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SETTLING DEVICE

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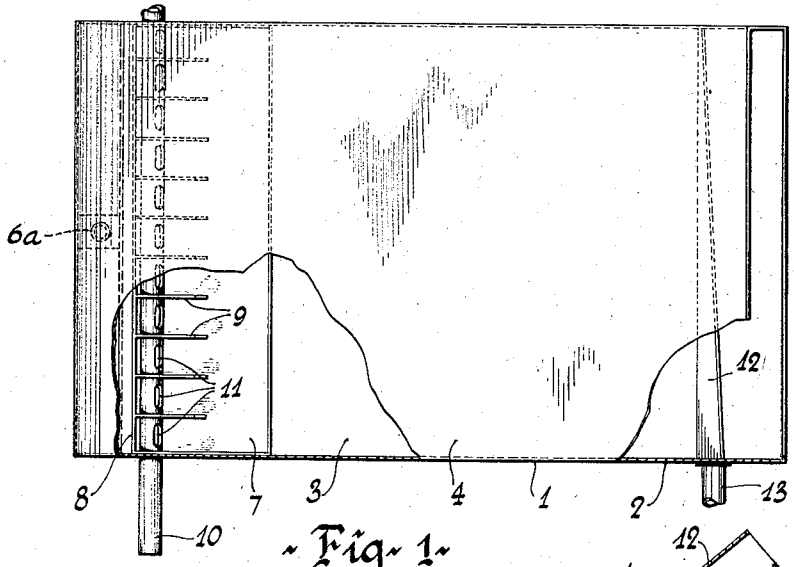


Fig. 1

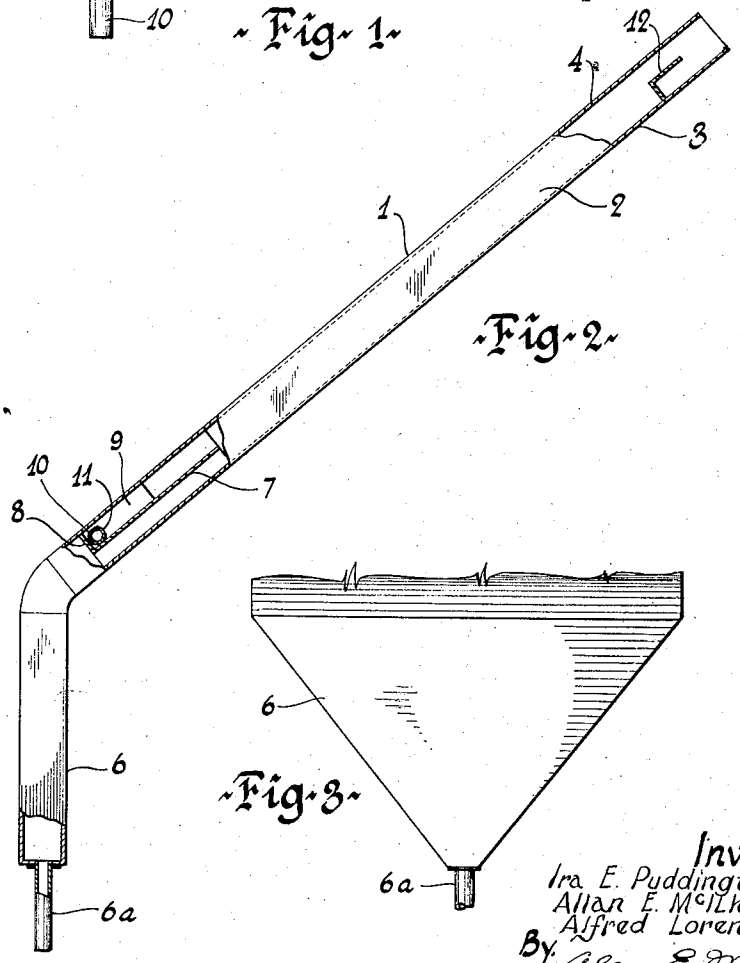


Fig. 2

Fig. 3

Inventors:
Ira E. Puddington
Allan E. McIlhinney
Alfred Lorenzo.
By Alex. E. MacRae
Attorney

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SETTLING DEVICE

Ira E. Puddington and Allan E. McIlhinney, Ottawa, Ontario, and Alfred Lorenzo, Edmonton, Alberta, Canada, assignors to National Research Council, Ottawa, Canada, a body corporate of Canada

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5 Claims. (Cl. 210—519)

This invention relates to fluid suspension settling devices, and more particularly to that type of device wherein the suspension chamber is angularly arranged such as shown, for instance, in copending applications Serial No. 402,916, filed January 8th, 1954 now Patent No. 2,793,186, and Serial No. 524,119, filed July 25th, 1955.

