Aug. 5, 1958 L. MESTRE 2,846,220

SHEET FEEDER FOR PRINTING PRESS

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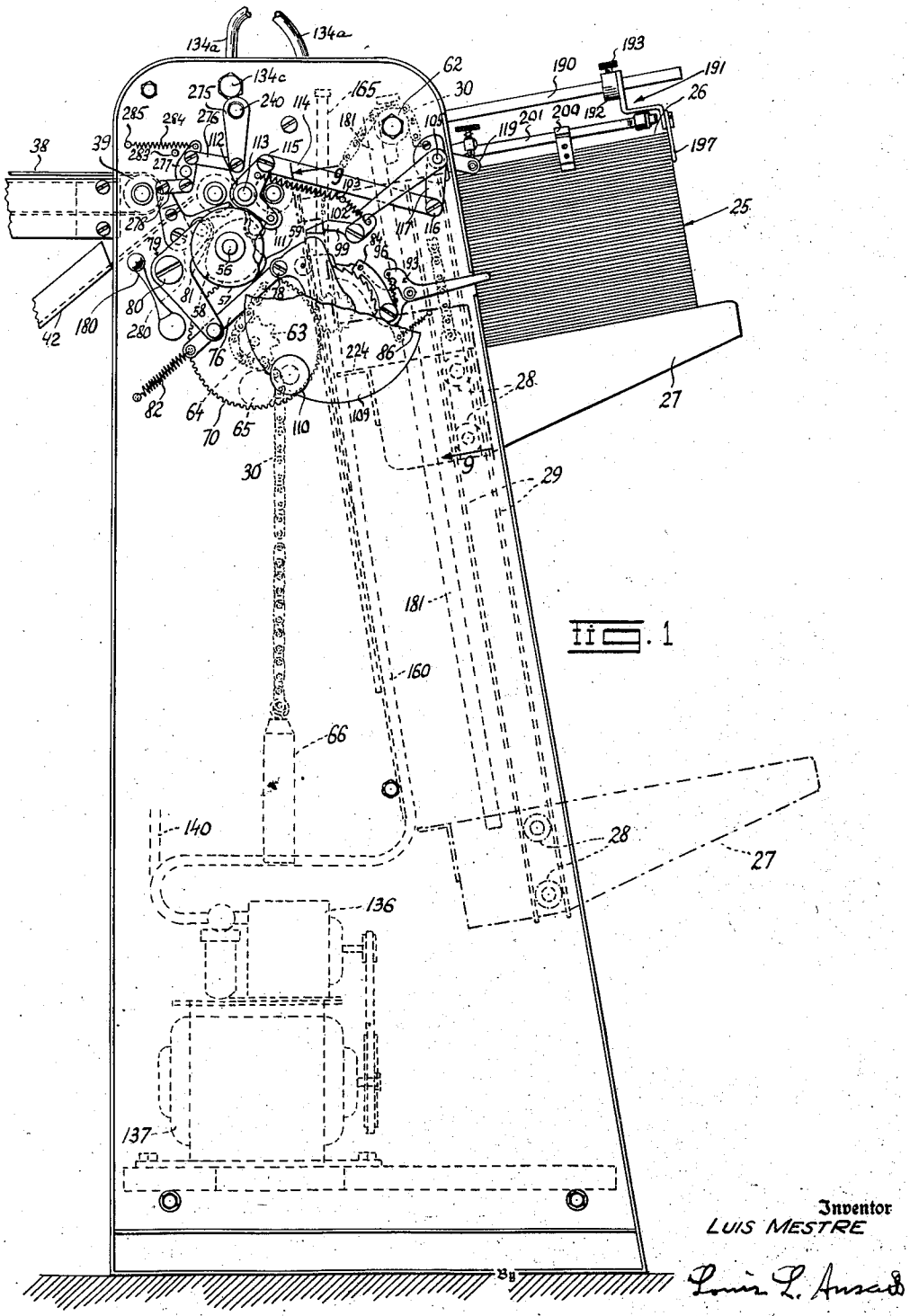


Fig. 1

Inventor
LUIS MESTRE

Louis L. Ansell
his Attorney

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SHEET FEEDER FOR PRINTING PRESS

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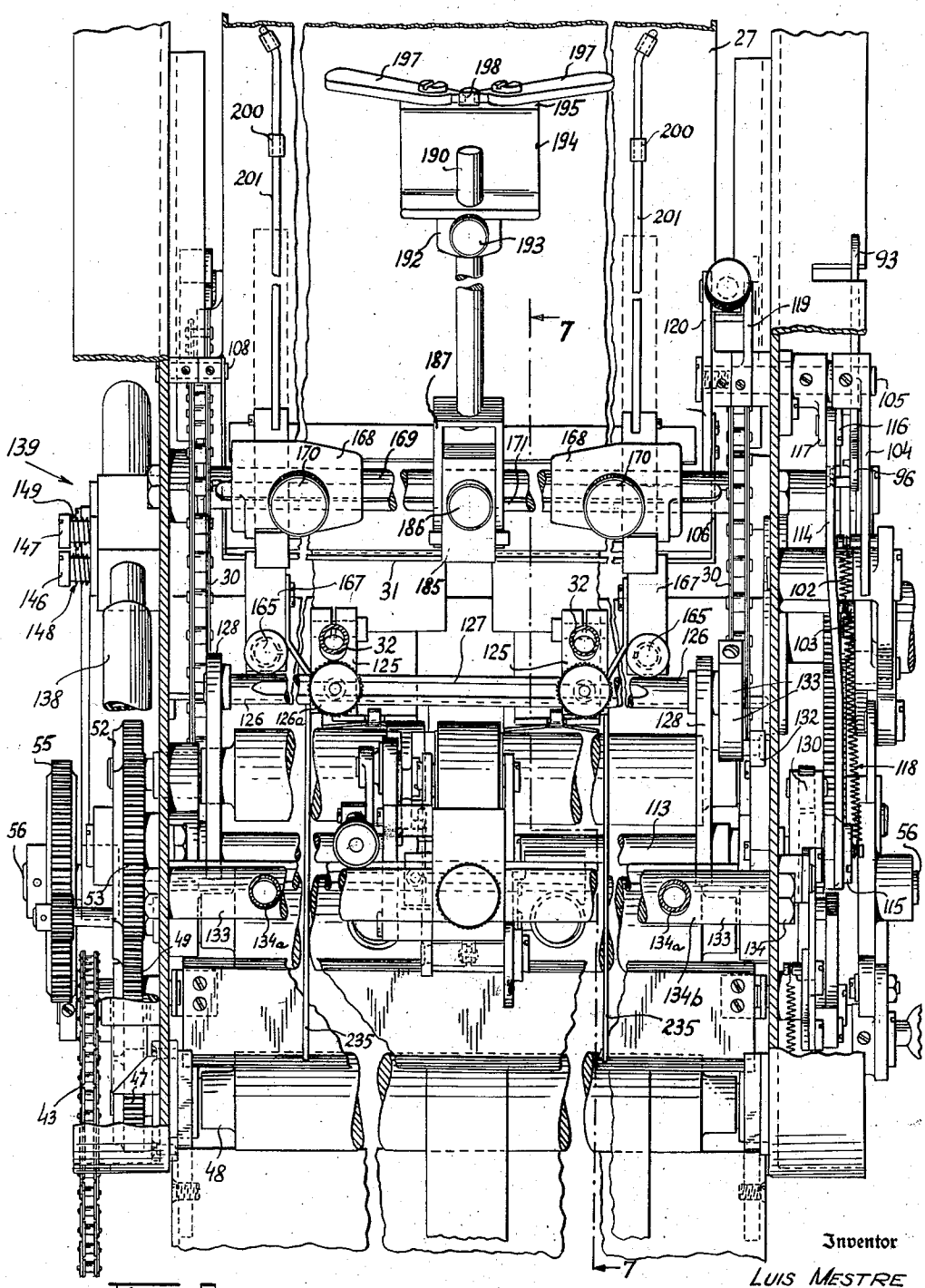


