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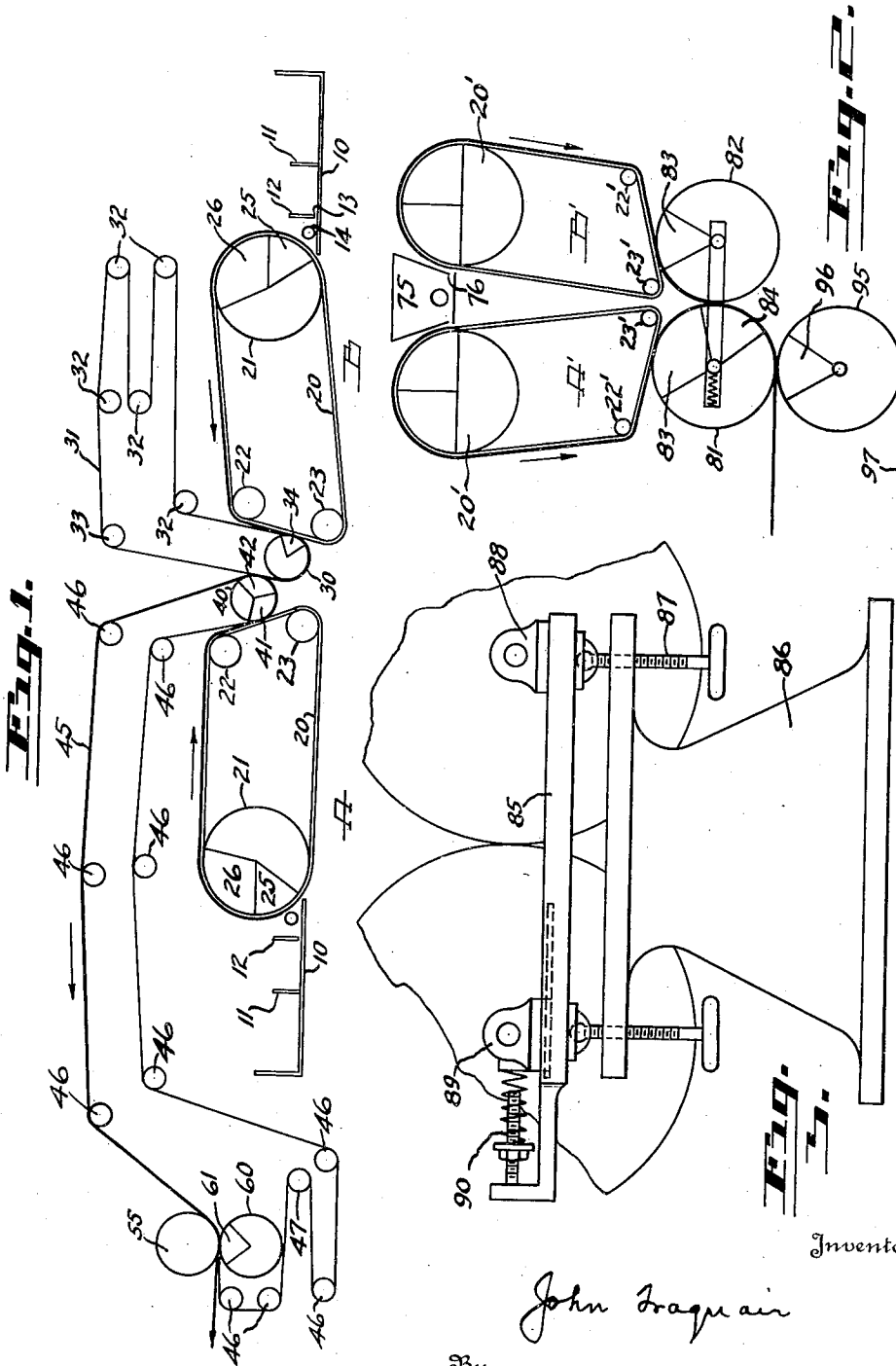
J. TRAQUAIR

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METHOD OF AND APPARATUS FOR MAKING PAPER

Filed April 3, 1926

2 Sheets-Sheet 1



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By *Marichal and Lohr* Attorneys

