R. MIEHLE.

SHEET DELIVERY MECHANISM.

APPLICATION FILED MAY 19, 1913.

1,107,437.

Patented Aug. 18, 1914.

2 SHEETS—SHEET 1.

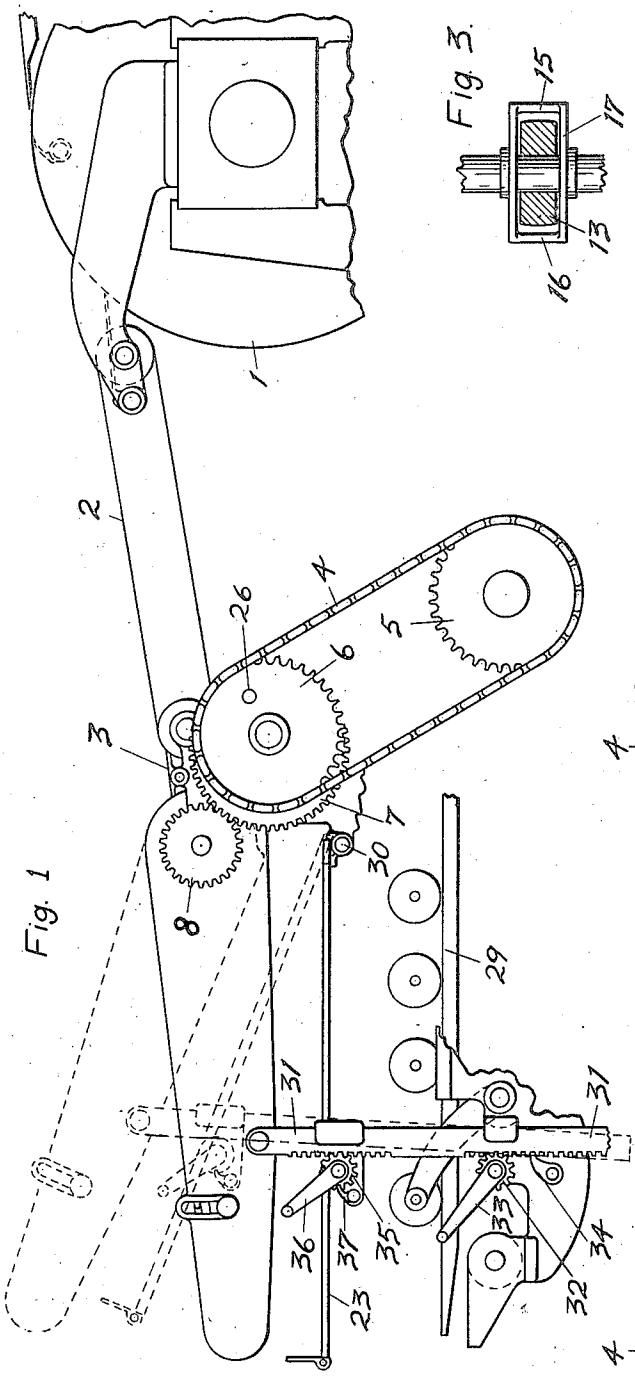


Fig. 1

Fig. 3.

