No. 810,391. PATENTED JAN. 23, 1906.

H. BRADSHAW.

PAPER FEEDING MACHINE.

APPLICATION FILED JULY 18, 1904.

8 SHEETS—SHEET 1.

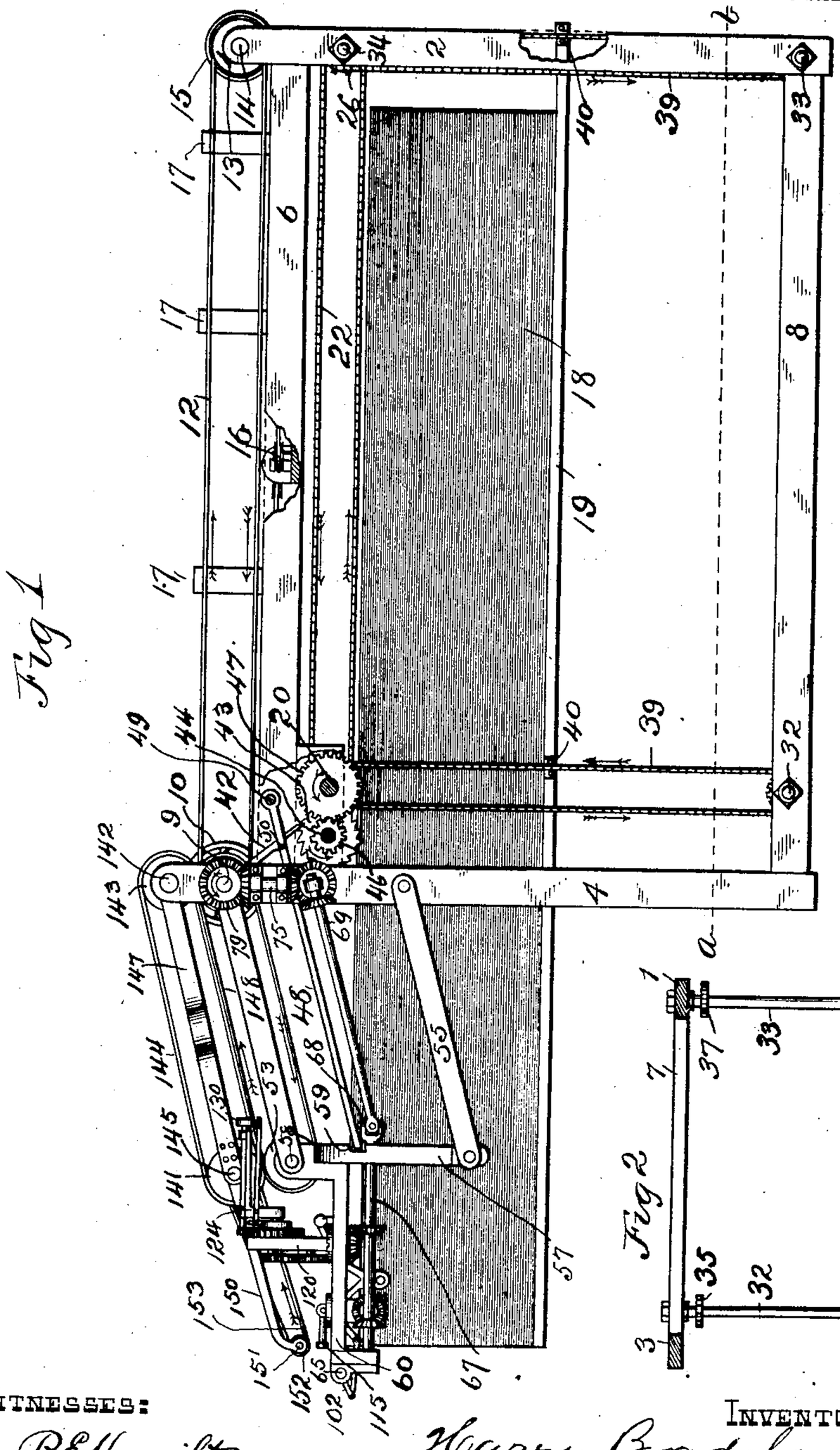

Fig 1

Fig 2

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INVENTOR

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By Warren D. Stone

His Attorney

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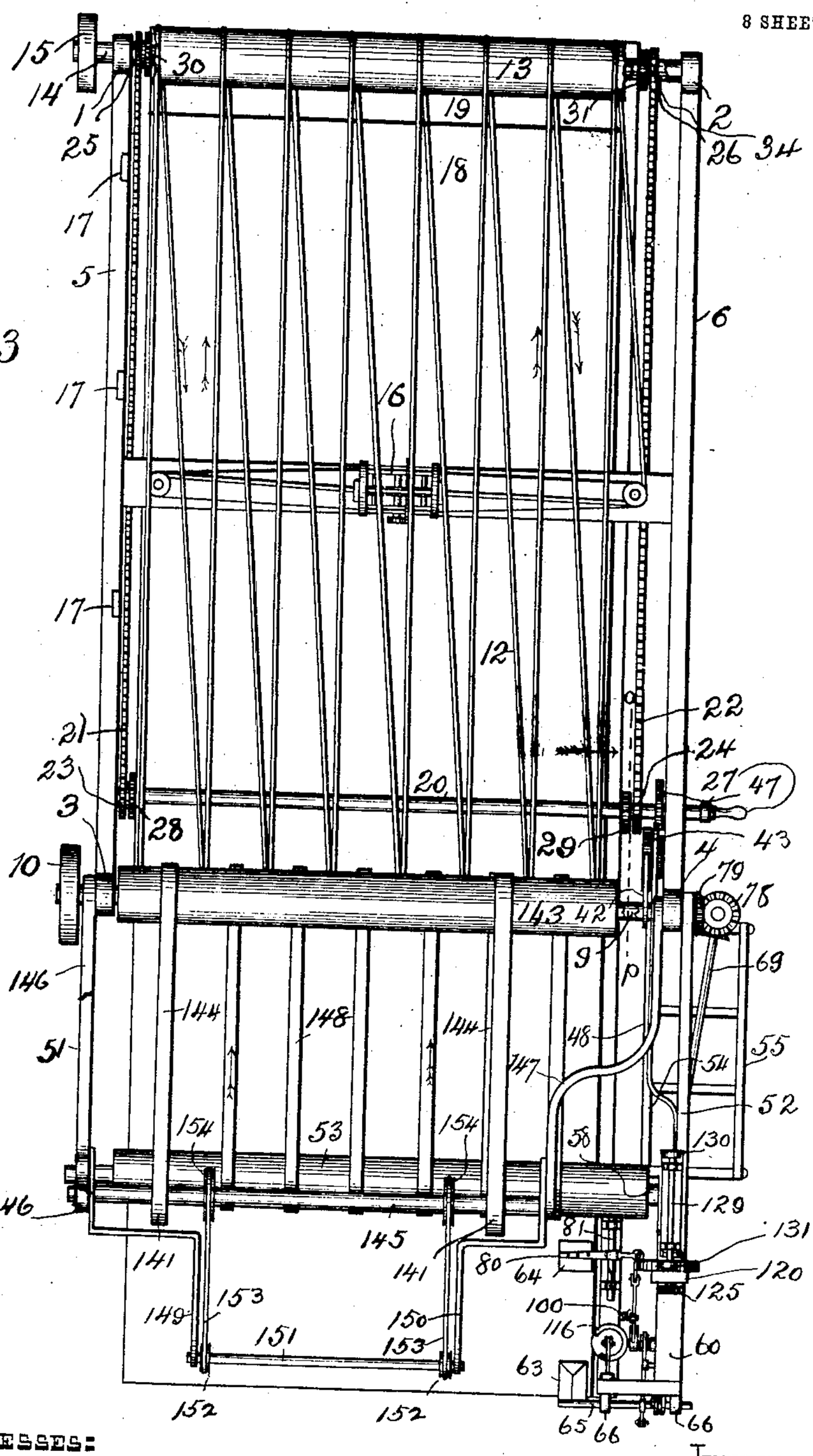
8 SHEETS—SHEET 2.

Fig 3



WITNESSES:

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8 SHEETS—SHEET 3.

