Jan. 9, 1923.

1,441,813.

W. LEES ET AL.

STIRRING DEVICE FOR AGITATING LIQUIDS.

FILED FEB. 17, 1921.

4 SHEETS—SHEET 1.

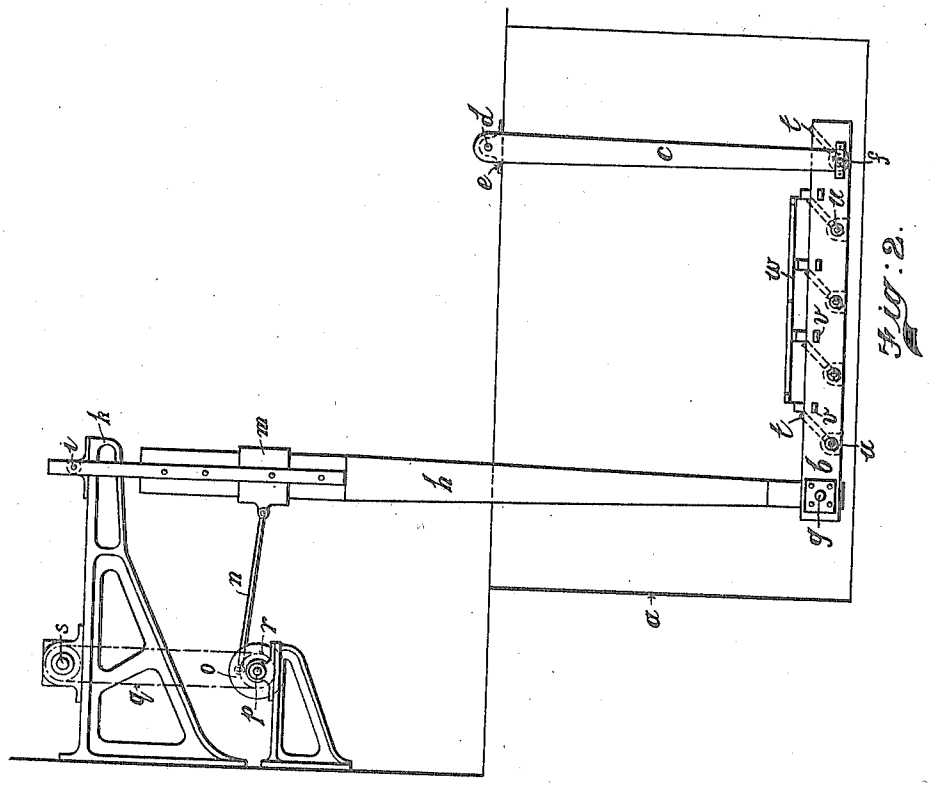


Fig. 2.

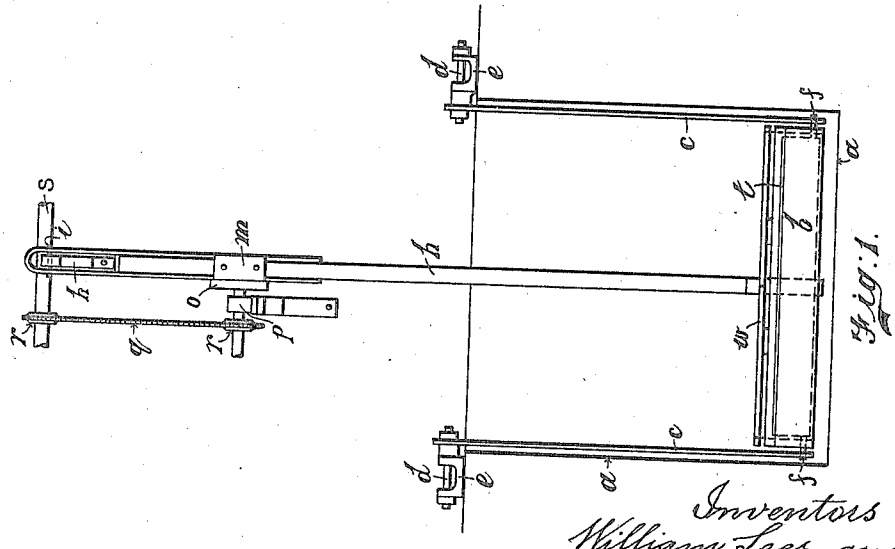


Fig. 1.

