C. E. POPE.

AUTOMATIC FEEDING MEANS FOR PAPER MACHINES.

APPLICATION FILED JULY 5, 1917.

1,283,889.

Patented Nov. 5, 1918.

4 SHEETS—SHEET 1.

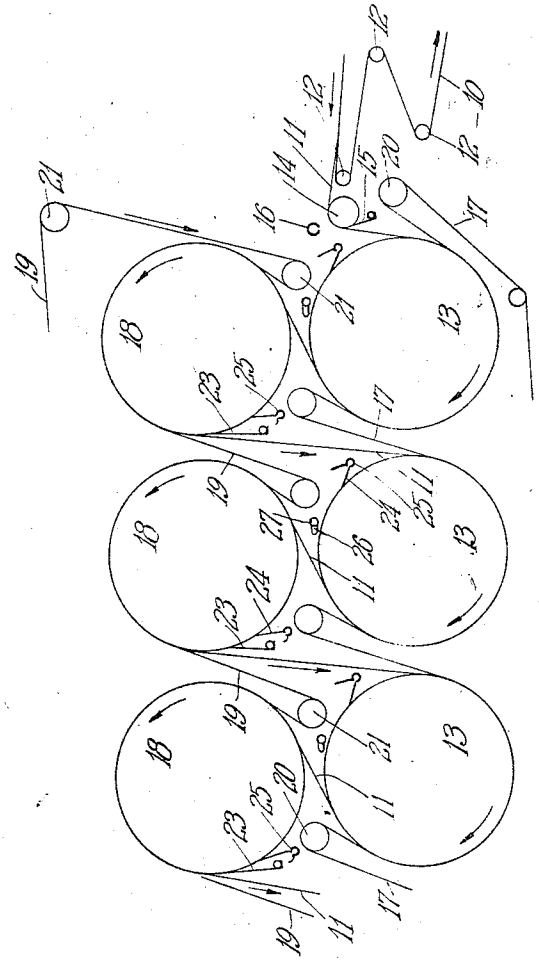


Fig. 1.

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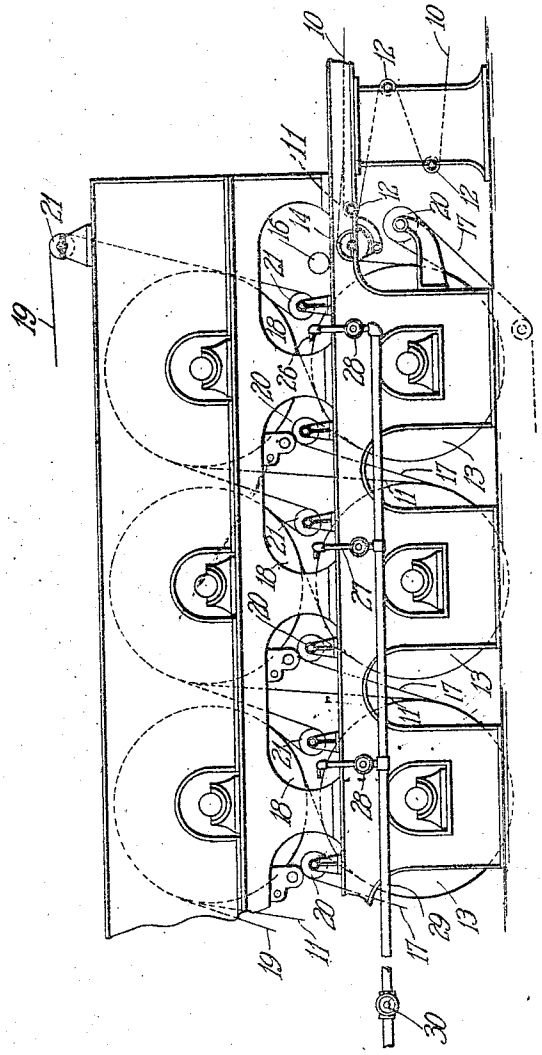


Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

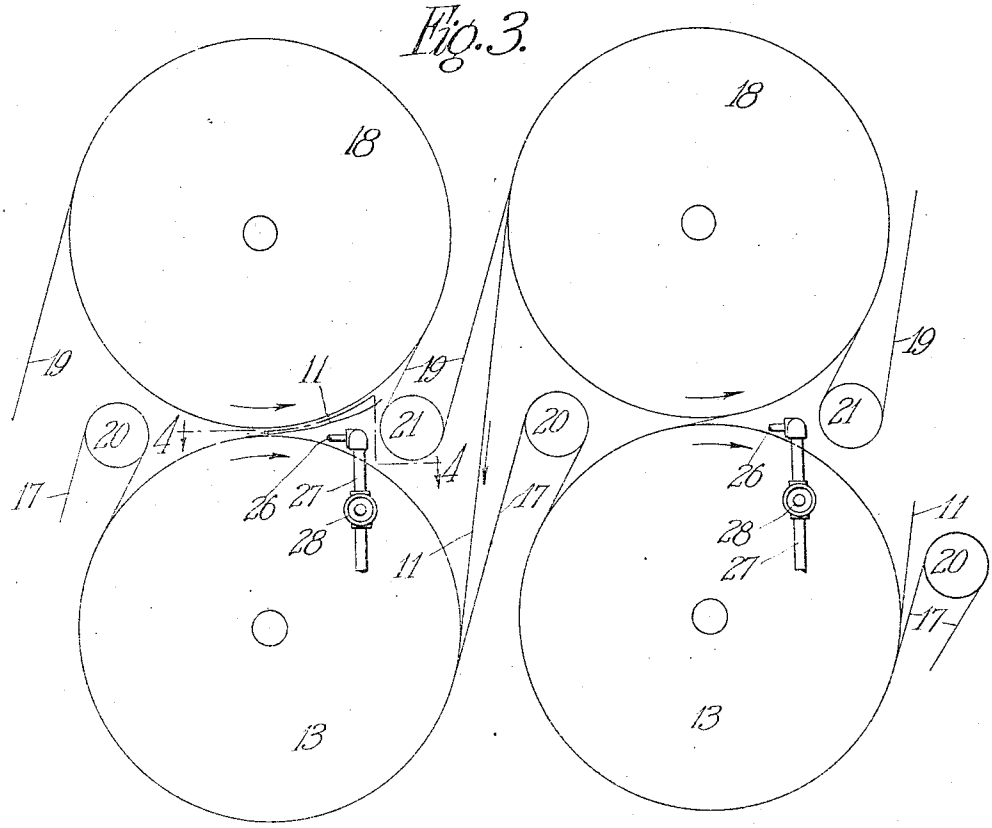
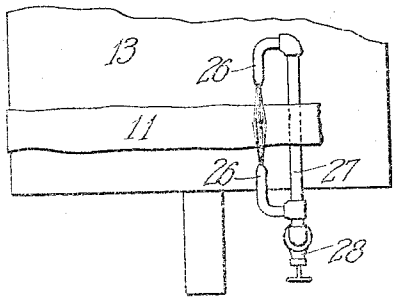


Fig. 4.



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Fig. 5.

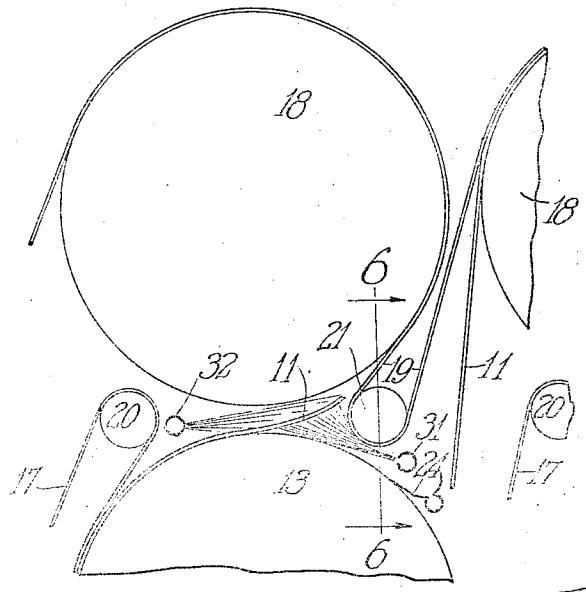


Fig. 6.

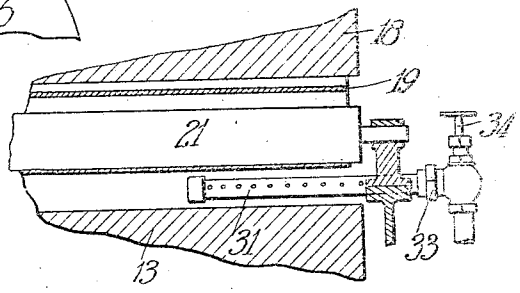


Fig. 7.

