(No Model.) 2 Sheets—Sheet 1.

J. H. MONTGOMERY.

ORE CONCENTRATOR.

No. 495,003. Patented Apr. 4, 1893.

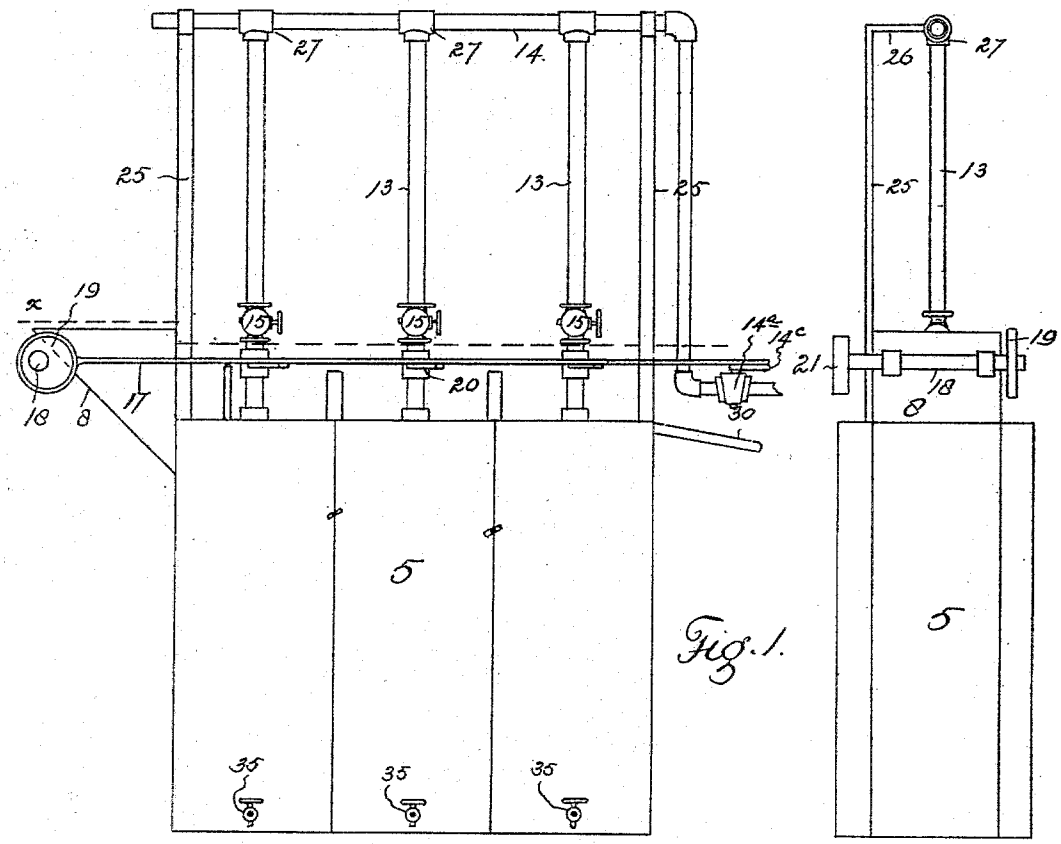
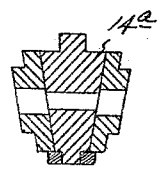


Fig. 1.

Fig. 2.

Fig. 7.



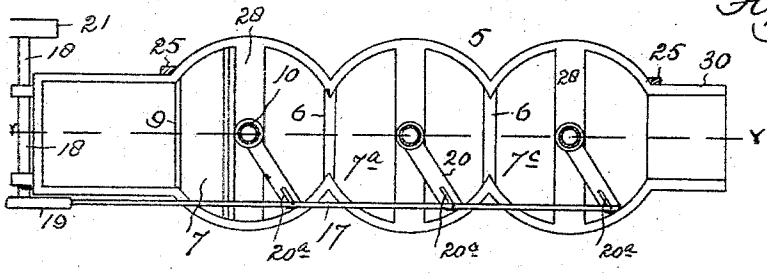


Fig. 3.

