MEANS OF WET SCREEN SIZING

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The invention relates to screening of ground minerals.

The object of the invention is to split a ground mineral of mixed sizes into plus and minus screen sizes, and thus scalp the finer sizes from the coarser sizes.

Present commercial wet screening of minerals is conducted on an inclined screen surface, with the particles assisted in downward movement by vibration, repulsing and water sprays. Its disadvantages, especially with screens of 48 mesh and smaller mesh are small capacity, binding of the screen openings, and screen wear due to abrasion. Other processes have many disadvantages.

The improvement of screening of ground minerals consists in passing the mineral of mixed sizes into an uprushing flow of water, above diffusion members, and below a screen of defined mesh, and by the action of the uprushing flow of water cause the flow with the mineral particles smaller than the screen mesh to pass towards and against the under surface of the screen and through its openings in water suspension and to separate recovery, while causing the mineral particles of sizes larger than the screen mesh which collect below the screen to move from the entrance and at right angles to the upward flow of water, by increase in density, to a discharge.

The improvement is applicable to minerals whose largest size can be maintained in teeter movement or action by the uprushing flow of water which carries the minus sizes towards the under surface of the screen and through the same.

The invention includes a novel apparatus, which consists in a diffusion member with a screen of the size necessary to carry out the desired screening spaced from the diffusion member, both parallel to each other and both horizontally disposed, with the water ascending at right angles thereto, and with the minerals of mixed sizes entering one part of the said space and with the larger sizes passing through the space by density increase, while the smaller sizes are carried by the ascending water through the screen openings from below to above the screen.

The invention will be more fully described hereinafter, an embodiment thereof shown in the drawings, and the invention will be finally pointed out in the claims.

In the accompanying drawings,

Fig. 1 is a vertical longitudinal section of one embodiment of my invention;

Fig. 2 is a plan view taken on the line 2-2 of Fig. 1;

Fig. 3 is a side view;

Fig. 4 is a left hand end view with a detail view of the screen tappet assembly, and Fig. 5 is a detail view of the screen tappet assembly, taken at a right angle to the view shown in Fig. 4.

Similar characters of reference indicate corresponding parts throughout the various views.

Referring to the drawings, generally considered, the invention embodies the concept of feeding the minerals to the under surface of a substantially horizontally disposed screen of suitable mesh to allow only particles of predetermined sizes to pass therethrough, and the particles of other sizes to be carried away from the screen zone. These may be again separated by a repetition of said hydraulic screening in a separate apparatus, but the meshes of the screen would then be larger or smaller. The hydraulic screening action takes place by a mix of different sizes entering an ascending flow of water, which by the continuation of the feeding of the mix causes the larger particles to move onward towards their discharge, while the finer particles pass through the open spaces of the screen from its bottom surface to above the screen to their discharge.

The operation is conducted in a rectangular container 10 having bottom, side and end walls 11, 12 and 13.

At the lower elevation of the container is a water compartment 15, with water inlet pipe 16 having a cap 17 and outlet holes 18 preferably at the bottom of the pipe, within the compartment and a control valve 19 and extension 20 to water supply, without the container. The upper elevation of this water compartment 15 is formed by a diffusion member 23 of porous plates 24, having a supporting frame 27, and end walls 29. The porous plates prevent settling upon their upper surface due to the multiplicity of water ejections merging into each other into one common upward flow.

Adjacent to this water compartment 13 is a second water compartment 30 formed of walls 33 and 39, vertically divided by a diffusion member 35 of porous plate 31 supported on a frame 37.

A water pipe 40 having a cap 41 and holes 42 is within the compartment, and control valve 43 and pipe extension 44 are without the compartment, with this pipe extension 44 connected to the water supply pipe 20.

Above the diffusion plate 31 of the water compartment 30 are L shaped outlet pipes 41, with an inlet 48 above the diffusion plate 31 and outlet 49 outside of the compartment 30.

Attached to the end wall 13 is a chamber 50 with outlet 51 at its bottom for receiving and discharging the oversize.

At the end of container opposite chamber 50, a feed chamber 60 is provided and defined by walls 13, 12 and 61. Above the area of the diffusion member 65, but exclusive of that portion of the area defined by the feed chamber 50 is suspended a screen 70, supported by and attached to the walls 13 and 61.

