No. 610,491. Patented Sept. 6, 1898.

R. MIEHLE.

SHEET DELIVERY MECHANISM.

(Application filed Sept. 3, 1896.)

(No Model.) 6 Sheets—Sheet 1.

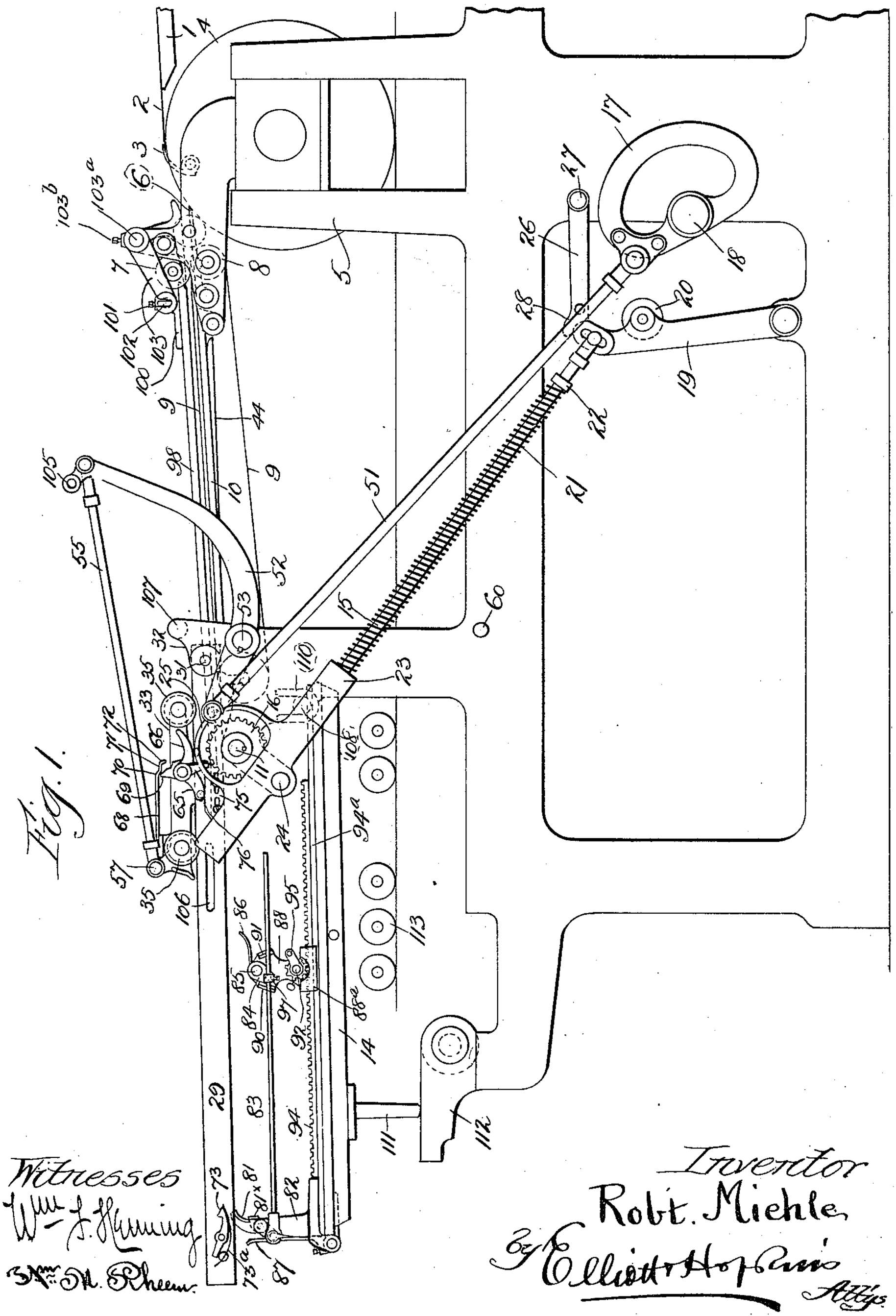

Fig. 1.

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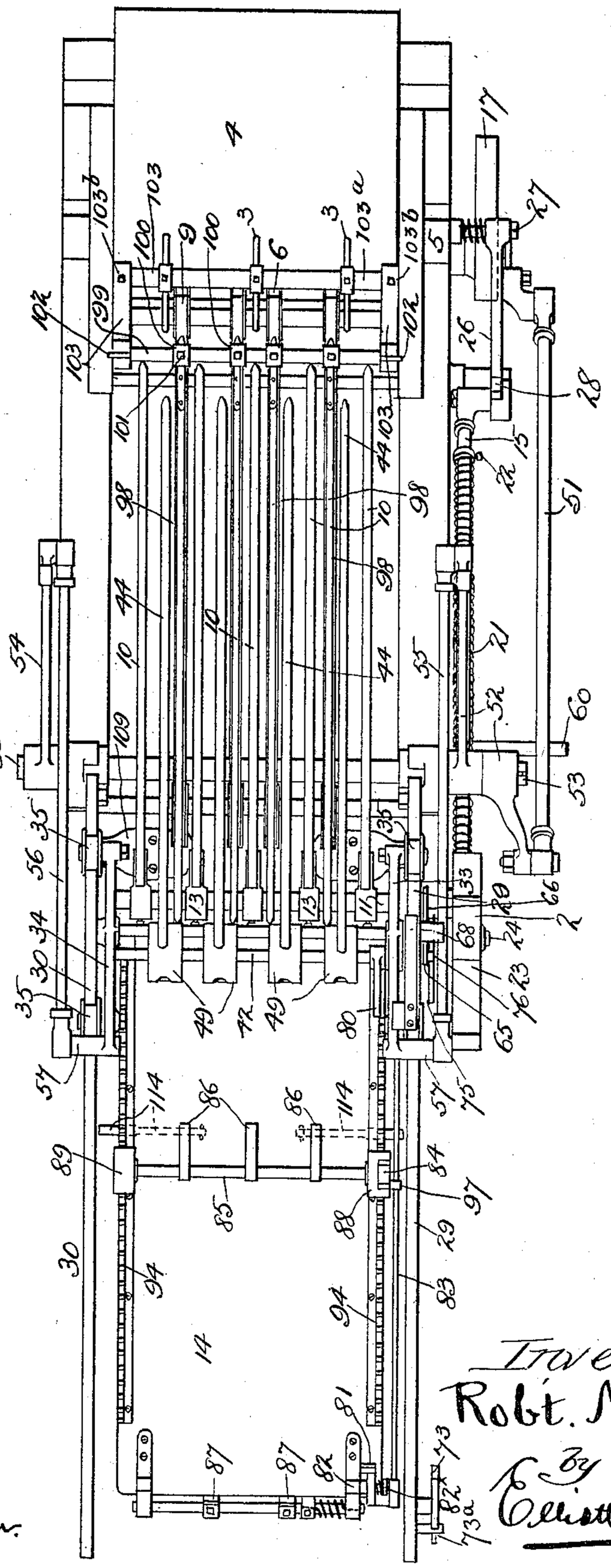
Fig. 2.



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(No Model.) 6 Sheets—Sheet 3.

