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H. E. STOLPER

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PRINTING PRESS SHEET DELIVERY APPARATUS

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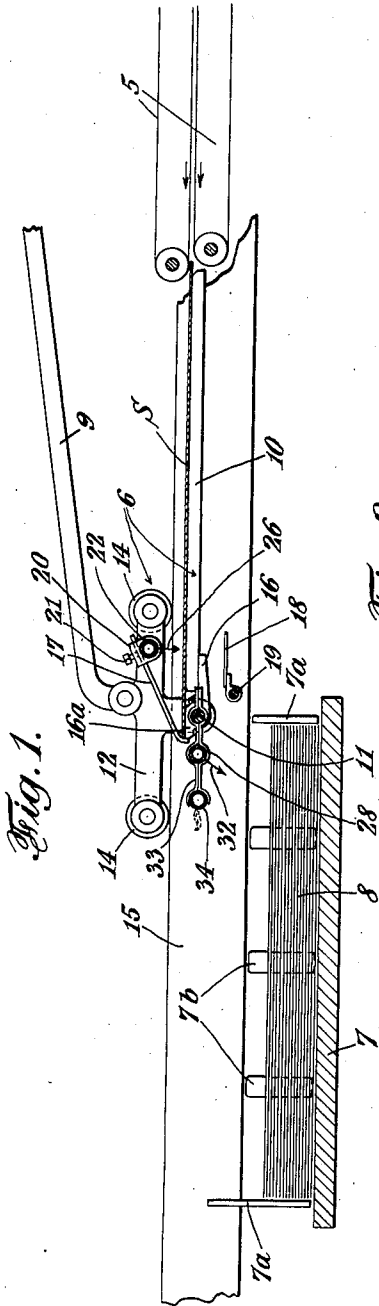


Fig. 2.

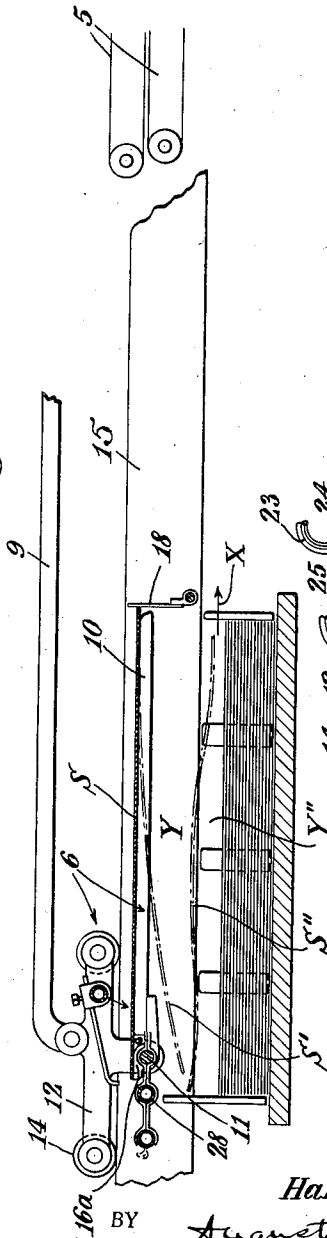
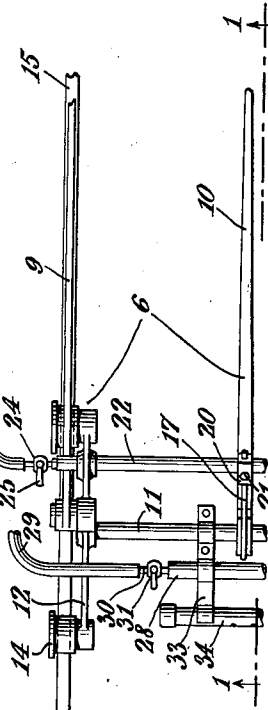


Fig. 3.