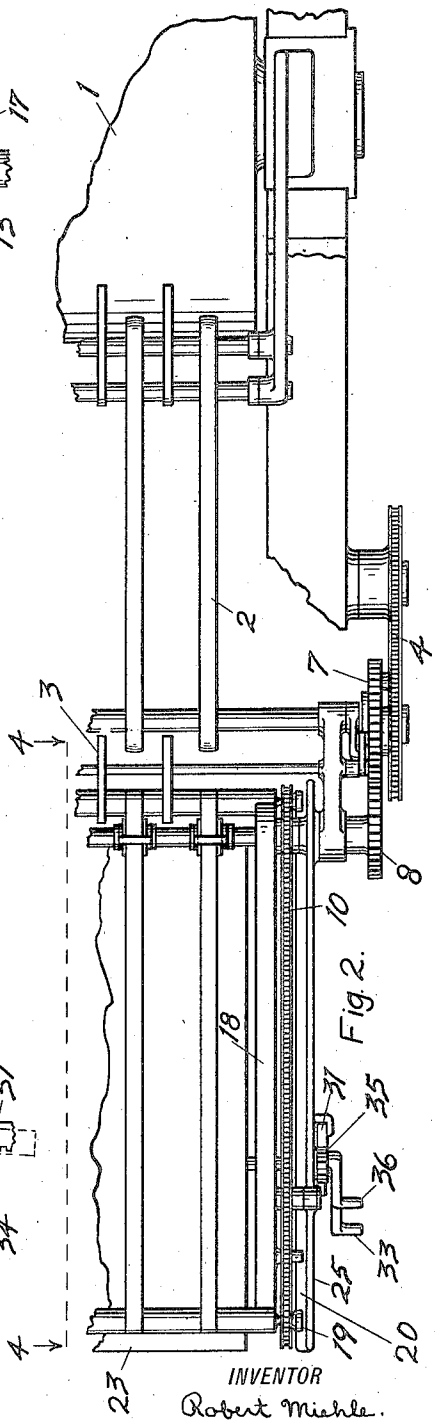


Fig. 2.

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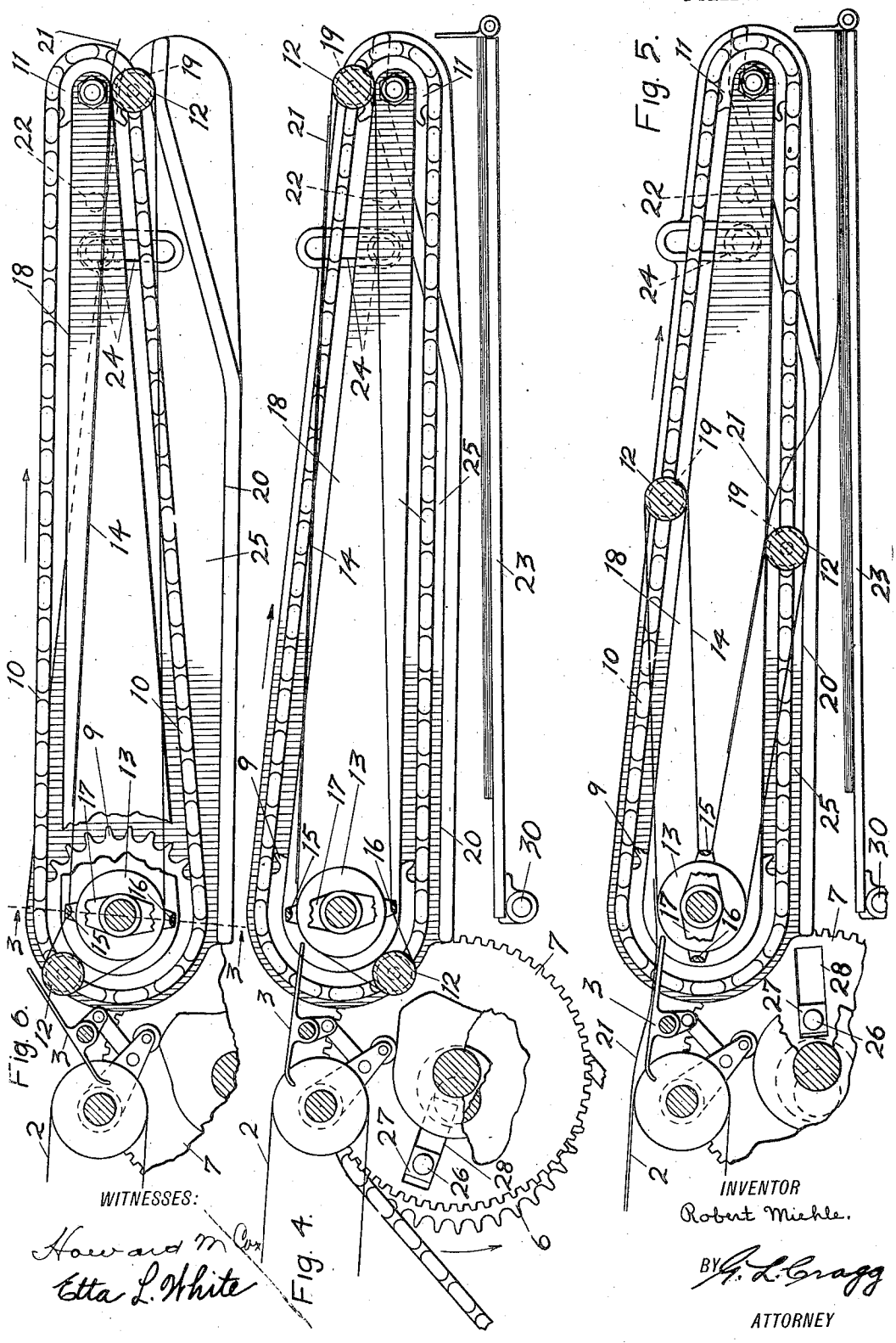


Fig. 6.

