

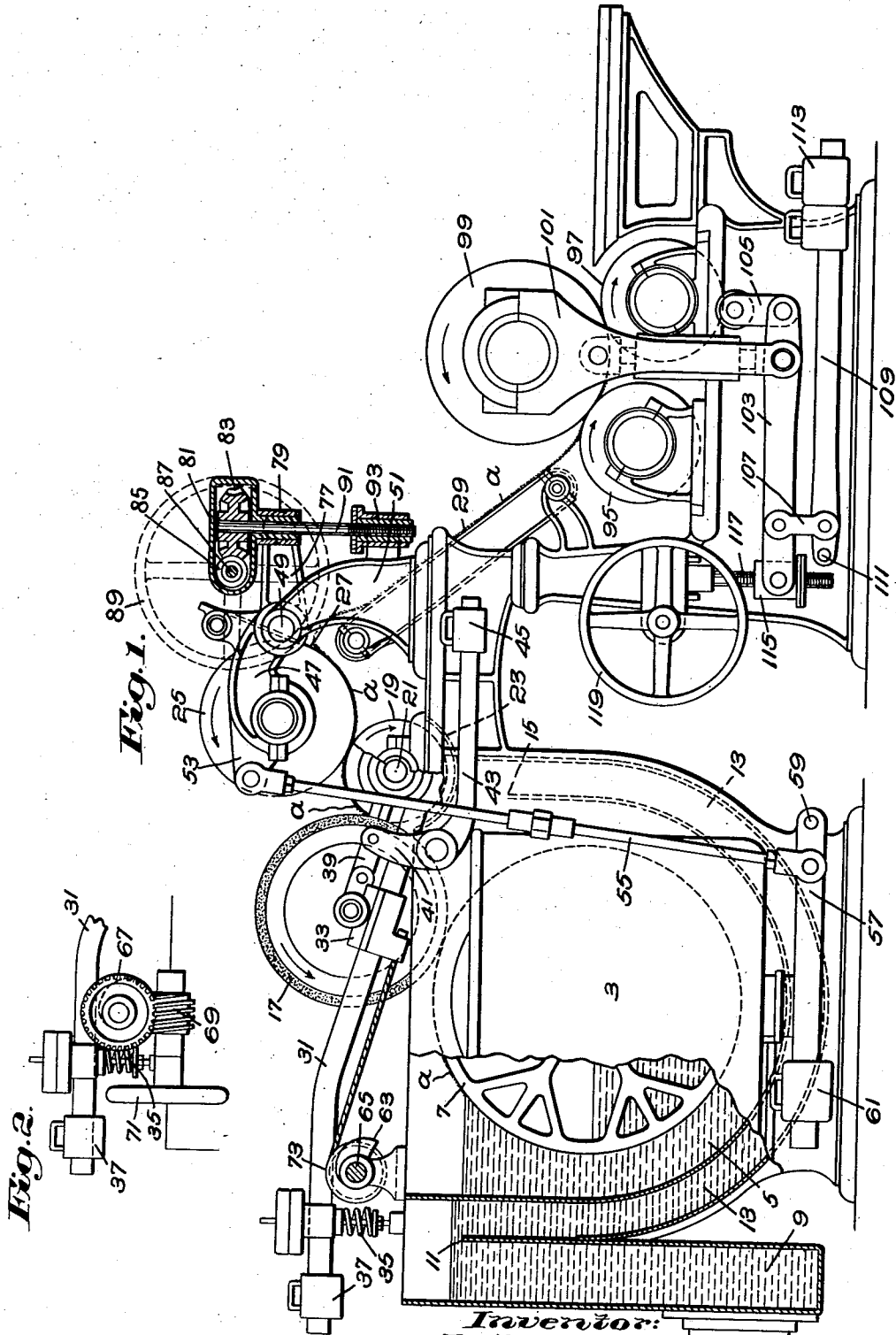
March 30, 1926.

A. J. HAUG

1,578,729

METHOD OF AND APPARATUS FOR MAKING PAPER

Filed March 22, 1924



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Patented Mar. 30, 1926.

1,578,729

UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR MAKING PAPER.

Application filed March 22, 1924. Serial No. 701,118.