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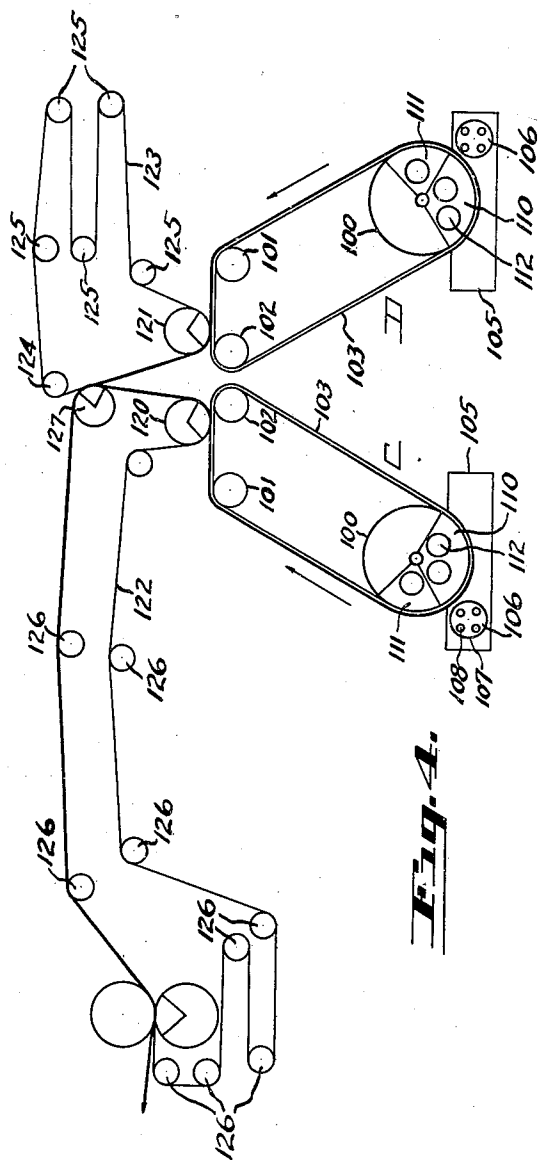
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METHOD OF AND APPARATUS FOR MAKING PAPER

Application filed April 3, 1926. Serial No. 99,530.

This invention relates to the manufacture of paper.

One of the principal objects of the invention is to provide a method of forming paper which is efficient and effective in operation, and produces a paper of marked superiority over any untreated paper as heretofore manufactured; and to also provide apparatus for carrying out that method.

Another object of the invention is to provide a method of and apparatus for forming a paper sheet having uniform characteristics on both sides.

Other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawing.

In the drawing in which like characters of reference designate like parts throughout the several views thereof,

Fig. 1 is a diagrammatic, elevational view, of a paper-forming machine constructed in accordance with this invention;

Fig. 2 is a similar view of a slightly modified form of apparatus;

Fig. 3 is an elevational view of part of the mechanism shown in Fig. 2; and

Fig. 4 is a similar view of still another modified form of apparatus.

Paper, today, is formed almost universally by flowing "stock", composed of fibers suspended in water, upon a wire; the water of the stock passing through the wire and leaving the fibers upon the wire interlaced as a mat or web. This web of fibrous material is removed from the wire, and subjected to pressing, drying, and other treatment, to produce the "machine finish" paper. This sheet of paper may be thereafter subjected to calendering to give it an improved finish. It may be coated to give it still a different finish. Or it may be otherwise treated as desired. All of these steps in forming and finishing the sheet are well known and generally used. The character of the paper, for a given character of fibrous material and given calendering or other final treatment, is determined by the treatment which it receives at the time it is formed upon the wire. And this forming

part or end is generally called in the trade the "wet end".

Obviously, and this is well known in the art, when the stock is flowed upon the wire and the water escapes through the wire leaving the mat or web of paper, the side of the web of paper which is in direct contact with the wire will have different surface characteristics from the upper side which is not in contact with the wire, and such different characteristics will carry through, in greater or less degree, into the finished paper. This variation in surface character is called in the trade "two-sidedness".

