No. 648,908.

Patented May 8, 1900.

F. L. BARTLETT.

ORE CONCENTRATOR.

(Application filed Mar. 1, 1899.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

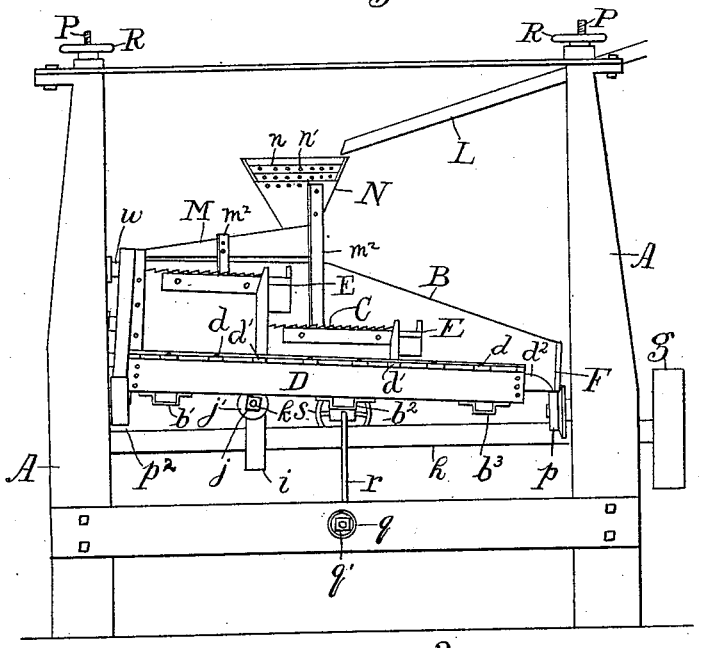
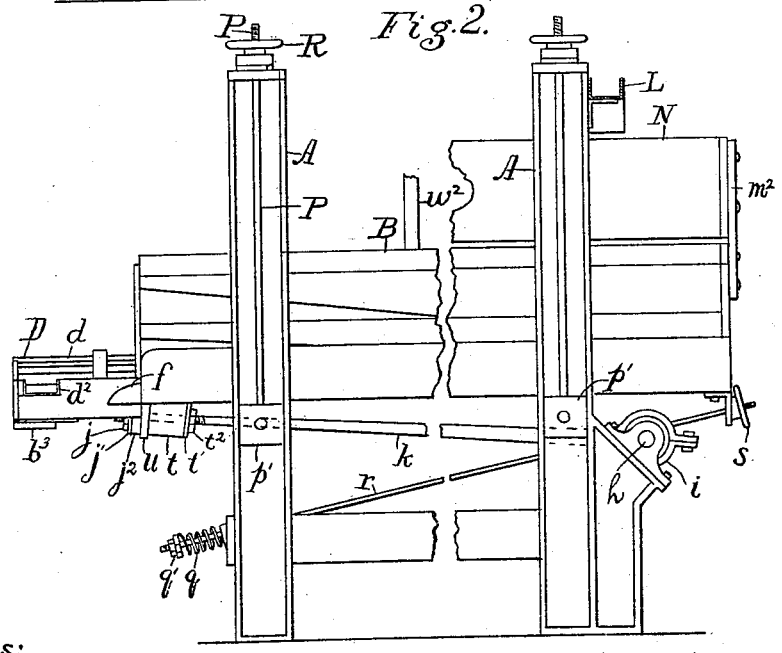


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

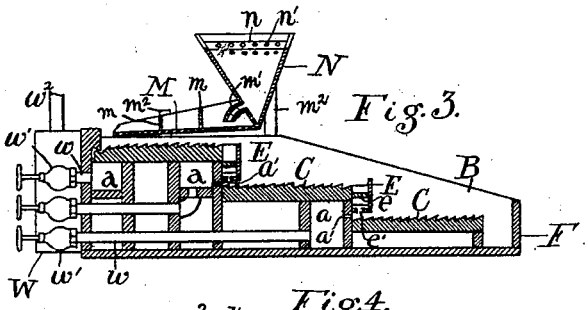


Fig. 4.

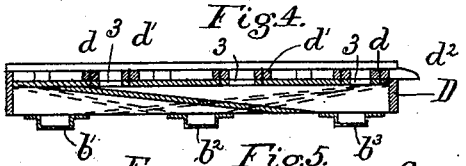


Fig. 5.

