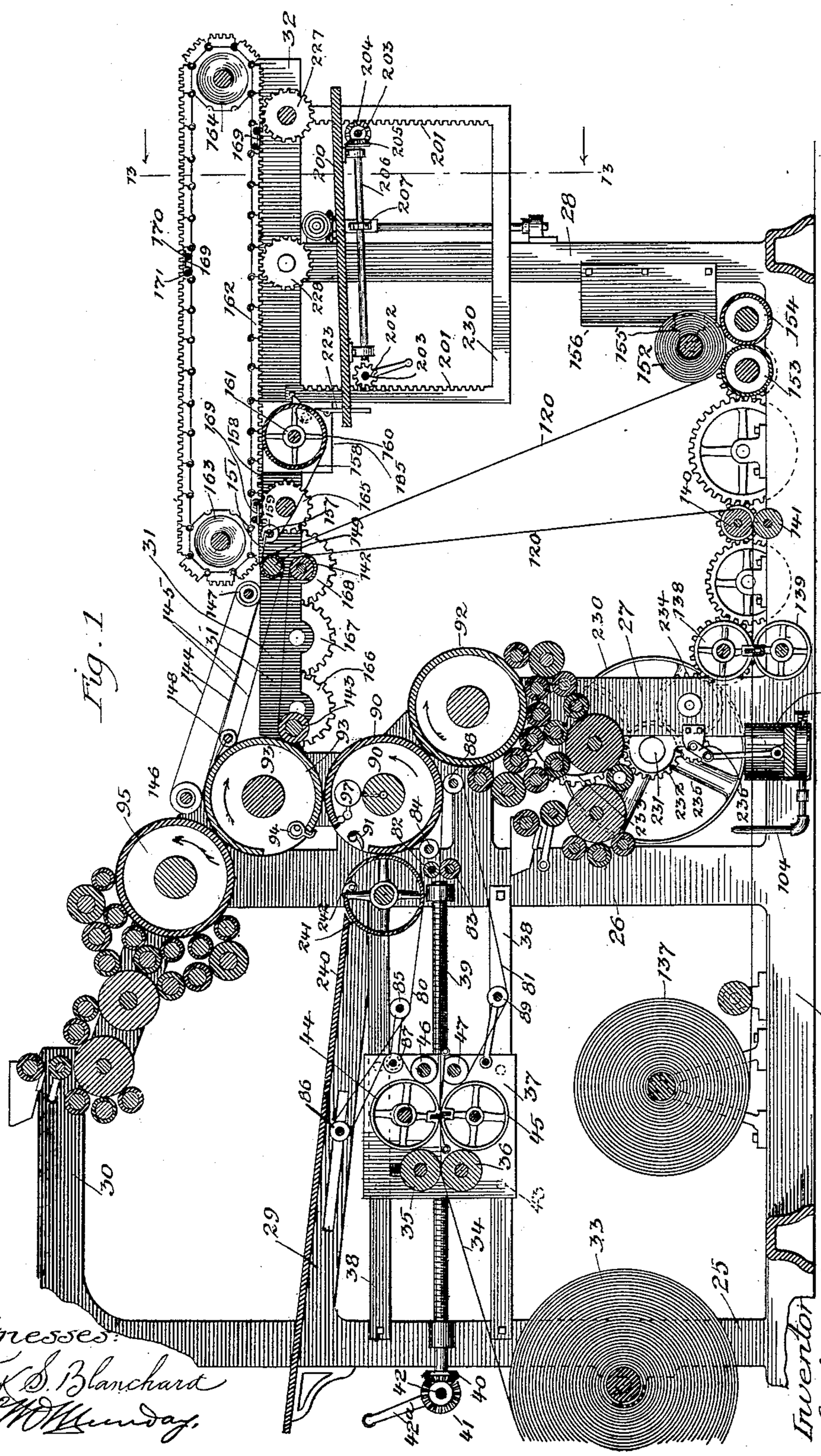
No. 677,408. Patented July 2, 1901.

C. B. FUNK.

PRINTING PRESS.

(Application filed Mar. 14, 1900.)

(No Model.) 8 Sheets—Sheet 1.



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No. 677,408. Patented July 2, 1901.

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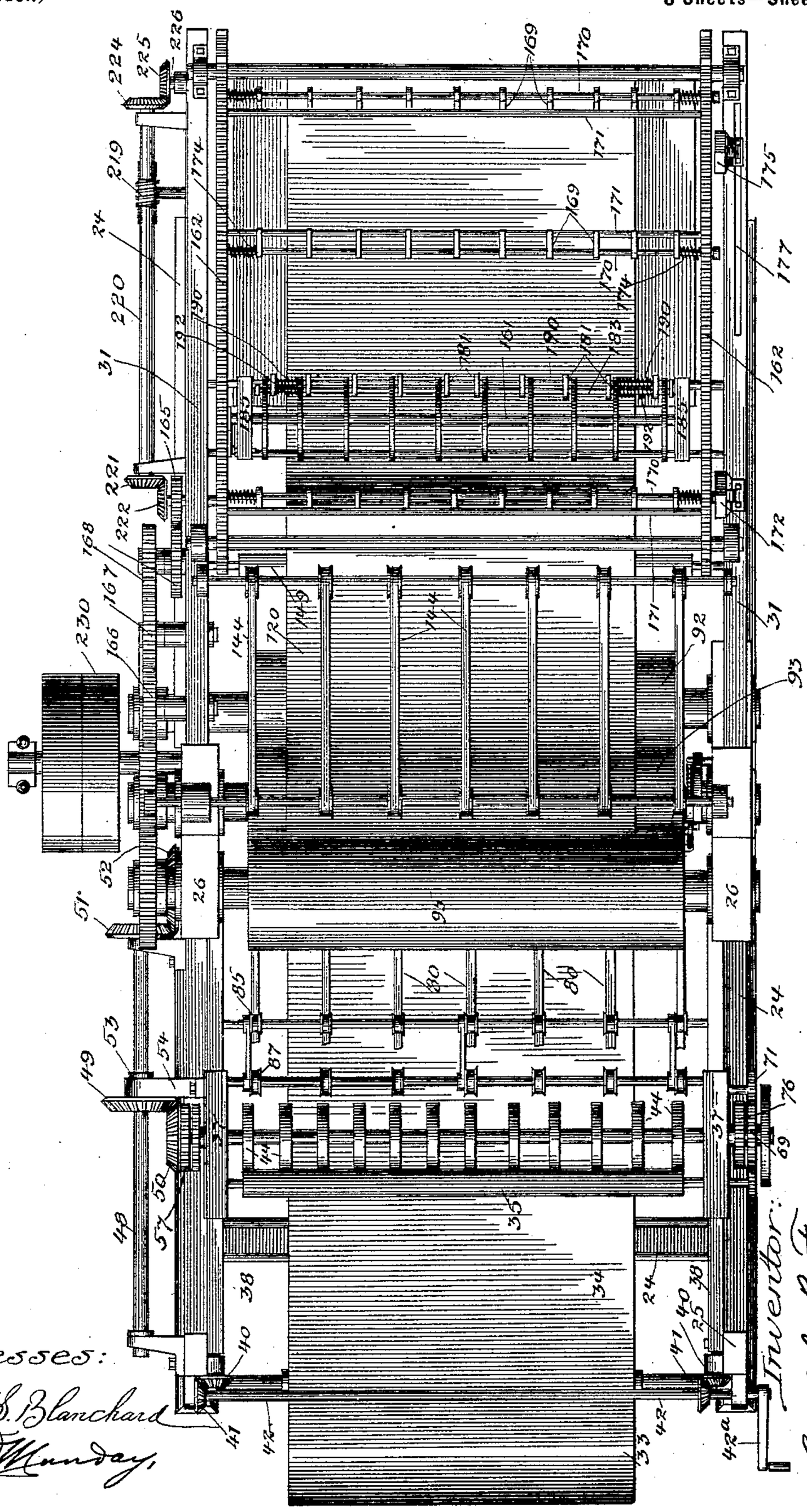
(Application filed Mar. 14, 1900.)

(No Model.) 8 Sheets—Sheet 2.

Fig. 2.



Witnesses:
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(No Model.) 8 Sheets—Sheet 3.