It is a general practice in the manufacture of certain grades of paper, such as book paper and the like, to incorporate in the stock, before it is flowed onto the wire, finely-divided clay or similar material which is held in suspension in the water along with the paper forming fibers, and constitutes a filling material. This filling material, or "filler" as it is generally called, tends to fill up the interstices and improve the quality of the surface of the paper so that when finished, or subsequently treated, it will have a better character.

Because of the two-sidedness above referred to, the amount of filler which may be added to paper as it has been heretofore manufactured is very definitely limited. For during formation of the web of paper, the filler becomes unevenly distributed through the web. Some of the filler is carried away with the water which escapes from the web, and a considerably greater proportion of the filler remaining in the web is in the upper or non-wire side of the sheet and a smaller proportion in the wire side. Increasing percentages of filler give increasingly diverging effects upon the characteristics of the upper side and the wire side of the web; that is,—the greater the amount of filler which is incorporated in the paper the greater the differential between the two sides. Consequently there is a very definite limit to the amount of filler which may be incorporated without producing two-sidedness which is so marked as to render the paper commercially undesirable. For example, it is customary to limit

the filler content in printing paper, such as book paper, to less than 20% on the weight of the total solids of the paper forming stock.

Where paper is made in accordance with the method disclosed herein, this two-sidedness in the finished paper is entirely avoided.

This is accomplished by forming the paper in two webs, removing the formed webs and placing the wire side of each of the two webs together, and then treating the conjoint webs to form a single sheet of paper, both sides of which then present the desirable characteristics normally present in the upper side,—that is the side opposite to the wire side.

This method of forming paper which is devoid of two-sidedness may be advantageously carried out on the apparatus diagrammatically shown in Fig. 1, which constitutes one preferred embodiment of apparatus for accomplishing this method.

In this embodiment of the invention the paper forming stock, including such filler as desired, is flowed simultaneously upon two "wet end" forming parts respectively designated, generally, by the letters "A" and "B". As shown these two forming parts are oppositely arranged. That is, they are positioned in general alignment with their respective delivery ends—the ends which correspond to the couch roll end of a conventional Fourdrinier machine, and from which the formed wet web of paper is removed from the forming wire—adjacent each other; while their respective inlet ends—the ends at which the stock is delivered or flowed onto the forming wires—are spaced apart. Except for such mechanical changes and rearrangement of parts as are incidental to one of the forming parts being "left handed" while the other is "right handed" these two wet ends are similar in construction and operation.

Each of these wet ends comprises a flow box 10 to which the stock is supplied in any suitable conventional manner. Satisfactory results may be secured with the type of flow box diagrammatically indicated on the drawing. The stock is delivered to each flow box back of the partition 11 and overflows that partition into the space back of the slice 12. This slice is adjustably mounted so that the extent of the "inlet opening" 13 may be varied to meet varying operating conditions. An agitator 14 which is shown as a perforated cylindrical hollow roll mounted on a rotatable drum (although any other suitable known type of agitator may be used) is associated with the inlet opening to stir the stock and maintain the desired distribution of the fiber and filler in the carrying water as the stock is flowed onto the wire. This agitator is driven in suitable manner from the driving mechanism of the forming part, as is well known in the art and therefore not illustrated.

The stock flowing from the inlet is delivered onto an endless wire, of the usual characteristics found in wires for paper making, so far as concerns mesh, the material of which it is made, etc. But in this apparatus the wire is very much shorter than the wires used on conventional Fourdrinier parts. It has been found that in the formation of a paper sheet or web on a travelling wire, a considerable proportion of the water of the stock escapes through the wire during the first few feet of travel, which may be called the initial forming zone, with the formation of a filter mat upon the wire through which the remaining quantity of water tends to escape more slowly. Consequently it has been necessary to use wires of considerable length to give sufficient time for the desired quantity of water to escape through the forming web of paper.

By subjecting the stock upon the wire to suction, as it is flowed onto the wire, the escape of water through the wire in the initial forming zone can be materially increased. In fact, in this method of paper formation, as large, or even a larger, percentage of the water in the stock may be withdrawn as the stock travels on the wire through a suction zone of a comparatively few inches, as will be withdrawn in the conventional Fourdrinier machine having a wire of a length of many feet.

