Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 1

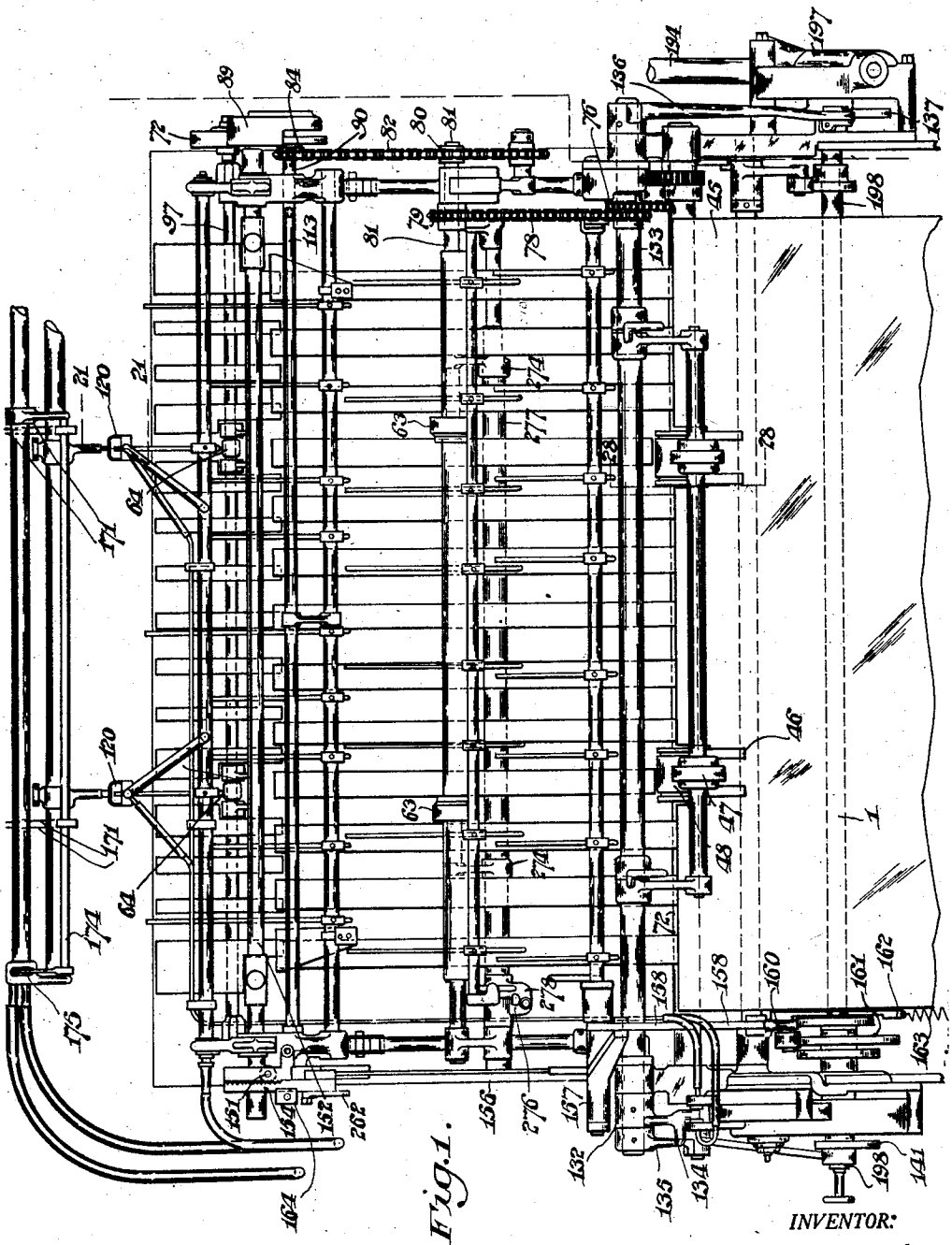


Fig. 1.

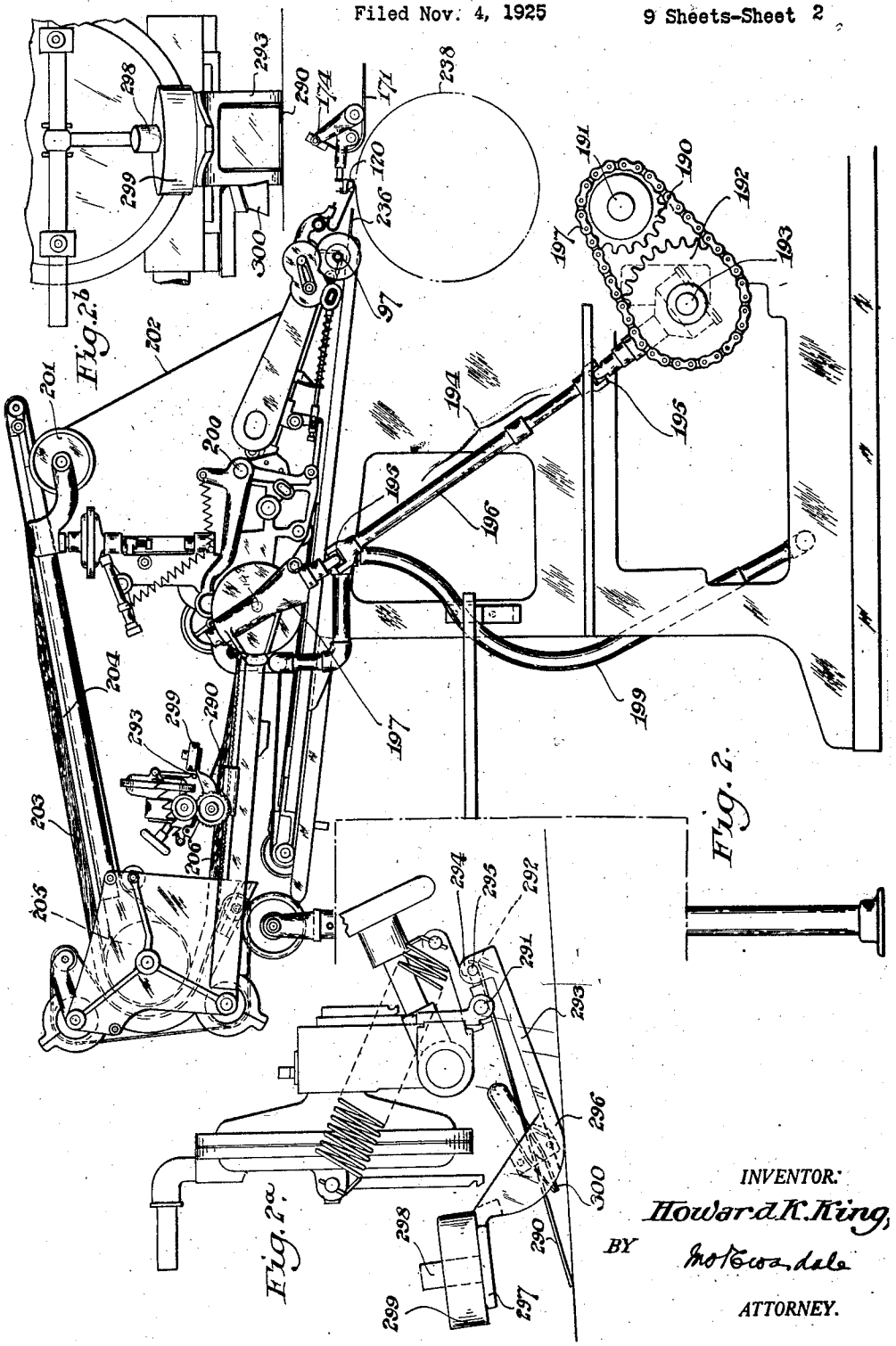
INVENTOR:
Howard K. King,
BY
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 2



INVENTOR:
Howard K. King,
BY Mott & Woodale
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 3

