April 16, 1929. T. G. MARTYN 1,709,676

APPARATUS FOR SEPARATING THE CONSTITUENTS OF PULP

Filed Dec. 24, 1926 2 Sheets-Sheet 1

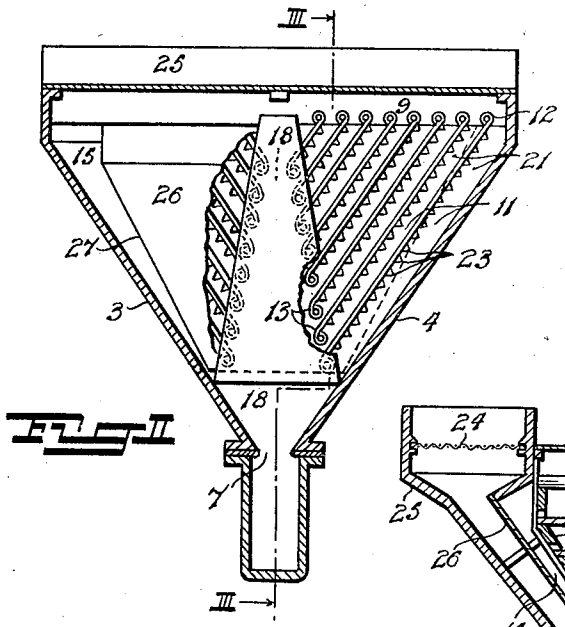


FIG II

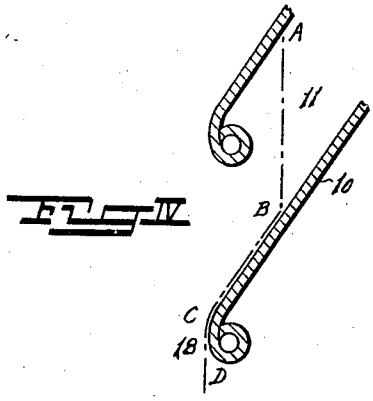


FIG IV

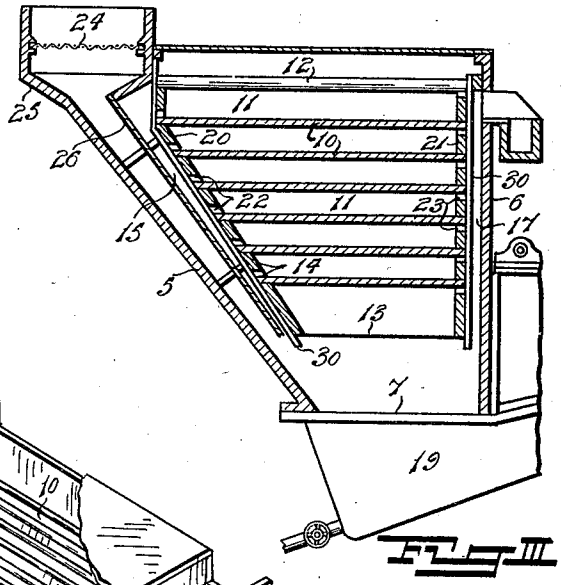


FIG III

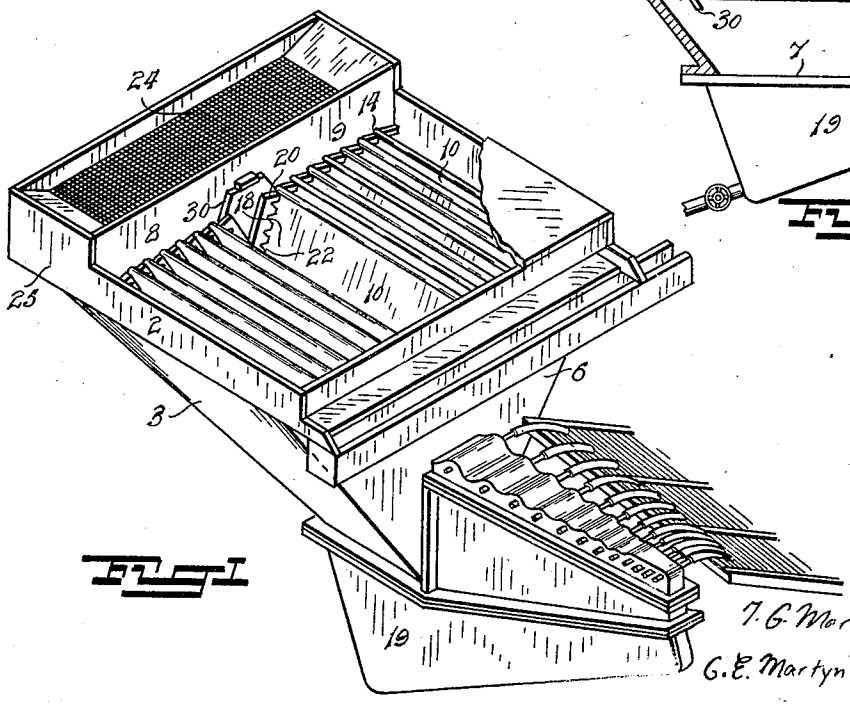


FIG I

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APPARATUS FOR SEPARATING THE CONSTITUENTS OF PULP

Filed Dec. 24, 1926 2 Sheets-Sheet 2

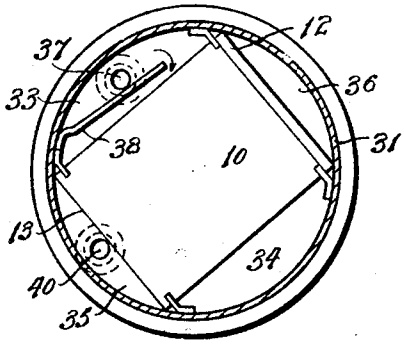


FIG VI

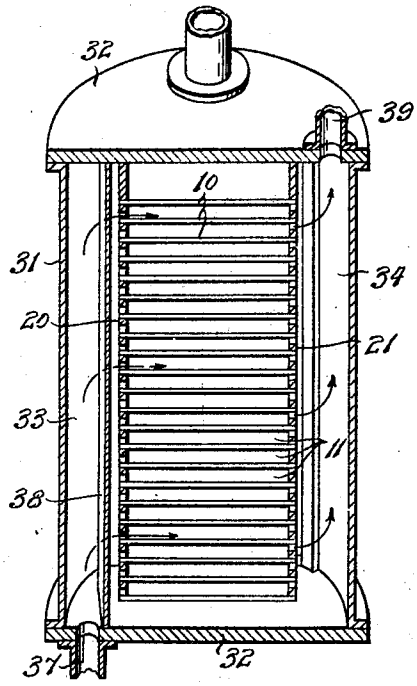


FIG VII

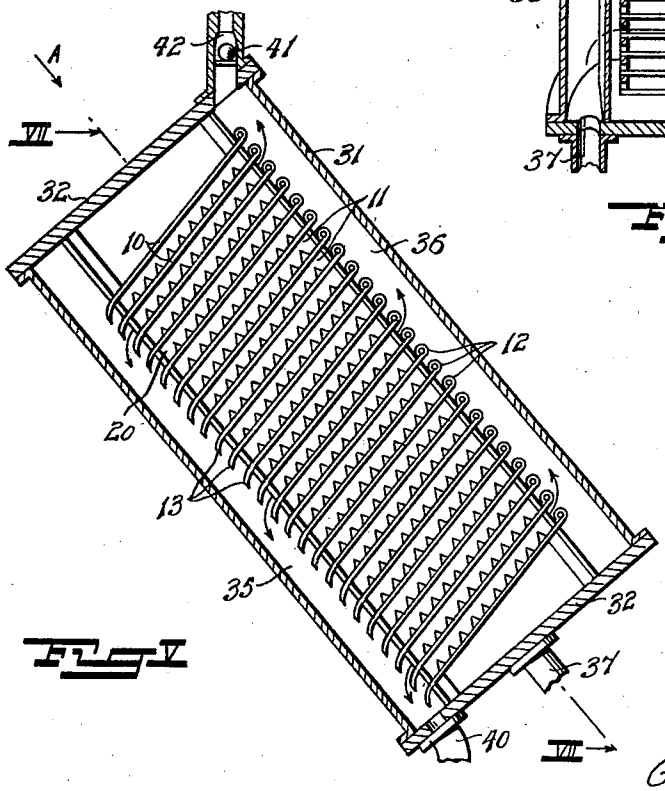


FIG V

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR SEPARATING THE CONSTITUENTS OF PULP.

Application filed December 24, 1923, Serial No. 156,970, and in Union of South Africa January 7, 1926.

The present invention relates to the treatment of pulp for the separation of constituents having a tendency to separate gravitationally from it by either rising or falling.

The invention is thus applicable to the dewatering or thickening of pulp; the removal of slime from mixed pulp; and the separation from pulp of constituents rendered buoyant for flotation separation.

According to this invention the pulp is caused to flow substantially horizontally between confining surfaces inclined to the vertical and spaced a short distance apart. The result is that a particle which gravitates across the stream, by either rising or falling, comes into contact with one of the confining surfaces after it has travelled a short distance. At such confining surface the velocity of the stream is lower than the velocity in the main section of the