The total length of the wire may therefore be cut down to very small proportions. In Fig. 1 is shown a forming wire, with associated suction means, of the character generally described just above. This wire 20, as shown, has an overall length of approximately eighteen feet, but this particular length is not at all an essential; though a short length wire is desirable from the viewpoint of low original cost, low operating cost and low maintenance cost. This wire is supported upon, and travels over, a suction roll 21—which in its location, and as a supporting means for the wire, corresponds to the conventional breast roll as used in the usual Fourdrinier type machine—and two supporting and guide rolls 22 and 23. These guide rolls serve substantially the same function as the conventional couch roll, guiding and supporting the wire, and being located in that zone of the wire from which the formed web of paper is picked off or removed from the wire. Preferably these two rolls are spaced apart a distance corresponding to the diameter of the roll 21. This construction is not at all essential, and if desired one roll at the delivery end may be used, or a plurality of rolls as desired. The primary function and purpose of these rolls is to support and guide the wire. It is desirable, however, to use two rolls which are adjustable with respect to each other so that the tension of the wire may be adjusted as desired. The particular means

for adjustably mounting these rolls is not shown, since any suitable mechanism of types well known in the paper-making industry may be used for this purpose. And in one modification described below adjustable means of suitable character is somewhat diagrammatically illustrated.

The roll 21 is a suction roll. It is preferably a hollow drum, the surface of which is of non-corrosive material and is perforated to permit the ready flow of water there-through. Located inside of the roll, and in fixed position are two suction boxes 25 and 26. The suction boxes are so located within the roll 21 that the stock flowed onto the wire from the inlet opening is delivered onto the wire within the suction zone. Preferably two suction boxes are used, although of course one box could be used if desired. The first of these suction boxes, that designated at 25, which is located beneath the delivery zone of the stock is under lower vacuum than the other box 26, which is located beneath what may be called the secondary portion of the paper-forming zone. As the stock is first flowed onto the wire the water of the stock flows very readily through the wire, and considerable acceleration of this flow is secured with a comparatively low vacuum. But as the water escapes in this initial suction zone a mat of fiber builds up on the wire which cuts down the rate of flow, and in the second suction zone therefore the forming paper web is subjected to increased suction, due to increased vacuum, to cause removal of the water at the desired rate. In the apparatus as shown the combined suction zone, in which the paper is subjected to rapid water removing action, is about thirty-five inches although nearly all the water removed in the wet end is removed in the first few inches of the suction zone. This may be increased or decreased as desired to meet varying operating conditions, but very satisfactory results may be obtained with substantially this extent of suction zone, when used in connection with the degree of vacuum referred to above and practically any wire speeds ordinarily used. The precise construction of the roll 21, and of the suction boxes 25 and 26 are not shown in detail, since they may be of any suitable known character, such for example as shown and fully described in the patent to William H. Millspaugh, Reissue No. 13,100, reissued April 12, 1910.

At the delivery end of each of the wet end portions A and B is a suction roll, the primary function of which is to pick the formed web of paper from the forming wire and deliver it onto a conveying belt of felt or the like. The direction of travel of the wires in the two wet ends A and B is opposite, the wire in the wet end A traveling in a clockwise direction, as indicated by the arrow, and the wire in the wet end B traveling in a

counter-clockwise direction as indicated by the arrow. These directions of travel may be varied with suitable variations in the cooperating parts. The suction roll cooperating with the delivery end of the wet end B is designated by the numeral 30. It too may be of the general construction shown in the above designated Millspaugh patent. This roll has passing thereover an endless felt belt 31, of the conventional character used in paper machinery, which belt is supported by a plurality of supporting and guide rolls 32; one of these supporting rolls being designated by the numeral 33, this particular roll being adjustably mounted. The adjustable mounting of the rolls 22 and 23 is such that the wire carried by those rolls may be held against the felt carried by the suction roll 30 with any desired operating pressure. Also, as shown, these two rolls 22 and 23 are arranged with their axes in a plane inclined against the direction of travel of the wire,— as a result of which the wire passes over the roll which is located closer to the suction roll and at an obtuse angle, while passing over the other roll at an acute angle. Because of the rapidity with which the water may be withdrawn from the web of paper, in the suction zone of the rolls 21, high-speed production may be secured. And the speed of travel of the wire may be so great that there is a tendency for the web to jump off the wire if its direction of travel is abruptly changed as the wire passes over the roll 22. By arranging the roll 22 so that the rapidity of change of direction is decreased this tendency is overcome.