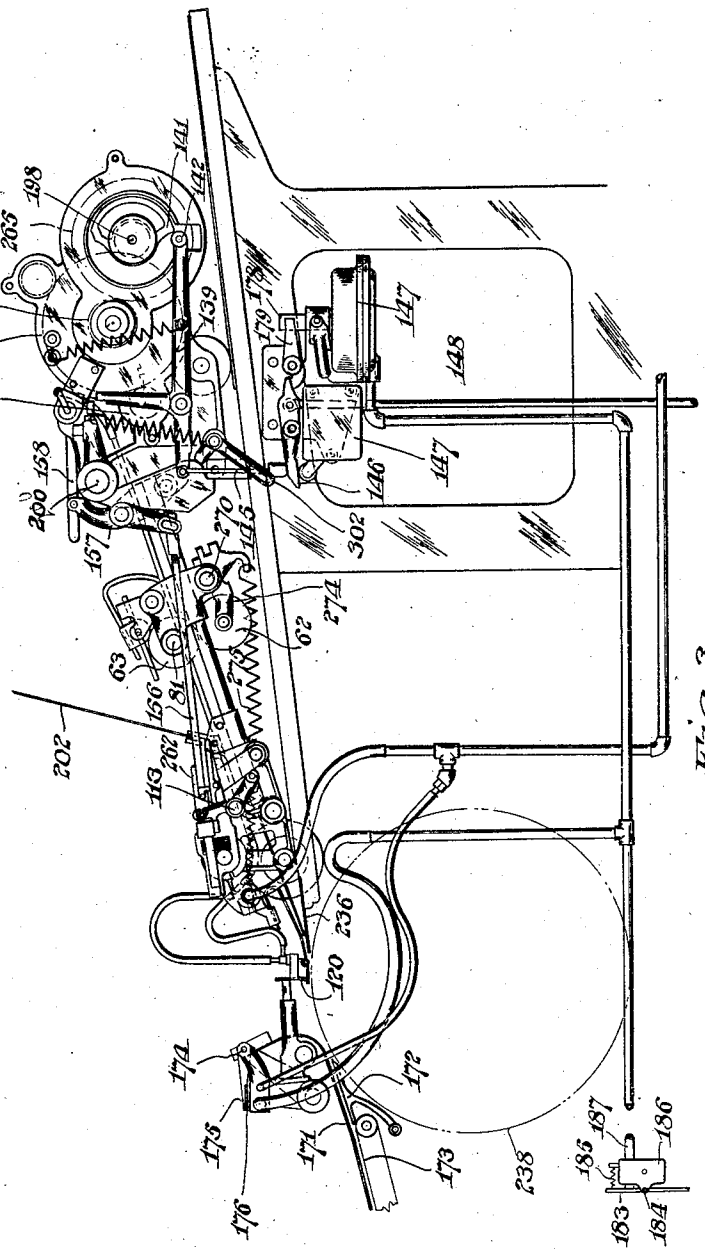


Fig. 3.

INVENTOR:
Howard K. King,

BY

ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 4

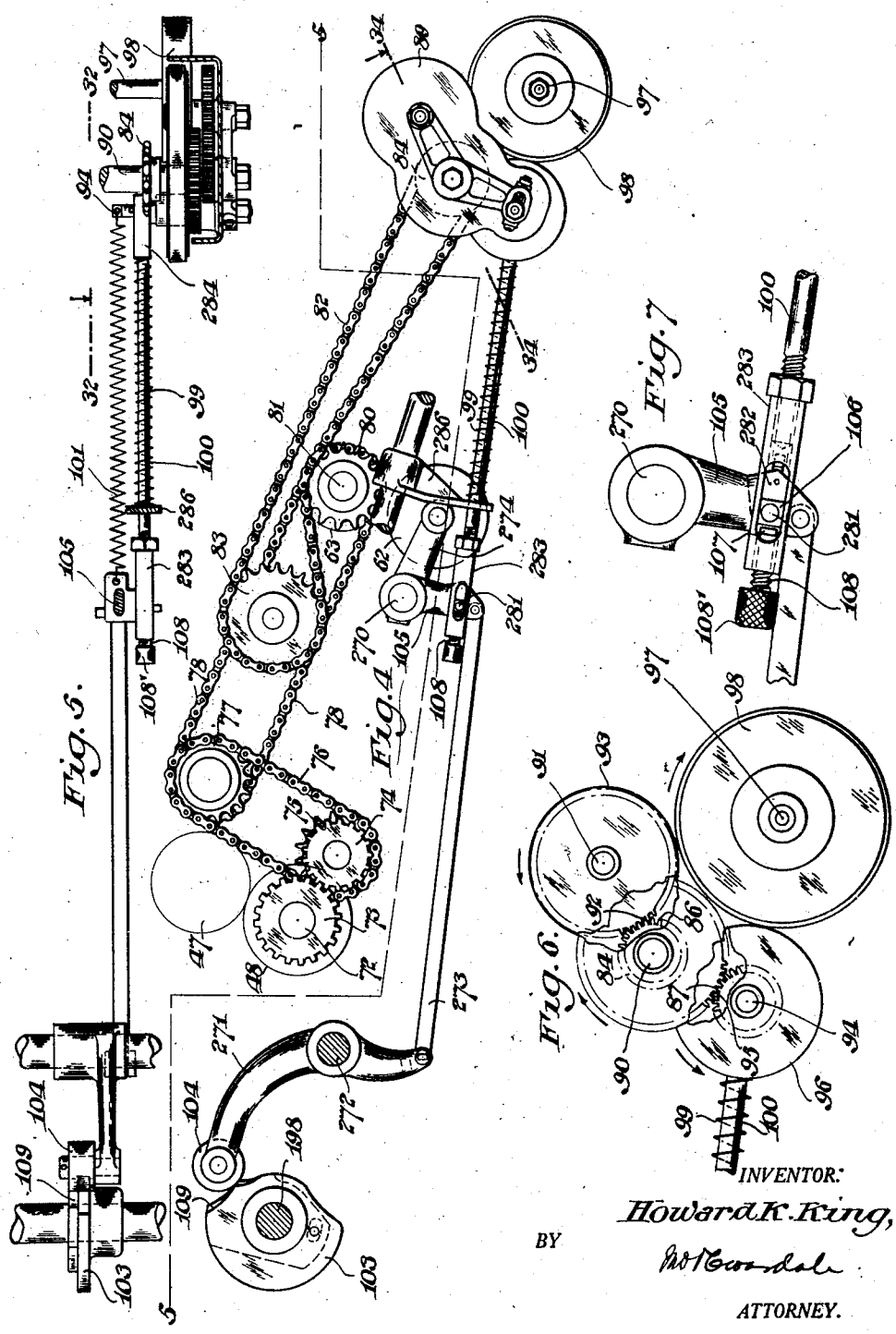


Fig. 5.

Fig. 4.

Fig. 7

Fig. 6.

INVENTOR:
Howard K. King,
BY
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 5

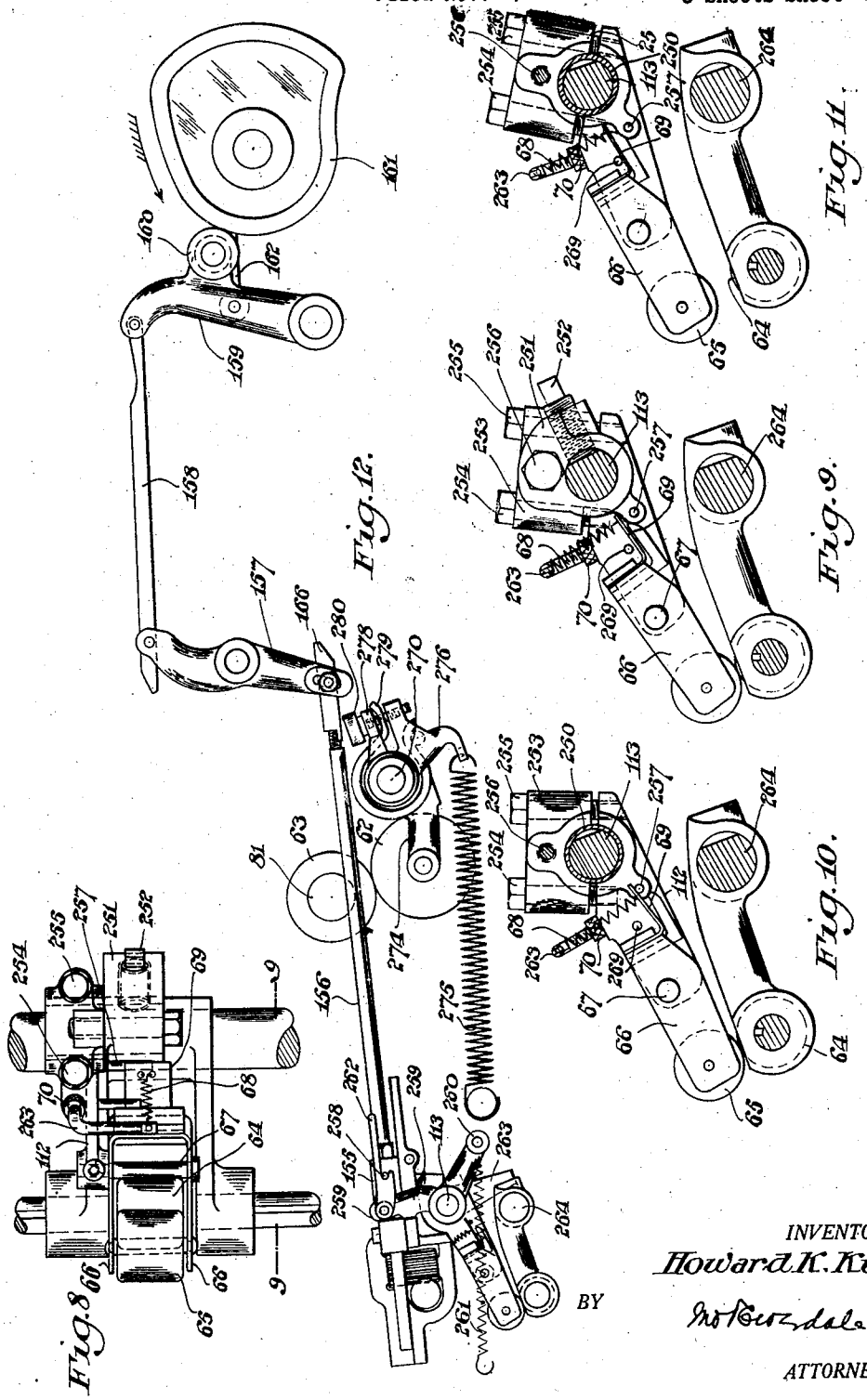


Fig. 8.