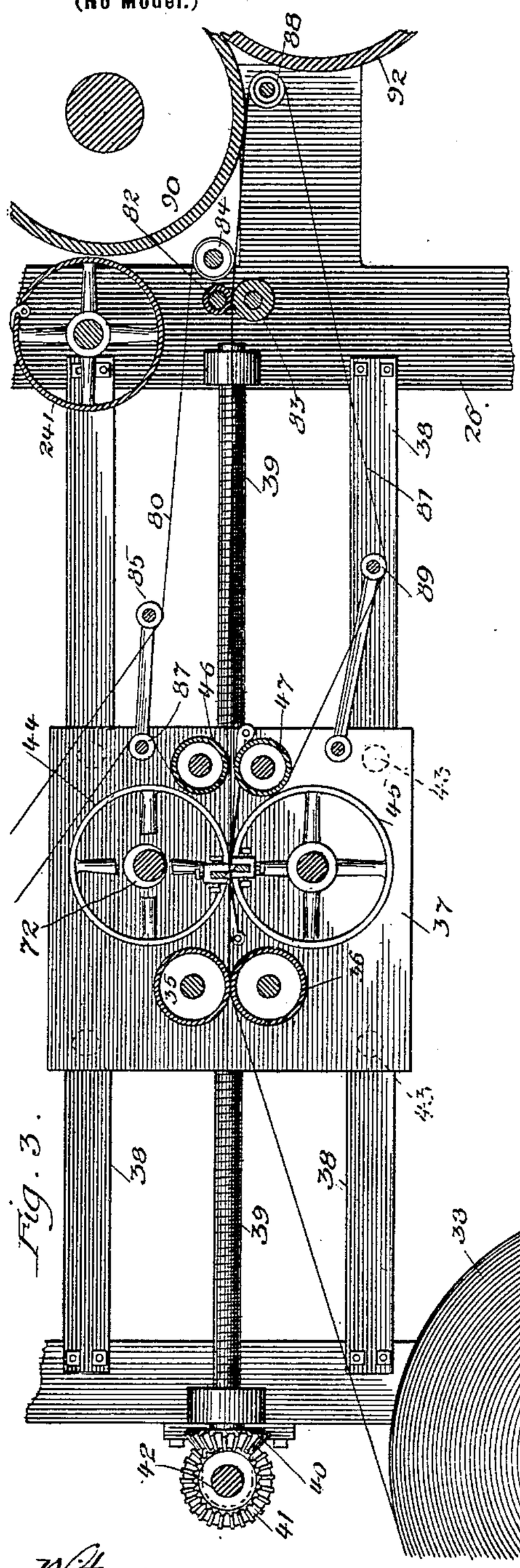

Fig. 3.

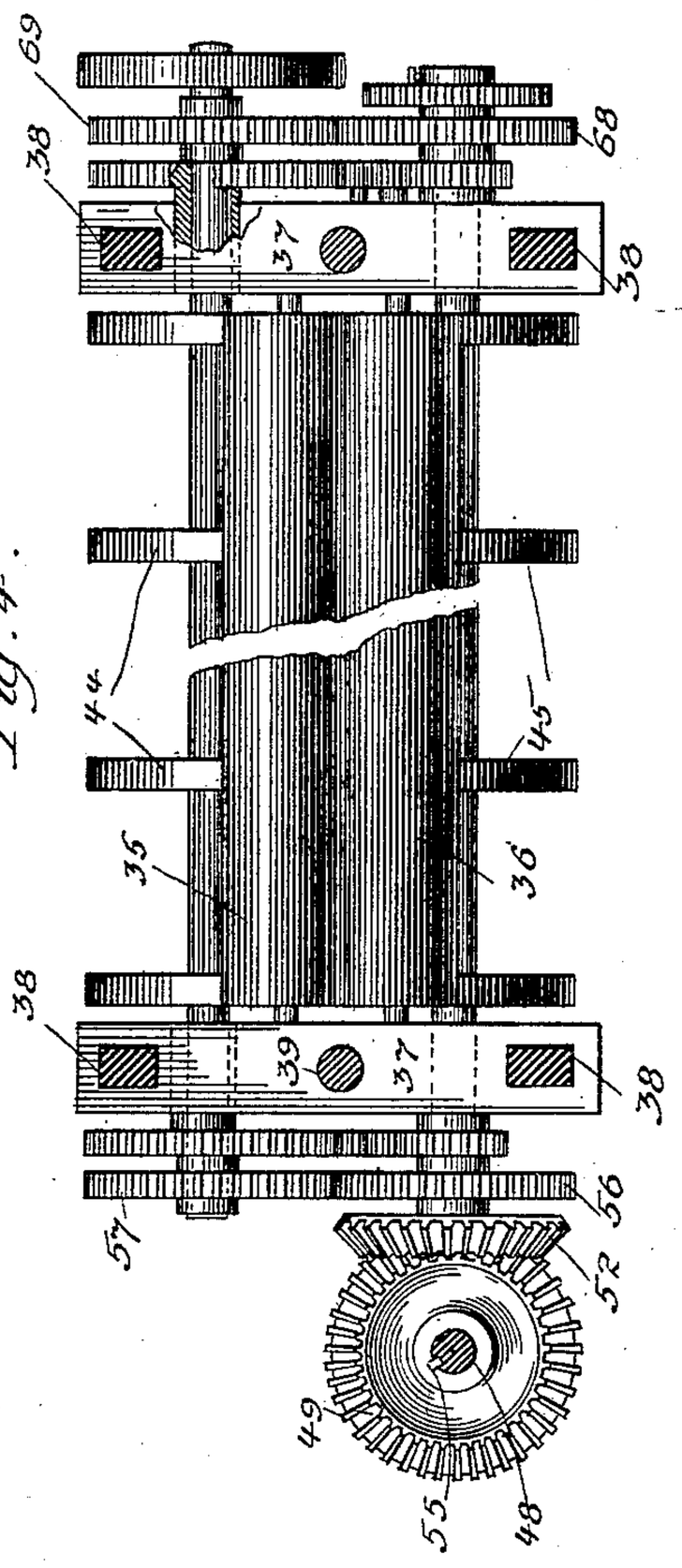

Fig. 4.

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(No Model.) 8 Sheets—Sheet 4.

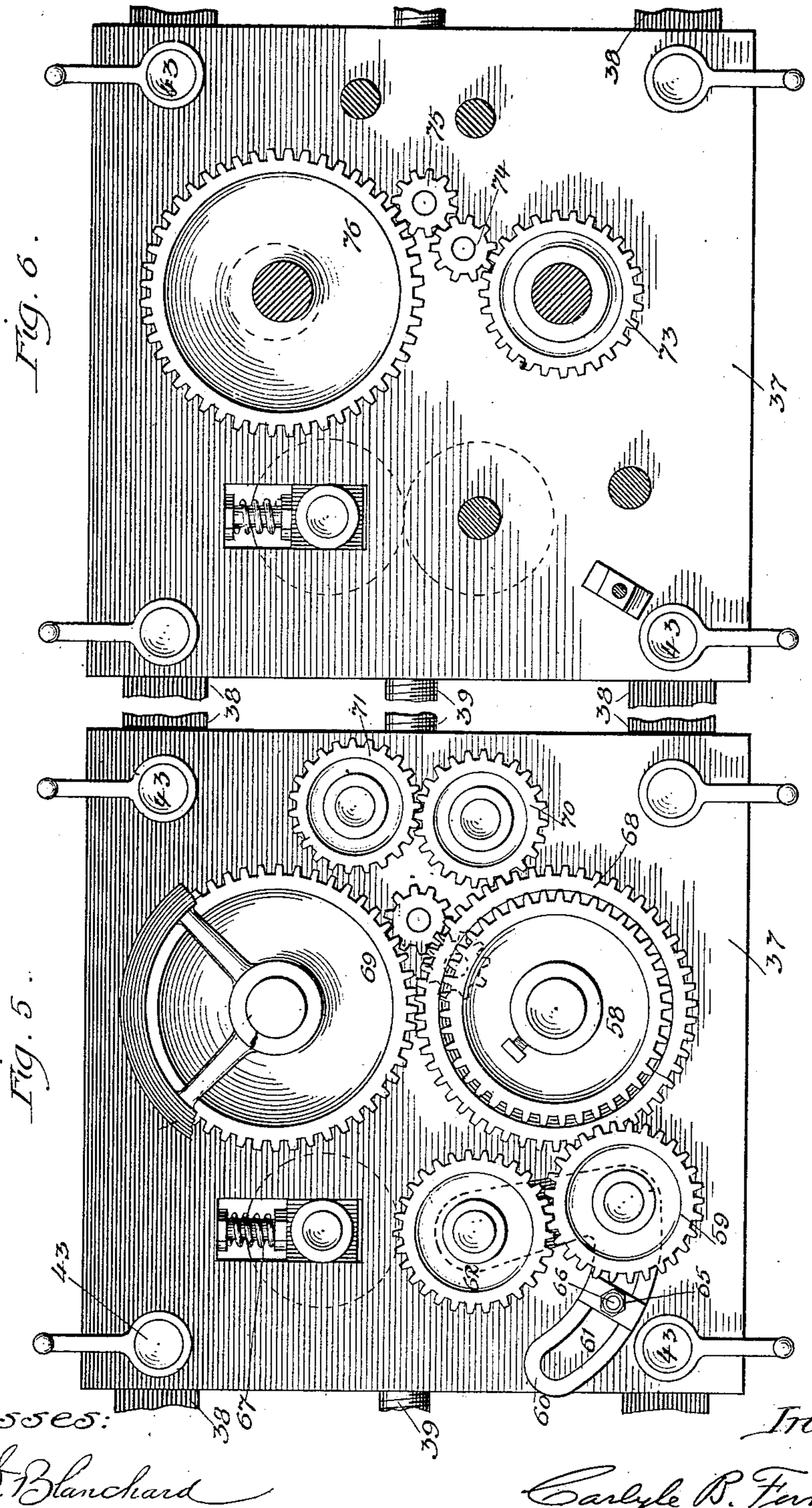

Fig. 6.

