

(No Model.)

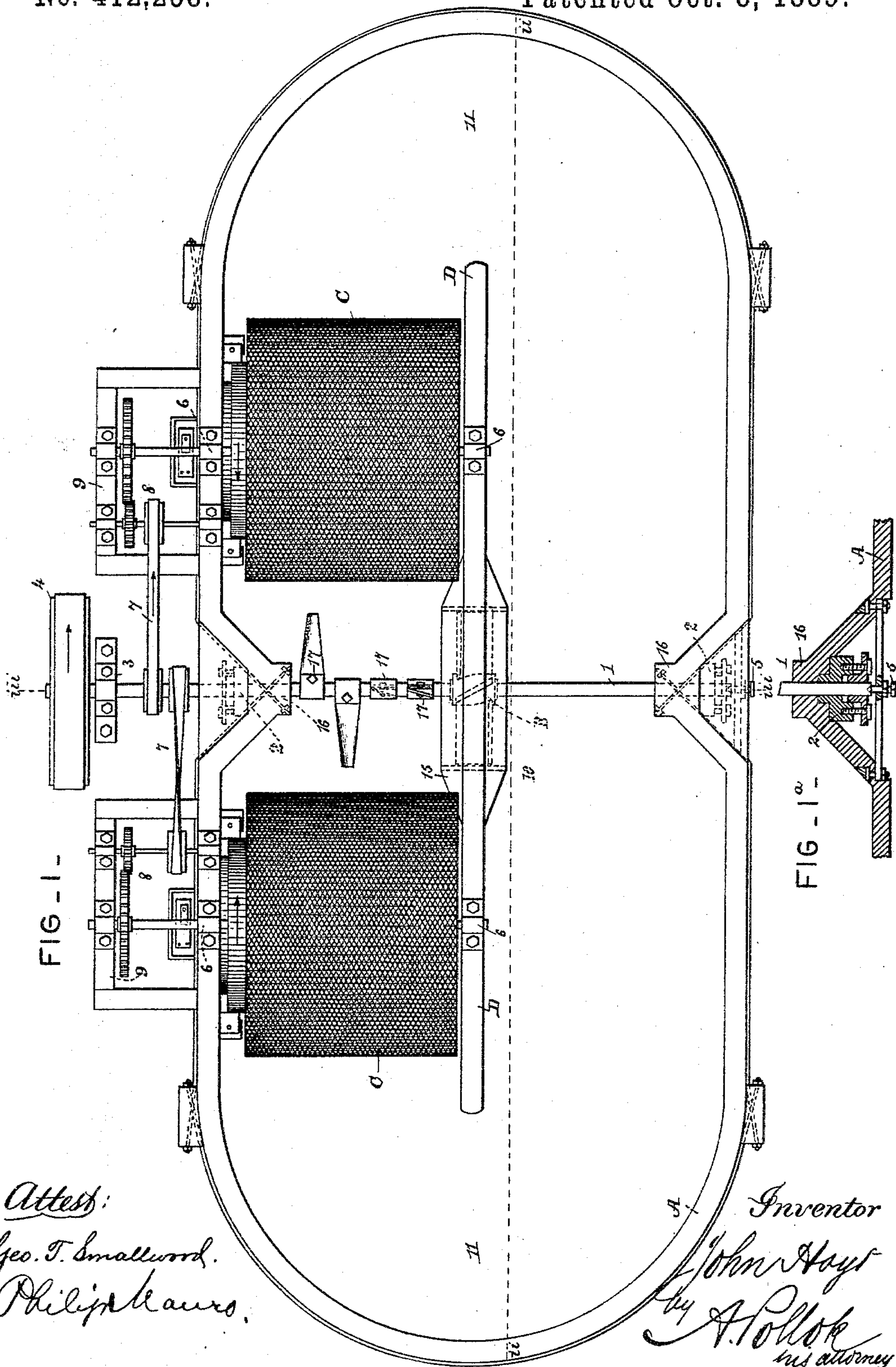
2 Sheets—Sheet 1.

