

W. H. DECKER.
 APPARATUS FOR MAKING PAPER.
 APPLICATION FILED JULY 9, 1908.

941,561.

Patented Nov. 30, 1909.
 3 SHEETS—SHEET 1.

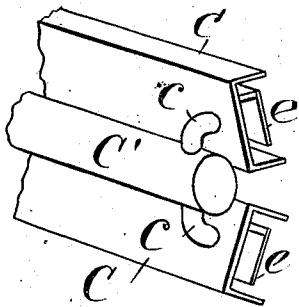
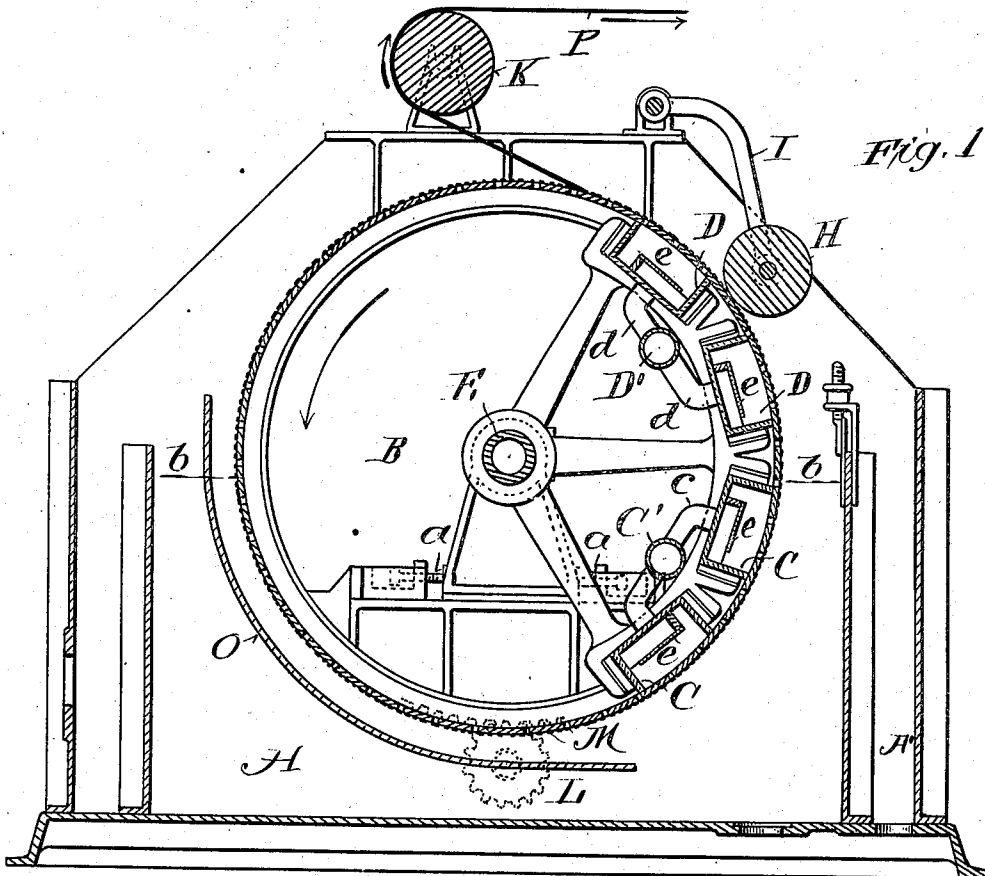


Fig. 4.

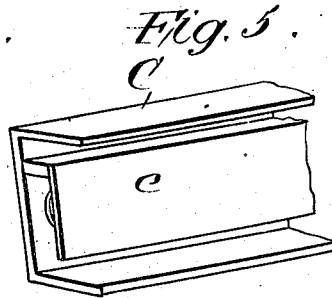


Fig. 5.