Fig. 12.

Fig. 11.

Fig. 9.

Fig. 10.

INVENTOR:
Howard K. King,
BY
Mr Bozdale
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 6

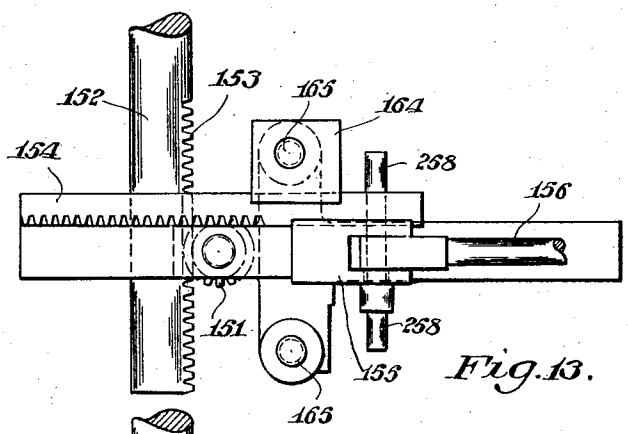


Fig. 13.

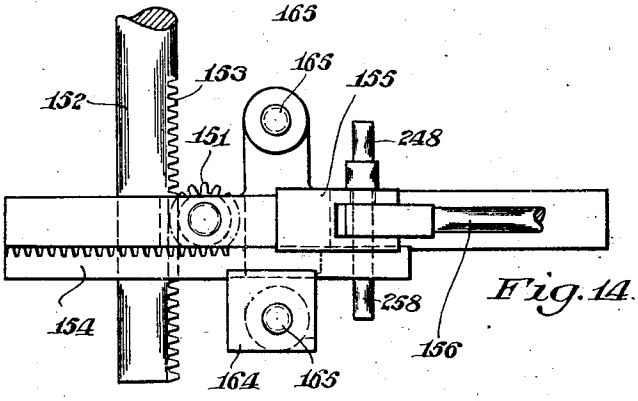


Fig. 14.

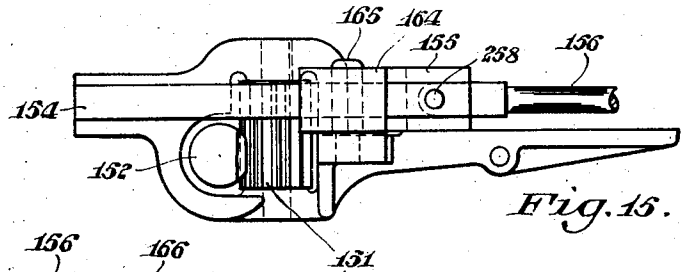


Fig. 15.

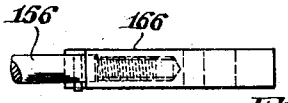


Fig. 16.

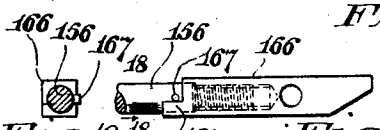


Fig. 18. Fig. 17.

INVENTOR:
Howard K. King,
BY
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 7

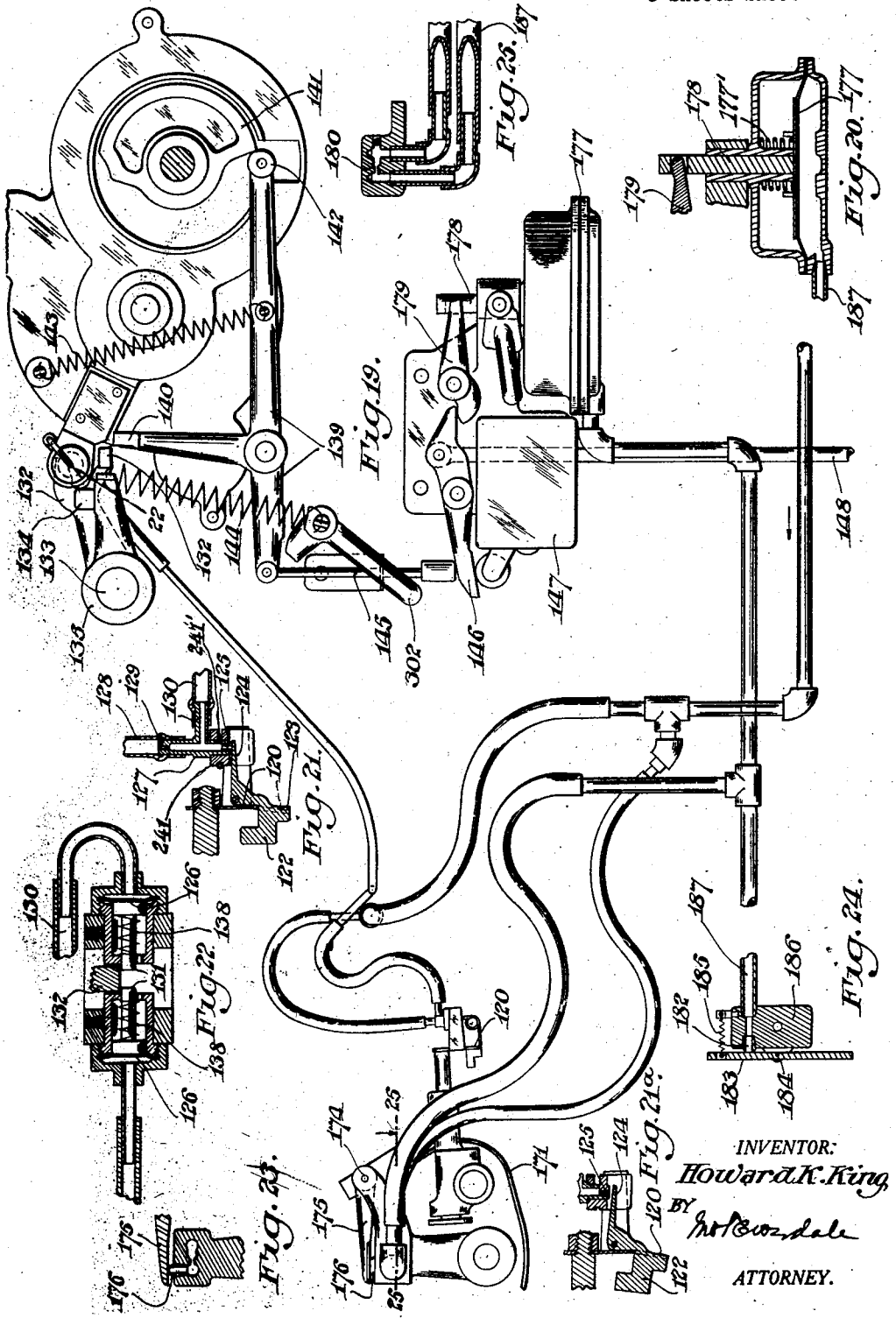


Fig. 19.

Fig. 20.

Fig. 21.

Fig. 21a.

Fig. 22.

Fig. 23.

Fig. 24.

INVENTOR:
Howard K. King
BY
Wm. E. Worsdale
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 8

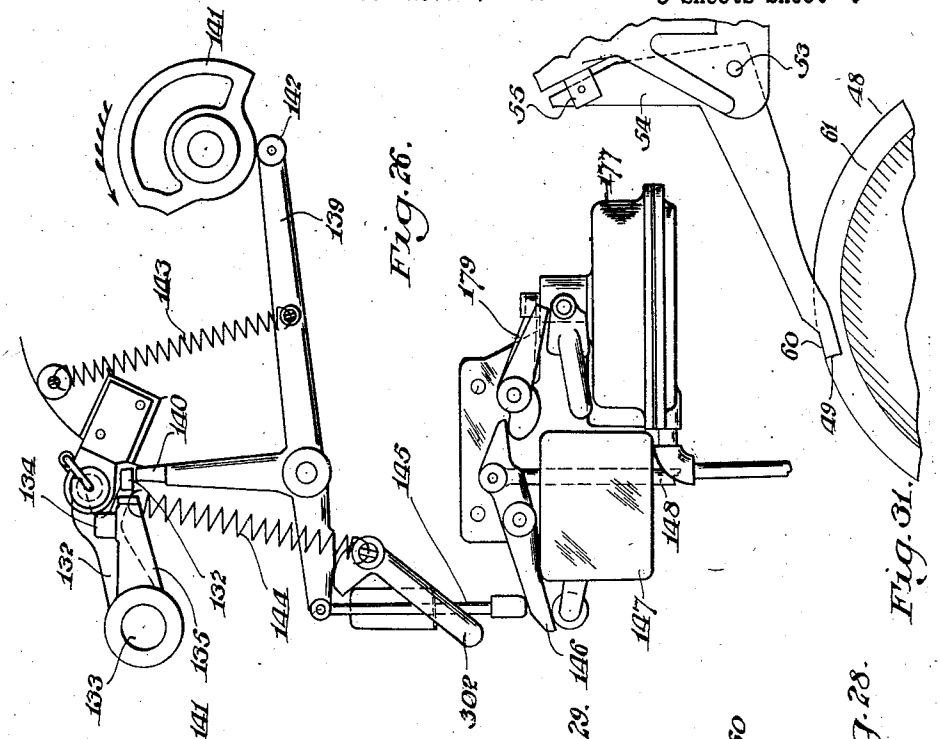


Fig. 26.