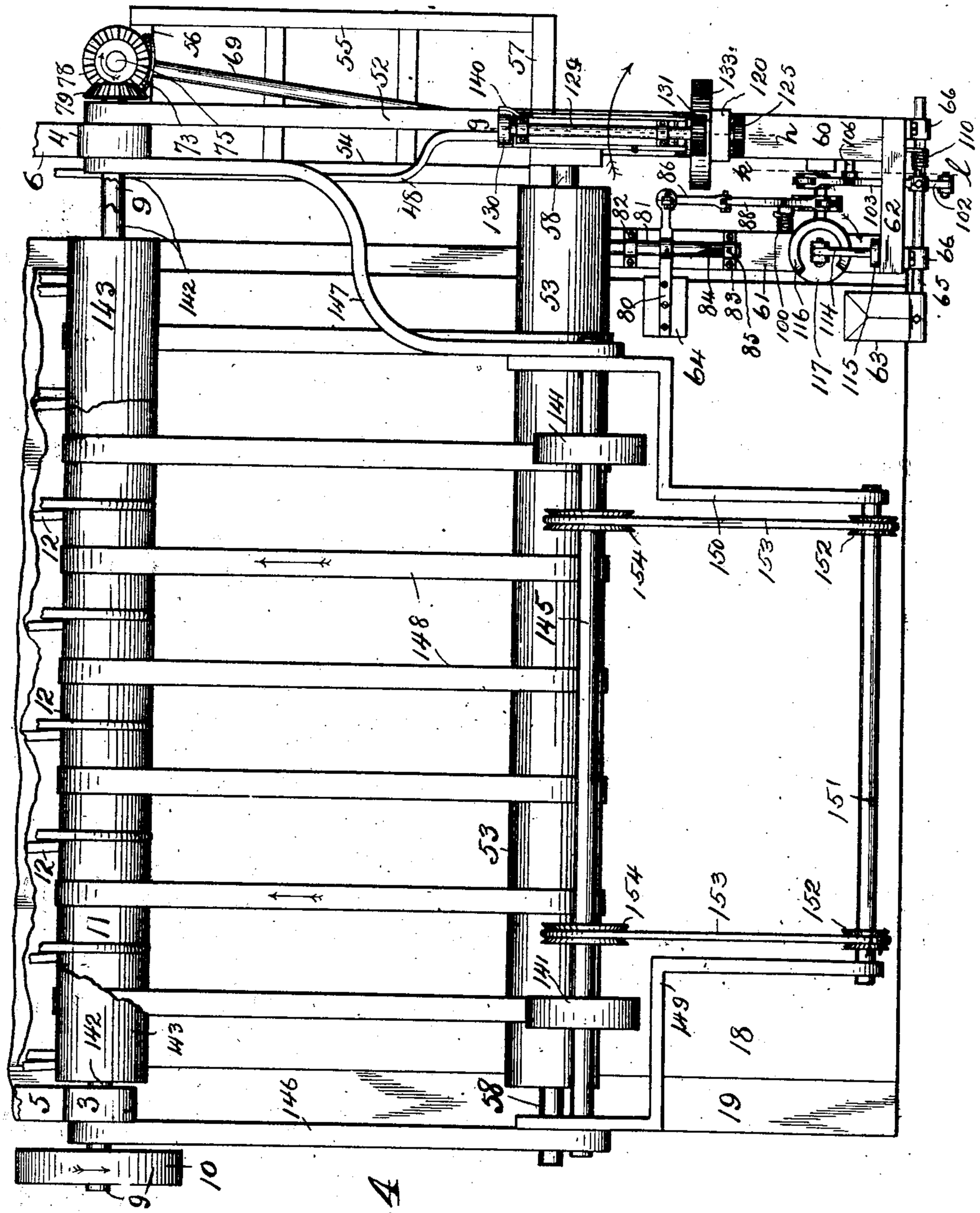

Fig 4

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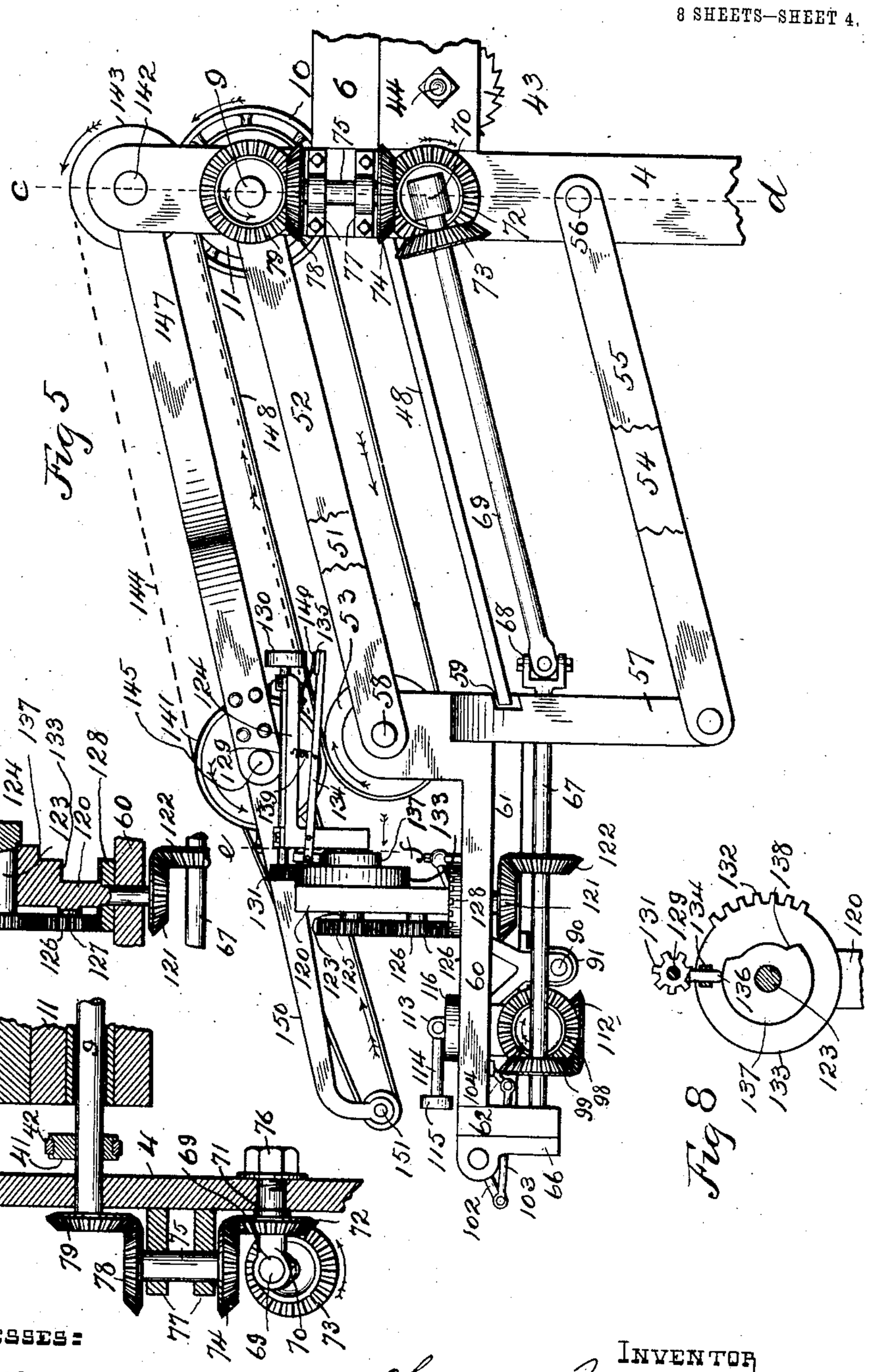
8 SHEETS—SHEET 4.



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8 SHEETS—SHEET 5.

Fig 9

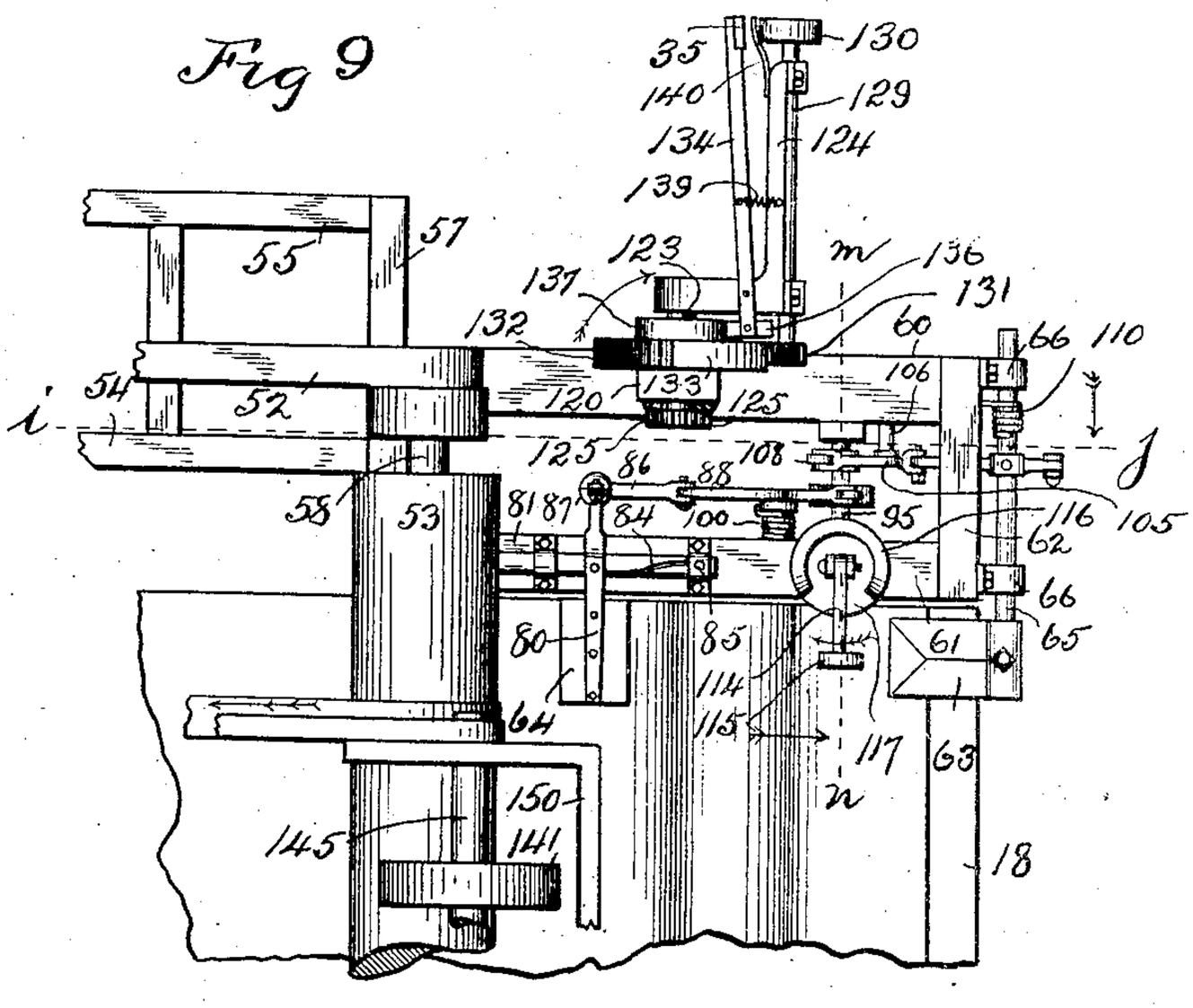
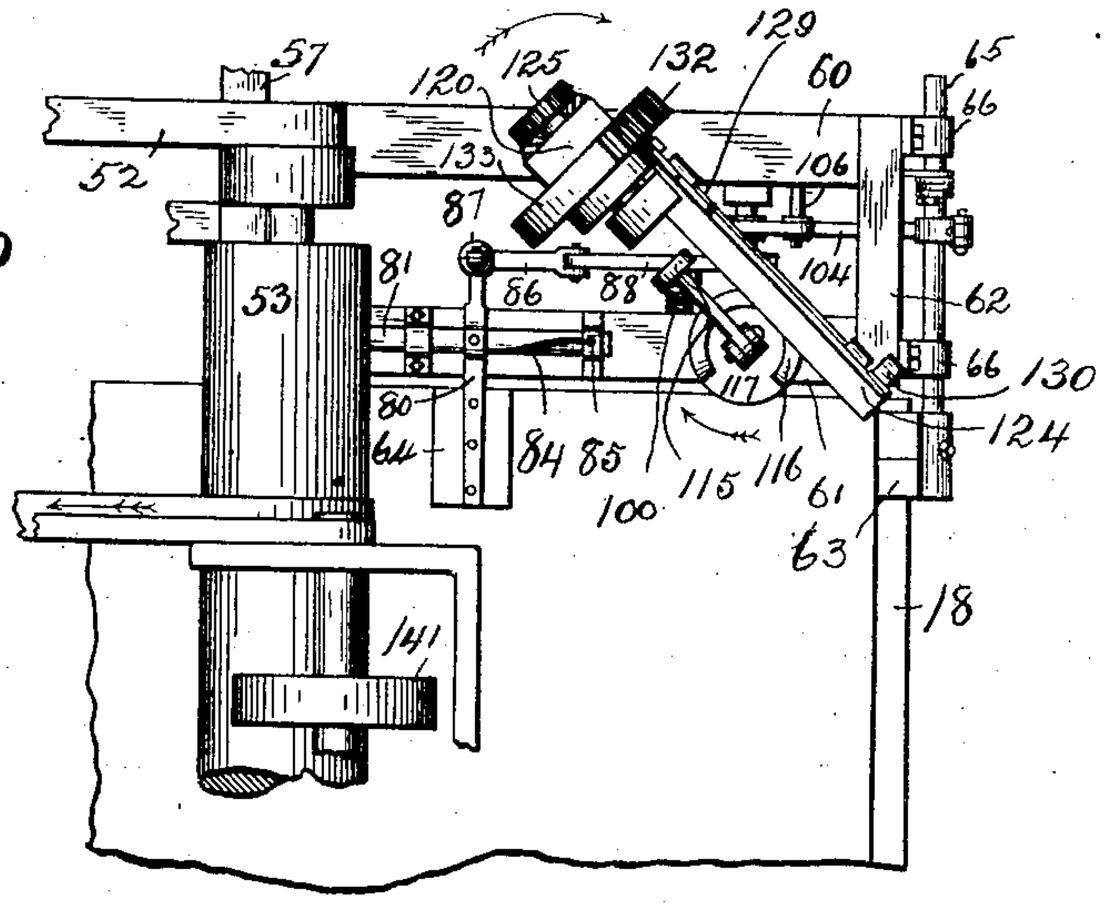


Fig 10



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8 SHEETS—SHEET 6.

