40, so that when the lifter 13 is being raised it makes an arcual motion forward in a vertical plane, as indicated in dot-and-dash lines in Fig. 5, for a purpose hereinafter specifically described. At the two sides of the lifter 13 are provided loops 42, through which loosely pass pressers or fingers 43, whereof the front ends are bent outward and are adapted to bear on the top sheet X of the pile Y, and the rear ends are pivoted at 44 to a link 45, pivoted at 46 to the before-described downwardly-depending arm 41. For convenience of illustration the presser or finger 43 (shown in Fig. 5) is represented as partly broken away. With each of the lifters 13 and the operating mechanism thereof there is combined one or more arc-shaped presser-feet 47, (two are represented in the drawings,) each pivoted to the lower end of a rod 48, alternately raised and allowed to descend by a lever 49 and cam 50 in practically the same manner as that described with reference to the ascent and descent of the lifter-rod 15. The levers 49, like that (18) appertaining to the lifter 13, are pivoted on the shaft 19 and are provided with antifriction-rollers 21 and at their free or vibrating ends bear against the under side of antifriction-rollers 20, pivoted in the forked upper ends of the presser-foot rods 48. Each of the presser-feet 47 presents its convexity to the rear of the machine and is pivoted to its rod 48, so as to rock in a vertical plane, and the major and heavier portion thereof is to the rear of the said rod. Its front and lighter portion 51 is adapted to engage with a projection 52, extending downward from the feeder-head 1, and carries a shoulder or abutment 53, adapted to engage with the front side of the rod 48 when the preferably roughened sole 54 of the presser-foot 47 is horizontal, as shown in Fig. 3.

The action of the before-described devices is as follows: The presser-feet 47 being raised and the transverse pressers or fingers 43 and the lifter 13 being on the top sheet X of the pile Y, as shown in dotted lines in Fig. 3, and suction having been established in the lifter, as hereinafter described, the lifter-cam 17 engages the lever 18 and raises the lifter-rod 15, so that the lifter 13 is also raised and lifts the top sheet X off the pile Y, and at the same time through the influence of the link 39 it makes an arcual motion forward in a vertical plane. By these means, as shown in Fig. 5, the top sheet X is buckled in front of the lifter 13 transversely of the pile, so as to make any following sheets x, should such have adhered to it up to that stage, separate from it and fall back onto the pile. The buckling of the paper is arcual, or approximately so, in cross-section, and it is assumed that the shorter the radius of that arc is the more likely is the second sheet to drop away from the top one, and it is for the purpose of thus limiting the width of the buckling that the pressers or fingers 43 are provided, these pressers, as shown in Fig. 5, remaining down on the pile during the first portion of the ascent of the lifter 13. The cams 50 allow the presser-feet 47 to descend at the same time as the cam 17 raises the lifter 13, and when the latter has ascended through about half of its travel and through the engagement of the lower ends of the loops 42 with the pressers or fingers 43 raised the latter off the pile Y the rear portions of the presser-feet 47 have descended and the shoulders or abutments 53 engage with the presser-foot rods 48, after which the soles 54 of the presser-feet, being parallel with the second and following sheets of the pile Y, descend onto the latter under or behind the lifted and buckled top sheet X, which it has cleared, owing to its own arcual shape and motion, as will be clearly understood by reference to Fig. 3. As the presser-feet 47 are raised their front ends 51 come into contact with the projections 52, so that, as shown in Fig. 5 and in dotted lines in Fig. 3, the said presser-feet are rocked into their original positions. When the cam 17 allows the lifter 13 to descend, the pressers or fingers 43, following for a time the downward movement of the loops 42, also descend onto the pile Y. While the top sheet X is being lifted, as before described, and after any sheet which may have

adhered to it has dropped back onto the pile, air-blasts are sent forward under the top sheet to "float" it, so to speak, up from off the pile in the well-known way. For this purpose the feeder-head 1 carries suitable pipes 55, terminating in nozzles 56, standing to the rear of the pile Y, a short distance above it and pointing downward, these pipes 55 being connected together, as shown, and also in any convenient way connected with the pump hereinafter described or other source of air-presser supply.