Fig. 2

Inventor
LUIS MESTRE

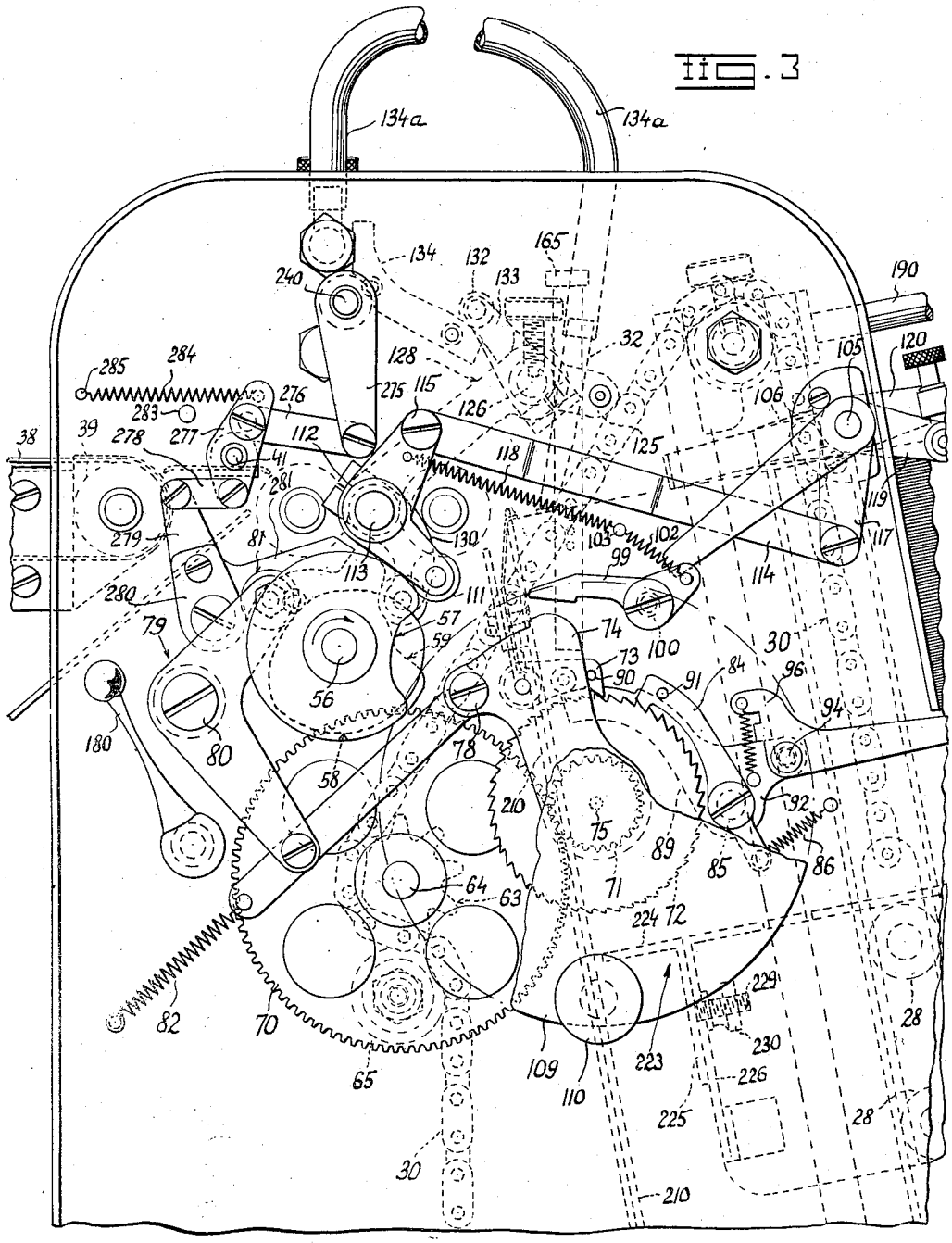
By Louis L. Arnaud
his Attorney

Aug. 5, 1958 L. MESTRE 2,846,220

SHEET FEEDER FOR PRINTING PRESS

Filed Oct. 12, 1953 10 Sheets-Sheet 3

Fig. 3



Inventor

LUIS MESTRE

By Louis L Amarc

his Attorney

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SHEET FEEDER FOR PRINTING PRESS

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Fig. 4

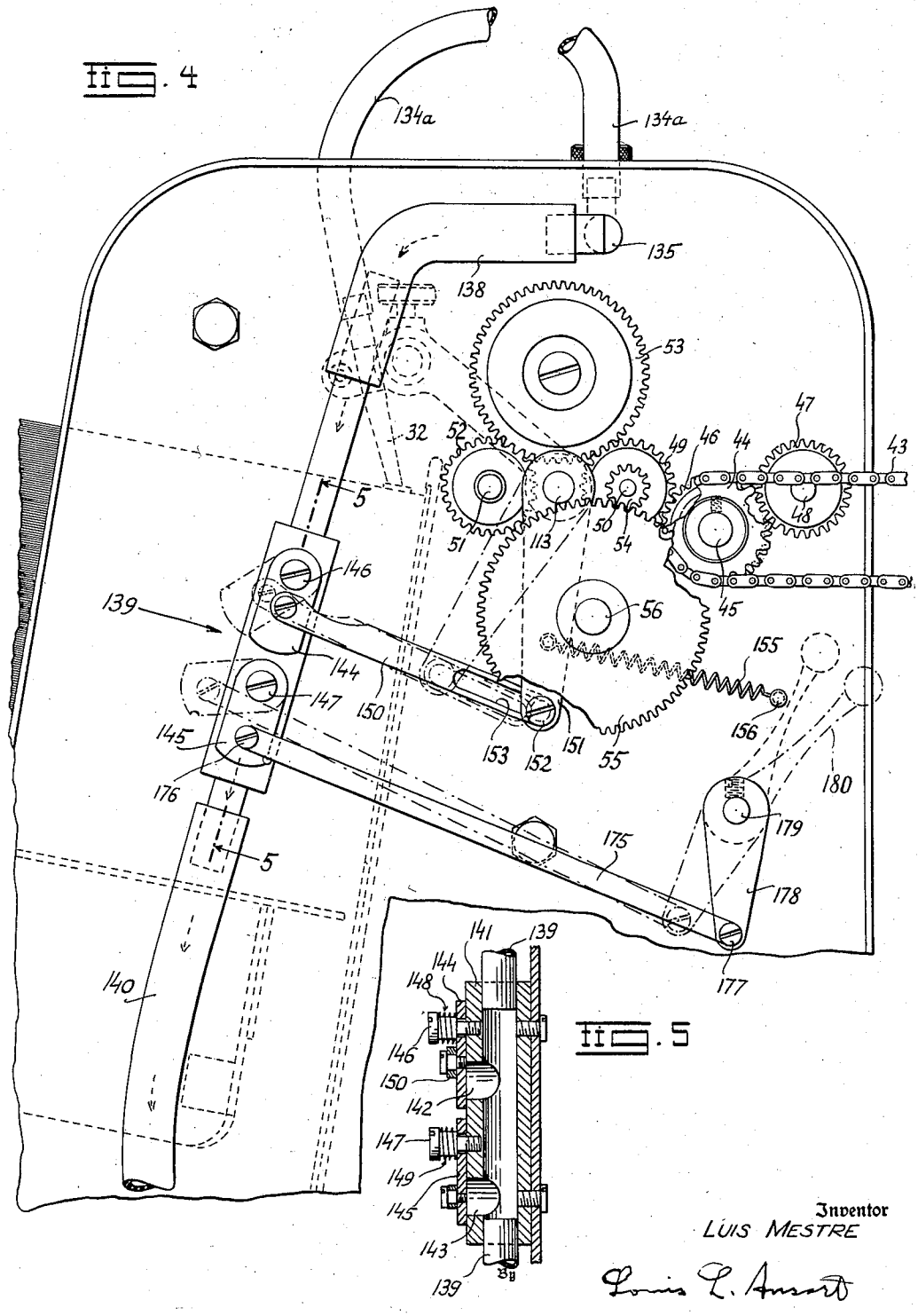


Fig. 5

Inventor
LUIS MESTRE

Louis L. Ansorg

his Attorney

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SHEET FEEDER FOR PRINTING PRESS

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Fig. 6

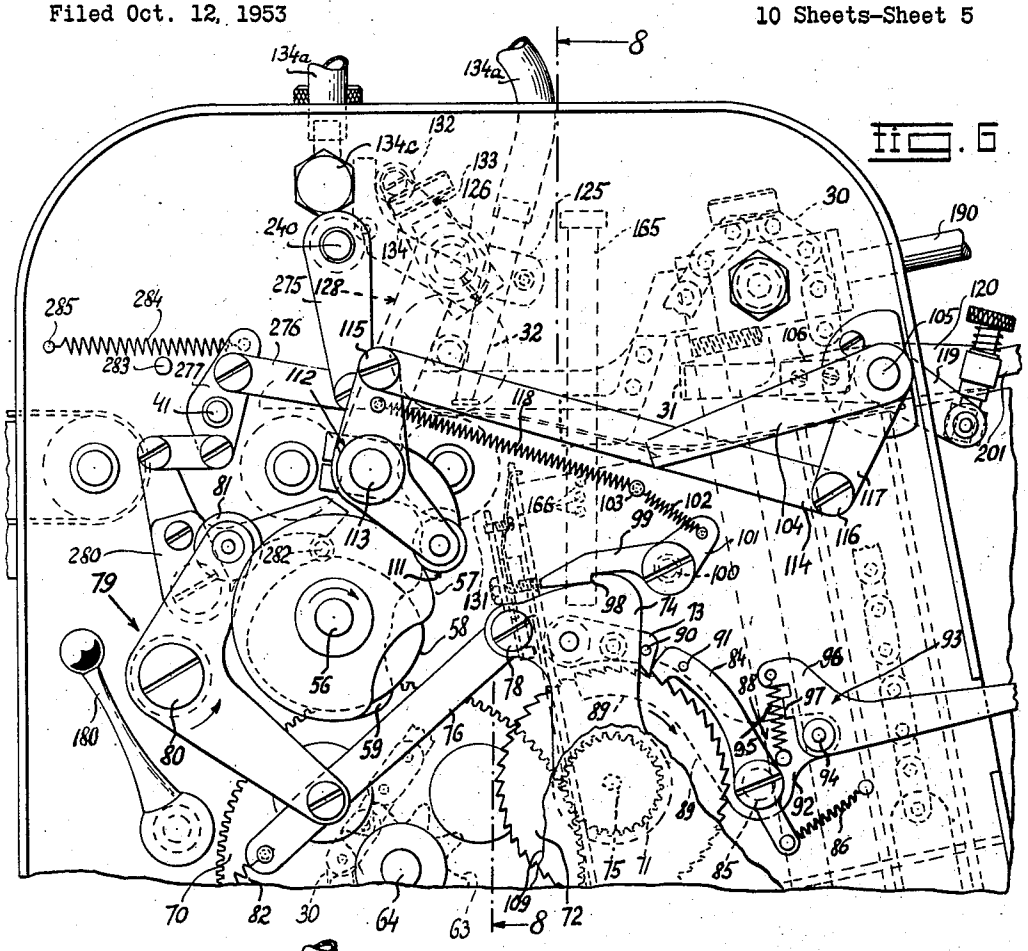
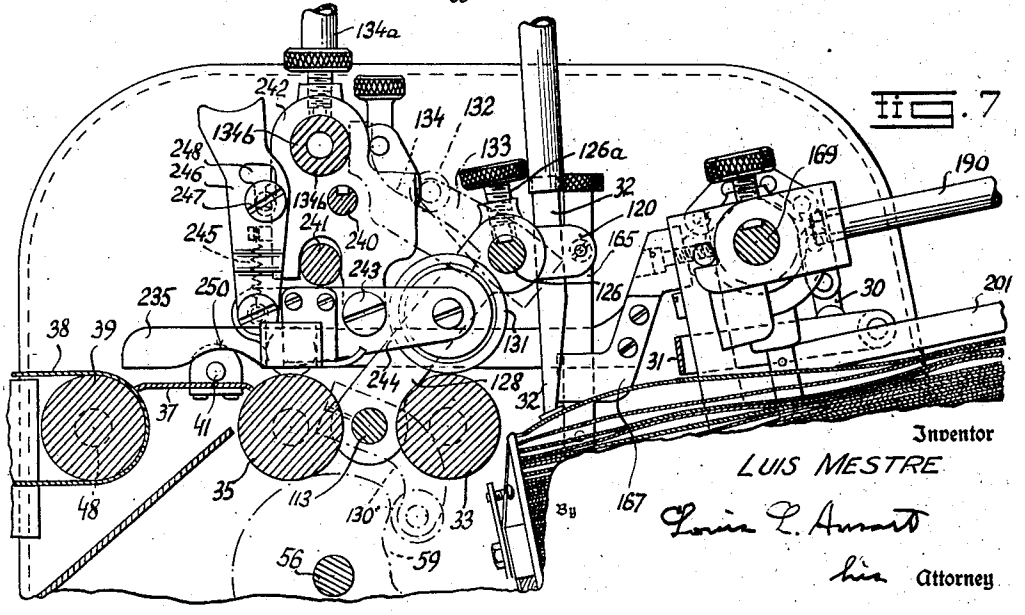