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, in the county of Hillsborough and State of New Hampshire, have invented an Improvement in Methods of and Apparatus for Making Paper, 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 forming and handling a web or fibre layer while in a moist or formative stage and removing the excess water therefrom.

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

In the drawings,—

Fig. 1 is a side elevation of an apparatus embodying one form of the invention; and

Fig. 2 is a detail of the parts for moving the couch roll.

Referring to the drawings, I have there shown for illustrative purposes one form of the invention embodied in a structure utilizing in part an apparatus of the type illustrated in my prior Patent No. 1,045,211, dated January 31, 1922, but the same as to many of its features may be adapted to various uses and applied to apparatus of quite dissimilar type.

Referring more particularly to the specific embodiment of the invention there illustrated, the same comprises a web-forming apparatus employing a tank 3 having a stock chamber 5 within which is mounted the cylindrical screen drum or cylinder mold 7, the latter being partly immersed in the stock and adapted to be rotated in the direction of the arrow by driving means not herein shown. The constructional details of this cylinder mold are immaterial and it may have any of the usual features of apparatus of this class, the liquid 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 the ends of the cylinder mold through suitable discharge orifices (not shown).

It is desirable in this class of machinery that the pulp supply be evenly distributed and that its flow be steady and calm in all parts of the tank. For this purpose the stock is first admitted through a feed spout or compartment 9 in which it rises and flows over a weir 11 into an intermediate chamber or compartment 13 which extends outside of and beneath the stock chamber 5 to the opposite side thereof where the pulp then flows over a second weir 15 into the stock chamber at the descending side of the cylinder mold, flowing through the tank in the direction of rotation of the cylinder mold.

The fibres are deposited on the wire covering of the cylinder mold forming a layer of pulp which is brought up by the revolving mold and subjected to the action of the couch roll 17 which rests in direct frictional contact with the cylinder mold and is driven by its engagement therewith.

The couch roll may be of any suitable construction which is adapted to remove by pressure and direct contact with the cylinder mold the accumulated wet fibre thereon. It may be constructed, for example, 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. The pressing of the stock by the couch roll, however, is intended primarily to close the sheet so that it can be picked up by the roll.

The web passing under the couch roll is next squeezed under heavier pressure between the couch roll and an expressing roll 19 which expresses water from the web and allows it to drain away without interference with the continuing travel of the web. For this purpose the expressing roll has a porous or perforated surface and the expressed water drains away in large part through the perforations of the roll. The surface of the expressing roll has a greater adhesive attraction for the fibre layer than the couch roll so that the water is not only forced out but the sheet is also picked up and carried by the expressing roll and further drained in its passage therefrom.

The expressing roll 19 is preferably con-

constructed so as to be capable of withstanding considerable pressure and may, for example, be similar to that described in my aforesaid prior patent where there are provided a series of spiders assembled upon the sleeve, the latter mounted on a shaft 21, the circumferential edges of the spiders providing a series of supporting rings which is covered by a perforated sheet-metal covering adapted to withstand considerable surface pressure. The couch roll is preferably located at a level considerably above that of the axis of the perforated expressing roll, so that the expressed water can readily drain away into the interior of the expressing roll and through the perforations at the bottom thereof without again coming in contact with the web. A trough 23 (similar to that shown in my prior co-pending application, Serial No. 612,033, filed January 11, 1923) may be provided beneath the expressing roll to receive liquid expressed from the web and maintain a body of liquid in which the lower part of the expressing roll is immersed. This tends to wash the accumulated fibres from the perforations of the expressing roll. The liquid from the trough 23 overflows into the stock chamber 5.

The web (which is represented at a) passes over the expressing roll and is then engaged between the latter and the imperforate pressing roll 25, the latter being mounted so that it may be pressed toward the expressing roll and exert pressure against the web still heavier than that to which the latter has previously been subjected. The pressing roll 25 has a smooth, hard surface and tends to express a large part of the remnant moisture from the web, the water passing down through the perforations of the perforated roll to the interior and out through the bottom thereof. Much of the air at the same time is expelled from the web, so that the latter clings to the roll 25 and passes around the underside thereof, being stripped from the roll by a doctor blade 27 and falling on the feed apron 29, whence it is carried to an apparatus for imparting to it the final compression.