The invention includes the following additional device (illustrated in Figs. 6, 7, 8, and 9) for separating or insuring the separation of a second and adhering sheet from the top one upon which the lifter 13 is acting at the time: A pneumatic suction-feeler 57, having a forwardly and upwardly presented mouth 58, terminates at its upper part in a body 59, resembling a cock-plug in so far that it turns within a casing or barrel 60 and has a port 61, adapted to be placed in and out of register with a port 62 in the casing or barrel 60. The latter is rigidly secured to the feeder-head 1 by lugs 63. The body 59, or, as it is hereinafter termed, the "plug," or the suction-feeler 57, is provided with lugs 64, pivotally connected to the lower end of a link 65, the upper end of which is similarly connected to a lever 66, pivoted on the before-mentioned shaft 19. The lever 66 is raised by a cam 67, secured on the before-described shaft 22, acting on an antifriction-roller 21, and it is depressed by a spring 68, connected to the said lever and to the feeder-head 1, so that through the link 65 the suction-feeler 57 is rocked from the position in which it is shown in full lines (in which position its mouth is against or immediately beneath the mouth of the lifter 13) to that in which it is shown in dotted lines in Fig. 9, and vice versa, the two before-described ports 61 and 62 being coincident when the feeler is in the full-line position and non-coincident when it is in the dotted-line position. A pipe 69 places the casing or barrel 60 in communication with the suction apparatus, and the action of the feeler 57 is to follow the sheet or sheets raised by or following the lifter 13. When it overtakes the said sheet or sheets, the suction which has at that time been duly established in it will cause the sheet or the lowermost of such sheets to adhere to it, so that when immediately thereafter the cam 67 swings the feeler 57 away from the lifter 13 and if a second sheet had ascended with the lifter and not fallen back onto the pile it carries the said sheet along with it. The ports 61 and 62 are moved out of coincidence immediately the suction-feeler 57 passes from beneath the lifter 13, so that the sheet (previously adhering to the said feeler when the said ports coincided) becomes detached therefrom and falls back onto the pile. A sheet so detached and falling is represented in dot-and-dash lines in Fig. 9. When, however, only one sheet is raised by the lifter 13, the suction exerted at the mouth of the feeler 57 being less than that exerted at the mouth of the lifter 13 by reason of the difference in the total area of the openings of the respective mouths fails to pull that sheet from the lifter and the feeler 57 is swung back without having effected any service.

There may be used in combination with the presser-feet 47 an adjustable spring-actuated presser-foot of the well-known type, adapted to press normally at each rear corner of the pile Y or the top sheet thereof, but with a pressure light enough to allow the two rear corners of the said sheet being drawn from under them by the pull of the lifter 13.

The pump above mentioned may be either of the reciprocating-piston type or rotary type. If of the former type, as shown in Figs. 1 and 2, wherein it is marked 70, its piston 71 may be actuated by a cam 72 on the main shaft 35 through the instrumentality of a lever 73, pivoted at 74 to the side frame 9 and connected by links 75 to the piston-rod 76. To the lower end of the pump 70 is connected a pipe 77, extending upward to a valve-chamber 78, from which branch out two pipes 79 and 80, the former connected to the branch 81 of the lifter 13 and to the before-mentioned pipe 69 of the feeler 57. Sections of suitable flexible tubing are interposed between the rigid portions of the tubing to admit of the adjustment and operation of the lifter and feeler. The pipe 80 is flexibly connected to the blast-pipes 55 and nozzles 56. As the pump 70 draws in air through the mouth of either the lifter 13 or feeler 57 or through the blast-nozzles 56 or through a plurality of these devices, any necessary cut-off valves are combined with the respective air-pipes.

As a rotary pump produces a constant suction and a constant blast at the same time when such is used in connection with the before-described apparatus, suitable valves arranged to act at the proper times must be combined with the respective air-pipes.

