R. A. FREEMAN.

SHEET FEEDING MACHINE.

APPLICATION FILED OCT. 8, 1910.

1,156,357.

Patented Oct. 12, 1915.

3 SHEETS—SHEET 1.

Fig. 2.

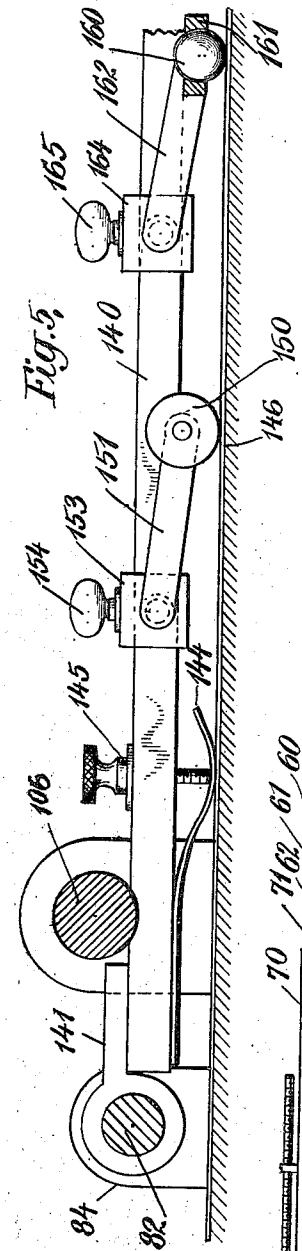
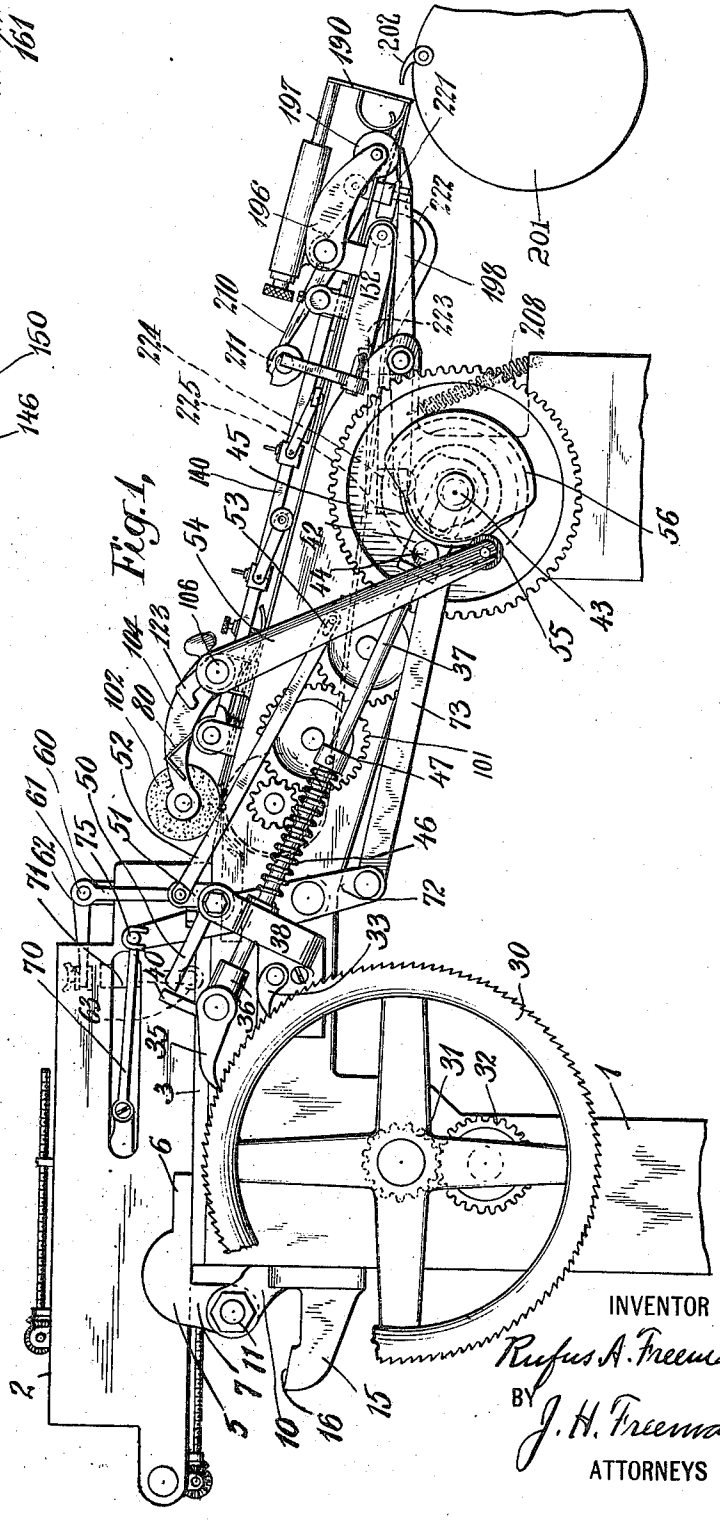