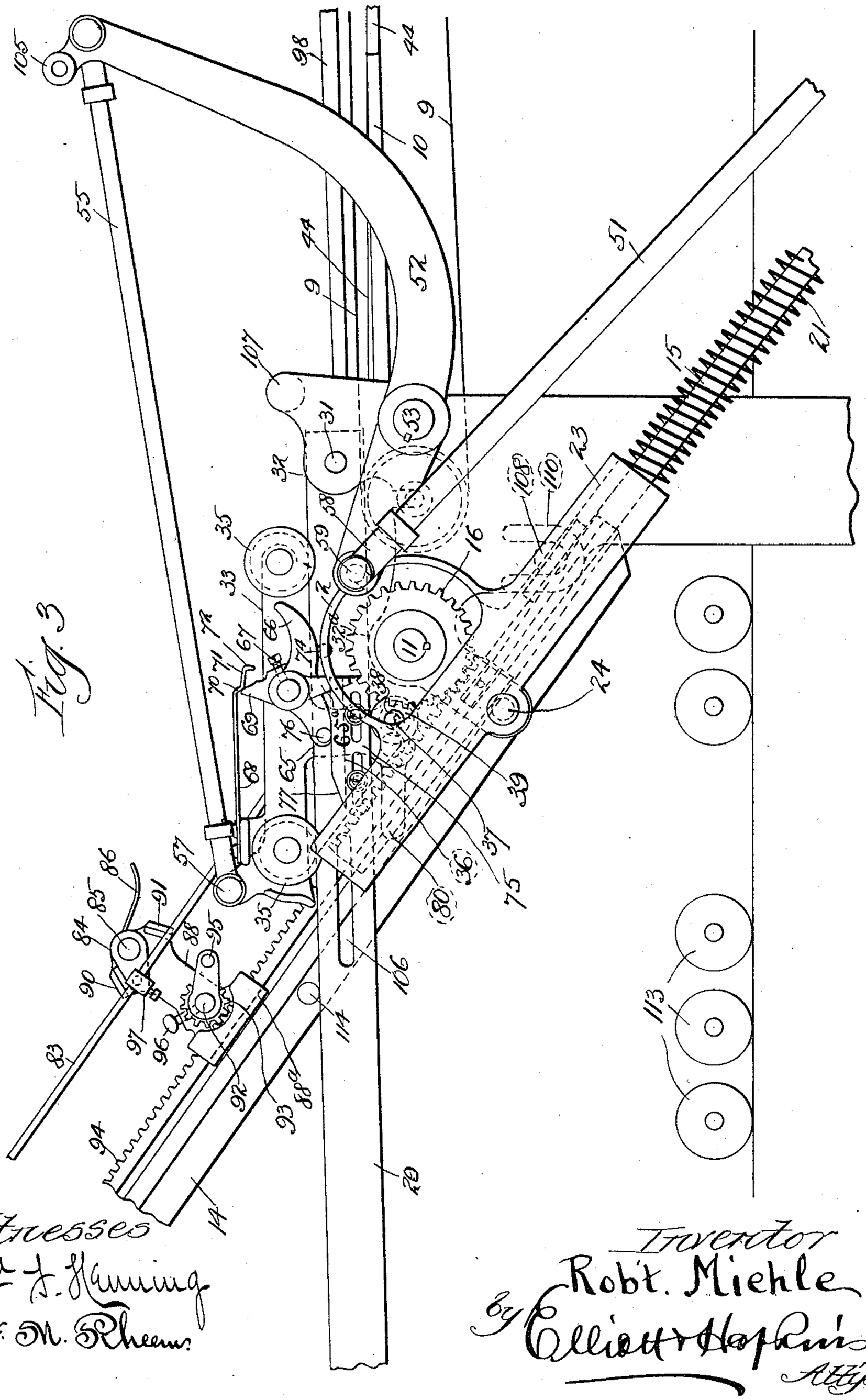

Fig. 3

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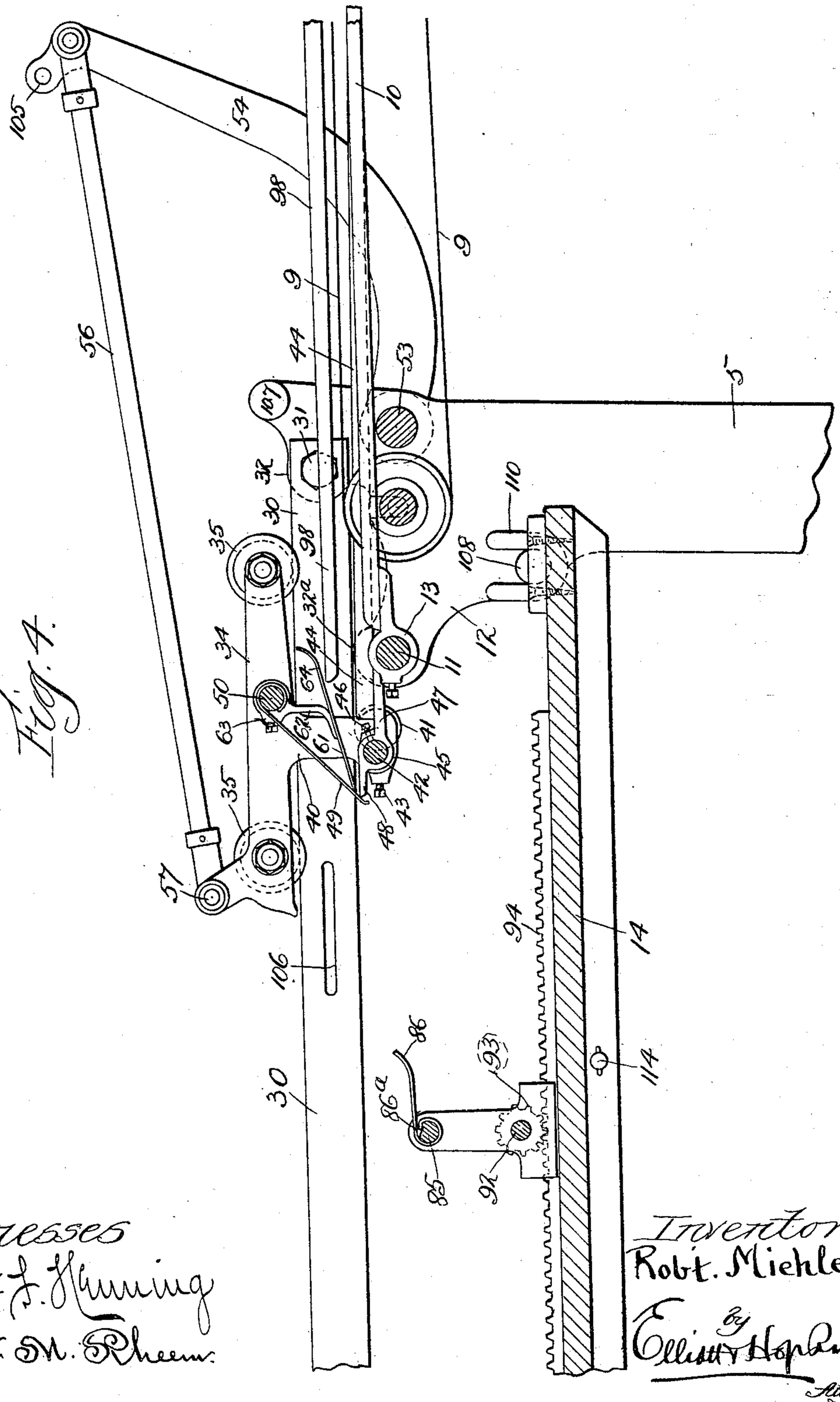
(No Model.) 6 Sheets—Sheet 4.

Fig. 4.



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(No Model.) 6 Sheets—Sheet 5.

Fig. 6.

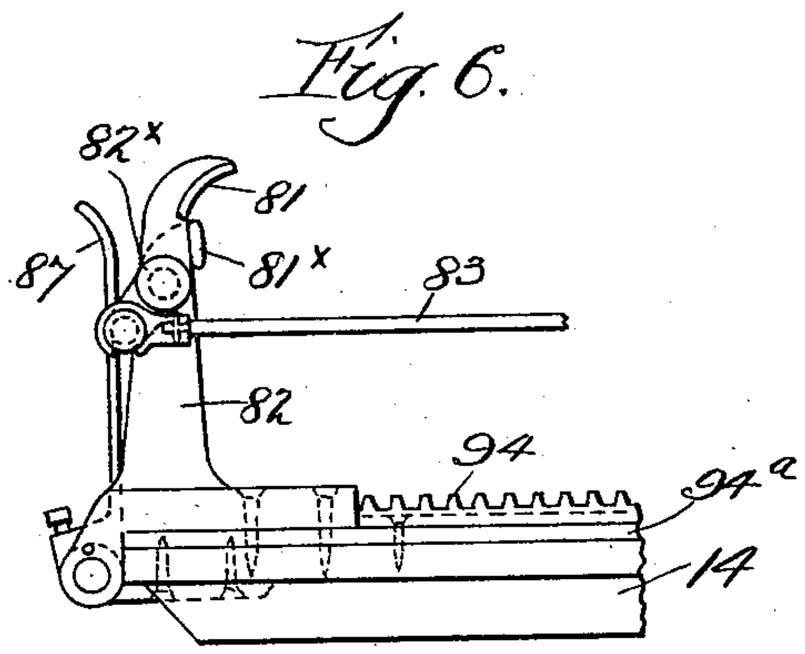


Fig. 7.

