Sept. 4, 1934. W. R. McPHERSON ET AL 1,972,389

PAPER MAKING MACHINE

Filed Nov. 20, 1933 3 Sheets-Sheet 1

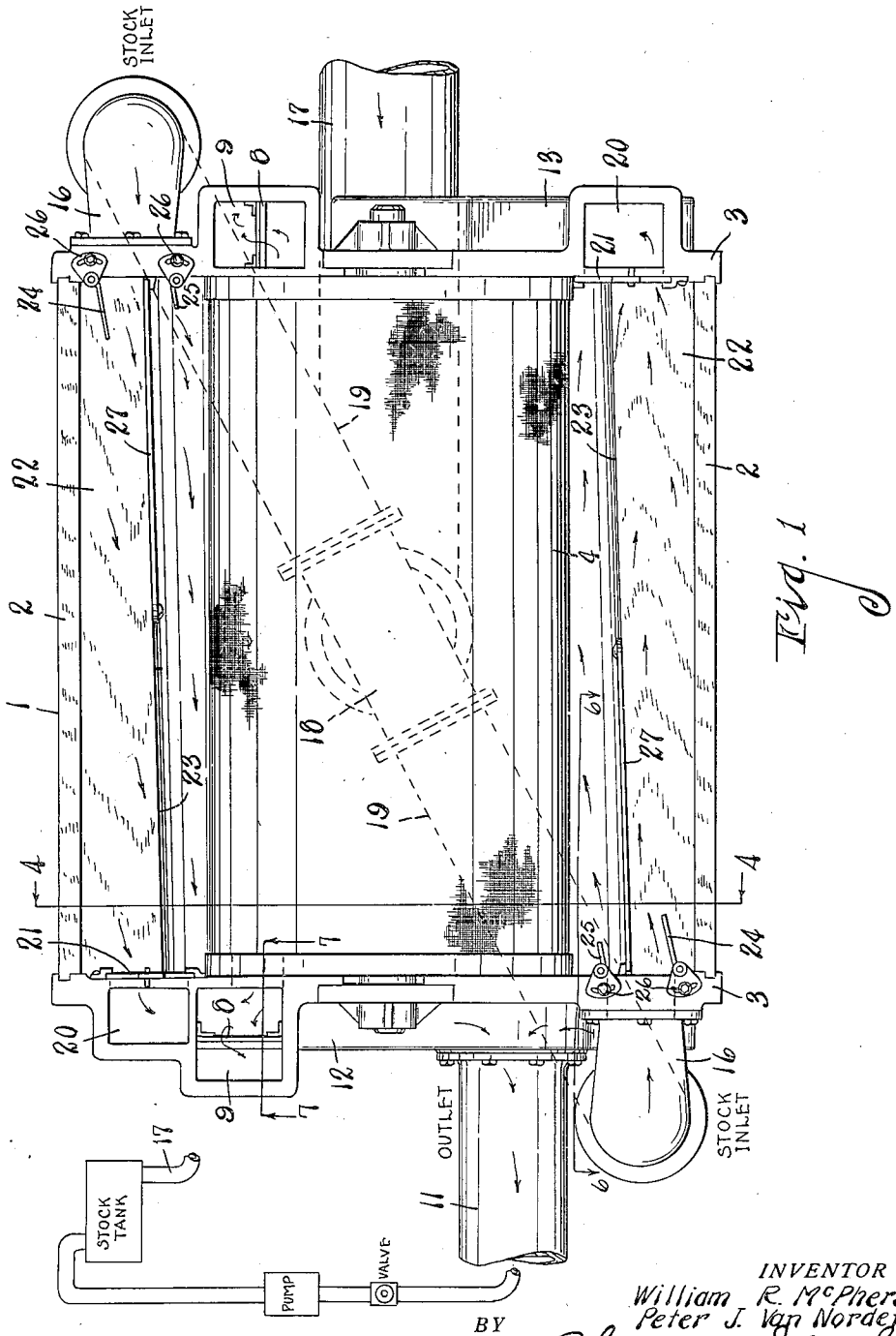


Fig. 1

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