It will be seen that in that part of the machine so far described four rolls are provided which maintain three contact points. The stock sheet varies in thickness and at each contact point provision should be had whereby the rolls are free to separate more or less to admit of this variation while still maintaining the desired pressure. Provision is herein had whereby the coacting rolls at each point of contact are under yieldable pressure, permitting the necessary automatic separation without disturbing the conditions at any of the two remaining contact points. Thus, in the illustrated embodiment of the invention, the couch roll is free to move to and from the cylinder mold without affect-

ing its relation to the perforated roll 19 and is also free to move to and from the perforated roll without affecting its relation to the cylinder mold. Similarly the heavy pressing roll 25 is free to move to and from the perforated roll without affecting the relation of the latter to the couch roll or the contact of the couch roll with the cylinder mold.

For this purpose in the described embodiment of the invention, the shaft 21 of the perforated roll is mounted in bearings fixed on the machine frame. At each side of the machine there is provided a lever arm 31 having a pivotal axis coinciding with the axis of the expressing roll shaft 21. Each end of the couch roll shaft is journaled in a bearing block 33 mounted on the lever 31 and adapted to slide on the same. The end of each lever 31 rests upon an adjustable compression spring 35 by which the pressure on the couch roll against the mold may be decreased as required. If found necessary to increase the pressure, adjustable weights 37 may be used at the ends of the levers 31.

The necessary pressure between the couch roll 17 and the perforated roll 19 is normally maintained by an arrangement which includes at each side of the machine a link 39 one end of which connects the couch roll bearing block 33 with one arm 41 of a bell crank lever pivoted at the side of the machine frame, the opposite arm 43 of the lever being weighted at 45 to draw the bearing blocks and the couch roll toward the perforated expressing roll 19. The pressure between the two rolls may be adjusted by the weights 45. The center of the couch roll lever pivot coinciding with the center of the perforated roll, the couch roll is free to move to and from its contact point with the cylinder mold but its movement describes an arc, the center of which is at the axis of the perforated roll so that any movement of the couch roll away from the cylinder does not interfere with its contact with or pressure against the perforated roll. On the other hand, movement of the couch roll bearings along the pivoted levers 31 has no substantial effect on the contact or pressure of the couch roll on the cylinder mold.

To obtain pressure between the heavy pressing roll 25 and the perforated roll 19, the former is mounted in bearings carried at each side of the machine by a lever 47, which latter is pivoted at 49 on a standard 51. Each lever 47 has an extension 53 which is secured by the depending link 55 to a lever 57 pivoted at 59 near the bottom of the machine frame, the opposite end of the lever having an adjustable weight 61. By means of the latter the pressure between the rolls 25 and 19 may be regulated and pressure and contact between these rolls may be automatically adjusted to suit the varying thick-

ness of the web without affecting the conditions between the remaining rolls.

It will be observed that all contact points between various rolls are exposed and can be readily observed. Also that the entire framework and supports are so designed as to make these points readily accessible.

It is very desirable that the rolls should not contact with each other when the machine is not in operation so that the true cylindrical surfaces of the rolls may be preserved intact and without deformation. For this purpose provision is made whereby the operator can readily lift the couch roll away from the cylinder mold. The bottom of each lever arm 31 is adapted to be engaged by an eccentric or cam 63 secured to a transverse shaft 65 mounted on the machine frame. This shaft (see Fig. 2) has secured to it a worm gear 67 meshing with a worm 69 secured to the short shaft at one side of the machine, so that the operator by turning the hand-wheel 71 on the shaft 69 can turn the eccentrics and raise the couch roll away from the mold. The shaft 65 is also provided adjacent each cam 63 with a winding drum 73 connected by a rope or cable 75 to the bearing block 33 so that when the shaft is revolved to lift the couch roll the cable 75 is wound around the pulleys and the couch roll simultaneously moved away from the perforated roll against the pull of the weights 45. This leaves the machine with the couch roll separated from both the cylinder mold and perforated roll.