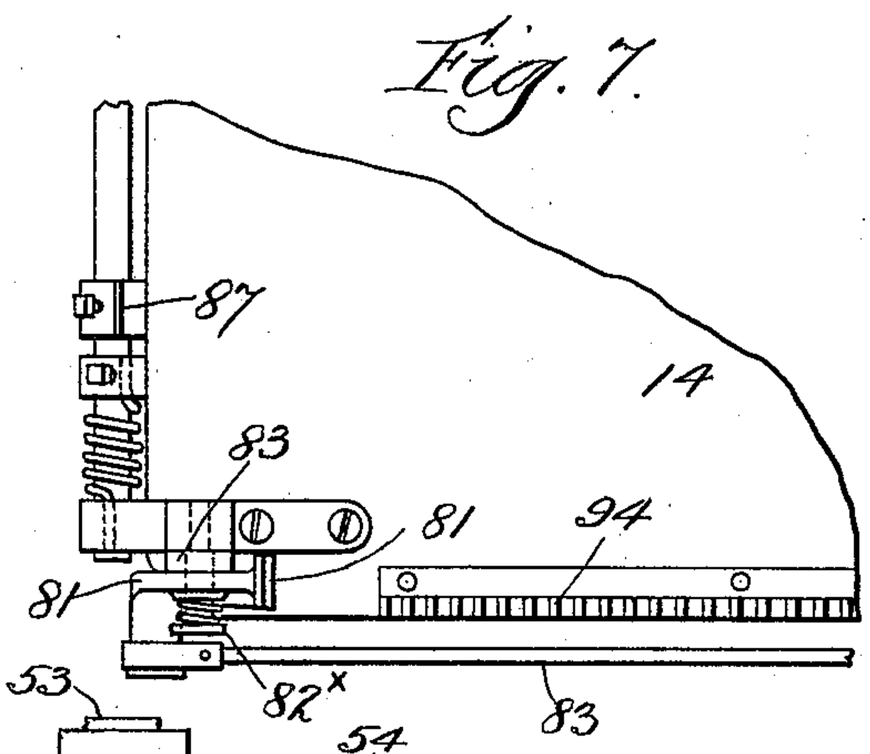


Fig. 5.

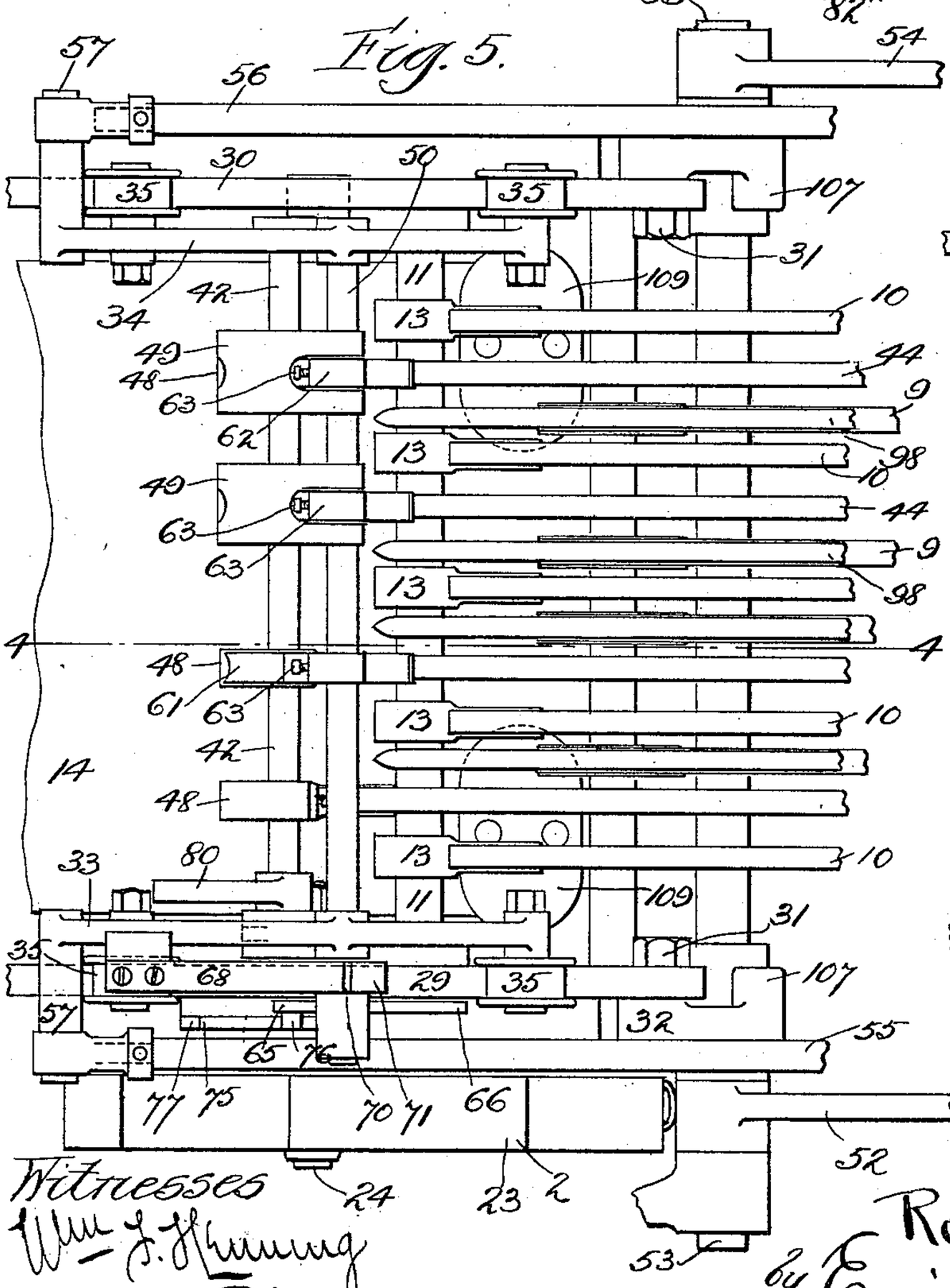
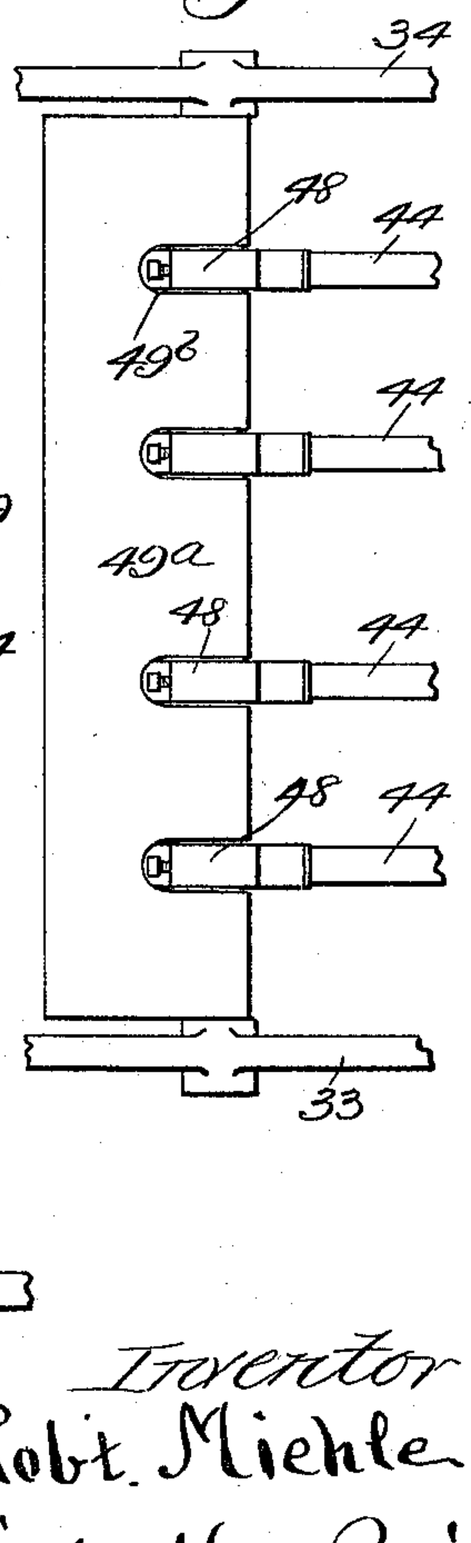


Fig. 9.



