

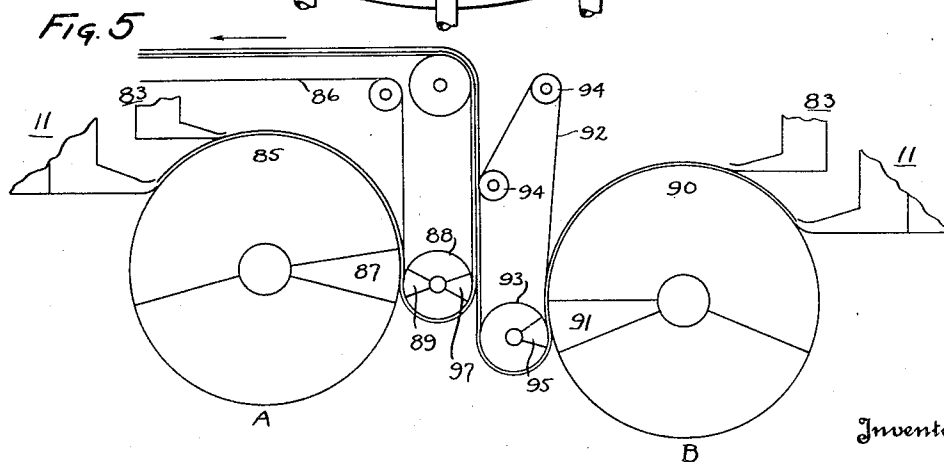
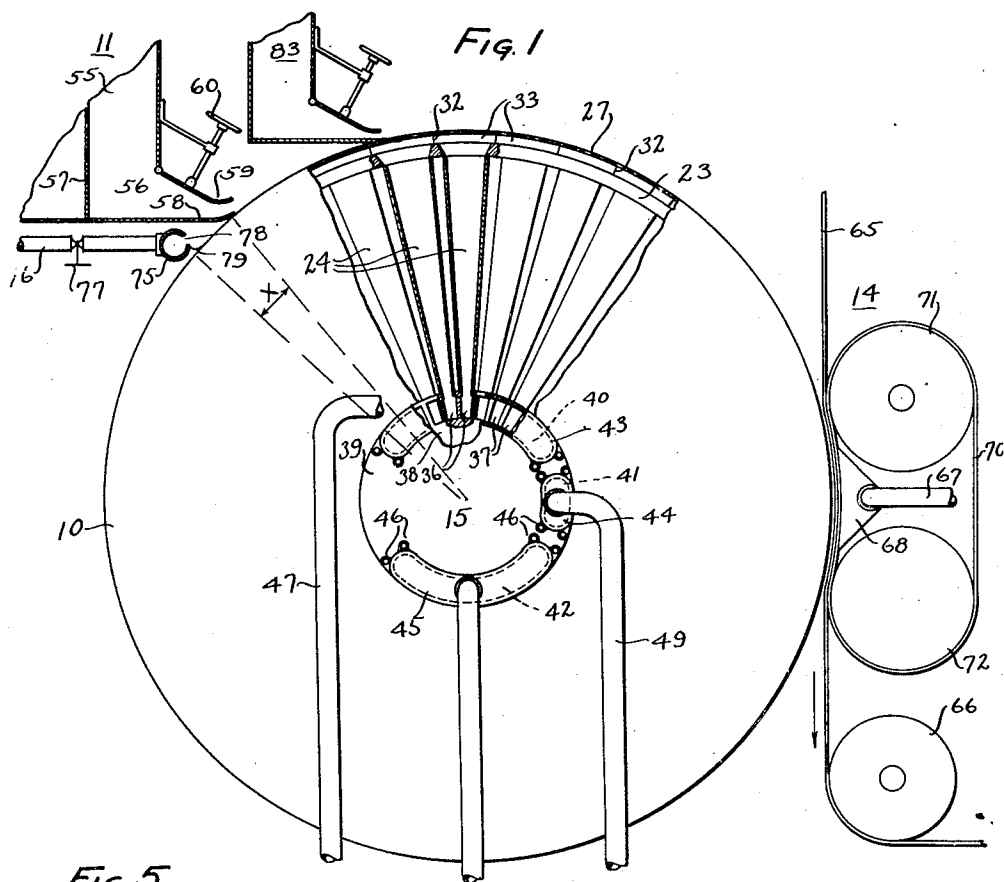
July 19, 1932.