stream owing to the frictional resistance offered by the surface to the flowing liquid. Consequently, on reaching the surface, the particle is to a material extent shielded from the carrying effect of the flowing stream, and is free to continue its movement towards a point out of the stream by sliding gravitationally up or down the confining surface.

By multiplying the number of confining surfaces, any desired volume of flow may be attained without varying the velocity of the stream and without increasing the distance through which a particle has to travel before being shielded from the stream.

The invention is illustrated in the accompanying drawing in which—

Fig. I is a general view of an apparatus in which the invention is employed to separate slime from sand prior to sorting the latter.

Fig. II is a vertical cross section.

Fig. III is a vertical longitudinal section on III—III Fig. II.

Fig. IV is a diagram.

Fig. V is a vertical section of another form of the invention.

Fig. VI is an end view of Fig. V, with the cover removed, seen from the direction of the arrow A in Fig. V.

Fig. VII is a section on VII—VII Fig. V.

Referring to Figs. I to III 2 indicates a box having walls, 3, 4, 5, 6, converging to a discharge slot 7.

Within the box are two sets 8, 9 of thin partitions 10; which partitions are spaced apart to provide settlement chambers 11 between them. The upper edges 12 and the lower edges 13 of the partitions are horizontal. All the partitions are, as seen in Figs. I and II, inclined to the vertical at an angle suitable to cause sand to gravitate down them. The partitions of the set 8 are parallel to one another and to the wall 3 of the box. Those of set 9 are similarly parallel to one another and to the wall 4 of the box.

The inclined edges 14 of the partitions are spaced away from the wall 5 of the box to leave between them a feed chamber 15. The opposite inclined edges 16 are similarly spaced from the wall 6 to form an outlet chamber 17.

The pulp to be treated flows from the feed chamber 15 through the sets of settlement chambers 11 to the outlet chamber 17. In flowing between the partitions, it is subdivided into sheets, which, for sand settlement, may each be about 2 inches thick. Particles of sand sink through the sheets; and upon reaching the lower surface of the settlement chamber in which they happen to be, slide down said surface to its lower edge 13. The lower edges 13 of the two sets of partitions are separated to form between them a sand collecting chamber 18, in which sand particles fall to the slot 7; to be thereafter further treated in the sorting apparatus 19.

The path of a settling sand particle may be represented as in Fig. IV in which the line A—B is the path of fall through the sheet; the line B—C the path of sliding down the partition and the line C—D the path of fall through the chamber 18. On reaching B and in traversing B—C the particle is substantially free from the carrying effect of the stream. In the path C—D the particle is out of the stream, although C may be above the bottom of the stream as a whole. It will thus be seen that whatever the depth of the stream, the distance A—B viz the vertical distance between two adjacent partitions, is the maximum distance which any particle has to fall through the flowing pulp.

