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G. L. BIDWELL

METHOD OF AND APPARATUS FOR MAKING MULTIPLY PAPER

Filed Aug. 4, 1925 2 Sheets-Sheet 1

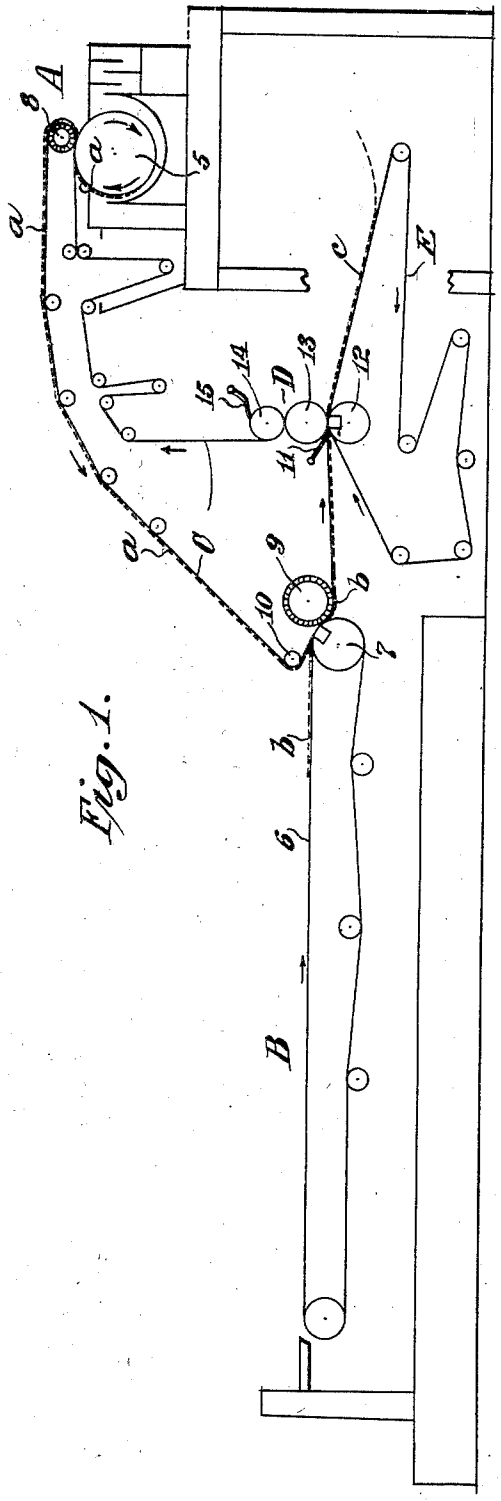

Fig. 1.

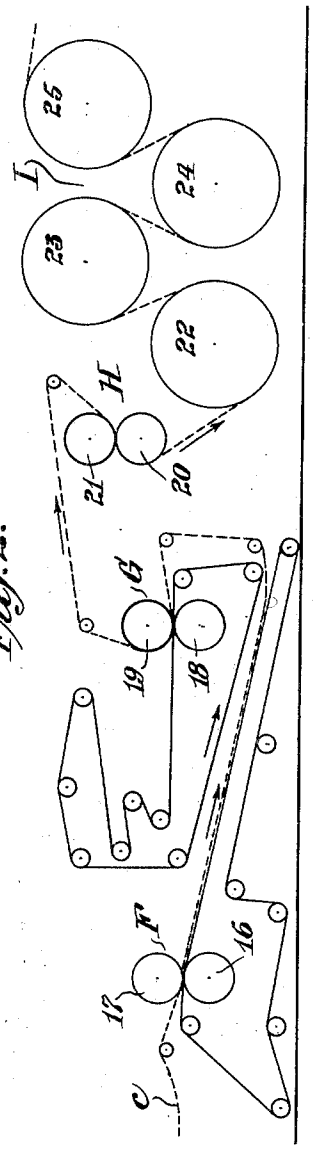

Fig. 2.

George L. Bidwell

INVENTOR

BY Wm B. Whitney

ATTORNEY

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Filed Aug. 4, 1925 2 Sheets-Sheet 2

Fig. 4.

