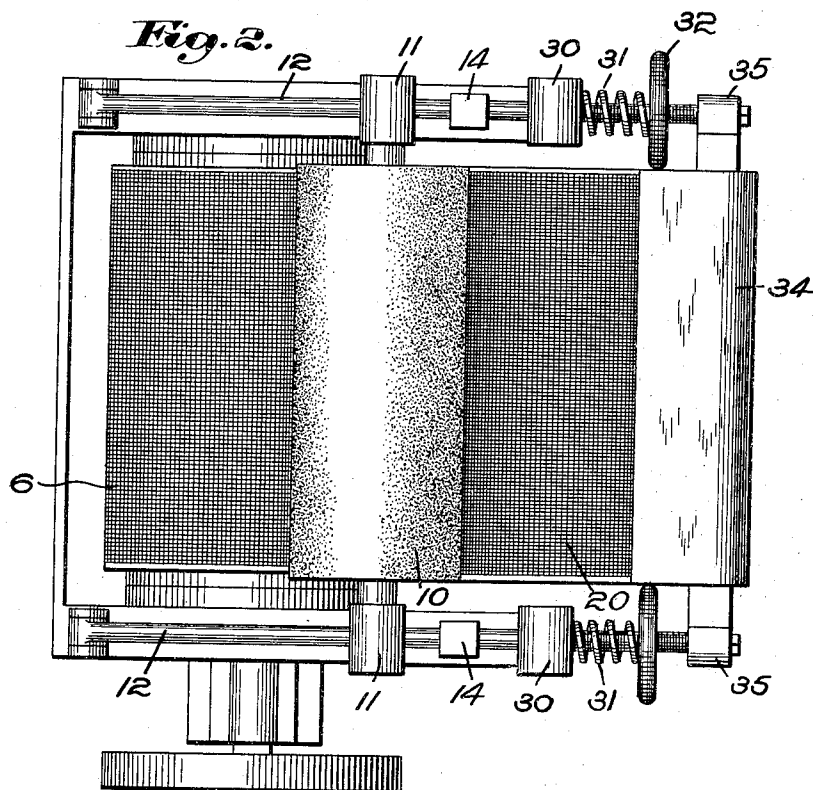
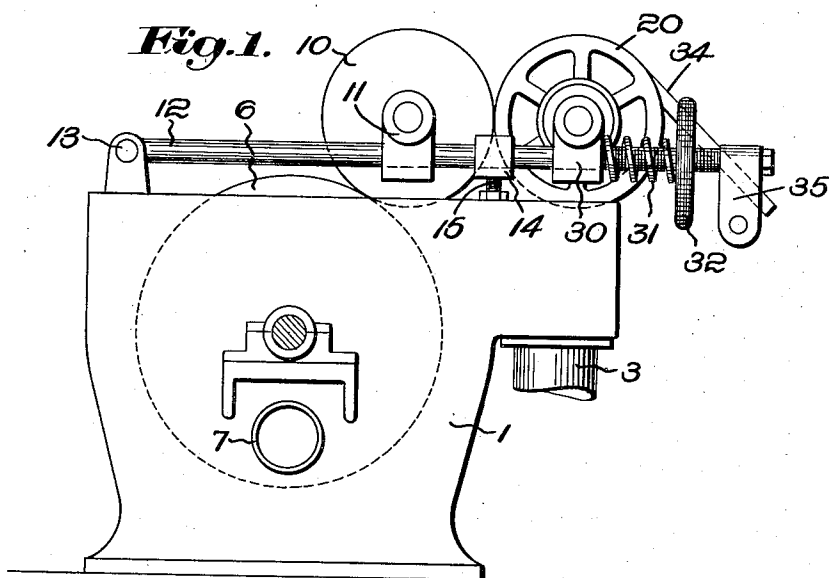


A. J. HAUG.
METHOD OF AND APPARATUS FOR DRAINING A MOIST WEB IN PAPER MAKING.
APPLICATION FILED SEPT. 24, 1918.

1,405,211. Patented Jan. 31, 1922.
3 SHEETS—SHEET 1.



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Fig. 3.

