

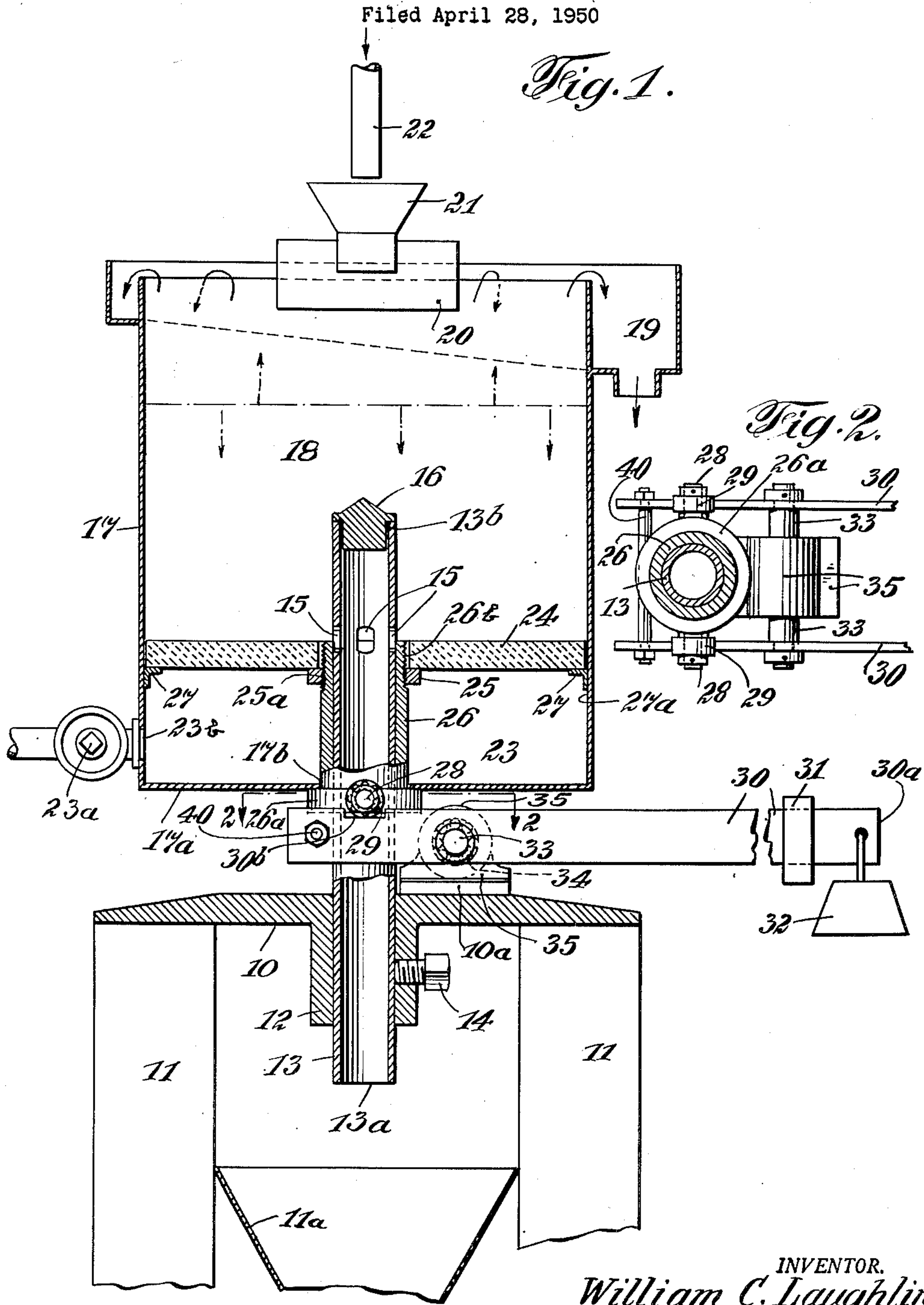
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W. C. LAUGHLIN

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## DISCHARGE MECHANISM FOR HYDRAULIC SEPARATORS

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INVENTOR.  
*William C. Laughlin*  
BY  
*C. P. Goepel*  
his ATTORNEY



## UNITED STATES PATENT OFFICE

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## DISCHARGE MECHANISM FOR HYDRAULIC SEPARATORS

William C. Laughlin, New York, N. Y.