The suction roll 30 is preferably positively driven at a speed which will give the felt 31 substantially the same rate of travel as the wire 20. The drive for this roll, as is the case with the drive for each of the other rolls, is not illustrated since it may be of any suitable conventional character, such drives as are generally used in the art. The suction box 34 within the roll 30 is located so that the zone of contact of the felt carrier 31 and the wire 20 lies within the suction zone. As the wire carries the formed web of paper into this suction zone the paper is picked off the wire and held against the felt carrier, and then travels along the felt carrier around the roll 30.

The suction roll 40, which is associated with the delivery end of the wet end portion A is similar in construction and operation to the suction roll 30, but is provided with two suction boxes 41 and 42. This roll also has a felt carrier or conveyor 45 traveling there-over, which is supported by suitable rolls 46, one of these rolls being designated by the numeral 47 and being preferably adjustable to vary the tension of the felt carrier belt. As shown the felt carrier passing over the suction roll 40 is pressed into contact with the wire, 130

or (during operation) against the web of formed paper on the wire 20 of the wet end portion A. It also is pressed into contact with the felt 31. One of the suction boxes of this roll 40,—the one designated 42—, provides a suction zone for the felt 31 while the other suction box 41 provides a suction zone for the wire 20 of the wet end portion A. As a result, during operation, the suction box 41 picks off the wire of the wet end portion A the traveling formed sheet of paper, which travels around the suction box 40 with the wire face of the paper away from the suction roll. As this web of paper travels around the suction roll it passes in surface contact with the web of paper from the wet end portion B which is being carried by the felt 31, the wire face of this latter web of paper being also outwardly presented. As the two component webs of paper pass through the zone of contact of the suction roll 40 with the felt 31 they are pressed together, with the wire faces against each other to form a composite sheet in which the other two or non-wire faces form the final surface of the completed composite sheet of paper. This composite sheet of paper travels over the felt 45, in the direction of the arrow.

As stated above the roll 33 is made adjustable. This adjustment is with respect to both the suction roll 30 and the suction roll 40. With respect to the suction roll 30 adjustment of the roll 33 effects the tension of the felt. But of course this tension may be adjusted by making any of the other rolls, 32, adjustable. With respect to the roll 40 the roll 33 is made adjustable so that the pressure of the felt 31 against the suction roll 40 may be varied to give desired operating conditions. It is to be noted also that direct contact of the suction rolls 30 and 40 with either of the rolls 22—23, or with each other, is avoided.

As a result ordinarily accurate construction and adjustment of these rolls is all that is necessary as they bear against flexible wires or felts, and not against rigid or unyielding parts.

Adjacent the delivery point from the felt 45 the sheet of paper passes between two press rolls 55 and 60. These rolls may be of any suitable conventional construction. Preferably, however, the upper roll 55 is a conventional press roll, while the lower roll 60 is a suction roll, of the type of the above Mills-paugh patent. These two rolls exert pressure upon the paper and squeeze out of the paper some of the water which is still in it. This water which is expressed tends to collect in the nip and to unduly wet the paper at that point. By using the suction roll 60, which has the suction box 61 so positioned therein as to provide a suction zone adjacent this point of contact, this expressed water is removed. This suction roll has an additional function in that it prevents the web of paper lifting

off of the carrier and following around the upper press roll as it has a tendency to sometimes do.

After the formed sheet of paper, which is now free from almost all of the moisture originally in the stock, passes through the press rolls it is picked off of the felt 45 in the conventional manner and thence passed through further presses and suitable drying mechanism, after which it may be given any additional treatment that may be desired, such as calendering, or supercalendering. Either with or without such treatment it may be rolled for use, or it may be subsequently coated, or otherwise treated, to give any other desired characteristics.