In settling devices of this nature, it is highly desirable that the feed of the material under treatment be such as to cause a minimum of disturbance in the settling chamber due to the formation of currents. While the problem of providing a satisfactory feeding system has been previously recognized, no fully effective solution has heretofore been proposed.

It is an object of this invention to provide a settling device having a simple convenient feeding arrangement adapted to ensure the highest possible operating efficiency of the device.

To this end, the invention comprises, in a settling device having at least one angularly arranged container having top, bottom and side walls, means for feeding fluid suspension to said container comprising a baffle plate disposed between and spaced from said top and bottom walls and extending longitudinally through a minor portion of said container, a feeding conduit extending through at least one of said side walls and disposed between said top wall and plate, said conduit having a plurality of feed openings within said container, and a plurality of substantially parallel baffles extending substantially perpendicularly from said plate and conduit, at least one of said openings being located between each pair of baffles.

The invention will be described with reference to the accompanying drawing, in which

Figure 1 is a plan view of a settling device in accordance with the invention.

Figure 2 is a side elevation partly in section, and

Figure 3 is a partial end elevation.

In the drawing, 1 is a container having side walls 2, bottom wall 3 and top wall 4. The side walls 2 are relatively narrow to provide a broad shallow container. The proportional dimensions of the container may vary greatly but, as shown, they may be of the order of 4 feet wide, 8 feet long, with about 2 inches spacing between walls 3 and 4. In operation, the container is adapted to be disposed in an inclined or angular position as shown in Figure 2. The angle of inclination should be approximately 40° to 60° from the horizontal. The upper end of the container may be open, as shown, and the lower end communicates with a downwardly extending collecting vessel 6, which converges towards a discharge pipe 6a leading therefrom.

Feeding means in accordance with the invention comprises a baffle plate 7 which, as shown, is arranged within the container in substantially parallel relation to top and bottom walls 4 and 3 and in spaced relation thereto. Thus, the plate may be substantially midway between walls 3 and 4, but under some circumstances it may be closer to the top wall or to the bottom wall. The plate 7 preferably extends from one side wall 2 to the other

end throughout a minor portion of the longitudinal extent of the container. This minor portion may be of the order of ⅛ the length of the container. For example, a plate 10 to 12 inches wide in a container 8 feet long is satisfactory.

The plate 7 has a right angular flange 8 extending from its lower edge towards but preferably spaced from top wall 4. Mounted on the plate and extending substantially right angularly therefrom and from the flange 8 are a plurality of uniformly spaced baffles 9. It will be apparent that baffles 9 are in generally parallel relation to the side walls 2 of the container. Furthermore, the baffles 9 preferably extend upwardly into substantial engagement with top wall 4.

A feed tube or conduit 10 extends through the side walls 2 and transversely of the container. The conduit is located above the plate 7 and closely adjacent the flange 8. Thus, the conduit also extends through each baffle 9 adjacent its lower end. The conduit has a plurality of aligned openings 11 therein, each opening being preferably in the form of a slot the longitudinal extent of which is in the axial direction of the conduit. While the size of the slots may vary, a slot ⅛ inch wide and 1 long, with a spacing of 2 inches along the length of the conduit, has been found satisfactory.

As shown each baffle 9 may be located substantially midway between each pair of adjacent slots. It will be understood that more than one opening 11 may be provided between each pair of baffles. Each baffle extends several inches upwardly from the feed conduit 10. Thus, in using a feed conduit of ⅜ inch internal diameter, a baffle of 5 inches long is satisfactory.

The feed tube 10 is preferably removably mounted in the container so that it may be readily removed for cleaning purposes as desired. To this end, it is proposed that the feed tube be retained in operative position by reason of its frictional engagement with side walls 2 and baffles 9. Such a mounting also permits rotative adjustment of the feed tube relative to the container. Thus, while the slots 11 are preferably and normally disposed somewhat closer to the top wall 4 than to the bottom wall 3, whereby flow therefrom is directed upwardly and substantially parallel to walls 4 and 3, it may be desirable in some instances to vary such direction of flow.

