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ORE CONCENTRATOR.

APPLICATION FILED OCT. 9, 1905.

921,090. **Patented May 11, 1909.**

3 SHEETS—SHEET 1.

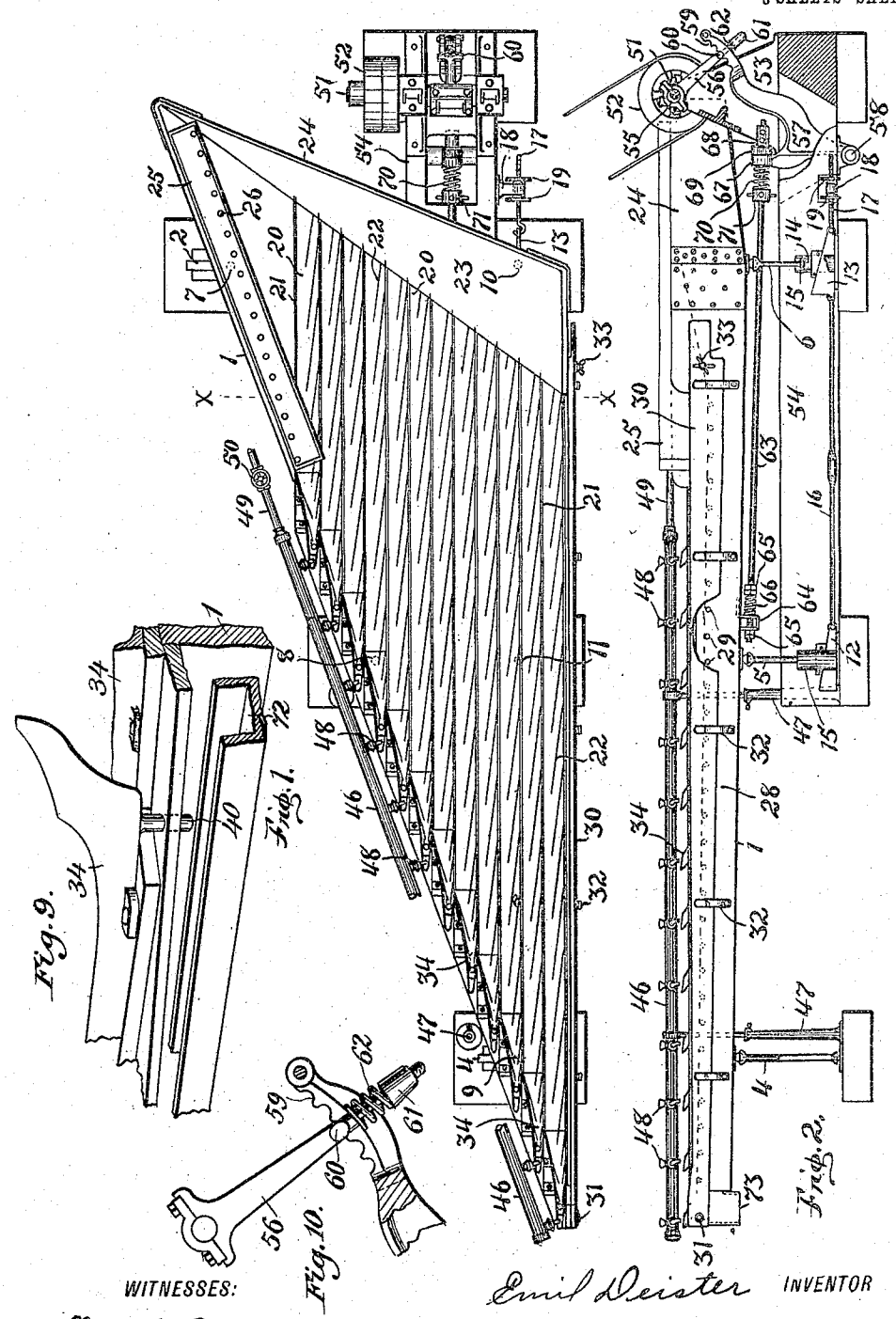


Fig. 1.

