Dec. 6, 1938. F. R. BELLUCHE 2,138,995

SHEET FEEDER

Filed June 7, 1937 2 Sheets-Sheet 1

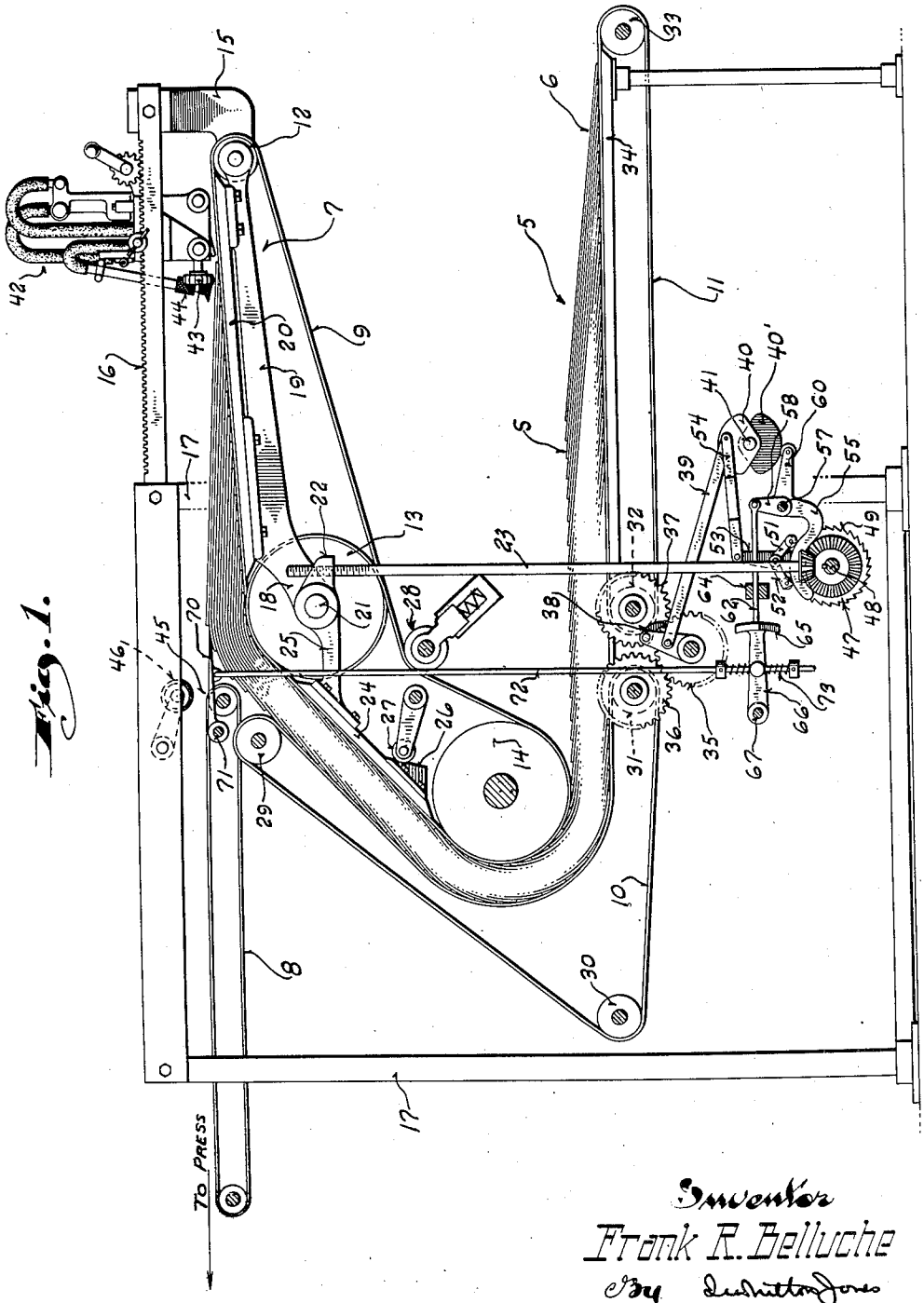


Fig. 1.

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SHEET FEEDER

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Fig. 2.