J. HOYT.

PULP WASHING AND BLEACHING MACHINERY.

No. 412,258.

Patented Oct. 8, 1889.



Attest:
Geo. T. Smallwood.
Philip Mauro.

Inventor
John Hoyt
by A. Pollok
his attorney

(No Model.)

2 Sheets—Sheet 2.

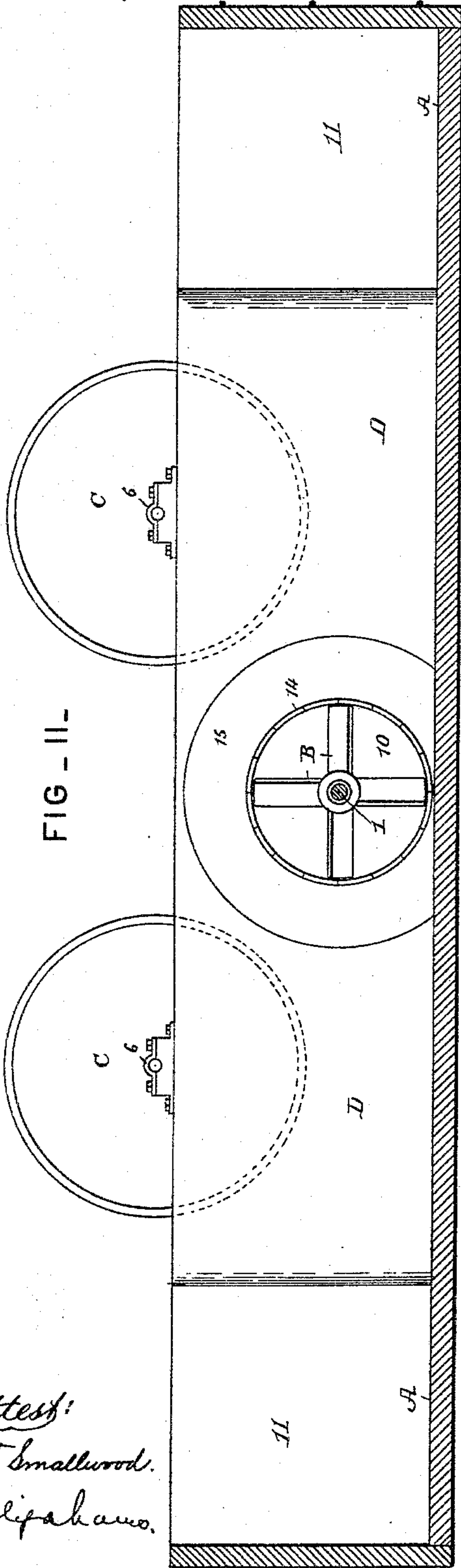
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FIG - II -



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FIG. IV.