Fig. 31.

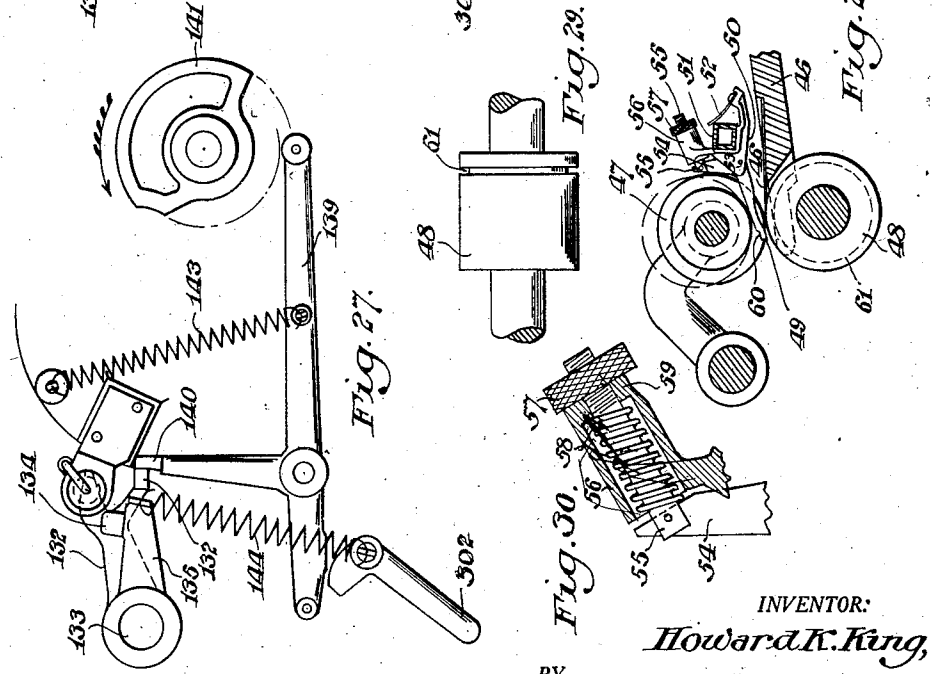


Fig. 27.

Fig. 29.

Fig. 28.

Fig. 30.

INVENTOR:
Howard K. King,
BY
Geo. Brodale
ATTORNEY.

Dec. 13, 1927. 1,652,172

H. K. KING

SHEET FEEDING MACHINE

Filed Nov. 4, 1925 9 Sheets-Sheet 9

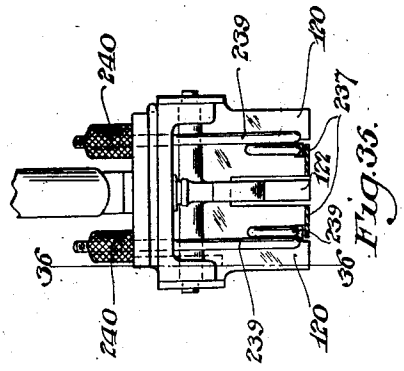


Fig. 35.

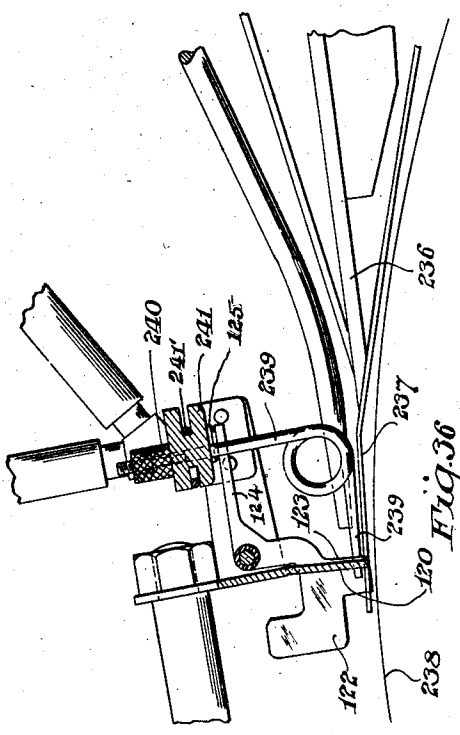


Fig. 36

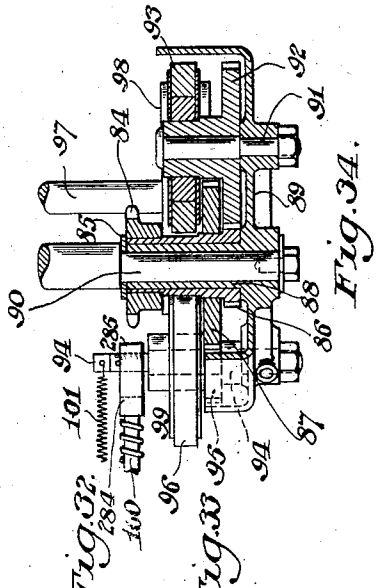


Fig. 34.

Fig. 32.

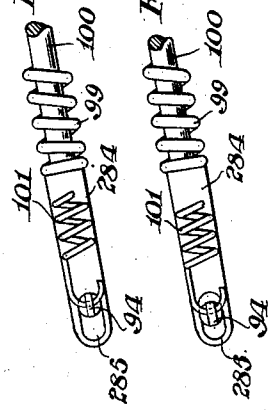


Fig. 33

INVENTOR:
Howard K. King,
BY Wolcox & Dale
ATTORNEY.

Patented Dec. 13, 1927. 1,652,172

UNITED STATES PATENT OFFICE.

HOWARD K. KING, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO CHAMBERS BROTHERS COMPANY, A CORPORATION OF PENNSYLVANIA.

SHEET-FEEDING MACHINE.

Application filed November 4, 1925. Serial No. 66,763.

The invention relates to improvements in sheet feeding machines. The object is to provide improved means for separating and delivering single sheets from a pile of sheets. The improvements relate to that type of sheet feeding machine commonly known as the continuous feed type.

The improvements are especially applicable to machines for feeding sheets to a printing press, although certain of the improvements are equally applicable to feeding sheets to folders or similar devices.

The machine as a whole is similar, in most respects, to that described in my Patent No. 1,154,406, dated Sept. 21, 1915, which was shown as especially applicable to feeding sheets to a folding machine or similar device.

It is therefore believed to be unnecessary to describe in detail the entire machine which is fully illustrated and described in said patent. Only such parts are described in the present application as are necessary to show the relation of the improvements herein described and claimed.

The present invention comprises two sets of drop and feed rollers, cooperating slow-down rollers and actuating and driving means therefor; improvements in the arrangement of the clamp and drag, improvements in the arrangement of the side guide, or registering device, means for adjustment of the control of the feeding operation, the arrangement of the front or press guides and means for assuring a square or true presentation of the front edge of the sheet, means for automatically stopping the press upon certain conditions, means arbitrarily actuated for stopping the press, improved means for adjusting the several parts, and improvements in details of construction.

Referring to the drawings which illustrate merely by way of example, suitable means for the embodiment of my invention;—

Fig. 1 is a plan view showing the delivery and a portion of the feeder.

Fig. 2 is a right hand side elevation of the feeder and delivery and a portion of the press.

Fig. 2[a] is a side elevation on an enlarged scale, of the tail clamp and drag.

Fig. 2[b] is a rear elevation of same.

Fig. 3 is a left hand side elevation of the delivery with the forward part of the feeder and the rear of the press shown.

Fig. 4 is a right hand elevation showing the drive and actuation mechanism of the slow-downs.

Fig. 5 is a section on line 5, 5 of Fig. 4.

Fig. 6 is an elevation of the slow-down driving rollers shown in Fig. 4, on an enlarged scale.

Fig. 7 is an enlarged detail of arm and connecting rods shown in Fig. 4.

Fig. 8 is a plan view of one of the slow-down rollers.

