May 10, 1927. H. BRADSHAW 1,628,225

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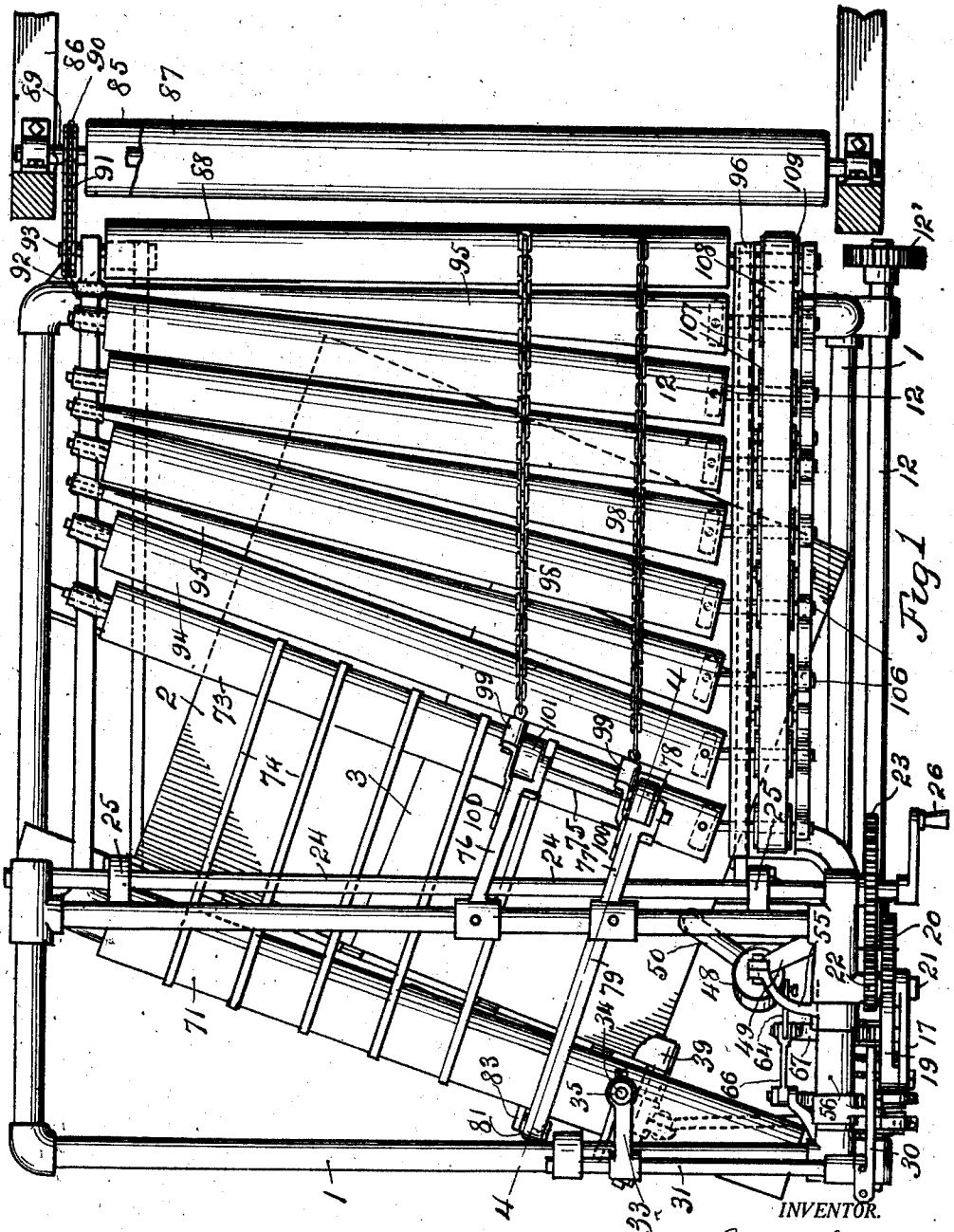


Fig 1

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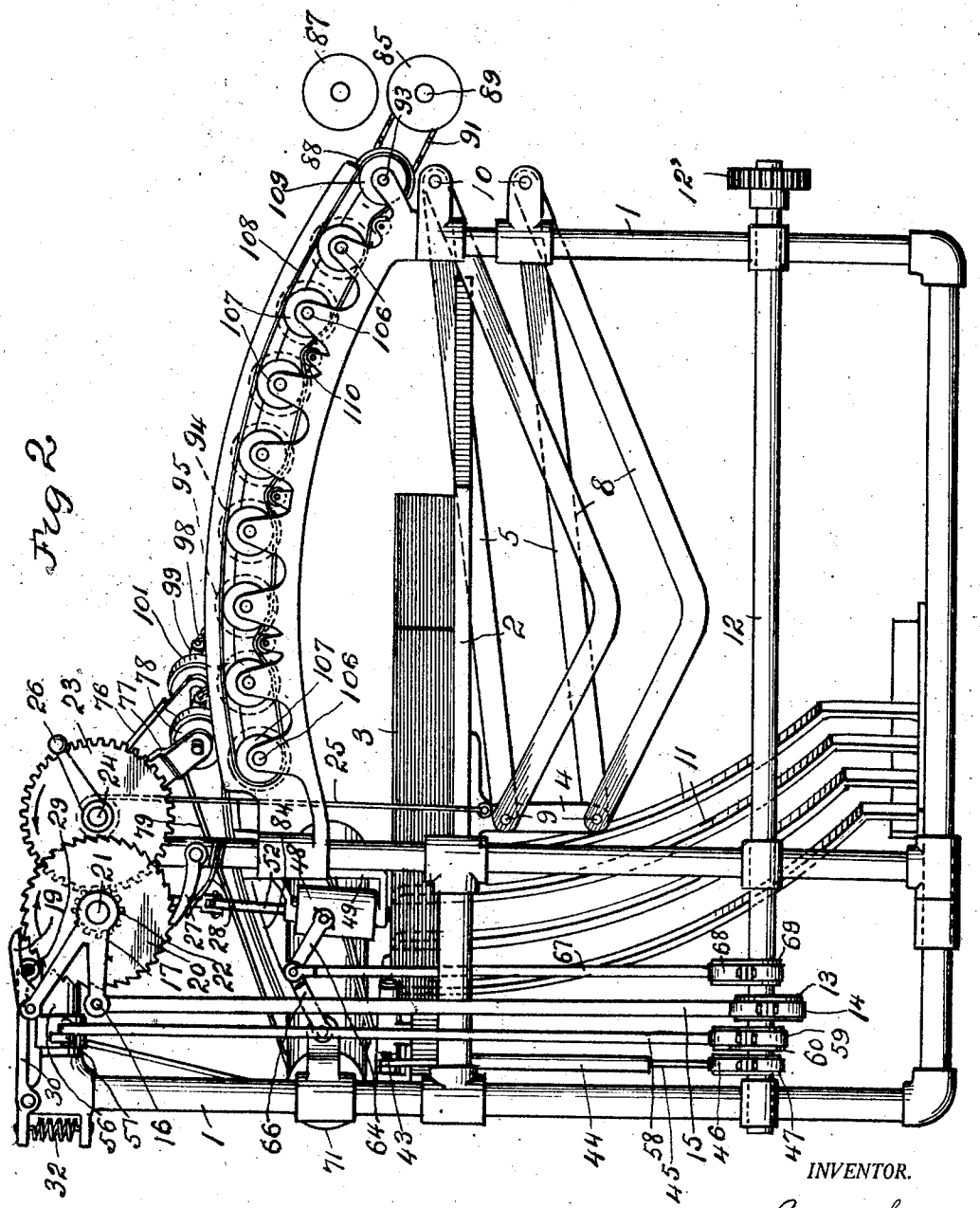


