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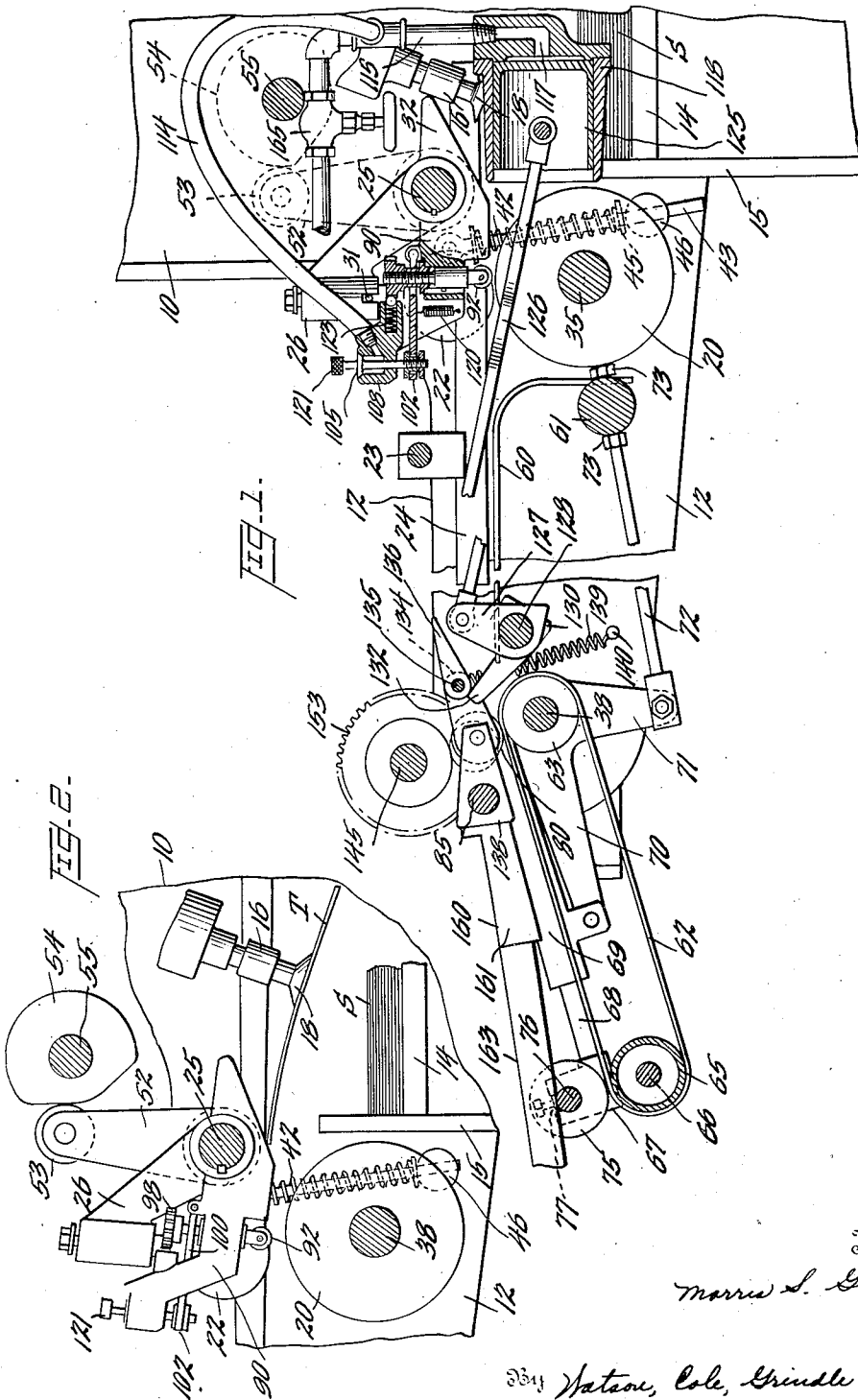
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2,225,005

DEFLECTOR FOR SHEET FEEDING MECHANISM

Filed June 13, 1939

3 Sheets-Sheet 1



Dec. 17, 1940.