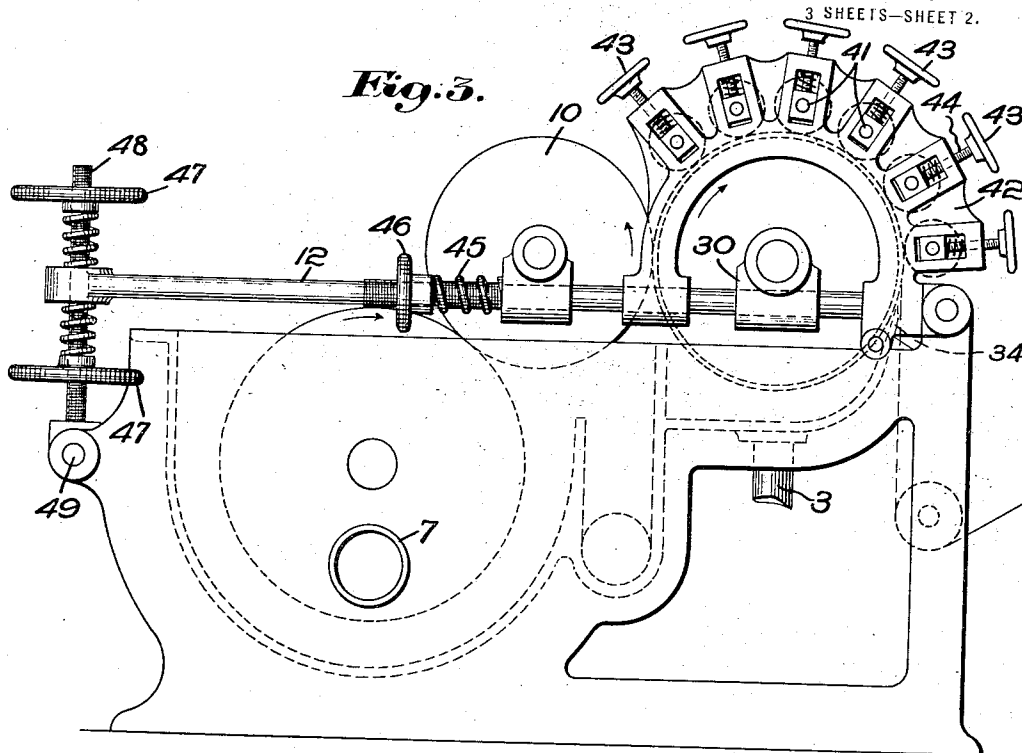


Fig. 4.

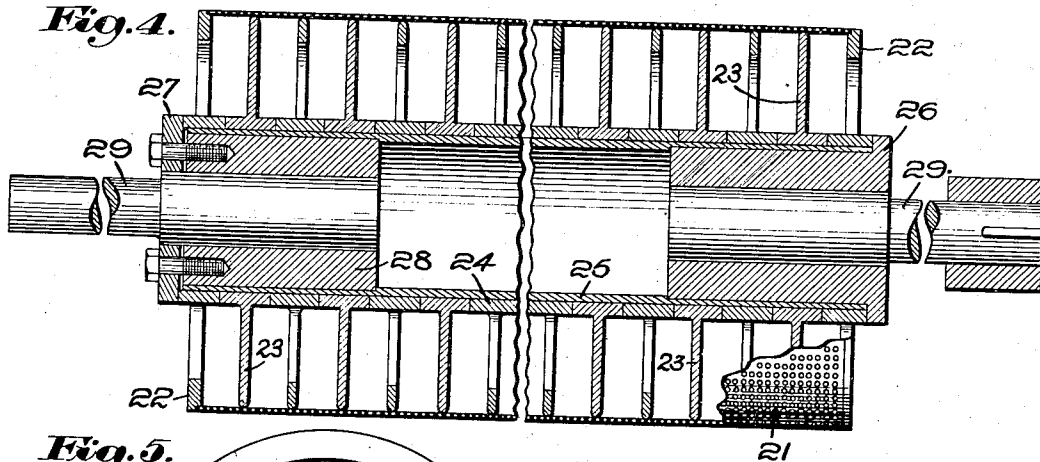
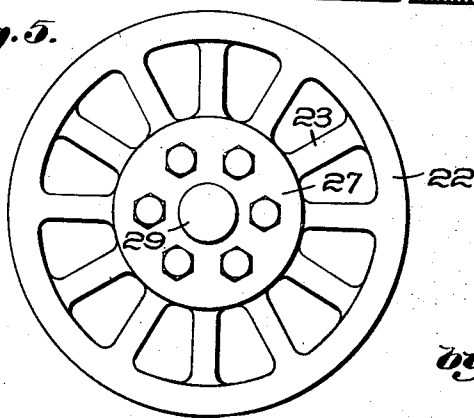


Fig. 5.