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UNITED STATES PATENT OFFICE

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PRINTING PRESS SHEET DELIVERY
APPARATUS

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9 Claims. (Cl. 271—84)

This invention relates to printing-press sheet-delivery apparatus; and, more particularly, the invention aims to provide an improved means for employing air under pressure in controlling and safeguarding the deposit in a stack or delivery pile of successive printed sheets as they are delivered one by one from a printing press having a reciprocating carriage each forward stroke of which transports a single printed sheet, printed side uppermost, from the printing mechanism, to the locus of said stack or pile, and in which printing press the sheet delivery apparatus so operates that, incidental to performance of a retraction stroke by the carriage, the printed sheet leaves the carriage to drop by gravity on the delivery pile so that on arrival of the sheet on the pile the printed side of the sheet is still uppermost.

Although the invention can be used advantageously in connection with any printing press incorporating a delivery apparatus having a reciprocating carriage for delivering the printed sheets intermittently to the delivery pile, and directly thereto, that is, without an intervening oscillation of a flyer to turn over the sheet to reverse the position of its printed side to have that side lowermost when the sheet adds itself to the delivery pile,—especially where the speed of the press is very high in terms of printed sheets per minute,—the invention will, for convenience, and in aid of clarity of exposition thereof, but not in any way to imply any limitation, be explained in regard to its use with the delivery apparatus of a flat-bed cylinder press. A well known press of this kind is the Miehle flat-bed cylinder press, to which press a now favored type of embodiment of the present invention has been applied, and in connection with which press said embodiment is now, and for some time has been, working perfectly. This Miehle press, as is well known, has a speed of about 1500 to 2000 printed sheets per hour.

In a delivery apparatus of the kind to which the invention pertains, a single new printed sheet, printed side uppermost, is freed from the carriage, following release of the leading or front end of the sheet and concomitant interposition of a stop to abut against the rear or tail end of the sheet, by withdrawal of the carriage from under the sheet incidental to performance by the carriage of its retraction stroke. The released sheet must drop, particularly at its tail or printing-cylinder-adjacent end, that is, at the sheet end which is last let go of by the withdrawing carriage, so as to be out of the way of the for-

ward end of the carriage when the carriage makes its next forward stroke. Unless the sheet thus drops very quickly, the next forward stroke of the carriage, completed within less than a second after release by the carriage of the tail end of the sheet, will result in the carriage engaging the sheet, ruining it, and necessitating stoppage of the press.

The printed sheets are often of light-weight and great expanse; and so the difficulty is a very serious one. As a result, complicated and expensive suction systems aimed at overcoming the trouble have been developed. One such, developed for the Miehle press aforesaid, and requiring that press to be rebuilt, is characterized by the use of a plurality of exhaust fans, special motors therefor, and elaborate devices including rotatable sucker-drums on the carriage for acting on the underside of the sheet to insure withdrawal of the carriage from under the sheet to free the latter over the delivery pile during the retraction stroke of the carriage, and a fixed line of large-bore sucker-throats having their mouths arranged horizontally across the press at a level below the carriage and above the top of the delivery pile, for sucking away the cushion of air between the top of the delivery pile and a down-floating sheet as it is released from the carriage, in an attempt to prevent that sheet from floating so long in a position above the top of the pile as to run the chance of its being crumbled by the carriage on the next forward stroke of the latter, bringing the next printed sheet for transfer to the delivery pile.

According to the present invention, such complications as these are dispensed with, and, instead, an air control is provided which is as dependable in operation as it is simple in concept and structure. And it is so simple in structure that it can readily be used by easy and quick attachment to a press already built, installed, and even in use; as against necessitating the building of a special press for obtaining its advantages.

I am aware that it has been proposed to employ air under pressure which acts positively, that is, by positive air-blast pressure applied to the sheet while on its way from the printing mechanism to the delivery pile, as well as to place air under pressure for the purpose of having air under negative pressure or suction act on the sheet while in delivery.