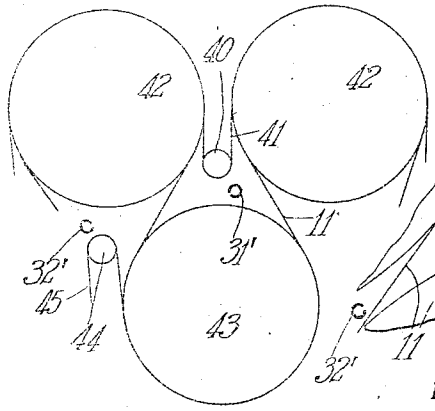
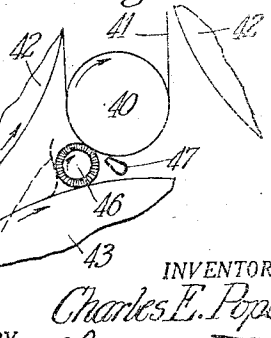


Fig. 8.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FEEDING MEANS FOR PAPER-MACHINES

1,283,889. Specification of Letters Patent. Patented Nov. 5, 1918.

Application filed July 5, 1917. Serial No. 178,730.

To all whom it may concern:

Be it known that I, CHARLES E. POPE, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Automatic Feeding Means for Paper-Machines, of which the following is a specification.

This invention relates to automatic feeding means for paper machines and particularly to improved means for automatically transferring the web from one drying cylinder to another.

Paper machines of the class described are characterized in that the web, at the start or after any break in the process of making the paper, is carried automatically through the machine, as distinguished from leading the web through the machine by hand. For example, the web is arranged to jump the distance from one drier to another and is thus transferred by its own momentum. Certain difficulties have from time to time appeared in the operation of such machines in practical use, and one of the main aims of this invention is to provide means to insure to an added degree the automatic transfer of the paper from drier to drier.

An object of this invention is to provide in a paper machine, in combination with the drying cylinders thereof, means whereby the forward end of the traveling web may be automatically guided or fed in a definite path to pass it from drier to drier.

Another object of the invention is to provide in a machine of the class described, means to direct blasts of air in opposite directions upon the forward end of a web as it passes from one cylinder to another, the arrangement being characterized by a continual stripping of the web from the lower drier and a lifting of the web toward the upper drier by the resultant force of the opposed blasts.

Other objects and advantages will appear in the description to follow and will be pointed out in the appended claims.

The invention, in an embodiment at present preferred, is shown for illustrative purposes in the accompanying drawings, in which—

Figure 1 is a diagrammatical view showing a series of drying cylinders with the invention applied thereto;

Fig. 2 is a partial side elevational view showing the mounting of the parts indicated in Fig. 1, so far as is necessary to an understanding of the invention by those skilled in the art;

Fig. 3 is a diagrammatical view on an enlarged scale, showing in detail the manner in which a web is automatically guided and transferred from drier to drier;

Fig. 4 is a sectional plan view taken on the line 4—4 of Fig. 3;

Fig. 5 is a diagrammatical view on an enlarged scale showing a modification in the means for automatically transferring a web from drier to drier;

Fig. 6 is a fragmentary sectional elevation taken on the line 6—6 of Fig. 5.

Fig. 7 is a diagrammatical view showing the invention in a slightly modified form as applied to another arrangement of drying cylinders; and

Fig. 8 is a modification of the arrangement shown in Fig. 7.

Referring to these drawings, the invention has been illustrated as applied to a high speed automatic paper machine of the type disclosed in my prior Patent No. 1,214,712, granted February 6, 1917. The invention is, however, capable of general application and is shown and described in connection with a machine of the type mentioned, merely as an illustrative example of one specific use of the invention.

As is well known by those skilled in the art, the web, at the start or after any break in the process of making the paper, is usually carried through the machine and fed to and through the drying cylinders by hand. Rather than to handle the full width of the web, the general practice is to form a ribbon, usually at one side of the wire, which is carried through the machine and afterward loads a web of full width for the normal operation.

