March 13, 1945. A. A. SAUL 2,371,190

SHEET HANDLING APPARATUS

Filed April 3, 1941 4 Sheets-Sheet 1

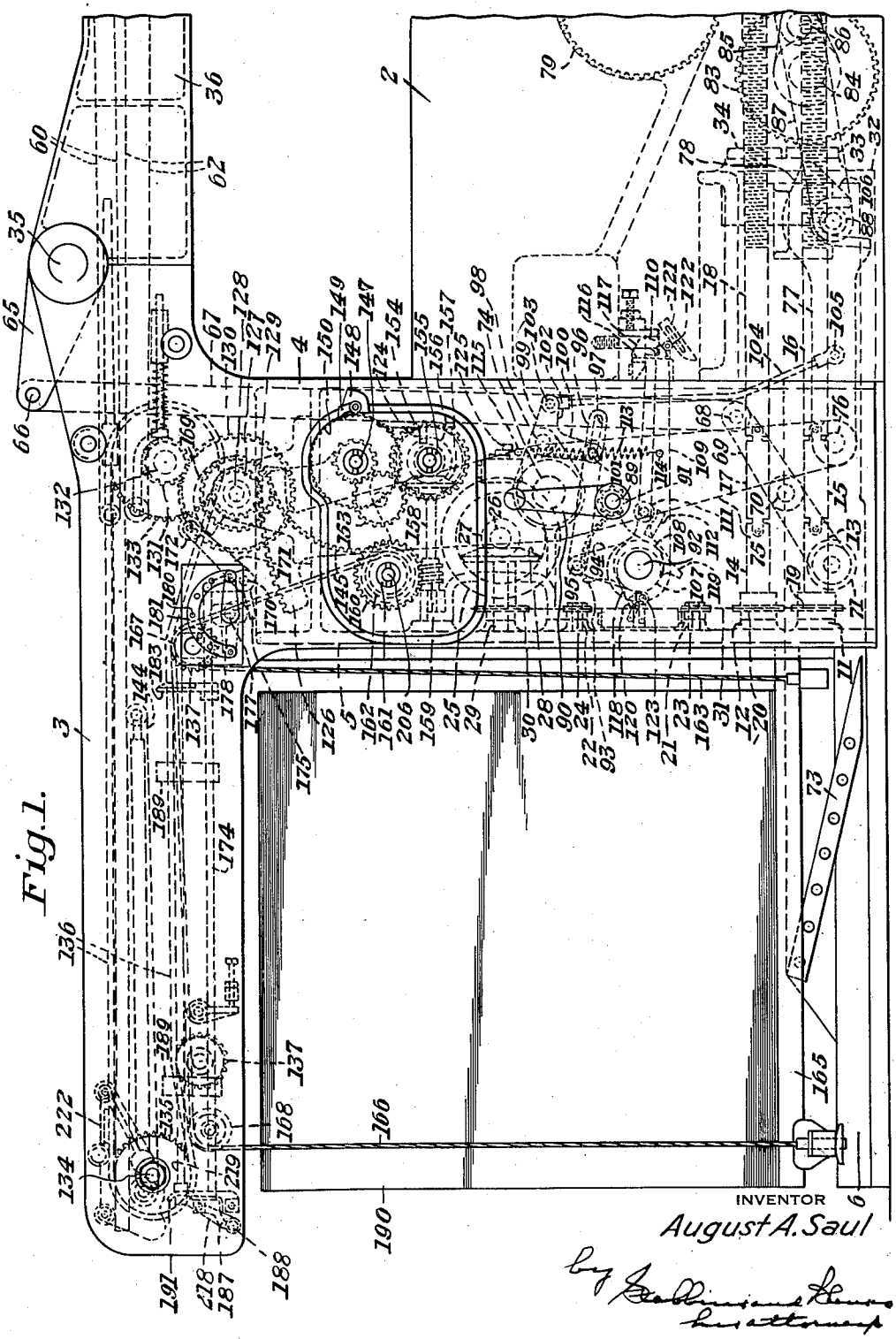


Fig. 1.