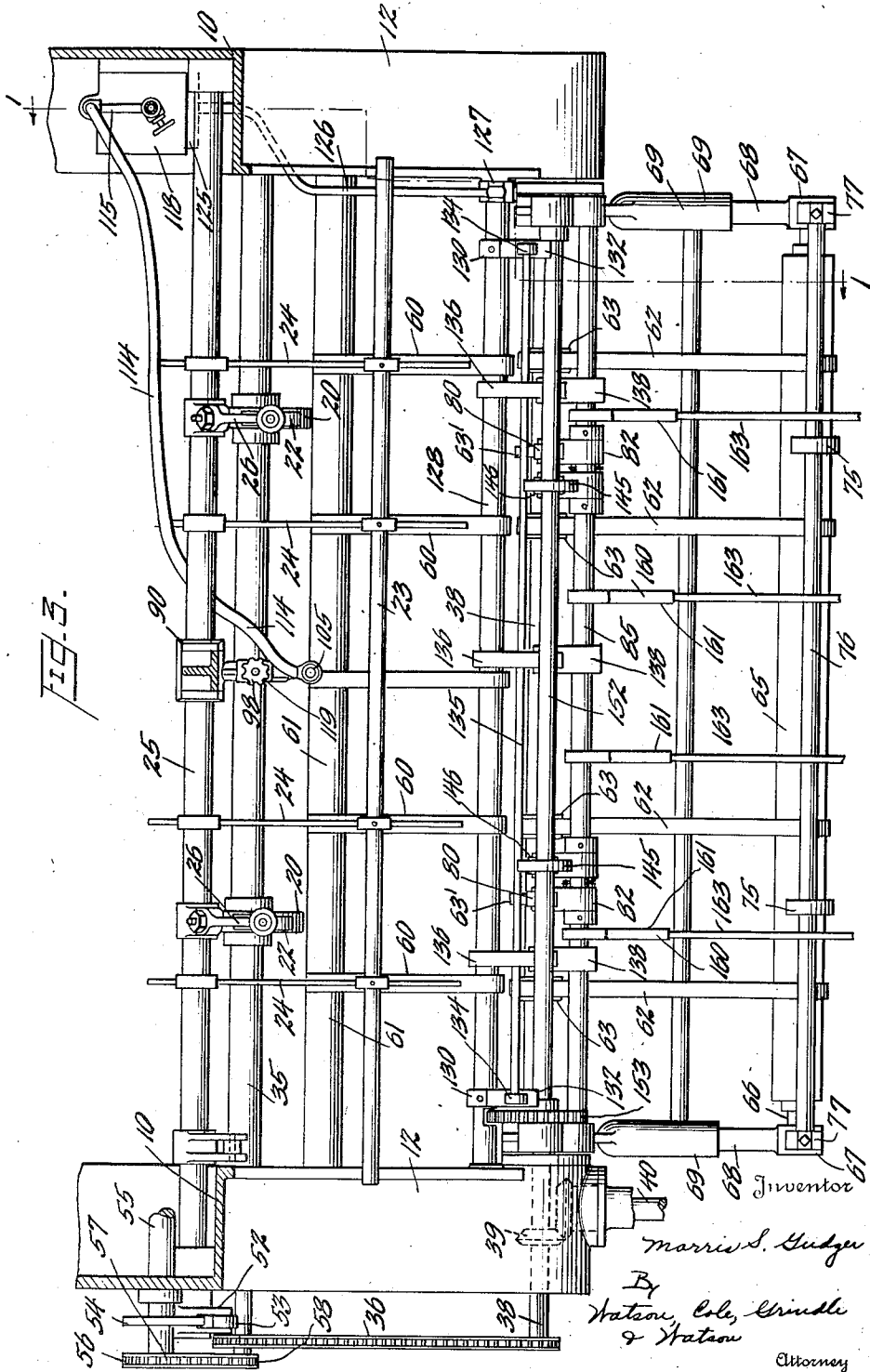
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DEFLECTOR FOR SHEET FEEDING MECHANISM

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3 Sheets-Sheet 2



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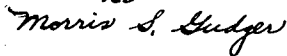
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DEFLECTOR FOR SHEET FEEDING MECHANISM

Filed June 13, 1939

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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DEFLECTOR FOR SHEET FEEDING
MECHANISM

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Application June 13, 1939, Serial No. 278,942

10 Claims. (Cl. 209—88)

This invention relates to feeding sheets and more particularly to processes and devices for accurately feeding, in timed sequence, single sheets of predetermined limits of thickness.

