C. E. POPE.

PAPER MACHINE.

APPLICATION FILED MAR. 6, 1916.

1,214,712.

Patented Feb. 6, 1917.

3 SHEETS—SHEET 1.

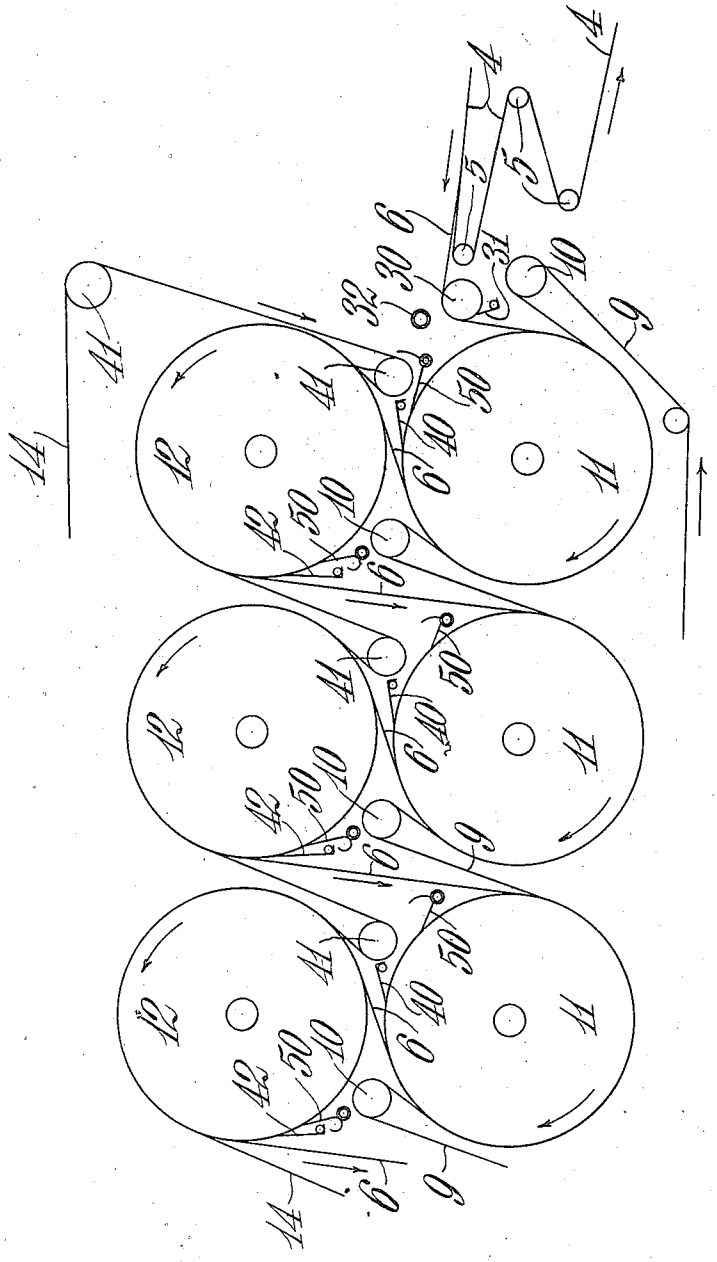


Fig. 1.

