

Dec. 29, 1925.

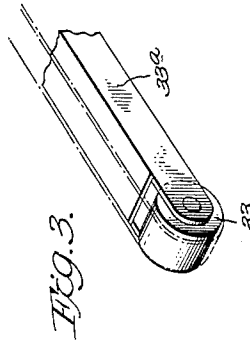
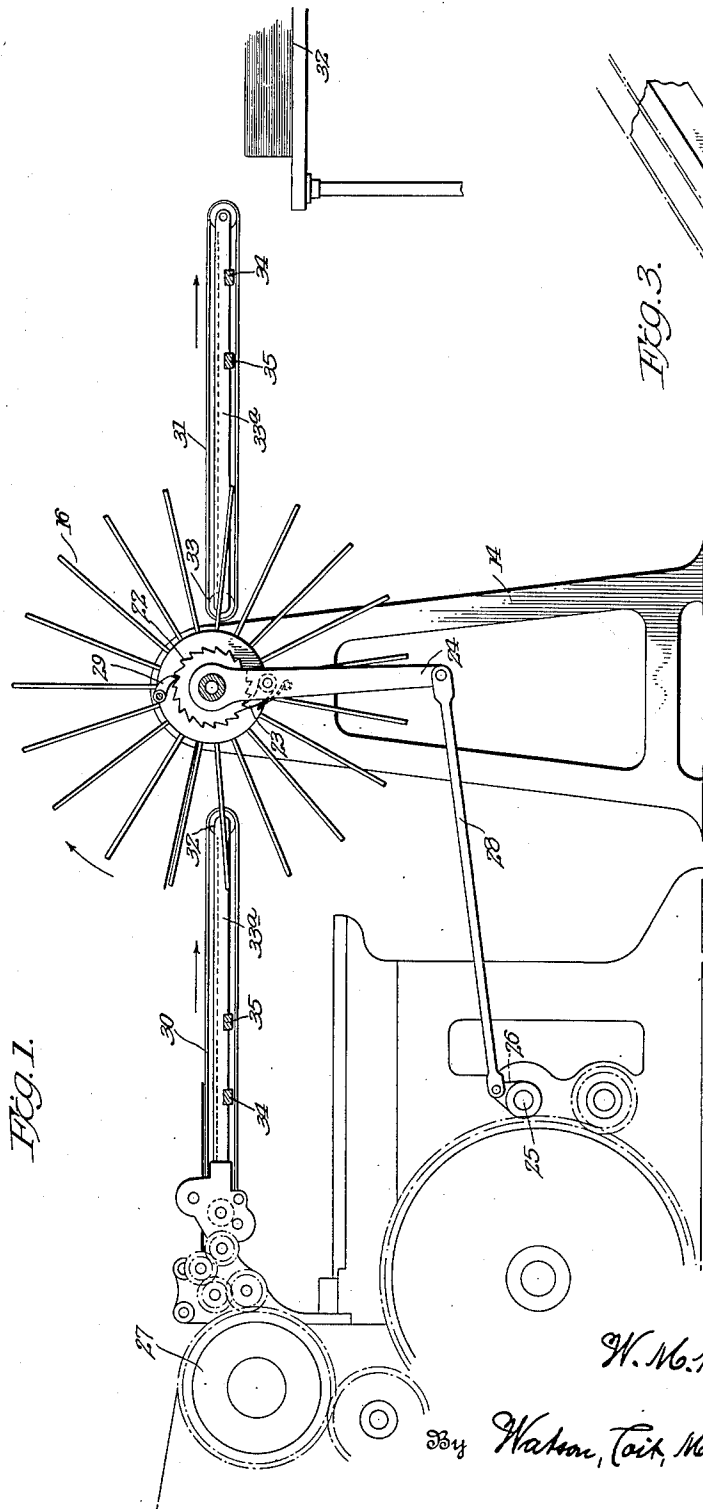
1,567,153

