

No. 702,673.

Patented June 17, 1902.

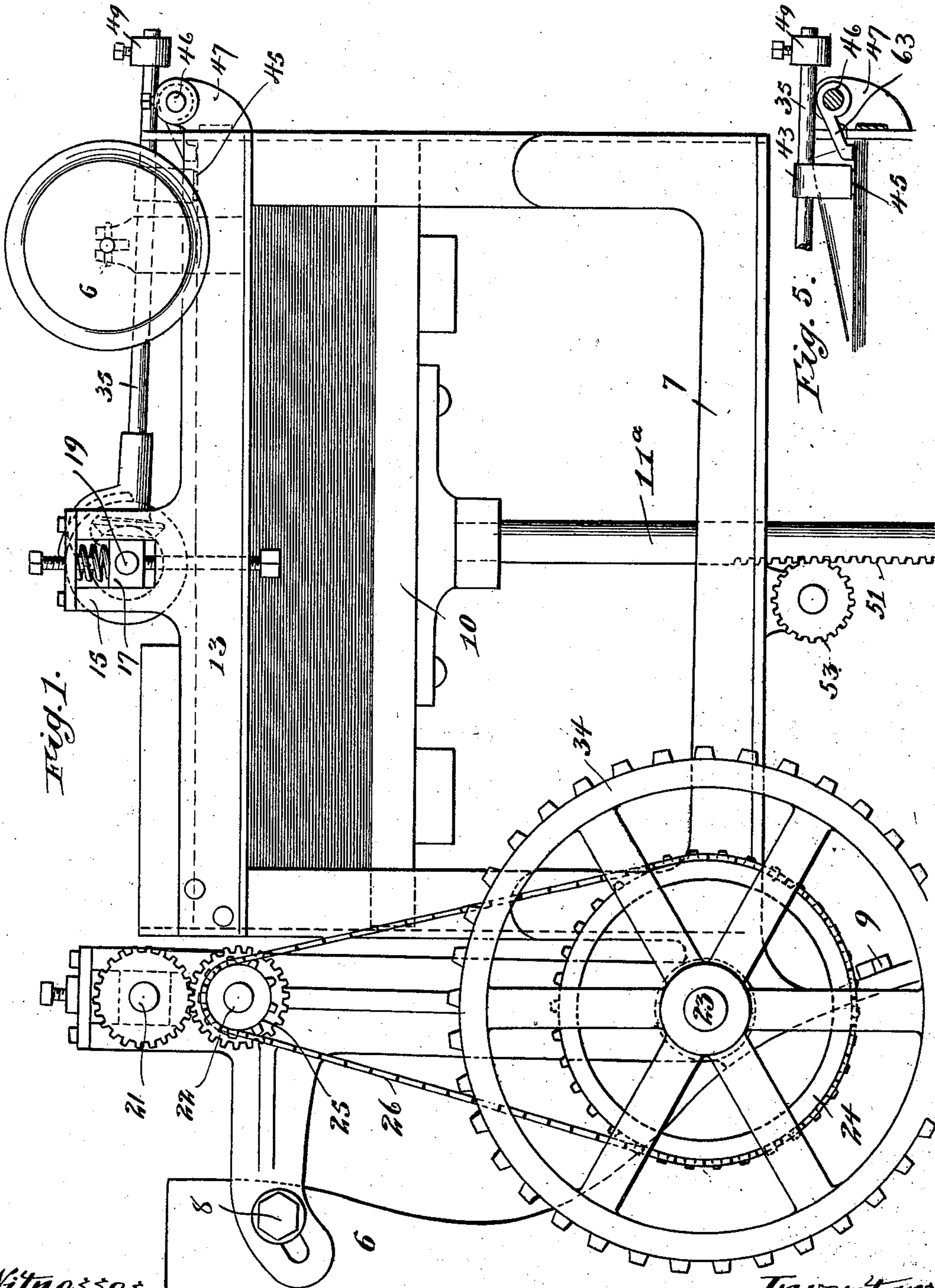
F. M. PETERS & H. H. HUNGERFORD.

PAPER FEED MECHANISM.

(Application filed July 12, 1901.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses,  
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5 Sheets—Sheet 2.