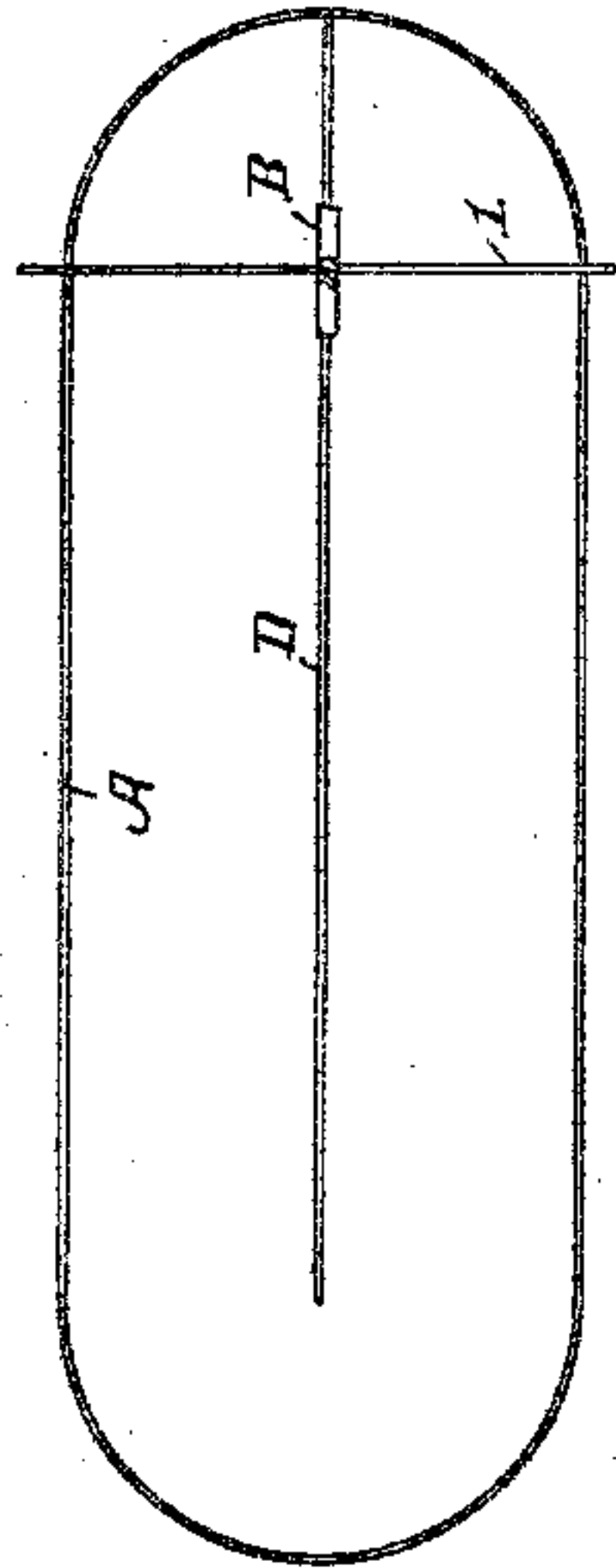


FIG. V.