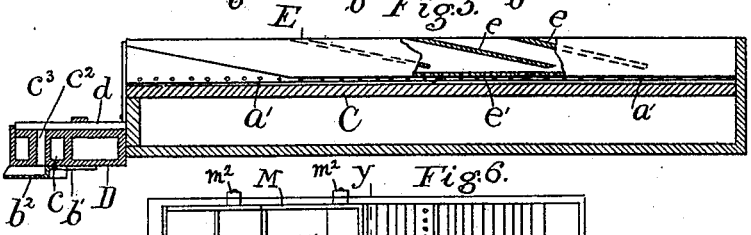
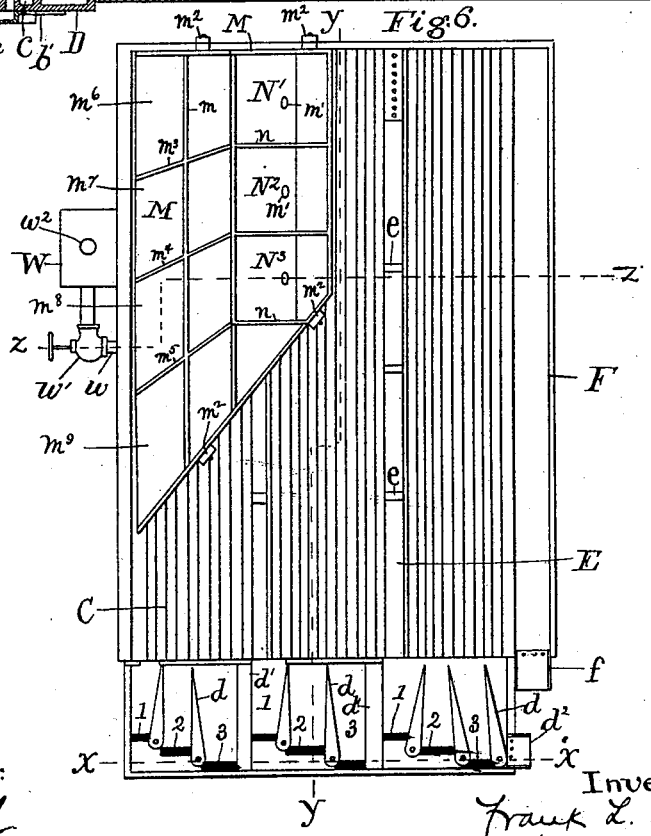


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

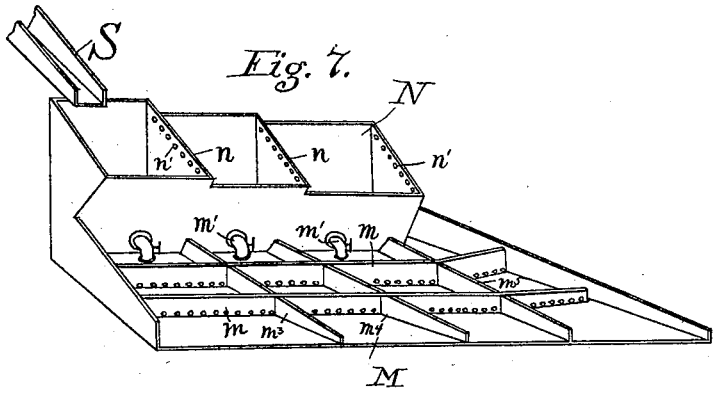
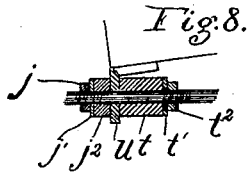


Fig. 8.



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Inventor:
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UNITED STATES PATENT OFFICE.

FRANK LESLIE BARTLETT, OF CANYON, COLORADO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 648,908, dated May 8, 1900.

Application filed March 1, 1899. Serial No. 707,320. (No model.)

To all whom it may concern:

Be it known that I, FRANK LESLIE BARTLETT, a citizen of the United States of America, and a resident of Canyon city, in the county of Fremont and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification.

My invention relates to the concentration of ores by the use of shaking-tables and to a method of and means for feeding the crushed ore and water to such tables, whereby the fine ore is protected from being washed away with the tails.

I have applied the invention as an improvement to my ore-concentrator patented March 21, 1899, No. 621,515, and known as the "Bartlett table," as hereinafter illustrated; but it is applicable to other forms of shaking-tables.