Fig. 9 is a section on line 9, 9 of Fig. 8.

Fig. 10 is a similar view as Fig. 9, with one part removed and parts in a slightly different position.

Fig. 11 is a similar view as Fig. 10 with the rollers in an elevated position.

Fig. 12 is a side elevation of mechanism for actuating the side guide and for opening and closing the slow-down rollers; this view also shows second feed roller in closed position.

Fig. 13 is a plan view of the left hand portion of the parts shown in Fig. 12 on an enlarged scale.

Fig. 14 is a view similar to Fig. 13, with parts in a different position.

Fig. 15 is a side elevation of the parts shown in Figs. 13 and 14.

Fig. 16 is a plan view of end of side guide connecting rod.

Fig. 17 is a side elevation of parts shown in Fig. 16.

Fig. 18 is a section on line 18, 18 of Fig. 17.

Fig. 19 is a diagrammatic side elevation of control and tripping mechanism.

Fig 20 is a section of the air diaphragm shown in Fig. 19.

Fig. 21 is a section of the feeding guide on line 21, 21 of Fig. 1, on an enlarged scale.

Fig. 21[a] is a similar view showing parts in different positions.

Fig. 22 is a section on an enlarged scale on line 22, of Fig. 19.

Fig. 23 is a section of a portion of Fig. 19, showing the air passage and control.

Fig. 24 is a section of a portion connected with the mechanism shown in Fig. 19.

Fig. 25 is a section on line 25, 25 of Fig. 19.

Fig. 26 is an elevation of some of the parts shown in Fig. 19, in different positions.

Fig. 27 is a view similar to Fig. 26, with some of the parts in different positions.

Fig. 28 is a section on line 28, 28 of Fig. 1.

Fig. 29 is an elevation of the feed roller shown in Fig. 28.

Fig. 30 is a fragmentary section on an enlarged scale of parts shown in Fig. 28.

Fig. 31 is a fragmentary elevation on an enlarged scale of other parts shown in Fig. 28.

Fig. 32 is an elevation on an enlarged scale of the end of connecting rod as seen on section 32, 32 of Fig. 5.

Fig. 33 is a view similar to Fig. 32 with parts in slightly different position.

Fig. 34 is a section on line 34, 34 of Fig. 4, on an enlarged scale.

Fig. 35 is a front elevation of the press feeding guide on an enlarged scale.

Fig. 36 is a section on line 36, 36 of Fig. 35.

Similar numerals refer to similar parts throughout the several views.

It will be understood that the bank of sheets is delivered around the drum and operated upon by the combing wheel in the manner described in said Patent No. 1,154,406. The front edge of the foremost sheet moves along the feed board 45 and over the steel blades 46, and passes between the first delivery drop rollers 47 and the feed rollers 48. See Figs. 1 and 28. The said drop and feed rollers, in this case, become part of the feeder, whereas in the device disclosed in said Patent No. 1,154,406, the feeder does not have any drop and feed roller, but uses the folder drop and feed rollers, becoming a complete feeder only when attached to a folding machine.

The trip finger 49 or "cut-out", shown in Fig. 28, operates to control a pneumatic valve by rocking the supporting shaft 51 in substantially the same way as that described in connection with Figs. 11, 12 and 14 of said Patent No. 1,154,406, except that the method of mounting and adjustment is different. The bracket 50 is mounted on the square shaft 51, by having two adjacent faces, at right angles with each other, engaging corresponding adjacent faces of the shaft, and a stiff spring plate 52 secured to bracket 50 engaging a diagonally opposite corner of the shaft as shown in said Fig. 28. This does away with the yoke and set-screw required in accordance with the former patent. The bracket 50 can be moved along the bar or shaft 51 to any desired position of adjustment and will be held firmly in said position of adjustment by the pressure of said spring 52. The adjustment of the trip finger 49 upon the bracket 50 is of great importance in order to secure the properly timed pneumatic control. In accordance with the former patent this trip finger was adjustably secured to the yoke by means of a slot and bolt. By such means it was difficult or inconvenient to secure accurate adjustment. In accordance with the present invention, it will be noted, that the trip finger 49 is pivoted at 53 to the bracket 50 and is provided with an arm 54 pivotally secured near its outer end to the rod 55. This rod 55 extends through a cylinder formation 56 which is preferably integral with bracket 50. The outer end of rod 55 is threaded and provided with a knurled nut 57 which engages the outer end of the cylinder formation 56. The cylinder formation is open at the opposite end and forms a housing for the compression spring 58, one end of which engages the abutment 59 in the cylinder formation 56 and the other end engages the end of the arm 54, so that the position of the outer end of trip finger 49 may be adjusted with great refinement by simply turning the knurled nut 57. It will also be noted that the upper surface 60 of the extreme outer end of trip finger 49 is in substantially the arc of the outer periphery of feed roller 48, and at a required distance from the underside of said trip finger, so that when this surface 60 corresponds with the peripheral surface of the roller 48, the finger projects the required distance into the groove 61 of said roller 48, to secure the normal actuation of the pneumatic device which it controls. This arrangement provides a simple and effective means for very accurate initial adjustment, and convenient means for modifying the said adjustment at will.

The sheet is started and carried by the first delivery drop and feed rollers until it is well under control of the second delivery drop and feed roller. The second delivery drop roller 62 (see Fig. 3) is under the sheet, with its feed roller 63 over the sheet. These delivery rollers have the same surface speed as the first delivery feed rollers. They are closed tightly together to receive the sheet, and act as carriers for the sheet, delivering it to the slow-down rollers 64 and 65, Figs. 8 to 12, and are located approximately half-way between the first drop and feed rollers and the "slow-downs".

The first drop-rollers drop to close the rollers at exactly the right time to start the sheet; the second drop-rollers drop to open at exactly the right time to deliver the sheet to the slow-downs which are running at a slower surface speed; therefore the delivery must be just right; if too slow in opening, the sheet would be buckled, if too quick in opening, the sheet would be left for an interval without positive control.

The first and second set of drop and feed rollers and the slow-down rollers are shown in pairs. A description of one pair will suffice.

The action of the slow-downs is somewhat similar to the second drop roller, except the drop or moving roller 65 is on the

top. The drop roller 65 is mounted on the end of arm 66, pivotally mounted at 67, and controlled by the helical spring 68 and by the flat angle spring 69. These rollers have three positions shown on Sheet 5; Fig. 10 shows them tightly closed to receive the sheet, the flat angle spring 69 giving the heavy pressure. Fig. 9 shows the roller under the control of the light helical spring 68, which by means of the knurled thumb nut 70, is adjustable and can be made very delicate, as the weight of the roller is very light and is also counterbalanced. Fig. 11 shows the rollers separated; they are in this position while the sheet is being side guided, and remain open until the sheet is carried away by the press.

This control is secured by the following mechanism:—

The arm 66 is pivotally mounted at 67 on the arm 112, which is mounted on the sleeve formation of bracket 250 extending from the element 251, which is clamped to the shaft 113 by the set-screw 252, having a flat end of ample dimension for engaging the flat portion of shaft 113 so as to insure the exact angular position of the element on the shaft. This element being laterally adjustable on said shaft. The arm 112 is clamped to the sleeve 250 by means of the cap 253 and bolts 254 and 255. This cap 253 is secured in fixed position to element 251 by the bolt 256. It will thus be seen that by loosening bolt 254 and tightening bolt 255, the outer end of arm 112 will be adjusted downward, carrying the pivot point 67 with it, and consequently the spring 69 into increased pressure of contact with the pin 257 on arm 112, which causes increased pressure of engagement of rollers 65 against rollers 64, when the parts are in position shown in Fig. 10, which position is secured by rocking the shaft 113 in the counterclockwise direction.

This rocking actuation of shaft 113 is secured with the side guiding mechanism as follows: The cross-head 155 is reciprocated by the side guide cam 161 as hereafter described. The cross-head carries the pins 258. Shaft 113 is provided with arms 259 and 260; the latter being connected to spring 261. To the outer end of arm 259 is pivotally secured the member 262 having a notch and an overhanging finger extending beyond the notch. This notch is adapted to engage with the pin 258 in certain position of reciprocation of cross-head 155. The action being to give shaft 113 the required rocking movement to lift the rollers 65 as shown in Fig. 11, prior to the operation upon the sheet of the side guide mechanism. The pin 269 engaging with the spring 69 secures the final movement of arm 66 with shaft 113. The arrangement is such that only a small part of the movement of the cross-head is utilized to actuate shaft 113. This shaft is controlled by spring 261 and the spring movement is limited by the engagement of arm 263 (also secured to shaft 113) against shaft 264, and the action is such that the pin 258 is withdrawn from the notch in member 262 to enable the roller 65 to be lifted prior to the action upon the sheet of the side guide mechanism.