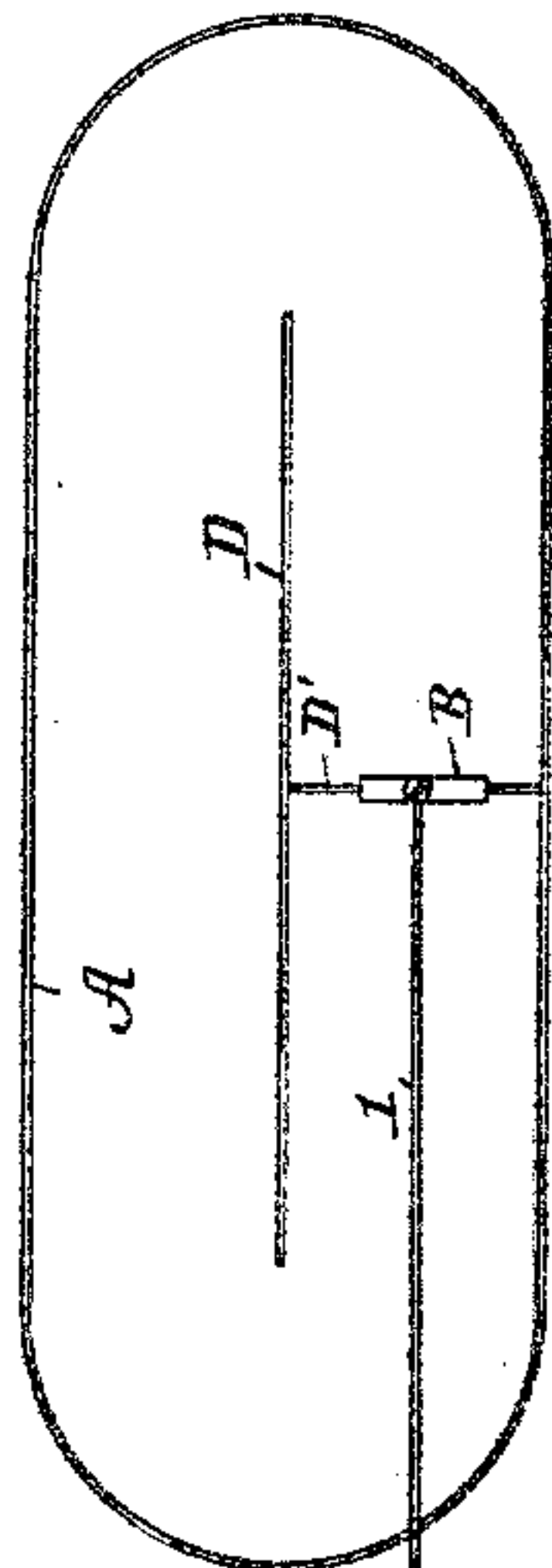
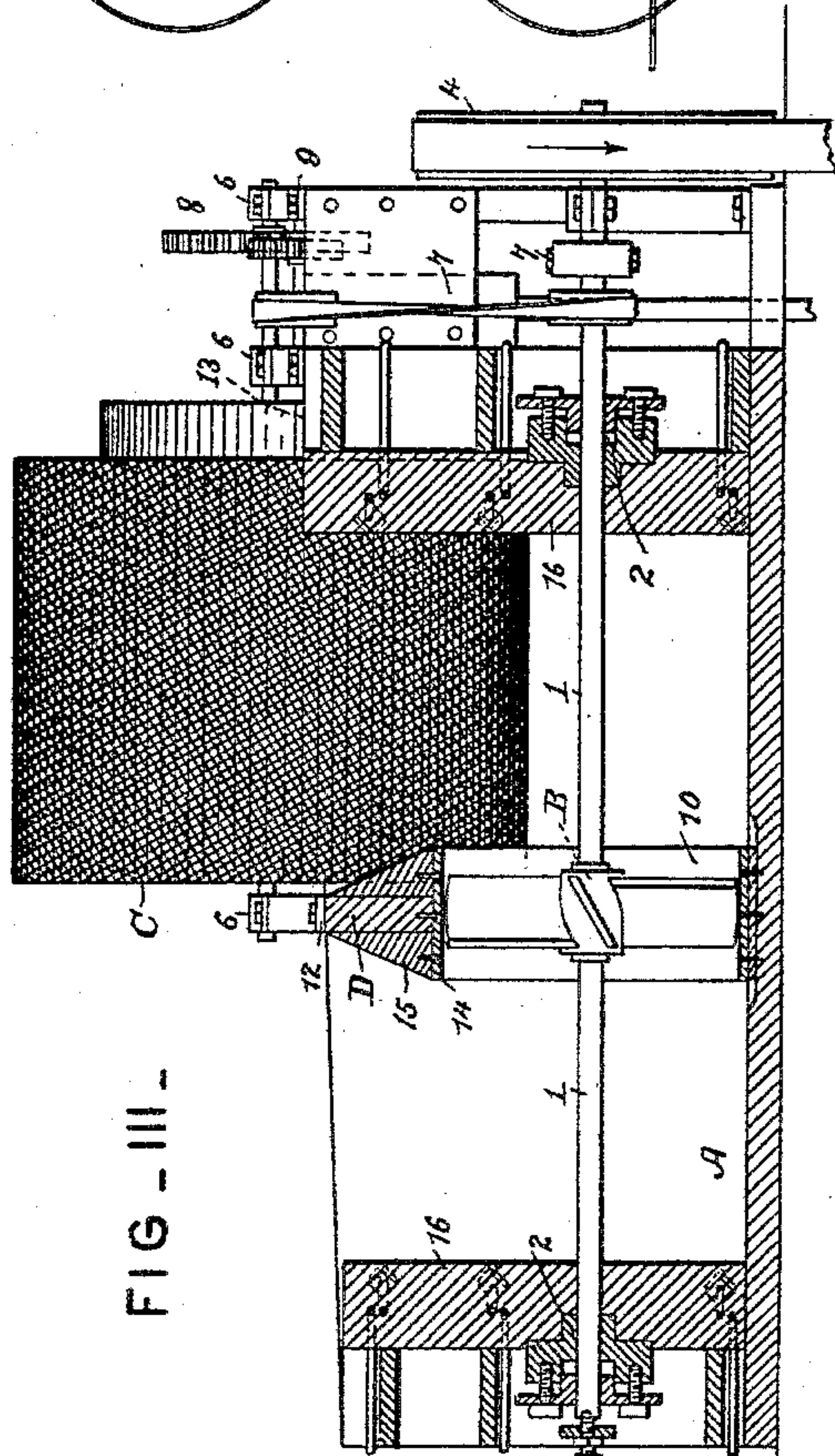