Fig. 9.

Fig. 10.

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

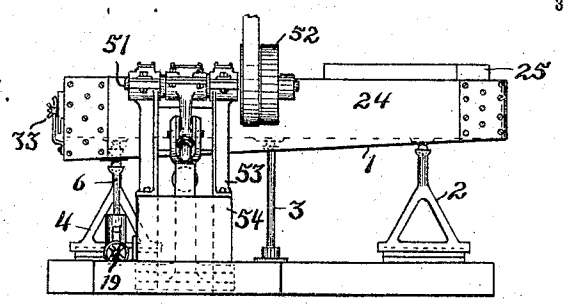


Fig. 4.

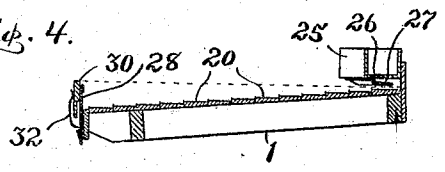


Fig. 5.

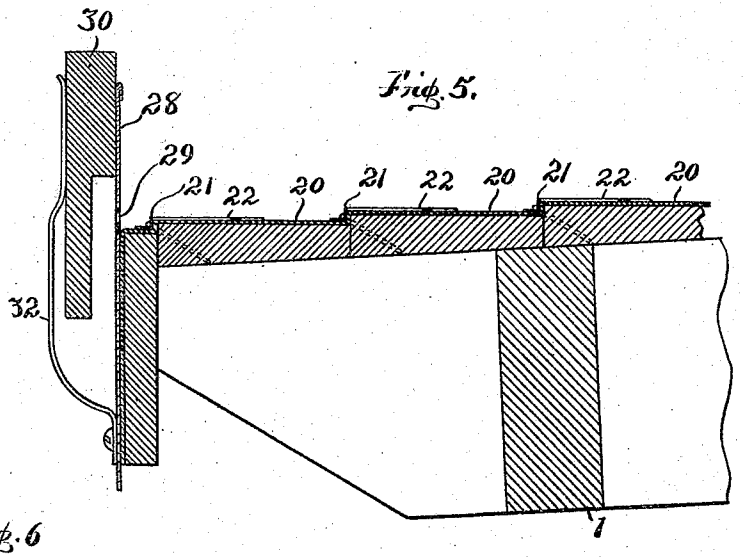
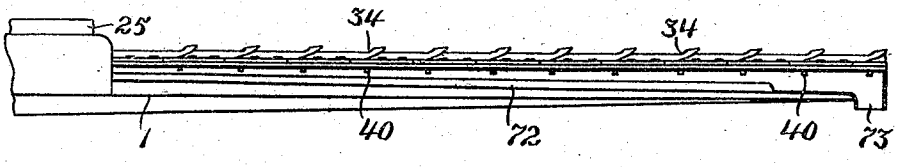


Fig. 6



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3 SHEETS—SHEET 3.