To raise the heavy pressing roll 25 from contact with the perforated roll, each supporting lever 47 has a rearward extension 77 pivotally connected to a sleeve 79, which latter depends from a housing 81 containing the worm gear 83 and worm 85. A worm shaft 87 is journaled in the housings 81 and by means of the hand-wheel 89 the worm and worm gear may be turned and turning movement imparted to each screw 91, the upper end of which is secured to the worm gear 83 and the lower end of which engages with a threaded sleeve 93 which is pivotally mounted on arms secured to the upright 51. By turning the hand-wheels each frame or housing 81 is depressed causing a shouldered portion thereof to engage with the rearward extension 77 of the lever and thereby lift the pressing roll 25 from the perforated roll against the pull of the weight 61. When the hand-wheels are reversely turned the screw 91 acts to lower the pressing roll until it contacts with the perforated roll, further movement thereof acting to lift the shouldered portion of each frame 81 from its lever 79 so that the automatic up and down movement of the roll 25 is unimpeded.

Referring now to the apparatus for applying the final pressure to the web, the same is provided with two bottom rolls 95 and 97

which are out of contact with each other and a heavier top press roll 99 which rests on and makes contact with the bottom rolls. The bottom rolls are perforated and may be of generally similar construction to the roll 19, each providing thereby an expressing and draining drum through which the expressed moisture may pass into a suitable tank below. The overlying roll 99 is preferably smooth and imperforate and of any suitable material, such as wood. The web *a* after being stripped from the roll 25 descends on the feed apron 29 and passes between the rolls 95 and 99, and thence between the rolls 97 and 99, winding around the latter, from which it may be cut off either by hand or automatically in the form of slabs or sheets when built of sufficient thickness or it may be removed from the top roll in a continuous sheet.

It will be observed that the first bottom roll 95 is set higher than the succeeding bottom roll 97 so that the top roll 99 exerts a greater pressure on the web over the second roll than over the first. Through this arrangement the web is pressed by stages of increased pressures, the last pressing being heavier than the first. By this arrangement a heavier sheet can be handled without crushing under the press rolls and a sheet can be pressed drier than can be done on the ordinary press.

In the disclosed embodiment of the invention, the upper press roll 99 is pressed against the bottom roll by any suitable means, such as a system of weights and levers. For this purpose the bearings of the press roll 99 are mounted at each side of the machine in an upright standard having a limited vertical movement, the lower end of the standard being pivoted to the lever 103 one end of which is supported on one end of the machine frame by the link 105. Near the opposite end there is a depending link 107 connected to the underlying lever 109 pivoted at 111, the opposite end of the lever 109 being provided with adjustable weights 113. By means of the latter the weight of the press roll itself may be supplemented more or less to increase the pressure to any desired amount.

To raise the press roll 99 out of contact with the bottom rolls 95 and 97 when the machine is out of operation the free end of the lever 103 is pivotally connected to a threaded sleeve 115 cooperating with the screw 117, the latter being adapted to be raised and lowered by the hand-wheel 119 and suitable worm gear connections, similar in principle to those described in connection with the roll 25.

While I have herein shown for purposes of illustration one specific embodiment of the invention, it is to be understood that the same is not limited to the mechanical de-

tails herein shown or to the form or relative arrangement of parts, but that extensive deviations may be made therefrom, all without departing from the spirit of the invention.

Claims.