Fig 11

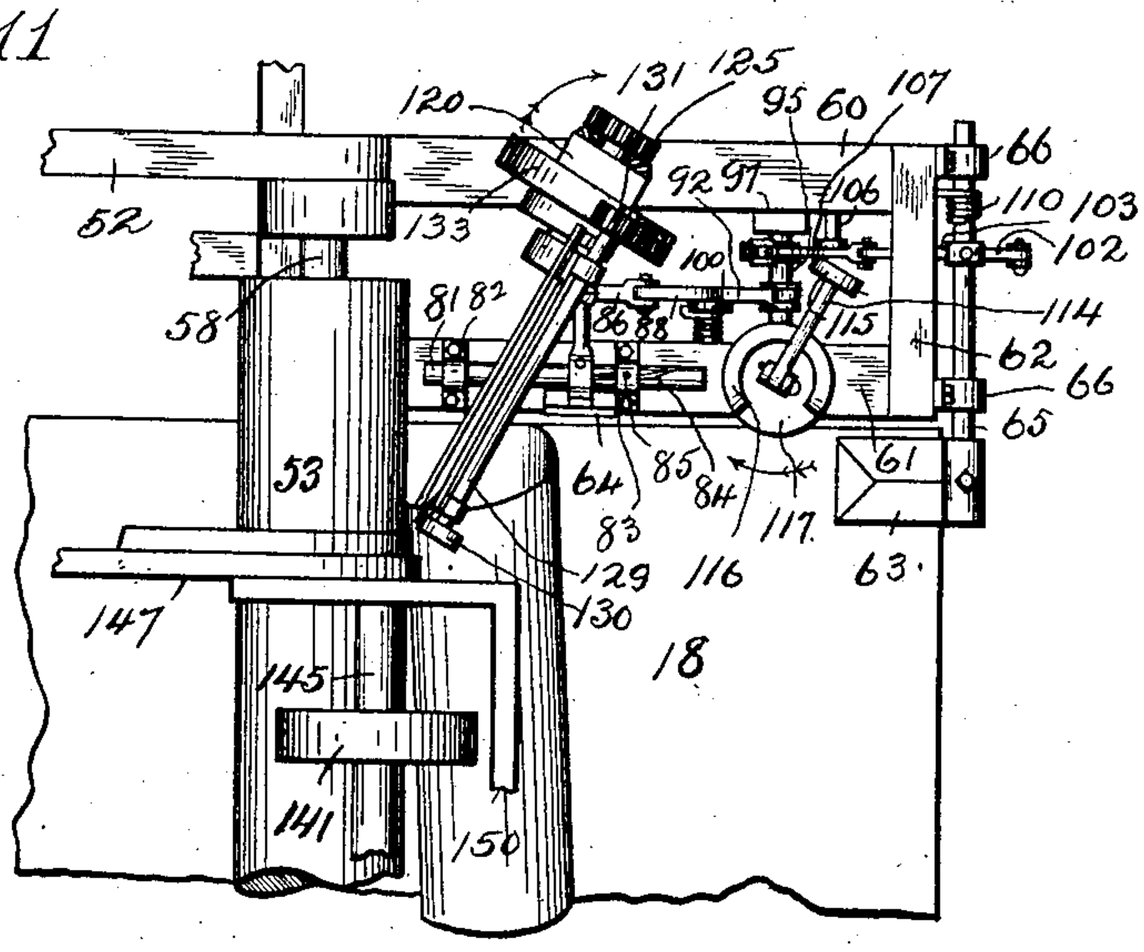
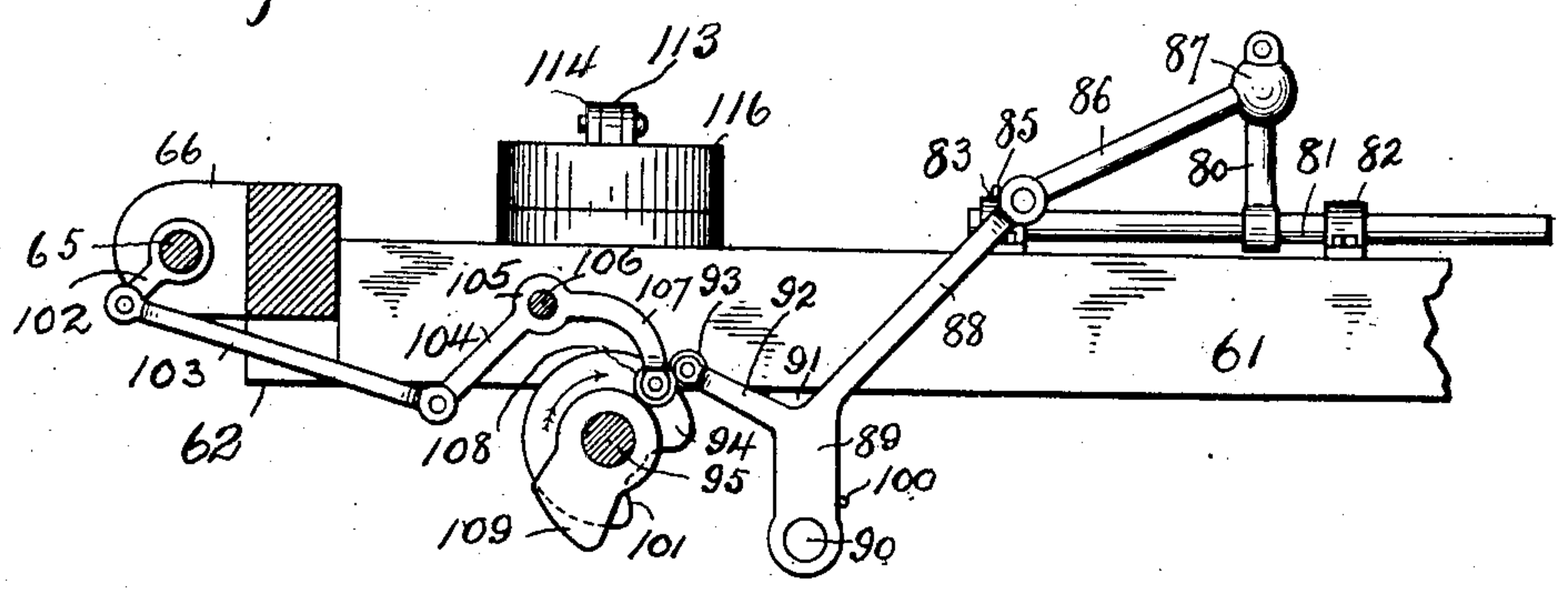


Fig 12



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8 SHEETS—SHEET 7.

Fig 13

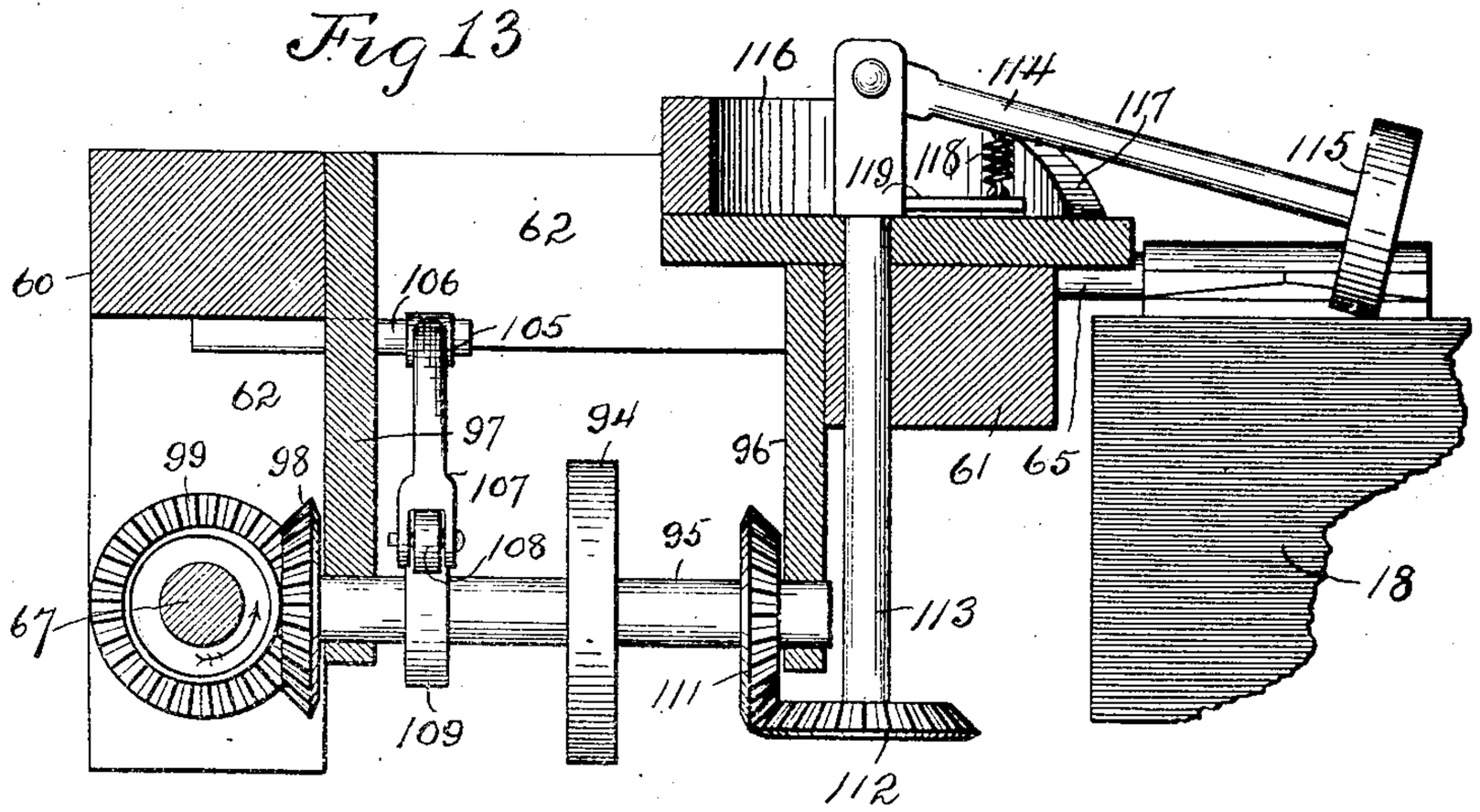
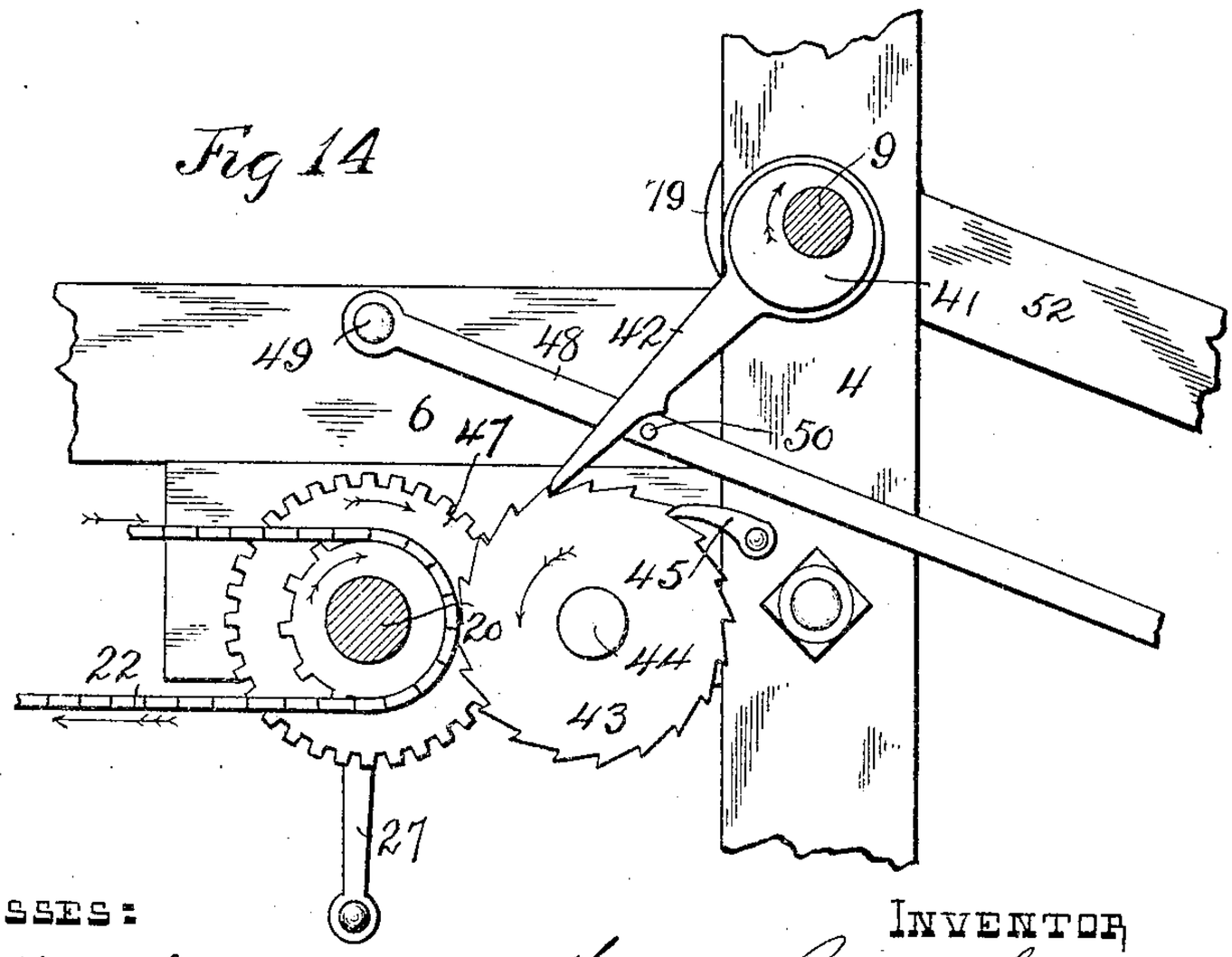