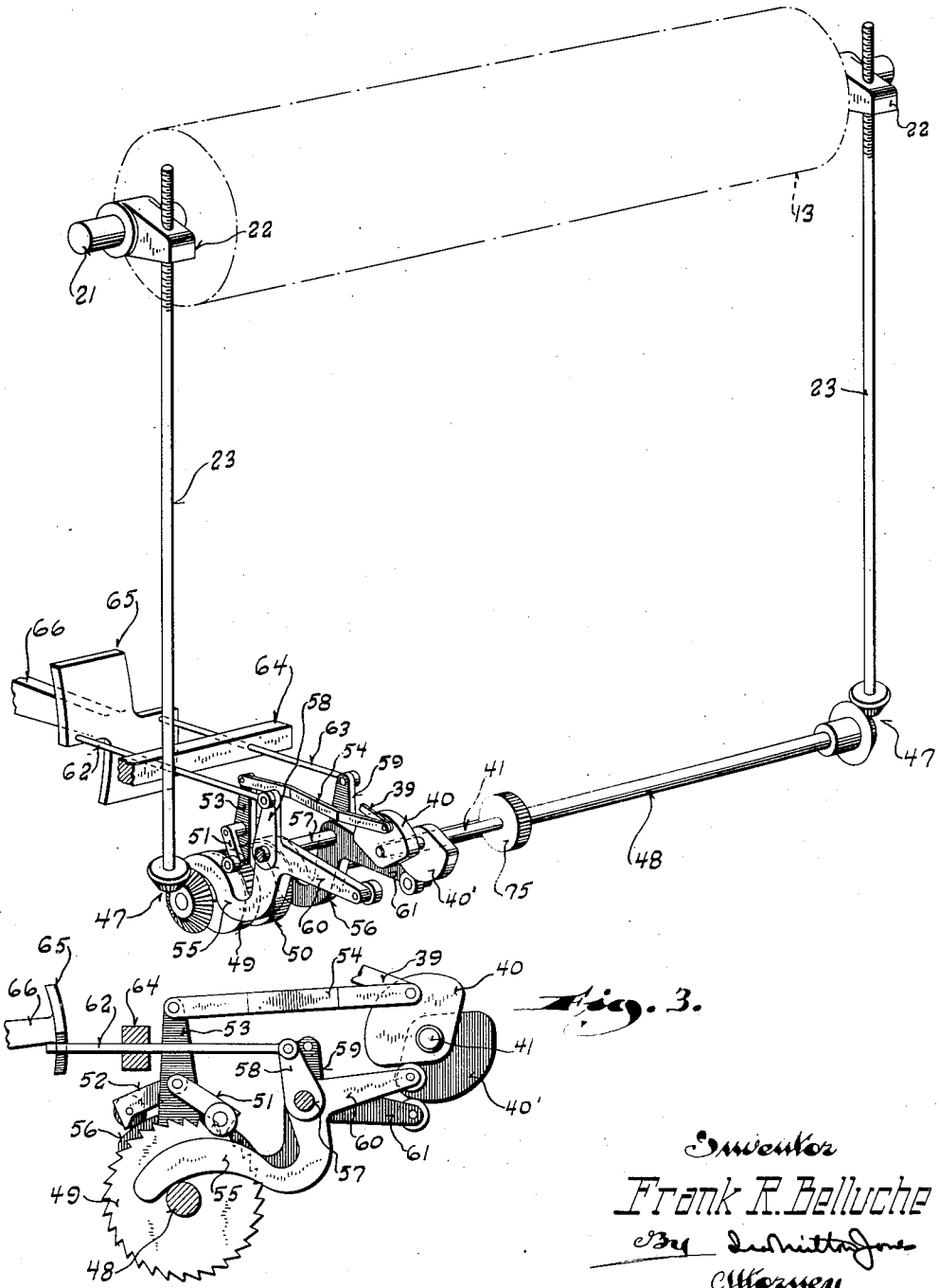


Fig. 3.

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UNITED STATES PATENT OFFICE

2,138,995

SHEET FEEDER

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Application June 7, 1937, Serial No. 146,789

17 Claims. (Cl. 271—38)

This invention relates to sheet feeders for feeding sheets of paper or other material to printing presses and other kindred machinery.

