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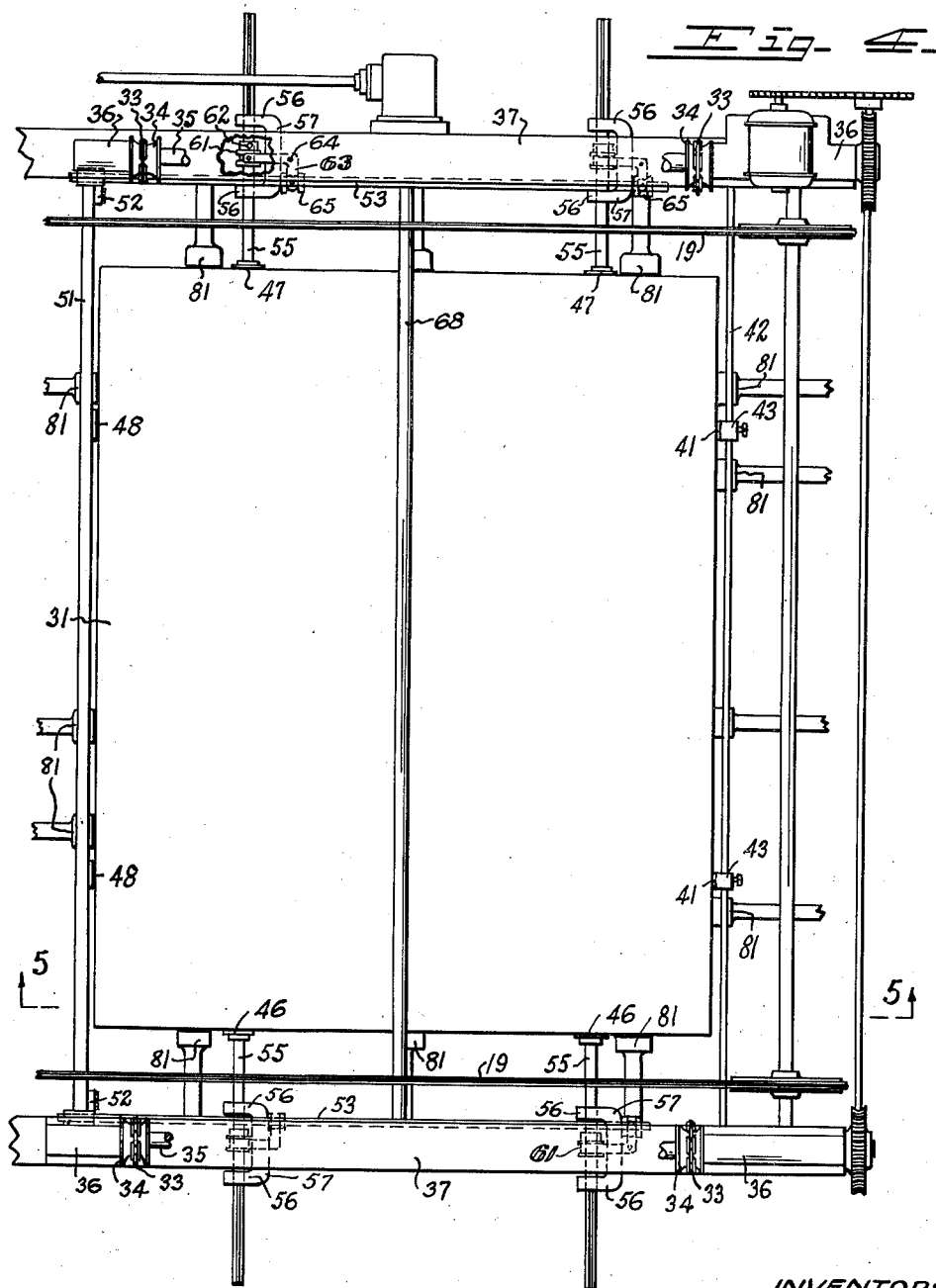
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METHOD OF DRYING FRESHLY PRINTED SHEETS AND APPARATUS THEREFOR

Filed Dec. 17, 1927

4 Sheets-Sheet 2



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Jan. 14, 1930.