Fig. 7



Inventor

LUIS MESTRE

By Louis L. Arnaud

Attorney

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SHEET FEEDER FOR PRINTING PRESS

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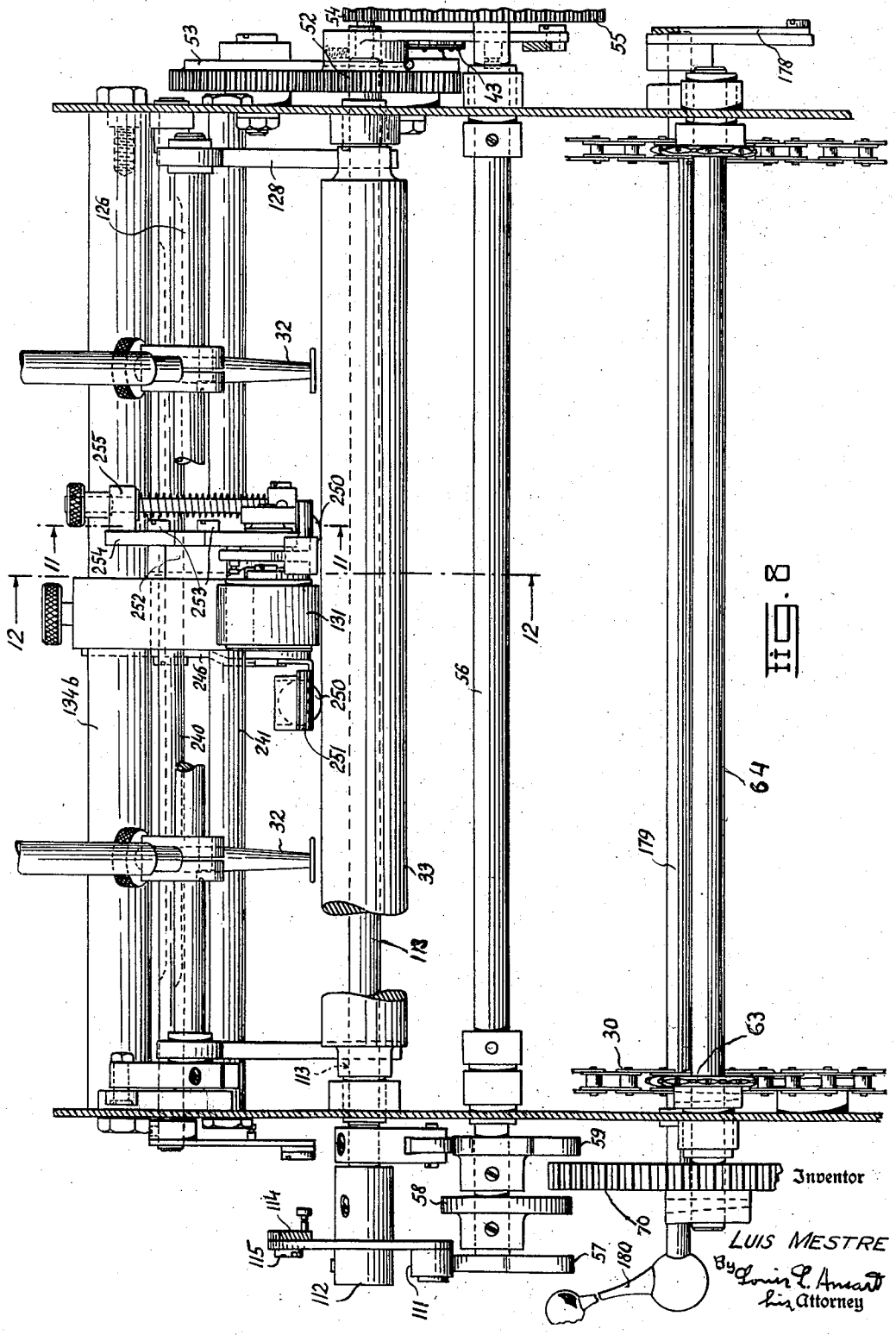


FIG. 8

Inventor
LUIS MESTRE
By Louis L. Amsatt
his Attorney

Aug. 5, 1958 L. MESTRE 2,846,220

SHEET FEEDER FOR PRINTING PRESS

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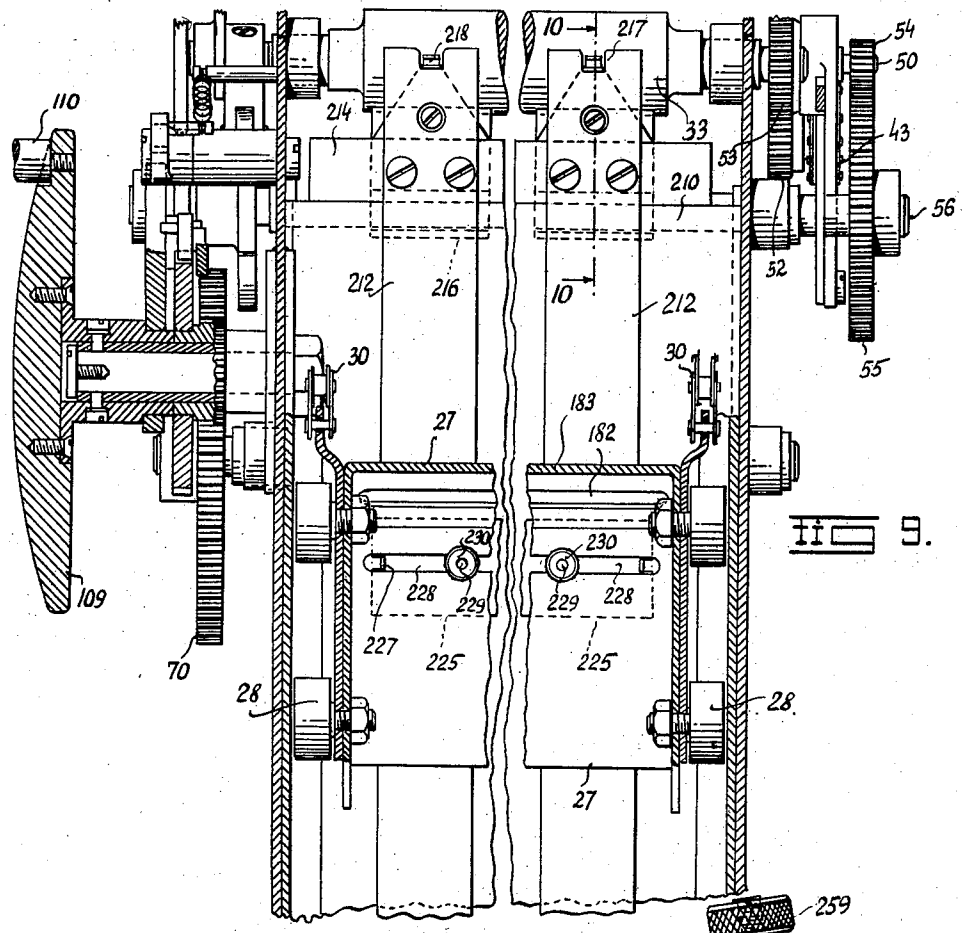


Fig. 9.

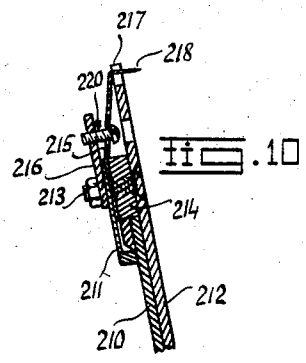


Fig. 10.

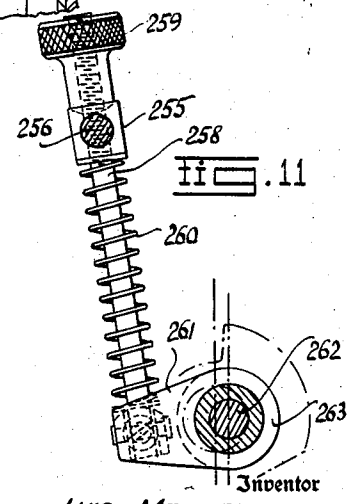


Fig. 11.

