Dec. 4, 1923. 1,476,250

R. S. HANDY ET AL

HYDRAULIC CLASSIFIER

Filed Dec. 7, 1921

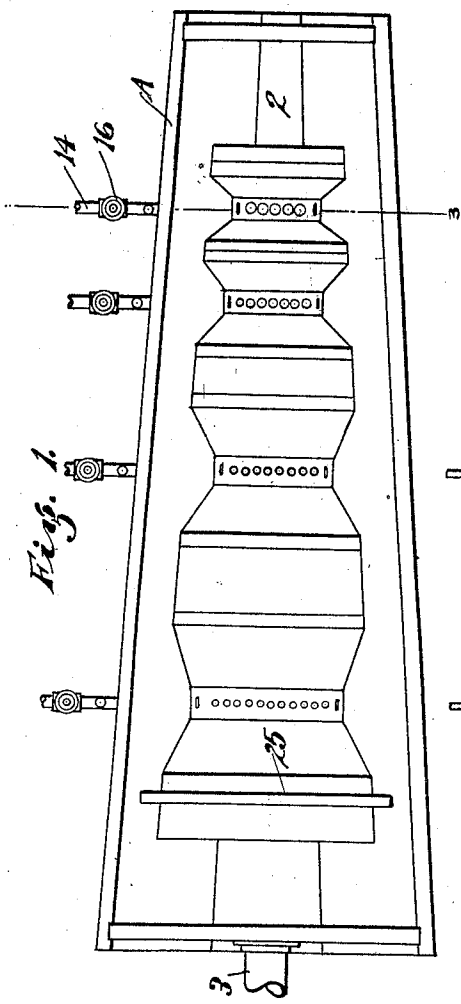


Fig. 1.

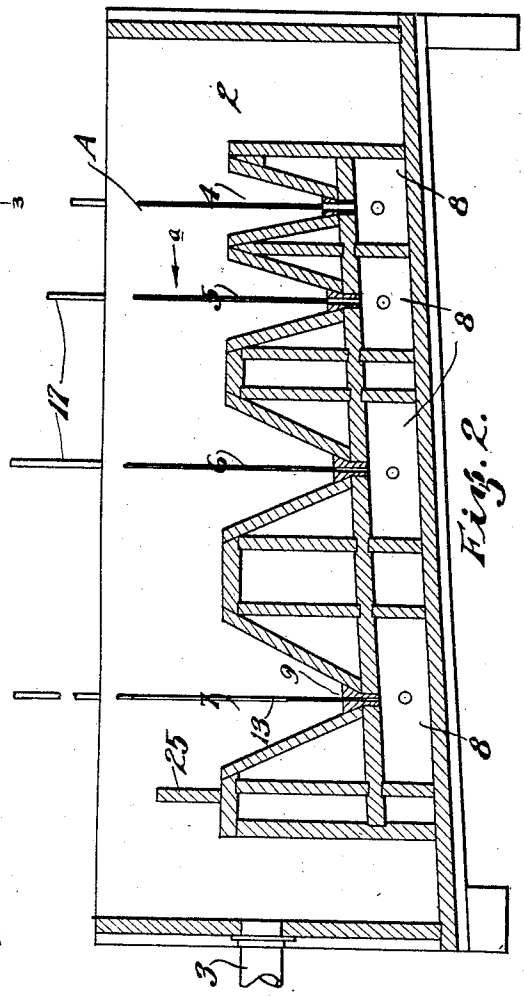


Fig. 2.

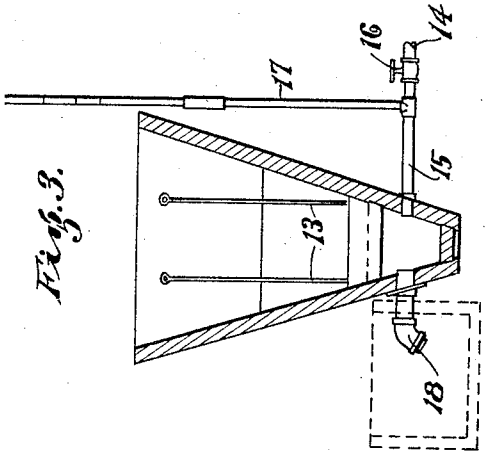


Fig. 3.