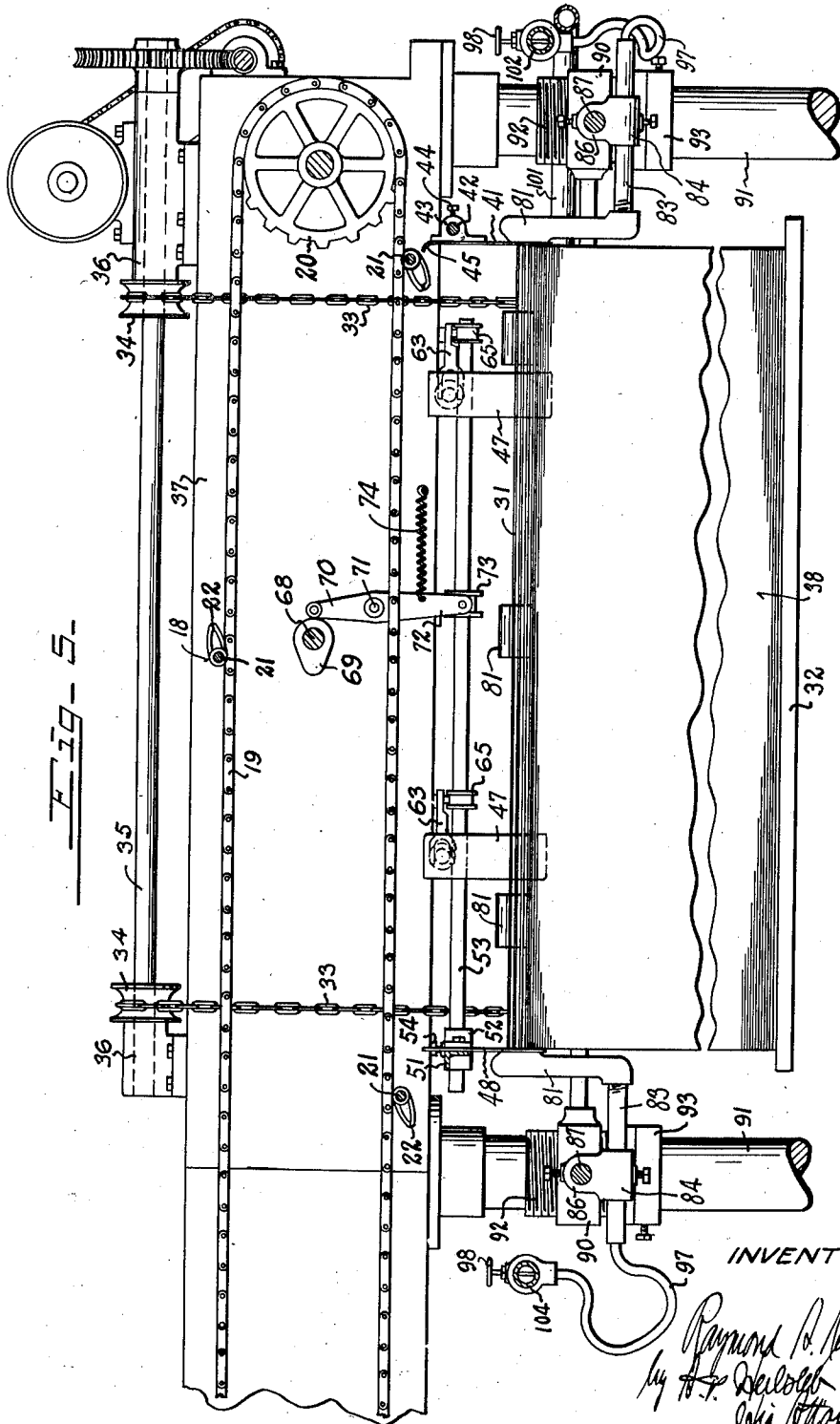
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METHOD OF DRYING FRESHLY PRINTED SHEETS AND APPARATUS THEREFOR

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4 Sheets-Sheet 3



INVENTOR:

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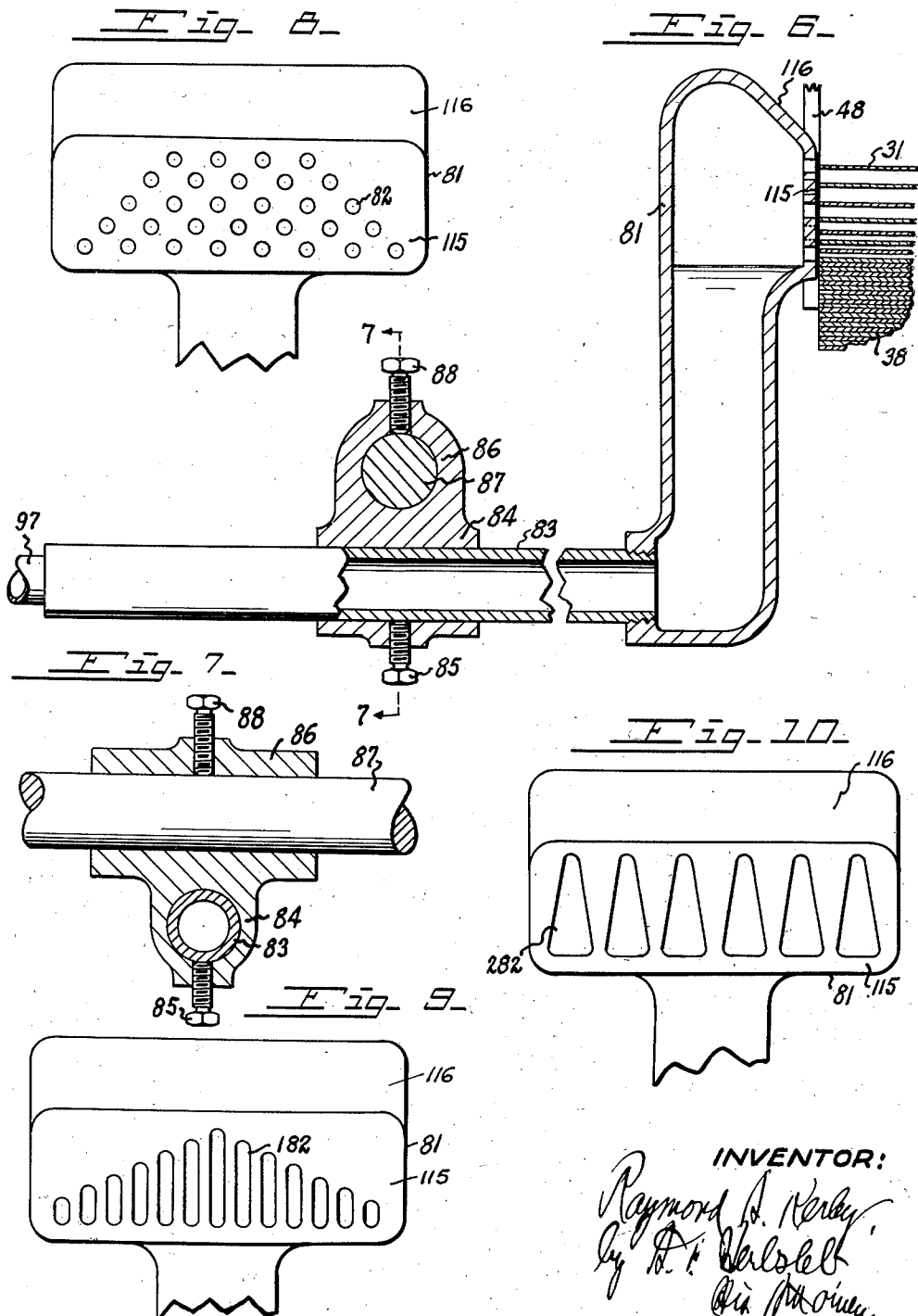
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METHOD OF DRYING FRESHLY PRINTED SHEETS AND APPARATUS THEREFOR

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

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METHOD OF DRYING FRESHLY-PRINTED SHEETS AND APPARATUS THEREFOR

Application filed December 17, 1927. Serial No. 240,731.

My invention relates to the drying of freshly printed sheets, and is applicable to drying the freshly printed sheets whether the same have been printed in sheet form or whether the same have been printed in a web and then severed into sheet form at or prior to the delivery thereof.

It is the object of my invention to cause a drying current to be directed upon the sheet while the sheet is being delivered in forming a stack of sheets; further, to cause a drying current or drying currents to be applied edgewise to the sheet being delivered to speed the drying of the ink thereon; further, to present a drying current or drying currents edgewise to the sheet so as to retard the falling of the sheet to the stack; and, further, to direct a drying current or drying currents edgewise to the sheets for injecting a layer or layers of drying medium between the sheets as the sheets settle in the stack.