FIG - III -



Inventor:
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By
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Attorney

UNITED STATES PATENT OFFICE.

JOHN HOYT, OF MANCHESTER, NEW HAMPSHIRE.

PULP WASHING AND BLEACHING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 412,258, dated October 8, 1889.

Application filed April 15, 1889. Serial No. 307,271. (No model.)

To all whom it may concern:

Be it known that I, JOHN HOYT, of Manchester, in the county of Hillsborough and State of New Hampshire, have invented a new and useful Improvement in Pulp Washing and Bleaching Machinery, which improvement is fully set forth in the following specification.

This invention relates more particularly to machinery for washing and bleaching wood fiber prepared for pulp by treating with soda, or other chemicals, but the improvements which constitute the said invention, or some of them, are applicable to pulp-treating machinery in general for washing, breaking, beating, extracting lyes, cutting, mixing, bleaching, dyeing, reducing, and other operations in which a circulation of paper-pulp is maintained in the vat.

In ordinary washing-machines the pulp to be washed is circulated in a vat around a partition by means of the beater-roll whose bars act like the blades of a paddle-wheel and lift the pulp over a sort of dam extending across the channel on one side of the partition; and the water is constantly drawn off from the pulp at one or more points by the washers composed each of a revolving screen or sieve, which is partly immersed in the pulp, so as to strain the fibrous portion from the water, and of means for discharging the water from the inside of the screen or sieve. The beater-roll is, however, expensive, and the arrangement of such a roll in connection with a back fall is not calculated to impart as powerful a circulation to the pulp as may be desired.

According to the present invention, inexpensive means are provided for securing a strong circulation. With this object a propeller-screw is combined in such a way with a suitable divided or partitioned vat that it circulates the pulp in the vat around the partition, or a centrifugal or other suitable rotary pump or a forcing apparatus in general adapted to operate when entirely immersed in the pulp, may be employed. The propeller-screw is, however, much the best appliance, as well because of its churning action as because of its ease of running, small liability to clog, ready application and simplicity, and its use is included specially in the invention, which extends nevertheless to the em-

ployment of forcing apparatus in general, (of which the screw is one form,) adapted to operate when entirely immersed in the pulp. One advantage of such general apparatus is that a small apparatus may be arranged to operate at or near the bottom of a comparatively deep vat, in which position it is more effective in preventing deposit of the fiber than when placed at the surface, and has not the same tendency to spatter or throw out the pulp. It is not as important, therefore, to have the vat or any considerable portion of it covered, which covering is a disadvantage, as excluding light and air. The propeller-screw or other forcing apparatus operative with complete immersion is included in the invention as well when connected with the vat by suitable conduits as when placed directly in the vat.

The passage or passages in the vat from the discharge side of the propeller-screw or forcing apparatus around the partition to the inlet side thereof are preferably of even or practically even depth throughout, so as to afford an unimpeded flow to the whole stream of pulp, instead of requiring it to pass in a sheet or thin stream over a dam or dams in such passage or passages.