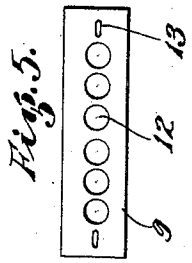


Fig. 5.

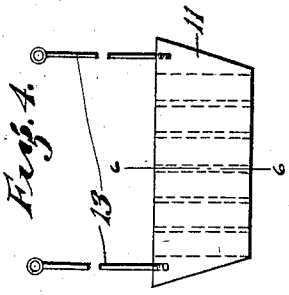


Fig. 4.

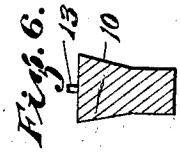


Fig. 6.

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UNITED STATES PATENT OFFICE.

ROYAL S. HANDY AND EDWARD HEARING, OF KELLOGG, IDAHO.

HYDRAULIC CLASSIFIER.

Application filed December 7, 1921. Serial No. 520,494.

To all whom it may concern:

Be it known that we, ROYAL S. HANDY and EDWARD HEARING, citizens of the United States, residing at Kellogg, in the county of Shoshone and State of Idaho, have invented new and useful Improvements in Hydraulic Classifiers, of which the following is a specification.

This invention relates to the construction of that class of apparatus commonly termed hydraulic classifiers, and is especially designed to progressively segregate the granular constituents of ore or pulp in the order of their specific gravities as they discharge from the stamps, pebble mills, or other grinding mechanism employed.

The objects of the present invention are to generally improve and simplify hydraulic classifiers; to render such classifiers durable and efficient in operation; to increase the capacity thereof; to minimize the amount of water employed; to permit visual observation and easy regulation of water pressure, and to permit quick and ready removal of such parts of the mechanism as may require cleaning from time to time.

Further objects will hereinafter appear.

The invention consists of the parts and the construction, combination and arrangement of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Fig. 1 is a plan view of the classifier.

Fig. 2 is a central, vertical, longitudinal section of the same.

Fig. 3 is a cross section on line 3—3, Fig. 1.

Fig. 4 is a side elevation of one of the classifying columns employed.

Fig. 5 is a plan view thereof.

Fig. 6 is a cross section on line 6—6, Fig. 4.

Referring to the drawings in detail, and particularly to Figs. 1, 2 and 3, A indicates in general a box shaped container in which is formed a series of pyramid shaped settling compartments of increasing surface area and depth as indicated at 4, 5, 6 and 7. The main container is also provided with a feed box 2, and a pipe 3, through which the pulp discharges after classification has taken place. Arranged below each settling chamber is an enclosed pressure chamber, as indicated at 8, and forming communication between each pressure chamber and the settling chamber arranged above the same is a crosswise extending slot, which is provided for the reception of a removable block 9. The slots and the blocks disposed therein are arranged in the vortex of the respective settling chambers and to a certain extent form the most essential part of the classifying mechanism. The blocks employed are specifically illustrated in Figs. 4, 5 and 6. They consist of elongated cast-iron blocks, the sides and ends of which are tapered as shown at 10 and 11 to conform with the contour of the slots. Each block is provided with sorting columns 12, which are formed by drilling the blocks or otherwise forming the columns therein. Each block is also provided with a pair of upwardly extending eye-bolts 13, which permit ready removal or insertion of the blocks, and the sorting columns employed are graduated in size with relation to the respective blocks, that is the block disposed in the first settling chamber, or that indicated at 4, contains sorting columns of the largest diameter, while the blocks disposed in the remaining settling chambers are provided with sorting columns of gradually decreasing size. In other words as the area and depth of the settling chambers increase, a proportionate decrease in the size of the sorting columns is resorted to. This is due to the fact that varying grades of classified material is sought, and also due to the fact that the coarser particles contained in the ore or pulp have a tendency to settle more rapidly than the lighter materials.