The feed tube 10 and its associated elements is preferably located as shown, namely adjacent the bottom of the container. However, it may be placed at various locations in the container depending upon the type of material under treatment and the velocity of feed. Ordinarily, it should be located at the level in the container in such a way that the natural convection currents in the material under treatment are disturbed as little as possible.

A collecting trough 12 having an outlet 13 extends transversely through the container adjacent the upper end thereof.

In operation, the fluid suspension under treatment is fed into feed tube 10. Preferably, feed is introduced in equal degree into both ends of the tube in order to provide substantially uniform velocity of flow from the slots 11 into the container. The baffles 9 prevent the formation of transverse currents in the flow of liquid in the container and tend to produce instead longitudinal currents. The restricted cross-section of flow effected by the plate 7 between the baffles 9 and beyond the latter tends to promote uniform distribution of feed across the width of the container. The use of slots permits a relatively large port area in a feeding tube small enough in diameter to give a liquid velocity sufficient to prevent the solids from settling out in the tube itself. Moreover, slots are less likely to become plugged with solids than are circular openings. The formation of longitudinal currents as near

the point of feeding as possible is desirable to minimize the effects of turbulence throughout the settling chamber.

The plate 7 is so arranged that solids in the suspension under treatment, which are carried part way up the container by the longitudinal currents, drop towards the bottom wall 3 as the current velocity decreases, and are carried in the downwardly moving convection current which is caused by the density gradient in the suspension normal to the walls 3 and 4 owing to vertical settling of the solid particles, such current passing beneath the plate 7. The solids continue down into the vessel 6 and are finally discharged therefrom. Clear liquid from which solids have separated is collected in the trough 12 at the top of the container and is discharged through outlet 13.

Restricting the space between plate 7 and top wall 4 by means of the flange 8 below the feed tube 10 prevents the formation of circular currents around the feed tube which would interfere with the settling movement of the solids.

The device described permits sufficient jet velocity of feed to avoid plugging, while introducing such feed in such a way that there is a minimum of disturbance due to the formation of currents in the suspension under treatment.

It will be understood that, while the device has been described with respect to a single cell or container 1, the device may comprise a plurality of such cells.

We claim:

1. In a settling device having a container disposed at an angle to the horizontal and having generally rectangular top, bottom and side walls, means for feeding fluid suspension to said container comprising a feed conduit extending through at least one of said side walls and disposed between said top and bottom walls, said conduit having a plurality of feed openings within said container, a baffle plate extending transversely within the container and located between said conduit and said bottom wall and spaced from said bottom wall, said baffle plate extending longitudinally through a minor portion of said container, and a plurality of substantially parallel baffles extending substantially perpendicularly from said baffle plate and conduit, at least one of said baffles being disposed between each pair of adjacent openings.

2. A settling device as defined in claim 1, said baffle plate being in substantially parallel relation to said top and bottom walls.

3. A settling device as defined in claim 1, said baffle plate having a flange extending from its lower edge upwardly towards said top wall, said conduit being located in adjoining relation to said flange, and said baffles each having an end edge in substantial engagement with said flange.

4. A settling device as defined in claim 1, said feed conduit being removably mounted in said container and extending through both said side walls whereby feed may be effected from both ends of said conduit.

5. In a settling device having a container disposed at an angle to the horizontal and having top, bottom and side walls, means for feeding fluid suspension to said container comprising a feed conduit extending through said side walls and having a plurality of feed slots within said container, the longitudinal extent of said slots being disposed in the axial direction of said conduit, said conduit being located adjacent the lower end of said container and having said slots directed upwardly, a baffle plate extending transversely within said container from side wall to side wall and located in spaced relation to said top and bottom walls, said conduit being disposed between said baffle plate and top wall, said baffle plate extending longitudinally through a minor portion of said container and having a flange extending from its lower edge towards said top wall, and a plurality of substantially parallel baffles extending substantially perpendicularly from said baffle plate and conduit and towards said top wall, each said baffle being disposed between an adjacent pair of said slots and extending longitudinally from said flange and terminating below the upper edge of said baffle plate, a collecting vessel communicating with the lower end of said container, and a collecting trough in said container adjacent the upper end thereof.

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