It will also be noted that in Fig. 9, the slow-down rollers are shown as engaging with very slight pressure; the purpose of which has already been described. This condition is secured, just prior to the opening movement, at the beginning of the withdrawal of pin 258 from the notch in member 262, whereupon the first stage of the rocking movement of shaft 113 in the clockwise direction will cause the elevation of pivot 67, which will lift spring 69 away from the pin 257, so that the arm 66 will now be under control solely of the light spring 68 which is attached at one end to spring 69 and at the other end to the arm 263, which is adjustable by means of the nut 70 as above described.

The driving of the feeder by the press can best be described by referring to Figs. 2, 3 and 4; the smaller sprocket 190, see Fig. 2, is on the press driving shaft 191, the larger sprocket 192 is on a short shaft 193. Shaft 191 therefore drives shaft 193 through said sprockets and the sprocket chain 197. Shaft 193 is suitably geared with the angle shaft 194. In this angle shaft are included two universal joints 195 and a telescopic sleeve 196. The angle shaft 194 is suitably geared within the housing 197 with the cam shaft 198 of the feeder.

Cam shaft 198 is (see Fig. 3) provided with the gear 265, which drives gear 266, which rotates with gear 267. Gear 267 drives gear 268 which is on shaft 72 of the feed roller 48, see Fig. 4. Shaft 72 is provided with the gear 73, driving pinion 74 connected to sprocket 75 carrying chain 76 which drives the double sprocket 77, which is connected by chain 78, to the sprocket 79, see Fig. 1, which is on shaft 81 of the second feed roller 63. Shaft 81 also carries sprocket 80 which is connected by chain 82 running over idler 83 and driving sprocket 84. Sprocket 84 is mounted in sleeve 85, see Fig. 34, which carries the pinion 86 and also the gear wheel 87. This sleeve 85 is mounted on the sleeve 88 which forms a part of the housing 89 and is supported by and adapted to rock on the stud 90, secured to the framework of the machine. The housing 89 carries the stud 91 on which is mounted the gear wheel 92 meshing with pinion 86. On the hub of gear wheel 92 is mounted the friction wheel 93. The housing 89 also carries the stud 94 on which is mounted the pinion 95 which meshes with gear wheel 87. On the hub of pinion 95 is

mounted the friction wheel 96. It will thus be seen that sprocket 84 drives through the gears 87 and 95 the high speed friction wheel 96, and, through the gears 86 and 92, the low speed friction wheel 93 (see Fig. 6). Shaft 97 carries the slow-down feed rollers 64. On this shaft 97 is mounted the friction wheel 98. This friction wheel 98 is adapted to cooperate with the high speed friction wheel 96, or with the low speed friction wheel 93, depending upon the position of housing 89, to give the slow-down feed rollers either a high speed or a low speed. Fig. 6 shows the elements in position for high speed drive.

The housing 89 is given a slight rocking movement to secure this high speed or low speed by the following mechanism.

Referring to Fig. 4, cam 103 mounted on shaft 198 operates cam roller 104 on arm 271, pivoted at 272, and connected at its lower end by connecting rod 273 with arm 105 secured to drop roller shaft 270. On shaft 270 is the arm 276, see Fig. 12, at the lower end of which is attached the spring 275. On shaft 270 is also mounted the sleeve 277, see Fig. 1, which carries the drop roller arms 274. On this sleeve 277 is also mounted the arm 278. A spring 279 having one end engaging arm 278, and the other end engaging arm 276, tends to separate said arms, and adjusting screw 280, having a shoulder engaging arm 278, and its end threaded into arm 276, counteracts the said spring tension. By this means the adjustment between arm 105 on shaft 270, and the drop roller arm 274 on sleeve 277, is secured.

On arm 105 is provided the pin 281, Fig. 7, carrying the block 106, which is seated in the slot 282 of connecting rod end 283, secured to the connecting rod 100. The other end of this rod is secured to the rod-end 284, provided with the slot 285, see Figs. 32 and 33, for the end of the stud 94. On connecting rod 100 is provided the heavy compression spring 99, one end of which engages the stationary abutment 286. The other end engages the end piece 284. A lighter tension spring 101 is connected at one end with the stud 94 and at the other end to the arm 105, Fig. 5.

When roller 104 is on the small diameter of cam 103, bringing drop roller 62 in contact with feed roller 63, the block 106 moves to the right in slot 282 which permits the spring 99 to force the connecting rod 100 to the right, in Fig. 4 (or to the left as shown in Fig. 32) thereby acting on stud 94 to rock the housing 89 to bring high speed friction wheel 96 into engagement with friction wheel 98. When cam wheel 104 is slightly raised from the small diameter of cam 103, arm 105 is moved slightly to the left and block 106 is moved to the left to engage the end 107 of screw 108, which moves connecting rod 100 to the left in Figs. 4 and 7. This results in compressing spring 99 and withdrawing the rod 100 away from stud 94, as shown in Fig. 33, whereupon the spring 101 becomes effective to rock housing 89 to bring the low speed friction wheel 93 into engagement with friction wheel 98.

It will thus be seen that, just as the sheet enters the slow-downs, the second drop roller releases its grip, and the sheet takes a reduced speed, (which is the high speed of the slow-downs), after which, as the sheet nears the press guides 120, the slow-downs operate at slow speed. There are two adjustments to time this change of speed at exactly the right instant. The loose adjustable piece 109, shown on the cam 103, is adjusted practically correctly. Then, with the press and feeder operating, the screw 108 is adjusted to get the desired delivery to the press guides. Just after the change in speed takes place, and before the sheet reaches the press guides, the firm grip of the slow-downs is changed to a light, delicate grip with just sufficient force to insure the sheet reaching and, for an instant, being held against the press guides.

The adjustable screw 108, which is provided with the knurled head 108′, is a very valuable feature because it permits of getting a refined working adjustment without the loss of production. It is entirely possible to operate the feeder without the use of this screw, by getting a very accurate adjustment of the loose piece 109 on the cam 103. However, it is obvious that more or less time will be consumed in getting a satisfactory working condition as both press and feeder must be stopped in order to make the adjustment.

It is usually desirable to make a slight adjustment for each, different job, and with the use of the screw 108, the sheet can be brought softly, or with more firmness, against the guides. The choice depending on the character of the stock, size of sheets, and speed at which the press is operated. Also in some cases, accuracy versus production. With the use of this screw, the loose piece 109 once adjusted can be left alone.

It will thus be seen that the second drop roller cam 103 controls the speed change, and the side guide cam 161 controls the pressure change and lifting of the slow-downs.

It will be understood that the sheet must be against both press guides 120 for the press to continue in operation. A failure to reach one or both guides will cause a make or break contact in a switch, thus causing the motor to stop, also the press cylinder will be tripped and the brake applied. The press guides 120 can be seen in Figs. 1–3, 19, 21 and in 35 and 36. Figs. 35 and 36, being on a larger scale, show clearly the "pendulum" 122 projecting in the path of the sheet. When the face 123 of the pendulum 122 pro-

jects beyond the guide 120 as shown in Figs. 21 and 36, the arm 124 of the pendulum will close the nozzle 125. This will result in maintaining pressure on a diaphragm head 126. When however, this face 123 is flush with the guide 120, the escape nozzle 125 will be open, as shown in Fig. 21ª, thus allowing the air to escape from one of the small diaphragms 126 shown in Fig. 22, Sheet 7. The air feed to the T 127 is from the pipe 128 through a restricted passage 129 with the escape nozzle 125 at the bottom. The passage 130 leads to one of the diaphragms 126 shown in Fig. 22. The area of the escape nozzle 125 is at least double that of the inlet passage 129; the result being, when the nozzle 125 is closed by the pendulum arm 124 as shown in Fig. 21 the air pressure will force the diaphragm piston in the position shown in Fig. 22, the piston rod 131 acting as a latch under the trip arm 132 loosely mounted on the drop roller shaft 133. This arm can be seen in Figs. 1, 3, 19, 22, 27 and 26. In Fig. 1, this arm shows the projecting lug 134 which rests on the top of the spring arm 135; the spring arm 135 is secured to the drop-roller shaft 133 in a fixed position. The drop-roller is operated through means of a cam arm 136 and cam 137 shown on the upper right hand corner of Sheet 1. This cam arm 136 is rigidly secured to the drop-roller shaft and is provided with an antifriction roller, which will follow the action of the cam 137 at all times. When the drop-roller 47 is up, the trip arm 132 is held slightly clear of the piston rods 131 shown in Fig. 22. In this position of the trip arm, the pistons 126 are free to act, therefore when not under air pressure they will be withdrawn by the helical springs 138 pushing on the reverse side of the piston. It is obvious that both of these piston rods 131 must be withdrawn before the trip arm 132 can follow the drop-roller down, and when so held up the three-way throw-out arm or element 139, see Fig. 19, will be permitted to work; the upper or latch-end 140 passing freely under the latch end of the trip arm 132. When the sheet is against both feeding guides, both of these pistons will be withdrawn, in this case the descending drop roller 47 will permit this trip arm 132 to fall in front of the latch portion 140 of the throw-out arm, thus preventing it from following its cam 141 further than the position shown in Figs. 19 and 27. It is given this amount of idle motion before being intercepted in order to get a quick action when required.