One of the objects of this invention is to provide a feeder which may be more conveniently loaded and which is so designed as to permit underlapped feeding of sheets to the press or other machine being fed.

More specifically it is an object of this invention to provide a sheet feeder of the continuous type wherein sheets are loaded in fanned-out relationship to continuously maintain a bank of sheets in position to be fed to a conveyor which carries the sheets to the press or other machine being fed.

Another object of this invention is to provide a feeder of the character described wherein the sheets are fed off the rear of the bank onto the conveyor which carries them to the press.

Another object of this invention is to provide means for maintaining the top of the bank at a predetermined elevation with respect to the feed-off conveyor and to control the means whereby necessary adjustment is effected from a feeler resting on top of the bank of sheets.

It is also an object of this invention to provide a sheet feeder of the continuous type so designed that the sheets are loaded on its lower stretch and fed off from its upper stretch, and wherein the transfer of the sheets from the lower to the upper stretch is effected by conveying tapes traveling around a plurality of drums instead of the usual single drum.

Another object of this invention is to provide a feeder of the character described wherein automatically operable adjusting mechanism is provided to raise or lower the feed-off end of the upper stretch of the conveyor to maintain the top of the bank of sheets carried thereby at a predetermined elevation.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side view of a sheet feeding mechanism embodying this invention;

Figure 2 is a perspective view illustrating the manner in which the desired adjustment of the upper stretch of the conveyor is attained; and

Figure 3 is a detail side view of part of the adjusting mechanism to illustrate its manner of operation.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts, the numeral 5 designates generally a conveyor of the continuous type having a lower stretch 6 and an upper stretch 7. The space between the upper and lower stretches of the conveyor is sufficient to permit loading of the sheets S on the lower stretch 6 in fanned-out relation.

Upon being conveyed onto the upper stretch 7, the bank of sheets assumes the form illustrated in Figure 1 with a thin forward end and a thick rear end.

A feed-off conveyor 8 of any suitable design is arranged with its receiving end in juxtaposition to the thick end of the bank of sheets on the upper stretch 7 to receive sheets off the top of the bank and forward them to the press or other machine being fed. The detailed construction of the conveyor 8 forms no part of this invention, and consequently, has not been shown.

The conveyor 5 comprises three sets of endless tapes 9, 10 and 11 arranged in a manner now about to be described.

The set of tapes 9 is trained about an upper end pulley or roll 12 and two intermediate rolls or drums 13 and 14. The drum 14 is mounted in fixed bearings (not shown), and the roll 12 is journalled in bearings 15 carried by an overhanging support 16. The support 16 comprises a frame structure including upright supporting posts 17, and so constructed as to offer no interference to the loading of the sheets onto the lower stretch 6.

The other intermediate drum 13 is adjustable vertically to permit adjustment of the height or elevation of the top of the bank of sheets. To adjustably support the drum 13, it is journalled in bearings 18 on the outer ends of arms 19 pivotally mounted from the shaft of the pulley or roll 12. These arms 19 also carry the upper feed board 20 of the conveyor 5 across which the upper stretch of the tapes 9 travels to advance the bank of sheets toward the pulley or roll 12.

To support the outer ends of the arms 19, and consequently the drum 13, the projecting shaft ends 21 of the drum have nut members 22 journalled thereon in which vertically disposed screw

shafts 23 are threaded. The screw shafts 23 are suitably supported in upright position and through rotation in one direction or the other raise or lower the drum 13, it being understood that there are two such screw shafts, one at each end of the drum, as clearly shown in Figure 2.

The projecting shaft ends 21 of the drum 13 also support the upper end of an inclined board 24 through brackets 25. The lower end of the board 24 is maintained in proper position to at all times dispose its upper surface tangentially to the drums 13 and 14 regardless of vertical adjustment of the drum 13, by means of a cam 26 fixed to the lower end of the board and riding on a roller 27 suitably supported from a stationary part of the structure.

An idler pulley 28 maintains the set of tapes 9 taut.