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1 Claim. (Cl. 209—496)

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This invention relates in general to ore separation by hydraulic means, and more particularly has for its object the provision of automatic discharge means for the recovery of the separated heavier constituents.

Ores which have been screen sized into portions which can be hydraulically classified into high and low gravity products in an uprising flow of water, with the spread in screen sizes being in relation to the relative gravities of the minerals, are especially suitable to such concentration. The invention is further applicable to the separation and recovery of large and small particles of minerals of like gravity.

For example, Mesabi Iron ores, having a hematite of 5<sup>2</sup> gravity and a silica gangue of 2<sup>6</sup> gravity require screening to approximately the Tyler Standard Screen Scale to produce portions which will hydraulically classify into clean products, while with Galena having a gravity of 7<sup>5</sup> the screen spread would be greater.

The present invention is applicable to a container in which a concentrate suspension of the high gravity mineral is obtained by subjecting an ore slurry with particles of defined plus and minus screen sizes to an uprising flow of water within such container, said container having an upper overflow for the low gravity mineral. A mobile suspension of the high gravity mineral of desired density and depth is obtained in the container, which container is yielding supported, and with its content, is counterbalanced by means outside of the container. Any additional high gravity mineral added to the container and augmenting the high gravity suspension will increase the weight and overcome the balance, and cause the container to move downwardly against the counterbalance and in turn cause a discharge means within the container to permit escape of high gravity mineral from the container as long as the unbalanced condition exists. When the balance has been restored, the container will rise and close the discharge means within the container.

The invention consists in the combination of parts to function first as means of hydraulic separation of one mineral constituent from the other, and secondly, as means of automatically removing such high gravity mineral as a result of the downward movement of the container to a fixed discharge opening, such downward movement and its consequent upward movement being controlled by the counterbalancing means outside of the container.

The invention also includes a novel method which consists in the compensating action of the

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weight of the container and its content, brought about by an applied counter force which is proportionate to any increase in weight, as will be hereinafter more particularly pointed out.

5 The invention will be hereinafter further described, an embodiment shown in the drawings, and the invention will be finally pointed out in the claim.

In the accompanying drawings,

10 Fig. 1 is a vertical central section of the improved device embodying the invention, and

Fig. 2 is a plan section taken on line 2—2 of Fig. 1.

15 Similar characters of references indicate corresponding parts throughout the drawings.

Referring to the drawings, a base plate 10 rests on a supporting frame 11, and has a downwardly extending centrally disposed cylindrical sleeve 12. A tube 13, open at its lower end 13a and having a loose fitting cap 16 at its upper end 13b, and vertical intermediate slots 15, is movable in the sleeve 12 but is retained at a predetermined position by a set screw 14 passing through the sleeve 12 and engaging the exterior of the tube 13.

20 Spaced above the base plate 10 is a tank 17 having an ore receiving and concentrating chamber 18 in its upper section, with a tailing launder 19 without and around its upper elevation. Ore feed means consist of a baffle 20, feed funnel 21 and feed pipe 22.

30 A water chamber 23, having a water inlet 23b controlled by a valve 23a is formed by the lower part of the container 17. A porous plate 24, supported by a ring nut 25 on a bushing 26 and on a circular angle iron 27 secured to the inner cylindrical surface 27a of the container 17, divides the interior of the tank 17 into the chambers 18 and 23. The bushing 26 has exterior screwthreads 26a and the ring nut 25 has internal screwthreads 25a to engage the screwthreads 26b for convenient assembly.

40 The bushing 26, forming the inner boundary of the water chamber 23 extends through an opening 17b of the bottom 17a of the tank 17 and has a flange or collar 26a upon which the bottom 17a rests. This collar 26a has two projecting lugs or trunnions 28 spaced at 180° which ride in the ball bearing 29. The inner diameter of the bushing 26 is substantially equal to the outer diameter of the tube 13 to provide a sliding fit. The tank assembly described is slidable as a unit on tube 13.