Fig. 5.

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(Application filed Mar. 14, 1900.)

(No Model.) 8 Sheets—Sheet 5.

Fig. 8.

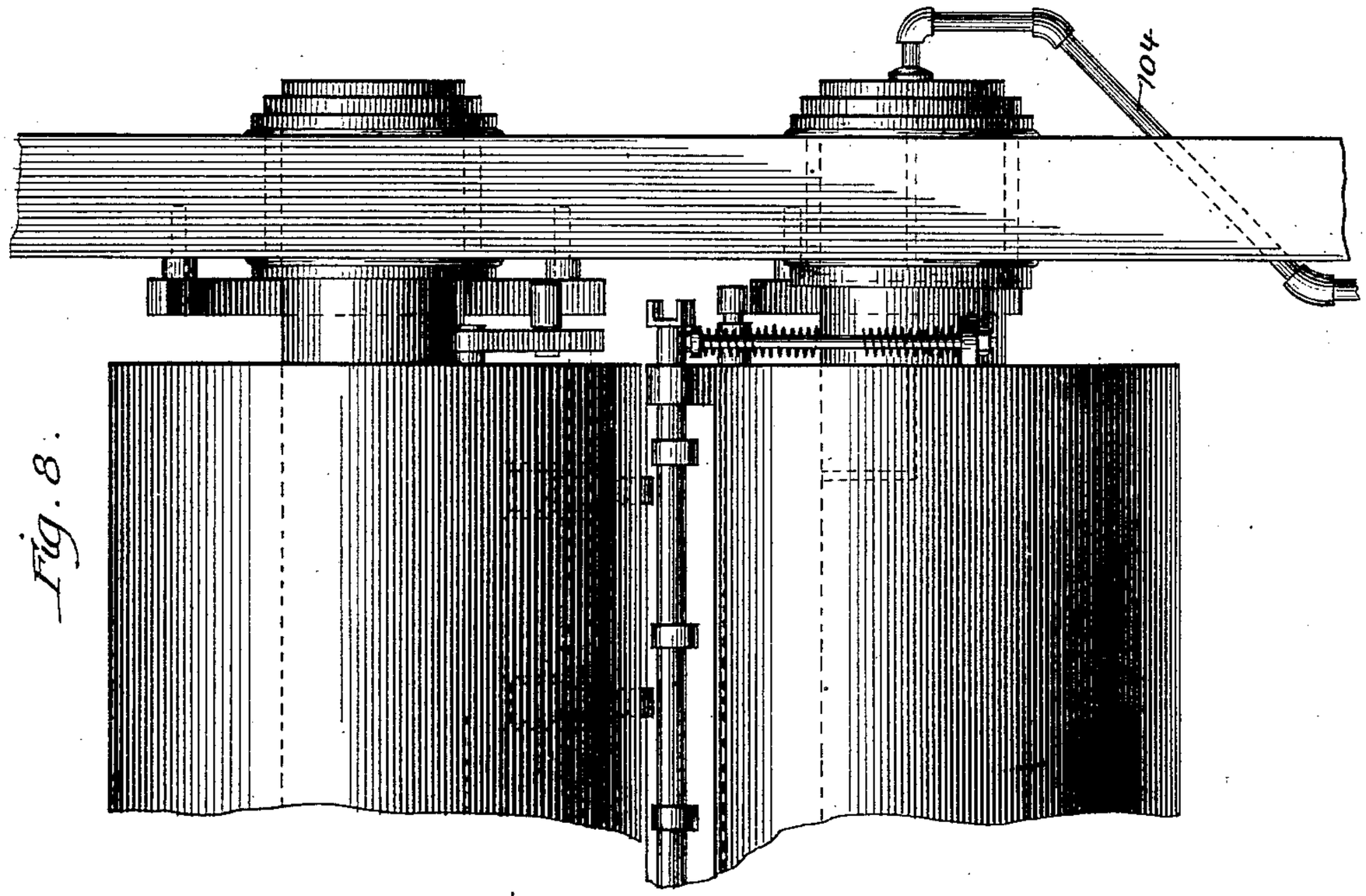
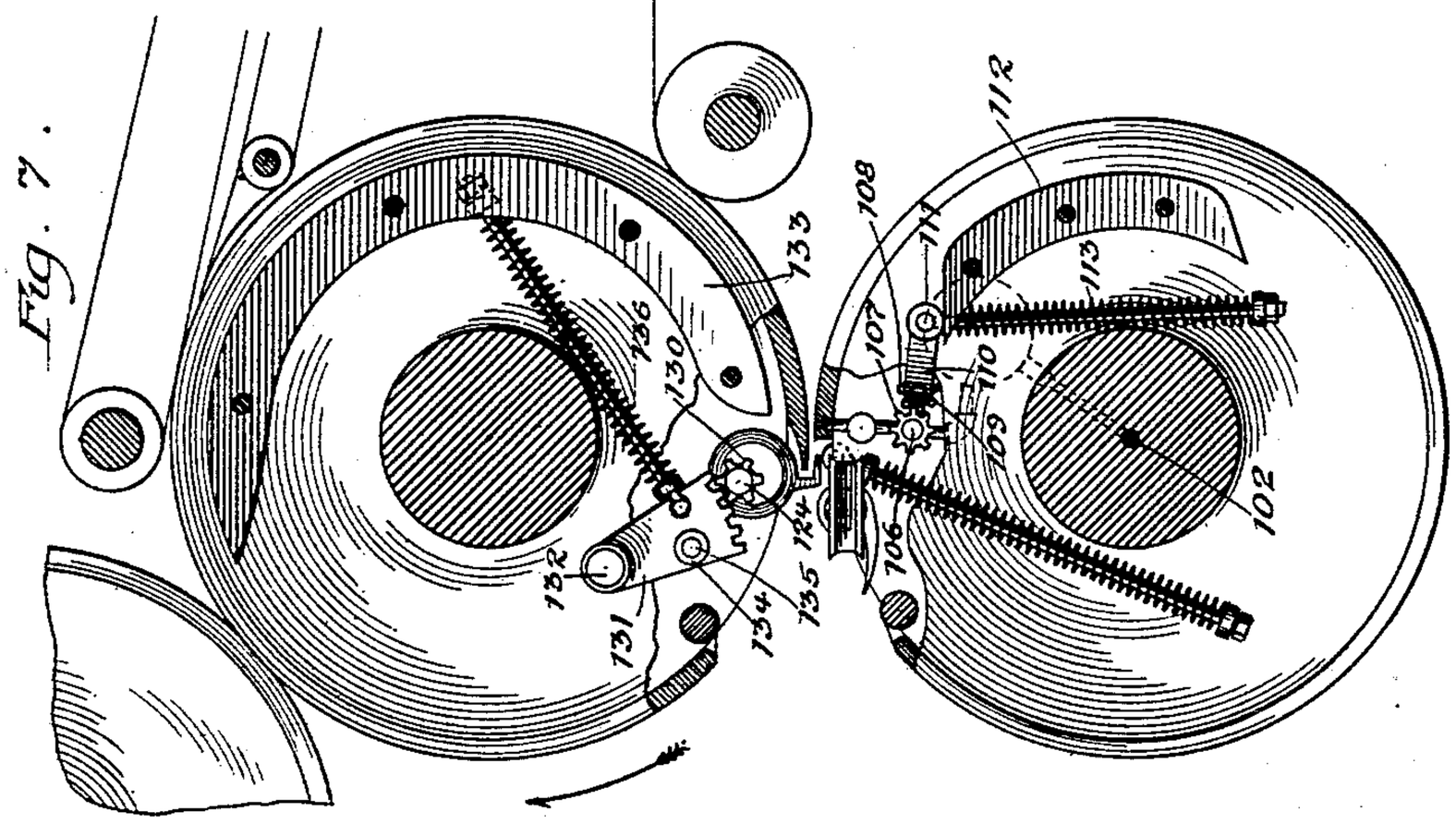


Fig. 7.



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(No Model.) 8 Sheets—Sheet 6.

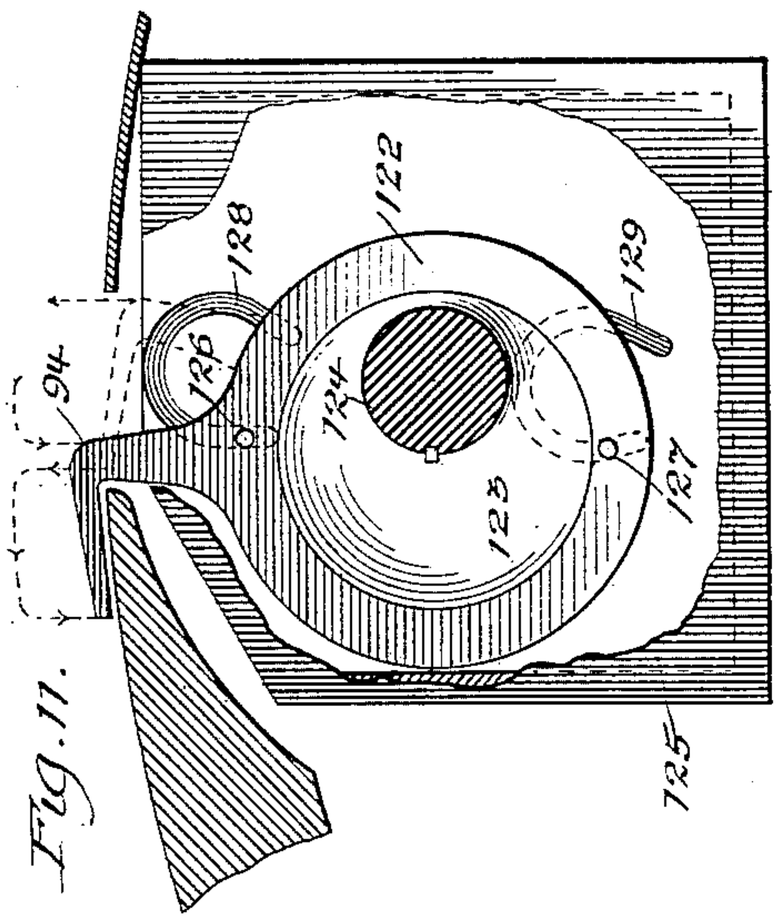

Fig. 11.