WITNESS

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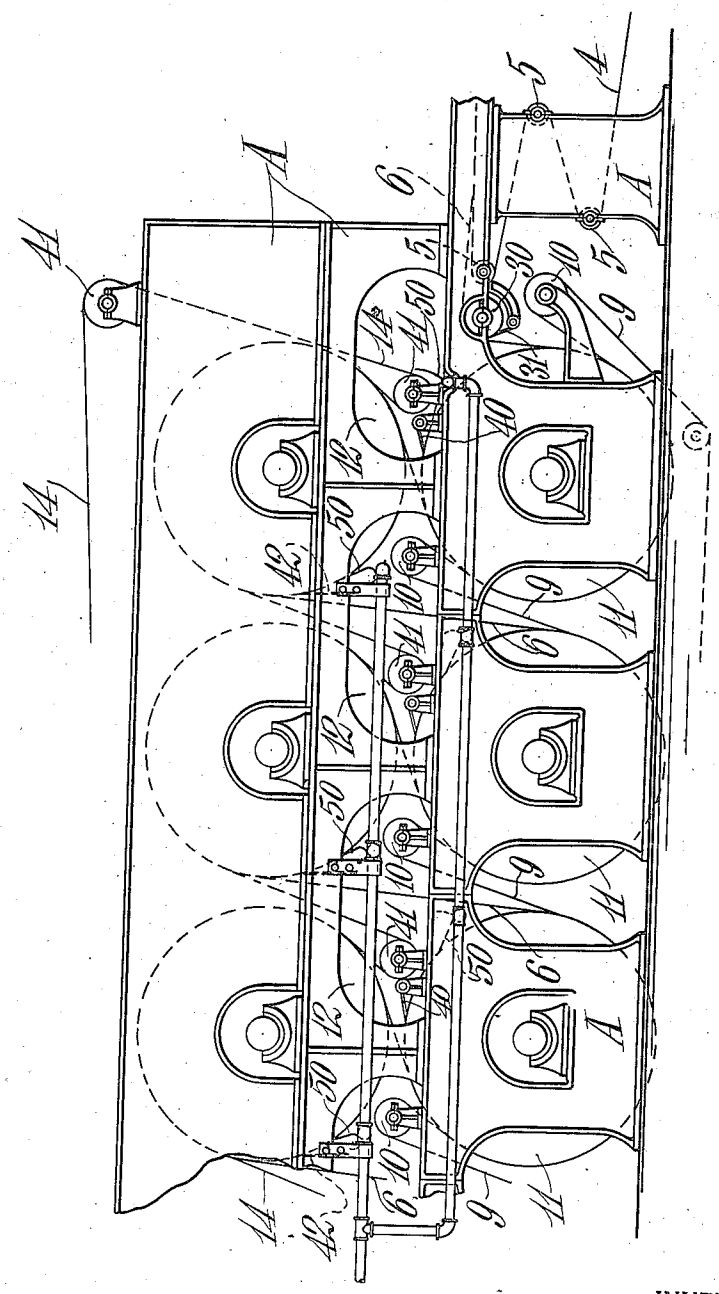


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 4.

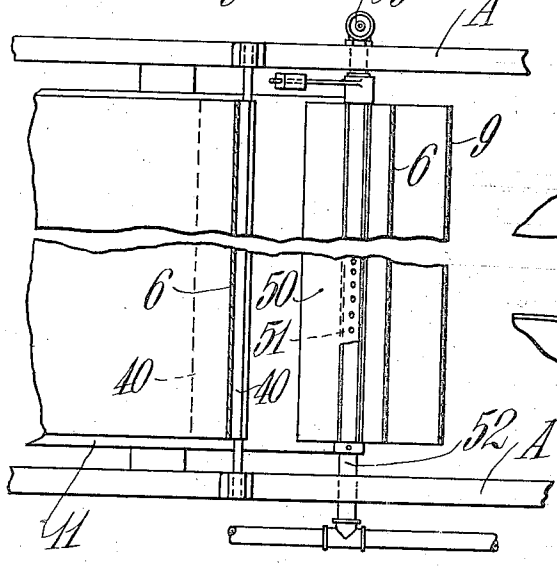


Fig. 5.

