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SHEET FEEDING AND DELIVERING MECHANISM FOR PRINTING MACHINES

Filed July 7, 1922

5 Sheets-Sheet 1

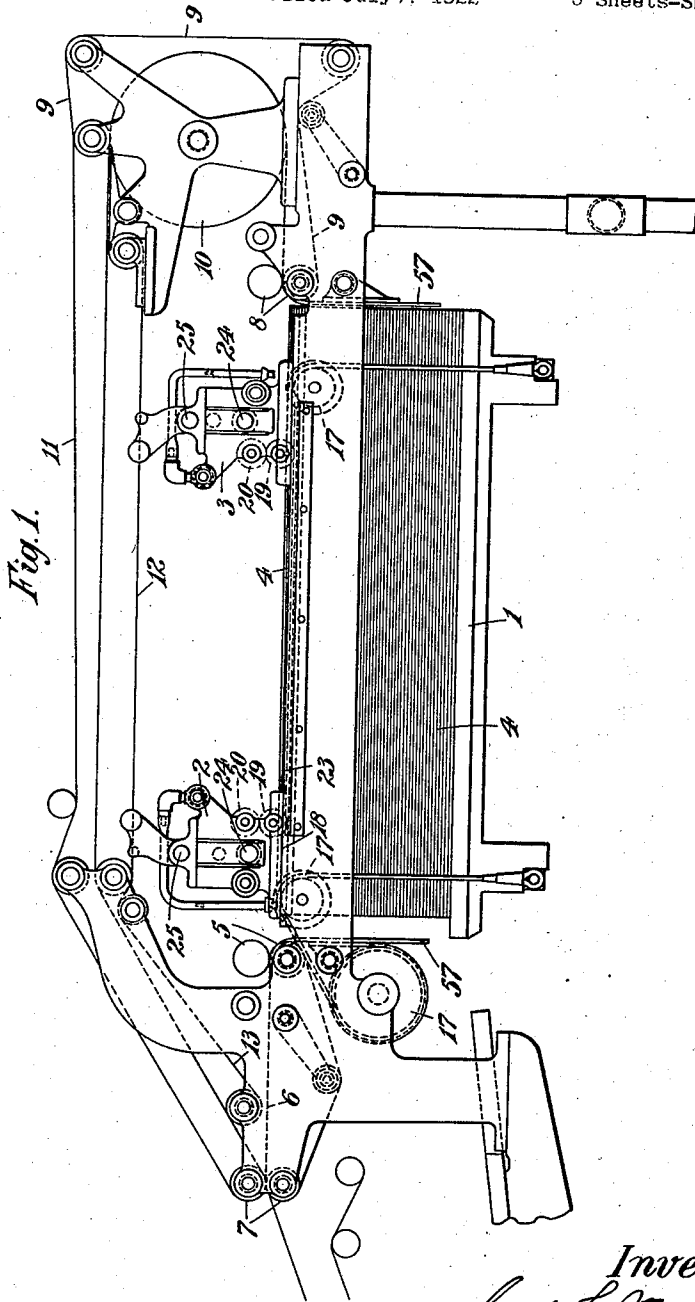


Fig. 1.

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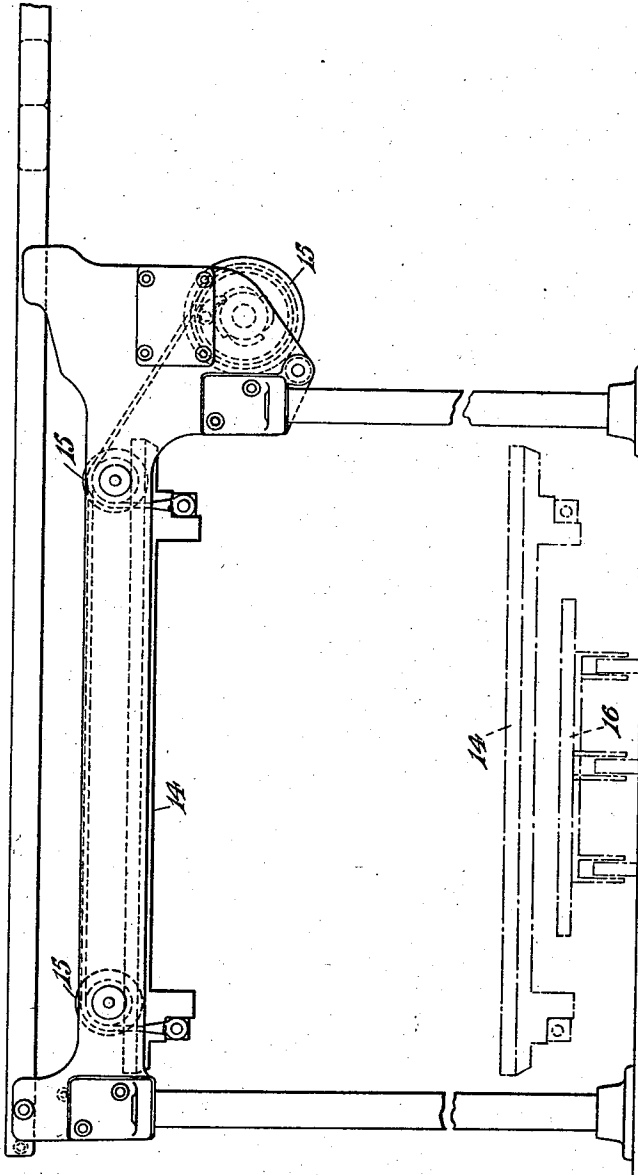
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Fig. 2.