It is the object of my invention further to provide means for accomplishing the respective aforementioned objects; further, to provide means for directing a drying current or drying currents edgewise to the freshly printed sheets; further, to provide such means acting in conjunction with jogger mechanism in stacking the sheets; further, to provide a nozzle or nozzles for directing a drying current or drying currents edgewise to the sheets; further, to provide means for adjusting the nozzles to increase or decrease the horizontal distance between them for positioning the nozzles with relation to sheets of various sizes; further, to adjust the paths of the drying currents with relation to each other for regulating the application of the same with relation to the area of the sheet, depending on the amount or solidity of printing on the various portions of the printed sheet; further, to provide orifices for the currents which increase in area away from the top sheet being acted on; and, further, to provide novel means for injecting drying currents between the sheets, which drying currents increase in volume as the distance from the top sheet increases for cushioning the falling of the successive

sheets and increasing the duration of application of the drying currents to the printed matter on the printed sheets.

It is the object of my invention, further, to provide means for retarding the falling of the sheets in the formation of the stack in cooperation with jogging mechanism for stacking the sheets and the invention will be further readily understood from the following description and claims, and from the drawings showing an exemplification of my invention.

I have exemplified a printing press in which sheets of paper are arranged to be printed in four colors, and to be received from the printing mechanism by a delivery mechanism which includes jogging means for aiding in the arrangement of the sheets in a stack of sheets, although my invention is applicable to printing presses of various types, whether printing in sheet form or in a web and then severing the web into sheets at or prior to delivery thereof, whether printed on one side or both sides of the paper, and whether printed in one or more colors.

In the drawings:

Fig. 1 represents a side elevation of an exemplifying printing press embodying my invention, partly broken away.

Fig. 2 is a horizontal cross-section of the delivery end of the same, taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section of a detail, taken on the line 3—3 of Fig. 1.

Fig. 4 is a plan view of the delivering end of the delivering mechanism embodying my invention, partly broken away.

Fig. 5 is a vertical section of the same, taken on the line 5—5 of Fig. 4.

Fig. 6 is a vertical section of one of the nozzles, taken in the plane of the line 6—6 of Fig. 2, showing its relation to the stack, and also showing its means for adjustment, partly broken away.

Fig. 7 is a vertical section of a detail of the same, taken in the plane of the line 7—7 of Fig. 6.

Fig. 8 is a front elevation showing a cur-

rent applying nozzle having orifices in one form.

Fig. 9 is a front elevation of a nozzle having orifices of a different form; and

Fig. 10 is a front elevation of a current supplying nozzle having orifices of still another form.

The printing press exemplified prints four colors on one side of the sheet, and comprises impression cylinders 11, 12, between which there is a transfer cylinder 13, a transfer cylinder 14 conveying the sheet fed to it from a feed table 15. The sheet delivery mechanism comprises stripper bars 16, tapes 17, and travelling gripper mechanism 18 comprising chains 19 looped about sprocket-wheels 20, suitably driven, gripper-rods 21 extending crosswise of the printing press and travelling with the gripper chains and having grippers 22 adjustably arranged along the rods. The path of the sheet is indicated by the arrows. Plate cylinders 23, 24, coact with the impression cylinder 11, and plate cylinders 25, 26, coact with the impression cylinder 12. Suitable inking mechanism is provided for the plate cylinders, as indicated generally by the inking rollers 27.

The freshly printed sheets 31, as they are being delivered, are received above a platform 32, suspended by cables 33 received about sheaves 34, on shafts 35, journaled in bearings 36, on the frame 37 of the delivery mechanism, and suitably controlled for lowering of the platform as the stack of sheets 38 thereon increases. The level of delivery of the sheets on the stack remains substantially constant in the present exemplification.

Suitable jogger mechanism is provided for the sheets and, as shown, comprises rear plates 41, which are adjustable laterally on a cross-bar 42 fixed in the frame, the plates being provided with bearings 43 about said rod and clamped in adjusted positions by set screws 44. The upper ends of the bars have forwardly curved portions 45 under which the rear or advancing edge of the freshly printed sheet is received, the grippers 22 releasing the sheet, caused by suitable mechanism at this point, so as to permit the falling of the sheet above the delivery platform. The lower ends of the plates 41 preferably extend below the top of the stack of sheets.