Attached to the screen 70 is a steel block 71, above which is a tappet 72 actuated in its up-
ward movement by cams 73 and 74, attached to a shaft 75 of a gear motor 76, and actuated in its downward movement by a spring 77 and guided by a hole 78a in a motor support 78, and by an upper support 79 which in turn is attached to motor support 78. The helical spring 71 is placed between two washers 71a and 71b, one of which, 71b, is secured to the tappet 72. A top 78c is supported by the upper ends of the walls 13 and 61.

Attached to the sides of the container along its length, with its upper elevation just below the screen level are launders 80 and 81.

The operation of the apparatus is as follows:

Water is passed to water chambers 15 and 30, and upwardly through the diffusion members 85, 26 and 35 and through the screen 70. Ore in mixed sizes is then fed to feed chamber 90 and the water adjusted at valve 19 to cause a stronger action of the particles and carry the undersize particles through the screen 70 and to discharge with the water rising from the screen and into the launders 80 and 81, while retaining the oversized particles in teeter movement below the screen, and by the increase in density the accumulated cause said oversized particles to move to the chamber 30 above the diffusion member 35, and from this chamber through outlet pipes 41, and to discharge to receiving chamber 56 and thence to discharge through outlet pipe 51. The screen in the preferred form is given a rapid tapping by means of a motor actuated tappet 72 to assist any mineral particles to pass from its upper surface and flow off with the water.

Comparative tests on finely ground iron ore of a 60% minus 100 mesh have shown a capacity of over twenty times that of the inclined down flow apparatus, per square foot of screen area, and with no binding of the meshes.

The method consists in subjecting particles of various sizes to a tetering action in an ascending diffusion flow of water, to enable the heavier particles to move horizontally and out of the path of the ascending diffusion flow of water, and to have it carry the finer particles through the openings of a screen from its lower surface to above its upper surface, to separate them from the heavier particles, and enable them to move away from the said heavier particles to be removed with the overflow of the ascending water. The screen sizes, preferably of the "Ton-Cap" type No. 2062 (The W. S. Tyler Company of Cleveland, Ohio), have shown a capacity of removing smaller than 100 mesh material. But other sizes of screens are suitable for other sizes of particles intended to be separated. The particles smaller than the screen openings are carried through said openings, and then cannot descend through the screen due to the flow of the water then passing through the openings of the screen, which flow carries the separated particles, through the openings and to the launder. There is no wear of the screen as heretofore.

It is to be particularly noted that the improvement is based on an uprising feed of the particles to the lower surface of the screen with those smaller than the screen openings, by a fluid flow passing through the openings, in contrast to a mixed feed moving along on the upper surface of a screen.

The tetering movement to which the larger particles are subjected enable them to be continuously and constantly shifted in a general horizontal direction from inlet to discharge, the finer particles having separated from the larger particles by such tetering action, being now free to find their exit up through the openings in the screen, those not being able to pass through following the passage from inlet to outlet of the large particles of the feed selected, which is gauged by the size of the meshes of the screen. The discharged material can be subjected to another screening in which case other screen openings are provided.

I wish it to be understood that I do not desire 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:

In an apparatus for wet screen sizing of mineral particles, the combination of a horizontal container having a horizontal base, and a porous plate of such porosity as to permit water to flow therethrough while retaining mineral particles above the same, said porous plate being substantially parallel with the base of the container, said porous plate dividing said container to form a water compartment for ascent through the porous plate, and forming the base of a channel above the porous plate, walls forming a channel with said base, a mineral particle inlet at one end of the channel, an outlet at the other end of the channel, and means supplying water to the water compartment for ascent through the porous plate to maintain the particles between said inlet and said outlet, in teeter suspension in the ascending water above said base, with a screen located above said porous plate and extending longitudinally along said channel disposed in contact with said suspended particles moving from inlet to outlet, said screen being disposed to retain mineral particles larger than the screen openings within the channel, and permit mineral particles smaller than the screen openings to pass therethrough, and means agitating the mineral particles adjacent the screen, whereby mineral of mixed particle size when fed into said inlet and against the flow of water rising from the porous plate, will move longitudinally in the channel and along the screen from said inlet and toward the opposed outlet, with particles smaller than the screen openings passing from the channel and through the screen openings with the uprising water and to discharge, while the particles larger than the screen openings retained within the channel continue in longitudinal movement to separate discharge at the outlet.

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