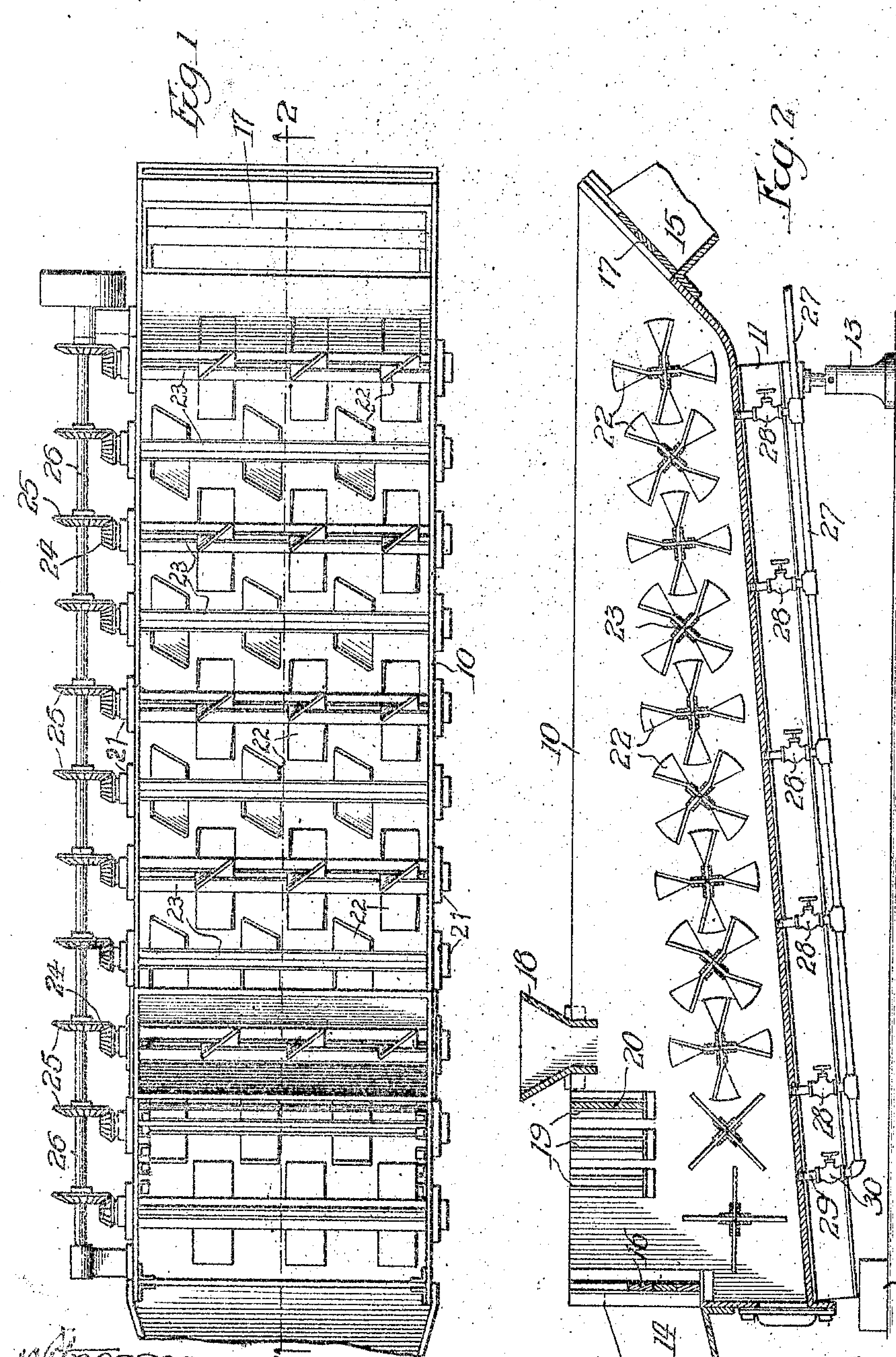
A. M. GOW.

ORE WASHER.

APPLICATION FILED MAY 5, 1911.

998,573. Patented July 18, 1911.



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UNITED STATES PATENT OFFICE.

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ORE-WASHER.

998,573. Specification of Letters Patent. Patented July 18, 1911.

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To all whom it may concern:

Be it known that I, ALEXANDER M. GOW, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Ore-Washers, of which the following is a specification.