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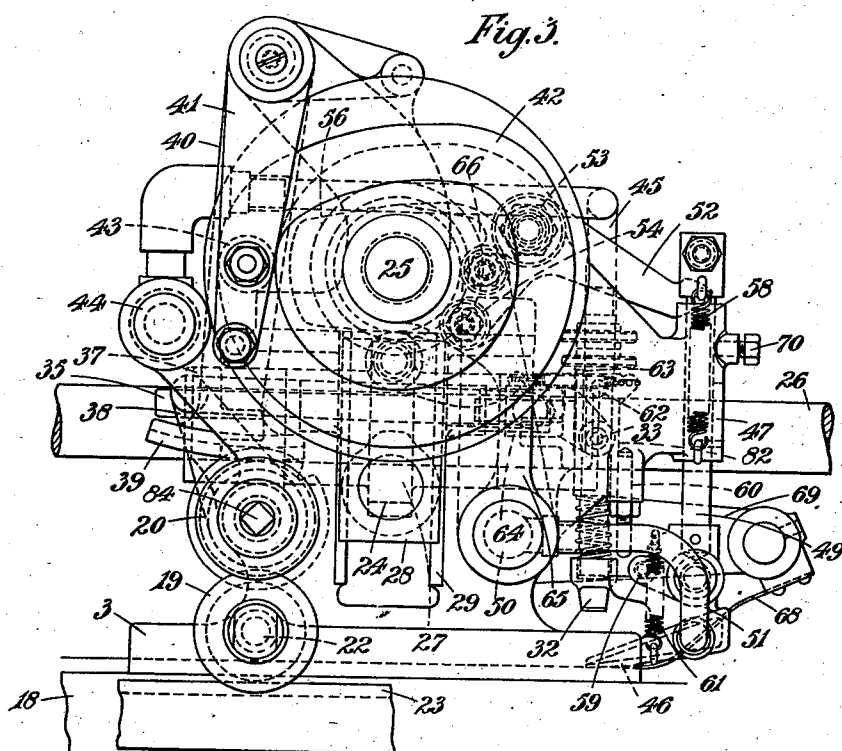
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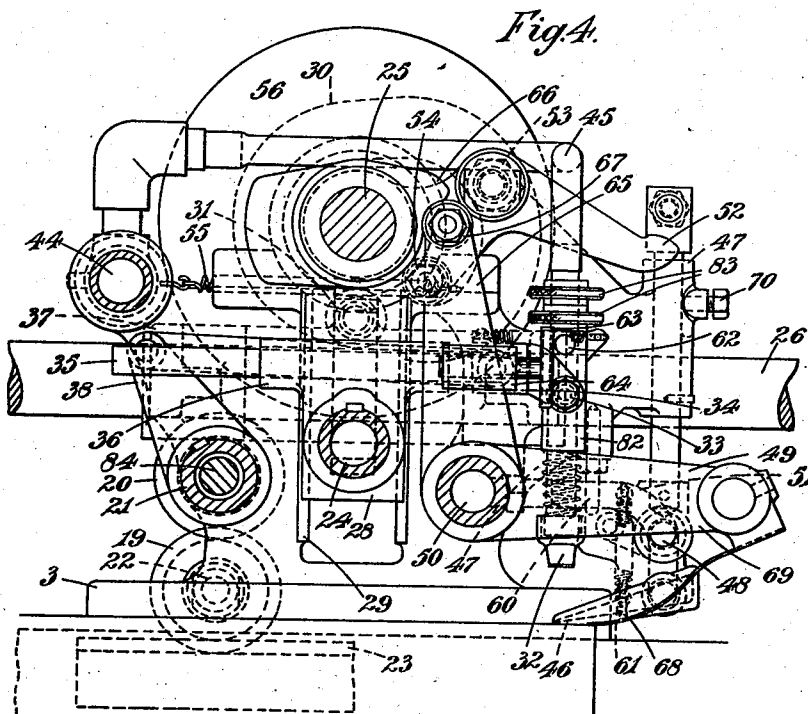
