No. 720,546. PATENTED FEB. 10, 1903.

L. F. FUCHS & B. K. FISHER.

PAPER FEEDING MACHINE.

APPLICATION FILED SEPT. 30, 1899.

NO MODEL. 4 SHEETS—SHEET 1.

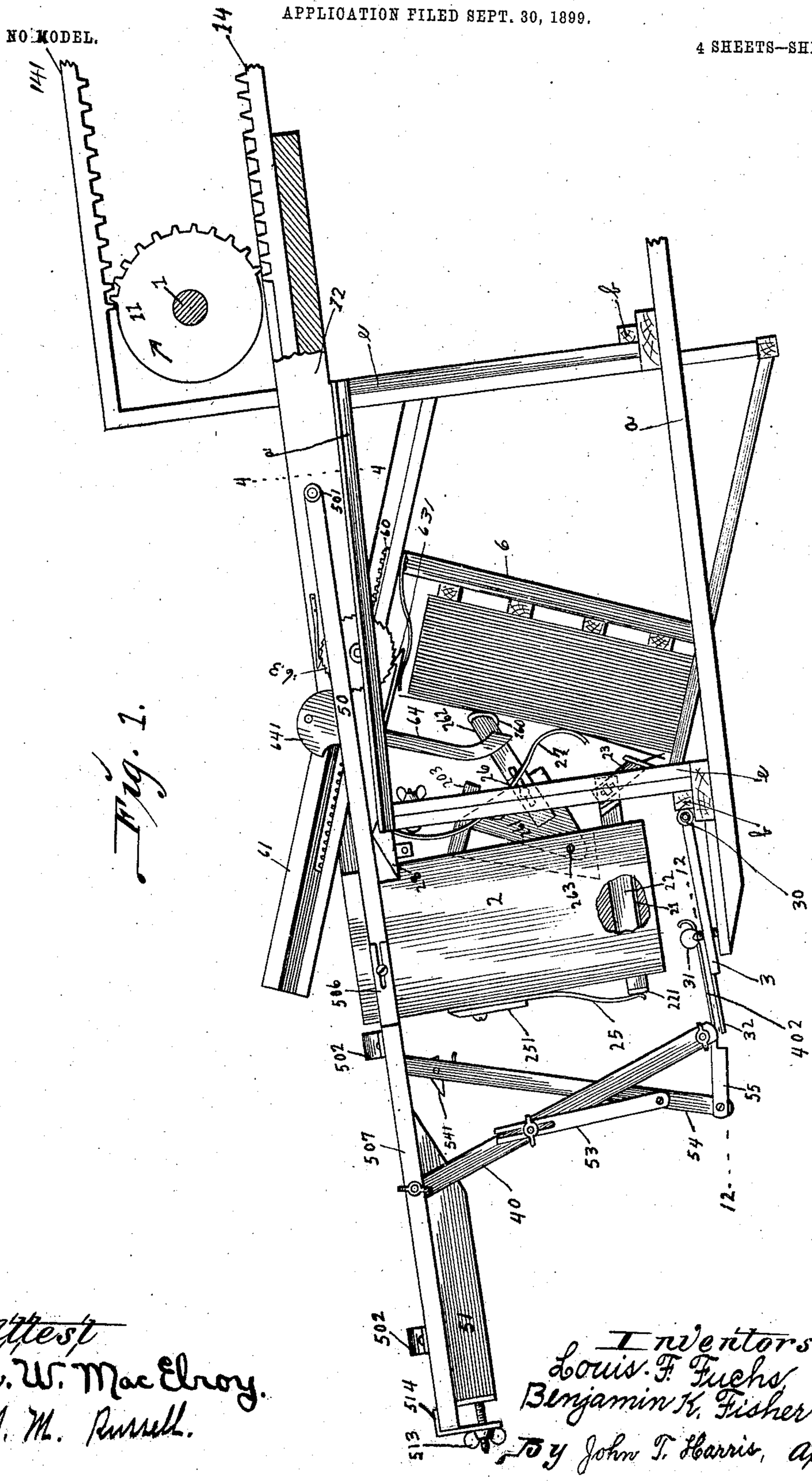

Fig. 1.

Attest
J. W. MacElroy.
I. M. Russell.

Inventors:—
Louis F. Fuchs,
Benjamin K. Fisher
By John T. Harris, Atty.

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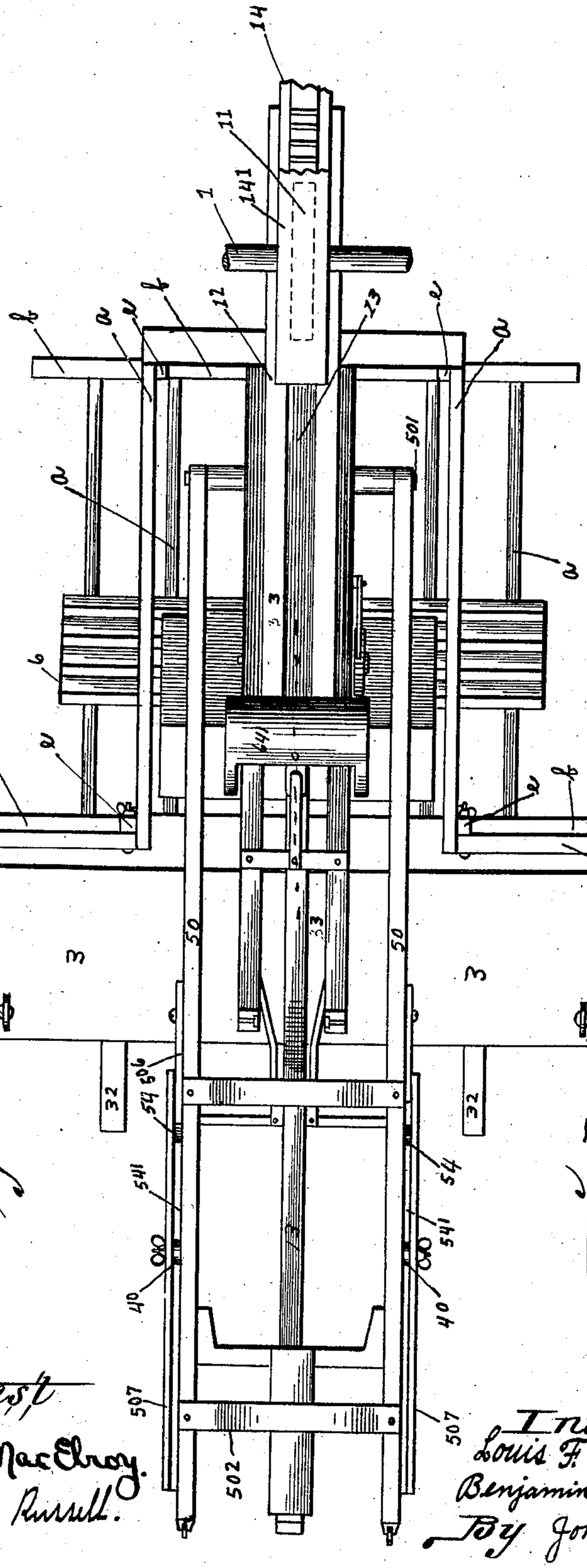

Fig. 2.