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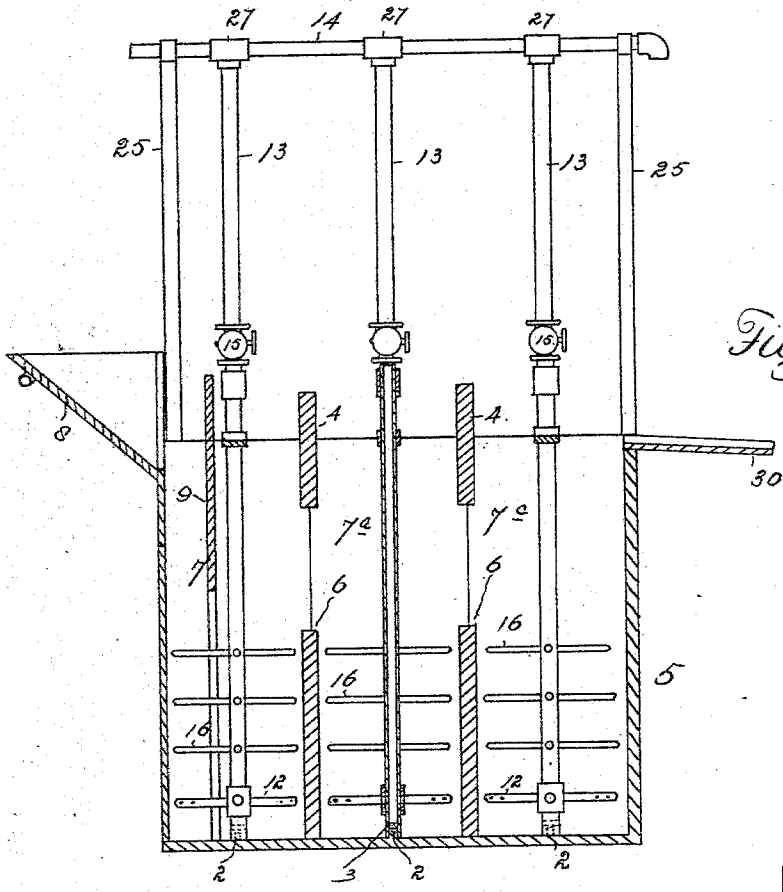

Fig. 4.

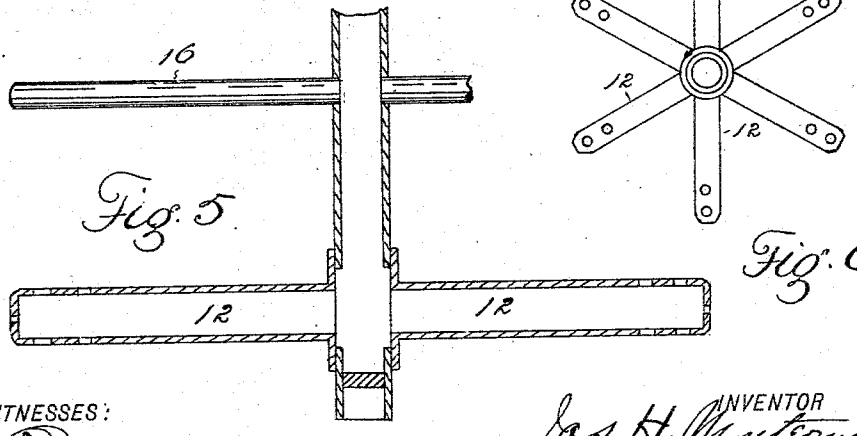

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

JAMES H. MONTGOMERY, OF DENVER, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 495,003, dated April 4, 1893.

Application filed April 11, 1892. Serial No. 428,589. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. MONTGOMERY, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in ore concentrators of that class in which the mineral is graded according to its gravity, and the object of the invention is to provide a concentrator of the class stated which shall be of simple and economical construction, reliable, durable in operation and thoroughly practicable in use.

To these ends the invention consists of the features, arrangements and combinations hereinafter described and claimed.

The improvement will be fully understood by reference to the accompanying drawings in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a side elevation of my improved concentrator. Fig. 2 is a front or end elevation of the same. Fig. 3 is a transverse section taken on line *x*—*x*, Fig. 1. Fig. 4 is a vertical longitudinal section taken on line *y*—*y*, Fig. 3. Fig. 5 is a vertical longitudinal section taken through one of the tubular agitating shafts. This is a fragmentary view on an enlarged scale. Fig. 6 is an underneath view on a smaller scale, illustrating the hollow perforated arms connected with the lower extremity of the bar and through which the water is delivered. Fig. 7 is a section of the valve located in the water-main.