Inventor
LUIS MESTRE

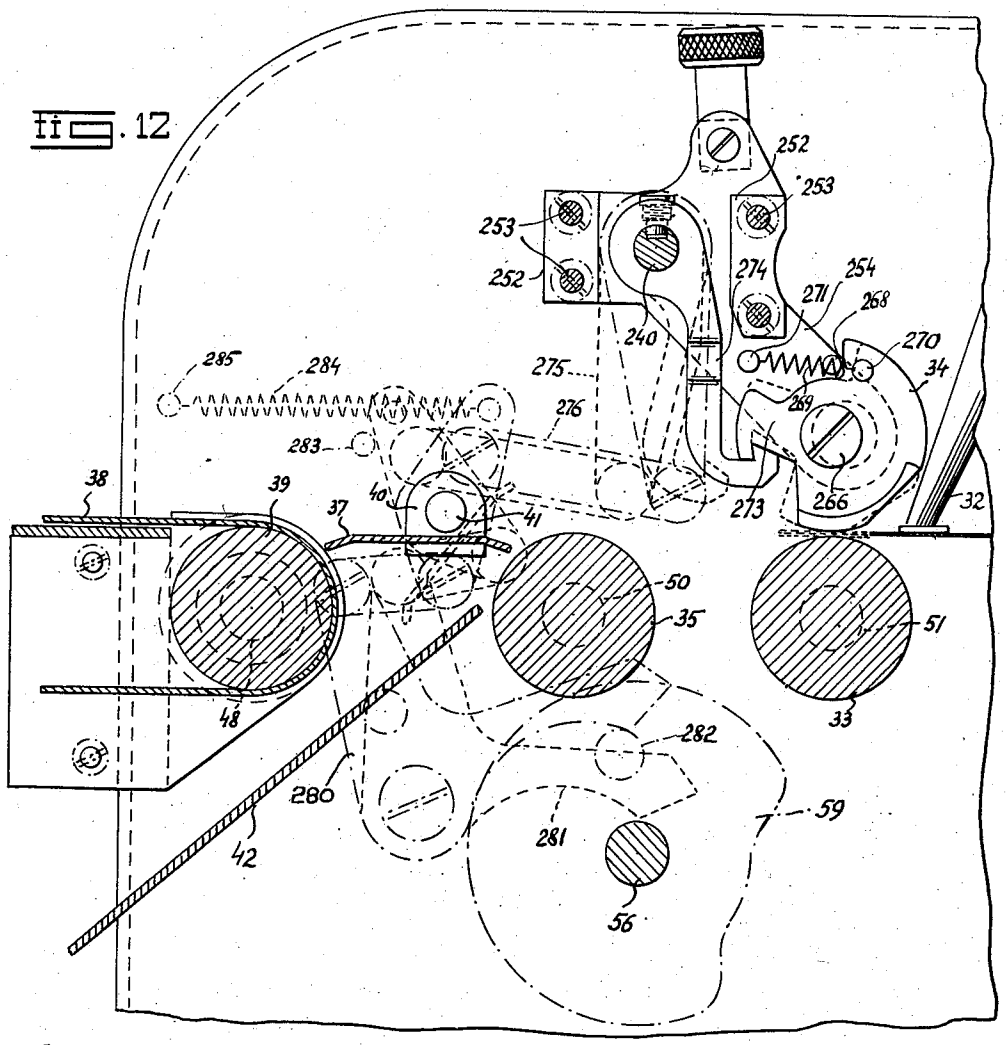
By Louis L. Amato
his Attorney

Aug. 5, 1958 L. MESTRE 2,846,220

SHEET FEEDER FOR PRINTING PRESS

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Fig. 12



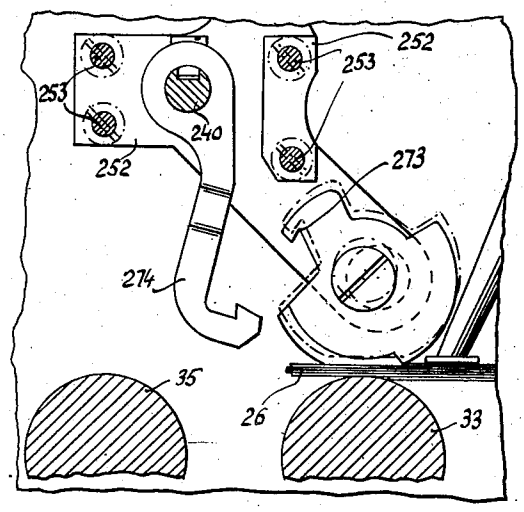


Fig. 13

Inventor
LUIS MESTRE
By Louis L. Amrand
his Attorney

Aug. 5, 1958 L. MESTRE 2,846,220

SHEET FEEDER FOR PRINTING PRESS

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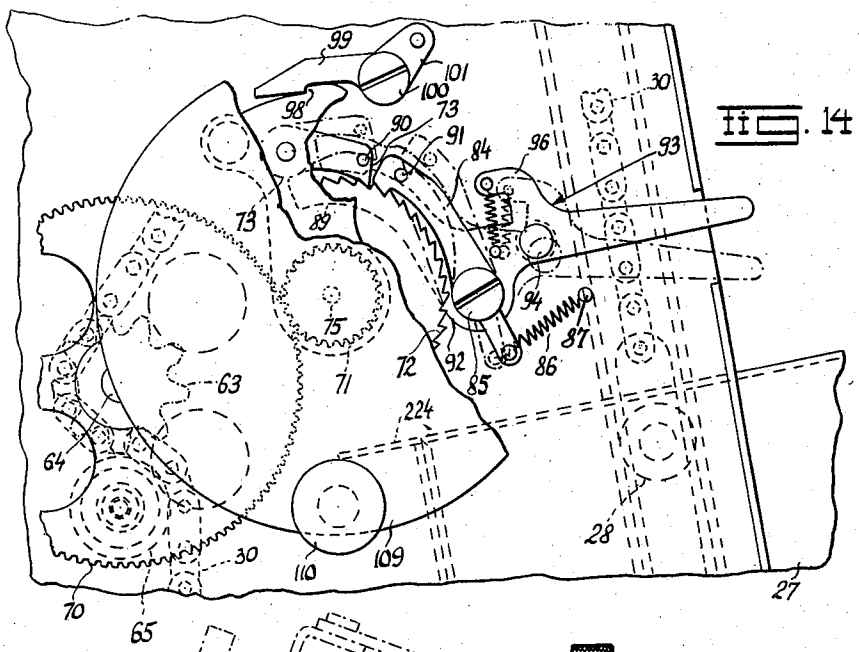


FIG. 14

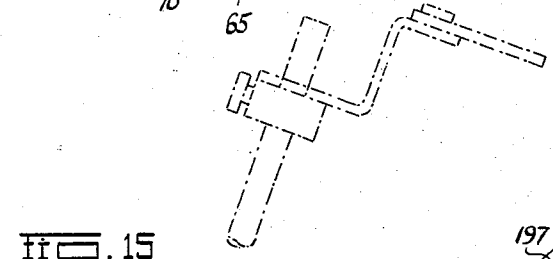


FIG. 15

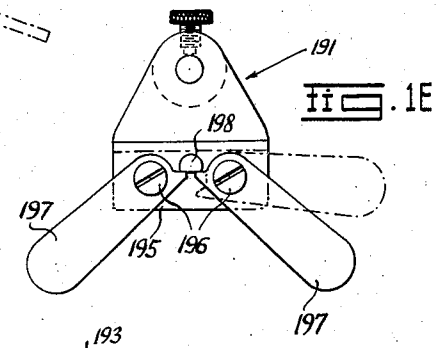
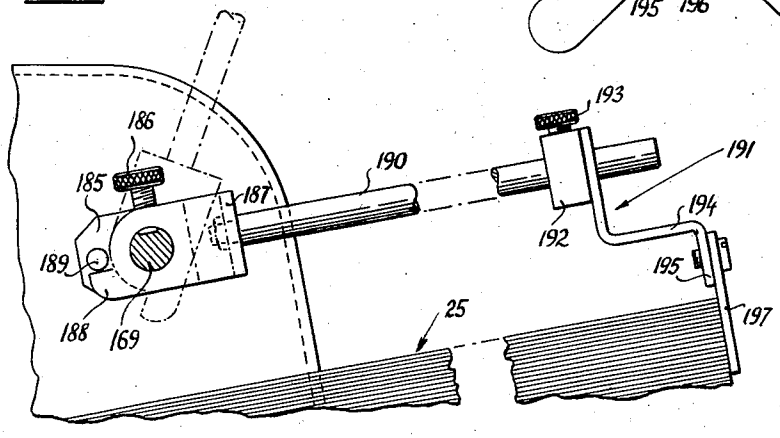