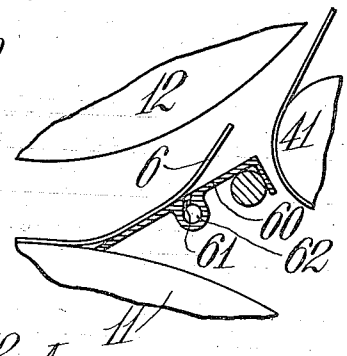
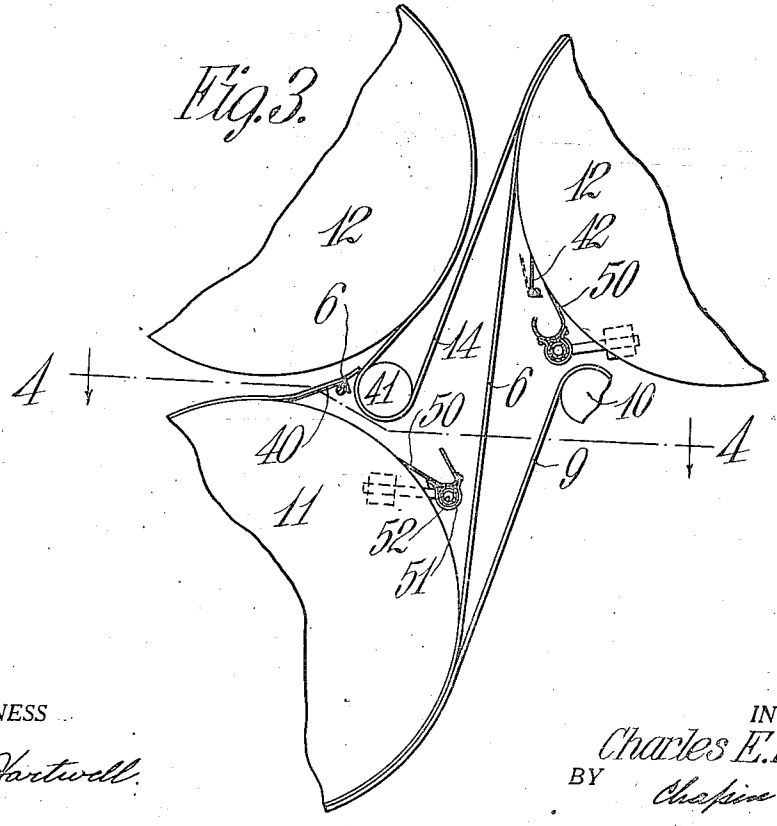


Fig. 3.



WITNESS

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UNITED STATES PATENT OFFICE.

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PAPER-MACHINE.

1,214,712. Specification of Letters Patent. Patented Feb. 6, 1917.

Application filed March 6, 1916. Serial No. 82,409.

To all whom it may concern:

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

This invention relates to high speed paper machines and particularly to an improved arrangement of drying cylinders and associated felts or aprons, whereby the web is transferred automatically from one cylinder to the next cylinder. This improved arrangement of drying cylinders also has certain advantageous features relating particularly to the drying function as will be explained.

An object of the invention is to provide drying cylinders in an improved arrangement characterized—first, by the positioning of a lower drier relatively to an upper drier, whereby the forward end of a fast traveling web may be stripped and jump from the former to the latter on a line closely approximating the horizontal, thus avoiding any considerable "climb" for the web before it reaches the bight of the upper drier and its apron; and, second, by the spacing of the successive pairs of driers whereby the web may pass from an upper drier with both sides exposed for a substantial distance, thus to permit the vapor to escape from contact with the web.

Another object of the invention is to provide in an arrangement of drying cylinders as described improved means whereby the forward end of a fast traveling web in passing from one drying cylinder to another may be stripped from one cylinder and automatically directed into the bight of the next cylinder and its associated apron.

Another object of the invention is to provide in combination with an improved arrangement of drying cylinders, wherein the successive pairs of driers are so spaced that a web from an upper may pass to a lower drier with both sides exposed for a substantial distance to permit the escape of vapor from the web, means whereby the moisture laden air may be withdrawn from the spaces on either side of the web, and a circulation set up in said spaces to expedite the drying of the web.

Another object is to provide, in connection with the improved arrangement of drying cylinders described, improved means, whereby dust, lint, and like material, remaining on the drying cylinder after the web is stripped therefrom, may be removed and carried away from the cylinder, thus preventing damage to the web or the aprons by the dropping of an accumulated mass of emulsified material thereon.

Other objects will appear in the detailed description and annexed claims.

A single preferred embodiment of the invention is shown, for illustrative purposes, in the accompanying drawings, in which—

Figure 1 is a diagrammatic view of the arrangement of drying cylinders and associated devices; Fig. 2 is a side elevational view of part of a paper making machine showing only the parts thereof necessary to an understanding of the invention by those skilled in the art; Fig. 3 is a diagrammatic view on an enlarged scale showing in detail the manner in which a web is automatically passed from one cylinder to another; Fig. 4 is a fragmentary sectional plan view taken on the line 4—4 of Fig. 3; and Fig. 5 is a sectional elevation of a device which may be used to strip the end of the web from one cylinder and transfer it to the other.