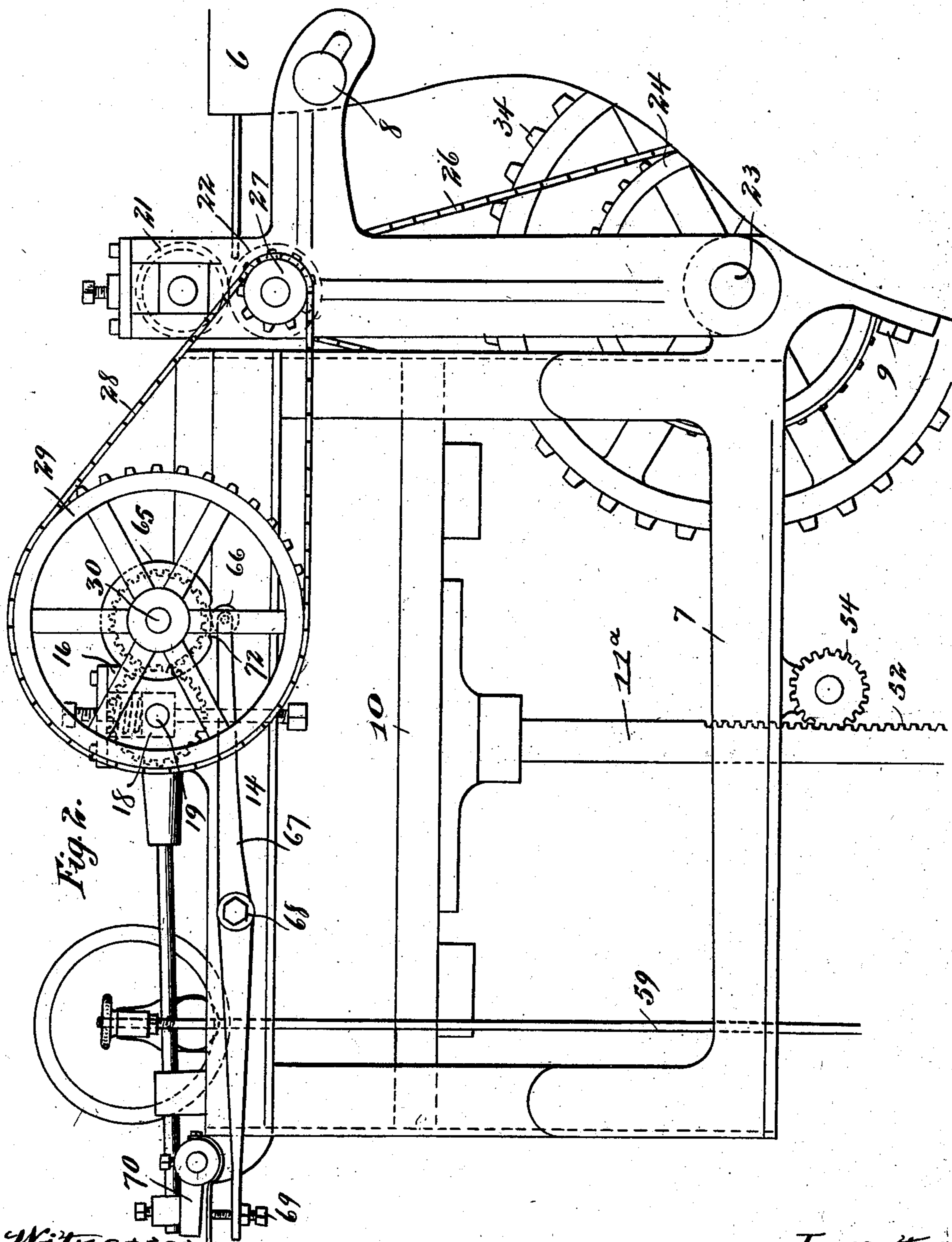


Fig. 2.

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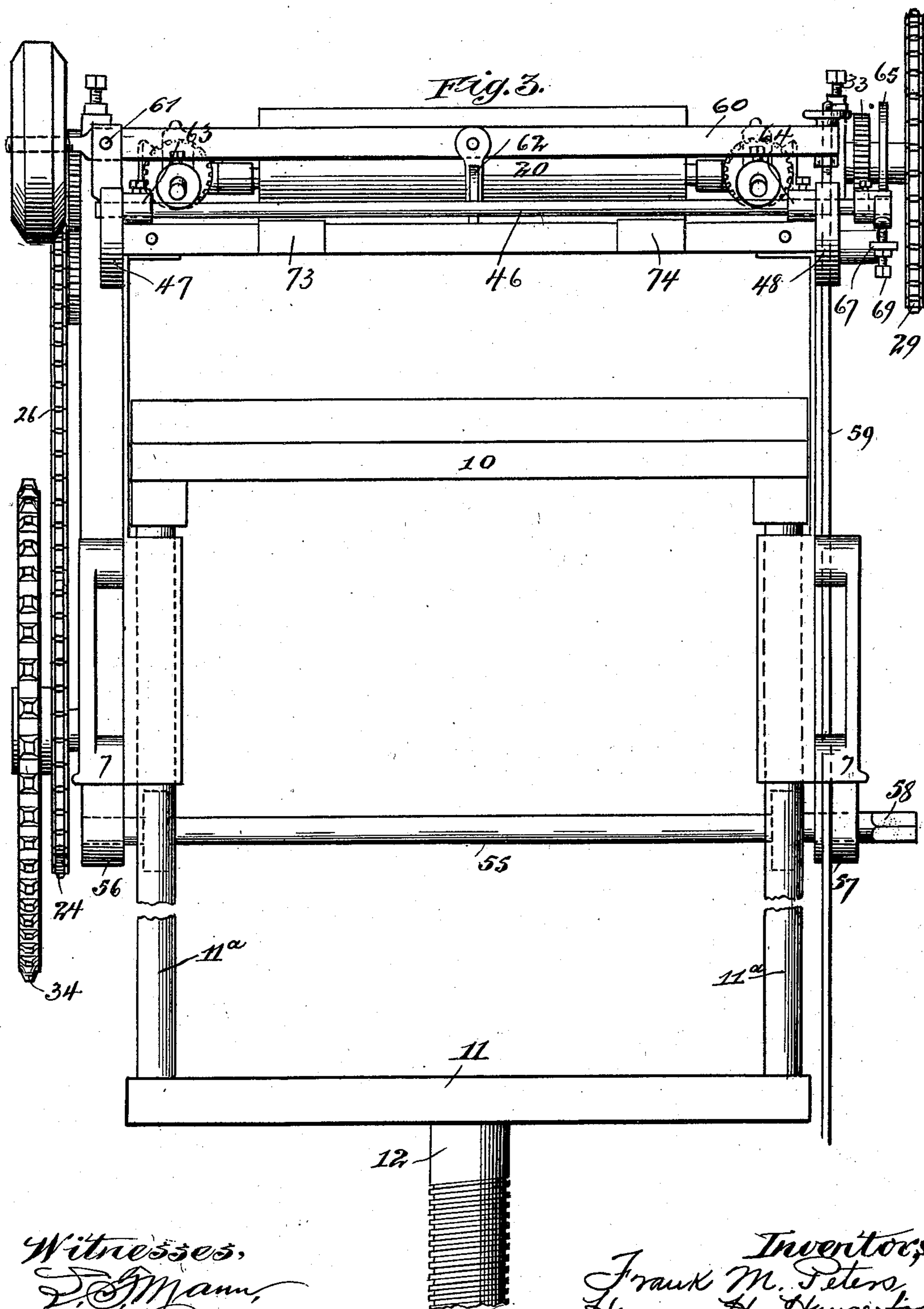
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5 Sheets—Sheet 3.