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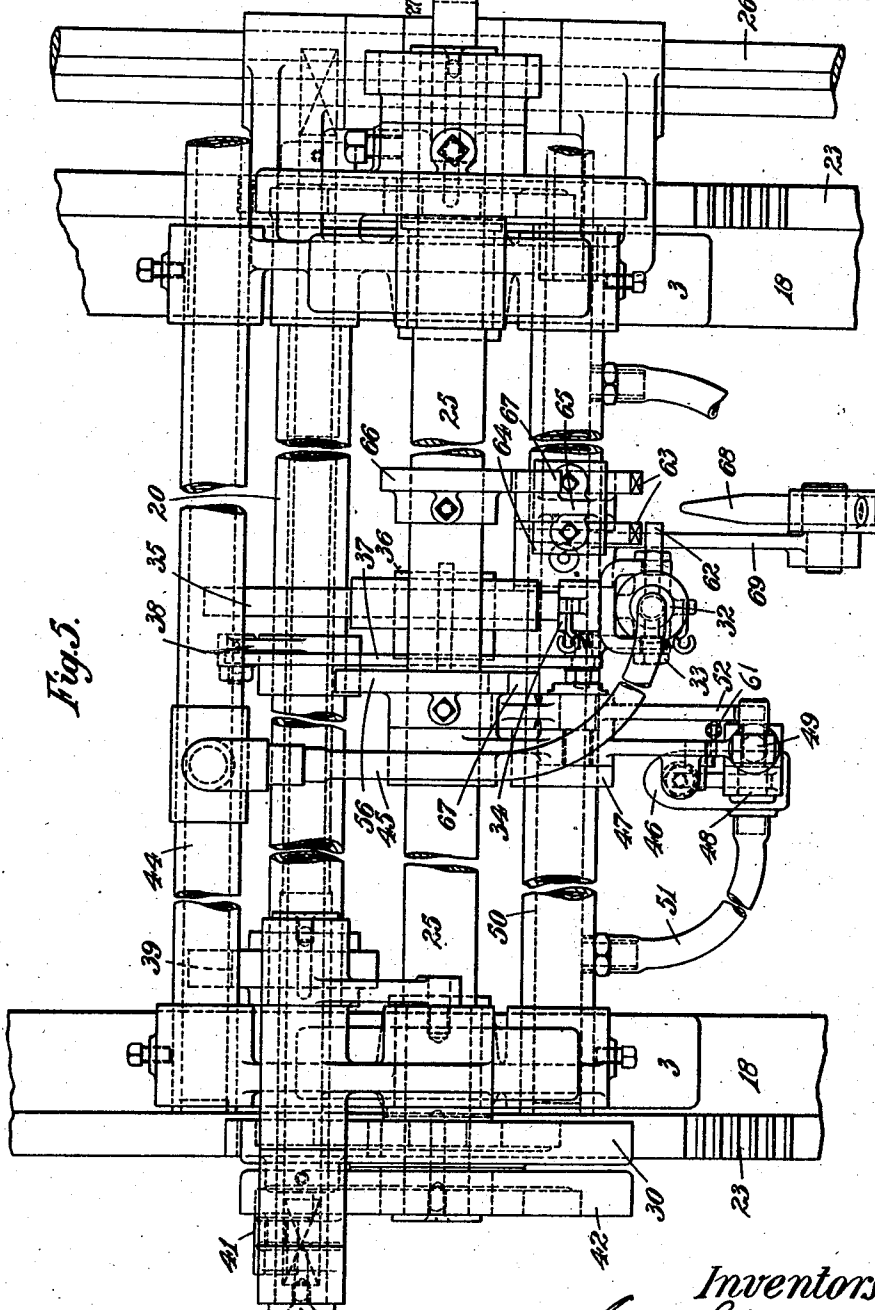
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SHEET FEEDING AND DELIVERING MECHANISM FOR PRINTING MACHINES