W. M. KELLY

SHEET DELIVERY APPARATUS

Filed Sept. 7, 1922

3 Sheets-Sheet 1



Inventor

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By Watson, Tait, Morse & Grindle,  
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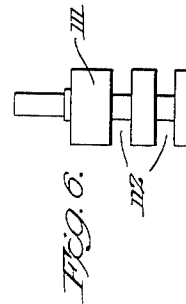
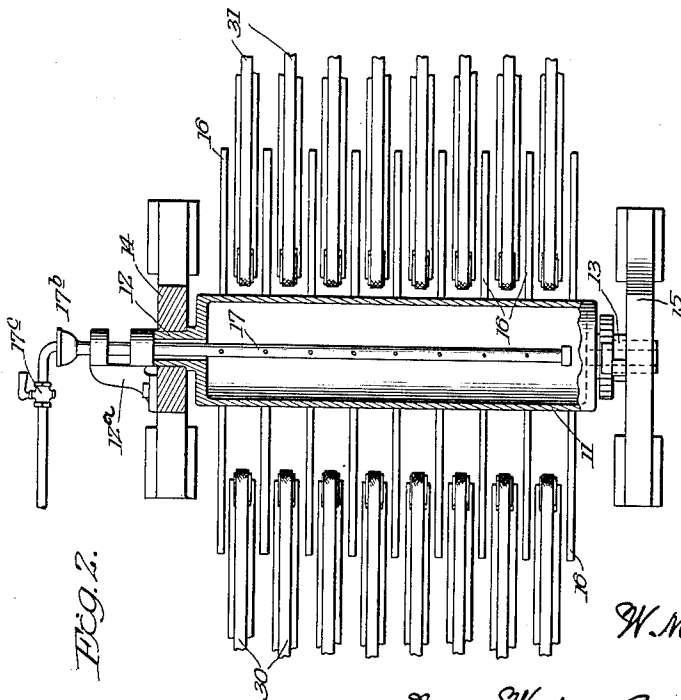
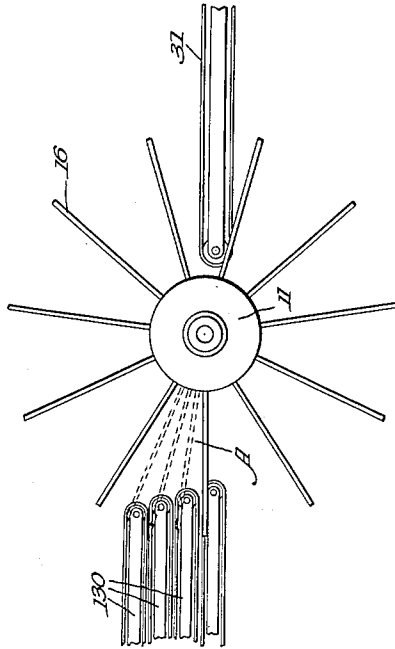
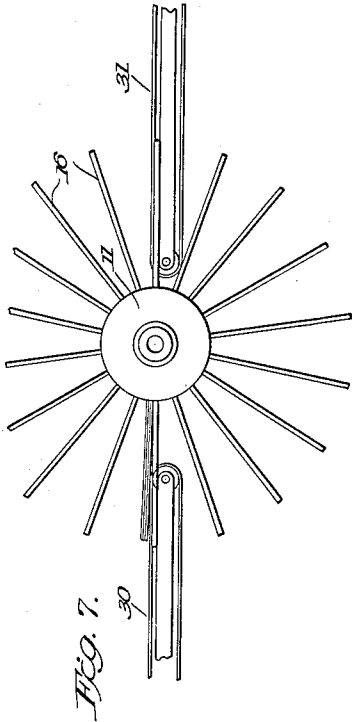
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SHEET DELIVERY APPARATUS