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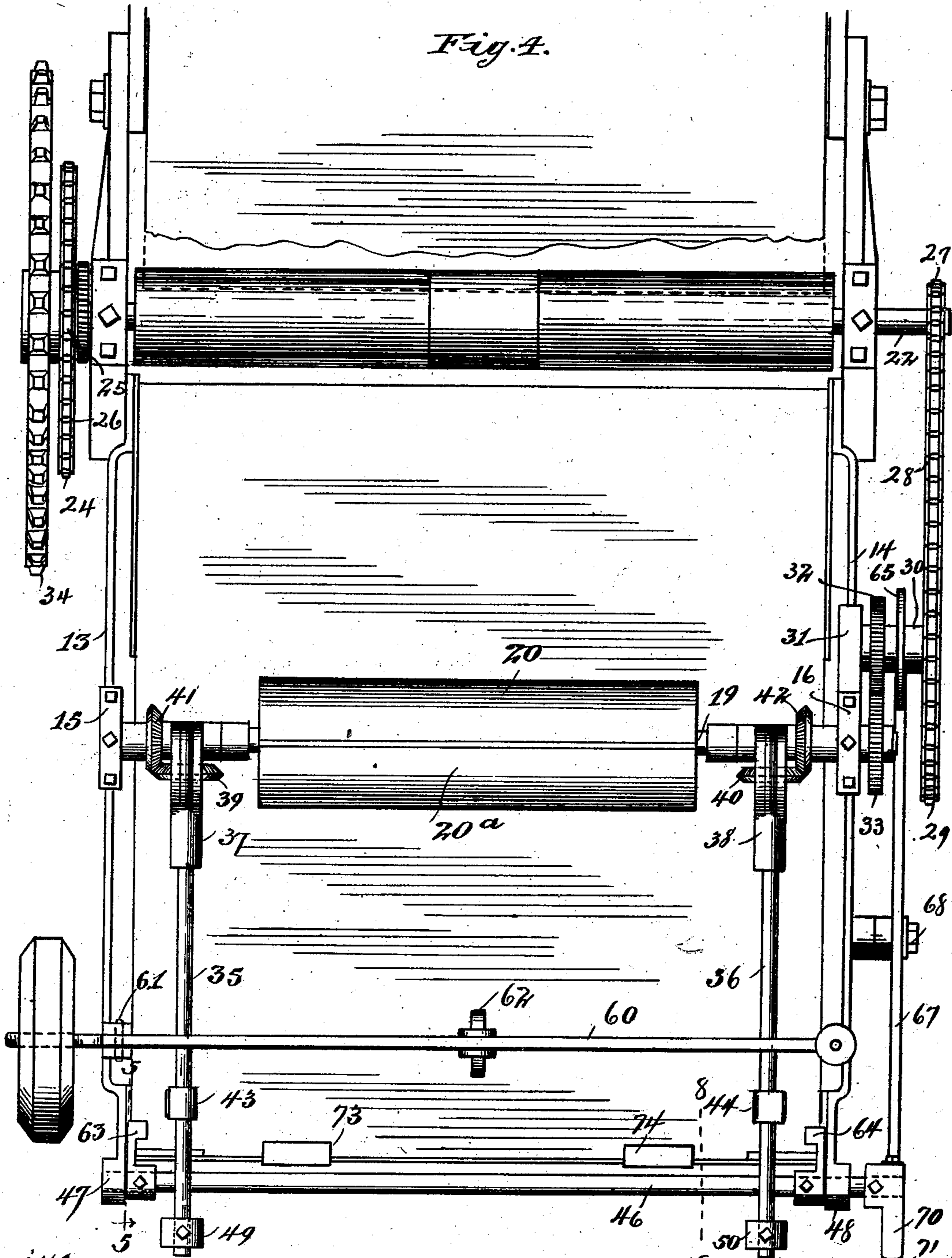
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(No Model.)

5 Sheets—Sheet 4.



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**No. 702,673.**