My invention relates to ore washers and has particular reference to an ore washer having transverse instead of longitudinally mounted agitators.

One of the objects of my invention is to provide an ore washer of the class described which shall be adapted for such adjustment that the ore passed therethrough may be concentrated or released from the silica with less loss than has heretofore been possible with concentrators of the common type.

In my investigation of certain iron ores I have found that a crude ore containing from twenty to forty per cent. silica can be washed and concentrated to a product containing from but eight to twelve per cent. silica by simple agitation with water and the rejection in the tailings of no particles of material coarser than eighty mesh. To accomplish this result it is necessary that the ore be thoroughly and repeatedly stirred in contact with a large quantity of water and that the point of discharge of the tailings with reference to the body of ore be such that all coarse particles, in fact everything but the fine slimes, shall be prevented from flowing away from the machine. The ores in question, currently known as "wash ores", vary between very wide limits in their iron and silica content as well as their degree of fineness, and a machine to handle them should be capable of the following adjustments, in order to meet the conditions required to successfully wash and concentrate these different grades: (*a*) Quantity of water. (*b*) Places of application of the water. (*c*) Depth of water. (*d*) Height of overflow of tailings. (*e*) Angle of slope of the containing tank. (*f*) Speed of the stirring paddles. (*g*) Height of discharge of washed ore. (*h*) Velocity of final current carrying away the tailings. It is the practice at present to wash these ores in what is known as "log washers" but owing to the large amount of coarse ore carried away in the tailings it is necessary to provide settling tanks and supplementary log washers, locally known as "turbos" to recover this coarse ore. The purpose of my invention is to provide a washer which shall dispense with settling tanks and "turbos" while at the same time the ore is given a very thorough and complete washing with the production of a high grade product and minimum tailing losses.

While I have incorporated in my invention the fundamental principle of the log washer, namely that of revolving shafts carrying paddles to stir the ore and project it toward the point of discharge, while the water flows in the opposite direction. Nevertheless, I have departed radically from the mechanical construction of existing log washers in that instead of having the shafts carrying the paddles parallel to the flow of the ore I place them transverse to the flow and provide a plurality of short shafts thus avoiding the serious troubles of the present form of log washers due to long shafts and end thrust on bearings. Owing to mechanical difficulties log washers as at present constructed are of limited length with consequent limited amount of agitation and washing of the ore while with my construction I am enabled to build a practical machine of any desired length and give to the ore any desired amount of agitation and washing.

My invention will be more readily understood by reference to the accompanying drawings wherein—

Figure 1 is a plan view of a machine such as is contemplated by me, and Fig. 2 is a section taken on line 2, 2 of Fig. 1.

Referring now more particularly to the drawings it will be seen that I provide a tank 10 of varying depth, this tank being mounted upon suitable supporting members such as the beams 11, resting at their lower ends on a support 12 and at their upper ends having adjusting means such as the jack-screw 13. The tank is provided at its lower end with a water discharge spout 14 and at its upper end with an ore discharge spout 15. The point of discharge through both of these spouts may be regulated by means of a plurality of planks 16, 17 carried in guides or grooves in the sides of the tank 10. A hopper 18 is provided, this hopper being arranged for sliding movement on the top of the tank in order that the ore to be treated may be placed in the tank at any desired point. Also within the tank are provided a plurality of guides 19 within which

is mounted a baffle or movable wall 20. By adjustment of this baffle plate 20, I provide for a large or small compartment at the outlet or water discharge end, for a purpose to be later described.

Mounted within the tank 10 in bearings 21, is a plurality of transverse shafts carrying paddles or agitators 22. These transverse shafts are preferably composed of four angle-irons 23, placed back to back, the paddle being riveted therebetween. Each of these shafts is provided with a beveled pinion 24 and meshing therewith is a beveled gear 25 rigidly mounted on shaft 26 connected to a suitable source of power.

Preferably the paddles in the compartment formed by the adjustable baffle are not angularly disposed, but as shown are parallel to the shaft. In this way I secure a more positive agitation at the point where it is needed. The purpose of placing the other paddles at an angle to the shafts is to secure the proper agitation of the ore body in the tank and reduce the power required to force each paddle into the layer of ore lying on the bottom thereof. The path of each particle of ore through the machine is a zig-zag one proceeding first toward one side and then toward the other but at the same time continually progressing toward the head or discharge end.