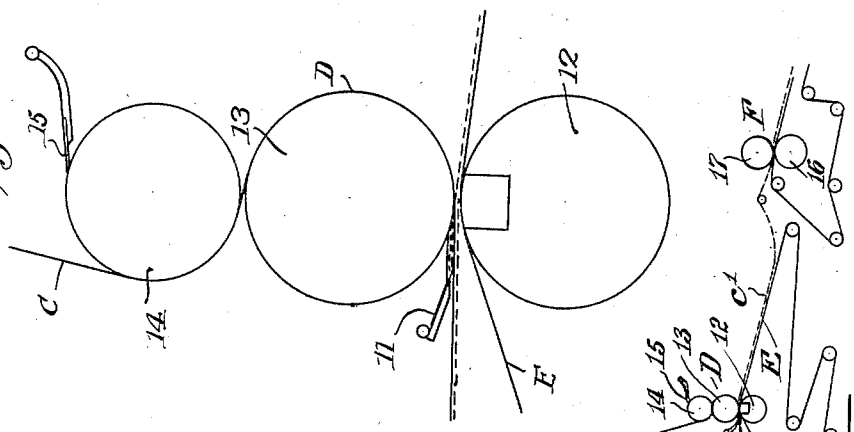
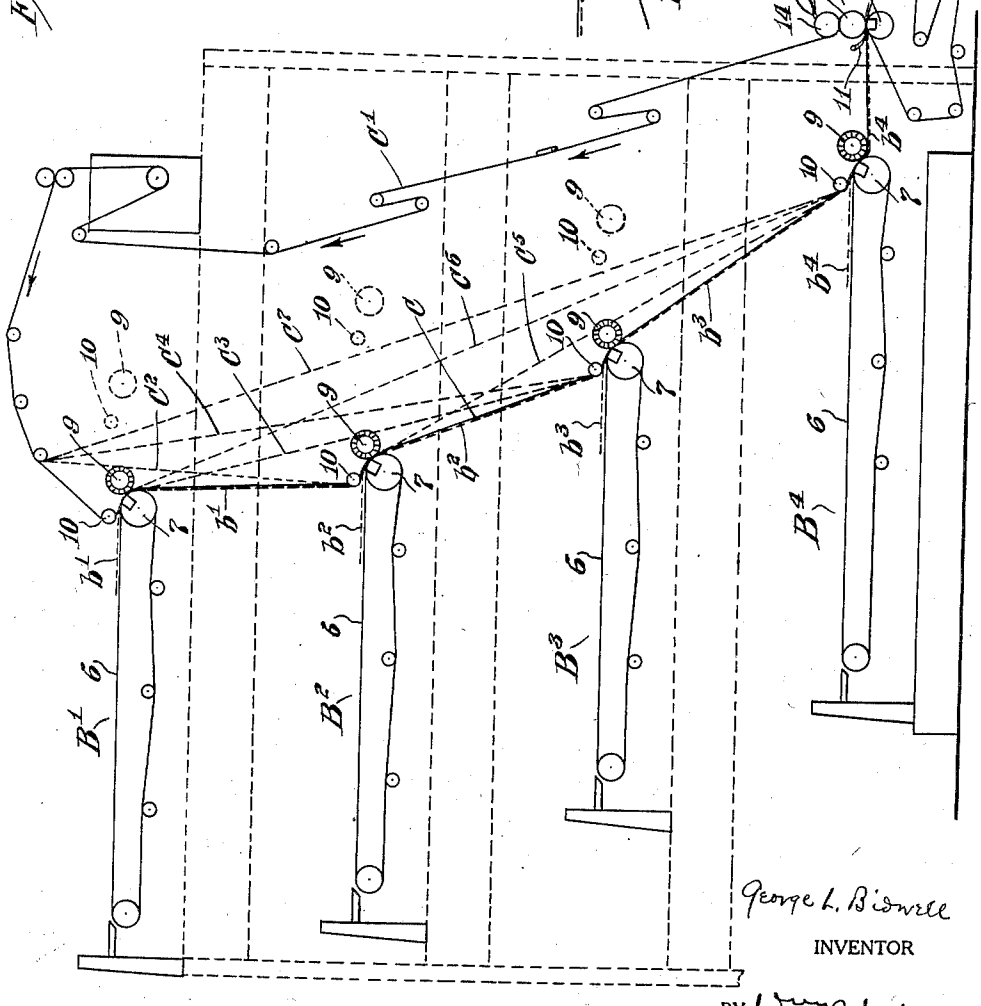


Fig. 3.