A feature of the present invention, however, is that an air-blast is delivered from an outlet moved back and forth with the carriage, and with such outlet located below the plane of the sheet

on the carriage, and near, but preferably somewhat beyond, the front end of the carriage; whereby on a forward stroke of the carriage this air-blast acts downwardly on the last previously deposited sheet while sweeping over the same from tail end toward front end thereof, and, on the next ensuing retraction stroke of the carriage, incidental to which another sheet is deposited over the pile as already explained, this air-blast acts downwardly on the sheet last-mentioned while sweeping over the same from the front end to the tail end thereof—a corollary to which last-mentioned action is a downward action of the air-blast also on the previously deposited sheet, if that is not already absolutely flat on the pile top, by indirection as it were, that is, by way of the sheet just deposited and by way of any air cushion remaining between that sheet and the previously deposited sheet.

Another feature of the invention is that this air-blast is discharged from its outlet in a forward as well as a downward direction, so that during both forward and retraction strokes of the carriage this blast acts thrustingly along the general plane of each down-floating sheet, away from the tail end of the latter and toward the front end thereof. Said outlet is preferably constituted as a horizontally extending line of orifices in a conduit arranged transverse to the press; and the air-blast is established by forcing continuously maintained jets of air under pressure through said orifices so as to provide an air-stream of a width substantially equalling the width of the carriage. Such air-stream, and its handling as above, have been found to insure driving out of the air cushion between the top of the delivery pile and a sheet deposited by the carriage for flatwise gravity drop to the pile, by positive downward squeeze so obliquely exerted that the tail end of said sheet is always forced to a location to clear the carriage on its next forward stroke, practically regardless of the thinness and limpness of the sheet and of its degree of expanse, even with the press running at maximum speed.

Another feature of the invention is, in combination with an air-blast means as just described, a second such means, this for delivering an air-stream like the one first-mentioned from an outlet which is also moved back and forth with the carriage, but which is located above the plane of sheet lie on the carriage, and intermediate the front and rear ends of the carriage, preferably fairly close to the front end of the carriage. This second outlet is also preferably constituted as a substantially horizontally extending line of air-jet orifices in a conduit extended transverse to the press; but such conduit is desirably a rockable one, so that in one position, which it maintains during a forward stroke of the carriage, it delivers its air-stream in one direction, that is, preferably substantially vertically downwardly, to assist in holding the portion of the sheet behind the leading edge of the sheet down flat on the carriage, and so that in another position, which it assumes on release of the sheet at the completion of a forward stroke of the carriage and which it retains during the ensuing retraction stroke of the carriage, it delivers its air-stream in another direction, that is, in a direction substantially paralleling that of the first-named air-stream, to act cumulatively relative to the latter in the work done thereby during a retraction stroke of the carriage as already described.

The invention will be more clearly understood,

from the following description of an embodiment of the invention now favored (because the one now being worked actually, as aforesaid), but one which is merely illustrative of many possible ways of carrying out the invention, which is illustrated in the accompanying drawing.

In said drawing:

Fig. 1 is a vertical longitudinal section, taken, substantially on the line I—I of Fig. 3, through the sheet-delivery apparatus of the Miehle press above referred to, as slightly modified to incorporate said embodiment; this view showing the reciprocating carriage just about at the starting of its forward stroke.

Fig. 2 is a view similar to Fig. 1, showing the reciprocating carriage at the completion of its forward stroke.

Fig. 3 is a fragmentary top plan view, showing certain details which might not be entirely clear from merely the other two views.

Referring to the drawing more in detail, the standard and usual parts of said Miehle press, such of them as are illustrated in the drawing, will first be described. Only enough of these parts are shown which are needful or helpful to a full understanding of the instant invention.