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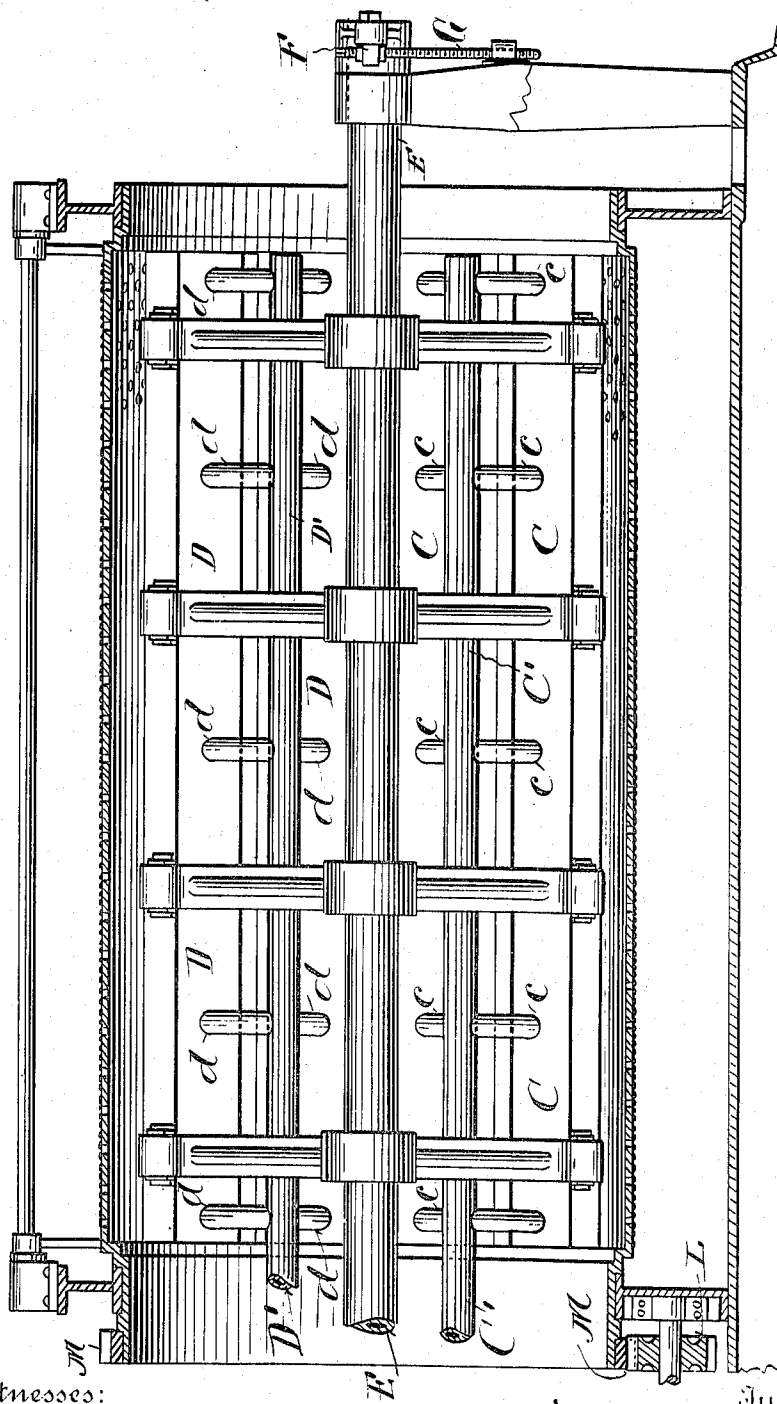


Fig. 2

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3 SHEETS—SHEET 3.