The set of tapes 10 is trained over three pulleys or rolls 29, 30 and 31 so disposed with respect to each other and the intermediate drums 13 and 14 as to maintain the inner stretch of the tapes 10 in parallel relationship to that portion of the tapes 9 passing over the drum 14 and extending upwardly to the drum 13 so that the sheets will be advanced between the tapes 10 and 9.

The tapes 11 are trained about pulleys or rolls 32 and 33 horizontally spaced apart to have the upper stretch of the tapes 11 travel across the top of a supporting table 34 and to advance the sheets loaded thereon to the tapes 9 and 10. To provide for the advance of the sheets, the pulleys or rolls 31 and 32 are intermittently driven by having a geared connection to a driving pinion 35.

The pinion 35 meshes with gears 36 and 37 fixed respectively to the shafts of the rolls or pulleys 31 and 32 and is intermittently advanced in a clockwise direction, as viewed in Figure 1, by a pawl 38 reciprocated by a link 39. The link 39 has its outer end connected to a cam 40 which is fixed to a continuously rotating shaft 41. For the purpose of providing an intermittent advance of the fanned-out sheets, the cam 40 acts merely as a crank, its cam function being for a different purpose to be hereinafter described.

As noted hereinbefore, when the sheets are brought to the upper stretch 7 of the continuous feeder, they are fed off rearwardly onto the conveyor 8 which carries them to the press or other machine being fed, or to any other destination, and to this end a sheet separator and forwarding mechanism, indicated generally by the numeral 42, is provided. While the detailed construction of the sheet separator and forwarder forms no part of this invention that type of separator and forwarder illustrated in Patent No. 2,075,016 issued to Elmer W. Belluche and Frank R. Belluche March 30th, 1937, may be used.

Without resorting to a detailed description, this mechanism comprises a combing wheel 43 adapted to engage the topmost sheet to buckle it and a suction feeder 44 to pick up the top sheet after it has been buckled, and through forward swinging thereof, advance the sheet rearwardly off the bank toward the conveyor 8.

To compensate for sheets of varying lengths, the separator and feed-off mechanism is adjustably carried on the overhanging support 16 which may be in the form of racks, as shown, to facilitate adjusting the position of the separator and feed-off mechanism with respect to the length of the sheet.

As the topmost sheet is engaged by the forwarder 44 and moved rearwardly off the bank, it is deposited between the receiving end 45 of the conveyor 8 and a drop roll 46 so timed with the operation of the forwarder as to drop down on top of the sheet as it is deposited on the receiving end 45 of the conveyor.

The timing of the entire feeder may be such that the sheets are individually presented to the press or other machine being fed, or in other words, advanced along the conveyor 8 in endwise spaced relation, but preferably the sheets are fed off the bank in underlapped relationship. As soon as one sheet has been deposited between the receiving end of the conveyor 8 and the drop roll 46, the next successive sheet is engaged by the forwarder 44 and advanced toward the conveyor 8.

Obviously, proper functioning with this manner of forwarding the sheets off the bank requires the top of the bank to be kept at the proper elevation with respect to the conveyor 8. This is accomplished with the present invention.

As noted hereinbefore, the drum 13 is adjustable vertically by rotation of the supporting screw shafts 23 in one direction or the other. Such rotation is imparted to the shafts 23 through bevel gear connections 47 with a cross shaft 48. Normally the shaft 48, and consequently the screw shafts 23, are stationary. To turn the shaft 48 in the proper direction to correct for any deviation in the elevation of the top of the bank, the shaft 48 has two ratchet wheels 49 and 50 fixed thereto with which pawls 51 and 52 engaged respectively to drive the shaft in one direction or the other. Both pawls 51 and 52 are pivotally mounted on a rocking lever 53 mounted to swing about the shaft 48 and oscillated from the cam 40 through a link 54.

Normally both pawls 51 and 52 are held out of engagement with their respective ratchet wheels by masks 55 and 56. Both of these masks are pivoted on a supporting shaft 57 and have curved upper surfaces which in the normal positions of the masks are concentric to the axis of the ratchet wheels and so spaced therefrom as to hold the pawls clear of the ratchet teeth. Rollers are provided on the outer ends of the pawls to track on these curved surfaces of the masks, as clearly shown in Figure 3.