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SHEET HANDLING APPARATUS

Filed April 3, 1941 4 Sheets-Sheet 2

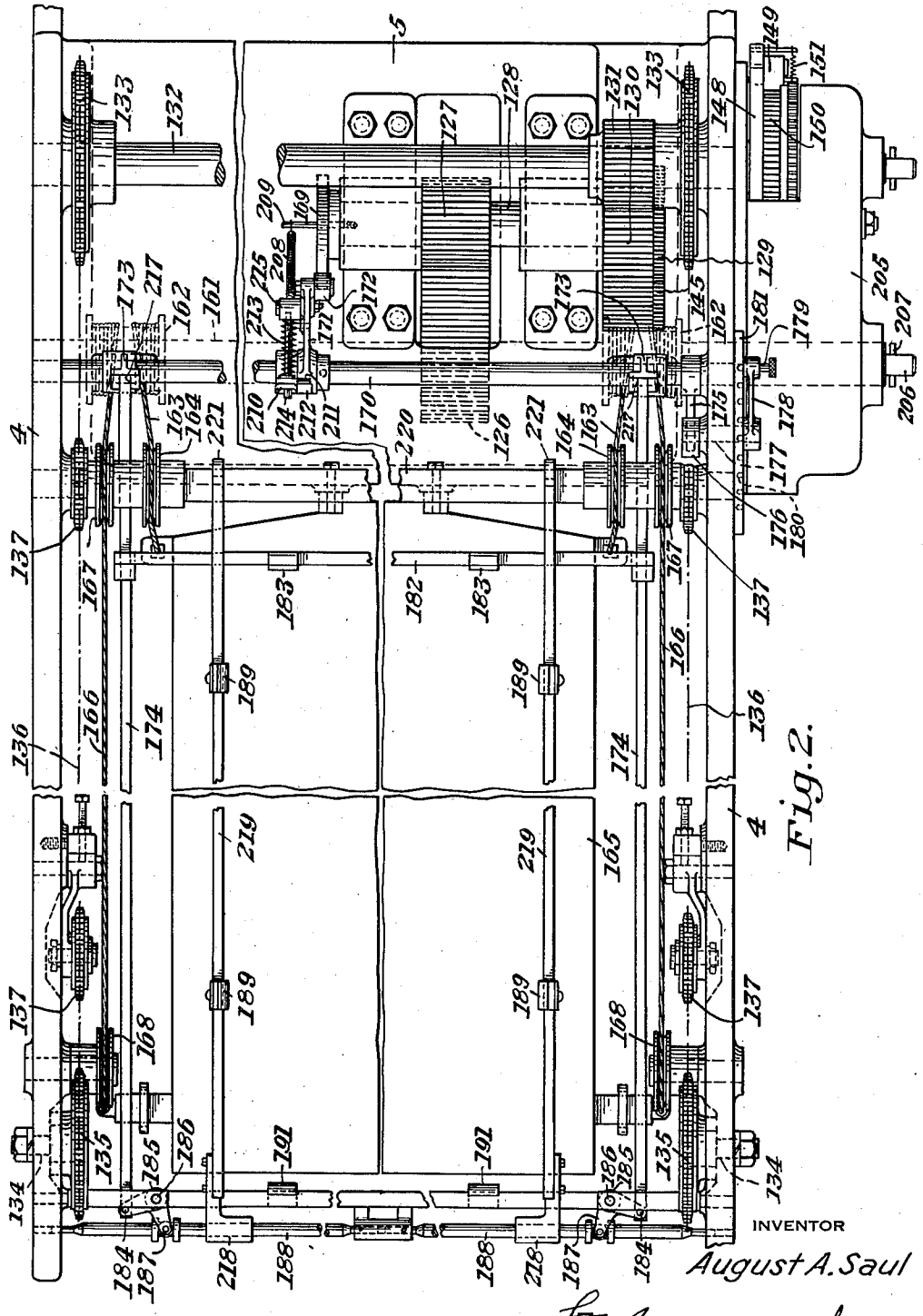


Fig. 2.

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March 13, 1945. A. A. SAUL 2,371,190

SHEET HANDLING APPARATUS

Filed April 3, 1941 4 Sheets-Sheet 3

Fig.3.

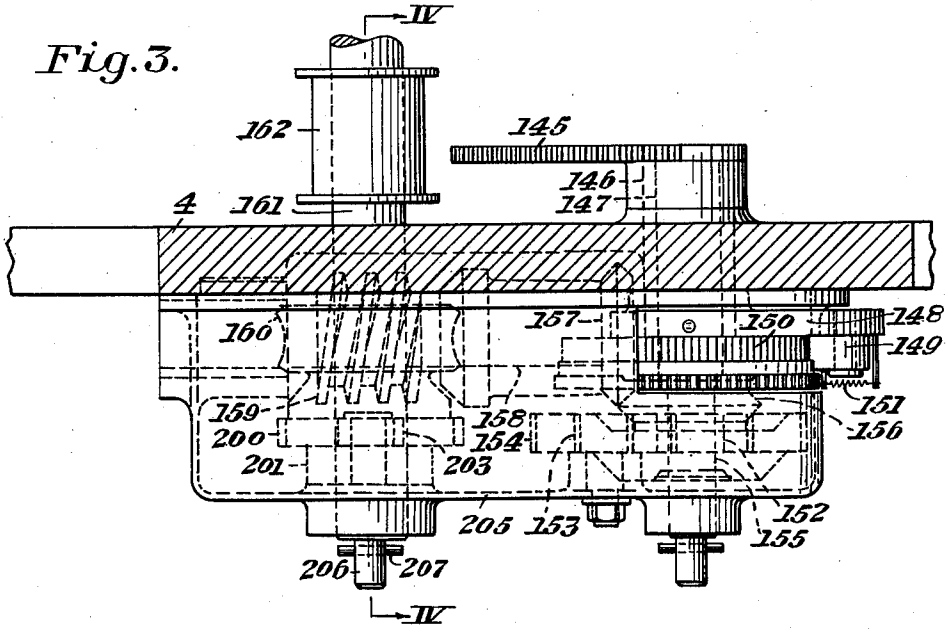


Fig.4.

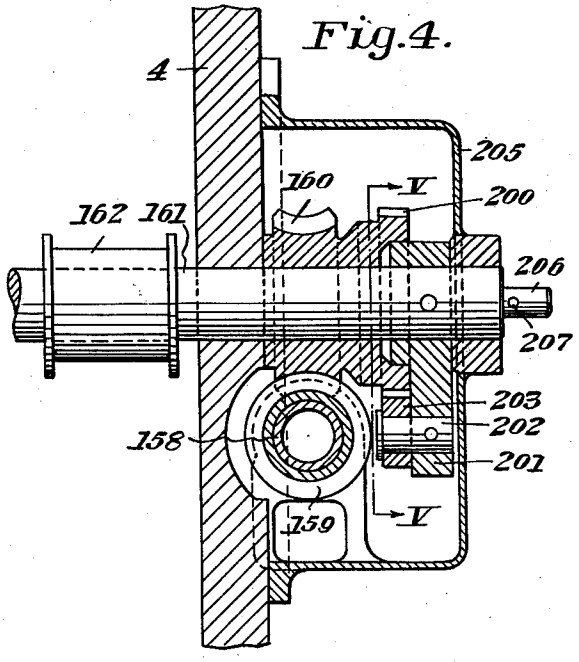
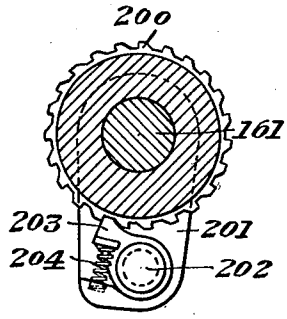


Fig.5.