Fig. 1.



WITNESSES:

Wm. J. Dolan,

R. R. Murphy.

INVENTOR

Rufus A. Freeman

BY

J. H. Freeman

ATTORNEYS

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3 SHEETS—SHEET 2.

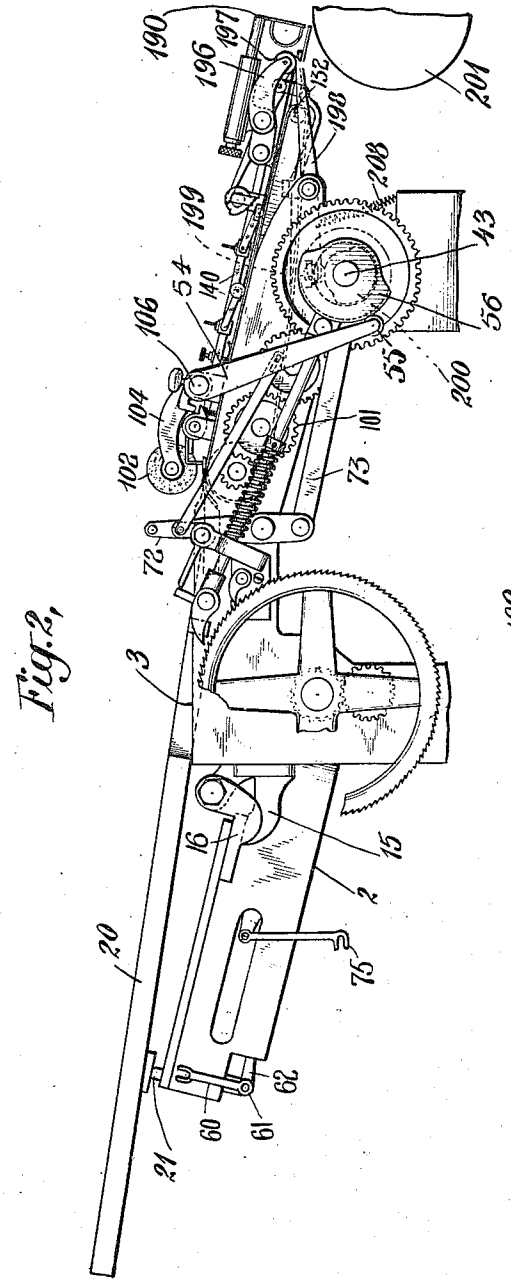


Fig. 2.