Inventors
William Lees, and
Walter Moors.
by Hubert W. Jenner
attorney.

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4 SHEETS—SHEET 2.

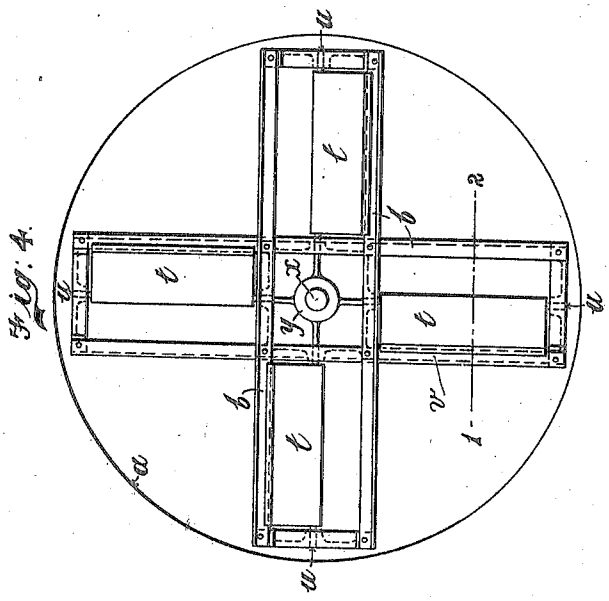


Fig. 4.

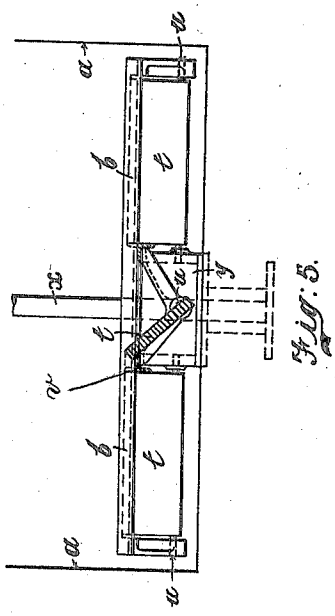


Fig. 5.

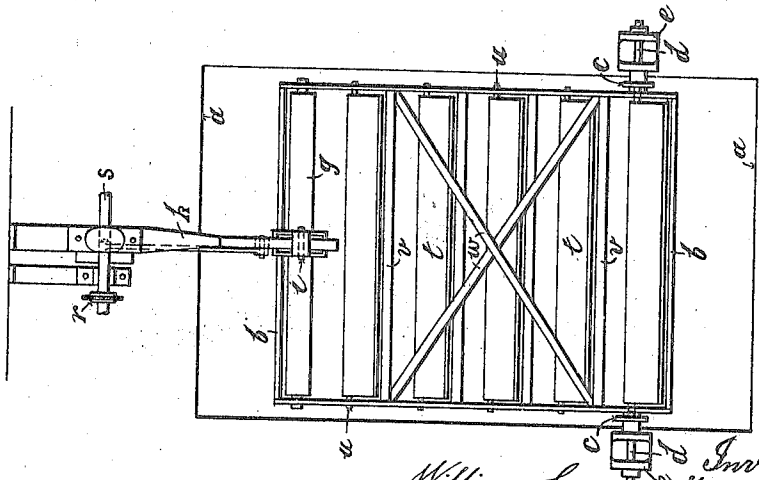


Fig. 5.

Inventors
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4 SHEETS—SHEET 3.

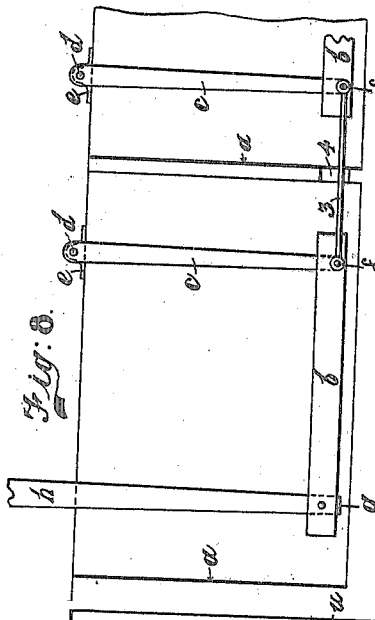


Fig. 8.