Similar reference characters indicating corresponding parts or elements in the several views let the numeral 5 designate a tank divided into several compartments by the vertical partitions 6 extending from the bottom upward about half the height of the tank. As shown in the drawings there are two partitions 6 dividing the tank into three compartments 7, 7^a and 7^c. While these partitions are shown of a height equal to about one half of the tank's depth, it must be understood that there is no precise limit to their height since the same may be varied to suit the purpose or the circumstances of the case. The material to be treated is fed in the shape of a pulp from an inclined mouth or chute 8 into the front compartment 7 this discharge being made in the rear of an adjustable sliding gate 9 engaging grooved or other suitable ways formed therefor in the sides of the tank. The gate extends from the top of the tank downward to about or somewhat below the same plane in which the upper extremities of the partitions 6 lie, whereby all the ore is made to pass under this gate to the first compartment. The tank is further provided with an adjustable gate 4 directly above each partition 6 for the purpose of breaking the current and facilitating the settling of the mineral within the compartments.

Within each compartment of the tank is located a vertical, tubular shaft 10 provided at its lower extremity with a set of hollow radial arms 12 having openings or perforations for the escape of the water discharged into the tank through tubes 10. The upper extremity of each of the last named tubes is connected with a branch pipe 13 leading from a main water conduit 14, whereby the necessary quantity of water is supplied to each compartment.

Each branch pipe 13 is provided with a valve 15 whereby the discharge of water therefrom is under perfect control and may be regulated according to the requirements of the case. Hence the amount of water will be varied according to the nature of the ore under treatment. The branch water pipes 13 are flexible and suitably supported by upright rigid bars 25 secured to the tank and provided with right angled arms or projections 26 terminating in metal sleeves or T's 27 through which the main pipe 14 passes and with which the depending branches 13 are connected. Each tube 10 is provided with a series of agitating arms 16 located above arms 12 and adapted to subject the ore to any degree of agitation which may be found necessary to effect, in conjunction with the water, a thorough separation of the mineral from the gangue. The water being only dis-

charged through the tubular arms 12 which are located close to the bottom of the tank, is obliged to pass up through the body of ore above and in the compartment into which it is discharged, before it can escape therefrom.

All the tubes 10 are suitably connected with a reciprocating pitman 17, actuated by a shaft 18, whereby a partial rotary movement in reverse directions is imparted to the tubes. As shown in the drawings an eccentric 19 located on the shaft is employed to effect this purpose, the strap of the disk being connected with the forward extremity of the pitman. The upper extremities of the vertical tubes are connected with the pitman by arms 20, rigidly secured upon the tubes and pivoted upon the pitman, said arms being slotted, as shown at 20^a, permitting the pitman to move in a direct line, while any point of each arm 20 describes the arc of a circle. Motion is communicated to shaft 18 from any suitable motor. For this purpose the shaft is shown provided with a pulley 21.

The sides of the tank's compartments are preferably curved as shown in Fig. 3 to correspond with the arc described by the radial arms of tubes 10. Bars 10 are journaled in the top of the tank in transverse stays 28 secured thereto, while their lower extremities are suitably pivoted. The bottom of each tube 10 is closed below the hollow perforated arms 12 as shown at 3, thus forming a stop and preventing the escape of water except through arms 12. As shown in the drawings the tube is left open below stop 3, forming a socket for the reception of a pivot 2 with which the bottom of the tank is provided, whereby the tube 10, is permitted to rotate freely, its foot being at the same time secured against lateral displacement.

From the foregoing description the operation of my improved concentrator will be fully understood. The ore to be treated passes first beneath gate 9 to compartment 7 where it is subjected to the agitation of the radial arms of tubes 10 and the action of the water, which is first discharged into the compartment and then forced up through the mass of ore to the top of the first partition 6. The heavier mineral is caught in this compartment while the lighter quality is carried to compartment 7^a where it is subjected to the same treatment, and in which another grade is saved, the lightest being carried to compartment 7^c.

During the operation of the mechanism the tank is filled with water and sand and the gangue or tailings passes over the top thereof and is discharged from a chute 30 at the rear. The mineral is drawn off from time to time through suitable taps 35 accessible from the outside and communicating with the bottom of the compartments.