FIG. 16



Inventor
LUIS MESTRE
By Louis L. Arnaut
his Attorney

Aug. 5, 1958 L. MESTRE 2,846,220

SHEET FEEDER FOR PRINTING PRESS

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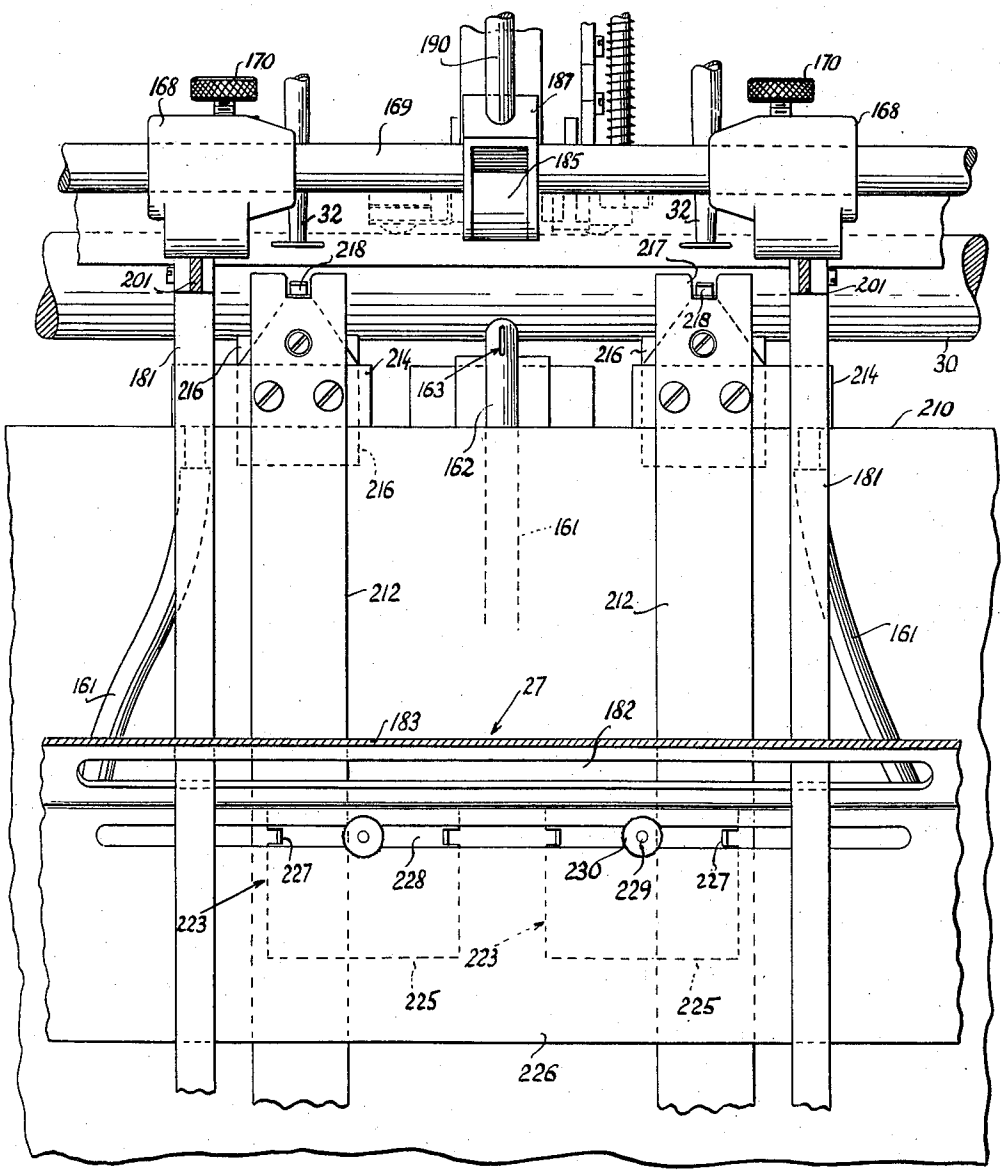


FIG. 17

INVENTOR.
LUIS MESTRE
BY Louis L. Ansaldo
his Attorney

United States Patent Office

2,846,220

Patented Aug. 5, 1958

2,846,220

SHEET FEEDER FOR PRINTING PRESS

Luis Mestre, New York, N. Y., assignor to Lewfor Development Corporation, New York, N. Y., a corporation of New York

Application October 12, 1953, Serial No. 385,430

9 Claims. (Cl. 271—31)

The present invention relates to a sheet feeder for a printing press and the principal object of the invention is to provide novel and advantageous means of the general character specified.

Another object is to provide novel and advantageous means for picking up sheets from a supply stack.

Another object of the invention is to provide novel and advantageous means for controlling the supply of sheets in a supply stack to a position for pick up by a pick-up device.

Another object of the invention is to provide novel and advantageous suction pick-up means.

Another object of the invention is to provide novel and advantageous air flow means to act on sheets at the top of the stack to facilitate pick up by suction pick-up means.

Another object of the invention is to provide novel and advantageous means for guiding the sheets of the stack during the upward movement of the stack.

Another object of the invention is to provide novel and advantageous means for separating the forward edge of the top sheet from the next lower sheet in the pick-up operation.

Another object of the invention is to provide novel and advantageous feeler means for controlling the operation of the stack feeding means.

Another object of the invention is to provide novel and advantageous means for raising a supply stack comprising a ratchet wheel, an actuating pawl, a pawl carrier for feeding an actuating pawl, a holding pawl for said ratchet and a pawl to cooperate with said pawl carrier and holding it against return movement at a position slightly back of its limiting operating position, means for releasing the pawl carrier when the top of the stack is below the proper level and cam means for operating the pawl carrier which are rendered ineffective by latching of the pawl in its forward position except for slight forward movement which relieves the pressure on the actuating pawl and on the holding pawl and enables easy release of the pawls at that time.

Another object of the invention is to provide novel and advantageous means for ejecting sheets when more than one sheet is carried forward at one time by the suction pick-up means.

Other objects, features and advantages will appear upon consideration of the following detailed description and of the drawings in which:

Fig. 1 is a front elevation of a machine constituting an embodiment of one form of the invention;

Fig. 2 is a top plan view of the machine illustrated in Fig. 1;

Fig. 3 is a view corresponding to the upper part of Fig. 1 but with additional parts shown in dotted lines;

Fig. 4 is a rear elevation of the parts of the machine illustrated in Fig. 3 with additional parts shown in dotted lines;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a view similar to Fig. 3 but with the parts in different positions;

Fig. 7 is a section taken along the line 7—7 of Fig. 2;

Fig. 8 is a section taken along the line 8—8 of Fig. 6;

Fig. 9 is a section taken along the line 9—9 of Fig. 1;

Fig. 10 is a section taken along the line 10—10 of Fig. 9;

Fig. 11 is a section taken along the line 11—11 of Fig. 8;

Fig. 12 is a section taken along the line 12—12 of Fig. 8;

Fig. 13 is a view illustrating parts of Fig. 12 shifted to other positions by the presentation of a plurality of sheets simultaneously;

Fig. 14 is a fragmentary view with parts broken away, illustrating on a larger scale the means for manually disengaging the holding pawl for the stack-lifting ratchet;

Fig. 15 is a view showing a device to engage the rear face of a stack of sheets on a carriage mounted for upward and downward movement;

Fig. 16 is a fragmentary view of the device of Fig. 15 as seen from the right; and

Fig. 17 is a view in elevation of the sheet-supply end of the machine.

Referring to the drawings, a stack 25 of sheets 26 of suitable material such as paper is placed on a carriage or elevator 27 which is provided at each side with two rollers 28 guided between parallel rails or guides 29. Said carriage 27 is raised intermittently by means including chains 30 at each side of said carriage extending upwardly from said elevator along the parallel rails 29. A feeler 31 (Fig. 7) moves down toward the top of the stack following each withdrawal of a topsheet or sheets. If the topsheet is above a predetermined level, there will be no upward feed of the carriage until one or more sheets are taken off the stack to enable the feeler to drop sufficiently to render the carriage feed effective.

Suction fingers 32 engage the top sheet of the stack at spaced points adjacent the edge of the sheet and with the aid of air jets pick up the topsheet 26 of the stack and place it on a feed roll 33 and beneath cooperative feeding means 131. At this same position (Fig. 12) is a rockable member 34 of a device which becomes operative if two or more sheets at a time are introduced to cause the ejection of such sheets from the machine after which said rockable member 34 is restored to normal position. From the feed roll 33 the sheet passes over a second feed roll 35 and beneath balls 250 Fig. 8, mounted for vertical movement and serving to assure friction drive of the sheet by feed roll 35. From the feed roll 35, the sheet normally passes over an ejector member 37 (Fig. 12) to the upper surface of a band or bands 38 of endless form passing around an adjacent roll 39 and a roll (not shown) of a machine such as an offset printing machine to which sheets are fed by the feeder of the present invention.

Said ejector member or plate 37 is supported at opposite ends by brackets 40 which are fixed on a rockshaft 41. When a plurality of sheets is introduced under rockable member 34, said ejector member 37 will be rocked counterclockwise sufficiently to direct the sheets to be ejected downwardly into an inclined chute 42. After such ejection the ejector member 37 will be restored to its normal position and following sheets will be fed to said bands 38 for feeding to the printing machine.

Power for operating the feeding machine in synchronism with a printing machine is provided by a sprocket chain 43, connecting a sprocket (not shown) on a driving shaft of the printing machine to a sprocket 44 fixed on a shaft 45 carried by the rear frame of the machine. Also fixed on said shaft 45 is a gear 46 meshing with a gear 47 on a shaft 48 carrying roll 39 which drives the

bands 38. Said gear 46 also meshes with a gear 49 on a shaft 50 on which feed roll 35 is fixed, said gear 49 being of the same size as said gear 47. Feed roll 33 is mounted on a shaft 51 having fixed thereon a gear 52 of the same size as gear 49. Gears 49 and 52 connected by a gear 53, turn in unison with each other and with gear 47. Consequently the feed rolls 33 and 35 and the band driving roll 39 are driven at the same surface speed.

To control the action of the various parts of the machine, including the air suction devices and air jet devices, a gear or pinion 54 fixed on shaft 50 meshes with a large gear 55 on a cam shaft 56 which extends to the front side of the machine. At the front side of the machine, said cam shaft 56 has fixed thereon an outer cam 57 to control said feeler 31 which forms part of mechanism to assure adjustment of the top sheet 26 of stack 25 to the proper level, an intermediate cam 58 to effect step-by-step upward movement of said elevator 27, and an inner cam 59 (Fig. 7) to actuate the suction pick-up fingers 32. Said inner cam 59 (Fig. 12) is provided at its outer face with a stud 282 having a cylindrical outer surface to engage and operate a bell crank lever 280, 281 to reset the feeling or sensing device which causes the ejection from the machine of multiple sheets picked up at one time from the stack.