A further improvement consists in employing a partition with an opening through or around it for the passage of the pulp from one side of the partition to the other and a forcing apparatus at the opening either in the same or near and opposite it or in other equivalent relation thereto for passing the pulp through the opening. The spaces on opposite sides of the partition are in communication with each other by a suitable return passage or passages, so that the pulp may flow around to be again passed through the partition by the forcing apparatus or propeller-screw. In connection with this partition forcing apparatus of any ordinary or suitable description may be employed to pass the pulp through the opening, and the invention extends to such general combination; but it is most useful to employ a forcing apparatus operative when fully immersed in the pulp, and a propeller-screw in particular, which is specially included in the invention.

The partition or division provided with an opening through or around it may be arranged in various ways, and is included in

the invention, irrespective of the precise arrangement; but the following arrangements are adopted in practice and constitute, severally and collectively, special features of the invention which may be used or disused without departing from the more general or leading features thereof, namely: First. The partition is placed vertically and extends from the bottom of the vat upward, and is provided with an opening at a suitable distance below its upper edge, the nearer the bottom of the vat the better; second, the opening through or around the partition is placed at a suitable point between its ends, the nearer the middle the better, and a passage or conduit for the return of the pulp is provided at each end of the said partition, so that the pulp which is piled up by the action of the forcing apparatus flows in both directions, and an equal charge of pulp is thus more rapidly circulated with the same expenditure of power; third, at the upper part of the vertical partition, at one or more places or along its whole length, an overflow is provided below the edge of the vat at the part where the level of the pulp is raised by the forcing apparatus, so that if the latter's action should be too energetic the pulp will flow back by the overflow and not be forced out of the vat. There are also some special features in addition which can more conveniently be explained in connection with the drawings. In the vat one or more washers of any ordinary or suitable construction are placed in the circulating pulp. Beaters or pulpers and agitators or mixers (or either of them) may be placed in the vat with or without the washers, and the same is true of other appropriate apparatus of known or suitable construction for acting on the pulp. In employing the propeller-screw additional agitating or mixing devices may be applied to the shaft, the use of obliquely-set arms, arranged at different angles so as to act upon the pulp first in one direction and then in the other, being preferred.

In the accompanying drawings, which form part of this specification, Figure I is a plan of a machine constructed in accordance with the invention. Fig. I^a is a detail view in longitudinal section. Fig. II is a longitudinal section on line *i i* of Fig. I. Fig. III is a cross-section on line *i i i*, and Figs. IV and V are diagrams of modified arrangements.

In the vat A, which may be of any suitable shape, but which, as shown, is an oblong vessel with rounded ends, is placed the propeller-screw or forcing apparatus B, operative with complete immersion, and the pulp-washers C of any suitable description. As shown, the diameter of the propeller-screw B is considerably less than the depth of the vat A, and said propeller-screw is placed close to the bottom of the vat, so as to act upon the underlying pulp and maintain the whole in circulation.

The shaft 1, on which the propeller-screw is

fastened, passes through stuffing-boxes 2 in the sides of the vat A, and is provided on the outside with a shaft stand or bearing 3 and a belt-pulley 4 at one end and a set-screw 5 at the other end; but other convenient means may be used for supporting and revolving the propeller-screw or forcing apparatus B.

The washers C are supported in bearings 6 on the wall of the vat A and on the partition D, by which the vat A is divided, and they are driven from the shaft 1 by the belts 7 and gears 8; but any convenient supporting and driving means may be used. The outer ends of the washer-shaft are shown supported in bearings on stands 9.

The partition D, Figs. I, II, and III, forms a division between the two parts of the vat, and it is provided with an opening 10, through which the pulp is passed by the action of the forcing apparatus or propeller-screw B. Passages or conduits 11 connect the spaces on opposite sides of the partition or division D, so that the pulp may return to the screw or forcing apparatus. The pulp being passed through the opening 10, the normal level is altered, so that the pulp flows around by the return-passages 11 to be again forced through the opening 10. As it flows past the washers C the foul water is drawn off by said washers, as is well understood.