In carrying the second part of the invention into effect the actual sheet-transferrer, as shown in Figs. 1 and 2 and in detail in Figs. 10, 11, and 12, is one or more (preferably two) disks or rollers for each pile. The distinguishing features of the improved transferrer are its compactness, its novel guides, their compound motions which impart the desired motion to each roller, and the simplicity of the means by which those motions derived directly from the main shaft of the principal machine are communicated to the transferrer. Each disk 82, whose periphery is composed of or coated with india-rubber or which is otherwise provided with a roughened or frictional periphery, is carried on an axle 83, secured in a fork 84, pivoted at its front end to a block 85, adjustable along a transverse rod 86, but incapable of rotary motion about the latter. Each end of the transverse rod 86 is secured in a carriage 87,

adapted to slide upon a longitudinal rod 88, there being one of these carriages 87 and rods 88 at each side of the principal machine or on each side of each transferrer. The blocks 85 may be moved to any desired position of adjustment along the transverse rod 86 and may be secured in any such position by means of clamping screws 89. The pressure exerted on the pile Y by each of the disks or rollers 82 is adjustable by any suitable device, such as a spring 90, compressible between an extension or arm 91 of the fork 84 by a screw-threaded nut 92 on a bolt or rod 93, pivoted to the block 85. A suitable stop, such as the abutments 94 and 95 on, respectively, the fork 84 and block 85, prevents the disk 82 dropping too low. Each of the disks or rollers 82 is provided with a ratchet-wheel 96, with which engages a gravity-pawl 97, pivoted to the arm 91 to prevent the said roller being rotated by its transferring-contact with the top sheet, while at the same time leaving it free to rotate when it is moved over the pile toward the rear of the machine. The longitudinal rods 88 are pivoted at their front ends, as at 98, to the side frames 8 and 9, and at their rear ends they are pivotally connected to the upper ends of links 99, the lower ends of which are similarly connected to arms 100, secured on a rocking shaft 101, which through an arm 102, Fig. 1, is oscillated by a suitable cam 103 on the main shaft 35, this mechanism serving to raise the disks or rollers 82 off the top sheet of the pile Y at the commencement of their backward movement and to allow them to descend onto the top sheet at the end of such rearward movement and before the commencement of the forward movement. Each of the carriages 87 has pivoted to it the forward end of a link 104, the opposite and rear end of which is pivoted to the top end of an arm 105, secured on a rocking shaft 106, which through an arm 107 and rod 108 is oscillated by an eccentric 109, secured on the main shaft 35. The action of this second part of the invention is as follows: Assuming that the eccentric 109 has pushed forward the carriages 87 and with them the disks or rollers 82, as in Fig. 10, which forward motion has inserted the front edge of the top sheet X between the tape-drums 110 111, the cam 103 begins to raise the rear ends of the rods 88 to lift the disks or rollers 82 off the pile, as in Fig. 12. The eccentric 109 then pushes the carriages 87 a little farther forward and gets them into their foremost position by the time the cam 103 has completed the lift of the disks or rollers 82. The eccentric 109 next begins to move the carriages 87 backward, the cam 103 at the same time beginning to drop or allow of the descent of the disks or rollers 82. By the time the carriages 87 are in their rearmost position the disks or rollers 82 are again down on the pile, whereupon the eccentric 109 again moves forward the carriages 87 to the point at which the disks will immediately thereafter be raised off the pile.

In carrying the third part of the invention into effect according to one arrangement the movement of the sheet-lifter 13 toward or onto the pile is used to detect the fact that the top sheet of the pile is below the normal level and also to communicate that fact to the feed-board-raising mechanism through a novel link and lever mechanism so constructed and proportioned that the short downward motion which alone is necessary to the lifter to communicate the above-mentioned fact to the feed-board-raising mechanism suffices to pull the pawl-controller away from the well-known pawl and allow the latter to drop into engagement with the ratchet-wheel. In this arrangement, as illustrated in Fig. 1, the pawl 112 is out of engagement with the ratchet-wheel 113 during the feed of a sheet or of several sheets, according to their thinness. The pitch of the teeth of the wheel 113 is such that the movement of the wheel through an arc equal thereto raises the feed-board 114 through a distance equal to the thickness of the thickest sheet. After the thickest sheet, or as many thin ones as equal it, has been fed off the pile the lifter 13 by its slightly-lower descent detects the fact that the top of the pile is below the normal level and communicates that fact to the feed-board-raising mechanism, so that the top of the pile is practically maintained at the proper level. To effect this, a stud 115 is positioned on the lifter-rod 15 to engage and (when the lifter finds the top of the pile below the normal level) depress an arm 116, feathered to a shaft 117, journaled in the before-described side frames 4 and 5 and having secured thereon an arm 118. This arm 118, through a link 119, rocks a lever 120, pivoted at 121, Fig. 1, to the main frame of the machine, and the lower end of this lever is connected by a link 122 with the pawl-controller 123, pivoted at 124 to the side frame 8. A suitable device, such as the spring 125, Fig. 1, is provided for returning the last-described link and lever mechanism to its normal position after it has by the stud 115 been deflected therefrom for allowing of the rotation of the ratchet-wheel 113. This wheel is secured on a shaft 126 and has a gravity-detent 127 engaging with it to prevent its backward rotation. The shaft 126 is journaled in the two side frames 8 and 9 and has secured on it a hand-wheel 128 and also two miter-wheels 129, the latter gearing with similar miter-wheels 130, secured on the lower ends of the vertical screw-shafts 131, engaging with nuts 132, secured to the feed-board 114, which latter is guided in its vertical movement by guides or rods 133. The above-mentioned pawl 112 is pivoted to one arm of a bell-crank lever 134, fulcrumed on the shaft 126 and rocked by an eccentric 135, secured on the main shaft 35.