Filed Sept. 7, 1922

3 Sheets-Sheet 2



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SHEET DELIVERY APPARATUS

Filed Sept. 7, 1922

3 Sheets-Sheet 3

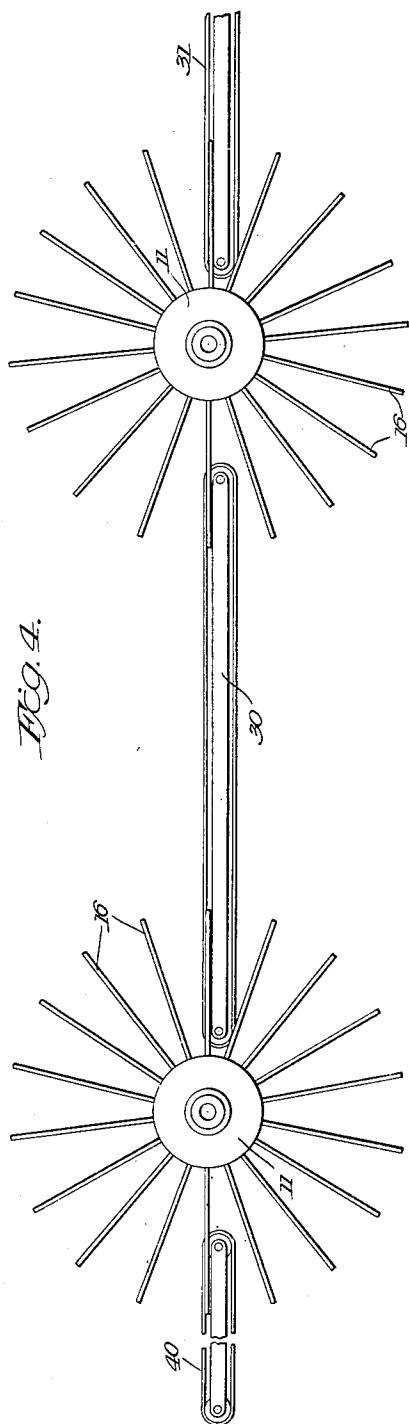


Fig. 4.

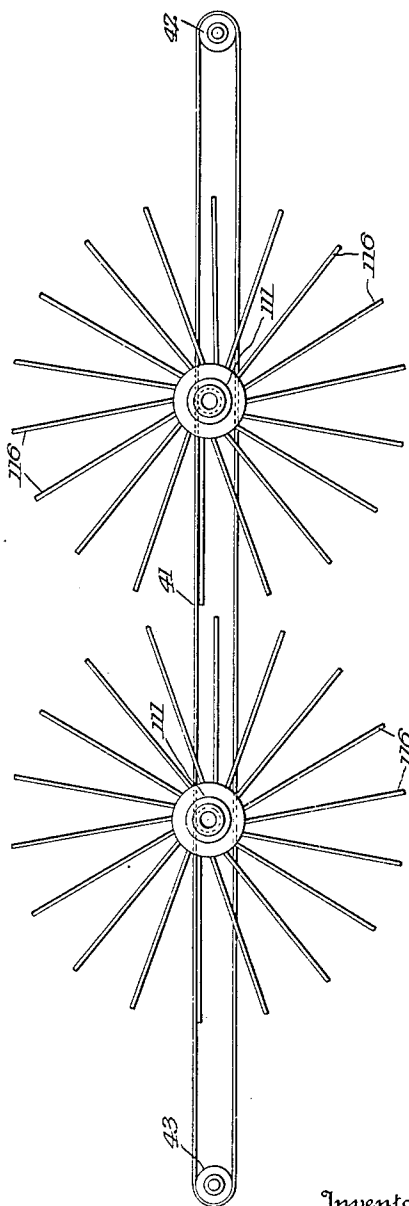


Fig. 5.

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## UNITED STATES PATENT OFFICE.

WILLIAM M. KELLY, OF WESTFIELD, NEW JERSEY.

## SHEET-DELIVERY APPARATUS.

Application filed September 7, 1922. Serial No. 586,700.

*To all whom it may concern:*

Be it known that I, WILLIAM M. KELLY, a citizen of the United States and residing at Westfield, Union County, State of New Jersey, have invented certain new and useful Improvements in Sheet-Delivery Apparatus, of which the following is a specification.