5 The general object of the invention is the provision of a novel and improved method and apparatus for feeding sheets of predetermined gauge singly to a receiving station, which may be associated with a machine for performing certain processing operations on the sheets, such as
10 for example, a slitter, shears, punch press, lithographic or other printing press, or the like.

More specifically, it is an object of the invention to provide, in a machine of this type, novel
15 means for caliper the sheets being fed and for deflecting multiple sheets and sheets of a thickness greater than that for which the device is set, and assembling said rejected sheets at a point of delivery separate from the destination of the
20 singly fed sheets which are within the predetermined limits of thickness.

In its preferred embodiment, the invention contemplates the provision of an adjustable caliper or gauging element adapted to be inter-
25 mittently brought to a position adjacent a feed roller so as to be actuated by contact with abnormally thick or multiple sheets. When contacted by such sheets, the caliper-detector is moved and, through suitable mechanical and
30 pneumatic connections, operates certain deflecting elements which are made to intersect the normal path of delivery of the sheets and thus divert these abnormal sheets to a separate delivery point. Means are also provided for ade-
35 quately prolonging the time that the switch or diverter is in operative position and for returning it to idle position for the normal feeding of the sheets.

One type of primary separator and feeder with which the present diverter or rejector may be
40 employed is disclosed in the copending application Serial No. 281,989, filed June 29, 1939, jointly by Frederick W. Seybold and myself.

Other objects and features of novelty will be
45 apparent from the following specification when read in connection with the accompanying drawings, in which one embodiment of my invention is illustrated by way of example.

In the drawings:

50 Figure 1 is a view in longitudinal section of the forward portion of a sheet feeder embodying the principles of my invention and illustrating in detail the caliper and deflecting mechanism, this view being taken substantially on line 1—1 of Figure 3;

Figure 2 is a fragmentary view of a portion of Figure 1 showing the caliper device in raised position;

Figure 3 is a horizontal sectional view through the upper part of the frame of the machine showing the sheet forwarding and deflecting
5 mechanism in plan;

Figure 4 is a fragmentary view in vertical longitudinal section of the caliper device;

Figure 5 is a view partly in side elevation and partly in vertical longitudinal section of a drop
10 roller arrangement;

Figure 6 is a view in vertical longitudinal section of the forward portion of the machine showing the paths of movement of the normal sheets
15 and of the thick or multiple sheets, the deflector element being tripped to divert rejected sheets; and

Figures 7 and 8 are fragmentary views in vertical section of details of the deflecting mech-
20 anism illustrated in Figure 6.

Although the present invention may be applied to sheet feeding and delivering apparatus of various kinds, it has been illustrated in connection with a feeder of the type disclosed in the
25 copending applications, Serial No. 281,989 and Serial No. 281,990, to which reference may be had for further details of the sheet separating and feeding devices and the mechanism for elevating the platform supporting the pile of sheets.
30 A portion of the upper part of the supporting frame and housing of the feeder is indicated at 10, and it will be seen by referring to Figures 1 and 3 that the upper portion of the frame is provided with forwardly projecting side members 12
35 which serve to support most of the mechanism comprised in the rejecting or deflecting conveyor provided by the present invention.

In Figures 1 and 2 the pile supporting platform is indicated at 14 and the pile of sheets is
4 designated by the letter S. A stationary forward wall 15 prevents displacement of the sheets forwardly until they are separated and removed by the devices provided for this purpose.