However, as the paper is formed and travels through the mechanism described the two wire faces of the component webs are positioned together, inside the body of the final formed sheet, and the two surfaces presented in this composite sheet are identical, in that each outer surface constitutes the upper surface in the forming part, and constitutes the surface which has been in contact with the respective conveyor belts 31 and 45. These two surfaces therefore are exactly alike. Two-sidedness is not present, and the percentage of filler can be considerably increased without detriment to the paper, in fact with increase in desirable final characteristics of the paper. Thus a filler content in excess of 20% may be used with advantageous results. For by suitably increasing the quantity of filler, a paper may be produced which, when calendered properly will approach in characteristics coated paper. This particular question of two-sidedness is especially important in connection with the better grades of paper such as are used for the manufacture of books and of magazines; but of course this method, and the apparatus for carrying it out, adapt themselves to the production of paper which is also particularly desirable for other uses.

In Figs. 2 and 3 is shown a slightly modified form of apparatus. In this form the suction rolls 20' are located above the rolls 22' and 23', and adjacent each other. A common flow box 75 may thus be used, having two inlet orifices 76, and suitable partitions and slices. Of course if desired two separate flow boxes may be used. Located at the delivery end of each of the wet end portions A' and B' is a suction roll, these rolls being designated respectively by the numerals 81 and 82. Each of these rolls is so located that its point of contact with the wire, or the web of paper carried by the wire, is between the cooperating rolls 22' and 23', and each of them may be of the Millspaugh construction with a suction box 83 therein to pick the paper web off of the wire. The roll 81 has an additional suction box 84 therein to pick the web of paper off of the roll 82 and press it

against the other web of paper. These two rolls are adjustably mounted with respect to each other so that the contact between them may be adjusted as desired. A simple form of mounting of this character is shown. This
 5 mounting comprises a supporting bracket 85, which is mounted upon a suitable standard 86 and vertically adjustable by means of cap screws 87. Each of the rolls is suitably supported, by means of bearings 88 and 89 upon
 10 these brackets, one of the bearings—as shown the bearing 89—being slidably mounted on the bracket, and a spring tensioning means 90 being provided for each bearing 89 for urging the rolls toward each other.

Cooperating with the roll 81 is a third suction roll 95, of the same construction as described, and having a single suction box 96. This roll 95 has a felt 97 running thereover,
 20 and the suction box 96 of this roll serves to pick the composite web of paper off of the roll 81 and to deliver it onto this felt. From this point it is passed through suitable press rolls, and then picked off of the felt and passed
 25 through suitable drying and other equipment, as described above. The wires of these two wet ends A' and B' travel in the direction of the arrows, and in this case as described above, the wire faces of the component paper webs
 30 are pressed together so that the non-wire or outer faces of these component webs constitute the outer surfaces of the finished sheet of paper.

In Fig. 4 is shown still another somewhat
 35 modified form of construction.

In this construction the two forming parts C and D are used, which, as described above, are similar in construction and operation, except in so far as any change is necessary because of one being left-hand and the other
 40 right-hand. Each of these forming parts comprises a suction roll 100 at the stock inlet, and two supporting rolls 101 and 102 at the formed sheet delivery end, a wire 103, of the character described above, traveling over
 45 these rolls during operation. Located beneath each of the suction rolls 100 is a vat or tray 105 into which is introduced, as needed, a supply of paper-forming stock. The arrangement of these parts is such that each
 50 of the suction rolls and its associated wire dips into the stock within its cooperating vat. As shown, the roll 100 of the wet end C travels in a clockwise direction as indicated
 55 by the arrow, while the roll 100 of the wet end D travels in a counter-clockwise direction as indicated, and of course the wire associated with each of these rolls travels in a corresponding direction.