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March 13, 1945. A. A. SAUL 2,371,190

SHEET HANDLING APPARATUS

Filed April 3, 1941 4 Sheets-Sheet 4

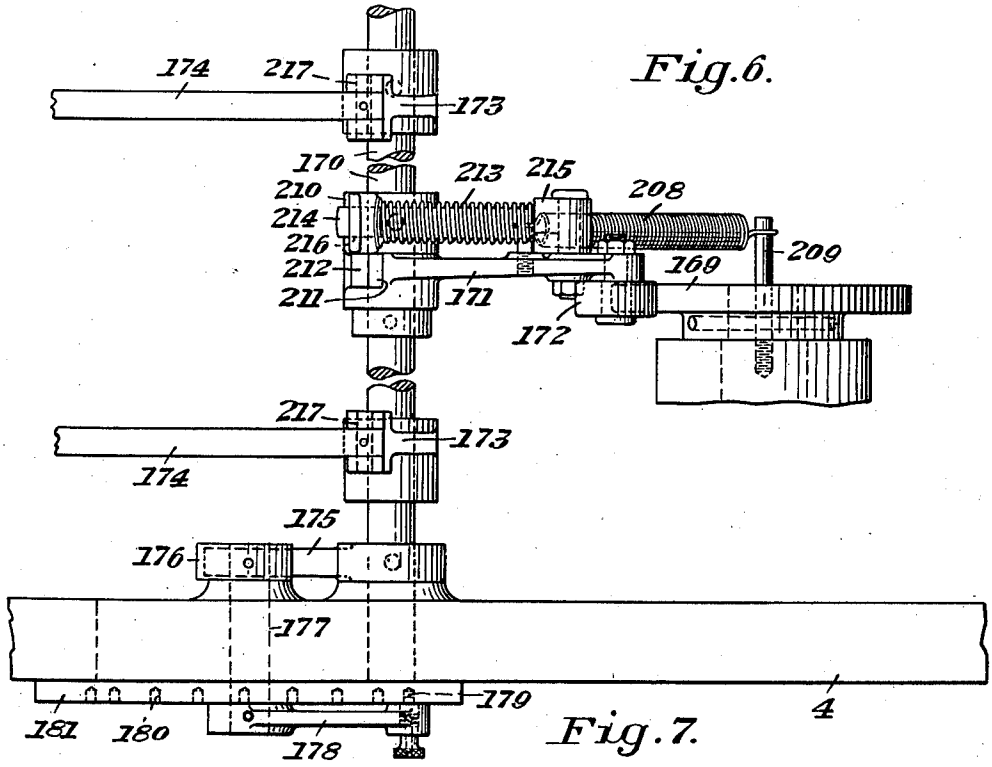
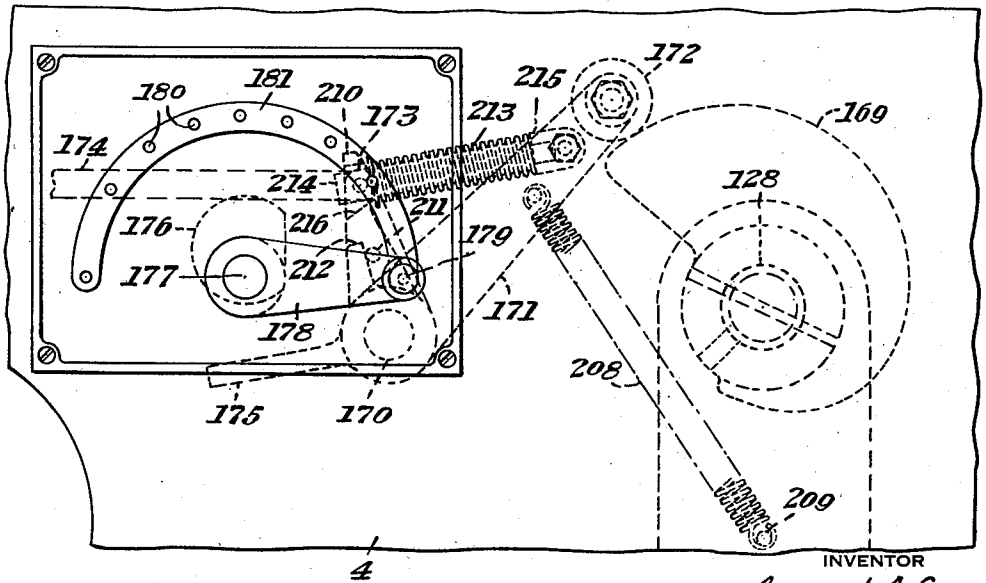


Fig.6.

Fig.7.



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Patented Mar. 13, 1945

2,371,190

UNITED STATES PATENT OFFICE

2,371,190

SHEET HANDLING APPARATUS

August A. Saul, Pittsburgh, Pa., assignor to Miller Printing Machinery Co., Pittsburgh, Pa., a corporation of Pennsylvania

Application April 3, 1941, Serial No. 386,652

13 Claims. (Cl. 271—89)

This invention relates to sheet handling apparatus and more particularly to sheet handling apparatus for use with a press or the like to handle sheets relatively thereto. While in its broadest aspects the invention is applicable to sheet handling apparatus generally it is in certain respects especially applicable to sheet delivery apparatus for delivering sheets from a press or the like.

The invention will be described as embodied in a sheet delivery apparatus for delivering sheets successively from a printing press wherein the sheets are printed. The invention in the structure selected for the purpose of explanation and illustration is concerned primarily with the means for changing the elevation of the pile support and the means for operating and adjusting the joggers. In a sheet delivery apparatus the pile support is gradually lowered as sheets are delivered thereto and the sheets at the top of the pile are periodically jogged, this ordinarily being done at each cycle—that is to say, upon the delivery of each sheet to the pile. The amplitude of the jogging movement is controlled depending upon the type of stock used and the size of the sheets.