Fig. 7

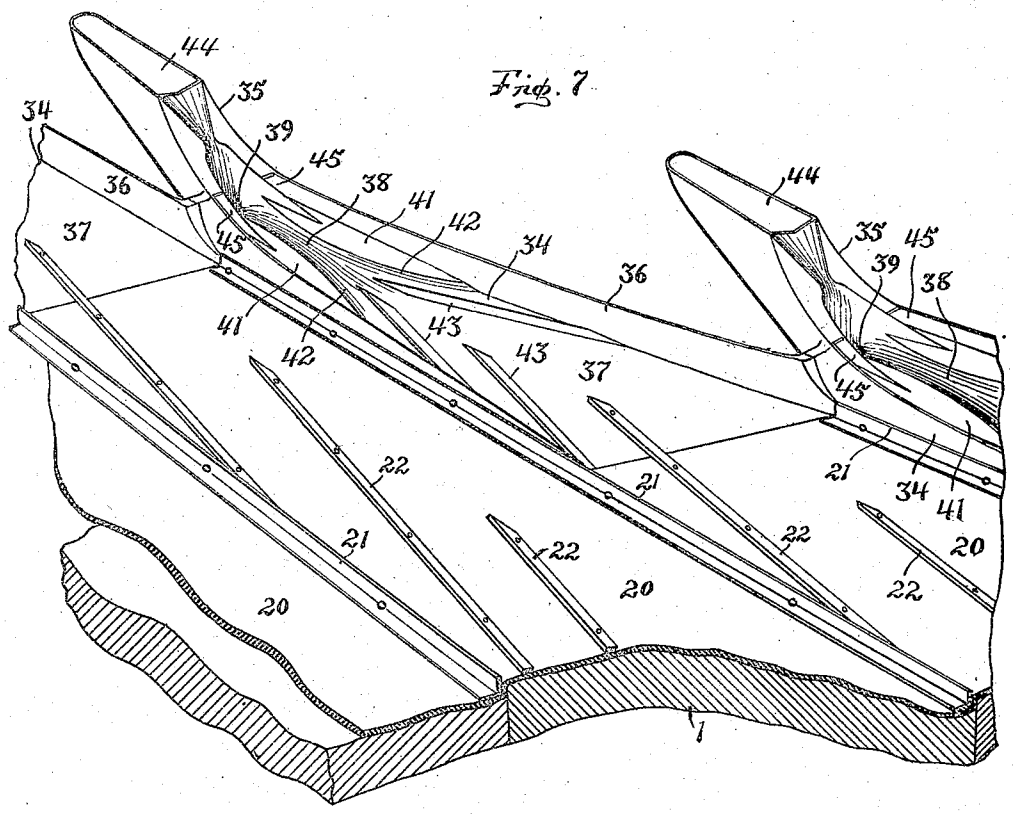
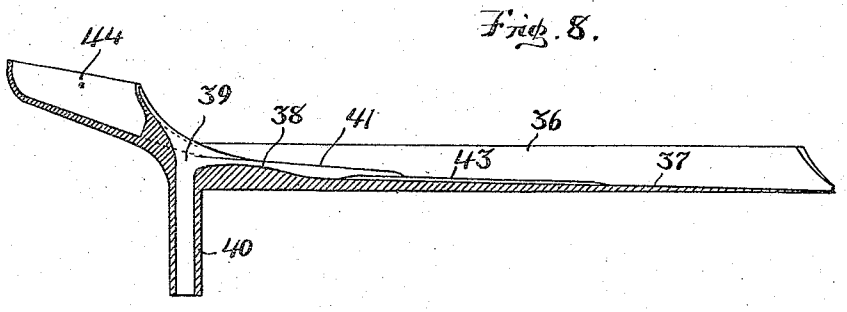


Fig. 8.



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UNITED STATES PATENT OFFICE.

EMIL DEISTER, OF FORT WAYNE, INDIANA, ASSIGNOR TO THE DEISTER CONCENTRATOR COMPANY, A CORPORATION OF INDIANA.

ORE-CONCENTRATOR.

No. 921,090. Specification of Letters Patent. Patented May 11, 1909.

Application filed October 9, 1905. Serial No. 282,043.

To all whom it may concern:

Be it known that I, EMIL DEISTER, a citizen of the United States of America, and resident of Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Ore-Concentrators, of which the following is a specification.

This invention relates to improvements in ore concentrators, and the objects thereof are to facilitate settlement of the metallic portion of ore pulp upon the concentrating surface of the table; and to effect a more perfect final separation of mineral values from the partially concentrated mass of pulp than is ordinarily attained; and further to effect the discharge of concentrates from the concentrating table as they become clean.