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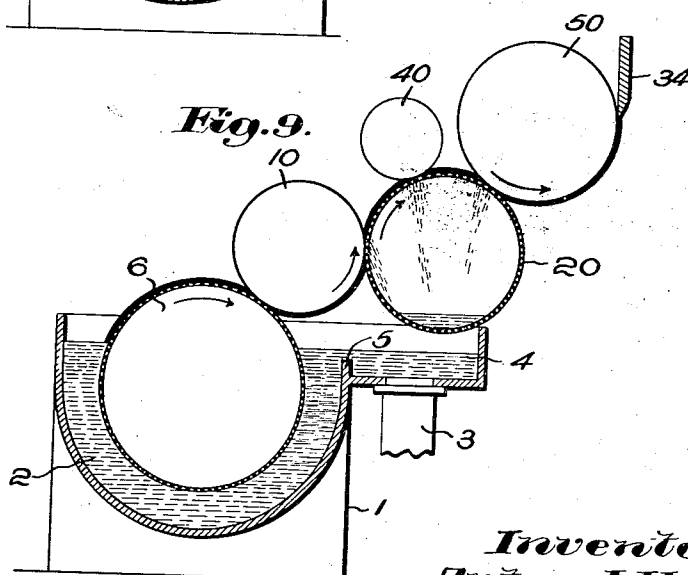
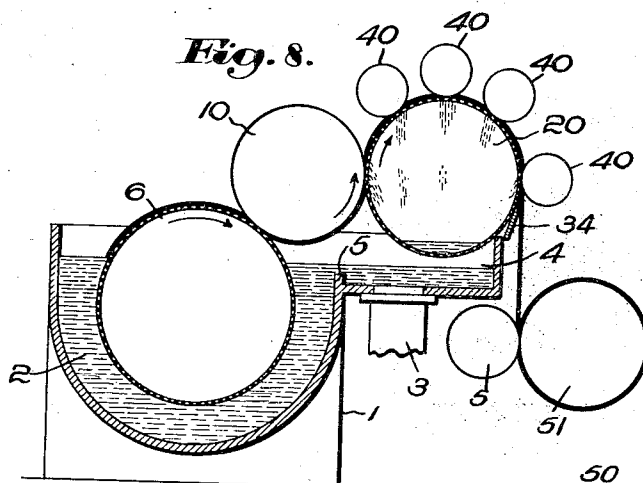
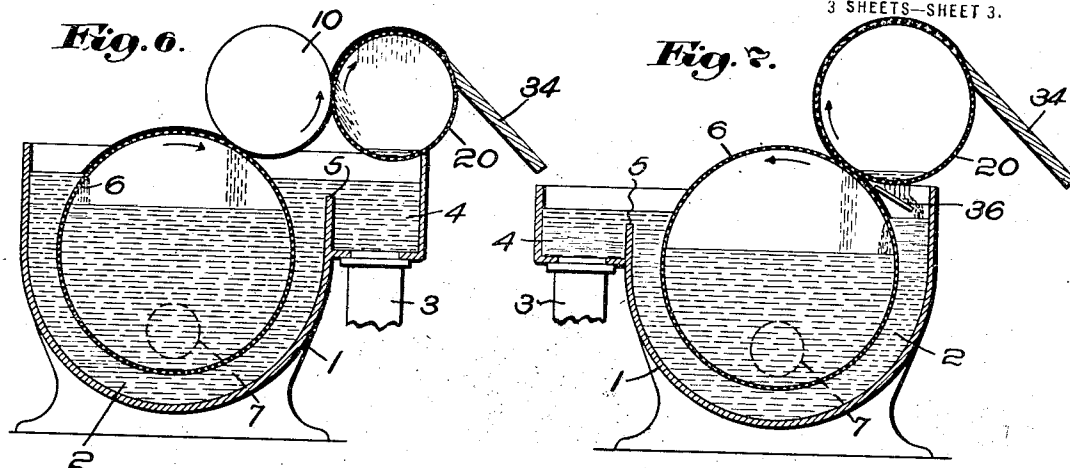
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3 SHEETS—SHEET 3.



Inventor:
Anton J. Haug,
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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR DRAINING A MOIST WEB IN PAPER MAKING.

1,405,211.

Specification of Letters Patent.

Patented Jan. 31, 1922.