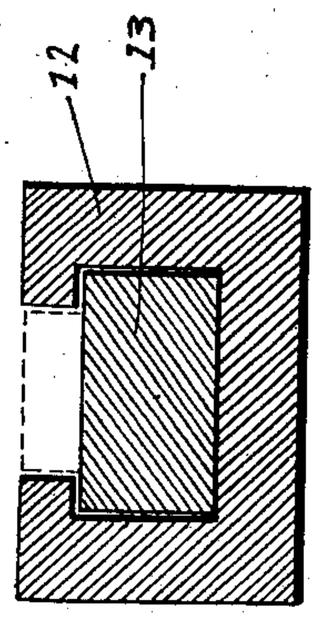

Fig. 4.

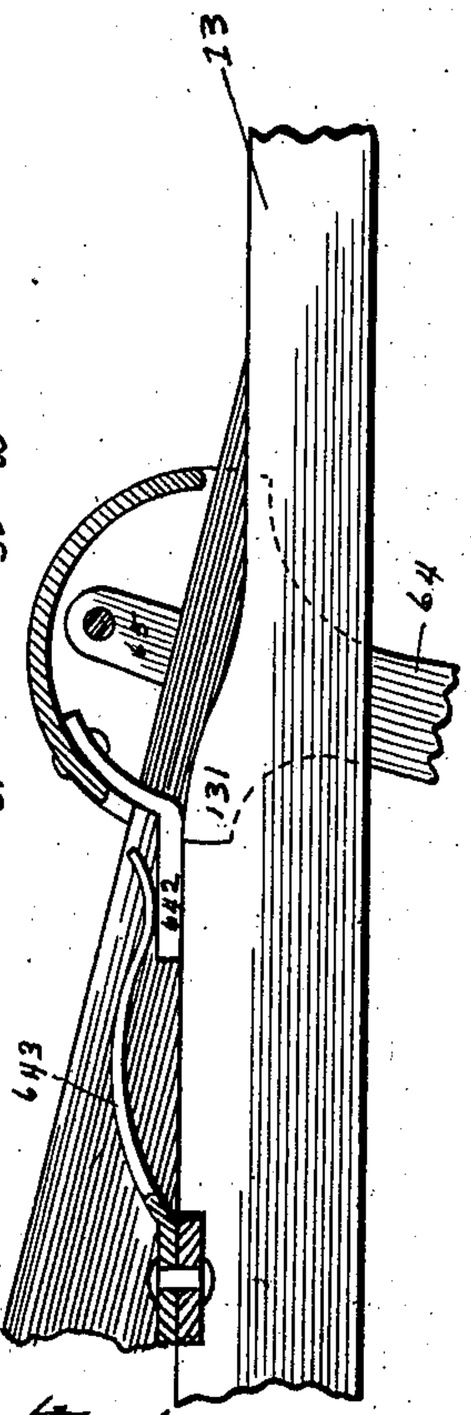

Fig. 3.

Attest

J. W. MacElroy.

I. M. Russell.

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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 5.

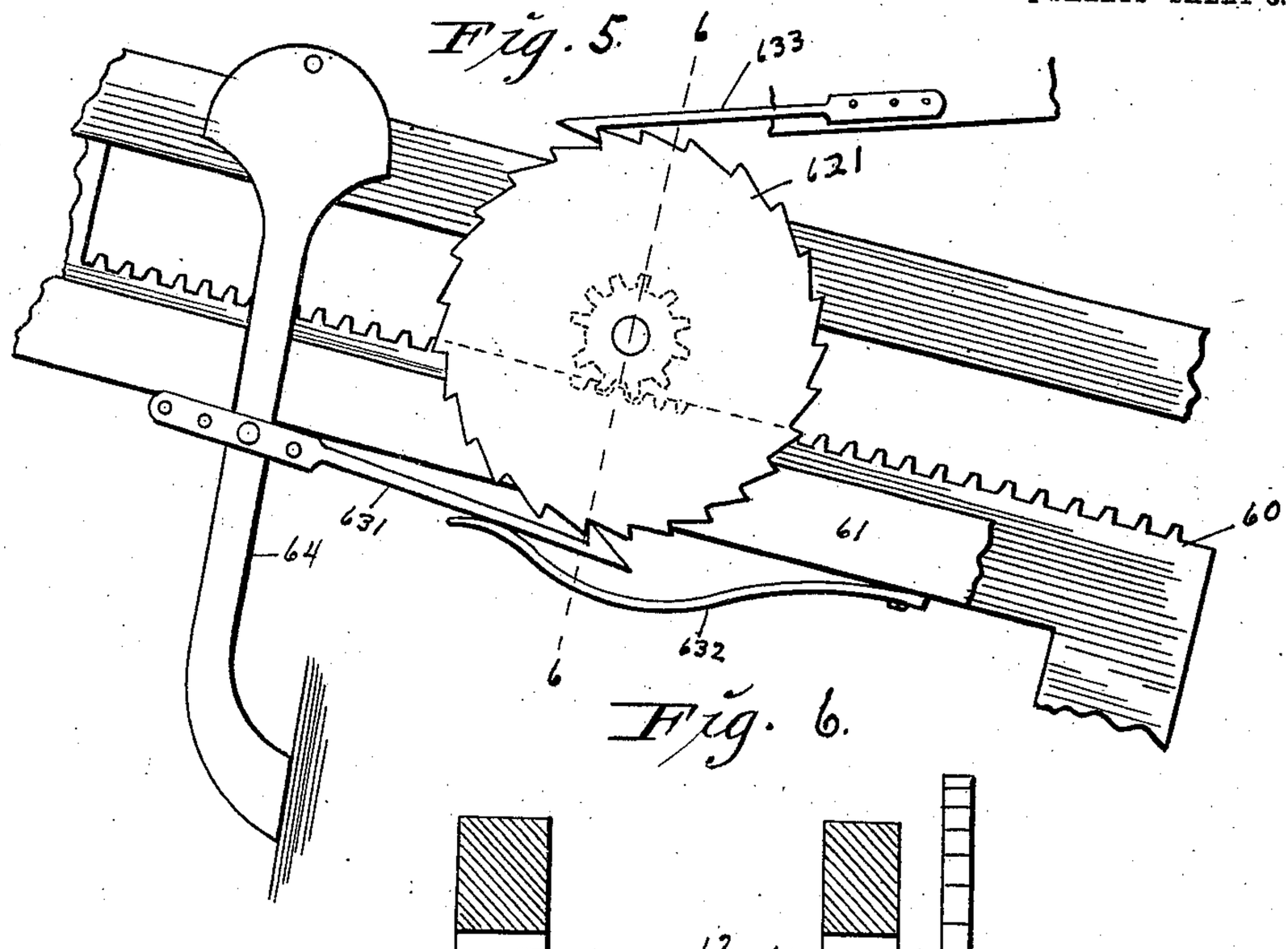


Fig. 6.

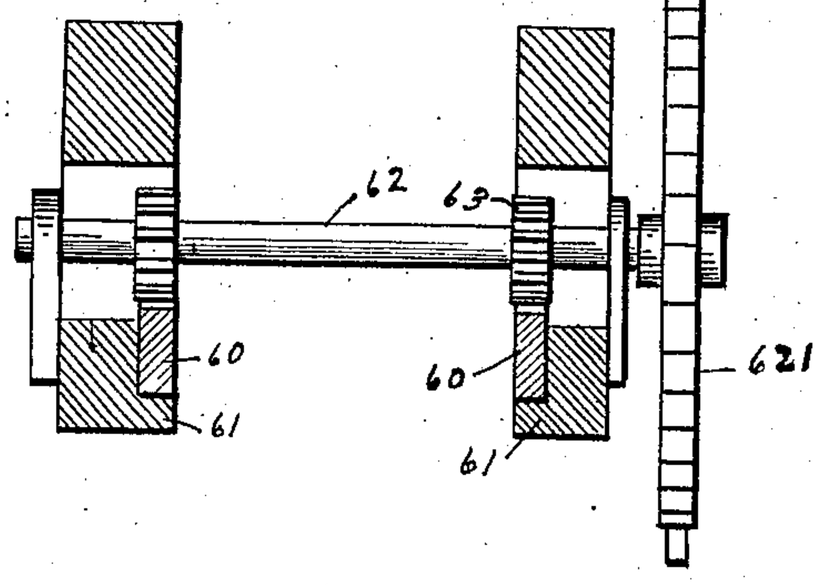


Fig. 7.