In the concentration of ores either on the well-known shaking-tables or by any means where the fine crushed pulp goes to the machine mixed with water there is always a heavy loss of fine suspended ore carried off in the water. I have discovered that by passing the ore through hydraulic sizers or other equivalent separators and carrying the overflow or lighter portion forward on the Bartlett table or any similar device and allowing this portion to reach the table ahead of or nearer the concentrates' discharge end than the coarser part a much better saving is effected. The reason for this is that by means of the separators and divisional feed-box the heavy coarse part reaches the table at the upper or feed end, followed by successive zones of finer ores toward the concentrates' discharge end, and, lastly, by the suspended finer material. The coarse ore moving toward the concentrates' discharge end passes under the point where the finer grades are being discharged, forming a bed on the table with large interstices on which the fine stuff falls, and is immediately protected by dropping into and among the coarse ore. Another advantage is that the fine ore requires less water than the coarse, and it is thus removed from the part of the table where much water is required, as in washing the heavier ore.

In order to illustrate my invention, I have shown the present form of the Bartlett table with my improved feed applied thereto and including unpatented improvements which constitute no part of my present invention.

In the drawings, Figure 1 is an end elevation of my ore-concentrator looking at the discharge end. Fig. 2 is a side elevation, partially broken away. Fig. 3 is a section on the line $z\ z$ of Fig. 6, showing the shaking-table proper. Fig. 4 is a section on the line $x\ x$ of Fig. 6. Fig. 5 is a section on the line $y\ y$ of Fig. 6. Fig. 6 is a plan or top view. Fig. 7 is a perspective view of the feeding-hopper, and Fig. 8 is a sectional view through the shaking connection.

A represents the framework of the machine.

B is the shaking-table, which rests on rolls $p\ p^2$, pivoted to blocks $p'\ p'$, vertically adjustable by means of the rods P and hand-nuts R.

The table B is made up of a series of shelves C, arranged at descending levels, and each shelf is supplied with water-jets along its upper side through apertures a', connecting with water boxes or pipes a, supplied by pipes w. These pipes are all connected with a water-chest W, which is supplied by means of the supply-pipe w^2, the pipes w being controlled by valves w'. Motion is given to the table by means of an eccentric i and an eccentric-rod k, the former being secured on the main driving-shaft h, which takes its power from the main pulley g. The end of the eccentric-rod k passes freely through the bracket u, which is secured to the under side of the table B, and the motion of the eccentric-rod is imparted to the bracket u by means of two buffers t and j^2 of unequal tension. These buffers are preferably formed of rubber, and the buffer t is much more yielding than the buffer j^2, the more yielding buffer being that which forces the table ahead or toward the discharge end. The buffer t is adjustably secured in place on the eccentric-rod by means of a washer t' and the nut t^2, while the buffer j^2 is secured by the washer j' and the nut j. The motion given to the table by these unequally-yielding buffers will carry it forward with a gradually-accelerating speed, whereby the momentum of the table will be gradually imparted to the ores on its surface with a short pause at the outward end of the stroke. The table will then start quickly on its return,

throwing forward the ores, and will gradually come to a rest at the rear end of the stroke. This movement of the table will tend to move the ores rapidly forward, particularly those fine and heavy concentrates which lie in the bottoms of the grooves. The movement of the table is regulated by means of a tension-rod r, which is secured by one end to the table, while the other end is yieldingly secured to the frame of the machine by a spring q, held in place by a nut q'. On the end of the rod is a hand-nut s, by which the tension of the spring q is regulated. It will be seen that the action of the spring q is to assist the buffer t in throwing forward the table, and the tension of this spring will therefore determine the amount of depression of the buffer t, and consequently its effect on the table and the rapidity with which the ores travel on the surface of the table.