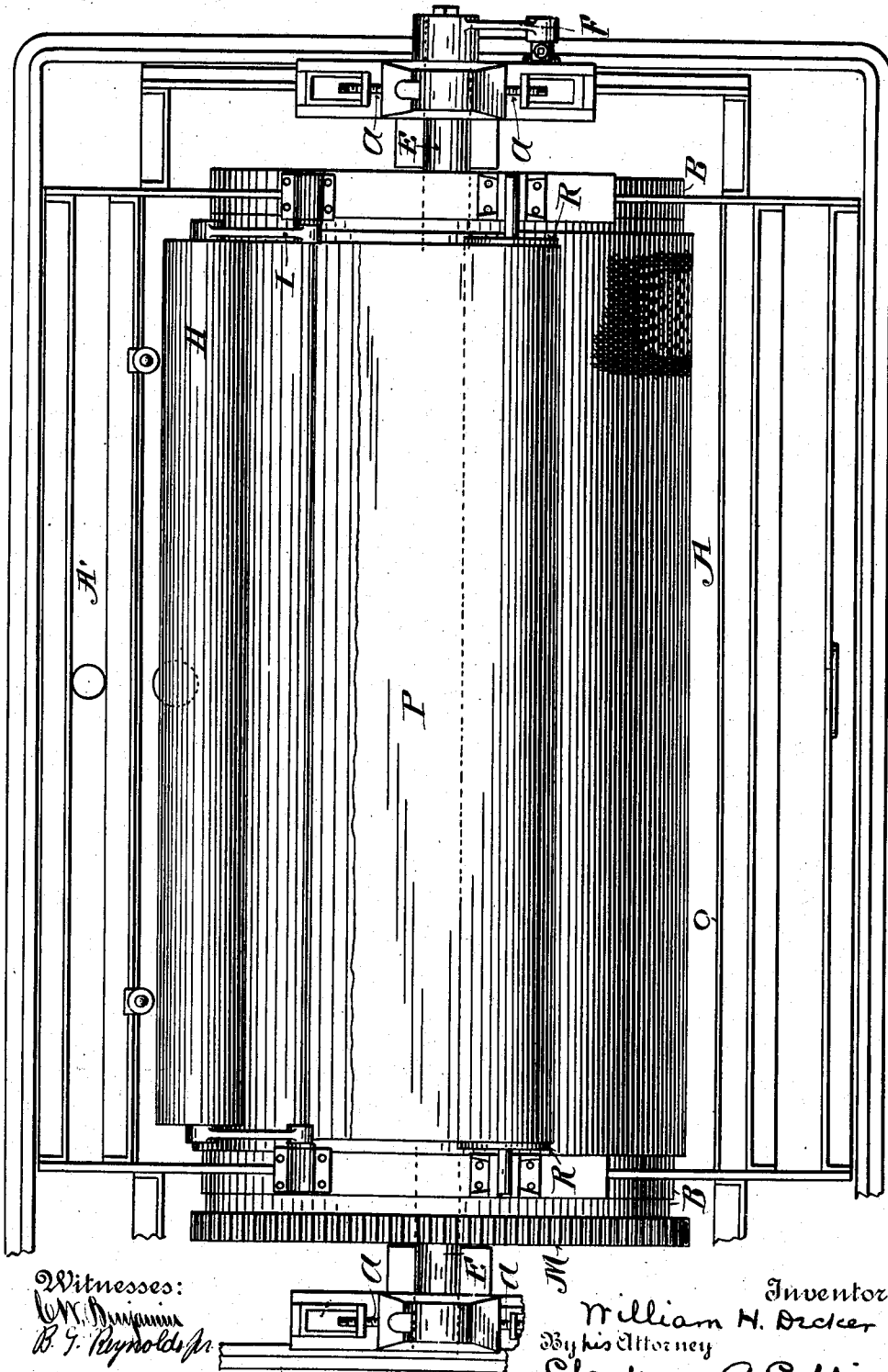
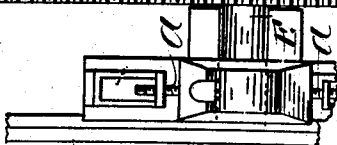


Fig. 3.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAKING PAPER.

941,561.

Specification of Letters Patent.

Patented Nov. 30, 1909.

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To all whom it may concern:

Be it known that I, WILLIAM H. DECKER, a citizen of the United States, residing in the city of Syracuse, county of Onondaga, and State of New York, have invented a new and Improved Apparatus for Making Paper, of which the following is a specification.