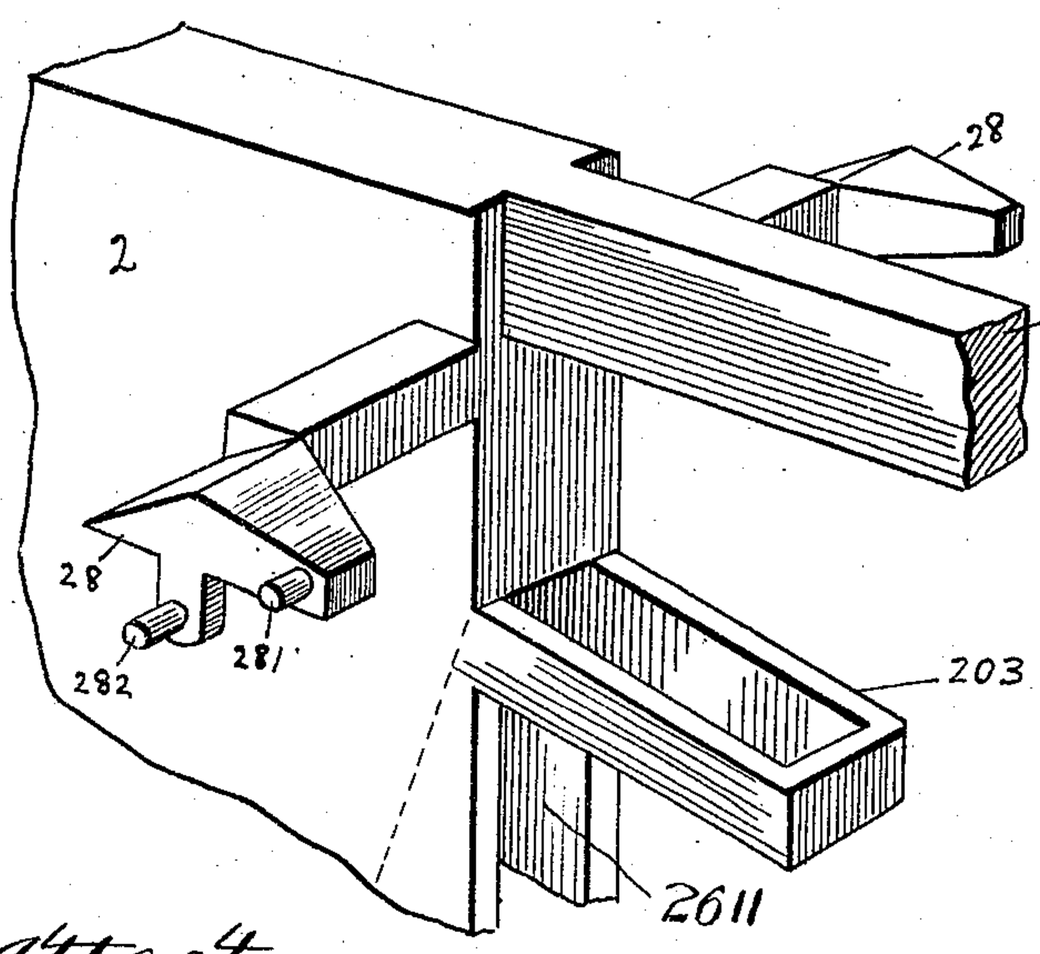


Fig. 8.

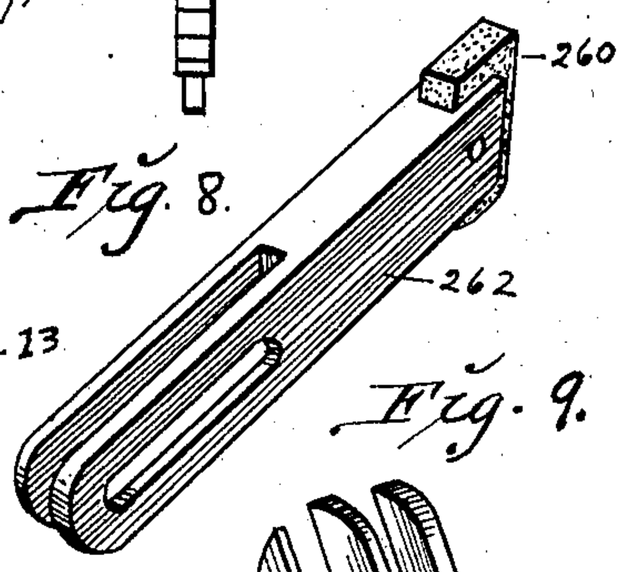
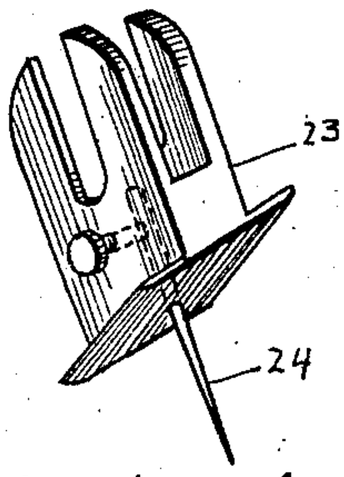


Fig. 9.



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Benjamin K. Fisher

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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 10.