The feature of the invention by which, on the start of the machine, the web is automatically transferred from one drying cylinder to another will first be described. 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 the driers by hand. Instead of handling the entire width of the web it is customary to form on the wire a ribbon, usually at one side of the wire, which is carried through the machine and afterward leads the web of full width for the normal operation.

Referring to Figs. 1 and 2, the lower apron 4 carries the web 6 from the last press rolls (not shown) to a guide roll 5 adjacent the periphery of the first drier 11, and the felt returns over other rolls 5. In line with the upper roll 5 and between it and the first drier 11 is a guide roll 30 provided with a doctor 31. Above and a little beyond the roll 30 is a horizontally arranged pipe 32 connected to a source of air under pressure. The web 6 traveling in loosened condition on the felt 4 and at high speed jumps the

distance between rolls 5 and 30 and comes beneath a downwardly directed blast from apertures in pipe 32. This blast forces or blows the web downwardly into the bight of drier cylinder 11 and its apron 9, whereupon the ribbon is pulled around roll 30. If, for any reason, the web should stick to roll 30, the doctor 31 will strip it off at a point above its proper entrance on the drier 11. This manner of leading the paper from the press rolls to the first drier 11 is claimed and more fully described in my copending application Serial No. 19098, filed April 5, 1915. This particular means for leading the web from the press rolls to the first drier 11 is shown simply for illustrative purposes and any other suitable means may be employed as desired.

The drying cylinders are arranged as shown in Figs. 1 and 2 so that each lower cylinder 11 of a series is located with its axis vertically, or approximately so, below that of its companion cylinder 12 in the upper series. The upper and lower cylinders are also arranged only a small distance apart or in such a way that the forward end of the web or ribbon 6, as it travels rapidly through the machine, may jump from the lower cylinder to the bight of the upper cylinder and its associated apron, without climbing any appreciable distance so that the web may readily be transferred by its momentum. To facilitate this transfer, a doctor 40 is arranged to strip the ribbon from cylinder 11 as it reaches its upper horizontal travel. The lower guide roll 41 for the apron 14 directs the latter to upper cylinder 12 from a point adjacent the doctor 40, so that, as the ribbon 6 is stripped from drier 11, it will jump by reason of its momentum to the apron 14. The rapidly traveling ribbon 6 is thus carried to the drier 12, and this result is automatically obtained substantially by an improved and new arrangement of old structures.

If desirable, another form of doctor may be used in place of doctor 40 such, for example, as is shown in Fig. 5. The doctor 60, there shown, has on its lower face, an axially extending conduit 62 which is connected to a source of compressed air. A series of apertures 61 lead from the conduit 62 to the upper face of the doctor, whereby air may be blown against the web 6 to assist it to enter the converging space between drier 12 and felt 14. This specific form of doctor, however, forms no part of the present invention except as an equivalent of the doctor 40 included in the broad combination.

The web or ribbon 6 is stripped from the drier 12 by a doctor 42 as it is traveling vertically or substantially so and downwardly in a direction substantially tangential to the lower drier 11 of the succeeding set. The upper left-hand guide rolls 10 and lower right-hand guide rolls 41 for the lower and upper aprons 9 and 14, respectively, are mounted close to their respective drying cylinders 11 and 12, as shown. The web 6, therefore, in passing from the upper to the lower driers, travels automatically and freely exposed on both sides a vertical distance from one drier to another about equal to that between the axes of the upper and lower driers. The free space on both sides of the exposed web permits the vapor, which would otherwise be imprisoned to a large degree by the aprons with the web, to escape and thus advances the drying operation.

After the ribbon has been started through the machine as described, a web of full width is formed and the normal operation of the machine ensues. After the paper is running through the machine, the doctors 40 and 42 are preferably moved to a retracted position (or if desired only doctor 42 is so moved) such as indicated in dotted lines in connection with doctor 42 in Fig. 3. Any of the devices well known by those skilled in the art may be applied to hold the doctor 42 against the drier and to hold it in retracted position.

