C. E. POPE.

METHOD AND MACHINE FOR MAKING PAPER.

APPLICATION FILED MAR. 14, 1918.

1,279,756.

Patented Sept. 24, 1918.

2 SHEETS—SHEET 1.

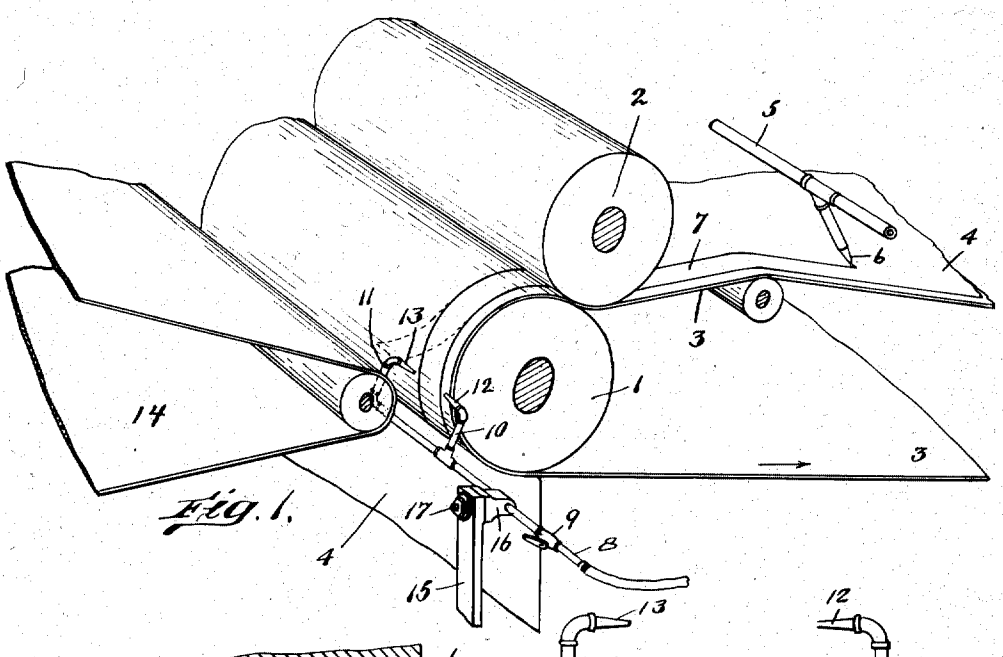


Fig. 1.

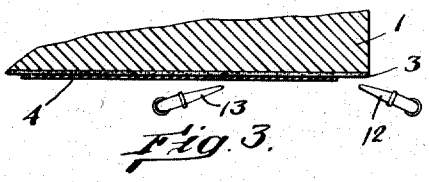


Fig. 3.

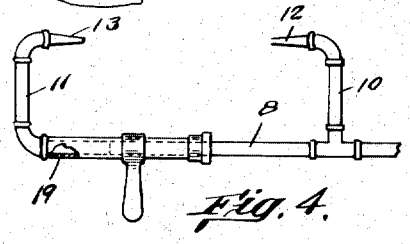


Fig. 4.

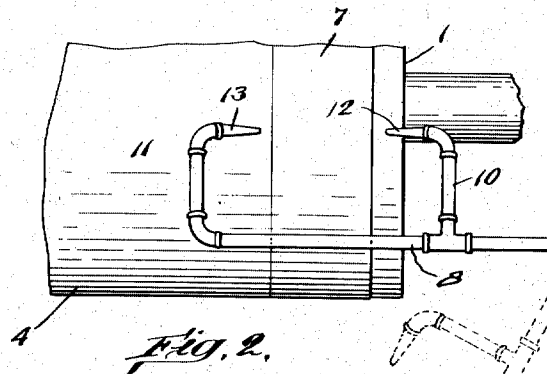


Fig. 2.