George L. Bidwell
INVENTOR

BY Wm. B. Whitney
ATTORNEY

Patented Sept. 4, 1928. 1,682,826

UNITED STATES PATENT OFFICE.

GEORGE L. BIDWELL, OF RIEGELSVILLE, PENNSYLVANIA, ASSIGNOR TO THE WARREN MANUFACTURING COMPANY, OF RIEGELSVILLE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

METHOD OF AND APPARATUS FOR MAKING MULTIPLY PAPER.

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The present invention relates to a multiply paper, and the object thereof is the production of such a paper in which the constituent plies are so interwoven and united as to form a substantially unitary sheet which will not split, no matter how severe the usage to which it may subsequently be put.

To this end the invention consists, broadly, in successively picking up the plies or webs of wet paper pulp from the wet end of at least two of a plurality of two or more standard paper-making machines, suitably arranged therefor and preferably including at least one Fourdrinier machine, upon an endless pick-up felt making contact with the wire screen of first one and then another of the machines, in then passing the wet paper webs between the pick-up felt upon which they have thus been superimposed and an outer endless wet felt through a suitable press, which puddles the pulp of the several webs by forcing water carried in the wet felt through the webs and the pick-up felt just before they enter the bite of the press, and in finally pressing, drying and finishing the composite paper sheet in the usual or in any suitable manner.

In the preferred practice of my invention I employ, where a two-ply paper only is to be made, one cylinder and one Fourdrinier machine, setting the cylinder machine above the Fourdrinier machine and so arranging the pick-up felt that it will pick up upon its outer side first the web of wet paper pulp from the cylinder machine and then that from the Fourdrinier machine, and, for a paper of two or more plies, a battery of Fourdrinier machines which are set one above the other with their wet ends so disposed that the pick-up felt may be made to contact with the wire screens of all or of any two or more of the machines, usually including the lowermost, as desired. The Fourdrinier machines are equipped with suction couches for the better control of the amount of the water which is to be left in the paper webs at the point where they are picked off therefrom. The pick-up felt is carried into contact with the wire of each paper-making machine, over a couch roll preferably of the type illustrated in Letters Patent to Hoffman, No. 533,356, January 29, 1895, or some equivalent thereof which, operating from its inner side, presses through the felt and against the wire of the paper-making machine and so picks up or, rather, couches off the web of paper at the point of contact. After the wet paper web has thus been couched off from the last or lowermost paper-making machine, which is set at such a level that the draw of the felt therefrom will be in an approximately horizontal plane, the pick-up felt with the several webs of wet paper superimposed on its outer and then under surface is carried to and through the suction press. This suction press, of the usual or of any suitable construction, is equipped with a bottom wet felt and with an upper felt slice, which slice drains off at the sides the water forced from the wet felt up through the paper webs and to the inner upper side of the pick-up felt and also serves as a dam to prevent the water from running out of the bite of the press and forcing the paper webs from the under side of the felt, and, in addition, carries on top of the upper press roll a metal roll on which is mounted the usual doctor for catching the fibers carried into the press when the machine is started up or when a break occurs in the paper web. The puddling of the wet paper webs between these two felts immediately before they pass into the bite of the press, in the manner hereinabove described, upsets their original formation and so interweaves and unites the fibers of the several webs as to form a substantially unitary one-ply sheet of paper, the suction action of the press at this point being such as to prevent a crush and so to help the final setting together or union of the plies. On passing through the suction press the pick-up felt is carried up and under the top iron roll and thence back over the usual pick-up and guide rolls and through a felt cleaner, the bottom wet felt is carried outwardly and over a guide roll and thence down and back, and the composite and now unified sheet of paper, stripped from the pick-up felt, is carried outwardly on the bottom wet felt from which it is

lifted and carried to and through or over the usual presses, dryers, etc.

The invention is shown, by way of illustration and not of limitation, in the accompanying drawings, in which—

Figure 1 is a view showing, diagrammatically, a cylinder and Fourdrinier machine, a pick-up felt, and a suction press suitably arranged for the manufacture of a two-ply paper according to my invention; Fig. 2 is a view, in continuation of the right-hand end of the view of Fig. 1, showing the presses, smoothing rolls and dryers through and over which the composite sheet of paper is passed after leaving the suction press; Fig. 3 is a diagrammatic view, similar to Fig. 1, of a battery of four Fourdrinier machines, a pick-up felt and a suction press for making a four-ply paper, illustrating an arrangement of the paper machines and of the pick-up felt whereby any one or more of the machines may be cut out of operation if, for instance, it is desired to make a paper of less than four plies; and Fig. 4 is an enlarged diagrammatic view of the suction press.