One of the suction gripper devices for separating and removing the successive top sheets T
4 from the pile is indicated at 16 in Figures 1 and 2, these members being provided with suction cups 18 at their lower ends for gripping and transporting the sheets. In the position of the
5 gripper shown in Figure 2, the sheet T has been raised from the pile S and moved a short distance forwardly toward the feed roll 20. The gripper continues its forward movement until it reaches the position shown in Figure 1, where-
5

upon the forward edge of the sheet has passed a short distance beyond the vertical center line of the feed roll 20 and has been seized between the feed roll 20 and the drop roll 22. In order to aid in guiding the forward edge of a sheet T toward the roller, the upper stationary guide strips 24 are provided, these strips being pivotally supported adjacent their rear ends upon the rock shaft 25 and connected by the rod 23 by which they may be raised to a vertical inoperative position. The shaft 25 also serves to support the laterally spaced brackets 26 which carry the drop rolls 22, as shown in Figures 3 and 5.

As shown in Figure 5 of the drawings, the drop rolls are carried upon the stems 28 which are resiliently seated within the cylindrical portions 29 of the brackets 26 by means of the spring 30. A pin and slot arrangement 31 prevents rotation of the drop roll in a horizontal plane. The drop roll brackets 26 are provided with lower curved and tapered guide portions 32 which assist in guiding the forward edge of the sheet between the feed and drop rolls. The shaft 25 upon which the drop roll brackets are secured is continually urged in a clockwise direction by means of the spring 42 which surrounds the rod 43 and is compressed between the spring seat 44 held by pin 47 upon the rod adjacent its upper end and a seat 45 which bears against the stationary stud 46 through which the rod 43 extends at its lower end. The upper end of the rod is pivotally connected as at 48 with the crank arm 50 secured to the shaft 25. Another arm 52 secured to the shaft is provided with a roller 53 which follows the cam 54 fixed to the cam shaft 55. Upon the outer end of the cam shaft 55 there is provided a sprocket 56 which is connected by means of the chain 57 with a sprocket 58 on the shaft 35. It will be seen that by this means the drop roll 22 is intermittently raised and lowered at predetermined points in the cycle of operation of the feeder so as to press upon the sheets as they are being forwarded by the feed roll 20.

The feed rolls 20 are carried by the rotary shaft 35 which is provided with suitable bearings in the frame extension 12 and is adapted to be driven by the sprocket chain 36 which connects the shaft 35 with the conveyor driving shaft 38 carried by the forward end of the side frame extensions 12. This shaft 38 is operatively connected by means of the bevel gears 39 with the initial drive shaft 40 which is adapted to be suitably connected and driven in synchronism with a machine to which the sheets are to be fed.

From the feed roll 20 the sheets are forwarded over the lower guide strips 60, which are secured at their rear downwardly projecting ends to the cross bar 61, and thence onto the tapes 62 of an endless conveyor. The tapes 62 pass around the driving rollers 63 carried on the conveyor shaft 38 and at their forward ends are guided around the elongated roll 65 which is carried on the shaft 66. The ends of this shaft 66 are rotatably carried in brackets 67 which are provided with arms 68 which are adjustably received within the hollow tubular portions 69 of the brackets 70 which are pivotally supported at each side of the conveyor upon the frame extensions 12. Downwardly projecting arms 71 are also formed on the brackets 70 and these conveyor supporting brackets are maintained in adjusted angular positions by means of the links

72 which connect the arms 71 with the shaft or cross bar 61, the links 72 passing through the bar and being adjustable by means of the nuts 73.

Pressure rollers 75 are carried by the shaft 76, the ends of which are secured as at 77 within the upper portions of the brackets 67. Pressure rollers also cooperate with the rollers 63 on the conveyor driving shaft 38, these rollers being designated by the reference numeral 80 and are trunnioned within the bifurcated ends 81 of the blocks 82 pivotally mounted upon the shaft 85 which extends between the conveyor supporting brackets 70 above the belt conveyor mechanism.

Thus far there has been described substantially all of the conveying and transferring mechanism necessary to effect the normal movement of the sheets from the suction grippers 16 to a receiving station beyond the forward end of the conveyor tapes 62, which station may be disposed upon a suitable machine for processing the sheets. The mechanism for detecting the feeding of abnormally thick sheets or multiple sheets will now be described, together with the mechanism for rejecting such abnormally fed sheets and deflecting them to a separate delivery point from the delivery station of the normally singly fed sheets.