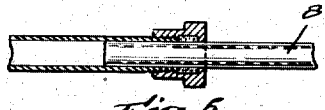


Fig 5

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by

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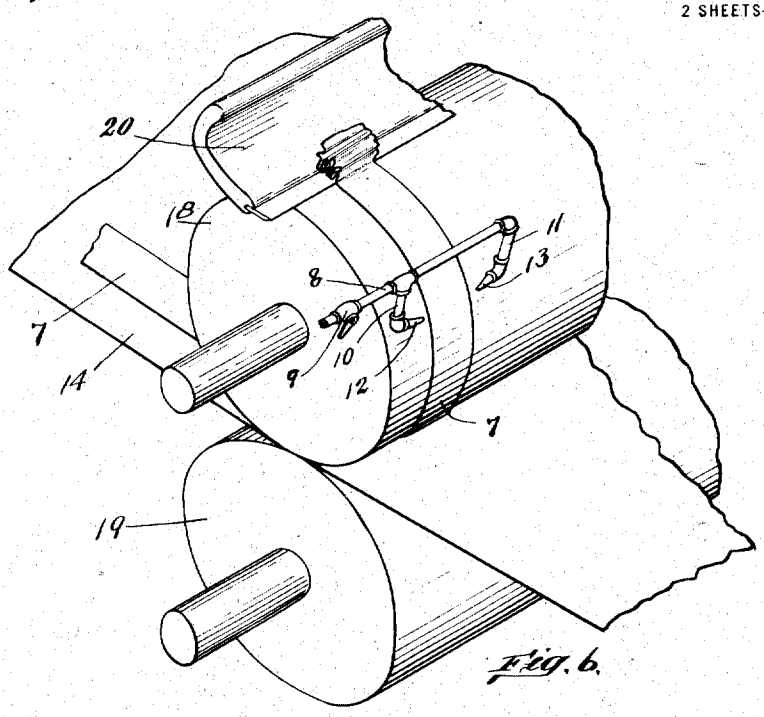


Fig. 6.

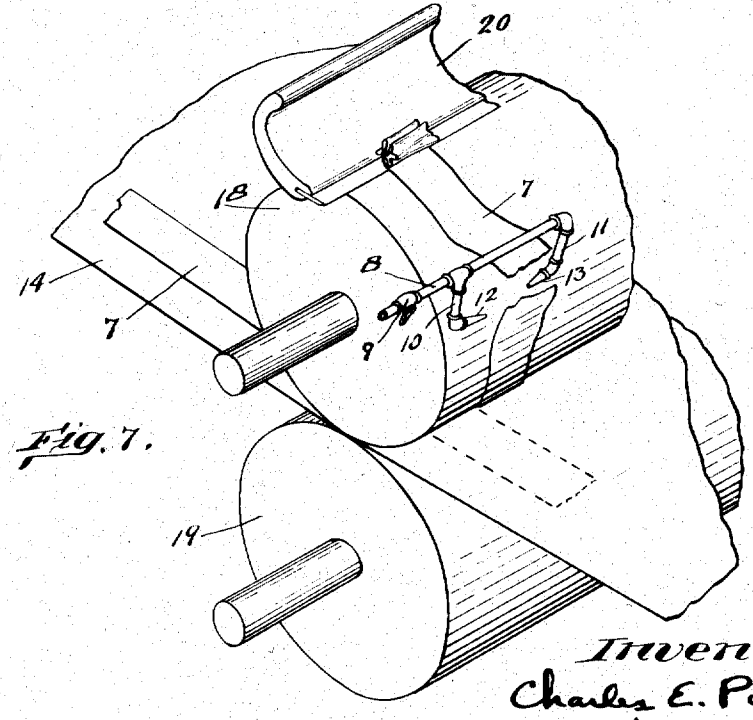


Fig. 7.

Inventor,
Charles E. Pope
by
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UNITED STATES PATENT OFFICE.

CHARLES E. POPE, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO GREAT NORTHERN PAPER COMPANY, OF MILLINOCKET, MAINE, A CORPORATION OF MAINE.

METHOD AND MACHINE FOR MAKING PAPER.

1,279,756. Specification of Letters Patent. Patented Sept. 24, 1918.

Application filed March 14, 1918. Serial No. 222,467.

To all whom it may concern:

Be it known that I, CHARLES E. POPE, a citizen of the United States, residing at Springfield, county of Hampden, and State of Massachusetts, have invented an Improvement in Methods and Machines for Making Paper, of which the following is a specification.

This invention consists in a method of taking off an end portion of a moving paper web from one part of a paper making machine to which it is adherent and deflecting it toward and carrying it to another part, without breaking the delicate fabric, and in apparatus for the use of said method, and is applicable at all stages of the machine where such removal is desired, and the method is independent of any particular apparatus by which to accomplish the result.