For the purpose of obtaining the classification desired, counter-currents are employed, that is each pressure chamber 8 is connected with a main water supply pipe 14 by means of pipes 15. Each pipe 15 is provided with a valve 16 whereby the pressure may be regulated, and each pipe 15 is also provided with a glass pressure gauge 17 to permit visible indication of the water pressure maintained in the respective chambers 8.

In actual operation the pulp or ore to be classified is delivered to the feed box 2, by means of water or any other suitable liquid. The pulp is here equally distributed and will flow over the settling compartments 4, 5, 6 and 7, in the direction of arrow *a*. As the pulp flows in this direction, the velocity will gradually reduce and the heavier particles contained will settle in the chambers 4, 5, 6 and 7. The settling particles will finally reach the drilled openings 12 or the sorting columns where they meet the rising currents discharging from the pressure

chambers 8, and as the velocity of these rising or counter currents is controlled by the valves 16 and the pressure is visibly indicated by the glass pressure gauges 17, it is obvious that any flow or velocity desired may be readily obtained, and that only particles of a given specific gravity and shape will be permitted to enter the respective compartments. Such particles as pass through the sorting columns will continue to settle into the pressure boxes, where they may be discharged through spigots, such as indicated at 18. The lighter particles descending into the first chamber, or into any chamber for that matter, which it is not desired to collect, will rise towards the top of the settling compartment from which it is expelled and will thus overflow into the succeeding compartment, where it may be permitted to settle through the columns if desired. This is possible as the slightly different conditions of counter-current in the sorting columns will permit such action, thus particles of one gravity will settle in the first compartment, and particles of another gravity or shape will settle in the second compartment, and so on, and varying grades are finally obtained.

The present machine may handle pulp from stamps, pebble mills, or any other class of grinding or crushing machinery desired. Practically any number of segregated grades or classes of material desired may be obtained by increasing or decreasing the number of settling chambers and classifying columns employed. The product thus classified may be returned to the crushing or grinding mechanism employed if a finer product is desired, or it may be directly delivered to concentrating tables, etc., that is the apparatus is equally applicable whether it is desired to slime the entire product or to merely classify the pulp for further concentration, etc.

The features desired in the apparatus here disclosed are: superior efficiency in every direction and greater ease of operation and control. These results are obtained: first, by providing the pyramid shaped settling chambers of increased area and depth, it is possible to gradually remove and segregate the ore particles of varying shape and size and specific gravity. Second, the removable blocks of sorting columns, not constricted, and which also vary in size and in number serve a similar purpose. Third, the glass pressure gauges permit visual indication of the pressure in each compartment, and as valves are provided in conjunction therewith, adjustments to accommodate varying conditions set up by the two preceding factors may be quickly and readily attended to. Fourth, the provision of removable blocks of sorting columns is of further importance as it permits almost instantaneous cleaning of the sorting columns, and renders the operation of the machine infinitely easier, that is wood pulp or other waste has a tendency to clog the fairly small openings formed in the blocks, and as this is the case the blocks must be cleaned from time to time which can be quickly accomplished in the present instance due to the fact that each block is provided with eye-bolts 13, which extend above the water level and thereby permit quick removal and re-insertion of the blocks. A fixed height or water level is maintained above the settling chambers 4, 5, 6 and 7, by means of an overflow or baffle board 25, and as this may be readily removed or changed, it is obvious that the height may be increased or decreased to suit varying conditions of pulp.

While certain features of the present invention are more or less specifically illustrated, we wish it understood that various changes in form and proportion may be resorted to within the scope of the appended claims, similarly that the materials and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or varying uses may demand.

Having thus described our invention, what we claim and desire to secure by Letters Patent is—

1. A classifier comprising a trough shaped container having a series of settling chambers formed therein and arranged in successive order lengthwise thereof, a pressure chamber formed below each settling chamber and communicating with the settling chamber thereabove and provided with an inlet opening and an outlet, valve operated means for admitting water to each pressure chamber and for regulating the pressure thereof and means between the regulating element of the water admitting means of each pressure chamber and the outlet thereof and disposed adjacent one side of the container to continuously indicate the pressure in each pressure chamber to thereby prevent the use of an excessive amount of water and thereby prevent the waste of water.