In order to support or lift said elevator 27, said chain 30 at the front and back of the machine passes over sprockets 62 at the top of said guides 29 and downwardly and forwardly to sprockets 63 fixed on a transverse shaft 64. Said chains extend downwardly along the fronts of said sprockets 63 and rearwardly along the bottoms of said sprockets and are held against said sprockets 63 by rolls 65. From said rolls 65 said chains 30 extend downwardly and are held in vertical positions by weights 66.

Shaft 64 is actuated to turn sprockets 63 and operate on chains 30 to lift said elevator 27. A relatively large gear 70 on the front end of said shaft 64 serves to rotate said shaft. A rotatably mounted pinion or gear 71 meshes with gear 70 to drive the latter. Power is applied to pinion 71 by means of a ratchet or ratchet wheel 72 fixed thereto turn about the same axis. The ratchet wheel 72 may be operated in a clockwise direction (Fig. 6) by an actuating pawl 73 pivoted on a pawl carrier 74 pivotally mounted to turn about the same axis.

Pinion 71 and ratchet 72 are fixed on shaft 75 and pawl carrier 74 is mounted to turn about said shaft. Said pawl carrier may be swung counter-clockwise about its pivot 75 by a link 76 of which the forward end is connected by a pivot 78 to the pawl carrier 74 and a part to the rear is connected at a point 78 to one arm of a bell crank 79 on a pivot 80. Pivoted on the other arm of said bell crank is a follower 81 for engagement with said intermediate cam 58. Said link 76 is drawn downwardly to the left by a spring 82 which tends to move follower 81 into engagement with said intermediate cam 58 on cam shaft 56, and to move pawl 73 to a position for starting a clockwise movement of said ratchet 72. Said spring 82 is illustrated (Fig. 1) as substantially in alignment with link 76 and connected at one end to said link and at the other end to a pin 83 on the frame of the machine.

A holding pawl 84 for the ratchet wheel 72 is mounted on a pivot 85 and is urged into engagement with the ratchet by a spring 86 (Fig. 14) connecting an extension of said holding pawl with a suitable part such as a pin 87 carried by the frame. Also mounted on said pivot 85 (Fig. 6) is a pawl-disengaging lever 88 having a work arm 89 with a curved or arcuate upper edge beneath pins 90 and 91 on actuating pawl 73 and holding pawl 84 respectively, and a power arm 92 on the other side of said pivot 85. A hand lever 93 is mounted on a pivot 94 and is normally held in substantially horizontal position by a spring 95 connecting a raised end of the inner arm 96 to said arm 92 and limited in its downward movement by a lateral lug 97 extending across said arm 92.

The upwardly extending pawl carrier 74 is provided at its top with a shoulder 98 facing toward the cam shaft 56 and adapted to cooperate with a hooked pawl 99 on a pivot 100. An arm 101 fixed to said pawl 99 is connected by a spring 102 to a fixed part here shown as a pin 103. With this structure and no more, a forward movement of pawl carrier 74 would carry the shoulder 98 beyond the hook of pawl 99. After the pawl carrier has had a short return movement, pawl 99 engages and holds the pawl carrier and cam 58 moves away from follower 81. The cam 58 in the following rotation will engage follower 81 in its outward position and thereby rock pawl carrier enough to relieve the pressure on pawl 99 so that it can easily be swung to ineffective position by an arm 104 on shaft 105, which is fixed to an arm 106 at one end of a cross bar or feeler 31 (Fig. 2). At the other end, the feeler is carried by an arm 107 pivotally mounted on a stud 108.

For the same general reasons, downward movement of the outer arm of hand lever 93 will produce lifting of arm 89 only when the pressure on pawl 99 is released by the slight movement of pawl carrier 74 by cam 58. Upon such release the elevator 27 may be moved up or down by means of hand wheel 109 which carries a handle 110 (Fig. 9).

Feeler 31 and arm 104 are lifted at each rotation of cam shaft 46 by the action of feeler cam 57 on follower 111 at the end of a downwardly and rearwardly extending arm of a bell crank 112 loosely mounted on shaft 113. A link 114 connects a pivot 115 at the end of an upwardly extending arm of the bell crank 112 with a pivot 116 at the end of a downwardly and forwardly extending arm 117 of which the other end is mounted on shaft 105 to turn the same. Downward movement of feeler 31 and arm 104 is produced by spring means such as a spring 118 connecting the upper arm of bell crank 112 with a fixed part which for convenience is shown as pin 103. A rearwardly extending arm 119 is fixed with respect to arm 117 and has an adjustable spring connection with a rearward projection 120 of arm 104.

Suction fingers 32 are moved back and forth between their discharge positions (Fig. 6) and their pick-up positions (Fig. 7). To this end each suction finger 32 is clamped in a block 125 (Fig. 2) slidable along a rod or shaft 126 but held against turning thereabout by a set screw 126*a* projecting into a longitudinal groove 127 or slot in the shaft. Said shaft 126 is mounted to turn in the upper ends of members or arms 128 fixed at their lower ends on a shaft 113. An arm 130 fixed on said shaft 113 is operated by said inner cam 59 to swing arm 128 from its lower (Fig. 7) position to pick up a sheet 26 from the stack 25 to its upper (Fig. 6) position to place the leading edge of the sheet between feed roll 33 and a cooperating roll 131 forming part of a device which assists in controlling the action of the ejector plate 37.

During the upward movement of shaft 126, a follower 132 at the outer end of an arm 133 fixed on shaft 126 rides upon a cam 134 on the front frame of the machine (Figs. 2 and 7), and the pick-up fingers 32 are turned in a clockwise direction against the resistance of tubes 134*a* of suitable resilient material connecting said pick-up fingers 32 to a transverse tube or header 134*b*.

At the front frame, said transverse tube 134*b* is closed by a plug 134*c*, and at the rear frame said tube 134*b* is connected through an elbow 135 with the suction end of an air pump 136 driven by a motor 137 (Fig. 1). The connection between said elbow 135 and the suction end of said pump 136 comprises a flexible tube 138, a valve device 139 and a flexible tube 140. Said valve device 139 comprises a hollow body 141 having a flat side provided with inlet ports 142 and 143 which are controlled by plates or valves 144 and 145 respectively, mounted on pivot screws 146 and 147. Springs 148 and 149 on screw pivots 146 and 147 urge said valves against their seats.

Valve 144 is operated mechanically through a link 150, an arm 151 having at its lower end a pivot 152 projecting through a slot 153 in said link 150, and said shaft 113 on the rear end of which the upper end of said arm 151 is fixed. The arm 151 (Fig. 16) is urged in a counter-clockwise direction (Fig. 4) by a tension spring 155 connected at one end to arm 151 and at the other end to a fixed member such as a pin 156. When the suction pick-up members 32 are in position to pick up a sheet, valve 144 is closed and the pump draws air out of the suction pick-up member or fingers 32 and lifts the uppermost sheet from the stack, arm 151 is swung clockwise and, when the pivot 152 engages the left end of said slot 153 and opens the valve 154 thus breaking the suction action at said suction fingers or nozzles, the sheet is released in position to cooperate with the feed roll 33. Air is forced from the pump 136 through a duct 160 such as a flexible hose and through branches 161 to jet nozzles including a central nozzle 162 having a discharge outlet 163 (Fig. 17) to act on the forward edges of sheets at the top of the stack.

Other branches 161 lead to additional air jet devices such as side nozzles 165 located at the sides of the stack near the forward edges of the sheets and having side outlets 166 (Fig. 6). Said side nozzles 165 are supported in the forward ends of arms or brackets 167 fixed on slides 168 in the form of blocks mounted on a shaft 169 held against rotation and about which said sprockets 62 rotate. Said slides 168 are held against rotation on said shaft 169 by set screws 170 extending into a groove 171 but can slide along said shaft. Preferably said side nozzles 165 are frictionally supported in brackets 167 so that they can readily be adjusted vertically and rotationally.

In order to get full benefit of the air currents particularly when starting, the air flow into the suction fingers and out of the air jets adjacent to the top sheets of the stack, should be established before the first sheet is picked up. This result may be attained by holding valve 145 (Fig. 5) open manually until the proper current of air is established. This may be done by opening valve 145 manually and holding it open as long as desired. When the air flow is established valve 145 may be closed.

Such manual control may involve the use of a link 175 connecting a pivot 176 on valve 145 with a pivot 177 on an arm 178 extending downwardly from the rear end of a shaft 179 extending to the front of the machine. Mounted on shaft 179 at the front of the machine is a handle 180 (Figs. 1, 4 and 6) by which the shaft can be operated.

From said slides 168 guide members 181 extend downwardly along the sides of the stack 26 substantially parallel to said guides or rails 29 and into a slot 182 in the bottom 183 of the elevator 27 (Fig. 17).

Mounted on said shaft 169 is a central slide or block 185 adjustably secured to the shaft 169 by means of a set screw 186. Pivoted on said shaft 169 is a yoke 187 enclosing said block 185 and having at the ends of the sides of said yoke teeth or lugs 188 to engage at opposite sides of the block stops 189 which may be the ends of a pin passing through the block 185.

A rod 190 is secured at one end to the cross piece of said yoke 187 and carries a device 191 (Fig. 16) to engage the rear face of the stack 25 and prevent displacement of the sheets rearwardly. Said device 191 comprises a collar 192 slidable on said rod 190 and provided with a set screw 193 to hold the collar 192 in any selected position, and a plate 194 having an upturned triangular forward portion with an opening receiving said rod 190, and secured to said collar 192. From the base of said triangular rear portion said plate 194 extends rearwardly parallel to said rod 190 and downwardly to provide a flange 195 to carry pivots 196 on which arms 197 are mounted.

Between said pivots 196 there is a projection 198 which cooperates with two lugs or teeth on the inner ends of arms 197 to limit the downward movement of arms 197. In ordinary operation the arms 197 are in their Fig. 16 positions. If the elevator rises so far that it engages arms 197, they will be swung upwardly about their pivots and will continue to engage the back face of the stack 25.