One apparatus disclosing this method is disclosed in my application, Serial No. 178,730, filed July 5, 1917, in which said invention is shown and claimed in combination with a successful apparatus used in combination with the driers, for passing the paper from one drier to another. My application Ser. No. 224,746, filed March 26, 1918, shows other uses of my invention in other combinations. The present application is to cover the broad process and a machine for using the same generally, and a method and apparatus applied to the Fourdrinier wire.

My new process consists of forming a narrow end or lead strip of the moving paper web and subjecting it to opposed blasts of air, directed from opposite sides of the narrow strip against the edges of the strip in a transverse direction to the direction of progress of the strip through the machine, in such a manner that as the strip progresses the blasts of air pass between the paper and the roller or other portion of the machine to which it is adherent, and the two opposing currents meet under the paper and reacting against the roller or other portion of the machine over which the paper is passing, deflect the paper outwardly, with a minimum of tearing effect, so that it will proceed by its own momentum in the desired direction, assisted by gravity or such other guiding means as are desired. The width of this lead piece is preferably about three inches at the wire, but the width may be varied within rather wide limits.

I am aware that blasts of air have been heretofore used in connection with Fourdrinier machines for taking off the paper from one part of the machine to which it is adherent and carrying it to another. The method herein claimed is limited to the method described in this application and apparatus for the application of the same.

The drawings show the use of the invention at the wire and at the press rolls, but the use of my invention is not limited to the parts of the machine shown in such described uses, nor so far as the process is concerned to the mechanism by which the process is used.

Figures 1 to 5 show my invention applied at the wire of a Fourdrinier machine.

Figs. 6 and 7 show my invention applied at the press rolls.

Fig. 1 is a side view in perspective, showing the couch rolls, wire, and first felt of a Fourdrinier machine with my invention applied to the same, with the air blast in operation, the parts unnecessary to the understanding of my invention being omitted.

Fig. 2 is a side detail view, showing the lower couch roll, with the narrow lead strip of paper passing along the same before my invention has been placed in operation.

Fig. 3 is a plan detail of the nozzles at a couch roll, showing the preferred arrangement of the air nozzle.

Fig. 4 shows a modification of the apparatus in which the nozzles are arranged to be moved apart.

Fig. 5 is a detail view of a part of the structure shown in Fig. 4.

Fig. 6 shows in perspective apparatus embodying my invention applied to a pair of press rolls and felt of a paper making machine, with the first strip of paper passing through the press rolls, as at the starting up of the machine or after a break and my machine arranged in correct relation thereto.

Fig. 7 is the same as Fig. 6, showing the apparatus in action.

Referring to Fig. 1, 1 represents the lower couch roll, and 2 the upper couch roll of a Fourdrinier machine, and 3 the papermaking wire. 4 represents the web or sheet of

paper passing through the machine. When the machine has been started and the paper web or sheet 4 is being formed on the paper making wire, it passes between the couch rolls and is removed from the wire after passing around the roll by its own weight or by a doctor, not shown, in the usual manner, and passes with the other waste to be used again in the machine until the formation of the web is satisfactory to the machine tender. Arranged above the papermaking wire, before it reaches the couch rolls, is a water pipe 5, having a nozzle 6, through which a fine stream of water may be directed against the web of paper upon the wire forming a well defined line of separation or path through the soft web, in such a manner as to form a new end-portion on the web, including a long narrow lead strip 7. This line of separation extends inward from the edge of the web for a short distance, and is produced by a corresponding transverse movement of the nozzle 6; and then extends in parallel relation with said edge to form the long narrow lead strip 7, and is produced by permitting the nozzle 6 to repose; and then extends to the other edge of the web, completing the separation of the waste and the formation of the new end-portion.