Referring first to Figs. 1 and 2, the apparatus therein illustrated comprises a cylinder machine A and Fourdrinier machine B, both standard paper-making machines, an endless woolen blanket C which serves as a pick-up felt, a suction press D, a bottom wet felt E, and the usual second and third presses F and G, smoothing rolls H and dryers I. The cylinder machine, which is provided with the usual wire-covered cylinder 5, is mounted in position, as shown, upon any suitable platform or other support. The Fourdrinier machine, the wire screen 6 of which passes at its wet end over a couch roll 7 preferably as stated a suction couch, is mounted upon a low base or support of a height sufficient to raise it to the level of the suction press. The endless pick-up felt C passes around a standard Hoffman or equivalent couch roll 8, by which it is carried into contact with the wire screen of the cylinder machine and thence over a series of support- and guide-rolls to and partially around a second Hoffman couch 9 and associated roll 10, which carry it into contact with the wire screen of the Fourdrinier machine as it passes over the couch, thence in an approximately horizontal plane beneath a felt slice 11 and between the rolls 12 13 of the suction press, and thence partially around the upper press roll, below and partially around the top metal roll 14 carrying the usual doctor 15, over guide- and take-up rolls and through a felt washer back to the cylinder machine. The bottom wet felt E runs between the rolls 12 13 of the suction press and thence outwardly at an incline and back over the usual guide- and take-up rolls. The wet paper web *a*, formed on the wire screen of the cylinder machine, is first picked up therefrom by the pick-up felt, then the web *b* is couched off from the wire screen of the Fourdrinier machine by the Hoffman couch and superimposed upon the web *a* on the then under side of the pick-up felt, and the two superimposed webs are carried thereon through the suction press between the pick-up felt and the bottom wet felt and are puddled as described. In leaving the suction press the composite paper sheet *c* is stripped from the pick-up felt and carried along upon the outward stretch of the bottom wet felt, from which it is lifted by a guide-roll and is thence carried, in the usual manner, between the rolls 16 17 and 18 19 of the two additional presses, both equipped with felts, the smoothing rolls 20 21, over the drying cylinders 22 23 24 25, and onto the finishing machine (not shown).

In the apparatus illustrated in Fig. 3, four Fourdrinier machines B^1 B^2 B^3 B^4 are set one above another, the lowermost on a slightly elevated base to raise it to the level of the suction press and the others upon mezzanine floors or other suitable platforms, with the couch roll 7 at the wet end of each of the three upper machines stepped back from that of the machine immediately below a distance progressively decreasing from the bottom upwards. The pick-up felt C^1 is carried from the last of a series of upper guide-rolls downwards, for a four-ply paper, over the four Hoffman couches 9 and accompanying rolls 10, each of which carries the felt into contact with the wire screen of one of the Fourdrinier machines and couches off therefrom upon the felt first the web b^1 and then in succession the webs b^2 b^3 b^4 from the other machines, and from the lowermost Hoffman couch and with the four wet paper webs superimposed upon its outer lower surface is carried, as in the case of the two-ply paper described, between the rolls 12 13 of the suction press, above the bottom wet felt E, where the webs are puddled as stated, and thereon up and back under the top metal roll 14, over the guide- and take-up rolls and through a felt washer, while the composite paper sheet c^1 is stripped therefrom and carried outwards on the wet felt and thence through and around the same presses and drying cylinders as hereinabove described. Each of the three upper Hoffman couches (and associated roll) is so mounted, however, that it may be moved outwardly within and bringing the felt away from the couch of the Fourdrinier machine, or it may be made removable altogether, and thus it is possible to carry the pick-up felt past and out of contact with any one, two, or all of the three upper Fourdrinier machines, as indicated by the broken lines C^2 C^3 C^4 C^5 C^6 C^7, the slack produced thereby in the felt being taken up by the take-up rolls. The lowermost Fourdrinier

machine may accordingly be operated with any one or two of the three upper machines, for making a two- or three-ply paper, the remaining machine or machines being cut out and stopped; and in this way machines making webs of different character, quality, or color may be operated in various combinations, as desired.