Fig 14



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APPLICATION FILED JULY 18, 1904.

8 SHEETS—SHEET 8.

Fig 15

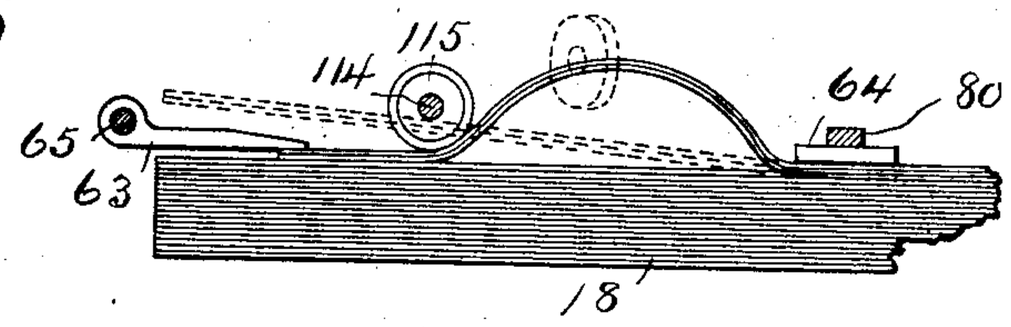


Fig 16

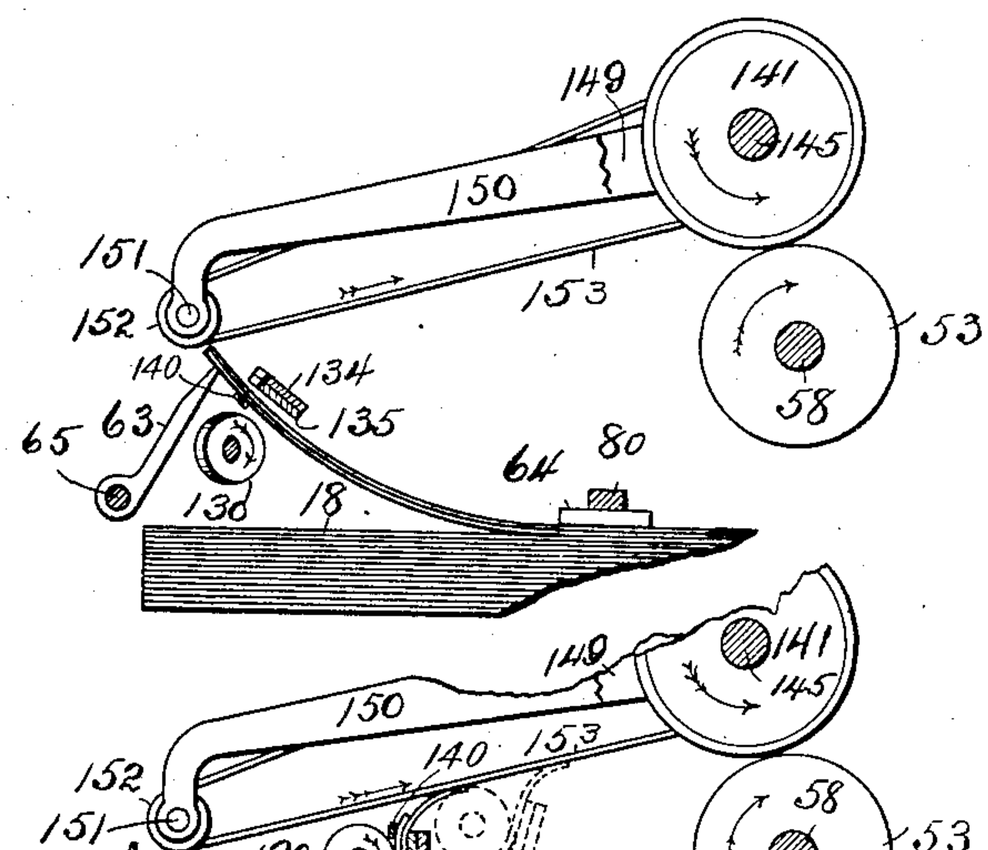


Fig 17

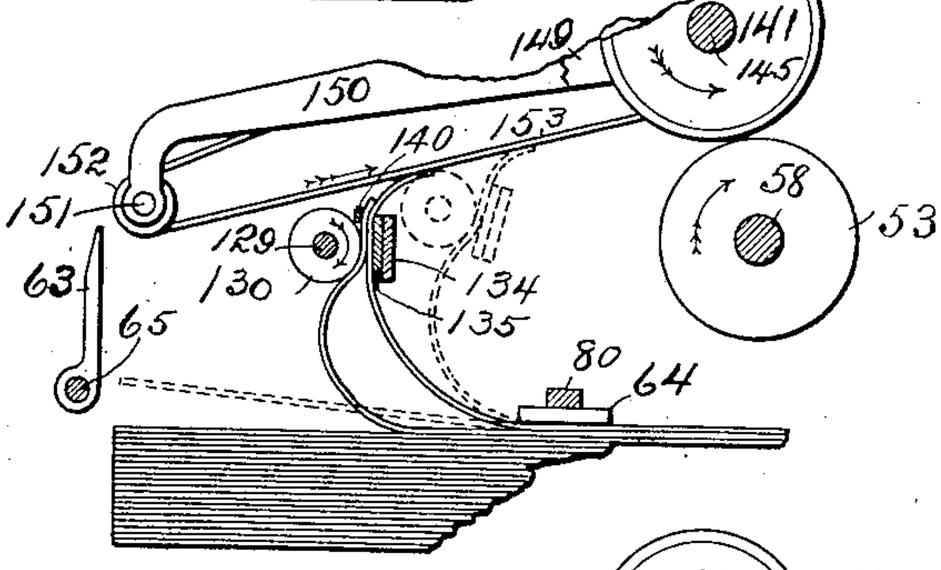
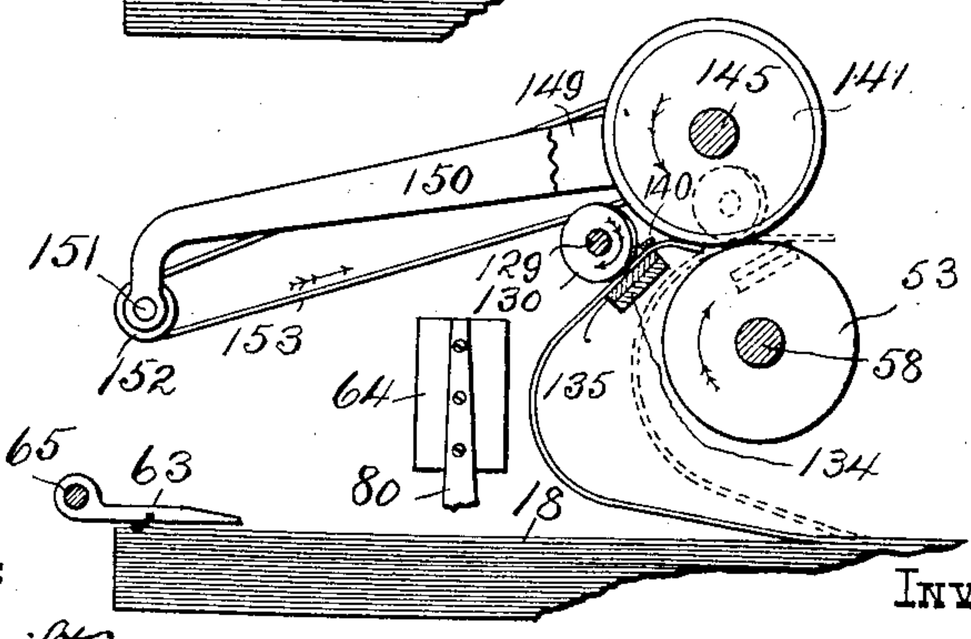


Fig 18



WITNESSES:

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R. L. House

INVENTOR

Harry Bradshaw

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His Attorney

UNITED STATES PATENT OFFICE.