Application filed September 24, 1918. Serial No. 255,445.

To all whom it may concern:

Be it known that I, ANTON J. HAUG, a citizen of the United States, and a resident of Nashua, county of Hillsboro, State of New Hampshire, have invented an Improvement in Methods of and Apparatus for Draining a Moist Web in Paper Making, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to paper making and more particularly to methods of and apparatus for handling a web or fibre layer while in a moist or formative stage and for removing the excess water therefrom.

The invention is applicable either to machines where the web is formed and cut into slabs or sheets and set aside for storage or shipment, or to other situations as, for example, where the formed web is passed on and subjected immediately thereafter to the action of further apparatus.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustration showing one specific application thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:—

Fig. 1 is a side elevation showing one type of web-forming machine embodying one form of the invention;

Fig. 2 is a plan view of the machine shown in Fig. 1;

Fig. 3 is a side elevation of a machine embodying a slightly modified form of the invention;

Fig. 4 is a central, sectional elevation, partly broken away, of one form of perforated expressing roll;

Fig. 5 is an end view of the roll shown in Fig. 4;

Fig. 6 shows more or less diagrammatically the principal elements of the machine illustrated in Figs. 1 and 2;

Fig. 7 is a similar diagrammatic representation of a modified form of the invention;

Fig. 8 is a similar diagrammatic representation of the machine represented in Fig. 3; and

Fig. 9 is a similar diagrammatic representation of still another modification.

Referring to the drawings and to the apparatus which is therein disclosed for illustrative purposes, I have therein shown a machine which is adapted to receive stock with the fibres held in liquid suspension, to form a web or fibre layer therefrom and express or remove the water from such layer.

Referring more particularly to Figs. 1, 2 and 6 I have there shown for illustrative purposes a web-forming apparatus which employs the tank casing 1 containing the chamber 2 to which stock may be fed through any suitable means. Herein the stock passes from any suitable source to the stock inlet 3 entering the delivery chamber 4, and thence over the baffle plate 5 to the tank space 2 where it is delivered to the web-carrying surface of the cylindrical screen drum or cylinder mold 6, the latter being partly immersed in the stock and adapted to rotate in the direction of the arrow (Figs. 1 and 6).

The constructional details of this cylinder mold are immaterial, and it may have any of the usual constructional characteristics of an apparatus of this class, the water being ordinarily compelled to pass from the exterior of the cylinder to the interior thereof through a suitable foraminous or screening surface, the screened liquid or white water passing through a suitable discharge outlet 7.

In the form of machine shown in Figs. 1, 2 and 6, the web-forming apparatus also includes the couch roll 10 which rests in direct frictional engagement with the cylinder mold. The couch roll may be of any suitable construction and adapted to remove, by pressure and direct contact with the cylinder mold, the accumulation of wet fibre thereon. The couch roll, by way of example, may be constructed of wood covered with a woolen or felt jacket of suitable thickness to take up the fibre and to some extent extract the moisture therefrom.

Herein the couch roll is supported to rotate in bearings 11 carried by the arms 12, the latter pivoted at 13 on the casing, the weight of the couch roll pressing it into fric-

tional engagement with the cylinder mold. The degree of contact with the cylinder mold may be adjustably limited in any desired way, as, for example, by the blocks 14 on the arms 12 which rest against the upright adjusting screws 15 on the casing 1.

As the wet fibre layer or sheet passes around the couch roll, it is subjected, in the form of machine shown in Figs. 1, 2 and 6, to the action of means which serve to remove the water from the fibre by expressing the same and causing the same to drain away without interference with the continuing travel or advance of the fibre web or sheet.

Herein such means is embodied in the form of a perforated expressing roll 20 arranged to be mechanically pressed against the couch roll 10, so that the water forced out of the fibre is allowed to drain away to the exterior of the roll through the perforations in the surface thereof. Preferably also the surface of the expressing roll 20 has a greater adhesive attraction for the fibre layer than the couch roll or other sheet-carrying member opposed thereto, so that the water is not only expressed and withdrawn by the pressure of the perforated roll against the fibre, but the sheet is also picked up and carried by the presser roll and further drained in its passage thereover.