I have devised sheet handling apparatus which incorporates a number of improvements facilitating operation of the apparatus and simplifying its structure. I provide relatively simple though desirably effective means for changing the elevation of the pile support. In a sheet delivery apparatus the pile support is, as above stated, gradually lowered during the delivery of sheets to the pile and when a pile of sheets is removed the pile support is rapidly raised to its upper position so that a new pile can be gradually built up thereon. In my copending application, Serial No. 537,222, which is a division of this application, sheet handling apparatus having improved means for changing the elevation of the pile support is claimed. I also provide improved jogger operating mechanism and improved and simplified means for controlling the amplitude of oscillation of the joggers. I provide for controlling at will the amplitude of oscillation of the joggers by means positioned at the outside of the delivery frame. Such means preferably includes a rapidly shiftable control member and means for maintaining the same in desired adjusted positions. The joggers are resiliently urged both inwardly and outwardly so that if they encounter any obstacle they will yield rather than becoming damaged or broken.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention, in which

Figure 1 is a side elevational view of sheet delivery apparatus with a portion broken away,

Figure 2 is a top plan view to enlarged scale and with portions omitted and portions broken away of part of the apparatus shown in Figure 1,

Figure 3 is a fragmentary plan view of a portion of the apparatus shown in the lower right hand corner of Figure 2, part being shown in horizontal cross section,

Figure 4 is a vertical transverse cross-sectional view taken on the line IV—IV of Figure 3,

Figure 5 is a detail longitudinal cross-sectional view taken on the line V—V of Figure 4,

Figure 6 is a fragmentary plan view of a portion of the apparatus shown at the right hand portion of Figure 2, parts being broken away, and

Figure 7 is an elevational view of the apparatus shown in Figure 6.

Referring now more particularly to the drawings, there is shown a sheet delivery apparatus adapted to deliver sheets from a printing press. The printing couple of the press is not shown but a portion of the press frame is indicated at 2, such frame having an extension 6 projecting to the left viewing Figure 1 and upon which the delivery apparatus, designated generally by reference numeral 3, is adapted to be guided in movements toward and from the press. The press structure is not shown in detail since the present invention does not relate particularly thereto. The press may print upon sheets passed therethrough or it may be equipped with cutting and crossing blades or other instrumentalities for acting on the sheets.

The delivery apparatus, which will be hereinafter referred to simply as a delivery, comprises opposed side frame members 4 and cross frame members 5 connected together to support and contain the delivery mechanism. The delivery is separate from the press and is adapted to be moved in a straight line toward and away from the press into and out of cooperative relationship with respect thereto. This provides a working space between the press and delivery. The delivery and press are relatively movable and while in the structure shown the press is stationarily mounted and the delivery moves over the floor the reverse might be the case or the press and delivery might both move.

The extension 6 above mentioned lies along the floor and the delivery is suitably supported and guided thereon to move toward and from the press. The delivery has bearings 11 and 12, respectively, wherein are rotatively journaled shafts 13 and 14, respectively. The shaft 13 is connected through a universal joint 15 with a screw 16 extending toward the press, and the shaft 14 is connected through a universal joint 17 with a screw 18 extending toward the press. Fixed to the shafts 13 and 14 are sprockets 19 and 20, respectively. Journaled in the delivery are stub shafts 21 and 22 carrying idler sprockets 23 and 24, respectively. Mounted in the delivery is an electric motor 25 whose shaft 26 carries a bevel pinion 27. The bevel pinion 27 meshes with a bevel gear 28 fixed to a driving shaft 29 journaled for rotation in the delivery and to which is also fixed a driving sprocket 30. A sprocket chain 31 meshes with the sprockets 30, 23, 19, 20 and 24, as shown in Figure 1. The mountings for the idler sprockets 23 and 24 may be such that these sprockets or one thereof may be shifted to suitably adjust the tension of the sprocket chain 31.

The press 2 comprises a base 32 having fixedly mounted therein nuts 33 and 34 with which the screws 16 and 18, respectively, are in threaded engagement. The screws 16 and 18 are of the same size, hand and pitch and the sprockets 19 and 20 are of the same size, so when the motor 25 is operated both of the screws 16 and 18 will turn in the same direction at the same speed and will cooperate in exactly similar manner with the respective nuts 33 and 34 through which they pass. Since the nuts 33 and 34 are fixedly positioned in the press base, driving of the screws by the motor 25 will inevitably result in movement of the delivery toward or from the press depending upon the direction in which the motor armature turns. Preferably the motor is a reversing motor so that it may be driven in either direction. Consequently when it is desired to move the delivery toward the press the motor is driven in one direction and when it is desired to move the delivery away from the press the motor is driven in the opposite direction.

Pivoted to the body of the delivery 3 by a cross shaft 35 is a frame 36 carrying one end of each of a plurality of endless conveyors 60 and 62. The frame 36 is adapted to be swung about the pivot 35 from its generally horizontal operative position as shown in Figure 1 to a position in which the right-hand extremity of the frame is raised. Means are provided, as will presently be described, for thus swinging the frame 36 automatically upon movement of the delivery away from the press and for swinging the frame back downwardly into operative position upon movement of the delivery toward the press. When the frame is in operative position the conveyors 60 and 62 are driven from the press with the upper reach of the conveyor 62 and the lower reach of the conveyor 60 moving toward the left viewing Figure 1 to deliver sheets from the press. The sheets normally rest upon the belts 62 and are conveyed away from the press thereby, the belts 60 serving to insure that the sheets do not fly up during movement. The structure of the conveyors and the means for operating them form no part of the present invention. Such structure and means are shown in my Patent No. 2,309,671 and my copending application Serial No. 394,319.

As above explained, the frame 36 is pivoted to the delivery by the shaft 35, the frame being fixed to the shaft 35 which is free to turn in its bearings in the delivery. Also fixed to the shaft 35 and extending toward the left therefrom viewing Figure 1 is an arm 65. Pivoted to the arm 65 at 66 is a link 67 which extends generally downwardly and is at its lower end pivotally connected at 68 to a lever 69 having a fulcrum 70 in the delivery and the opposite end of which carries a cam following roller 71. The press frame extension 6 carries an inclined cam 73 the upper active surface of which extends upwardly and toward the left viewing Figure 1.