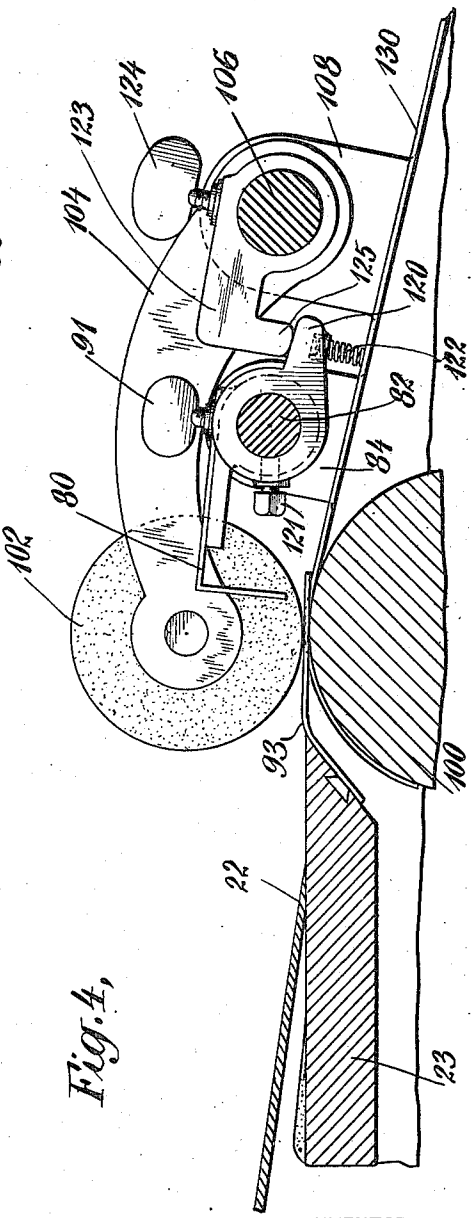


Fig. 4.

WITNESSES:

Wm. J. Dolan

R. R. Murphy

INVENTOR

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BY

J. H. Freeman

ATTORNEYS

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3 SHEETS—SHEET 3.

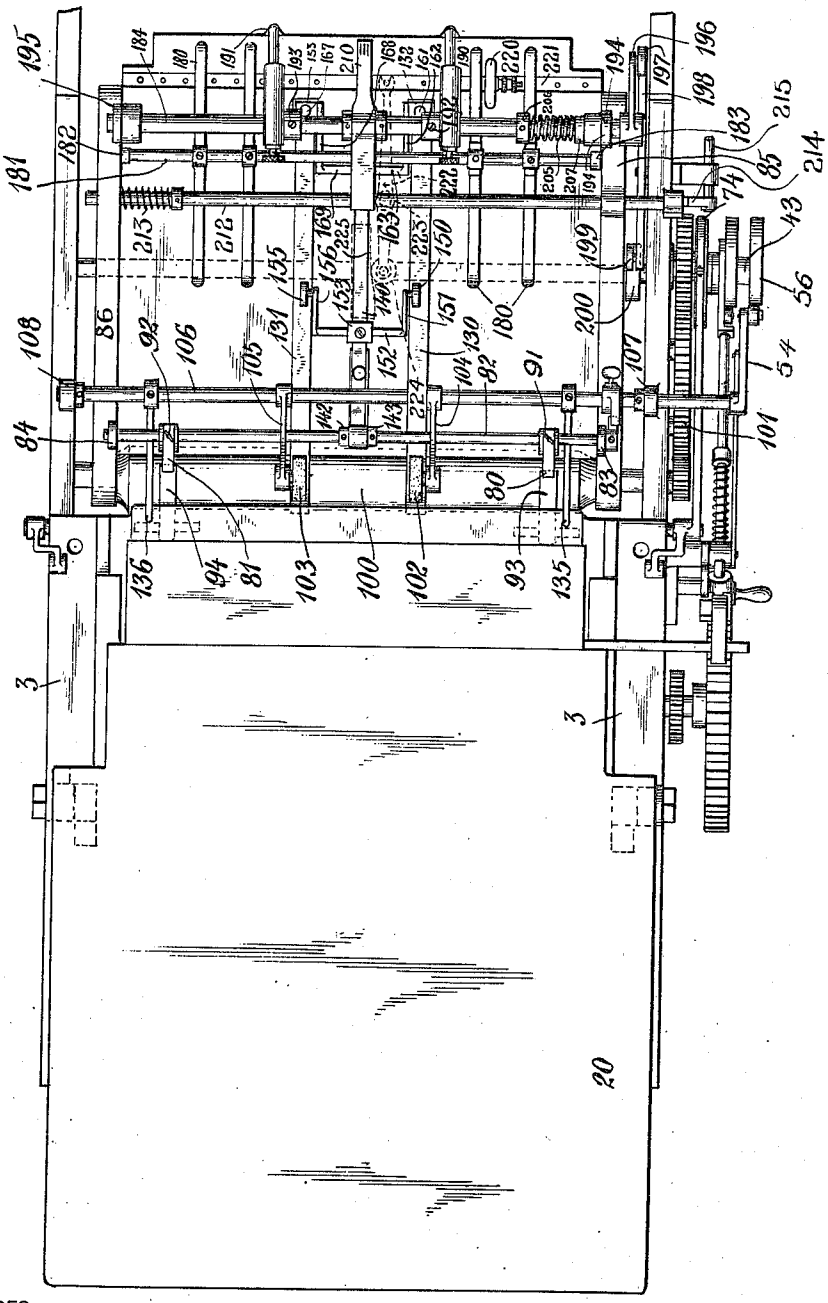


Fig. 3.

