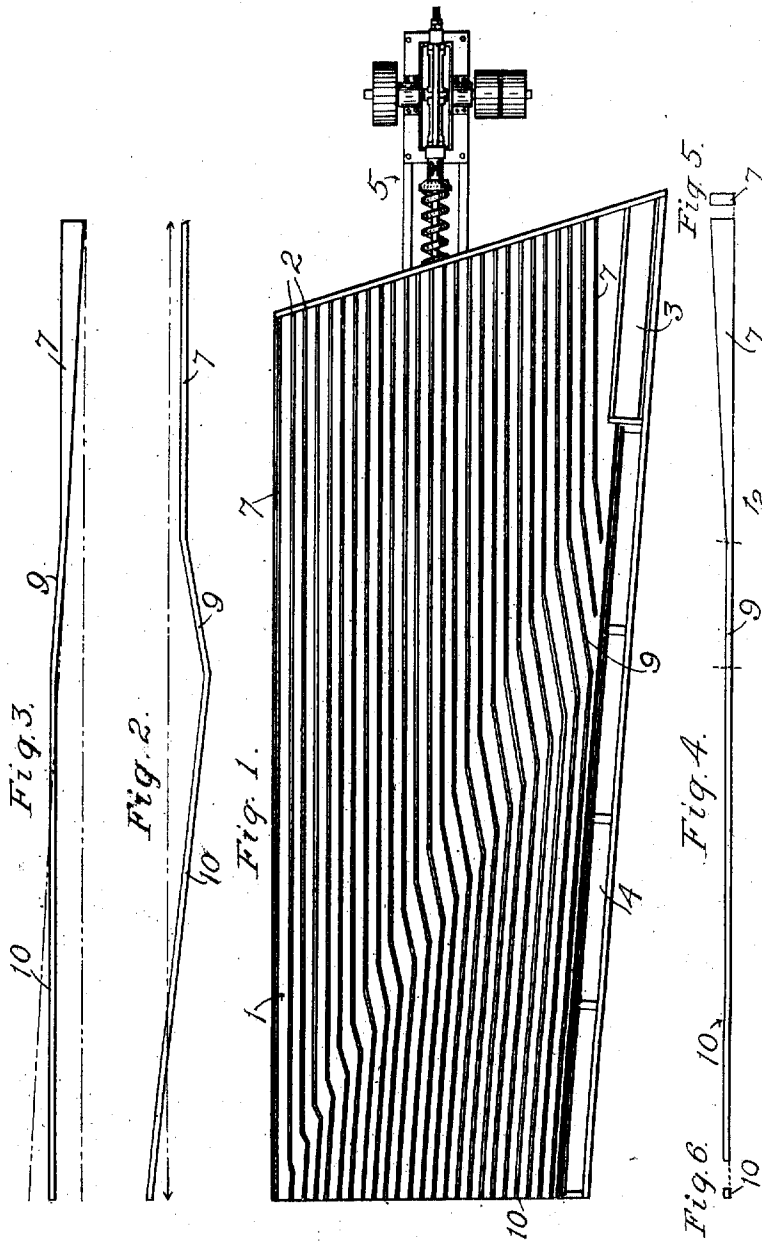


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CONCENTRATOR.
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UNITED STATES PATENT OFFICE.

WILLIAM A. BUTCHART, OF LOS ANGELES, CALIFORNIA.

CONCENTRATOR.

1,000,579.

Specification of Letters Patent. Patented Aug. 15, 1911.

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To all whom it may concern:

Be it known that I, WILLIAM A. BUTCHART, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Concentrator, of which the following is a specification.

This invention relates to improvements on the concentrator table disclosed in my application, Serial No. 608,455, filed in the United States Patent Office February 13th, 1911, and the main object of the present invention is to improve the method of placing the riffles upon the surface of a concentrator table as set forth in said application, with a view to reducing to a minimum the loss of values, facilitating the separation of the values from sands or gangue and sharply differentiating between the discharge of tailings and of values.