In Figure 1 the delivery is shown in operative position. When it is desired to move the delivery to inoperative position away from the press the motor 25 is energized to turn the screws 16 and 18 in a direction which will result in movement of the delivery toward the left viewing Figure 1. The entire delivery including the frame 36 will move rectilinearly toward the left for a substantial distance while the frame remains in fixed position relatively to the body of the delivery. Such movement will continue until the delivery reaches the position in which the follower 71 engages the cam 73. Further movement of the delivery toward the left is accompanied by riding of the follower 71 up the inclined cam 73 and consequent turning of the lever 69 about its fulcrum 70 in the clockwise direction viewing Figure 1. This results in pulling the link 67 downwardly and the link in turn through the arm 65 causes the frame 36 to pivot in the counter-clockwise direction about the axis of the shaft 35. Thus as the delivery moves toward the left the frame 36 is automatically pivotally raised in the counter-clockwise direction viewing Figure 1 about the axis of the shaft 35. When the follower 71 reaches approximately the top of the cam 73 the frame 36 will have reached its extreme upper position and the delivery will have reached its extreme position away from the press, at which time the motor 25 will preferably be stopped by means presently to be described.

When the motor is operated in the opposite direction the delivery is moved toward the right, which movement is accompanied by riding of the follower 71 down the inclined cam 73 and consequent swinging of the frame 36 generally in the clockwise direction about the axis of the shaft 35 viewing Figure 1 to the position shown in that figure. Continued movement of the delivery toward the press is unaccompanied by any relative movement between the delivery body and the frame 36 and the entire delivery moves rectilinearly into operative position relatively to the press.

Mounted in the delivery for pivotal movement about a transversely extending pivot 74 is a lever 75. Pivoted to the lever 75 at its lower end at 76 is a link 77 having a hook-shaped end 78. The press driving gear is shown diagrammatically in Figure 1 at 79. Through gearing (not shown) it drives a gear 83 fixed to a shaft 84. Also fixed to the shaft 84 is a crank 85 to which is pivoted at 86 a connecting rod 87. The opposite end of the connecting rod 87 is carried by a reciprocable crosshead having a crosshead pin 88 preferably carrying an anti-friction roller as shown. The hook 78 is adapted to hook over the crosshead pin 88. When the parts are thus engaged operation of the press which is accompanied by reciprocation of the crosshead pin 88 is also accompanied by oscillation of the lever 75.

Mounted in the delivery frame is a shaft 89 having fixed thereto a manually operable control handle 90 which is positioned outside the frame.

Also fixed to the shaft 89 inside the frame is a pinion 91. Mounted in the delivery frame is a shaft 92 to which is fixed a gear segment 93 meshing with the pinion 91. Thus turning of the handle 90 causes through the pinion 91 and the segment 93 turning of the shaft 92 through a limited angle.

Fixed to the shaft 92 is an arm 94. Pivoted to the arm 94 at 95 is a link 96 having a elongated slot 97 in its opposite end. A stub shaft 98 is mounted in the delivery and has a bell crank lever 99 turnably mounted thereon. The bell crank lever has a generally downwardly extending arm 100 having at its extremity a pin 101 which enters the elongated slot 97 in the link 96. The bell crank lever 99 also has a generally laterally extending arm 102 to which is pivoted at 103 a generally downwardly extending rod 104 which in turn is pivoted to the link 77 at 105.

When the press and delivery are operating the crosshead pin 88 lies within the hook 78, as shown in Figure 1. When the delivery is to be moved away from the press the handle 90 is turned two revolutions in the counter-clockwise direction, viewing Figure 1. This, through the pinion 91 and the segment 93, causes rotation of the shaft 92 through a limited angle in the clockwise direction, viewing Figure 1. Such rotation of the shaft 92 pushes the link 96 toward the right against the pin 101 in the arm 100 of the bell crank lever 99 and turns such lever in the counter-clockwise direction about its axis 98. This lifts the rod 104, which raises the link 77 about its pivot 76 and disconnects the hook 78 from the crosshead pin 88. In this manner the delivery drive is disconnected from the press so that the delivery can be moved away from the press.

When the delivery is to be moved back into cooperative relationship with respect to the press the handle 90 is first returned to the position shown in Figure 1. This lowers the link 77 to approximately the orientation shown in Figure 1 but as thus lowered the hook 78 is not engaged over the crosshead pin 88. Upon movement of the delivery toward the press the inclined nose surface 106 of the link 77 rides up on the crosshead pin 88, thus raising the right-hand end of the link 77 about its pivot 76. As the delivery continues movement toward the press the right-hand end of the link 77 is progressively raised until the hook 78 finally drops down over the crosshead pin 88. This movement of the link 77 is permitted by reason of the provision of the elongated slot 97 in the link 96, for when the right-hand end of the link 77 is raised by engagement of the inclined nose surface 106 with the crosshead pin 88 this pushes up the rod 104 and turns the bell crank lever 99 to a limited extent in the counter-clockwise direction, during which movement the pin 101 simply slides freely in the slot 97. Also during operation of the mechanism when the crosshead pin 88 oscillates back and forth carrying the link 77 with it such oscillation is accompanied by slight up and down movement of the rod 104, which is permitted by the slot 97 which allows the pin 101 to ride freely therein during such movement.

Fixed to the shaft 92 is an eccentric 107. Surrounding the eccentric 107 is an eccentric strap 108 forming one end of an arm 109 having an upwardly facing hook 110 at its opposite end. Mounted in the delivery frame is a stationary fulcrum pin 111. The arm 109 has a lateral projection 112 which underlies the fulcrum pin 111. The arm 109 is normally urged upwardly by a coil spring 113 connected to the arm at 114 and to the delivery frame at 115. The press has a latch plate 116 with which the hook 110 is adapted to cooperate to mechanically latch the delivery to the press during operation.