An expressing roll of this character may be constructed in any suitable way, an illustrative example of such a device being shown in Figs. 4 and 5. Therein the perforated covering 21, which may be of perforated sheet metal of any suitable mesh, is supported upon a series of spiders, the latter having each the circumferential supporting ring 22 connected by the radial arms 23 with the hub 24. These spiders are assembled upon the pipe or tubular member 25 with their ends in abutment, and preferably with the arms 23 of successive spiders occupying a staggered relation, the spiders being held against displacement at one end by the headed member 26 fixed in one end of the tube, and at the other end by the plate 27 bolted to the sleeve 28 fixed in the opposite end of the tube. The members 26 and 28 are secured to the journal members 29, which latter are mounted in bearings 30 (see Fig. 1), the latter slidably mounted on the supporting arms 12.

The character of the surface of the expressing roll and the shape, size, location and number of the perforations may be widely varied while securing the desired relative adhesive qualities and the desired drainage capacity. By way of illustration and without in any way limiting my invention thereto, I have found satisfaction with a smooth, sheet-metal surface employing closely arranged round perforations varying from four-hundredths of an inch or less in diameter to one-tenth of an inch or more

in diameter, according to the character of the stock employed. Thus, the larger perforations appear to be preferable for sulphite and the smaller perforations for ground wood. The sheet metal is of sufficient thickness and the spiders sufficient support to permit the roll to withstand a considerable surface pressure.

The bearings 30 for the expressing roll being slidably mounted on the arms 12, mechanical pressure against the couch roll is applied to the expressing roll by means of a coiled spring 31 at each side of the machine on the adjacent arm 12 and located between the bearings 30 and the hand wheel 32. These springs are each adapted to be compressed more or less by the adjustment of the hand wheel 32, which, as shown, engages with the screw-threaded portion of the supporting arms 12.

In the operation of the machine, the cylinder mold being turned through the drive pulley 33 connected to any suitable source of power, the formed web is carried up by the web-carrying surface of the cylinder mold and removed by the couch roll 10, thence passing up and between the couch roll and the expressing roll 20. The pressure of the latter against the wet fibre expels the excess water, the latter, however, escaping freely through the perforations in the surface of the expressing roll and draining out through the bottom of said roll into the delivery chamber 4 where it mingles with the incoming stock. This excess water drains away without interfering with the advance of the fibre and the latter tends to leave the couch roll and cling to the perforated expressing roll. The fibre layer which is picked up by the perforated expressing roll, is thereupon carried up and over the latter, thereby affording opportunity for the drainage and withdrawal of the remaining excess water through the perforations in the roll. To remove the drained fibre layer from the presser roll, the doctor or stripper blade 34 may be provided, the latter being carried in supports 35 secured to the ends of the supporting arms 12.

In Fig. 7 I have shown a modified form of the machine illustrated in Figs. 1, 2 and 6, wherein the presser roll 20 is held mechanically pressed against the cylinder mold 6 and performs both the function of a couch roll and an expressing roll. In the operation of this form of machine, the cylinder mold being driven in the direction of the arrow shown, the fibre layer formed thereon is compressed by the presser roll 20, the water expressed thereby draining down through the interior of the cylinder mold and also through the interior of the perforated presser roll 20, as indicated in Fig. 7, the latter portion of the drainage passing

down through the bottom of the roll where it strikes the deflecting plate 36 which prevents it from striking the web which is being formed and carried up by the cylinder mold. The web as it is picked up by the expressing roll is carried around and stripped therefrom by the doctor 34.

In Figs. 3 and 8, I have shown a web-forming machine employing one or more imperforate presser rolls 40 running in close proximity to the perforated roll 20 and adapted to press the web against said roll in such manner as to augment the expression and drainage which the web has already undergone and to express the remnant of the moisture from the web to any desired extent without disturbing or lifting the fibre. By these or similar means substantially all the excess moisture may be withdrawn. Such expressed water drains through the perforations to the interior of the perforated roll and again into the inlet chamber 4. To prevent the imperforate presser rolls from picking up the fibre layer, they are preferably made with a smooth but somewhat porous surface. Their material may be metal or wood (the latter with the grain on end), according to the character of stock employed, wood being preferably used in the case of ground wood and metal in the case of sulphite. If desired, rolls made of polished porous stone may be employed to good advantage.

The auxiliary presser rolls 40 which are preferably of smooth surface or otherwise constructed so as to have no tendency to withdraw the fibre from the presser roll 20, may be mounted in any suitable way to secure the desired pressure against the presser roll, being herein shown as carried each in bearing boxes 41 which are slidably mounted in the frame 42 and adjustable each to and from the presser roll by means of the hand wheel 43 and the threaded rod 44. The frame 42, as shown in Fig. 3, is carried upon the supporting arms 12, together with the presser roll bearings 30, pressure between the couch roll 10 and the presser roll 20 being regulated by the compression spring 45 and the adjusting nut 46, the vertical position of the supporting arms 12 being regulated by the handled nuts 47 on the upright threaded rod 48 swiveled at 49 to the casing.