Floatable matter rises out of the subdivided streams and gravitates along the upper bounding surfaces of the chambers 11 to the surface of the liquid in the box 2. The top edges 12 of the partitions are preferably sub-

merged to facilitate skimming of the buoyant matter from the surface of the liquid.

It is preferred to control the inflow and outflow of liquid to and from the settlement chambers 11 and to promote an even flow through all said chambers, by means of end baffles 20, 21 which may also space the partitions from one another. Said baffles are perforated respectively at 22 and 23 to permit limited flow through them. The perforations 22 of the incoming baffles are at the bottom of the baffles and those 23 of the outgoing baffles are at the top. This arrangement prevents direct currents across the chambers 11. It also assists scouring away of sand which may bank up at the incoming ends of the chambers 11 and prevents the scouring away of fine sand which settles at the outgoing ends of said chambers.

The pulp is fed through a grating 24 into a hopper 25, and thence passes into the feed chamber 15 behind a baffle 26 which tranquilizes the flow and assists to distribute the pulp vertically.

The pulp passes around the edges 27 of the baffles 26, and it is preferred to bring said edges fairly close to the side walls 3, 4, of the box in order to scour the adjacent corners of the box and prevent solids from banking therein. The ends 30 of the sand collecting chamber 18 are closed to prevent direct access of pulp to said chamber.

The apparatus shown in Figs. V to VII is suitable for dewatering slime and clarifying liquids, and is so constructed that it may form part of a system under pressure or vacuum. It consists of a circular vessel 31 fitted with end covers 32. Rectangular partitions 10 are arranged in the vessel parallel with one another and spaced to form settlement chambers 11, leaving four unoccupied segmental chambers 33, 34, 35, 36. The necessary inclination, from the vertical, of the partitions 10 may be attained both by inclining the partitions to the axis of the vessel and by tilting the vessel as a whole.

One, 33, of the chambers to which the partitions present their inclined edges is provided with an inlet pipe 37 for the pulp to be treated, and a baffle 38 for distributing the pulp. From there the pulp flows substantially horizontally between the partitions 10, passing to the outlet chamber 34 and to the discharge pipe 39.

Perforated baffles 20, 21 similar to those described above are provided at the ends of the settlement chambers 11.

As the pulp flows through the chambers 11 its heavier constituents settle from it and slide down the partitions to the sludge collecting chamber 35, whence it is withdrawn from the outlet 40.

Air bubbles, particles treated for flotation, and other buoyant matters rise into the collecting chamber 36. This chamber may be provided with a gas discharge valve 41 which floats and is held to its seat 42 by water, but which sinks and opens the outlet when gas collects around it.

What is claimed is:

1. Apparatus for separating the constituents of pulp, comprising inclined upper and lower boundary members providing between them an inclined settlement chamber, means to feed pulp in at one inclined end of said chamber and to withdraw pulp from the other inclined end of said chamber and thereby cause pulp to flow substantially horizontally across the chamber, baffles at the inclined ends of the chamber controlling the flow of pulp into and from the said chamber, and means to collect material which gravitates out of the settlement chamber.

2. Apparatus for separating the constituents of pulp, comprising inclined upper and lower boundary members providing between them an inclined settlement chamber, means to feed pulp in at one inclined end of said chamber and to withdraw pulp from the other inclined end of said chamber and thereby cause pulp to flow substantially horizontally across the chamber, a baffle at the inclined inlet end of the settlement chamber arranged to admit pulp near to the lower boundary member thereof, baffle at the inclined outlet end of the settlement chamber arranged to discharge pulp near to the upper boundary member thereof, and means to collect material which gravitates out of the settlement chamber.

In testimony whereof I affix my signature.

GERTRUDE ELLEN MARTYN,
Executrix Testamentary for Thomas Graham Martyn, Deceased.