It will be observed that any desired number of my improved concentrating tanks may be arranged side by side in suitable proximity and all operated by the same shaft 18. The necessary quantity of water is provided through water pipe 14 under suitable pressure. It is preferable that this water have a pulsatory discharge into the tank since the delivery in pulsating jets is better adapted to aid in the separation of the mineral from the gangue, than a steady or uninterrupted flow. To obtain this pulsating discharge I provide the main supply pipe 14 with a valve 14^a operated by a slotted arm 14^c, connected with a pitman 17 which is rearwardly extended sufficiently for the purpose. This valve is of ordinary construction as shown in Fig. 7, and the reciprocating movement of the pitman imparts thereto alternating partial rotations in reverse directions, whereby the flow of water through the main pipe is turned off and on, alternately, causing the water to be delivered to the tank compartments in pulsating jets.

Having thus described my invention, what I claim is—

1. In a concentrator the combination of a tank having a gate located at the head thereof whereby the material is first carried to the lower part of the tank, said tank being divided by suitable partitions into a series of contiguous compartments, gates located at the heads of the tank compartments whereby the material to be treated is carried into the lower portion thereof, means for discharging water into the bottom of each compartment of the tank, and suitable agitating mechanism therefor, substantially as described.

2. In a concentrator the combination with a suitable tank body, an adjustable gate located at the head thereof whereby the material is first carried to the lower part of the tank, means for discharging water into the lower part of the tank and suitable agitating mechanism, substantially as described.

3. In a concentrator the combination of a tank for the reception of the ore to be treated, said tank having a gate located at its head whereby the material to be treated is first carried into the lower portion thereof, one or more tubular vertical shafts pivoted in the tank and provided with hollow radial perforated arms located at their lower extremities and having agitating arms above, and suitable means for imparting to the vertical shafts, a partial rotary movement in reverse directions, substantially as described.

4. In a concentrator the combination of an ore tank having an adjustable gate located at its head whereby the material is first carried to the lower part thereof, said tank being divided into a series of compartments by suitable vertical transverse partitions, a vertical tubular shaft located in each compartment and provided with openings at the bottom for the escape of water and having agitating means above, and suitable mechanism for imparting motion to the vertical tubular shafts, substantially as described.

5. In a concentrator the combination of a tank provided with a gate located at its head

whereby the material is first carried to the lower part thereof, a series of vertical transverse partitions dividing the tank into contiguous compartments in which the ore is graded according to its gravity, a tubular vertical agitating shaft located in each compartment and having openings in the bottom for the escape of water, said tubular shafts being connected with a suitable water supply source and suitable means for imparting to the bars the desired movement, substantially as described.

6. In a concentrator the combination with a tank having gate located at its head and in its upper portion and in front of which the ore is discharged, a series of transverse vertical partitions of a less height than the depth of the tank and dividing the same into contiguous compartments in which the mineral is graded according to gravity, tubular agitating shafts located in the tank, one bar for each compartment, said bars having openings for the escape of water into the tank, and suitable means for imparting to the bars a partial rotary movement in reverse directions, substantially as described.

7. In an ore concentrator the combination of a tank having an adjustable gate located at its head and in the upper portion thereof, a series of vertical transverse partitions dividing the tank into compartments, tubular agitating shafts located in the tank and provided with openings for the escape of water, a water supply source with which said bars are connected, and suitable means for simultaneously imparting to the agitating bars a partial rotary movement in reverse directions, substantially as described.

8. In an ore concentrator the combination of a tank having an adjustable feed gate located at the head thereof whereby the material is first carried to the lower part of the tank, said tank being provided with a series of transverse compartments having curved or arc-shaped sides, and a rotating shaft provided with agitating fingers located in each compartment, substantially as described.

9. In a concentrator the combination with a tank body, of an adjustable gate located between the feeding and discharging spouts across the channel or material flow-way thereof whereby the material to be treated is first carried to the lower part of the tank, and means for discharging the water into the bottom of said tank in pulsations, substantially as described.

10. In a concentrator a valve mechanism located between the source of supply and discharge of water, in combination with a tank having an agitator and suitable mechanism to impart a partial rotary movement to said agitator and means for opening and closing the ports of said valve mechanism whereby the water is delivered in the bottom of the tank in pulsations, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES H. MONTGOMERY.

Witnesses:
WM. MCCONNELL,
LOUIS E. P. WILKES.