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE.

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SHEET FEEDING AND DELIVERING MECHANISM FOR PRINTING MACHINES.

Application filed July 7, 1922, Serial No. 573,277, and in Great Britain July 18, 1921.

This invention relates to sheet feeding and delivering mechanism for printing machines, and particularly to those constructions known as pile feeders and pile deliveries.

5 In producing, with such mechanism, multi-colour work, that is to say, printing in two or more colours on one side of each sheet, it is usual, after the sheets have received their first impression, to transfer them by

10 hand in batches from the delivery pile back to the feeding pile, from which they are again fed into the machine, with the same edge leading as in the previous printing, for receiving the second impression, and so on for any further impressions.

15 In producing with this type of mechanism perfecter work, that is to say, sheets printed on both sides, it is necessary, in effecting a transfer similar to that above mentioned, to invert each batch of sheets, and also reverse the same so that the edge which was the leading one during the printing on one side shall be the leading edge during the printing on the opposite side.

25 In both the above named systems of working, the handling of the sheets during the transfer from the delivery mechanism to the feed mechanism disturbs the pile alignment which had been previously secured by the jogging mechanism on the delivery board, and such alignment has to be restored before the sheets are again fed through the machine to ensure proper register of the successive impressions.

30 The object of the present invention is to provide means whereby the transfer from the delivery mechanism to the feeding mechanism may be effected without necessitating under any circumstances, an inversion of the sheets and disturbance of the pile alignment of such sheets.

35 For attaining the above named object, means are provided in conjunction with the feed board whereby the top sheet from the pile may be fed to the machine with either its front or rear edge foremost, as desired, and when fed with its rear edge foremost, inverted, and means are provided in conjunction with the delivery mechanism where-

40 by the delivery board with the pile thereon may be transferred as a complete entity to the pile feeder with either the leading or the following edge foremost, and without in

any way disturbing the pile alignment of the sheets.

The invention will now be described by reference to the accompanying drawings in which:—

Figure 1 is a diagrammatic side elevation of the feed end of a printing machine showing the application thereto of a constructional form of the invention in which two feeder heads are employed, one operable at each end of the pile of sheets;

Figure 2 is a similar side elevation of the delivery end of the machine;

Figures 3 and 4 are respectively a side elevation and a sectional elevation of the feeder head shown at the right-hand side of Figure 1, drawn to a larger scale than that figure, and showing one constructional form of sheet feeding devices suitable for use in connection therewith and

Figure 5 is a plan of the same feeder head partly broken away.

According to the constructional form of the invention herein dealt with, which is illustrated diagrammatically in Figures 1 and 2, there are provided in connection with the feed board 1, two feeder heads 2, 3. One of these feeder heads 2 carries devices adapted to operate near the foremost edge of the pile 4 on the feed board to lift the top sheets from the pile in succession and introduce them between the feed rolls 5, by which they are passed along the tapes 6 to the rolls 7, which in turn pass them on to the printing couple, while the other of the heads 3 carries devices adapted to operate near the rear edge of the pile 4 to lift the top sheets from the pile in succession and deliver them between the rolls 8 to the endless tape 9, by which they are inverted over the roll 10, and thence fed by sheet-conveying devices such as the tapes 11, 12, 13 to the rolls 7, by which they are delivered to the printing couple, as in the case of sheets fed direct from the foremost edge of the pile. When printed, the sheets are delivered printed side up to the delivery board 14, which is similar in all respects to and interchangeable with the feed board 1, and when effecting multi-colour printing, this delivery board 14 with the pile of sheets bearing the first impression is lowered by the usual mechanism 15 on to a trolley 16, shown

diagrammatically in Figure 2, carried thereon to the feeding mechanism and transferred from the trolley 16 to the feed board raising and lowering mechanism 17, being placed thereon with the previously leading edges of the sheets foremost, that is to say, in such a position that the said edges will lay against the front one of the two so-called "lays" 57 between which the feed board is raised and lowered. For the next subsequent print, the feeder head 2 is operative at the foremost edges of the sheets to feed them direct to the rolls 5 and 7, while the inverting mechanism is inoperative and the feeder head 3 at the rear edge of the sheets is arranged to co-operate with the head 2 for directly feeding the sheets as hereinafter described.