Fig 2

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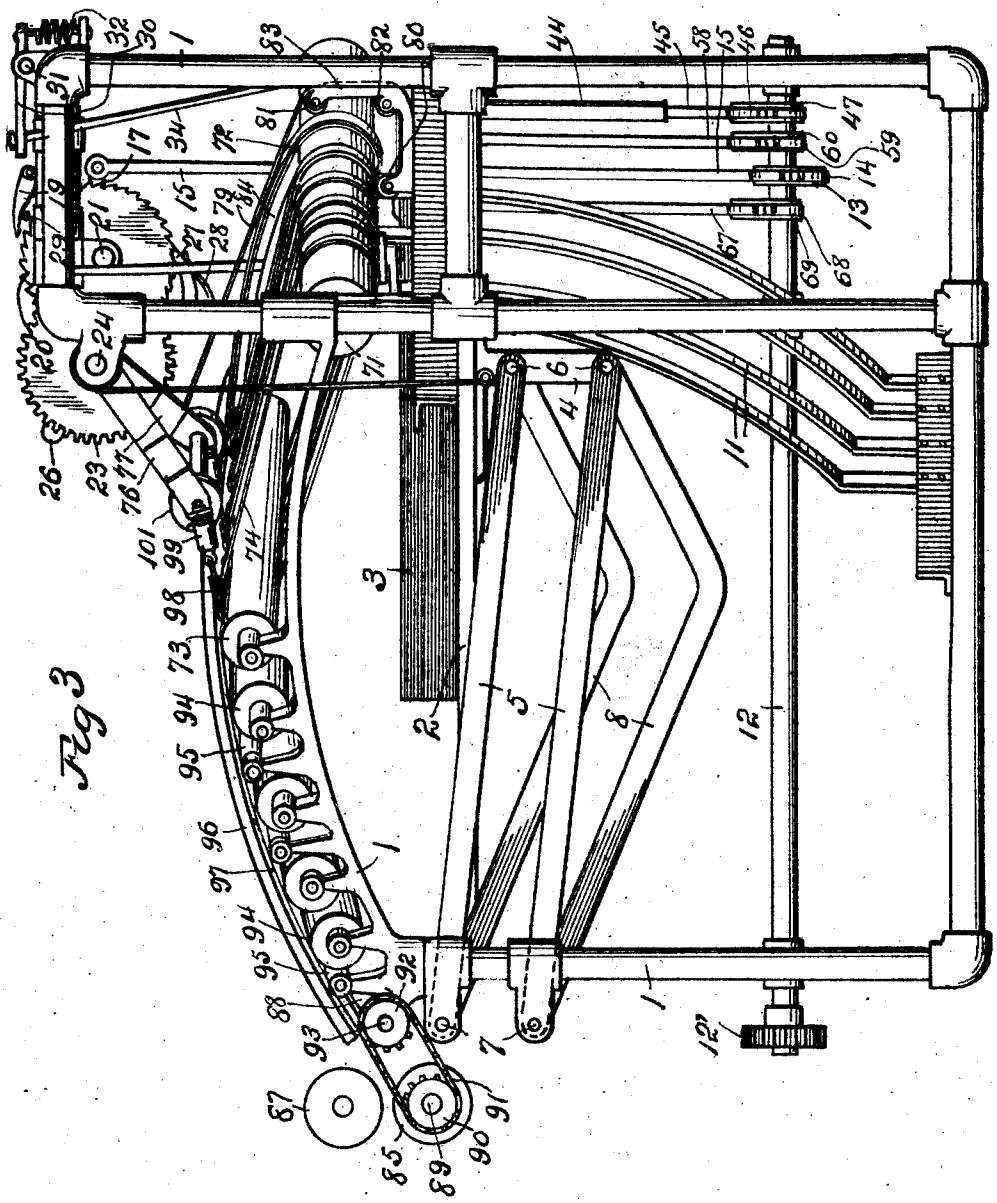