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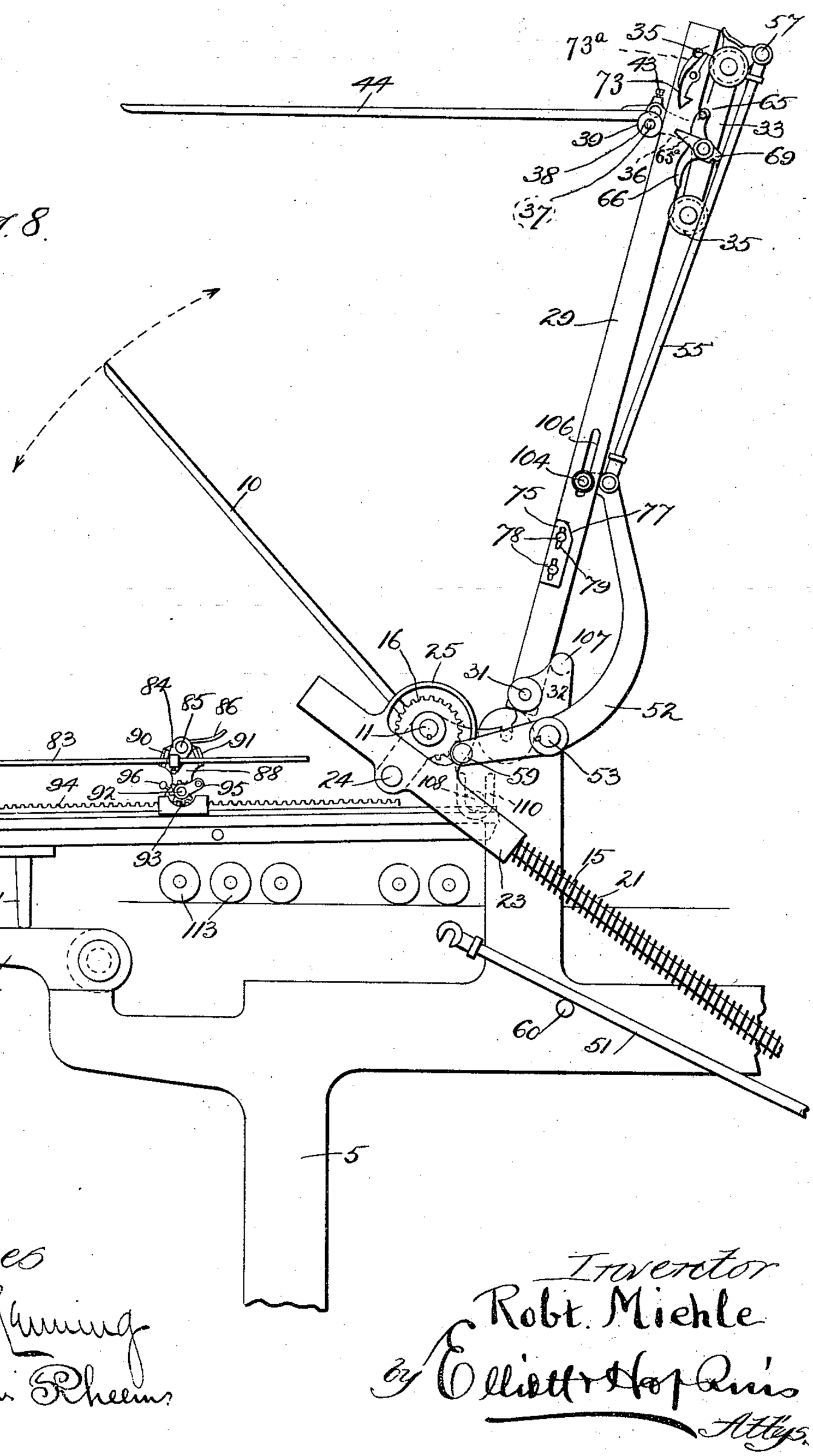
SHEET DELIVERY MECHANISM.

(Application filed Sept. 3, 1896.)

(No Model.) 6 Sheets—Sheet 6.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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SHEET-DELIVERY MECHANISM.

SPECIFICATION forming part of Letters Patent No. 610,491, dated September 6, 1898.

Application filed September 3, 1896. Serial No. 604,778. (No model.)

To all whom it may concern:

Be it known that I, ROBERT MIEHLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Sheet-Delivery Mechanisms, of which the following is a full, clear, and exact specification.

My invention relates more particularly to improvements in that class of sheet-delivery mechanism in which the sheet-carrier or carrying-fingers have a reciprocating movement to and from the impression-cylinder and are adapted to deliver the sheet printed side up; and my invention has for its primary object to combine a reciprocating delivery of this character with the ordinary fly-delivery, whereby the two may be employed interchangeably and the conversion from one to the other readily and quickly effected without entailing any appreciable loss of time.

Another object of my invention is to provide the reciprocating delivery with improved means for receiving and holding the forward edge of the sheet without pinching or marring the same and which shall prevent the sheets from riding the wind and will insure regular and uniform delivery thereof upon the piling-table; and a still further object of my invention is to provide means whereby ready access to the inking-rollers may be gained without the necessity of lifting the entire reciprocating sheet-delivery mechanism, as heretofore.

With these ends in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects hereinafter appearing are attained, all as fully described in the specification, shown in the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a side elevation of a portion of a two-revolution cylinder printing-press equipped with my improved sheet-delivering mechanism. Fig. 2 is a plan view thereof. Fig. 3 is an enlarged detail view of a part of the delivery mechanism shown in side elevation, as in Fig. 1, but illustrating the piling-table in its elevated position. Fig. 4 is an enlarged vertical longitudinal sectional view taken on the line 4 4, Fig. 5. Fig. 5 is a plan view of the greater part of the mechanism shown in Fig. 4. Fig. 6 is an enlarged detail side elevation of one end of the piling-table and the trip mechanism for actuating the sheet-pushers hereinafter described. Fig. 7 is a plan view thereof. Fig. 8 is a side elevation of the delivery mechanism, showing the position of the reciprocating-delivery mechanism when inactive and the fly-delivery in operation; and Fig. 9 is a plan view of the ends of the reciprocating sheet-carrying fingers and the sheet-stop therefor, illustrating certain modifications hereinafter explained.

1 represents the feed-table, upon which the sheets are piled and from which they are fed to the grippers 3 of the impression cylinder or device 4, which is mounted as usual or in any suitable manner in the frame 5. The sheet 2, after being carried around by the cylinder 4 and receiving the impression, is released by the grippers 3 and is stripped from the cylinder 4 by means of the usual strippers 6, which project into close propinquity to the periphery of the cylinder in the ordinary manner, and these strippers 6 guide the sheet between the usual tape-rollers 7 8 and upon conveying-tapes 9, which carry the sheet away from the cylinder 4 to a position immediately over the fly-fingers 10. These fly-fingers 10 are mounted at their lower or butt ends upon a shaft 11, journaled in a portion 12 of the main frame and having sleeved thereon a number of castings 13, each of which serves as means of attachment for one of the fly-fingers 10, as will be understood. These fly-fingers 10 descend between the tapes 9, and when in position to receive and carry the sheet they are substantially horizontal and slightly below the plane of the tapes 9, as shown more clearly in Fig. 4, and when conveying the sheet to the piling-table 14 they make an upward sweep through an arc of about one hundred and eighty degrees as the shaft 11 is oscillated in the ordinary manner. An oscillatory movement is imparted to the shaft 11 through the intermediary of a reciprocating rack-bar 15, which engages with the pinion 16 on the shaft 11

and which is itself reciprocated by means of a cam 17, arranged on a driving-shaft 18 and adapted to engage with a pivoted arm 19, having an antifriction-roller 20 running against the surface of the cam, the arm 19 being pivoted or otherwise secured to the rack-bar 15, and the rack-bar being returned and the roller held normally in contact with the cam 17 by means of a spring 21, coiled upon the bar 15 and bearing between a collar 22 on the bar 15 and a sleeve 23, pivoted at 24 and forming a housing for holding the rack-bar in engagement with the pinion 16, the sleeve 23 being provided with a guard 25, which surrounds the pinion for preventing injury to the operator. All of these parts may be of the usual or any suitable construction; but it is preferable to effect an operative connection between the rack-bar 15 and the cam 17 by means substantially the equivalent of that described in order that the rack-bar 15 may be readily rendered inoperative and the fly-fingers 10 held in a substantially horizontal position below the plane of the conveying-tapes 9 when it is desired to deliver the sheets by the reciprocating delivery mechanism, as before intimated. When the construction for effecting this connection between the rack-bar 15 and the cam 17 which I have described is employed, the fly-delivery mechanism may be readily thrown out of operation and the fly-fingers held in the described position by means of a lock consisting of an arm 26, pivoted at 27 to the main frame and having a notched end 28, adapted to engage with the pivoted arm 19 and hold the roller 20 out of the line of movement of the surface of the cam 17.