The utility of the following described system of riffling depends upon the fact that the mineral contents of pulverized ore may be impelled and conducted along an upwardly inclined channel not parallel to the line of reciprocal motion of the table and against a suitable flow of water moving in a contrary direction, while the pulverized rock or sand is unable to follow the same course and may thus be separated from the mineral. The total rise in such upwardly inclined and deflected channels must be properly proportioned to the specific gravity of the mineral contents of the ore, and as an ore may carry its values in several chemical combinations of different specific gravities, it becomes desirable to so vary the total rise in said deflected channels that all values may be taken into concentrates.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate the invention, and referring thereto: Figure 1 is a plan of the table. Fig. 2 is a plan of one of the riffles. Fig. 3 is a contour diagram of one of the riffles. Fig. 4 is a side elevation of one of the riffles. Fig. 5 is an elevation of the rear end of the riffle shown in Fig. 4. Fig. 6 is an elevation of the front end thereof.

1 designates the concentrator table or deck. Said table is provided with riffles 2, extending longitudinally thereon with a feed box 3 at the rear end and at the side which, in the operation of the machine, is the higher side of the table, and with a water

box 4 on the same side as the feed box and extending the remainder of the length of the table, for supplying wash water to the higher side thereof. Suitable means are provided for supporting the table at an inclination both transverse and longitudinal, and for permitting of longitudinal reciprocating motion imparted to the table by any suitable head motion, for example, means indicated at 5 in Fig. 1.

Each of the riffles of my system comprises a tapering rear portion 7, extending from the rear or feed end of the table to a point intermediate of its length, uniformly diminishing in height from rear to front, and terminating upon a diagonal line extending from a point at the rear of the table near the feed box toward the lower front discharge corner of the table, and a riffle portion indicated at 9 and 10 extending from the termination of said tapered portion to the discharge end of the table, this portion 9 and 10 of the riffle being of practically uniform height throughout its length. These riffles may be made of any suitable material. The two portions described may be made separately and joined upon the table surface, or the whole riffle may be made in one continuous strip combining the features of the two portions, or may be constructed by cutting or otherwise removing from a suitable surface such portion thereof as will leave the said riffles projecting therefrom in the shape and form described. These riffles are of rectangular cross-section throughout their length. The riffles are bent at certain points in such a manner as to divide the table into three distinct areas or zones as follows:

1. The tapering rear portions 7 of the riffles are laid parallel to the line of motion or longitudinal axis of the table, receive the supply of pulverized ore and its accompanying water, and constitute, with their intervening channels, the stratifying zone.

2. From the diagonal line upon which said tapering portions terminate, the succeeding portion 9 of the riffle is not parallel to the line of motion of the table, but extends at an angle thereto and toward the higher or feed and wash water side of the table, for a distance and at an angle determined by the class of ore which the table may be designed to handle. These deflected portions are from one and one-half to three and one-half feet in length near

the feed box, becoming progressively shorter and having a decreasing total rise as the lower front discharge corner of the table is approached to permit discharge of values having low specific gravity. The angle at which these portions are deflected becomes progressively greater as they diminish in length and total rise, the increasing gradient maintaining a uniform backward flow of wash water throughout the area of deflected riffles and giving better control of the finer sand near the lower front discharge corner of the table. This portion of the riffle system constitutes the separating and cleaning zone, and its function is to receive and conduct the already stratified mineral, while the backward flow of water caused by the upward deflection of the riffles, washes away and removes the pulverized rock or sand.

The decreasing length of the deflected riffle portions is preferably such as to give to this zone a triangular shape, the base being at the rear of the table near the feed box and the apex approaching the lower front discharge corner of the table.

3. From the diagonal line forming the forward boundary of the separating and cleaning zone, the succeeding or terminal portion 10 of each riffle is deflected toward the lower side of the table along a course which will equalize the longitudinal elevation and the transverse depression of the table, so that the channels between the riffles are approximately level. This arrangement allows a free transverse flow of water to the separating and cleaning zone, prevents more than the desired amount of water going over the concentrates discharge end of the table, the retention of ample water in the terminal riffle portions being requisite to the proper movement and discharge of the concentrates. These terminal portions of the riffles form the discharge zone.