It is to be understood that both the method and the apparatus illustrated and described may be modified in their several details, within the scope of the appended claims, without departing from the spirit or sacrificing the substantial advantages of the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. The method of making a multi-ply paper which comprises forming a plurality of wet paper webs, successively picking up the webs upon a pick-up felt, and passing the pick-up felt with the webs superimposed upon its under side to and through a suction press in contact with a bottom wet felt.

2. The method of making a multi-ply paper which comprises forming a plurality of wet paper webs, successively picking up the webs upon a pick-up felt, passing the pick-up felt with the webs superimposed upon its outer under side to and through a suction press in contact with a bottom wet felt, and damming up the water pressed from the wet felt upward through the paper webs and the pick-up felt and draining it off at the sides of the latter.

3. The method of making a multi-ply paper which comprises as steps therein successively couching off and superimposing upon a pick-up felt the webs of wet paper as formed on a plurality of paper-making machines and puddling the superimposed webs by running them between the pick-up felt and a wet felt through a suction press.

4. The method of making a multi-ply paper which comprises selectively couching off upon a pick-up felt the wet paper webs from two of a greater plurality of Fourdrinier machines set one above another and from the last machine carrying the pick-up felt and the wet paper webs superimposed upon its then lower surface in a substantially horizontal plane through a suction press above and in contact with a wet felt.

5. In apparatus for making multi-ply paper the combination with means for forming a plurality of wet paper webs of means for superimposing the webs and means including a suction press and a web felt passing therethrough for puddling the superimposed webs.

6. In apparatus for making multi-ply paper the combination with means for forming a plurality of wet paper webs of means for superimposing the webs and means including a suction press and a wet felt running therethrough and a felt slice for puddling the webs.

7. In apparatus for making multi-ply paper the combination with means for forming a plurality of wet paper webs of means for successively couching off from the forming means and superimposing the webs and means including a suction press and a wet felt running therethrough for puddling the superimposed webs.

8. In apparatus for making multi-ply paper the combination with three or more Fourdrinier machines set one above another of means for selectively couching off and superimposing the paper webs from one of the upper and from the lowermost of the Fourdrinier machines and means for puddling the superimposed paper webs.

9. In apparatus for making multi-ply paper the combination with three or more Fourdrinier machines set one above another of means for successively couching off and superimposing the wet paper webs from any two or more of the Fourdrinier machines and means including a suction press and a wet felt running therethrough for puddling the superimposed webs.

10. In apparatus for making multi-ply paper, the combination of a plurality of paper making machines, a pick-up felt, and a plurality of couch rolls over which the pick-up felt is run, the couch rolls being so adjustably mounted with respect to the machines that the pick-up felt can be selectively carried into contact with the wires of one or more of the machines.

11. In apparatus for making multi-ply paper the combination of a plurality of paper-making machines set one above another, a pick-up felt, a plurality of couch rolls over which the pick-up felt runs and each of which is adapted to carry the felt into contact with the wire of one of the paper-making machines, a suction press which is located substantially at the level of the lowermost couch rolls and through which the pick-up felt is run after leaving the said couch, a bottom wet felt which is run through the suction press below the pick-up felt, and a felt slice which rests upon the inner upper side of the pick-up felt just as it is entering the bite of the press.

12. In apparatus for making multi-ply paper the combination of a plurality of Fourdrinier machines set one above the other with the couches of their wire screens stepped back, from bottom to top, each a progressively shorter distance from the one immediately below, an endless pick-up felt, a plurality of couch rolls mounted within the pick-up felt each adjacent the couch of the wire of one of the Fourdrinier machines and adapted to carry the felt into contact with the wire of the machine, one or more of the said couch rolls being so mounted that

it may be moved away from the Fourdrinier wire to allow the pick-up felt to pass the wire without contacting therewith.

13. In apparatus for making multi-ply paper the combination with three or more Fourdrinier machines set one above another of an endless pick-up felt, means including a plurality of couch rolls operating within the pick-up felt for selectively carrying the felt into contact with and couching off the wet paper webs from the wire screens of any two or more of the Fourdrinier machines, and means including a suction press and a wet felt running therethrough for puddling the wet paper webs thus superimposed upon the pick-up felt.

GEORGE L. BIDWELL.