The present invention relates to a sheet delivery apparatus adapted to dry the sheets naturally or by artificial heat and also adapted for "collating."

Various devices have been used and proposed for drying sheets received from various sources such as printing presses and for dissipating or eliminating charges of static electricity. In the most common type, a heating element is attached to the reciprocating carriage of the sheet delivery mechanism of the press in such a manner that the sheets are subjected to heat from the device as they leave the carriage. In some instances the carriage reciprocates over the top of the pile of delivered sheets and the heating device is so disposed that the top sheet of the pile is subjected to the heat from the device to some extent, during reciprocation of the carriage. With such arrangements the maximum time that a sheet is subjected to the heating device corresponds to three single strokes of the carriage. Obviously this is an extremely short time. As the heating device cannot be too hot without injuring the paper, the sheets are not dried as thorough as might be desired.

The time during which the sheet is exposed to the heat is so short that an excessively hot source of heat must be employed to compensate for the short exposure to heat which often causes the sheet to warp. Best results, particularly with highly finished stocks, are obtained when the sheet is merely exposed to the air at room temperature for a sufficient length of time to dry the sheet. This may be termed "natural" drying as distinguished from "artificial" drying, where artificial heat is employed.

The principal aims of the present invention are to provide a sheet delivery which will dry the sheets satisfactorily merely by exposure to the air; and also to provide such a dryer which may use artificial heat, if desired.

As a "natural dryer," the invention com-

prehends a sheet delivery having means to receive and retain each sheet, exposed to the air, for a sufficient period to dry the same. Each sheet is retained by the dryer, exposed to the air, for a period of time during which a plurality of sheets are successively fed to the device. Merely by way of example and without in any way intending the same as a limitation, it may be stated that the dryer may retain each sheet for a period during which as many as fifty sheets have been successively fed to the device. If the device is delivering 3000 sheets per hour, at the above rate, each sheet would be exposed one minute to the air for natural drying, before being piled.

As an artificial heater the object is to provide an efficient heater in which the sheet is subjected to heat for a longer time than with previous devices, thereby drying the sheets more thoroughly and permitting the use of a heater at a lower temperature than heretofore. Another object is to subject the sheet to heat for a short period without interruption. Obviously this gives better and more efficient results than where the sheet is subjected intermittently to the heat. With the intermittent type the sheet cools off between the times it is under the influence of the heat so that a device like the present that exposes the sheet to heat continuously is more economical.

Another object of the invention is the provision of a collating device adapted to take sheets and collate them into groups.

To these ends the invention comprehends a novel sheet delivery including a device adapted to receive a sheet and retain it exposed to air or heat or both for a period of time during which a plurality of sheets are successively fed to the device.

Other objects and features of novelty of the invention will be apparent from the description taken in connection with the drawings in which:

Figure 1 is a more or less diagrammatic view in elevation (part being in section) illustrating one embodiment of the present invention associated with the delivery end of a printing press;

Figure 2 is a more or less diagrammatic sectional plan view taken substantially through the axis of the transfer device;

Figure 3 is a perspective view of the end

of one of the fingers showing the manner of mounting the roller at the end thereof;

Figure 4 is a diagrammatic view illustrating a form of the invention employing a plurality of drums;

Figure 5 is a diagrammatic view illustrating a form of the invention employing a plurality of drying devices with one set of tapes;

Figure 6 is a plan view of one of the drying devices employed in the form of Figure 7; and

Figures 7 and 8 are two diagrammatic views illustrating an embodiment of the invention as a collating device.

Referring to the drawings, the sheet delivery embodying the present invention is shown as being disposed at the delivery end of a printing press, although the invention is not limited to use in connection with printing presses but may be utilized in connection with other machines.

In the form of the invention illustrated the delivery device comprises a drum 11 rotatably mounted by means of the hollow trunnions 12 and 13 in the side frame members 14 and 15 respectively. The drum is provided with a plurality of sets of spokes or arms 16. As shown, the spokes of each set are spaced along a line parallel to the axis of the drum and the sets of spokes are spaced uniformly around the periphery of the drum, forming a plurality of sheet receiving pockets. The spokes may be spaced so closely circumferentially of the drum, that there will be as many as one hundred or more.