The above objects are accomplished by the construction illustrated in the accompanying drawings, in which:

Figure 1, is a plan view of the invention, a portion of the dressing water supply-pipe being cut away; Fig. 2, is a side elevation of the same, a portion of the adjustable dam being cut away for showing discharge openings for tailings; Fig. 3. is a head end elevation of the machine; Fig. 4. is a cross section of the concentrating-table on the line *x*—*x* of Fig. 1; Fig. 5. is a detail view showing a cross section, upon an enlarged scale, of a portion of the concentrating-table on the line *x*—*x* of Fig. 1; Fig. 6. is a detail view showing a portion of the side of the concentrating table where concentrates are discharged; Fig. 7. is a detail view in perspective, upon an enlarged scale, showing the relative position of one shoal with the adjacent shoals; Fig. 8, is a longitudinal section, upon an enlarged scale, of one of the shoals. Fig. 9 is a detail perspective view of one of the shoals and concentrates launder; and Fig. 10 is a detail view showing the connecting rod and spring for holding it in connection with the lever, the latter being shown cut away.

Similar numerals of reference indicate corresponding parts throughout the several views, and referring now to the same: 1 is a concentrating table, preferably of triangular form, mounted upon swinging props 2, 3, 4, 5, and 6, respectively, which admit longitudinal, reciprocating motion to be imparted to the table. The props 2, 3, and 4, are arranged in alinement beneath the table along the longest side thereof and support the same, respectively, at points indicated by the dotted circles 7, 8, and 9; and the props 5 and 6 are similarly arranged beneath the table and support the same at points adjacent the tailings discharge side of the table as indicated respectively by the dotted circles 10 and 11. The two props 2 and 4 are made wide at the base in order to prevent the table from moving laterally respecting the line of motion; and the two props 5 and 6 are made adjustable by means of wedges 12 and 13 so that the tailings discharge side of the table may be elevated or lowered as desired to give the table a suitable decline toward its tailings discharge side. Each of the props 5 and 6 rest upon a movable block 14 which is loosely arranged in a corresponding cylinder 15, the block being adapted to be raised or lowered accordingly as the corresponding wedge is adjusted. The wedges 12 and 13 are connected by a rod 16, and the wedge 13 has in connection therewith a screw-threaded rod 17 which extends through a fixed bracket 18; and the rod 17 has mounted thereon adjusting wheels 19 upon either side of the bracket, so that the wedges may be adjusted and held in a desired position by manipulating the wheels 19.

The concentrating surface of the table is composed of a series of steps 20 arranged in parallel relation with each other, and each successive step is lower than the adjacent preceding step, the lowermost step being nearest the tailings discharge side of the table, and the upper surfaces of all of said steps are approximately level in cross section and range upon a uniform incline toward the concentrates-discharge portion of the table. Along the discharge edge of each step is an upwardly projecting lip 21 which extends throughout the length of the corresponding step, and upon each step is secured a uniform series of riffles 22, each riffle commencing its course at the corresponding lip and ranging diagonally upon the adjacent surface of the corresponding step; and all the riffles are disposed in the direction of the concentrates-discharge side of the table.

At the head end of the table is a gradually sloping breast 23 which extends from the lower ends of the steps upward toward the head-board 24; and a feed-box 25, having feed-openings 26 in the bottom thereof, is mounted in connection with the table along the forward portion of the longest side thereof. An inclined shelf 27 is attached to the underside of the feed-box and serves to more or less distribute the ore-pulp as it passes from the feed-openings onto the table.

Along the tailings-discharge edge of the table is secured an apron 28 consisting of a plate which extends both above and below the adjacent edge of the table, and a series of tailings-discharge openings 29 are made in the apron in line with the adjacent concentrating surface of the table. A vertically adjustable dam 30 rests against the outer face of the apron 28, and extends throughout the length of the apron to the rear end of the table where it is pivotedly connected to the latter as indicated at 31. The dam is held in place against the apron by means of springs 32, and is held in adjusted position by means of a suitably mounted thumb-nut 33.