In operation, the pulverized ore supplied to the table through the feed box, from any suitable source discharging into said box, is received upon the tapering rear portions 7 of the riffles in the stratifying zone, where it is spread in a broad band or sheet, the differential motion of the table causing the mineral content to settle to the bottoms of the inter-riffle channels and to advance thereon toward the separating and cleaning zone, while the lighter sand is washed over the successive riffles toward the lower edge of the table and eventually discharged as waste. When the mineral reaches the deflected portions 9 of the riffles in the separating and cleaning zone, its greater specific gravity and cohesion allow it to be carried forward along the upwardly deflected inter-riffle channels against the backward flow of wash water by which the last traces of sand are removed, this cleaning

being facilitated by the spreading of the concentrates over the wider spaces separating the riffles of the separating and cleaning zone. The heavier portions of the concentrates are stratified and carried forward by the upper tapering riffles and are brought to the separating and cleaning zone at the point of maximum total rise in the inter-riffle channels, while the lighter portions of the concentrates, stratified and carried forward by the tapering riffle portions lower on the table, are brought to the separating and cleaning zone at points where the decreased total rise in the inter-riffle channels is proportionate to the lower specific gravity of such concentrates, and thereupon pass to the discharge zone by reason of having reached points in the cleaning zone at which their specific gravity is sufficient to cause them to be carried over the rise in such inter-riffle channels. In passing from the cleaning zone to the discharge zone, the concentrates are gathered into a compact mass completely filling the narrower inter-riffle channels of the latter, over which the wash water flows unobstructedly to those portions of the cleaning zone lower on the table. The concentrates are carried to the end of the table and discharged into a suitable receptacle, the sand does not pass the separating and cleaning zone and is discharged along the front or lower side of the table.

What I claim is:

1. A reciprocating concentrator table having a plane surface, means for feeding material at the upper rear portion of the table and means for supplying wash water along the upper side of the table, riffles upon said table, comprising tapering rear portions parallel to the line of motion of the table, terminating upon a diagonal line, adjacent riffle portions deflected obliquely toward the higher side of the table and at an angle to the longitudinal axis thereof, said deflected portions progressively decreasing in length from the higher or rear side of the table toward the lower or tailings discharge side thereof, said deflected portions commencing upon the diagonal line formed by the ends of the tapering portions and ending along a line also diagonal to the longitudinal axis of the table, the initial and final ends of said deflected portion of each riffle being nearer to the concentrates discharge end of the table than the corresponding ends of the deflecting riffle portion next higher on the table.

2. A reciprocating concentrator table having a plane surface, means for feeding material at the upper rear portion of the table and means for supplying wash water along the upper side of the table, riffles upon said table, comprising tapering rear portions parallel to the line of motion of

the table, terminating upon a diagonal line, adjacent riffle portions deflected obliquely toward the higher side of the table and at an angle to the longitudinal axis thereof, said deflected portions progressively decreasing in length from the higher or rear side of the table toward the lower or tailings discharge side thereof, in such manner as to form a separating and cleaning zone of substantially triangular shape with the base at the back of the table and the apex near the lower front discharge corner thereof, said deflected portions commencing upon the diagonal line formed by the ends of the tapering portions and ending along a line also diagonal to the longitudinal axis of the table, the initial and final ends of said deflected portion of each riffle being nearer to the concentrates discharge end of the table than the corresponding ends of the deflected riffle portion next higher on the table.