Fig 3

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Fig 4

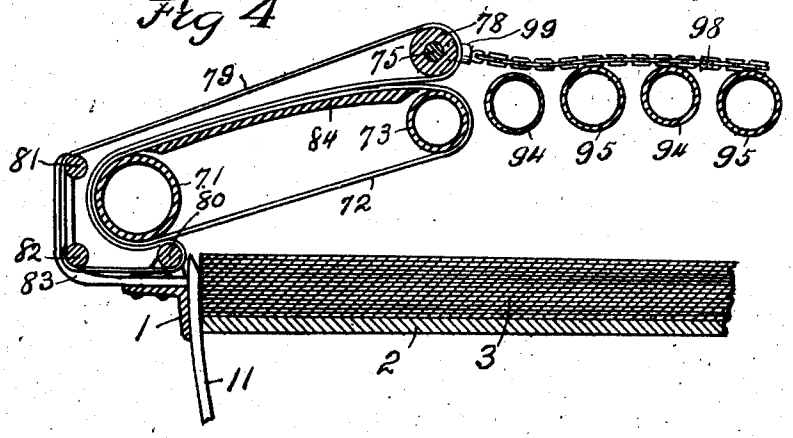
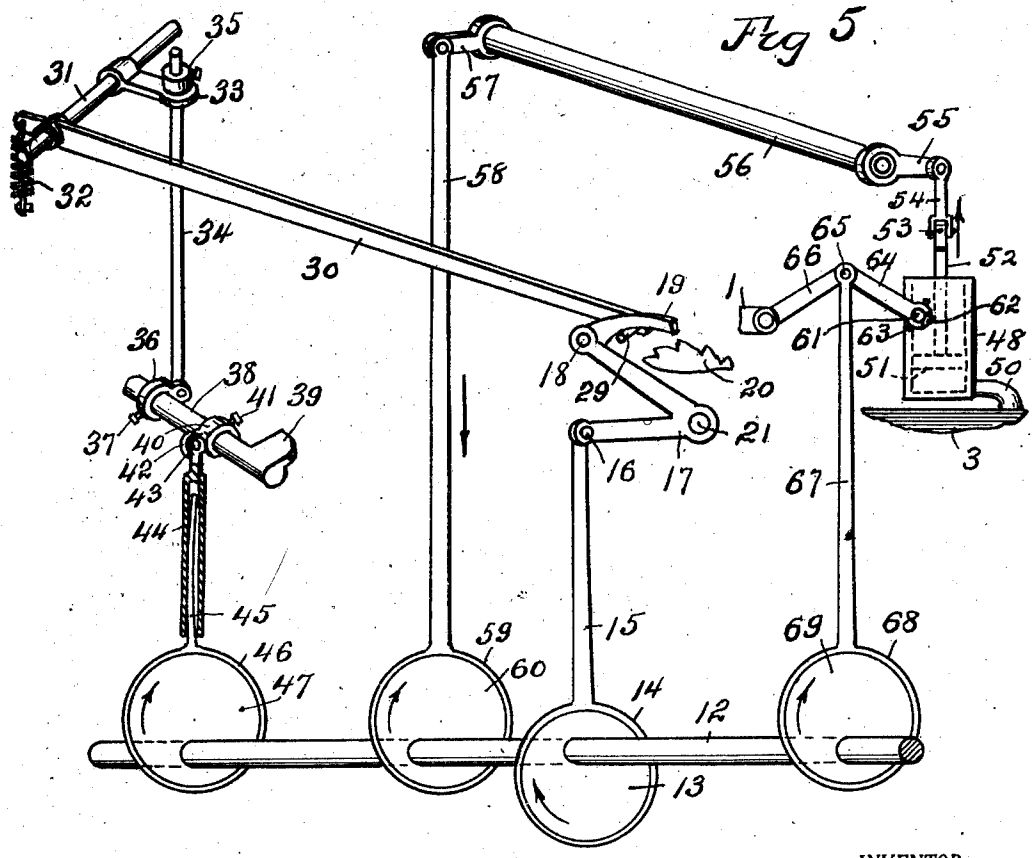


Fig 5



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Fig 6

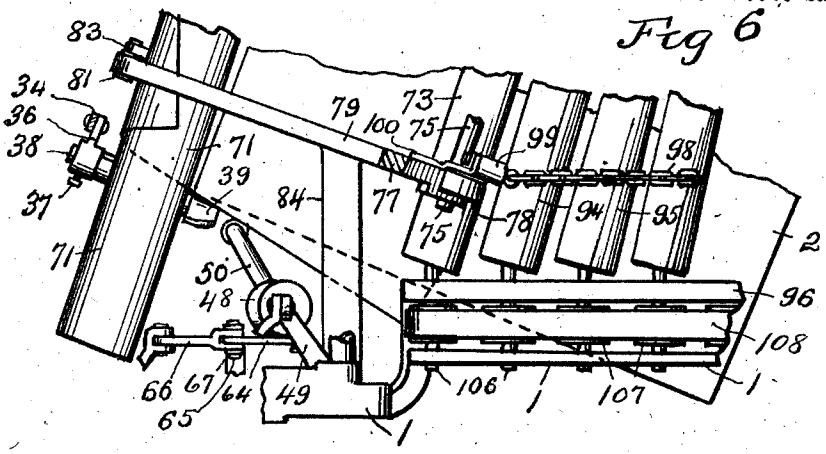


Fig 8

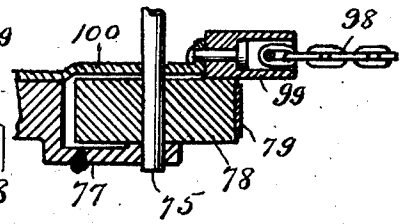


Fig. 7

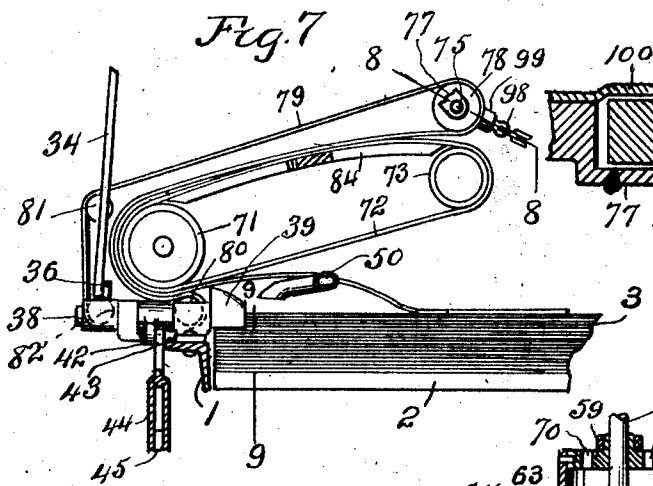


Fig 10

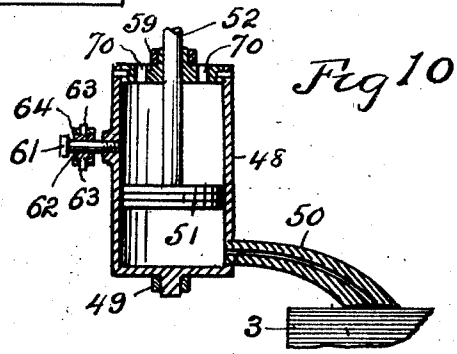
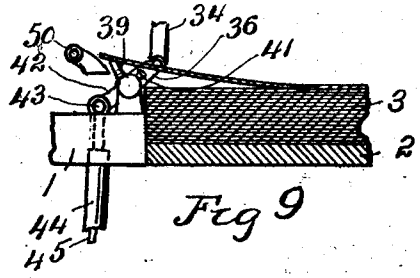