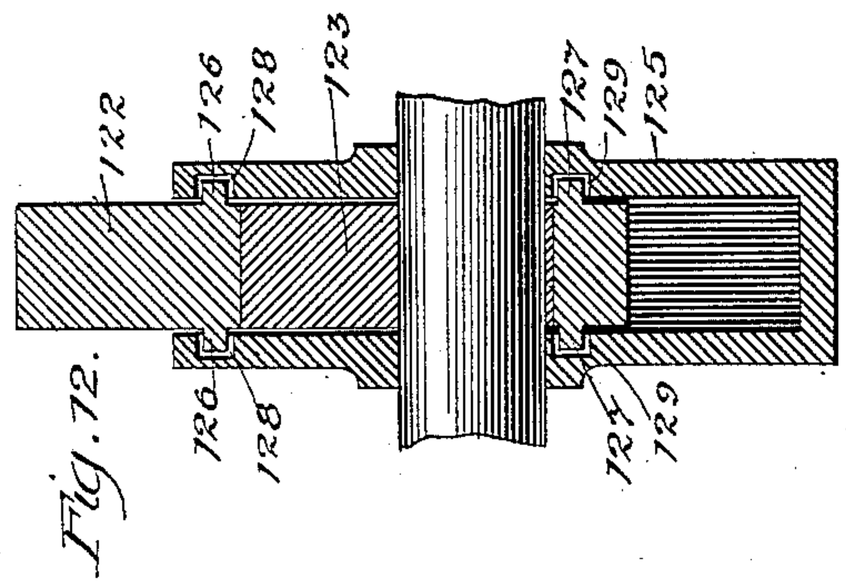

Fig. 12.

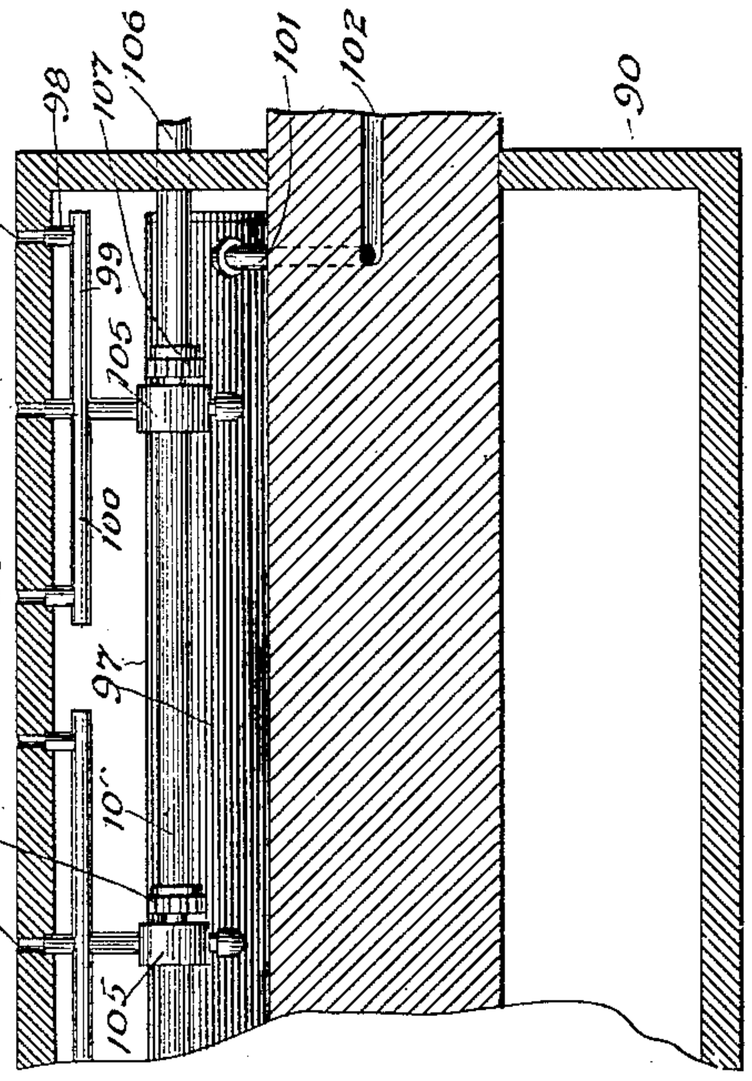

Fig. 9.

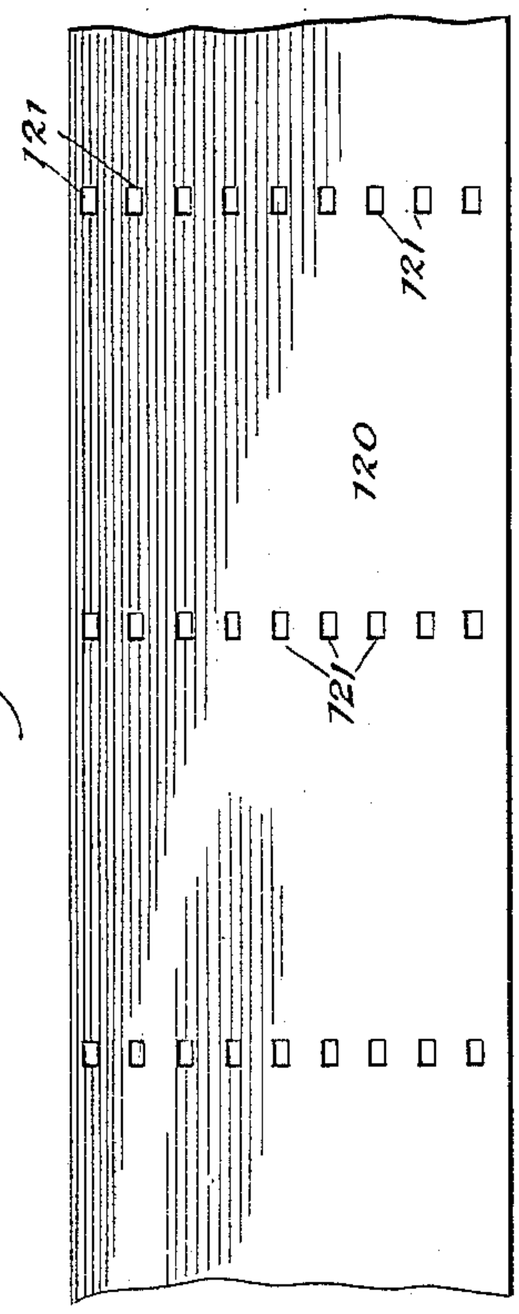

Fig. 10.

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(Application filed Mar. 14, 1900.)

(No Model.) 8 Sheets—Sheet 7.

Fig. 15.

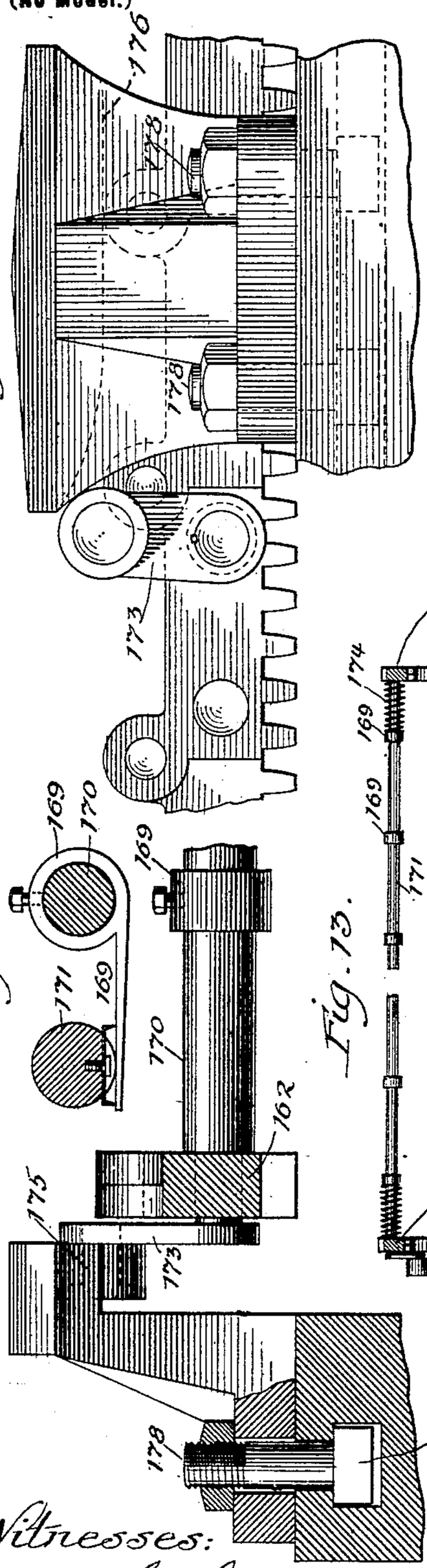


Fig. 16.