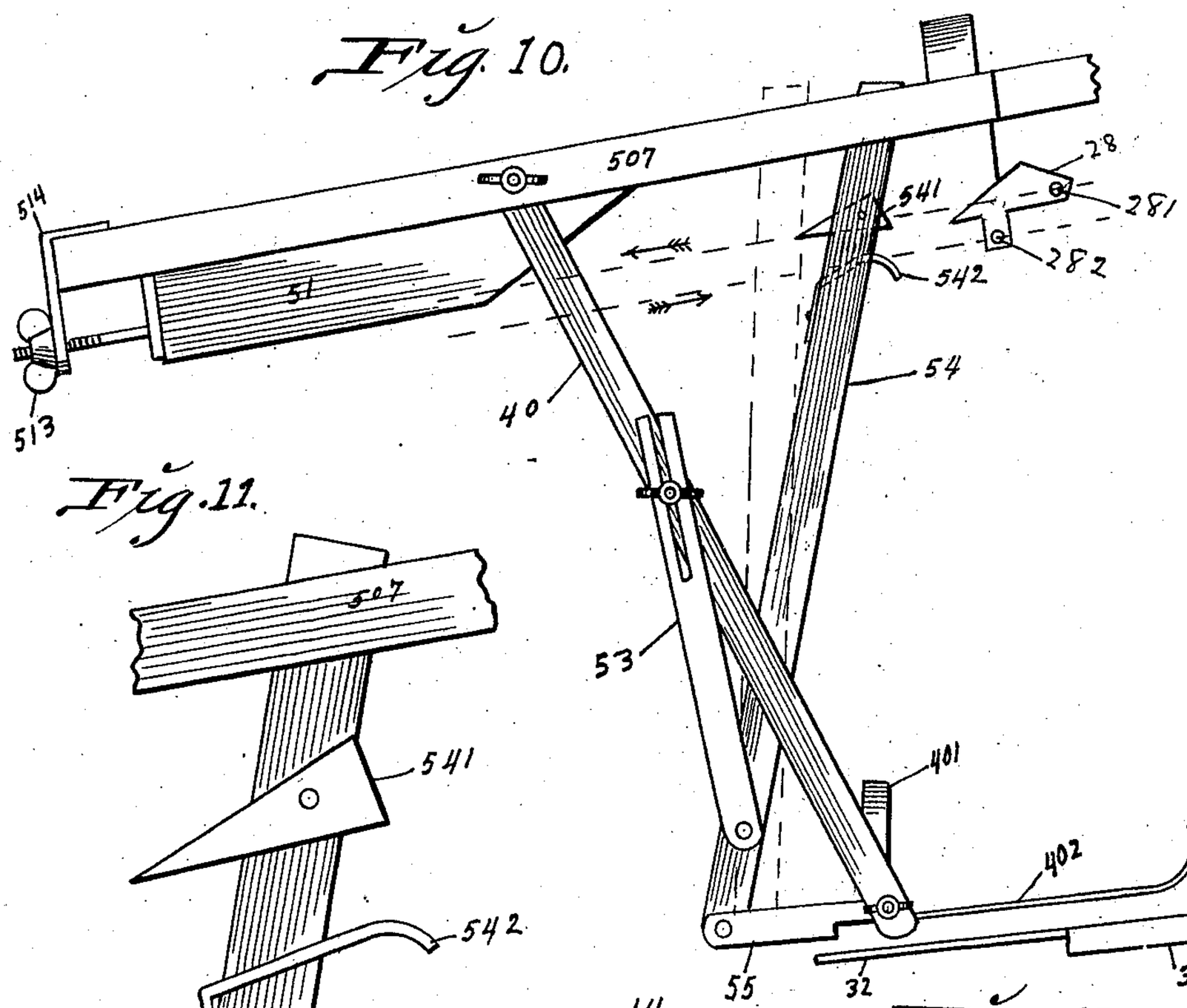


Fig. 11.

Fig. 12.

Fig. 13.

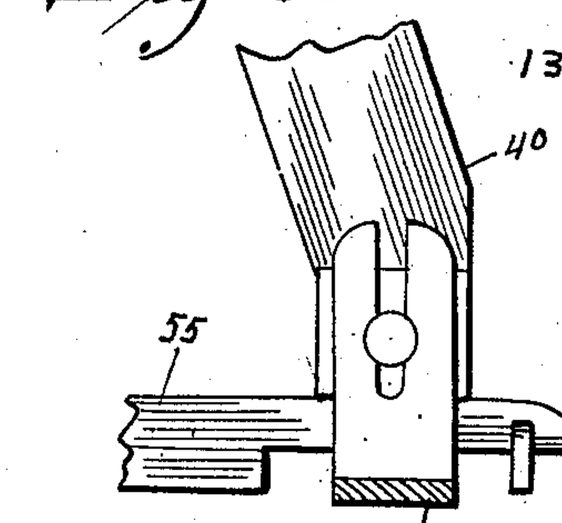
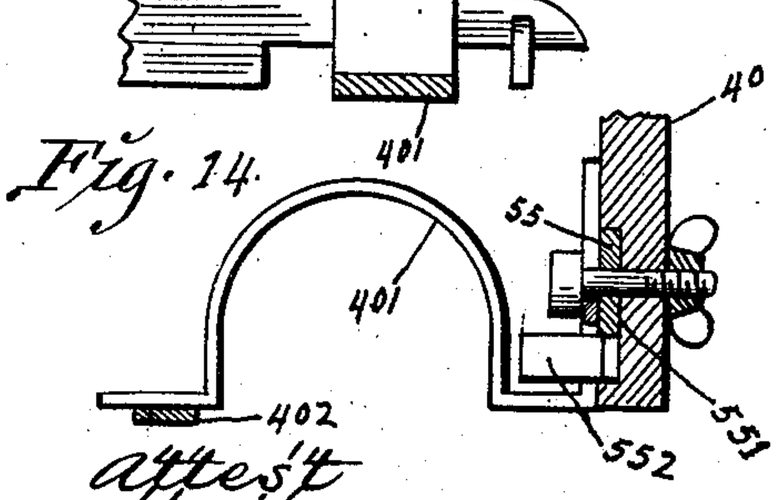


Fig. 14.



Attest

J. W. MacElroy.

J. M. Russell.

INVENTORS:—

Louis F. Fuchs

Benjamin K. Fisher

By John T. Harris, Atty.

UNITED STATES PATENT OFFICE.

LOUIS F. FUCHS AND BENJAMIN K. FISHER, OF ST. LOUIS, MISSOURI.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 720,546, dated February 10, 1903.

Application filed September 30, 1899. Serial No. 732,249. (No model.)

To all whom it may concern:

Be it known that we, LOUIS F. FUCHS and BENJAMIN K. FISHER, citizens of the United States, residing in the city of St. Louis, State of Missouri, have invented a new and useful Paper-Feeding Machine, of which the following is a specification.

This invention relates to paper-feeding machines by which sheets are fed one by one from the top of a pile to a printing-press or to a ruling, folding, or other machine requiring the separation of sheets of paper from the pile and their presentation one by one to such machine.

One object of this invention is to construct a paper-feeding machine which shall be simple and reliable in operation and which can be readily adjusted to size and kind of paper to be fed.

Another object is to provide a practical machine of the type in which an inclined needle is employed in combination with means to move the sheet at such an angle to the needle as to cause the sheet to impale itself on the needle.

Another object of the invention is to construct a machine in which the sheet shall be caused to impale itself on a needle, making a small angle therewith, and thereafter to cause the sheet to be drawn along the shank of said needle, which is inclined away from the paper, and thereby to become separated from the next lower sheet.

Another object of this invention is to so arrange the needle that after the topmost sheet has become impaled on said needle the point of the needle will rest against the second sheet, making with said second sheet less than a right angle, and thereby holding said sheet against movement with the top sheet.

A further object is to enable the separator-needle to carry the sheet onto the feed-table without the possibility of said sheet becoming detached from the needle and thereafter to remove said sheet from the needle at the proper time.

Another object is to provide gage mechanism which shall accurately move the sheet which is placed upon the feed-table to a predetermined position with relation to the table and to the grippers of the machine with which the feeder is employed.

Another object is to so arrange the machine that the feeding and gage mechanisms shall be removed from the path of the grippers of said printing or other machine which is to take away the separated sheet during an interval after the deposit of said sheet on the feed-table.

A further object of our invention is to provide improved means for keeping the topmost sheet of the pile at an approximately constant distance from the separator mechanism.

A further object is to combine with the main features of the machine such novel details of construction and arrangement as to provide a highly-efficient machine for the purpose described which will work rapidly, certainly, and with a high degree of accuracy, never feeding more than one sheet at a time and never displacing the second sheet.

A still further object is to improve the general construction of machines for feeding paper, embodying therein certain novel details of construction which we have devised to overcome objections and defects of previous machines.

The scope of the invention will be pointed out in the claims which are annexed hereto.