When effecting perfecter work, the delivery board 14 bearing the sheets printed on one side is turned, during the transfer from the delivery to the feeding mechanism, so that the board is placed on the latter in a position to present the previously leading edges of the sheets against the rear lay 57, the correct pile alignment of those edges having been established, in the usual way, with the aid of a similar lay (not shown in Figure 2) provided at the forward end of the delivery board. Then, for the next subsequent print on the reverse side of the sheet, the feeder head 3 is rendered operative to feed the sheets between the rolls 8 to the inverting mechanism by which they are passed to the feed rolls 7 with the same edge leading as during the previous print and with the previously printed side down, the head 2 being arranged to co-operate with the head 3 to feed the sheets towards the inverting mechanism.

According to the invention the two feeders heads, such as 2 and 3, are operable conjointly to feed the sheets in either direction. The details of the construction, by which this last-mentioned result is, in the present example, attained, are illustrated in Figures 3, 4 and 5, and will now be described. It is to be noted that the feeder heads 2, 3 are right and left-hand respectively, being in all other respects replicas of each other, and for this reason the description and illustration has been confined to the head 3. The head comprises two frames 3, 3, (which numeral is herein used to designate the head when referred to as a whole), upon which are mounted the shafts for supporting and operating the sheet lifting and separating devices, these frames being supported above the level of the pile 4 on side rails 18, 18, along which the head is adjustable as a whole by means of racks 23 at the side of the rails 18 and pinions 19, one at each end of a shaft 22 which is rotated when desired by means of gear wheels 20 on a shaft 84 extending axially through a tubular shaft 21.

The sheet lifting and separating devices, which in the constructional form shown are pneumatic, are respectively carried by, and adjustable transversely along, shafts 24 and 50, and are operated from a rotating shaft 25, which is driven by means of a spiral gear 27 adjustable along the first-driven shaft 26. The shaft 24 is journaled in bearings 28 sliding in guides 29 in the side frames and is vertically reciprocated by means of grooved cams 30 on the shaft 25, which are engaged by bowls 31 on the bearings 28.

The suction device 32, by which the top sheets are lifted from the pile, is adjustable vertically, by means of milled nuts 83, within a hollow casing 82 which is pivoted at 33 to a forked bracket 34 carried by a rod 35 capable of sliding fore-and-aft in a bearing bracket 36 which is adjustable along the shaft 24. The bracket 34 is connected by a link 37 to an arm 38 fast on the tubular shaft 21 which is rocked through segmental gear 39, and levers 40 and 41, by a groove-cam 42, mounted on the shaft 25, with which engages a bowl 43 on the lever 41.

The sheet lifter 32 is thus, through the vertical movement of the shaft 24, periodically lowered on to and raised away from the pile, and, through the rocking of the shaft 21, moved backwards and forwards above the pile. At appropriate stages during these movements, a pipe 44, carried by the frames 3, with which pipe the lifter 32 communicates by a flexible tube 45, is connected to an air-exhauster and opened to atmosphere, so that the successive top sheets of the pile are lifted, fed forward to the rolls 8 and released. This completes the action of the sheet feeding device when it is being used to feed sheets direct to the adjacent feed rolls. As previously mentioned, there are preferably two sheets feeding devices operating simultaneously on each head, and when feeding direct, as just described, these will be adjusted at such distance apart on the shaft 24 as to act near opposite sides of the pile. When, however, the head is being used on the following edges of the sheets to assist the other head in feeding the sheets in the opposite direction, these lifting devices will be adjusted closer together so as to operate near the centre of the rear of the sheet, and will be used in conjunction with the sheet separating device next to be described.

Each sheet-separating device consists of a nozzle 46 normally resting on the top of the pile and pivoted at 48 to a rod 49 slidable within a bracket 47 adjustable along a hollow shaft 50 with the interior of which the nozzle 46 is connected by a flexible tube 51. The upper end of the rod 49 is engaged by one arm of a lever 52 pivoted at 53 to the before-mentioned bracket 47, whose other arm is provided with a bowl 54 held, by a

tension spring 58 acting between the bracket 47 and the top of the rod 49, in contact with a cam 56 fast on the shaft 25. The nozzle 46 is thus periodically raised away from and lowered on to the pile 4 by the action of said cam and spring. During the raising movement, the nozzle is tilted backwards away from the pile about the pivot 48 through the contacting of a projection 59 with a pin 60 adjustable in the bracket 47, and during the lowering movement it is restored to normal position by the action of a spring 61. As the nozzle 46 returns to the pile 4 it is supplied with a blast of air from the pipe 50, which assists in separating from the pile the top sheet just previously engaged by the sucker 32, so that the said top sheet is floated up from the pile and can be more conveniently secured by the lifter of the other head operating at the opposite edge of the sheet, by which it is to be fed forward to the feed rolls.