It is desired to rotate the drum slowly in timed relation to the operation of the printing press, so that each sheet may be exposed to the air long enough to dry the ink. Any suitable means may be used for this purpose. As illustrated, a ratchet wheel 22 is secured to rotate with the drum, at one end thereof, and is actuated by the spring pressed pawl 23 carried by the lever or arm 24 pivotally mounted on the trunnion 13 of the drum at the side of the ratchet wheel 22. This arm 24 is oscillated by any suitable means, in timed relation to the operation of the press. As shown in Fig. 1, shaft 25 of the press has a crank arm 26, this shaft and arm rotating in timed relation with the printing operations of the press. Thus, if the impression cylinder 27 of the press makes two revolutions for each printing operation, then the crank arm 26 will make one rotation for two rotations of the impression cylinder. On the other hand, if the impression cylinder makes one rotation for each impression, then the crank arm rotates the same as the impression cylinder. The crank 26 is connected to the end of the arm 24 by a link 28 so that the arm is thus oscillated in timed relation with the printing operations of the press. To pre-

vent rearward rotation of the drum, a holding pawl 29 is provided to cooperate with the ratchet wheel 22.

In operation the sheets are delivered from the press to the drying device by conveying means such as the tapes 30, it being understood that a set of spokes 16, when the dryer is not turning, is disposed so as to receive the sheet from said tapes 30 and the individual spokes located to move upwardly through the lateral spaces between the tapes to lift the sheet off the tapes. As soon as the sheet has been received in the pocket between a set of spokes, the drum is rotated through an angle to bring another set of spokes to receive the succeeding sheet. Thus, step by step the sheet is carried around to the delivery tapes 31. As shown in Fig. 2 of the drawings, when the sheet has been carried through an angle of about 180°, it is deposited on the delivery tapes 31 which carry the sheet to a sheet receiving surface such as 32, the spokes moving downwardly through the lateral spaces between the tapes 30. The rollers 32 and 33 adjacent the drum around which the tapes 30 and 31 respectively pass are carried by fingers 33<sup>a</sup> each having bifurcated end for receiving a roller and supported on transverse members 34 and 35 adjacent its other end. In this manner the spokes 16 of the drum are free to pass in the spaces between the tapes. It will be noted that the sheet is retained by the dryer for a considerable period of time. At least the period during which the sheet is carried by the drum is a multiple of the time required for a printing operation of the press. With the proportions shown in Fig. 2 of the drawings the sheet will be retained by the dryer during eleven printing operations of the press, and by providing more spokes this may be increased to fifty or more. It follows that the sheet will be exposed to the air long enough to be thoroughly dried.

However, if artificial heat is desired, any suitable heating means may be conveniently disposed in the drum 11. Thus, if gas is to be used, a perforated pipe 17, for the mixture of gas and air, extends into the drum through trunnion 12, being supported by bracket 12<sup>a</sup>, and the products of combustion pass out through the opposite trunnion 13. Any suitable air mixing device indicated at 17<sup>b</sup> may be provided and a valve 17<sup>c</sup> to control the supply of gas. Any other suitable heating device may be employed. Because of the relatively long time that the sheet is subjected to heat, the temperature of the heating device itself, that is to say the drum, may be much lower than with types of devices in which the sheet is exposed to the heat for only a fraction of this time. Furthermore, as the sheet is subjected to the heat continuously without any interruption during this period, the heating effect is more

efficient than in the intermittent type of heaters. The sheet is not exposed directly to any flame, and hence the fire hazard is almost eliminated.