As the parts are shown in Figure 1 the center of the eccentric 107 is generally to the left of the center of the shaft 92. As explained above in connection with the delivery driving mechanism, when the delivery is to be moved away from the press the handle 90 is turned through two revolutions in the counter-clockwise direction viewing Figure 1 and this turning of the handle is accompanied by rotation of the shaft 92 to a limited extent in the clockwise direction. Such clockwise turning of the shaft 92 swings the eccentric upwardly and toward the right viewing Figure 1. But since the fulcrum pin 111 is stationary such swinging of the eccentric causes the arm 109 to pivot about the fulcrum pin 111 and the hook or latch 110 moves downwardly and disengages from the latch plate 116 on the press. This severs the mechanical connection between the delivery and press and frees the delivery for movement away from the press.

When the delivery is away from the press and ready to be moved back toward the press the handle 90, eccentric 107 and arm 109 are moved to the position shown in Figure 1. As the delivery approaches the press the inclined forward surface 117 of the hook 110 rides down on the latch plate 116. For reasons presently to be explained the delivery ordinarily stops a fraction of an inch away from the press so that it does not move quite far enough for the arm 109 to swing back up under the action of the spring 113 to engage the latch 110 over the latch plate 116 as shown in Figure 1. When the parts are thus positioned the handle 90 is turned in the counter-clockwise direction somewhat less than two complete revolutions. This, as above explained, is accompanied by turning of the shaft 92 and movement of the center of the eccentric 107 generally upwardly and toward the right viewing Figure 1. But the lateral component of such movement moves the arm 109 as a whole to the right sufficiently for the latch 110 to clear the plate 116 and when this has occurred the spring 113 pulls up the latch into latching engagement with the plate 116. The handle 90 is then turned back in the clockwise direction to the position shown in Figure 1, which swings the eccentric 107 downwardly and toward the left. This tends to move the arm 109 to the left, but since the opposite end of the arm is firmly hooked or latched to the press the result is that during such clockwise turning of the handle 90 the delivery is by the arm 109 through the eccentric 107 drawn up firmly and tightly against the press.

While only a single arm 109 and associated mechanism have been described above I prefer to employ two such arms, one adjacent each side of the delivery, the two arms being identical and operating synchronously. This causes the delivery and press to be drawn together firmly adjacent both side frames.

It has been explained above that operation of the motor 25 in one direction or the other causes rotation of the screws 16 and 18 to move the delivery toward or from the press. The motor circuit is controlled by four switches, one for closing the circuit to start the motor in one direction to move the delivery out, a second for opening such circuit to stop outward movement of the delivery,

a third for closing the circuit to start the motor in the reverse direction to move the delivery in, and a fourth for opening such circuit to stop inward movement of the delivery. The delivery being in the out position, the handle 90 is turned in the clockwise direction to the position of Figure 1. Fixed to the shaft 92 is a pair of switch operating arms 118 and 119. When the handle 90 is moved as above described the arm 118 operates a switch 120 which closes the motor circuit to operate the motor in the direction to cause the delivery to move inwardly toward the press. The switch 120 is mounted on the frame of the delivery adjacent the shaft 92 and in position to be operated by the arm 118 upon movement of the handle 90 as just explained. The delivery continues its inward movement until a switch operating member 121 on the press operates a switch 122 on the delivery which opens said motor circuit and stops inward movement of the delivery toward the press. The switch 122 and switch operating member 121 are so positioned that the switch 122 is operated to stop the delivery a fraction of an inch before it reaches its fully operative position adjacent the press as above explained. Thereafter manipulation of the handle 90 as above explained draws the delivery up tight against the press.

When the delivery is to be moved out away from the press the handle 90 is turned two revolutions in the counterclockwise direction viewing Figure 1. This causes the switch operating arm 119 to swing upwardly and operate a switch 123 carried by the delivery adjacent the shaft 92 to close the circuit which operates the motor in the direction opposite that in which the delivery is moved in toward the press. Consequently the delivery moves outwardly away from the press. This movement, as above explained, is accompanied by downward movement of the link 67. Such link carries a switch operating arm 124, which when the delivery has reached its full outward position operates a switch 125 carried by the delivery adjacent the link 67. Operation of the switch 125 opens the circuit and the delivery stops.

The handle 90 controls the motor for moving the delivery, the driving connection between the delivery and press and the mechanical connection or latch for holding the delivery in place against the press. When the delivery is in, as shown in Figure 1, turning of the handle 90 through two revolutions in the counter-clockwise direction releases the latch 110, disconnects the driving connection 78 and finally initiates operation of the motor to move the delivery out. The handle 90 also initiates operation of the motor to move the delivery in and positions the arm 109 and the link 77 to adapt them to cooperate with the press when the delivery moves in. The delivery automatically stops a fraction of an inch short of its ultimate position and again the same handle 90 simply by being turned somewhat less than two revolutions first in the counterclockwise direction from the position shown in Figure 1 and then back in the clockwise direction to that same position causes the hook 110 to draw the delivery firmly up against the press, this operation being accompanied by dropping of the hook 78 over the crosshead pin 88 to render the delivery operable from the press drive. Thus a minimum of manual effort is needed to move the delivery toward and from the press. This subject matter is claimed in my copending application Serial No. 386,651.

The lever 75 carries at its upper end a gear segment 126 which meshes with a pinion 127 fixed to a shaft 128. Also fixed to the shaft 128 is a gear 129 and another gear 130. The gear 130 meshes with a pinion 131 fixed to a shaft 132. Also fixed to the shaft 132 is a pair of sprockets 133, one adjacent each side frame. Carried by each of the side frames of the delivery is a stud 134. Each stud 134 carries interiorly of the side frame with which it is connected a sprocket 135. Each sprocket 135 is in alignment with one of the sprockets 133. A sprocket chain 136 at each side of the delivery meshes with one of the sprockets 133 and the aligned sprocket 135. Each of the sprocket chains 136 passes over idler sprockets 137, one or both of which may be adjusted for tensioning the chain.