Fig. 4.

Fig. 5.

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SHEET-DELIVERY MECHANISM.

1,107,437. Specification of Letters Patent. Patented Aug. 18, 1914.

Application filed May 19, 1913. Serial No. 768,604.

To all whom it may concern:

Be it known that I, ROBERT MIEHLE, citizen of the United States, residing at Plymouth, in the county of Marshall and State of Indiana, have invented a certain new and useful Improvement in Sheet-Delivery Mechanism, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to sheet delivery mechanism and in its preferred embodiment constitutes an improvement upon the construction disclosed in my co-pending application Serial No. 676,096, filed February 7, 1912, though the invention is not to be limited to such embodiment.

In the apparatus of my aforesaid application there is included means for causing the sheet supporting surface of the belt element to increase when the sheet to be supported is being placed thereupon and to be decreased when the sheet is to be discharged therefrom, the sheet supporting surface of the belt element moving in one level to receive the sheet to be supported and in a lower level there to discharge the supported sheet. A bight or loop forming device preferably in the form of a roller takes part in bringing the sheet supporting surface of the belt element from its receiving to its discharging level. This bight or loop forming roller has planetary motion through substantially 180° when it takes part in shifting the sheet supporting surface of the belt element from the upper to the lower level. Hitherto such bodily planetary motion of the bight forming roller was effected about a substantially fixed axis and along a substantially fixed semicircular path portion, it being bodily lowered a distance equal to the diameter of such semicircular path. Such lowering movement of the roller while following its downward semicircular path hitherto occurred rapidly and when the carried sheet projected outwardly beyond the roller. The sheet would thus move downwardly with the roller, maintaining sufficient proximity thereto if the sheet were sufficiently heavy but, if it were quite light, the sheet would be unduly buoyed up by the cushion of air beneath so that the proper proximity thereof with respect to the roller would not always be maintained.

According to one feature of my invention the semicircular path followed by the bight forming roller and the axis of such path, which were both hitherto fixed, are together elevated sufficiently to prevent such a descent of the roller while moving in its semicircular path as would subject the projected sheet to undue buoying action. In the preferred embodiment of the invention said roller is not permitted to descend at all, when moving from the upper to the lower limit of said semicircular path, this path being shifted upwardly the full distance through which the roller hitherto moved downwardly, the upward movement of the path gradually proceeding as the roller moves toward the lower end of the path so that no descent of the roller occurs at any time while the roller follows this path portion. The invention, however, is not to be limited to a construction in which the roller is prevented from being bodily lowered at all while moving upon its semicircular path. After the roller has been brought to the lower limit of its bodily shifted semicircular or curved path means come into play for gradually lowering such path to its normal position, such means also operating to lower the roller at a sufficiently slow rate to prevent undue buoying action upon the sheet. Hitherto the loop or bight forming roller was mounted upon an endless carrier whose rate of lineal travel was uniform whereby the speed of the roller about its own axis and about the axis of its semicircular path would become materially accelerated.

In accordance with another feature of my invention the speed of the endless carrier is decreased when the roller passes on its curved or semicircular path whereby the speed of the roller about its own axis and about the axis of its semicircular path may be sufficiently reduced to maintain desirable relative speed between the roller and the belt element upon which it operates properly to check the carried sheet preparatory to its deposit, such speed being increased after the roller has cleared said semicircular path.

I will explain my invention more fully by reference to the accompanying drawings in which—

Figure 1 is a side view of a portion of a printing press and the equipment of my invention shown in conjunction therewith; Fig. 2 is a plan view of a part of the struc-

ture as it appears in Fig. 1; Fig. 3 is a sectional view on line 3 3 of Fig. 6; Fig. 4 is a view in the direction of arrows 4 of Fig. 2; Fig. 5 is a view showing most of the parts illustrated in Fig. 4, certain of the parts being in different relationship; and Fig. 6 is a view similar to Fig. 5 except that the parts are shown in still another relationship.

Like parts are indicated by similar characters of reference throughout the different figures.

The printing press from which the sheets are delivered is generally indicated by the reference character 1, and inasmuch as the apparatus of my invention is not to be limited to any particular type of press, it is not essential to give a detail description of the press shown as the same is well known by those skilled in the art. The sheets are initially delivered from the press upon carrying tapes 2. The tapes 2 and the mechanism for operating the same are so well known as not to require description. The sheets are transferred from the tapes 2 to the sheet carrier of my invention over a guide finger structure 3.