Secured to the same shaft 25 that carries the drop rolls 22 is the bracket 90 which may be disposed substantially centrally of the shaft. The bracket 90 is intermittently oscillated in the same way as the drop rollers are moved and it is provided with caliper mechanism which is brought down into contact with the sheets passing between the feed rolls 20 and the drop rolls 22. The caliper mechanism comprises the small roller 92 carried upon the lower end of the stud 93 which is vertically slidable within the bracket 90, rotation being prevented by the key 94 which slides within the keyway 95 formed in the bore of the bracket through which the stud moves. The upper end of the stud 93 is threaded as at 97 for the reception of the nut 98. The nut 98 is provided with the annular grooved portion 99 which receives the bifurcations of the rear end of the lever 100 which is pivoted to the bracket 90 as at 101. The forward end of the lever is adjustably connected as at 102 with the lower threaded end of the valve stem 103. The valve body 105, carried at the upper end of the stem, seats upon the beveled rim 106 of the upwardly opening chamber 107 formed in the upward extension 108 of the bracket 90. A passageway 110 leads from this chamber to a threaded opening 111 into which fits a nipple 112 which is connected to a tube 114 which communicates with a pipe 115 leading from a suitable source of vacuum to the inlet passageway 117 of the pneumatic cylinder 118.

A spring 120 serves to urge the lever 100 downwardly to valve closing position and it will be noted that the relative application of forces to the lever 100 is such that a slight upward movement of the caliper wheel 92 will open the valve to a considerable extent. A knurled knob 121 may be provided upon the valve stem 103 for adjustment purposes, as indicated in Figures 1 and 2. In order to set the caliper to the limit of thickness of the sheets being fed, its position may be adjusted with relation to the lever 100 by rotation of the nut 98. The upper end of the nut 98 is provided with an annular series of indentations 119 within which the ball 122 is adapted to be resiliently pressed by means of the spring 123. The ball and spring are seated

within the bore 124 of the upper portion of the bracket and serve as stop means for maintaining the adjusted position of the nut 98.

A piston 125 is reciprocably mounted in the cylinder 118 and is connected by means of a rod 126 with an arm 127 fixed upon the transverse shaft 128 adjacent one end thereof. At points near both ends of the shaft 128 there are secured the blocks 130 which are provided with fingers 132 which are disposed beneath and are designed to support the rollers 134 secured upon the ends of the cross rod 135. This rod passes through the deflector fingers 136, of which there are three, disposed in spaced relation across the width of the conveyor mechanism. These deflector fingers 136 are pivotally mounted between the bifurcations at the rearward ends of the blocks 138 secured to the cross rod 85. The rod 135 and its supported deflector fingers 136 are urged downwardly so that the rollers 134 continually press upon the fingers 132, by means of the spring 139 which is secured to the frame extension 12 as at 140.

The operation of the calipering and deflecting mechanism will now be described. When abnormally thick sheets or multiple sheets are inadvertently fed onto the feed roll 20, the descending caliper roller 92 is moved upwardly with respect to the bracket 90, thus swinging the lever 100 and opening the valve 105. This breaks the vacuum in the piping 114, 115, and permits the piston 125 to move outwardly within the cylinder 118, and the blocks 130 with their fingers 132 to move downwardly under the influence of the spring 139. This causes the fingers 136 to pass across the path of the sheets over the strip 60 on their way to the conveyor tape 62 and diverts them upwardly over the fingers 136 and the upper surfaces of the tapered blocks 138 so that they pass between the upper rotating feed rollers 145 and the lower pressure rollers 146 which are carried by the ends of the tapered blocks 147 which are loosely mounted upon the shaft 85, adjacent the roller-carrying blocks 82. A spring 148 serves to urge the blocks 147 and 82 in opposite directions of rotation around the shaft 85. One end of the spring 148 is connected to an upper left-hand portion of the block 147 as at 149, and the other end of each of the springs 148 is connected as at 150 to a portion of the block 82 to the right of the shaft 85. In this way the roller carrying ends of the blocks 82 are urged downwardly so that the rollers 80 press upon the conveyor feed rollers 63 and the roller carrying ends of the blocks 147 are urged upwardly so that the rollers 146 press against the auxiliary feed rollers 145. The feed rollers 145 are carried upon the shaft 152 which is provided with a gear 153 which meshes with and is driven from a corresponding gear 154 carried by the conveyor shaft 38.