Each of the sprocket chains 136 has one or more special links, the special links in the respective chains being positioned opposite each other. Each of such special links has connected thereto a bracket, the opposed brackets being connected by cross members to form a carriage 222 oscillatable in the horizontal direction viewing Figure 1. The structure of the carriage and the means for supporting and guiding it form no part of the present invention and are not shown and described in detail. The oscillatory movement of the segment 126 is transferred through the gear 127, the shaft 128, the gear 130, the pinion 131, the shaft 132 and the sprockets 133 to the sprocket chains 136 and thence to the carriage itself. Thus during operation of the mechanism the reciprocable delivery carriage moves back and forth longitudinally of the delivery and toward and from the press. The carriage carries sheet handling means including tapes 144 cooperating with the tapes 60 and 62 to receive and deliver sheets, but since such means form no part of the present invention they will not be described in detail. Suffice it to say that the reciprocable delivery carriage ordinarily receives a sheet from the tapes 60 and 62 upon each reciprocation thereof and delivers the same to the delivery pile.

Meshing with the gear 129 is a segment 145 fixed to a sleeve 146. The sleeve 146 is journaled for angular oscillation upon a shaft 147. The sleeve 146 passes through the delivery side frame as shown in Figure 3 and carries at its outer end an arm 148. Since the segment 145 and the arm 148 are both fixed to the sleeve 146 they are to all intents and purposes unitary. The arm 148 carries a pawl 149 projecting laterally therefrom and engaging a ratchet 150 fixed to the shaft 147. The pawl is normally resiliently urged into engagement with the ratchet 150 by a coil spring 151. Upon oscillation of the segment 145 the pawl 149 advances the ratchet 150 and, consequently, the shaft 147 to which it is fixed, step by step. Means forming no part of the present invention are provided for adjusting the arc through which the pawl moves the ratchet upon each oscillation of the segment 145.

Fixed to the shaft 147 is a pinion 152. Such pinion meshes with a gear 153 which, in turn, meshes with a gear 154 fixed to a shaft 155. Also fixed to the shaft 155 is a bevel gear 156 meshing with a bevel pinion 157 fixed to a shaft 158 carrying a worm 159 meshing with a worm wheel 160. The worm wheel 160 is mounted loosely for rotation upon a shaft 161. Integral with the worm wheel 160 is a ratchet 200. Fixed

to the shaft 161 is an arm 201 which pivotally carries at 202 a pawl 203 engaging the teeth of the ratchet 200. The pawl 203 is urged into engagement with the ratchet 200 by a compression coil spring 204. Also fixed to the shaft 161 is a pair of drums 162, one adjacent each side frame. A pair of cables is adapted to be wound up on and paid out by each of said drums 162. One of said cables 163 passes over a sheave 164 and thence downwardly to the pile support 165. The other 166 of said cables passes over a pair of sheaves 167 and 168 and thence downwardly to the pile support 165.

The weight of the pile of sheets upon the pile support 165 causes such support due to gravity to strain the cables 166 so as to tend to turn the shaft 161 in the clockwise direction viewing Figure 5. But since the arm 201 is fixed to the shaft 161 the pawl 203 carried by such arm and engaging the ratchet 200 prevents the shaft 161 from turning unless the ratchet 200 turns also. Oscillation of the lever 75 and the mechanism above described causes the ratchet 200 to turn periodically in the clockwise direction viewing Figure 5. This allows the shaft 161 to turn with a step-by-step movement in the clockwise direction viewing Figure 5 whereby to lower the pile support. In other words the ratchet 200 gives way step-by-step before the pawl 203 which is fixed to the shaft 161 through the arm 201 and this results in gradual lowering of the pile support as sheets are delivery to the pile during operation of the delivery apparatus.

The gearing above described for lowering the pile support is enclosed within a casing 205 applied to the outside of the side frame of the delivery. The shaft 161 extends through the casing 205 and has a reduced extremity 206 provided with a pin 207. A handle is adapted to be applied over the reduced extremity 206 and engage with the pin 207 to turn the shaft 161 in the counter-clockwise direction viewing Figure 5, whereby manually to raise the pile support 165. When the pile support is thus raised the pawl 203 simply passes over the teeth of the ratchet 200 so that the position of such ratchet and the worm wheel 160 integral therewith is not disturbed.

Fixed to the shaft 128 is a cam 169. Journaled in the delivery frame is a shaft 170 on which is loosely mounted for rotation an arm 171 carrying at its extremity a roller 172 adapted to lie against and follow the cam 169. The arm 171 is urged down toward the position in which the roller 172 engages the cam 169 by a tension coil spring 208 acting between the arm 171 and a pin 209 carried by the delivery frame. Fixed to the shaft 170 at each side of the delivery is a generally upwardly extending arm 173. Fixed to the shaft 170 is an arm 210 having a laterally projecting pin 211. The pin 211 is adapted to lie against a generally upwardly projecting finger 212 integral with the arm 171 which, as above stated, is loose on the shaft 170. A compression coil spring 213 surrounds a guide rod 214 connected with a hub 215 pivoted to the arm 171 and passing through an opening 216 near the upper end of the arm 210. The spring 213 bears between the arm 210 and the hub 215, thereby urging the pin 211 into contact with the finger 212.

A jogger operating rod 174 is pivoted to each of the arms 173 at 217 and is adapted to be oscillatorily moved thereby in a direction generally longitudinally of the delivery upon oscillation of the shaft 170. Fixed to the shaft 170 is a generally horizontally extending arm 175. Such arm underlies an eccentric turnable cam-like stop member 176 fixed to a shaft 177 passing through the delivery side frame and having a control arm 178 fixed thereto and disposed outside the side frame. The position of the stop member 176 is determined by the position of the control arm 178 which may be moved to any one of a plurality of adjusted positions and maintained therein by means of a spring pin 179 in the arm 178 which may enter any one of a plurality of arcuately arranged openings 180 in a plate 181 fastened to the outside of the side frame. The stop member 176 determines the extent to which the shaft 170 may turn in the clockwise direction viewing Figure 7.