In the drawings, Figure 1 represents a side elevation of the machine. Fig. 2 represents a plan of the machine. Fig. 3 represents a longitudinal detail section on line 3 3 of Fig. 2. Fig. 4 is a cross-section on line 4 4 of Fig. 1. Fig. 5 is an enlarged detail view of the pawl-and-ratchet mechanism and other parts of the pile-raising means. Fig. 6 is an enlarged cross-section on line 6 6 of Fig. 5. Fig. 7 is a perspective detail of a portion of the block carrying the separator devices. Fig. 8 is a perspective detail of the rubber-tipped pusher-lever. Fig. 9 is a detail of the separator-pin. Fig. 10 is a side view of the gage mechanism. Figs. 11, 12, 13, and 14 are enlarged detail views of this gage mechanism.

The frame supporting the machine comprises parallel upper and lower longitudinal bars *a a a a* and upper and lower cross-bars *b b b b*, vertical ports *e e e e*, supporting the upper bars, and suitable braces, as *d d d d*. This framework may obviously be varied as is found expedient and forms no part of the invention.

A driving-shaft 1, suitably journaled in the

frame, is connected by appropriate means to the printing or other machine with which the feeding-machine is employed or to any other suitable source of power, so as to be driven therefrom. This connection is such that one operation of the feeder is given for every operation of the printing or other machine. Fast on said shaft 1 is a pinion 11, located over the median line of the machine. This pinion is provided with teeth on approximately one half of its periphery, the remainder being smooth, as seen in Fig. 1. Secured on the frame of the machine and centrally of its width is a long guideway 12. This guideway extends from the front or right-hand end of the machine along its median line to or beyond its longitudinal center. The length of the guideway 12 is essentially such as to give support for a bar 13, which is guided therein, as shown in Figs. 2 and 4.

The bar 13 is relatively longer than the guideway 12. It carries near the left end thereof the sheet-separating devices. This bar 13 is reciprocated for the purpose of separating the sheets and transferring them to a suitable feed-table. Any suitable means may be employed to reciprocate this bar. The one devised by us comprises the pinion 11 on the driving-shaft, above described, and a double rack-bar 14 141, rigidly connected with the bar 13. The pinion revolving in the direction of the arrow thereon in Fig. 1 will engage by means of its toothed portion first with the lower rack 14 to move the bar 13 and the separator mechanism carried thereby to the left or backward from the pile of paper. After the said pinion has revolved through approximately a half-revolution the toothed portion thereof will become disengaged from the rack-bar 14 and simultaneously or after a brief interval will engage with the upper rack-bar 141, and thereby cause the bar 13 to travel toward the right, bringing the separator mechanism forward toward the pile of paper. Fixed to said bar 13 and depending from it is the block 2. This block is provided near its lower end with a channel or way 21, extending therethrough. Sliding freely through this way is a bar 22, provided at its rear end with a head or stop 221 to limit its movement in the way 21. The forward end of this bar has attached thereto a needle-block 23, (see Figs. 1 and 9,) carrying a needle 24, suitably secured therein. This needle forms one of the essential elements of the feed mechanism. As shown, and preferably, this needle-block 23 is adjustably attached to the bar 22 by a horizontal pivot, whereby an angular adjustment of the said block and its carried needle about said pivot may be obtained. The needle-block 23 is also longitudinally adjustable on said bar 22, such adjustment being provided for in the form shown by slotting the block 23, as is clear in Fig. 9, whereby it may be adjustably connected to bar 22 by the pivot-bolt above referred to. The needle-bar 22 is pressed yieldingly forward into said way 21 by suitable means, such as a bowed spring 25, secured to the back of block 2. A block 251 is clamped to the back of said spring and is adjustable thereover to vary the pressure of said spring on said needle-bar 22. Moving in unison with said bar 13 and conveniently carried by the block 2 is a lever 26. This lever is arranged on a horizontal pivot. The free forward end of the lever is adapted to make contact at an acute angle with the paper. The lever also makes an angle with the before-described separator-needle. As shown, and conveniently, this lever comprises the block 261 and the arm 262. The former is of approximately triangular form, pivoted at its lower corner, which is the apex of said triangle, to the block 2, and the arm 262 is jointed by a horizontal pivot for angular adjustment to the block 261. The arm is also arranged for longitudinal adjustment on said block 261. The upper end of said block 261 or a stud thereon is guided in a yoke 203, projected from the block 2. This yoke 203 also limits the movement of the lever 26 on its pivot in the block 2. As shown, this pivot is so located and the mass of the block 261 is so distributed that the lever tends to fall by gravity toward the pile of paper and is limited in such movement by the yoke 203 above mentioned. It is clear that a suitable spring or other means might be employed to give the lever this tendency to move toward the paper.

The parts of the machine thus far described are so arranged that the free end of the lever when in its lowest position will come in contact with the topmost sheet of the pile of paper immediately after the separator-needle has made contact with said sheet. The needle and lever may, however, be so adjusted as to make simultaneous contact with said sheet.

The separating of the sheets one by one is accomplished as follows: The bar 13 is moved forward toward the pile of paper, carrying with it the block 2 and the needle and lever or pusher arm 26, carried thereby, as just described. The needle is adjusted so that it inclines downward and makes less than a right angle with the paper. The said angle formed will be more or less acute, according to the quality of paper being fed and other considerations, but always decidedly less than a right angle. After the needle contacts with the paper the bar 22 will slide back in its channel 21 in the block 2, the spring 25 yielding for this purpose, so that the needle is not forced into the sheet to any appreciable extent, but is merely held firmly against the outer sheet.

The lever-arm 262 on the block 261 is adjusted to form a predetermined acute angle with the paper, as found by experience, and is also adjusted longitudinally of its length on said block, so as to contact with the paper immediately after the needle has made contact with the same. It is essential that the needle and the lever or pusher be inclined in opposite directions, as one downward and the

other upward. It will be remembered that the pusher is rigidly connected with the block 261, which is mounted to turn freely about the horizontal pivot 263, carried by the block 2. As the block 2 is moved positively forward the end of the lever 26 is compelled to slide up the pile, and by reason of the rubber face on said end the friction with the top sheet of paper is sufficient to cause the sheet to be slid upward on the pile with the rubber-faced end. The block 261 and arm 262 are compelled after the end strikes the pile of paper to turn on said pivot 263, thus causing the said free end of arm 262 to move relatively to the pivot 263 in the arc of a circle.

It will be noted that the needle has no motion relative to the pile of paper after the point has made contact with the uppermost sheet. The needle is, however, inclined downward at a small angle to the sheet. The first effect, therefore, of the movement of the said top sheet under the influence of the pusher 26 is to cause it to move against the needle-point at the described angle. The result of this movement of the sheet is that it is perforated by the needle, and in the continued movement of the sheet by the pusher it is guided by said perforation upward and outward from the pile along the shank of the needle. The result of this movement is a gradually-increasing separation of the lower portion of the sheet from the pile. As the sheet is held taut by the action of the needle and pusher the sheet is separated from the pile throughout approximately the entire length from the end near the needle to the place where the pusher contacts with it. Therefore by positioning the needle and pusher so that they will make contact with the sheet near its opposite ends the effect of their movements just described is to separate the sheet from the pile throughout nearly its entire length against the force which causes it to adhere to the next sheet of the pile.

It will be observed that when the pusher first contacts with the sheet said sheet is in contact with the second one throughout its whole length and the adhesion of its whole area has to be overcome; but as the sheet slides up on the needle more and more of its surface is separated from the next sheet, and it will therefore require less and less force to move it with relation to said second sheet against the force of adhesion.