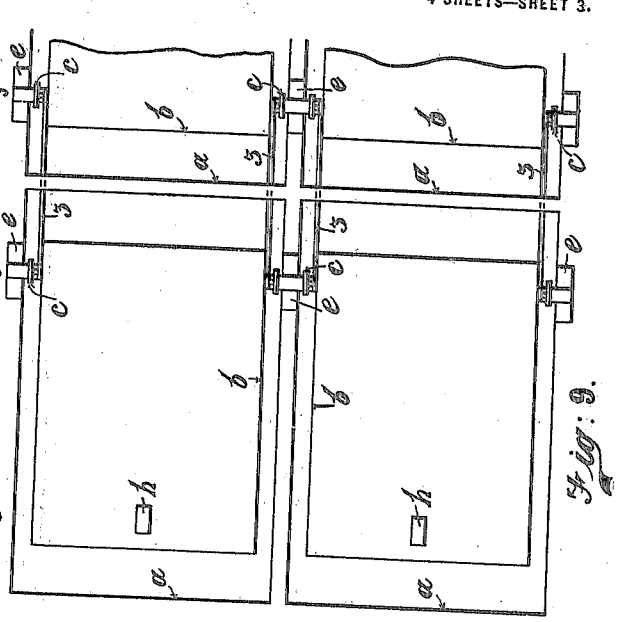


Fig. 9.

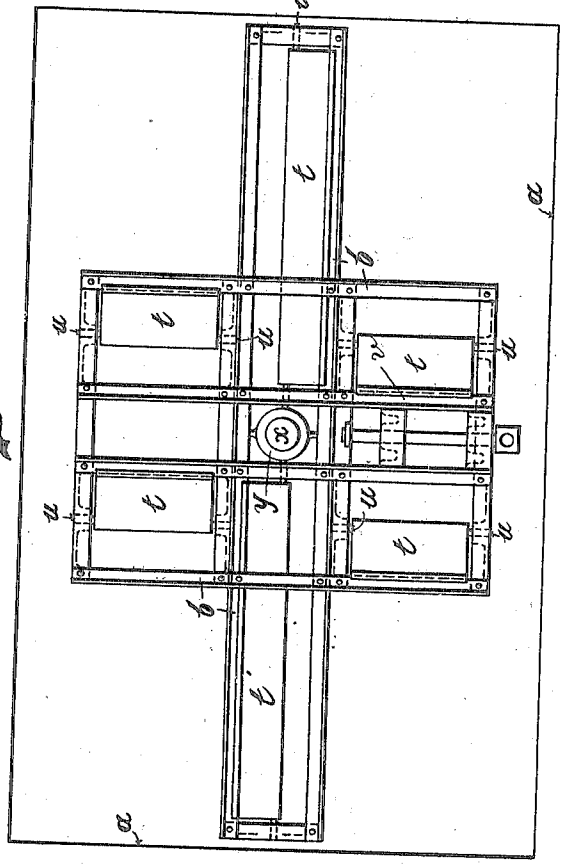


Fig. 6.

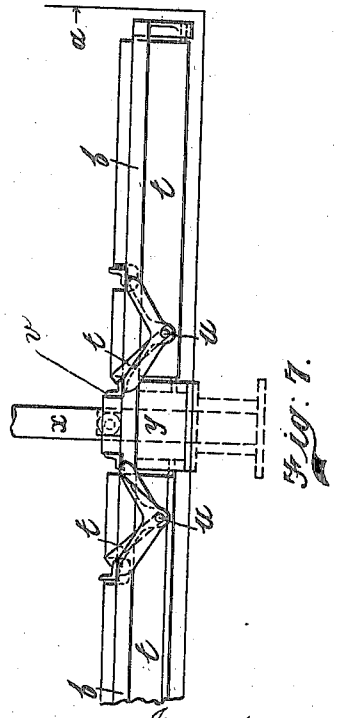


Fig. 7.

Inventors
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Jan. 9, 1923.

1,441,813.

W. LEES ET AL.

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FILED FEB. 17, 1921.