When the lifter 32 is operating in conjunction with the separator 46, it is desirable for the rear edge of the sheet to be slightly buckled during the lifting, and this buckling is secured by a tilting movement of the lifter which is imparted to it by the following means:—From the casing 82, above the pivot 33, there projects a pin 62 in a position to be engaged by a plate 63 which is adjustably mounted in a bracket 64 secured to an arm 65 capable of being rocked about the shaft 50 and having at its upper end a bowl 67 held in contact with a cam 66 fast on the shaft 25, by a spring 55. By the action of the cam 66 the plate 63 is moved forward against the pin 62 just as the top sheet is being raised from the pile, the lifter 32 being thereby tilted and the sheet buckled.

To assist in preventing displacement of any sheets of the pile excepting the top one, a blade spring 68 may be provided to bear lightly on the rear edge of the centre of the pile, and this may be conveniently secured to a bracket 69 on the shaft 50 in such manner that it may be raised and held out of operative position when the respective head is being used for direct feeding. As the nozzle 46 is similarly required to be out of action under the last-mentioned circumstances, a setscrew 70 is provided in the bracket 47 by means of which the rod 49 may be secured in its raised position out of the range of action of the lever 52. Further, as the tilting action of the sucker 32 is likewise not required when the head is used for direct feeding, the bracket 64 and arm 65 are arranged near the centre of the shaft 50 so as to be out of contact with the lifter 32 when the latter is adjusted outwards along the shaft, as it is when feeding direct. In Figure 5, one lifter and separator with their operating mechanism are shown in position for operating on the following edge of

a sheet, but it is to be understood that corresponding mechanism is, in the present constructional form, symmetrically arranged at that part of the head which is broken away in Figure 5 and that the second plate 63 shown will effect the tilting motion of the second lifter when in that position.

Any suitable sources of suction and compression may be employed for producing a vacuum in the pipes 44 and air-pressure in the pipes 50 of the respective heads, and it may be convenient to operate the valves for connecting and disconnecting said sources and pipes by cams mounted on the shaft 26. Such valve mechanism is not illustrated in the drawings, as it constitutes no part of the present invention, although it is to be noted that, in the constructional form of the invention in which the function of the respective heads as co-operating feeders and separators requires to be changed, suitable known means for reversing the order of opening and closing of the valves must be provided.

It is to be understood that the particular mechanisms hereinbefore described are given merely as convenient examples, and that different constructional forms of apparatus for the respective purposes may be employed within the scope of the invention.

Having thus described our invention, we declare that what we claim and desire to secure by Letters Patent is:—

1. In or for a printing machine, a pile feeder comprising mechanism adapted to operate at one edge of the pile as a sheet feeder to feed the sheets in one direction and at the same edge of the pile as a sheet separator when sheets are being fed in a different direction.

2. In or for a printing machine, sheet feeding mechanism comprising the combination of a pile feed board, two feeder heads adapted to operate conjointly at opposite ends of the pile, one as a sheet feeder and the other as a sheet separator, and means whereby the operation of each may be converted from that of a feeder to that of a separator and vice versa.

3. In or for a printing machine, sheet feeding mechanism comprising the combination of a pile feed board, two feeder heads adapted to operate conjointly at opposite ends of the pile, one as a sheet feeder and the other as a sheet separator, means whereby the operation of each may be converted from that of a feeder to that of a separator and vice versa, for feeding sheets respectively towards and away from the printing machine, and means co-operating with one of said heads to convey sheets received from that head towards the printing machine.

4. In or for a printing machine, sheet feeding mechanism comprising the combination of a pile feed board, two feeder heads

adapted to operate conjointly at opposite ends of the pile, one as a sheet feeder and the other as a sheet separator, means whereby the operation of each may be converted from that of a feeder to that of a separator and vice versa, for feeding sheets respectively towards and away from the printing machine, and means co-operating with one

of said heads adapted to invert sheets received from that head and convey them towards the printing machine. 10

In testimony whereof we have affixed our signatures hereto.

CARL LOUIS STERN.
ARTHUR VICTOR BUGLER.