It will now be noted that by the arrangement of the pusher for pivotal movement, as shown, the effect as its end slides up the pile after making contact with the uppermost sheet is to lessen the angle which it makes with the paper. The effect of this is to lessen the horizontal component of its pressure on the paper, which lessens its frictional engagement with the sheet. At the same time and in inverse ratio the vertical component of both the pressure and the velocity is increased. It will thus be seen that these two agencies of the separating mechanism work in perfect harmony and are adjusted to each other with great nicety. They coöperate to separate the sheets with the least possible expenditure of power and in a manner to prevent displacement of the second sheet, as will be more particularly described below.

The needle performs an important function in preventing the displacement of the second sheet. After perforating the topmost sheet it rests yieldingly against the second sheet without perforating it. The angle at which it contacts with said second sheet prevents movement of said second sheet either outward with the first sheet along the needle-shank or upward under the transmitted action of the pusher, so that the said second sheet is effectually held fixedly in its place on the pile.

The adjustment of spring 25 by means of block 251 provides for adjusting the pressure of needle 24 against the paper. This adjustment will vary with the hardness and other qualities of the paper and the inclination of the needle thereto.

The arrangement shown of the pile inclined somewhat to the vertical and the needle inclined downward and the pusher inclined upward is the preferred one in this tyye of machine. It is clear, however, that the invention is not limited to the precise described relation of these parts; neither is it limited to an arrangement of machine in which the paper is held on an approximately upright rack, as the paper may lie on a horizontal rack and the separator devices be arranged so that one is inclined frontward and downward and the other backward and downward. Our invention therefore is not limited to the particular arrangement shown, but we consider many variations of this arrangement to come within its scope.

Arranged in the rear of the paper-rack is a table 3. This table is in the present machine connected to the framework at its front edge by hinges, as at 30. The rear edge is provided with set-screws 31, the lower ends of which rest upon or are received in recesses in the framework, whereby the height of said edge is adjusted. In the machine shown this table is so adjusted as to incline downward for a purpose which will be explained. Extended from the rear of this table are fingers 32, which serve to support the rear edge of the sheet fed onto the table, as will appear. They thus increase the capacity of the table for handling large sheets and leave the rear edge of the sheet unsupported at intervals to facilitate the action of the press-grippers in taking it to the printing-machine. This table is provided with a groove located directly under the bar 13, and therefore in the path in which the needle 24 travels in the reciprocations of the bar 13. As shown, in this machine the table 3 is made in two sections with a narrow space between them, which is one way of providing this groove. (See Fig. 12.)

Depending from opposite sides of the machine, as shown in Fig. 2, are two bars or

hangers 40. Attached to the inner sides of these bars at their lower ends for vertical adjustment thereon are inwardly-projecting arms 401. (See Fig. 12.) These arms are provided at their inner ends with forwardly-projecting fingers 402, which extend over the table 3, as shown in Figs. 1 and 12. In the form shown these arms are made to diverge to better accomplish their function, as will appear. They are also provided with upwardly-curved ends 403, as seen.

Springs 27 (see Fig. 1) are attached to the frame above and in the rear of the paper-rack and bear against the outer sheet of the pile near its middle.

When the backward movement of the bar 13 begins, due to the pinion 11 having reached the period of its rotation when its toothed portion becomes disengaged from the rack-bar 141 and engaged with the rack-bar 14, the block 2 and its attached feed devices begin to move away from the pile of paper to transfer to the table 3 the sheet which has become partially separated from the pile and secured to said needle. As the backward movement begins the bar 22 slips forward through its socket, due to the pressure of spring 25, until its head 221 contacts with the block 2, when the needle begins its backward movement, dragging the top sheet, which is still held upright and taut on the needle by the springs 27, back across the table 3. This table is provided, as before stated, with the groove 33 in the path of the needle. Into this groove the end of the needle is received and travels, whereby the paper is prevented from accidentally dropping off the needle before it has been carried to its proper position on the table 3. As before stated, the table is adjustably supported at its rear edge and in practice may be caused to incline downward. By this means the paper is not only fed down an incline, by reason of which said feed movement is facilitated, but as the needle, moving in an approximately horizontal plane, drags the sheet across the inclined table the sheet is by reason of such inclination allowed to slip down on said needle toward its end preparatory to becoming disengaged therefrom when the feed movement has been completed. In addition to this passive means, which allows of this movement of the sheet toward the end of the needle, said sheet is acted upon by the fingers 402, under whose upwardly-curved guiding ends 403 the sheet is dragged, and as the sheet is moved onward these arms, which are parallel with the inclined table and spaced but a short distance therefrom, compel said sheet to follow their downward slope and slide down the needle toward its point. These arms therefore act as strippers and may be designated as such. The sheet is therefore removed from the needle when the path which the sheet is compelled to follow passes below the path in which travels the point of the needle. This will occur, with the parts adjusted as shown, when the rear edge of the sheet is over the table extensions 32.

For the purpose of accurately adjusting the position at which the sheets shall be left on the feed-table by this machine we have devised a gage mechanism to move said sheets to a predetermined position. This is desirable because the sheets must be delivered uniformly to the grippers of the press in order to insure perfect work, as is well understood. The best form of such gage or sheet-positioning mechanism which we have yet devised for use with this machine is shown in Figs. 1, 10, and 11. It comprises the bars 50, pivoted to the guideway 12 at 501 and normally extending parallel thereto, as seen in Figs. 1 and 2. These bars extend to the extreme rear end of the machine and are spaced some distance apart. To insure stability, these bars may be connected by arched braces 502, as shown in Figs. 2 and 10. Secured to the under side of these bars at their rear end for sliding adjustment therealong are blocks 51, having their front ends beveled. These blocks are adjustable along the bars 50 by suitable means, such as a screw 513, working in a bracket 514. (See Fig. 10.) Depending from said bars 50 are hangers 40. Adjustably secured to said hangers 40 are links 53, to which are pivoted between their ends levers 54. The upper ends of these levers are guided in a way 508 in the bars 50. As shown, this way is formed by spacing a cleat 507 a suitable distance from bar 50 by means of adjustable blocks 506 and the hangers 40. These blocks 506 and hangers 40 thereby form stops in such guideway. Gages 55 are pivoted to the lower ends of levers 54 and are guided in ways 551, formed in the hangers 40, as shown in Figs. 13 and 14. These gages are provided with lateral extensions 552 at their ends to give a larger surface to contact with the edge of the sheet to prevent indenting the same. The levers 54 are provided on their inner sides near their upper ends with detents 541 and below these with other detents 542. The block 2 is provided on each side near its front upper corner with wedges 28, having beveled upper faces, as shown. These wedges 28 are further provided with pins 281 and 282, located, respectively, in the planes of the detents 541 and 542 on the levers 54. The pins 281 strike the detents 541 as the block 2 is carried backward and turn said levers 54 on their pivotal connection with links 53, and thereby move forward the gages 55 in their guideways 551, making them strike the edge of the paper and push it forward to its proper place on the table, from which it may be taken by the press-grippers. By adjusting the links 53 on hangers 54 their length can be varied, and thereby the starting-point from which move the gages. Consequently the position at which the sheet will be left is determined. The detents on the levers 54 are caused, in the movement of

said lever by the pins 282, to describe an arc of a circle having a radius equal to the length of the upper arm of said lever. Said detents will therefore in their movement leave the horizontal plane in which the pins 281 found them, and in so doing disengage themselves from the said pins at the time the gages complete their stroke. The pins 281 then pass under the said detents, leaving the levers in the position last mentioned. The block 2 in its continued rearward movement brings the beveled faces of wedges 28 into contact with the oppositely-beveled ends of the blocks 51, attached to pivoted bars 50. As the movement of block 2 continues said bars 50 are turned on their pivots and the hangers 40 are raised, bringing up with them the levers 54 and the gages 55. This period during which the gages are raised may be employed by the grippers of the press or other machine in removing the sheet of paper. This raising of the gage mechanism is important, as it leaves an unobstructed way through which to withdraw the sheet. While the bars 50 are raised the bar 13 completes its backward stroke and the forward reciprocation of it and the block 2 begins, due to the engagement of the pinion with the rack 141. As the block 2 moves forward the blocks 51 are allowed to descend to their normal position and the pins 282 make contact with the detent 542 on lever 54 to move the latter back to its normal position and retract the gages. As shown, the detents 542 are yielding fingers with which the pins 281 make sliding contact. This gage mechanism is very simple and well adapted to operate in connection with our sheet-separating mechanism. By means of the adjustment of the parts provision is made for variation in the size of sheets and point to which the feed is to be made. The table 3 may be adjusted by the set-screw 31 bearing upon the frame to compensate for the adjustments of the gage mechanism or for other purposes.