5 If one drying device is not sufficient, a plurality may be employed, as shown in Figure 4. The tapes 31 deliver the sheets to the pockets between spokes 16 of drum 11, and tapes 30 take the sheets therefrom 10 and deliver them to a second drying device comprising drum 11 and spokes 16. From the latter, the sheets are taken by another set of spaced tapes, indicated at 40 and delivered to the sheet receiving table 32. 15 Where two such devices are employed the sheets are piled on the table printed side up. Although only two devices are shown, more might be used, if desired.

Figures 5 and 6 illustrate a form of the invention similar to Figure 4, but employ- 20 ing only one set of spaced tapes. As shown the tapes 41 extend from the tape pulleys 42 at the right to and around pulleys 43 at the left and then back to pulleys 42. The dry- 25 ing devices are interposed longitudinally between the pulleys 42 and 43 and comprise the drums 111 provided with radial arms or spokes 116. As shown in Figure 6, if small pulleys are used, the drums will be provided 30 with annular grooves 112 for the tapes. In operation the sheets will be conveyed to the pockets of the first dryer by the tapes 41, and taken therefrom and conveyed to the pockets of the next dryer by the same tapes. 35 Finally these tapes take the sheets from the last drum and carry them to the delivery point.

The rotation of the drums of Figures 4, 5 and 6 will be effected in any suitable man- 40 ner, as by the ratchet mechanism previously described, and will be timed to properly receive and deliver the sheets.

The use of the invention as a collating device is illustrated in Figures 7 and 8. In 45 Figure 7 the arrangement is the same as previously described, except that the drum is rotated step by step at a rate that will permit the delivery, into each pocket, of a plurality of sheets. Thus, if sheets are to be 50 collected in groups of  $n$  sheets each, then the ratchet will be actuated to turn the drum one pocket, after  $n$  sheets have been delivered by the conveyor tapes. As each pocket reaches the delivery tapes 31, the en- 55 tire group of sheets in the pocket will be taken by said tapes and delivered to the sheet receiving table.

In the form shown in Figure 8 there are 60 a plurality of conveyors 130 arranged one above another, there being as many conveyors as sheets in each group. In the figure, four conveyors are shown. The drum is rotated step by step so that each pocket successively receives a sheet from the con- 65 veyors. Thus the pocket A is receiving a

sheet from the lowest conveyor 130. Before another sheet is discharged from the conveyors, pocket A will be turned to receive a sheet from the next higher conveyor and so on. In this manner, each pocket will re- 70 ceive as many sheets as there are conveyors. The groups of sheets in the pockets will be transferred to the receiving table by the tapes 31 as already explained.

Having thus described my invention what 75 I claim as new and desire to secure by Letters Patent is:

1. A sheet delivery apparatus comprising, in combination, means for conveying sheets, positively acting means for delivering 80 sheets, relatively slow acting means for taking successive sheets from said conveying means and operating step by step in timed relation to said conveying means, such slow acting means depositing the sheets on said 85 delivery means and including a heater to which the sheets are exposed during their slow travel from said conveying means to said delivery means.

2. A sheet delivery apparatus comprising 90 in combination, means for conveying sheets, means for delivering sheets, and means for taking successive sheets from said conveying means and turning said sheets through a predetermined angle while subjecting the 95 same to heat and depositing said sheets singly on said delivery means.

3. A sheet delivery apparatus comprising in combination, a set of spaced tapes, a ro- 100 tatable drum having a number of spokes projecting from the periphery thereof, said spokes being arranged to form a series of sheet receiving pockets and to rotate through the spaces between said tapes, means for op- 105 erating said drum step by step to bring successive pockets into position to receive a sheet from said tapes, and means to dry said sheets while they are in said pockets.

4. A sheet delivery apparatus comprising in combination, a set of laterally spaced 110 tapes, a drum rotating on a horizontal axis and having a number of spokes projecting from the periphery thereof, said spokes being arranged to form a series of sheet re- 115 ceiving pockets and to rotate through the lateral spaces between said tapes, means for operating said drum step by step to cause the spokes to move upwardly through the spaces between said tapes and to bring said pockets successively into positions to receive 120 the sheets, and means to heat said sheets while they are in said pockets.