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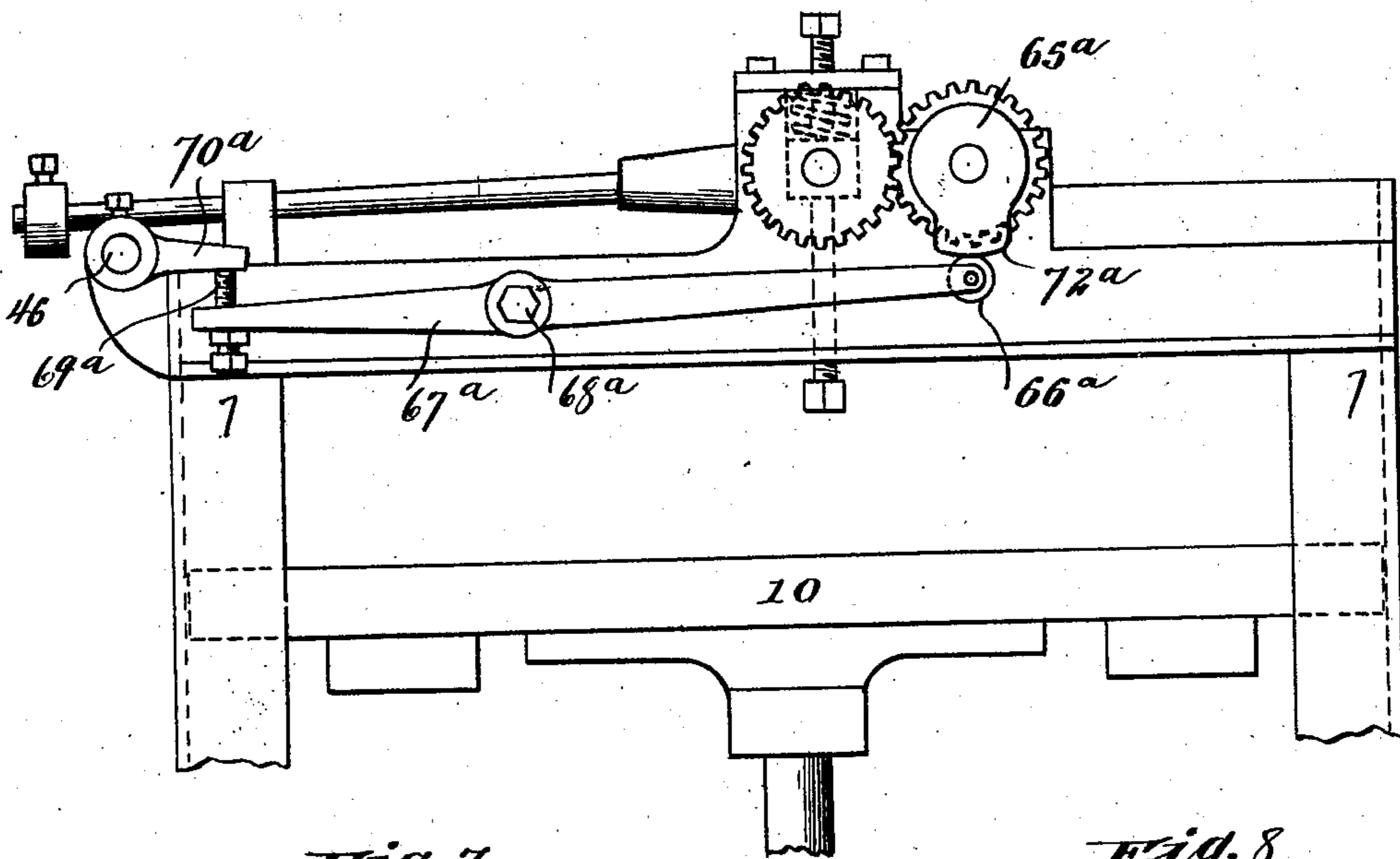
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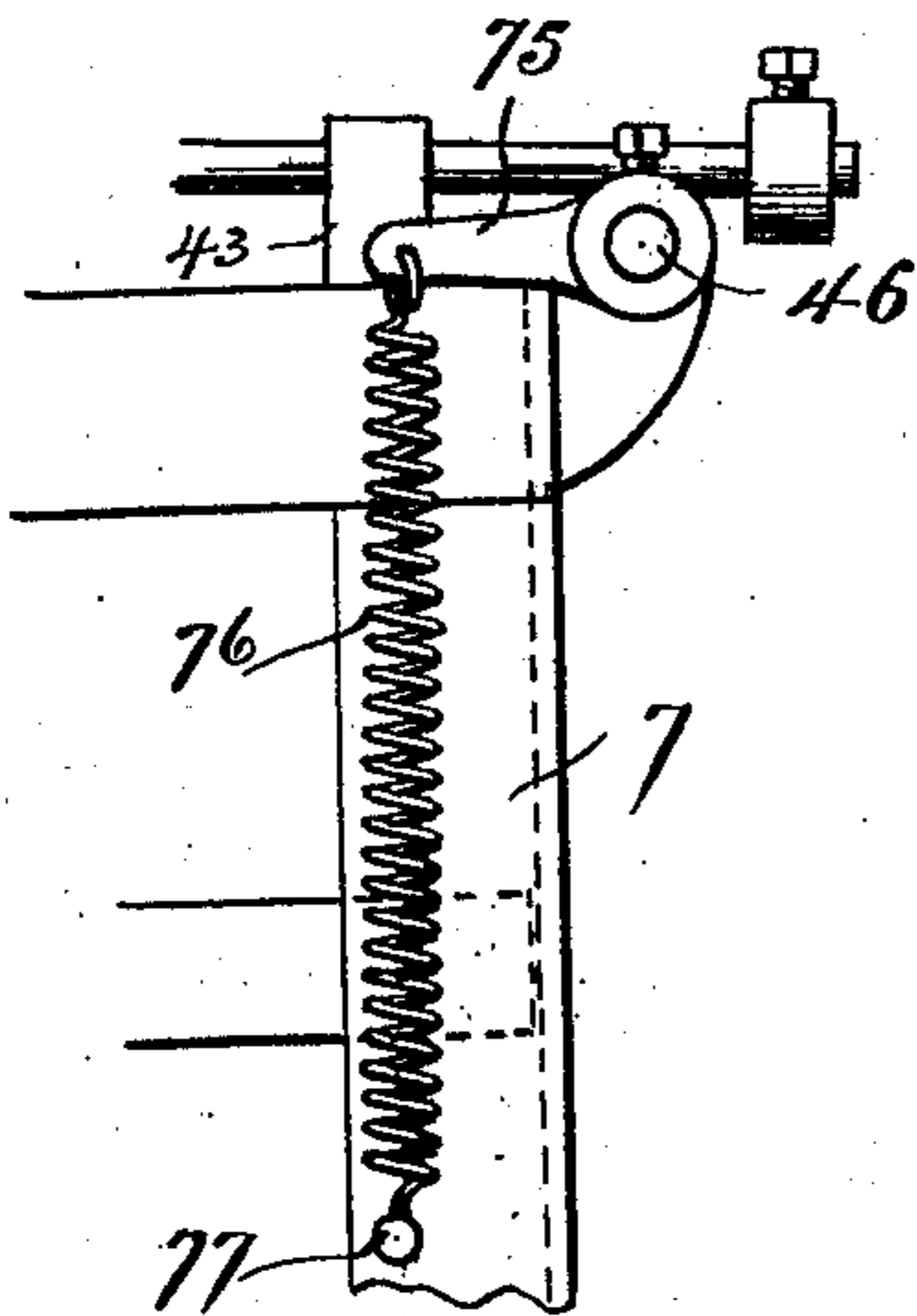
**5. Sheets—Sheet 5.**