4 SHEETS—SHEET 4.

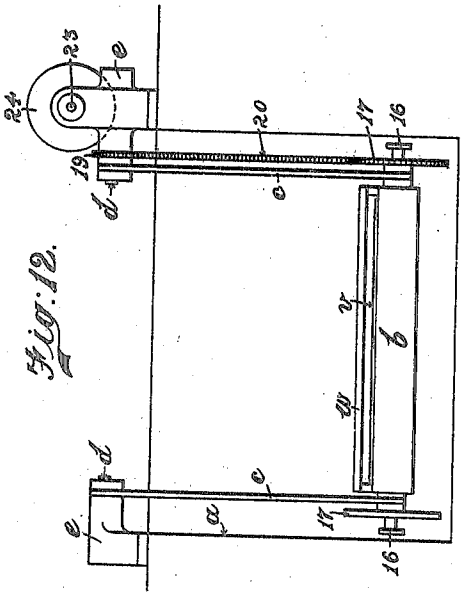


Fig. 12.

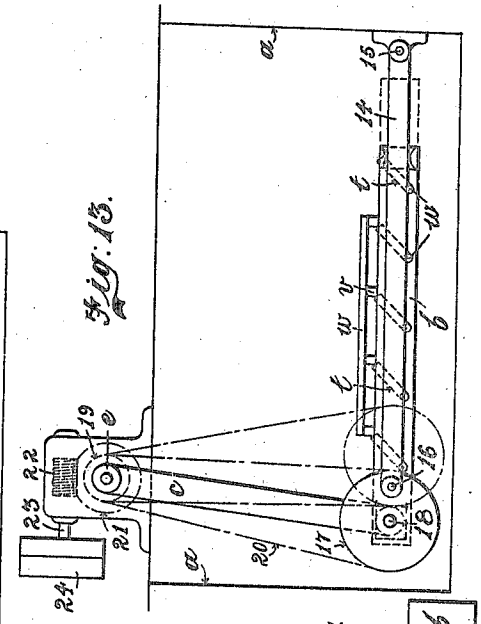


Fig. 13.

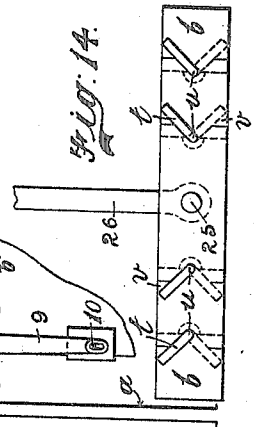


Fig. 14.

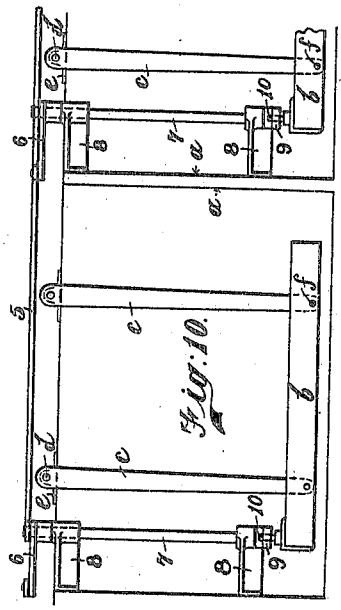


Fig. 10.

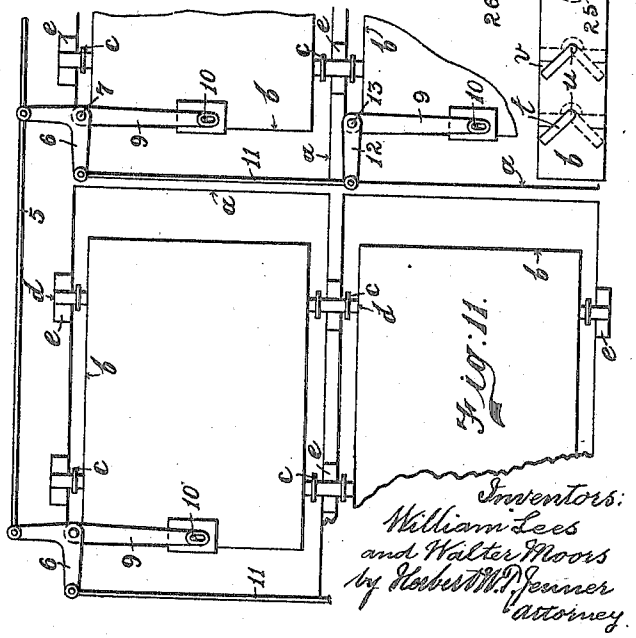


Fig. 11.

Inventors:
William Lees
and Walter Moors
by Herbert W. Jenner
Attorney.

Patented Jan. 9, 1923. 1,441,813

UNITED STATES PATENT OFFICE.