The top of the pile is always kept within reach of the separating devices by the following means: The rack or magazine 6 is rigidly connected to the rack-bars 60, which work in guideways formed by the strips 61, fastened to the guide-frame 12 and to the frame of the machine. Journaled in suitable bearings in the frame of the machine is a shaft 62, carrying pinions 63, which coöperate with the racks 60 to move the magazine 6. The shaft 62 also carries a ratchet-wheel 621. Levers 64 are pivoted at their upper ends by brackets 65 to the frame 12. These levers are connected at their upper ends by a heavy block 641. The pivot is so located with relation to this weight that the depending ends of the levers will tend by gravity to swing backward against the pile of paper. On the block connecting these levers is a forwardly and downwardly extending tongue or lug 642, which rests on the sliding bar 13 by reason of the weighted heads of the levers. To further insure the contact of this tongue with bar 13, a spring 643 may be used. On one of the levers 64 is pivoted the pawl 631, which is arranged to engage the ratchet 621. The pawl is held against said ratchet by spring 632 or other suitable means. The bar 13 has in its upper face a shoulder 131. As the bar 13 is moved backward the tongue 642 slides down the shoulder 131 and the ends of the levers are thereby allowed to swing back against the pile of paper, sliding the pawl 631 on a tooth of the ratchet 621. When enough paper has been taken from the pile to allow the ends of the levers to swing back far enough to cause the pawl to engage a new tooth on the ratchet, the ratchet will be turned one notch by the return movement of the bar 13, turning the levers 64 as the tongue 642 is lifted by the shoulder 131. The ratchet 63 turns the shaft 62 and causes the pinions to advance the rack 60, and thereby advance the pile of paper. After the pile has been advanced the pawl works back and forth on a ratchet-tooth until enough paper has been used to allow it to catch another tooth. Ratchet 63 is prevented from turning back by a pawl.

The operation of the machine is as follows: Assuming the bar 13 to be moving with the block 2 toward the right in Figs. 1 and 2, the needle first contacts with the topmost sheet of paper near its lower end, but does not puncture it. Instead the needle-bar slides back in its socket in the block, overcoming the pressure of the spring 25. Immediately after the needle strikes the paper and has become firmly pressed against it the inclined lever or pusher 26 comes in contact with the said top sheet near its other end, and as the block 2 continues to advance the lever yields upward by turning on its pivot 263. As the end of the lever yields upward the sheet is pushed upward along with it. This causes the sheet to be drawn onto the needle and up along its shank, which, due to the inclination of the needle, separates the lower end of the top sheet from the next sheet, which in turn is pressed against by the point of the needle, and thereby prevented from separating from the pile along with the top sheet. This contact of the needle with the second sheet also prevents its being carried upward by the pusher along with the top sheet. When the block 2 has completed its forward movement, the sheet will have become pushed well up on the shank of the needle, and thereby separated from the next sheet without disturbing said second sheet. The backward movement of the block will then begin, due to the contact of the pinion 11 with the other rack-bar. The pusher will be first withdrawn from contact with the sheet and the springs 27 will thereafter hold the same in erect position, preventing it from falling over toward the block 2 and also preventing it from sliding back downward on the needle-shank. The needle then begins its backward movement, due to

the contact of the head of the needle-bar with the back side of the block 2. The needle carries back with it the sheet of paper. The point of the needle travels in the groove in the feed-table and the sheet is therefore prevented from sliding down over or off the end of the needle by being obliged to travel on the surface of the table. The springs 27 hold the sheet taut on the needle until the needle end has reached the groove in the table. The sheet is carried under the strippers 402 to the rear side of the table. By the time it reaches the rear of the table the path which it is compelled by the strippers to follow has diverged so far from the approximately horizontal plane in which the point of the needle moves that the sheet has been drawn off the needle and dropped on the table. In the continued backward movement of the block 2 the levers carrying the gages are actuated by the pins on the blocks 28, and said gages are thrust forward against the rear edge of the paper and push it to a predetermined position on the table, from which to be taken by the press or other grippers. As the block 2 still continues in its backward movement the beveled face of the block 28 reaches the end of wedge 51 and lifts thereby the arms 50 and the gage and strippers to allow the press-grippers free access to the properly-positioned sheet on the table. When the direction of movement of the bar 13 and block 2 is now reversed, the arms 50 and gages and strippers carried thereby are allowed to fall into their normal position as the block 28 passes from under the wedges 51. As the bar 13 has moved backward toward the left the tongue has slid down the shoulder on said bar and allowed the levers 6 to swing their ends against the pile of paper, with the result of pressing the top sheet firmly into position on the top of the pile and, further, of causing the pawl 631 to slide back on a tooth of the ratchet-wheel. If enough paper has been removed from the pile to make this movement of the pawl sufficient to catch a new tooth on the ratchet-wheel, it will be thrown into engagement with such a tooth by the spring 632. When the movement of bar 13 is reversed and the shoulder thereon comes forward, it will strike the tongue 642, which is rigid with the said levers, and swing them away from the paper and through them draw back the pawl. If a tooth of the ratchet-wheel is in engagement with said pawl, the ratchet-wheel will be turned one notch, and through the pinions 63 and rack-bar 60 the paper-rack will be moved back a short distance toward the block 2. If the pawl has not engaged with a fresh tooth on the ratchet-wheel, no movement is transmitted by the levers to said ratchet and to the paper-rack. By this means the top of the pile of paper is kept at approximately a constant distance from the limit of forward movement of the separator devices.

While we have shown and described in detail a machine embodying one form of our invention, this invention is not limited to the particular machine shown.

Our invention covers also any machine which comprises a needle or similar instrument adapted to contact with the top sheet of a pile of paper and means to move said top sheet with relation to the needle to cause it only to become impaled on the needle and separated from the next sheet, in which machine the needle acts without perforating the second sheet as a stop against the said second sheet to prevent it from partaking of the movement of the top sheet.

Having now disclosed the nature of our invention and shown and illustrated one embodiment of it in a machine without attempting to describe all the forms in which it may be embodied, what we desire to claim and secure by Letters Patent is—

1. In a mechanism for the purpose specified a reciprocating feed-bar and mechanism carried thereby to separate the outer sheet from a pile of paper and convey it to a predetermined position on the feed-table, combined with mechanism to remove the said sheet from the feed mechanism.

2. In a mechanism for the purpose indicated a reciprocating feed-bar, and mechanism carried thereby to separate the outer sheet from a pile and convey it to a predetermined position on the feed-table, combined with stripping means to remove the sheet from the feeding mechanism and means to adjust said stripper to vary the position in which the sheet is deposited.