WITNESSES:

Wm. J. Dolan

R. R. Murphy

INVENTOR

Rufus A. Freeman

BY

J. H. Freeman

ATTORNEYS

UNITED STATES PATENT OFFICE.

RUFUS A. FREEMAN, OF FLUSHING, NEW YORK, ASSIGNOR TO THE AUTOPRESS COMPANY, A CORPORATION OF NEW YORK.

SHEET-FEEDING MACHINE.

1,156,357. Specification of Letters Patent. Patented Oct. 12, 1915.

Application filed October 8, 1910. Serial No. 585,955.

To all whom it may concern:

Be it known that I, RUFUS A. FREEMAN, a citizen of the United States, and a resident of Flushing, Queens county, State of New York, have invented certain new and useful Improvements in Sheet-Feeding Machines, of which the following is a specification.

The invention relates to sheet feeding machines and more particularly to machines for feeding sheets to printing presses and the like.

Objects of the invention are to provide mechanism whereby the sheets may be separated either automatically or by hand, the sheets in either case being registered automatically preparatory to passing to the printing mechanism, whereby the machine is given an exceedingly wide field of usefulness. For example, it has been found impracticable to feed all kinds of paper automatically, owing chiefly to difficulty in separating the sheets. With such a mechanism as this, the materials which cannot be separated automatically may yet be fed rapidly and accurately by hand separation.

Other objects of the invention are to provide automatic and hand separating devices, either of which may be easily and rapidly put in operative relation with the forwarding, registering and printing devices as desired; to provide for accurate positioning of the hand separated sheets preparatory to their being forwarded to and registered for the printing devices; to provide for timing the hand separated sheets preparatory to their being forwarded for registering and printing; to provide an automatic separating structure adapted to be moved into position to feed sheets automatically to the forwarding means or to serve as a support for the hand separating means when the latter is so used; to provide devices which will prevent bounding or other undesirable movement of the forwarded sheet, while permitting free movement of the sheet by the registering devices preparatory to its being taken by the printing or like devices.

These and other objects of the invention will in part be obvious and will in part be set forth hereinafter.

The invention consists in the novel parts, constructions, arrangements, combinations, and improvements, herein shown and described.

The accompanying drawings, which are referred to herein and form a part hereof, illustrate one embodiment of the invention, the same serving in connection with the description herein to explain the principles thereof.

Of the drawings: Figure 1 is a side elevation of a machine constructed in accordance with the principles of the invention and showing the automatic sheet separating mechanism in operative position; Fig. 2 is a view corresponding to Fig. 1, upon a reduced scale, showing the hand separating means in operative position; Fig. 3 is a top plan corresponding to Fig. 2; Fig. 4 is a detail elevation with parts in section of the sheet registering and forwarding means; and Fig. 5 is a detail elevation, the parts in section of certain of the sheet forwarding devices.

Referring to the accompanying drawings, illustrating by way of example one embodiment of the invention, a support or frame 1 is provided, of any suitable form, and supported thereon is an automatic sheet separating mechanism 2. This mechanism is not illustrated in detail as the specific form thereof is not a part of the present invention. Preferably, such a separating mechanism as that illustrated in my application, No. 560,572, filed May 11, 1910, is used, the same being indicated in the drawings of this application.

The automatic sheet separating mechanism 2 rests upon the upper surfaces 3 at each side of the frame 1 when in operative relation with the sheet forwarding devices. Means are provided whereby said mechanism may be moved out of operative position relatively to the sheet forwarding devices to permit of the sheets being separated by hand and supplied to the sheet forwarding means. In the present embodiment, lugs 5 are fixed to each side of the automatic separating mechanism 2. Each of said lugs 5 has an outwardly extending portion 6 and a downwardly extending portion 7 which is pivotally connected by a bolt 11 to a lug 10 extending from the frame 1. The automatic separating mechanism 2 is thus permitted to be swung about the pivots 11 out of its operative position, as shown in Fig. 1 to an inoperative position, as shown in Fig. 2. When in this position, the portions 6 of the lugs 5 rest upon the bearing surfaces 16

of brackets 15 fixed at either side on the frame 1.