As my invention is specifically embodied in the structure shown by the drawings there is present a sprocket chain 4 driven by the gearing 5 and in turn driving a sprocket 6 in novel driving relation, to be hereinafter described, with a spur gear 7 in mesh with a spur gear 8 upon whose shaft sprocket wheels 9, one upon each side of the sheet carrier, are mounted. An endless sprocket chain 10 is disposed upon each side of the sheet carrier structure, these chains being driven by the sprocket wheels 9 and in turn passing over idler sprocket wheels 11, the wheels 9 and 11 generally defining the orbits in which the chains 10 substantially move.

The chains 10 constitute endless belts and carry bight or loop engaging and forming elements 12 which are desirably, though not necessarily, in the form of rollers rotatably mounted upon and with respect to the chains 10 at points thereon which divide the chains into two equal parts. Additional bight forming elements are employed which are preferably in the form of loose pulleys 13 co-axial with sprocket wheels 9. I employ a conveyer belt element for finally delivering the sheets, which element is preferably in the form of endless tapes 14 that are engaged by the rollers 12 and the pulleys or rollers 13. The organization also includes conveyer belt holding or gripping devices 15 and 16 (each tape of the belt structure being associated with two such elements 15 and 16) which are preferably mounted upon a yoke 17 free to rotate, due to the action of the tapes thereupon, about the axis of the sprocket wheels 9 and pulleys 13. As shown in Figs. 4, 5 and 6 of the drawings, the sprocket wheel 9 moves in a clockwise direction so as to cause the chains 10 to travel substantially in a uniform direction as indicated by the arrows whereby the rollers 12 are caused to travel substantially in a uniform direction in the orbit of the chains 10.

Describing the operation as it commences with the parts as illustrated in Fig. 4, the left hand roller 12 will rise and the right hand roller 12 will descend as the chains 10 move them from the positions shown in Fig. 4 whereby the upper sides of the tapes 14 will engage the elements 15 then uppermost, relative motion between the elements 15 and the upper sides of the tapes being prevented by the friction between said elements and tapes. During the initial portion of the movement of the left hand roller it will swing the elements 15 and the yoke 17 carrying the same to permit the gradual formation of a bight at 15, in the upper side of each of the conveyer tapes (Figs. 6 and 5). The bight forming elements 15, during one-half of their revolutions, prepare to form such bights, form them, and release the tapes to permit the bights they have formed to disappear whereupon the bight forming elements 16 enter upon a similar cycle. The cycle of operations of each set of elements 15 and 16 occurs during the travel of the chain structure 10 through one-half of its cycle. When the rollers 12 are at the ends of the closed path afforded by the chains 10 but two bights are formed in each tape 14. As the chains 10 travel to bring the left hand roller 12 above the level of the right hand roller 12, the process of forming four bights in each tape 14 is commenced, Fig. 5 illustrating one position of the tapes 14 in which such four bights are formed, the elements 12, 12, and 15 forming three of the bights and a pulley 13 now forming the fourth bight. When the chain element 10 has traveled through a half of its cycle, it interchanges the positions of the rollers 12 and again limits the tapes 14 to the presence of but two bights in each. During the second half of the cycle of travel of the chain element 10, the bight forming operation is repeated with similar results excepting that the bight forming element 15 will be replaced by the bight forming element 16 in a bight forming function. The tapes should be made of elastic material or should include such material in its formation to maintain the same sufficiently taut properly to support the sheet to be carried. The rollers 12 have rolling contact with the upper side of the frame pieces 18 to prevent them from causing the chains 10 to sag. The frame pieces 18 also operate to engage the rollers, where such engagement is desirable, to turn the rollers independently of the tapes and thereby elimi-

nate or reduce friction between the tapes and the rollers, the rollers being free to turn upon the shafts by which they are mounted upon the chains 10.