Movable side jogger-plates are shown at 46, 47, at the respective sides of the printing press, and movable end jogger-plates are shown at 48, at the front of the stack of sheets. The movable jogger-plates are adjustable toward and from the edges of the stack of sheets, and means are also provided for reciprocating the movable jogger-plates toward and from the stack of sheets, for stacking the sheets evenly, one above the other, the movable jogger-plates acting upon

the edges of the sheets as they fall from the delivery mechanism. These movable jogger plates also preferably extend below the top of the stack of sheets.

The jogger-plates 48 are mounted on a cross-bar 51, secured at its respective ends to bearings 52, adjustable lengthwise on endwise reciprocating rods 53, and held in adjusted positions on said rods by set-bolts 54. The side jogger-plates 46, 47, are respectively mounted on endwise reciprocating rods 55, reciprocating endwise in bearings 56 on yokes 57 secured to the frame of the printing press. The respective rods 55 are prevented from turning in their bearings. A spool 61 is adjustably secured to each of the rods 55 at suitable positions lengthwise of the rods, by means of set-bolts 62, for adjusting the side jogger-plates in and out. A bell-crank lever 63 is pivoted to the frame at 64 at each of the side jogger-rods and has fork connection with the spool 61 at one of its ends, and fork connection with a spool 65 at its other end, the latter spools being secured to the respective endwise reciprocating rods 53.

A cam-shaft 68 is suitably journaled in bearings on the frame, and has a cam 69 at each of its ends, arranged to operate a lever 70, pivoted at 71 to the side frame of the machine, and having a fork 72 cooperating with a spool 73 on each of the jogger rods 53. A spring 74 normally moves the lever into coactive relation with the cam. Suitable means are provided for rotating the cam-shaft.

When the freshly printed sheets are released by the delivering grippers, the sheet descends by gravity between the sets of jogger-plates so as to form a stack of sheets whose edges are even. The sheets are freshly printed and delivered in rapid succession, with the danger that the ink on one sheet will soil the next sheet when the sheets are stacked, the fresh ink on one sheet offsetting upon or smudging the neighboring sheet and also being spread or smudged upon the freshly printed sheet.

I avoid these objections by applying a drying current or drying currents upon the sheets as they are being delivered, and I preferably direct the drying current or drying currents edgewise upon the freshly printed sheets, and between the freshly printed sheets, as they are being stacked. The drying currents are preferably currents of air, which has been preferably heated, as by means of a heater 75 and the air may also have been supplied with an additional oxidizing agent. I find that the drying currents of air directed upon the sheet have the effect of forming a hardened film on the outer surface of the ink, and of drying the ink, so that soiling, smudging or offsetting between sheets is avoided.

The means I employ for supplying the drying currents comprise nozzles 81, having orifices 82, through which the drying currents are directed against the sheets. I have shown the nozzles affixed to tubes 83, which are adjustable lengthwise in bearings 84, being held in adjusted positions by set-bolts 85. The bearings 84 have bearings 86 rigid therewith. The bearings 86 are received about rods 87, and are adjustable lengthwise of the rods and held in adjusted positions by set-bolts 88.

The ends of the rods 87 are mounted in bearings 89, rigid on collars 90, supported on the posts 91 of the delivering mechanism of the printing press. These collars are adjustable to elevation, as by being threaded and having hollow bolts 92 threaded therein, the bolts 92 being supported on collars 93 fixed to the respective uprights by set-bolts 94. Positioning of the collars 93 on the posts or adjustment of the hollow bolts determines the heights of the nozzles with relation to the top of the stack.

Flexible tubes 97 connect the respective tubes 83 with suitable feed-pipes, there being preferably a feed-pipe for each edge of the stack.

The respective feed-pipes are provided with valves 98 for regulating the flow of the drying fluid through the respective nozzles, so as to adjust each nozzle for the amount of drying current which it is desired to pass therethrough. These feed-pipes are shown respectively at 101, 102, 103, 104, and respectively have valves 105, 106, 107, 108, therein, for separately controlling the feed of drying current through the respective sets of nozzles, these feed-pipes connecting with a main feed-pipe 109, having a valve 110 therein, for regulating or shutting off the supply of drying fluid to all of the nozzles.

The nozzles of each of the sets of nozzles are separately laterally adjustable on their supporting rods and arranged to be fixed in adjusted positions so as to place the nozzles either closer together or farther apart at the respective edges of the printed sheet, dependent on the relations of the heavy printed portions and light printed portions on the sheet. The arrangement is such that a larger volume of drying medium may be supplied at the heavily printed portions of the sheet and a less volume of drying medium applied at the lighter printed portions of the sheet. The valves for regulating the feeding of the currents of drying medium are also so placed that great elasticity in application of the drying currents is provided for. The valve for each nozzle is separately adjustable, the valve for each set of nozzles is separately adjustable, and the main valve is adjustable.