Referring to Figs. 1 and 2, the lower apron 10 carries the web 11 from the last press rolls (not shown) to a guide roll 12 adjacent the periphery of the first drier 13 and the apron returns over other rolls 12. In line with the upper roll 12 and between it and the first drier 13 is a guide roll 14

provided with a doctor 15. Above and a little beyond roll 14 is a horizontally arranged pipe 16 connected to a source of air under pressure. The web 11, traveling at high speed, jumps the distance between rolls 12 and 14 and is forced downwardly by a blast of air from pipe 16 into the bight of the first drier 13 and its apron 17, whereupon the ribbon is pulled around roll 14. This manner of leading the web from the press rolls to the first drier is claimed and more fully described in my prior Patent No. 1,183,113, granted May 16, 1916, and is shown and described herein simply for illustrative purposes, as any other suitable means may be employed, as desired.

The arrangement of the drying cylinders shown in Figs. 1 and 2 is claimed and fully described in my first-named prior patent. This arrangement of the driers will be briefly described herein so far as is necessary to an understanding of the present invention. Each lower drier 13 of a series is located with its axis vertically or substantially so, below that of its companion upper drier 18 in the upper series. The upper and lower driers are also arranged only a small distance apart or in such a way that the forward end of the web or ribbon 11, as it travels rapidly through the machine, may jump from the lower drier into the bight of the upper drier and its associated apron 19, without climbing any appreciable distance. The aprons 17 and 19 are carried by suitable guide rolls 20 and 21, respectively, and the lower roll 21 directs its apron 19 to the upper drier 18, so that, as the ribbon 11 leaves the drier 13, it will jump to the apron 19 and be transferred to the upper drier. This result is either achieved by the momentum of the web, or the latter is aided and guided in its transfer by means constituting the main feature of my present invention in one preferred embodiment as will be later described.

I wish it to be clearly understood that by the use of the present invention the ribbon may be automatically transferred from drier to drier independently of any special arrangement of the driers. If the latter are arranged to make the transfer of the ribbon from drier to drier automatically the present invention will insure such transfer with greater certainty. What I consider to be broadly new however, is the air blast transferring means independently of any specific arrangement of the driers, as will be pointed out in the claims.

The web or ribbon 11 is stripped from the drier 18 by a doctor 23 as it is traveling vertically or substantially so and downwardly in a direction substantially tangential to the lower drier 13 of the succeeding set. The upper left hand guide rolls 20 and lower right hand guide rolls 21 are mounted close to their respective cylinders, and the web, therefore, may pass freely and automatically downward into the bight of the lower drier 13 and its associated apron 17.

After the ribbon has been started through the machine, a web of full width is formed and the normal operation ensues. The doctors 23 are then preferably moved to a retracted position. Below the doctors 23 are other devices which function to clean the driers 18 of the cylinders. Similar devices are provided for the lower driers 13, as indicated. These devices comprise doctor blades 24 bent into substantially the form shown to form troughs. Each trough is mounted upon a pipe 25 and is connected with the interior thereof in a manner disclosed in the first-named prior patent, to which reference is made for a more complete disclosure. For the present purposes, it will suffice to state that the pipes 25 are connected to a suitable vacuum pump whereby the film of dust and lint collected from the driers may be automatically removed from the troughs.

The structure so far described is substantially the same as that disclosed in the above-named prior patents. The present invention is more particularly concerned with improved devices which facilitate the automatic transfer of the web from one drier and directing it into the bight of the other drier and its associated apron.

The preferred form of these improved devices will now be described. Referring particularly to Fig. 4, between each pair of upper and lower driers in the form shown or suitably arranged otherwise according to the drier arrangements, two horizontally arranged nozzles 26 are mounted in spaced relation on a pipe 27 with their outlets directed in opposed relation and axially with respect to the drying cylinders. Preferably nozzles 26 are spaced sufficiently to permit the free passage of the narrow ribbon 11 between them, since ordinarily the full width of the web is not handled at the start or after any break in the process of making the paper. It is to be understood that nozzles 26, although closely adjacent the peripheries of cylinders 13 do not actually engage therewith and are spaced far enough from the driers to permit the web to pass under them when desirable as when the full sheet is running through. Each pipe 27 is provided with a valve 28 (Fig. 2) and the several pipes are connected to a common pipe 29 which leads to a suitable source of air under pressure, a valve 30 being provided in pipe 29 to control the entire series of nozzles 26.