Fig. 14.

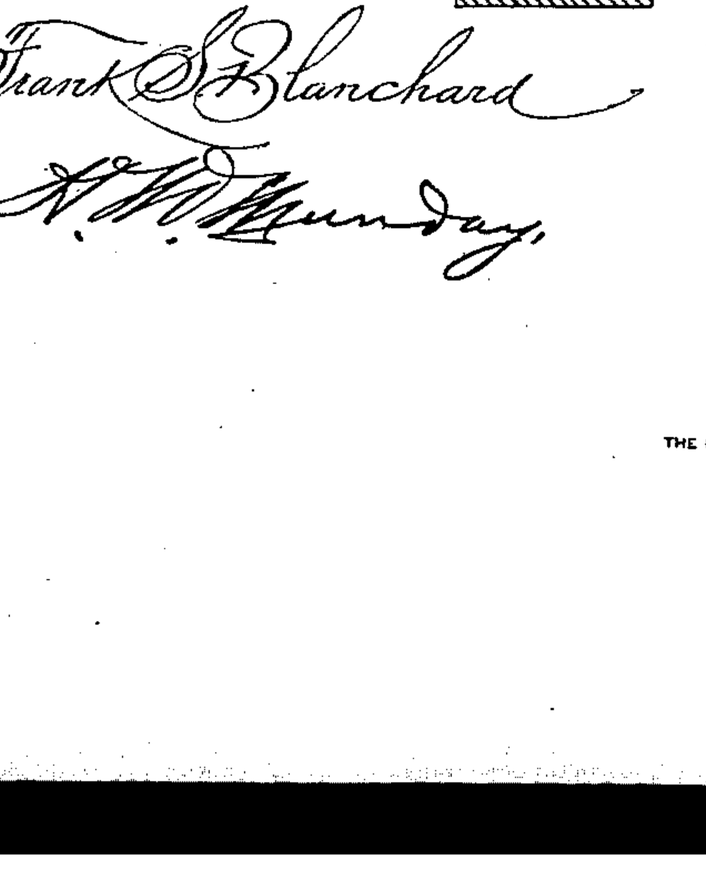


Fig. 17.

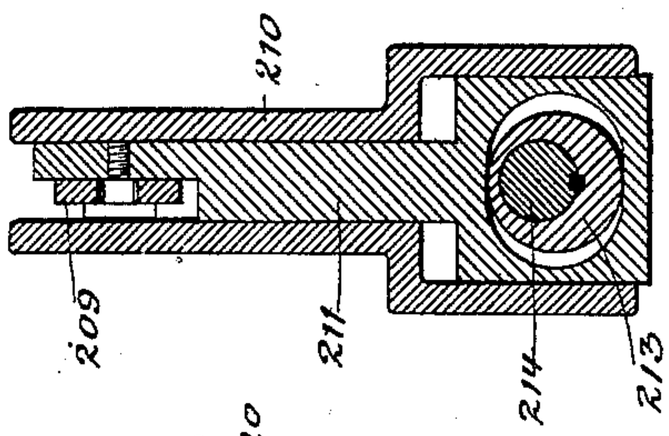
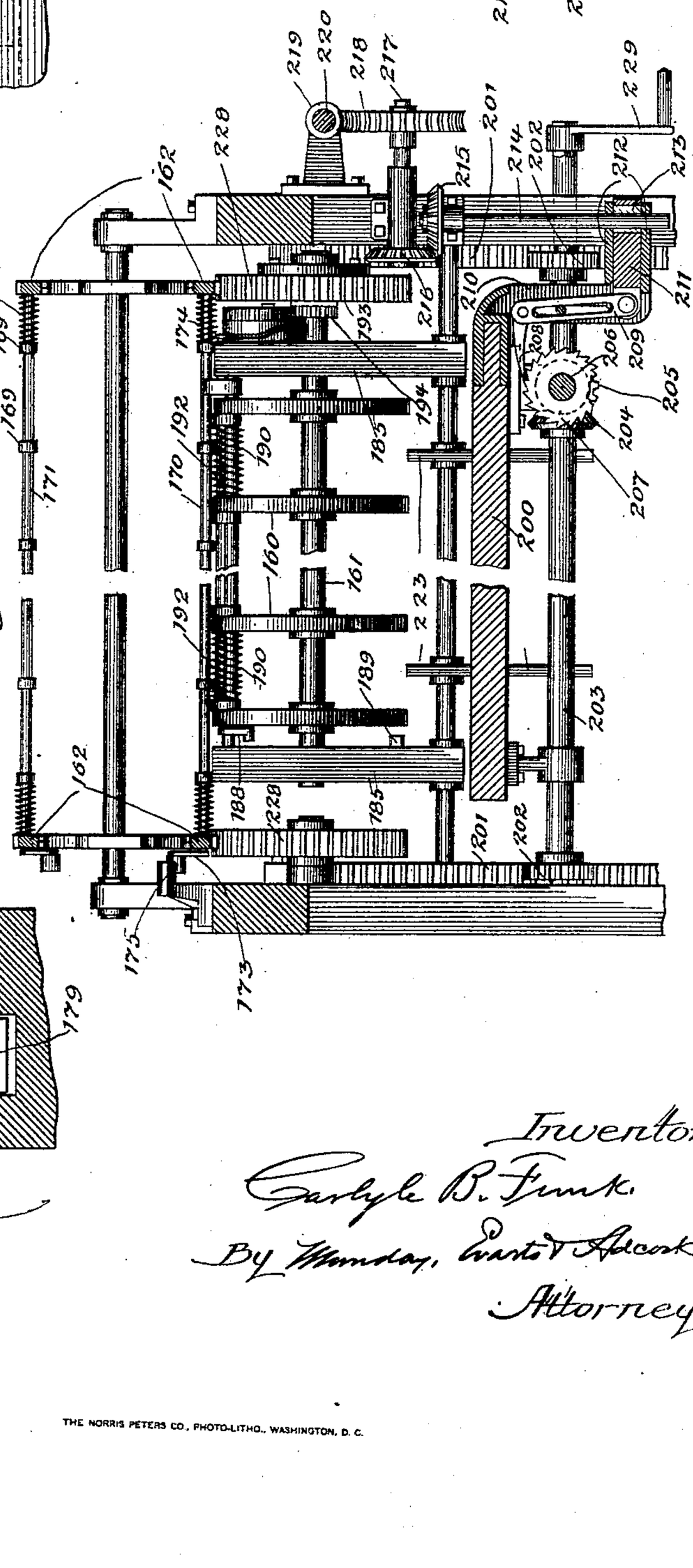


Fig. 13.



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No. 677,408. Patented July 2, 1901.