J. TRAQUAIR
PAPER MANUFACTURE

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2 Sheets-Sheet 1



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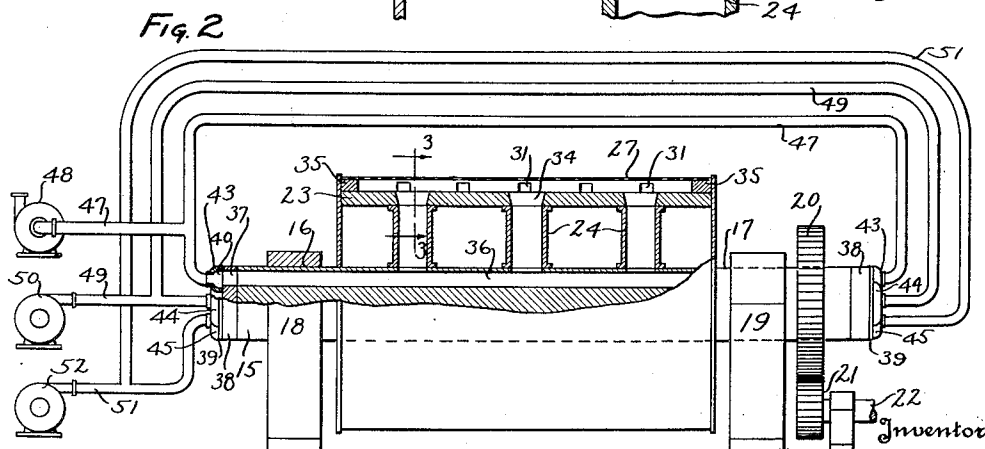
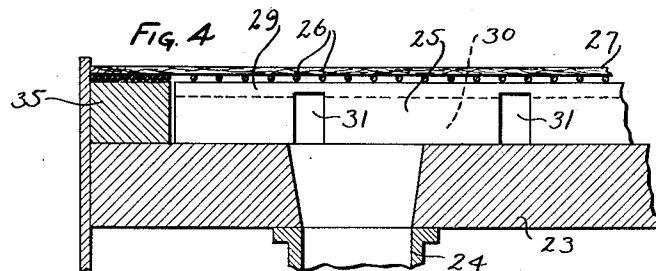
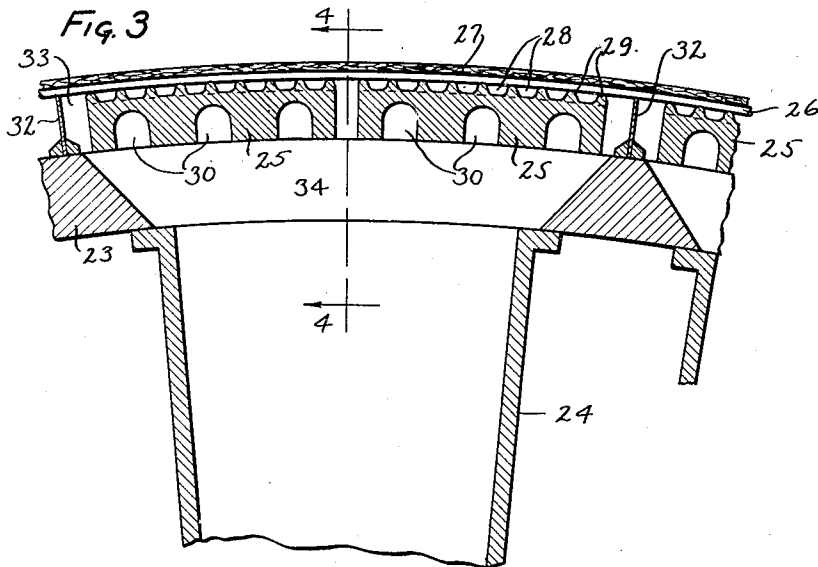
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PAPER MANUFACTURE

Application filed October 25, 1929. Serial No. 402,340.

This invention relates to the manufacture of paper.

One of the principal objects of the invention is to provide a paper making apparatus which is simple and economical in construction, capable of operation at high speeds, requires but a relatively small amount of space for its installation, is highly efficient and effective in operation, and capable of producing a high grade paper.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings, and appended claims.