While the machine illustrated in Figs. 6 and 7 is in the form of a decker, the same principles may be employed to produce a drained fibre layer which may be utilized for any appropriate purpose. Such web or fibre layer may be carried in the form of a continuous traveling sheet to further apparatus, or it may be formed and cut into sheets, as in the usual wet machine (as will more fully appear), but without the necessity of using the ordinary felt carrier.

When it is attempted to pass wet or

moist fibre between rolls which are pressed toward each other, without the aid of a felt apron or other light traveling carrier, the water which is forced from the fibre passing between or to the rolls tends to work back and carry the fibre with it, preventing it from advancing with the rolls. That is to say, the expressed water being driven to its only path of escape, forces back the fibre and prevents its advance to the rolls. I find, however, that by the use of the perforated expressing roll, of which the roll herein described is an illustrative example, the wet fibre may be held to or toward its designed path of travel between the rolls, while at the same time the expressed water may be extracted and allowed to drain away without interference with the desired progress and advance of the fibre.

The drained fibre web passing from the presser roll 20 may, therefore, be carried to the press rolls, similar to the press rolls of an ordinary wet machine, such press rolls being indicated diagrammatically in Fig. 8 by the smaller roll 50 and the larger roll 51. These press rolls 50 and 51 may be driven by any suitable mechanism and may be of any desired or usual construction. The roll 50, for example, may be of metal and the roll 51 of wood, any usual means (not shown) being preferably provided for journaling the rolls so that they can be yieldably and adjustably forced into contact with each other.

In the form of machine shown in Fig. 8, the stripper plate or doctor 34 supported by the frame 42, removes the drained web from the perforated presser roll 20 and guides it downwardly between the press rolls 50 and 51. Passing between the rolls 50 and 51, it adheres to the larger roll 51 and is allowed to build up by successive rotations until it reaches the desired thickness, whereupon it is stripped by the operator from the roll in the form of a slab or sheet and set aside for future use. Obviously, any of the other modified forms of machine may be employed in connection with similar presser rolls, or, if desired, the drained web may be carried to any other desired apparatus in the form of a continuous traveling sheet.

In Fig. 9 I have shown still a further modified type of machine in the form of a decker wherein the action of the presser roll 20 against the couch roll 10, and the subsequent action of the imperforate, non-adhering roll 40 against the expressing roll 20, is supplemented and succeeded by the further action of an imperforate presser roll 50 having such a surface that the fibre sheet tends to adhere thereto and leave the imperforate presser roll 20. The fibre sheet passing up and around the presser roll 50 is stripped therefrom by the doctor 34. In this form of machine the excess water is

withdrawn through the perforater roll not only at a point adjacent the couch roll 10 and the press roll 40, but also at a point adjacent the adhering presser roll 50.

While I have herein shown and described for purposes of illustration one specific form of the invention, it is to be understood that extensive deviations may be made therefrom and other uses and applications than those herein referred to may be made thereof, all without departing from the main spirit and purpose of the invention.

Claims—

1. In an apparatus for forming a fibre web in paper making, the combination with a web-carrying surface, of a perforated roll pressed toward said surface and against the web thereon and adapted to receive interiorly water expressed through its perforations and to drain said water from within through said perforations.

2. In an apparatus for handling a moist fibre layer or web in paper making, the combination with a web-carrying surface, of a roll pressed toward said surface against the web thereon, said roll having a relatively adhering and perforated surface adapted to pick up the web from the web-carrying surface and receive the expressed water from the web through the perforations of the roll and to drain or discharge the water thus received back through said perforations.

3. In an apparatus for extracting excess water from a continuous traveling web of pulp, the combination with a web-carrying surface, of a perforated expressing roll pressing against the web on said surface and adapted to pick up the web therefrom, said roll having provision to receive water through its perforations from the web and to drain it back through its perforations without disturbing the web.

4. In an apparatus for handling a moist fibre layer in paper making, the combination with a web-carrying member, of a perforated expressing roll, and means for pressing the latter against the web carried on the carrying member, said roll having provision to receive water through its perforations from the web and to drain it back through its perforations without disturbing the web.