Means whereby the sheets may be separated by hand and fed one by one to the sheet forwarding means are provided, and the embodied form thereof comprises a feed board 20, shown in Figs. 2 and 4 in operative position relatively to the sheet forwarding means. Said feed board is supported upon the automatic separating mechanism 2 when the latter is in the inoperative position, being, as shown, positioned upon the dowel pins 21 at the rear with its forward end 22 resting upon the transverse support 23 adjacent to the driven roller 100 and the drop rollers 102 and 103 forming a part of the sheet forwarding mechanism, as shown in Fig. 4.

Means are provided for keeping the surface of the sheet stack, which is mounted in the frame 1 below the automatic separating mechanism at the proper level for separating and feeding off the sheets, and the form thereof herein shown comprises a ratchet wheel 30 carried upon the frame 1 and having a pinion 31 fixed to rotate therewith and engaging a gear 32, which in turn is suitably connected to the pile by suitable means not shown.

Coöperating with the ratchet wheel 30 is a check pawl 33 and an actuating pawl 35 pivoted to a head 36 carried on a reciprocating rod 37, guided in a lug 38 fixed upon the machine frame. Fixed to the head 36 is a lug 40. The other end of the rod 37 is in the form of a yoke 42 which straddles a shaft 43, and is provided with a cam roll 44 riding upon a cam 45 fixed on the shaft 43. The cam roll 44 is held to the cam 45 by a spring 46, coiled about the rod 37 between the lug 38 and an adjustable collar 47 fixed on the rod 37. Pivotally mounted upon the lug 38 is a bell crank lever having one arm 50 located just in the rear of the projection 40, and having the other arm 51 pivotally connected to a link 52. The link 52 has, at its other end, a pin and slot connection 53 with a lever 54. The lever 54 has a cam roll 55 in operative relation with a cam 56 upon the shaft 43. Also pivoted to the lever arm 51 is a forked arm 60 fixed to a shaft 61. Fixed also to said shaft 61 is an arm 62, to which arm is connected a finger 63 adapted to move into and out of contact with the top of the sheet stack beneath the automatic separator 2. The pin and slot connection permits the finger 63 to regulate the swing of the lever arm 50, so that when the top of the sheet stack is too low the arm 50 is swung clear of the lug 40, thus permitting the rod 37 and pawl 35 to move backwardly and then by engagement with the ratchet wheel 30 feed up the sheet stack. By reason of the fork at the end of the arm 60, as shown in Fig. 2, the automatic separator with its feeler may be readily connected with and disconnected from the stack raising mechanism.

The automatic sheet separator is actuated in a suitable manner, and in the illustrated form, a link 70 is pivotally connected to the moving parts of the automatic separator through an aperture 71 in the side thereof. The link 70 is pivoted to one end of a lever 72 fulcrumed on the machine frame, the other end of said lever 72 connecting with a pivoted link 73, which is actuated by an eccentric 74 on the shaft 43, see Fig. 3. The link 70 is detachably connected to the lever 72, as by the hook 75 to permit the automatic separator to be swung over into the position shown in Fig. 2.

Gages are provided for registering and timing the sheets as they pass to the sheet forwarding devices preparatory to being forwarded thereby. These front gages 80 and 81 are shown fixed to a shaft 82 to rock therewith. The shaft 82 is carried in lugs 83 and 84 mounted upon the frame members 85 and 86 respectively, of the forwarding mechanism. See Fig. 3. The gages 80 and 81 are adjustable longitudinally and angularly on the shaft 82 by suitable means, such as set screws 91 and 92. Tongues 93 and 94 extend outwardly from the cross piece 23 in line with each gage onto which tongues the corresponding gages drop in position to register the sheet. The tongues and gages are adjustable transversely of the machine to accommodate sheets of different widths.