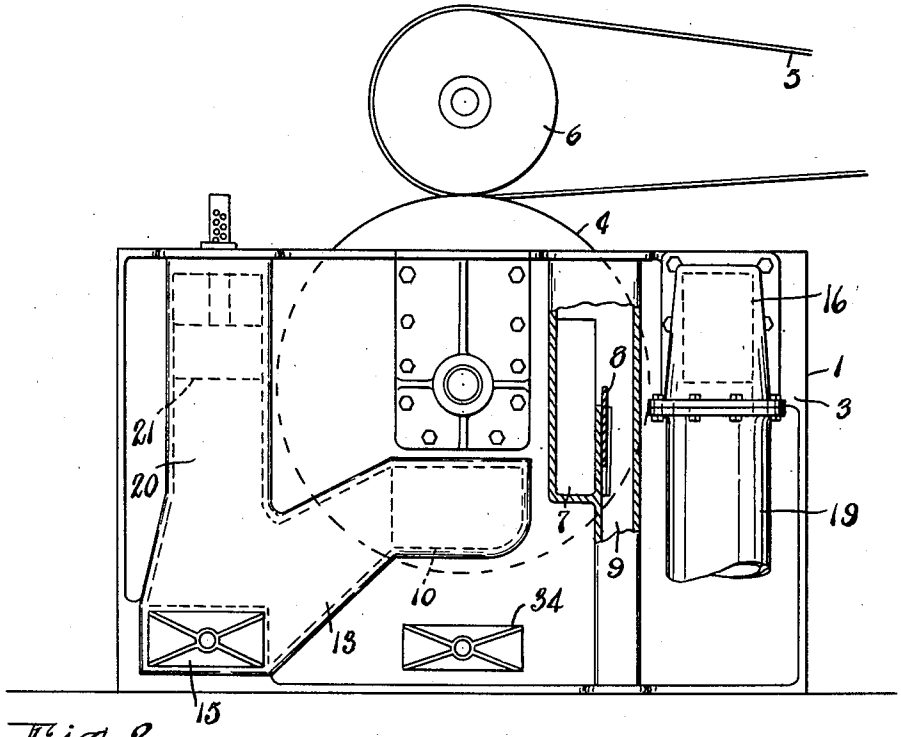


Fig. 2

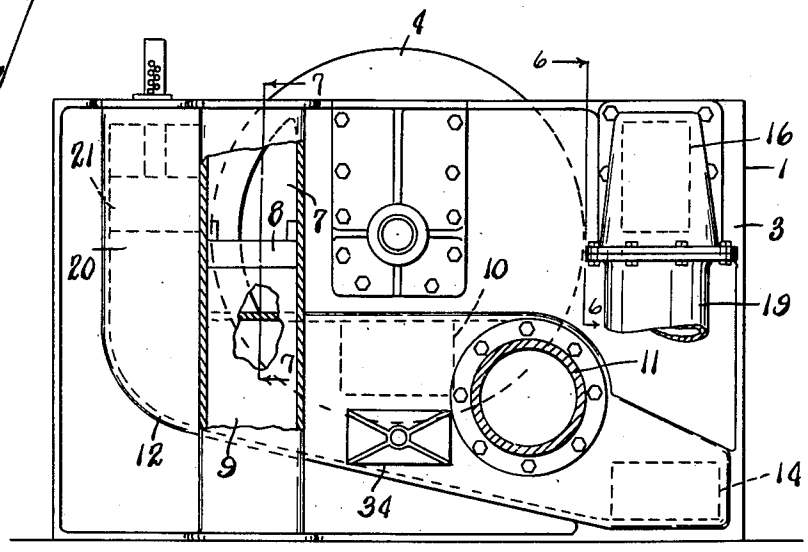


Fig. 3

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Filed Nov. 20, 1933 3 Sheets-Sheet 3