At 5 is indicated a portion of the system of delivery tapes for delivering the printed sheet, printed side uppermost, from the printing mechanism (not shown), to the reciprocating carriage. This carriage is generally designated 6, and is for transporting the printed sheet, printed side still uppermost, to a position overlying the platform 7 for receiving the printed sheets, printed side still uppermost, and one by one, to accumulate a stack of said sheets to a predetermined total. Said stack, or delivery pile, is marked 8. The platform carries horizontally adjustable end posts 7a, and similarly adjustable side posts 7b, set to delimit an area on the platform appropriate to that of the sheet being printed. Said platform, by well-known means not shown, is gradually manually lowerable, as the height of the pile increases, properly to lower the top of the pile, but so as always to have the top of the pile not far below the plane of sheet lie on the carriage during performance by the latter of its forward or sheet-transporting stroke. The reciprocation of the carriage is effected by a simple crank motion a link of which is indicated at 9. Said plane of sheet lie is a horizontal one, provided by the tops of a line of fly-sticks 10 forming part of the carriage. These sticks 10 all extend parallelly, in the direction of travel of the carriage, and they are spaced across the carriage in the direction of width of the press, to provide a skeletal flat bed, hereinafter called the fly-stick bed. As components of the fly-stick bed, the sticks 10 do not move relative to the forward wheeled structure of the carriage, in the sheet delivery apparatus of the kind being described; although the narrower rear ends of the sticks are free, the sticks are anchored at their forward ends to a cross-rod 11 which is secured at its opposite ends to two like sub-carriages 12 against rotation relative thereto. Each of these sub-carriages 12 mounts at its forward and rear ends flange-type rollers 14, and each pair of such rollers at the opposite side of the delivery apparatus rides on the horizontal upper edge of a side bar 15, as a track. The tread of each sub-carriage is long enough to allow the weight of the carriage to hold the fly-stick bed horizontal during reciprocation of the carriage. At suitable intervals along the cross-rod 11, there are secured thereto bracket-extensions 16 which

support the ends of the fly-sticks adjacent to the cross-rod.

These bracket-extensions 16 have table portions 16a located forward of and above the top of the cross-rod 11, so as in advance of the latter to present flat and horizontal top surfaces in the same plane with the top surfaces of the fly-sticks 10 aligned therewith. With the carriage as shown in Fig. 1, that is, at the end of a retraction stroke and about to start a forward stroke, a printed sheet, S, has been advanced by the tapes 1 to lie as shown in that view, that is, with the forward portion of said sheet on said table portions 16a and with the leading or front edge of said sheet flush with the front ends of said table portions. This flush set of the sheet is due to abutment of the front edge thereof against a line of stops spaced across the press, one over each table portion 16a; which stops, as they are called in the art, are indicated at 17 and will hereinafter be called the placer-fingers. These fingers are downwardly and forwardly inclined from a line of support extending across the carriage, and hence are bodily moved with the carriage. Also, they are moved in unison up and down at suitable times, by fractional rotation of their common support, through means (not shown) operatively connected to a power-driven element of the press.

Another line of pivotally mounted stops is indicated at 18, these also arranged in a line across the press, but with their pivotal support fixed and relative to which the carriage moves; which stops, as they are called in the art, will hereinafter be called the take-off fingers. These fingers, secured to a cross-rod 19 extended between the side bars 15, are rocked in unison between the positions shown in Figs. 1 and 2, through means (not shown) also operatively connected to a power-driven element of the press.

Operation

The printed sheet S is advanced by the tapes 5 to come to rest on the carriage as shown in Fig. 1, and with the forward edge of the sheet caught by the placer-fingers 17, at the instant the carriage is ready to perform its forward stroke for delivery of the sheet to the pile. When the carriage has completed this stroke, to advance the sheet S to the position shown in Fig. 2, the placer-fingers 17 rise, as there shown; and simultaneously the take-off fingers 18 swing up vertical, as in Fig. 2. Thereby, on the immediately ensuing retraction stroke of the carriage, the sheet is left behind and over the pile location, in the hope that such sheet will drop flat on the top of the stack.

Unless said sheet thus drops, and quickly, the next forward stroke of the carriage will catch it, ruin it, and necessitate stopping the press.

The purpose of such a complicated suction system as that referred to above, is to suck away, in the direction of the arrow X of Fig. 2, the cushion of air Y, and so prevent the printed sheet, after the latter is left at the location shown in Fig. 2, following completion of the retraction stroke of the carriage to return the carriage to the position shown in Fig. 1, from floating so long in such a disposition as that indicated at S' as to run the chance of it being crumpled by the carriage on the next forward stroke of the carriage.