Note the position of the cam 141 and the antifriction roller 142 on the portion of the arm 139 projecting to the right. It is obvious the cam action has passed the necessarily slow part of the movement and is fully under way for quick action, when not intercepted by the trip arm. Fig. 27 shows it intercepted, and also shows how the cam will gently engage it at the end of the period and depress it ready for another start. Referring to Figs. 19, 26 and 27, the helical spring 143 pulls this portion of the arm 139 upwardly and in contact with the cam as shown in Fig. 26, except when prevented by the trip arm 132 as shown in Fig. 27. The spring 144, to the left, in the above mentioned figures, is one of the springs pulling the drop roller 47 down; there being two springs in addition to gravity for this purpose. The vertical plunger 145 pivoted on the left branch of the throw-out arm 139 is shown in Fig. 19, in contact with the pivoted arm 146, but has not depressed it far enough for action. However in Fig. 26 the plunger 145 is shown fully depressed. When so depressed the "door" switch contained in the casing 147, is operated to make or break contact, depending on the method of wiring. This in turn cuts the current from the press motor. The rod 148 which is connected to the arm 146, unlatches well known spring controlled mechanism common to this type of press feeder, not shown. One side of this applies the press brake, the other "trips" the press, so that the type will not come in contact with the cylinder; there being no sheet to receive the ink from the type. This mechanism may be called the trip box. There are two foot pedals provided for resetting it. The operation is similar to setting a heavy spring controlled trap, and the above described plunger 145 simply unlatches the double trap. The trip box levers are connected to the same brake and "trip" that are used when the press is fed from its regular feed board by hand; both brake and trip being provided with a foot pedal. This arrangement, being common to all makes of flat bed printing presses, is not shown.

The object of having the press stopped in case a sheet fails to get squarely against both press guides is to prevent sheets out of register getting through without being detected. With everything properly adjusted, the press may run for hours without stopping.

In starting the press and feeder the operator cuts out the control at the press-guides by means of lever 302, just long enough to present the first sheet to said guides.

After the sheet has been placed squarely against the feeding guides, the sheet is side-guided. There is a side guide on both sides of the delivery for this purpose; only one guide being used at a time. One is selected for printing the first side of the sheet, and the other side guide is used when printing the reverse side; although the reverse side is frequently printed on a different press. In color work the sheet may be printed on one side from three to five times. The edge of the sheet selected for register must be used in all operations. The side guide used in this

connection is fully described in my Patent No. 1,466,660, Sept. 4, 1923. This guide is shown in place in Fig. 1, but is not shown in detail in these drawings. The actuating mechanism however is shown in several figures. The novelty in this connection consists in the means for reversing the motion; the same cam being used for either side.

Referring to Figs. 1, 13, 14 and 15, as shown in Fig. 1, both side guides are mounted on the same shaft. The patent last referred to, will show this feature in detail. The shaft gives motion to one guide only, the shaft sliding freely through the other guide.

The long pinion 151 shown in Fig. 15, engages with the shaft 152, see also Figs. 13 and 14. Teeth 153 are cut in the side of the round bar or shaft 152 for this purpose.

Referring to Fig. 15, it will be noted that the pinion 151 extends for a considerable distance above the round shaft. A rack 154, working at right angles to the round shaft 152, gives motion through the pinion to this shaft, the rack being secured to the side of a small cross-head 155, the connecting rod 156 from this cross-head 155 extending back to rod end shown in detail in Figs. 16 and 17, and shown in assembly connected to a rock arm 157 in Fig. 12. Connected to the upper end of this rock arm 157 is a shorter connecting rod 158, which in turn is connected to the cam arm 159, having the cam roller 160 cooperating with the cam 161. The spring-rod 162 and spring 163 serve, in the usual way, to keep the roller in contact with the cam.

Fig. 13 shows the position of the rack 154 when the right hand side guide is in use, and Fig. 14 shows its position when the left hand side guide is in use.

To change from one side to the other, the guide block 164 is lifted from its pin 165, also the cross-head 155 with the rack 154 is lifted in the same direction. The cross-head is then given a half turn. Figs. 16 and 17 show the construction that permits this. The rod 156 is screwed into the rod end 166, and fitted to turn fairly free, the small pin 167 cooperating with the shoulder 168 limiting to half a turn. A fine thread is used for connecting rod 156 with end piece 166 and the difference in the length of the rod, one to half a turn, does not interfere with the two actuations performed by this rod.

The patent last above referred to shows how the upper or moving guide adjusts itself to position on the shaft.

After side guiding, the sheet is taken by the grippers in the usual manner; the first turn of the cylinder, printing the sheet as the bed travels with the cylinder, the second turn delivering the sheet as the bed returns, the cylinder then being slightly elevated to permit the type clearing it. As the sheet is delivered, it must be stripped from the cylinder. This is all done in the usual way, and is a part of the press operation, and not a feeder operation. However, at this point, it sometimes happens that a sheet will fail to deliver properly, and will crumple up. This is usually called a "choke up", the sheet remaining jammed between the upper and lower guides. When the press is fed by hand, this will be noticed by the operator, who will stop the press and trip the cylinder, and take the sheet out. With a press feeder, it is necessary that the press be stopped automatically in case of a "choke" at this point, as more sheets coming would increase the jam.

Referring to Figs. 1, 2, 3 and 19, two or more light fingers 171 are provided; the number depending on the size of the press. This much is common to other press feeders As shown best in Fig. 3, they are immediately over the sheet and are parallel with the supporting bars 172 and tapes 173; and are made long enough to fully cover the place where a "choke" is mostly likely to occur. These fingers 171 are light and are secured to a shaft 174 journalled at each end. They are prevented from dropping beyond the position shown, by an arm 175 secured to the left hand end of this shaft 174. This arm 175 rests upon and closes an air nozzle 176. When this nozzle is kept closed the air pressure keeps the diaphragm piston 177 in an elevated position, against the spring 177′, see Figs. 19 and 20, 23 and 25. The movement of diaphragm piston 177 is communicated through piston rod 178 and lever 179 to lever or pivoted arm 146. It follows that the descent of this diaphragm piston and rod operating on lever 146, causes the stopping and tripping of the press cylinder, through the same means as does the action of plunger 145 above referred to. The air supply is fed to the diaphragm 177 through a restricted passage 180, shown in Figs. 23 and 25. This is the same principle as described for the press guides; however the escape passage is considerably larger relative to the restricted passage. The reason for the escape nozzle being larger relatively, is to get a very quick action on the escape; a quite as slow movement is permissible in filling the diaphragm again. In the case of the small pistons, shown in Fig. 22, it is desired to have about the same speed in both directions. The feeder is provided with a constant air supply at a pressure of about 1⅕ lbs. per square inch. This air pressure is still available while the press is stopped. The blower with its motor are not shown on these drawings, as any air supply may be used; the feeder itself being pneumatically operated as usual from the same supply.

Fig. 24 shows a nozzle 182, similar to the

one shown in Fig. 23; this is normally closed by a flat bar or plate 183 pivoted at 184 near its center. This bar is controlled by the spring 185. The lower end of this bar 183 serves as a handle. The body portion 186 forms a support for the different elements, and is connected by pipe 187 to the diaphragm 177 shown in Figs. 19 and 20, this pipe being a branch of the pipe connecting the other nozzle shown in Fig. 23. It is obvious if the nozzle shown in Fig. 24 is opened it will produce the same results as does opening the nozzle shown in Fig. 23. The part shown in Fig. 24 is located at a convenient place at the front of the press, where the operator or pressman can reach it when examining sheets as they are delivered in the pile. A slight pressure of the finger on plate or bar 183, opens nozzle 182 and causes a quick stop of the press and feeder.

The air hose 199, shown in this figure is the supply for the feeder, and not the trips; however the trips on the other side of the feeder are piped from the same supply.

When the feeder is not in use, the delivery apron, pivoted at 200, can be elevated by the drums 201 and cable 202 shown in Fig. 2. After this apron is elevated, the entire feeder may be wound back a distance of from 16″ to 22″. Fig. 2 nicely shows the bank 203 of feathered paper from the upper feed board 204 and coming around the drum 205 and on the lower board 206 in the usual manner.

The tail clamp and drag.

The tail clamp, in the present machine, is similar in construction, adjustment and control, to that shown in Figs. 1, 9 and 10 of my Patent No. 1,412,872, of Apr. 18, 1922. The drag however, in accordance with the present invention, is incorporated with the tail clamp structure, as shown in Figs. 2, 2^a and 2^b.