At the start of the machine, valve 30 is open and blasts of air issue in opposite directions from each pair of nozzles 26, as indicated in Fig. 4. The nozzles are direct-

ed substantially tangential to the lower drier 13 and the web 11, as it reaches the top of the latter, is met along each edge by the oppositely directed blasts of air. The air is blown in under the web to strip the latter from the lower drier. The oppositely directed blasts of air come together in under the web and, as they meet in opposition, the web is forced upwardly. The web, meanwhile having been traveling at high speed, is carried by its momentum, aided and guided by the resultant effect of the opposed blasts of air, into the bight of the drier 18 and its associated apron 19.

The force of the blasts from nozzles 26 is regulable by the valve 28, whereby the lifting action of the web may be adjusted to the desired degree to automatically transfer the web to the driers. These valves 28, after having been once properly adjusted, may be fixed in any suitable manner, as by removing the hand wheels, for example, and thereafter the valve 30 only is used to control the entire series, as a starting and stopping means for the blasts. After the ribbon 11 has been led through the driers as described, the blasts from nozzles 26 are no longer necessary, and valve 30 may then be closed.

The oppositely directed blasts of air may be otherwise arranged to accomplish the same general purpose, for example, as in Fig. 5. Referring to this figure, horizontally arranged pipes 31 are mounted adjacent lower driers 13 and between the lower right hand guide rolls 21 and the devices 24 for the lower driers. Other similarly arranged pipes 32 are provided adjacent the left hand guide rolls 20 and between them and the driers 13, or these pipes 32 may be arranged beyond said guide rolls and be directed to sweep across the top thereof, as shown in my United States Patent No. 992,688, May 16, 1911, to coöperate with the pipes 31 referred to above. The detailed manner of mounting pipes 31 is shown in Fig. 6 and the mounting of pipes 32 is similar. As there indicated, the pipes preferably extend from one side of the machine inwardly a relatively short distance only, since they ordinarily act only upon the narrow ribbon formed at the start or after any break in the process of making the paper. Obviously, however, the pipes may extend the entire distance across the machine and thus assist in carrying over the paper when the entire width of the sheet is started. Each pipe 31 and 32 is provided with a row of perforations, as shown in Fig. 6, and I have found that, if the perforations are made one-sixteenth of an inch diameter and spaced one-half of an inch on centers, satisfactory results are obtained. Obviously, pipes 31 and 32 may be provided with other forms of openings and other arrangements of perforations as desired, but the described arrangement has been found advantageous. Pipes 31 are connected by unions 33 to valves 34, as shown in Fig. 6, and it is to be noted that by reason of the "union" connection, angular adjustment of each pipe may be conveniently made, as desired. In the same manner the nozzles 26 may be angularly adjusted through their pipe fitting connections to pipe 27. Valve 34, and similar valves (not shown) provided for pipes 32, may be connected to the described supply pipe 29 in an analogous manner to that in which the valves 28 are connected.

At the start of the machine air under pressure is supplied to pipes 31 and 32 and blasts of air issue in opposite directions therefrom, as indicated in Fig. 5. The web 11, as it reaches the top of the lower drier 13 is stripped therefrom by the blast from pipe 31 and blow toward the upper drier 18. The web 11, as it is thus forced to the left (as viewed in Fig. 5), is met by a blast of air from pipe 32 which tends to hold the web away from the upper drier. The force of the blast from pipes 31 and 32 is regulable by the individual valves provided and is so adjusted that the web 11 is guided into the bight of the upper drier 18 and its associated apron 19. The automatic transfer of the web or ribbon from a lower to an upper drier by the momentum of the web is thus aided by the stripping action of pipes 31 and the guiding action of the pipes 31 and 32 working in coöperative relation. The automatic transfer of the web in the manner just described is more particularly pointed out and claimed in my co-pending application Serial No. 145,678, filed Jan. 31, 1917.

To secure the desired coöperative action of the pipes 31 and 32 under various conditions, separate valves are provided for each as described to permit adjustment of the pressure of the air blasts and the unions 33 for angular adjustment of the air blasts. When once properly adjusted, these valves may be fixed as described in connection with valves 28, and the valve 30 only is used as before to control the entire series of pipes.