HARRY BRADSHAW, OF KANSAS CITY, MISSOURI, ASSIGNOR OF ONE-HALF TO WARREN D. HOUSE, OF KANSAS CITY, MISSOURI.

PAPER-FEEDING MACHINE.

No. 810,391. Specification of Letters Patent. Patented Jan. 23, 1906

Application filed July 18, 1904. Serial No. 217,114.

To all whom it may concern:

Be it known that I, HARRY BRADSHAW, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Paper-Feeding Machines, of which the following is a specification.

My invention relates to improvements in paper-feeding machines.

The object of my invention is to provide a machine by which sheets of paper may be separated and detached one at a time from a pile of paper.

My invention provides a novel means by which one or more sheets may be partially lifted from the pile of paper, means by which when a plurality of sheets have been so lifted the top sheet may be separated from the other lifted sheets and withdrawn from the pile of paper, the other lifted sheets being replaced upon the pile.

My invention provides, further, mechanism by which the top sheet of the pile is seized and withdrawn therefrom with its sides reversed.

My invention provides, further, mechanism by which one or more of the top sheets are lifted from the pile of paper, other mechanism for seizing the lifted sheets and throwing back upon the pile all but the top sheet and at the same time carrying said top sheet and delivering it to a forwarding and registering mechanism.

My invention provides, still further, a sheet-separating mechanism of novel construction, combined with means controlled by the withdrawal of the sheets from the pile, for keeping the pile of paper within the reach of the separating mechanism.

In two applications filed of even date herewith, having Serial Nos. 217,115 and 217,116, respectively, I have shown, described, and claimed the sheet-registering and table-elevating mechanism herein shown and used in connection with the sheet-separating mechanism herein described and claimed.

My invention provides, further, other novel features, which are hereinafter fully described and claimed.

In the accompanying drawings, illustrative of my invention, Figure 1 is a side elevation view of my paper-feeding machine, a portion of the main framework being broken away. Fig. 2 is a horizontal sectional view, reduced in size, of the main framework, taken on a plane corresponding to the dotted line *a b* of Fig. 1. Fig. 3 is a top view of the machine, the upper forwarding-tapes being omitted. Fig. 4 is a top view of the front end of the machine including the sheet lifting and separating mechanism. Fig. 5 is a side elevation view of the parts shown in Fig. 4. Fig. 6 is a vertical sectional view taken on the dotted line *c d* of Fig. 5. Fig. 7 is a vertical sectional view taken on the dotted line *g h* of Fig. 4, some of the parts being broken away. Fig. 8 is a vertical sectional view taken on the dotted line *e f* of Fig. 5. Fig. 9 is a top view of the sheet-separating mechanism and some of the parts connected therewith, the device for rubbing back the top sheet of the pile being shown engaged in such operation. Fig. 10 is a view similar to Fig. 9, the top sheets being shown lifted and about to be seized by the frictional separating members. Fig. 11 is a view similar to Figs. 9 and 10, showing the frictional sheet-separating members delivering the top sheet to the forwarding tapes and rollers. Fig. 12 is a vertical sectional view taken in a plane corresponding to the dotted line *i j* of Fig. 9 and the dotted line *k l* of Fig. 4. Fig. 13 is an enlarged vertical sectional view taken on the dotted line *m n* of Fig. 9. Fig. 14 is a vertical sectional view taken on the dotted line *o p* of Fig. 3. Fig. 15 is a vertical sectional view showing the corner of the pile of paper, the two supporting-shoes, and the rubbing-disk, with the two upper sheets partly rubbed from under the forward shoe. In this view, in dotted lines, the two upper sheets are shown released from the rubbing-disk, which disk has moved forward and upward. Fig. 16 is a vertical sectional view showing the corner of the pile of paper, the front forwarding-rollers, the forward shoe with the two top sheets lifted thereon, and the two frictional separating members in the open position about to engage the two lifted sheets. Fig. 17 is a view similar to Fig. 16, the frictional separating members being shown with the two top sheets seized between them. In dotted lines the said separating members are shown further advanced and carrying one sheet, the

detached sheet being represented as having fallen nearly to the pile of paper, the forward supporting-shoe being shown in the vertical position. Fig. 18 is a view similar to that shown in Fig. 17, the rear supporting-shoe being shown elevated and the forward supporting-shoe depressed, the frictional separating members being shown in a position in which they are about to deliver the top sheet between the forwarding-rollers. In dotted lines the frictional separating members are shown in the open position and the top sheet engaged by the forwarding-rollers.

Similar characters of reference denote similar parts.

The main frame of the machine comprises four vertical posts 1, 2, 3, and 4, respectively. Connecting the upper ends, respectively, of the posts 1 and 3 and 2 and 4 are two horizontal parallel plates 5 and 6. Connecting the lower ends of the posts 1 and 3 and 2 and 4, respectively, are two horizontal parallel plates 7 and 8. A transverse horizontal driving-shaft 9 has its ends rotatively mounted in the posts 3 and 4, respectively. On the left end of the said shaft as viewed in Fig. 3 is mounted and rotatable therewith a driving-pulley 10, which may be rotated by any convenient means. Rotatively mounted on the shaft 9 is a roller 11, over which passes an endless cord or tape 12, which is also supported and driven lengthwise by means of a roller 13, mounted on and rotatable with a transverse horizontal shaft 14, rotatively mounted in the upper ends, respectively, of the posts 1 and 2. Upon the left end of the shaft 14 as viewed in Fig. 3 is mounted and rotatable therewith a pulley 15, by means of which the shaft 14 and roller 13 are rotated, rotation of the pulley 15 being acquired in any desirable manner. The endless cord or tape 12 is wound backward and forward upon the rollers 11 and 13 in a manner forming a series of loops, the upper sides of which connect the uppes sides of the rollers 11 and 13 and support the sheets of paper that are delivered thereon from the forwarding-tapes, hereinafter described. The cord or tape 12 is driven by the roller 13 in a direction denoted by the arrows in Fig. 3. Rotation of the cord or tape 12 is imparted by means of a twisting mechanism 16, the particular construction of which is described and claimed in the sheet-registering application above referred to. The loops forming the cord or tape 12 have their upper sides disposed parallel with each other, and the spiral movement of the cord or tape will carry the sheets detached from the pile lengthwise toward the roller 13 and laterally to and against a side guide consisting of one or more vertical projections 17 on the upper edge of the plate 5. A further description of the sheet-registering mechanism is not deemed necessary, as such mechanism is fully described in the aforesaid application for a sheet-registering machine, filed of even date herewith.

I will now give a brief description of the mechanism for supporting and elevating the pile of paper, a complete description of the construction of such mechanism being given in the aforesaid application for a table-elevating mechanism, filed of even date herewith.

The pile of paper (denoted by 18) rests upon a horizontal platform or table 19, disposed between posts 1 and 3 and 2 and 4. The forward end of the table extends a considerable distance in front of the posts 3 and 4. The platform or table 19 is supported as follows: A horizontal shaft 20 is rotatively mounted at its ends in transverse holes provided, respectively, in the plates 5 and 6 near the forward ends thereof. On the shaft 20 near its ends are secured sprocket-wheels 23 and 24, which sprocket-wheels are connected by the sprocket-chains 21 and 22 with the sprocket-wheels 25 and 26, respectively, rotatively mounted upon a transverse tie-rod 34, the ends of which are secured, respectively, in posts 1 and 2. A tie-rod 32 below and parallel with the shaft 20 and below the platform 19 has its ends secured, respectively, in the plates 7 and 8. A similar tie-rod 33, similarly located relative to the tie-rod 34, has its ends secured, respectively, in the posts 1 and 2. Rotatively mounted on the tie-rod 32 near its end respectively are sprocket-wheels 35 and 36. Similarly located on the rod 33 and rotatable thereon are sprocket-wheels 37 and 38. On the tie-rod 34, adjacent, respectively, the sprocket-wheels 25 and 26, are rotatively mounted sprocket-wheels 30 and 31. Vertical chain belts 39, disposed two upon each side of the platform 19, engage, respectively, sprocket-wheels 28 and 35, 29 and 36, 30 and 37, and 31 and 38. One side of each chain belt 39 is rigidly secured at 40 to the adjacent edge of the platform 19. The shaft 20 being rotated, the chain belts 39 will be driven by means of the mechanism just described—that is, the forward belts 39 will be driven by the sprocket-wheels 28 and 29. The rear chain belts 39 will be driven by means of sprocket-wheels 23, 24, 25, 26, 30, and 31, and chain belts 21 and 22. Sprocket-wheels 25 and 30 and 26 and 31 are rigidly connected together, so that when rotation is imparted to sprocket-wheel 25 sprocket-wheel 30 will also rotate. In the same manner sprocket-wheel 31 will be rotated when the sprocket-wheel 26 is rotated. Thus when the shaft 20 is rotated in the direction indicated by the arrow shown in Fig. 1 the platform 19 will be raised. In order that the platform 19 may be raised or lowered by hand, a crank 27 is secured to one end of the shaft 20. Rotation to the shaft 20 for the purpose of raising the table or platform 19 is obtained as follows: Near one end of the

shaft 9 is mounted an eccentric 41. Pivotally mounted at one end on said eccentric is a pawl 42, the other end of which rests upon the toothed periphery of a ratchet-wheel 43, rotatively mounted on a stud 44, rigidly secured to and extending horizontally inward from the plate 6. A pawl 45, pivoted at one end to the inside of the post 4, engages the teeth of the ratchet-wheel 43 and prevents its rearward retraction. Secured to the ratchet-wheel 43 and rotatively mounted on the stud 44 is a spur-gear wheel 46, which meshes with a spur-gear wheel 47, secured on and rotatable with the shaft 20. A forwardly-extending downwardly-inclined bar 48 has its rear end pivoted on a pin 49, extending horizontally from the inner side of the plate 6 above the shaft 20. An inwardly and laterally projecting pin 50 is mounted on the bar 48 in a position such that when the forward end of said bar is swung upward to the proper position the pawl 42 will be lifted by said pin 50, so as not to engage the teeth of the ratchet 43; but when the forward end of bar 48 swings downward to the proper position the pawl 42 will again engage the ratchet-wheel 43. When pawl 42 is engaged with the ratchet-wheel 43, rotation of the shaft 9, as denoted by the arrows in Figs. 1, 5, and 14, the pawl 42 will be reciprocated by eccentric 41, and step-by-step rotation will thus be imparted to the shaft 20 by means of gears 46 and 47 and ratchet-wheel 43. Swinging movement to the forward end of bar 48 is imparted as follows: Pivoted at their rear ends to the shaft 9 are two downwardly forwardly inclined bars 51 and 52, the forward ends of which are pivoted upon a transverse horizontal roller-shaft 58, carrying roller 53. Below and parallel with bars 51 and 52 are bars 54 and 55, the rear ends of which are pivoted, respectively, to the post 4 and a horizontal projection 56 on said post, and the forward ends of said bars 54 and 55 are pivoted to the vertical plate 57, the upper end of which is pivoted to the shaft 58. Said bars 51, 52, 54, and 55, shaft 58, and plate 57 form a swinging frame, the forward end of which moves upward and downward. In the rear side of plate 57 is provided a notch 59, in which is located the forward end of the bar 48. As the swinging frame of which the plate 57 is a part moves downwardly, owing to the removal of sheets from the top of the pile of paper, the bar 48 will be swung downwardly, thus permitting the pawl 42 to engage the teeth of the ratchet-wheel 43, and the rotation of the ratchet-wheel 43 will cause the table or platform 19 to be elevated, as already described. The table in being elevated will carry with it the pile of paper and swing the outer end of the swinging frame upward, thus swinging upward the bar 48 until the pin 50, carried by said bar, raises the pawl 42 from the ratchet-wheel 43, at which time the table-elevating will cease and the table will remain stationary until sufficient sheets have been fed from the pile to again permit the pawl 42 to engage the ratchet-wheel 43.