(No Model.)

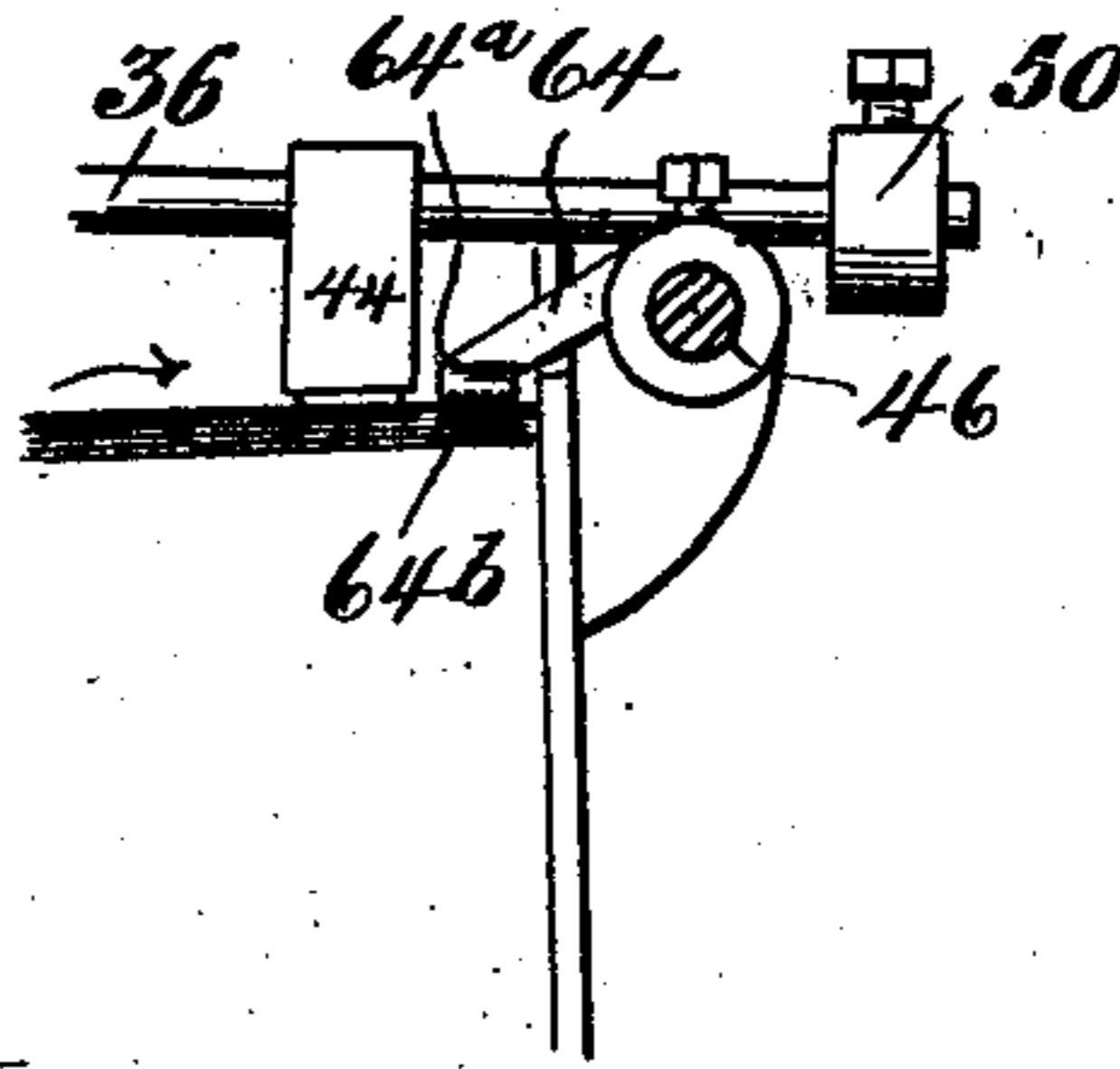
*Fig. 6.*



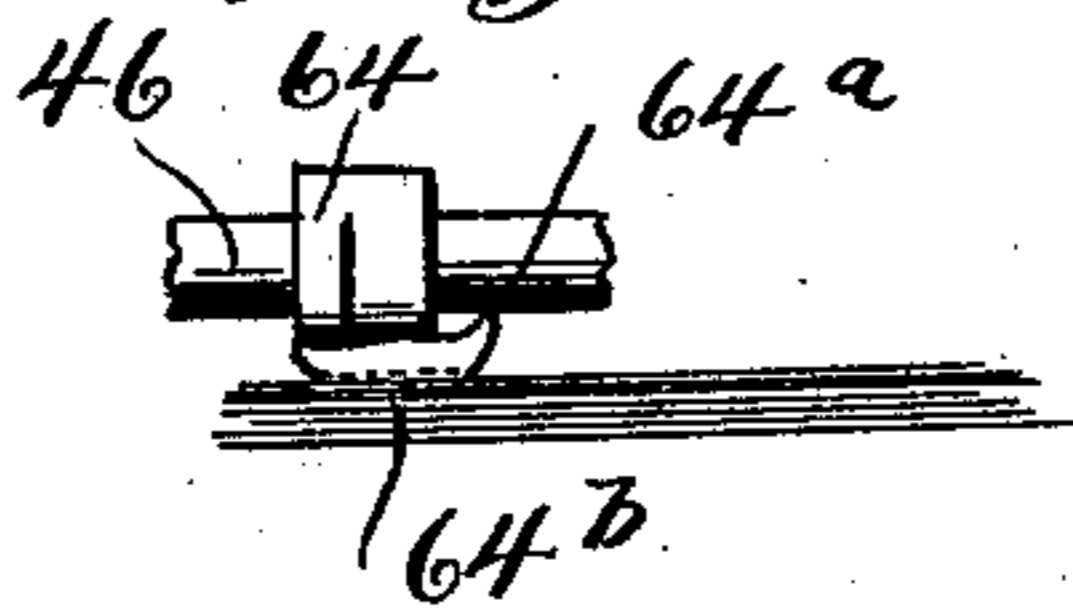
*Fig. 7.*



*Fig. 8*



*Fig. 9.*



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# UNITED STATES PATENT OFFICE.

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## PAPER-FEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 702,673, dated June 17, 1902.

Application filed July 12, 1901. Serial No. 67,961. (No model.)

*To all whom it may concern:*

Be it known that we, FRANK M. PETERS and HENRY H. HUNGERFORD, citizens of the United States, and residents of Chicago, in the county of Cook and State of Illinois, have  
5 invented certain new and useful Improvements in Paper-Feed Mechanisms, of which the following is a specification.

Our invention relates to improvements in  
10 the mechanism used for feeding sheets of paper to wrapping-machines, printing-presses, and similar machines in which sheets of paper of uniform size are employed or operated upon for various purposes, and more specifically  
15 our invention has to do with that type or class of paper-feed devices in which a stack of sheets cut to a uniform size is carried on a vertically-movable carrier, the individual sheets being automatically fed forward one  
20 after another from the top of the stack by a continuously - rotating feed - roll operating thereabove, which roll is equipped with a friction-surface disposed lengthwise thereof and covering a portion of the cylindrical surface of the roll and adapted by the continuous  
25 rotation of the latter to intermittently engage successive sheets of paper on the top of the stack and feed the same forward to a pair of gripping-rolls or other gripping mechanism constituting the receiving end of the  
30 machine. Devices of this general character have heretofore been in comparatively common use in connection with printing-presses, wrapping-machines, and the like; but a common fault heretofore met with in the practical operation of such mechanisms has resided in the difficulty of clearly separating the top-most sheet of the stack from those lying immediately thereunder, so as to insure the  
40 feeding forward of the sheets one at a time.

It is the object of the present invention to effect an improvement in this particular respect in mechanisms of this character; and to this end our invention, generally stated,  
45 resides in an automatic mechanism whereby the top sheet of the stack is loosened and separated from the next adjacent sheet immediately before the forward feeding of the same into the machine takes place. The  
50 principal elements of the mechanism which we have devised for this purpose consist of a

pair of fingers disposed above and at opposite sides of the stack, and preferably near the rear end thereof, and operating to frictionally engage the upper surface of the top  
55 sheet laterally thereof and carry the edges of the same inwardly toward each other, thereby producing a slight upward bend or curl of the sheet, whereby it is effectively separated from the companion sheet lying next there-  
60 beneath.

The mechanism embodying our present invention further comprises, in combination with the separating-fingers above referred to, certain automatic holding devices for per-  
65 mitting the release of the top sheet at the proper time and holding or binding the remaining sheets of the stack securely against any frictional or other tendency to stick to and follow the top sheet, all as hereinafter  
70 described, and more particularly set forth in the appended claims.

Our invention in a preferred embodiment thereof is illustrated in the accompanying  
75 drawings, in which—

Figure 1 is a side elevation of a paper-feed mechanism having our improvements applied thereto. Fig. 2 is a similar view of the same mechanism as seen from the opposite side thereof. Fig. 3 is an end elevation of the  
80 same. Fig. 4 is a top plan view. Fig. 5 is a sectional detail on line 5 5 of Fig. 4, illustrating the action and coöperation of the separating and presser fingers. Fig. 6 is a view similar to Fig. 2 with certain parts omitted, illustrating a modification of the means employed  
85 for actuating the presser-fingers. Fig. 7 is a detail view of a part of the modified mechanism shown in Fig. 6 viewed from the opposite side. Fig. 8 is a sectional detail view  
90 on line 8 8 of Fig. 4, showing the inner side of one of the presser-fingers and its upwardly-turned end; and Fig. 9 is a front detail of the presser-finger viewed in the direction of the arrow, Fig. 8.  
95

As hereinabove stated, the mechanism to which our present improvements relate is intended to be applied at the receiving end of any suitable machine in connection with which it is adapted to coöperate. The receiving end of such machine is indicated at 6 in  
100 the drawings.