When the top of the pile is below the nor-

mal level, and consequently the descent of the lifter 13 is correspondingly extended, the stud 115 and the various operative members 116, 117, 118, 119, 120, and 122 swing the pawl-controller 123 forward out of the path of the pawl 112, which thereby at its next upward movement engages with and partially rotates the ratchet-wheel 113, so as, through the vertical screw-shafts 131, to raise the feed-board 114 and the pile Y thereon to the normal level. The pawl-controller 123 is normally retained in the path of the pawl 112 by the spring 125, so that the pawl cannot at these times engage with the ratchet-wheel 113, and it is only when the pawl-controller 123 is deflected from this path, as above described, that the said pawl effects the raising of the feed-board 114. When it is desired to lower the feed-board 114—as, for example, when a new pile of paper is required in the machine—the pawl 112 and detent 127 are disengaged from the ratchet-wheel 113 and the shaft 126 is rotated in the necessary direction by the hand-wheel 128.

In the alternative form of mechanism shown in Fig. 13 for controlling the ascent of the feed-board 114 the pawl-carrying bell-crank lever 134 is oscillated on the shaft 126 through a link 136 from a rocking arm 137, to which vibratory motion is imparted in any convenient manner. The pawl-controller 123 is moved out of the path of the pawl 112 by means of an arm 138, pivoted to the frame 8, the inclined end 139 of the said arm being caused to bear upon an antifriction-roller 140 on the controller 123, whenever the top of the pile is below the normal level. For this purpose the arm 138 is pivoted to the lower end of a link 141, whose upper end is pivoted to one arm of a bell-crank lever 142, whereof the other arm carries an antifriction-roller 143, against which acts a cam 144, secured on a suitable rotating shaft 145. The bell-crank lever 142 is secured upon a short shaft 146, which extends through and is journaled in the adjacent frame 8, at the inner side of which the said shaft carries an arm 147, in which is adjustably secured a rod or finger 148, the free end of which is adapted to bear on the top of the pile.

When the top of the pile is at the normal level, the finger 148, bearing thereon, supports the arm 138 out of contact with the roller 140 or prevents it during its operation by the cam 144 reaching the said roller, so that under the influence of a light spring 125 the controller 123 is drawn into and maintained in the path of the pawl 112, which is thereby prevented from engaging with the ratchet-wheel 113. When, however, the top of the pile is below the normal level and the finger 148 occupies a correspondingly lower position, the arm 138, as shown in Fig. 13, engages the roller 140 and moves the controller to the outside of the path of the pawl 112, which consequently engages the ratchet-wheel 113 and through the screw-shafts 131 effects the necessary raising of the feed-board 114.

I claim—

1. In apparatus for feeding sheets to printing and other machines, the combination of an air-exhauster, a pneumatic sheet-lifter in communication with the air-exhauster, a rod pivoted to the sheet-lifter, cam mechanism for moving the rod vertically, means operatively connected with the lifter for imparting to it arcual movement in a vertical plane, an arc-shaped presser-foot, a rod pivoted to the presser-foot, cam mechanism for moving said rod vertically, devices in the path of the presser-foot for tilting it backward, a forwardly-directed nozzle, a source of air-pressure supply connected with the nozzle, a pneumatic feeler, cam mechanism for vibrating the said feeler to and from the lifter, valved connections between the feeler and the air-exhauster, pressers adapted to bear on the pile in front of the lifter, and projections on the lifter for raising the pressers, all substantially as set forth.