In the normal operation of the machine an improved arrangement of structure is provided to clean the drier cylinders 11 and 12 of the foreign matter, which ordinarily gathers as a fine film upon the periphery of the cylinders. The preferred structure is best shown in Figs. 3 and 4 and comprises a doctor blade 50 bent into substantially the form shown to form an open-ended trough. The blade 50 is secured to a horizontally arranged sleeve 51 which in turn is rotatably mounted on a pipe 52 extending entirely across the machine as shown in Fig. 4. The contacting portions of the blade 50 and sleeve 51 are perforated, and these perforations register with openings in the pipe 52. The latter is connected at one end to a suitable vacuum pump, and at the other end is provided with a valve 53. In operation the blade 50, held against the drier by the weighted arm shown in Figs. 3 and 4 removes the film of dust and lint from the drier and allows it to pass into the open-ended trough. This film, which collects upon the roll, is extremely finely divided material, and, in consequence, it passes freely through the perforations into pipe 52. The valve 53 may be suitably adjusted to cause in connection with the vacuum pump a rush of air through the pipe, which sweeps the finely divided material away, or, if desired, the valve may be closed off entirely leaving the removal of material to the suction through openings 51 alone. It will thus be seen that the material removed by the blade 50 is prevented from accumulating,

as heretofore possible with the usual doctor, to form a mass, which may fall upon or between the web and apron to damage either or both.

Another important and advantageous feature of this arrangement is that the trough-like doctor arrangement assists in drying the web as it sets up a circulation in each of the spaces formed between the web 6 and the aprons 9 and 14. These spaces would in the absence of such an arrangement, as described, or its equivalent, be filled with stagnant air practically saturated with moisture. The circulation set up by the pipe 51, however, relieves this condition by withdrawing the saturated air and vapor from the freely exposed web 6. Thus, the drying operation is advanced by the use of this improved construction and arrangement.

In addition to the features above described, the improved arrangement of drying cylinders is of advantage in that a considerable amount of floor space is saved by mounting each pair of driers substantially one above the other. Where driers are arranged as heretofore in staggered relation, the space of at least one cylinder is necessary for a given number of driers, in excess of the space required for the improved arrangement described.

It has not been thought necessary to describe the driving connections for the several parts, the frame A, the pipe connections, etc., or the specific manner of mounting them in the machine. From the drawings and description disclosed, one skilled in the art can readily put the invention into use.

The invention is defined in its proper scope by the appended claims.

What I claim is—

1. In a paper making machine, the combination of a set of drying cylinders, aprons therefor, means to guide the web to the driers, the apron on a bottom drier being arranged to hold the web against the drier until it reaches a point where it travels substantially horizontally on the upper surface of the drier, means to strip the web from the bottom drier, the apron on a companion top drier being arranged to form with its drier an entrance in line with the substantially horizontally traveling web stripped from the lower drier, whereby the web is transferred automatically from a lower to an upper drying cylinder.

2. In a paper making machine, the combination of a set of drying cylinders, an apron for the lower tier of cylinders and an apron for the upper tier of cylinders, means to guide the aprons to and from the cylinders, whereby the web has a very short exposed travel in passing from a lower to an upper cylinder and a comparatively long exposed travel from an upper to a lower cylinder, whereby the vapor may escape from the surface of the web in its long travel and the web may be readily fed from one cylinder to another.

3. In a paper making machine, the combination with upper and lower drying cylinders, aprons therefor, means to guide the latter to and from the cylinders, arranged so that the web in passing from one cylinder to another is exposed on both sides for a portion of its travel, and means on either side of the exposed portion of the web to remove the moisture laden air and thus advance the drying operation.

4. In a paper making machine, the combination of sets of companion drying cylinders, the horizontal axes of the cylinders in each set being substantially in the same vertical plane one with the other, an apron for the lower cylinders and an apron for the upper cylinders, guiding means to direct the apron to an upper cylinder in a line substantially radial with respect to its companion lower cylinder and to direct the apron away from the upper cylinder to the adjacent upper cylinder in a substantially common tangent line, and guiding means to direct the apron to and from the lower cylinders in just the reverse manner.

5. In a paper making machine, the combination of a set of drying cylinders, an apron for a lower tier of driers and an apron for an upper tier of driers, the apron on a lower drier arranged to hold the web against the drier until it reaches a point where it travels substantially horizontally on the upper surface of the drier, the apron on a companion upper drier being arranged to form with its drier an entrance for the substantially horizontally traveling web, and means to loosen the web from the lower drier and direct the same into said entrance, whereby the web is transferred automatically from a lower to an upper drying cylinder.