The numeral 7 designates as an entirety a suitable skeleton frame of generally rectangular form, which frame may be suitably secured to the receiving end 6 of the machine by bolts or otherwise, as indicated at 8 and 9.

Within the frame 7 and suitably guided by the four corner-posts thereof is a vertically-movable carrier, the same comprising in its essential features a horizontal top plate 10, on which the stack of paper is adapted to rest, as shown in Fig. 1, and a vertical support secured to the under side of said plate 10, said support in the form shown comprising a U-shaped frame 11, (see Fig. 3,) having the slide-rods 11<sup>a</sup> disposed centrally of the opposite sides of the plate 10, and a vertical post 12 in the nature of a feed-screw, on the upper end of which the frame 11 is secured.

Extending across the top of the frame 7, on opposite sides thereof, are a pair of parallel horizontally-disposed supporting members 13 and 14, which latter carry at points approximately centrally thereof a pair of vertically-slotted journal-supports 15 and 16, respectively, in which latter are contained a pair of spring-pressed journal-bearing blocks 17 and 18, respectively, these latter carrying the spindle 19 of a horizontal feed-roll 20, which latter thus occupies a position transversely of and directly above the stack of papers carried by the carrier-plate 10, all as clearly shown in Fig. 1. This roll 20, as best shown in Fig. 4, is a plain cylindrical roll of a length somewhat less than the width of the underlying stack upon which it operates and has formed on or applied to its cylindrical surface for the full length thereof and throughout a fractional portion of the circumference thereof a friction-surface, (designated by 20<sup>a</sup>,) the same comprising a strip or pad of suitable friction material, preferably india-rubber.

21 22 indicate a pair of usual gripping-rolls journaled in the frame 7 at an appropriate location relatively to the feed-roll 20 and the receiving end of the machine in which paper is to be operated upon; but as such gripping-rolls are common and well understood in this relation and form no part of our present invention the same need not be more particularly described.

The feed-roll 20 is designed to have a continuous rotation in one direction, which may be imparted from a driven shaft 23 through the following mechanism: A sprocket-wheel 24 on said shaft 23 drives a small sprocket 25 on one end of the lower gripping-roll 22 through a sprocket-chain 26. A small sprocket 27 on the opposite end of said lower gripping-roll drives, through a sprocket-chain 28, a large sprocket 29, fast on a short shaft 30, which latter is rotatably journaled in a suitable bearing 31, carried by the horizontal support 14. A gear 32, fast on shaft 30, meshes with a similar gear 33, fast on the spindle 19, to which the feed-roll 20 is splined or otherwise secured. The shaft 23 may itself

be driven by a sprocket 34 from the main power-shaft of the machine or other suitable source of power.

35 and 36 designate a pair of shafts, which are disposed in directions at right angles to the spindle 19 and at their ends are rotatably supported in a pair of hangers 37 38, respectively, which latter are pivotally mounted at their inner ends upon the spindle 19 at points intermediate the ends of the feed-roll 20 and the proximate journal-supports 15 and 16, respectively. These shafts 35 and 36 are adapted to be driven continuously in opposite directions through the agency of bevel-gears 39 and 40, fast on the inner ends of said shafts, respectively, which bevel-gears engage corresponding bevel-gears 41 and 42, fast on the spindle 19. At suitable points on the shafts 35 and 36 are keyed a pair of what we term "separating-fingers" 43 44, said fingers overlying approximately the rear edge of the stack of papers carried on the plate 10, each of said fingers being provided at its outer or free end with a friction device, preferably in the nature of a rubber tip 45. The shafts 35 and 36 near their outer ends overlie and rest upon a transverse rod 46, except when the fingers 43 44 are buckling the underlying sheet of paper, which rod is rotatably supported in a pair of upstanding brackets 47 and 48, secured to the upper ends of the rear corner-posts of the frame 7, a pair of weights 49 and 50, slidably keyed on the free ends of the shafts 35 and 36, respectively, together with the gravitation effect of the shafts themselves, providing a downward pressure of the fingers 43 and 44 upon the top sheet of the underlying stack sufficient to afford the requisite friction between said parts to enable the fingers to properly perform their functions upon and with reference to the successive sheets of paper, all as hereinafter more particularly set forth.

Any desired or known means may be employed for setting the carrier 10 at any suitable height in the frame 7 at the commencement of work and for effecting the automatic upward feed of the same as the sheets of paper carried thereby are successively withdrawn from the stack. For the former purpose we have herein shown the vertical slide members 11<sup>a</sup> of the U-frame 11 as formed with racks 51 52, which latter are engaged by pinions 53 and 54, respectively, keyed on a transverse horizontal shaft 55, rotatably supported in hangers 56 57, pendent from the under side of the frame 7, one end of which shaft 55 is squared, as at 58, to receive a crank-arm or equivalent operating device.

At 59, 60, 61, and 62 are shown certain elements of a mechanism for raising the stack of paper and interrupting the upward feed thereof by the feed-screw 12; but as this mechanism is old and forms no part of our present invention further description and illustration of the same is unnecessary.

In order that the sheets of paper may be fed

forward successively one at a time, it is of course necessary that when the top sheet is engaged by the feed-roller some means be provided for engaging and holding back the remaining sheets of the stack to prevent one or more of the latter from clinging to the top sheet and being fed along therewith. To effect this result, we have devised the following-described mechanism: On the transverse rod 46, adjacent the extremities thereof, are keyed a pair of presser-fingers 63 and 64, the free ends of which overlie and press down upon the rear edge portion of the stack of papers, binding or clamping them together at all times except when the top sheet is being separated from the next underlying sheet preparatory to being fed forward, at which time the downward pressure of the fingers is relieved. These presser-fingers 63 and 64 have their free ends preferably extended inwardly slightly and turned upwardly, as shown at 64<sup>a</sup> in the detail views Figs. 8 and 9, thereby presenting convex under surfaces curved in a direction transversely of the underlying stack of papers, and the convex engaging surfaces of said fingers are preferably roughened or corrugated, as indicated at 64<sup>b</sup> in Figs. 8 and 9, in order to afford said fingers a more effective hold on the stack. The rod 46 is oscillated, so as to actuate the presser-fingers 63 and 64 in properly-timed relation to the other elements of the mechanism, by means of a cam-disk 65, fast on the stub-shaft 30, the periphery of said disk engaging a roller 66, mounted in one end of a lever 67, which latter is pivoted at a point 68 intermediate its length to the horizontal supporting member 14 of the frame 7. The opposite extremity of the lever 67 carries an adjustable contact-point in the nature of a vertically-disposed set-screw 69, the upper end of which is adapted to engage and operate a short rearwardly-extending arm 70, keyed on the extremity of the rod 46. In order that the lever 67 may actuate the rod 46 and the fingers 63 and 64 carried thereby in an elastic or yielding manner, there is preferably interposed between the contact device 69 and the arm 70 a spring 71, whereby the force exerted by the lever 67 upon the presser-fingers 63 and 64 through the connections described is gradually and elastically applied and withdrawn. It will be observed that the disk 65 is circular throughout the greater portion of its periphery, but has a depression 72 formed therein for a short distance, whereby the disk is caused to have a cam action on the contacting end of lever 67. The action of the disk 65 upon the presser-fingers 63 and 64 through the connections described is such as to maintain said fingers in their depressed and clamping position upon and relatively to the rear edge portion of the stack of papers throughout the engagement of all except the depressed portion of the periphery of the disk 65 with the roller 66.