5. In a beltless web machine forming a drained fibre web in paper making, the combination with a cylinder mold, of a couch roll adapted to take the web directly from the cylinder mold, and a perforated press roll for expressing and draining the water from the formed web without disturbing the latter.

6. In a machine for forming a drained fibre web in paper making, the combination with a cylinder mold, of a couch roll, a perforated expressing roll pressed toward the couch roll and having a perforated and

relatively adhering surface adapted to pick up the web from said couch roll and drain the excess water therefrom through the perforations of the roll without disturbing the web.

7. In a machine for handling moist fibre layers, the combination with a web-carrying member, of a perforated expressing roll pressed toward said member and adapted to receive the web therefrom, and one or more relatively non-adhering rolls adapted to press the web against said perforated expressing roll, the latter having provision for draining away the expressed water through its perforations without disturbing the web.

8. A web-forming apparatus in paper making, having a cylinder mold, couch roll, perforated expressing roll pressed against the web on the couch roll and adapted to pick up the web therefrom, and one or more imperforate press rolls pressed against the web on said expressing roll.

9. In a paper machine for handling a moist fibre layer, the combination with engaging presser rolls, of means for presenting a moist fibre layer to be received between said rolls, said means including a web-carrying member and a perforated expressing roll pressed against the web carried thereon and adapted to receive and carry the web and to drain water from the fibre layer prior to its presentation between the presser rolls.

10. In a paper-making machine, the combination with a cylinder mold, of a pair of presser rolls to which the moist fibre layer formed by the said cylinder mold is conveyed, and a perforated expressing member pressed against the conveyed web having provision for picking up the web and conveying the same, said roll having provision for draining away through the perforations the water expressed thereby, whereby water is removed from the web prior to its presentation to the presser rolls.

11. The process of draining a continuous web of moist fibre, which consists in passing the web over a perforated roll and applying pressure to express the water from the web through the perforations of the roll and then draining the water away back through the perforations of the roll.

12. The process of draining and pressing a web of moist fibre, which consists in first expressing the water therefrom by a rolling action between two web-carrying surfaces, transferring the web from one surface to the other, draining the expressed water by gravity away from and without disturbing the web, and thereafter subjecting the web to the pressing operation.

13. The process of draining and pressing a web of moist fibre which consists in first expressing the water therefrom by pressure produced through a rolling action between two web-carrying surfaces, transferring the

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web from one surface to the other and draining the expressed water by gravity without disturbing the web.

14. In an apparatus for forming a fibre web in paper making, the combination with a web-carrying surface of a perforated roll pressed toward said surface and against the web thereon and adapted to take the web from said surface and to drain the expressed water by gravity away from the web and through the perforations of the roll.

15. In an apparatus for forming a fibre web in paper making, the combination with a web-carrying surface of a perforated roll pressed toward said surface and against the web thereon and adapted to take the web from said surface and to drain the expressed water by gravity and without interference with the web.

16. In an apparatus for forming a fibre web in paper making, the combination with a web-carrying surface of a hollow, perforated roll pressed against said surface and against the web thereon and adapted to take the web from said surface and to withdraw the water by gravity to a perforated side of the roll out of contact with the web.

17. In a paper-making apparatus for removing water from paper stock, the combination with a perforated traveling surface of a cooperating roll, said surface and roll being so related as to permit the presentation between them of stock from which the water is to be expressed, and the roll and the surface being pressed toward each other to

express water from the stock and cause it to pass through the perforations of the surface, said roll and surface also being so positioned as to permit the water expressed from the perforations to gravitate and drain away from the stock from which the water has been expressed through perforations in the lower part of the roll.

18. In a paper-making apparatus for removing water from paper stock, the combination with a perforated hollow roll of a cooperating pressure roll, means to present stock from which water is to be expressed between the two rolls, means cooperating with said rolls to exert pressure one against the other and means to drain the water by gravity which has escaped through the perforations in the lower part of the roll and divert it from the thickened stock.

19. In a paper-making apparatus for removing water from paper stock, the combination with a perforated hollow roll of a cooperating pressure roll, means to present stock from which the water is to be expressed between the two rolls, the pressure roll being located to press the stock against a portion of the upper part of said perforated roll, whereby the water expressed may drain by gravity through the lower part of said roll without interference with the thickened stock.

In testimony whereof, I have signed my name to this specification.

ANTON J. HAUG.