Underneath the tank I provide water supply means such as the pipe 27 having a plurality of connections entering the lower wall of the tank. These connections are each provided with controlling means such as valves 28. At the lower end I provide also an additional water supply connection 29 having a controlling valve 30. This valve may be normally closed but in certain instances it will be found desirable to increase the rate of water discharge over the tail gate and this valve will be opened. This means, in connection with the adjustable wall or baffle, will give what is in effect a hydraulic classifier with an agitator at the bottom and by adjustment of the two means the ore may be separated to any desired degree; in fact, if desired, nothing but the very finest particles may be allowed to pass over the tail gate.

It will be understood that the height of the discharge spout 14 is always less than that of the ore spout 15 and for this reason they are both made adjustable. The tank is made adjustable in order to adapt it to all grades of ore. For instance, a very fine or light ore will necessitate a slower flow of water and the tank in a less inclined position than is required for a more coarse ore.

The operation is as follows: Assuming the agitators in operation and a supply of water entering the tank through the water supply pipes, a quantity of ore is dumped into the tank through the hopper. The solid matter descends to the bottom where it is thoroughly stirred, the chunks broken up and the silica more or less suspended by the liquid. The agitators tend to force the ore remaining on the bottom upward toward the ore discharge spout, in a zig-zag path, the tendency of the water being toward the lower end. This carries the silica and fine slimes to the lower end where the final separation or classification takes place.

I claim:

1. An ore washer comprising, in combination, a container having outlet spouts for the ore and for the liquid and lighter material and an adjustable tail gate, a plurality of agitators within said container adapted to agitate the material and propel the heavier material toward the ore spout, a baffle adjustably mounted within and transversely of said container, and an independent fluid supply connection between the baffle and the outlet for lighter material whereby the flow of liquid from the tail gate may be augmented if desired, substantially as described.

2. In combination, a container having a discharge for ore at one end and an overflow discharge for water and lighter material at the other end, the former being elevated above the latter, a longitudinal series of transversely mounted rotatable agitators adapted to propel the ore toward its discharge, the series of agitators being located a substantial distance below the water level at the overflow end, and progressively rising to and above said level toward the discharge for heavier material, substantially as described.

3. In combination, a container having a discharge for ore at one end and an overflow discharge for water and lighter material at the other end, the former being elevated above the latter, a longitudinal series of transversely mounted rotatable agitators adapted to propel the ore toward its discharge, paddles upon the agitators, the paddles or successive agitators being reversely disposed, the series of agitators being located a substantial distance below the water level at the overflow end, and progressively rising to and above said level toward the discharge for heavier material, substantially as described.

4. In combination, a container having a discharge for ore at one end and an overflow discharge for water and lighter material at the other end, the former being elevated above the latter, a longitudinal series of transversely mounted rotatable agitators adapted to propel the ore toward its discharge, the series of agitators being located a substantial distance below the water level at the overflow end, and progressively rising to and above said level toward the discharge for heavier material, one or more of the lowermost of the series of paddles being pro-

vided with agitating paddles and the others with agitating and propelling paddles, substantially as described.

5. An ore washer comprising, in combination, a container having outlet spouts for the ore and for the liquid and lighter material and an adjustable tail gate, a plurality of agitators within said container adapted to agitate the material and propel the heavier material toward the ore spout, a baffle adjustably mounted within and transversely of said container, an independent fluid supply connection between the baffle and the outlet for lighter material, whereby the flow of liquid from the tail gate may be augmented if desired, and a plurality of additional fluid supply connections disposed throughout the length of the container, substantially as described.

6. In combination, a container having a discharge for ore at one end and an overflow for water and lighter material at the other end, the former being located above the latter, means whereby the height of both said discharge openings may be regulated, a longitudinal series of transversely mounted rotatable agitators adapted to propel the ore toward its discharge, the series of agitators being located a substantial distance below the water level at the overflow end and rising to and above said level toward the discharge for the heavier material, substantially as described.

7. In combination, a container having a discharge for ore at one end and an overflow discharge for water and lighter material at the other end, the former being elevated above the latter, a longitudinal series of transversely mounted rotatable agitators adapted to propel the ore toward its discharge, the series of agitators being located a substantial distance below the water level at the overflow end, and progressively rising to and above said level toward the discharge for heavier material, and means for adjusting the angle of inclination of said container in order to properly separate the different grades of ore, substantially as described.

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