In the drawings, in which is disclosed a preferred embodiment of the invention—

Fig. 1 is a diagrammatic elevational view with parts broken away and in section, of a paper forming machine constructed in accordance with this invention;

Fig. 2 is a diagrammatic side elevational view with parts broken away and in section of the paper forming machine of Fig. 1;

Fig. 3 is a partial vertical sectional view taken on the plane of the line 3—3 of Fig. 2;

Fig. 4 is a partial vertical sectional view taken on the plane of the line 4—4 of Fig. 3; and

Fig. 5 is a diagrammatic showing of two machines constructed similarly to Fig. 1, and which are positioned so that the output of the machines may be joined to form a sheet having uniform surface characteristics.

Referring to the drawings, in which like characters of reference designate like parts throughout the several views thereof, the numeral 10 designates a rotatable paper forming roll of a paper making machine. A stock inlet 11 of some suitable type is provided having an apron board adapted to flow a stream of stock onto the peripheral surface of the paper forming roll in a direction approximately tangential to the surface of the roll to form a paper web. A device, generally designated at 14, is provided for removing the formed paper web from the roll. The paper forming roll has a foraminous cylindrical surface to which suction is applied on the under side in order to quickly withdraw the water which is flowed onto the

roll surface with the paper forming stock so that the paper web will be formed within a relatively short angular movement of the roll.

The roll is provided with a central hub 15 which extends outwardly beyond the ends of the roll to form journals 16 and 17 which in turn are mounted in suitable bearings 18 and 19 respectively, to permit the roll to rotate. The roll is positively driven, as by means of a gear 20 fixed to an extended end of the hub 15 and meshing with a suitable driving gear 21 mounted on a drive shaft 22.

A cylindrical member such as a wood deck 23 is concentrically positioned with respect to the hub 15 and is supported therefrom by hollow members or manifold connections 24 which are attached at their outer ends to the wood deck 23 and at their inner ends to the hub 15. A plurality of spacing blocks 25 are secured to the outer surface of the wood deck 23 and are provided with curved outer surfaces which form a cylindrical support for a wire wrapping 26 which binds the whole in assembled relation. Adjacent turns of the wire are spaced apart sufficiently to provide ample openings for the passage of air and water therebetween, while forming a good support for an outer forming surface 27. The spacing blocks 25 are formed as segments whose outer surfaces are curved and grooved as shown at 28 in the direction of the longitudinal axis of the roll to provide a plurality of ribs 29 to support the encircling wire 26. Longitudinal and transverse interconnecting grooves 30 and 31 respectively are provided on the under side of the blocks 25, the grooves 31 being of sufficient depth to communicate with the grooves 28 on the outer surface of the blocks to thereby provide communicating passageways through the blocks 25. Division strips 32 extend completely across the roll parallel with the longitudinal axis and are uniformly spaced around the periphery of the wood deck 23 to divide the area between the deck 23 and the wire 26 into the series of compartments 33. Each hollow tube 24 communicates with a passage 34 through the deck 23 to thereby provide communication between the space within the

tube 24 and its respective compartment 33. During the cycle of operation of the roll, the compartments 33 are subjected to changes of pressure through the tubular members 24, and such changes in pressure are thus operative upon the paper forming surface 27. This forming surface may be made of conventional paper making wire or fabric such as filter cloth, or other suitable material.

A fabric filter cloth, such as a woven felt, functions very satisfactorily for this forming surface. This may be made in one endless piece, and preferably has cotton weft threads and wool warp threads, although other combinations of materials may be used. The endless felt is slipped onto the roll over the wire wrapping 26 and is contracted to a tight fit by shrinkage on wetting. The ends of the compartments 33 are closed by ring shaped members 35. The perimeter of the roll thus comprises a series of closed compartments covered by a foraminous paper forming surface.

The supporting members 24 are of considerable cross-section to provide unrestricted communication with the interior of the compartments 33. The inner ends of the supporting members 24 connect with passages 36 extending longitudinally through the hub 15 of the roll. A separate passage 36 is provided for each compartment 33; and there are preferably a plurality of members 24 extending between each passage 36 and its respective compartment 33 to equalize the suction throughout the length of the compartment. These passages 36 terminate in openings 37 in the faces of valve plates 38, one of which is attached to each end of the hub 15 beyond the journals so as to rotate therewith. The openings 37 in the faces of valve plates 38 are spaced equally apart and are concentrically positioned with respect to the axis of the roll. Stationary valve decks 39 which are circular plates of the diameter of the valve plates 38 contact flush with the flat surface of each valve plate 38 and each is provided with manifold openings 40, 41 and 42 adapted to register with the openings 37 in the valve plate upon rotation of the roll and valve plate. Openings 40, 41 and 42 extend through the decks 39 and are closed on the outer side of the decks by manifold covers 43, 44 and 45 respectively.