This lead strip 7, like the remainder of the sheet 4, will adhere to the wire and be carried to the waste to be used again in the machine until removed from the same as above referred to. In order to remove or start off the lead strip 7 from the Fourdrinier wire and carry it to the press roll felt, or to an adjacent roll I arrange a compressed air pipe 8, governed by a valve 9, in proximity to the lower couch roll and at about the point where the wire turns around it, so that the lead strip 7, when adhering to the wire, will pass between the pipe 8 and the couch roll 1. To this pipe 8 I attach two branches, 10 and 11, having nozzles 12 and 13, close to the couch roll and directed toward each other and toward the lead strip 7, passing between them and so arranged that when air is directed through the pipe 8, blasts will be delivered from both nozzles between the lead strip 7 and the wire about the couch roll with sufficient force to remove the lead strip 7 from the wire and deflect it in the desired direction. In order to direct the air blast at the exact point where its center will pass between the lead strip and the wire, the nozzles should aim slightly away from a line drawn between their two points (see Fig. 3) the exact angle not being very material, provided the blast is passed between the lead strip and the wire from each nozzle to meet the blast from the other nozzle in the opposed relation above described and react or abut against the couch roll and wire to remove the strip as above described. The strip 7 may be started at its end or may be ruptured by the blasts of air which are delivered with considerable velocity, the air pressure being maintained at say two to four pounds or other satisfactory pressure. The strip 7 thus removed is forced away from the wire by the opposed blasts which meet under it and is deflected toward the felt 14 and, assisted by its momentum and gravity, lies down on that felt and is carried along by it. When the strip has once been caused to lie down on the felt and pass on through the machine, the air blast may be shut off until the narrow strip 7 has been led entirely through the machine, or if desired, it may be left in operation until the full sheet is to be passed through the machine. In practice, after the narrow strip 7 has been led to the first pair of press rolls, I prefer to widen the lead strip 7 by moving the nozzle 6 transversely of the machine in the usual manner until the lead strip has attained a width of about 6 inches. The mechanism for the nozzle 6 is not here shown, as such mechanism is common on Fourdrinier machines, and may be arranged in any suitable manner. After the lead strip has been passed through the machine and the opposed blast takeoff has been used to the full extent desired, the nozzles being more or less in the way, may be removed and replaced as desired. For this purpose pipe 8 is supported on a standard 15 by a clamping device 16, held in place by a nut. This nut is screwed up tightly to hold pipe 8 and nozzles 12 and 13 in proper operative position when the apparatus is in use. When the opposed blasts are no longer needed, the nut 17 is loosened and the takeoff apparatus then falls into non-operative position, as shown in Fig. 2. In order to permit this, I prefer to attach pipe 8 to its supply by a flexible coupling of sufficient length. Obviously, any other suitable means of supporting the apparatus in operative position and removing it when no longer needed may be employed, or the apparatus may be permanently arranged.

The pipe 8 should be kept free from water, and if this is found difficult, a drainage hole 19, Fig. 4, may be added, and when the compressed air is turned on this will clear out the water without harm to the operation of the machine.

If any difficulty is found in widening out the lead strip, for instance, if the paper breaks when it is attempted to widen out the strip, the air blast may be maintained while the strip is so widened, and if desired, the inner nozzle 13 may be arranged to be moved as the strip is widened, as shown in Figs. 4 and 5, or in any other manner, so that said nozzle 13 may continue to assist in carrying over the lead strip so long as such assistance is found necessary. This arrangement is also useful in case it is desired to vary the width of the lead strip for any

reason. In practice I have not found it necessary to make use of this idea, as I find that after the lead strip is once carried over, the sheet may be widened out to its full width without the assistance of the air blast, but my modification will be useful in case the paper is more than usually fragile.

Referring to Fig. 6, a pair of press rolls are shown, 18, representing the upper press roll; and 19, the lower press roll, with the usual press roll felt 14 passing between them. The narrow strip of paper formed at the wire and passing through the machine as at the start or after a break, is shown as 7. In practice I prefer to widen the lead strip 7 to about 6 inches before taking it off from the first press rolls. This strip, after passing between the press rolls 18 and 19, adheres to the upper press roll until removed and is carried against a doctor 20 until the machine tender is ready to lead the paper along to the next pair of press rolls, or the driers. To remove the strip 7 from the upper press roll and to cause it to pass to the driers, I arrange a compressed air pipe 8, governed by a valve 9, in proximity to the upper press roll, so that the lead strip 7 when sticking to the upper press roll will pass between the pipe 8 and the press roll 18. To this pipe 8 I attach two branches, 10 and 11, having nozzles 12 and 13, directed toward each other and toward the lead strip 7, passing between them, and so arranged that when compressed air is directed through the pipe 8, it will pass through both nozzles and be delivered as blasts therefrom, which enter between the lead strip 7 and the roll and deflect it in the desired direction. As is the case at the couch roll, the direction of the nozzles is determined by the requirement of passing the stream of air between the lead strip and the press roll in opposed relation, and this result can best be obtained by directing the stream of air from the nozzles in a line slightly toward the roll and away from a direct line between the two nozzles. (See Fig. 3). The strip 7 broken by the air blast as above described or otherwise lifted free from the roll is forced away from the press roll by the opposed blasts which abut against each other under it, and is deflected toward the felt and lies down on and is carried along by it. This operation can be performed by an inexperienced attendant, with almost no training. When the strip has once been caused to lie down on the felt and pass on through the machine, the air blast may be shut off and a broader and broader strip may be carried through the machine by widening the strip by the nozzle 6 at the wire, as above described, until the whole width of the paper is carried along.