29 and 30 represent two rails arranged in substantially a horizontal position, one on each side of the machine, and being pivoted at 31 to lugs or projections 32, formed on the main frame and being supported by the fly-casting 32ª or in any suitable manner so as to project over each side of the piling-table 14. These rails 29 30 constitute the frame of the reciprocating sheet-delivery, and they are arranged at a sufficient distance apart to permit the fly-fingers 10 to oscillate between them and to deposit the sheet onto the piling-table without interference. Mounted upon the rail 29 on one side is a carriage 33 and on the rail 30 on the other side a carriage 34. Each of these carriages is provided with antifriction-rollers 35 at each end thereof whose peripheries are grooved or flanged and embrace the upper edges of the rails 29 30, and thus serve to hold the carriage in place or against lateral displacement, while at the same time reducing the friction to the minimum. The carriage 33 is provided with a depending arm or hanger 36, in the lower end of which is pivoted a pin 37, provided with an eccentric enlargement 38, upon which is journaled a roller 39, which engages under the rail 29 and serves to prevent the rollers 35 from leaving the rail, the portion 38, upon which the roller 39 is journaled, being eccentric, so that by the rotation of the pin 37 the roller 39 may be adjusted with reference to the rail 29. In this manner provision is made for taking up wear and holding the carriage-rollers firmly down against the rail. The carriage 34 on the other side of the machine is likewise provided with a depending arm or hanger 40, which carries a roller 41, having an eccentric journal (not shown) similar to the journal 37 38 before described and for a similar purpose. These hangers 36 40 are connected together by a transverse shaft 42, which is securely bound at each end in the hangers 36 40 and normally held against rotation by means of set-screws 43, extending through the hangers 36 40 and impinging the shaft 42. This shaft 42 constitutes the means for supporting and carrying the reciprocating sheet-delivery devices or fingers 44 of the reciprocating carrier, which are arranged at suitable intervals apart on the shaft 42 and which when in their normal position project in substantially a horizontal direction between the fly-fingers 10 and across the upper side of the fly-finger shaft 11 and are so disposed as to lie below the plane of the upper fold of the conveying-tapes 9, and their upper or right-hand ends as viewed in Fig. 1 are depressed below the fly-fingers 10 when in the position shown in Fig. 1, ready to receive the sheet, so that the fly-fingers 10 will, in conjunction with the tapes 9, constitute means for supporting the sheet and preventing sagging thereof between the tapes while the reciprocating fingers 44 are moving toward and under the sheet, thus causing the fly-fingers 10 to perform the twofold function of delivering the sheet when the fly-delivery mechanism is in operation and of serving to support the sheet preparatory to its reception by the reciprocating fingers 44 when the reciprocating mechanism is operated and the fly-delivery mechanism is inactive.

The fingers 44 may be supported upon and secured to the shaft 42 in any suitable manner; but I prefer to employ for this purpose a number of castings or hubs 45, each provided with a set-screw 46, whereby the hub may be secured against rotation on the shaft, and each of these hubs is provided with an arm 47, to which the finger 44 is attached. Each of these hubs 45 is also provided with a projecting ledge 48, which virtually constitutes a continuation of the finger 44 and upon which the sheet rests while being carried by the reciprocating delivery. When the reciprocating fingers 44 are at the extremity of their return movement, or in position to receive the sheet, they are in the position shown more clearly in Figs. 1 and 4, and while in this position the sheet is fed forward from the printing-cylinder by the tapes 9 and is pushed onto the ledges or projections 48 of the fingers 44, and in order that the position of the sheet on the ledges 48 may be gaged and the sheet prevented from being pushed at various dis-

tances beyond the ends of the ledges 48 the latter are provided with a number of stops 49, which preferably project down over the extreme ends of the ledges 48, so as to protect the edge of the sheet from the current of air occasioned by the sheet moving forward on the carrying-fingers 44, thus preventing the edge of the sheet from riding the wind. This result is further prevented by reason of the angular arrangement of the stops 49 with reference to the plane of the projections 48, inasmuch as this arrangement constitutes a sharp angle in which the edge of the sheet is projected and held. These stops 49 are mounted loosely upon a transverse shaft 50, which has its ends supported in the carriages 33 34, and the stops are preferably independent of each other and also independent of the shaft 50, so as to be capable of independent rotation or oscillation on the shaft and to gravitate against the projections or ledges 48 when not held aloof by other means.

The carriages 33 34 are reciprocated back and forth upon their rails 29 30 by a suitable connection with the driving-shaft 18, but which of course is capable of being rendered inoperative when it is desired to operate the fly-delivery mechanism. This operative relation or connection between the shaft 18 and the carriages 33 34 is preferably established by means of a connecting-rod 51, which is pivoted at one end to the cam 17 and is detachably connected at its other end to a lever 52, keyed to a shaft 53, extending athwart the machine in a plane below the fingers 10 and 44. One arm of the lever 52 is duplicated, as shown at 54, at the other end of the shaft 53, and each of the levers 52 54 is connected by connecting-rods 55 56, respectively, to a pivot-pin 57 on each of the carriages 33 34, so that as the cam 17 rotates the levers 52 54 will be thrown first into the position shown in Figs. 1 and 4 and will then be projected forwardly, forcing the carriages 33 34 to the outer extremity of their traverse or to the left-hand ends of the rails 29 30 when viewed as in Fig. 1. The rod 51 is connected to the lever 52 by means of a hook 58, engaging with a pin 59 on one arm of the lever 52, so that the rod 51 may be detached and rested upon any suitable support or lug 60 when it is desired to throw the reciprocating delivery out of operation. These parts are so proportioned and timed with relation to the printing mechanism and the conveying-tapes 9 that the carriages 33 34 will start on their delivery movement with the sheet at about the time the edge of the sheet reaches the stops 49, and for a short portion of their travel they will move in unison with the tapes 9, and thus afford opportunity for the reciprocating delivery-fingers 44 gaining full possession of the sheet and preventing the friction of the sheet upon the tapes from pulling it away from the stops 49. Ordinarily, therefore, my improved delivery is operative without other means for gripping the edge of the sheet and holding it in firm contact with the delivery-fingers 44; but in order to guard against the possibility of the displacement of the sheet upon the projecting ledges 48 I prefer to employ means for automatically impinging the edge of the sheet against the delivery-fingers 44, or, which amounts to the same thing, against the projections 48. This means consists, preferably, of a number of grippers consisting of a number of springs 61, secured to arms 62, which are in turn rigidly attached by hubs and set-screws 63 to the rocker-shaft 50. These springs 61 are also arranged at an angle to the plane of the projections 48, so that the sheet may readily pass under them, and their lower ends are preferably notched, as shown in Fig. 5, so as to afford a firmer grip upon the sheet and to press the latter securely against the ledges 48. Their upper ends are turned upwardly in the form of guards 64, so as to insure the passage of the sheet under them. When the carriages 33 34 return to receive the sheet from the tapes 9, the grippers 61 rise a short distance from the ledges or projections 48 to permit the sheet to pass under them and to come into contact with the stops 49, and at the other end of the traverse of the carriages 33 34 the grippers 61 again ascend and in so doing come against the under sides of the stops 49 and also lift them clear of the projections 48, so as to permit the sheet to slide from the latter onto the piling-table. I will now describe the mechanism for accomplishing this operation.

The shaft 50 is provided on one end with a shoe which is composed of a runner or cam-like portion 66 on one side, a projection 65 on the other, and an intermediate depending projection 65^a, and which shoe is securely fastened to the shaft 50 by means of a set-screw 67 or other suitable device, so that the oscillation of the shoe will also cause the shaft 50 to rock. Secured to the top of the carriage 33 is a spring or presser arm 68, which bears normally upon an angular projection 69, formed on the upper side of the shoe 65 66. This spring 68 is provided with an offset or angular bend 70, from which continues a portion 71, formed in substantially a parallel line with the main portion of the spring 68, and which portion 71 terminates in a hook 72. The spring 68 in pressing upon the projection 69 tends to hold the shoe in either position in which it might be tilted. When the grippers 61 are down in engagement with the ledges 48 and impinging the sheet, the projection 69 is tilted on the left of the center and is resting against the offset 70, and the shoe is held in this position by the pressure of the spring 68, which is then down in engagement with the apex of the projection 69; but by the time the carriages 33 34 reach the traverse of their delivery movement or the extremity of their travel on the left the under edge of the projection 65^a comes in contact with a pivoted dog or pawl 73, pivoted to the side of the rail 29 and pressed normally upward by a spring 73^a. As