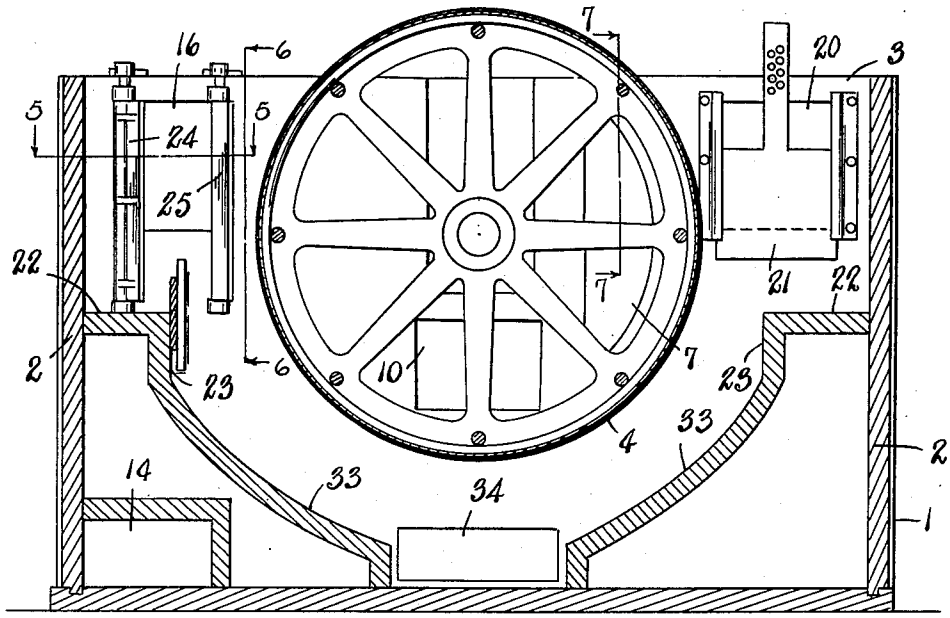


Fig. 4

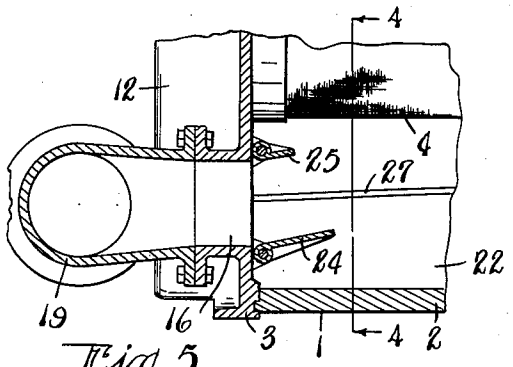


Fig. 5

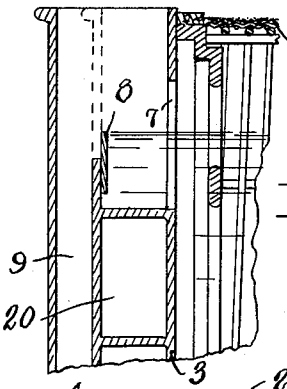


Fig. 7

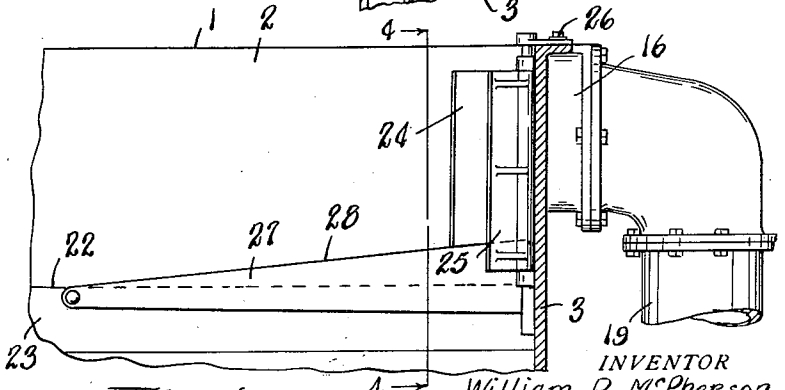


Fig. 6

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Patented Sept. 4, 1934

1,972,389

UNITED STATES PATENT OFFICE

1,972,389

PAPER MAKING MACHINE

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Otsego, Mich.

Application November 20, 1933, Serial No. 698,774

24 Claims. (Cl. 92—43)

The main objects of this invention are:

First, to provide a paper making machine for making box board and the like having a crosswise tensile strength comparable to its lengthwise tensile strength.

Second, to provide a machine of this character having means for controlling the flow of stock across the opposite side faces of the cylindrical mold.

Third, to provide a vat or box having means associated therewith for thoroughly and effectively crossing the fibers on the cylindrical mold, which results in the formation of a sheet of substantially uniform strength and stiffness in all directions.

Objects relating to details and economies of our invention will appear from the description to follow. The invention is defined and pointed out in the claims.