In Fig. 1 part of the valve deck has been broken entirely away, another part is shown in section, while the balance is illustrated in elevation. That part which contains the openings 40 and its corresponding manifold cover 43 is shown partly removed for the purpose of clearness. The manifold covers are shown in Fig. 1 as attached to the deck 39 by bolts 46. The manifolds 43 for the openings 40 are connected by a pipe 47 to a suction pump 48 or other source of suction. Manifolds 44 for the openings 41 are

connected by a pipe 49 to a source of fluid pressure such as air under pressure, provided for example by a pump 50. Manifolds 45 for openings 42 are connected by a pipe 51 to a source of washing liquid or water under pressure supplied, for example, from the pump 52. Each opening 40, 41 and 42 is positioned so as to register with the openings 37 of passages 36 in hub 15. Thus upon rotation of the roll and hub, which carries with it the valve plates 38, the passages 33 are successively brought in registration with suction, air under pressure and washing water. The various compartments 33 and the roll forming surface are thus subjected during predetermined periods in the cycle of rotation of the roll to suction, air pressure and washing water.

In the operation of the machine stock is flowed from the inlet 11 onto the porous surface of the rotating roll. The inlet 11 is diagrammatically shown and may be of the Voith or some other suitable type. As shown, the inlet comprises a flow box 55 within which stock is maintained in suitable depth to provide a pressure head adjacent the stock discharge 56 to cause the stock to issue therefrom at approximately the velocity of the surface of the roll 10. Staggered baffles 57 are provided within the flow box in the usual manner. An apron board 58 for the discharge opening 56 is formed with a curved outer end so as to direct the flowing stream of stock onto the surface of the rotating roll in a direction substantially tangential to the roll surface. A pivoted lip member 59 having suitable adjusting means 60 cooperates with the apron 58 to control the size of the inlet opening as desired. The outer end of the lip member 59 may be curved upwardly to conform with the curvature of the outer end of the apron board 58. As the stock is flowed onto the forming surface of the roll, the water is rapidly withdrawn from the stock as the roll rotates due to the suction which is placed on the roll surface by means of the suction manifold 43 connected through the openings 37 to the hollow tubes 24 and thence to the compartments 33. The suction zone preferably begins at an angular position ahead of the angular position where the stock is flowed onto the roll; the beginning of the suction zone being dependent upon the absorption characteristics of the forming surface being used. As shown in Fig. 1, an angular lead indicated by the angle X is used. Due to the suction created on the roll surface a mat of fibers is quickly formed with a relatively short angular travel of the roll, and as the roll continues to rotate additional water is withdrawn from the stock and a paper web is formed upon the surface of the roll.

Further rotation of the roll brings the formed paper web to a transfer point where the web is removed from the roll and trans-

ferred to a travelling carrier 65 for further treatment. As the roll rotates through the suction zone and the water is withdrawn from the stock into the compartments and thence away through the manifolds 43, the openings 37 eventually pass beyond the openings 40 of the suction zone and come into alignment with the openings 41 of the pressure zone which is within the area supplied by the pressure manifold 44. Pressure within the manifolds 44 is communicated through the openings 37 and the members 24 to the compartments 33 and the pressure there exerted on the porous roll surface tends to disengage the formed paper web from the roll surface and transfer it to the traveling felt 65 passing over suitable guide rolls 66 and brought in contact with the web on the roll surface at the transfer point. The transfer of the web is aided by the application of suction to the side of the carrier 65 opposite that in contact with the paper web. Suction is supplied by pipe 67 leading from a suitable source of suction to the suction compartment 68 which is positioned adjacent the carrier 65 at the transfer point. In order to reduce the wear on the traveling member 65, an endless porous felt 70 is provided between the carrier 65 and the suction chamber 68. The endless felt 70 travels over guide rolls 71 and 72 and between the suction chamber 68 and the carrier 65 to prevent contact and subsequent wear on the carrier 65 by frictional drag over the surface of the suction chamber 68. The guide rolls 71 and 72 also assist in training the felt 65 into desired surface contact with the web on the surface of the forming roll. The combination of air pressure on the roll side and suction on the felt side effectively removes the web from the forming roll even at high speeds and transfers it securely to the felt 65 which carries it to further treating apparatus, such as press rolls (not shown).