My invention relates generally to that class of apparatus in the use of which the pulp of which the paper is formed is in the first instance lifted from the tank in which it is contained upon the surface of a cylinder, or mold roll.

In making paper by such apparatus as heretofore practiced, the weak, wet sheet of pulp lifted from the mass thereof upon the surface of the cylinder is removed therefrom by means of a couch roll, and transferred to a conveyer of felt, upon which it is carried to and between press rolls, and otherwise treated to remove the free water therefrom and compact the pulp and convert it into paper before it is subjected to the final steps of drying and calendering, where calendering is required.

I have discovered that if the film of pulp formed upon the surface of the cylinder by its rotation be subjected to a high pressure before being lifted from the mass of pulp in the tank, while approaching the point at which it leaves the mass, and again to a high pressure after being lifted from the mass of pulp, and while still upon the surface of the cylinder, it can be so compacted and dried as to be converted into paper while still on the cylinder, and can be taken directly from the cylinder to the drying and calendering rolls. To the end, then, of shortening the time required for the production of paper, and of simplifying and reducing the cost of the apparatus employed, by dispensing with so much thereof as has heretofore interposed between the forming cylinder and the drying rolls, for converting the pulp into paper, my invention, broadly stated, consists in combining with the cylinder upon which the film of pulp is lifted from the tank means for applying to the film of pulp formed upon the surface of the cylinder, as it approaches the point where it leaves the mass, a high pressure, and also means for applying a high pressure to the film after it has been lifted from the mass, and while it is still upon the surface of the cylinder. By this means I am able to so compact the sheet

or film of pulp, and extract the free water therefrom, that it is converted into paper while still on the surface of the cylinder, and can be at once dried and calendered without intermediate treatment.

The means which I employ for applying pressure to the film of pulp are two suction boxes, or series of suction boxes, located, on the interior of the cylinder, with their open faces against the inner surface thereof, the one below the surface of the mass of pulp in the tank, and in the vicinity of the point where the film leaves the mass in its upward movement, *i. e.*, in the upgoing quadrant of the cylinder, and the other above the mass of pulp in the tank.

Each of the suction boxes or series of suction boxes is connected with an air exhaust apparatus capable of inducing a high pressure. By means of these the air is withdrawn from the suction boxes, so that the overlying film is subjected to pressure, and the water extracted from the film is drawn off and discharged. By the applied pressure, the film is rendered more compact, and somewhat thickened if desired, before being drawn out of the mass of pulp, and after being lifted from the pulp is still further consolidated and deprived of its free water, thereby being converted into paper.

The invention will be best understood by reference to the accompanying drawings, of which—

Figure 1 shows a transverse vertical section; Fig. 2 shows a longitudinal vertical section, and Fig. 3 a plan view of the apparatus; and Figs. 4 and 5 show elevations of the suction boxes.

Referring to the drawings, A indicates the usual pulp containing tank, within which is a cylinder, B, of any usual or desired shape, having a perforated metal shell covered with wire netting, and arranged to rotate in the direction indicated by the arrow.

C, C, D, D, indicate suction boxes located within the cylinder, B, and impinging closely against the inner surface thereof. These suction boxes are mounted upon a shaft, E, which may be rotated by means of arm, F, and screw, G, to adjust the position of the suction boxes in relation to the circumference of the cylinder, B, and the degree of their impingement against the inner surface of the cylinder may be adjusted by means of set screws, *a, a*.

Within each suction box is a baffle plate, *e*, the effect of which is to cause the suction to act more uniformly upon the surface of the overlying film.

5 The suction boxes, C, C, are located below the surface of the mass of pulp in the tank (indicated by the line, *b, b,*) and in the upgoing quadrant of the cylinder, and are connected by pipes, *c, c*, with an air pipe, C', leading to an air exhaust device (not shown in the drawings), of any usual or suitable construction, capable of inducing a high pressure.