Fig 9



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Fig 11

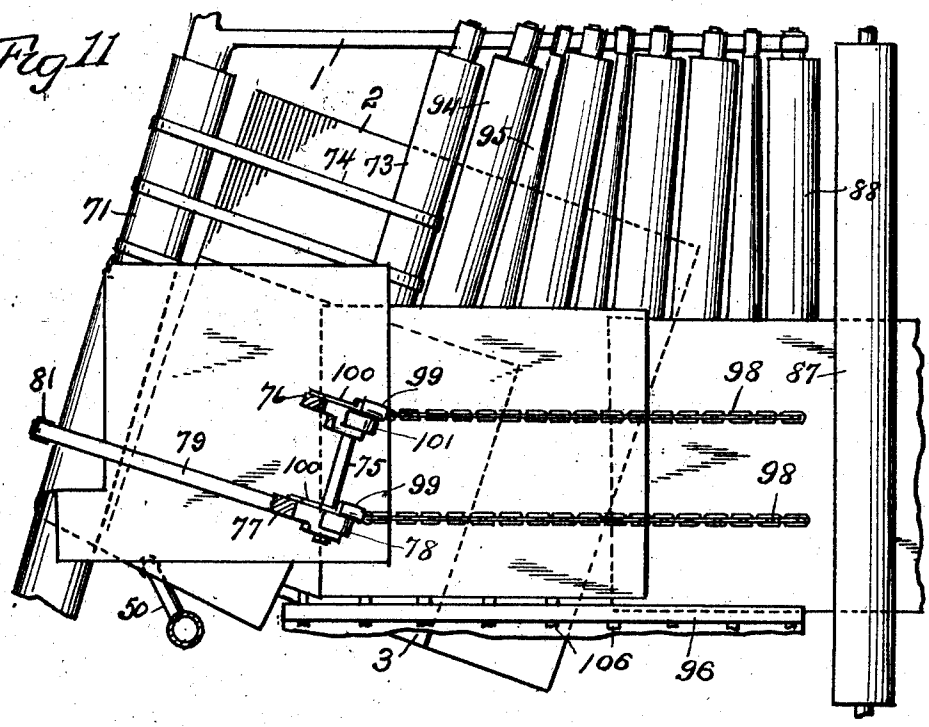


Fig 12

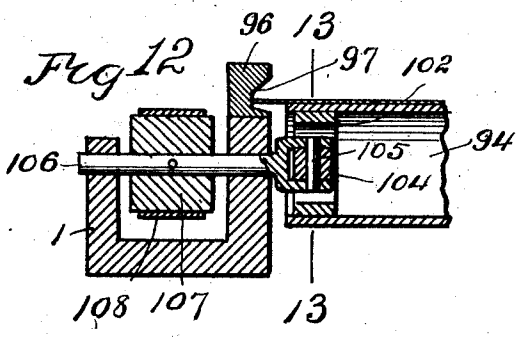
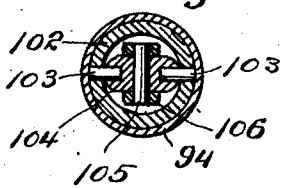


Fig 13



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UNITED STATES PATENT OFFICE.

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PAPER FEEDING.

Application filed August 7, 1924. Serial No. 730,630.

My invention relates to improvements in paper feeding. It relates particularly to the feeding of single sheets of paper from a pile, in the operation of feeding sheets to a ruling machine, printing press or the like.

One of the objects of my invention is to provide a novel method of detaching and withdrawing the outer sheet of a pile of paper, which method is adapted for sheets of all sizes and for the rapid feeding thereof from the pile.

Another object of my invention is the provision of novel means for reliably separating and partly detaching the outer sheet from the pile.

A further object of my invention is the provision of novel means for engagement of the partly detached sheet adjacent to a corner portion thereof and carrying the detached sheet forwardly with its sides reversed, whereby the sheets in being fed may overlap each other, thereby permitting a maximum speed of operation, without interfering with the proper timing of the sheets, as they are delivered to the ruling machine, printing press, or folding machine.

A further object of my invention is the provision of novel means by which the detached sheets are brought into proper register.

Still another object of my invention is the provision of novel means for raising the pile of paper automatically, as the sheets are fed therefrom.

Still another object of my invention is to provide a paper feeding machine of the kind described, which is relatively simple, which is durable, not liable to get out of order, which is readily adapted to be used in connection with ruling machines, folding machines and printing presses, which are now in use, which reliably detaches single sheets from the pile and brings them into proper register, and which has a maximum speed of operation.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings, which illustrate the preferred embodiment of my invention,

Fig. 1 is a plan view, partly broken away, of my improved paper feeding machine shown operatively connected to the portion of a ruling machine with which it is adapted for use.

Fig. 2 is an elevation looking at one side of my improved paper feeding machine.

Fig. 3 is an elevation looking at the opposite side of the machine.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a diagrammatic view of the eccentrics which respectively operate the suction mechanism, table lifting mechanism, and the mechanism which controls the latter, and parts connected therewith.

Fig. 6 is a plan view partly broken away of portions of the sheet separating, detaching, reversing and registering mechanisms.

Fig. 7 is a side view partly in vertical section of some of the parts shown in Fig. 6.

Fig. 8 is a section, enlarged, on the line 8—8 of Fig. 7.

Fig. 9 is a sectional view on the line 9—9 of Fig. 7.