soon as the projection 65ª engages over the tooth of the dog 73 the reciprocating delivery starts on its return movement, and in doing so forces the end 65 of the shoe upward, and consequently instantly raises both the grippers 61 and the stops 49 and permits the sheet to pass or fall onto the piling-table as the fingers 44 recede or return for another sheet. I am aware that it has heretofore been proposed to open the front grippers of a reciprocating carrier as the latter nears the extremity of its delivery stroke; but this prior construction is objectionable, because if the the sheet is released before the delivery stroke is entirely completed the momentum of the sheet will cause it to shoot from the carrier in an erratic manner when the carrier ceases its delivery movement, whereas in raising or releasing the stops 49 from the edge of the sheet at the finish of the stroke of the carrier (and by the expression "at the finish of the stroke of the carrier" is meant the time when the carrier no longer undergoes delivery movement) I absolutely overcome the momentum of the sheet before its edge is released by the stops, and consequently when the carrier recedes from under the sheet the latter will drop straight down by gravity at the point to which the carrier conveyed it and will not fly haphazard from the carrier. It will also be seen that owing to the elastic character of the grippers 61 and to their forward frictional movement against the surface of the sheet they are apt to impart a slight forward impetus to the sheet as they rise therefrom; but by raising them slightly in advance of the time of raising the stops 49 any movement thus imparted to the sheet will be restrained by such stops 49. This action of the dog 73 forces the projection 69 past the offset 70 and over against the hook 72. The projection 69 is held in this position, tilted to the right of the center, and the grippers and the stops consequently held aloof from the projections 48 until the carriages 33 34 are about to complete their return movement, whereupon the lower edge of the runner 66 comes in contact with a pin 74, projecting from the side of the rail 29 at or near the opposite end from the pawl 73. This causes the shoe 65 66 to be tilted to the left, carrying the projection 69 over into engagement with the inclined offset 70, and which inclined offset under the pressure of the spring 68 would complete the oscillation of the shoe 65 66 and cause the grippers 61 as well as the stops 49 to again descend into contact with the projections 48; but arranged on the side of the rail 29 is a cam or incline 75, with which engages a pin 76, projecting from the side of the end 65 of the shoe, and which cam and pin 75 76 coöperate in holding the shoe 65 66 in the position indicated in Fig. 3, with the apex of the projection 69 resting intermediate the ends of the offset 70, and when in this position the grippers 61 are sufficiently low to permit the stops 49 to descend against the projection 48, as shown more clearly in Fig. 4, while the grippers themselves are slightly elevated from such projections 48, so as to permit another sheet to pass under them and to come squarely against the stops 49. The cam 75 is provided at one end with an inclined edge 77, while the remainder of its upper edge is substantially straight and parallel with the upper edge of the rail 29, so that the grippers 61 will remain elevated throughout a small fraction of the travel of the carriages 33 34 and will be permitted by the incline 77 to be gradually forced down into engagement with the sheet under the influence of the spring 68, bearing with its inclined offset 70 upon the projection 69. If desired, the cam 75 may be rendered adjustable on the rail 29 by the use of set-screws 78, passing through slots 79 in the cam 75, and thus securing the latter to the rail 29. The inner edge of the cam 75 is rabbeted, as indicated in Fig. 3 in dotted lines and in Fig. 5 in full lines, so as to permit the lower edges of the runners 65 66 to pass without obstruction, and the depending projection 65ª is formed on the under side of the hub of the shoe and is offset to the outer side of the cam 75, so as not to strike the latter. When the pin 76 passes down the incline 77 and the offset 70 completes the tilting movement of the shoe, and thus brings the grippers 61 into firm engagement with the sheet, the apex of the projection 69 will be in engagement with the main portion of the spring 68, as before described, and the parts will remain in this position until the projection 65ª comes into engagement with the dog 73 on the return movement, as before explained, and by the time this occurs the finger 80, secured in any suitable manner to the shaft 42, which carries the fingers 44, comes into engagement with the upper end of a lever 81, pivoted in standard 82 and having its lower end or arm connected by rod 83, with a crank 84 on a rocker-shaft 85, which bears a number of pushers or fingers 86, which may be termed "pushers," because they in effect push the sheet from the fingers 44 as the latter recede. When the finger 80 strikes the lever 81, it causes the pushers 86 to stand in an upright position between the fingers 44, and consequently as the latter recede or return toward the cylinder the sheet is crowded off of them and falls onto the piling-table 14, the latter being provided at its lower or outer end with the usual spring stops or gages 87, against which the lower edge of the sheet strikes and which serves to pile the sheets in regular order, as will be understood. By the time the shaft 42 of the reciprocating-delivery mechanism reaches the pushers 86 the sheet has been substantially pushed off of the reciprocating delivery, and the shaft 42, by coming into engagement with the pushers 86, forces the latter down out of the way into the position shown in Fig. 1, so that when the fingers return with another sheet the shaft 42 passes

over the pushers 86 without engaging therewith.

The lever 81 is limited in its movement in one direction, or to the right, by means of a stop $81^{\times}$, formed on the standard 82. The lever 81 is held against accidental movement by means of any suitable friction-hold—such, for instance, as the coil-spring surrounding the pivot of the lever 81 and bearing between the lever and a head or shoulder on such pivot, as clearly shown at $82^{\times}$ in Figs. 6 and 7.

The shaft 85, which carries the pushers 86, is journaled in a pair of castings or slides 88 89, one on each side of the machine, and the casting 88 is provided with two stops 90 91, which limit the movement of the crank-arm 84, the stop 90 limiting such movement when the crank is thrown by the engagement of the shaft 42 with the pushers 86, while the stop 91 serves to limit the reverse movement occasioned by the finger 80 striking the lever 81. The castings 88 89 are adjustable longitudinally of the line of movement of the delivery-fingers 44, so as to have the pushers 86 in the proper position for various sizes of sheets. To this end I journal in the castings 88 89 a transverse shaft 92, upon each end of which is secured a pinion 93, which pinions engage, respectively, with two rack-bars 94, secured along the upper edge of the piling-table 14 on each side, and the shaft 92 is provided with a crank 95, whereby the pinions 93 may be simultaneously rotated, and thus cause the castings or slides 88 89 to move in unison along the rack-bars 94. When the proper adjustment is reached, the slides may be held against further movement by means of a set-screw 96, passing through the casting 88 and impinging the shaft 92. This of course necessitates an adjustable connection between the rod 83 and crank-arm 84, which may be effected by means of a block 97, pivoted to the crank-arm 84 and having a set-screw which impinges the rod 83, passing through it. The foot of each of the castings 88 89 straddles the rack-bar 94 and is cut away, as clearly shown in Fig. 1, to permit the pinion 93 to engage with the teeth of the rack-bar. The upper edge of the table 14 is channeled under the rack-bar 94, (shown at 94^{a},) and the foot-piece of the casting or slide 88 89 is provided with an inwardly-projecting flange (shown in dotted lines at 88^{a}) which engages in this channel 94^{a} and holds the casting in place.

Owing to the rapid movement of the sheet while being conveyed to the grippers 61 by the tapes 9, the sheet is liable to ride the wind or float upwardly as its forward edge comes from the tapes, and thus fail to properly enter the space between the grippers 61 and the projections 48, and in order to guard against this I arrange over the tapes 9 a series of guide-fingers 98, whose lower ends project under the upwardly-curved ends 64 of the grippers 61. These guide-fingers 98 must of course be of such a character as to be capable of removal when the fly-delivery mechanism is to be operated, and this might be done by slipping them sidewise on their shaft; but in order that they may be moved more fully out of the way of the operator with but the minimum loss of time I secure the upper ends of the fingers 98 to a transverse bar 99 (see Fig. 2) by means of castings 100, having set-screws 101, holding the castings from rotation on the bar 99. The ends of the bar 99 are squared or flattened, as shown at 102, and these ends are seated in notched brackets 103, arranged on each side of the machine, so that the bar 99 may be readily lifted out of the notched brackets and the guide-fingers 98 thus removed from the path of the fly-fingers 10, or, if desired, the brackets 103 may be loosely sleeved upon the rod 103^{a} and held by set-screws 103^{b}, so that instead of removing the series of fingers bodily they may be removed by simply turning them upward on the rod 103^{a}, and the set-screws then turned for holding them in such position.

When the reciprocating delivery is in operation, the parts are in the condition more clearly illustrated in Fig. 1, with the roller 20 out of the line of movement of the cam 17; but when it is desired to render the reciprocating delivery inactive and to operate the fly-delivery the series of guide-fingers 98 is removed by lifting the bar 99 out of its sockets in the brackets 103. The hook 58 is then disengaged from the pin 59 in the lever 52 and the rod 51 rested upon the support or pin 60. The levers 52 54 are then forced over to the left, carrying the carriages 33 34 to the extremity of their movement in that direction, and the carriage is held in this position by means of a pin 104, which is passed through a perforated lug or ear 105 on each of the levers 52 54 and engaging in a slot 106 in each of the rails 29 30, thus binding each of the levers 52 54 to one of the rails 29 30. When this has been accomplished, the rails 29 30 may be stood upward in a slightly-leaning position on their pivots 31 in the manner shown in Fig. 8, in which position the rails 29 30 are held by stops or lugs 107, formed on the portions 32 of the frame. The set-screws 43, which bind the finger-shaft 42, are now loosened and the shaft 42 rotated until the fingers 44 of the reciprocating delivery assume the position indicated in Fig. 8 or are sufficiently turned out or upward to permit the fly-fingers 10 to pass between the rails 29 30 without striking the fingers 44. The release of the lock 26 from the arm 19 then completes the conversion of the mechanism from the reciprocating delivery to a fly-delivery, and this conversion may be effected in an exceedingly short space of time.