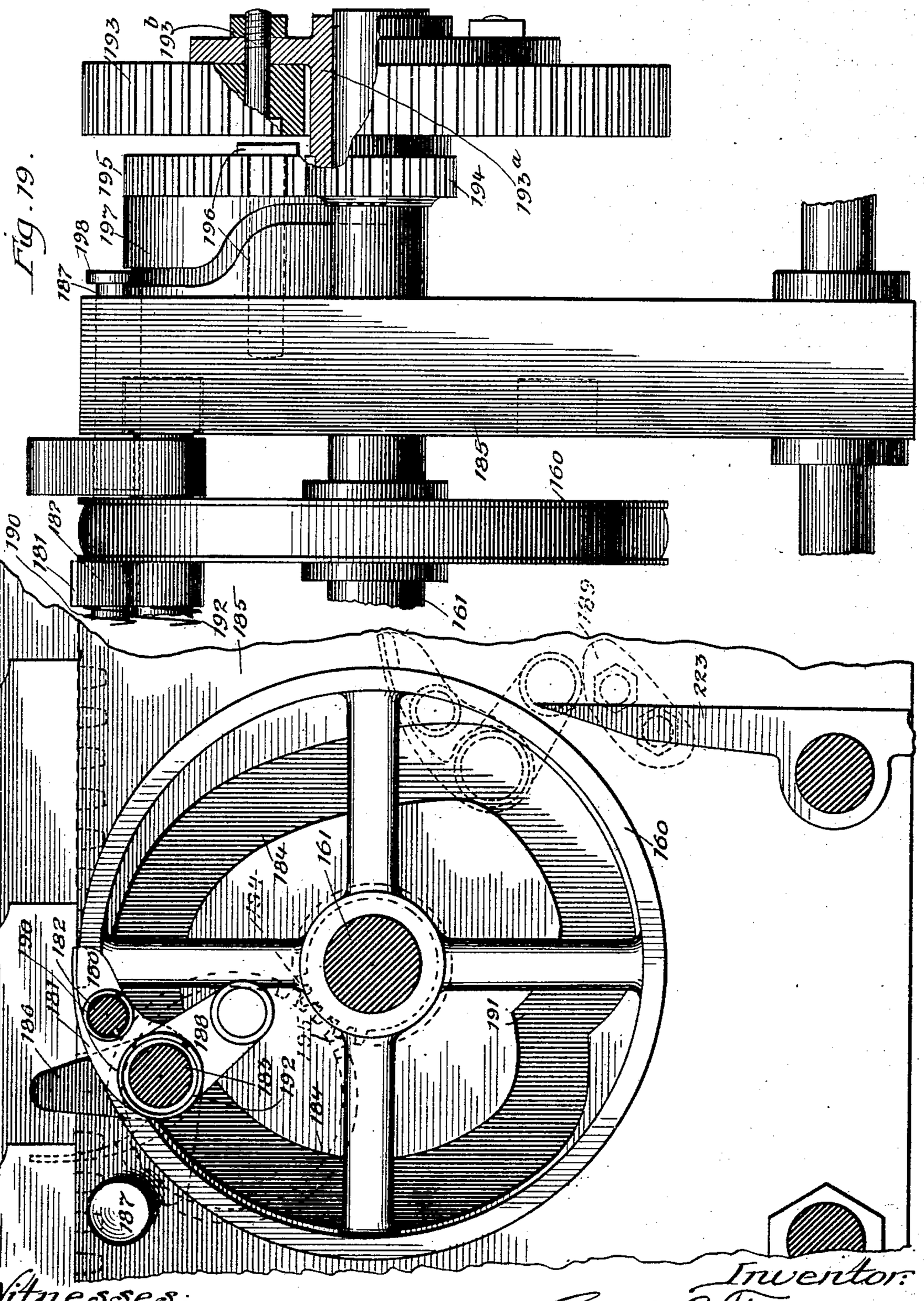
C. B. FUNK.

PRINTING PRESS.

(Application filed Mar. 14, 1900.)

(No Model.) 8 Sheets—Sheet 8.

Fig. 19.



Witnesses:
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UNITED STATES PATENT OFFICE.

CARLYLE B. FUNK, OF CHICAGO, ILLINOIS.

PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 677,408, dated July 2, 1901.

Application filed March 14, 1900. Serial No. 8,579. (No model.)

To all whom it may concern:

Be it known that I, CARLYLE B. FUNK, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Printing-Presses, of which the following is a specification.

The main feature of this invention is the improved offset-preventing means whereby I am enabled to use a continuous offset-web in connection with the second impression-cylinder and thereby to avoid all smutting, because a clean portion of the web is constantly presented for contact with the printed surface of the sheet. This feature of the invention consists in providing the second impression-cylinder with grippers adapted to move quickly in and out of the cylinder and in providing the offset-web with openings registering with such grippers, whereby the latter are allowed to move through the web and into position to seize the printed sheet.

The nature of my invention, which also embraces features of improvement other than the one above mentioned, is fully set forth in the description given below and also illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a printing-press embodying my invention. Fig. 2 is a plan of the same. Fig. 3 is an enlarged longitudinal vertical section of the paper feeding and cutting mechanism, and Fig. 4 is a cross vertical section of the same. Fig. 5 is an elevation of the carriage of said mechanism, and Fig. 6 is a like view with the outer wheels omitted. Fig. 7 is a sectional view showing ends of the first and second impression-cylinders, and Fig. 8 is a partial elevation thereof. Fig. 9 is a partial longitudinal section of the first impression-cylinder. Fig. 10 is a plan of the offset-web. Figs. 11 and 12 are cross and longitudinal sections of one of the grippers employed in the second impression-cylinder. Fig. 13 is a transverse vertical section of the delivery-table and the parts over it. Fig. 14 is a detail section showing the tripping device for operating the chain-grippers, and Fig. 15 is an elevation thereof. Fig. 16 is a detail of the chain-grippers. Fig. 17 is a horizontal section of a portion of the delivery-table-lowering mechanism. Fig. 18 is an enlarged section of the paper-arresting gripper-cylinder, and Fig. 19 is a side elevation of one end thereof, partly broken away.

In the drawings, 24 represents the base of the press, and 25, 26, 27, 28, 29, 30, 31, and 32 are parts of the frame.

The mechanism for feeding and severing the sheets from the web is desirably constructed as follows: The paper-roll is shown at 33, and the web 34 therefrom is shown as being entered first between feed or forwarding rolls 35 and 36, mounted in a carriage consisting of two vertical frames 37, properly united together and adjustable back and forth on steel bars 38, attached at their ends to the frame-uprights 25 and 26. The adjustments of the carriage are in the line of the feed of the paper, are intended to enable the knife-cylinders, which are mounted in the carriage, to sever the paper into any lengths desired and are effected by screws 39, threaded in said frames and supported on said uprights. Each screw carries a bevel-pinion 40 at its end, meshing with one of the pinions 41 on the cross-shaft 42, having a hand-crank 42^a. The carriage is locked in any position desired by set-screws 43, bearing against the faces of the bars 38. Adjacent to the feed-rolls above mentioned and mounted in said carriage are cutting-cylinders 44 and 45, adapted to sever the web into sheets, and tape-reels 46 and 47. The rolls, cylinders, and reels are all geared together and actuated from a shaft 48, arranged longitudinally and at one side of the press, by means of a bevel-gear 49, splined to but sliding on said shaft, and a like gear 50 on the shaft of the lower cutting-cylinder. The shaft 48 is driven by bevel-gears 51 and 52, the latter on the shaft of the second impression-cylinder. Gear 49 has a long hub 53, which is grasped by an arm 54, projecting laterally from the carriage, and by this means said gear is compelled to move on its shaft with the carriage in the adjusting movements of the latter. The key or spline of said gear is shown at 55, Fig. 4. Gear 51 is preferably made readily detachable from the shaft 48, so as to destroy mesh with gear 52 to permit the feeding and cutting rolls to be turned independently in inserting the web 34 preparatory to starting a run. The shaft of the lower

knife-cylinder is provided with a gear 56, adjacent to said bevel-gear 49, which meshes with a gear 57, mounted on the shaft of the other knife-cylinder. Power is carried from the lower knife-cylinder to said feed-rolls by a changeable gear 58 on the shaft of the former, an intermediate gear 59, having a movable support consisting of a V-shaped frame 60, having a circular or arc slot 61 in one limb and suspended from the journal of roll 36 by the other limb, the gear 62 on the journal of roll 36 meshing with gear 59. Roll 35 is actuated by friction with roll 36. By this construction the speed of the feed-rolls can be varied at will to change the length of the sheet by changing gear 58 and adjusting gear 59 so that it meshes with the substituted gear without destroying its engagement with gear 62. The frame 60 is held in its adjusted positions by the button 65 and screw 66, passing through the slot 61. The shaft of the lower roll 36 may be fixed in its location in the carriage, but that of roll 35 is vertically movable, and its bearings are pressed downward by springs 67. The knife-cylinders are also preferably provided with gears 68 and 69, such gears being duplicates of gears 56 and 57 and located on the other ends of their shafts from the latter. Power is carried to the tape-reels 46 and 47 by means of said gear 68 on the shaft of the lower knife-cylinder and gears 70 and 71 on the journals of the reels.

The feed-roll-driving mechanism embraces change-gear 58 and adjustable gear 59 in order that the speed of the feed-rolls may be proportioned at all times to the length of the sheets into which the web 34 may be cut, the feed-rolls being slowed as the sheets diminish in length. This feature is not new with me, broadly speaking, and I therefore lay no claim to it except in combination with other parts of the mechanism.

The knife-cylinders are made one-half the size of the printing-cylinders and are given the same surface speed, and as they thus make two revolutions to one revolution of the printing-cylinders it will be seen that they must be prevented from cutting the paper web at each alternate revolution. In consequence of this requirement the shaft of the upper knife-cylinder is supported at each end in revolving eccentrics 72, and these eccentrics are each driven so that they make but one revolution to two of the cylinder by means of the trains of gears 73, 74, 75, and 76, the gears 73 being on the shaft of the lower cylinder and the gears 76 on the hubs of the eccentrics. This construction is fully illustrated at Figs. 3, 4, and 6, and it causes the raising of the upper cylinder out of its acting position by the eccentrics at each second revolution of the cylinder, so that the knives are then prevented from acting.