3. In a mechanism of the character described, a reciprocating feed-bar carrying sheet separating and feeding devices; and means to reciprocate said bar, comprising a double rack on said bar, and a pinion adapted to engage alternately with the two sides of the rack to move the bar in opposite directions, substantially as described.

4. In a mechanism of the character described, a frame, a guideway 12 centrally located thereon, a bar 13 carrying a separator mechanism arranged to be reciprocated in said guideway, a double rack as 14 141 rigid with the bar 13, a shaft 1 suitably mounted on the frame and carrying a pinion 11 between the portions of the rack, said pinion being arranged to engage the said portions of the rack alternately to reciprocate the bar 13, substantially as described.

5. In a mechanism of the character described, a reciprocating carrier provided with a yieldingly-mounted needle arranged at an acute angle to the surface of the paper; and means to cause the upper sheet of paper to move obliquely to the needle to cause the latter to penetrate the sheet; and means thereafter to carry the sheet to the feed-table, substantially as described.

6. In a mechanism of the character described, a reciprocating bar, a needle yieldingly carried thereby to a position against the

paper (said needle mounted obliquely to the plane of the paper); and means, carried also by said bar, to cause the sheet to move in its plane, whereby the needle is caused to penetrate the sheet and the latter to slide up on the shank of the needle; and means to cause the needle to feed the sheet, substantially as described.

7. In a sheet-separating mechanism, a reciprocating bar carrying a needle, which is brought into yielding contact with the pile of paper during the backward reciprocation of the bar, a pusher also brought into yielding contact with the paper in said backward reciprocation, said pusher serving to move the outer sheet in its plane against the contact of the needle, whereby the sheet is punctured by and caused to slide up on the shank of the needle; said needle being then moved forward by the forward reciprocation of the bar to carry the sheet to the feed-table, substantially as described.

8. In a sheet-separating mechanism, a reciprocating bar carrying a needle, which is brought into yielding contact with the pile of paper during the backward reciprocation of the bar, a pusher also brought into yielding contact with the paper in said backward reciprocation, said pusher serving to move the outer sheet in its plane against the contact of the needle, whereby the sheet is punctured by and caused to slide up on the shank of the needle, said needle being then moved forward by the forward reciprocation of the bar to carry the sheet to the feed-table; combined with means to hold the second sheet in place during such forward movement of the separator mechanism, substantially as described.

9. In a sheet-separating mechanism, a reciprocating bar carrying a needle, which is brought into yielding contact with the pile of paper during the backward reciprocation of the bar, a pusher also brought into yielding contact with the paper in said backward reciprocation, said pusher serving to move the outer sheet in its plane against the contact of the needle, whereby the sheet is punctured by and caused to slide up on the shank of the needle; means to retain the second sheet in place against the pile while the top sheet moves away from it and up the needle; said needle being then moved forward by the forward reciprocation of the bar to carry the sheet to the feed-table; combined with means to hold the second sheet in place during such forward movement of the separator mechanism, substantially as described.

10. In a mechanism of the class described, the following instrumentalities, viz., a needle arranged to be yieldingly contacted with the upper sheet of paper, a pusher arranged to be positively contacted with said sheet to move the same onto the needle, a feed-table to receive the sheet, a groove in said table to cover the end of the needle, means to move the needle across said table with its end in the groove, means to automatically remove said sheet from the needle, substantially as described.

11. In a separator mechanism, a needle and means to cause the paper to be impaled thereon and carried thereby, combined with means to engage the paper at the proper time to strip the same from the needle, said means comprising a pair of fingers arranged obliquely to the path of movement of said paper, whereby said sheet is depressed from said path of movement of said needle and removed therefrom, substantially as described.

12. In a machine of the character described, a gage mechanism comprising a horizontal bar, a depending arm rigid therewith; a lever, a link adjustably and pivotally connecting said lever to said arm, a gage-arm connected with said lever, means to rock said lever on said depending arm to advance and retract said gage-arm in a substantially horizontal plane, as and for the purpose stated.

13. In combination with a sheet-separating mechanism, a gage mechanism comprising levers carrying a gage-arm on one end thereof, guides in the frame of the machine to receive the other ends of said levers; means to intermittently actuate said levers to alternately advance and retract said gages, and means to intermittently raise said gage mechanism, substantially as described.

14. In combination with a sheet-separating mechanism, a gage mechanism comprising a bar reciprocating in the frame of the machine, a block carried by said bar, said block having an inclined front face; arms pivoted to the frame and carrying gage devices, a block on said pivoted arms, in the path of movement of said reciprocating block and having an inclined face arranged to coöperate with said reciprocating block, whereby the said pivoted bar and the gage mechanism carried thereby are intermittently raised out of operative position, substantially as described.

15. In combination with separator mechanism, means to position the sheets comprising a lever pivoted between its ends to a rigid arm, a gage-arm carried by one end of said lever, a dog carried by the lever and means to intermittently engage and disengage said dog to operate the gage, substantially as described.

16. In combination with a separator mechanism, a gage mechanism comprising levers pivotally connected to the frame of the machine, gages carried by said levers; a reciprocating block to intermittently engage and disengage the levers to actuate the gages, and stops to limit the movement of said levers, substantially as described.

17. A gage mechanism of the character described, comprising levers, gage-arms mounted on the levers, a link pivotally connecting said levers between their ends to the frame of the machine; guideways in the frame to receive the end of the levers, dogs carried by said levers, means to intermittently engage said dogs to cause said gages to be alternately

advanced and retracted, substantially as described.

18. In a machine of the class described, a reciprocating bar carrying sheet-separating devices; a beveled block rigid with said reciprocating bar; lugs 50 on said beveled block; bars pivoted to the machine, beveled lugs on said bars located in the path of movement of said first-mentioned beveled lugs; depending arms rigid with said pivoted bars, gage-levers pivoted between their ends to said depending arms, lugs on said levers in the path of movement of said first-mentioned lugs, and means to actuate said reciprocating bar to cause the lugs 50 to engage and actuate said gage-levers, and in its further movement to engage the beveled lugs on the pivoted bar, and raise the gage-levers out of contact with the lugs 50 and the gage mechanism, to give clearance for the withdrawal of the sheet, substantially as described.

19. In a machine of the class described, a sheet-separating means comprising a reciprocating bar and sheet-separating devices carried thereby, a pile-rack, a rack-bar rigid therewith, bell-crank levers pivoted to the frame of the machine, one arm arranged to contact with the top of the pile, the other arm arranged to contact with a cam-surface on the reciprocating bar, a pawl carried by said lever, a ratchet coöperating with the said pawl, and a pinion rigid with said ratchet and engaging said rack-bars, whereby the pile-rack is advanced as the pile is decreased, substantially as described.

20. In a machine of the character described, a gage mechanism comprising a horizontal bar, a depending arm rigid therewith; a lever, a link adjustably and pivotally connecting said lever to said arm, a gage-arm connected with said lever, means to rock said lever on said depending arm to advance and retract said gage-arm in a substantially horizontal plane, as and for the purpose stated.

21. In combination with a sheet-separating mechanism, a gage mechanism comprising levers carrying a gage-arm on one end thereof, guides in the frame of the machine to receive the other ends of said levers; means to intermittently actuate said levers to alternately advance and retract said gages, and means to intermittently raise said gage mechanism, substantially as described.

In testimony whereof we have hereunto subscribed our names in the presence of two subscribing witnesses.

LOUIS F. FUCHS.
BENJAMIN K. FISHER.

Witnesses:
A. N. H. BEEMAN,
GEO. H. MAXWELL.