A structure which is a preferred embodiment of our invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a fragmentary top plan view of a paper making machine embodying the features of our invention.

Fig. 2 is a fragmentary end elevation, a portion of the box or vat being broken away and shown in section.

Fig. 3 is a fragmentary opposite end elevation of the box, portions being broken away and shown in section.

Fig. 4 is an enlarged transverse section on a line corresponding to line 4—4 of Figs. 1, 5, and 6.

Fig. 5 is a fragmentary horizontal section on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary longitudinal vertical section on a line corresponding to line 6—6 of Figs. 1, 3, and 4.

Fig. 7 is an enlarged fragmentary longitudinal vertical section on a line corresponding to line 7—7 of Figs. 1, 3, and 4.

In the embodiment of our invention illustrated in the drawings, numeral 1 indicates a pulp vat or box having side walls 2, 2 and ends walls 3, 3. The vat is adapted to contain a mixture of paper pulp stock and water, hereinafter referred to as stock. The forming cylinder 4 is disposed between and rotatably supported by the end walls 3, 3. The cylinder itself is of the conventional screen type and therefore forms no part of our invention. It is arranged for coaction with a felt belt 5 which passes around the couch roll 6 disposed in such relation to the top of the cylinder 4 that the belt contacts with the cylinder and picks up the fibers from the cylinder, the cylinder being rotated by such contact.

The end walls of the vat are provided with white or waste water gravity outlets 7, 7 opening to the interior of the cylinder at the upwardly moving side thereof. Such outlets are controlled by means of vertically adjustable weirs 8, 8, respectively, which control the level of the white water. The latter flows over the weirs and downwardly through the vertical passages 9, 9 which are connected to the sewer drain or to a save-all (not shown).

The end walls are also provided with stock suction outlets 10, 10 opening to the interior of the cylinder at the bottom thereof. These stock outlets are connected to the main stock outlet 11 by means of the end conduits 12 and 13, respectively, the latter in turn being connected by the longitudinal outlet passage 14 disposed in one of the lower corners of the box. At one end, the passage is provided with a clean-out closure 15. The main stock outlet 11 is connected to a recirculating pump providing suction means for the stock outlet 10, 10.

Stock inlets 16, 16 are provided in the end walls at opposite sides of the cylinder, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box. The stock inlets 16, 16 are connected to the common stock supply 17 by means of the central T-coupling 18 and pipes 19, 19 arranged under the vat. The main stock inlet 17 is connected to the stock tank. The end walls are also provided with stock gravity outlets 20, 20 opposite the stock inlets. Vertically adjustable weirs or gates 21, 21 are associated with the overflow stock gravity outlets for controlling the level of the pulp in the vat. The stock outlets 20, 20 are connected to the main stock outlet 11 by means of the end passages 12 and 13, such end passages being in communication with each other through the longitudinal passage 14, as pointed out above.

Horizontal shelves or flow ledges 22, 22 are disposed in opposite sides of the box adjacent the side walls at the lower level of the stock inlets, the ledges having their inner edges 23, 23 spaced from the cylinder 4 and biased toward the same from the stock inlets. The ledges act to direct the flow of stock, directing the fibers toward the cylinder uniformly of the length thereof, resulting in a uniform sheet, or "levels" the sheet, as it is called. Curved walls 33, 33 extend from the ledges and under the cylinder, as shown, to the clean-out 34.

Adjustable flow directors 24 and 25 are pivoted

at the sides of the stock inlets for controlling the direction of the stock flow as desired. Bolts 26 are provided for securing the flow directors in adjusted position.

Baffles 27 are associated with the inner edges of the flow ledges and have their upper edges 28 downwardly inclined toward the same from the stock inlets acting to provide channels of gradually diminishing depth. The baffles direct the settling fibers of the stock toward the center of the vat and prevent them from settling over the edge of the ledge near the stock inlet.

The flow of stock is in opposite directions on opposite sides of the cylinder, the amount of water circulating is controlled by the arrangement of the gravity outlets and the fibers are all kept in suspension in the stock. This prevents bunching of the fibers. In general, our arrangement tends to give a very uniform formation of fibers on the cylinder. Further, it will be observed that by the use of adjustable gates at the gravity outlets there will be just as much water in circulation on a heavy weight sheet as on a light weight sheet, which is very desirable in keeping the fibers in suspension.