The operation of our improved paper-feed mechanism as hereinabove described is as

follows: Power being applied to the driven shaft 23, the gripping-rolls 21 22, the feed-roll 20, and the shafts 35 and 36 are all continuously rotated in properly-timed relation to each other through the driving connections hereinabove described. It will be obvious that once during each complete rotation of the feed-roll 20 its friction-surface 20<sup>a</sup> will engage and feed forward to the gripping-rolls the uppermost sheet of the stack lying therebeneath on carrier 10. The shafts 35 and 36 are so geared as to rotate in opposite directions to each other and make a complete revolution synchronously with each complete revolution of the feed-roll 20, and the separating-fingers 43 and 44 are so set on their respective shafts 35 and 36 that their tips 45 will engage and wipe over the top of the stack of papers just prior to the engagement of the friction-surface 20<sup>a</sup> therewith. Such action of the fingers 43 and 44 tends to curl up the opposite side portions of the rear ends of the top sheet, as indicated, and in order that the separating-fingers may thus operate upon the top sheet the downward pressure of the presser-fingers 63 and 64 upon said sheet is relieved simultaneously with the engagement of the separating-fingers therewith by reason of the roller 66 of lever 67 dropping into the depression 72 of the cam-disk 65, whereby the tension exerted by spring 71 is temporarily withdrawn. As soon, however, as the separating-fingers have thus withdrawn the rear corner portions of the top sheet from above the next underlying sheet the presser-fingers 63 and 64 are immediately carried downwardly into binding engagement with the rear corners of said next underlying sheet, thereby securely clamping not only that sheet, but also all the underlying sheets of the stack, against any tendency, through frictional contact with the top sheet thus separated, to feed forward with said top sheet. In this operation the upwardly-curved convex inner ends of the presser-fingers serve in case the separating-fingers should curl up not only the top sheet, but also one or more of the next underlying sheets, to readily allow said underlying sheet or sheets to slip back into proper position under said presser-fingers to lie and be held there until their turn to be fed forward arrives. By the described means the feed-roll, through the engagement of its friction-surface 20<sup>a</sup> with the top sheet, moves the latter forward a sufficient distance to carry its front edge between the gripping-rolls or equivalent device, whereby the top sheet is completely withdrawn from the stack and carried forward into the machine by the time the feed-roll 20 and the separating-fingers have completed another rotation and are ready to operate in the manner already described upon the next sheet of the stack, which has thus become the top sheet.

The mechanism as hereinabove described has been found in practice to operate reliably and satisfactorily; but we have found that

the separation of the rear corners of the top sheet from the next underlying companion sheet by the separating-fingers 43 and 44 may be facilitated by the employment of suitable holding devices overlying the rear edge of the stack and disposed at intervals from the separating-fingers best suited to form a stop or abutment for the upwardly-curved portion of the sheet, whereby the top sheet is more effectively separated and the fingers are less liable to curl up the corners of two or more sheets at the same time. For this purpose we may employ clips 73 and 74, the same being merely a pair of angle-plates secured by their vertical members to the rear top horizontal member of the frame 7 and having their horizontal portions overlying and resting upon the rear edge of the top sheet of the stack.

An important feature of our invention resides in the fact that the shafts 35 and 36, carrying the separating-fingers 43 and 44, are independently journaled and geared to the spindle of the feed-roll, whereby they are capable of independent automatic vertical adjustment to accommodate the separating-fingers to inequalities in the heights of the opposite sides of the paper stack.

Figs. 6 and 7 illustrate a modification of the means already described for actuating the presser-fingers. In this construction the cam-disk 65<sup>a</sup> instead of having a depression formed in its periphery, as in the construction already described, is provided with a cam projection 72<sup>a</sup>. The arm 70<sup>a</sup>, which is keyed to the adjacent end of rod 46, instead of extending rearwardly, as shown in Fig. 2, is made to extend inwardly toward the cam-disk and is adapted to be engaged and lifted by the adjustable contact-pin 69<sup>a</sup>, carried in the underlying extremity of a lever 67<sup>a</sup>, which is pivoted intermediate its ends at 68<sup>a</sup> and at its opposite extremity carries a roller 66<sup>a</sup>, which engages the periphery of the cam-disk 65<sup>a</sup>. On the opposite end of the rod 46, Fig. 7, is another inwardly-extending arm 75, to the outer end of which is secured one end of a tensile spring 76, the lower end of the spring being secured at 77 to the frame 7.

By the foregoing construction it will be seen that instead of maintaining the clamping effect of the presser-fingers through the engagement of the cam-disk 65 with the lever 67 and permitting the release of the presser-fingers by the engagement of the depression 72 of the cam-disk with said lever the said presser-fingers are normally maintained in clamping contact with the stack by means of the spring 76 and arm 75, while the cam projection 72<sup>a</sup> of the cam-disk 65<sup>a</sup>, engaging the lever 67<sup>a</sup>, serves, through the connections described, to positively raise said fingers against the action of the spring 76 at the proper time and through the interval required for the withdrawal of the edges of the top sheet by means of the separating-fingers.

The modified construction last described is

obviously the full mechanical equivalent of the construction as described and shown in Fig. 2, and we wish it to be understood that the employment of either is optional within the lines and scope of our invention.

We claim as our invention—

1. In a paper-feed mechanism, the combination with a vertically-movable carrier adapted to support a stack of sheets of paper, of a feed-roll journaled transversely thereabove and adapted to frictionally engage and feed forward the sheets of the stack successively at each rotation thereof, of continuously-rotating separating devices automatically operating to withdraw the opposite side edge portions of the successive top sheets from the next underlying sheet immediately prior to the engagement of the feed-roll therewith, and holding devices automatically operated immediately after the operation of the separating devices to hold the remaining sheets of the stack against displacement during the feeding forward of the top sheet, substantially as described.