10 The amount of pressure required will vary somewhat with the thickness of paper desired, and the efficient amount of opening of the suction boxes. The greater the opening, the less the pressure required, and the greater the thickness of paper desired, the greater is the pressure required, and vice versa. The pressure must, however, be relatively high. I have found in practice that a pressure of about seven inches mercury column is sufficient, and the air exhaust apparatus should be capable of producing a minimum pressure of this amount. The exact amount of pressure to be applied under any given conditions will be readily determined by experiment, by those skilled in the art, keeping in mind that it is desirable that the film shall be compacted as much as possible without being too greatly thickened.

15 The location of the suction boxes, C, C, in the upgoing quadrant of the cylinder, B, is determined by the fact that if the strong suction required to sufficiently compact the film should be applied thereto when it is still very porous, as it is when it begins to be formed, the pulp would tend to be drawn to the cylinder in masses; and in any event the film would be thickened to an impracticable extent.

20 The suction boxes, D, D, are located above the level of the pulp in the tank, A, and are connected by pipes, *d, d*, with a pipe, D', leading to an air exhaust apparatus (not shown in the drawings), which must be capable of inducing a sufficiently high pressure to complete the consolidation of the film, and remove the free water therefrom as it passes over the suction boxes. In practice I have found a pressure of from twelve to fourteen inches, mercury column, sufficient for this purpose.

25 If desired, a dandy-roll, H, supported by a pivoted arm, I, having a surface like that of the cylinder, B, may be allowed to rest upon the paper, whereby the two sides of the paper will be surfaced alike.

30 The operation of the device is as follows: The tank, A, being filled with pulp to the desired depth, as to the line, *b, b*, the cylinder, B, is rotated in the direction indicated by the arrow. When the film of pulp formed upon the surface of the cylinder by

its rotation reaches the suction boxes, C, C, the air exhaust devices are set in operation, and withdraw the air from the suction boxes, and also draw off and discharge the water extracted from the pulp. Under the high pressure induced, the film of pulp is compacted and somewhat thickened as it passes over the suction boxes, C, C. As the film of pulp is lifted from the mass and carried over the suction boxes, D, D, the free water is extracted therefrom, leaving only the water of absorption, and the conversion of the film of pulp into paper is completed. The end of the moist sheet of paper may then be lifted from the cylinder by hand, and brought over a carrying roll, I, whence it may be wound upon a roll in the moist state or conveyed to drying and calendering rolls, or otherwise treated as desired.

35 By means of my invention I do away entirely with all that part of the apparatus heretofore interposed between the forming cylinder and the drying rolls, thereby greatly reducing the cost of the apparatus, and I also largely reduce the time of production and the cost of handling, and produce a fabric having the same texture and appearance on both sides, advantages which will be readily appreciated by those skilled in the art.

40 What I claim as new and desire to secure by Letters Patent is:

1. In a paper making apparatus, the combination with a pulp containing tank, of a rotary cylinder provided with a perforated surface, and supported in such position that a portion of the perforated surface is below the level of the pulp in said tank, a suction box located within the cylinder, a support for said suction box located substantially axially with respect to the cylinder, supporting means for the cylinder independent of the support for the suction box, supporting devices connected with said suction box and rotatably engaging said support, means for securing said supporting devices adjustably to said support, and a suction pipe connected to said suction box independent of its support.

2. In a paper making apparatus, the combination with a pulp containing tank, of a rotary cylinder provided with a perforated surface, and supported in such position that a portion of the perforated surface is below the level of the pulp in said tank, a suction box located within the cylinder, a support for said suction box located substantially axially with respect to the cylinder, supporting means for the cylinder independent of the support for the suction box, supporting devices connected with said suction box and rotatably engaging said support, means for securing said supporting devices adjustably to said support and means for adjusting said suction box support laterally

to adjust the suction box toward and from the inner surface of the cylinder.