The masks 55 and 56 each have levers 58 and 59, respectively, and arms 60 and 61, respectively, extending upwardly and laterally from their hub portions which engage the supporting shaft 57. The levers 58 and 59 have feeler rods 62 and 63, respectively, connected thereto and slidably supported at their outer ends by passing through a member 64. The ends of these feeler rods 62 and 63 are arranged to abut against a stop 65 carried on the outer end of a lever 66 pivotally mounted from any suitable fixed support, as at 67.

The shape of the stop 65, as clearly shown in Figure 2, is such that when in its neutral position, the ends of both of the feeler rods 62 and 63 engage therewith to prevent their respective masks dropping down to a position permitting the engagement of the pawls with the ratchet wheels. Upon upward movement of the lever 66 carrying the stop 65, the obstruction to the feeler rod 62 is removed, which permits the mask 55 to drop to the position shown in Figure 3, allowing engagement of the pawl 51 with the ratchet wheel 49. As a result of this engage-

ment, the shaft 48 is given a slight turn in a clockwise direction, as viewed in Figure 2.

This rotation of the shaft 48 imparts rotation to the screw shafts 23 in a direction to lower the drum 13. Likewise movement of the lever 66 downwardly from its neutral position carries the stop 65 clear of the feeder rod 63 which results in the engagement of the pawl 52 with its ratchet wheel 50, and in the manner described, effects a raising of the drum 13.

Up and down motion of the lever 66 is effected by any variation in the elevation of the top of the bank and is controlled therefrom through the medium of a feeler finger 70 pivoted as at 71 and having its outer end resting on top of the bank. A link 72 connects the feeler finger 70 with the lever 66, through a yielding connection 73, as shown.

The feeler finger 70 has its outer end tapered down so as not to obstruct the rearward passage of the top sheet to the conveyor 8, and is of such length that the topmost sheet just clears its outer end, as shown in Figure 1.

After each engagement of the pawls with their ratchet wheels, the masks are restored to their normal positions by the cam 40 and another cam 40' similar to the cam 40 but disposed diametrically opposite thereto.

The cams 40 and 40' are engaged by rollers carried on the outer ends of the arms 60 and 61, respectively, and are so timed with the oscillation of the lever 53 as to lift the masks back to their normal positions at the completion of each operating stroke of the pawls.

If only a slight adjustment is required to restore the top of the bank to its proper elevation, one engagement of the pawl with its ratchet wheel may be sufficient, but if a greater deviation exists the cycle will be repeated until the lever 66 and its stop 65 are restored to the position blocking both feeler rods 62 and 63.

The shaft 41, which as stated is continuously driven, may derive its power from any suitable source and through any desired manner, as for instance by having a gear 75 fixed to the shaft meshing with a driving gear (not shown).

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art, that this invention provides a sheet feeding mechanism for printing presses and kindred machines which combines in a unitary practical structure the advantages of a continuous type of feeder having a low loading elevation with simple and efficient means for effecting underlapped feeding, and that the optimum of speed and accuracy is assured by automatically maintaining the top of a bank of sheets at a predetermined elevation.

What I claim as my invention is:

1. In a sheet feeder, the combination of: means for feeding a plurality of sheets in fanned-out relation to a predetermined position to form a fanned-out bank having a thick end and a thin end; means located at the thin end of the bank for separating and forwarding the topmost sheet rearwardly off of the thick end of the bank; means for conducting sheets so separated away from the bank to a press or other printing machine; and means for adjusting the elevation of the bank to maintain the top of the bank at the same elevation with respect to the last named means regardless of the thickness of the bank.

2. In a sheet feeding mechanism, the combination of: a plurality of tapes constituting a feeder of the continuous type having a lower and an upper feeding stretch spaced apart sufficiently to permit sheets to be loaded in fanned-out relation on the lower stretch for conveyance to the upper stretch to form a fanned-out bank on the upper stretch having a thick rear end and a thin front end; sheet separating and feed-off means acting upon the thin end of said bank to feed sheets off the rear thick end of the bank; conveyor means to carry such sheets away from the bank; and means for adjusting the elevation of the upper stretch of the continuous feeder to maintain the top of the bank at a predetermined elevation with respect to the conveyor means.