2. In a paper-feed mechanism, the combination with a suitable frame and a vertically-movable carrier-plate guided therein and adapted to support a stack of sheets of paper, of a feed-roll journaled in the upper portion of said frame transversely thereof and directly above said stack of paper, said roll being provided with a friction-surface on its periphery whereby it is adapted to engage and feed forward the top sheet of the stack at each rotation thereof, a pair of separating-fingers supported above the rear edge portions of the stack, means for continuously rotating said fingers driven from the feed-roll whereby the free ends of said fingers are caused during the lower portion of their rotary travel to wipe over the upper face of the stack and frictionally carry the opposite side edge portions of the top sheet inwardly toward each other, and automatically-operated clamping-fingers adapted to bear upon and hold the remaining sheets of the stack while the top sheet is being fed forward, substantially as described.

3. In a paper-feed mechanism, the combination with a suitable frame and a vertically-movable carrier-plate guided therein and adapted to support a stack of sheets of paper, of a feed-roll journaled transversely across the top of said frame, a pair of rearwardly-extending shafts geared to the spindle of said feed-roll and adapted to rotate synchronously therewith, a pair of separating-fingers fixed on said last-named shafts and at their free ends adapted to frictionally engage the top sheet of the stack simultaneously and carry its opposite side edge portions inwardly, thus separating them from the next underlying sheet, and a pair of holding-fingers through which a clamping pressure is normally maintained on the rear margin of the stack, and means for relieving such pressure during the interval when the separating-fingers are per-

forming their function, substantially as described.

4. In a paper-feed mechanism, the combination with a suitable frame and a movable carrier-plate guided therein and adapted to support the stack of sheets of paper, of a spring-pressed feed-roll journaled horizontally across the top portion thereof, a pair of shafts extending rearwardly of and at right angles to the feed-roll and independently geared at their inner ends to the spindle of said feed-roll, a pair of separating-fingers fixed on said last-named shafts and rotating synchronously but in a plane at right angles to that of the feed-roll, and serving, through frictional engagement with the top sheet, laterally thereof, to separate the side edge portions thereof from the next underlying sheet, an oscillatory rod supported at the rear upper end of the frame parallel with the feed-roll, a pair of clamping-fingers fixed on said rod and operating upon the stack at points outside the points of contact of the separating-fingers upon the stack and suitably-timed driving connections whereby said feed-roll, separating-fingers, and clamping-fingers are adapted to cooperate to effect the forward feeding of the sheets successively from the top of the stack, substantially as described.

5. In a paper-feed mechanism, the combination with a suitable frame of a vertically-movable carrier guided therein and adapted to support a stack of sheets of paper thereon, a feed-roll transversely journaled across the top of said frame, a pair of hangers journaled on the spindle of said feed-roll, a pair of rearwardly-extending shafts journaled in said hangers at right angles to the feed-roll and capable of independent automatic vertical adjustment, intermeshing driving-gears on said last-named shafts and the spindle of the feed-roll, an oscillatory rod journaled in the upper rear portion of the frame upon which rod the free ends of said shafts are supported, a pair of separating-fingers fixed on said shafts, a pair of adjustable counterweights carried on the free ends of said shafts, a pair of clamping-fingers keyed on said rod, and mechanism for actuating said parts in properly-timed order to first separate the side marginal portions of the top sheet from the next underlying sheet and then feed the same forward while the remaining sheets of the stack are securely clamped in place upon the carrier, substantially as described.

6. In a paper-feed mechanism, the combination with a suitable frame and a vertically-movable paper-carrier guided therein and adapted to support a stack of sheets of paper, of a feed-roll journaled horizontally above the upper portion of said frame, an oscillatory rod journaled across the upper rear portion of said frame parallel with the feed-roll, a pair of hangers journaled on the spindle of said feed-roll, a pair of shafts at one end journaled in said hangers and geared to the spindle of the feed-roll and extending rearwardly

of and at right angles to the latter and having their rear ends suitably counterweighted and overlying said rod, a pair of separating-fingers fixed on said shafts and at their free ends frictionally engaging the side marginal portions of the top sheet in directions at right angles to the direction of the feed, a pair of clamping-fingers keyed on said rod and overlying the rear edge of the stack, elastic means operating upon said rod whereby said clamping-fingers are caused to clamp and hold the rear portion of the stack, and other positively-driven connections between the spindle of the feed-roll and said rod whereby said clamping-fingers are raised when the separating-fingers are operative to withdraw the side edge portions of the top sheet from contact with the corresponding portions of the underlying sheet preparatory to the feeding forward of the top sheet, substantially as described.

7. In a paper-feed mechanism, the combination with a suitable frame and a vertically-movable paper-carrier guided therein and adapted to support a stack of sheets of paper, of a feed-roll journaled horizontally above the upper portion of said frame, an oscillatory rod journaled across the upper rear portion of said frame parallel with the feed-roll, a pair of hangers journaled on the spindle of said feed-roll, a pair of shafts at one end independently journaled in said hangers and geared to the spindle of the feed-roll and extending rearwardly of and at right angles to the latter and at their rear ends overlying said rod, a pair of separating-fingers fixed on said shafts and at their free ends frictionally engaging the side marginal portions of the top sheet in directions at right angles to the direction of the feed, a pair of clamping-fingers keyed on said rod and overlying the rear edge of the stack, arms on the opposite ends of said oscillatory rod, a spring between the outer end of one of said arms and a stationary point on the frame and tending to depress said clamping-fingers, a disk geared to the spindle of the feed-roll and having a cam projection on its periphery, and a lever pivoted on the frame and having one end engaging the periphery of said cam-disk, and its other end adapted to engage the other arm of the oscillatory rod to actuate the latter against the tension of the said spring and thereby raise the clamping-fingers, substantially as described.

8. In a mechanism of the character described, the combination with the paper-carrier, the feed-roll and the laterally-operating separating-fingers serving to curl upwardly and inwardly the opposite side margins of successive sheets, of a pair of oscillatory clamping-fingers adapted to overlies the rear margin of the paper-carrier and having their free ends formed with convex engaging surfaces curved in a direction transversely of the carrier, substantially as and for the purpose described.

9. In a mechanism of the character de-

scribed, the combination with the paper-carrier, the feed-roll and the laterally-operating separating-fingers serving to curl upwardly and inwardly the opposite side margins of  
5 successive sheets, of a pair of oscillatory clamping-fingers adapted to overlie the rear margin of the paper-carrier and having their free ends turned inwardly and upwardly so as to provide convex engaging surfaces

curved in a direction transversely of the carrier, such convex engaging surfaces of the fingers being corrugated or roughened, substantially as and for the purpose described.

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