The invention is not limited in application to the described arrangement of drying cylinders and is capable of general use. The invention may be used with the ordinary and well-known staggered arrangement of drying cylinders, as shown diagrammatically in Fig. 7. A pipe 31′ may be located between each guide roll 40, for the apron 41 of the upper driers 42, and each lower drier 43 and a pipe 32′ may be arranged beyond each guide roll 44 for the apron 45 of the lower driers 43 to direct the air across the apron 45 as it bends over the roll which will tend to strip the ribbon therefrom if it starts to follow the apron, all as indicated in Fig. 7. These pipes may be constructed, mounted,

and connected in a manner analogous to that already described in connection with Figs. 1 and 2 to operate in a similar way to strip the web 11 from a lower drier and direct it into the bight of the upper drier and its associated apron.

If desired, means in addition to the air blasts described may be employed to strip the web 11 from the lower driers 13 or 43. As an illustrative example, the means shown in Fig. 8 may be used if a mechanical instead of pneumatic means is desired to separate a sheet of paper from the drier. A brush 46 is mounted to rotate between the lower drier 43 and the guide roll 40 and brushes lightly against the former. This brush is suitably driven, as by belt connections (not shown) from roll 40, to rotate in an opposite direction to the lower drier and at a surface speed somewhat in excess of that of the web. I have found that, if the surface speed of the brush is about twenty-five per cent. faster than that of the web, satisfactory results will be obtained. Brush 46 may be mounted in any suitable manner, and it may extend inwardly from one side of the machine in a manner analogous to pipe 31, a sufficient distance to cover the ribbon. The pipe 31′ may be replaced by a nozzle 47 through which a blast of air is directed through the bristles on the upper part of the brush. The web 11 is stripped from the drier 43 by the rapidly revolving brush, and thrown toward the drier 42, as indicated by dotted lines in Fig. 8, and as it travels upwardly is thrown into the bight of the upper drier and its apron 41 by the blast of air from nozzle 47 and an additional blast from a pipe similar to pipe 32′ if desired. Although the arrangement described has been illustrated in connection with the well known staggered arrangement of driers, it may equally well be applied to the arrangement of driers shown in Fig. 1.

The arrangement of the pipes 31 and 32 to direct blasts of air in opposite directions on each side of the web is important and advantageous. The pressure of the air blasts is capable of variation as is also the direction thereof. By properly adjusting the direction and force of the blast from one pipe with relation to the direction and force of the blast from the other pipe, the web may be carried in a clear unobstructed path from a lower drier into the bight of the upper drier and its associated apron. The web is thus carried in a definite path which may be defined as the line of neutrality at every point of which the force from one blast is exactly balanced by that from the other. The same general but different specific result is obtained by the use of the opposed nozzles 26, which act in a direction substantially at right angles to that in which the pipes 31 and 32 are arranged to act. The arrangement, involving nozzles 26, constitutes the preferred form of the invention and has the advantage that the air pressure from both nozzles is continuously available for lifting the web to more effectively transfer the ribbon from a lower to an upper drier.

By the term "face" or "faces" is meant the principal side or sides or surface or surfaces of the web while the term "edge" or "edges" is used to denote the lesser surface or surfaces which are thin. The term "side" or "sides" is employed generically and in its broad significance to denote any of the edges or faces, that is to say, any of the four sides of the web.

The invention has been described herein for illustrative purposes, but the scope of the invention is defined by the appended claims rather than by the foregoing description.

What I claim is—

1. In a paper making machine, upper and lower driers, aprons therefor, and means to direct blasts of air in opposition on the web as it travels from drier to drier, whereby the web may be stripped from one and directed into the bight of the other drier and its associated apron.

2. In a paper making machine, upper and lower driers, aprons therefor, and pneumatic means acting upon the web in opposition to strip the latter from one and carry it toward the bight of the other drier and its associated apron.

3. In a paper making machine, upper and lower driers, aprons therefor, and means adjacent one drier to direct blasts of air in opposition upon the web during its transition to the other drier, said oppositely directed means arranged to act in substantially an axial direction on one drier to strip the web therefrom and carry it toward the other drier.

4. In a paper machine, an upper drier and a lower drier, air blast nozzles arranged adjacent the lower drier and directed transversely of the paper and at its edges, whereby air may be forced under the side edges and the paper lifted and blown to the upper drier and its apron.

5. In a paper machine, upper and lower driers, air blast directing means arranged to force air under the opposite edges of the paper web, to lift the paper from the lower drier and force it to the upper drier by the change in direction of the air current when the oppositely directed blasts meet under the paper.

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