Rigidly connected with the jogger operating rods 174 are rear jogger carriers 182 carrying rear joggers 183. Each of the rods 174 is pivoted at 184 to a bell crank lever 185 pivoted to the frame at 186 and having an arm 187 operating a transversely slidable rod 188. The respective rods 188 at opposite sides of the delivery move always in opposite directions, that is, both of such rods at any given time move inwardly or outwardly. Each rod 188 has fixed thereto a bracket 218 carrying a rearwardly extending rod 219 carrying side joggers 189 and the rear end of which rests upon a transverse member 220 and has a downturned extremity 221 positioned rearwardly of the member 220. The delivery pile 190 is guided at its outer edge by stationary guides 191 and is adapted to be jogged in the usual manner by the rear joggers 183 and the side joggers 189.

The cam 169 oscillates continuously during operation of the mechanism. When the roller 172 rides up on the high part of the cam 169 the arm 171 is swung in the counterclockwise direction, viewing Figure 7, and the spring 213 moves the arm 210, and with it the shaft 170 to which the arm 210 is fixed, in the counter-clockwise direction, thus moving the jogger operating rods to the left and moving all of the joggers inwardly toward the pile. When the joggers strike the edges of the pile they are arrested thereby and movement toward the left of the rods 174 stops. This is true even if the roller 172 has not yet reached the highest point of the cam 169 as the spring and pin connection between the lever 171 and the arm 210 permits further swinging of the arm 171 without an accompanying turning of the shaft 170. When the roller 172 rides down onto the low part of the cam 169 the spring 208 pulls the arm 171 downwardly or in the clockwise direction about the axis of the shaft 170, viewing Figure 1, and thus, through the engagement of the finger 212 against the pin 211, turns the shaft 170 in the clockwise direction and pulls the joggers outwardly away from the pile. This outward movement of the joggers continues as long as the shaft 170 continues to turn. The extent to which such shaft may turn in the clockwise direction is determined by the position of the stop member 176. Thus the stop member 176, which is controlled by the arm 178, controls the amplitude of oscillation of the joggers. If it is desired that the amplitude of oscillation of the joggers be less than the maximum amplitude provided for by the design of the cam 169 the control arm 178 is shifted to a position to swing the stop member 176 downwardly. When the shaft 170 turns in the clockwise direction in response to the action of the spring 208 during the time the roller 172 is riding from the high point to the low point of the cam 169, such turn-

ing will be interrupted when the arm 175 strikes the stop member 176. But since the arm 210 is fixed to the shaft 170 the pin 211 will prevent the arm 171 from following the cam 169 down to its lowest point, and the roller 172 will stop in mid air until it is engaged by the cam 169 upon the subsequent turning movement thereof in the clockwise direction, viewing Figure 7.

Through the mechanism above described oscillation of the lever 75 carrying the segment 126 operates the joggers while provision is made for adjustment of the amplitude of oscillation of the joggers by a rapidly shiftable control member on the outside of the delivery frame. The joggers are operated through an oscillatory cam and the means for controlling the amplitude of oscillation of the joggers predetermines the portion of the normally effective surface of the cam which operates to move the joggers. The joggers are resiliently urged both toward and from the pile so that they will yield to any obstruction encountered in movement in either direction without damage thereto.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the same is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, spring means for urging the joggers toward the pile, means including an oscillatable cam for retracting the joggers away from the pile and means for changing the amplitude of said retraction.

2. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, a jogger retracting member, spring means urging said member in a jogger retracting movement, means periodically moving said member in the opposite direction against the action of said spring means and adjustable means limiting the jogger retracting movement of said member.

3. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, a jogger retracting member, spring means urging said member in a jogger retracting movement, means periodically moving said member in the opposite direction against the action of said spring means and an adjustable eccentric stop member limiting the jogger retracting movement of said jogger retracting member.

4. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, a jogger retracting arm, spring means urging said arm in a jogger retracting movement, an oscillatable cam periodically moving said arm in the opposite direction against the action of said spring means, an adjustable stop member limiting the jogger retracting movement of said arm and rapidly shiftable means for adjusting said stop member.

5. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, spring means urging the joggers toward the pile, a jogger retracting arm, other spring means urging said arm in a jogger retracting movement, means periodically moving said arm in the opposite direction against the action of said second mentioned spring means to permit said first mentioned spring means to move the joggers toward the pile and adjustable stop means limiting the jogger retracting movement of said arm.

6. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, an arm connected with the joggers, spring means urging said arm to move the joggers toward the pile, means for moving said arm against the action of said spring means to retract the joggers and adjustable means limiting the extent of operation of said last mentioned means.

7. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, a jogger retracting member, means including a rotary cam for oscillating said member, said member having a follower following said cam and means determining the amplitude of the retracting movement of the joggers by limiting the arc of contact of said follower on said cam upon turning of the latter.

8. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, jogger operating means and means including a swingable arm and means for fixing the arm selectively in a plurality of adjusted positions determining the amplitude of movement of the joggers.

9. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, an oscillatable jogger operating cam, means connected with the joggers and having a follower riding on said cam whereby the joggers are moved and adjustable means determining the extent of contact between the follower and the cam and thereby controlling the amplitude of movement of the joggers.

10. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, means for moving the joggers toward the pile comprising relatively light spring means, and relatively strong spring means for retracting the joggers away from the pile, said first mentioned means including means periodically rendering inoperative the relatively strong spring means and thus permitting the first mentioned means to urge the joggers toward the pile.

11. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile and means including spring means for oscillating the joggers in both directions, said means also including an oscillatable cam for controlling operation of the spring means.

12. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, means for oscillating the joggers and means including a rapidly shiftable member, a series of stationary positioning portions adapted to maintain said member in a selected position when it is shifted thereto for changing the amplitude of oscillation of the joggers, and means on said member cooperating with said positioning portions.

13. Sheet delivery apparatus comprising a support for a pile of sheets, joggers for the pile, means including an oscillatable cam for oscillating the joggers and means separate from the cam operable during operation of the apparatus for changing the amplitude of oscillation of the joggers.

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