Tests on board made with the conventional vat show that the tensile strength crosswise is only 25% of the tensile strength lengthwise. Board made with our improved vat has a tensile strength crosswise of 65% of the tensile strength lengthwise. Substantial uniformity of stiffness and tensile strength of the sheet is obtained in all directions. This obviates the necessity of the specification by the box maker for grain a certain way of the sheet. Very substantial saving is effected in the furnish inasmuch as less sulphite pulp is required to give the desired bending qualities of the sheet in either direction. Further, less kraft and jute furnish are required to give the desired Mullen test. It will be also evident to those skilled in the art that great savings are effected in the manufacture of boards such as carton stock, box stock, bottle cap, and in fact, any grade where it is advantageous to get uniform tensile strength in all directions as well as high Mullen test.

Our improved vat can be installed in the same space or in less space than is required by the commonly used type of vat, which is a very desirable feature as it saves the mill from changing the felt framework. Also, the same cylinders and couchers now in use can be used with our improved vat. In general, our improved vat is very easily adapted for use in place of the ordinary type of vat.

Our improved vat acts to cross the fibers on the cylinder mold quite thoroughly and results in a sheet of approximately uniform strength and stiffness in all directions.

We have illustrated and described our improvements in an embodiment which we have found very practical. We have not attempted to illustrate or describe other embodiments or adaptations, as it is believed this disclosure will enable those skilled in the art to embody or adapt our improvements as may be desired.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a cylinder mold disposed between and rotatably supported by said end walls, waste water gravity outlets in the end walls opening to the interior of the cylinder mold adjacent the top thereof, stock suction outlets in the end walls opening to the interior of the cylinder mold at the bottom thereof, stock inlets in the end walls at opposite sides of the cylinder mold, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box, overflow stock gravity outlets in the end walls opposite the stock inlets, means for adjusting the level of said waste water and overflow stock gravity outlets, horizontal flow ledges disposed in opposite sides of the box adjacent the side walls adjacent the lower level of the stock inlets and having their inner edges spaced from the cylinder mold and biased toward the same from the stock inlets, vertical adjustable flow directors at the sides of the stock inlets, and baffles associated with the inner edges of said ledges and having their upper edges downwardly inclined from the stock inlets.

2. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a cylinder mold disposed between and rotatably supported by said end walls, waste paper gravity outlets in the end walls opening to the interior of the cylinder mold adjacent the top thereof, stock suction outlets in the end walls opening to the interior of the cylinder mold at the bottom thereof, stock inlets in the end walls at opposite sides of the cylinder mold, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box, overflow stock gravity outlets in the end walls opposite the stock inlets, suction means connected to said stock suction outlets, horizontal flow ledges disposed in opposite sides of the box adjacent the side walls adjacent the lower level of the stock inlets and having their inner edges spaced from the cylinder mold and biased toward the same from the stock inlets, vertical adjustable flow directors at the sides of the stock inlets, and baffles associated with the inner edges of said ledges and having their upper edges downwardly inclined from the stock inlets.

3. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a cylinder mold disposed between and rotatably supported by said end walls, waste water gravity outlets in the end walls opening to the interior of the cylinder mold adjacent the top thereof, stock suction outlets in the end walls opening to the interior of the cylinder mold at the bottom thereof, stock inlets in the end walls at opposite sides of the cylinder mold, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box, overflow stock gravity outlets in the end walls opposite the stock inlets, horizontal flow ledges disposed in opposite sides of the box adjacent the side walls adjacent the lower level of the stock inlets and having their inner edges spaced from the cylinder mold and biased toward the same from the stock inlets, and baffles associated with the inner edges of said ledges and having their upper edges downwardly inclined from the stock inlets.

4. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a forming cylinder, waste water gravity outlets in the end walls opening to the interior of the cylinder at the side thereof, stock suction outlets in the end walls opening to the interior of the cylinder at the bottom thereof, stock inlets in the end walls at opposite sides of the cylinder, there being one inlet

in each end wall and the inlets being arranged in diagonally opposite corners of the box, overflow stock gravity outlets in the end walls opposite the stock inlets, horizontal flow ledges disposed in opposite sides of the box adjacent the side walls at the lower level of the stock inlets and having their inner edges spaced from the cylinder, and flow directors at the stock inlets.

5. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a forming cylinder, waste water gravity outlets in the end walls opening to the interior of the cylinder at the side thereof, stock suction outlets in the end walls opening to the interior of the cylinder at the bottom thereof, stock inlets in the end walls at opposite sides of the cylinder, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box, and overflow stock gravity outlets in the end walls opposite the stock inlets.

6. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a forming cylinder, and stock inlets in the end walls at opposite sides of the cylinder, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box.

7. In a paper making machine of the class described, the combination of a pulp vat or box comprising side and end walls, a forming cylinder, and stock inlets arranged in diagonally opposite corners of the box.

8. In a paper making machine of the class described, the combination of a pulp vat or box having side and end walls, a forming cylinder, stock inlets in the end walls at opposite sides of the cylinder, there being one inlet in each end wall and the inlets being arranged in diagonally opposite corners of the box, horizontal flow ledges disposed in opposite sides of the box adjacent the side walls adjacent the lower level of the stock inlets and having their inner edges spaced from the cylinder and biased toward the same from the stock inlets, adjustable flow directors at the stock inlets, and baffles associated with the inner edges of said flow ledges and having their upper edges downwardly inclined from the stock inlets.

9. In a paper making machine of the class described, the combination of a pulp vat or box having side and end walls, a forming cylinder, stock inlets arranged in diagonally opposite corners of the box, flow ledges disposed in opposite sides of the box adjacent the side walls adjacent the lower level of the stock inlets and having their inner edges spaced from the cylinder and biased toward the same from the stock inlets, adjustable flow directors at the stock inlets, and baffles associated with the inner edges of said flow ledges and having their upper edges downwardly inclined from the stock inlets.

10. In a paper making machine of the class described, the combination of a pulp vat or box having side and end walls, a forming cylinder, stock inlets arranged in diagonally opposite corners of the box, flow ledges disposed in opposite sides of the box adjacent the side walls adjacent the lower level of the stock inlets and having their inner edges spaced from the cylinder, flow directors at the stock inlets, and baffles associated with the inner edges of said flow ledges.

11. In a paper making machine of the class described, the combination of a vat having bottom walls comprising lower curved converging portions and upper horizontal portions constituting flow ledges, a forming cylinder disposed centrally of the vat, the bottom including the flow ledge portions being biased relative to the axis of the cylinder, stock inlets disposed at diagonally opposite corners of the vat above the flow ledges and at the narrower ends of the flow ledges, stock outlets disposed opposite said inlets above the flow ledges, the stock outlets being provided with adjustable weirs, baffles associated with the inner edges of the flow ledges and having their upper ends downwardly inclined, said baffles being pivoted at their inner ends for vertical adjustment, and forced circulating discharge connections to the inside of the cylinder operatively associated with a source of stock supply and with said stock inlets.

12. In a paper making machine of the class described, the combination of a vat having bottom walls comprising lower curved converging portions and upper horizontal portions constituting flow ledges, a forming cylinder disposed centrally of the vat, the bottom, including the flow ledge portions, being biased relative to the axis of the cylinder, stock inlets disposed at diagonally opposite corners of the vat above the flow ledges and at the narrower ends of the flow ledges, stock outlets disposed opposite said inlets above the flow ledges, baffles associated with the inner edges of the flow ledges and having their upper ends downwardly inclined, said baffles being pivoted at their inner ends for vertical adjustment, and forced circulating discharge connections to the inside of the cylinder operatively associated with a source of stock supply and with said stock inlets.

13. In a paper making machine of the class described, the combination of a vat having bottom walls comprising lower curved converging portions and upper horizontal portions constituting flow ledges, a forming cylinder disposed centrally of the vat, the bottom, including the flow ledge portions, being biased relative to the axis of the cylinder, stock inlets disposed at diagonally opposite corners of the vat above the flow ledges and at the narrower ends of the flow ledges, stock outlets disposed opposite said inlets above the flow ledges, the stock outlets being provided with adjustable weirs, and forced circulating discharge connections to the inside of the cylinder operatively associated with a source of stock supply and with said stock inlets.