The tape-reels 46 and 47 receive the advance edge of the web prior to the severing and conduct it by means of tapes 80 and 81 to the pinching-rolls 82 and 83, which run at the same surface speed as the printing-cylinders and are located in close proximity thereto; and the carriage is adjusted at such distance from the pinching-rolls as to enable the latter to take hold of the severed sheet immediately after the severation occurs. In this manner the severed sheet, whatever its length may be, is retained under perfect control while passing from the knives to the pinching-rolls, and no opportunity is afforded it to lag behind or get out of place, and it is in order that no time may elapse between the severation and the seizing of the sheet by the pinching-rolls that I make the carriage of the knife-cylinders and feed-rolls adjustable to and from the pinching-rolls. Ordinarily, therefore, the carriage will be positioned so that the distance between the knives and the pinching-rolls will be about equal to the length of the sheet. The tapes 80 move first to roll 84, thence back under a swinging tightener 85, over the adjustable roll 86, supported in the stationary parts 29 of the frame, thence over rolls 87 back to reels 46, and the tapes 81 move first to roll 88 and thence back under swinging tightener 89 to reels 47. The tapes 81 support the sheets until they come in full contact with the first impression-cylinder 90 and are seized by the grippers 91 thereof.

Instead of feeding sheets cut from a continuous web by the feeding mechanism above described the press is also provided with a feed-table 240 and with feeding-cylinder 241, provided with grippers 242, whereby previously-severed sheets may be fed to the printing-cylinders in the ordinary way.

The sheets receive their first impression from the first plate or type cylinder 92, and are delivered by cylinder 90 to the second impression-cylinder 93, whose grippers 94 will be particularly described later on. By cylinder 93 the sheet is carried past and receives its second impression from plate or type cylinder 95. The grippers 91 are adapted to swing back inside their cylinder, as shown, to avoid interference with cylinder 93, and to prevent the sheet from leaving the cylinder when the grippers let go a line of holes 96, Fig. 9, is provided along the gripper edge of cylinder 90, all connected by pipes 98, 99, and 100 to a vacuum-chamber 97, located in the cylinder and connected by an air-passage 101 with an axial hole 102 in the shaft of the cylinder. The hole 102 is connected to an air-pump 103 by a pipe 104, and thereby the vacuum in chamber 97 is maintained. As the suction caused by the vacuum is needed only while the forward edge of the sheet is moving from the point where it is released by grippers 91 of the first cylinder to the point where it is seized by grippers 94 of the second cylinder, means are provided for shutting it off at other times. These means consist of valves 105 in the pipes 100, all mounted on a rod 106 and operated by pinions 107 on the

rod and pinions 108 on a shaft 109, arranged parallel to said rod and receiving motion from an arm 110, fixed to the shaft 109 and carrying an antifriction-roller 111, which encounters and rides over a stationary cam 112 at each revolution of the cylinder. This cam causes a rocking of shaft 109, which in turn causes the opening of the valves, so that the suction will be felt by the sheet, and the suction is continued in service until the roller has passed off the cam, when the retracting-spring 113 forces the arm 110 back to its starting position, thereby closing the valves and cutting off the suction from the sheet without destroying the vacuum existing in chamber 97.

In my offset-preventing mechanism I employ a continuous web 120, as already stated, and instead of using the devices heretofore employed for controlling the printed sheet when the offset-preventing device is a continuous web I provide openings in the web through which suitable grippers may emerge and seize the sheet and then retire from action before the web leaves the cylinder. These openings are shown at 121 and are arranged in rows across the sheet (see Fig. 10) and are otherwise so positioned that they will register with the grippers while riding on the cylinder.

The grippers 94 of cylinder 93 are unlike ordinary grippers, but may be made in different ways, and hence I do not wish to be limited to the construction shown. In fact, instead of using grippers to control the sheet exhaust-air could be used with the offset-web having openings 121, as such openings would permit the exhaust to reach the printed sheets directly, and thus to control them, and hence I do not wish to be limited in all my claims to the use of mechanical grippers in combination with an offset-web having perforations.

The grippers 94, which are deemed the best embodiment of the sheet-controlling means of my invention now known to me, receive their inward and outward movements from eccentric rings 122, encircling eccentrics 123, mounted upon a shaft 124, arranged longitudinally of the impression-cylinder. The grippers are hook-shaped projections extending outward from the rings 122, and each is inclosed in a casing 125, suitably supported in the cylinder. Each ring 122 is provided with laterally-projecting guide-pins 126 and 127 at opposite sides of its axis, such pins entering grooves 128 and 129 in the sides of the casing 125 and causing the forward and backward movements of the grippers, which are thus compelled to traverse a path much like that of a four-motion feed, as will be presently understood. The shaft carrying the eccentrics is rotated in both directions by means of a pinion 130 on its end, meshing with toothed segment 131, supported on a pivotal shaft 132, the segment being operated in one direction by a stationary curved cam 133, which is encountered by roller 134 on pins 135, projecting from the segment, and in the reverse direction by the expanding spring 136. The normal position of the grippers (occupied by them between operations) is indicated by dotted lines in Fig. 11, and in this position they are retracted entirely within the outer line of the cylinder. When, therefore, the shaft 124 is rotated by the spring 136, it causes the grippers to first move outward radially of the cylinder to the outer position, (also indicated in said figure.) From here they move so as to carry the hooks over the solid surface of the cylinder. Then they move toward the center of the cylinder, so as to cause the hooks to press the printed sheet against the offset-web and cylinder and remain in this position until the cam 133 on the roller 134 forces the segment back against the power of spring 136. This causes the grippers to retrace their movement and brings them again within the cylinder, where they remain until the engagement of the cam with the segment is ended and spring 136 again acts. The end of the cam which releases the segment and allows the springs to act is preferably more abrupt than the end at which the cam takes control of the segment, the grippers being thus allowed to act quickly under the power of the spring when they move outward through the offset-web and seize the printed sheet and to act more slowly when they withdraw from action.

The offset-web is drawn from the roll 137 and moves between punching-rolls 138 and 139, by which the openings 121 are cut at the first use of the web, and thence between feed-rolls 140 and 141. From here it is carried up over roll 142, thence to roll 143, and on to the impression-cylinder, where the printed sheet is delivered to the grippers 94. From the impression-cylinder the web enters between sets of tapes 144 and 145, the former being operated by reels 146 and 147 and the latter by rolls 148 and 149, carrying the printed sheet with it. The sheet is diverted from the web, however, by steel fingers or strippers 151, while the web passes down from roll 149 to a rewinding-roll 152, supported upon and rotated by two parallel adjacent rolls 153 154 and having its journal engaged by vertically-sliding guides 155, moving on the stationary way 156, this construction giving the rewinding-roll a uniform surface speed notwithstanding its gradual increase in size. The punching-rolls 138, the feed-roll 140, and the roll 153 are all driven by gearing, as shown at Fig. 1.

The strippers 151 are loosely mounted on a stationary shaft 157 and act to direct the sheet onto a set of tapes 158, moving around reels 159 on shaft 157 and actuated by the wheels 160, composing the reverse or paper-arresting cylinder hereinafter mentioned and mounted on shaft 161. The upper course of tapes 158 is horizontal, so that the sheet is carried by them close under and parallel to

a pair of endless gripper-chains 162, supported upon sprocket-wheels 163 and 164. The links of chains 162 are toothed upon the outer side, and such teeth mesh with gears 165, driven by a train of gears, of which those shown at 166, 167, and 168 are a part, and thereby said chains are actuated. The chains carry a number of sets of grippers 169, each set mounted on an oscillating rod 170 and resting normally on a rest or rod 171, arranged parallel to the shaft, and both shaft and rod supported by the chains. These grippers are opened when they pass off wheels 163, so they may take hold of the sheets, by a cam 172, acting on the crank-arm 173, carried upon one end of the gripper-rod 170 and oscillating said rod. As soon as the crank-arm has passed said cam the springs 174 on the rod close the grippers on the sheets, and the latter are then pulled along by the grippers until the crank-arm 173 encounters another cam 175, which acts to open the grippers a second time and release the sheets. The cams 172 and 175 are alike in construction and are supported on one of the frame side rails 32, and the shape given their acting faces is clearly disclosed by the broken line 176 in Fig. 15, and they overhang the path of the crank-arms. The cam 172 is stationarily located, while cam 175 is adjustable within the limits of the slot 177, formed in said side rail, in order that it may be positioned in correspondence with the lengths of the sheets being printed. The cam 175 is secured in its various adjusted positions by the bolt 178, the body of which is movable through said slot and the head of which is confined in the undercut portion 179 of the slot. At the instant the grippers 169 release the forward end of the sheet the rear end has been brought over the series of wheels 160, already mentioned and which carry other or reversed grippers, the construction of which is best shown at Figs. 18 and 19, and consisting of opposing opening-and-closing jaws 180 and 181. These reverse grippers seize the tail of the sheet as they are moving through the upper part of their path and take complete control of it as soon as its forward end is released from grippers 169 and after gradually arresting its forward movement allow it to drop onto the delivery-board 200, hereinafter mentioned; the sheet having by this time arrived at a position over said board. The jaws 180 of the reverse grippers are secured centrally between their ends on a cross-rod 182, stationarily supported in the wheels or cylinder 160, near the periphery thereof, and are also pivotally attached at their inner ends to and carry a rock-shaft 183. The other part 181 of the grippers is fast to said rock-shaft. The end of this rock-shaft projects into a continuous cam-groove 184, formed in stationary part 185 of the machine, and thereby acts to control the position of the grippers, retracting and projecting them from the peripheral lines of the wheels as needed, and especially acting in conjunction with the rod 182 to hold the acting ends of the grippers substantially horizontal from the time they seize the sheet until they release it, so that the tail edge of the sheet is not bent up or creased in any way. The cam-grooves 184 are partly concentric and partly irregular, being adapted to reverse the grippers at one point. The shaft 183 is rocked so as to throw gripper-jaw 181 open preparatory to seizing the sheet by the engagement of arm 186 on the shaft with a stationary stud 187, and another arm 188 on the same shaft encounters a stationary cam 189, thus opening the same part of the gripper and releasing the sheet. The cross-rod 182 rocks on its axis as the position of gripper-jaw 180 changes, and springs 190 encircle it, and their tension is exerted in a direction contrary to the action of the cam-grooves, and in consequence of this while the rock-shaft 183 is traversing that part of the cam-grooves between the paper seizing and releasing positions the grippers are changed or reversed by said spring from the position at the top of Fig. 18 to the dotted position at the side of the same figure, and when the shaft reaches the bend 191 in the grooves the grippers are tipped over or returned to their positions indicated at the top of said figure in full lines, this being the position occupied by them immediately after the seizing of the sheet. The rock-shaft 183 is also provided with springs 192, whereby it may be rocked back after each opening of gripper-jaw 181 by the stud 187 and cam 189.