The orifices in the nozzle are preferably so placed or arranged that the volume of

drying currents increases downwardly. This is shown accomplished in the arrangement of orifices shown in Fig. 8, in which the numbers of orifices increase from the top to the bottom of the nozzle. A different arrangement is shown in Fig. 9, in which the orifices 182 form upright slots, the lower ends of which are on a level and the upper ends of which are arranged slopingly upwardly toward the middle of the nozzle. A still different form of orifice is shown in the nozzle represented in Fig. 10, in which the orifices 282 are of equal height but widened toward their bottoms.

The face 115 of the nozzle in which the orifices are located, is preferably close to the edge of the stacked sheets with which it cooperates. The lower ends of the jogger plates and these faces preferably overlap, that is, the lower ends of the jogger plates preferably extend sufficiently low to engage the edges of all the sheets which are being wholly or partly sustained by the drying currents.

The upper ends of the nozzles adjacent the edges of the sheets are preferably provided with downwardly and inwardly sloping faces 116, so that if the edges of the sheets being delivered should contact with the upper ends of the nozzles, the sheets may be urged into central position above the stack.

In the operation of my improved device, and in the performance of the method, the freshly printed sheets are carried above the platform by the delivering gripper mechanism, the grippers gripping the rear edge of the sheet, and the balance of the sheet being sustained in its delivery in suitable manner until it arrives in practically horizontal position above the platform.

As the advancing edge of the freshly printed sheet almost arrives at the position of the rear jogger-plates 41, with the advancing edge of the sheet under the forwardly curved upper ends 45 of the rear jogger plates, the grippers release the sheet, and the sheet descends by gravity upon the stack, being subjected to the actions of the movable jogger-plates for causing the successive freshly printed sheets to stack evenly.

As the freshly printed sheets descend, they are subjected to the drying currents directed at their edges crosswise of the sheets. These drying currents attack the freshly applied ink for drying the same and cause a hardened film to be formed at the outer surface of the ink, for preventing transferring of the ink on any sheet to a neighboring sheet, and also preventing the smearing or smutting of any of the ink on the freshly printed sheet.

The drying currents also form cushions below the freshly printed sheets being delivered for retarding the descent of the sheets and creating cushions of air between the sheets. There are a number of the

5 sheets which are thus successively retarded for simultaneously floating above the stack. The lower sheets thus sustained finally rest by gravity upon the stack, but are in the meantime subjected to the drying currents for thoroughly drying the ink thereon.

10 In order to enhance this effect, the capacity of the orifices of the nozzles increase from their tops downwardly, as the lower portions of these combined orifices furnish sufficient currents to sustain a number of sheets, the number of sheets sustained decreasing toward their top.

15 The nozzles inject currents of air toward the edges of the freshly printed sheets and upon the freshly printed surfaces of said sheets, and sustain such application of drying currents for a considerable length of time so as to thoroughly dry the freshly applied ink upon the sheets before they form firm parts of the stack of sheets.

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

25 1. The method of drying freshly printed sheets while said sheets are being delivered to form a stack, which comprises causing drying currents to be passed crosswise of the sheets between the sheets as they settle upon the stack of sheets, the said currents increasing in volume with the distance downwardly from the uppermost sheet.

30 2. In a printing press, the combination of jogger mechanism including jogger-plates acting on the edges of the sheets while the sheets fall by gravity to form the stack of sheets, and means for delivering drying currents edgewise between the sheets and in greater volume as the distance increases from the top sheet to retard the settling of the sheets in the stack.

35 3. In a printing press, the combination of delivery means for delivering sheets in a stack, and means for delivering drying currents edgewise upon the sheets being delivered and in increasing volume from the top downwardly.

40 4. In a printing press, the combination of jogger mechanism including jogger-plates acting on the edges of the sheets while the sheets fall by gravity to form the stack of printed sheets and means for reciprocating said jogger-plates, means for delivering drying currents edgewise to the sheets while said sheets are being acted on by the jogger-plates, and means for adjustably relatively positioning said jogger-plates and said last-named means.

50 In testimony whereof, I have hereunto signed my name.

RAYMOND A. KERLEY.