The ores are fed to the table through a feed box or hopper N, by which a preliminary separation is effected, and different grades of ore are fed at different points on the upper shelf of the table. The feed-hopper H is here shown as being secured to the shaking-table proper by supports m^2; but it may be independent of the table and may be secured to the latter by any suitable means without affecting the character of my invention. The feed-hopper is divided by vertical partitions n into several compartments—in the present instance three—so arranged that there will be a successive overflow from one to the other. This is accomplished in the present case by making the upper edge of each partition successively lower from one end of the hopper to the other, so that the finer material of the pulp will overflow from one compartment to the other, and finally will overflow from the hopper at the lower edge of the lower compartment. The pulp is introduced into the upper compartment of the hopper through the spout L, which is connected with a suitable source of supply. In order to insure a thorough mixing of the pulp, I perforate the partitions n with holes n' near the upper edge of said partition, so that the overflow will take place through these holes. The coarser material which tends to settle in each compartment is drawn off from the bottom through gates or openings m', which are preferably supplied with valves. Spouts are provided for taking the discharge of coarse material from each of the gates m' and conveying it to the upper edge of the upper shelf, where it is acted upon by the table, and the fine material which overflows from the lower end of the hopper is in like manner conveyed by a spout to the upper side of the table. These spouts are so disposed with reference to the table that the coarser material is discharged near the upper end and the finer toward the lower end. The path of the coarser ore passes beneath the points where the finer grades drop onto the table, so that the finer ores dropping into the interstices of the coarser are protected from being washed away by the flow of water. The finer ores are thus kept away from the heavy flow of water which it is necessary to put on with the coarser ores, and the result is a very great saving. As I have constructed the feed-hopper the spouts for conveying the several grades of ore to the table are all formed on an apron M, which is connected by one edge with the lower portion of the hopper, while the opposite edge is near to and parallel with the upper side of the table. (See Fig. 6.) The several spouts are formed by strips m^3, m^4, and m^5, which extend from the hopper out to the discharge edge of the apron, thus forming spouts, three of which receive the discharge from the gates m', while the end one receives the overflow of fine material from the end of the hopper. In order to more thoroughly mix the pulp as it flows through each spout, several perforated diaphragms m extend across the spouts, and the pulp is thus prevented from flowing in single streams and is more thoroughly distributed along the edge of the apron when it overflows onto the table. It will be seen that by this form of feed-hopper there is a constant tendency to separate the pulp into grades by drawing off the coarse material which settles in each compartment and overflowing the finer material into the next compartment below until finally the fine rich slimes are discharged over the lower end of the hopper and are delivered onto the table out of the way of the heavy flow of water which comes with the main body of the pulp. By this preliminary separation the table may be run at a higher speed, the feed of ore increased in amount, and the capacity of the table very largely increased.

The separation of the ores on the surface of the table will be understood on reference to my said prior patent. The motion of the table settles the fine and heavy material into the grooves and moves them along to the end of the table, over which they are discharged. The waste and unconcentrated material is delivered over the side of each of the upper shelves to the next lower shelf through the inclined spouts E, each of which is pitched somewhat from the discharge end to the upper end and has in it several inclined partitions e e, Fig. 5, the lower ends of which are left somewhat above the bottom e' of the spout E. These partitions form a series of inclined passages by which the waste and unconcentrated material from each of the two upper shelves are conveyed to different points on the upper side of the next shelf below. The action of this spout has a tendency to carry forward the process of concentration, as the lighter particles are swept by the action of the water toward the upper end of the spout, while the heavier particles tend to drop into the partitions nearest the discharge end of the table. Again, the motion of the table at the lower ends of the passages as

the table jars tends to form a suction and to draw the material down through. This spout thus not only prevents the material which has once been separated from being again mixed, but it also carries on the process of separation while delivering the material from one shelf to the other. A spout F carries off from the machine the water and tailings from the lower shelf, discharging through an apron *f*.

The grading-box D, by which the concentrates are graded and classified as they come from the ends of the grooves, extends across the end of the table and has an open top divided into compartments by means of strips *d'*, each compartment being so located as to receive the concentrates from one of the several shelves. Means are provided for grading the concentrates from each shelf, so as to combine like grades from the several shelves. To do this I have in the floor of each compartment several openings 1, 2, and 3, through which like grades from each shelf are led through several chutes c', c^2, and c^3 to common discharge-spouts b', b^2, and b^3, Figs. 4 and 5. Each of the openings marked 1 is placed opposite the upper grooves of the shelf, from which the finest concentrates come, the openings 3 are placed opposite the lower grooves, and the openings 2 are placed opposite the middle grooves, as herein shown. The various grades of concentrates are conducted to the discharge-openings by dividing-strips *d*, which are pivoted between the openings, their inner ends swinging adjacent to the end of the table. By moving the ends of the strips one way or the other the concentrates are guided from any desired group of grooves into any of the openings. Each of the openings 1 communicates through the chute c' to the discharge-spout b', so that the finest grades from each shelf are mixed and delivered from a common spout, and the medium and lower grades are treated in the same manner.

I claim—

1. The combination, in an ore-concentrator of a laterally-inclined and longitudinally-reciprocating shaking-table having longitudinal riffles, a grading or separating feed-box, ducts or spouts leading from the feed-box for delivering the several grades of ore along the upper edge of the table and a water-supply means extending along the upper edge of the table outside of the line of delivery of the ore.

2. The combination, in an ore-concentrator of a laterally-inclined and longitudinally-reciprocating shaking-table having longitudinal riffles, a grading or separating feed-box, ducts or spouts leading from the feed-box for delivering the several grades of ore along the upper edge of the table the fine nearer the concentrates' discharge end than the coarse, and a water-supply means extending along the upper edge of the table outside of the line of delivery of the ore.

Signed by me at Canyon city, Colorado, this 13th day of February, 1899.

FRANK LESLIE BARTLETT.

Witnesses:
CHARLES BOCKING,
LAVERNE HOWELL.