3. In a paper making apparatus, the combination with a pulp containing tank, of a rotary cylinder provided with a perforated surface, supporting devices for said cylinder holding it partly above and partly below the normal pulp level in said tank, and constructed to permit the rotation of said cylinder, suction boxes within the cylinder, certain of said boxes being located above and certain of said boxes being located below the normal pulp level, supports for said suction boxes arranged substantially axially with respect to the cylinder but independent of the supporting devices therefor, connections from said suction boxes, rotatably engaging said support, and adjusting devices for securing said boxes in different positions in the cylinder with respect to the pulp level, a suction pipe connected to the boxes above the pulp level, and a separate suction pipe connected with the boxes below the pulp level.

4. In a paper making apparatus, the combination with a pulp containing tank, of a rotary cylinder provided with a perforated surface, supporting devices for said cylinder holding it partly above and partly below the normal pulp level in said tank, and constructed to permit the rotation of said cylinder, suction boxes within the cylinder, certain of said boxes being located above and certain of said boxes being located below the normal pulp level, supports for said suction boxes arranged substantially axially with respect to the cylinder but independent of the supporting devices therefor, connections from said suction boxes rotatably engaging said support, and adjusting devices for securing said boxes in different positions in the cylinder with respect to the pulp level, a suction pipe connected to the boxes above the pulp level, and a separate suction pipe connected with the boxes below the pulp level and means for adjusting said suction box support laterally to adjust the suction boxes toward and from the inner surface of the cylinder.

5. In a paper making machine, the combination with a pulp containing tank, of a rotary cylinder provided with a perforated surface, supported above said tank in such position that a portion of its surface extends below the pulp level of said tank, a shaft extending longitudinally through said cylinder and supported independently thereof, suction boxes secured to said shaft, and engaging the inner face of said cylinder, and means for moving said shaft toward and from the inner surface of the cylinder.

6. In a paper making machine, the combination with a pulp containing tank, of a rotary perforated cylinder supported above said tank and having a portion extending

into said tank below the pulp level therein, a shaft extending longitudinally through said cylinder, horizontally movable supports for said shaft, and adjusting devices for moving said supports horizontally, and suction boxes supported by said shaft adjacent to the inner face of the cylinder.

7. In a paper making machine, the combination with a pulp containing tank, of a rotary perforated cylinder supported above said tank, and having a portion extending into the tank below the pulp level therein, a shaft extending longitudinally through said cylinder, a suction box supported from said shaft and having its open portion adjacent to the inner face of said cylinder, an arm secured to said shaft and an adjusting device secured to said arm.

8. In a paper making machine, the combination with a pulp containing tank, of a rotary perforated cylinder supported above said tank and having a portion extending into said tank below the pulp level therein, a shaft extending longitudinally through said cylinder, horizontally movable supports for said shaft, and adjusting devices for moving said supports horizontally, and suction boxes supported by said shaft adjacent to the inner face of the cylinder, an arm secured to said shaft, and an adjusting screw engaging said arm.

9. In a paper making machine, the combination with a pulp containing tank, of a rotary perforated cylinder having a portion extending into the tank below the pulp level therein, a suction box stationarily supported adjacent to the inner face of said cylinder, a suction pipe connected with said suction box, and a baffle plate interposed between the suction pipe and the inner face of the cylinder to equalize the suction.

10. In a paper making machine, the combination with a pulp containing tank, of a rotary perforated cylinder having a portion extending into said tank below the pulp level therein and a portion above said pulp level, of suction boxes stationarily supported within and extending longitudinally of said cylinder, certain of said boxes having open portions adjacent to the wall of the cylinder below the pulp level, and certain of said boxes being located above the pulp level, air exhaust pipes connected with the said boxes, and a dandy roll having an outer surface corresponding in texture with the outer surface of the cylinder, whereby both sides of the paper will be alike in finish.

In testimony whereof, I have hereunto subscribed my name, this 30th day of June, A. D., 1908.

WILLIAM H. DECKER.

Witnesses:

JOHN R. WICKES,
FRED H. BISHOP.