Now to describe the exemplifying embodiment of the present invention illustrated in the drawing:

For providing the air-blast stream last dis-

cussed in the introduction hereof, there is simply substituted, for a solid cross-rod (not shown) standard in the Miehle press,—and on which cross-rod the placer-fingers 17 are secured by individual collars and set-screws like those shown in Figs. 1 and 3 at 20 and 21, respectively, as carried by the upper end of the finger 17 there seen,—a hollow rod, or pipe, 22, of the same external diameter as the diameter of said solid cross-rod.

This pipe 22 has a line of orifices along its underside, so that when air under pressure is admitted to one end of said pipe, as by a rubber hose 23, attached to a nipple 24 on the pipe and carrying a cock 25 for shutting off the air or regulating its pressure, the air-blast stream last discussed in the introduction hereof will be discharged downwardly across the width of the press.

Since the pipe 22, in addition to its new function of providing an outlet for establishing such air-blast stream, has all the functions of the solid cross-rod it displaces, the pipe 22 is rocked by the means for rocking said cross-rod, thereby, in properly timed relation to the movement of the carriage, to dispose the placer-fingers 17 as in Fig. 1 or as in Fig. 2, this air-blast stream is directed as shown by the arrow 26 in Fig. 1 over a predetermined interval of operation of the press, and as shown by the arrow 27 in Fig. 2 over another predetermined interval of operation of the press.

For providing the air-blast stream hereinabove first-mentioned, all that is added to the standard Miehle press illustrated, is a second pipe 28, arranged horizontally across the width of the press like the pipe 22, and having also a line of air-jet orifices. The horizontal line of these orifices, however, is toward the forward side of the pipe 28, so that when air under pressure is admitted to one end of said pipe, as by a rubber hose 29 attached to a nipple 30 on the pipe and carrying a cock 31 for shutting off or regulating the air pressure, said air-blast stream will be delivered in the direction of the arrow 32 of Fig. 1.

This air-blast stream is always delivered in the same direction; since pipe 28, although mounted on the carriage for movement therewith, is fixed against rotation, being anchored at opposite ends in a pair of hangers one of which is shown at 33 and the other of which is at the opposite side of the carriage, both of these hangers rigidly clamped to the cross-rod 11. These hangers are of the double-strap type; and hence quickly and easily installed.

At 34 is shown a third pipe, also extending across the press, and located ahead of the air-blast pipe 28. This pipe 34 is a gas-supplying one, having a horizontal line of orifices at its forward side, to provide a gas-burner which when ignited delivers a flame as indicated; and its use as such burner is at times valuable for warming the air above the delivery pile to hasten drying of the ink on the printed sheets. This pipe, mounted in an ideal location for its purpose, on the carriage so as to move back and forth with the latter, and thus mounted by the same hangers 33 which mount the air-blast pipe 28, is a feature of the invention which acts perfectly for its intended purpose during running of the press while the air-blast streams of the invention are employed to control and safeguard the deposit on the delivery pile 8 of the successive printed sheets as they are freed one by one from the carriage.

As to the operation of these air-blast streams:

The air-blast stream from the pipe 22 has two functions. This air-blast impositively but securely holds down the forward portion of the sheet S at a point somewhat in rear of the plunger fingers 17, so there is no possible slip of the sheet on the fly-stick bed, while the carriage is performing its forward stroke, that is, is moving from the position of Fig. 1 to that of Fig. 2. This insures that the take-off fingers 18 will surely be effective to catch the tail end of the sheet, when said fingers are swung up as shown in Fig. 2.

The other function of this air-blast from the pipe 22 is to cooperate with the air from the pipe 28 during the next ensuing retraction stroke of the carriage, in the work which the last-mentioned air-blast is to do during both strokes of the carriage.