6. In a paper making machine, the combination of a set of upper and lower drying cylinders, aprons therefor, means to guide the web to the driers, the apron on the bottom drier arranged to hold the web against the drier until it reaches a point where it travels substantially horizontally on the upper surface of the drier, the apron on a companion top drier being arranged to form with its drier an entrance in line with the substantially horizontally traveling web, and means to strip the web from the bottom drier and force the same into said entrance, whereby the web may be transferred automatically from a lower to an upper drying cylinder.

7. In a paper making machine, the combination of a set of upper and lower drying cylinders, an apron for the upper tier of cylinders, means to guide the aprons to

and from the cylinders, whereby the web has a very short exposed travel in passing from a lower to an upper cylinder and a comparatively long exposed travel in passing from an upper to a lower cylinder, means to clean the foreign material from each cylinder at a point where the latter is exposed, and means to automatically convey said material away from each cylinder arranged to prevent accumulated masses of the material from falling upon the web or the aprons.

8. In a paper making machine, the combination of sets of companion drying cylinders, the horizontal axes of the driers in each set being substantially in the same vertical plane one with the other, an apron for the upper driers and an apron for the lower driers, the apron on an upper drier being arranged to hold the web to the drier until it reaches a point where it travels substantially tangential to a lower drier in the next set of cylinders, means to loosen the web and throw it away from the upper drier, the apron on a lower drier arranged to form with its drier an entrance in line with the traveling web stripped from the upper drier, whereby the web is transferred automatically from an upper drier in one set to a lower drier in the next set.

9. In a paper making machine, the combination of a set of drying cylinders, an apron for the upper tier of cylinders and an apron for the lower tier of cylinders, means to guide said aprons whereby a web is transferred automatically from one drier to another, doctors for said cylinders, and a trough-shaped device for each cylinder arranged in combination with its doctor, to collect and remove any material adhering to said cylinders after the web has been stripped therefrom, whereby said material is prevented from falling in an accumulated mass upon the web or the felts.

10. In a paper making machine, the combination of a set of drying cylinders, an apron for the upper tier of cylinders and an apron for the lower tier of cylinders, means to guide the aprons to and from the cylinders arranged so that the web has a very short exposed travel in passing from a lower to an upper cylinder and a comparatively long travel in passing from an upper to a lower cylinder, whereby the vapor may escape from the surface of the web in its long travel, and means located on either side of the exposed portion of said web to remove the moisture laden air and thus advance the drying operation.

11. In a machine of the class described, the combination of upper and lower drying cylinders, aprons therefor, means to guide the latter to and from said cylinders, arranged to permit a web to pass from one cylinder to another with both sides exposed for a portion of its travel, whereby the vapor may escape from the surface of the web, and means on either side of the exposed portion of the latter to remove the saturated air from and cause a circulation of air about the exposed portion of the web to advance the drying operation.

12. In a machine of the class described, the combination of upper and lower drying cylinders with aprons therefor, a doctor mounted to bear temporarily against an upper cylinder to strip the web therefrom at a point above its entrance between the lower cylinder and its apron, a second doctor arranged below the first doctor to permanently bear against the cylinder and provided with a collecting trough, and means for automatically removing the collected material from the trough.

13. In a paper making machine, a series of drying cylinders, a series of collecting troughs associated therewith, each having a doctor extending from one edge thereof, pipes connecting all the troughs in said series, and a pneumatic means connected to said pipes and operable to remove the material as it collects in said troughs.

14. In a paper making machine, the combination of two horizontal sets of drying cylinders arranged one set above the other, the several cylinders in one set having their axes arranged respectively in substantially the same vertical plane with the axes of the several companion cylinders in the other set, an apron for the lower cylinders, an apron for the upper cylinders, guiding and driving means for said aprons, whereby they are caused to travel synchronously with the drying cylinders and in such relation thereto as to carry the paper web around said cylinders, a doctor for each of the lower cylinders arranged to engage the upper portion of its cylinder to strip the paper therefrom and direct it to the bight between the upper apron and the companion upper cylinder, and a doctor arranged to engage each of the upper cylinders to strip the web therefrom and permit it to pass downwardly.

CHARLES E. POPE.