14. In a paper making machine of the class described, the combination of a vat having bottom walls comprising lower curved converging portions and upper horizontal portions constituting flow ledges, a forming cylinder disposed centrally of the vat, the bottom, including the flow ledge portions, being biased relative to the axis of the cylinder, stock inlets disposed at diagonally opposite corners of the vat above the flow ledges and at the narrower ends of the flow ledges, stock outlets disposed opposite said inlets above the flow ledges, and forced circulating discharge connections to the inside of the cylinder operatively associated with a source of stock supply and with said stock inlets.

15. In a paper making machine of the class described, the combination of a vat, a forming cylinder within said vat, the vat having a curved bottom disposed in a biased relation relative to the axis of the cylinder and including horizontal flow ledge portions at the top of the curved portions, stock inlets disposed at diagonally opposite corners of the vat to discharge above the flow ledges, stock outlets opposite the inlets, baffles as-

sociated with the stock inlet ends of the flow ledges and having their upper edges inclined away from the stock inlets, and forced circulating discharge connections to the inside of the cylinder operatively associated with the stock outlets, the stock supply and said stock inlets.

16. In a paper making machine of the class described, the combination of a vat, a forming cylinder within said vat, the vat having a curved bottom disposed in a biased relation relative to the axis of the cylinder and including horizontal flow ledge portions at the top of the curved portions, stock inlets disposed at diagonally opposite corners of the vat to discharge above the flow ledges, stock outlets opposite the inlets, and forced circulating discharge connections to the inside of the cylinder operatively associated with the stock outlets, the stock supply and said stock inlets.

17. In a paper making machine of the class described, the combination of a vat, a coacting forming cylinder disposed within the vat, the vat having stock directing walls disposed in a biased relation to the axis of the cylinder, stock inlets disposed at diagonally opposite corners of the vat, stock outlets disposed opposite the inlets white water discharge connections opening to the inside of the cylinder at both ends thereof, the stock outlets being connected to said white water discharge connections, and a circulating means operatively associated with said white water discharge connections.

18. In a paper making machine of the class described, the combination of a vat, a forming cylinder within said vat, the vat having a curved bottom disposed in a biased relation relative to the axis of the cylinder and including horizontal flow ledge portions at the top of the curved portions, stock inlets disposed at diagonally opposite corners of the vat to discharge above the flow ledges, stock outlets opposite the inlets, baffles associated with the flow ledges and having their upper edges inclined away from the stock inlets, and white water discharge connections to the inside of the cylinder at each end thereof.

19. In a paper making machine of the class described, the combination of a vat, a forming cylinder within said vat, the vat having a curved bottom disposed in a biased relation relative to the axis of the cylinder and including horizontal flow ledge portions at the top of the curved portions, stock inlets disposed at diagonally opposite corners of the vat to discharge above the flow ledges, stock outlets opposite the inlets, and white water discharge connections to the inside of the cylinder at each end thereof.

20. In a paper making machine of the class described, the combination of a vat, a coacting forming cylinder disposed within the vat, the vat having stock directing walls disposed in a biased relation to the axis of the cylinder, stock inlets disposed at diagonally opposite corners of the vat, stock outlets disposed opposite the inlets, and white water discharge connections opening to the inside of the cylinder at both ends thereof.

21. In a paper making machine of the class described, the combination of a vat, a forming cylinder within said vat, stock inlets disposed at diagonally opposite corners of the vat, stock outlets opposite the inlets, and forced circulating discharge connections to the inside of the cylinder operatively associated with the stock outlets, the stock supply and said stock inlets.

22. In a paper making machine of the class described, the combination of a vat, a coacting forming cylinder disposed within the vat, stock inlets disposed at diagonally opposite corners of the vat, stock outlets disposed opposite the inlets, white water discharge connections opening to the inside of the cylinder at both ends thereof, the stock outlets being connected to said discharge connections, and a forced circulating means operatively associated with said discharge connections and stock inlets.

23. In a paper making machine of the class described, the combination of a vat, a coacting forming cylinder disposed within the vat, stock inlets disposed at diagonally opposite corners of the vat, stock outlets disposed opposite the inlets, white water discharge connections opening to the inside of the cylinder at both ends thereof, and a forced circulating means operatively associated with said stock inlets, said white water discharge connections and stock outlets.

24. In a paper making machine of the class described, the combination of a vat, a coacting forming cylinder disposed within the vat, stock inlets disposed at diagonally opposite corners of the vat, stock outlets disposed opposite the inlets, and white water discharge connections opening to the inside of the cylinder at both ends thereof.

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