As the surface of each roll 100, and the wire carried thereby, travels through the stock in its associated vat there is a tendency to force the stock in the direction of travel of these parts and to cause waves therein. In order to
 60 prevent this, and to maintain proper distribution of the fiber, etc., in the water, an agitator 106 is positioned in each vat. These agitators may be of the perforated roll type described above, but they are shown herein as shafts each carrying a plate 107 at each
 70 end having rods or wires 108 spaced around the peripherals of such plates. Each of these agitators is preferably positioned to one side of its cooperating suction roll, and rotates in a direction opposite to the direction of rotation of the roll so that it has a tendency to
 75 throw the stock upwardly against the suction roll. Each of the rolls 100 has therein two suction boxes 110 and 111, which as described above in connection with the suction
 80 boxes 25 and 26 are under different vacuum, the suction box 110 being under substantially the same vacuum as suction box 25 and suction box 111 the same as suction box 26. In order to expedite removal of the water which
 85 is withdrawn from the stock by the suction boxes, a plurality of suction pipes 112 are provided, inside the suction boxes 110 and 111, which suction pipes are perforated and pick up the water within the suction box and
 90 deliver it to any desired place. Except for these suction pipes 112, which may derive their suction from the same source as the suction boxes, the suction rolls 100 may be of the same Millsbaugh type as described above.

Associated with the delivery end of the wet end sections C and D is a suction roll, such rolls being respectively designated 120 and 121, each of which has an endless felt conveyor associated therewith, these two conveyors being designated respectively by the numerals 122 and 123.

The conveyor 123 is supported by suitable rolls, one of these rolls being designated by the numeral 124 and the others by the numeral 125. This roll 124 is adjustable as described in connection with roll 33. Cooperating with the felt 122, which is also supported by suitable rolls 126, is a suction roll 127, which is the same in character as the suction rolls 121. This roll is so positioned that the suction zone thereof is located at the zone of contact of the felt 122 with the felt 123. Adjustability is given to the roll 124 so that the degree of contact between the felt 123 and the roll 127 may be controlled.

The operation of this device is substantially the same as that described above. The suction within the suction rolls 100 withdraws from the stock in the vats 105 some of the water, at the same time pressing the fibers in that stock against the traveling wire, these fibers interlacing to form the web of paper. The water is extracted from this web of paper by means of the suction boxes 110 and 111 to substantially the same degree as explained above. As the component webs of paper on the wet ends C and D travel under the rolls 120 and 121 each web is picked off of its wire and pressed onto the respective
 120
 125
 130

felts 122 and 123, and at the zone of contact of the two felts, at the roll 127, the web of paper on the felt 123 is picked off of that felt and pressed against the web of paper on the felt 122; the wire surfaces of the two webs being pressed together. The composite sheet of paper is then passed through press rolls, and subjected to any desired subsequent treatment, as described above.

While the method herein described, and the forms of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and forms of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In the manufacture of paper, the method of forming a composite web which is free from two-sidedness which comprises forming a component web on one traveling wire, forming a second component web on another traveling wire, removing by suction each component web from its respective traveling wire, and bringing the said component webs so formed in contact with each other with the wire sides together to unite the same.

2. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for flowing paper-forming stock upon each traveling wire, means for subjecting said paper-forming stock to suction as it is flowed onto each of the said wires, and suction means in juxtaposition to the two said wires to contact with the webs thereon for removing from each wire the web of paper formed thereon and uniting the said webs into a single component sheet with the wire sides of the said webs together.

3. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for flowing paper-forming stock upon each traveling wire, means for subjecting said paper-forming stock to suction as it is flowed onto each of the said wires, a suction roll cooperating with each of said wires and contacting with the web thereon for removing from each such wire the web of paper formed thereon, and means for combining the two said formed webs with the wire sides together.

4. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for flowing paper-forming stock upon each traveling wire, means for subjecting said paper-forming stock to suction as it is flowed onto each of the said wires, a roll cooperating with each said wire; a conveying felt carried by each of the said rolls and held in contact with the cooperating one of the

said forming wires, suction means for removing the formed web from each wire and transferring it to the cooperating conveying felt with the wire sides out of contact with the said felts, and means for removing the formed web from one felt and uniting it with the formed web on the other felt with the two wire sides together.

5. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for flowing paper-forming stock upon each traveling wire, means for subjecting said paper-forming stock to suction as it is flowed onto each of the said wires, a roll cooperating with each said wire; a conveying felt carried by each of the said rolls and held in contact with the cooperating one of the said forming wires, suction means for removing the formed web from each wire and transferring it to the cooperating conveying felt with the wire sides out of contact with the said felts, and means for removing the formed web from one felt and uniting it with the formed web on the other felt with the two wire sides together, said removing means comprising a suction roll.

6. In apparatus of the character described, a traveling wire, means for flowing paper-forming stock upon said wire, a rotatable suction roll supporting said wire adjacent the stock delivering means, a plurality of rotatable rolls supporting the delivery portion of said wire, said rolls being arranged in a plane inclined against the direction of travel of the wire, and means for removing the web from said wire intermediate said rotatable rolls.

7. In apparatus of the character described, a traveling wire, means for flowing paper-forming stock upon said wire, a rotatable suction roll supporting said wire adjacent the stock delivering means, a plurality of rotatable rolls supporting the delivery portion of said wire, and means for removing the formed web from the wire at the delivery portion thereof, said means comprising a suction roll contacting with said wire at a portion intermediate two of the said rotatable supporting rolls.

8. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for forming a paper web upon each traveling wire, a rotatable roll cooperating with the delivery portion of each wire, a conveying felt carried by each of the said rotatable rolls and held in contact with the cooperating one of the said forming wires, a suction pocket in each roll for removing the formed web from each wire and transferring it to the cooperating conveying felt with the wire side of each web turned out and the smooth side in to contact with its cooperating felt, a plurality of supporting rolls for each of the said conveying felts, said suction rolls

and said felt supporting rolls being so positioned that the webs supported by their conveying felts are brought in contact with the wire sides together, and means positioned at said contact to unite said webs and to transfer the composite sheet to one of the conveying felts, such conveying felt being constructed to transport said composite sheet through the first wet press.

9. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for forming a paper web upon each traveling wire, a rotatable roll cooperating with the delivery portion of each wire, a conveying felt carried by each of the said rotatable rolls and held in contact with the cooperating one of the said forming wires, a suction pocket in each roll for removing the formed web from each wire and transferring it to the cooperating conveying felt with the wire side of each web turned out and the smooth side in to contact with its cooperating felt, a plurality of supporting rolls for each of the said conveying felts, said suction rolls and said felt supporting rolls being so positioned that one of the webs carried by its conveying felt after leaving its suction roll is brought in contact with the other web carried by its conveying felt while traveling around its suction roll, and a second suction pocket in said latter suction roll adjacent said contact for uniting said webs with the wire sides together and for transferring said composite sheet to one of said conveying felts.

10. In apparatus of the character described for forming paper which is free from two-sidedness, two cooperative traveling forming wires, means for forming a paper web upon each traveling wire, a rotatable roll cooperating with the delivery portion of each wire, a conveying felt carried by each of the said rotatable rolls and held in contact with the cooperating one of the said forming wires, a suction pocket in each roll for removing the formed web from each wire and transferring it to the cooperating conveying felt with the wire side of each web turned out and the smooth side in to contact with its cooperating felt, a plurality of supporting rolls for each of the said conveying felts, said suction rolls and said felt supporting rolls being so positioned that one of the webs carried by its conveying felt after leaving its suction roll is brought in contact with the other web carried by its conveying felt while traveling around its suction roll, a second suction pocket in said latter suction roll adjacent said contact for uniting said webs with the wire sides together and for transferring said composite sheet to one of said conveying felts, and an adjustable means for one of said felt supporting rolls for controlling the pressure of said contact.

11. In the manufacture of printing paper, the method which comprises incorporating in

a paper forming stock an amount of filler in excess of 20% of the weight of the total solids of the stock such as to give an objectionable two-sidedness to a sheet of paper formed from said stock and to provide a sheet having an upper or felt surface of superior printing quality, forming a component web on one forming machine from such stock, forming a second component web on a second forming machine from such stock, and bringing the said component webs together and uniting them with the wire sides together and the felt sides outermost to form a sheet having similar surface characteristics on both sides with the surfaces of superior printing quality outermost.

In testimony whereof I hereto affix my signature.

JOHN TRAQUAIR.