Various arrangements of partitions or divisions with suitable openings and return-passages may be employed; but, as shown, the partition or division D extends upward from the bottom of the tank and the opening 10 is placed near the bottom of the vat or as much below the upper edges as may be, and the return-passages are formed in part by the spaces left between the ends of the partition and the vat. As shown, also, the passages from the discharge side of the propeller-screw or forcing apparatus around the partition to the inlet side of the said screw or apparatus are of even depth throughout, and thus afford an unimpeded flow to the whole stream of pulp.

The opening 10 and the forcing apparatus B might be placed at one end of the vat, the vertical partition being extended to the end wall, as indicated in Fig. IV; or it might be in a lateral extension D' of the partition D extending to the adjacent side wall of the vat, as indicated in Fig. V, and in either case the pulp would be forced to travel the whole length of the vat or of the partition D before it would find a passage to return; but by placing the opening 10 at a suitable distance from both ends of the partition D and providing passages at both ends, as shown in Figs. I, II, and III, the pulp, under the action of the screw or forcing apparatus B, may flow in both directions, and each current is compelled to travel only half the length of the vat or of the partition.

It will be observed that in Fig. IV, as well as in Fig. I, the shaft 1 is transverse to the length of the vat A, which is divided longi-

tudinally by the vertical partition D, and this is preferable to arrangement of the shaft lengthwise, as it allows the employment of a shorter shaft supported at both ends.

5 The mashers in Figs. IV and V may be placed in any desired part of the vat, and if more than one be used they may be on the same or on opposite sides of the partition D.

The vertical partition D is made (see Fig. III) 10 with its upper edge 12 below that 13 of the vat on the side where the pulp is highest, so as to form an overflow by which the pulp, if its level be raised excessively by a too energetic action of the propeller-screw or forcing apparatus, will return directly to the opposite side of the vertical partition, instead of running over the edge of the vat. The overflow might be formed, of course, by an opening or openings at or near the top of the dam, 20 if it should be desired to have the top of the latter higher.

The propeller-screw B, as shown, is placed in the opening 10 in the partition in a tube or a tubular casing 14, whose length is somewhat 25 greater than that of the screw. One advantage of this tube is that it prevents the screw from splattering the liquid or pulp when filling the tank before the level is raised sufficiently to immerse the screw. It also gives 30 a better draft to the screw. It can be made in various ways; but it should consist of or be provided with a renewable lining, as it is subjected to considerable wear by the constant friction of the pulp thereon. As shown, 35 the tube is formed by lags or strips of wood, which are fastened in the partition D. Moldings 15 may be placed on the ends of the tube when it projects, so as to avoid dead-spaces in the vat.

40 With the same object of avoiding dead-spaces, it is preferred to build the vat A with sides re-entrant at 16 at one or both ends of the shaft of the propeller-screw.

Beside creating a circulation, the propeller-screw exerts a certain beating or mixing action on the pulp. To increase this action additional agitators may be provided. As shown, stirring or beating arms 17 are fixed on the shaft of the propeller-screw B, so as 50 to be supported and operated thereby; but they may be otherwise supported and operated. Preferably the arms are flat and set oblique to the shaft, some turned one way, some the other, so as to move the pulp back 55 and forth, and thus more thoroughly heat and mix the same.

Two washers C are shown, but one or more may be used, they being placed at any convenient points in the vat.

60 The improvements are shown in what is considered their best form, but are claimed as well generally as in that form.

I claim as my invention or discovery—

65 1. In combination with a partitioned vat and pulp-treating apparatus therein, forcing apparatus, operative with complete immersion, arranged in the vat for creating a circu-

lation therein around the partition, substantially as described.