At the rear end of each step is fixed a shoal 34, the upper surface of which gradually ascends from the adjacent concentrating surface of the corresponding step toward its head 35. The outer edge of each shoal has an upturned flange 36 which extends from its head to the head of the next preceding shoal, where it connects with the adjacent innermost side thereof. The said flanges thus arranged, in connection with the heads of the respective shoals, constitute a levee which prevents an overflow of pulp from the table at its concentrates-discharge side. The concentrating surface 37 of each shoal narrows toward its upper rear portion and leads up to the throat 38 which communicates with the concentrates-discharge opening 39, and the latter opens into a discharge-spout 40. Upon either side of the throat 38 is a miniature plateau 41, each of which extends to the corresponding side of the shoal and has a gradually rounded inner margin 42. Upon the concentrating surface of the shoal are several riffles 43 which lead toward the throat from the corresponding sides of the shoal and extend toward the entrance of its throat, the upper ends of the two rear riffles ranging between the plateaus. The head 35 of each shoal is hollow and has an elongated opening 44 at its top, and has also discharge-ports 45 which lead respectively out upon the corresponding plateaus 41. The shoals are all located in the same horizontal plane, the height of each at the throat being approximately in line with the level of water, upon the table, which is maintained by adjusting the dam accordingly as the tailings-discharge side of the table is raised or lowered. A pipe 46 is supported by suitable standards 47 and extends along the concentrates-discharge side of the table, adjacent the shoals; and a series of cocks 48 connect with the pipe 46, and are adapted respectively to discharge dressing water into the corresponding openings 44 of the corresponding shoals. The pipe 46 is connected with a suitable head of water by means of a connecting pipe 49, the latter having a valve 50.

The actuating mechanism consists of a rotative shaft 51 which has mounted thereon tight and loose pulleys 52, and is mounted in a supporting casting 53 which is secured upon a bed 54. An eccentric 55 on the shaft 51 has driving relation with the connecting rod 56. A lever 57 is connected at its lower end to a shaft 58 which is suitably supported in connection with the bed, and the upper end of the lever is bifurcated and has a series of notches 59 made therein in which the ends of the cross head 60 are adapted to be seated. The cross head 60 is adapted to be shifted from one pair of notches in the bifurcated end of the lever to the other pairs of notches and thus cause the lever to be actuated with a greater or less range of movement, and the cross head is held in position in said notches by means of a screw-threaded hand-piece 61 which is mounted upon the projecting end of the connecting-rod 56. The said hand-piece has in connection therewith a coil spring 62 which acts against the adjacent face of the lever.

A driving rod 63 extends at its rear end through a bracket 64 which is rigidly fixed to the underside of the table, and upon said rod is secured two sets of jam-nuts 65, one set upon either side of said bracket 64; and a stiff coil spring 66 is interposed between one set of said jam-nuts and the bracket, which serves to prevent play between the driving-rod and table. The forward end of the driving-rod extends loosely through a lug 67 which projects from the lever 57, and has mounted upon its extreme end a collar 68. A rubber buffer 69 is interposed between the collar and the adjacent face of the lug 67; and a yielding coil spring 70 is interposed between the opposite face of the lug 67 and an adjacent collar 71 which has screw-threaded relation with the driving-rod. By adjusting the collar 71 so as to increase or decrease the stress upon the spring 70, the degree of differential motion imparted to the table may be varied.

In the operation of this invention, the table is set in differential reciprocating motion lengthwise respecting the steps, and a suitable quantity of dressing water is supplied to the shoals from the cocks 48. Ore pulp is then supplied to the feed-box in the usual manner. It is the intention to maintain a suitable depth of water upon the table, and to effect