Secured at their rear ends to the forward side of the plate 57 are two parallel horizontal forwardly-extending plates 60 and 61. A transverse horizontal plate 62 has its ends secured, respectively, to the forward ends of said plates 60 and 61.

The swinging frame is supported at its forward end by means of two swinging shoes 63 and 64, which rest, respectively, upon the right corner of the pile as viewed in Fig. 4, the shoe 63 being disposed adjacent the forward and the shoe 64 adjacent the right side edge of the pile of paper. The shoe 63 is mounted on and movable with a transverse horizontal rock-shaft 65, mounted in bearings 66 on the plate 62, forming a portion of the bracket. Supported at its ends in the plates 62 and 57 is a longitudinal rotary shaft 67, connected at its rear end by a universal joint 68 with the forward end of a rotary shaft 69, disposed parallel with the plate 55 and having its rear end rotatively mounted in the outer end of a horizontal stud 70, pivotally mounted in the post 4. The inner end of said post 70 is screw-threaded and has mounted thereon a nut 76, bearing upon the inner side of the post 4. The shoulder 71 of the stud 70 bears against the outer side of said post 4. On the stud 70 is rotatively mounted a beveled gear-wheel 72, meshing with a beveled gear-wheel 73, mounted on and rotatable with the shaft 69. The beveled gear 72 also meshes with a bevel-gear 74, mounted on and rotatable with a vertical shaft 75, rotatively mounted in two bearings 77, secured to the outer side of the post 4 above the stud 70. Upon the upper end of the shaft 75 is secured a bevel-gear 78, which meshes with a bevel-gear 79, mounted on and rotatable with the shaft 9. Rotation to the shaft 67 is thus imparted from the shaft 9 by means of gears 78 and 79, shaft 75, gears 72, 73, and 74, shaft 69, and universal joint 68. The shoe 64 is mounted on the inner end of a transverse arm 80, secured near its middle to a horizontal rock-shaft 81, disposed parallel with the plate 61 and mounted in bearings 82 and 83, secured to the upper side of the plate 61. The forward end of the rock-shaft 81 is provided with a longitudinal spiral groove 84, in which is disposed the lower end of a vertical pin 85, rigidly secured in the bearing 83. The rock-shaft 81 is slidable lengthwise and when rocked, as hereinafter described, has a spiral motion imparted to it by means of the pin 85 and the groove 84. Such spiral motion of the shaft 81 causes the shoe 64 when the shaft is properly rocked to be moved forward from the position shown in Fig. 10 to the position shown in Fig. 11, thus at the proper time removing

the shoe 64 from a position in which it would interfere with the withdrawal from the pile of the top sheet of paper.

I will now describe the means for rocking the shaft 81 to and fro. Referring particularly to Figs. 5, 9, 10, 11, 12, and 13, 86 denotes a link, the rear end of which is connected, by means of a universal joint 87, to the outer end of the arm 80, to which the shoe 64 is attached. The forward end of the link 86 is pivotally connected to one end of the rear arm 88 of a bell-crank lever 89, pivotally mounted upon a horizontal pin 90, rigidly secured in a downwardly-extending projection 91 on the lower side of the plate 61. The other arm 92 of the bell-crank lever 89 is provided with a friction-roller 93, rotatively mounted on the arm 92 and bearing upon the periphery of a cam 94, mounted on and rotatable with a transverse horizontal shaft 95; the ends of which are respectively mounted rotatively in two vertical downwardly-extending plates 96 and 97, secured, respectively, to the plates 61 and 62. The outer end of the shaft 95 has secured to it a bevel-gear 98, which meshes with a bevel-gear 99, secured to and rotatable with the shaft 67. On the pin 90 is mounted a coil-spring 100, one end of which is secured to the said pin 90 and the other end of which bears upon the bell-crank lever 89 and normally holds it in position such that the roller 93 will follow the surface of the cam 94. The cam 94 is of circular form, provided at one place in its periphery with a recess 101. When the shaft 95 is rotated by means of the gears 98 and 99 and shaft 67, the cam 94 will hold the bell-crank lever 89 in a position such that the shoe 64 will rest upon the pile of paper, thus supporting the outer end of the swinging frame carrying the separating mechanism. When the cam 94 has rotated to a position such that the roller 93 will enter the recess 101, the spring 100 will swing the bell-crank lever 89 so as to raise and bring forward the shoe 64 through the intermediacy of the link 86 and arm 80. When the cam 94 moves so that the roller 93 passes out of the recess 101, the shoe 64 will be again depressed so as to rest upon the pile of paper. The shoe 63 is swung as follows: On the rock-shaft 65 is secured a crank-arm 102, to the end of which is pivoted the forward end of a rearwardly-extending link 103, the rear end of which is pivoted to one end of the arm 104 of a bell-crank lever 105, pivotally mounted on a horizontal pin 106, rigidly mounted on the inner side of the plate 60. The other arm 107 of the bell-crank lever 105 has rotatively mounted in it a roller 08, which rests upon a cam 109, secured upon the shaft 95. When the shaft 95 rotates, the cam 109 will swing the bell-crank lever 105 and through the intermediacy of the link 103 and crank-arm 102 will rock the shaft 65 so as to elevate the shoe 63. Rocking of the shaft 65 in the opposite direction when permitted by the cam 109 is obtained, a coil-spring 110 encircling the shaft 65, to which one end of the said spring is secured, the other end of the spring bearing upon the plate 62.

The friction device for forcing out the sheets of paper from under the shoe 63 comprises the following mechanism: Referring particularly to Figs. 9, 10, 11, and 13, 111 denotes a bevel-gear rigidly secured upon the shaft 95 and meshing with a bevel-gear 112, rigidly secured to the lower end of a vertical shaft 113, rotatively mounted in the plate 61 and having pivoted to its upper end one end of a bar 114, on the other end of which is secured a disk 115, provided, preferably, on its periphery with a frictional material, such as soft rubber. Secured upon the upper side of the plate 61 is a cam having a vertical circular flange 116, disposed concentrically with the shaft 113 and provided on the side adjacent the table or platform 19 with a recess 117. The cam-flange 116 is adapted to support and elevate the bar 114, thus lifting the friction-disk 115 off from the pile of paper excepting as at such times when the bar 114 passes into the recess 117. The bar 114 is normally drawn downward by means of a coil-spring 118, the upper end of which is secured to the said bar and the lower end of which is secured to a horizontal pin 119, secured at one end to the shaft 113. The function of the friction-disk 115 is to rub upon and force one or more of the top sheets of the pile from under the shoe 63. The operation of this mechanism is as follows: The shaft 95 in rotating imparts rotation to the shaft 113 by means of the gears 111 and 112, thus swinging the bar 114 in a circular manner. Rotation of the bar 114 is in the direction indicated by the arrow adjacent thereto in Fig. 9. When the bar 114 passes into the recess 117, the friction-disk 115 will pass upon the top of the pile of paper, forcing one or more of the top sheets from under the shoe 63. The shoe 64 at this time is in a depressed position and prevents the entire top sheet from slipping rearwardly when acted upon by the friction-disk 115. The friction-disk 115 by its circular movement on the paper imparts movement in a similar direction to the adjacent portion of the top sheet, thus facilitating its separation from the sheets below. When the top sheet or sheets are withdrawn from under the shoe 63, they are released from the friction-disk 115 and fall back, as shown in dotted lines in Fig. 15, toward and upon the shoe 63, which shoe is then elevated in the manner already described by means of the cam 109 and intermediate mechanism to the position shown in Fig. 16, at which time the raised sheets are in position to be seized by the mechanism employed to separate the raised sheets from each other and carry the

top sheet to the forwarding rollers and tapes. I will now describe the said separating mechanism: Referring particularly to Figs. 4, 5, 7, 9, 10, and 11, 120 denotes a vertical post rotatively mounted at its lower end in plate 60. To the post 120 below the plate 60 is rigidly secured a bevel-gear 121, which meshes with the bevel-gear 122, rigidly secured upon the shaft 67. Rotation to the vertical post 120 is thus imparted by means of the gear-wheels 121 122 when the shaft 67 is rotated. Rotatively mounted in a transverse hole provided in the upper end of the post 120 is a horizontal shaft 123, provided at one end with a right-angled crank-arm 124 and having secured at its other end a pinion 125, which meshes with an intermediate spur gear-wheel 126, rotatively mounted on a horizontal projection 127 on the side of the post 120. The said intermediate gear 126 also meshes with the teeth of a horizontal crown gear-wheel 128, rigidly secured to the upper side of the plate 60 and encircling and concentric with post 120. Rotatively mounted on and parallel with the horizontal portion of the crank-shaft 124 is a shaft 129, on one end of which is secured and rotatable therewith a friction-disk 130, the periphery of which is preferably provided with a frictional surface, such as soft rubber. On the other end of the shaft 129 is secured a pinion 131, adapted to engage with peripheral teeth 132, provided on a circular disk 133, forming a part of the post 120 and concentric with the shaft 123. Pivoted to the crank-arm 124 is a bar 134, having secured to its outer end on the side adjacent the friction-disk 130 a frictional pad 135, preferably of soft rubber. To the other end of the bar 134 is secured a plate 136, adapted to bear upon a cam 137, integral with the post 120, having a general circular form concentric with the shaft 123 and provided in its periphery with a notch 138. The coil-spring 139, connected at one end to the bar 134 and at the other end to the horizontal portion of the crank-arm 124, normally swings the bar 134 in a direction such that the friction-pad 135 will be moved toward the friction-disk 130. On the crank-arm 124 is secured one end of a flat spring 140, the other end of which is disposed opposite and is adapted to press the sheets of paper gripped between the friction-disk 130 and the friction-pad 135 against the friction-pad 135. The flat spring 140 being of metal exerts small frictional force upon the grip-sheets of paper compared with the frictional force exerted by the rubber disk 130 and pad 135. The total of the frictional force exerted upon the gripped sheets on the sides adjacent the disk 130 and spring 140 will therefore be less than the total frictional force exerted by the friction-pad 135. When the friction-disk 130 is rotated at a time when there are two or more sheets held upon the pad 135 by the spring 140 and disk 130, all the sheets except the sheet next to the pad 135 will be ejected; but the sheet in contact with the pad 135 will be retained, the frictional force tending to retain the sheet preponderating over the frictional action of the disk 130. So when more than one sheet is gripped between the disk 130 and pad 135 all except the top sheet will be thrown back upon the pile; but the top sheet will be held notwithstanding the rotary movement of the disk 130 and will be carried by the said disk and the pad 135 to the forwarding rollers and tapes, hereinafter described. When the shaft 67 is rotated, thus rotating the post 120 by means of the gears 121 and 122, the shaft 123 and crank-arm 124, together with the shaft 129 and bar 134, will be caused to describe a circle with the axis of the post 120 as a center, thus carrying the friction-disk 130 and pad 135 over the corner of the pile of paper adjacent the shoe 63. At the same time rotation to said crank-arm 124, shaft 129, bar 134, and parts connected therewith will be obtained around the axis of the shaft 123. The arrangement of the parts are such that when the crank-arm 124 is in the position shown in Fig. 10 the relative positions of the disk 130 and pad 135 will be that shown in Fig. 16, the disk and pad being separated so as to admit between them the raised sheets, the disk 130 being upon the under and the pad 135 upon the upper sides of said raised sheets. At about this time, the post 120 being rotated in the direction indicated by the arrow in Fig. 10, the plate 136 will enter the recess 138 in the cam 137, (shown in Fig. 8,) thus permitting spring 139 to press the pad 135, spring 140, and disk 130 tightly against the raised sheets. At the same time the pinion 131 will engage the teeth 132 on the disk 133, and rotation will thus be imparted to shaft 129 and disk 130. Engagement of the pinion 131 with the teeth 132 is due to the rotation of the shaft 123, which is driven by means of pinions 125, gear 126, and crown-gear 128. At about the time that disk 130 begins to rotate, cam 109 on the shaft 95 will, through the intermediate mechanism already described, swing the shoe 63 to the vertical position, as shown in Fig. 17. Continued rotation of the disk 130 will force out from between said disk and the pad 135 all the raised sheets excepting the top one, the other sheets falling back upon the pile. The shoe 63 then descends, cam 109 permitting, to the horizontal position upon the pile of paper, thus supporting the swinging frame and the mechanism carried thereby. Continued rotation of the post 120 will through the mechanism hereinbefore described continue the rotation of the shaft 123 with the crank-arm 124 and parts carried by said crank-arm until the pad 135 and the disk 130 will have been swung to the position shown