WILLIAM LEES, OF HOLLINWOOD, AND WALTER MOORS, OF RUNCORN, ENGLAND.

STIRRING DEVICE FOR AGITATING LIQUIDS.

Application filed February 17, 1921. Serial No. 445,793.

To all whom it may concern:

Be it known that we, WILLIAM LEES and WALTER MOORS, subjects of the King of Great Britain and Ireland, and residents of Hollinwood, in the county of Lancaster, England, and Runcorn, in the county of Chester, England, respectively, have invented certain Improvements in Stirring Devices for Agitating Liquids, for which we have filed an application in Great Britain November 6, 1919, and of which the following is a specification.

This invention relates to improvements in stirring devices for agitating liquids employed in various commercial and manufacturing processes such as in scouring, bleaching, dyeing and analogous operations in the treatment of textile and other materials and fabrics, and in the liming, leaching and tanning of hides, skins and like goods.

Our invention has reference to an improved agitating device consisting of a frame or paddle adapted to be given a reciprocating and rising and falling movement—or in some cases a reciprocating movement only—and one or more vanes or flaps pivoted to said frame adapted to move about it or their pivotal centres between limiting stops at each side of such centres so as to agitate the liquid and prevent the deposition at the bottom of the tank or other vessel of the solid matter held in suspension in the liquid, the aforesaid means being combined with any suitable or known means for giving the necessary motion to the frame or paddle.

Our invention will be fully described with reference to the accompanying drawing in which—

Fig. 1 is an end elevation of one form of the apparatus constructed in accordance with our invention,

Fig. 2, side elevation of same,

Fig. 3, plan,

Fig. 4, plan of a modified form of the device,

Fig. 5, sectional elevation of the device shown in Fig. 4 on line 1—2 of such figure,

Fig. 6, plan of a modified form of the device indicated in Figs. 4 and 5 and

Fig. 7, side elevation of same,

Fig. 8, side elevation of an arrangement similar to that shown in Figs. 1 to 3 indicating the means of communicating motion from one paddle or frame to another or others,

Fig. 9, plan of same partly in section,

Figs. 10 and 11 side elevation and plan, respectively of modified means to those shown in Figs. 8 and 9 for reciprocating a plurality of the paddle frames,

Fig. 12 end elevation of a further modified form of the device,

Fig. 13 side elevation of same and

Fig. 14 end elevation of another modified form of the device.

In all the foregoing figures similar reference characters indicate corresponding parts.

In carrying out our invention with reference to Figs. 1 to 3 *a* represents the outline of a tank the liquid contained in which is to be agitated and *b* a paddle or frame of skeleton formation adapted to be given a reciprocating and rising and falling movement or, in other words, a backward and forward curvilinear movement in which said frame rises and falls from a neutral position towards and from each end. To enable this to be done the frame is suspended at one end by a pair of links *c* or other equivalent means, the upper ends of which are provided with or secured to studs *d* supported in bearings *e* carried at the upper edge of the tank *a* or at a still higher level, the lower ends of the links supporting the frame by studs *f*. The opposite end of the frame supports a shaft *g* to which the lower end of a second link *h* is coupled, the upper end of such link being suitably pivoted on a pin or shaft *i* carried by a bracket *k*. The link *h* is provided with a fixed collar or clip *m* to which is coupled one end of a connecting rod *n*, the other end of which is, in turn, connected to a crank pin *o* in a crank disc *p* driven by chain *q* and chain wheels *r* from a line shaft *s*. The link *h* and its connections are adapted to give the reciprocating and rising and falling movement to the frame or paddle *a*, but we would have it understood that we do not confine ourselves to the means by which said movement is effected as it will be obvious that this may be carried out in many ways without departing from the essential features of our invention.

In conjunction with the frame or paddle *b* we employ one or a plurality of flaps or vanes *t* each of which consists of a board or plate of suitable material pivoted at each end at one of its edges to the frame *a* at *u*. These vanes are quite free to move about their pivots but their motion in either direction is limited by stops *v*. The angular

movement is substantially through 90 degrees. Their action is such that in moving in either direction they rest against their stops at the upper edges and so lift or force the liquid in the direction in which they and their supporting frame are moving for the time being. On the reverse movement the vanes change their position and act on the liquid in a similar manner. There is thus a constant agitation of the liquid which prevents the deposition of solid matter within the tank. During the movement the liquid displaced can pass between the vanes but in so passing is bound to be agitated thereby. The frame *b* may be stiffened by cross or diagonal stays *w*.