2. A classifier comprising a trough shaped container having a series of settling chambers formed therein and arranged in successive order lengthwise thereof, each successive chamber increasing in area, a pressure chamber formed below each settling chamber and communicating therewith and provided with an outlet, valve operated means for admitting water to each pressure chamber and for regulating the pressure thereof, and a gauge disposed in the path of the water admitting means of each pressure chamber between the regulating element of the water admitting means and

the container adjacent to one side of the latter to visibly indicate the pressure in the respective pressure chamber to thereby prevent the use of an excessive amount of water and thereby prevent the waste of water.

3. A classifier comprising a trough shaped container having a series of settling chambers formed therein and arranged in successive order lengthwise thereof, a pressure chamber formed below each settling chamber and communicating with the settling chamber thereabove and provided with an inlet opening and an outlet opening, valve operating means for admitting water to each pressure chamber and for regulating the pressure thereof, and means between the regulating element of the water admitting means of each pressure chamber and the outlet thereof and disposed adjacent one side of the container and extending above the container to continuously indicate the pressure in each pressure chamber.

4. A classifier comprising an elongated container having a series of pyramid shaped settling chambers formed therein, and arranged in successive order lengthwise thereof, an enclosed pressure chamber formed below each settling chamber, means for admitting water to each pressure chamber and for regulating the pressure thereof, a slot formed in the bottom of each settling chamber and at the apex of each chamber, said slots forming communication with the respective pressure chambers, a removable block disposed in each slot, and a plurality of interspaced vertically disposed passages formed in each block.

5. A classifier comprising an elongated container having a series of pyramid shaped settling chambers formed therein, and arranged in successive order lengthwise thereof, an enclosed pressure chamber formed below each settling chamber, means for admitting water to each pressure chamber and for regulating the pressure thereof, a slot formed in the bottom of each settling chamber and at the apex of each chamber, said slots forming communication with the respective pressure chambers, a removable block disposed in each slot, and a plurality of interspaced vertically disposed passages formed in each block, the area of the passages in each block being of increasing diameter.

6. A classifier comprising an elongated container having a series of pyramid shaped settling chambers formed therein, and arranged in successive order lengthwise thereof, an enclosed pressure chamber formed below each settling chamber, means for admitting water to each pressure chamber and for regulating the pressure thereof, a slot formed in the bottom of each settling chamber and at the apex of each chamber, said slots forming communication with the respective pressure chambers, a removable block disposed in each slot, a plurality of interspaced vertically disposed passages formed in each block, the area of the passages in each block being of increasing diameter, and means for visually indicating the pressure in each pressure chamber.

7. A classifier comprising an elongated container having a series of pyramid shaped settling chambers formed therein, and arranged in successive order lengthwise thereof, said chambers increasing successively in area and depth, an enclosed pressure chamber formed below each settling chamber, a crosswise extending longitudinal slot formed in the bottom of each settling chamber and communicating with each adjacent pressure chamber, a block disposed in each slot, a plurality of interspaced vertical passages formed in each block, means for admitting water to each pressure chamber and for regulating the pressure thereof, a feed box adapted to deliver a pulp to the elongated container, a discharge pipe communicating with said container, and means for maintaining a predetermined pulp level above the settling chambers.

8. In a classifier of the character described the combination with the elongated container and the successive settling chambers formed therein, of a pressure chamber formed below each settling chamber, a communicating crosswise extending slot formed in the bottom of each settling chamber, a removable block receivable in each slot, and a plurality of interspaced vertically disposed passages formed in each block.

9. In a classifier of the character described the combination with the elongated container and the successive settling chambers formed therein, of a pressure chamber formed below each settling chamber, a communicating crosswise extending slot formed in the bottom of each settling chamber, a removable block receivable in each slot, and a plurality of interspaced vertically disposed passages formed in each block, said settling chambers presenting an increased area and depth, and said vertical passages in the blocks presenting a decreasing area.

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