Fig. 10 is an enlarged longitudinal sectional view of the pump cylinder and parts connected therewith.

Fig. 11 is a plan view of a portion of the machine, showing the path of travel of the sheets.

Fig. 12 is an enlarged sectional view on the line 12—12 of Fig. 1.

Fig. 13 is a sectional view on the line 13—13 of Fig. 12.

Similar reference characters designate similar parts in the different views.

The frame 1 of the machine may be of any desired form and material. As shown it is substantially rectangular and composed for the most part of piping.

2 designates a horizontal table adapted to support a pile of paper 3, which is to be fed. The table 2 has rigidly secured to its under side respectively adjacent to its side edges, two depending brackets 4, which support the table. For holding the table 2 in a horizontal position in whatever position to which it may be raised or lowered, there is provided the following mechanism. At one side of the table 2 are two parallel bars 5, Fig. 3, which at one set of ends are pivoted by horizontal bolts 6 to the adjacent bracket 4. The other ends of the bars 5 are pivoted by horizontal bolts 7 to the frame 1. The bolts 6 are spaced apart the same distance as the bolts 7.

At the other side of the table 2 are two parallel bars 8 one set of ends of which are pivoted by horizontal bolts 9 to the adjacent

bracket 4 in respective alinement with the bolts 6. The other ends of the bars 8 are pivoted by horizontal bolts 10 to the frame 1 in respective alinement with the bolts 7. By means of this arrangement, when the table is raised or lowered it will retain its horizontal position. The bars 8 may be depressed at their middle portions, as shown, to provide ample space for the insertion above them onto the table from that side of the machine, of a pile of paper.

At the left of the table 2, as viewed in Fig. 2, there are provided upstanding curved guide bars 11, the upper and lower ends of which are rigidly fastened to the frame 1. The concave sides of the bars 11 are adjacent to and conform in curvature to the path taken by the adjacent edge of the table 2, the pile of paper 3 being disposed on the table 2 with its forward edge against the guide bars 11.

For automatically lifting the table 2 as the sheets are fed from the pile 3, the following described mechanism may be employed. 12 designates a horizontal longitudinal shaft which is rotatable in the frame 1 at one side thereof, and which is adapted for continuous rotation by any suitable means, such as a spur gear wheel 12′ arranged to be driven by any suitable power, not shown, Figs. 2, 3 and 5.

Rigidly secured on the shaft 12 is an eccentric 13, which is embraced by a strap 14 to which is attached one end of an upright rod 15, the upper end of which is pivoted by a horizontal bolt 16 to one arm of a bell crank lever 17, the other arm of which has mounted in it a horizontal bolt 18 on which is pivoted a pawl 19, which is adapted to engage by gravity with a ratchet wheel 20, which is rotatable on a horizontal stud 21 provided on the frame 1. The bell crank lever 17 is also mounted and adapted to swing on the stud 21. Secured to the inner side of the ratchet wheel 20 and rotatable therewith is a pinion 22, which meshes with a spur gear wheel 23, which is secured on and rotatable with a transverse horizontal shaft 24 which is rotatable in the frame 1, Figs. 1, 2 and 5.

Two flexible members, which may be two steel bands 25, have their upper ends secured to and adapted to be wound on the shaft 24. The lower ends of the bands 25 are respectively attached to the brackets 4. When the shaft 24 and gear wheel 23 are rotated in the direction indicated by the arrow on the wheel 23, Fig. 2, the bands 25 will be wound on the shaft 24, thus lifting the table. For raising and lowering the table 2 by hand, the shaft 25 may have attached to it a crank 26. To hold the ratchet wheel 20 from turning counter clockwise, as viewed in Fig. 2, there is provided a pawl 27 which engages the ratchet wheel and is pivoted on the frame 1, a spring 28 attached to the frame 1, and bearing on said pawl 27 holding the latter engaged with the ratchet wheel.

When the shaft 12 is rotated in the direction indicated by the adjacent arrows in Fig. 5, the eccentric 13, will, through the rod 15, oscillate the bell crank lever 17, thereby oscillating the pawl 19. Upon such oscillation of the pawl 19, when it is engaged with the ratchet wheel 20, the pawl 19 will effect step by step rotation of the ratchet wheel and the gear wheel 23 and shaft 24, thereby effecting step by step lifting of the table 2.

As it is desired to lift the table 2 only fast enough to retain the top of the pile of paper 3 at a substantially uniform height, means are provided by which, until sufficient sheets have been fed from the pile to lower the top thereof below such height, the pawl 19 will be held out of engagement with the ratchet wheel 20, after which the pawl will engage the ratchet wheel, and the table lifting will proceed until the pile again reaches the desired height.

For automatically lifting the pawl and holding it disengaged from the ratchet wheel 20, it has extending transversely under it a pin 29 mounted in a longitudinal bar 30 rigidly secured to a transverse rock shaft 31 mounted in the frame 1, Figs. 1, 2 and 5. A coil spring 32 attached to the bar 30 and the frame 1, serves to swing the end of the bar 30 carrying the pin 29 upwardly to normally lift the pawl 19 from engagement with the ratchet wheel 20.

In order that the pawl 19 may be permitted to engage the ratchet wheel 20, when the top of the pile 3 falls below a predetermined height, the shaft 31 has an arm 33 through which slidably extends an upright rod 34, which has mounted on it a vertically adjustable collar 35 adapted to contact with and swing downwardly the arm 33, thus rocking the shaft 31 to lower the pin 29, when the rod 34 is pulled downwardly. The lower end of the rod 34 is pivoted to a collar 36 secured rigidly by a set screw 37 to a horizontal rock shaft 38 mounted in the frame 1 and having attached to it a shoe 39, which is adapted to rest on top of the pile 3. Rigidly secured on the rock shaft 38 is a collar 40, which is held in place by a set screw 41, Figs. 5, 6, 7 and 9.

The collar 40 has an arm 42 through which extends a horizontal bolt 43 to which is pivoted the upper end of a tube 44 in which is longitudinally slidable a curved bar 45, the curvature and resilience of which effects a sliding frictional engagement of the curved bar with the tube 44. The lower end of the bar 45 is attached to a strap 46 which encircles an eccentric 47 secured to and rotatable with the shaft 12.