The upper sheets 26 of stack 24 are held against sidewise displacement by fingers 200 at opposite sides of the stack and slidably mounted on rods 201 pivoted at their forward ends on slides or blocks 168.

At the forward face of the stack, there is a transverse or cross member 210 supporting two devices for separating the forward edges of sheets. Each of these devices for separating the forward edges of sheets comprises a strip or strap 212 of material such as metal extending downward at the rear surface of said member 210. At a point above the upper edge of each member 210, each strip 212 is secured by means including two bolts 213 to a supporting member such as a bar or block 214. A thin resilient member or spring 215 is secured to the supporting member or bar by a spacing member 211 and a relatively stiff sheet or outer member 216. Said spring 215 is tapered above the edge of block 214 and inclined rearwardly into a notch 217 through which its sharp edge 218 projects.

Along the inclined part of said spring the shank of a screw 220 extends through a hole in the spring and the head engages the spring 215 from the rear. The shank of the screw 220 is threaded into member 216. By inserting a screw driven through hole 221 in strap 212 the screw 220 can be operated to adjust the position of said sharp edge 218. When a sheet is lifted by the suction fingers 32 the forward edge snaps over edges 218 and is separated from the next lower sheet. The position of said sharp edges 218 may be varied to meet the requirements.

At the forward edge of the floor of elevator 27 there are two separate floor members 223 adjustable along the forward edge of the elevator floor to accommodate different widths of sheets. Each of said parts 223 is in the form of an angle—one side of which is an extension 224 of the upper face of the elevator floor and the other side 225 engages the forward wall 226 of the elevator floor. For guiding purposes, said sides 225 have tongues 227 struck out and passed through a corresponding slot 228 in wall 226.

For additional guiding and also for clamping, use is made of screw threaded studs 229 secured as by riveting to side 225 and projecting through slots 230 in wall 226. Nuts 231 on said threaded studs 229 may be used to clamp said floor parts or members 223 in adjusted position. A sheet of paper on its way from the stack to the feed rolls 33 and 35 and over ejector member or plate 37, is held against upward movement at its edges by guides or bars 235 secured at their rear ends to brackets 167 carrying the side nozzles 165. Said guides extend over said feed rolls and also over the ejector plate to assure downward deflection of ejected sheets or groups of sheets.

As shown clearly in Figs. 7 and 8, a device for pressing sheets 26 against feed rolls 33 and 35 for effecting a satisfactory friction drive and for controlling means for ejecting multiple sheets is mounted on said hollow shaft or air duct 134*b*, a parallel rotative shaft 240 and a parallel fixed shaft 241. Two frame members 242 are mounted on said shafts 134*b*, 240 and 241. Mounted on pivots 243 are levers 244 carrying at their rear ends said roll 131. A spring 245 is connected at its lower end to the forward end of one of said levers 244 and at its upper end to a fixed pin on one of said frame members 242, thus assuring effective contact with feed roll 33.

An upright plunger 246 in the form of a plate is pivoted at its lower end to the forward end of the lever 244 to which spring 245 is connected. A pin 247

extends through a slot 248 and is secured in one frame member 242. Said slot 248 has a vertical part and a horizontal part at the upper end of said vertical part. Said spring 245 normally keeps pin 247 in the lower end of the vertical parts of the slot but roll 131 can be raised and held raised by pressing the plunger 246 down until the horizontal part of the slot is opposite pin 247 and then pressing the plunger rearwardly so that the horizontal part of the slot contains the pin. The plunger may be released by moving it forwardly and roll 131 will return to effective position. Balls 250 in frames 251 connected with frames 242 keep the sheets in suitable engagement with roll 35.

The frame members 242 are connected by cross members 252 and screws 253 with frame member 254 (Fig. 8). At the top of frame member 254 a block 255 is pivotally supported by means of a pin 256. The block 255 has a bore therethrough containing a rod 258 the upper end of which is screw threaded and carries a nut 259. Below block 255 a helical compression spring 250 surrounds said rod 258 and is compressed between block 255 and a pivotal connection 261 between rod 258 and an arm 262 fixed on shaft 263. A round member 264 on shaft 263 is mounted for turning in a bearing in frame member 254. Eccentrically mounted on the end of round member 264 is a detector member 34 being mounted on a pivot 266 eccentrically mounted in the end of member 264.

It will be seen that by adjusting the nut 259 the distance of the pivot 266 from the top of feed roll 33 may be determined. The spring 260 urges the pivot 266 toward the top of the feed roll 33 but by adjusting the nut 259 the pivot 266 may be kept at the desired distance from the top of roller 233. The detector member 34 has an upwardly projecting part 267 normally held in engagement with a pin 268 projecting from frame member 254, by means of a spring 269 connecting a pin 270 on the detector member 34 with a pin 271 on the frame member 254. The lower part of said detector 34 is relatively broad as shown in Fig. 8 and is normally located immediately above feed roll 33. To the rear of the roll 233 the broad part of the detector member is cut away as shown in Fig. 12.

At the forward side of pivot 266 the detector is provided with a downwardly turned hook 273 which engages the lower upturned end of a hook 274, the upper end of which is secured on a shaft 240. Said shaft 240 is provided at its front end with a downward extending arm 275 (Fig. 3). The lower end of arm 275 is connected by a generally horizontal link 276 with the upper arm of a lever 277. The lower end of said lever 277 is connected by a generally horizontal link 278 with an upwardly extending arm 279 of a bell crank 280 of which a second arm 281 may be actuated by a device 282 on the rear cam 59 carried by the cam shaft 56. The upper arm of lever 277 is urged toward a pin 283 connecting the end of said lever 277 with a fixed pin 285. Normally said hook 274 is locked in position by said hook 273 and the arm 281 of the bell crank 280 will be held out of the path of the stud 282 which may be in the form of a pin with a sleeve rotatably mounted thereon to avoid friction.

When a plurality of sheets passes between the detector 34 and the forward roll 33 the detector will be thrown from its normal position shown in Fig. 12 to the position shown in Fig. 13 and the pivot 266 will be raised against the action of spring 260. In this movement the hook 273 is lifted and releases the hook 274, thus allowing the spring 284 to act through the various connections and lower arm 281 of bell crank 280 into a position to be actuated by stud 286. The hook 274 will then be swung toward the detector 34. The lever 277 is mounted on shaft 41 on which are mounted two brackets 40 carrying the ejector plate 37. The release of said hook 274 will cause the detector plate to move from its full line position (Fig. 12) to its dotted line position and will direct a group of multiple sheets downwardly to a chute 42. When the multiple sheets have passed the feed roll 33 the detector 34 may return to its original position and subsequent actuation of bell crank 280 by stud 286 will cause the hook 274 to pass beneath the hook 273 to lift the latter enough for hook 274 to be locked by hook 273 when it reaches its full line position in Fig. 12.

In operating the machine a stack 25 of sheets 26 is in position on the elevator 27 which is positioned approximately at the proper level for removal of the top sheet by the suction pick-up fingers 32. The slides 168 are adjusted on transverse shaft 169 so as to engage the sides of the stack and members 212 are adjusted along the member 210 at the forward side of the stack to the proper positions between the sides of the stack so that fingers 218 will serve to separate the sheets when lifted by the suction fingers 32.

The suction pick-up fingers 32 are adjusted along transfer shaft 126 to come to positions suitably related to the sheets separating members 218. Also the central jet member 162 and the side jet members 165 are set at suitable positions so that they will tend to lift the uppermost sheet at its forward edge and at its sides near its forward edge. When suction pick-up fingers are lowered to a position immediately above the uppermost sheet on the stack, the valve 144 will be closed so as to make the suction action effective and the forward edges of the sheets will be placed between the feed roll 33 and the cooperating roll 131. If only one sheet is fed to the feed roll 33 it will ordinarily pass over the second feed roll 35 and under balls 250 which assure suitable frictional contact of the sheets with feed roll 35. From the feed roll 35 the sheet will normally pass over the ejector member 37 and pass to the bands or belt leading to the printing machine.

In connection with starting the operation the motor 137 is thrown into operation to operate the pump 36 which draws in air through the suction pick-up finger 32 and drives air out through the air jet devices 162 and 165. By means of the handle 180 the valve 145 in the air duct may be held open so that no suction will be produced at the suction pick-up fingers. By opening the suction line in this way the regular current of air through the air ducts is established and after that occurs and the machine proper is started, the handle 180 may be restored to its normal position and the suction regulated by the valve 144 which is mechanically opened and closed.

The elevator will be raised whenever the level of the sheets in the stack is below a predetermined level but when the uppermost sheet is at or above the predetermined level the lifting of the stack will be eliminated until the uppermost sheet again comes below the predetermined level.

When a plurality of sheets is passed between the feed roll 33 and the detector 34, the hook 273 is raised and unlocks hook 274. The spring 284 then acts to shift the deflecting plate or ejector 37 to inclined position to direct the sheets downwardly to chute 42 and to shift bell crank lever into position for its arm 281 to be engaged by stud 286. Such engagement will restore ejector plate 37 to its normal position and cause hook 274 to be locked in its normal position. The machine will then be in condition for normal operation.

The shapes of feeler-lifting cam 57, pick-up finger cam 59 and elevator-lifting cam 58 should be noted. Cam 59 has a high dwell portion and a short concave portion of which the ends merge smoothly with the high dwell portion. As a result of the shape of cam 59, the pick-up fingers 32 are held in their high positions during the greater part of a revolution of cam shaft 56, and in the remainder of the revolution are dropped rather quickly to pick up a sheet 26 and then lifted rather quickly to their high positions to feed a sheet to a feeding roll and cooperating device.

The feeler-lifting cam 57 may be of the same shape as cam 59 but is somewhat advanced on shaft 56 so that

the feeler 31 goes down before the pick-up fingers drop and is lifted before the pick-up fingers are lifted, thus avoiding any resistance by the feeler to the upward movement of a sheet 26 picked up by said pick-up fingers 32.