The foregoing represents merely one simple and efficient apparatus for the use of my method, but like results can be obtained by the direction of opposed blasts of air from any source whatever, or by any apparatus whatever in opposed relation transverse to the line of movement of the narrow strip of web of the paper machine, in such a manner as to work between the paper and the roll or part of the machine with which the paper is in contact, so as to loosen its adhesion to such point of contact, and deflect it in the desired direction, so that the two opposing blasts will meet or abut behind the narrow strip, and reacting against the back abutments formed by the roll or other material, will deflect the strip outwardly and permit it to proceed by its own momentum, assisted by gravity, as desired.

My machine is here shown as applied to the couch and the press rolls, but it may be used at any point of the machine where such takeoff action is desired; for instance, at any of the driers. (see my application Ser. No. 178,730, filed July 5, 1917) or in leading the paper to calenders, for which last-named purpose I have devised a special apparatus, which is the subject of a special application, filed March 26, 1918, Serial No. 224,746. In short, with the aid of this little machine, which in practice I apply permanently at all points of the machine where an automatic takeoff is desired, the taking off and leading along of the paper is made simple and practically automatic.

In practice I find it desirable to carry along the paper from each adhesion point as a separate step under the eye of the machine tender; for instance the new sheet is first formed on the wire and allowed to drop under the machine in the usual manner until the formation of the sheet is satisfactory. The narrow lead strip of paper say 3 inches in width is then formed and carried over to the press roll felt as above described, but the air blast is not turned on at the first pair of press rolls until it is seen that the strip is coming to the felt properly formed and accordingly the paper lead strip roll is upon the upper press roll of the first pair of press rolls until everything is running well to that point. I prefer then to widen out the lead strip to about 6 inches by the squirt, when the air blast is turned on at the first pair of press rolls as above described and the lead strip passes to the next pair of press rolls where the process is repeated, and so on at the next pair of press rolls and to the first drier. From the first lower drier to the first upper drier the lead strip is led upward in the manner pointed out in my pending application, Serial No. 178,730, filed July 5, 1917, or any other suitable manner, by the aid of the air blast, and ordinarily no air blast is required to cause it to pass from the first upper drier to the

second lower drier. I prefer in practice to let the lead strip pass to the doctor on the second lower drier before turning on the air at that drier and so on step by step to each lower drier until the paper passes along without assistance, as it will at the later driers, but I may turn on the air simultaneously at all the driers, where I desire to use my invention. After the paper has passed through the driers the strip is preferably allowed to run to waste for a short time to make sure that it is properly dried and running smoothly at the preceding parts of the machine, before it is passed to the calenders, and as a practical matter, it is usual to widen out the strip and carry the full sheet through the driers for this purpose before it is passed to the calenders, but if this is done, I prefer to form another lead strip 7 at the last drier and pass it through the calenders by the aid of my invention, either in the manner pointed out in my application, Serial No. 224,746, filed March 26, 1918, or in any other suitable manner involving my invention. After passing through the calenders, the lead strip is allowed to run through the floor until the entire width of the paper has been passed through the calenders, as there is no advantage in passing a narrow strip to the reel. By carrying along the lead strip step by step I avoid the trouble and waste of time caused in case the paper is not running properly at any point of the machine by the fact that poorly formed paper may be carried along and will very likely break in the driers and time will be required for clearing the driers; but so far as my process is concerned, if the paper is coming along correctly formed from the wire, the air blast may be turned on simultaneously at each point where it is needed, and the paper may pass straight through the machine, after it has left the wire, without handling by the machine tender. This completely automatic result however, is not necessary to my invention. A great part of the value of my invention is in the fact that the paper may be removed from each point of adhesion and deflected in the desired direction by the manipulation of the air blast, requiring no manual dexterity and little or no experience, with the result that the operating life, so to speak, of the machine tender is extended from the age when extreme manual dexterity is lost to almost any age and men may be fitted for the work of tending the machines with very slight training, and speeds far beyond that for which the most highly dexterous machine tender is fitted may be reached.