Further rotation of the forming roll brings the openings 37 out of registration with the pressure manifolds 44 and into registration with the openings 42 of the manifolds 45, whereby washing water is supplied for thoroughly cleansing the felt forming surface of the roll before that surface is again rotated to a position where stock is supplied thereto.

The openings 37 after leaving the area supplied by the washing manifolds 45 again enter the suction zone which is within the area supplied by the suction manifolds 43. The compartments in their rotation are placed under suction somewhat before they arrive at the position where the stock is flowed on, and in this interval of travel the washing water which saturates the forming surface is withdrawn so that the surface is under full suction when it reaches the position where the stock is flowed onto the roll. At the same time, the withdrawal of the water from the

forming surface prevents the passage of undue quantities of air through the surface before it passes into the forming zone, so that the suction is not objectionably impaired. The relative positioning of the openings 40 is so coordinated with the location of the inlet 11 as to secure effective removal of the washing water and the production of a substantially uniform degree of suction in the forming zone.

Uniformity of suction may be further controlled by flowing a sheet of water onto the roll surface from the conduit 75 which is shown positioned near the roll surface adjacent the beginning of the suction zone. Water is supplied from some suitable source of pressure through the pipe 76, controlled by valve 77, to the conduit 75 which extends across the width of the forming surface. A slot 78 is provided in the conduit from which water may flow onto a flexible lip 79 which directs it in a sheet onto the forming surface. When wire, such as Fourdrinier wire, is used for the forming surface the washing water is quickly withdrawn from the surface and the additional water from the conduit 75 is provided to prevent undesired entrance of air into the compartments before they reach the forming zone. When a heavy felt forming surface is used the conduit may be dispensed with entirely, or it may be adjusted by means of the valve 77 to flow just enough water onto the forming surface to maintain the desired uniformity of suction. This provides an effective sealing means to prevent objectionable ingress of air through the forming surface which is thus subject to suction in advance of the forming zone, the sealing means being maintained out of rubbing contact with the forming surface to prevent wear thereof. The valve decks 39 are designated with zones of suction, pressure air and washing water of predetermined location and extent and are made readily replaceable to provide for the substitution of different valve decks having zones of different extent or relative location to meet different operating conditions.

A uniform degree of suction over the roll surface in the forming zone is made possible by having no abrupt dividing walls between the adjacent compartments. The dividing walls as described, comprise the upstanding members 32 which have a narrow contact with the inner surface of the wire wrapping 26 so that there is substantially no inactive surface. Any variation in surface suction which might occur adjacent the points of contact of the members 32 is eliminated by separating the roll forming surface from the ends of the members 32 by the layer of wire wrapping 26 and the thickness of the forming surface. Suction from the compartments adjacent the dividing walls is sufficient to creep around the edges of the members 32 and provide a uniform degree of suc-

tion over the roll surface. The fabric forming surface of the roll being endless, there are no irregularities or joints on the surface which objectionably imprint in the web of paper and show up in the final product. A forming machine of this character capable of producing a relatively high degree of suction for the forming zone enables the rapid removal of the water of the stock with the production of a superior sheet, even at unusually high speeds and where a closely woven fabric or felt forming surface is used.

This invention permits the formation of a composite web through the use of a plurality of stock inlets associated with one forming roll, in which the first inlet 11 supplies a suspension of primarily fibrous material in water to form a filter mat on the forming surface. Following this first inlet and spaced therefrom to allow the water to be withdrawn from the stock flowed on at the first inlet 11 is a second inlet 83 which may be supplied with stock comprising water, short fibers, and a high filler content to provide a surfacing layer upon the formed filter mat. Due to the filter mat which has been formed at the first inlet, there will be additional resistance to the flow of water from the stock added at the second inlet, and this will tend to produce uniform distribution of the short fibers and filler on top of the filter mat. If desired, a higher degree of suction may be provided at the second forming zone than is provided at the first forming zone by the use of a valve deck having two suction openings respectively connected to sources of suction of different degree.