The clamp plate 290 is shown as pivotally supported at 291, and has an upwardly curved end 292, projecting beyond the pivot 291. The drag comprises the member or bifurcated formation 293, having the upwardly extending ends or ears 294 to which is secured the cross-pin 295 which rests upon the curved end 292 of the clamp plate 290 which extends between said ends 294. The underside of the middle part 296 of formation 293 is solid and curved and adapted to rest upon the bank of sheets in front of the sheet engaging end of clamp plate 290. The forward end of formation 293 is raised and provided with the flange 297 and post 298 for holding the weight 299, one or more of which may be used as required. On the side of the drag formation 293 is mounted the nozzle 300. The function of which is similar to that shown in Figs. 18 and 19 of my said Patent No. 1,412,872. It will thus be seen that the drag and nozzle are incorporated in the tail clamp structure and partake of the same adjustable movements as that of the tail clamp and has the additional advantage of bringing its dragging influence in the same path of travel on the sheet as that of the tail clamp.

Figs. 35 and 36 show the press feeding guide 120 as used with this feeder, drawn full size. In addition to the trip pendulum 122 incorporated in it, there is an improvement in the guides over the sheet. This is desirable in connection with a press feeder, as the two very small rods 239 over the sheet can be adjusted to bring them very close to the plate 237 below the sheet and made parallel with it. This place or spring 237, shown in elevation in Fig. 36, is just above the periphery of the press cylinder 238. It also is shown in section in Fig. 35. It is a regular part of the press. This plate is sprung in position, up against the heavy plate 236 forming the lower part of the regular press feed board. When the press guides 120 come down on these spring plates 237 they depress them slightly thus forming a close contact. The small round rods 239 having substantially horizontal and vertical extensions with a coil between said extensions are also sprung in place, the front end is under the press guide 120 and firm against it, there being a notch cut in the guide. The depth of this notch is slightly more than the flattened end of the rod 239; this fixes the space for the sheet at this end. The other end can be elevated or depressed through means of the small nut 240 at the top of the rod and bearing against the yoke or supporting frame 241 through which the rods 239 project. When properly adjusted these rods 239 insure the sheet being kept flat and straight at this vital point.

The nozzle formation 127 shown in Figs. 21 and 36 is in the form of a T having three nozzles. One arm of the T is detachably secured in the yoke or frame 241 by means of the spring 241′ engaging in a notch provided in said arm.

What I claim is:—

1. In a sheet feeding machine, the combination of two sets of drop and feed delivery rollers constantly driven with the same surface speed, one set positioned in advance of the other, and actuating means for securing their operation in required relationship for acting upon each successive sheet.

2. In a sheet feeding machine, the combination of drop and feed delivery rollers, and cooperating slow-down rollers and automatically controlled means for driving the slow-down feed rollers at different speeds as required.

3. In a sheet feeding machine, the combination of drop and feed rollers, and cooperating slow-down rollers, side registering mech-

anism and means, operating relatively to the said side registering mechanism for causing a separation of the slow-down rollers.

4. In a sheet feeding machine, the combination of drop and feed rollers, and cooperating slow-down rollers, side registering mechanism and means, operating relatively to the said side registering mechanism, for causing a variation in the pressure between the slow-down rollers.

5. In a sheet feeding machine, the combination of drop and feed rollers, and cooperating slow-down rollers, side registering mechanism and means, operating relatively to the said side registering mechanism, for causing a variation in the pressure between the slow-down rollers, and means for adjusting the time of actuation of the slow-down rollers with respect to the operation of the side registering mechanism.

6. In a sheet feeding machine, the combination of drop and feed delivery rollers and cooperating drop and feed slow-down rollers, a two-speed drive for the slow-down feed roller, means for controlling the drive and at the same time actuating the delivery drop roller.

7. In a sheet feeding machine, the combination of two sets of drop and feed rollers and cooperating pair of slow-down rollers operating relatively, means for actuating the drop roller of the second set, and means operating relatively thereto for changing the speed of the slow-down rollers, and means for adjusting the time of said change speed control.

8. In a sheet feeding machine, the combination of two sets of drop and feed rollers, cooperating slow-down rollers, actuating means therefor operating to close the first set of drop and feed rollers, at exactly the right time to start the sheet, and to open the second set of drop and feed rollers at exactly the right time to deliver the sheet to the slow-downs.

9. In a sheet feeding machine, the combination of two sets of drop and feed rollers, cooperating slow-down rollers, actuating means therefor operating to close the first set of drop and feed rollers at exactly the right time to start the sheet, and to open the second set of drop and feed rollers at exactly the right time to deliver the sheet to the slow-downs, and means for causing a heavy pressure between the cooperating slow-down rollers to receive the sheet, and then to cause a lighter engagement between the slow-downs to bring the sheet into position against the guides.

10. In a sheet feeding machine, the combination of two sets of drop and feed rollers, cooperating slow-down rollers, actuating means therefor operating to close the first set of drop and feed rollers, at exactly the right time to start the sheet, and to open the second set of drop and feed rollers at exactly the right time to deliver the sheet to the slow-downs, means for causing a heavy pressure between the cooperating slow-down rollers to receive the sheet, and then to cause a lighter engagement between the slow-downs to bring the sheet into position against the guides, and means for adjusting the pressure of said lighter engagement.

11. In a sheet feeding machine, the combination of two sets of drop and feed rollers, cooperating slow-down rollers, actuating means therefor operating to close the first set of drop and feed rollers, at exactly the right time to start the sheet, and to open the second set of drop and feed rollers at exactly the right time to deliver the sheet to the slow-downs, means for causing a heavy pressure between the cooperating slow-down rollers to receive the sheet, and then to cause a lighter engagement between the slow-downs to bring the sheet into position against the guides, and then to cause a separation of the slow-downs.

12. In valve controlling mechanism for sheet feeding machines, the combination of a rock shaft, a bracket slidably movable on the shaft provided with a spring for engaging the shaft to maintain the bracket in its position of adjustment upon the shaft, a trip pivotally secured to the bracket, and a threaded element for adjusting the pivotal position of the trip with respect to the bracket.

13. In valve controlling mechanism for sheet feeding machines, the combination of a rock shaft, a bracket slidably movable on the shaft provided with a spring for engaging the shaft to maintain the bracket in its position of adjustment upon the shaft, a trip pivotally secured to the bracket, a spring acting upon the trip and a threaded element acting in opposition to the spring for securing the required adjustment of the trip with respect to the bracket.

14. In a valve controlling mechanism for sheet feeding machines, the combination of a rock shaft, a trip adjustably secured thereto, a feed roller provided with a peripheral groove, the trip provided with an end adapted to project into the groove, said end having an upper margin adapted normally to register with the top margin of the groove, as means for indicating the proper adjustment of the trip.

15. In a sheet feeding machine, the combination of cooperating slow-down rollers, means for driving the same at different speeds, comprising a friction element on the roller shaft, and two friction drive wheels driven at different speed and means for causing alternate engagement of one or the other of said friction drive wheels with said friction element as required.

16. In a sheet feeding machine, the combination of drop and feed rollers and cooperating slow-down rollers, and actuating and controlling means therefor, including means for changing the speed of the slow-downs, and means for adjusting the time of said change.

17. In a sheet feeding machine, the combination of drop and feed rollers and cooperating slow-down rollers, and actuating and controlling means therefor, including means for changing the speed of the slow-downs, and means for adjusting the time of said change, comprising a rotating cam, a cam piece adjustably secured thereto, and a cooperating connecting rod.

18. In a sheet feeding machine, the combination of drop and feed rollers and cooperating slow-down rollers, and actuating and controlling means therefor, including means for changing the speed of the slow-downs, and means for adjusting the time of said change, comprising a rotating cam, a cooperating connecting rod and means for adjusting the effective length of the connecting rod.

19. In a sheet feeding machine, the combination of drop and feed rollers and cooperating slow-down rollers, and actuating and controlling means therefor, including means for changing the speed of the slow-downs, and means for adjusting the time of said change, comprising a rotating cam, a cooperating connecting rod and a slide box and a coacting threaded member, and means for adjusting the effective length of the connecting rod.

20. In a sheet feeding machine, the combination of drop and feed rollers and cooperating slow-down rollers, and actuating and controlling means therefor, including means for changing the speed of the slow-downs, and means for adjusting the time of said change, comprising a connecting rod, means operating synchronously with other parts of the machine for actuating the connecting rod, and a hand operated element capable of varying the effective length of the connecting rod while the machine is operating.

21. In a sheet feeding machine, side guiding mechanism comprising a longitudinally reciprocating shaft, having a rack associated therewith, a reciprocating actuating rack moving at right angles therewith, a pinion common to both racks, a cam actuated cross-head associated with the actuating rack, connecting means between the cam and cross-head including a connecting rod and rod-end and cooperating pin and shoulder for limiting the relative movement between rod and rod-end to a half turn and means whereby the cross-head may be turned from one side to the other to give right hand or left hand actuation as required.

22. In a valve controlling mechanism, the combination of a rock-shaft of substantially square cross-section, a trip-supporting bracket mounted to slide on the shaft having two adjacent faces at substantially right angles with each other for engaging corresponding faces of the shaft, and a spring plate secured to the bracket having its free end engaging a corner of the shaft diametrically opposite the angle between the bracket engaging faces.

HOWARD K. KING.