5. A sheet delivery apparatus comprising in combination, a set of laterally spaced 125 constantly running tapes, a drum rotating on a horizontal axis and having a plurality of sets of spokes projecting from the periphery thereof, the spokes of each set being spaced along a line parallel to the axis of the drum and the several sets being regularly spaced 130

around the drum to form a series of sheet receiving pockets and said spokes being arranged to move upwardly between the lateral spaces between said tapes, means for operating said drum step by step, and heating means disposed within said drum.

6. In combination with a printing press, a drum rotating on a horizontal axis and having a plurality of sets of spokes projecting from the periphery thereof, the spokes of each set being spaced along a line parallel to the axis of the drum and the several sets being regularly spaced around the drum to form a series of sheet receiving pockets, a set of laterally spaced constantly running tapes extending from the impression cylinder of the press and projecting in proximity to said drum between the spokes thereof, means for operating said drum step by step in timed relation to the operation of the press, and means to heat said drum.

7. In combination with a printing press, a sheet delivery apparatus comprising a set of laterally spaced constantly running tapes extending from the impression cylinder of the press, a drum in front of said tapes rotatable on a horizontal axis and having a number of spokes projecting therefrom, said spokes being arranged to form a series of sheet receiving pockets and to rotate through the lateral spaces between said tapes, means for operating said drum step by step in timed relation to the operation of the press to cause the spokes to move upwardly through the spaces between said tapes and to bring said pockets successively into position to receive the sheets, and a heater located within said drum.

8. A sheet delivery apparatus comprising in combination, a set of laterally spaced constantly running tapes, a drum mounted for rotation on a horizontal axis and having a plurality of sets of spokes projecting therefrom, the spokes of each set being spaced along a line parallel to the axis of the drum and the several sets being regularly spaced around the drum to form a series of sheet receiving pockets, a set of laterally spaced constantly running delivery tapes arranged in substantial alignment with the first mentioned tapes and spaced therefrom, said drum being located between said sets of tapes and arranged to have the spokes thereof rotate through the lateral spaces between said tapes, means to operate said drum step by step, and means to heat said drum.

9. In combination with a printing press, a sheet delivery apparatus comprising a set of laterally spaced constantly running tapes, extending from the impression cylinder of the press, a drum mounted for rotation on a horizontal axis and having a plurality of sets of spokes projecting therefrom, the spokes of each set being spaced along a line parallel to the axis of the drum and the

several sets being regularly spaced around the drum to form a series of sheet receiving pockets, a second set of laterally spaced constantly running tapes, said drum being located between said sets of tapes and arranged to have the spokes thereof rotate through the lateral spaces between said tapes, means to operate said drum step by step in timed relation to the operation of the press, and means to heat said drum.

10. A sheet delivery apparatus comprising in combination, a set of laterally spaced tapes, a drum mounted for rotation on a horizontal axis in front of said tapes and having a series of radial pockets regularly spaced therearound, means for operating said drum step by step to bring successive pockets into position to receive a sheet from said tapes, and a heater located within said drum.

11. A sheet delivery apparatus comprising in combination a set of laterally spaced tapes, a drum mounted for rotation on a horizontal axis in front of said tapes and having a series of radial pockets regularly spaced therearound, means for operating said drum step by step to bring successive pockets into position to receive a sheet from said tapes and means to dry the sheets while carried in said pockets.

12. A sheet delivery apparatus comprising in combination a set of laterally spaced tapes, a drum mounted for rotation on a horizontal axis in front of said tapes and having radial pockets regularly spaced therearound, a second set of laterally spaced tapes extending from the opposite side of said drum, means for operating said drum step by step to bring successive pockets into position to receive a sheet from said first mentioned tapes and to deliver a sheet to said second mentioned tapes, and means to heat said drum.

13. In combination with a printing press, a sheet delivery apparatus comprising a set of laterally spaced constantly running tapes extending from the impression cylinder of the press, a drum mounted for rotation on a horizontal axis and having a series of radial pockets regularly spaced therearound, a second set of laterally spaced constantly running tapes, said drum being located between the two sets of tapes, means to operate said drum step by step in timed relation to the operation of the press to bring successive pockets into position to receive a sheet from said first mentioned tapes and to deliver a sheet to said second mentioned set of tapes, and heating means within said drum.