The function of the air from the pipe 28 is to act on the top of, and through, the sheet S, after the latter is released over the pile 8, by withdrawal of the carriage from under said sheet in the retraction stroke of the carriage following the forward stroke of the carriage which brought said sheet to the position shown in Fig. 2; the carriage during said retraction stroke leaving the sheet over the pile 8, because during such stroke the take-off fingers 18 remain vertical. As to the sheet now being considered, the air from the pipe 28 first acts on that sheet by being swept from the left to the right in Fig. 2, but with the air-blast striking the sheet at such an oblique angle thereto, that is, approaching the top of the sheet in a direction inclined toward the front or left-hand end of the sheet in Fig. 2, that the air cushion Y is driven out as at X, so quickly, and in such manner, that the natural tendency of the sheet to drop first to the disposition S' is combatted and the tail end of the sheet is dropped safely before the carriage can arrive subsequently at any position interceptive of the sheet.

Still considering the sheet last-mentioned, the air from the pipe 28 next, during the ensuing forward stroke of the carriage to bring another sheet over the pile 8, acts on the former sheet by being again swept thereover, but this time from the right to the left in Fig. 1, yet still so that the air-blast will approach the sheet in a downward direction inclined toward the front end of the sheet.

During any forward stroke of the carriage, it is only the air-blast from the pipe 28 which bears down on a still floating previously freed sheet or sheets (as during such carriage stroke the air-blast from the pipe 22 is applying itself as and for the purpose just above described on the sheet now being transported by the carriage to location over the pile 8). But during each retraction stroke of the carriage, both air-blasts are acting cumulatively of each other on a still floating previously freed sheet or sheets, as the just preceding freed sheet, say now at the location S' in Fig. 2, and if need be on the second preceding freed sheet, say now at the location S'', and consequently having interposed between it and the top of the file a secondary air cushion Y''.

In any stroke of the carriage, either a forward one or a retraction one, there is positive-pressure squeeze applied to any still floating previously freed sheet or sheets, and applied thereto in such manner not only to insure lining up of the front ends of all the sheets in the pile 8 against the adjacent end posts 7a, but to clear away, as required, in the direction of the arrow

X, the air-cushion Y, and any secondary air-cushions, as the air-cushion Y'.

The pressure of the air is varied according to the weight and type of paper for the sheets being printed; however, actual long-continued and continuous operation has shown that for an under-standard, or light-weight paper, say 60 lbs., and even with the paper a coated one and so usually with less inherent stiffness than otherwise, about 10 to 15 lbs. pressure suffices, practically regardless of the size of the sheet. Such air can be supplied to the pipes 22 and 28, as by way of the rubber hose 23 and 29, from the compressor already installed for other purposes, as for operating a dryer-spray, in the usual printer's plant.

The heat from the pipe-burner 34, with its accompanying convection effect on the air above the top of the pile, does not, it has been found, interfere with the described actions of the air-blasts from the pipes 22 and 28 relative to the air-cushions mentioned, and so, with or without the burner ignited, the positive-pressure handling and safeguarding of the freed printed sheets is absolutely dependable under all conditions.

The new apparatus, or as it is desirably constituted for use with a standard Miehle flat-bed cylinder press, the new attachment, so far as is concerned the embodiment thereof now favored and hence shown in the drawing, has been described with great particularity, to bring out clearly its manner of operation and advantages, and not to limit the scope of the invention in any way. Parts of the improvements may be used without others. While I have shown what I now believe to be the most satisfactory and practicable form of the invention in the relation just mentioned, it will be appreciated that various changes and modifications can be resorted to within the scope of the invention as defined by the claims following, which are to be interpreted as broadly as is consistent with the prior art.

I claim:

1. In apparatus of the kind described, in combination with a reciprocating carriage for delivering a single printed sheet to a position over a pile location and there freeing said sheet during a retraction stroke of the carriage, means for delivering an air-blast against said sheet downwardly thereon following its complete release from the carriage; means for moving the means first-mentioned in a direction of carriage reciprocation; a second means for delivering an air-blast downwardly against said sheet; and a means for moving said second means in timed relation with the reciprocation of the carriage, said second means being placed to have its air-blast act downwardly on a previously freed sheet during transport of a subsequent sheet by the carriage on a forward stroke of the latter and to have its air-blast act downwardly on said subsequent sheet during freeing thereof from the carriage incidental to the ensuing retraction stroke of the carriage.