3. A reciprocating concentrator table having a plane surface, means for feeding material at the upper rear portion of the table and means for supplying wash water along the upper side of the table, riffles upon said table, comprising tapering rear portions parallel to the line of motion of the table, terminating upon a diagonal line, adjacent riffle portions deflected obliquely toward the higher side of the table and at an angle to the longitudinal axis thereof, said deflected portions progressively decreasing in length and in total rise, from the higher or rear side of the table toward the lower or tailings discharge side thereof, in such manner as to form a separating and cleaning zone of substantially triangular shape with the base at the back of the table and the apex near the lower front discharge corner thereof, said deflected portions commencing upon the diagonal line formed by the ends of the tapering portions and ending along a line also diagonal to the longitudinal axis of the table, the initial and final ends of said deflected portion of each riffle being nearer to the concentrates discharge end of the table than the corresponding ends of the deflected riffle portion next higher on the table.

4. A reciprocating concentrator table having a plane surface, means for feeding material at the upper rear portion of the table means for supplying wash water along the upper side of the table, riffles upon said table, comprising tapering rear portions parallel to the line of motion of the table, terminating upon a diagonal line, adjacent riffle portions deflected obliquely toward the higher side of the table and at an angle to the longitudinal axis thereof, said angle of deflection of said riffle portions increasing inversely as their length, said deflected portions progressively decreasing in length and total rise, from the higher or rear side of the

table toward the lower or tailings discharge side thereof, in such manner as to form a separating and cleaning zone of substantially triangular shape with the base at the back of the table and the apex near the lower front discharge corner thereof, said deflected portions commencing upon the diagonal line formed by the ends of the tapering portions and ending along a line also diagonal to the longitudinal axis of the table, the initial and final ends of said deflected portion of each riffle being nearer to the concentrates discharge end of the table than the corresponding ends of the deflected riffle portion next higher on the table.

5. A reciprocating concentrator table having a plane surface, means for feeding material at the upper rear portion of the table and means for supplying wash water along the upper side of the table, riffles upon said table, comprising rear portions parallel to the line of motion of the table, terminating upon a diagonal line, adjacent riffle portions deflected obliquely toward the higher side of the table and at an angle to the longitudinal axis thereof, said angle of deflection of said riffle portions increasing inversely as their length, said deflected portions progressively decreasing in length and total rise from the higher or rear side of the table toward the lower or tailings discharge side thereof, in such manner as to form a separating and cleaning zone of substantially triangular shape with the base at the back of the table and the apex near the lower front corner thereof, said deflected portions commencing upon the diagonal line formed by the ends of the tapering portions and ending along a line also diagonal to the longitudinal axis of the table, the initial and final ends of said deflected portion of each riffle being nearer to the concentrates discharge end of the table than the corresponding ends of the deflected riffle portion next higher on the table, and terminal riffles extending from the discharge ends of the deflected riffle portions obliquely toward the lower side of the table upon lines which neutralize the longitudinal and transverse inclinations of the table so that the channels between the riffles are approximately level.

6. A reciprocating concentrator table having a plane surface, means for feeding material at the upper rear portion of the table and means for supplying wash water along the upper side of the table, riffles upon said table, comprising rear portions parallel to the line of motion of the table, terminating upon a diagonal line, adjacent riffle portions deflected obliquely toward the higher side of the table and at an angle to the longitudinal axis thereof, said angle of deflection of said riffle portions increasing progressively from the rear toward the front

of the table, said deflected portions progressively decreasing in length and total rise from the higher or rear side of the table toward the lower or tailings discharge side thereof, in such manner as to form a separating and cleaning zone of substantially triangular shape with the base at the back of the table and the apex near the lower front discharge corner thereof, said deflected portions commencing upon the diagonal line formed by the ends of the tapering portions and ending along a line also diagonal to the longitudinal axis of the table, the initial and final ends of said deflected portion of each rifle being nearer to the concentrates dis-

charge end of the table than the corresponding ends of the deflected rifle portion next higher on the table, and terminal riffles extending from the discharge ends of the deflected rifle portions obliquely toward the lower side of the table upon lines which neutralize the longitudinal and transverse inclinations of the table.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 26th day of May 1911.

WILLIAM A. BUTCHART.

In presence of—

ARTHUR P. KNIGHT,
GLADYS RUSSELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."