this the dam 30 is raised sufficiently so that the water will rise upon the table to a height approximately in line with the throats of the shoals. The tailings-openings 29, in the apron, are numerous and of a size capable of passing the solids of the tailings, but are not such as to drain the table of its body of water so as to prevent the water overflowing the dam while the contemplated quantity of pulp is being supplied to the machine. Because of the buoyancy afforded the pulp by the detained body of water upon the table, the mineral values of the pulp quickly settle upon the concentrating surface of the table, and thereupon are carried toward the shoals because of the differential motion of the table. The pulp tends to move toward the tailings-discharge side of the table, and the underlying portion of the settled ore-matter is moved toward the shoals, while the overlying portion thereof falls from step to step successively to the discharge edge of the table where it becomes discharged through the tailings-openings 29, or is carried over the dam with the overflow water. The underlying portion of the settled ore-matter is detained upon the steps more or less because of the projecting lips 21, and is further conserved upon the steps by the diagonally disposed riffles thereon, and as such underlying ore-matter reaches the shoals it will have become more or less separated from the gangue and may be said to have been partially concentrated. This partially concentrated material enters the shoals and masses at the entrance of the throats thereof, and is there shaken and simultaneously subjected to the washing action produced by the discharge of dressing water from the ports 45. The effect of this treatment is such as to cause the lighter portions of the partially concentrated masses to pass backward from the throats of the shoals and fall over the inner edges thereof upon the next succeeding steps respectively. The heavier portions of the partially concentrated masses, thus freed from the lighter portions, pass onward through the throats and into the openings 39 and are discharged through the spouts 40. A launder 72 is secured to the table immediately beneath the spouts 40 to receive the discharge of concentrates therefrom, and the discharge end 73 of the launder is preferably located at the rear end of the table.

A particular feature in the operation of this invention is that the partially concentrated material is treated in the shoals to a shaking and washing action in masses, in contradistinction to the common practice of spreading the partially concentrated material in a thin layer over a smooth and unprotected, or unriffled, washing surface; and in the present invention the concentrates become discharged from the table as they become cleaned, instead of being conveyed over a long course to a common concentrates-discharge place as on ordinary tables, thus avoiding a loss of mineral values occasioned by protracted contact with the dressing water as usually applied. Another feature of this invention is in the position of the adjustable props 5 and 6 relative to the table and the non-adjustable props 2, 3, and 4: It will be obvious that by raising or lowering the former props, the table will thereby become tilted so that the longitudinal incline of the steps will be decreased or increased accordingly without altering the horizontal position of the concentrates-discharge side of the table, and therefore, the shoals will be maintained at a uniform height; and when the table is tilted by lowering or raising the adjustable props, movement of pulp toward the tailings-discharge side of the table will accordingly be accelerated or retarded.

Matter somewhat similar in character is contained in a previous application, Sr. No. 274,515, filed by me August 17, 1905, for "ore concentrators", the similarity residing particularly in the shoals.

Having described my invention what I claim as new and desire to secure by Letters Patent, is:

1. In an ore concentrator, a transversely inclined reciprocating concentrating table, having a level concentrates-discharge portion, the concentrating surface of the table being composed of a series of steps arranged longitudinally and in parallel relation with each other and in line with the direction of the motion of the table, approximately, and all the steps ranging upon an incline toward the said concentrates-discharge portion; an upwardly projecting lip secured along the discharge edge of each step; a series of riffles secured upon the concentrating surface of each step, each riffle commencing its course at the corresponding lip and ranging diagonally upon the adjacent surface of the corresponding step; a shoal located at the rear end of each step, the concentrating surface of each shoal ascending from the concentrating surface of the corresponding step, each shoal having a throat and discharge opening; means for supplying each shoal with dressing water at the sides of its throat; and a dam in connection with the tailings-discharge side of the table adapted to maintain a water level upon the table approximately in line with the throats of the shoals.

2. In an ore concentrator, a transversely inclined reciprocating concentrating table, the concentrates-discharge side of which ranges in a horizontal plane, having thereon a series of riffles adapted to direct underlying ore-matter toward its concentrates-discharge side; a series of shoals arranged along the concentrates-discharge side of the table, each

ranging upon an incline from the adjacent concentrating surface thereof, and each having a throat and discharge opening; means for supplying dressing water to each shoal at the sides of its throat; and a dam in connection with the tailings-discharge side of the table adapted to maintain a water level over the table approximately up to the throats of the shoals.

3. In an ore concentrator, a transversely inclined reciprocating concentrating table having riffles thereon adapted to direct underlying ore-matter toward its concentrate discharge side; a series of shoals located along the concentrates discharge side of the table, each having a discharge opening near its head, and throat leading from its concentrating surface to its opening, the outer edge of each shoal being higher than its inner edge; and means for supplying dressing water to each shoal at the sides of its throat.