2. In apparatus of the kind described, in combination with a reciprocating carriage for delivering a single printed sheet to a position over a pile location and there freeing said sheet during a retraction stroke of the carriage, means for delivering an air-blast against said sheet downwardly thereon following its complete release from the carriage; means for moving the means first-mentioned in a direction of carriage reciprocation; a second means for delivering an air-blast downwardly against said sheet; and a means mounting said second means above the

sheet on the carriage, and including a member periodically moved in timed relation to the movement of the carriage by automatic means forming part of said apparatus, whereby during a retraction stroke of the carriage the air-blast from said second means is directed at an inclination to the vertical.

3. In apparatus of the kind described, in combination with a reciprocating carriage for delivering a single printed sheet to a position over a pile location and there freeing said sheet during a retraction stroke of the carriage, means for delivering an air-blast downwardly against said sheet following its complete release from the carriage; means for alternately moving the air-blast means in opposite directions while maintaining said air-blast at a constant inclination to the vertical; a second means for delivering an air-blast downwardly on said sheet; and means for moving said second means in a direction of stroke of the carriage.

4. In apparatus of the kind described, in combination with a reciprocating carriage for delivering a single printed sheet to a position over a pile location and there freeing said sheet during a retraction stroke of the carriage, means for delivering an air-blast against said sheet downwardly thereon following its complete release from the carriage; means for moving the means first-mentioned in a direction of carriage reciprocation; a second means for delivering an air-blast downwardly against said sheet; a means for moving said second means in a direction of carriage reciprocation; and a means for causing the first-named means and said second means to deliver their air-blasts substantially in parallel directions during one stroke of the carriage.

5. In apparatus of the kind described, in combination with a reciprocating carriage for delivering a single printed sheet to a position over a pile location and there freeing said sheet during a retraction stroke of the carriage, means for delivering an air-blast against said sheet downwardly thereon following its complete release from the carriage; means for moving the means first-mentioned in a direction of carriage reciprocation; a second means for delivering an air-blast downwardly against said sheet; and a means for moving said second means in a direction of carriage reciprocation, the first-named means and said second means delivering their air-blasts substantially parallelly during one

stroke of the carriage; and means for causing discharge of said air-blasts in dissimilar directions during another stroke of the carriage.

6. In apparatus of the kind described, in combination with a reciprocating carriage for delivering a single printed sheet to a position over a pile location and there freeing said sheet during a retraction stroke of the carriage, means for delivering an air-blast against said sheet downwardly thereon following its complete release from the carriage; means for moving the means first-mentioned in a direction of carriage reciprocation; a second means for delivering an air-blast downwardly against said sheet; a means for moving said second means in a direction of carriage reciprocation; and means for causing both said air-blasts to be discharged in a direction inclined toward the front end of the pile during a retraction stroke of the carriage.

7. A sheet-delivery-safeguarding attachment for a printing press having a sheet-transporting reciprocating carriage, a rockable solid rod, and means for rocking said rod in timed relation with the movement of the carriage,—characterized by the combination of a conduit for delivering an air-blast downwardly on a sheet being transported by said carriage to delivery location, said conduit being a hollow rod substituted for the solid rod aforesaid and having air-blast emitting means therealong and so adjacent to its underside that when said pipe is rocked to one position said blast is discharged substantially vertically downward.

8. An attachment as in claim 7, and including a second means for delivering an air-blast downwardly directed from the carriage, said second means being fixed on the carriage at a point ahead of said conduit and at a level below the plane of sheet lie on the carriage.

9. An attachment as in claim 7, and including a second means for delivering an air-blast downwardly directed from the carriage, said second means being on the carriage at a point ahead of said conduit and at a level lower than the plane of sheet lie on the carriage, said second means having air-blast emitting means extended therealong and placed to deliver said air-blast at an angle to the vertical, said second means being fixed on the carriage to maintain the direction of delivery of said air-blast constant.

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