As shown, the inlet or inlets are preferably positioned on the upper side of the forming roll, so that formation of the web is aided both by gravity and by the suction existing within the suction compartments. A very satisfactory arrangement comprises a first inlet positioned to discharge a flowing stream of stock upon the surface of the forming roll above a horizontal diameter of the roll and in front of a vertical diameter thereof. A second inlet may be located in spaced relation to the first inlet and above the horizontal diameter of the roll, preferably at about the uppermost portion of the roll.

Fig. 5 shows two of the above described machines arranged with their output ends facing one another. A paper web is formed within the zone 85 of machine A and is transferred to the traveling felt 86 at the release point where air pressure is applied to the inner surface of the roll of machine A at 87, and suction is applied on the other side of the felt 86, as by means of rotatable roll 88 about which the felt 86 passes, the roll 88 having a stationary suction box 89 therein. A second machine B is provided having a forming zone 90 and a releasing zone 91 where the paper web formed on this machine is trans-

ferred to an endless felt 92 carried by a rotatable roll 93 and guide rolls 94. Pressure applied within the zone 91 of the forming roll of machine B and suction applied by a stationary suction pocket 95 of the roll 93 aid in transferring the web to the endless carrier 92. The traveling felts 86 and 92 are so arranged as to bring the webs from machine A and machine B into contact with their "wire" sides, or sides which were disposed in contact with their respective forming felts, innermost, and with their smooth surfaced sides outermost, opposite a second suction pocket 97 in roll 88, where the webs are united to form a composite web having uniform surface characteristics. The composite web, securely held by the traveling felt 86, is carried by the felt to further treating apparatus, such as press rolls (not shown).

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Paper making apparatus of the character described comprising a rotary forming roll, a continuous shrunk-on foraminous covering for said forming roll providing a paper forming surface thereon, means for supplying fibrous stock to said forming surface, and means for rotating said roll to form a traveling web of paper.

2. A paper making machine of the character described comprising a rotary forming roll having an outer forming surface, said roll having a plurality of compartments having closed ends formed therein opening to atmosphere through said outer forming surface, said compartments being adapted to rotate with said roll, an inlet for producing a flowing stream of stock and for directing the flowing stream onto the said outer forming surface at one side of the roll above a horizontal diameter thereof and in the direction of travel of the roll, means for producing suction within said compartments opposite the position that said stream of stock flows onto said roll to form a paper web and for maintaining suction for a substantial distance of the arc of travel of the web on the surface of said roll, the outer side of said web supported by the roll being freely exposed to atmosphere beyond the position at which said stock stream flows onto the roll, whereby drying of said web is assisted by gravity draining and the drawing of air from atmosphere through the moist web carried on said roll, means for removing the said web from said roll at the side of the roll opposite the said inlet, and means for disconnecting said

compartments from suction in advance of the said web removing means.

3. A paper making machine of the character described comprising a rotary forming roll having an outer forming surface, a plurality of compartments within said roll and in communication with said outer forming surface, said compartments being adapted to rotate with said roll, means for flowing a stream of paper forming stock onto the outer forming surface of said roll to form a paper web thereon, means for connecting said compartments to suction and to fluid pressure at predetermined periods in the cycle of rotation thereof for respectively reducing the water content and facilitating the removal of the paper web, and means for supplying said compartments with washing liquid at a position intermediate the position of removal of the paper web and the position of flowing the stock onto the roll.

4. A paper making machine of the character described, comprising a rotary forming roll having a peripheral forming surface, a plurality of compartments formed within said roll and in communication with said outer forming surface, said compartments being adapted to rotate with said roll, paper forming stock supply means for forming a paper web on the forming surface of said roll, means for connecting said compartments to suction at a predetermined period in the cycle of rotation of said roll to reduce the water content of the paper web on said forming surface, means for removing the web with reduced water content from said roll, and means for connecting said compartments to a source of supply of washing liquid at another predetermined period in the cycle of rotation of said roll intermediate the position of removal of the web from the roll and the position of forming the web thereon.

5. A paper making machine of the character described, comprising a rotary forming roll having a peripheral forming surface, an inlet for flowing a stream of paper making stock upon said forming surface of the roll to form a paper web thereon, means for placing said forming surface under suction during a predetermined period in the cycle of rotation of the roll adjacent the position of flowing stock thereon to reduce the water content of the paper web, means for applying pressure fluid to said forming surface at another predetermined period in the cycle of rotation of said roll to facilitate the removal of the web with reduced water content from said roll, and means for supplying washing liquid to said forming surface at still another predetermined period in the cycle of rotation of said roll intermediate the point of removal of said web and the point of flowing stock onto said roll to thereby wash said forming surface.