When the eccentric 47 is revolved with the

shaft 12, the bar 45 raises and lowers the tube 44, thus rocking the shaft 38. The oscillation of the latter is limited in one direction by the bolt 43 striking the frame 1, Fig. 7, and the movement of the rock shaft in the opposite direction is limited by the tube 44 striking the collar 40. The stroke of the bar 45 is such that it continues its upward movement in the tube 44, after the latter has contacted with the collar 40, and the bar 45 continues its downward movement after the bolt 43 strikes the frame 1.

In the operation of the machine, when sufficient sheets have been fed from the pile, to require the table to be lifted, the shoe 39 will not be obstructed by the pile, so that the bar 45 will move the tube 44 so as to rock the shaft 38 to a position in which the collar 35 will strike and pull down the arm 33, thereby rocking the shaft 31 so that the bar 30 will swing in a direction which lowers the pin 29 enough to permit the pawl 19 to engage the ratchet wheel 20. The eccentrics 13 and 47 are so disposed relatively to each other on the shaft 12, that the shoe 39 will be slightly in advance of the pawl 19, that is the shoe 39 will have begun to lift from the pile of papers as the pawl reaches the limit of its movement to the left, as viewed in Fig. 5. As the shoe 39 rises, the pawl 19, when dropped so as to engage the ratchet wheel, will be turning the ratchet wheel 20 so as to lift the table, as above described. When the shoe is moving downward toward the pile, the pawl 19 is being retracted over the ratchet wheel 20. As long as the top of the pile 3 is below the predetermined level, shown for example, in Fig. 4, the pawl 19 will be engaged with the ratchet wheel 20, thereby effecting lifting of the table 2. When the top of the pile again reaches the proper height, the pile 3 will resist the downward movement of the shoe 39, so that the collar 35 can not pull down the arm 33, and the spring 32 will swing the bar 30 so that the pin 29 will lift the pawl 19 and hold it disengaged from the ratchet wheel, at which the lifting of the table will temporarily cease.

The frictional engagement of the bar 45 and the tube 44 is so adjusted that the bar will slip in the tube when the pile holds the shoe from making its full stroke downwardly. The frictional engagement is such as to overcome the strength of the spring 32, to enable the bar 45 to force upwardly the tube 44, so that the collar 35 can move the arm 33 downwardly, to permit the pin 21 to allow the pawl 19 to engage the ratchet wheel.

For separating the outer sheet from the pile and for partly detaching the separated sheet from the pile, suction means is provided which lifts and carries the top sheet. Such means may comprise a suction cylinder 48 supported at its upper and lower ends by a bracket 49 fastened to the frame 1. The cylinder 48 is oscillatively mounted on an axis oblique to the top of the table 2, and is provided at one side adjacent to its lower end with a tubular suction arm 50, which is swung by the cylinder 48 back and forth between the positions shown in Figs. 1 and 11. The inclination of the axis of the cylinder 48 is such that as the suction arm 50 moves from its rear position, shown in Fig. 1 toward the forward position, shown in Fig. 11, the mouth of the suction arm will rise from contact with the pile of paper, and will move in an arc and will lift and carry forwardly and laterally the top sheet of the pile.

To create suction in the cylinder 48 and arm 50, there may be slidably fitted in the cylinder 48 a piston 51 attached to a piston rod 52 slidable through the upper head of the cylinder, Fig. 10. The upper end of the rod 52 is connected by a universal joint 53 with a link 54, the upper end of which is pivoted to a crank arm 55 on a rock shaft 56, which is a sleeve oscillatable on the frame 1. The rock shaft 56 has a crank arm 57 extending oppositely to the crank 55, to which is pivoted the upper end of a bar 58, the lower end of which is attached to a strap 59 which embraces an eccentric 60 secured to and rotatable with the shaft 12.

For oscillating the cylinder 48 on its axis, it has extending laterally from it a bolt 61, Fig. 10, on which is pivoted a collar 62 having oppositely extending pins 63 on which is pivoted the bifurcated end of a link 64, Fig. 5.

The link 64 is pivoted on a bolt 65 on which is also pivoted the adjacent ends of a link 66 and the upper end of a bar 67. The link 66 is pivoted to the frame 1, and the lower end of the bar 67 is attached to a strap 68 which embraces an eccentric 69 secured to and rotatable with the shaft 12.

The eccentrics 60 and 69 are so disposed on the shaft 12, that the piston 51 has started on its upward suction movement when the suction arm 50 is at its rear position on the pile, as shown in Fig. 5. Thus, when the suction arm starts on its forward movement from the position shown in Fig. 5, it will have sucked and is holding the top sheet, as the cylinder 48 swings the arm 50 forwardly. The arm 50 will then carry the top sheet forwardly and laterally until the advanced corner portion of the sheet is gripped by the mechanism which carries the sheet from the pile and carries it to the registering mechanism. As the eccentric 60 is disposed in advance of the eccentric 69, the suction effect in the cylinder and arm will cease before the suction arm reaches its most forward position, thereby releasing the sheet, which at the time will have been seized by the carrying off mechanism. On

the downward movement of the piston 51, air will be blown from the arm 50. The upper end of the cylinder 48 has openings 70 for the admission of air on the down stroke, and for the expulsion of air on the upstroke of the piston 51.

The suction arm 50 is disposed so as to pass laterally off from the pile at its forward limit, and it can then pass under the sheet which is just being detached by the carrying mechanism.

For carrying the top sheet from the pile, and reversing it, the following described mechanism is provided.

Referring particularly to Figs. 1, 4, 6, 7 and 11, 71 designates a transverse roller disposed horizontally at the left of and slightly oblique to the left edge of the table 2, as viewed in said figures. A belt 72 embraces the roller 71 and a roller 73 at the right of and higher and parallel with the roller 71. The latter is rotatably mounted in the frame 1, and may be connected by other belts 74, Figs. 1 and 11, with the roller 73.