The force of the air blast used depends on the nature of the paper being made and the other conditions of manufacture. In the manufacture of paper at high speed, for which purpose alone it is necessary to use these automatic carrying over devices, the best force to be employed may readily be determined by experiment, it being obvious that the minimum force which will carry the paper over properly is the best, as excessive force is likely to tear the paper. In the manufacture of newspaper of the ordinary strength, I find that a pressure of two to four pounds per square inch as shown by a pressure gage is ample at the Fourdrinier wire, and the same pressure is satisfactory at other parts of the machine. It is not necessary, however, to measure this in practice, because if sufficient power is provided in the pipe, it is only necessary for the attendant to turn on the blast until the required result is reached.

I claim as my invention:

1. That improvement in the art of making paper on a papermaking machine which consists in forming a narrow lead strip on the web of paper and advancing it and directing blasts of air toward each other transverse to the line of movement of the narrow strip and between the narrow strip and the part of the machine to which it is adherent in such a manner as to pass between the narrow strip and the roller or part of the machine to which it is adherent and from which it is desired to deflect the paper and to meet between the paper and said part to which it is adherent and to react against the backing at that point and to deflect the narrow web of paper from such point of adherence and to cause it to leave said point of adherence and pass, with the aid of gravity and its own momentum, in the desired direction.

2. That improvement in the art of making paper on a papermaking machine which consists in taking off the paper web at the beginning of the operation of the machine or after a break, from a roll or part of the machine from which its adhesion must be broken, in the following manner: First, by forming a narrow lead strip of the paper at the paper making wire, and then by directing blasts of air in opposed direction at opposite edges of the narrow strip transverse to its line of movement, in such a manner that the opposed air blasts will force their way between the paper and the roller or part of the machine with which the paper is in contact and from which its adhesion must be broken and will loosen its adhesion at such point of contact and meeting behind the narrow strip will break the adhesion of the paper at such point of contact and reacting against the roller or other material will deflect the narrow strip outwardly and permit it to proceed by its own momentum, assisted by gravity, as desired.

3. A device for taking off the lead strip of paper web from a part of a paper machine to which it is adherent consisting of air piping

and two nozzles connected therewith, said nozzles being directed toward each other in a direction transverse to the line of movement of the paper web, said nozzles being placed in close proximity to the part from which the lead strip is to be removed and so that the lead strip will pass between them, whereby two blasts of air may be directed between the lead strip and the part to which it is adherent and break its adhesion to that part and deflect it to enable it to pass along through the machine.

4. A device for taking off the lead strip of paper web from a part of a paper machine to which it is adherent consisting of air piping and two nozzles connected therewith, said nozzles being directed toward each other in a direction transverse to the line of movement of the paper web, and in a line slightly away from a direct line between their points, said nozzles being placed in close proximity to the part from which the lead strip is to be removed and so that the lead strip will pass between them, whereby two blasts of air may be directed between the lead strip and the part to which it is adherent and break its adhesion to that part and deflect it to enable it to pass along through the machine.

5. That improvement in the art of making paper on a papermaking machine which consists in removing the paper web from the papermaking wire at the beginning of the operation of the machine or after a break, in the following manner: First, by forming a narrow lead strip of the paper at the paper making wire, and then by directing blasts of air in opposed direction against opposite edges of the narrow strip transverse to its line of movement, in such a manner that the opposed air blasts will force their way between the strip and the wire, at approximately the point where the strip leaves the wire and will loosen its adhesion to such point of contact and will meet behind the narrow strip and break the adhesion of the paper at such point of contact and reacting against the wire and roller which form abutments will deflect the narrow strip outwardly and permit it to proceed by its own momentum, assisted by gravity, to the press roll felt.

6. In a Fourdrinier papermaking machine the combination with the Fourdrinier wire and the roll around which it makes its traverse as it turns under the machine, of a device for forming a narrow lead strip of paper and widening the same, and a device for taking off the lead strip of paper from the wire at said roll, consisting of piping and two nozzles connected therewith, said nozzles being directed toward each other in a direction transverse to the line of movement of the web, said nozzles being placed in close proximity to the part from which the lead strip is to be removed, and so that the lead strip will pass between them, whereby two blasts of air may be directed between the lead strip and the wire to which it is adherent and break the adhesion of the lead strip to the wire and deflect it to enable it to pass along to the press roll felt.

7. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, means to deliver blasts of air against the opposite side edges of the lead strip which act to lift said strip free from contact with its support.

8. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web means to deliver blasts of air against the opposite side edges of the lead strip which act to lift said strip free from contact with its support and a control valve for said air delivering means.

9. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, means to deliver opposed blasts of air against the opposite side edges of the lead strip so that said streams of air will abut together, and lift the strip free from contact with its support and assist in supporting it in elevated position while it is being moved to the next supporting point.

10. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, means to deliver opposed blasts of air against the opposite side edges of the lead strip, which extend beneath the strip and abut together, and lift the strip free from contact with its support and assist in supporting it in elevated position while it is being moved to the next roll, said blasts of air also abutting against the adjacent parts and being deflected thereby assist in moving the web forward.

11. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, removable means adapted to be arranged in proximity to one of said rolls for delivering blasts of air against the opposite side edges of the lead strip and act to lift said strip free from contact with its support.

12. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, and nozzles connected with an air supply arranged in proximity to one of the rolls for delivering blasts of air against the opposite side edges of the strip and beneath the same, to lift the strip free from contact with its support and assist in supporting it in elevated position while it is being moved to the next supporting point.

13. In a paper making machine, the com-

bination of adjacent rolls for the web, means for forming a lead strip at the end of the web, and nozzles connected with air supply arranged in proximity to one of the rolls for delivering blasts of air against the opposite side edges of the strip and beneath the same to lift the strip free from contact with its support and assist in supporting it in elevated position while it is being moved to the next roll, one of said nozzles being movable with respect to the other to widen the space between them and provide for a strip of correspondingly increased width.

14. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, and nozzles connected with an air supply arranged in proximity to one of the rolls for delivering blasts of air against the opposite side edges of the strip and beneath the same to lift the strip free from contact with its support and assist in supporting it in elevated position while it is being moved to the next roll, one of said nozzles being slidably connected with its support whereby it may be moved to provide for variations in the width of the strip.

15. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, and nozzles connected with an air supply arranged in proximity to one of the rolls for delivering blasts of air against the opposite side edges of the strip and beneath the same to rupture the strip and lift an end portion thereof free from contact with its support and assist in supporting said end portion in elevated position while it is being moved to the next supporting point.

16. In a paper making machine, the combination of adjacent rolls for the web, means for forming a new end portion on the web including a long narrow lead strip said means being shiftable transversely with respect to the web, whereby the width of portions of the newly formed end portions may be varied, and means for delivering blasts of air against the opposite side edges of the strip, said means being capable of transverse adjustment whereby the blasts will engage the opposite edges of the strip at portions thereof of different widths and will also pass beneath the strip to assist in supporting the strip in elevated position while it is being moved to the next supporting point.

17. In a paper making machine, the combination of adjacent rolls for the web, means for forming a lead strip at the end of the web, means adapted to be arranged in proximity to one of said rolls for delivering blasts of air against the opposite side edges of the lead strip which act to lift said lead strip free from contact with its support, and a movable frame bearing said means which is movable on its pivot to shift the position of said means into and out of engaging position.

18. In a paper making machine, the combination with a couch-roll, a paper making wire, a felt roll arranged adjacent the couch-roll, of means to form a long narrow lead strip at the end of the paper web on the wire, means to provide two blasts of air for engagement with the opposite side edges of the lead strip and which pass beneath said strip and act to lift said strip free from contact with the wire and assist in supporting it in elevated position while it is being moved to the felt roll.

19. In a paper making machine, the combination with a couch-roll, a paper making wire, a felt roll arranged adjacent the couch-roll, of means to form a long narrow lead strip at the end of the paper web on the wire, means to provide two opposed blasts of air arranged for engagement with the opposite side edges of the lead strip and which pass beneath said lead strip and abut against each other to lift said strip free from contact with the wire and assist in supporting it in elevated position while it is being moved to the felt roll.

20. In a paper making machine, the combination with a couch-roll, a paper making wire, a felt roll arranged adjacent the couch-roll of means to form a long narrow lead strip at the end of the paper web on the wire, means to provide two blasts of air for engagement with the opposite side edges of the lead strip and which pass beneath said strip and act to lift said strip free from contact with the wire and assist in supporting it in elevated position while it is being moved to the felt roll, said means being movable into and out of engaging position, and a control valve for said means.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHARLES E. POPE.

Witnesses:
WILLIAM H. SEAVER,
CARL V. STOCKWELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."