6. In apparatus of the character described,

a traveling member for conveying a web thereon, suction means positioned on the web side of said traveling member for removing said web from the traveling member, and pressure means positioned on the opposite side of said traveling member and acting therethrough to assist in the removal of said web.

7. A paper making machine of the character described comprising a rotating paper forming roll, means for supplying paper forming stock to said roll to form a web thereon, and means for removing the web from the forming roll comprising both pressure and suction means active on the web adjacent the point of removal.

8. A paper making machine of the character described comprising a rotating paper forming roll, means for supplying paper forming stock to said roll to form a web thereon, conveying means contacting with said web, means for creating pressure on the roll side of said web adjacent said conveying means, and means for creating suction effective on the exterior of said web adjacent the conveying means.

9. A paper making machine of the character described comprising a rotating paper forming drum, a stock inlet for flowing stock onto said drum to form a paper web on said drum, conveying means contacting with said web, a suction member opposite the contacting area of said conveying means and web, a traveling perforate member intermediate said suction means and said conveying means, and means for providing suction in said suction member to effect transfer of the web to said conveying means.

10. A paper making machine of the character described comprising a rotary forming roll of large diameter having a substantially horizontal axis, an outer foraminous forming surface for said roll, means for rotating said roll, a plurality of suction pockets within said roll adapted to rotate therewith and communicating with said outer forming surface, means for supplying paper forming stock to said forming surface to form a web thereon, and an inlet in spaced relation to said stock supplying means positioned to flow a stream of material onto the paper web on said forming surface at appreciable velocity and substantially entirely in the direction of travel of said forming surface while the web is being subjected to suction of said rotary suction pockets.

11. A paper making machine of the character described comprising a rotary forming roll having a substantially horizontal axis, an outer foraminous forming surface for said roll, means for rotating said roll, a plurality of suction pockets within said roll adapted to rotate therewith and communicating with said outer forming surface, an inlet holding paper forming stock out of contact with said

forming surface until discharged therefrom for flowing a stream of paper forming stock at substantial velocity onto said forming surface, said inlet being positioned to flow the
 5 stock onto the roll above a horizontal diameter thereof and in advance of a vertical diameter thereof in the direction of rotation of the roll, and a second inlet in spaced relation to said first inlet holding paper forming
 10 stock out of contact with said forming surface and web carried thereby until discharged from the inlet for flowing a stream of material onto the web formed at said first inlet at a zone above the horizontal diameter
 15 of said roll and in the direction of rotation of the roll.

12. A paper making machine of the character described comprising a rotary forming roll, a foraminous paper forming surface
 20 for said roll, a suction compartment communicating with said forming surface, a stock inlet for flowing stock onto said forming surface to form a web thereon, means for connecting said compartment to a source of suction,
 25 said suction compartment being operative to place said forming surface under suction in advance of the area where the stock flows onto the forming surface.

13. A paper making machine of the character described comprising a rotary forming roll, a foraminous paper forming surface for
 30 said roll, a suction compartment communicating with said forming surface, a stock inlet for flowing stock onto said forming surface to form a web thereon, means for connecting said compartment to a source of suction, said
 35 suction compartment being operative to place said forming surface under suction in advance of the area where the stock flows onto the forming surface, and means positioned
 40 out of contact with said foraminous forming surface for retarding the ingress of air through said portion of the forming surface subject to suction in advance of the area where
 45 the stock flows onto the forming surface.

14. A paper making machine of the character described comprising a rotary forming roll, a foraminous paper forming surface for
 50 said roll, a suction compartment communicating with said forming surface, a stock inlet for flowing stock onto said forming surface to form a web thereon, means for connecting said compartment to a source of suction, said
 55 compartment being operative to place said forming surface under suction in advance of the area where the stock flows onto the forming surface, means for removing the web from said roll, and means for supplying
 60 liquid to said fabric forming surface intermediate the zone at which the web is removed from the roll and the zone at which the stock is flowed onto the fabric forming surface to retard the ingress of air through
 65 said portion of the forming surface subject

to suction in advance of the area where the stock flows onto the forming surface.