Above the roller 73 and parallel therewith is a shaft 75, which is rotatably mounted in two brackets 76 and 77, Figs. 1 and 11, supported on the frame 1. Secured to and rotatable with the shaft 75, is a roller 78, on which is mounted a belt 79, disposed above and parallel and in contact with the belt 72, and which bears against the belt 72 at the left and under side of the roller 71, and which is mounted upon a small roller 80, Figs. 4 and 7, which is disposed parallel with the roller 71 below the latter and between the latter and the pile 3. The belt 79 also passes over two rollers 81 and 82, rotatably mounted on a bracket 83, Fig. 3, which is supported on the frame 1. An arcuate bracket 84 has its convex upper side extending between the rollers 71 and 73 and holding the upper portion of the belt 72 against the adjacent portion of the belt 79, Figs. 4, 6 and 7. The bracket 84 is supported by the frame 1.

The suction arm 50 carries the top sheet forwardly, and owing to its swinging movement, and to the disposition of the rollers 71 and 80 slightly oblique to the adjacent edge of the pile 3, and owing also the suction arm 50 engaging the sheet adjacent to the most advanced corner thereof, the corner portion of the sheet first enters between the belts 72 and 79, Figs. 6, 7 and 9, and is gripped by and between the belts, and is carried off from the pile 3 with its sides reversed. This reversal of the sides of the sheets, is to enable them to overlap each other, as shown in Fig. 11, the last sheets as they are being fed lying on top of those immediately preceding. The overlapping of the sheets in this manner does not interfere with the action of the timing mechanism of the machine to which the sheets are being fed, such as the gate of the ruling machine, and it enables fast operation to be effected.

85 designates one of the rollers of a ruling machine 86, Figs. 1, 2 and 3, said roller being disposed below and parallel with a roller 87 of the ruling machine. The sheets are first detached and carried from the pile 3, as hereinbefore described. They are then brought into side register, after which they pass between the rollers 85 and 87 and are carried forwardly thereby at a greater speed than they were fed by the paper feeding mechanism of my machine.

For bringing the detached sheets into proper side register, the following described mechanism may be provided:—

In the frame 1, is rotatably mounted a horizontal transverse roller 88, Fig. 1, which is close to and parallel with the roller 85. The roller 85 is mounted on a shaft 89 to which is secured a sprocket wheel 90, which is embraced by a sprocket belt 91 which also embraces a sprocket wheel 92 secured to a rotary shaft 93, which carries the roller 88. The latter is thus rotated when the shaft 89 of the ruling machine is revolved, and in a like direction.

Intermediate of the rollers 88 and 73 are transverse cylindrical rollers 94, the axes of which are oblique to the rollers 88 and 73 and to each other. To fill the spaces between the rollers 94, and between the roller 88 and the adjacent roller 94, and also to slow relatively the sheet at one side edge thereof, there are provided tapering rollers 95, Fig. 1.

The rollers 94 and 95 are rotatably mounted at one set of ends in the frame 1. Adjacent to the other set of ends of said rollers is a longitudinal registering side guide comprising a plate 96 fastened to the frame 1, and having in its side next the rollers 94 and 95 an arcuate sheet receiving groove 97, Fig. 12. The upper surfaces of the rollers 94, 95, 88 and 73 register with the groove 97, so that as the sheets are fed forwardly and at the same time laterally, they will be arched and will enter and be guided by the groove 97.

The purpose of arranging the rollers 73, 94, 95 and 88 in an arch, as described, is to stiffen the sheet, so that light sheets will stand the strain placed on them upon feeding them laterally toward the guide 96.

The axes of the rollers 73, 94 and 95 converge from the guide 96 toward the opposite side of the machine. The guide 96 is so disposed with relation to the pile of paper 3 and the belts 72 and 79, that the latter on gripping a corner portion of the sheet and carrying it forwardly with its sides reversed, will dispose the detached sheet with its adjacent longitudinal edge substantially parallel with the guide groove 97, see Fig. 11.

The rollers 73, 94 and 95 being oblique to the guide groove 97, and having their upper sides moving toward said groove, will carry the sheets forwardly, and at the same time laterally to the guide 96.

In order to hold the sheets against the upper sides of the rollers 94, 95 and 88, and also to assist in moving the sheets laterally toward the guide 96, there may be provided flexible members comprising, preferably, chains 98 which rest transversely across and upon the rollers 94, 95 and 88 and have one set of ends respectively attached to two rollers 99, which are respectively rotatably mounted on two plates 100 which are respectively secured to the brackets 76 and 77, see Figs. 1, 6, 8 and 11. One of the rollers 99 has its periphery bearing against one end of a roller 101, and the other roller 99 has its periphery bearing against one end of the roller 78.

The rollers 78 and 101 in revolving, revolve the chains so that the under sides of the latter move toward the guide 96, thus moving the sheets, which are fed between the chains 98, and the rollers 94 and 95, toward the guide groove 97.

Each of the rollers 73, 94 and 95 has its end which is next adjacent to the guide 96 supported by the following described mechanism. Referring particularly to Figs. 12 and 13, which illustrates the support for the roller 94 next adjacent to the roller 88, 102 designates a ring fitted in the end of the roller next adjacent the guide 96. Mounted in the ring 102 are two diametrically opposite pins 103 on which is rotatably mounted a connecting member 104 through which extends a pin 105. A horizontal shaft 106 is rotatably mounted transversely in the frame 1, and has a bifurcated inner end, the arms of which respectively embrace opposite sides of the connecting member 104, the pin 105 being mounted in the said arms of the shaft 106. A universal joint connection is thus effected between the shaft 106 and the adjacent roller which it drives.

For rotating all of the shafts 106 in like directions, so as to rotate the rollers 73, 94 and 95 in the proper direction, said shafts 106 have respectively secured to and rotatable with them pulleys 107. A driving belt 108 embraces a pulley 109 secured to the shaft 93. The belt 108 also embraces the upper and lower sides of the pulleys 107, Figs. 1, 2 and 12. Tensioning pulleys 110 rotatably mounted on the frame 1 bear at intervals against the lower portion of the belt 108, so as to hold the latter in driving contact with the different pulleys 107 and 109 with which the belt engages.

In the operation of the invention, the pawl 27 is disengaged from the ratchet wheel 20, and the crank 26 is turned so as to lower the table. The pile of paper is then inserted on the table, with the forward edges of the sheets against the guide bars 11. The pawl 27 is then permitted to again engage the ratchet wheel 20, and the crank 26 is turned to wind the bands 25 on the shaft 24 to lift the table to a position in which the top sheet will be about level with the center of the roller 80.