The piling-table 14 is provided at its inner end with trunnions 108, secured to the upper side of the table by means of plates or castings 109, and these trunnions are mounted in open bearings 110. The outer edge of the

table is supported by legs 111 on a portion 112 of the frame. The table 14 is of less width than the distance between the rails 29 30, so that the table and the mechanism carried thereon may be raised between the rails 29 30 in the manner shown in Fig. 3 without the necessity of lifting the rails 29 30 and the mechanism carried thereby, when it is desired to gain access to the inking-rollers 113. In order that the table may be supported in its elevated position, I provide the same on each side with a pin 114, which pins are capable of being drawn out over the rails 29 30, and thus supporting the table thereon. In Fig. 9, which illustrates a modification of the stops 49, instead of making the stops independent of each other, they are composed of a single plate 49ª, which extends entirely across the series of delivery-fingers and is provided with cut-away portions 49ᵇ for the accommodation of the castings 63. The object of this is to protect the end of the sheet from the current of air, as heretofore explained.

As shown more clearly in Fig. 4, the pusher-fingers 86 are preferably formed of thin steel or other flexible material and wound around the shaft 85, which is formed with a V-shaped groove 86ª, into which the ends of the fingers 86 are turned. This construction avoids any possibility of damage to the fingers 86 or to the reciprocating delivery if by accident the fingers should be turned upward while the delivery is advancing or moving forward. Should this occur, the shaft 42 of the delivery would strike the fingers and turn them down, the part of the finger encircling the shaft 85 turning freely thereon and forcing the end out of the groove 86ª. When thus displaced, the fingers may be readily returned to their normal position, with the inturned ends engaging in the groove 86ª, by simply turning them on the shaft 85 until the groove is reengaged.

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

1. The combination of a cylinder printing-press, a fly-delivery and a reciprocating delivery arranged as described, and means for holding the fly-delivery below the plane of the sheet so that they act together in delivering the sheet printed side up, substantially as set forth.

2. The combination with a cylinder printing-press and delivery-tapes, a fly frame or fingers suspended in normal position between said tapes and adapted to be rendered inoperative, and means for supporting the fly-fingers below the delivery-tapes, of a sheet-carrier movable to and from said fly-frame and tapes, to deliver the sheet with the printed side up on the receiving-table, substantially as set forth.

3. The combination of a cylinder printing-press, delivery-tapes and an oscillatory fly-frame, of a reciprocating sheet-carrier and means substantially as described for suspending operation of one or the other of said oscillating fly-frame or sheet-carrier and holding the fly-fingers below the said tapes, substantially as set forth.

4. The combination with a printing-press and delivery-tapes, of a fly-delivery having means whereby it may be rendered inactive during the operation of the press, a reciprocating delivery arranged at the delivery ends of said tapes and adapted to receive the sheet therefrom, said reciprocating delivery having means moving therewith for projecting under and supporting the sheet, substantially as set forth.

5. A sheet-delivery mechanism having in combination a fly-delivery device provided with oscillating fly-fingers, means for holding said fly-fingers substantially horizontal and below the line of travel of the sheet, and whereby they will assist in supporting the latter, guide-fingers supported over the line of travel of the sheet, and a reciprocating delivery arranged to receive the sheet from the said tapes and fly-fingers and deliver it upon the delivery-table with the printed side up, substantially as described.

6. A sheet-delivery mechanism having in combination a fly-delivery mechanism provided with fly-fingers, means for rendering said fly-fingers inoperative and holding them substantially horizontal, and a reciprocating delivery having sheet-supporting fingers reciprocating between said fly-fingers, substantially as set forth.

7. A sheet-delivery mechanism having in combination sheet-conveying tapes, a fly-delivery mechanism provided with fly-fingers arranged between and below said tapes and serving in conjunction therewith to support the sheet, means for rendering said fingers inoperative and holding them substantially horizontal in position to support the sheet, and a reciprocating delivery having sheet-supporting fingers reciprocating between and below said fly-fingers, substantially as set forth.

8. A sheet-delivery mechanism having in combination a fly-delivery provided with fly-fingers, a driving-shaft, means for oscillating said fingers having disengageable connection with said driving-shaft and adapted to hold said fingers substantially horizontal and inactive, a reciprocating delivery and means for reciprocating said reciprocating delivery having detachable connection with said driving-shaft, substantially as set forth.

9. A sheet-delivery mechanism having in combination a fly-delivery mechanism provided with fly-fingers a rocker-shaft for oscillating said fingers, a driving-shaft, means having a cam for rotating said rocker-shaft, means for suspending operative relation between said rocker-shaft and said cam, a reciprocating delivery and a detachable connection between said reciprocating delivery and driving-shaft, substantially as set forth.

10. A sheet-delivery mechanism having in combination a fly-delivery device provided with oscillating fly-fingers, means for holding said fly-fingers inactive and substantially horizontal and below the line of travel of the sheet and whereby they will assist in supporting the latter, removable guide-fingers supported over the line of travel of the sheet, and reciprocating delivery-fingers arranged below the plane of said guide-fingers, substantially as set forth.

11. A sheet-delivery mechanism having in combination a fly-delivery device provided with oscillating fly-fingers, means for holding said fly-fingers inactive and substantially horizontal and below the line of travel of the sheet and whereby they will assist in supporting the latter, guide-fingers supported over the line of travel of the sheet, and reciprocating delivery-fingers arranged below the plane of said guide-fingers, substantially as set forth.

12. A sheet-delivery mechanism having in combination a fly-delivery device provided with oscillating fly-fingers, means for holding said fly-fingers inactive and substantially horizontal and below the line of travel of the sheet, the notched brackets 103, a bar having squared or flattened ends resting in said notched brackets, guide-fingers secured to said bar and held thereby over the line of travel of the sheet, and reciprocating sheet-delivery fingers arranged below the plane of said guide-fingers, substantially as set forth.

13. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops moving with said carrier for limiting the independent movement of the sheet and means for moving said stops entirely from across the plane of the supporting-surface of said carrier at the finish of the stroke of the carrier, substantially as set forth.

14. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops having their ends turned down over the ends of said carrier for limiting the independent movement of the sheet, and means for moving said stops out of the way at the finish of the stroke of said carrier, substantially as set forth.

15. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops arranged to be struck by the sheet and to limit the independent movement of the latter, a rocker-shaft moving with said carrier and having means traveling with the carrier for limiting the downward movement of said stops, means for oscillating said shaft, means for holding said stops in position until the sheet has passed under the stops and means for moving the stops into position to limit the independent movement of the sheet, substantially as set forth.

16. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, means for conveying the sheet to said fingers, stops arranged to be struck by and to limit the independent movement of the sheet on said fingers, a rocker-shaft moving with said fingers and having means for limiting the downward movement of said stops, a shoe for oscillating said shaft, a projection at one end of the stroke of said fingers arranged to be engaged by the said shoe, means for holding said shoe in the position given it by said projection and a trip or projection arranged at the other end of the stroke for tilting said shoe to its former position, substantially as set forth.

17. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, means for conveying the sheet to said fingers, stops arranged to be struck by and to limit the independent movement of the sheet on said fingers, a rocker-shaft moving with said fingers and having means for elevating said stops, a shoe for oscillating said shaft, said shoe being provided with a projection, a spring engaging with said projection for holding the shoe in the position to which it is tilted, and projections arranged on or near opposite ends of the line of movement of said shoe and adapted to engage therewith for alternately tilting said shoe in opposite directions, substantially as set forth.

18. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, means for conveying the sheet to said fingers, stops arranged to be struck by and to limit the independent movement of the sheet on said fingers, a rocker-shaft having means for elevating said stops, a shoe moving with said fingers and connected to said shaft for rocking it, projections arranged at opposite ends of the line of movement of said shoe and adapted to engage therewith and to alternately tilt the shoe in opposite directions, the projections 69 on said shoe, a spring bearing against said projection 69 and having the inclined offset 70 and the portion 71, substantially as set forth.

19. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, and pushers for crowding the sheet from said carrier, guideways and adjustable supports thereon for said pushers substantially as described.

20. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops for limiting the movement of said sheet and pushers for crowding the sheet from said carrier substantially as set forth.

21. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops for limiting the movement of said sheet, and pushers for crowding the sheet from said carrier, the said pushers being ad-

justable for different-sized sheets, substantially as described.

22. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, means for conveying the sheets to said fingers, a pair of rails, carriages supported upon said rails and carrying said fingers, stops carried by said carriages and projecting below the plane of said fingers, and means for holding said stops aloof at the finish of the stroke of said fingers, substantially as set forth.

23. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, means for feeding the sheet to said fingers, a pair of rails, a carriage supported on each of said rails and having grooved rollers embracing the upper edge of the same, a roller having an eccentric pivot or journal carried by each of said carriages and engaging under each of said rails, a shaft connecting said carriages together and carrying said fingers, and stops carried by said carriages for limiting the independent movement of the sheet on said fingers, substantially as set forth.

24. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier having fingers, means for conveying the sheet to said carrier, stops arranged at the ends of said carrier for limiting the independent movement of the sheet thereon, pushers for crowding the sheet from said carrier, means for automatically projecting said pushers between said fingers at the rear edge of the sheet, and means for holding said stops aloof from said fingers at the conclusion of the delivery stroke of the fingers, substantially as set forth.

25. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops arranged at the ends of said carrier for limiting the movement of the sheet thereon, means at the end of the delivery stroke of said carrier for moving said stops out of the way, pushers arranged out of the line of movement of said carrier, a rocker-shaft on which said pushers are mounted, and means for oscillating said rocker-shaft for projecting said pushers between the delivery-carrier, substantially as set forth.

26. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops carried by said carrier and projecting over the end thereof for limiting the movement of the sheet, means for moving said stops out of the way at the completion of the delivery stroke, pushers arranged out of the line of movement of said carrier and adapted to be projected up through it, a rocker-shaft carrying said pushers, means for oscillating said rocker-shaft, said pushers being turned out of the way by the bar of the sheet-carrier, substantially as set forth.

27. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops for limiting the movement of the sheet upon the carrier grippers for impinging the sheet against said carrier, and being movable independently of said stops and means for holding said grippers out of the way to permit the sheet to be deposited upon and to leave the carrier, substantially as set forth.

28. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, grippers impinging the sheet against said carrier, stops arranged over and adapted to be raised by said grippers, for limiting the movement of the sheet upon said carrier, and means for moving said grippers out of the way, substantially as set forth.

29. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, grippers for impinging the sheet against said carrier, a shaft carrying said grippers, a shoe for oscillating said shaft, an incline or cam at one end of the stroke for tilting said shoe in one direction and holding said grippers out of engagement with the sheet and means for pressing the grippers into engagement with the sheet when the shoe passes said cam or incline, substantially as set forth.

30. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, a rocker-shaft moving in unison with said carrier, grippers secured to said shaft and adapted to impinge the sheet upon said carrier, stops arranged over said grippers and adapted to be moved thereby, said grippers being capable of slight movement against said carrier independently of said stops for impinging the sheet, substantially as set forth.

31. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, a shaft moving in unison with said carrier, grippers carried by said shaft and arranged to impinge said fingers, loose stops arranged over said grippers and adapted to be elevated thereby, said grippers having a slight movement independently of said stops, a shoe secured to said shaft for rocking it, means at one end of the stroke of said carrier for tilting said shoe in one direction and raising said grippers and stops clear of said carrier, a projection at the other end of the stroke of said carrier for tilting said shoe in the opposite direction, a cam or incline for preventing said shoe from completing its tilting movement in the latter direction and thereby holding the grippers aloof from the carrier, and a spring bearing normally against said shoe for completing the said tilting movement thereof and forcing the grippers into contact with the carrier as soon as said cam is passed, substantially as set forth.

32. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, a shaft carried in unison with said carrier, grippers secured to said shaft and

adapted to impinge said carrier, loose stops arranged over said grippers and adapted to be elevated thereby, said grippers being capable of slight movement independently of said stops, a shoe secured to said shaft and having the ends 65 66 and the projection 69, a spring moving in unison with said shaft and having the inclined offset 70 and the portion 71 adapted to engage with said projection 69, a projection at one end of the stroke of said fingers for elevating the end 65 of said shoe and forcing the projection 69 against the portion 71, a projection at the opposite end of the stroke of said fingers for elevating the end 66 and forcing the projection 69 into engagement with the offset 70 and causing said stops to descend into engagement with said carrier, and means for holding said grippers aloof from the carrier until the sheet has reached a position against said stops, substantially as set forth.

33. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, the carriages carrying said fingers, rails upon which said carriages travel, a rocker-shaft carried by said carriages, grippers secured to said rocker-shaft for impinging said fingers, stops arranged over said grippers and adapted to be lifted thereby, a shoe on said rocker-shaft, a dog arranged at one end of one of said rails for engaging with said shoe and elevating said grippers and stops, a projection arranged at the opposite end of said rail for tilting said shoe in the opposite direction and returning said grippers and stops to the fingers, means tending to continue the tilting movement of the shoe in the latter direction, a cam secured to said rail and engaging with a projection on said shoe for resisting the last said movement, substantially as set forth.

34. A sheet-delivery mechanism having in combination reciprocating sheet-delivery fingers, a rocker-shaft movable in unison with said fingers, carriages carrying said fingers and shaft, rails upon which said carriages travel, grippers secured to said shaft and impinging said fingers, stops arranged over said grippers and adapted to be elevated thereby, a shoe on said shaft, means for oscillating said shoe in opposite directions at each end of the travel of said carriages, and an adjustable cam for temporarily holding said shoe from completing its oscillation in one direction, substantially as set forth.

35. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, pushers arranged out of the plane thereof, and means for projecting said pushers through said carrier when the latter returns, and in the direction of the movement of the sheet substantially as set forth.

36. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, pushers arranged under the line of movement of said carrier, means for automatically projecting said pushers through said carrier while the latter is making its return movement, rack-bars extending lengthwise of the line of movement of said carrier, slides mounted upon said rack-bars and supporting said pushers, a rocker-shaft journaled in said slides and a pinion on each end of said shaft engaging said rack-bars for simultaneously adjusting said rock-shaft at each end, substantially as set forth.

37. A sheet-delivery mechanism having in combination a fly-delivery mechanism having oscillatory fly-fingers, a reciprocating-delivery mechanism having a pivoted frame adapted to be stood into an upright position and through which frame said fly-fingers are adapted to pass, substantially as set forth.

38. A sheet-delivery mechanism having in combination a fly-delivery mechanism provided with oscillatory fly-fingers, a reciprocating-delivery mechanism having a pivoted frame adapted to be stood into an upright position and through which frame said fly-fingers are adapted to pass, said reciprocating-delivery mechanism having fingers provided with means for holding them out of the line of movement of said fly-fingers, substantially as set forth.

39. A sheet-delivery mechanism having in combination a fly-delivery mechanism provided with oscillatory fly-fingers, a reciprocating-delivery mechanism having a pivoted frame adapted to be stood into an upright position and being provided with a reciprocating delivery, means for holding said reciprocating delivery at substantially its outward movement and the same being adapted to be moved out of the line of movement of said oscillatory fingers, substantially as set forth.

40. A sheet-delivery mechanism having in combination a fly-delivery mechanism having oscillatory fly-fingers, a reciprocating-delivery mechanism having a pivoted frame adapted to be stood into an upright position, a lever for reciprocating said delivery mechanism, having operative connection therewith, and means for locking said lever and frame together and thereby holding said reciprocating-delivery mechanism substantially at the extremity of its outward movement, substantially as set forth.

41. A sheet-delivery mechanism having in combination fly-delivery mechanism provided with oscillatory fingers, a reciprocating-delivery mechanism having a pivoted frame adapted to be stood into an upright position, carriages on said frame, sheet-delivery devices carried by said carriages, levers having link connection with said carriages for reciprocating them, and means for locking said levers and frame together with the carriages at substantially the extremity of their outward movement, substantially as set forth.

42. A sheet-delivery mechanism having in combination fly-delivery mechanism provided with oscillatory fingers, a reciprocating-delivery mechanism having a pivoted frame

adapted to be stood into an upright position, the reciprocating delivery-carrier and the levers for reciprocating said carrier, and means for locking the frame and levers together, substantially as set forth.

43. A sheet-delivery mechanism having in combination a reciprocating-delivery mechanism provided with a supporting-frame, a hinged sheet-piling table arranged under said frame and being of less width than said frame and adapted to rise through said frame, and pushers supported over and movable bodily with the table substantially as set forth.

44. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops for limiting the movement of the sheet on said carrier adapted to engage the sheet until the extremity of the delivery stroke is reached, and means for raising said stops from said carrier at the beginning of the return stroke of the carrier, substantially as set forth.

45. A sheet-delivery mechanism having in combination a reciprocating sheet-delivery carrier, means for conveying the sheet to said carrier, stops for limiting the movement of the sheet on said carrier adapted to remain in their active engaging position until the delivery stroke of the carrier is completed and the return stroke of the carrier is about to commence, and means for raising said stops at the beginning of the return stroke of the carrier for allowing the sheet to pass through between the stops and the carrier and to fall by gravity upon the piling-table, substantially as set forth.

46. The combination in a cylinder printing-machine of a reciprocating carriage arranged in front of the impression-cylinder, for carrying the sheets forward over the delivery-table and for delivering the same on the delivery-table printed side uppermost, and a fly mechanism arranged to deliver the sheets on said table printed side down, and connections whereby the sheets may be delivered in either way, substantially as set forth.

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