The cylinder-wheels 160 are supported on a shaft 161, carrying a gear 193, which meshes with the teeth of one of the gripper-chains 162 and is of the same diameter as the wheels, so that the latter move at the same surface speed as the printing-cylinders. They are, however, only half as large as the cylinders, and therefore make two revolutions to one of the cylinders, and consequently I provide means whereby the gripper 181 may be prevented from opening when it passes the point at which the paper is seized at each alternate revolution of the carrying-wheels 160. These means consist of the following devices: On the shaft 161 is a pinion 194, meshing with a gear 195 on a stub-shaft 196, secured in the stationary support of the shaft 161, and attached to gear 195 is a circumferentially-grooved cam 197, engaging a collar 198 on one end of said stud 187. This cam draws said stud longitudinally away from its acting position, so as to prevent it from engaging the arm 186 during alternate revolutions of the gripper-wheels, and returns it to its acting position at the intermediate revolutions, the pinion 194 and gear 195 being proportioned to insure this result.

The delivery-board 200 is adapted to automatically adjust itself to the number of sheets piled upon it, so that the top of the pile will remain at substantially the same level during the operation of the press. To this end it is supported at its ends from racks 201,

formed in a stationary frame 230, by pinions 202 on cross-shafts 203, attached to the table and meshing with the racks. Cross-shafts 203 are each operated by a pair of bevel-pinions 204 and 205, and the pinions 205 are on a shaft 206, actuated by a ratchet-wheel 207, driven by a pawl 208, mounted on the upper end of a lever 209, pivoted to the leg 210, depending from the table, said lever having its lower end pivotally joined to a horizontally-moving slide 211, moving in ways 212 and reciprocated by an eccentric 213, movable up and down on the vertical shaft 214, but splined thereto. Shaft 214 receives power through bevel-pinions 215 and 216, the latter on a short shaft 217, carrying a worm-gear 218, actuated by the worm 219 on a shaft 220, arranged at the side of the machine and driven by pinions 221 and 222 from the shaft of gear 165. It will be noticed from this construction that the worm, which is continuously operated, will gradually operate the eccentric 213, and that the latter will, through the connections described, cause the pawl 208 to operate the ratchet at any predetermined intervals, depending, for instance, on the number or thickness of the sheets deposited on the table during each interval, and that thereby the table will be lowered slowly at intervals as the pile increases in height, so that the top of the pile will not vary materially from a given plane. Through the crank 229 on one of the shafts 203 the table may be operated either up or down at will, provided pawl 208 is kept out of ratchet 207.

223 represents guards at the end of the delivery-table, intended to serve as means for securing the uniform positioning of the sheets as they fall on the table. The worm-shaft 220 carries at its rear end a bevel-pinion 224, meshing with a like pinion 225 on a cross-shaft 226, provided with gears 227, meshing with the teeth of the chain-links and assisting in operating the chains. The gears 228, located centrally between gears 165 and 227 and meshing with the chain-teeth, are employed to support the lower course of the chains and prevent any sagging thereof.

The press is driven by belt-pulley 230 on shaft 231, and this shaft carries a pinion 232, meshing with a gear 233, actuating the first type-cylinder, and said pinion also meshes with a gear 234, meshing with the driven punch-cylinder 138. The piston of air-pump 103 receives its motion from pinion 232 through the medium of pinion 235 and crank 236. I have not undertaken to indicate in detail all the gearing by which the various parts of the press are actuated; but it will be understood that the impression-cylinders and the other type-cylinder are driven from the first type-cylinder. The gear 193 is made separate from its hub 193^a and is adjustable thereon in order to permit changes in the position of arresting gripper-wheels 160 and is secured to the hub by bolts 193^b, passing through arc slots (not shown) in the web of the gear.

I claim as my invention—

1. A printing-press wherein are combined an impression-cylinder, a continuous offset-web moving over said cylinder and provided with openings as set forth, and means for controlling the printed sheet acting thereon through said openings, substantially as specified.

2. A printing-press wherein are combined an impression-cylinder, a continuous offset-web moving over said cylinder and provided with openings through which the grippers may move into and out of the cylinder, and grippers carried by the cylinder and adapted to move through the web, substantially as specified.

3. A printing-press wherein are combined an impression-cylinder, a series of grippers supported in said cylinder and having a quick outward movement, and a continuous offset-web provided with openings through which said grippers may operate, substantially as specified.

4. A printing-press wherein are combined an impression-cylinder, a series of grippers supported in said cylinder, movable radially in and out of the cylinder and also movable forward to seize the sheet, and a continuous offset-web provided with openings through which said grippers may operate, substantially as specified.

5. A printing-press wherein are combined an impression-cylinder, a series of grippers in said cylinder movable radially outward, then forward, then inward against the cylinder-surface, then outward, then backward and finally radially inward to its starting position in the cylinder, and a continuous offset-web having openings through which said grippers may operate, substantially as specified.

6. A printing-press wherein are combined an impression-cylinder, a series of grippers in said cylinder having a quick radial movement in and out of the cylinder, means for imparting such movement to the grippers, and a continuous offset-web having openings through which said grippers may operate, substantially as specified.

7. The combination with the impression-cylinder and the offset-web having gripper-openings, of the grippers, the eccentric for operating the grippers radially and the cam-grooves and pins for imparting the forward and back movements, substantially as specified.

8. The combination with the impression-cylinder and the offset-web having gripper-openings, of the grippers and the eccentrics for moving the grippers in and out of the cylinder, substantially as specified.

9. The combination with the impression-cylinder and the offset-web having gripper-openings, of the grippers, the eccentric for moving the grippers in and out, and means

for rocking the eccentric-shaft, substantially as specified.

10. The combination with the impression-cylinder and the offset-web having gripper-openings, of the grippers, the eccentric for moving the grippers in and out, the segment and pinion for rocking the eccentric-shaft, the cam for operating said segment in one direction, and the spring for operating the segment in the other direction, substantially as specified.

11. The combination with the impression-cylinder and the offset-web having gripper-openings, of the grippers, the eccentric for moving the grippers in and out, and spring-actuated devices for imparting a quick movement to said grippers in one direction, substantially as specified.

12. The combination with the impression-cylinder and the offset-web having gripper-openings, of the grippers, the eccentric for moving the grippers in and out, the segment and pinion for operating said eccentric-shaft, and a stationary cam for actuating said segment in one direction, substantially as specified.

13. The combination with the second impression-cylinder, the offset-web and the grippers working through the web, of the first impression-cylinder also having grippers, and having an air-exhaust for controlling the advance edge of the sheet after its grippers have let go, substantially as specified.

14. The combination in a printing-press with the continuous offset-web, of means for forming gripper-openings in the web, substantially as specified.

15. The combination in a printing-press, with a continuous offset-web, the impression-cylinder over which the web moves, and grippers carried by said cylinder, of means for forming openings in said web through which said grippers may operate, substantially as specified.

16. The combination with the second impression-cylinder, of a continuous tympan or offset web, traveling with and enwrapping the cylinder, and having series of perforations extending across the web and occurring at distances apart equal to the circumference of the cylinder, and grippers in the cylinder movable outward through said perforations and seizing the sheets so that they are caused to travel smoothly and concertedly, substantially as specified.

17. The combination with the second impression-cylinder, of a perforated tympan or offset web traveling with and enwrapping said cylinder, the perforations in such web registering with openings in the cylinder, and means for controlling the printed sheet operating thereon through said perforations and cylinder-openings, substantially as specified.

18. The combination with the second impression-cylinder, of a perforated tympan or offset web traveling with and enwrapping the cylinder, the perforations in such web registering with openings in the cylinder, a series of grippers moving through said openings and perforations and operated by eccentrics mounted on a rod or shaft, a pinion on the end of said rod, a segment-gear meshing with said pinion, and a cam and spring operating said segment and causing it to operate the eccentrics, substantially as specified.

CARLYLE B. FUNK.

Witnesses:
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