2. In apparatus for feeding sheets to printing and other machines, the combination with an air-exhauster, a pneumatic sheet-lifter in communication with the air-exhauster, a rod pivoted to the sheet-lifter, cam mechanism for moving the rod vertically, link devices operatively connected with the lifter for imparting to it arcual movement in a vertical plane, of pressers in operative connection with the lifter adapted to bear on the pile in front of the lifter and projections on the lifter for raising the pressers, substantially as set forth.

3. In apparatus for feeding sheets to printing and other machines, the combination with an air-exhauster, a pneumatic sheet-lifter in communication with the air-exhauster and cam mechanism in operative connection with the lifter for moving it vertically, of a pneumatic feeler in valved communication with the air-exhauster and cam mechanism operatively connected with the feeler for vibrating it to and from the lifter substantially as set forth.

4. In apparatus for feeding sheets to printing and other machines the combination with an air-exhauster, a pneumatic sheet-lifter in communication with the air-exhauster, cam mechanism in operative connection with the lifter for moving it vertically, of a pneumatic feeler, cam mechanism for vibrating the said feeler to and from the lifter, a port in the said feeler, a barrel or casing wherein the feeler is pivoted and a port in said barrel in communication with the air-exhauster and with which the feeler-port is intermittently moved into and out of register, substantially as set forth.

5. In apparatus for feeding sheets to printing and other machines, the combination with an air-exhauster and a pneumatic sheet-lifter in communication therewith of a pneumatic

feeler also communicating with the air-exhauster, cam mechanism operatively connected with the feeler for vibrating its mouth into and out of juxtaposition with that of the lifter, less suction being exerted at the mouth of the feeler than at the mouth of the lifter, substantially as set forth.

6. In apparatus for feeding sheets to printing and other machines, the combination with the fixed frames, of two guide-rods pivoted thereto, carriages movable along the guide-rods, a transverse rod secured in the carriages, a block adjustable on the transverse shaft, a roller and a detent for the roller, on the block, a pressure-adjuster for the roller and mechanism in operative connection with the guide-rods and carriages for tilting them and traversing the carriages on the guide-rods, substantially as set forth.

7. In apparatus for feeding sheets to printing and other machines, the combination with the fixed frames, of two guide-rods pivoted thereto, carriages movable along the guide-rods, a transverse rod secured in the carriages, a block adjustable on the transverse shaft, a bracket or fork pivoted to the block, a roller, and a detent for the roller, pivoted to the bracket, and mechanism in operative connection with the guide-rods and carriages for tilting them and traversing the carriages on the guide-rods, substantially as set forth.

8. In apparatus for feeding sheets to printing and other machines, the combination with the fixed frame, two guide-rods pivoted thereto, carriages movable along the guide-rods, a transverse rod secured in the carriages, a block adjustable on the transverse shaft, a bracket or fork pivoted to the block, and a roller pivoted to the bracket, of a pressure-adjuster for the roller comprising an arm on the bracket, a screw-threaded rod pivoted to the block and traversing the arm, a nut on the screw-threaded rod and a compression-spring between the arm and the nut, substantially as set forth.

9. In apparatus for feeding sheets to printing and other machines, the combination with a pneumatic sheet-lifter, a movable feed-board supporting the pile of sheets and ratchet-and-pawl mechanism for moving the feed-board, of a pawl-controller movable on the frame and lever-and-link mechanism operatively connecting the lifter and controller whereby the controller is moved into and out of the path of the pawl, substantially as set forth.

10. In apparatus for feeding sheets to printing and other machines, the combination with a movable feed-board supporting the pile of sheets and ratchet-and-pawl mechanism for moving the feed-board, of a pawl-controller movable on the frame, a cam-ended lever, engaging the pawl-controller, a rocking shaft in operative connection with the lever, and a feeler or finger, adjustable on the rocking shaft and adapted to rest on the pile, substantially as set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

EDWARD THOMAS CLEATHERO.

Witnesses:
ARTHUR H. SMITH,
HERBERT PARKER.