Intermediate the base plate 10, and the tank assembly is a pair of levers or beams 30 having movable weight 31 and a fixed weight 32 at the 55 end of the lever 30. The upper surface of the



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levers 30 preferably has a cut out 30b below bearing 29. The levers 30 are fulcrumed on a shaft 33 riding in a ball bearing 34, supported by a housing 35 secured to the upper surface 10a of the plate 10. A crossbar 40 holds the beams 30 in spaced relationship, so that the beams straddle collar 26a.

In assembling, the levers or beams 30 are preferably fixed in a level position and the tube 13 is adjusted and fixed by the set screw 14, so that the slots 15 are positioned 50% of their openings above the top of the bushing 26, as shown in Fig. 1. A discharge hopper 11a receives the discharge from the tube 13 to guide the concentrate from the device.

The operation is as follows:

In Figure 1, the apparatus is shown with the beams 30 in a horizontal position, and with the slots 15 of the tube 13 in half open position above the bushing 26. However, the movable weight 31 and the fixed weights 32 on the beams 30 are so determined that the slots 15 are closed with reference to the bushing 26, until such time as a suspension of high gravity mineral is developed above the porous plate 24 to a desired operating depth, at which point the weights 31 and 32 are adjusted, to equalize the combined weights of the tank container and its content. Any further addition of high gravity mineral to the suspension of high gravity mineral then adds to the weight of the tank content, and upsets the balance. Thereby the tank moves downwardly on the tube 13 and brings the slots 15 into a partial or full opening position above the bushing 26. High gravity mineral then passes from the tank to the discharge at 13a, and such discharge continues as high gravity mineral is added to the suspension. When the weight of said suspension becomes decreased to a point approximating its original weight, the counterpoised weights 31 and 32 on the beam 30 then lifts the tank 17 with its bushing upwardly and closes slots 15.

During the formation of the suspension referred to, the water rising from the porous plate moves the relatively lighter constituents from the suspension and these lighter constituents discharge from the container with the continuous flow of water.

From the foregoing it will have been noted that the improved device causes a high density suspension to be formed within the classifying sections of a container, that the container is yieldingly supported and its contents are balanced against the counterweight or the like, without the container, that downward movement of the container is caused against a counterweight by further addition to the suspension; that high gravity mineral is discharged when fixed discharge opening is contacted, and that an uplift of the container by counterweight when load of high gravity decreases is obtained.

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to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:

5 In an apparatus for separating minerals of fine ores having a container with a bottom wall and with a central opening, and an upper end, a horizontal porous partition in said container spaced from said bottom wall and from said upper end to form a lower and an upper chamber, and having a central bore in vertical alignment with said bottom opening, with a water supply inlet below said partition filling the lower chamber with water and supplying an uprising flow of water through said partition into said upper chamber, said container having a discharge means for said water and lighter mineral at said upper end, the combination of a bushing centrally of said partition engaging said central bore and extending through the bottom opening, and below said container, and fixed to said container, said bushing below said container having guide wheels, a discharge tube slidably disposed within said bushing and extending from above said partition to below and beyond said guide wheels, said discharge tube having an upper discharge opening, a supporting frame below said container, means securing the lower end of said discharge tube to said frame, a pivot means supported on said frame, and a lever pivoted to said pivot means and extending under said guide wheels at one end and adjustably weighted on the other end to counterbalance the weight of the container and its content, said counterbalancing being overcome by any excess of heavier mineral over said balanced content in said container above said partition, said upper discharge opening being horizontally aligned with said partition and closed by said bushing, and said tube having a lower discharge opening at its lower end, whereby the bushing is moved downwardly away from said upper discharge opening in said tube to discharge the heavier minerals into said tube and out of the same from its lower discharge opening, until the removal of said excess of heavier material enables the counterbalanced end of said lever to press its other end against said guide rollers, and move the said bushing with said container upwardly to close the discharge opening in said tube, until further high gravity mineral is again in excess.

WILLIAM C. LAUGHLIN.

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55 The following references are of record in the file of this patent:

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