1. In an apparatus for handling a moist fibre web, the combination with a train of rotary members adapted to convey the web in succession from one to another, the same comprising a cylinder mold, a couch roll, a perforated expressing roll pressed against the couch roll and a press roll pressed against the perforated expressing roll, of provision permitting relative separation of said rotary members at the three points of engagement each without affecting the relation between the remaining members.
2. In an apparatus for handling a moist fibre web, the combination with a train of rotary members adapted to convey the web in succession from one to another, the same comprising a cylinder mold, a couch roll, and a perforated expressing roll pressed against the couch roll, one of said members being mounted to move toward and from another member in a curvilinear path concentric with the axis of the remaining member.
3. In an apparatus for handling a moist fibre web, the combination with a train of rotary members adapted to convey the web in succession from one to another, the same including a cylinder mold, a couch roll and a perforated expressing roll, of a device to provide a yieldable pressure between the couch roll and expressing roll, and a support for the couch roll permitting the latter to move to and from the cylinder mold in a path concentric with the axis of the expressing roll.
4. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll pressed against the couch roll, a support for the couch roll bearings pivoted at a point substantially concentric with the axis of the expressing roll and permitting the couch roll to move toward and from the cylinder mold without affecting the relation between the couch roll and the perforated roll.
5. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, an expressing roll, couch roll supports pivoted at the axis of the perforated roll, and bearings for the couch roll mounted for movement lengthwise said supports to permit the couch roll to be pressed against the perforated roll and independently against the cylinder mold.
6. In an apparatus for handling a moist fibre web, the combination with a train of rotary members adapted to convey the web in succession, from one to another, the same comprising a cylinder mold, a couch roll, a perforated expressing roll pressed against the couch roll, and a press roll pressed against the perforated expressing roll, of stationary bearings for the perforated roll, couch roll and also toward and from the latter to permit relative separation of the couch roll and cylinder mold and couch roll and perforated roll, each independently of the other, and movably mounted bearings for the press roll to permit the latter to move toward and from the perforated roll.
7. An apparatus for handling a moist fibre web, comprising a train of expressing rolls adapted to take the web in succession from one to another and comprising an intermediate roll with provision for yieldably separating each one relatively to the preceding and succeeding roll, one of said rolls being movable in the path concentric with the axis of one of the remaining rolls.
8. An apparatus for handling a moist fibre web, comprising a train of expressing rolls adapted to convey the web in succession from one to another and comprising an intermediate roll, a succeeding roll with means for yieldably pressing it toward the intermediate roll, a preceding roll with bearing supports permitting it to move in a path concentric with the axis of the intermediate roll, and means for yieldably pressing the bearing supports toward the intermediate roll.
9. An apparatus for handling a moist fibre web, comprising a train of expressing rolls adapted to convey the web in succession from one to another, and including an intermediate roll, a succeeding roll having movable bearings carried by weighted supports to yieldably depress the succeeding roll against the intermediate roll, a preceding roll with bearings mounted on supports pivoted concentrically with the axis of the intermediate roll, said bearings being movable on said supports toward and from the latter roll, and weighted levers secured thereto to yieldably press the preceding roll toward the intermediate roll.
10. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a gravity depressed couch roll co-operating therewith, an expressing roll co-operating with the couch roll and adapted to take the web therefrom, bearing supports for the couch roll pivoted concentrically with the expressing roll, said couch roll having bearings on said bearing supports with means yieldably pressing the couch roll toward the expressing roll lengthwise said bearing supports.
11. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a gravity depressed couch roll co-

operating therewith, an expressing roll co-operating with the couch roll and adapted to take the web therefrom, bearing supports for the couch roll pivoted concentrically
 5 with the expressing roll, said couch roll having bearings on said bearing supports with means yieldably pressing the couch roll toward the expressing roll lengthwise said bearing supports, an additional press roll
 10 adapted to take the web from the preceding expressing roll, said last named roll being mounted in movable bearings, and means for yieldably pressing said roll toward said preceding roll.

12. In a paper making machine, the combination with a couch roll, of a perforated expressing roll adapted to take the web from the couch roll, a further expressing roll engaging the perforated roll and adapted
 20 ed to take the web away from the latter and means for positively moving and holding the last named expressing roll from contact with the perforated roll.

13. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a pair of expressing rolls adapted to convey the web in succession from one to another, the second expressing roll being yieldably depressed toward the
 30 first, and means for positively raising the second roll and holding it out of contact with the first.

14. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, an expressing roll adapted to take the web from the couch roll, a press roll resting against the expressing roll and adapted to take the web therefrom, pivoted arms supporting the press roll, and
 40 worm and gear mechanism for moving said arms to raise the press roll.

15. An apparatus for handling a moist fibre web having a train of rotary members, comprising a cylinder mold, a couch roll yieldably pressed toward the cylinder mold, an expressing roll with means for yieldably pressing the same in relation to the couch roll, a press roll with means for yieldably pressing the same in relation to the expressing roll, and devices for separating said rotary members each from its companion member and holding the same separated when the machine is out of operation.

16. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll with means for yieldably pressing the two rolls into engagement, and mechanism to raise the couch roll from the cylinder mold and simultaneously to separate the
 60 couch roll and perforated roll.

17. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll with means for yieldably pressing

the two rolls into engagement, mechanism to raise the couch roll from the cylinder mold and simultaneously to separate the couch roll and perforated roll, the same including pivoted supports for the couch roll, and
 70 couch roll bearings movably mounted on said supports.

18. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll with means for pressing the rolls relatively toward each other, devices to separate the couch roll from the cylinder mold, and devices to separate the perforated roll from the couch roll.

19. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll, supports for said couch roll pivoted at the axis of the expressing roll, devices for
 85 moving the supports to separate the couch roll from the cylinder mold, and devices for moving the couch roll on the supports to separate the same from the expressing roll.

20. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll with means for yieldably pressing the two rolls into engagement, mechanism to raise the couch roll from the cylinder mold and simultaneously to separate the couch roll and perforated roll, the same including pivoted supports for the couch roll, bearings movably mounted on said supports, and a hand operated device adapted to simultaneously raise the supports to separate the couch roll from the cylinder mold and to move the bearings to separate the couch roll from the expressing roll.

21. In an apparatus for handling a moist fibre web, the combination with a cylinder mold, of a couch roll, a perforated expressing roll with means for yieldably pressing the two rolls into engagement, mechanism to raise the couch roll from the cylinder mold and simultaneously to separate the couch roll and perforated roll, the same including supporting arms for the couch roll, bearings slidably mounted on said arms, a cam shaft with cams for raising said arms, and a winding device and cable connection for sliding the bearings on said arms simultaneously with the raise thereof.

22. An apparatus for handling a moist fibre web, comprising a web carrying member, a perforated expressing roll pressing against the web on said member to express water therefrom, a press roll to receive the web from said perforated roll, and a train of press rolls to which the web is delivered, including a pair of adjacent rolls over which the web passes in succession and an overlying roll yieldably depressed against said adjacent rolls, the succeeding one of said adjacent rolls being at the lower level than
 120
 125
 130

the preceding one to increase thereat the pressure of the overlying roll on the web.

23. In an apparatus for pressing and drying a moist fibre web, the combination with
 5 two adjoining but separated perforated rolls, of an overlying press roll yieldably pressed down toward both underlying rolls, and means for feeding the web to pass first between the overlying press roll and one of the
 10 underlying rolls and then between the overlying press roll and the remaining underlying roll.

24. In an apparatus for pressing and drying a moist fibre web, the combination with
 15 two adjoining but separated perforated rolls, of an overlying press roll yieldably pressed down toward both underlying rolls, and means for feeding the web to pass first between the overlying press roll and one of
 20 the underlying rolls and then between the overlying press roll and the remaining underlying roll, said remaining underlying roll being at a lower level than its companion to increase the pressure of the press roll
 25 thereat.

25. In an apparatus for pressing and drying a moist fibre web, the combination with
 two adjoining but separated rolls, of an overlying press roll yieldably pressed down
 30 toward both underlying rolls, and means for feeding the web to pass first between the overlying press roll and one of the underlying rolls and then between the overlying press roll and the remaining underlying roll.

35 26. In an apparatus for handling a moist fibre web, the combination with means for initially expressing and draining the water from the web, of devices for further express-

ing the water therefrom comprising a pair of adjoining but separated perforated ex- 40 pressing rolls and a weighted overlying press roll resting against both underlying rolls, and means to feed the web to pass between the overlying press roll and the underlying rolls in succession.

27. An apparatus for handling a moist fibre web, comprising a pair of separated but adjacent perforated expressing rolls, an overlying press roll pressed against said ex- 45 pressing rolls, means for conveying a web to pass between the press roll and said underlying rolls in succession, and means for positively raising the overlying press roll to separate the same from the underlying rolls. 50

28. The method 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 con- 55 veying the web between a common press roll and a pair of perforated rolls in succession to express further moisture therefrom.

29. The method 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 therefrom, and then conveying the web between a common press roll and a pair of perforated rolls in succession and subjecting the web to an in- 65 creasing pressure as it passes over the last named perforated rolls.

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

ANTON J. HAUG.