From this point the sheets are moved along the guide surfaces 160 of the arms 161 which are also pivoted to the shaft 85 and then drop upon the strips 163 above the normal delivery point from whence they may be removed from the feeder.

In the vacuum line 115 there is disposed a needle valve 165 which is adjusted to throttle the flow of air and is set at a point where, after the valve 106 has closed, it will prevent the suction from building up sufficiently to return the piston 125 and the deflecting fingers 136 to their normal position before the tail of the rejected sheet has passed the fingers.

Various changes and modifications may be made in the embodiments illustrated and described herein without departing from the scope of the invention as defined in the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a sheet feeder of the class described, in combination, a fixed feed roll over which the sheets successively pass on their way through the feeder, an intermittently actuated pivoted detector device adapted to be moved to a point adjacent said fixed roll and spaced therefrom a distance equal to the predetermined normal thickness of the sheets each time a sheet is fed, a deflecting switch normally positioned out of the ordinary path of the sheets at a point beyond the detector device, a movable element on said detector device adapted to be actuated by multiple sheets or sheets of abnormal thickness, resilient means urging said switch toward deflecting position, means acting to prevent said movement, a vacuum cylinder, a piston in said cylinder and operatively connected with said preventing means, a source of vacuum, a conduit providing communication between said cylinder and said source of vacuum, a valve for opening said conduit to the atmosphere, said valve being embodied in said detector device, a valve actuating element adapted to be moved by abnormal or multiple sheets to open said valve and break the vacuum, whereby said switch is shifted to sheet deflecting position.

2. The device as set forth in claim 1 in which there is disposed in said conduit at a point between the source of vacuum and said release valve, a constriction for preventing the rapid restoration of vacuum in said cylinder so that the switch will not be restored until the abnormal sheets have passed.

3. In a sheet feeder of the class described, in combination, a fixed feed roll over which the sheets successively pass on their way through the feeder, an intermittently actuated pivoted detector device adapted to be moved to a point adjacent said fixed roll and spaced therefrom a distance equal to the predetermined normal thickness of the sheets each time a sheet is fed, a deflecting switch normally positioned out of the ordinary path of the sheets at a point beyond the detector device, a movable element on said detector device adapted to be actuated by multiple sheets or sheets of abnormal thickness, resilient means urging said switch toward deflecting position, means acting to prevent said movement, a vacuum cylinder, a piston in said cylinder and operatively connected with said preventing means, a source of vacuum, a conduit providing communication between said cylinder and said source of vacuum, a valve for opening said conduit to the atmosphere, said valve being embodied in said detector device, a valve opening plunger adapted to be moved by abnormal or multiple sheets to open said valve and break the vacuum, whereby said switch is shifted to sheet deflecting position, means for adjusting the relative position of said plunger and said valve to set the device for predetermined limits of thickness of sheets.

4. In a deflecting sheet feeder of the class described, in combination, means for forwarding sheets successively along a normal path of movement, comprising preliminary feeding means and a subsequent feed roll, a deflector switch dis-

posed between said preliminary feeding means and said feed roll, caliper means for actuating said switch to divert abnormal sheets from said normal path and away from said feed roll along another path of movement, another feed roll adjacent said second path for feeding said abnormal sheets toward a separate destination, a plurality of pressure rollers pivotally mounted on a common shaft, and means connecting certain of said pressure rollers together and resiliently urging some toward one feed roll and others toward the other feed roll.

5. In a deflecting sheet feeder of the class described, in combination, means for forwarding sheets successively along a normal path of movement, comprising preliminary feeding means and a subsequent feed roll, a deflector switch disposed between said preliminary feeding means and said feed roll, a cross shaft upon which said deflector switch is pivotally mounted, caliper means for actuating said switch to divert abnormal sheets from said normal path and away from said feed roll along another path of movement, another feed roll adjacent said second path for feeding said abnormal sheets toward a separate destination, a pair of pressure rollers pivotally mounted on said cross shaft, and resilient means connected to both of said pressure rollers to urge them in opposite directions to cooperate respectively with said feed rolls.