in Figs. 11 and 18, the disk 130 at this time being above the pad 135. In this position the top sheet of paper, as shown in Fig. 18, will be brought in position to be inserted between and grasped by the forwarding-rollers 141 and 53, respectively. At this time the crank-arm 124 will have been swnug to a position such that the pinion 131 will pass out of the teeth 132, when the shaft 129 and disk 130 will cease to rotate. At the same time the plate 136 will pass out of the recess 138 onto the circular periphery of the cam 137, thus swinging the bar 134 so that the pad 135 will move away from the spring 140 and disk 130. The top sheet of paper will thus be released, so that it can be removed freely from the pile of paper by the rollers 141 and 53. At the same time the shaft 95 will have been so rotated that the roller 93 of the bell-crank lever 89 will enter the recess 101 of the cam 94. The spring 100 will then swing the bell-crank lever 89 so as to depress the outer end of the arm 80 by means of the link 86 and universal joint 87. The rock-shaft 81 will thus be rocked and at the same time slid forward in the bearings 82 and 83 by means of the pin 85 and spiral groove 84. The shoe 64 will thus be raised and moved forward to the position shown in Figs. 11 and 18, thus clearing the said shoe from the top sheet and permitting the said shoe to again pass back upon the top of the pile of paper below said top sheet. Continued rotation of the post 120 and parts connected therewith will again bring the parts to the position shown in Fig. 10, at which time one or more sheets of paper will have again been rubbed up from the pile by means of the friction-disk 115 and deposited upon the shoe 63, which will have once more been lifted to the position shown in Fig. 16, the cam 109 so permitting, at which time the raised sheets will be seized between the disk 130 and the pad 135, and the operation of separating the raised sheets will be repeated. The arrangement of the several parts is such that the different steps hereinbefore described will take place in their proper consecutive order. For every rotation of the shaft 113, carrying the bar 114, having thereon the disk 115, the post 120 will also make one rotation, and the shoes 63 and 64 will be raised and lowered once each. The form of the cams 94 and 109 and their position upon the shaft 95 are such that one of the shoes 63 or 64 always rests upon the pile of paper, insuring the supporting of the forward end of the swinging frame carrying the paper rubbing and separating mechanism.

A transverse horizontal shaft 142 is rotatively mounted at its ends above the roller 11 in the posts 3 and 4. On said shaft 142 is mounted and rotatable therewith a roller 143. Endless tapes 144 connect said roller 143 with rollers or disks 141, mounted on and rotatable with a transverse horizontal shaft 145, the ends of which are rotatively mounted, respectively, in the forward ends of two forwardly-inclined bars 146 and 147, the rear ends of which are pivoted on the shaft 142. The rollers 141 rest upon the roller 53, by which the rollers 141 and tapes 144 are driven. The function of tapes 144 and rollers 141 and 143 is to prevent the sheets from being raised from the endless tapes 148, mounted on the rollers 11 and 53, which tapes 148 are the carrying-tapes which carry the separated sheets from the sheet-separating mechanism hereinbefore described and deliver them upon the registering cord or tape 12. The forward ends of the bars 146 and 147 have secured, respectively, to them the rear ends of two forwardly-extending bars 149 and 150, in the forward ends of which is rotatively mounted a transverse shaft 151, having secured thereon two grooved wheels 152, connected by endless tapes 153 with grooved wheels 154, secured upon the shaft 145. The function of tapes 153 is to properly guide the top separated sheet between the rollers 53 and 141.

The general operation of my invention is as follows: The paper to be fed and registered is placed in a pile (denoted by 18) on the table or platform 19 and disposed so that the shoe 63 rests upon the top of the pile adjacent the right forward corner of the pile, as viewed in Figs. 3 and 4, and the shoe 64 resting upon the top of the pile near the right side thereof and to the rear of shoe 63. Rotation is then imparted to the pulley 15, thus rotating the shaft 14 and roller 13 and driving the cord or tape 12 in the direction denoted by the arrows in Fig. 3, so as to carry the sheets deposited on the cord 12 toward the roller 13, the rotation of the cord 12 carrying the sheets sidewise to the guide projections 17. At the same time pulley 10 is rotated, thus rotating, through the mechanism already described, the shafts 69, 67, and 95. The roller 11 is driven by the cord 12 and in turn imparts movement to the roller 53 by means of tapes 148. The tapes 144 are driven by rollers 141, rotated by means of roller 53. The same roller rotates wheels 154, thus driving the belts or tapes 153. Rotation of the shaft 67 is imparted to the shaft 113 by means of the mechanism described, and the bar 114 is thus swung in a circle upon the cam 116. The friction-disk 115 when the bar 114 enters the notch or recess 117 passes down upon the pile of paper and rubs out one or more of the top sheets from under the shoe 63, which sheets as the disk 115 is again raised by the cam 116 fall back upon the shoe 63, by which shoe they are lifted to the position shown in Fig. 16, the shoe 63 being raised by means of the mechanism connecting it with shaft 67, hereinbefore described. The raised sheets are now seized by the friction-pad 135 and the friction-disk 130

and are carried toward the forwarding or carrying rollers 141 and 53, the said friction pad and disk being rotated by means of the mechanism already described. During the forward movement of the raised sheets all but the top sheet are thrown back upon the pile by means of the rotation of the disk 130, the top sheet being held between the disk 130 and the pad 135 until the sheet is seized between the rollers 53 and 141, at which time the disk 130 and pad 135 are caused to separate, as already described, and thus releasing from them the top sheet, which is now stripped from the pile with its sides reversed and is carried on the tapes 148 to and between the rollers 11 and 143 and upon the registering cord or tape 12. As the sheets are fed from the table 19 the swinging frame carrying the shoes 63 and 64 lowers until the frame carries the outer end of the bar 48 down sufficiently for the pawl 42 to engage the ratchet-wheel 43, thus causing, as described, the table-elevating mechanism to raise the table, which upward movement continues until the bar 48 strikes, through its pin 50, the pawl 42 and raises the said pawl from engagement with the ratchet-wheel 43. Thus as the sheets are fed from the pile the table is intermittently raised corresponding with the swinging of the swinging frame supporting the sheet-separating mechanism. The shoe 64, while serving to support the swinging frame when the shoe 63 is lifted, also serves to hold the top sheets from slipping when the disk 115 is rubbing the top sheet or sheets rearwardly, as shown in Fig. 15. The flat spring 140 serves to hold the raised sheets against the pad 135 while the disk 130 is being rotated against the raised sheets. The rotation of the crank 124 with the shaft 123 enables the disk 130 and pad 135 to grasp the top sheet and reverse the sides of the said sheet while carrying it to and delivering it between the rollers 53 and 141.

Any other sheet-registering mechanism than the one shown may be employed with my sheet-separating mechanism.

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

1. In a paper-feeder, the combination with a sheet-carrying device provided with two members for gripping between them and removing from the pile one or more sheets thereof, of means for removing all sheets but one from between said gripping members and permitting said removed sheets to fall back on the pile.

2. In a paper-feeder, the combination with a sheet-carrying device having two members provided with means for gripping between them and reversing the position of a part of each of one or more of the top sheets of a pile of paper, of means for withdrawing from between said two members and permitting to fall back on the pile all but one of said reversed sheets.

3. In a paper-feeder, the combination with a sheet-carrying device having two members provided with means for gripping between them and reversing the position of a part of each of one or more of the top sheets of a pile of paper, of means for withdrawing from between said two members and permitting to fall back on the pile all but one of said reversed sheets, and means for seizing and stripping from the pile said reversed sheet retained gripped by the two members.

4. In a paper-feeder, the combination with a sheet-carrying device comprising two sheet-gripping devices between which one or more sheets of paper are gripped, of a rubbing device, and means by which said rubbing device may apply a rubbing pressure to the sheets against one of the gripping devices.

5. In a paper-feeder, the combination with two sheet-gripping devices adapted to grip between them one or more sheets of a pile, of a rotary rubbing device, and means by which said rubbing device may exert a pressure upon the sheets against the surface of one gripping device.

6. In a paper-feeder, the combination with two sheet-gripping devices adapted to grip between them one or more sheets of paper, one device having a surface of a relatively greater frictional nature and the other a surface of a relatively less frictional nature, of a rubbing device adapted to be rubbed against the sheets upon the gripping device having the greater frictional nature.

7. In a paper-feeder, the combination with two sheet-gripping devices one having a surface of a relatively greater frictional nature and the other a surface of a relatively less frictional nature exposed to the sheets gripped between them, of a rotary rubbing device adapted to press upon the sheets against the gripping device having the greater frictional nature.

8. In a paper-feeder, the combination with two sheet-gripping devices, each having a frictional surface exposed to the sheets gripped between them, of means for rotating one of said two devices, and a third device for pressing the sheets against the other of said two devices, the third device having a surface possessing frictional qualities relatively less than either of the other two.

9. In a paper-feeder, the combination with a sheet-gripping device, of a resilient device adapted to bear thereupon, means for inserting one or more sheets between said devices, and a rubbing device for bearing upon the sheets against the gripping device.

10. In a paper-feeder, the combination with a gripping device having a frictional surface, a resilient device for pressing one or more sheets upon said frictional surface, and a rub-

bing device having a frictional surface for rubbing against said sheets against the frictional surface of the gripping device.

11. In a paper-feeder, the combination with a gripping device having a frictional surface, of a resilient gripping device having a surface of a relatively less frictional nature for pressing the sheets against the frictional surface of the other gripping device, and a frictional rubbing device for rubbing against said sheets against the gripping device having the greater frictional nature.