The gages 80 and 81 are used when the sheets are separated by hand and presented one by one to the sheet forwarding means, the gages insuring that the sheets will enter the forwarding means at the proper time and with their front edges substantially at right angles to the direction of movement. When the automatic separator is used, the gages 80 and 81 may be turned angularly about their shaft and fastened in inoperative positions. The parts are so shown in Fig. 1.

The roller 100 is located beneath the path of the sheets at the receiving end of the sheet forwarding devices, said roll being driven by a train of gears 101 connecting to the shaft 43. The drop rollers 102 and 103 cooperate with the driven roller 100, or with tapes carried thereby, to start the separated sheets forward. Said drop rollers are carried, respectively, by arms 104 and 105 fixed to a shaft 106, which shaft is carried in lugs 107 and 108 on the machine frame. This shaft is fixed to and operated by the arm 54 and the cam 56 previously referred to.

Devices are provided for causing the front gages and drop rollers to rise and fall in the proper time with respect to each other, in order that the sheets may be fed up to the front gages and after they are so fed up, the gages rise and the drop rollers fall, thus

feeding off the sheets in correct timing with respect to the registering and printing devices. In the present embodiment, a finger 120 is fixed to the shaft 82 by suitable means such as a set screw 121. A spring 122 acts upon the finger 120 to press the gages 80 and 81 down upon the tongues 93 and 94. Fixed to rock with the shaft 106 is a finger 123, which is connected to the shaft by a set screw 124. The end 125 of the finger 123 bears on the finger 120 so that when the cam 56 rocks the arm 54 to raise the drop rollers 102 and 103, the finger 123 will rock upwardly from the position shown in Fig. 4 to that shown in Fig. 2, permitting the spring 122 to rock the shaft 82 and thus bring the gages 80 and 81 down into operative position. When the cam 56 causes the drop rollers 102 and 103 to drop down upon the roller 100, or the tapes 130 and 131 to forward the sheet, the finger 123 will contact with the finger 120, and rock it downwardly, referred to Fig. 4, and lift the gages 80 and 81 as shown in Fig. 4, to permit the forwarding of the sheets.

Tapes 130 and 131 are shown running over the roller 100 and passing also over rollers 132 and 133 near the other end of the sheet forwarding devices. In the present embodiment, the drop rollers are shown dropping onto these tapes to forward the sheet. Suitable devices are provided for directing the sheets to the positively acting forwarding devices. For this purpose two fingers 135 and 136 are carried upon the shaft 106 and extending forward past the drop rolls.

Means are provided for preventing the forwarding of more than one sheet at a time. The embodied form of such means comprises a bar 140 having one end thereof loosely supported from the shaft 82 by means of a piece 141 attached to one end of the bar 140 and encircling the shaft 82. Said bar 140 extends above and longitudinally of the path of the sheets. Collars 142 and 143 maintain the bar 140 in position longitudinally of the shaft 82. Beneath the bar 140, and fixed thereto, is a spring 144, curved downwardly toward the path of the sheets. A screw 145 threaded in the bar 140 bears against the spring 144 to regulate the space between the spring and the table 146 along which the sheets travel, so as to permit the ready passage of a single sheet, but if more than one sheet should be separated and forwarded at a time, when they come in contact with the spring 144, they are stopped. The resulting absence of a sheet in position to be taken by the press, calls the automatic throw off mechanism into operation, and the press is stopped. This automatic throw off mechanism is preferably constructed in accordance with the improvements set forth in my application, No. 428,258, filed April 20, 1908. In so far as the throw off mechanism is herein shown, it comprises a feeler 210 pivotally mounted on a shaft 184, with one end resting on a support near the front edge of the sheet when at the front gages 190 and 191. The opposite end of said feeler 210 is in line with a groove 211 in a slidable rod 212. Said slidable rod is impelled in one direction by a spring 213 but is normally restrained from such sliding movement by a cam (not shown). Said rod 212 at one end, coöperates with an arm 214 fixed to a shaft 215 which connects to a suitable stopping mechanism for the press. When the sheet is forwarded to the front stops 190 and 191, it passes beneath the lever 210 and rocks it so that its end enters the groove 211 in the slidable rod 212. The restraining cam then ceases to act for a brief interval. The feeler 210, however, prevents the rod 212 from sliding. If, however, there is no sheet in position, the feeler 210 will not be rocked into the groove 211, and the rod 212 will be free to slide under the impulsion of its spring 213 and stop the press.