In Figs. 4 and 5 a modification of the device is shown as applied by a circular tank. In these figures the agitating action is carried out by an oscillating horizontal motion about a vertical shaft *x* to which is secured a central boss *y* carrying radially extending frames *b* of skeleton formation to which the vanes or flaps *t* are pivoted in the same manner as before and limited in their movements by stops *v*. In Figs. 6 and 7 a similar construction to that shown in Figs. 4 and 5 is shown applied to a rectangular tank. In Figs. 4 to 7 any suitable means may be employed for giving an oscillating horizontal motion about the axial centre of the shaft *x*.

In Figs. 8 and 9 we have indicated means for communicating motion to two or more frames *b* in a corresponding number of tanks *a*. These means consist in coupling the frames or paddles *d* in the separate tanks by connecting rods 3 passing through slots 4 in the walls of the tanks. In Figs. 10 and 11 a number of frames *b* are operated simultaneously by other means consisting of a rod 5 reciprocated from any suitable source coupled to bell crank levers 6 mounted at the upper ends of shaft 7 carried in bearings 8 within the tanks *a*, the lower ends of said shafts having fixed to them arms 9 slotted at their free ends to engage with studs 10 carried by the frames *b*. The second arms of the bell crank levers are coupled by links 11 to single arms 12 on a second set of shafts 13 which communicate motion by slotted arms 9 to the frames *b* in a series of tanks alongside those first mentioned. A series of the frames shown in Figs. 4, 5, 6 and 7, may be oscillated simultaneously by coupling-rods or connecting-rods, and levers secured on their rock-shafts *x*, in a similar manner to the levers 6 shown in Figs. 10 and 11, and such levers may be coupled or connected by rods 11, as shown in Figs. 10 and 11.

In the modification shown in Figs. 12 and 13 the frame *b* is supported on two arms 14 pivoted at 15 to the one end of the tank *a*. The frame *b* is slidable on the arms 14 by connecting one of its ends to crank pins 16 carried by discs 17 fixed on a shaft 18, such shaft being supported in the lower ends of a pair of suspension links *c* pivoted respectively on a pin *d* and shaft d^1, the latter having fixed on it a chain wheel 19 driving one of the discs 17—which is provided with teeth—by a chain 20. Shaft d^1 drives worm wheel 21 from worm 22 on a shaft 23 on which the fast and loose pulleys 24 are mounted. The action of the parts is to give a rising and falling movement to the frame *b* about the pivotal points 15 and a reciprocating movement on the arms 14, during which the vanes *t* move from side to side as previously described to agitate the liquid.

In the modification shown in Fig. 14 the frame *b* is pivoted on or fixed to a horizontal shaft 25, which in the latter instance is given an oscillating horizontal motion by arm 26 operated in any suitable way. In the former case the latter is connected to the frame. The vanes *t* are pivoted to frame *b* as before but instead of moving from side to side they move from top to bottom or vice versa as frame *b* is rocked. Stops *e* limit the movement of the vanes as before. In each form of the device hereinbefore described, each frame is moved in a horizontal plane in a tank, and each frame has vanes *t* pivoted to the lower parts of it and adapted to rest on stops *e* at the ends of their tilting movements. The frames may be moved horizontally in straight lines or on the arcs of circles. The frames which are moved on circular arcs can be coupled together by connecting-rods in a similar manner to those which move in straight lines.

What we claim as our invention and desire to secure by Letters Patent is:—

1. The combination, with a tank for liquid, of a vertical rock-shaft arranged in the tank, frames supported by the rock-shaft and extending longitudinally upon opposite sides of it, tilting vanes having their lower portions pivoted to the lower parts of the said lower parts of frames, and stops on the frames which limit the tilting movements of the vanes.

2. The combination, with a tank for liquid, or a vertical rock-shaft arranged in the tank, frames supported by the rock-shaft and arranged radially of it in the form of a cross, tilting vanes having their lower portions pivoted to the lower parts of the said frames, and stops on the frames which limit the tilting movements of the vanes.

In testimony whereof we have hereunto set our hands in the presence of two witnesses.

WILLIAM LEES.
WALTER MOORS.

Witnesses:
WILLIAM H. TAYLOR,
M. E. RAMSBOTTOM.