12. In a paper-feeder, the combination with a frictional gripping device, of a resilient device bearing thereupon, and a rotary rubbing device provided with means for bearing against the frictional gripping device.

13. In a paper-feeder, the combination with means for raising one or more sheets from a pile of paper, of two gripping devices for seizing said raised sheets, one of said gripping devices having a surface of a frictional nature and the other a surface of a relatively less frictional nature exposed to the sheets of paper, and a rubbing device for rubbing against said sheets and against the gripping device having the greater frictional nature.

14. In a paper-feeder, the combination with two gripping devices simultaneously movable with each other and movable toward and from each other, of a rotary rubbing device movable simultaneously with said gripping devices and movable toward and from and adapted to bear upon one of said gripping devices.

15. In a paper-feeder, the combination with a frictional rubbing device movable along the top of a pile of paper for raising therefrom parts of one or more sheets of the pile, a lifting device for supporting and lifting the sheets detached by the said rubbing device, two sheet-gripping devices for gripping between them the said lifted sheets, and a rubbing device for bearing against one of said gripping devices and upon the sheet or sheets held thereon by the other gripping device.

16. In a paper-feeder, the combination with means for partly raising from the pile one or more sheets of paper, of two gripping devices for seizing between them said raised portions of said sheets, and a rubbing device for bearing against one of said gripping devices and upon the sheets held thereon.

17. In a paper-feeder, the combination with means for partly raising from the pile one or more sheets of paper, of two gripping devices for seizing between them said raised portions of said sheet, one of said gripping devices being provided with a frictional surface exposed to the sheets, and a frictional rubbing device adapted to be pressed upon the sheets against the frictional surface of the gripping device.

18. In a paper-feeder, the combination with means for raising portions of one or more sheets from a pile of paper, of two gripping devices for seizing between them the raised sheets, one gripping device having a frictional surface, the other gripping device being resilient and holding the sheets upon the said frictional surface, and a rotary frictional device for rubbing against the sheets upon said frictional surface.

19. In a paper-feeder, the combination with means for raising portions of one or more sheets from a pile of paper, of a gripping device for seizing said raised sheets, means for moving said gripping device so as to reverse relative to the pile the gripped portions of the sheets, means for removing from the gripping device all the sheets except the top sheet of the pile, and means for taking the top sheet from said gripping device and stripping it from the pile of paper in the said reversed position.

20. In a paper-feeder, the combination with a sheet-carrying device provided with two sheet-gripping devices movable toward and from each other, of means for rotating said carrying device, a rubbing device carried by said carrier and adapted to bear upon one of the gripping devices, means for rotating said rubbing device, means for raising one or more sheets and depositing them between said gripping devices, and means for seizing the sheets carried by the gripping devices and stripping them from the pile.

21. In a paper-feeder, the combination with a friction-pad, of means for holding the top sheet or sheets against said pad, and a rotary device having a frictional surface movable toward and from and adapted to bear against said pad.

22. In a paper-feeder, the combination with a friction-pad, of resilient means for holding the top sheet or sheets against said pad, and a rotary device having a frictional surface movable toward and from and adapted to bear against said pad.

23. In a paper-feeder, the combination with a friction-pad, of a spring for holding the top sheet or sheets against said pad, and a rotary device having a frictional surface movable toward and from and adapted to bear against said pad.

24. In a paper-feeder, the combination with a friction-pad, of a rotary shaft provided with a crank-arm supporting said pad, means for rotating said shaft around its axis, means for revolving said shaft around an axis disposed at right angles to the axis of rotation, a spring carried by said crank-arm and adapted to press the top sheet or sheets of paper against said pad, a friction-disk rotatively mounted on said crank-arm, the pad and disk being movable relatively toward and from each other, and means for rotating said disk.

25. In a paper-feeder, the combination

with means for raising one or more top sheets of paper from a pile, of a friction-pad, a frictional rotary device, means for rotating said rotary device, means for moving said rotary device and said pad relatively toward and from each other, and a device for pressing said raised sheets against said pad.

26. In a paper-feeder, the combination with means for raising one or more sheets from the pile, of a friction-pad, a spring for holding said raised sheets against said pad, a friction-disk, means for rotating said friction-disk, and means for moving relatively the said pad and disk toward and from each other.

27. In a paper-feeder, the combination with means for raising a part of one or more sheets from the pile, of two friction devices adapted to grip between them the raised sheet or sheets, means for rotating one of said friction devices, means for holding the raised sheets against the other of said friction devices, means for revolving said friction-devices around each other, and means for revolving said friction devices around an axis disposed at an angle to the axis of revolution around each other.

28. In a paper-feeder, the combination with means for raising one or more of the top sheets of the pile, of two friction devices adapted to grip between them said sheet or sheets, means for rotating one of said friction devices, means moving relatively said devices toward and from each other, and means for so moving said friction devices as to reverse the position of the sheet or sheets held between them.

29. In a paper-feeder, the combination with means for raising one or more sheets from the pile, of two friction devices adapted to grip between them said sheets, means for rotating one of said devices, means for pressing said sheets against the other of said friction devices, means for relatively moving said friction devices toward and from each other, and means for so moving said friction devices as to reverse the position of the sheet or sheets held between them.

30. In a paper-feeder, the combination with means for raising one or more sheets from the pile, of two friction devices adapted to grip between them said sheets, means for rotating one of said devices, resilient means for pressing said sheets against the other of said friction devices, means for relatively moving said friction devices toward and from each other, means for so moving said friction devices as to reverse the position of the top sheet retained between them, and means for seizing said reversed sheet from said friction devices and stripping it from the pile.

31. In a paper-feeder, the combination with means for raising a part of one or more sheets from the pile, of means for gripping said raised portions of the sheets and carrying them toward a sheet-stripping mechanism, means for removing from said gripping means and throwing back on the pile all but the top one of said raised sheets, and a stripping mechanism for seizing and stripping from the pile said top sheet.

32. In a paper-feeder, the combination with means for raising a part of one or more sheets from a pile, of means for gripping said raised portions of the sheets and carrying them toward a stripping mechanism, means for removing from said gripping means all but the top sheet of said raised sheets and throwing said removed sheets back upon the pile, means for so moving the said gripping means as to reverse the position of the said top sheet, and a stripping mechanism for seizing and stripping from the pile said top sheet.

33. In a paper-feeder, the combination with means for raising a part of one or more sheets from the pile, of a frictional pad, means for pressing said raised sheets against said pad, a rubbing device, means for applying said rubbing device with a rubbing pressure against the sheets held pressed against said pad, means for so moving said pad and sheet-pressing means as to reverse the position of the sheets held thereby, and a sheet-stripping mechanism for seizing and stripping from the pile the sheet retained by the said pad and sheet-pressing means.

34. In a paper-feeder, the combination with means for raising a part of one or more sheets from a pile, of a frictional pad, adapted to receive thereon the raised parts of said sheets, a spring for holding said sheets against said pad, a frictional disk, means for rotating said friction-disk, means for relatively moving said disk and said pad toward and from each other, a sheet-stripping means, and means for moving the pad, spring and disk between the sheet-raising and sheet-stripping means.

35. In a paper-feeder, the combination with means for raising a part of one or more sheets from the pile, of a frictional pad adapted to receive thereon the raised sheets, a spring for holding the sheets against the pad, a rotary disk for rubbing against the sheets and against the pad, means for rotating said disk, means for relatively moving the pad and disk toward and from each other, a sheet-stripping mechanism, and means for so moving said pad, spring and disk as to reverse the position of the sheet retained thereby and carry it toward the sheet-stripping mechanism.

36. In a paper-feeder, the combination with a supporting-frame, of a table for carrying the pile of paper vertically movable on the frame, a swinging frame pivotally connected with the supporting-frame having two supporting-shoes and adapted to alternately rest upon the pile of paper carried by the table, a sheet separating and detaching

mechanism supported by the swinging frame for withdrawing the sheets from the pile, and means controlled by the movement of the swinging frame for elevating the table.

37. In a paper-feeder, the combination with a supporting-frame, of a table for carrying the pile of paper and vertically movable upon the frame, a sheet-separating and a sheet-stripping mechanism supported by a swinging frame, the said swinging frame pivotally connected with the supporting-frame and having two supporting-shoes and adapted to alternately rest upon the pile of paper, means for supporting and elevating the table upon the supporting-frame, means for actuating said table-elevating means, and means controlled by the swinging of the swinging frame for controlling the table-elevating means.

38. In a paper-feeder, the combination with a supporting-frame, of a table vertically movable thereon, a sheet carrying and supporting mechanism carried by said frame, a swinging frame pivotally connected with the table and having two supporting-shoes adapted to alternately rest upon the pile of paper, a sheet-separating mechanism supported on the swinging frame, a sheet-stripping mechanism for seizing the separated sheets from the sheet-separating mechanism and delivering them to the sheet-registering mechanism, means for elevating the table, and means controlled by the movement of the swinging frame for controlling the table-elevating means.

39. In a paper-feeder, the combination with a table adapted to support a pile of paper, of a support, a swinging frame pivotally connected to said support and having two supporting-shoes and adapted to alternately rest upon the pile of paper, and a sheet separating and detaching mechanism mounted on and movable with said swinging frame.

40. In a paper-feeder, the combination with a table adapted to support a pile of paper, of a support, a swinging frame pivotally connected to said support and adapted to rest upon the pile of paper, two shoes pivotally mounted on said frame, means for swinging said shoes alternately so that they may alternately support the frame on the pile of paper, means for forcing out one or more of the top sheets from under one shoe and depositing the said sheet or sheets upon said shoe, means for gripping said deposited sheets and throwing back on the pile all but one, and means for seizing said retained sheet, and stripping it from the pile.

41. In a paper-feeder, the combination with a table adapted to support a pile of paper, of a support, a frame pivotally connected with said support, two shoes pivotally mounted on said frame and adapted to rest alternately upon the pile of paper for supporting thereon said frame, a rubbing device rotatively mounted on the frame and adapted to rub the top sheet or sheets out from under one of said shoes and drop them upon the said shoe, means for swinging the shoe supporting the sheets so as to lift the sheets from the pile, a stripping mechanism carried by the frame for seizing and stripping from the pile sheets raised by one of the shoes, and a sheet-separating mechanism comprising a friction-pad, a device for pressing the raised sheets upon the said pad, a rotary friction-disk for rubbing against the sheets carried on the pad, means for rotating said disk, means for relatively moving the disk and pad toward and from each other, and means for moving said pad, friction-disk and pressing device between the shoe supporting the sheets and the stripping mechanism.

42. In a paper-feeder, the combination with a vertical post, of means for rotating said post, a transverse shaft rotatively mounted in said post and provided with a crank-arm, means for rotating said shaft, a second shaft rotatively mounted in said crank-arm, means for rotating said second shaft, a friction-disk mounted on said second shaft, a friction-pad mounted on the crank-arm and movable toward and from the friction-disk, means for so moving said pad, a spring carried by said crank-arm and adapted to press against said pad, and means for raising one or more of the top sheets from a pile and depositing them between said pad and spring and friction-disk.

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

HARRY BRADSHAW.

Witnesses:

WARREN D. HOUSE,

HENRY F. ROSE.