Suitable devices are also provided for keeping the sheets in contact with the tapes 130 and 131 in order that they may be forwarded with accuracy and uniformity. The embodied form thereof comprises rollers 150 and 155 adapted to rest on the tapes 130 and 131. Said rollers are mounted upon arms 151 and 156 carried on a shaft 152 journaled in a block 153 carried upon the rod 140. The block 153 is also slidable along the rod 140 and may be fixed in position thereon by a set screw 154. Other devices for holding the sheets to the tapes are provided comprising balls 160, also resting on the tapes. Said balls are carried in apertured plates 161 and 167 fixed to arms 162 and 168, which are connected to a shaft 163 journaled in a block 164. The block 164 is also slidable along the rod 140 and may be clamped in position thereon by the screw 165.

A suitable side registering device is provided. The embodied form thereof comprising the sheet engaging member 220 (see Fig. 3), which pushes the sheet to the proper sidewise position prior to its being seized by the press grippers. Said engaging member is mounted on a slidable bar 221, which is engaged and actuated by a lever 222, pivoted at 223. The other end of said lever 222 has a cam roll 224 in operative relation with a cam 225 which gives the requisite movement to said side registering device.

The mechanism is arranged so that, when the sheet is against the front gages 190 and 191, the tail of the sheet is just clear of the rollers 150 and 155. The balls 160 and 166 bear on the surface of the sheet and prevent rebound thereof from the front

gages, while permitting free movement of the sheet for side registering.

A series of fingers 180 are provided above the path of travel of the sheets for preventing the sheets flying upwardly and also assuring their proper feed to the registering surfaces on the front gages preparatory to their delivery to the press. The fingers 180 are carried on a rod 181 supported in lugs 182 and 183 on the frame.

The front gages 190 and 191 are fixed to the shaft 184 to rock therewith, but are adjusted longitudinally and angularly of the shaft by means of set screws 192 and 193 respectively. The shaft 184 is shown journaled in lugs 194 and 195 carried on the frame. Fixed to an end of the shaft 184 is an arm 196 carrying a cam roll 197. In operative relation with said cam roll is a lever 198 pivoted on the machine frame and having at its opposite end a cam roll 199, in operative relation with a cam 200 carried upon the shaft 43.

A spring 205 coiled about the shaft 184 and acting between a collar 206 upon the shaft and a collar 207 connected to the lug 194 acts to bring the front gages 190 and 191 down into registering position. A spring 208 acts to hold the lever 198 to its cam 200. An impression cylinder 201, shown only partially in the drawings, is provided with grippers 202 for taking the sheet after it has been registered by the front gages 190 and 191.

The operation of the herein described mechanism will be clearly understood from the descriptions of operations already given in connection with the various groups of mechanism. It will be understood further that a machine has been provided which realizes the objects of invention and the advantages herein set forth, together with other objects and advantages.

The invention in its broader aspects is not limited to the precise construction and arrangement herein shown and described, but many modifications may be made in the construction and arrangement without departing from the main principles of the invention and without sacrificing its chief advantages.

I claim:

1. A sheet feeding machine including in combination, sheet forwarding means, automatic sheet separating means, comprising separating devices and a supporting structure therefor, a frame, pivotal connections between said frame and said supporting structure of the sheet separating means, whereby said separating means may be swung into and out of position to deliver the separated sheets to said sheet forwarding means, and a hand feed board for delivering sheets to said sheet forwarding means when said automatic sheet separating means is out of said delivering position, said supporting structure serving as a support for said feed board.

2. A sheet feeding machine including in combination, sheet forwarding means, automatic sheet separating means comprising separating devices and a supporting structure therefor, a frame, pivotal connections between said frame and said supporting structure, whereby said supporting structure may be swung toward said sheet forwarding devices to bring the delivering end of said sheet separating means into position to deliver the separated sheets thereto, or said supporting structure may be swung away from said sheet forwarding devices so as to project from said frame away from said sheet forwarding devices to serve as a support for a hand feed board in position to deliver sheets to said sheet forwarding devices.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

RUFUS A. FREEMAN.

Witnesses:
R. R. MURPHY,
EDWARD W. GROTZ.