The power is then applied to operate the ruling machine 86 and to rotate the shaft 12. This will effect rotation, by means of the mechanism already described of the rollers 73, 94, 95 and 88. The belts 74 and the belt 72 will effect rotation of the roller 71, and the belt 72 will drive the belt 79.

The shaft 12 will effect rotation of the eccentrics 47, 60, 13 and 69. These eccentrics will respectively operate the shoe and pawl lifting means, the piston 51, oscillate the pawl 19 and oscillate the suction cylinder 48. The latter in oscillating will oscillate the suction arm 50, and the latter will pick up a sheet and carry it forwardly into and between the belts 72 and 79, by which the sheet will be gripped and carried forwardly from the pile with one corner in advance. The belts 72 and 79 will reverse the sides of the detached sheet, and will deliver the sheet between the chains 98 and the rollers 94 and 95, and with one longitudinal edge of the sheet adjacent to the guide 96 parallel with the guide.

The rollers 94 and 95, and the chains 98 will cause the sheet to be moved laterally into the groove 97, and the rollers will at the same time carry the sheet forwardly to and between the rollers 85 and 87 of the ruling machine 86. The groove 97 will hold the sheet arched. The tapering rollers 95 in addition to carrying the sheets forwardly tends to retard the movement of that edge portion of the sheet next adjacent to the small ends of the rollers, as the periphery of each tapering roller travels slower at the small end than at its large end. This prevents light sheets being buckled due to the pressure to which it is subjected against the guide 96.

With every forward movement of the suction arm 50, the shoe 39 is lifted from the pile to permit the separated sheet being withdrawn from the pile, and at each return movement of the suction arm 50, the shoe 39 is again brought down on the pile.

When the top of the pile of paper lowers sufficiently, the shoe will be permitted to lower to a point where the collar 35 engages the arm 33, and rocks the shaft 31 so that the pin 29 will permit the pawl 19 to engage the ratchet wheel 20. The eccentric 13 in effecting oscillation forwardly and backwardly of the pawl 19, will cause the latter to effect step by step rotation of the ratchet wheel 20, until the table has been lifted to raise the top of the pile to the posi-

tion shown in Fig. 4, at which time, the pile of paper will resist the downward movement of the shoe 39, and the bar 45 will slip in the tube 44, so that the rock shaft 38 will not rock sufficiently to cause the collar 35 to swing the arm 33 to permit the pin 29 letting the pawl 19 engage the ratchet wheel 20, and the lifting of the table 2 will be discontinued until the top of the pile has again lowered enough to permit the pawl 19 to again engage the ratchet wheel 20.

It will be noted, Fig. 4, that the entrance for the sheet between the belts 72 and 79 is so disposed that the sheet which is passing between the belts will tilt upwardly from the rear of the roller 80. This, and the position of the pile of paper, permits the shoe 39 to pass under a sheet which is being drawn off by the belts 72 and 79, whereby the shoe can then rest on the next sheet below. The shoe 39 is also positioned, so that the sheet in being withdrawn passes over the rear curved edge of the shoe, Figs. 7 and 9.

I do not limit my invention to the structure shown and described, as many modifications, within the scope of the appended claims may be made without departing from the spirit of my invention.

What I claim is:—

1. In paper feeding, means for lifting a corner portion of the outer sheet of a pile of paper, and means for engaging said corner portion and withdrawing the sheet from the pile with its sides reversed and in a direction at an angle to the adjacent longitudinal edge of the pile.

2. In paper feeding, means for applying suction to the outer sheet of a pile of paper to partly withdraw the sheet from the pile and means for engaging a corner portion of the partly withdrawn sheet and fully withdrawing it from the pile with its sides reversed and in a direction at an angle to the adjacent longitudinal edge of the pile.

3. In paper feeding, means for moving forwardly and laterally the outer sheet of a pile of paper to partly detach the sheet, and means for withdrawing the partly detached sheet from the pile with its sides reversed and in a direction at an angle to the adjacent longitudinal edge of the pile.

4. In paper feeding, means for moving forwardly and laterally the outer sheet of a pile of paper to partly detach the sheet and advance a corner portion thereof, and means for engaging said corner portion of the sheet and withdrawing the sheet with its sides reversed and in a direction at an angle to the adjacent longitudinal edge of the pile.

5. In a paper feeding machine, sheet carrying means including two parallel rollers and two co-operating belts respectively engaging said rollers, means for supporting a pile of paper with its front edge oblique to said rollers, and means for moving the outer sheet of the pile forwardly between and into engagement with said belts with one corner portion only of the sheet first engaging said belts.

6. In a paper feeding machine, sheet carrying means including two parallel rollers and two co-operating belts respectively engaging said rollers and arranged to reverse the sides of the sheet while carrying the sheet, means for supporting a pile of paper with its front edge oblique to said rollers, and means for moving the outer sheet of the pile forwardly between and into engagement with said belts with one front corner portion only of the sheet first engaging said belts.

7. In a paper feeding machine, a sheet registering guide, means for supporting a pile of paper with its front edge oblique to said guide, means for separating the outer sheet from the pile sheet carrying means for engaging and carrying the separated sheet from the pile with its sides reversed and with one longitudinal edge of the sheet parallel with the guide, and means for carrying the sheet forwardly and at the same time laterally with said longitudinal edge of the sheet brought into contact with said guide.

8. In a paper feeding machine, a sheet registering guide, means for supporting a pile of paper with its front edge oblique to said guide, rollers disposed obliquely to said guide, means for revolving said rollers so that their upper sides move toward said guide, and means for detaching the outer sheet from the pile and delivering it upon said rollers with one of its longitudinal edges parallel with said guide and with the sides of the sheet reversed.

9. In a paper feeding mechine, a sheet registering guide, means for supporting a pile of paper with its front edge oblique to said guide, registering rollers disposed obliquely and at different angles to and converging from said guide, means for revolving said rollers with their upper sides moving toward said guide, and means for detaching the outer sheet from the pile and delivering it with its sides reversed upon said rollers and with one of its longitudinal edges parallel with said guide.

In testimony whereof I have signed my name to this specification.

HARRY BRADSHAW.