14. A sheet handling apparatus including in combination, a rotatable device having a plurality of radial pockets, means to feed sheets to said pockets, means to rotate said device step by step in timed relation to said feeding means, and positively acting means

to take the sheets from the pockets after the device has turned through a predetermined angle.

15. A sheet handling apparatus including in combination, a rotatably mounted drum having means to removably retain sheets radially disposed with respect to the drum and means to feed sheets to said first means, means to turn the drum step by step in timed relation with the feed of sheets thereto, and positively acting means to take the sheets from said first means after the drum has turned through a predetermined angle.

16. A sheet delivery apparatus comprising in combination, a set of laterally spaced tapes, a drum rotating on a horizontal axis and having a number of spokes projecting from the periphery thereof, said spokes being arranged to form a series of sheet receiving pockets and to rotate through the lateral spaces between said tapes, and means for operating said drum step by step to cause the spokes to move upwardly through the spaces between said tapes and to bring said pockets successively into positions to receive the sheets.

17. In combination with a printing press, a drum rotating on a horizontal axis and having a plurality of sets of spokes projecting from the periphery thereof, the spokes of each set being spaced along a line parallel to the axis of the drum and the several sets being regularly spaced around the drum to form a series of sheet receiving pockets, a set of laterally spaced constantly running tapes extending from the impression cylinder of the press and projecting in proximity to said drum between the spokes thereof, and means for operating said drum step by step in timed relation to the operation of the press.

18. In combination with a printing press, a sheet delivery apparatus comprising a set of laterally spaced constantly running tapes extending from the impression cylinder of the press, a drum in front of said tapes rotatable on a horizontal axis and having a number of spokes projecting therefrom, said spokes being arranged to form a series of sheet receiving pockets and to rotate through the lateral spaces between said tapes, and means for operating said drum step by step in timed relation to the operation of the press to cause the spokes to move upwardly through the spaces between said tapes and to bring said pockets successively into position to receive the sheets.

19. A sheet delivery apparatus comprising

in combination, a set of laterally spaced constantly running tapes, a drum mounted for rotation on a horizontal axis and having a plurality of sets of spokes projecting therefrom, the spokes of each set being spaced along a line parallel to the axis of the drum and the several sets being regularly spaced around the drum to form a series of sheet receiving pockets, a set of laterally spaced constantly running delivery tapes arranged in substantial alignment with the first mentioned tapes and spaced therefrom, said drum being located between said sets of tapes and arranged to have the spokes thereof rotate through the lateral spaces between said tapes, and means to operate said drums step by step.

20. In combination with a printing press, a sheet delivery apparatus comprising a set of laterally spaced constantly running tapes, extending from the impression cylinder of the press, a drum mounted for rotation on a horizontal axis and having a plurality of sets of spokes projecting therefrom, the spokes of each set being spaced along a line parallel to the axis of the drum and the several sets being regularly spaced around the drum to form a series of sheet receiving pockets, a second set of laterally spaced constantly running tapes, said drum being located between said sets of tapes and arranged to have the spokes thereof rotate through the lateral spaces between said tapes, and means to operate said drum step by step in timed relation to the operation of the press.

21. In combination with a printing press, a sheet delivery apparatus comprising a set of laterally spaced feed tapes extending from the impression cylinder of the press, a drum in front of said tapes rotatable on a horizontal axis and having a number of spokes projecting therefrom, said spokes being arranged to form a series of sheet receiving pockets and to rotate through the lateral spaces between said tapes, means for operating said drum step by step in timed relation to the operation of the press to cause the spokes to move upwardly through the spaces between said tapes and to bring said pockets successively into position to receive the sheets, and a heater located within said drum.

In testimony whereof I hereunto affix my signature.

WILLIAM M. KELLY.