6. In a deflecting sheet feeder of the class described, in combination, a supporting frame, means for forwarding sheets successively flatwise along a definite path of movement on said frame, a point of deflection on said path beyond which are disposed divergent paths for the sheets, a plurality of pivoted deflector tongues at said point, means for resiliently urging said tongues toward positions for deflecting sheets into one of said divergent paths, a transverse rod connecting all of said tongues, a crank arm pivoted upon said frame adjacent said rod and adapted to contact the latter, a piston and a pneumatic cylinder in which it is adapted to move, linkage connecting said crank arm with said piston, and means for controlling the pressure in said cylinder, whereby said piston will move therein and cause the crank arm to move said tongue against the influence of said resilient means to divert sheets into another of said divergent paths of movement.

7. A switching arrangement for a deflecting sheet feeder or the like comprising in combination, a frame, a support on said frame along which successive sheets are adapted to be moved flatwise along a definite path, a point of deflection on said path beyond which are disposed divergent paths for the sheets, a deflector for diverting certain of said sheets along one or the other of said divergent paths, a pair of spaced feed rolls beyond said deflector each adapted to move the sheets along one of said divergent paths, a pair of cooperating pressure rollers disposed between said feed rolls, one of each pair adapted to respectively cooperate with one of said feed rolls, said pressure rollers mounted respectively on adjacent brackets which are pivotally carried by a common shaft, a spring element secured at each end to a point on the respective brackets, said points being both upon the same side of a plane passed through the axis of said shaft, said spring element being bent around said shaft, whereby said brackets are mutually urged in opposite directions about said shaft and the rollers

into resilient contact with their respective feed rolls.

8. A switching arrangement for a deflecting sheet feeder or the like comprising in combination, a frame, a support on said frame along which successive sheets are adapted to be moved flatwise along a definite path, a point of deflection on said path beyond which are disposed divergent paths for the sheets, a deflector tongue pivotally mounted upon a transverse shaft for diverting certain of said sheets along one or the other of said divergent paths, a pair of spaced feed rolls beyond said deflector each adapted to move the sheets along one of said divergent paths, a pair of cooperating pressure rollers disposed between said feed rolls, one of each pair adapted to respectively cooperate with one of said feed rolls, said pressure rollers mounted respectively on adjacent brackets which are pivotally carried by said transverse shaft, a spring element secured at each end to a point on the respective brackets, said points being both upon the same side of a plane passed through the axis of said shaft, said spring element being bent around said shaft, whereby said brackets are mutually urged in opposite directions about said shaft and the rollers into resilient contact with their respective feed rolls.

9. In a sheet deflecting feeder of the class described, which includes a deflector element having an operating means controlled by variations in fluid pressure and a fluid conduit connecting said operating means with a source of pressure; a calipering device which comprises a bracket adapted to be disposed adjacent the path of movement of sheets being fed, a plunger guided in said bracket for reciprocating movement only and adapted to be moved by the passage of abnormal or multiple sheets, a passageway in said bracket communicating with said conduit, a valve adapted to control the fluid pressure in said passageway and conduit, a lever fulcrumed on said bracket and pivotal connections between said lever and said valve and between said lever and said plunger, whereby said valve will be actuated by said plunger to control the fluid pressure and thus the actuation of said deflector, at least one of said pivotal connections being adjustable for regulating the desired thickness of sheets to be permitted to pass said calipering device.

10. In a sheet deflecting feeder of the class described, which includes a deflector element having an operating means controlled by variations in fluid pressure and a fluid conduit connecting said operating means with a source of pressure; a calipering device which comprises a bracket adapted to be disposed adjacent the path of movement of sheets being fed, a plunger guided in said bracket for reciprocating movement only and adapted to be moved by the passage of abnormal or multiple sheets, a passageway in said bracket communicating with said conduit, a reciprocating valve adapted to place said passageway into and out of communication with the atmosphere, a lever fulcrumed on said bracket and pivotal connections at spaced points along its length with said valve and with said plunger whereby said valve will be actuated by said plunger to control the fluid pressure and thus the actuation of said deflector, both of said pivotal connections being adjustable in order to set the device for predetermined limits of thickness of the sheets.