3. In a sheet feeding mechanism: a sheet conveyor, said conveyor being disposed at a fixed elevation; means for carrying a fanned-out bank of sheets to the elevation of said conveyor including a vertically adjustable suport for the bank of sheets; means for separating and feeding off the topmost of the sheets on said vertically adjustable support; and means for automatically maintaining said vertically adjustable support at the proper elevation to dispose the topmost of the sheets thereon at a predetermined level with respect to the conveyor.

4. In a sheet feeding mechanism: a sheet conveyor, said conveyor being disposed at a predetermined fixed elevation; means for presenting a bank of fanned-out sheets to said conveyor with the rear of said bank in juxtaposition to the conveyor including a vertically adjustable support for the sheets; means for separating and rearwardly feeding off the topmost of the sheets on said vertically adjustable support for disposition on to the conveyor; and means for automatically maintaining said vertically adjustable support at the proper elevation to dispose the topmost of the sheets thereon at a predetermined level with respect to the conveyor.

5. In a sheet feeding mechanism: a conveyor to carry sheets along a definite path, said conveyor being disposed at a fixed elevation; another conveyor for carrying sheets in a fanned-out bank to the elevation of said first named conveyor; sheet separating and feed-off mechanism for feeding sheets off the top of said fanned-out bank of sheets onto the first named conveyor; and means for automatically controlling the elevation of said second named conveyor to maintain the top of the bank of fanned-out sheets in a predetermined relationship with respect to the first named conveyor.

6. In a sheet feeding mechanism: a conveyor to carry a fanned-out bank of sheets to a predetermined elevation; a second conveyor arranged to receive sheets from the first conveyor, one of said conveyors being adjustable vertically with respect to the other conveyor; and automatic means controlled by the thickness of the fanned-out bank of sheets on the first named conveyor for adjusting the elevation of said adjustable conveyor.

7. In a sheet feeding mechanism, the combination of: a first conveyor to carry sheets in a fanned-out bank to a predetermined elevation; a second conveyor adapted to receive sheets from the first conveyor, said two conveyors being relatively adjustable; and means controlled by the thickness of the bank of sheets on the first named conveyor for maintaining a predetermined relationship between said conveyors.

8. In a sheet feeding mechanism, the combination of: a conveyor arranged to carry a plurality of fanned-out sheets upwardly to a prede-

termined elevation to maintain a fanned-out bank of sheets at said elevation, said bank having a thick rear end and a thin front end; a second conveyor having its receiving end so disposed with respect to the first named conveyor as to be located in juxtaposition to the thick rear end of the bank, said conveyors being relatively adjustable to maintain a predetermined relationship, therebetween; and automatic means controlled by the thickness of the fanned-out bank of sheets on the first-named conveyor for effecting relative adjustment between the conveyors to maintain said predetermined relationship.

9. In a sheet feeding mechanism, the combination of: a conveyor for carrying a plurality of fanned-out sheets upwardly to a predetermined elevation to maintain a bank of fanned-out sheets having a thick rear end and a thin front end; a second conveyor having its receiving end so disposed with respect to the first named conveyor as to be adjacent to the thick end of the fanned-out bank, said conveyors being relatively adjustable; sheet separating and feed-off mechanism acting upon the topmost sheets at the thin end of the bank for feeding sheets rearwardly off the thick end of the bank and onto the second named conveyor; means for adjusting one conveyor with respect to the other; and a control for said means including a feeler resting on the thick end of the fanned-out bank of sheets.

10. In a sheet feeding mechanism: a conveyor for carrying sheets in fanned-out relationship and having an upper stretch to support a bank of fanned-out sheets; means for advancing said conveyor to maintain said bank of fanned-out sheets constantly supplied as sheets are removed from the top thereof; mechanism for removing the topmost sheet from said bank, said mechanism requiring the top of said bank to be disposed at a predetermined elevation; means for adjusting the elevation of said upper stretch of the conveyor; and a control for said adjusting means including a feeler resting on top of said bank, and mechanism operable upon raising or lowering of said feeler to initiate operation of the adjusting means in the proper direction to restore the upper stretch of said conveyor to its proper position.