The rollers 12 are provided with rollers 19 at their outer ends. Cam tracks 20 are upwardly inclined so as to be engaged by the rollers 19 when the rollers 12 co-axial with the rollers 19 enter upon the semicircular portion of their path which is defined by the sprocket wheels 11, the cam tracks 20 being horizontally extended at their upper ends so as to maintain engagement with the rollers 19 that are moving upon such semicircular path, and as the cam tracks 20 do not prevent the movement of such rollers 19 upon their path but do prevent the descent of such rollers, the sprocket wheels 11 must be elevated, their elevation gradually proceeding as the rollers 12 and 19 move along the semicircular path portion defined by the sprocket wheels 11 so that the conveyed sheet 21 will not be lowered, or sufficiently lowered, as the rollers 12 are moving along their semicircular path portion, to be unduly subjected to the buoying action of the air beneath the same. When the rollers 12 and 19 reach the lower limit of their bodily shifted semicircular path portion they enter upon the inclined portion of the cam tracks 20 which are of such gradual slope as to permit the rollers 19 to be so slowly lowered as to prevent improper buoying action of the air upon the sheet 21, the inclined portions of the cam tracks 20 being suitably calculated for this purpose. Studs 22 project laterally from the frame pieces 18 and are adapted to engage (at fixed places) the inclined portions of the cam tracks 20 to support the frame pieces 18 in proper relation to the receiving board or table 23 when the rollers 19 do not have such engagement with the cam tracks 20 as properly to perform this function. The planes of movement of the frame pieces 18, which are thus seen to be mounted to swing about the axis of the rollers 13, with respect to the cam tracks 20 are defined by the pin and slot connections effected at 24 between the frame pieces 18 and wall portions 25 projecting vertically from the cam tracks 20.

As my invention is preferably practised the lineal speed of the chain element 10 is highest where the rollers 12 are approximately in the position illustrated in Fig. 5, such speed decreasing to the lowest value where the rollers 12 are at the extreme ends of the chains 10 whereby the peripheral speed of each roller 12 as it rounds each semicircular portion of its path is reduced. By this means the speed of the endless sheet conveying belt element is properly increased after the sheet enters upon the belt element and when the sheet is on the point of leaving the belt element, the speed being gradually decreased as the belt element is approaching the point where the sheet is to leave the same so that the bodily travel of the sheet is checked, and slowly checked, preparatory to its deposit. This acceleration and retardation in the travel of the chains 10 is preferably accomplished by the mechanism illustrated most clearly in Figs. 1, 4 and 5. The axes of rotation of the gear elements 6 and 7 are offset, the wheel 7 being rotated through the agency of a crank 26 carried by the wheel 6, this crank having mounted thereupon a block 27 that is adapted to travel back and forth in the radial slot 28 in the gear 7. These parts are so relatively positioned that the speed is highest when the rollers 12 are approximately in the position illustrated in Fig. 5, such speed increasing as the rollers approach this position and decreasing as they leave the same for the purposes which have been set forth.

The printed paper sheet receiving table 23 is interposed between the inking mechanism 29 of the printing press and the portion of the sheet delivery mechanism embracing the chains 10. In order to secure access to the inking mechanism 29 the sheet delivery mechanism and the sheet receiving table are adapted to be elevated at their outer ends, the sheet delivery mechanism being mounted to swing about the axis of the pulleys 13 while the table is mounted to swing about the shaft 30. Unitary mechanism is provided for effecting simultaneous movement of the sheet delivery mechanism and the table away from the inking mechanism, this unitary mechanism including a rack bar 31 having suitable connection with both table and sheet delivery and a pinion 32 operable by a crank 33 for elevating and lowering the rack to secure the simultaneous adjustment of the sheet delivery and table, the desired adjustment being maintained by a holding pawl 34. If relative adjustment between the sheet delivery and table is desired a pinion 35, operable by a crank 36, may be turned to move the rack 31 upwardly and downwardly with respect to the table, the desired adjustment being maintained by a holding pawl 37.

Reference may be had to my co-pending application Serial No. 710,933, filed July 22, 1912.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may be readily be made without departing from the spirit of the invention, but

Having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. A sheet carrier including a sheet sup-

porting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including a carrier for transferring said sheet supporting surface of the belt element from the upper to the lower level; and means for lifting the carrier upon the initiation of the transfer then to prevent the carried sheet from being unduly subject to the buoying action of the air.

2. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including an endless carrier engaging said sheet supporting surface of the belt element and operating to initiate the transfer of the same from the upper to the lower level when the belt engaging portion of the carrier turns from the upper to the lower portion of its path; and means for lifting the carrier where it engages the sheet supporting surface of the belt element upon the initiation of the transfer then to prevent the carried sheet from being unduly subject to the buoying action of the air.

3. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including an endless carrier and a bight forming element supported by the carrier and engaging said sheet supporting surface of the belt element and operating to initiate the transfer of the same from the upper to the lower level when the bight forming element turns from the upper to the lower portion of its path; and means for lifting the carrier as the bight forming element moves from the upper to the lower portion of its path to prevent the carried sheet from being unduly subject to the buoying action of the air.

4. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including a bight forming element engaging said sheet supporting surface of said belt element, and means for causing said bight forming element to move in upper and lower adjacent portions of a path; and means for obstructing the descent of the bight forming element as it leaves its upper path portion then to prevent the carried sheet from being unduly subject to the buoying action of the air.

5. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including a carrier for transferring said sheet supporting surface of the belt element from the upper to the lower level; means for lifting the carrier upon the initiation of the transfer then to prevent the carried sheet from being unduly subject to the buoying action of the air; and means for lowering the carrier after the discharge of the carried sheet has been initiated.

6. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including an endless carrier engaging said sheet supporting surface of the belt element and operating to initiate the transfer of the same from the upper to the lower level when the belt engaging portion of the carrier turns from the upper to the lower portion of its path; means for lifting the carrier where it engages the sheet supporting surface of the belt element upon the initiation of the transfer then to prevent the carried sheet from being unduly subject to the buoying action of the air; and means for lowering the carrier after the discharge of the carried sheet has been initiated.

7. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including an endless carrier and a bight forming element supported by the carrier and engaging said sheet supporting surface of the belt element and operating to initiate the transfer of the same from the upper to the lower level when the bight forming element turns from the upper to the lower portion of its path; means for lifting the carrier as the bight forming element moves from the upper to the lower portion of its path to prevent the carried sheet from being unduly subject to the buoying action of the air; and means for lowering the carrier after the discharge of the carried sheet has been initiated.

8. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including a bight forming element engaging said sheet supporting surface of said belt element, and means for causing said bight

forming element to move in upper and lower adjacent portions of a path; means for obstructing the descent of the bight forming element as it leaves its upper path portion then to prevent the carried sheet from being unduly subject to the buoying action of the air; and means for lowering the bight forming element after the discharge of the carried sheet has been initiated.

9. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including an endless carrier and a bight forming element supported by the carrier and engaging said sheet supporting surface of the belt element and operating to initiate the transfer of the same from the upper to the lower level when the bight forming element turns from the upper to the lower portion of its path; means for lifting the carrier as the bight forming element moves from the upper to the lower portion of its path to prevent the carried sheet from being unduly subject to the buoying action of the air; and a cam track engaged by the bight forming element after such bight forming element has reached the lower portion of its path and operating to permit the bight forming element to be lowered.

10. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including a bight forming element engaging said sheet supporting surface of said belt element, and means for causing said bight forming element to move in upper and lower adjacent portions of a path; means for obstructing the descent of the bight forming element as it leaves its upper path portion then to prevent the carried sheet from being unduly subject to the buoying action of the air; and a cam track engaged by the bight forming element after such bight forming element has reached the lower portion of its path and operating to permit the bight forming element to be lowered.

11. A sheet carrier including a sheet conveying belt element for transferring sheets to a place of deposit; a bight forming element over which the belt element passes at the place where the sheet to be conveyed enters upon the belt element; a second bight forming element over which the belt element passes at the place where the departure of the conveyed sheet from the belt element is initiated; and means for causing the belt element to travel at a variable speed which decreases as the conveyed sheet approaches the place of its departure from the belt element.

12. A sheet carrier including a sheet supporting belt element; means for causing the sheet supporting surface of the belt element to move in one level there to receive the sheet to be supported and in a lower level there to discharge the sheet, said means including a carrier for transferring said sheet supporting surface of the belt element from the upper to the lower level; and means for lifting the carrier upon the initiation of the transfer then to prevent the carried sheet from being unduly subject to the buoying action of the air and for thereafter lowering the carrier.

13. Sheet delivery apparatus including a sheet receiving table; sheet delivery mechanism in discharging relation to the table; mechanism for effecting simultaneous up and down adjustments of the said table and the portion of the sheet delivery mechanism in discharging relation thereto; and mechanism for effecting adjustment of the spacing between the said table and the portion of the sheet delivery mechanism in discharging relation thereto.

14. Sheet delivery apparatus including a sheet receiving table; sheet delivery mechanism in discharging relation to the table; mechanism for effecting simultaneous up and down adjustments of the said table and the portion of the sheet delivery mechanism in discharging relation thereto; and mechanism for effecting adjustment of the spacing between the said table and the portion of the sheet delivery mechanism in discharging relation thereto, said adjusting mechanisms having a common element.

In witness whereof, I hereunto subscribe my name this 15th day of May, A. D. 1913.

ROBERT MIEHLE.

Witnesses:
ALFRED GRATER,
OTTO LONG.