4. In an ore concentrator, a transversely inclined reciprocating concentrating table, the concentrates-discharge side of which ranges in a horizontal plane, having thereon a series of riffles adapted to direct underlying ore-matter toward its concentrates-discharge side; a series of shoals arranged in successive order along the concentrates-discharge side of the table, the outer edge of each shoal having an upturned flange, the said flanges constituting a levee adapted to prevent an overflow of pulp from the table at its concentrates-discharge side, and each shoal having also a throat and discharge opening; means for supplying dressing water to each shoal at the sides of its throat; and a dam in connection with the tailings-discharge side of the table adapted to maintain a water level over the table approximately up to the throats of the shoals.

5. In an ore concentrator, a transversely inclined reciprocating concentrating table having riffles thereon adapted to direct underlying ore-matter toward its concentrates-discharge side; a series of shoals located along the concentrates-discharge side of the table, each having a throat at its discharge end and plateaus upon each side of its throat; and means for supplying dressing water to each shoal upon its plateaus.

6. In an ore concentrator, a transversely inclined reciprocating concentrating table of triangular form, and having riffles thereon adapted to direct underlying ore-matter toward its concentrates-discharge side, the said concentrates-discharge side ranging in a horizontal plane; a series of shoals, at the concentrates-discharge side of the table, adapted to receive ore-matter directly from the adjacent concentrating surface of the table, each shoal having a discharge opening, and throat leading from its concentrating surface to its opening, the outer edge of each shoal being higher than its inner edge; and means for supplying dressing water to each of said shoals at the sides of its throat.

7. In an ore concentrator, a transversely inclined reciprocating concentrating table having riffles thereon adapted to direct underlying ore-matter toward its concentrates-discharge side; a series of shoals located along the concentrates-discharge side of the table, each having a throat and discharge opening; an upwardly projecting apron, secured along the tailings-discharge side of the table, having tailings openings therein in line with the adjacent concentrating surface of the table; a dam in connection with the apron adapted to maintain a water level over the table approximately up to the throats of the shoals; and means for supplying dressing water to each shoal at the sides of its throat.

8. In an ore concentrator, a transversely inclined reciprocating concentrating table of triangular form, the concentrates-discharge side of which is level and the tailings-discharge side of which ranges upon an incline toward its rear end, and the concentrating surface of which is composed of a series of steps which extend lengthwise up to the concentrates-discharge side thereof; a series of shoals located along the concentrates-discharge side of the table, one at the end of each step, and being adapted for the purpose set forth; means for supplying dressing water to each shoal; and a dam in connection with the tailings-discharge side of the table adapted to maintain a water level over the table approximately up to its concentrates-discharge side.

9. In an ore concentrator, a transversely inclined reciprocating concentrating table of triangular form, the concentrates-discharge side of which is level, and the tailings-discharge side of which ranges upon an incline toward its rear end, and the concentrating surface of which is composed of a series of steps which extend lengthwise up to the concentrates-discharge side thereof, each step having an upwardly projecting lip along its discharge edge; a shoal located at the rear end of each step adapted for the purpose set forth; a series of diagonally disposed riffles upon each of said steps, each riffle commencing its course at the corresponding lip; means for supplying dressing water to each shoal; and a dam in connection with the tailings-discharge side of the table adapted to maintain a water level over the table approximately up to its concentrates-discharge side.

10. In an ore concentrator, a transversely inclined reciprocating concentrating table of triangular form, the concentrates-discharge side of which is level, and the tailings-dis-

charge side of which ranges upon an incline toward its rear end, and having thereon a series of riffles adapted to direct underlying ore-matter toward its concentrates-discharge side; a series of shoals located along the concentrates-discharge side of the table; means for supplying dressing water to each shoal; and a dam in connection with the tailings-discharge side of the table adapted to maintain a water level over the table approximately up to its concentrates-discharge side.

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

EMIL DEISTER.

Witnesses:
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