2. In combination with a partitioned vat 70 and a pulp washer or washers therein, a propeller-screw or forcing apparatus, operative with complete immersion, arranged in the vat for creating a circulation therein around the partition, substantially as described. 75

3. In combination with a vat and a pulp washer or washers therein, a propeller-screw or forcing apparatus, operative with complete immersion, arranged in the vat for creating a circulation therein, and an additional agi- 80 tator or agitators also in said vat, substantially as described.

4. In combination with a vat and a pulp washer or washers therein, a propeller-screw or forcing apparatus, operative with complete 85 immersion, arranged in the vat for creating a circulation therein, and an additional agitator or agitators provided with arms set obliquely at different angles, so as to throw the pulp back and forth in opposite directions, 90 substantially as described.

5. In combination with a partitioned vat and pulp-treating apparatus therein, a propeller-screw set in the vat below the pulp-level for creating a circulation therein around 95 the partition, substantially as described.

6. In combination with the pulp-vat, a partition provided with an opening, a propeller-screw or forcing apparatus at the opening, whereby the pulp is forced through the said 100 opening from one side of the partition to the other, and a return passage or passages connecting the spaces on opposite sides of said partition, substantially as described.

7. In combination with the pulp-vat, an up- 105 right partition provided with an opening at a distance below the top, a propeller-screw or forcing apparatus, operative with complete immersion, arranged at said opening, and a return passage or passages connecting the 110 spaces on opposite sides of said partition, substantially as described.

8. In combination with the pulp-vat, a partition provided with an opening at a distance from both ends of said partition, a propeller- 115 screw or forcing apparatus at said opening, whereby the pulp is forced through the same, and return-passages around both ends of said partition, substantially as described.

9. In combination with a pulp-vat, an up- 120 right partition provided with an opening therein, a propeller-screw or forcing apparatus at said opening, a return passage or passages between the spaces on opposite sides of the partition, and an overflow by which the 125 pulp can return directly to the first side of the partition rather than run out of the vat, substantially as described.

10. In combination with an oblong vat divided longitudinally, a propeller-screw or 130 forcing apparatus, operative with complete immersion, placed at an opening in the lower part of a vertical partition in said vat, and a return passage or passages around the end

or ends of the partition, substantially as described.

11. In combination with an oblong vat, an upright longitudinal partition provided with
5 an opening therein, a propeller-screw set in said opening and mounted on a shaft transverse to the said vat and partition, and a return passage or passages, substantially as described.

10 12. In combination with a vat, an upright partition provided with a tube or tubular casing opening into the vat on opposite sides of the partition, a propeller-screw not substantially longer than said tube or tubular casing
15 set therein, and a return passage or passages, substantially as described.

13. In combination with a vat, a partition provided with an opening therein, a renewable lining to said opening, a propeller-screw
20 in said opening, and a return passage or passages, substantially as described.

14. The pulp-vat provided with re-entrant sides, a vertical partition transverse to the line connecting said sides, and return-passages at the ends of said partition, in combination with a shaft across the vat at the re-entrant portion of the sides and a propeller-screw at an opening in said partition, substantially as described.

30 15. The combination, with the pulp-vat provided with a partition and passages or con-

duits for the circulation of the pulp, of a propeller-screw in said vat, and beating or mixing arms mounted on the shaft of said screw, substantially as described. 35

16. The combination of the pulp-vat, a pulp washer or washers therein, a vertical partition provided with an opening at its lower part, a propeller-screw at said opening, and a return passage or passages, substantially as described. 40

17. The combination of the pulp-vat, a pulp washer or washers therein, a vertical partition provided with an opening at its lower part, a propeller-screw at said opening, a return passage or passages, and beating or mixing arms fixed with the propeller-screw on the shaft of the latter, substantially as described. 45

18. The combination, with a partitioned vat and pulp washer or washers, of a propeller-screw for creating a circulation in said vat around the partition, the passage or passages from the discharge side of said screw around the said partition to the inlet side thereof being of even depth, substantially as described. 50

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 55

JOHN HOYT.

Witnesses:

PHILIP MAURO,
CHARLES J. HEDRICK.