11. In a sheet feeding mechanism: a conveyor forming part of a feeder of the continuous type and arranged to carry sheets from a low level to a higher level in fanned-out relationship to maintain a bank of fanned-out sheets at said higher level, said bank having a thin front end and a thick rear end; another conveyor arranged with its receiving end so disposed with respect to the first named conveyor as to be adjacent to the thick end of said fanned-out bank of sheets; means for vertically adjusting one of said conveyors with respect to the other; a control for said adjusting means including a feeler resting on top of the bank; and mechanism operable upon a rise or fall of said feeler for intiating the operation of said adjusting means to lower or raise the adjustable conveyor to maintain a predetermined relationship between the two conveyors; and sheet separating and feed-off mechanism acting on the topmost sheet of said bank and operable to feed such sheets rearwardly off the bank and onto the second named conveyor.

12. In a sheet feeding mechanism: conveying means having a low loading stretch and an elevated discharging stretch with an intermediate portion connecting the same, the upper stretch being spaced sufficiently above the lower loading stretch as to enable loading of sheets onto the lower stretch in fanned-out relationship; means for advancing said conveying means to continuously maintain a fanned-out bank of sheets on the upper discharging stretch; a conveyor at the elevation of the discharging stretch and so disposed with respect thereto as to have its receiving end opposite the thick rear end of said fanned-out bank, said upper stretch of the first named conveying means being adjustable vertically to maintain a predetermined relationship between it and said conveyor; automatic means for raising and lowering the upper stretch of the conveying means; a control for said automatic means including a feeler resting on top of the bank of sheets; and mechanism operable upon a rise or fall of said feeler to initiate operation of said automatic means to raise or lower said upper stretch; and sheet separating and feed-off mechanism acting upon the topmost sheet of said bank for feeding sheets rearwardly off the bank onto said conveyor.

13. In a sheet feeding mechanism: a sheet support adapted to support a pile of sheets, said support being vertically adjustable to maintain the top of the pile at a predetermined elevation; power driven means for raising or lowering said sheet support; and a control for said power driven means including a feeler resting on top of said pile of sheets; and mechanism operable upon vertical motion of said feeler above or below a predetermined elevation for initiating operation of said power driven means to raise or lower the support.

14. In a sheet feeding mechanism: a vertically adjustable sheet support adapted to support a pile of sheets; means for adjusting said support vertically including a screw, rotation of which in one direction raises the support and in the other direction lowers the support; power driven means for rotating the screw in one direction or the other; and means to govern the connection of said power driven means with the screw including a feeler resting on top of the pile of sheets; and mechanism operated by any vertical motion of the feeler above or below a predetermined normal for effecting connection between the power driven means and the screw to lower or raise the sheet support.

15. In a sheet feeding mechanism: a vertically adjustable sheet support; a screw rotatable in one direction to raise the support and in the other direction to lower the support; power driven means for turning the screw in one direction or the other; means for normally disconnecting said power driven means from the screw, said means including two moving feelers; a movable abutment in the path of said feelers and adapted when in a predetermined neutral position to arrest motion of said feelers at a predetermined point and thereby prevent connection of the power driven means with the screw; another feeler resting on top of the pile of sheets; and a connection between said feeler and the movable abutment operable to shift said movable abutment one way or the other from its neutral position upon any vertical motion of the feeler so as to establish a driving connection between the power driven means and the screw to raise or lower the sheet support until said feeler is restored to its predetermined position.

16. In a sheet feeder of the character described: three spaced rolls arranged with their axes substantially at the points of a triangle; fixed supports for two of the three rolls; an adjustable support for the other of said rolls adapted to

swing the same in an arc about the axis of one of said two fixed rolls; and a plurality of endless tapes trained about said three rolls.

17. In a sheet feeder of the continuous type having a lower stretch upon which sheets are loaded in fanned-out relation and an upper stretch to support a bank of fanned-out sheets, said upper stretch and its connection with the lower stretch comprising: three spaced rolls; fixed supports for two of the rolls; an adjustable support for the third roll arranged to swing the same in an arc about the axis of the uppermost of said two fixed rolls; and endless tapes trained about said three rolls, adjustment of said third roll determining the elevation of the bank of fanned-out sheets on said upper stretch of the conveyor.

FRANK R. BELLUCHE.