15. In a paper making machine of the character described, having means for flowing a stream of paper making stock onto a
 70 forming surface to form a web thereon; a traveling felt forming surface onto which the said stock is flowed at the forming zone, and means for supplying a relatively high degree of suction to said felt forming surface
 75 adjacent said forming zone to provide for the formation of the web with a short travel of the felt forming surface.

16. A paper making machine of the character described, comprising a rotary forming
 80 roll having a forming surface, a plurality of compartments formed within said roll and opening to atmosphere through said forming surface, said compartments being adapted to rotate with said roll, division strips separating the said compartments, means for supplying stock to the forming surface of said
 85 roll to form a web thereon, said stock supplying means being located at a definite location at the periphery of said roll, and means for connecting said compartments to a source of suction at a predetermined position in the
 90 cycle of rotation of said roll, said last mentioned means being operative to connect each rotary compartment to suction in advance of the location of stock supply with reference
 95 to the direction of rotation of the roll, so that a substantially even and desired subatmospheric pressure is effective within each compartment at the time it moves opposite the
 100 position of stock supply.

17. A paper making machine of the character described, comprising a rotary forming roll having a forming surface, a plurality of
 105 compartments formed within said roll and opening to atmosphere through said forming surface, said compartments being adapted to rotate with said roll, division strips separating the said compartments, means for supplying stock to the forming surface of said roll
 110 to form a web thereon, said stock supplying means being located at a definite location at the periphery of said roll, means for connecting said compartments to a source of suction at a predetermined position in the cycle of
 115 rotation of said roll, said last mentioned means being operative to connect each rotary compartment to suction in advance of the location of stock supply with reference to the direction of rotation of the roll, so that a
 120 substantially even and desired subatmospheric pressure is effective within each compartment at the time it moves opposite the position of stock supply, and means for retarding the ingress of air through the forming
 125 surface of each compartment at the time each compartment is connected to suction and before the forming surface thereof moves opposite the position of stock supply.

18. A paper making machine of the char- 130

acter described, comprising a rotary forming roll having a forming surface and rotary compartments within the said forming surface, means for supplying fibrous stock to said forming surface to form a web thereon, means for connecting each of said compartments to suction in substantial angular advance of the position of stock supply with reference to the direction of rotation of said roll, and means for retarding ingress of air from the outside through the forming surface into each compartment subject to suction in advance of the position of stock supply.

19. A paper making machine of the character described, comprising a rotary forming roll having a centrally arranged hub which rotates with the roll, said hub having a plurality of longitudinal passages therein extending from one end of the hub to the other, a plurality of longitudinal compartments formed about the periphery of said roll, a foraminous forming surface enclosing said compartments, a plurality of sets of pipes providing communication from the passages in said hub with said compartments, the various sets of pipes being spaced longitudinally of said roll and each set having a plurality of pipes arranged radially, to thereby provide a separate pipe for each compartment, and stationary valve decks arranged in cooperation with each of the opposite ends of said hub, the said valve decks having ports therein adapted to register simultaneously with the opposite ends of the passages within the said hub.

20. A paper making machine of the character described, comprising a rotary forming roll having a centrally arranged hub which rotates with the roll, said hub having a plurality of longitudinal passages therein extending from one end of the hub to the other, a plurality of longitudinal compartments formed about the periphery of said roll, a foraminous forming surface enclosing said compartments, a plurality of sets of pipes providing communication from the passages in said hub with said compartments, the various sets of pipes being spaced longitudinally of said roll and each set having a plurality of pipes arranged radially, to thereby provide a separate pipe for each compartment, stationary valve decks arranged in cooperation with each of the opposite ends of said hub, the said valve decks having ports therein adapted to register simultaneously with the opposite ends of the passages within the said hub, a pipe interconnecting the corresponding ports in each of the said valve decks, and a common source of controlled absolute pressure in communication with the said interconnecting pipe.

21. In the manufacture of a finished sheet of paper on a rotary forming surface having suction compartments effective beneath the surface and rotating therewith, the method

which comprises flowing a shallow stream of paper forming stock at appreciable velocity onto the forming surface and in the direction of travel thereof, and applying suction to the suction compartments in substantial angular advance of the position of stock flow onto the forming surface to provide a substantially even subatmospheric pressure within each compartment at the time it moves opposite the position of stock flow.

In testimony whereof I hereto affix my signature.

JOHN TRAQUAIR.

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