Elevator-lifting cam 58 has a high dwell portion extending about half way around the periphery and a portion gradually decreasing in height from both ends to a central low point. The pawl carrier 74 will then be held in advanced position by the cam for a substantial part of a rotation of the cam shaft 56, and when the return movement of pawl carrier 74 is limited by pawl 99, the high part of cam 58 will advance the pawl carrier sufficiently to release the pressure on pawl 99 and facilitate movement thereof to ineffective position by feeler controlled means.

It should be understood that various changes may be made and that certain features may be used without others, without departing from the true spirit and scope of the invention.

What is claimed is:

1. A sheet feeder for a printing press comprising stack raising means to present top sheets at proper levels for removal, means to hold the sheets in proper position in their planes, means to act on the uppermost sheets to facilitate their removal from the stack, a plurality of feed rolls, means above said feed rolls to hold said sheets on said rolls, a feeler operated to ascertain the position of the uppermost sheet, means controlled by said feeler for rendering said stack raising means ineffective when the top sheet of the stack is too high and effective when no sheet is above the required level, means including suction pick-up fingers for delivering top sheets to the first feed roll, said stack raising means comprises a platform, means including upwardly extending guides for said platform, sprockets at the upper ends of said guides, sprocket chains connected to the ends of said platform and extending over said sprockets and downwardly, a transverse shaft, other sprockets fixed on said shaft engaging the downwardly extending parts of said sprocket chains, a ratchet wheel, speed reducing gearing from said ratchet wheel to the shaft for the lower sprocket wheels, a pawl carrier movable about the same axis as said ratchet wheel, an actuating pawl for said ratchet wheel on said pawl carrier, a holding pawl for said ratchet, an actuating arm operatively connected to said pawl carrier, a moving cam acting on said arm, a spring urging said arm toward said cam, a pawl spring-pressed against said pawl carrier to limit rearward movement of said pawl carrier to less than one tooth whereby the actuating arm will be shifted slightly out of the path of said cam during part of a revolution of the cam and then the actuating arm will be struck by the cam to relieve the pressure on the pawl engaging the pawl carrier, and an arm on said feeler to release the pawl-carrier retaining pawl.

2. A sheet feeder for a printing press comprising stack raising means to present top sheets at proper levels for removal, means to hold the sheets in proper position in their planes, means to act on the uppermost sheets to facilitate their removal from the stack, a plurality of feed rolls, means above said feed rolls to hold said sheets on said rolls, a feeler operated to ascertain the position of the uppermost sheet, means controlled by said feeler for rendering said stack raising means ineffective when the top sheet of the stack is too high and effective when no sheet is above the required level, means including suction pick-up fingers for delivering top sheets to the first feed roll, said stack raising means comprises a platform, means including upwardly extending guides for said platform, sprockets at the upper ends of said guides, sprocket chains connected to the ends of said platform and extending over said sprockets and downwardly, a transverse shaft, other sprockets fixed on said shaft engaging the downwardly extending parts of said sprocket chains, a ratchet wheel, speed reducing gearing from said ratchet wheel to the shaft for the lower sprocket wheels, a pawl carrier movable about the same axis as said ratchet wheel, an actuating pawl for said ratchet wheel on said pawl carrier, a holding pawl for said ratchet, a hand wheel connected to said ratchet wheel, lateral releasing projections on said actuating and holding pawls, a curved lever arm on the pivot of said holding pawl at the inner sides of said projections to release said pawls when swung outwardly, a second lever arm on the same pivot as the first lever arm, and spring means connecting said lever arms, whereby movement of said second lever arm to release said actuating and holding pawls will stress said spring and upon releasing the pressure on said pawls by manual actuation of said hand wheel, the curved lever arm under pressure by said spring means will engage said projections and render the pawls ineffective so that said platform may be moved up and down by said hand wheel.

3. A sheet feeder for a printing press comprising a support for a stack of sheets, means for elevating said platform to place the uppermost sheets in proper position for removal, sheet advancing means and means for picking up sheets one by one from said stack and supplying them to said advancing means comprising suction fingers, a transverse shaft, slides adjustable along said shaft and rotatable therewith, said suction fingers being clamped in said slides, a second shaft, arms fixed on said second shaft and provided at their outer ends with bearing receiving the first mentioned shaft, means for swinging said arms upwardly and forwardly, an arm fixed on one end of the slide-carrying shaft, a follower on said arm and a fixed cam engaged by said follower and acting to turn the slide-carrying shaft to swing said suction fingers in clockwise direction to the sheet delivery position.

4. A sheet feeder for a printing press comprising a support for a stack of sheets, means for elevating said platform to place the uppermost sheets in proper position for removal, sheet advancing means and means for picking up sheets one by one from said stack and supplying them to said advancing means comprising suction fingers, a transverse shaft, slides adjustable along said shaft and rotatable therewith, said suction fingers being clamped in said slides, a second shaft, arms fixed on said second shaft and provided at their outer ends with bearings receiving the first mentioned shaft, means for swinging said arms upwardly and forwardly, an arm fixed on one end of the slide-carrying shaft, a follower on said arm, means to raise said suction fingers and turn them counterclockwise to delivering position, a transverse header and resilient flexible tubes connecting said suction fingers to said header.

5. A sheet feeder for a printing press comprising a support for a stack of sheets, means for elevating said platform to place the uppermost sheets in proper position for removal, sheet advancing means and means for picking up sheets one by one from said stack and supplying them to said advancing means comprising suction fingers, a transverse shaft, slides adjustable along said shaft and rotatable therewith, said suction fingers being clamped in said slides, a second shaft, arms fixed on said second shaft and provided at their outer ends with bearings receiving the first mentioned shaft, means for swinging said arms upwardly and forwardly, an arm fixed on one end of the slide-carrying shaft, a follower on said arm, means to raise said suction fingers and turn them counterclockwise to delivering position, a transverse header, resilient flexible tubes connecting said suction fingers to said header, blowing devices at each side of the stack to aid in separation of sheets and supports for said blowing devices adjustable to conform with widths of the stack.

6. A sheet feeder for a printing press comprising a support for a stack of sheets, means for elevating said platform to place the uppermost sheets in proper position for removal, sheet advancing means and means for picking up sheets one by one from said stack and supplying them to said advancing means comprising suction fingers, a transverse shaft, slides adjustable along said shaft

and rotatable therewith, said suction fingers being clamped in said slides, a second shaft, arms fixed on said second shaft and provided at their outer ends with bearings receiving the first mentioned shaft, means for swinging said arms upwardly and forwardly, an arm fixed on one end of the slide-carrying shaft, a follower on said arm, means to raise said suction fingers and turn them counterclockwise to delivering position, a transverse header and resilient flexible tubes connecting said suction fingers to said header, blowing devices at each side of the stack to aid in separation of sheets, supports for said blowing devices adjustable to conform with widths of the stack, an air pump, a suction duct connecting said header with the suction side of said pump and branch ducts connecting said blowing devices with the discharge end of said air pump.

7. A sheet feeder for a printing press comprising a support for a stack of sheets, means for elevating said platform to place the uppermost sheets in proper position for removal, sheet advancing means and means for picking up sheets one by one from said stack and supplying them to said advancing means comprising suction fingers, a transverse shaft, slides adjustable along said shaft and rotatable therewith, said suction fingers being clamped in said slides, a second shaft, arms fixed on said second shaft and provided at their outer ends with bearings receiving the first mentioned shaft, means for swinging said arms upwardly and forwardly, an arm fixed on one end of the slide-carrying shaft, a follower on said arm, means to raise said suction fingers and turn them counterclockwise to delivering position, a transverse header, resilient flexible tubes connecting said suction fingers to said header, blowing devices at each side of the stack to aid in separation of sheets, supports for said blowing devices adjustable to conform with widths of the stack, a valve in said suction duct, and means for closing said valve as the suction fingers are about to contact a sheet in the stack and remaining closed until the sheet is fed to the sheet advancing means and to keep the valve open during the downward movement of the suction fingers.

8. A sheet feeder for a printing press comprising a support for a stack of sheets, means for elevating said platform to place the uppermost sheets in proper position for removal, sheet advancing means and means for picking up sheets one by one from said stack and supplying them to said advancing means comprising suction fingers, a transverse shaft, slides adjustable along said shaft and rotatable therewith, said suction fingers being clamped in said slides, a second shaft, arms fixed on said second shaft and provided at their outer ends with bearings receiving the first mentioned shaft, means for swinging said arms upwardly and forwardly, an arm fixed on one end of the slide-carrying shaft, a follower on said arm, means to raise said suction fingers and turn them counterclockwise to delivering position, a transverse header and resilient flexible tubes connecting said suction fingers to said header, blowing devices at each side of the stack to aid in separation of sheets, supports for said blowing devices adjustable to conform with widths of the stack, a valve in said suction duct, means for closing said valve as the suction fingers are about to contact a sheet in the stack and remaining closed until the sheet is fed to the sheet advancing means and to keep the valve open during the downward movement of the suction fingers and a second manually controlled valve to be held open until the proper air flow is established in the air flow system.

9. A sheet feeder for a printing press comprising an elevator for a stack of sheets, a cross member extending across the front of said stack, devices slidably mounted on the upper edge of said member and comprising strips with their upper ends raised above the upper edge of said cross member and extending downwardly to the lower part of the path of the elevator, each of said strips having a central notch at its upper end, a supporting member secured to said strips and engaging the upper edge of said cross member, a flat spring back of said supporting member inclined rearwardly from the upper edge of said supporting member and tapered at both sides to provide a sharp edge projecting through one of said notches, a spacing member and a stiff sheet member at the forward side of the supporting member, bolts extending through the upright strip, the supporting member, the spring and the stiff sheet, and an adjusting screw extending through a hole in the inclined portion of said spring and threaded into said stiff sheet, said main strip having a hole exposing the head of said adjusting screw, said sharp edge acting to separate the forward edges of the sheet.

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